BANKSTOWN AIRPORT

SOUTH WEST PRECINCT SITE WORKS AND WAREHOUSE MAJOR DEVELOPMENT PLAN

VOLUME 2

NOVEMBER 2019

SYDNEY **METRO** AIRPORTS

BANKSTOWN

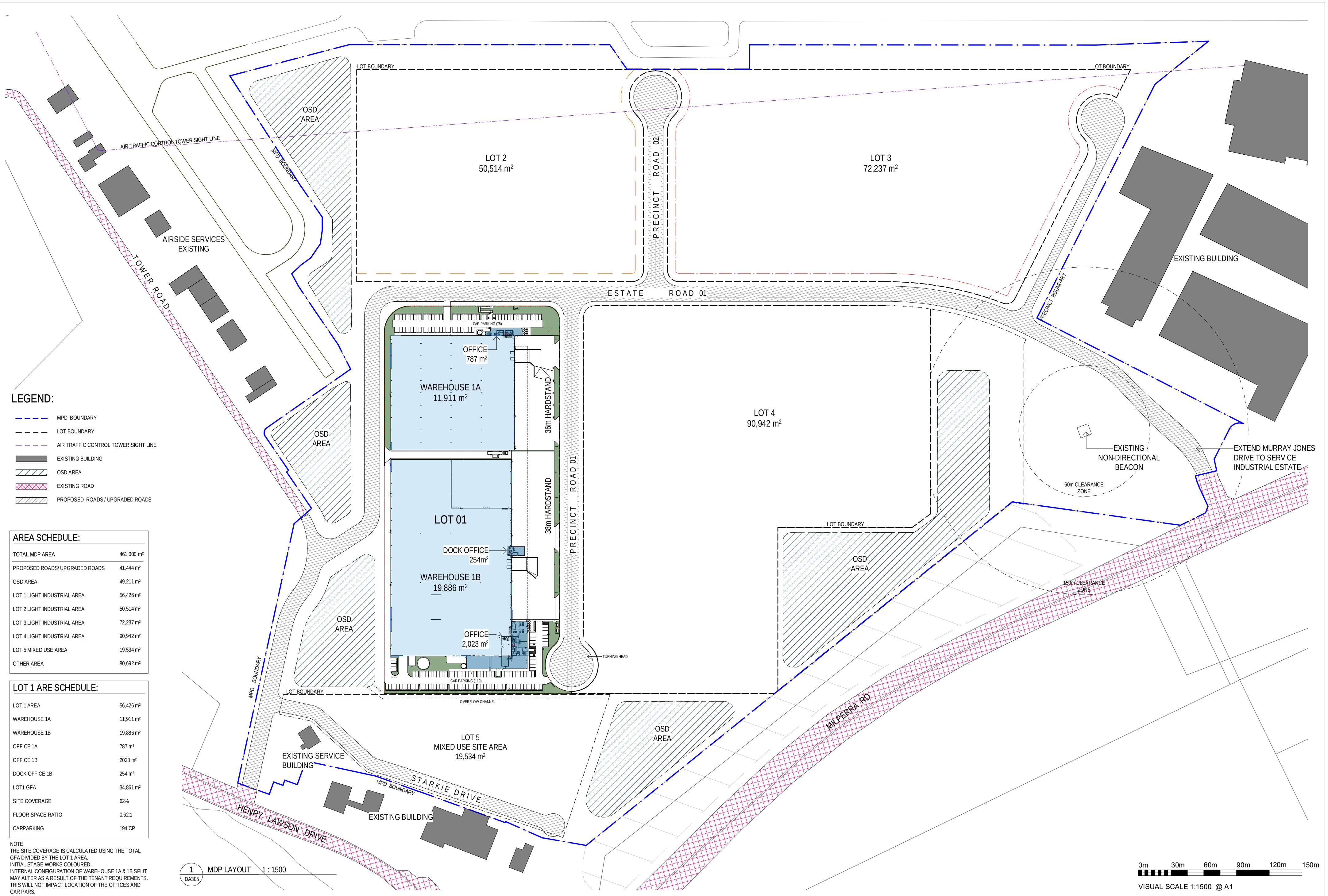
APPENDIX A

CONSISTENCY WITH THE AIRPORTS ACT 1996

Major Airport Development triggers (section 89 of the Airports Act 1996)	Site Works and Warehouse Project Comment
(a) constructing a new runway	Not applicable
(b) extending the length of a runway	Not applicable
(ba) altering a runway (other than in the course of maintenance works) in any way that significantly changes: (i) flight paths; or (ii) the patterns or levels of aircraft noise	Not applicable - no alteration of runways are proposed
(c) constructing a new building wholly or principally for use as a passenger terminal, where the building's gross floor space is greater than 500 square metres	Not applicable – the building will not be used as a passenger terminal
(d) extending a building that is wholly or principally for use as a passenger terminal, where the extension increases the building's gross floor space by more than 10%	Not applicable – the building will not be used as a passenger terminal
(e) constructing a new building, where: (i) the building is not wholly or principally for use as a passenger terminal; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Yes - Value of building will exceed $20 million
(f) constructing a new taxiway, where: (i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(g) extending a taxiway, where: (i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(h) constructing a new road or new vehicular access facility, where: (i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(j) extending a road or vehicular access facility, where: (i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(k) constructing a new railway or new rail handling facility, where: (i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(l) extending a railway or rail handling facility, where: (i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds $20 million or such higher amount as is prescribed	Not applicable
(m) a development of a kind that is likely to have significant environmental or ecological impact	The Project will not likely have any significant environmental or ecological impact
(n) a development which affects an area identified as environmentally significant in the environment strategy	The Project will not affect an area which is identified as environmentally significant
(na) a development of a kind that is likely to have a significant impact on the local or regional community	The Project is likely to have a positive impact on the local and regional community, providing jobs and additional services.
(nb) a development in relation to which the Minister has given an approval under section 89A	Not applicable
(o) a development of a kind specified in the regulations	Not applicable

APPENDIX B

CONCEPT PLANS



LEGEND:

— · —	MPD BOUNDARY
- - -	LOT BOUNDARY
- - -	AIR TRAFFIC CONTROL TOWER SIGHT LINE
■	EXISTING BUILDING
▨	OSD AREA
▩	EXISTING ROAD
▨	PROPOSED ROADS / UPGRADED ROADS

AREA SCHEDULE:

TOTAL MDP AREA	461,000 m²
PROPOSED ROADS/ UPGRADED ROADS	41,444 m²
OSD AREA	49,211 m²
LOT 1 LIGHT INDUSTRIAL AREA	56,426 m²
LOT 2 LIGHT INDUSTRIAL AREA	50,514 m²
LOT 3 LIGHT INDUSTRIAL AREA	72,237 m²
LOT 4 LIGHT INDUSTRIAL AREA	90,942 m²
LOT 5 MIXED USE AREA	19,534 m²
OTHER AREA	80,692 m²

LOT 1 ARE SCHEDULE:

LOT 1 AREA	56,426 m²
WAREHOUSE 1A	11,911 m²
WAREHOUSE 1B	19,886 m²
OFFICE 1A	787 m²
OFFICE 1B	2023 m²
DOCK OFFICE 1B	254 m²
LOT1 GFA	34,861 m²
SITE COVERAGE	62%
FLOOR SPACE RATIO	0.62:1
CARPARKING	194 CP

NOTE:
THE SITE COVERAGE IS CALCULATED USING THE TOTAL GFA DIVIDED BY THE LOT 1 AREA.
INITIAL STAGE WORKS COLOURED.
INTERNAL CONFIGURATION OF WAREHOUSE 1A & 1B SPLIT MAY ALTER AS A RESULT OF THE TENANT REQUIREMENTS. THIS WILL NOT IMPACT LOCATION OF THE OFFICES AND CAR PARS.

1 / DA305 MDP LAYOUT 1 : 1500

0m 30m 60m 90m 120m 150m

VISUAL SCALE 1:1500 @ A1

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ISSUE	DESCRIPTION	DATE
I	ISSUE FOR INFORMATION	09/09/19
H	COORDINATION ISSUE	07.05.18
G	COORDINATION ISSUE	03.05.18
F	COORDINATION ISSUE	24.04.18
E	COORDINATION ISSUE	19.04.18
D	COORDINATION ISSUE	16.04.18
C	COORDINATION ISSUE	13.04.18
B	COORDINATION ISSUE	11.04.18

CLIENT

BANKSTOWN AIRPORT INDUSTRIAL - SOUTH WEST PRECINCT

BANKSTOWN AIRPORT - SITE WORKS & WAREHOUSE MAJOR DEVELOPMENT PLAN

NORTH

TITLE
MDP LAYOUT

JOB NO.	DWG NO.	SCALE	REDUCED SCALE (A3)	DATE
17202	SK12	As indicated @ A1	HALF A1	09/09/19

REVISION
I

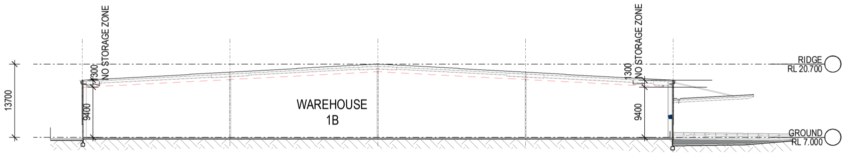
9/09/2019 4:48:28 PM C:\Users\PC USER\Documents\17202_Bankstown Airport Industrial_BASE_R19_Stephen_SBA.rvt

1 EAST ELEVATION 1 : 500

2 WEST ELEVATION 1 : 500

3 SOUTH ELEVATION 1 : 500

4 NORTH ELEVATION 1 : 500



5 TYPICAL SECTION 1 : 500

0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

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ISSUE	DESCRIPTION	DATE
1	ISSUE FOR INFORMATION	09/09/2019

CLIENT

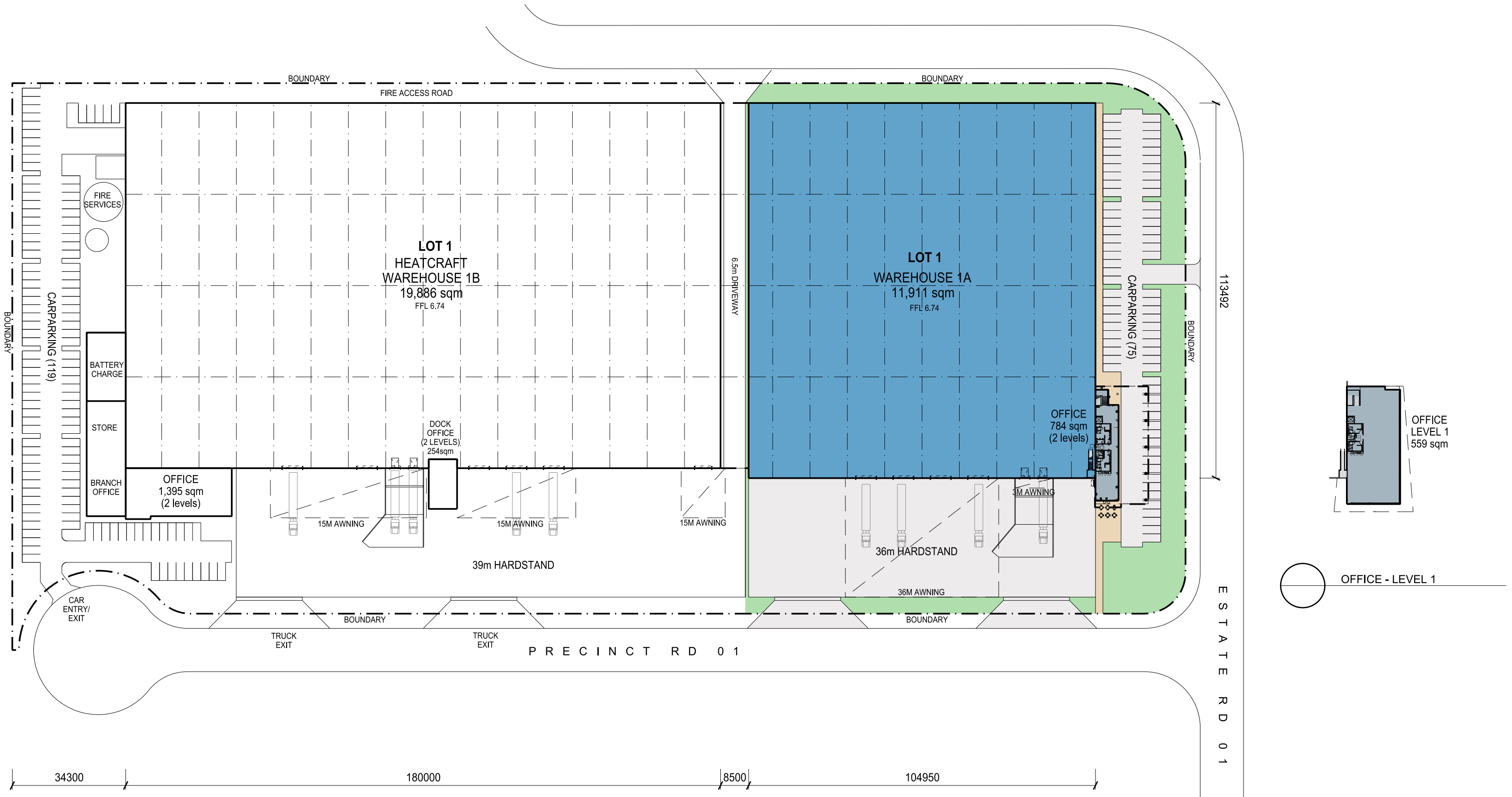
INDUSTRIAL DEVELOPMENT

BANKSTOWN AIRPORT SOUTHWEST PRECINCT

NORTH

TITLE
MDP ELEVATIONS

DATE	SCALE	JOB NO.	DWG NO.	REVISION
09/09/2019	1 : 500 @A1	19129	SK15	1



LOT 1A AREA SCHEDULE

WAREHOUSE 1A	11,911 sqm
OFFICE GROUND	225 sqm
OFFICE LEVEL 1	559 sqm
1A GFA	12,695 sqm
CARPARKING	75 cp

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ISSUE	REV.	DESCRIPTION	DATE

PROPOSED WAREHOUSE FACILITY

BANKSTOWN AIRPORT - SOUTH WEST PRECINCT

DRAWING TITLE
WAREHOUSE 1A PLAN

DATE	SCALE	JOB NO.	DRAWING NO.	ISSUE
08.08.19	1:1500@A3	19129	MK 01	A

APPENDIX C

CONSTRUCTION

CEMP Outline

1. DEFINITIONS
2. INTRODUCTION
    - 2.1. Purpose
    - 2.2. Objective
3. PROJECT DETAILS
    - 3.1. Project Description
    - 3.2. Legislative Requirements
    - 3.3. Construction Program
    - 3.4. Plant and Equipment to be used on Site
    - 3.5. Responsibility and Key Contacts
4. GENERAL MANAGEMENT REQUIREMENTS
    - 4.1. Environmental Awareness and Training
    - 4.2. Environmental Management Records
    - 4.3. Waste Disposal
    - 4.4. Dewatering
    - 4.5. Monitoring and Auditing
    - 4.6. Complaint Handling
    - 4.7. Non Conformance with Targets
    - 4.8. Environmental Incidents and Emergencies
    - 4.9. Required Approvals
    - 4.10. Reporting
5. IDENTIFICATION AND MANAGEMENT OF ENVIRONMENTAL ISSUES
    - 5.1. Identification of Potential Environmental Impact
    - 5.2. Establishment of Environmental Risk
    - 5.3. Identification of Environmental Management Measures
    - 5.4. Site Management
        - 5.4.1. Site Access
        - 5.4.2. Traffic Management
    - 5.5. Demolition
    - 5.6. Erosion and Sediment Control
    - 5.7. Air Quality Management
    - 5.8. Water Quality Management (Stormwater and Flood)
    - 5.9. Flora

ISO A1 594mm x 841mm

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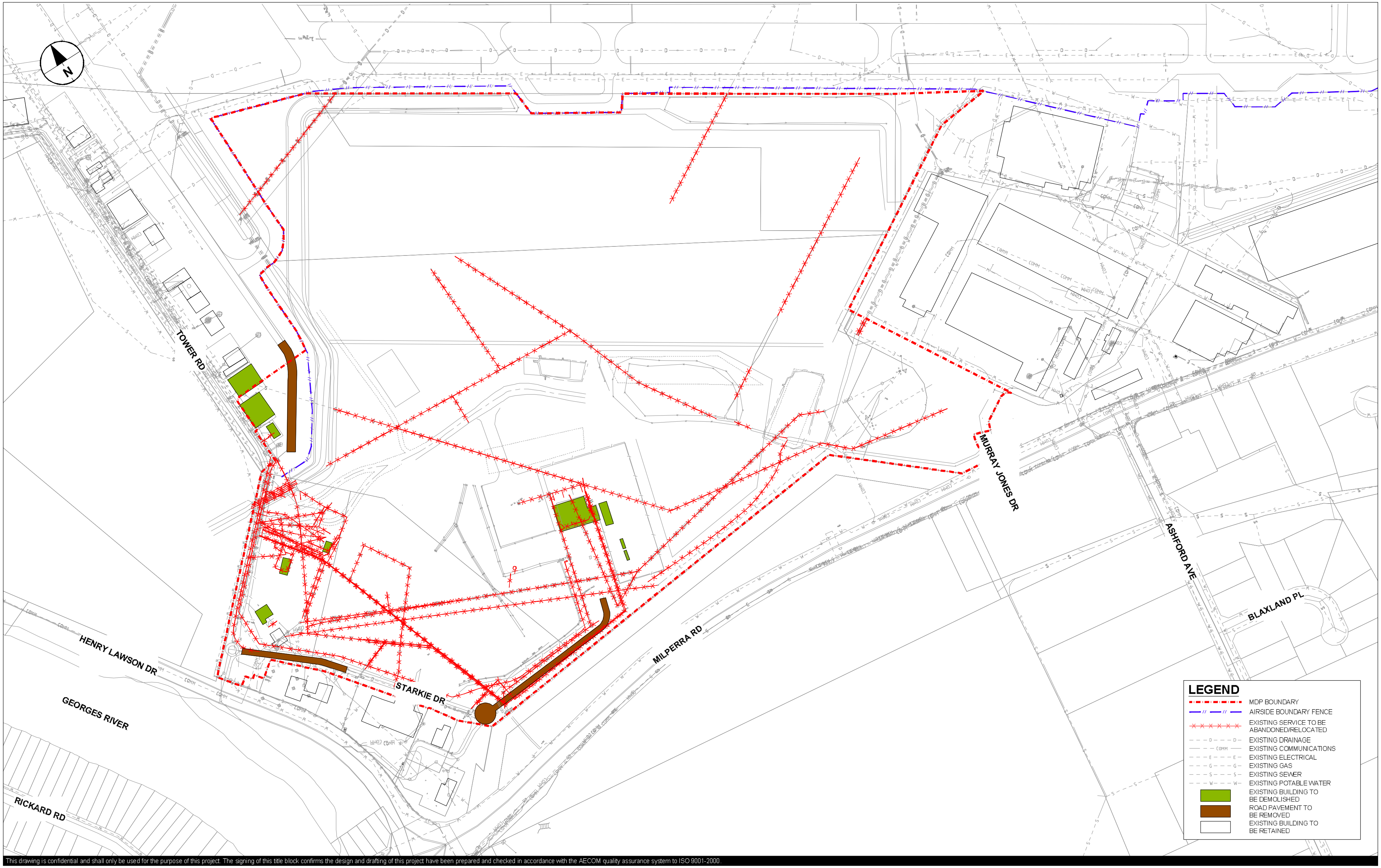
Filename: \\AUSYD1FP001\PROJECTS\605X\60569579\5. CAD\25-SKETCHES\60569579-SKE-00-1000-CI-0007.DWG



This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system to ISO 9001-2000.

AECOM

CONSULTANT

AECOM Australia Pty Ltd
A.B.N 20 093 846 925
www.aecom.com

PROJECT

Bankstown Airport -
South West Precinct
Site Works and
Warehouse MDP

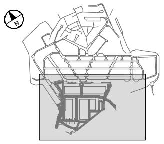
CLIENT

SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN



PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	17.05.2018	FOR INFORMATION
01	19.04.2018	FOR INFORMATION

PROJECT NUMBER

60569579

SHEET TITLE

DEMOLITION
PLAN

SHEET NUMBER

60569579-SKE-00-1000-CI-0007

APPENDIX D

AVIATION ASSESSMENT

Bankstown Airport Ltd (BAL)
July 2018

Bankstown Airport
South-West Precinct Site Works and Warehouse Major Development Plan

Aviation Assessment

Bankstown Airport – South-West Precinct Site Works and Warehouse Major Development Plan

Aviation Assessment

Client: Bankstown Airport Ltd

ABN: N/A

Prepared by

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ABN 20 093 846 925

03-Jul-2018

Quality Information

Document Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Ref 60569579

Date 03-Jul-2018

Prepared by Joseph Coughlan

Reviewed by Richard Murran & Robbie Williams

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	23-May-2018	Draft for Review	Richard Murran Principal Engineer	Richard Murran
1	03-Jul-2018	For Review	Robbie Williams Principal Engineer	Robbie Williams

Table of Contents

1.0 Overview

This report provides a detailed summary of the aviation considerations and related constraints for the Bankstown Airport South West Precinct Site Works and Warehouse Major Development Plan (MDP). The South West Precinct development at Bankstown Airport needs to take into consideration the potential impacts that any development of sites will pose on existing aviation operations. Such consideration includes building height limitations (OLS and PANS-OPS), navigational aids, noise, public safety risk, ground lighting, bird hazard management, and reflectivity and glare.

International regulatory requirements are currently implemented by the Commonwealth Airports (Protection of Airspace) Regulations 1996 (Airspace Protection Regulations), Civil Aviation Safety Regulations 1998, the Civil Aviation (Building Control) Regulations 1988 and the Civil Aviation Safety Authority's Manual of Standards Part 139.

Guidance is also provided by the National Airports Safeguarding Advisory Group (NASAG) in the National Airports Safeguarding Framework (NASF). Each of the NASF guidelines and how they apply to the proposed development has been addressed.

2.0 Protected Airspace

2.1 Obstacle Limitation Surface

The Obstacle Limitation Surface (OLS) is a conceptual envelope associated with a runway, which defines the lower limits at which objects become obstacles to aircraft operations in aerodrome airspace.

The existing OLS envelope in relation to the proposed warehouse location is presented in Appendix A on drawing 0001. Bankstown Airport has also developed a future OLS to safeguard for any potential upgrades to the current runway classifications. The future OLS is based on a higher runway classification and therefore has a reduced development height allowance. The future OLS is presented in Appendix A on drawing 0002. The proposed warehouse does not result in any penetration of the existing OLS or the future OLS.

2.2 PANS-OPS

The PANS-OPS (Procedures for Air Navigation Services – Aircraft Operations) defines the rules for designing instrument approach and departure procedures. The PANS-OPS surfaces are defined in accordance with the International Civil Aviation Organisation Procedures for Air Navigation Services – Aircraft Operations (Doc 8168).

Bankstown Airport have provided existing and future PANS-OPS surfaces which are presented with the proposed warehouse in Appendix A on drawings 0003 and 0004. The existing and future PANS-OPS surfaces are not impacted by the proposed warehouse development.

2.3 Sydney Radar Terrain Clearance Chart (RTCC)

The purpose of the Sydney RTCC is to protect the operation of radar signals used by Air Traffic Controllers around the Sydney region. The Sydney RTCC maps heights for different regions around Sydney that obstacles are not allowed to exceed. This chart has been reviewed and the proposed development is within the acceptable range specified by the RTCC.

3.0 Navigational Aids

3.1 Wind Indicator

CASA Manual of Standards (MOS) Part 139 (v1.14) requires Airports to install and maintain at least one wind direction indicator and requires that non-precision approach runways be provided with a wind direction indicator at the threshold of the runway.

CASA MOS Part 139 lists the following requirements in relation to wind indicators:

- A wind direction indicator must be located so as to be visible from aircraft that are in flight or aircraft that are on the movement area.
- A wind direction indicator must be located so as to be free from the effects of air disturbance caused by buildings or other structures.
- A wind direction indicator provided at the threshold of a runway must be located:
    - On the left hand side of the runway as seen from a landing aircraft (if possible);
    - Outside the runway strip; and
    - Clear of the transitional obstacle limitation surface.

Bankstown Airport has two illuminated wind indicators, one located in the north west sector and the other located in the south east sector.

The Bureau of Meteorology provides guidance on the siting of wind indicators in the document Observation Specification No. 2013.1 Guidelines for the siting and exposure of meteorological instrument and observing facilities. The document lists the WMO (World Meteorological Organization) standard as the minimum requirement which states an obstruction free slope of 1:10. This protection surface with the proposed development is shown in Appendix A on drawing 0005.

Based on the current location of the illuminated wind indicator there are no impacts envisaged as a result of potential development within the South West Precinct.

3.2 Non-Direction Beacon (NDB)

A Non-Directional Beacon is a low frequency radio transmitter used for non-precision approaches. Bankstown Airport has a single NDB in operation located immediately adjacent to Murray Jones Drive.

CASA MOS Part 139 provides the following guidance around the NDB:

- The immediate 150m radius area around the NDB should be kept free of buildings exceeding 2.5m; and
- The immediate 60m radius area around the NDB should be kept free of buildings less than 2.5m and any vehicular movement.

The proposed warehouse is outside of both the 60m and 150m exclusion zones as shown in Appendix A on drawing 0006.

The proposed realignment of Murray Jones Drive access road from Milperra Road into the South West Precinct does fall within the 60m exclusion zone. The road alignment will also require the maintenance access to the control unit to be moved from the east side to the south side of the unit to avoid vehicles stopping on Murray Jones Drive. These changes were presented to Airservices Australia who own and operate the NDB, confirmed by email the proposals were acceptable, refer to the email in Appendix B. Airservices Australia is an Australian corporate Commonwealth entity responsible for Australia's airspace management, aeronautical information, aviation communications, radio navigation aids and aviation rescue firefighting services.

A meeting was held with Airservices Australia on 7th December 2017 (meeting minutes contained in Appendix B) to discuss the interface between the non-directional beacon and the South West Precinct development.

The following guidance was provided around operational constraints:

- The 60m offset requirement around the beacon could be infringed by civil infrastructure e.g. roads and earthworks batters;
- Any development needs to avoid the fenced radiation zone (approximately 5m x 5m) located within the 60m exclusion zone;
- On site detention could be located within the 60m zone around the NDB provided that any stormwater would be temporary in nature i.e. non-permanent water body.

Another meeting was held with Airservices Australia on 11th April 2018, focussed on the NDB, to present the updated proposal to them for their review. An email summary of the meeting and Airservices Australia's response that the proposal is acceptable are shown in Appendix B.

Following the consultation with Airservices Australia and the recommended operational constraints, the proposed developments for the South West Precinct have been deemed to not have an impact on the NDB.

3.3 Precision Approach Path Indicator (PAPI)

Runway 11C/29C is equipped with a Precision Approach Path Indicator at each end of the runway. There is an obstacle assessment surface associated with the PAPI to ensure that its operation is not impacted by obstacles. The protection surface is defined in MOS Part 139 and consists of a rising plane that starts at the surface elevation at the end of the runway and rises at a rate of 1.9 degrees. This surface is shown on drawing 0013 and shows that the proposed development has no impact on the operation of the PAPI.

4.0 Air-Traffic Control Tower

The Air Traffic Control Tower (ATCT) is located along Tower Road in the north-western corner of the proposed South West Precinct. The tower was commissioned in 1970 and is heritage listed. The existing ATCT has a height of 15m to the cabin floor (source: Airservices Australia).

A survey of the external features of the ATCT was carried out on the 26/09/2017 and based on the surveyed elevations the eye elevation was assumed to be 22.0mAHD.

The line of sight from the control tower to the airfield manoeuvring area has been considered in the design of proposed developments. An area of approximately 6 hectares to the northern boundary of the South West Precinct area is directly interfaced by the control tower sight lines. This represents the developable areas that could potentially have height restrictions in order to accommodate the viewing angle of the ATCT. These sight lines are critical and cannot be negotiated with the authorities.

A meeting was held with Airservices Australia on 7th December 2017 (meeting minutes contained in Appendix B) to discuss the interface between the ATCT line of sight and the South West Precinct development.

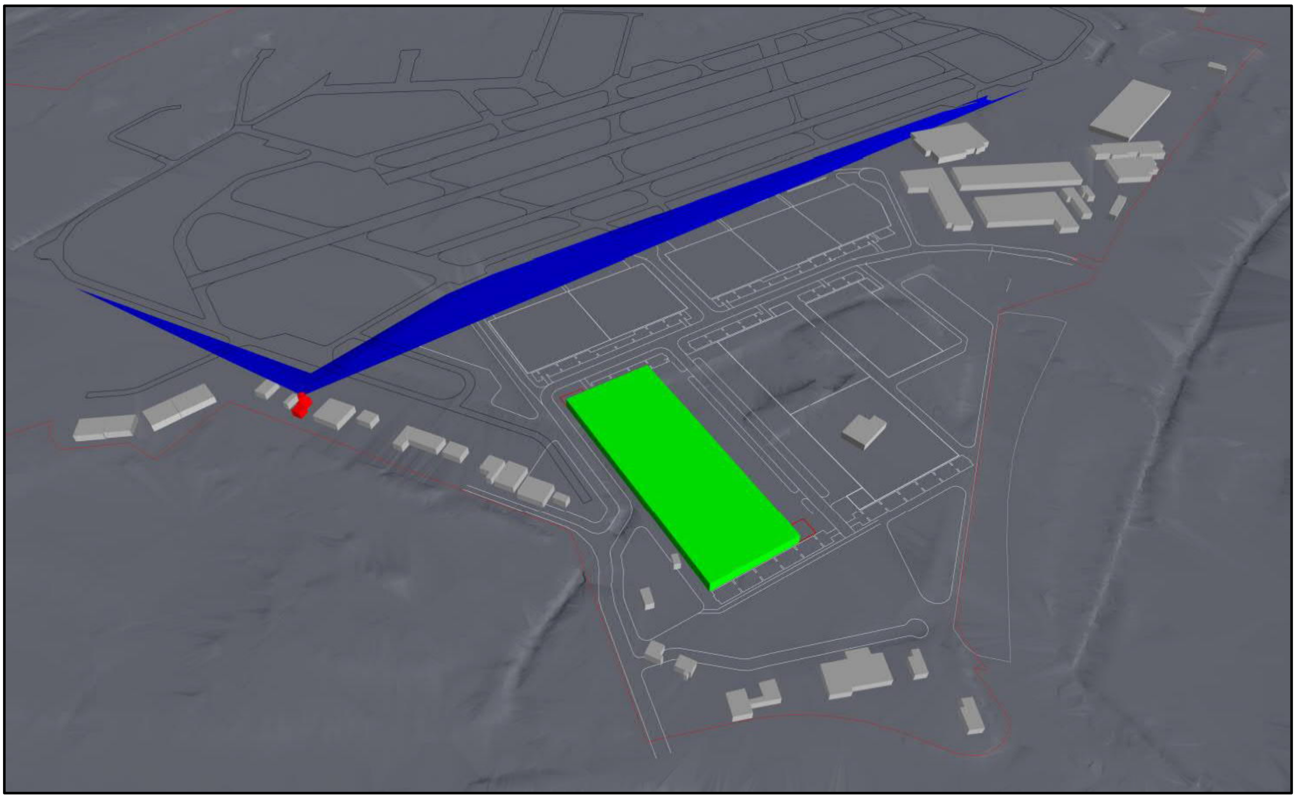
Assuming the ATCT remains in its current location the following guidance was provided around sightline constraints:

- Full visibility is required for the "Manoeuvre Area" (Taxiways & Runways)
- Sightlines from the ATCT to the farthest edge of the existing run-up bays adjacent to the existing "Quickstep" building are not fully visible from the ATCT;

The line of sight from the ATCT is presented in Figure 1 below and in Appendix A on drawing 0007. The proposed warehouse 1 development is outside of the line of sight of the ATCT and therefore does not impact on the operation of this facility.

Another meeting was held with Airservices on 9th May 2018, focussed on the air traffic control tower (ATCT), to present the updated design and confirm the sight line impacts. Airservices agreed the sight line drawing confirmed that the development caused no impediment to the visibility of the existing airfield manoeuvring area.

Figure 1 - Existing ATCT Line of Sight (proposed warehouse building in green, ATCT in red, line of sight in blue)



5.0 Other Aviation Considerations

5.1 Aerodrome Reference Point Interface

The Aerodrome Reference Point (ARP) is the designated geographical location and elevation of the aerodrome. The location of the Bankstown ARP is shown on drawing 0008 in Appendix A. The ARP is located to the south of TWY B and has been sighted and surveyed by RPS surveyors with the surveyed location noted as follows:

E 314050.741 N 6244407.647 RL 6.215 (as surveyed 18th October 2017)

The location of the ARP is confirmed to be north of the existing airside boundary fence. All MDP works proposed are south of the existing airside fence and therefore there are no impacts to the ARP.

5.2 Security

Bankstown Airport is classified as Security Controlled Airport Category 6 and has in place security measures based on risk assessments and the requirement of the Aviation Transport Security Act 2004. The Airport has a transport security program based on a comprehensive security risk analysis and addresses how security activities are managed and how security incidents are reported and responded to.

Airside boundary fences should be clear of obstructions such as trees, fixed equipment or vehicle parking areas, and where possible, maintaining a horizontal clearance to the top of the fence 2m airside and 3m landside. The following items have been identified as part of the future design development considerations as follows:

- Consideration for 3m high fence with 3m landside horizontal clearance;
- Consideration for automatic perimeter detection systems (PIDS);
- Consideration for Airside Access gates;
- Consideration for CCTV surveillance;
- Consideration for vehicle containment barriers;

It is not anticipated that the security fence will be impacted as part of the development. Any works that could potentially impact the fence will be temporary and have the appropriate measures in place.

5.3 Rotary Operations

Bankstown Airport has two operational helipads at the airport. Both of the helipads and their associated Obstacle Limitation Surface (OLS) are located north of and parallel to the runways. The development extents are south of the runways and outside of the rotary OLS and therefore will not have an impact of rotary operations.

6.0 National Airports Safeguarding Framework

6.1 Guideline A: Measures for Managing Impacts of Aircraft Noise

The 2033/2034 ANEF Contours from the 2014 Master Plan within the South West Precinct are shown on drawing 0009 in Appendix A. Australian Standard AS 2021-2015 “Acoustics – Aircraft Noise Intrusion – Building Siting and Construction” governs Australian Noise Exposure Forecast (ANEF) contours as outlined in Table 1 below.

The proposed warehouse development falls within the 20 – 30 ANEF range. The proposed warehouse would be classified as a light industrial building and therefore is acceptable in zones less than 30. The northern area of the South West Precinct is within the 30-35 zone and would be considered conditionally acceptable under the light industrial building classification.

Building Type	ANEF Zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF

Building Type	ANEF Zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Table 1 Australian Standard 2021-2015 Aircraft Noise Intrusion

The warehouse development falls within a zone that is considered acceptable for aircraft noise.

Further noise assessment detail is in the environment chapter of the Site Works and Warehouse MDP document and the standalone AECOM Noise assessment for the MDP.

6.2 Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports

The effects of windshear and Turbulence have been assessed by SLR and the findings are presented in the ‘Impact on Airport Operations’ chapter and the standalone SLR report (Ref: 610.17532, 15 May 2018).

6.3 Guideline C: Managing the Risk of Wildlife Strikes in the Vicinity of Airports

Guideline C provides guidance to manage the risk of collisions between wildlife and aircrafts.

The development is not expected to increase the attraction of wildlife and therefore not increase the risk of wildlife strikes at the airport.

6.4 Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation

Guideline D provides guidance on the development of wind farms to manage the risk to civil aviation. This guideline is not applicable to proposed development for this MDP.

6.5 Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports

Guideline E provides guidance on managing the risk of lighting or light fixtures near airports that may distract pilots. CASA Manual of Standards 139 sets out standards for the maximum intensity of light sources around airports. The maximum intensity light zones for Bankstown Airport and the proposed development is shown on drawing 0010 in Appendix A. The warehouse falls within Zones B, C and D and therefore the maximum lighting intensity varies from 50cd to 450cd. The northern car parking area is in Zone B (maximum 50cd) and the southern car parking area is in Zone D (maximum 450cd).

All lighting being constructed as part of the MDP will be design and constructed in accordance with the standards as set in CASA Manual of Standards 139.

6.6 Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports

Guideline F provides guidance for managing intrusions into the operational airspace of airport by buildings, cranes, trees and other tall structures. The existing and future Obstacle Limitation Surfaces and PANS-OPS surfaces are discussed in Section 2.0.

The proposed site works and warehouse development will have no impact on the existing or future OLS or PANS-OPS surfaces.

6.7 Guideline G: Protecting Aviation Facilities — Communications, Navigation and Surveillance (CNS)

Guideline G provides guidance on the protection of CNS facilities at airports. The non-directional beacon, secondary wind indicator and air traffic control tower have been identified as CNS facilities that need to be assessed for the development. These CNS facilities and how they interface with the developments is discussed in Section 3.0 and 4.0.

The CNS facilities investigated were found to not be impacted by the proposed development.

6.8 Draft Guideline I: Managing the Risk in Public Safety Zones at the Ends of Runways

Public Safety Zones (PSZ) are implemented at airports to protect the safety of the general public from aviation activities and accidents. The International Civil Aviation Organization (ICAO) data indicates that if an accident occurs, it will likely occur within 1,000m before the runway on approach or within 500m beyond the runway end on departure. The PSZ is placed within this zone to protect public safety.

The NASAG have released a draft guideline on PSZ seeking comments from the aviation industry. The draft guideline has been reviewed to confirm that it complies with the recommendations of the draft guideline.

The guideline suggests two methods are suitable for a planning-led approach to the assessment of the PSZ:

- UK NATS Methodology
- Queensland State Planning Policy

The Queensland State Planning Policy has been adopted on previous developments at Bankstown Airport and is considered a suitable approach for assessing this development.

The Queensland policy states that development within the PSZ should avoid:

- The manufacture or bulk storage of flammable, explosive or noxious materials;
- Uses that attract large numbers of people (e.g. sports stadium, shopping centre, industrial or commercial uses involving large numbers of workers or customers);
- Institutional uses (e.g. education establishments, hospitals); or
- The use or storage of hazardous materials.

The PSZ based on the Queensland State Planning Policy for each of the three existing runways is shown on drawing 0011 in Appendix A. The PSZ for runway 11R/29L encroaches on the northern corner of the South West Precinct however it is outside of the proposed building envelopes.

The proposed warehouse development is completely outside of the runway PSZs and therefore development does not violate this constraint.

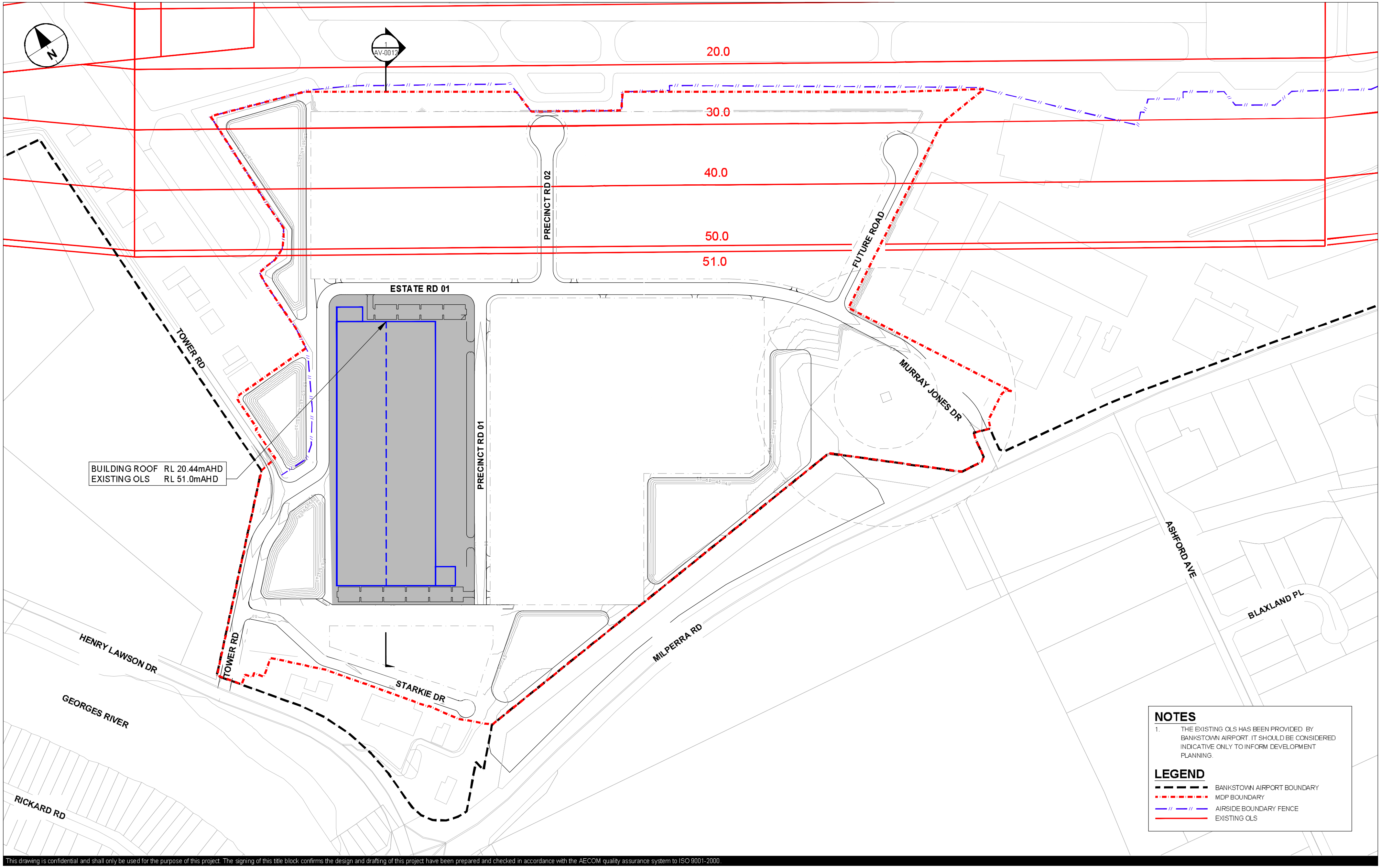
7.0 Conclusion

The Site Works & Warehouse development will not impact the aviation constraints or operations at Bankstown Airport. The future South West Precinct developments will need further assessment, however the current preliminary layout will not impact aviation constraints or operations.

8.0 Appendix A – Drawings

60569579-SKE-00-1000-AV-0001	Existing Obstacle Limitation Surfaces
60569579-SKE-00-1000-AV-0002	Future Obstacle Limitation Surfaces
60569579-SKE-00-1000-AV-0003	Existing PANS-OPS Surfaces
60569579-SKE-00-1000-AV-0004	Future PANS-OPS Surfaces
60569579-SKE-00-1000-AV-0005	Navigational Aids – Wind Indicators
60569579-SKE-00-1000-AV-0006	Navigational Aids – Non-Directional Beacon
60569579-SKE-00-1000-AV-0007	Air Traffic Control Tower Line of Sight
60569579-SKE-00-1000-AV-0008	Aerodrome Reference Point
60569579-SKE-00-1000-AV-0009	Aircraft Noise – ANEF Zones
60569579-SKE-00-1000-AV-0010	Maximum Lighting Intensity Zones
60569579-SKE-00-1000-AV-0011	Public Safety Zones
60569579-SKE-00-1000-AV-0012	Typical Building Section
60569579-SKE-00-1000-AV-0013	PAPI Obstacle Assessment Surface

ISO A1 594mm x 841mm



NOTES

1. THE EXISTING OLS HAS BEEN PROVIDED BY BANKSTOWN AIRPORT. IT SHOULD BE CONSIDERED INDICATIVE ONLY TO INFORM DEVELOPMENT PLANNING.

LEGEND

▬ ▬ ▬	BANKSTOWN AIRPORT BOUNDARY
▬ · ▬ · ▬	MDP BOUNDARY
— // — // —	AIRSIDE BOUNDARY FENCE
———	EXISTING OLS

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PROJECT

Bankstown Airport -
South West Precinct
Site Works and
Warehouse MDP

CLIENT

SCALE BAR

0 50 100
m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

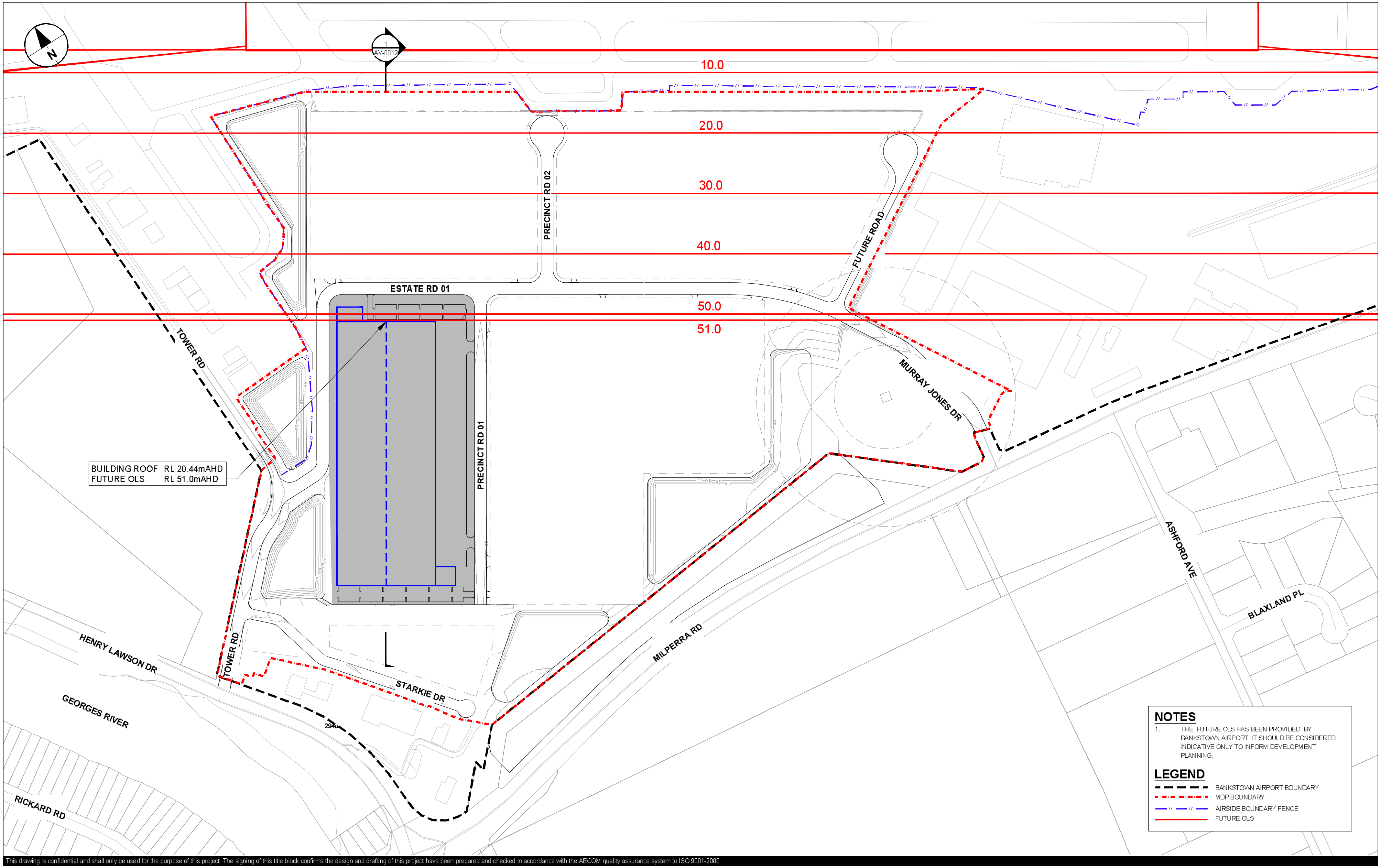
SHEET TITLE

EXISTING OBSTACLE LIMITATION SURFACES

SHEET NUMBER

60569579-SKE-00-1000-AV-0001

ISO A1 594mm x 841mm



NOTES

1. THE FUTURE OLS HAS BEEN PROVIDED BY BANKSTOWN AIRPORT. IT SHOULD BE CONSIDERED INDICATIVE ONLY TO INFORM DEVELOPMENT PLANNING.

LEGEND

▬ ▬ ▬	BANKSTOWN AIRPORT BOUNDARY
▬·▬·▬	MDP BOUNDARY
—//—//—	AIRSIDE BOUNDARY FENCE
———	FUTURE OLS

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SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

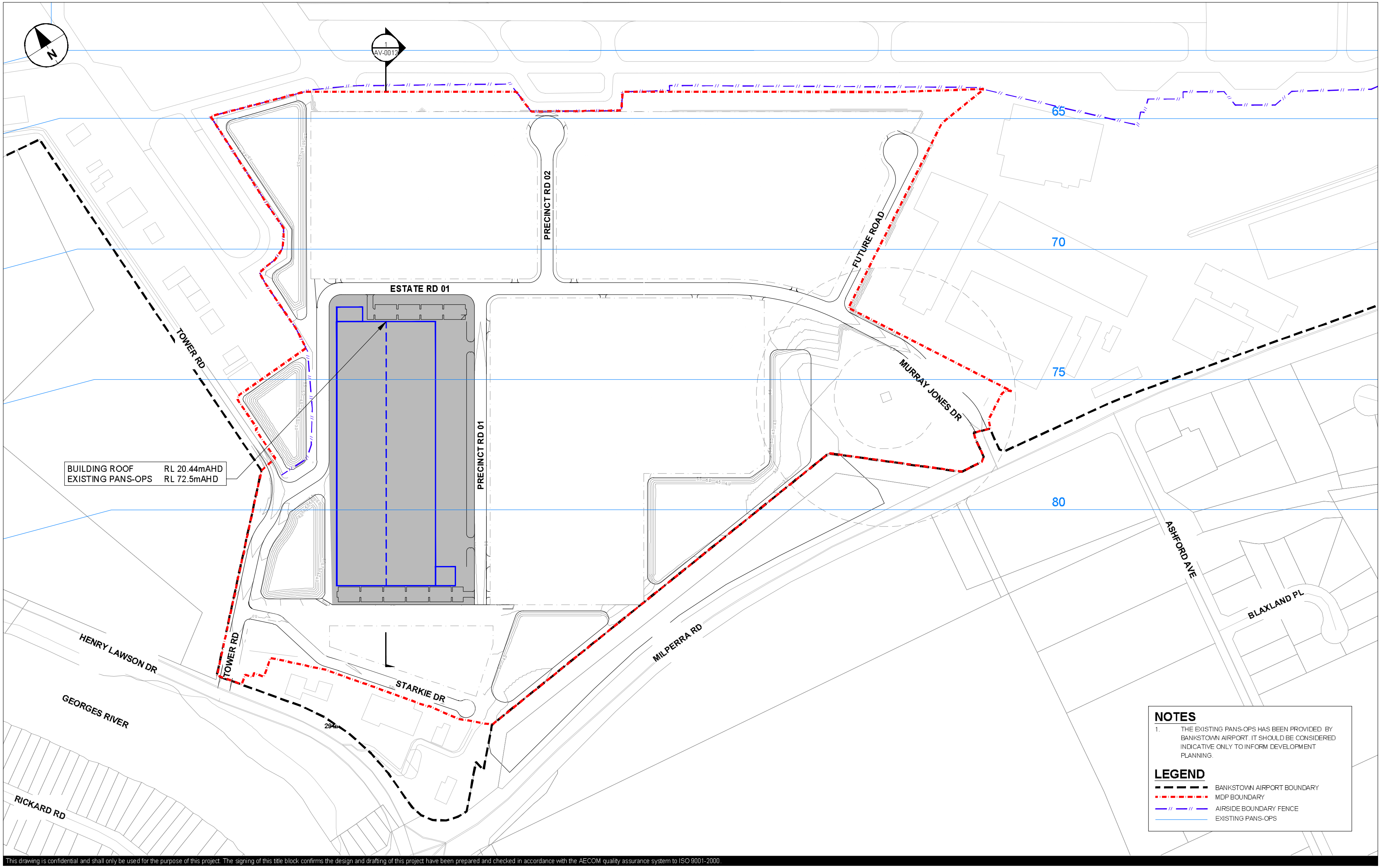
SHEET TITLE

FUTURE OBSTACLE LIMITATION SURFACES

SHEET NUMBER

60569579-SKE-00-1000-AV-0002

ISO A1 594mm x 841mm



NOTES

1. THE EXISTING PANS-OPS HAS BEEN PROVIDED BY BANKSTOWN AIRPORT. IT SHOULD BE CONSIDERED INDICATIVE ONLY TO INFORM DEVELOPMENT PLANNING.

LEGEND

— — —	BANKSTOWN AIRPORT BOUNDARY
—·—·—	MDP BOUNDARY
—//—//—	AIRSIDE BOUNDARY FENCE
———	EXISTING PANS-OPS

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SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

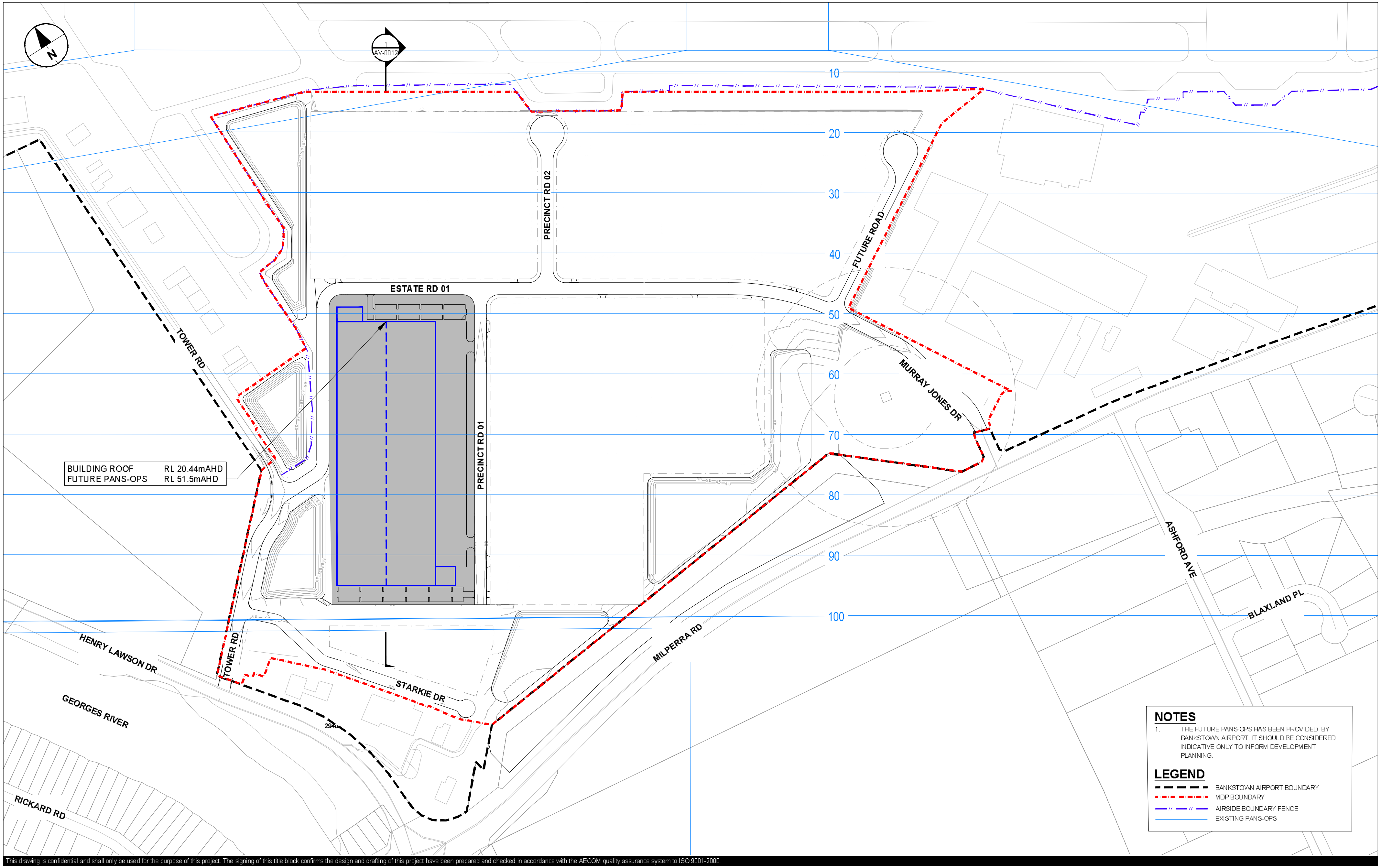
SHEET TITLE

EXISTING PANS-OPS-SURFACES

SHEET NUMBER

60569579-SKE-00-1000-AV-0003

ISO A1 594mm x 841mm



NOTES

1. THE FUTURE PANS-OPS HAS BEEN PROVIDED BY BANKSTOWN AIRPORT. IT SHOULD BE CONSIDERED INDICATIVE ONLY TO INFORM DEVELOPMENT PLANNING.

LEGEND

▬ ▬ ▬	BANKSTOWN AIRPORT BOUNDARY
─·─·─	MDP BOUNDARY
─//─	AIRSIDE BOUNDARY FENCE
────	EXISTING PANS-OPS

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BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

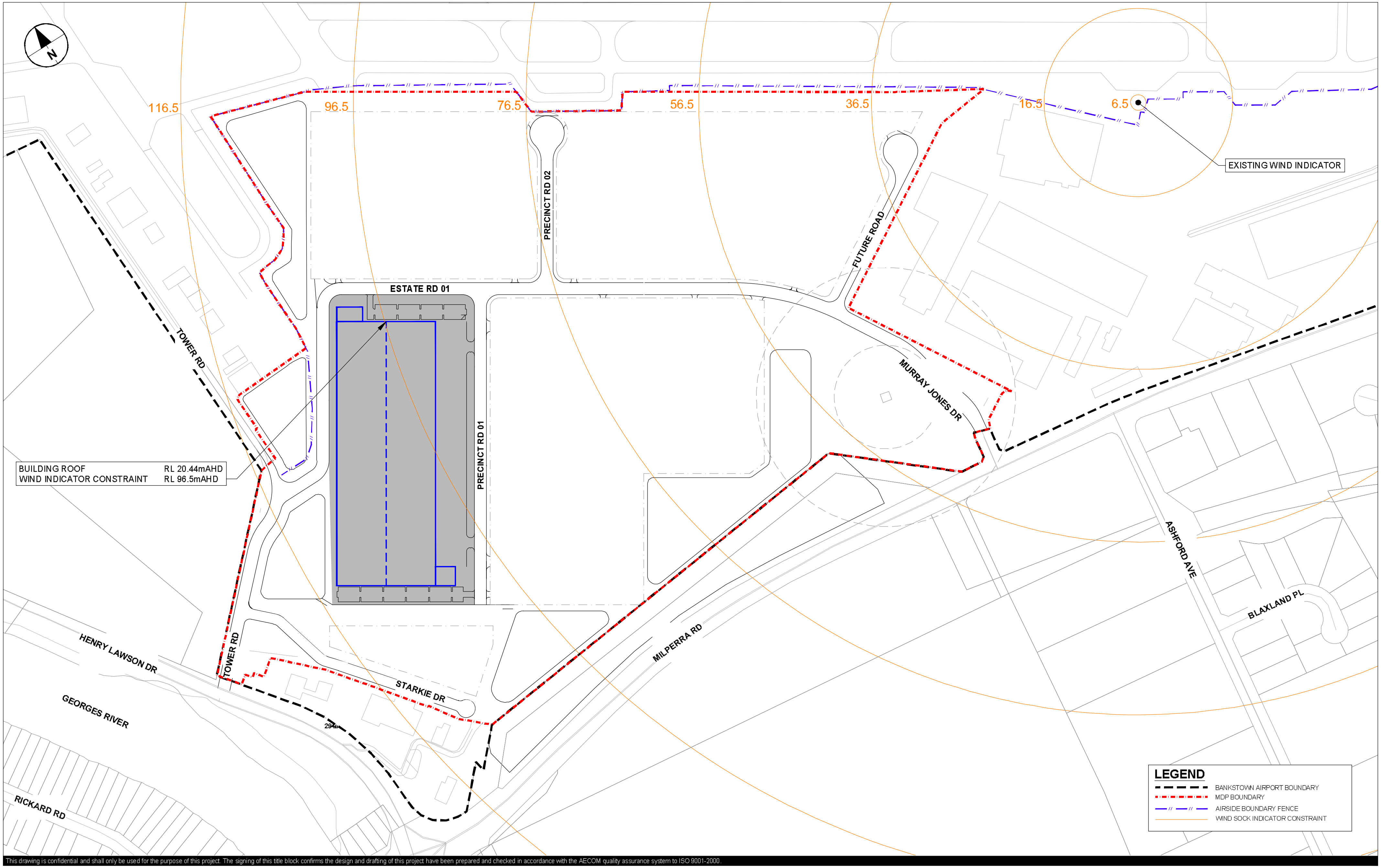
02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60569579

SHEET TITLE
FUTURE PANS-OPS SURFACES

SHEET NUMBER
60569579-SKE-00-1000-AV-0004

ISO A1 594mm x 841mm



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SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

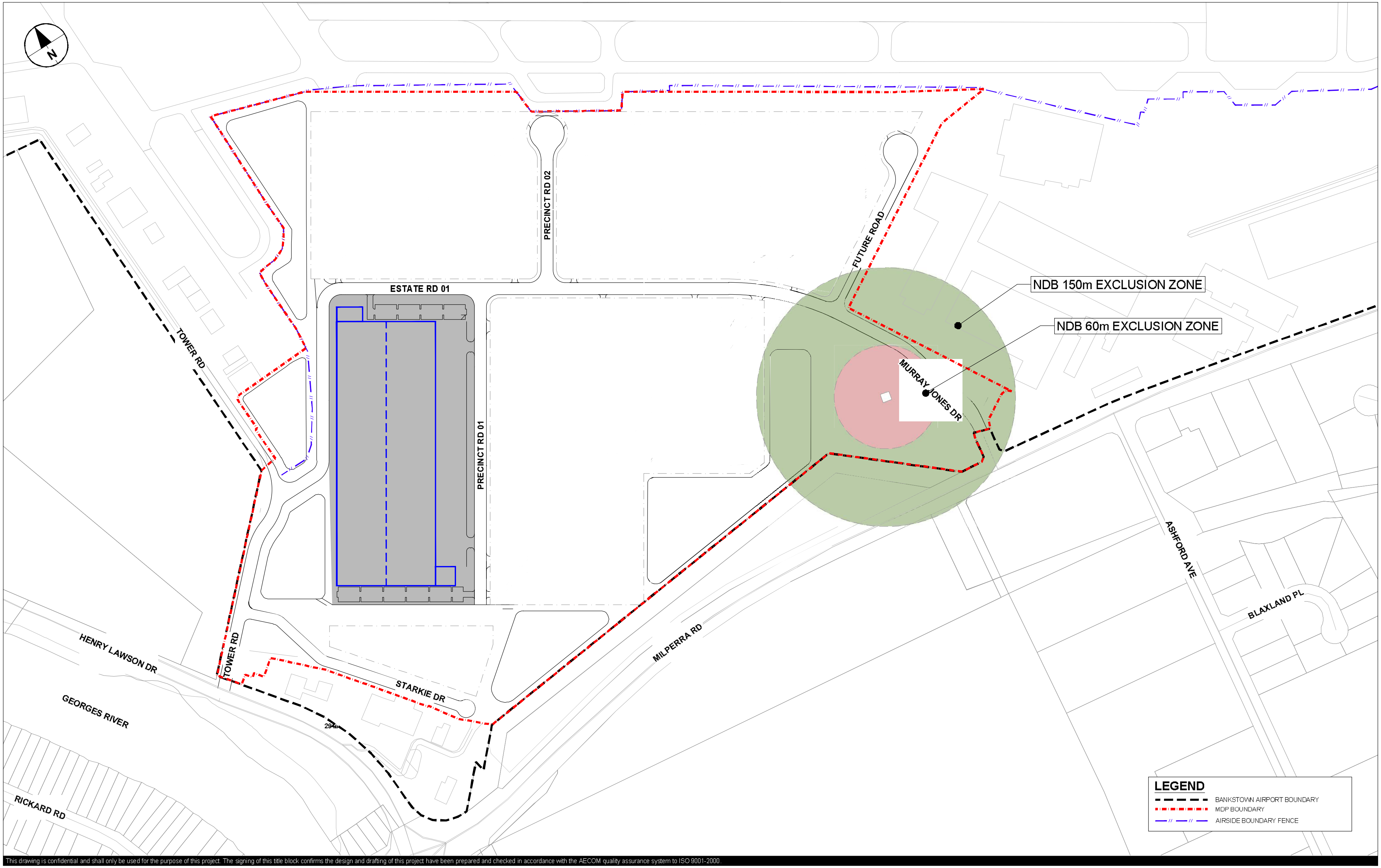
SHEET TITLE

NAVAGATIONAL AIDS
WIND INDICATORS

SHEET NUMBER

60569579-SKE-00-1000-AV-0005

ISO A1 594mm x 841mm



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BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

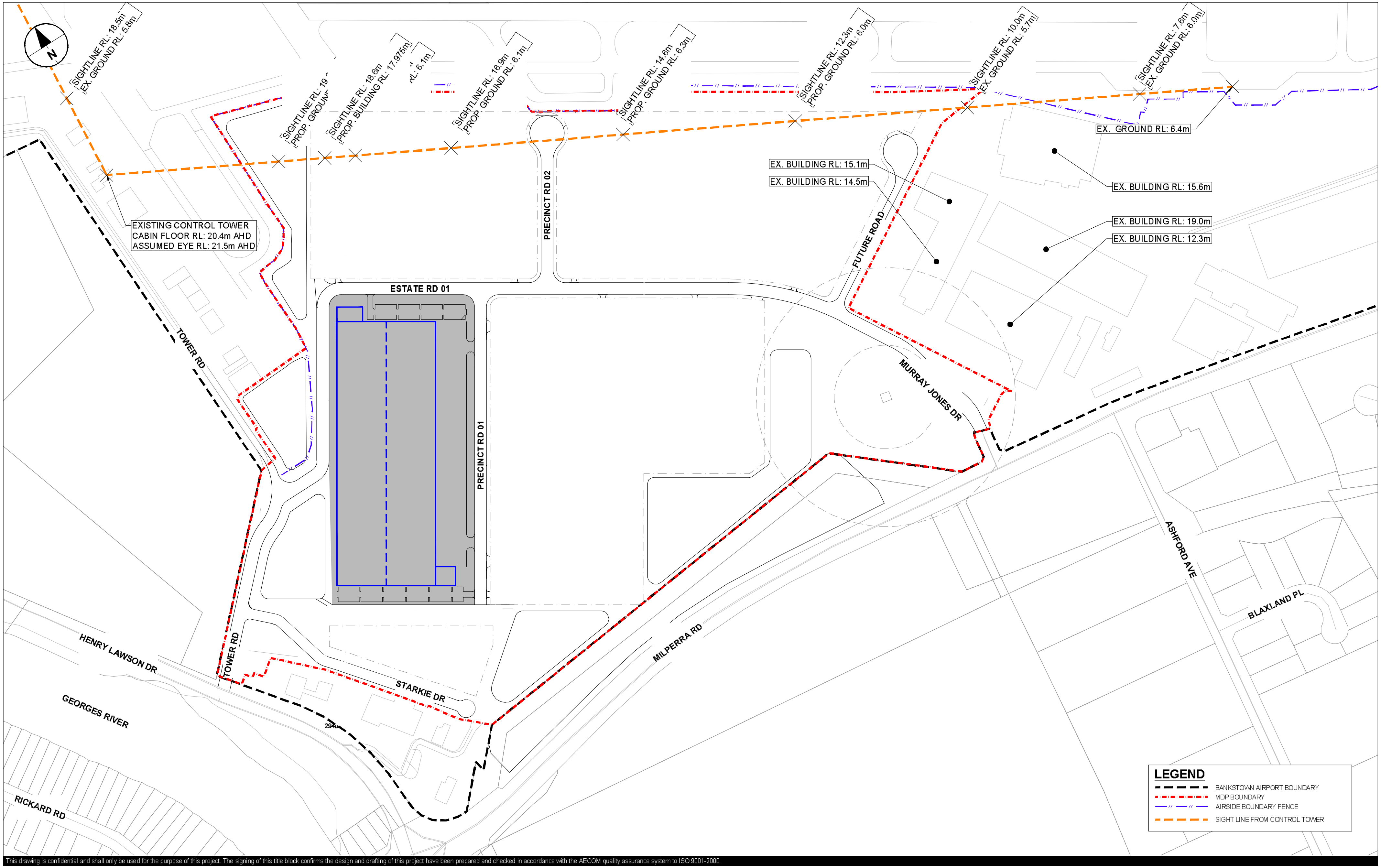
SHEET TITLE

NAVAGATIONAL AIDS
NON-DIRECTIONAL BEACON

SHEET NUMBER

60569579-SKE-00-1000-AV-0006

ISO A1 594mm x 841mm



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BANKSTOWN

SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

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01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

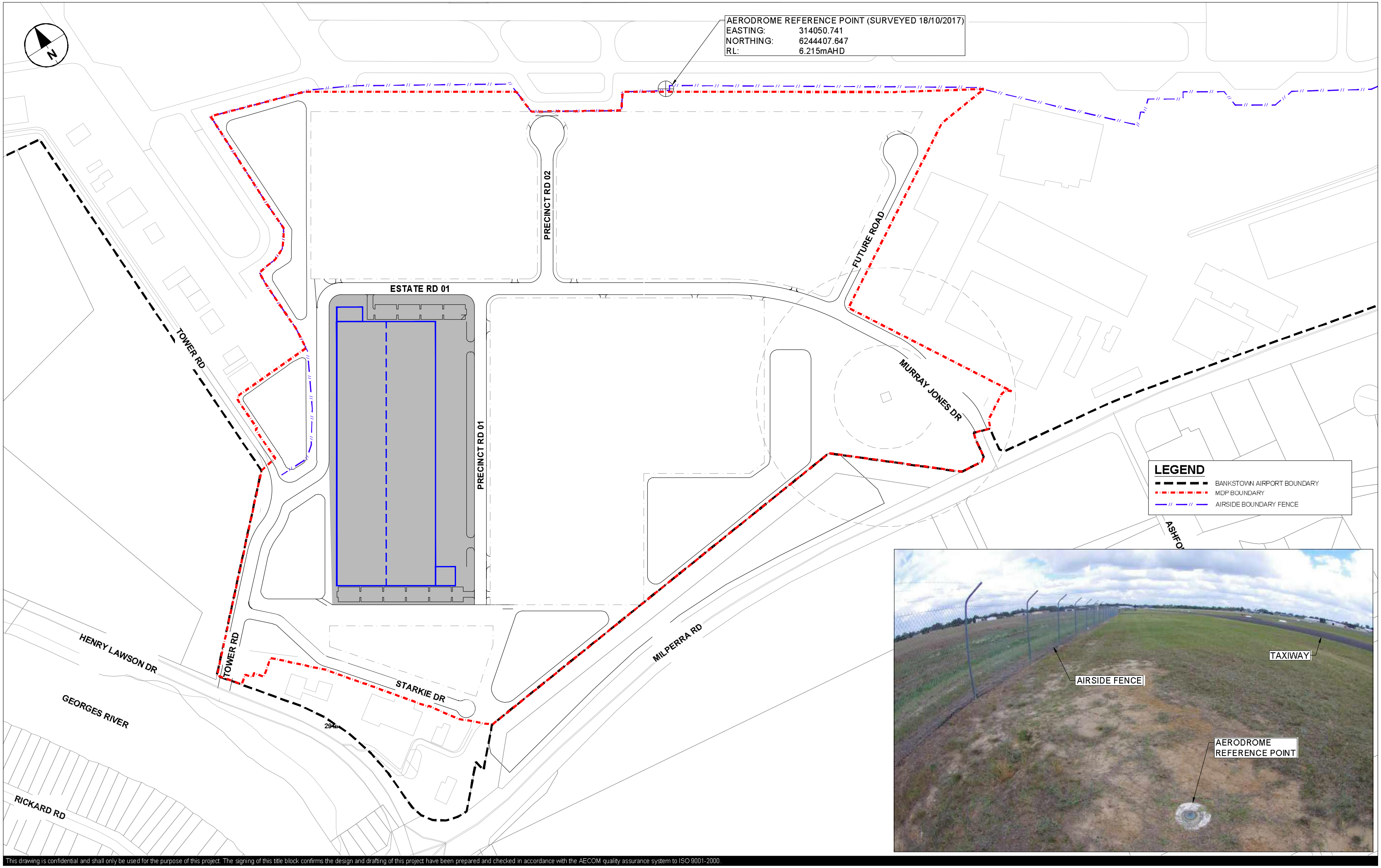
SHEET TITLE

AIR TRAFFIC CONTROL TOWER
LINE OF SIGHT

SHEET NUMBER

60569579-SKE-00-1000-AV-0007

ISO A1 594mm x 841mm



AERODROME REFERENCE POINT (SURVEYED 18/10/2017)

EASTING:	314050.741
NORTHING:	6244407.647
RL:	6.215mAHD

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SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION

PROJECT NUMBER

60569579

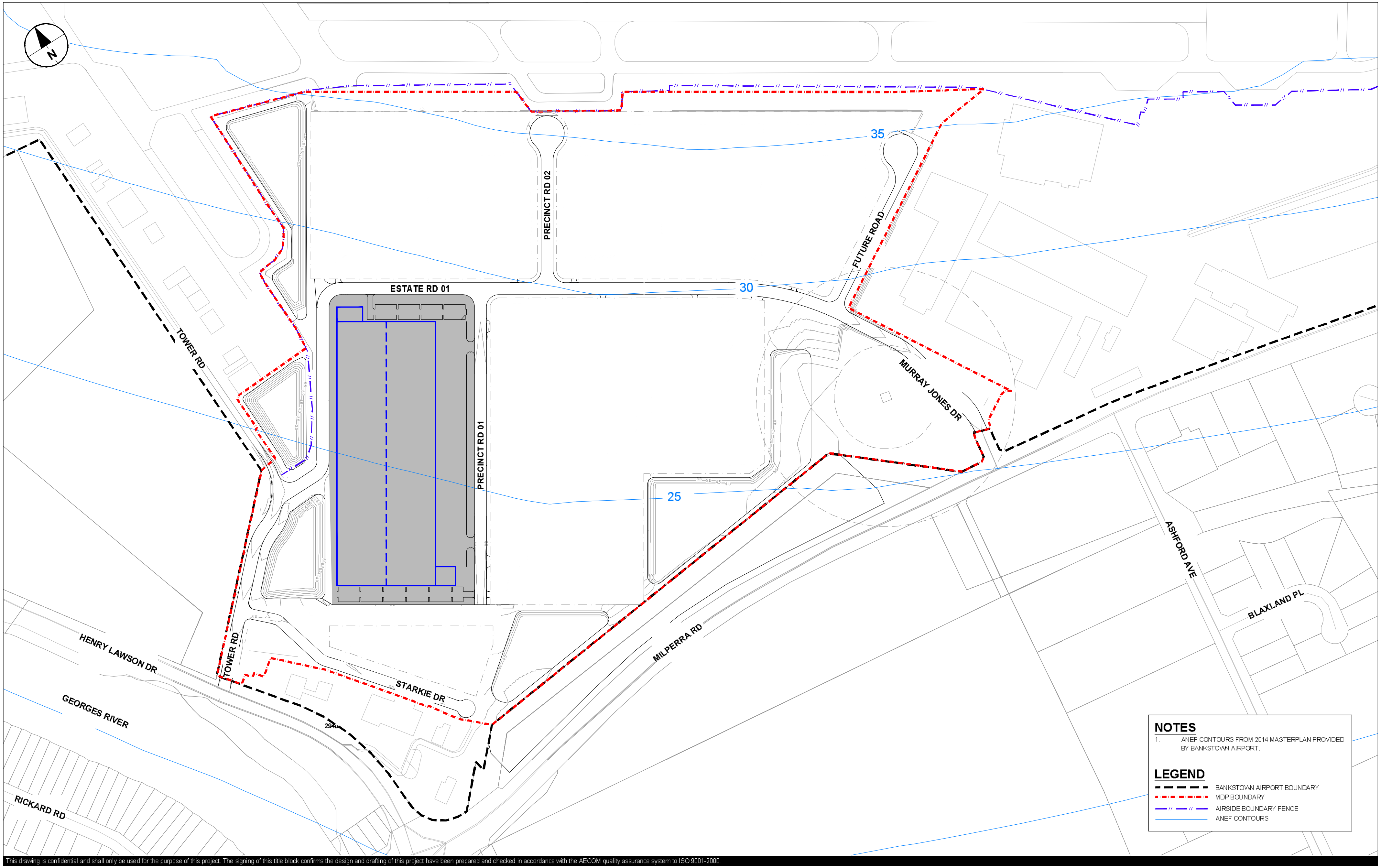
SHEET TITLE

AERODROME REFERENCE POINT

SHEET NUMBER

60569579-SKE-00-1000-AV-0008

ISO A1 594mm x 841mm



NOTES

1. ANEF CONTOURS FROM 2014 MASTERPLAN PROVIDED BY BANKSTOWN AIRPORT.

LEGEND

▬ ▬ ▬	BANKSTOWN AIRPORT BOUNDARY
▬ · ▬ · ▬	MDP BOUNDARY
▬ // ▬ // ▬	AIRSIDE BOUNDARY FENCE
───	ANEF CONTOURS

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SCALE BAR

0 50 100 m
1:2000

KEY PLAN

PROJECT MANAGEMENT INITIALS

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DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

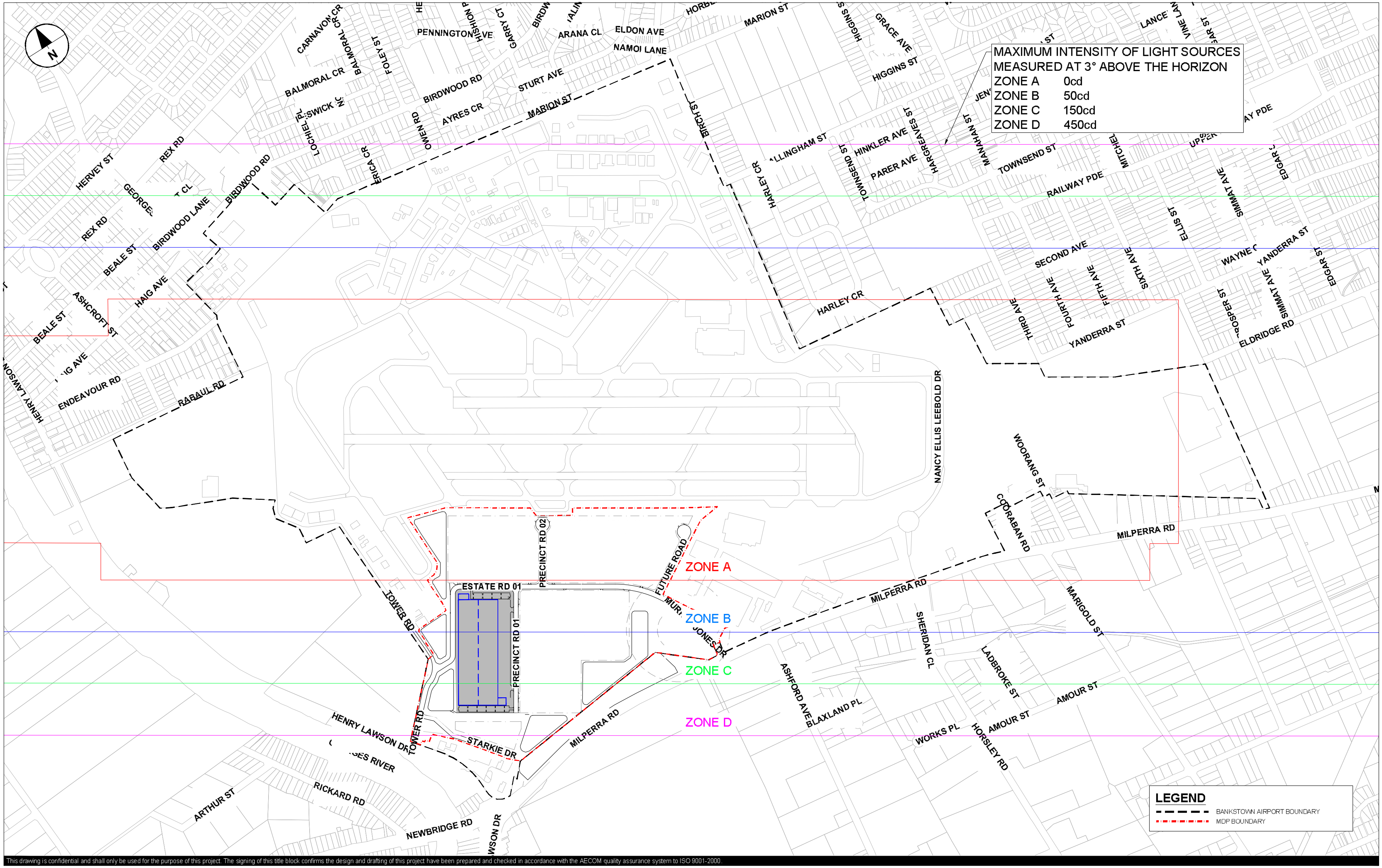
SHEET TITLE

AIRCRAFT NOISE - ANEF ZONES

SHEET NUMBER

60569579-SKE-00-1000-AV-0009

ISO A1 594mm x 841mm



MAXIMUM INTENSITY OF LIGHT SOURCES MEASURED AT 3° ABOVE THE HORIZON

ZONE A	0cd
ZONE B	50cd
ZONE C	150cd
ZONE D	450cd

LEGEND

- BANKSTOWN AIRPORT BOUNDARY
- MDP BOUNDARY

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CLIENT
SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR
0 125 250 m
1:5000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

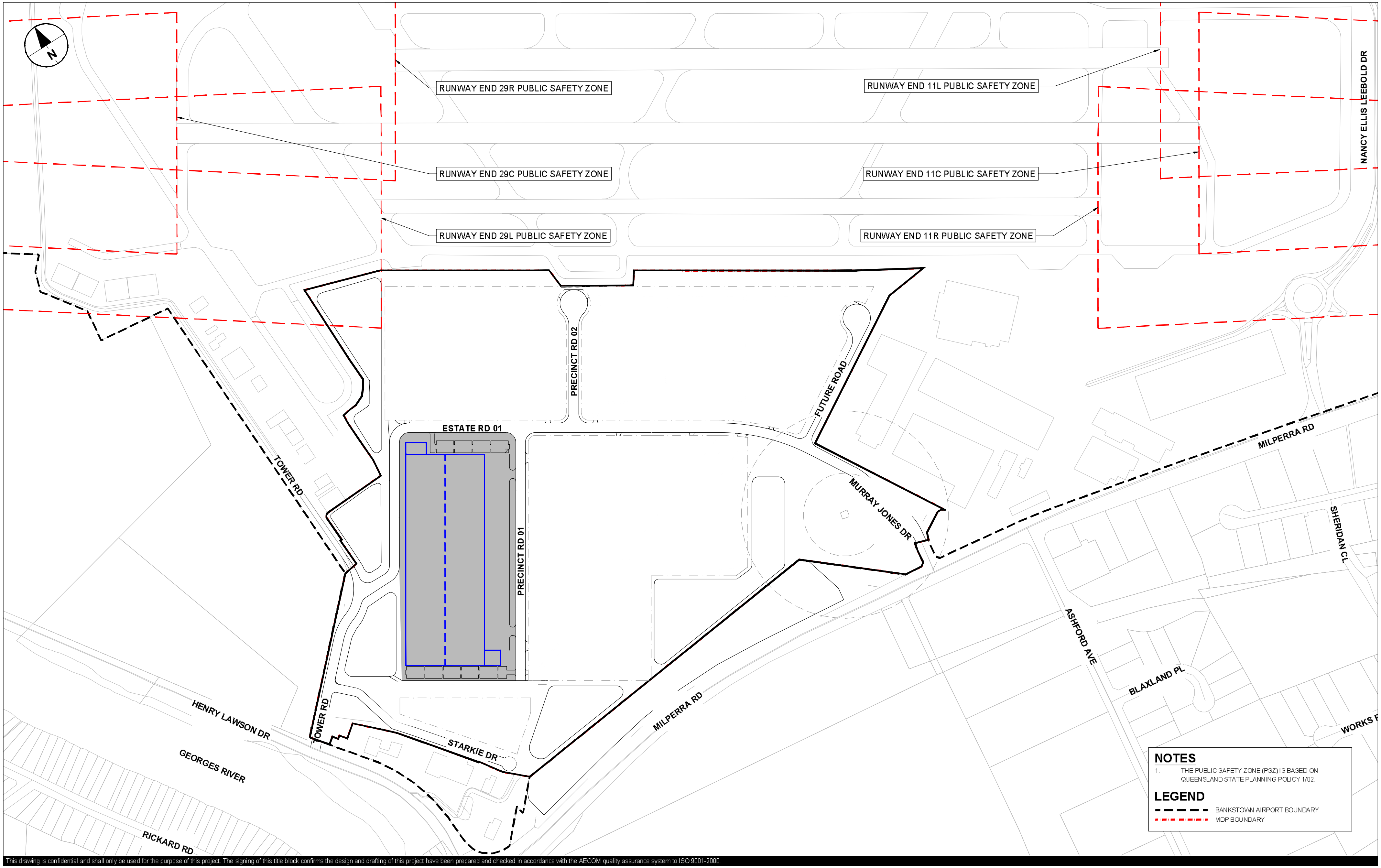
I/R	DATE	DESCRIPTION
02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION

PROJECT NUMBER
60569579

SHEET TITLE
MAXIMUM LIGHTING INTENSITY ZONES

SHEET NUMBER
60569579-SKE-00-1000-AV-0010

ISO A1 594mm x 841mm



NOTES

1. THE PUBLIC SAFETY ZONE (PSZ) IS BASED ON QUEENSLAND STATE PLANNING POLICY 1/02.

LEGEND

▬ ▬ ▬ BANKSTOWN AIRPORT BOUNDARY
▬ · ▬ · MDP BOUNDARY

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CLIENT

SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR

0 62.5 125
m
1:2500

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION

PROJECT NUMBER

60569579

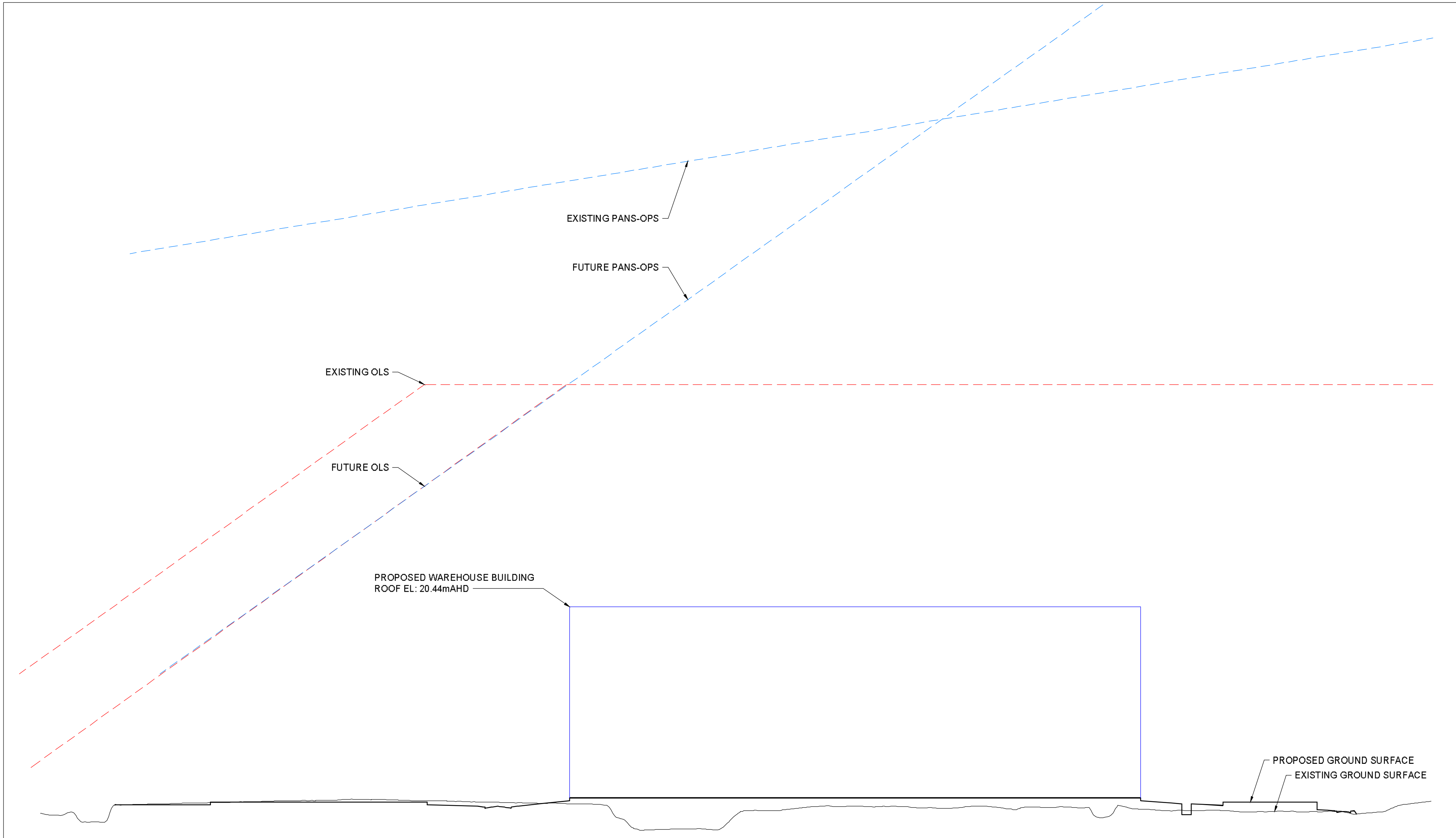
SHEET TITLE

PUBLIC SAFETY ZONES

SHEET NUMBER

60569579-SKE-00-1000-AV-0011

ISO A1 594mm x 841mm



1 AV-0001 **SECTION**
Scale 1:1000H 1:200V

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CLIENT
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BANKSTOWN

SCALE BAR
0 25 50 m
1:1000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	17.05.2018	FOR INFORMATION
01	24.04.2018	FOR INFORMATION

PROJECT NUMBER
60569579

SHEET TITLE
TYPICAL BUILDING SECTION

SHEET NUMBER
60569579-SKE-00-1000-AV-0012

ISO A1 594mm x 841mm

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BANKSTOWN

SCALE BAR

0 125 250 m
1:5000

KEY PLAN

PROJECT MANAGEMENT INITIALS

J.C.	R.W.	R.W.
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AHD	SURVEY	MGA

ISSUE/REVISION

01	17.05.2018	FOR INFORMATION
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60569579

SHEET TITLE

PAPI SURFACE

SHEET NUMBER

60569579-SKE-00-1000-AV-0013

9.0 Appendix B – Airservices Australia Minutes & Correspondence

AECOM Australia Pty Ltd
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Sydney NSW 2000
PO Box Q410
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Australia
www.aecom.com

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+61 2 8934 0001 fax
ABN 20 093 846 925

Minutes of Meeting

Bankstown Airport - South West Precinct

Subject	Air Services Australia - Aviation Constraints Queries	Page	1
Venue	Air Services Australia - Mascot Office	Time	11.00am
Participants	Mario Perin – ASA Senaka Wewegam – ASA Robbie Williams – AECOM Joseph Coughlan – AECOM David Binskin – BAL		
Apologies	Mark Crudden – Altis Rob Mason – AECOM		
File/Ref No.	60548670/2.5	Date	07-Dec-2017
Distribution	Robert Tims – Altis		

No	Item	Action	Date
1	Introductions		
2	Project Background • South West Precinct - The project is a layout concept design for a Light Industrial development south of the runways between Murray Jones Drive and Tower Road. • Possible staging – The staging is to be confirmed based on the tenants requirements and the constraints. • Constraints – The key non-aviation constraints are the flooding and Road network capacity	Note	
3	Non-Directional Beacon • Relocation was raised by MP and responded to by DB. BAL are considering two locations at the western end of the runways. DB suggested one is too close to the teaching runway. The second location exclusion zone impinged on the adjacent golf course, RW also noted the potential impact to Herbertia during construction. • The remaining discussion was based around the assumption that the NDB was not going to move. • Key Constraints o The guidance on the NDB is dated and about 20-30 years old, there is new draft guidance out but not yet approved o MP noted it would be difficult to interfere or obstruct the NDB as it operates at such a low frequency o MP noted there is degree of flexibility around the 60m offset requirement o RW queried if there was any issue with the proposed road adjacent being at 3-4 meters high, which MP confirmed it would not be a problem. o RW then queried if battering into the 60m offset would be acceptable, MP said yes as long as it did not extend		

No	Item	Action	Date
	significantly (~5-6m). o MP noted there is small radiation zone in the 60m circle that is in a fenced area of approximately 5x5m which needs to be avoided, it appears this is centrally located based on images of the NDB by RPS. o RW queried if using the area within the 60m for On-site Detention would be acceptable. MP said in a way the presence of water would be preferred as it can help with the resistance/interference of the NDB. However, any OSD would not be permanent water. • Design summary		
4	Air Traffic Control Tower (ATCT) • Sight Line constraints o Currently AECOM have utilised the guidance on the ASA website, RPS survey information and a conservative assumption that the eye level of the controller is 1.1m above the cabin floor. o DB noted it would be possible to gain access to the ATCT to complete a survey if necessary despite previous guidance from BAL that it would not be possible. RW indicated this could be considered at a later design stage as current design indicated the sight clearance above buildings was reasonable currently and the conservative calculation is ok for this stage of feasibility assessment. o DB noted full visibility was required for the 'Manoeuvre Area' (Taxiways & Runways) and also for the 'Movement Area' (Taxiways, Runways & Aprons). o DB noted the run-up bays adjacent to 'Quickstep' building are not visible due to the building; they were constructed after the building. o The critical line being the ground level of the farthest edge of taxiway passed the 'Quickstep' building. • Airside Connectivity – This was confirmed by MP and DB that connection to the airside is not a design standards requirement. DB noting that BAL operation needs regular access through an adjacent gate.		
5	AOB • MP indicated ASA communication (this meeting) in regards to the NDB should be added to any MDP to simplify the consideration during the process.		

From:	Perin, Mario <Mario.Perin@AirservicesAustralia.com>
Sent:	Thursday, 12 April 2018 1:57 PM
To:	Williams, Robbie H J
Cc:	david.Binskin@bankstownairport.com.au; joseph.ajaka@altisproperty.com.au; Mark Crudden (mark.crudden@altisproperty.com.au) (mark.crudden@altisproperty.com.au); Burman, Brenton; Aiezza, Tony; Roberts, Jessica; Elovitch, Lior; Bagley, Peter; Young, Gordon; Bartle, Craig; Cook, David
Subject:	RE: Bankstown Airport - Road Adjacent to Existing NDB [SEC=UNCLASSIFIED]
Attachments:	17202_BASW_SK12_B_MDP Layout.pdf; 17202_BASW_SK11_B_SWP Fully Developed Layout.pdf; 60548670-SKE-MJD-00-CI-0004.pdf; 60548670-SKE-MJD-00-CI-0002.pdf

Robbie

As discussed, the proposed development shown in the plans will not impact the operation of the NDB and is acceptable. Minor realignment of access to the NDB shelter and associated works including the provision of new double gates if required is also acceptable.

Rgds, Mario

From: Williams, Robbie H J [mailto:Robbie.Williams@aecom.com]
Sent: Wednesday, 11 April 2018 4:49 PM
To: Perin, Mario <Mario.Perin@AirservicesAustralia.com>
Cc: david.Binskin@bankstownairport.com.au; joseph.ajaka@altisproperty.com.au; Mark Crudden (mark.crudden@altisproperty.com.au) (mark.crudden@altisproperty.com.au) <mark.crudden@altisproperty.com.au>; Burman, Brenton <Brenton.Burman@aecom.com>
Subject: Bankstown Airport - Road Adjacent to Existing NDB

Hi Mario,

Thank you for meeting with us at the Air Services offices in Mascot today to discuss the Non-Directional Beacon (NDB).

Meeting Summary – 11/04/18 – 10.00am – Air Services Australia Offices, Kyeemagh Avenue, Mascot.

Attendees:
Mario Perin – Air Services
David Binskin – Bankstown Airport Limited
Joseph Ajaka – Altis Property Partners
Robbie Williams – AECOM Australia

- RW provided a description of the updated alignment of Murray Jones Drive (road immediately east of the NDB), providing the attached AECOM Sketches 60548670-SKE-MJD-00-CI-0002-02 and 60548670-SKE-MJD-00-CI-0004-02, both dated 05/04/18, for detail.
  - The road encroaches on the 60m radius of the NDB, but is not impeding the existing fenceline and property boundary of the NDB
  - The road level is generally at the existing asphalt ground level, but rises up approximately 850mm above existing level where encroaching on the 60m radius
  - The small building on the raised platform, which is currently access from the east through gates, is now proposed to be accessed from the south to avoid vehicles stopping on the new road alignment for safety requirements. It is understood there is a small level difference to the south of up to 300mm, which will be build up to provide smooth vehicle access.
- MP communicated he did not see any issues with the updated proposal on initial review.
- RW provided further context of the works by presenting two SBA plans – the MDP layout and the fully developed South West Precinct Layout, also attached SBA Sketches 17202_BASW_SK12 and 17202_BASW_SK11.
- RW queried whether it would be possible to get a letter to demonstrate within the upcoming MDP that we had consulted with Air Services Australia in regards to NDB.
  - MP suggested he would be able to provide an email response confirming there were no concerns with the proposals, if the plans presented in the meeting were emailed to him today, which could be used within the MDP.

I look forward to receiving your response. If you have any queries with the above summary of today's meeting, please call me.

Kind Regards,
Robbie

Robbie Williams
Principal Civil Engineer
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APPENDIX E

WIND SHEAR AND TURBULENCE

9 September 2019

610.17532-L02-v1.0.docx

Bankstown Airport Limited
c/o Altis Property Partners
Level 14, 60 Castlereagh Street
SYDNEY NSW 2000

Attention: Mr Joseph Ajaka

Dear Joseph

Bankstown Airport - Letter of Advice
South West Precinct - Warehouse Major Development Plan - Lot 1
Risk Management of Building-Generated Windshear & Turbulence

SLR Consulting Australia Pty Ltd (SLR) has been previously commissioned by Bankstown Airport Limited (BAL) to undertake a windshear and wind turbulence report for a proposed warehouse - Lot 1 within a precinct located in the southwest corner of Bankstown Airport in support of a Major Development Plan (MDP).

- SLR Report 610.17532 SW Precinct MDP V1.1 dated 25 May 2018
- Response to CASA Comments – CASA Ref:F17/8907-4 dated 14 February 2019

The assessment has been conducted for the following scenarios in accordance with the National Airports Safeguarding Framework (NASF) Guideline B, 2018 – *Managing the Risk of Building Generated Windshear and Turbulence at Airports* - specifically to address wind impacts on runways at Bankstown Airport:

- Scenario 1 – Current (Pre-MDP Development)
- Scenario 2 – Post-MDP Development

Since preparing the above reports the following changes have been proposed for the site:

- The dividing wall between the two warehouses is now a covered driveway/breezeway
- Total Warehouse area down 3,203 m^2 from 35,000 m^2
- Total internal Office area up 435 m^2 from 2,000 m^2
- Total Gross Lettable Area down 2,768 m^2 from 37,000 m^2
- Total car spaces up 5 spaces from 189 spaces
- The awning on Warehouse 1A has increased from 15 m to 36 m
- The split of the warehouses has changed from;
    - Warehouse 1A – 17,500 m^2 to 11,911 m^2
    - Warehouse 1B – 17,500 m^2 to 19,886 m^2
- The battery charge and branch offices are now on the outside of Warehouse 1B

A comparison between the previous (Post–MDP) and current design scheme (Post - Updated MDP) is shown in Figure 1.

BAL has recently commissioned a quantitative Computational Fluid Dynamics (CFD) modelling assessment and report to assess the impact of the above changes on the conclusions of the above reports.

Due to the relative position of the proposed building to the runway direction, the following critical cross-wind directions for the windshear and turbulence are analysed in this study:

- South-Southeast (Wind Angle = 155.5°), Previously Requested by CASA
- South (Wind Angle = 180°)
- South-Southwest (Wind Angle = 200°), Critical Wind Direction, Previously Requested by CASA

The following conclusions have been reached based on results of simulations:

- The proposed changes have a minor impact on the conclusions of SLR previous study.
- The recommended strategy remains unchanged: Amend operations so that Runway 11R/29L is not the duty runway when winds exceed 11.0 knots from the S to SW or to implement other operational risk mitigation acceptable to the airport operator and CASA.

If you have any questions please do not hesitate to contact me on 0401 416 274 / (02) 9427 8100 or via email at nal-khalidy@slrconsulting.com.

Yours sincerely

Nehad

DR Neihad Al-Khalidy
Technical Director– CFD, Wind and Energy
(Call at any time on 0401 416 274)

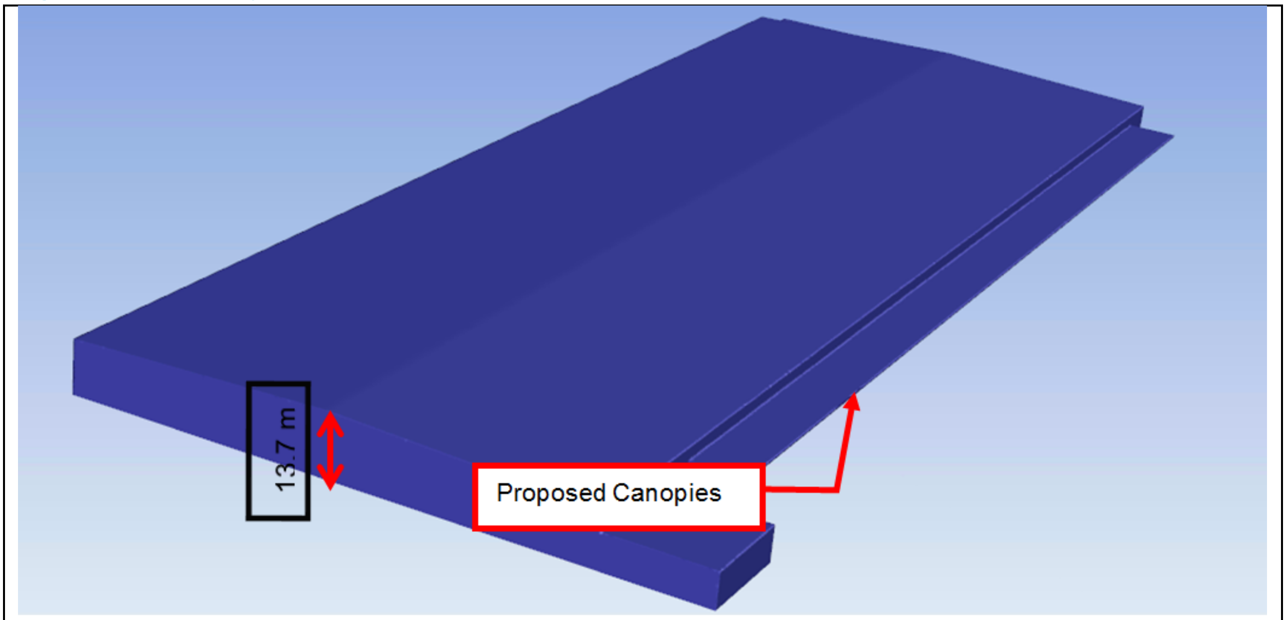
Submission Details
Reviewed by: PG

ATTACHMENTS

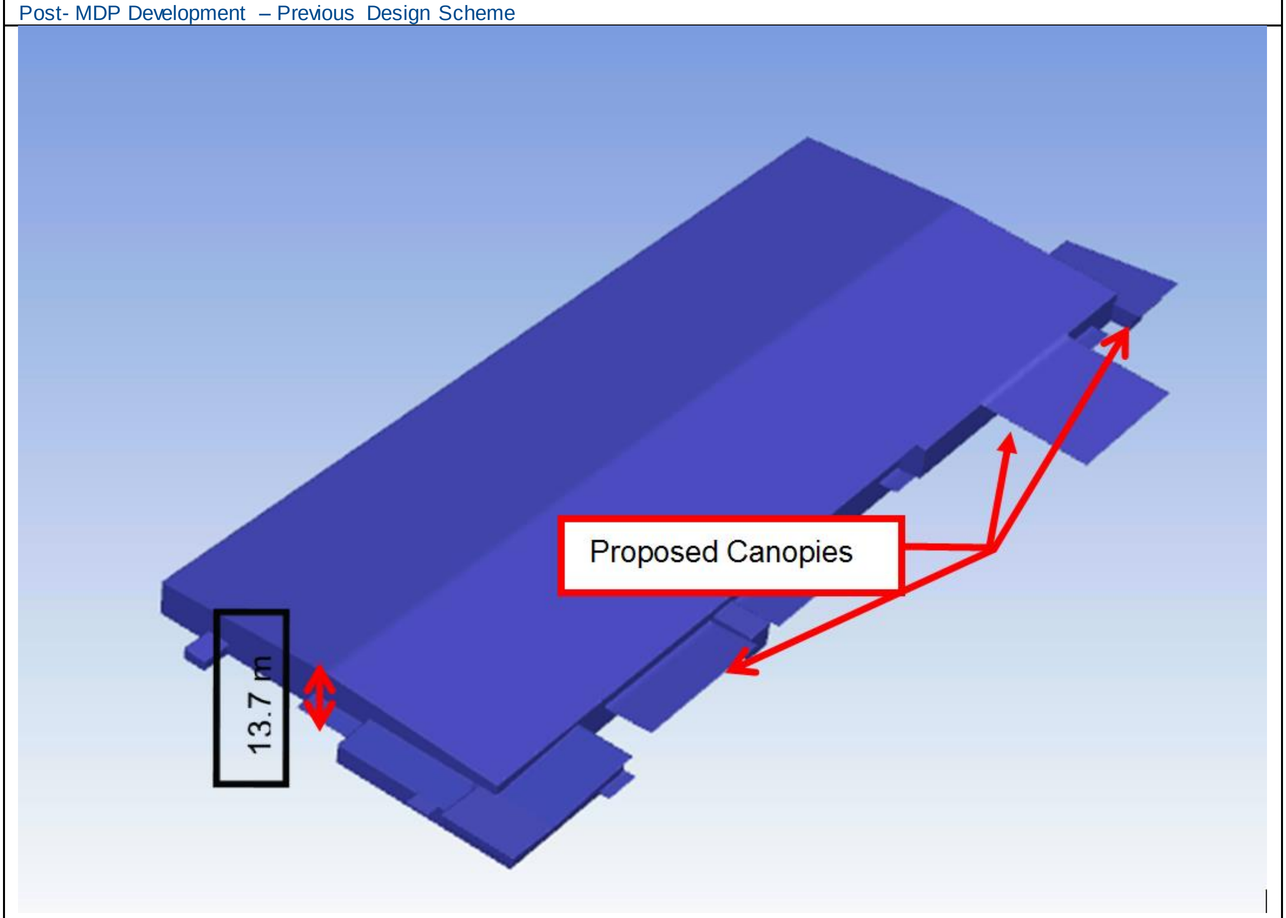
Geometry for CFD Modelling	Figure 1	Development Site and Surrounds
Landing Flight Scenarios - 3° Glide Path Assumed	Figure 2	Range of Potential Landing Scenarios Simulated (Paths 1a to 1f)
Simulation Test Results **Wind Angle = 180°** DLES Turbulence Model	Figure 3	Velocity Vectors (m/s) at RL10.5m Approach 10 m Height Mean Wind – 25 kt
	Figure 4	RMS (Standard Deviation, kt) - All Runways Approach 10 m Height Mean Wind – 25 kt
	Figure 5	Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most-Impacted Trajectory on Runway 29L/11R Approach 10 m Height Mean Wind – 25 kt
Simulation Test Results **Wind Angle = 200°** DLES Turbulence Model	Figure 6	Velocity Vectors (m/s) at RL10.5m Approach 10 m Height Mean Wind – 25 kt
	Figure 7	RMS (Standard Deviation, kt) - All Runways Approach 10 m Height Mean Wind – 25 kt
	Figure 8	Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most-Impacted Trajectory on Runway 29L/11R Approach 10 m Height Mean Wind – 25 kt
Simulation Test Results **Wind Angle = 155.5°** DLES Turbulence Model	Figure 9	Velocity Vectors (m/s) at RL10.5m Approach 10 m Height Mean Wind – 25 kt
	Figure 10	RMS (Standard Deviation, kt) - All Runways Approach 10 m Height Mean Wind – 25 kt
	Figure 11	Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most-Impacted Trajectory on Runway 29L/11R Approach 10 m Height Mean Wind – 25 kt

Geometry for CFD Modelling

Figure 1 Development Site and Surrounds



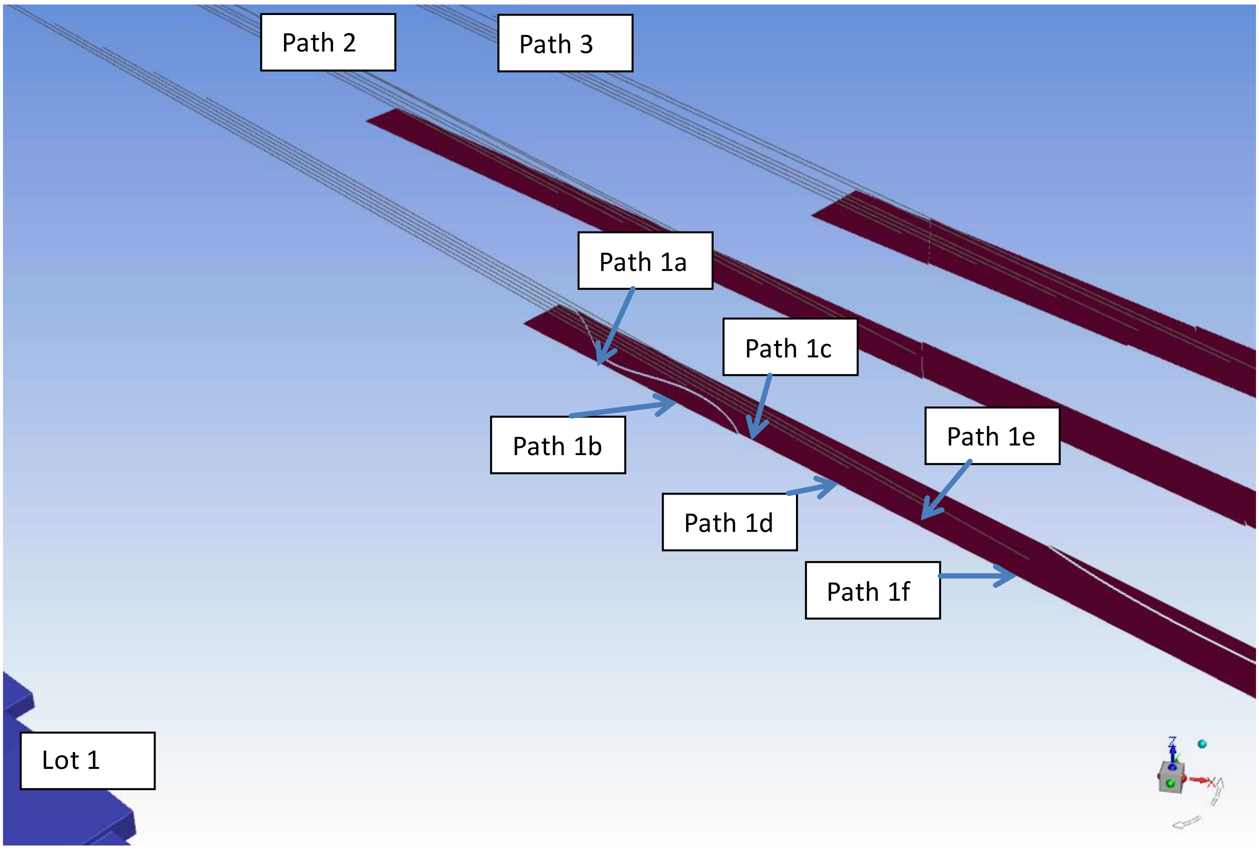
Post- MDP Development – Previous Design Scheme



Post- Updated MDP Development – Latest Design Scheme

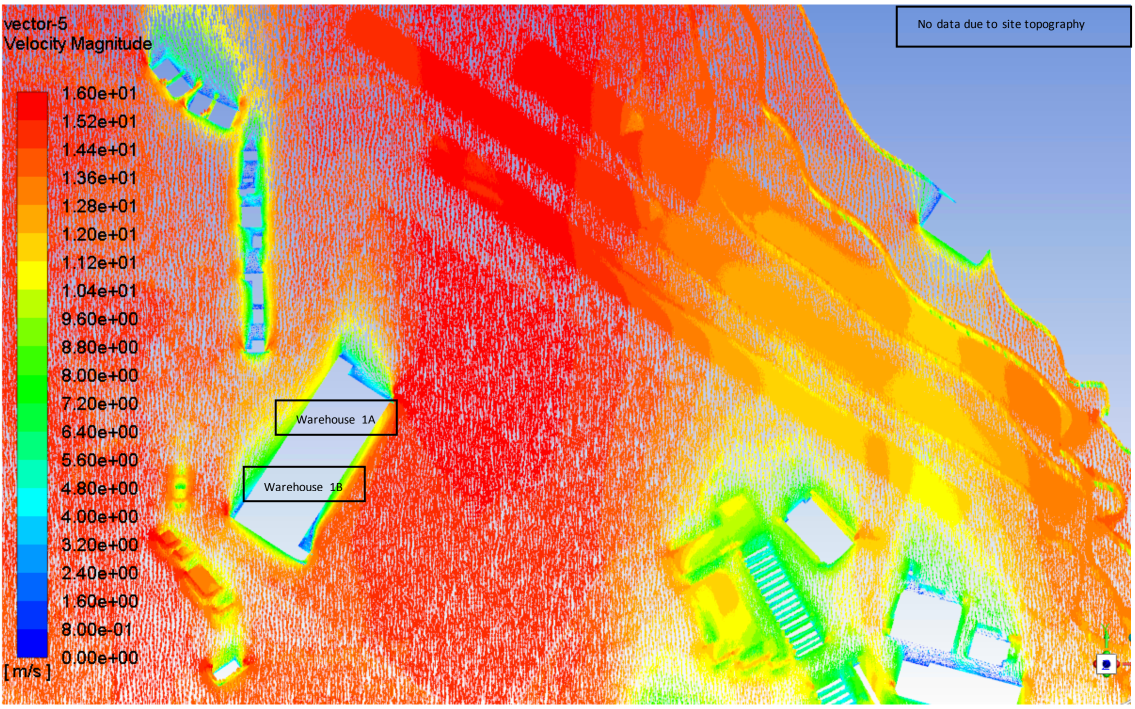
Landing Flight Scenarios - 3° Glide Path Assumed

Figure 2 Range of Potential Landing Scenarios Simulated (Paths 1a to 1f)

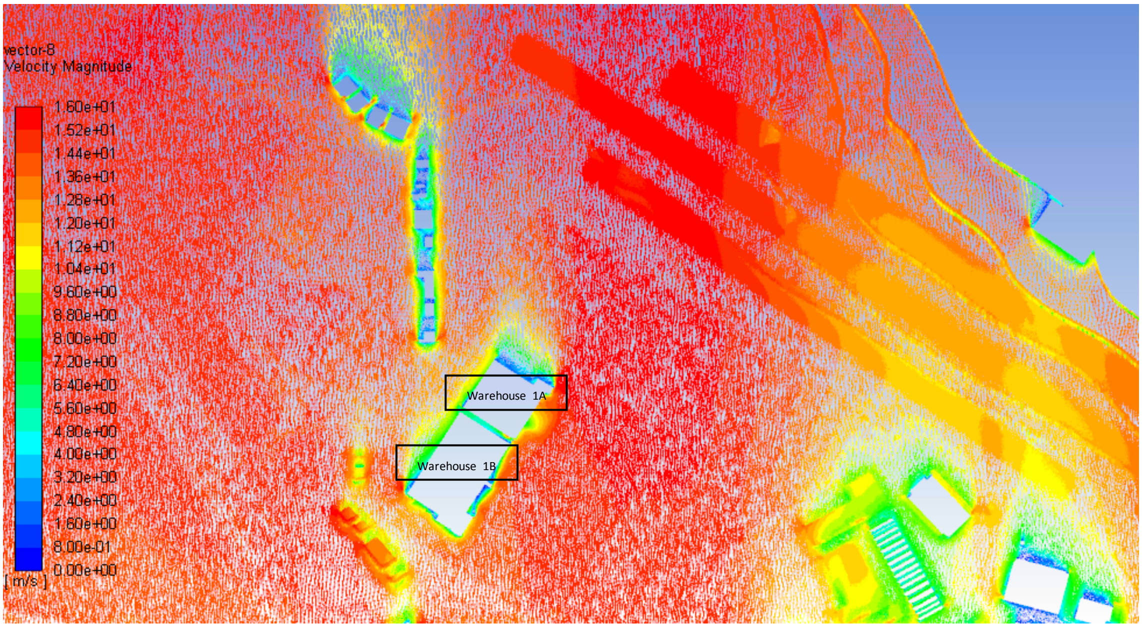


Simulation Test Results: Wind Angle = 180° / DLES Turbulence Model

Figure 3 Velocity Vectors (m/s) at RL10.5m – Approach 10m Height Mean Wind = 25 kt

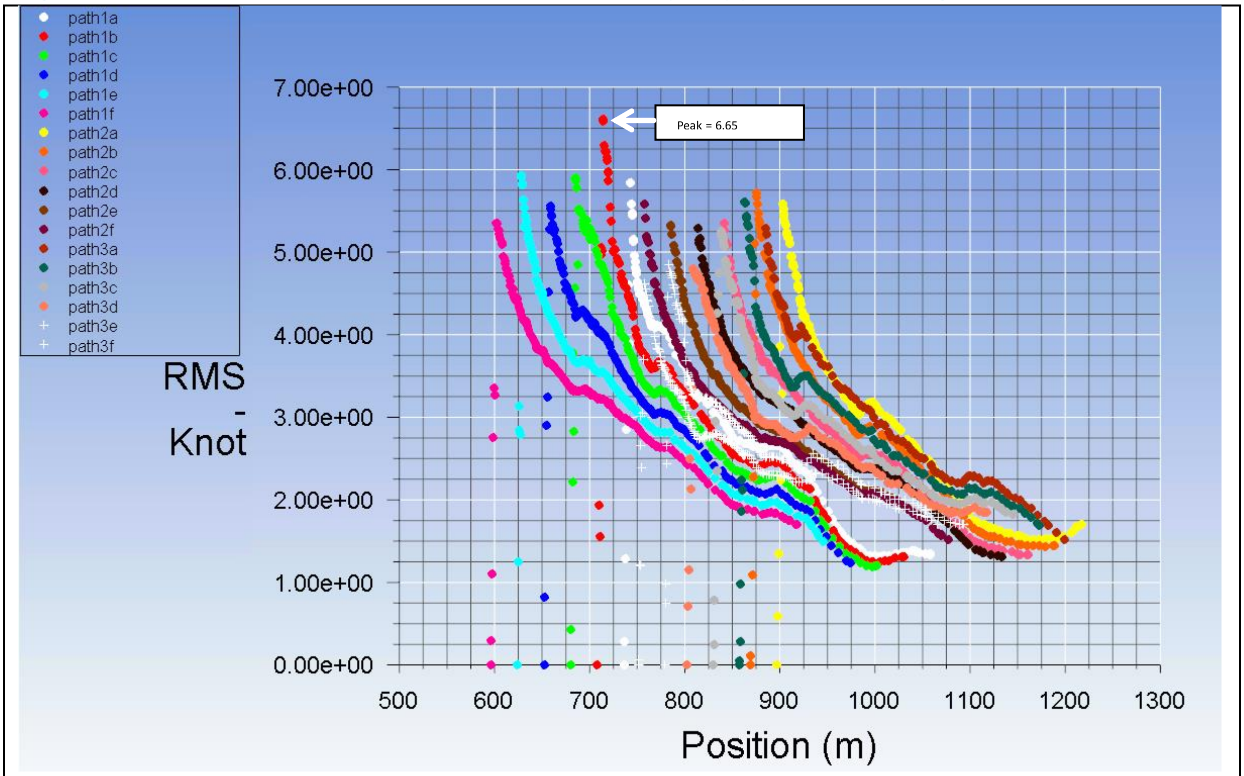


A:Post MDP

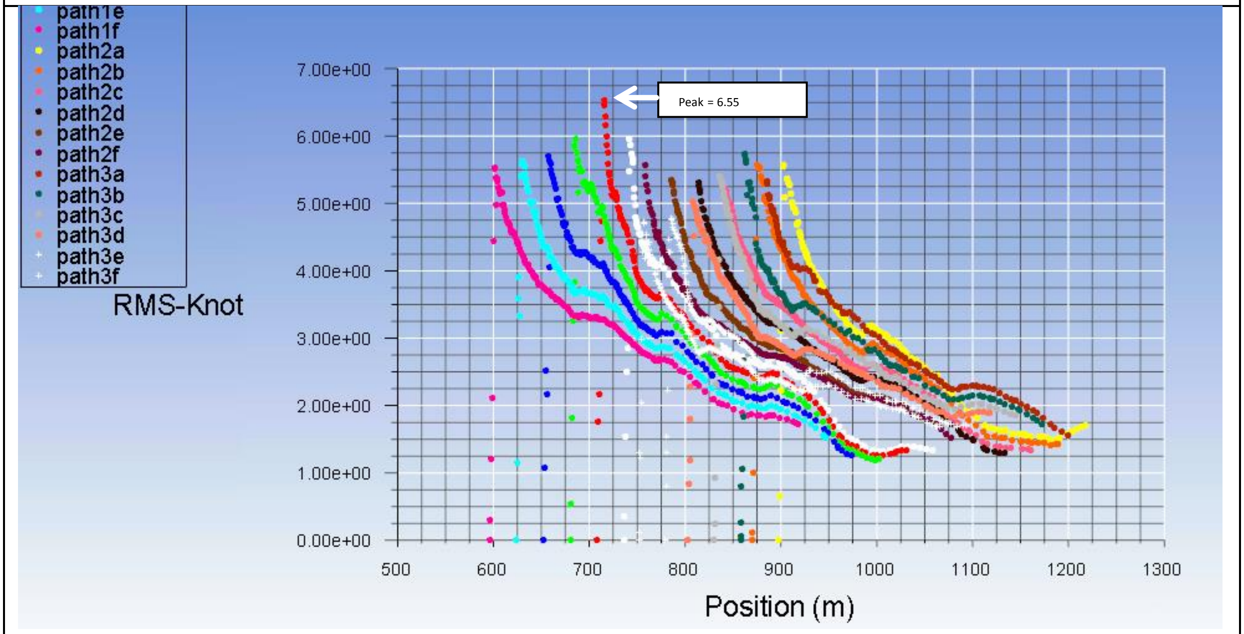


B:Post-Updated MDP

Figure 4 RMS (Standard Deviation, kt) - All Runways, Approach 10 m Height Mean Wind = 25 kt

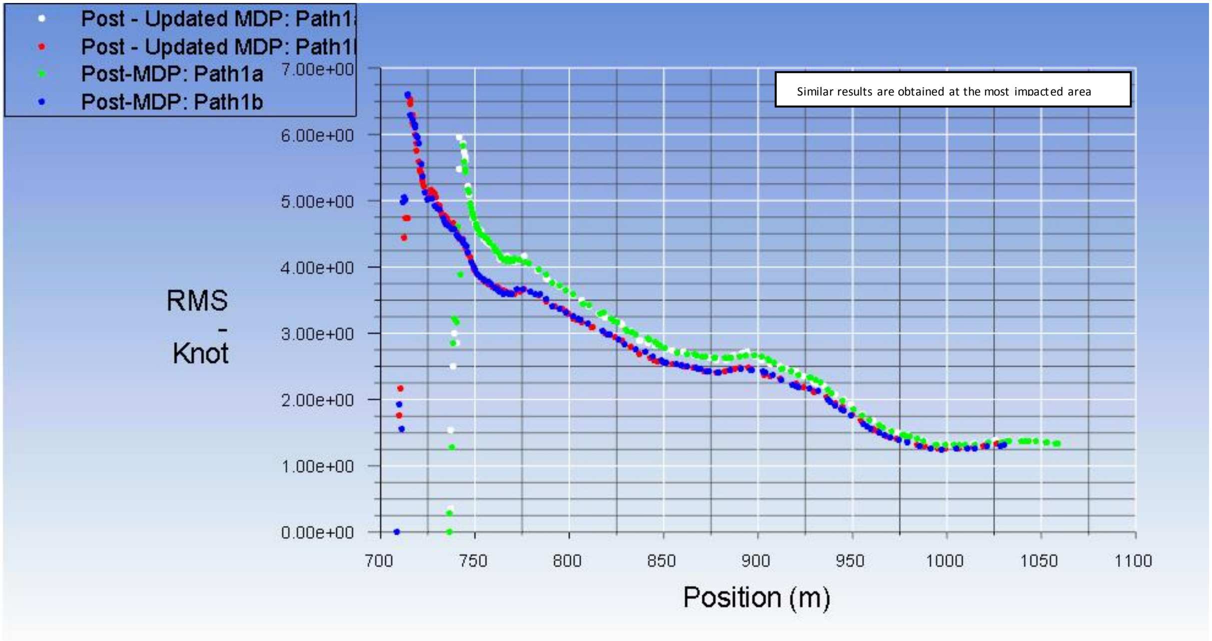


A: Post - MDP



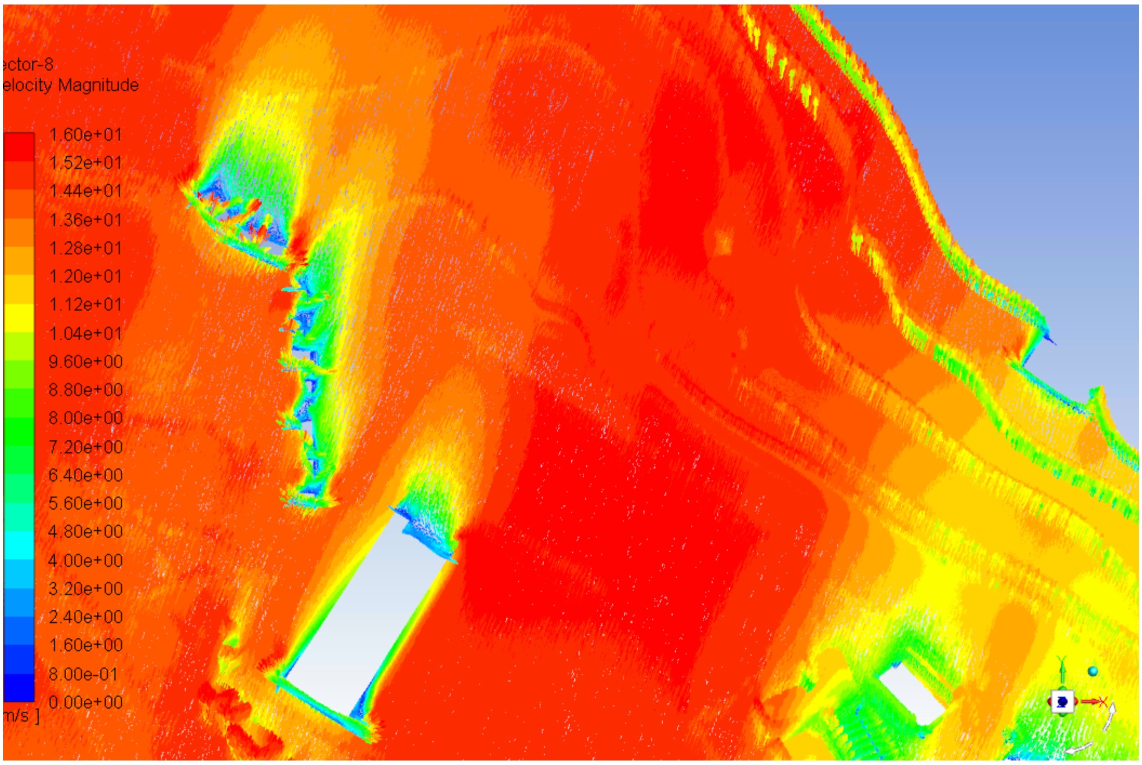
B: Post-Updated MDP

Figure 5 Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most Impacted Aircraft Trajectory on Runway 29L/11R - Approach 10 m Height Mean Wind = 25 kt

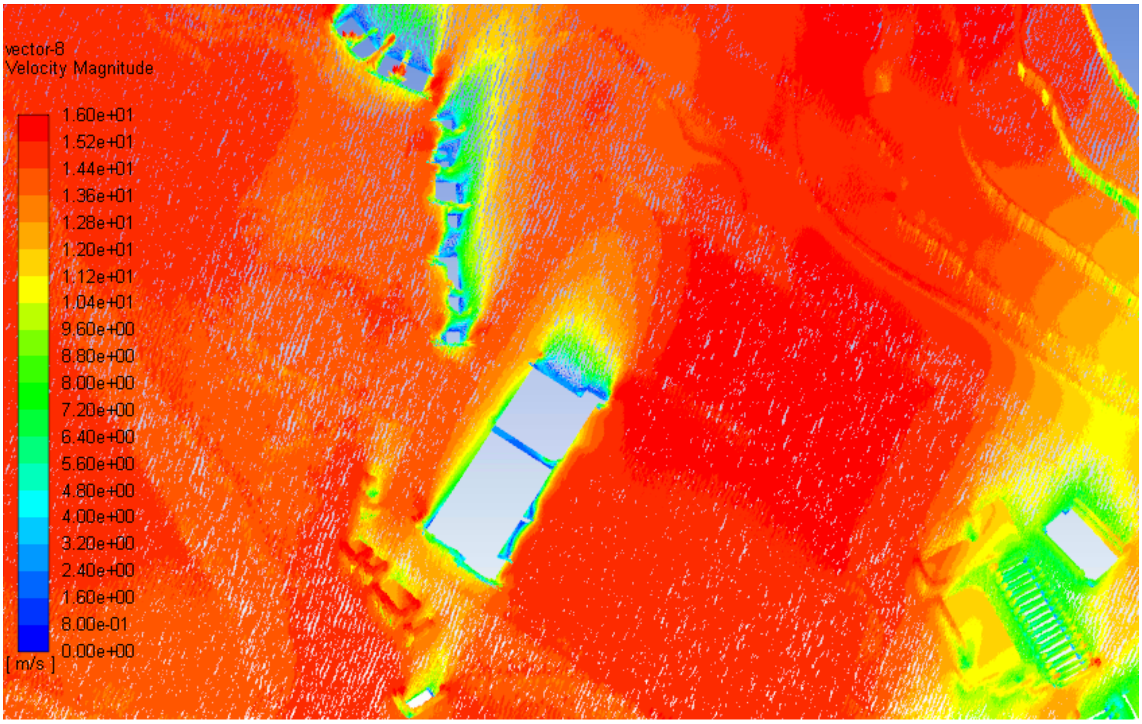


Simulation Test Results: Wind Angle = 200° / DLES Turbulence Model

Figure 6 Velocity Vectors (m/s) at RL10.5m – Approach 10m Height Mean Wind = 25 kt

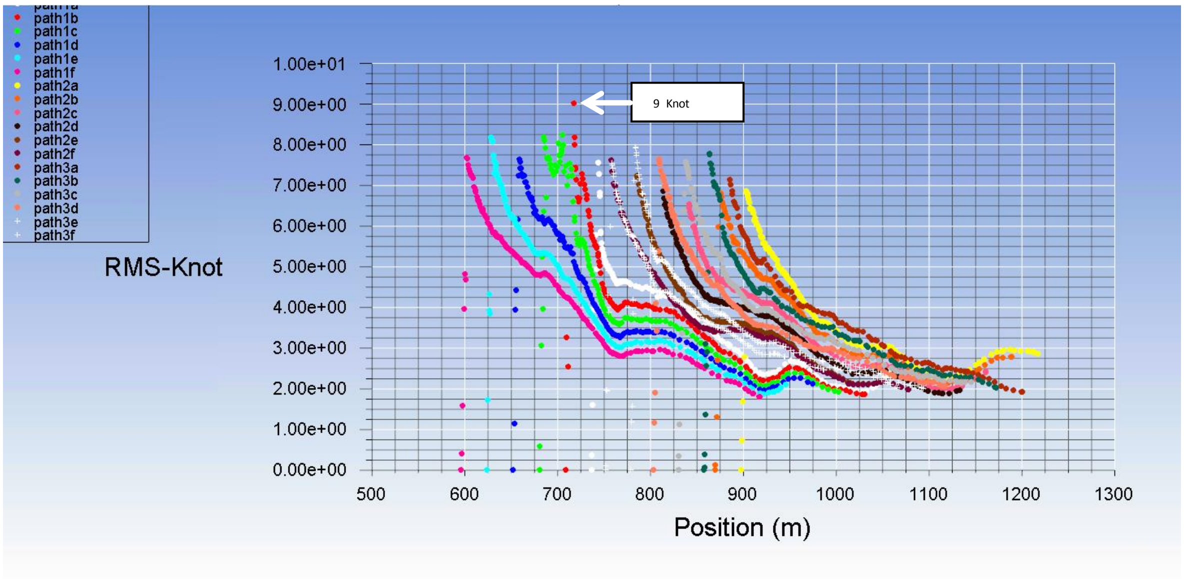


A:Post - MDP

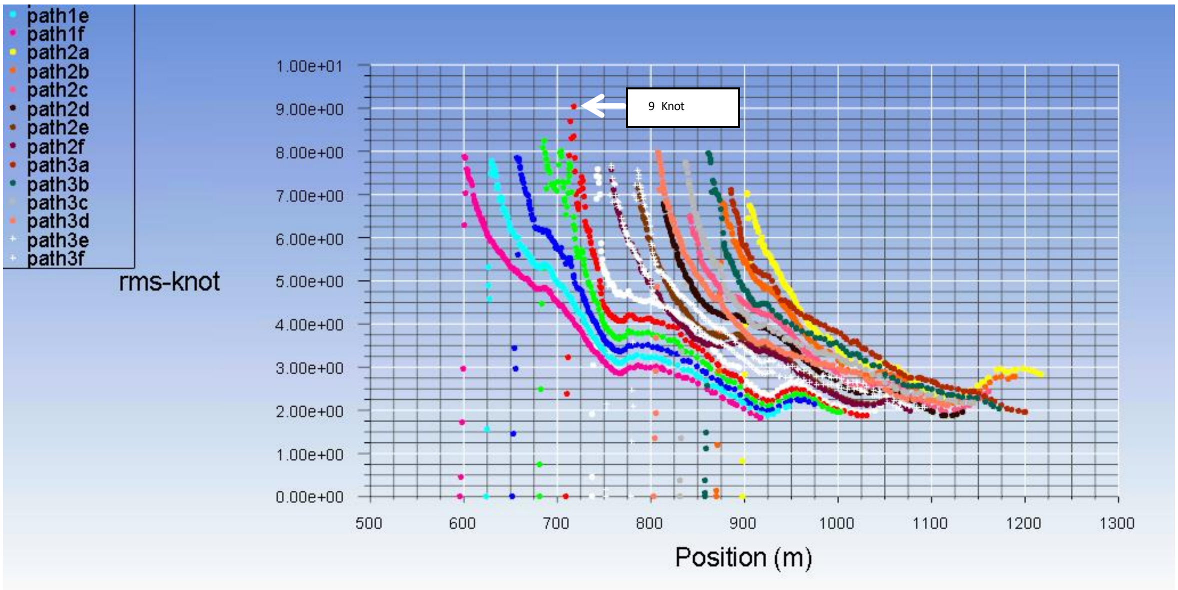


B:Post - Updated MDP

Figure 7 RMS (Standard Deviation, kt) - All Runways, Approach 10 m Height Mean Wind = 25 kt

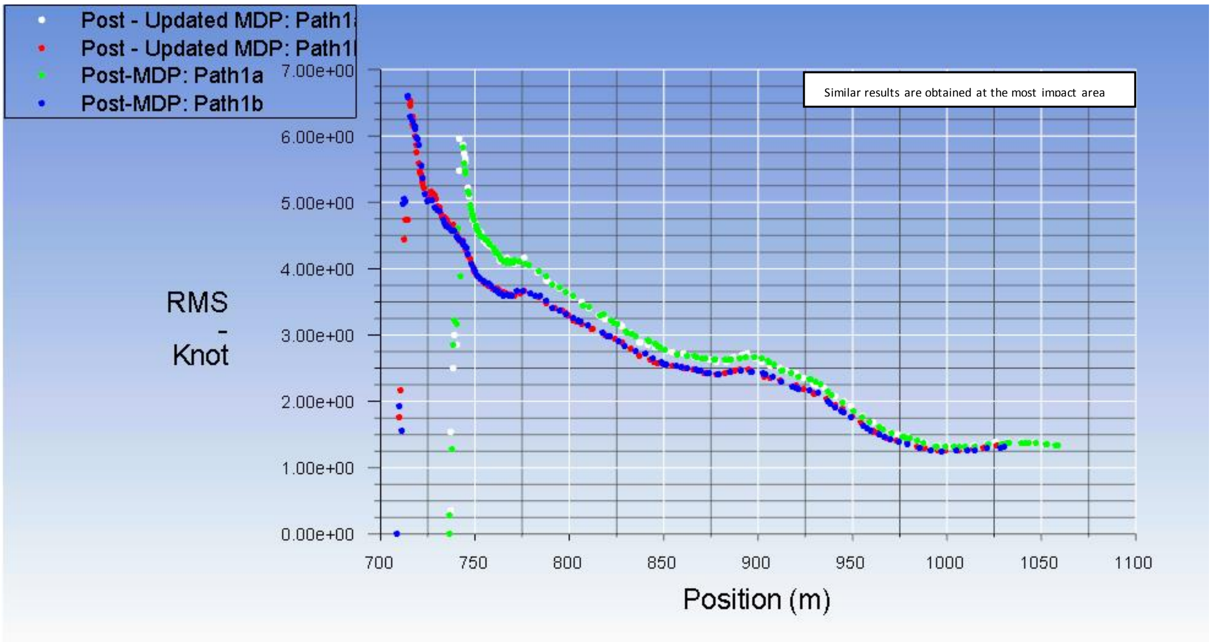


A:Post - MDP



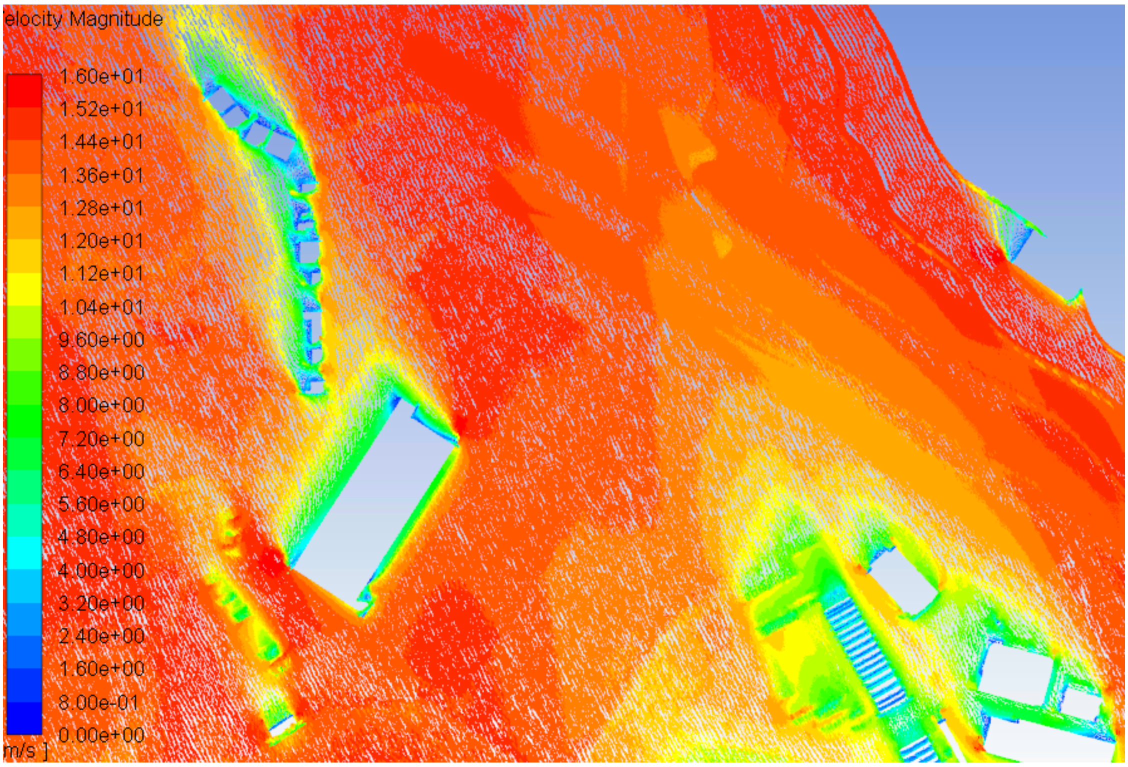
B:Post – Updated MDP

Figure 8 Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most Impacted Aircraft Trajectory on Runway 29L/11R - Approach 10 m Height Mean Wind = 25 kt

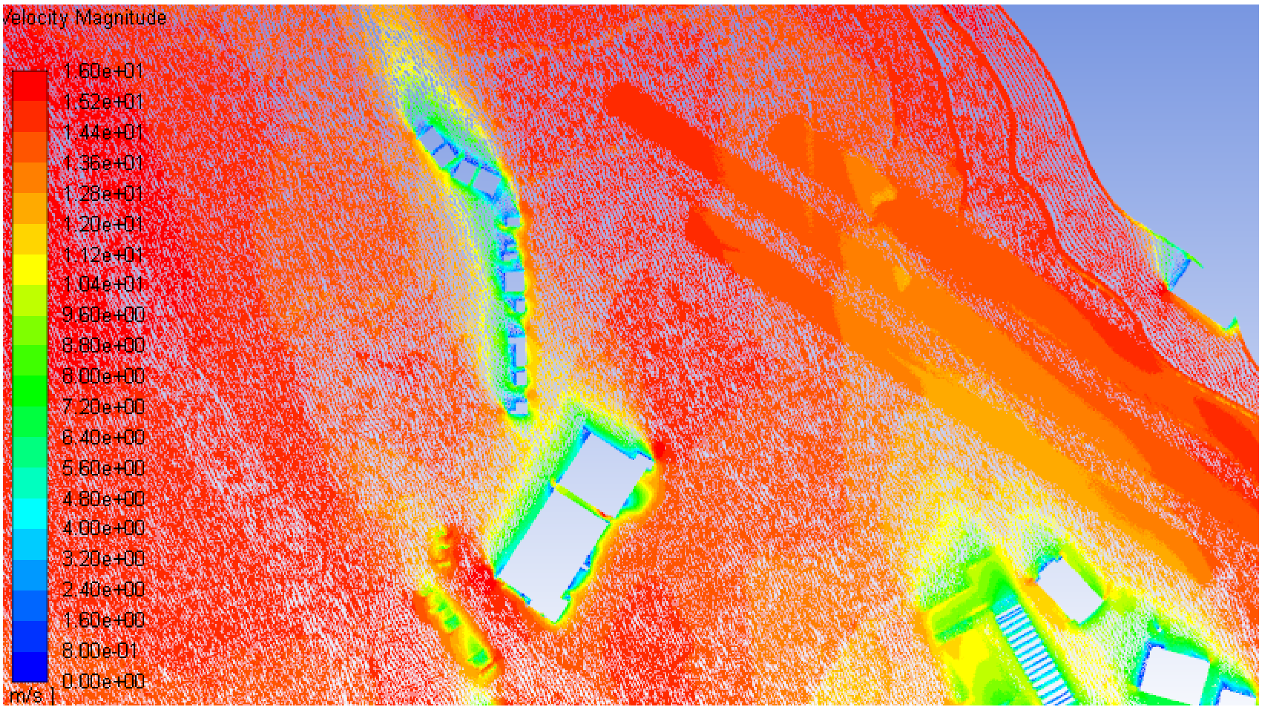


Simulation Test Results: Wind Angle = 155.5° / DLES Turbulence Model

Figure 9 Velocity Vectors (m/s) at RL10.5m – Approach 10m Height Mean Wind = 25 kt

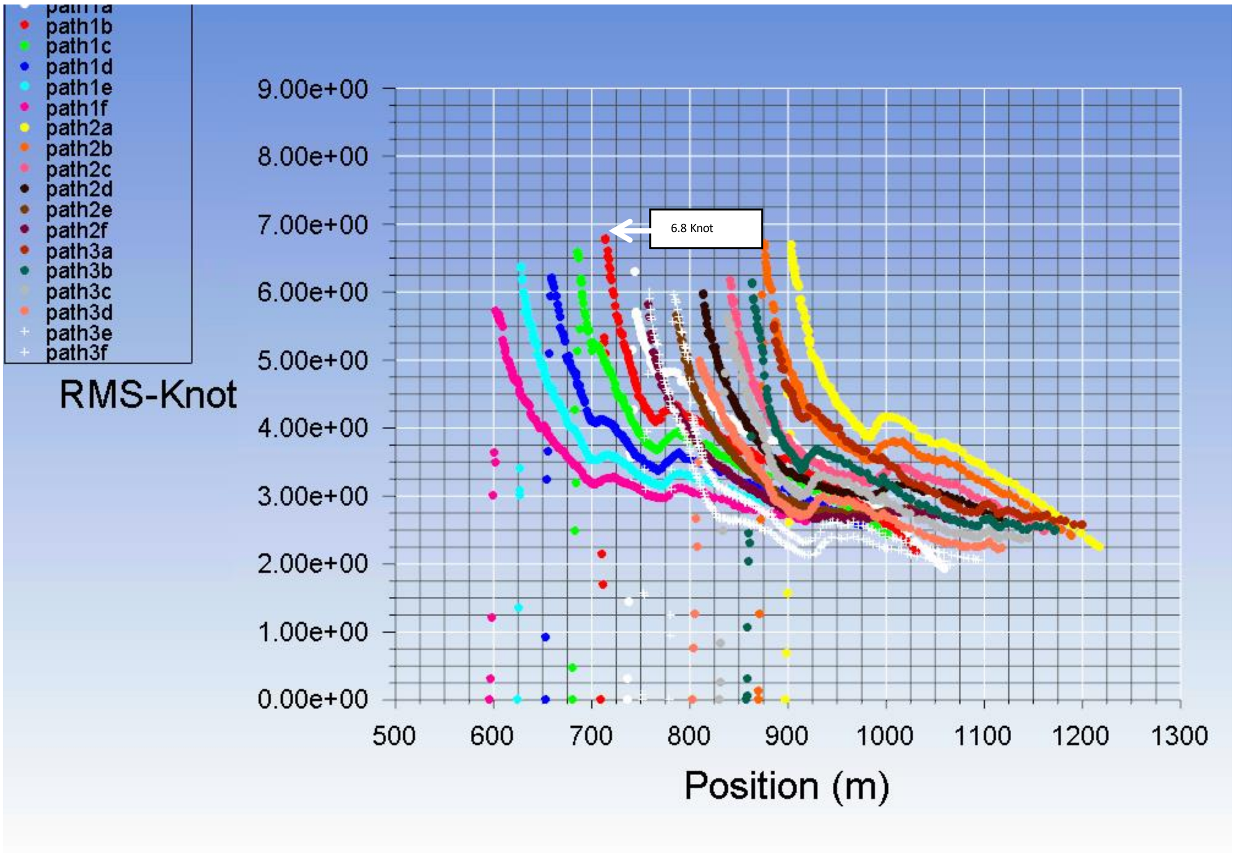


A:Post - MDP

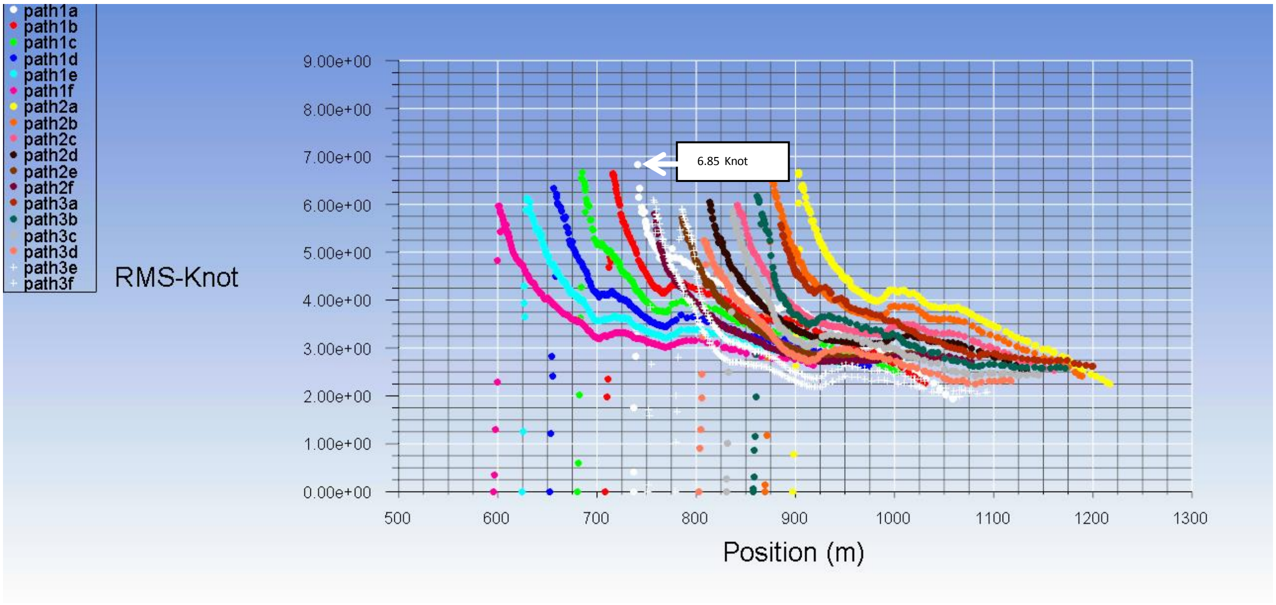


B:Post - Updated MDP

Figure 10 RMS (Standard Deviation, kt) - All Runways, Approach 10 m Height Mean Wind = 25 kt

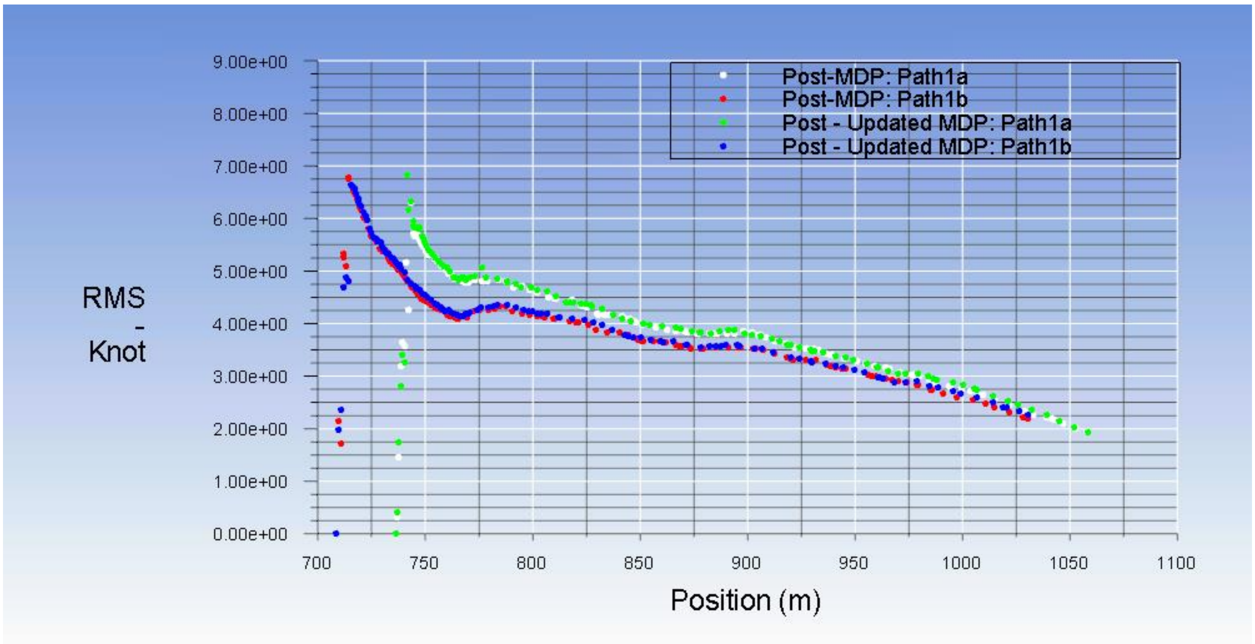


A:Post - MDP



B:Post – Updated MDP

Figure 11 Comparison of RMS (kt) for POST-MDP and Post-Updated MDP Scenarios for Most Impacted Aircraft Trajectory on Runway 29L/11R - Approach 10 m Height Mean Wind = 25 kt



Bankstown Airport - South West Precinct Site Works and Warehouse Major Development Plan

Risk Management of Building Generated Wind Shear and Turbulence

CFD Based Study

Report Number 610.17532

24 May 2018

Bankstown Airport Limited (BAL)
C/- Altis Property Partners
Level 14, 60 Castlereagh Street
Sydney NSW 2000

Version: -v1.1

Bankstown Airport - South West Precinct Site Works and Warehouse Major Development Plan

Risk Management of Building Generated Wind Shear and Turbulence

CFD Based Study

PREPARED BY:

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
610.17532-R01	V1.1	24 May 2018	Dr Neihad Al-Khalidy	Dr Peter Georgiou	Dr Neihad Al-Khalidy
610.17532-R01	V1.0	22 May 2018	Dr Neihad Al-Khalidy	Dr Peter Georgiou	Dr Neihad Al-Khalidy

Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Bankstown Airport Limited (BAL) to undertake a wind shear and wind turbulence report for a proposed development, Lot 1 within a precinct located in the south west corner of Bankstown Airport in support of a Major Development Plan (MDP)

The subject site is approximately 46 ha and located between Milperra Road and Henry Lawson Drive. The nearest perimeter of the proposed Lot 1 is located approximately 365 m to the south-west of Runway 11R/29L.

BAL has commissioned a quantitative Computational Fluid Dynamics (CFD) modelling assessment and report on the wind shear and turbulence effects of the proposed MDP.

The assessment is conducted in accordance with the National Airports Safeguarding Framework (NASF) Guideline B, 2018 – *Managing the Risk of Building Generated Windshear and Turbulence at Airports* - specifically to address wind impacts on runways at Bankstown Airport. The criteria are:

- The *"7-knot alongwind criterion"* – the variation in mean wind speed due to wind disturbing structures must remain below 7kt (3.6 m/s) along the aircraft trajectory at heights below 200 ft. The speed deficit change of 7kt must take place over a distance of at least 100 m.
- The *"6-knot crosswind criterion"* – the variation in mean wind speed due to wind disturbing structures must remain below 6kt across the aircraft trajectory at heights below 200 ft. The speed deficit change of 6kt must take place over a distance of at least 100 m.
- The *"4-knot turbulence criterion"* – the standard deviation of wind speed must remain below 4kt at heights below 200 ft.

The instability which building-induced wake effects can cause to an aircraft is significantly reduced once an airplane has touched down (upon landing) or is at reasonable height (200 ft off the ground prior to landing). After touch-down, the aircraft has increased stability/support from contact with the runway pavement and above 200 ft, the consequences of a drop in altitude or a change in wind bank are considerably less and the pilot has increased latitude and hence time to correct for an induced effect on the aircraft prior to touch-down.

Bankstown Airport is situated south west of the Sydney CBD and comprises three runways (11R/29L, 11L/29R and 11C/29C) suitable for fixed wing aircraft movements and aeronautical facilities required for substantial rotary wing movements as well. Night activity at 11C/29C is approximately 2.5% of all movements.

In relation to the location of the development described in the MDP , the wind directions deemed to have the greatest impact on Runway 11R/29L and to a lesser extent on Runway 11C/29C are the winds originating from South 180° to Southwest 225°.

The study of the current and post MDP development winds has been undertaken using a quantitative CFD analysis approach. The reference approaching wind speed for this study is 25kt at 10 m height taking into account the local exposure factors by wind direction. Cross winds at and above 25kt for the relevant S to SW wind directions for the current study have a very low frequency of occurrence.

- A 25kt or higher mean wind speed from the S to SW occurs 7 times in 5 years (this is 0.016% or less than 2 in 10,000 frequency).

Executive Summary

The following major conclusions have been reached based on results of simulations for the critical wind directions and assessment of Bankstown Airport Bureau of Meteorology (BoM) Weather Station data covering a 5-year period from 2011 to 2015 inclusive.

Existing Wind Conditions (obtained from the BoM Weather Station at Bankstown Airport)

Mean Wind Speed at 10 m Height above Floor Level

- There were 7 hours where the mean wind speed exceeded 25 kt taking into account wind directions between S and SW over the 5 year BoM record period.
- There were 99 hours where the mean wind speed exceeded 20 kt taking into account wind directions between S and SW over the 5 year BoM record period.

Runway 11R/29L and Runway 11L/29R operate during daylight only from 06:00 hrs to 18:00 hrs while 11C/29C operates 24 hours a day. The occurrence of the exceedance for 25 and 20 kt is reduced when only daylight hours are included in SLR's assessment (Refer **Section 3.2.1**)

Turbulence Exceedance at the Anemometer Location (Refer **Figure 15** for Anemometer location)

- There were 329 occasions during the 5 year BoM record period (66 per year) where natural turbulence exceeded 4-kt taking into account ALL wind directions.
- There were 113 occasions during the 5 year BoM record period (approximately 23 per year) where natural turbulence exceeded 4-kt from S to SW.

It should be noted that while many of those exceedance "occasions" occurred on different days, some occurred in consecutive hours on the same day during the passage of major windstorm events.

Future Wind Conditions (Associated with the Post-MDP Scenario)

The following major conclusions have been reached based on results of CFD simulations for the critical wind directions:

Wind Shear

- In general the runways are currently exposed to southerly winds without a significant built environment upstream. The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2 and Path 3) at a height below 60 m (200 ft) over a distance just below 100 m.
- The post-MDP scenario has a small localised wake and very minor impact on the runways.
- The variation in the mean wind speed due to the proposed MDP is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2, Path 3) at a height below 60 m (200 ft) over a distance of at least 100 m due to the following:
    - Shape of the proposed warehouses. The dimension in line with wind is greater than its width by a factor 2:75:1 resulting in a small wake behind the proposed warehouse.
    - Proximity to runways (~365 m to the closest runway – Refer **Figure 7**)
    - Relatively low building height (13.7m max) above finished floor level
    - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the project site sits between the RL's 6.3 and 6.74 m). The proposed warehouse sits at RL 6.74 m finished floor level.
    - Building layouts and features, canopies, etc.

Executive Summary

Wind Turbulence

- Current Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 12 knots for the most critical wind direction.
  - There were 144 times in one year where the cross-wind speed exceeded 12 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 168.75° to 236.25°).
  - Runway 11R/29L operated during the daytime (6:00 am to 6:00 pm) ONLY. A 12 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 115 hours in one year.
- Post-MDP Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 11.5 knots for the most critical wind direction.
  - There were 170 times in 1 year where the cross-wind speed exceeded 11.5 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 168.75° to 236.25°).
  - Runway 11R/29L is operated during the daytime (6:00 am to 6:00 pm) ONLY. A 11.5 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 136 hours in one year.

Summary Results

Results of simulations for the worst case scenario are summarised in below table:

Scenario	Compliance Criteria			Limiting Wind (kt) to satisfy Turbulence Criterion	Turbulence Exceedance Probability in one Year 24 Hrs[1,2]	Turbulence Exceedance Probability in One Year 6 am - 6 pm[1,2]
	Along Wind 7 kt	Cross Wind 6 kt	Turbulence 4 kt			
Current	Yes	Yes	No	12	144	115
Post - MDP	Yes	Yes	No	11.5	170	136

Note 1: The number of hours per annum that a 4-knot turbulence exceedance occurs is based on the mean wind speeds data recorded during the period 1999-2017 at BoM Station 66137. The calculation takes into account wind directions between S 180° and SW 225° where the angle bandwidth is ±11.25°. This covers wind directions from S 168.75° to SW 236.25°).

Note 2: The calculation of the number of exceedance is slightly conservative. For example for the post-PMD scenario, the calculation assumes that the turbulence criterion of 4 knots is triggered at cross-wind of 11.5 knots from S to SW. The criterion is triggered at cross wind of 15 kt at Wind Angle = 180° (Refer **Section 5.1.2**); 11.5 kt at Wind Angle =215° (Refer **Section 5.2.1**) and 12 kt at Wind Angle = 225° (Refer **Section 5.3.1**).

Recommendations

The recommended operational strategy therefore to mitigate building-induced turbulence for the project site is to amend operations so that Runway 29L is not the duty runway when winds exceed 11.0 kt from the S to SW **or** to implement other operational risk mitigation acceptable to the airport operator and CASA.

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FIGURES

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Bankstown Airport Limited (BAL) to undertake a wind shear and wind turbulence report for a proposed development, Lot 1 within a precinct located in the south west corner of Bankstown Airport in support of a Major Development Plan (MDP)

The subject site is approximately 46 ha and located between Milperra Road and Henry Lawson Drive. The nearest perimeter of the proposed Lot 1 is located approximately 365 m to the south-west of Runway 11R/29L.

BAL has commissioned a quantitative Computational Fluid Dynamics (CFD) modelling assessment and report on the wind shear and turbulence effects of the proposed MDP.

The main operational runway is Runway 11C/29C. The runway is 1416 m in length and 30 m in width, with the centreline of the runway being over 280 m away from the proposed precinct.

Runway 11L/29R has primary and secondary operations which operate independently and in conjunction with Bankstown's main runway.

The southern Runway 11R/29L, at 1038 m in length and 23 m wide, is only suitable for single and small twin engine light aircraft such as Cessna 172, 206 and Piper aircraft. The Runway is a further 365 m to the north of the proposed warehouse.

Simulations for worst wind directions from South to Southwest (SW) have been modelled, given the position of Lot 1 relative to typical landing zone range of Runway 11R/29L.

The objective of this study is to undertake a quantitative Computational Fluid Dynamics (CFD) analysis approach of current and post-MDP for the most critical cross-wind directions.

1.1 Development Site

The Lot 1 design involves the development of two warehouses (warehouse 1A and warehouse 1B - refer **Figure 2**). The following area schedule and massing data are proposed:

- Total Site Area ≈ 46 ha;
- Lot 1 Area = 56,390 m^2 (Warehouse = 35,000 m^2 and Office = 2,000 m^2);
- Site RL range = 6.3 m to 6.74 m;
- Lot 1 RL = 6.74 m finished floor level;
- Building Height = 13.7 m maximum above finished floor level;
- Roof Pitch = 2 degrees; and
- The roof ridgeline runs along the long axis of the warehouse.

The current study allows for site topography for the current and post-MDP scenarios.

Figure 1 Aerial View of Proposed Development Site

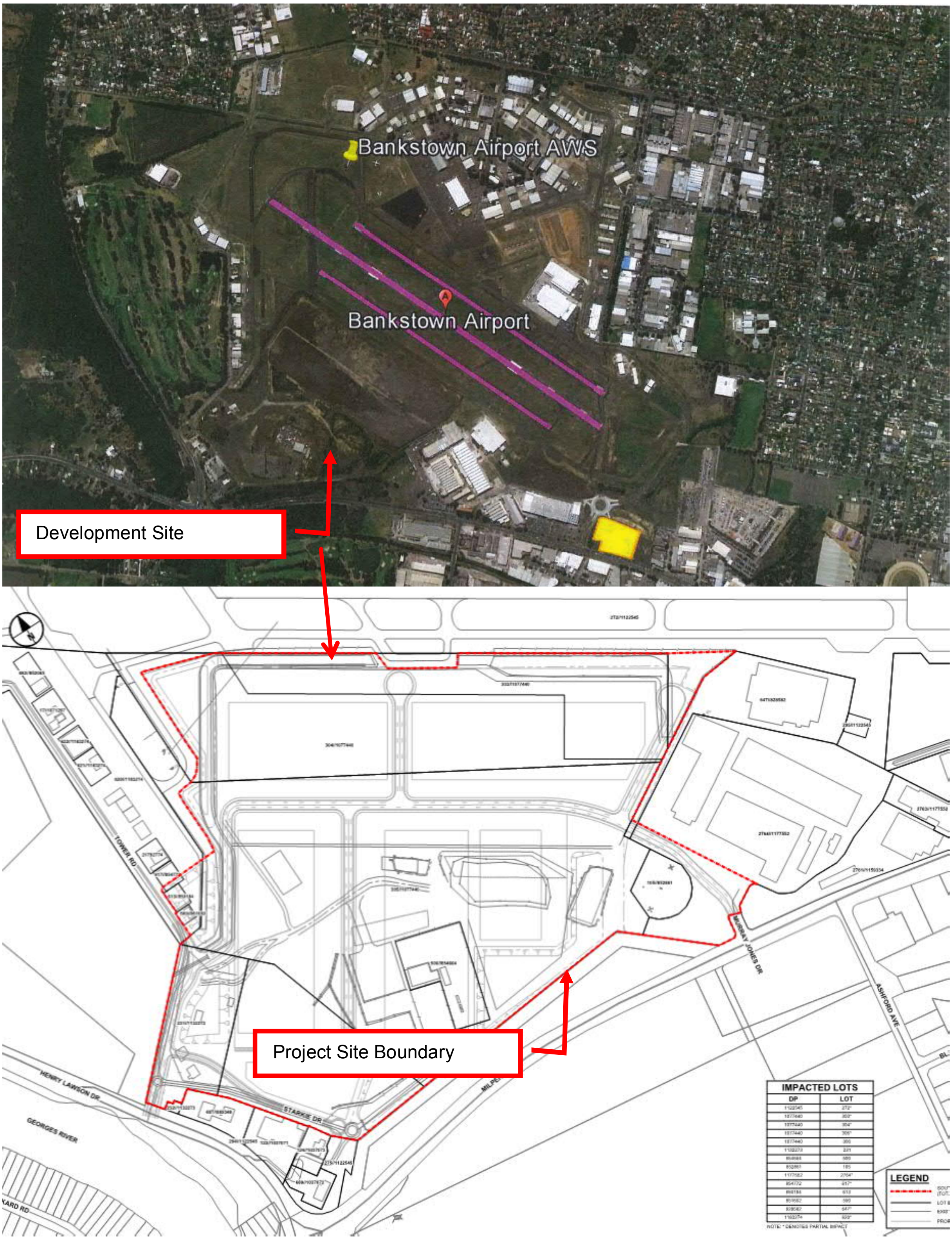
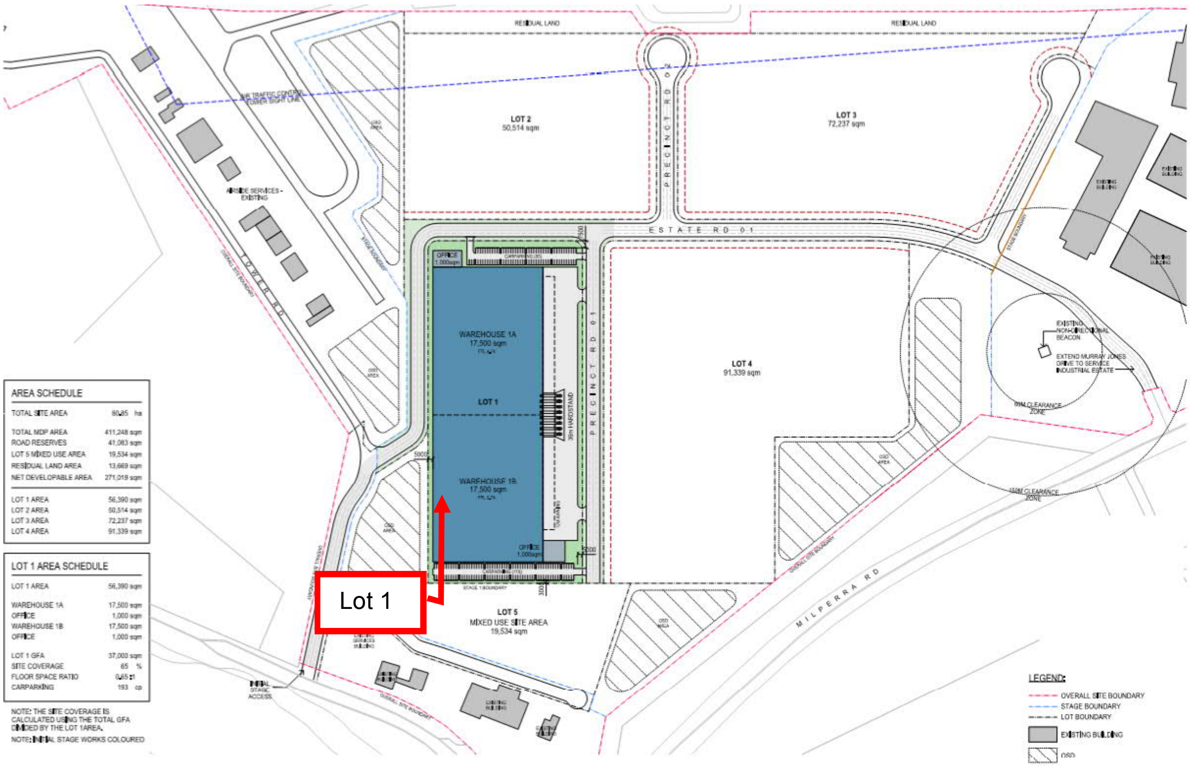


Figure 2 Proposed Lot 1 – Site Plan



AREA SCHEDULE	
TOTAL SITE AREA	60.85 ha
TOTAL MDP AREA	411,248 sqm
ROAD RESERVES	41,083 sqm
LOT 5 MIXED USE AREA	19,534 sqm
RESIDUAL LAND AREA	13,669 sqm
NET DEVELOPABLE AREA	271,019 sqm
LOT 1 AREA	56,390 sqm
LOT 2 AREA	50,514 sqm
LOT 3 AREA	72,237 sqm
LOT 4 AREA	91,339 sqm

LOT 1 AREA SCHEDULE	
LOT 1 AREA	56,390 sqm
WAREHOUSE 1A	17,500 sqm
OFFICE	1,000 sqm
WAREHOUSE 1B	17,500 sqm
OFFICE	1,000 sqm
LOT 1 GFA	37,000 sqm
SITE COVERAGE	65 %
FLOOR SPACE RATIO	0.65 :1
CARPARKING	193 cp

NOTE: THE SITE COVERAGE IS CALCULATED USING THE TOTAL GFA DIVIDED BY THE LOT 1AREA.

NOTE: INITIAL STAGE WORKS COLOURED

2 ACCEPTABILITY CRITERIA

2.1 The National Airports Safeguarding Framework (NASF) Guideline B - 2018

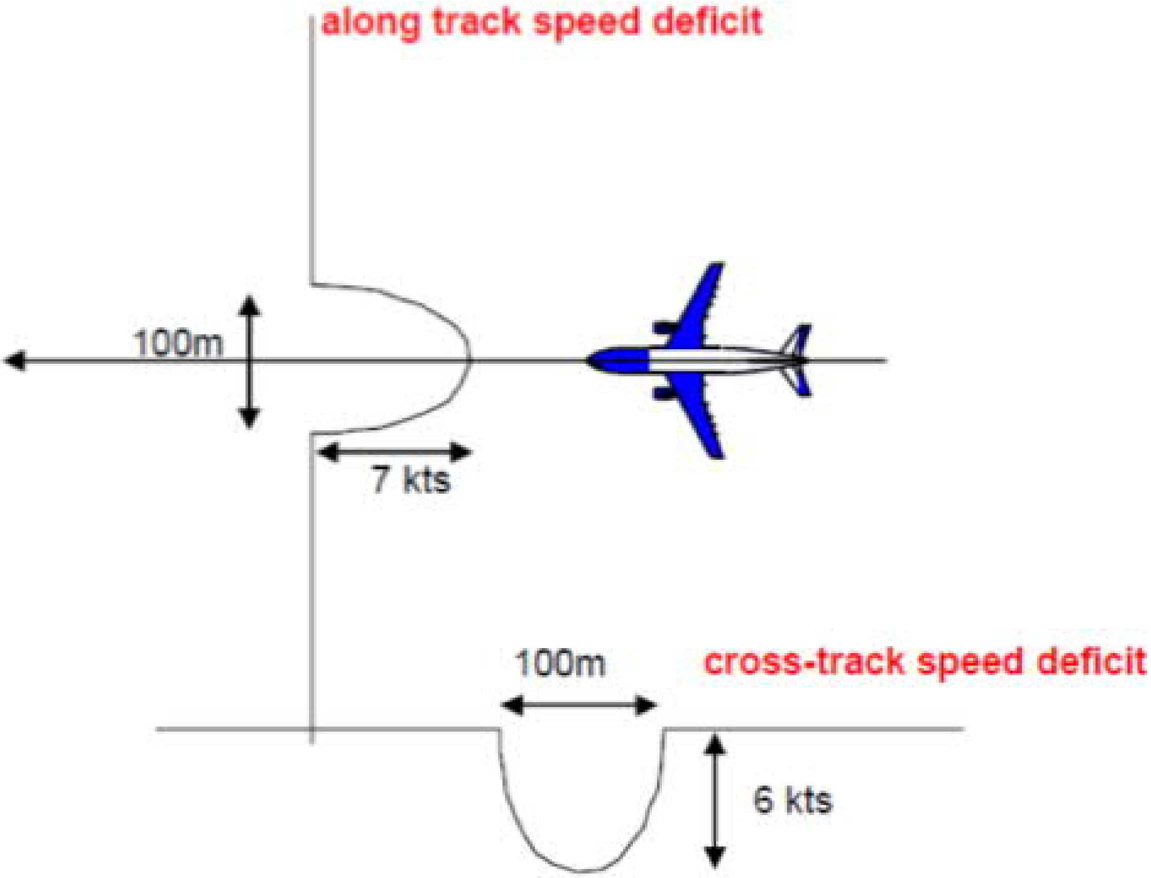
The assessment has been conducted in accordance with the National Airports Safeguarding Framework (NASF) Guideline B, 2018 – Managing the Risk of Building Generated Windshear and Turbulence at Airports specifically to address wind impacts on Bankstown Airport runways which state:

- The "6-knot cross-wind criterion" – i.e. variation in mean wind speed due to wind disturbing structures must remain below 7 kt along the aircraft trajectory at heights below 200 ft. The speed deficit change of 7 kt (3.6 m/s) must take place over a distance of at least 100 m.

- The "6-knot cross-wind criterion" – i.e. the variation in mean wind speed due to wind disturbing structures must remain below 6 kt across the aircraft trajectory (Refer **Figure 3**) at heights below 200ft. The speed deficit change of 6 kt must take place over a distance of at least 100m.

- The "4-knot turbulence criterion" – i.e. the standard deviation of wind speed must remain below 4 kt at heights below 200ft.

Figure 3 Wind Shear Criteria



3 LOCAL EXPOSURE OF THE SITE

3.1 Critical Wind Directions for the Site

Due to the relative position of the proposed building to the runway direction, the critical cross-wind directions for the wind shear and turbulence are between South 180° and Southwest 225°.

3.2 Bankstown Airport Bureau of Meteorology Data

3.2.1 Mean Wind Speed Exceedance

SLR has analysed the Bankstown Airport Bureau of Meteorology (BoM) Weather Station data for the period 2011-2015. This dataset contains records at hourly intervals of:

- Mean Wind Speed - average wind speed during the 60-minute period
- Gust Wind Speed – peak 2-3 second gust occurring (anytime) within the 60-minute period
- Wind Direction – average wind direction during the 60-minute period

From this dataset, SLR has derived the occurrence of the exceedance for various wind speed levels at a 10 m reference height (which is close to the proposed building height) where the angle bandwidth is ±22.5°. This covers wind directions from 157.5° to 247.5°– refer **Table 1**.

Table 1 Mean Wind Speed Exceedances (Hours) in the Period 2011-2015 versus Wind Direction (all hours of the day)

10m ht MEAN Wind Speed (kt)	Wind Direction								
	N 0°	NE 45°	E 90°	SE 135°	S 180°	SW 225°	W 270°	NW 315°	ALL
5	1912	3351	2807	4429	3171	3339	2794	3022	24825
10	313	1260	1356	2848	1481	902	1125	587	9872
15	37	62	107	862	443	173	390	173	2247
20	0	0	7	115	89	10	74	26	321
25	0	0	0	12	7	0	7	1	27

Table 1 shows, over the 5-year period 2011-2015, that:

- There were 27 hours total where the mean wind speed exceeded 25kt taking into account ALL wind directions
  - from the South (ie between SSE 157.5° and SSW 202.5°) to Southwest (ie between SSW 202.5° and WSW 247.5°) there were 7 hours where the mean wind speed exceeded 25 kt
- There were 321 hours total where the mean wind speed exceeded 20 kt taking into account ALL wind directions
  - from the S to SW there were 99 hours where the mean wind speed exceeded 20 kt
- There were 2,247 hours total where the mean wind speed exceeded 15 kt taking into account ALL wind directions
  - from the S to SW there were 616 hours where the mean wind speed exceeded 15 kt

It should be borne in mind that the above "hours" of exceedance do not translate into the same number of "windstorm events" during this 5-year period. There were a number of occasions during the passage of extreme windstorm systems, when these exceedances occurred during consecutive hours on the same day, ie associated with the same windstorm.

One such example occurred during the passage of a strong low pressure system on 29 October 2013. The wind remained above 20 kt for a continuous 6-hour period between Noon and 6:00 pm that day. Accordingly, this one "event" accounted for 6 hourly exceedances of 20 kt.

The data shown in **Table 1** has been reproduced in **Table 2**, this time as an annual exceedance probability of occurrence. The following conclusions can be reached from **Table 1** and **Table 2**.

- A probability of a 25 kt or higher mean wind speed from the S to SW is 0.016%, ie a probability of occurrence less than 2 in 10,000.
- The probability of exceeding 20 kt from the S or SW is approximately 0.226%, ie a 2.2 in 1,000 chance of exceeding 20 kt from that direction.

Table 2 Mean Wind Speed Exceedance Probability in the 2011-2015 versus Wind Direction (all hours of the day)

10m ht MEAN Wind Speed (kt)	**Wind Direction**								
	N 0°	**NE 45°**	**E 90°**	**SE 135°**	**S 180°**	**SW 225°**	**W 270°**	**NW 315°**	**ALL**
5	4.36%	7.65%	6.41%	10.11%	7.24%	7.62%	6.38%	6.90%	56.6%
10	0.71%	2.88%	3.09%	6.50%	3.38%	2.06%	2.57%	1.34%	22.5%
15	0.08%	0.14%	0.24%	1.97%	1.01%	0.39%	0.89%	0.39%	5.13%
20	0.000%	0.000%	0.016%	0.262%	0.203%	0.023%	0.169%	0.059%	0.732%
25	0.000%	0.000%	0.000%	0.027%	0.016%	0.000%	0.016%	0.002%	0.062%

Runway 11R/29L and Runway 11L/29R operate during daylight only from 06:00 – 18:00 while 11C/29C operates 24 hours. Night activity at 11C/29C would be approximately 2.5% of all movement. (Refer **Table 3**). As per **Table 3** the actual number of movements in 2014

- on 11R/29L was 116,240 per year.
- on 11C/29C was 32,141 per year. Approximately 804 movements occurred during night time.
- on 11L/29R was 47,220 per year.

Table 3 Maximum Number of Movements at Bankstown Airport in 2014

Category	Movements	HLS	NWS	11L	11C	11R	29L	29C	29R
Fixed Wing	79,362			23.8%	16.2%			24.3%	35.7%
Fixed Wing Training	116,240					40%	60%		
Helicopters	26,217	100%							
Rescue Helicopters	1,360			30%	10%		20%		40%
Helicopter Training	6,377		100%						
TOTAL in 2014	**229,556**								

The data shown in **Table 1** has been reproduced in **Table 4**, this time only daylight hours (6:00 – 18:00 are included in the assessment. **Table 4** shows, over the 5-year period 2011-2015, that

- There were 21 hours total where the mean wind speed exceeded 25 kt taking into account ALL wind directions
  - from the South (ie between SSE 157.5° and SSW 202.5°) there were 6 hours where the mean wind speed exceeded 25 kt
  - from the Southwest (ie between SSW 202.5° and WSW 247.5°) there were NO hours where the mean wind speed exceeded 25 kt
- There were 249 hours total where the mean wind speed exceeded 20 kt taking into account ALL wind directions
  - from the South (ie between SSE 157.5° and SSW 202.5°) there were 62 hours where the mean wind speed exceeded 20 kt
  - from the Southwest (ie between SSW 202.5° and WSW 247.5°) there were 8 hours where the mean wind speed exceeded 20 kt

Table 4 Mean Wind Speed Exceedances (Hours) in the 2011-2015 versus Wind Direction (Daylight Hours)

10m ht MEAN Wind Speed (kt)	Wind Direction								
	N 0°	NE 45°	E 90°	SE 135°	S 180°	SW 225°	W 270°	NW 315°	ALL
5	1288	1418	1584	2396	1690	1959	1792	2087	14214
10	242	644	907	1715	950	633	736	425	6252
15	35	44	90	605	315	129	304	155	1677
20	0	0	3	85	62	8	66	25	249
25	0	0	0	7	6	0	7	1	21

The data shown in **Table 2** has been reproduced in **Table 5**, this time as an annual exceedance probability of occurrence.

Table 5 **Mean Wind Speed Exceedance Probability in the 2011-2015 versus Wind Direction (Daylight Hours)**

10m ht MEAN Wind Speed (kt)	**Wind Direction**								
	N 0°	**NE 45°**	**E 90°**	**SE 135°**	**S 180°**	**SW 225°**	**W 270°**	**NW 315°**	**ALL**
5	2.94%	3.24%	3.61%	5.47%	3.86%	4.47%	4.09%	4.76%	32.4%
10	0.55%	1.47%	2.07%	3.91%	2.17%	1.44%	1.68%	0.97%	14.3%
15	0.080%	0.100%	0.205%	1.381%	0.719%	0.294%	0.694%	0.354%	3.83%
20	0.000%	0.000%	0.007%	0.194%	0.141%	0.018%	0.151%	0.057%	0.568%
25	0.000%	0.000%	0.000%	0.016%	0.014%	0.000%	0.016%	0.002%	0.048%

With regard to the limits of the approaching wind speed, SLR has been advised that there are practical aspects of the runways becoming inoperable in high cross-winds at and above 25kt.

3.2.2 Natural and Existing Built Environment Turbulence Exceedance

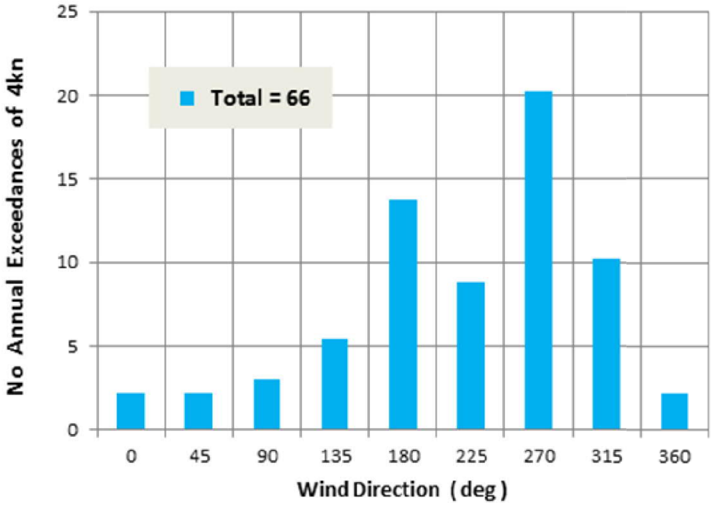
SLR's analysis of the Bankstown Airport Bureau of Meteorology (BoM) Weather Station data for the period 2011-2015 has yielded the number of annual exceedance of 4-kt as shown in **Table 6** and **Figure 4**. The following conclusions can be reached from **Table 6** and **Figure 4**.

- There were 329 occasions in a 5 year period (66 times in 1 year) where the 4-kt exceeded taking into account ALL wind directions.
- The wind directions which relate to the location to the proposed development are the winds originating from the S to SW. There were 113 occasions in 5 years (approximately 23 occasions in 1 year) where the 4-kt exceeded from the S to SW direction.
- It should be noted that most of those exceedance are occurring on different days but some of these exceedance would likely occur in consecutive hours during the passage of major wind storm events.

Table 6 **4 knot Turbulence Exceedance Mean Wind Speed Exceedance Probability in the 2011-2015 versus Wind Direction**

No of Annual Exceedances of 4kt	**Wind Direction**								
	N 0°	**NE 45°**	**E 90°**	**SE 135°**	**S 180°**	**SW 225°**	**W 270°**	**NW 315°**	**ALL**
5 Years (2011-2015)	11	11	15	27	69	44	101	51	329
1 Year	2.2	2.2	3	5.4	13.8	8.8	20.2	10.2	65.8
%age annual	0.025%	0.025%	0.034%	0.062%	0.158%	0.100%	0.231%	0.116%	0.025%

Figure 4 4 knot Turbulence Exceedance Probability in 1-Year – Bankstown Airport BOM Weather Data



4 CFD MODELLING, ASSUPTION AND ANALYSIS

SLR has modelled the proposed MDP and the surrounds using the Creo Parametric software package. This was then imported to ANSYS to prepare the model for solving.

The surrounding buildings and airport runways were included in the study. The model was then moved to the specialised world leading CFD software ANSYS-FLUENT V18.1 for computation.

Ambient wind profiles have been created for all critical wind directions.

Wind speeds were then determined at the runways relative for the current and post-MDP scenarios.

4.1 Modelling

A 3D model of the development area and surrounding buildings was created from 2D AutoCAD files supplied by AECOM and SBA Architects (received 5/4/2018).

The geometry for CFD Modelling is shown in **Figure 5** to **Figure 7.** The developed model accounts for all small features of the proposed development (eg canopies, gaps, etc.).

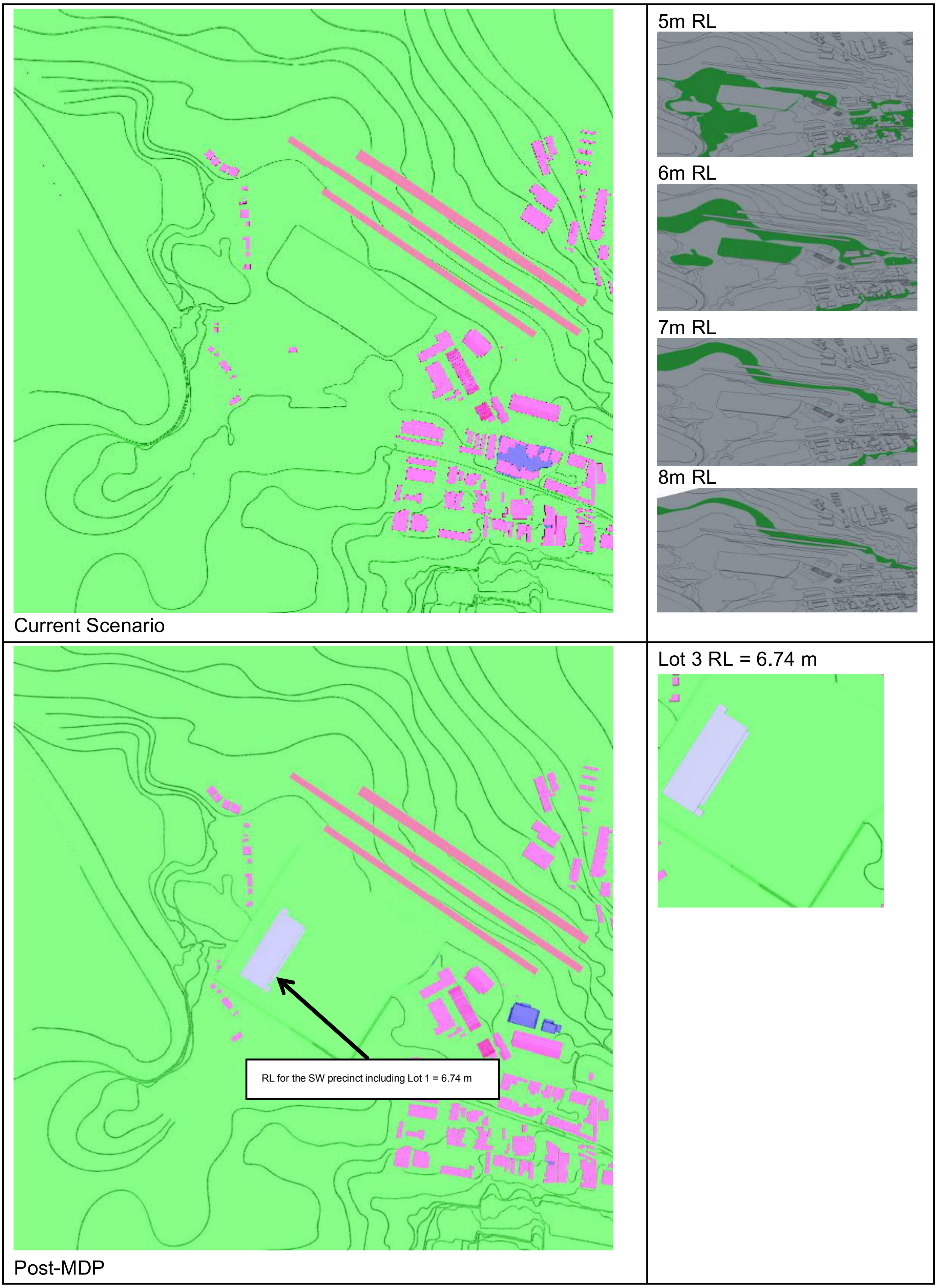
SLR has also reviewed the survey data for the areas of interest. The available survey data for the proposed development site has shown elevated ground at the areas of interest. All complex topographic features are also included in the current and post-MDP scenarios (Refer **Figure 5**).

In the CFD geometry the runway RL's are:

- 11R/29L – generally 6 m
- 11C/29C – mostly 8 m falling to 6 m toward 11C
- 11L/29R - mostly 9 m falling to 7 m toward 11L

A calculation domain of 2,448 m length, 2,448 m wide and 400 m high was used for the CFD analysis.

Figure 5 **Development Site and Surrounds**



Current Scenario

5m RL

6m RL

7m RL

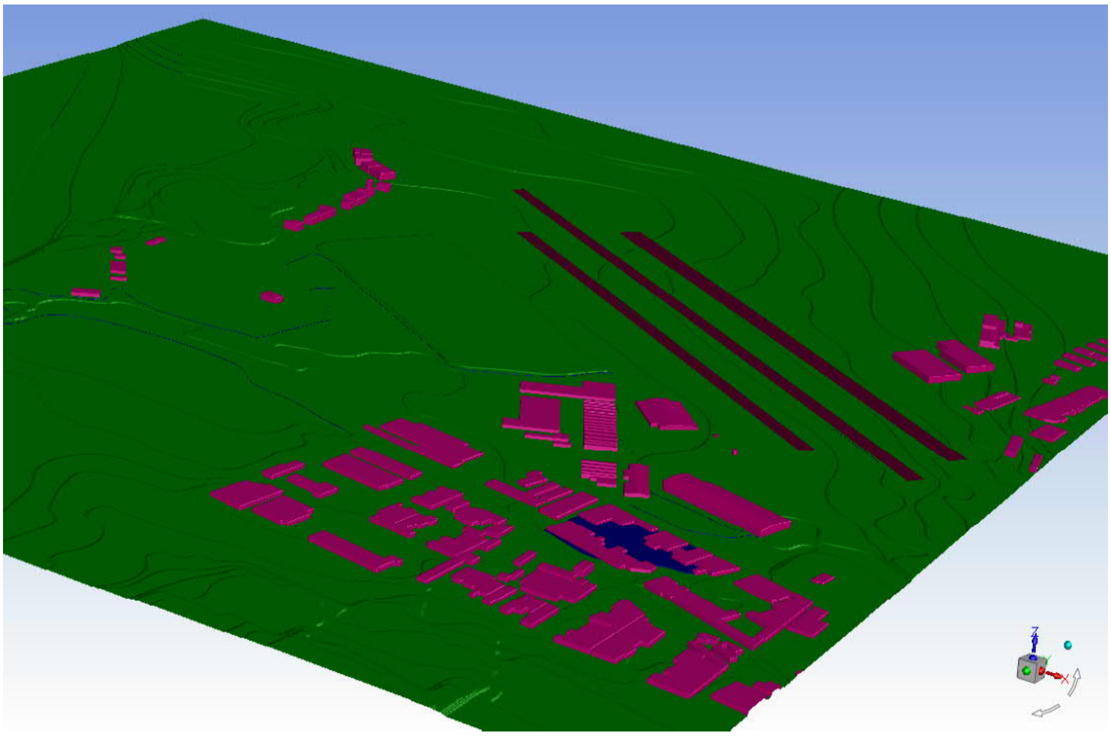
8m RL

Post-MDP

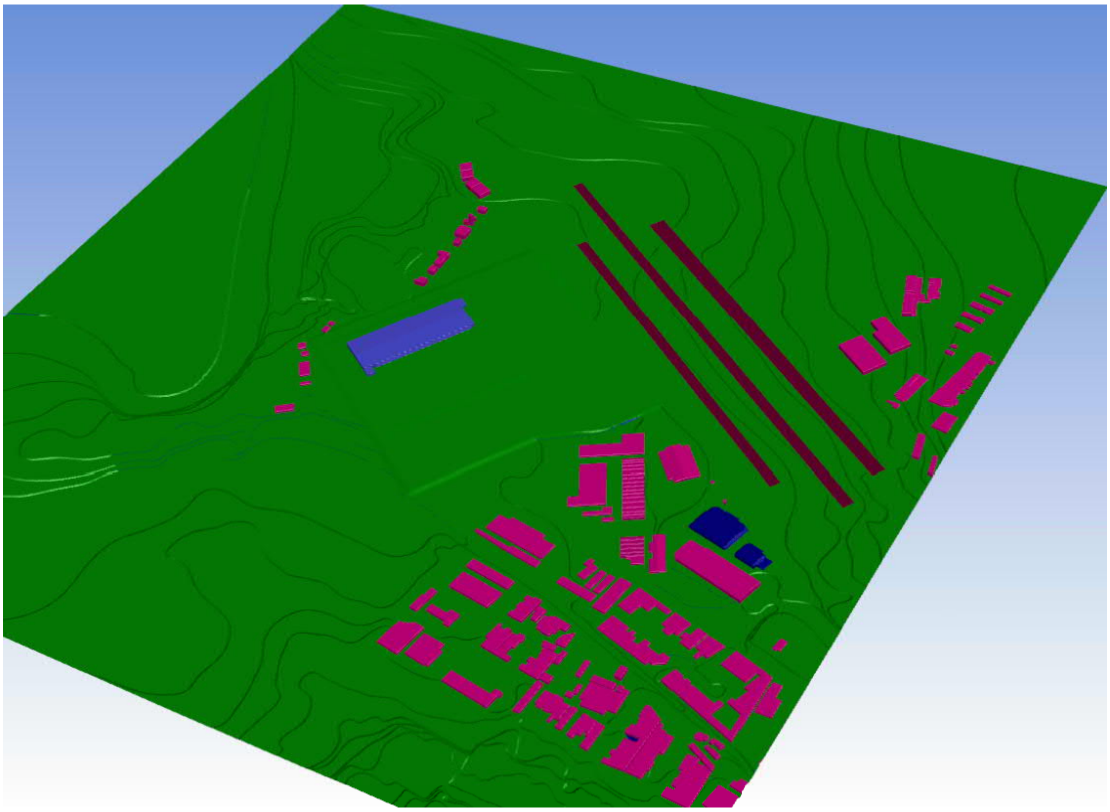
RL for the SW precinct including Lot 1 = 6.74 m

Lot 3 RL = 6.74 m

Figure 6 3D Model of the Site and Surrounds Including Modelled Site Topography

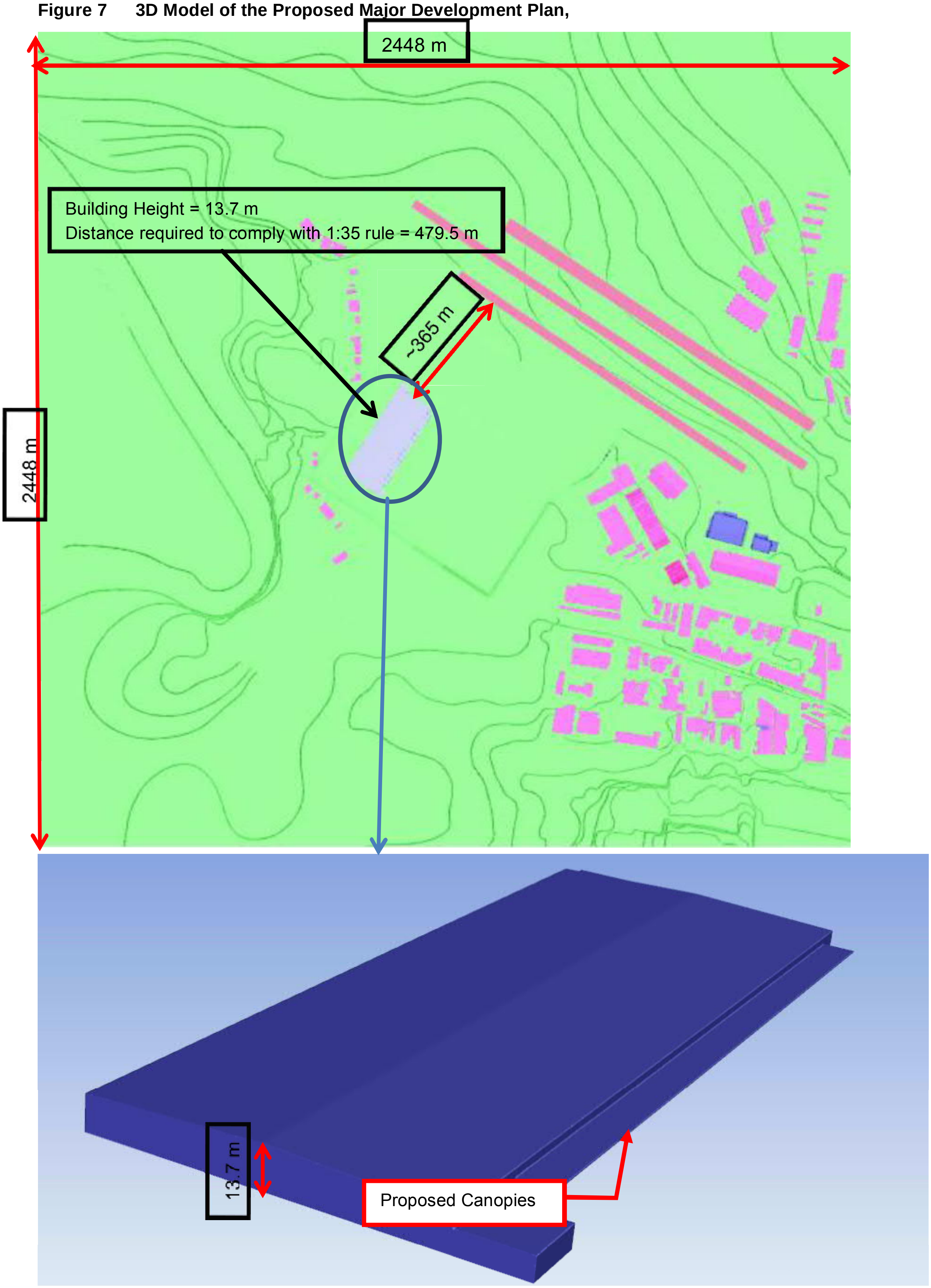


A: Current



B: Post-MDP

Figure 7 3D Model of the Proposed Major Development Plan,



4.2 Wind Condition

The results in the following sections are presented for a reference approach wind speed of 25 kt at 10 m height above ground taking into account the local exposure factors by wind direction.

The Bankstown Airport Bureau of Meteorology (BoM) Weather Station data for the period 2011-2015 shows that there were 7 hours total (Refer **Table 1**) where the mean wind speed exceeded 25 kt from the wind orientating from the south quadrant (ie between S and SW) or 1.4 Hours per year where the mean wind speed exceeded 25 kt. The results in this study will be presented for the worst case wind conditions.

At the upwind free boundary inlet, velocity profiles were derived from the Australian Wind Code, AS1170.2. For example the approaching wind speed is 25 kt at 10 m height with a vertical profile determined by the surrounding terrain in accordance with the Terrain Category classification contained in the Code. The effect of terrain roughness on wind speed is then used to obtain the variation in wind speed with height.

4.3 Turbulence Model

For the current study, SLR used an advanced Detached Large Eddy Simulation (D-LES) turbulence model to capture the unsteadiness arising from turbulence for a number of critical wind directions. The implemented D-LES (hybrid modelling mythology) approach combines the benefits of Reynolds-averaged Navier–Stokes equations (or RANS equations) and LES while minimising their disadvantages; while the RANS (Realizable k-epsilon in this study) can achieve good prediction for attached boundary layers, LES can capture unsteady motions of large eddies in separated regions.

This approach is significantly more reliable for the turbulence intensity prediction. However, it is important to understand that the D-LES method is substantially more computationally demanding than RANS simulations. SLR has used a small time step in the order of 0.1 s to provide an adequate temporal resolution of the flow as it passes through each cell at the area of the interest.

4.4 Discretization

The quality of the mesh is a critical aspect of the overall numerical simulation and it has a significant impact on the accuracy of the results and solver run time.

A mesh sensitivity assessment has been carried out for the current and post-MDP scenarios.

For all cases in this study, polyhedral elements with a total number of 18,852,516 cells for the post-development scenario and 11,231,776 for the current scenario were used to cover the computational domain. Polyhedral cells are especially beneficial for handling recirculating flows and used to provide more accurate results than even hexahedra mesh. For a hexahedral cell, there are three optimal flow directions which lead to the maximum accuracy while for a polyhedron with 12 faces there are six optimal directions which, together with the larger number of neighbours lead to a more accurate solution with a lower cell count.

5 RESULTS AND DISCUSSION

Due to the relative position of the proposed building to the runway direction, the following critical cross-wind directions for the wind shear and turbulence are analysed in this study:

- South (Wind Angle = 180^o)
- South-Southwest (Wind Angle = 215^o) – Perpendicular Cross Wind Direction
- Southwest (Wind Angle = 225^o)

The impact of west-southwest winds on the runways is minor. Results of simulations are completed for four wind directions and presented for the above three wind directions.

5.1 Wind Angle: South (180^o)

5.1.1 Wind Shear Assessment

Figure 8 shows the wind speeds at RL 10.5 m (RL at the project site = 6.74 m and at the ridge roof = 20.4 m). Dark blue represents still conditions at 0 m/s and red representing the strongest wind speed. The following conclusions can be reached from the above figure:

- The CFD model captures the fluid flow characteristics in significant detail. Wind is approaching the site from the south at 180^o as per the given boundary condition. Wind is then accelerated near the edges and stagnated and recirculated behind the buildings.
- There is a slight increase in mean wind speed at the project site for the post development scenario due to change in site topography due to earth work and filling (6.74 m for the development site verses 6 m (or less) at most existing locations).
- There is a very minor variation in wind speeds along the width of the runways.
- A comparison for the wind shear shows that the proposed MDP will have a minor impact at the runways (Refer **Figure 8b**).

Figure 9 with resultant velocity indicates that the disturbance to the approaching mean wind speed is highly localised due to MDP development shape (eg the dimension in line with wind is greater than its width by a factor 2:75:1 and the wake is small).

The variation in mean wind speed due to wind disturbing structure must remain below 6 kt along the aircraft trajectory at a height below 200 ft (60 m). The speed change of 6 kt must take place over a distance of at least 100 m (NASF, 2018). The aircraft instability is significantly reduced once the airplane has touched down or is above 200 feet off the ground after take-off.

The approaching angle for landing will be between 2.7 degrees and 4 degrees, with 3 degrees considered as the average. Six possible landing scenarios per runway with an approaching angle of 3 degrees are analysed in this study. Landing paths are shown in **Figure 10**.

A comparison for the wind along the aircraft trajectory for the above paths is shown in **Figure 11** to **Figure 13**. The following comments are made with regards to the above graphs:

- The graphs present the results at variable height of the aircraft trajectory (3 degrees).
- The presentations are made for the worst case condition, starting from an altitude band of 30 m. The wind deficit at an altitude >30 m is negligible due to the buildings height and runways locations.
- The wind shear calculation is based on the normal component of the approaching wind.

The following clarifications are provided with regards to **Figure 11**:

- The runway starts at approximately X=785 m for flight path 1a and the aircraft lands at approximately X=735 m for flight path 1a.
- The approaching mean wind speed at 10 m above ground is 25 kt. Wind speed increases with height. Higher wind speed is therefore predicted at 30 m above ground (~x=1,061 for flight path 1a).
- Impact of the existing built environment is captured by the CFD model (Refer **Figure 11A**).
- Highest wind deficit is obtained at the wake of buildings (existing or proposed development).
- The wind speed and wind deficit results are proportional.
- The mean wind speed at the ground = 0.

The following conclusions can be reached from **Figure 11** to **Figure 13**:

- The current scenario has a negligible wake. In general the runways are currently exposed to southerly winds without a significant built environment upstream.
- The post development scenario has a small localised wake and very minor impact on 11R/29L due to proximity to the runway. The impact on other runways is negligible.
- The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2 and Path 3) at a height below 60 m over a distance just below 100 m.
- The variation in the mean wind speed due to the proposed MDP is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2, Path 3) at a height below 60 m (200 ft) over a distance of at least 100 m due to the following:
  - Shape of the proposed warehouses. The dimension in line with wind is greater than its width by a factor 2:75:1 resulting in a small wake behind the proposed warehouse.
  - Proximity to runways (~365 to the closest runway – Refer **Figure 7**)
  - Relatively low building height (13.7m max)
  - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the warehouses sit between the RL’s 6.74 m).
  - Building layouts and features, canopies, etc.

Figure 8 Velocity Vector (m/s) at RL 10.5 m - DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 180°

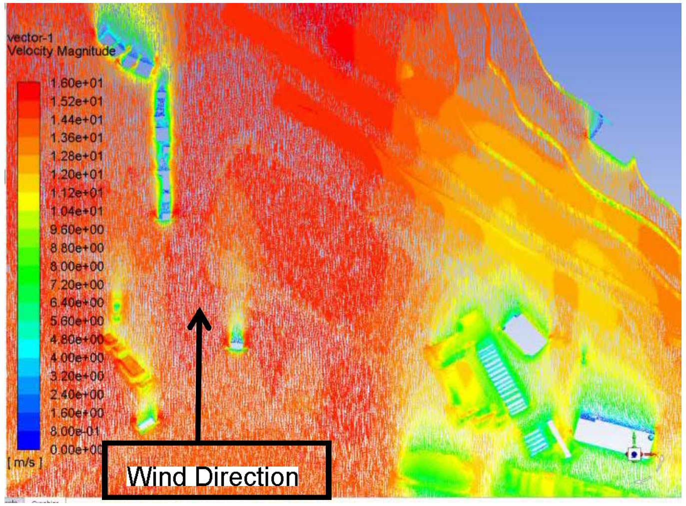
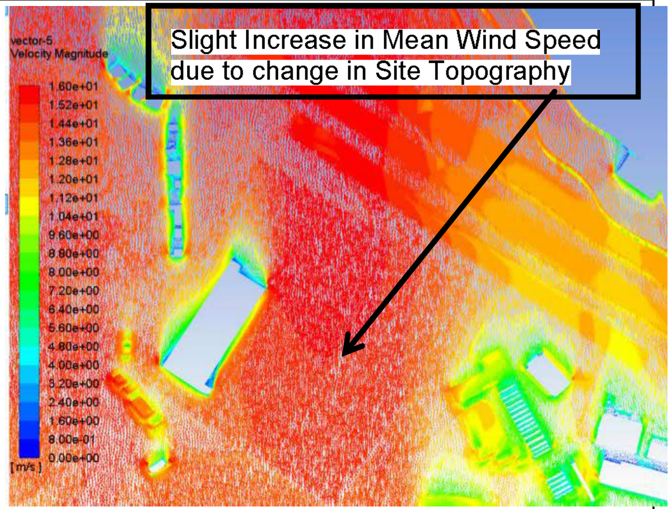
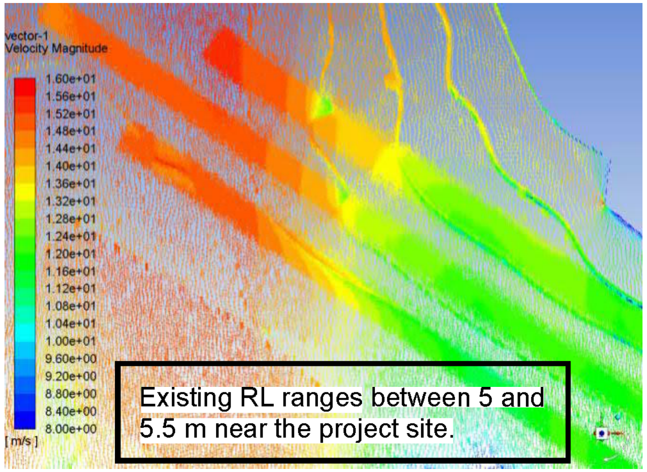
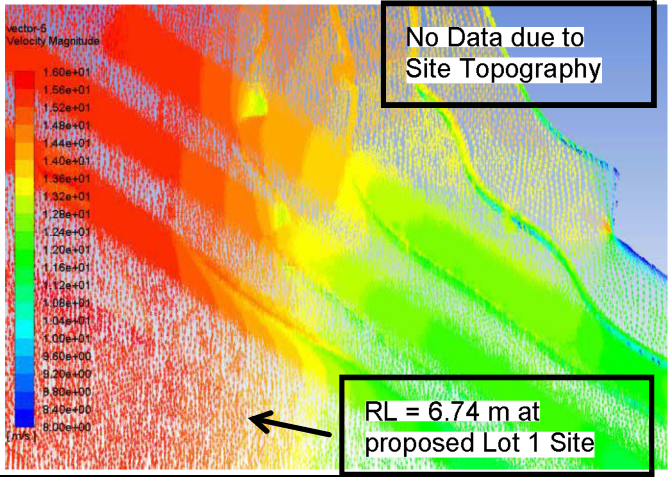
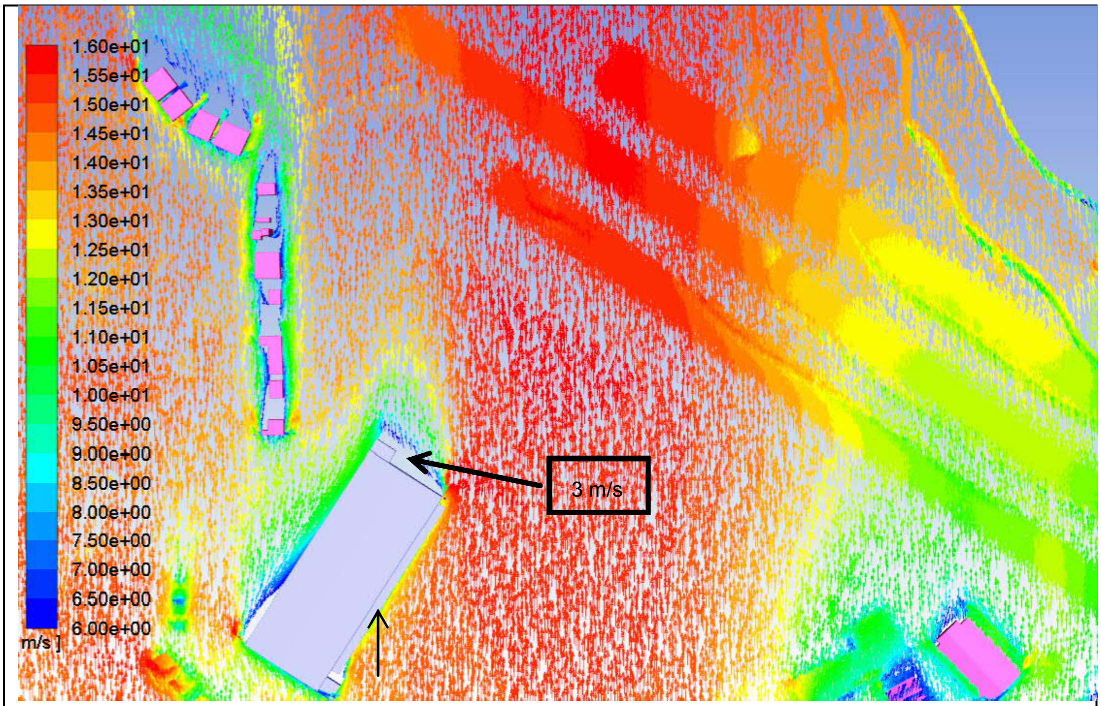
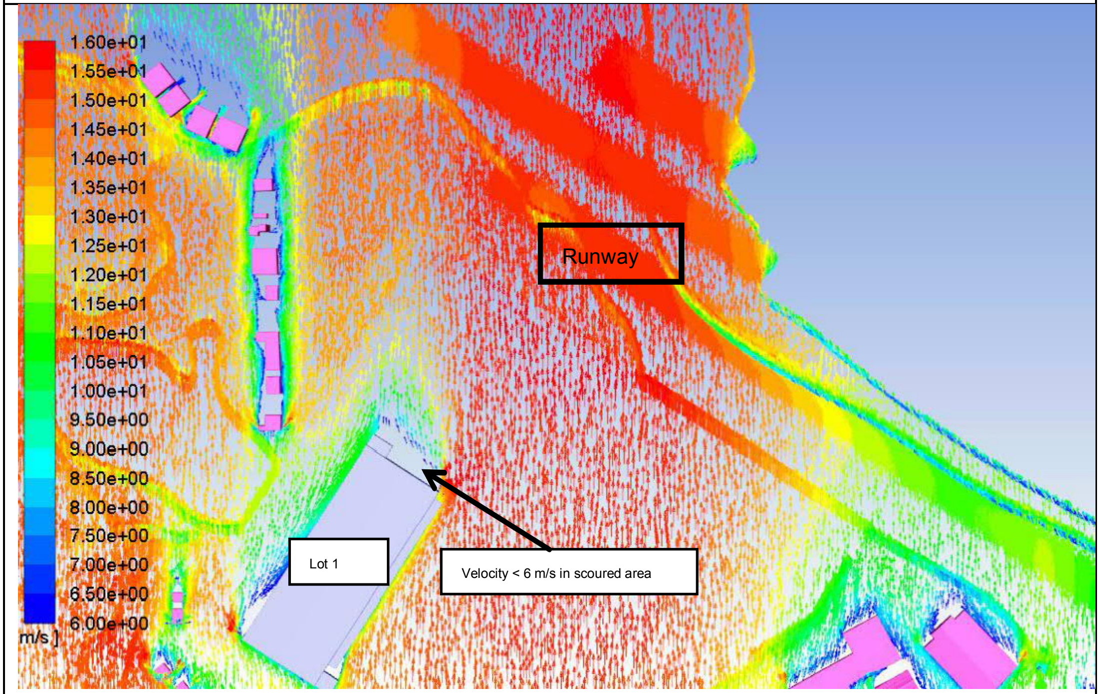
	Current	Post-MDP
A: On 0 – 16 m/s Scale	 Wind Direction	 Slight Increase in Mean Wind Speed due to change in Site Topography
B: On 8 – 16 m/s Scale	 Existing RL ranges between 5 and 5.5 m near the project site.	 No Data due to Site Topography RL = 6.74 m at proposed Lot 1 Site

Figure 9 Velocity Vector Contoured by Velocity Magnitude (m/s) - Wind Angle = 180°



A: RL 10.5 (On 8 – 16 m/s Scale)



B: RL8.5 m (On 8 – 16 m/s Scale)

Figure 10 Possible Landing Scenarios at 3 Degrees Approaching Angle

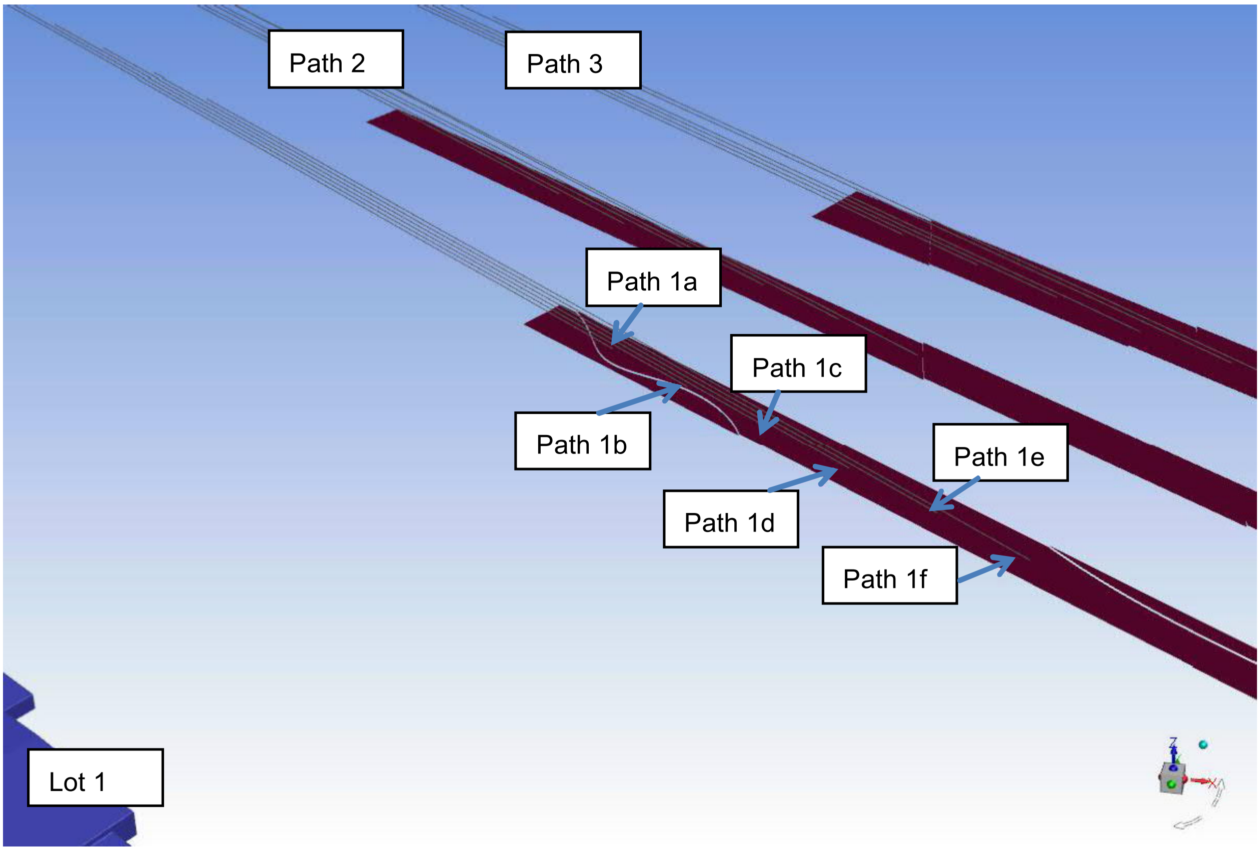
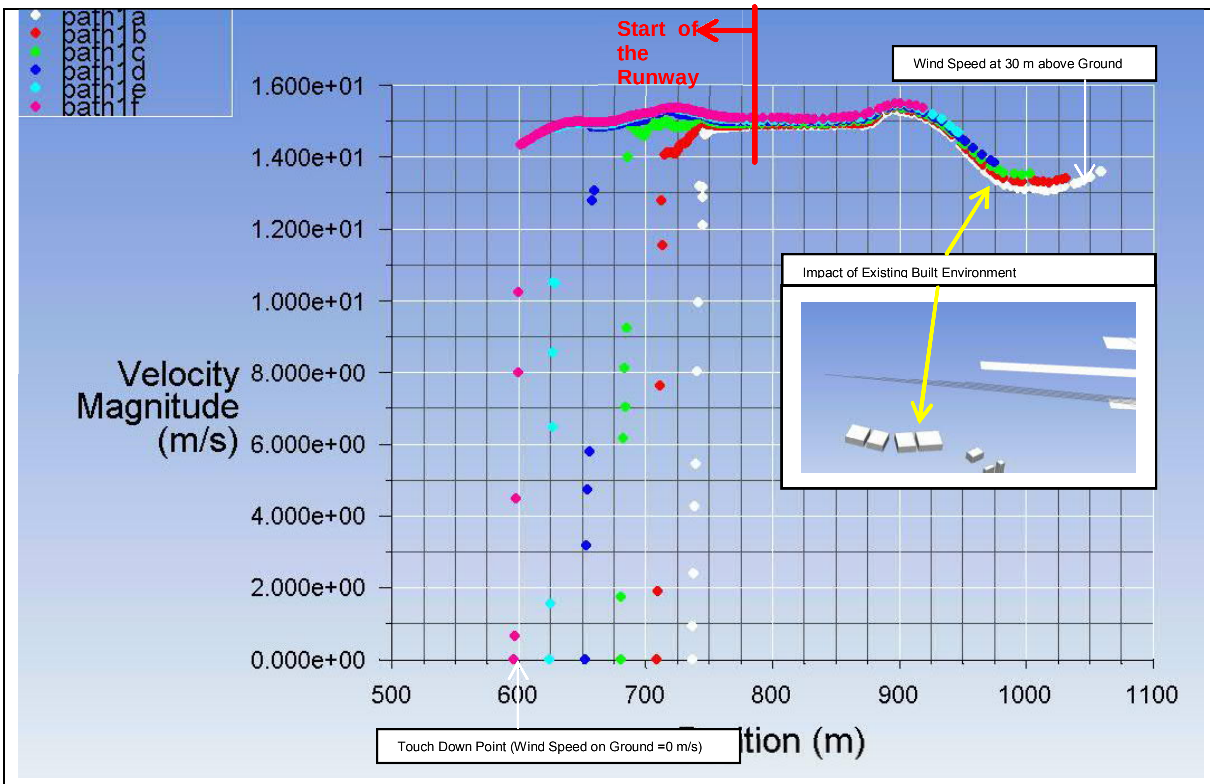
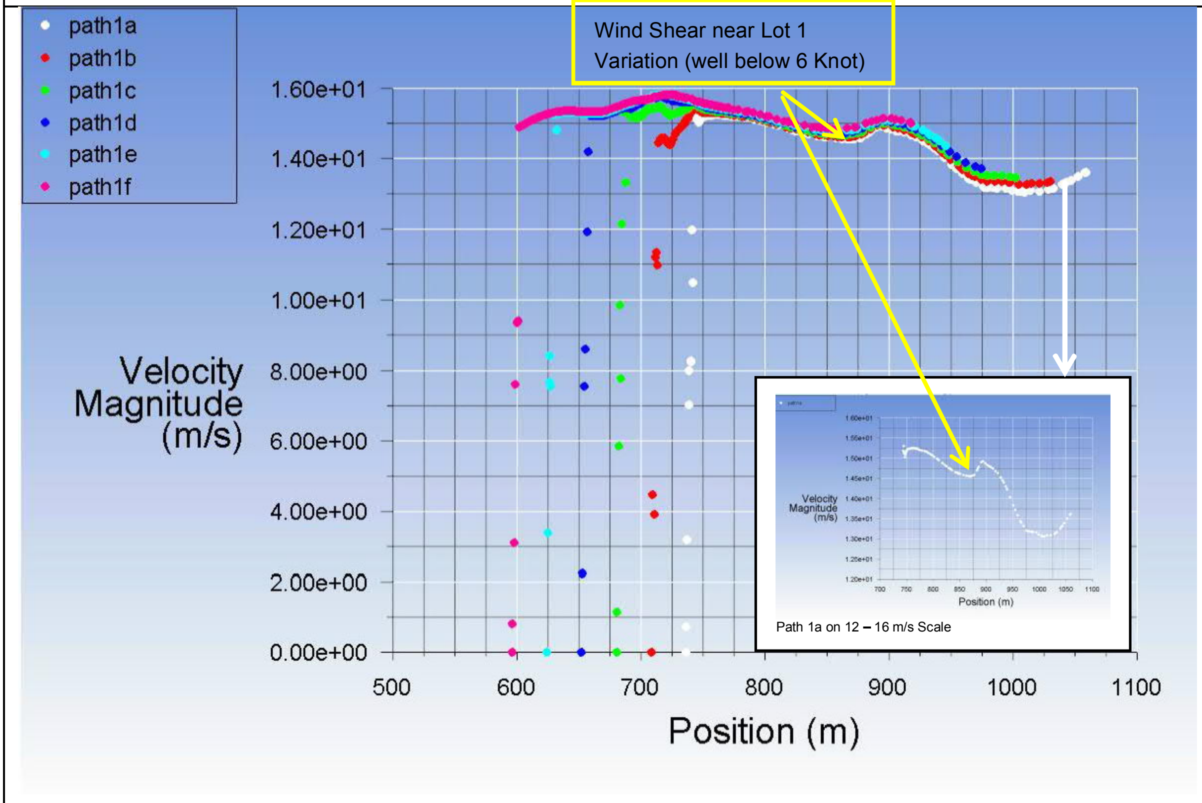


Figure 11 Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11R/29L Path 1 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 180°)

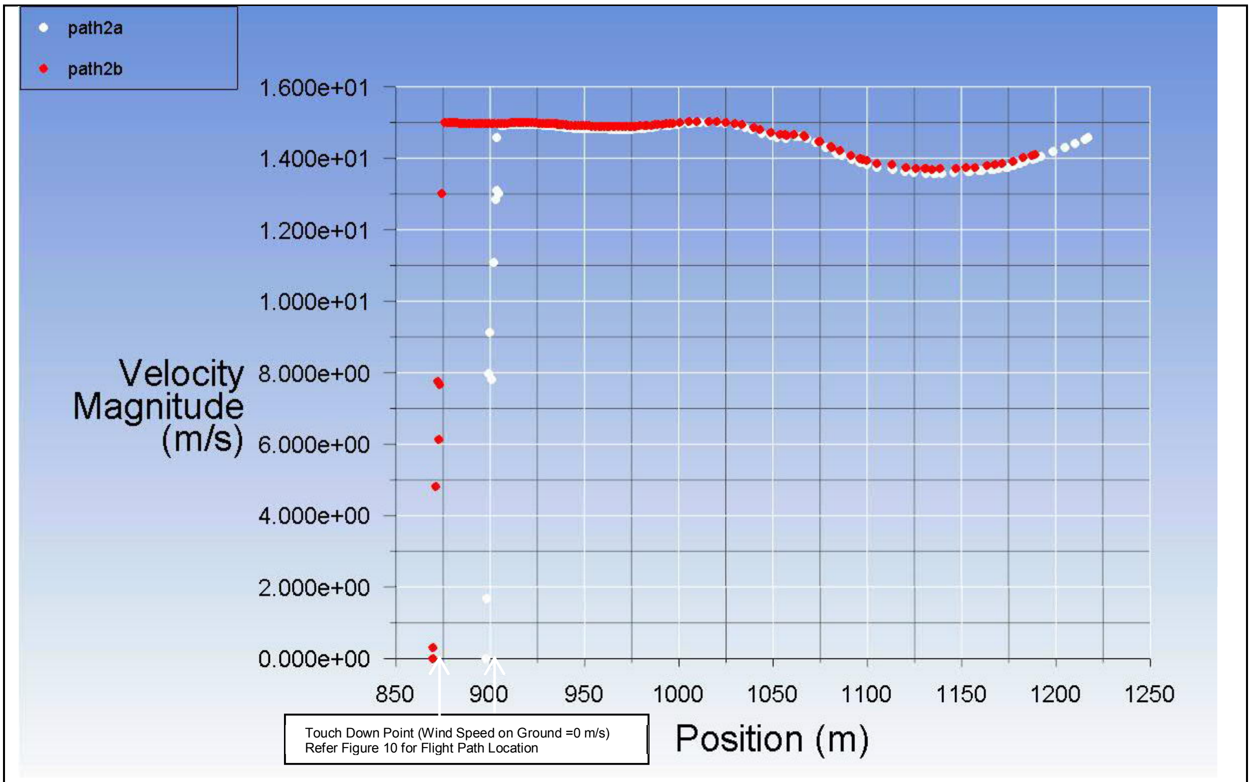


A: Current



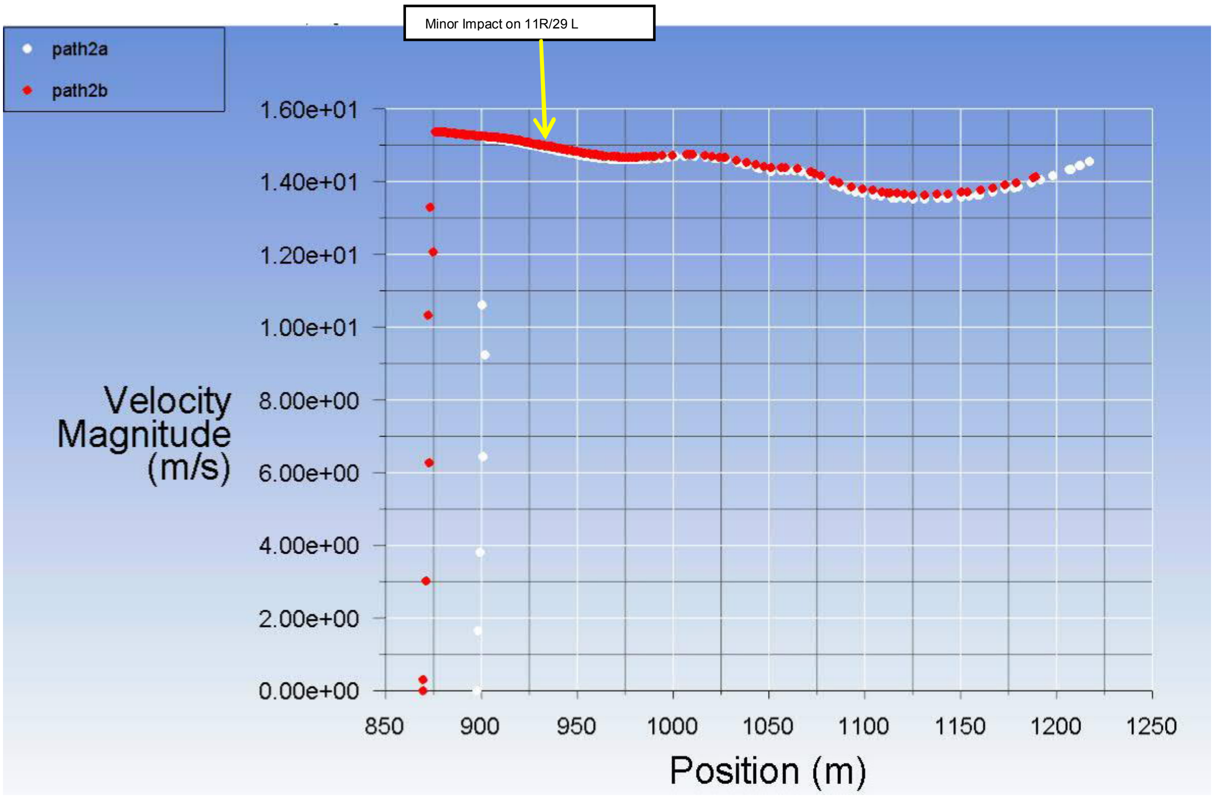
B: Post-MDP

Figure 12 Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11C/29C – Path 2 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 180°)



Touch Down Point (Wind Speed on Ground =0 m/s)
Refer Figure 10 for Flight Path Location

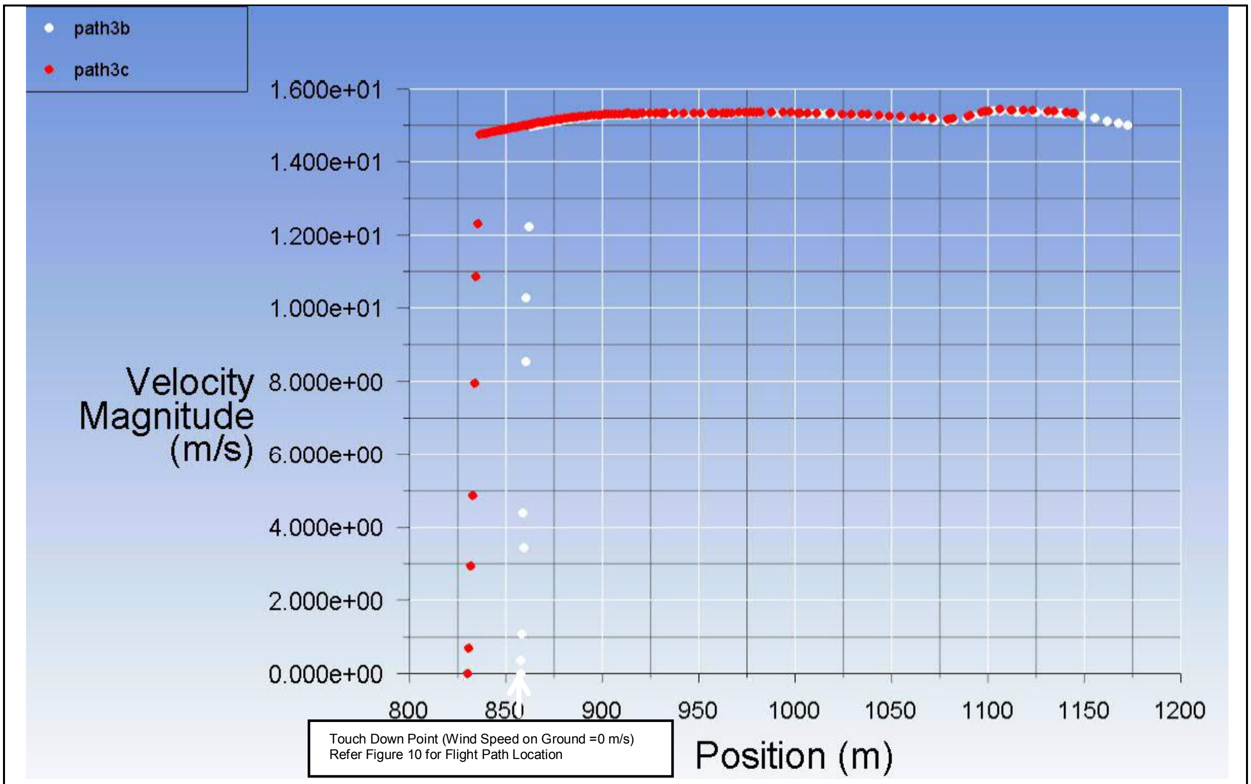
A: Current



Minor Impact on 11R/29 L

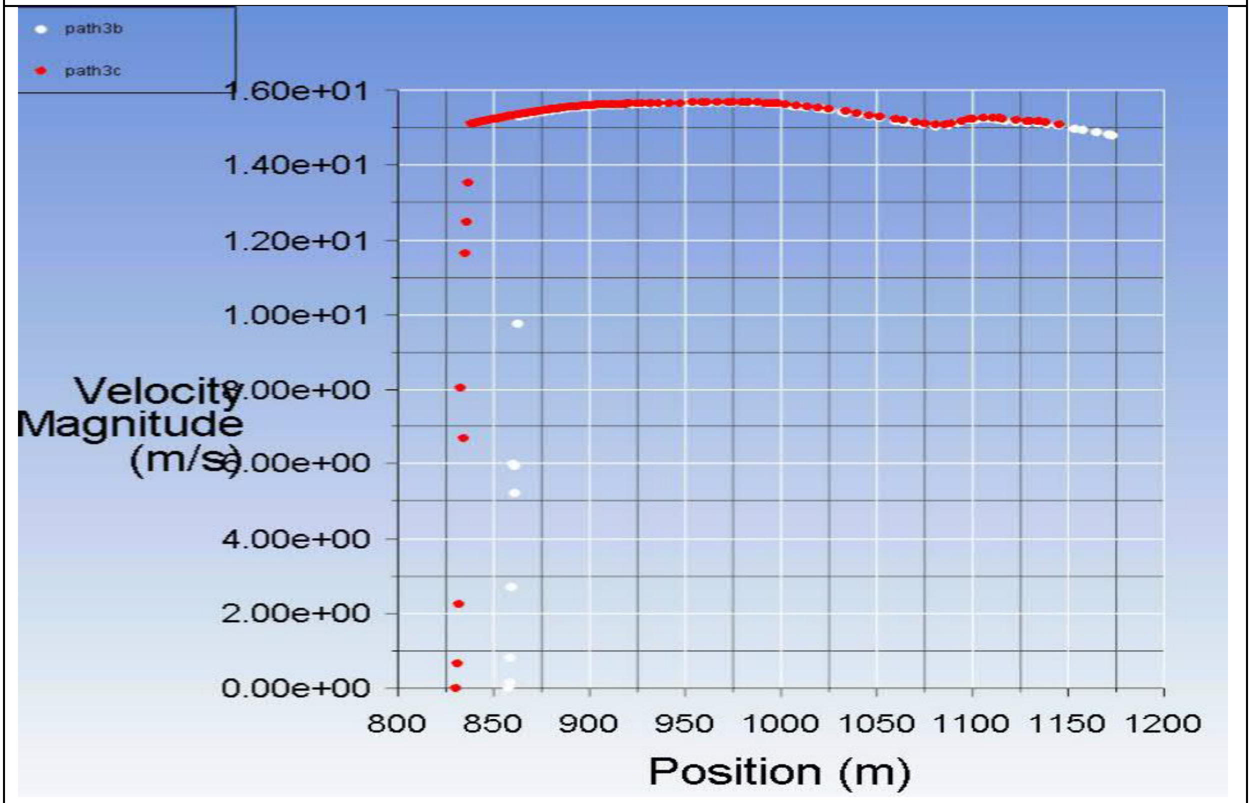
B: Post-MDP

Figure 13 **Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11L/29R – Path 3 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 180°)**



Touch Down Point (Wind Speed on Ground =0 m/s)
Refer Figure 10 for Flight Path Location

Current



Post-MDP

5.1.2 Turbulence Assessment - Wind Angle = 180°

The NASF Guideline B, 2018 adopts the NLR additional turbulence criteria:

- The "4-knot turbulence criterion" – i.e. the standard deviation of wind speed must remain below 4 kt at heights below 200ft.

SLR assumes that the criterion is triggered if 4 kt is exceeded at any point along the aircraft trajectory for the analysed flight paths.

The predicted turbulence intensity at all flight paths is shown in **Figure 14**. The following conclusions can be reached from **Figure 14**:

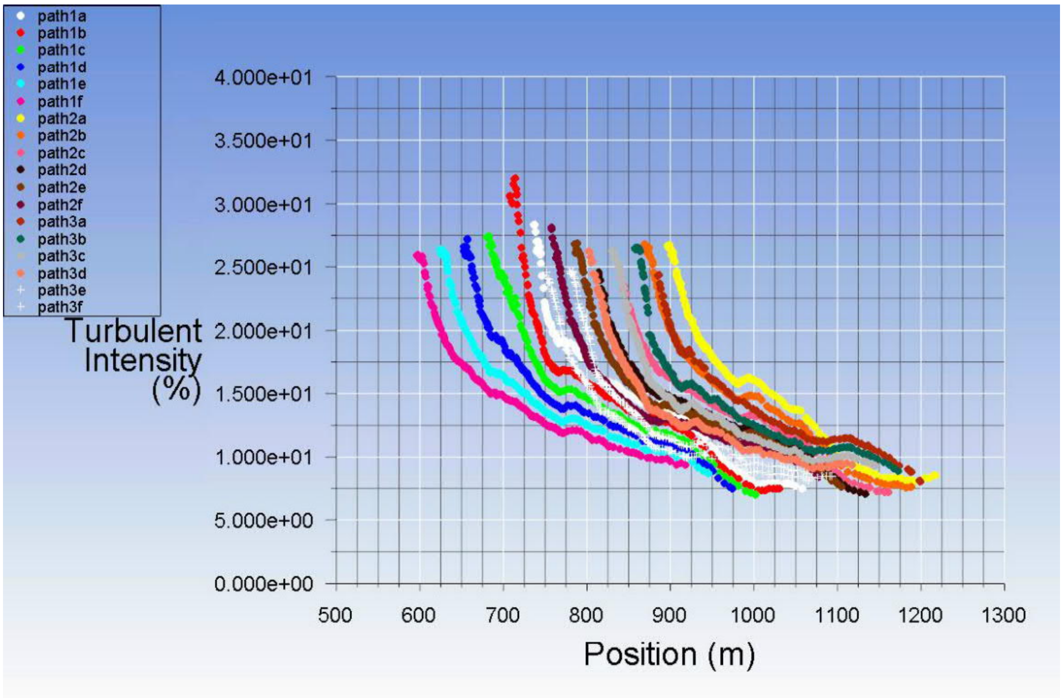
- Highest turbulence intensity occurs near the ground and in the wake of upstream buildings as expected.

The turbulence intensity is also predicted at the Bankstown Airport weather station (Refer **Figure 15**). The predicted turbulence intensity (~22%) using the advanced DLES turbulence model correlates well with the measured intensity (19%). The airport terrain and built environment at Bankstown Airport are such that the anemometer location does not experience localised "interference" caused by the presence of nearby buildings which would significantly distort the wind characteristics recorded by the anemometer. The exposure of the anemometer to southeast winds in particular is very open, with a large stretch of runway area upstream in the southeast direction. This is borne out by the turbulence intensity recorded at the anemometer site, which is fairly constant, at around 0.19, from the south clockwise around to the northeast, and then drops to around 0.14 from the southeast

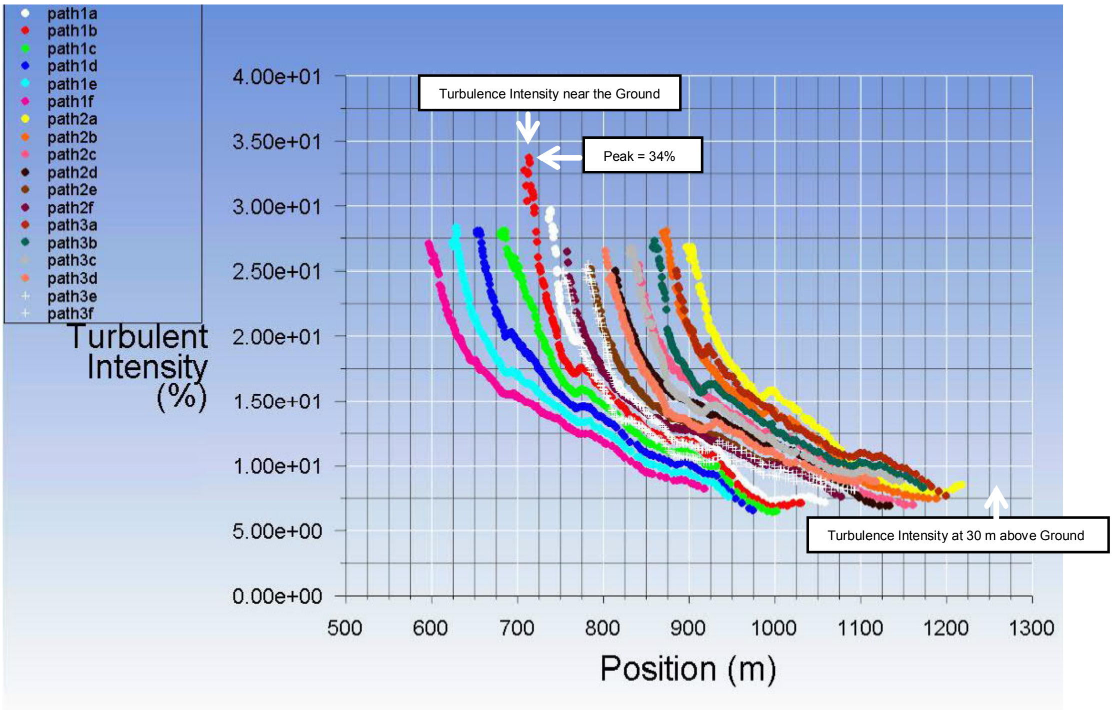
The turbulence or root-mean-square (RMS) value along the aircraft trajectory for the flight paths in **Figure 10** is calculated based on the wind shear results and turbulence intensity data (**Figure 14**) and shown in **Figure 16**. The following conclusions can be achieved from **Figure 16**:

- The RMS (standard deviation) is above the 4 kt for an approaching wind of 25 kt at 10 m above ground for the current and post-MDP scenarios.
- The turbulence due to the proposed developed is increased by ~0.5 kt at two critical flight paths (Refer also **Figure 17**).
- The RMS reduces with reducing the crosswind speeds and increases with increasing turbulent intensity. Turbulence is calculated based on the combined effect of the above parameters.
- An approaching mean wind speed of approximately 16 kt can generate a 4 kt turbulence for the current scenario under the southerly wind direction (Wind Angle = 180^{o}).
- An approaching mean wind speed of approximately 15 kt can generate a 4 kt turbulence for the post-MDP scenario under the southerly wind direction (Wind Angle = 180^{o}).

Figure 14 Turbulence Intensity along the Aircraft Trajectory at All Runways - DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 180°)

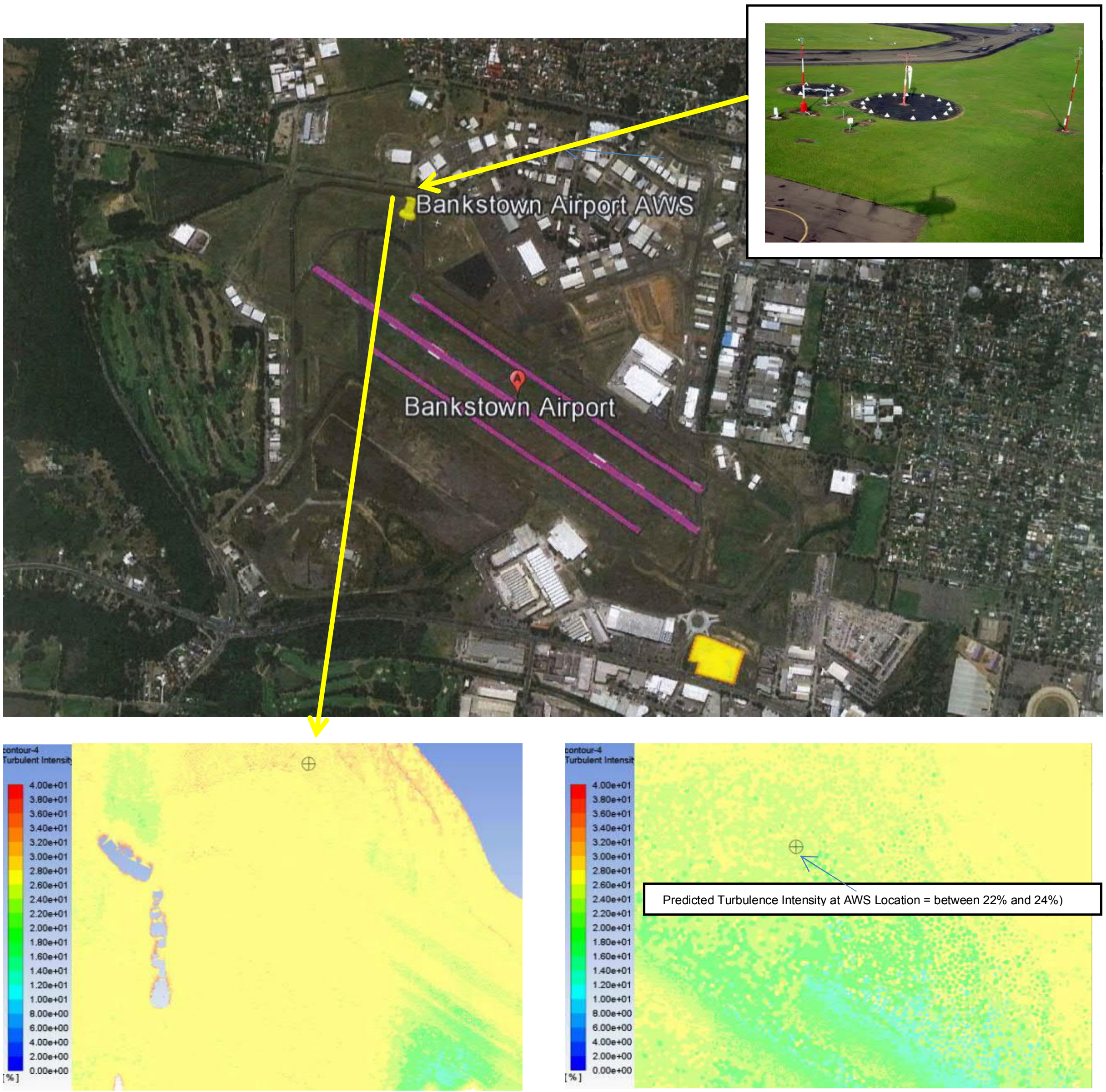


A: Current Scenario



B:Post-MDP Scenario

Figure 15 Predicted Turbulence Intensity at the Banknstown Airport AWS Location

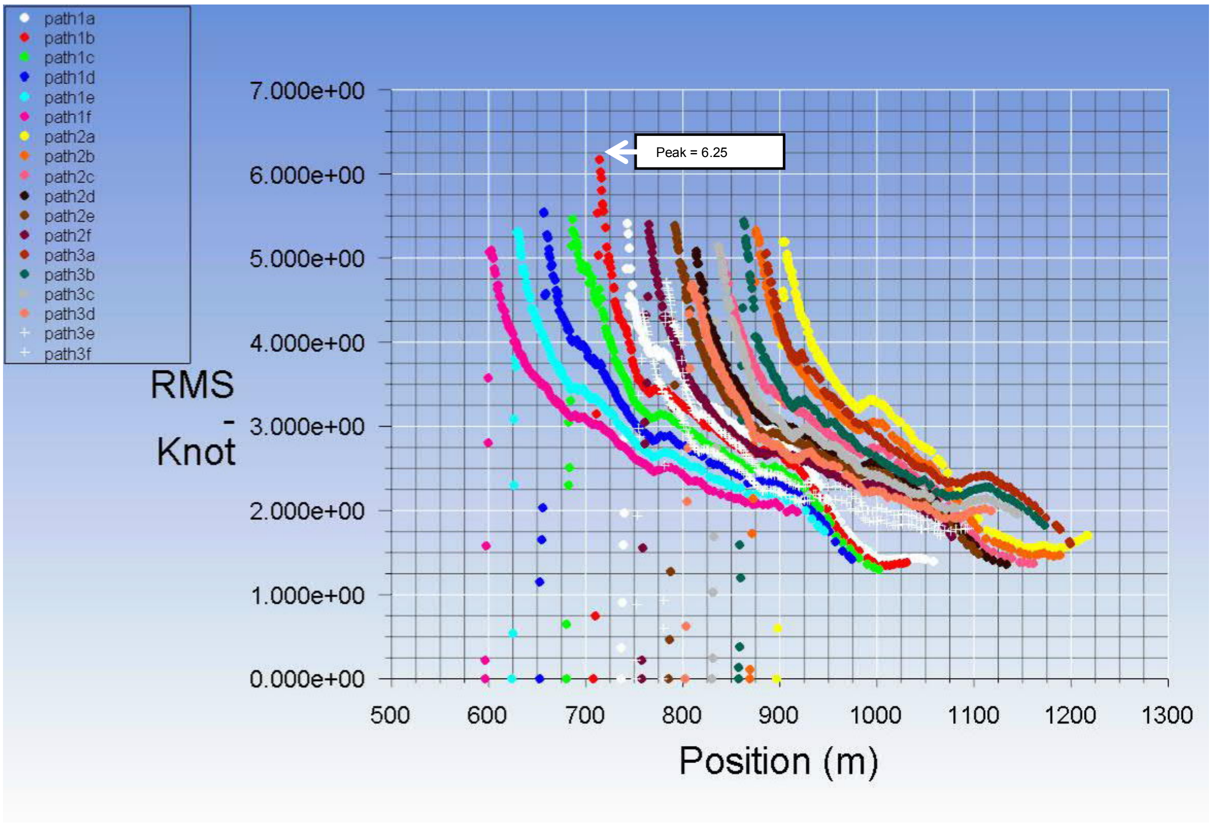


Predicted Turbulence Intensity at AWS Location = between 22% and 24%)

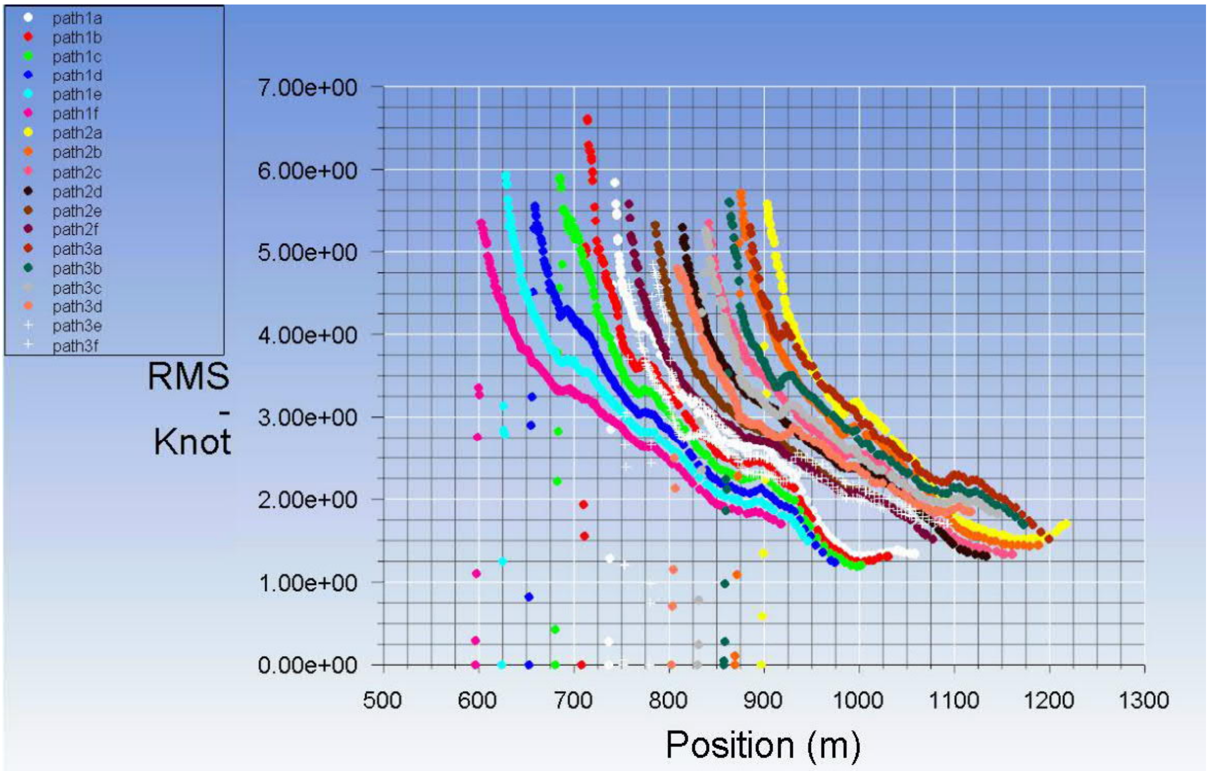
A: At RL10.5 m (3 .5 m above ground)

B:At RL17 m at the AWS height

Figure 16 **RMS (Standard Deviation) Value in Knot along the Aircraft Trajectory at All Runways – DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 180°)**

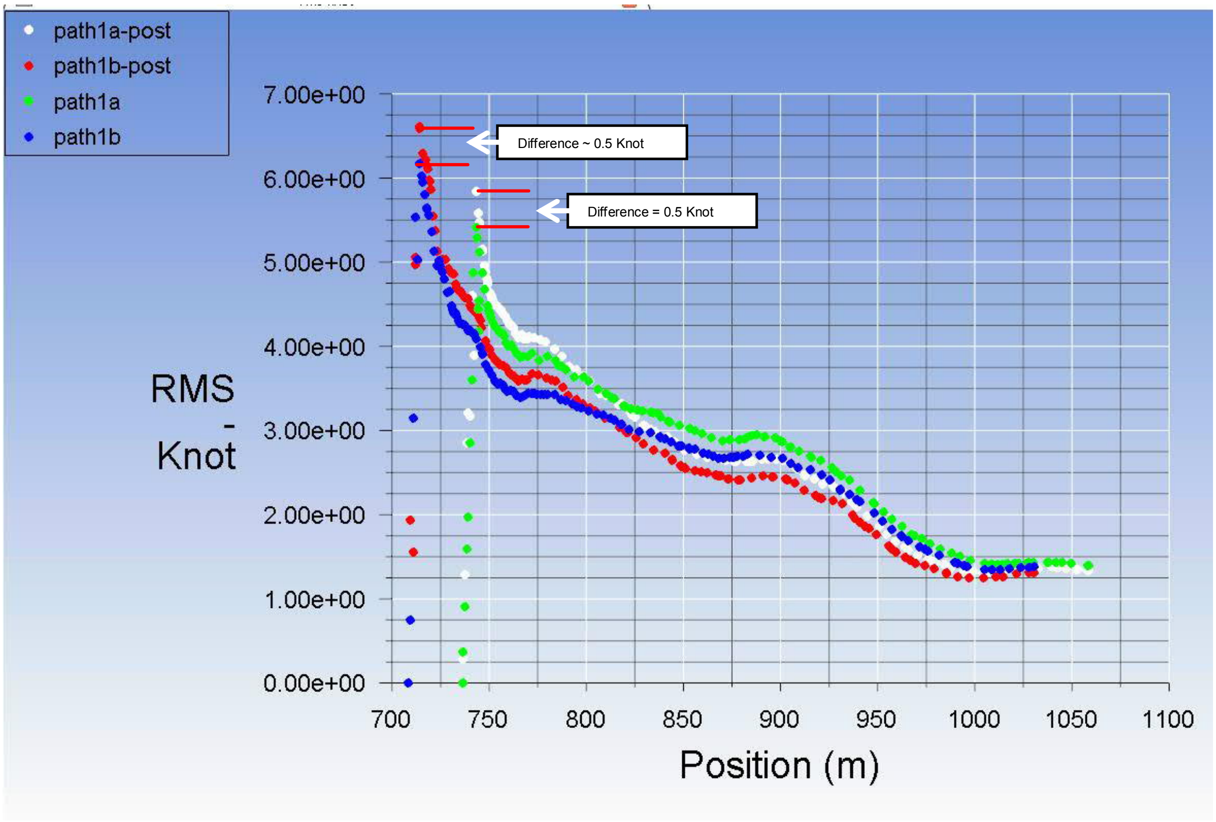


A: Current



B: Post-MDP

Figure 17 **RMS Current and Post-MDP Comparison in Knot along selected Aircraft Trajectories at 29L/11R Runway – DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 180°)**



5.2 Wind Angle: Southwest (225^{o})

Figure 18 and Figure 19 show the wind speeds at various RLs. The following conclusions can be reached from the above figures:

- The CFD model captures the fluid flow characteristics in significant detail (Refer **Figure 18A**). Wind is approaching the site from the south west at 225^{o} as per the given boundary condition. Wind is then accelerated near the edges and stagnated and recirculated behind the buildings.
- There is a minor variation in wind speeds along the width of the runways.
- A comparison for the wind shear close to the ground shows that the proposed buildings slightly expand the existing shears upstream at the 11R/29L at most locations.

A comparison for the wind along the aircraft trajectory for the flight paths in **Figure 10** is shown in **Figure 20** to **Figure 22**. The following conclusions can be reached from the above figures:

- The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories at a height below 60 m over a distance just below 100 m.
- The variation in the mean wind speed due to the proposed development is less than 6 kt along all analysed aircraft trajectories at a height below 60 m (200 ft) over a distance of at least 100 m due to the following:
  - Shape of the proposed warehouses. The dimension in line with wind is greater than its width by a factor 2:75:1 resulting in a small wake.
  - Proximity to runways (~365 to the closest runway – Refer **Figure 7**).
  - Relatively low building height (13.7 m max).
  - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the Lot 1 warehouses sit at RL’s 6.74 m.
  - Building layouts and features, canopies, etc.

Figure 18 Velocity Vector (m/s) at RL 10.5 m - DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 225°

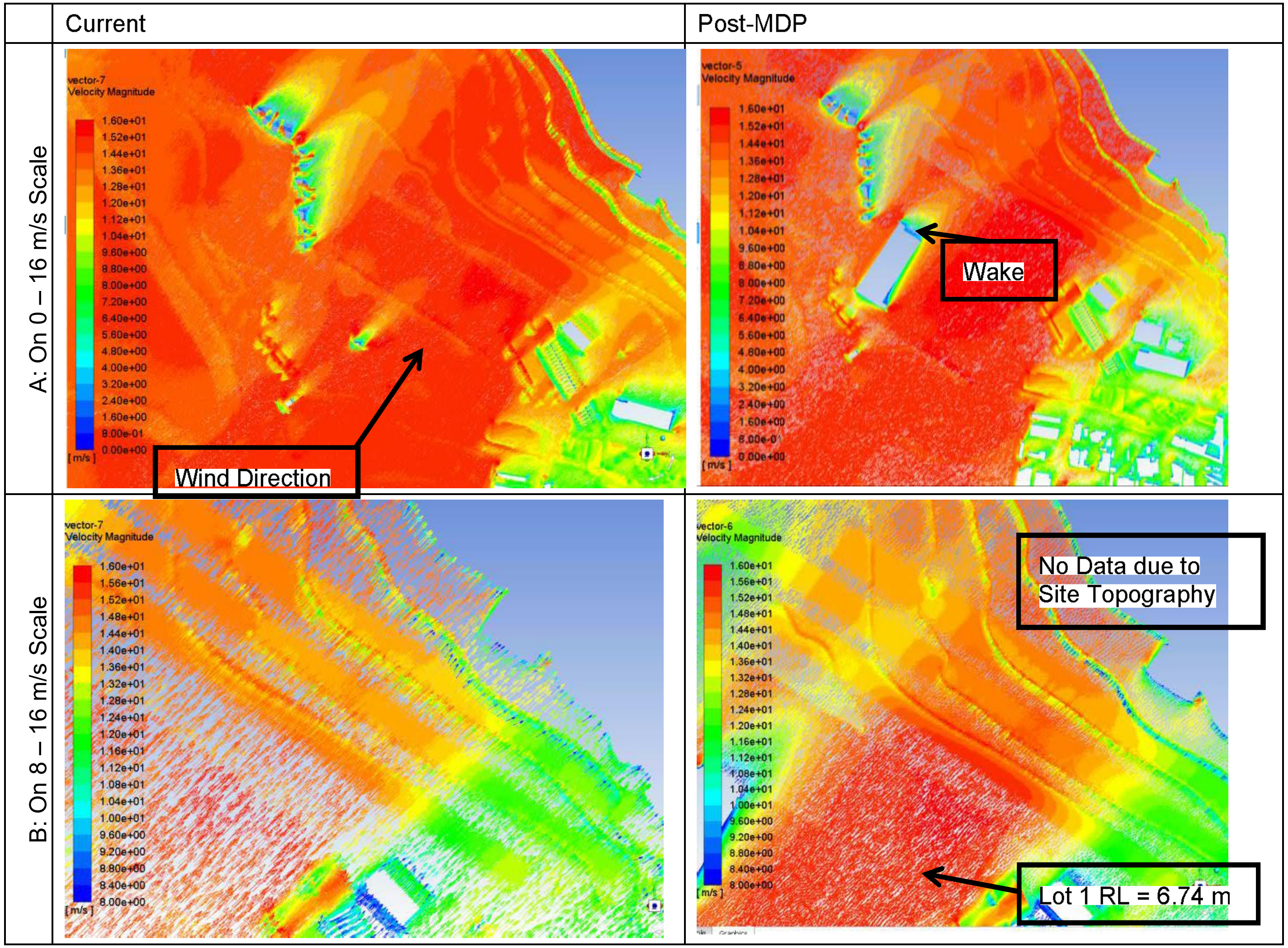
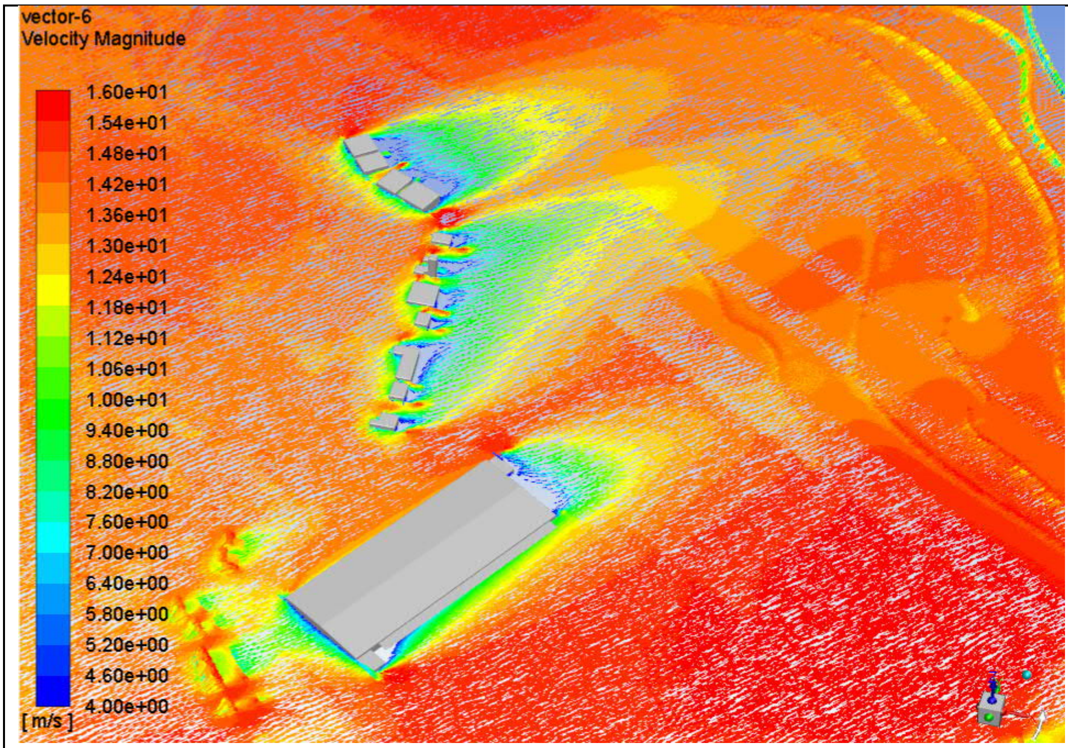
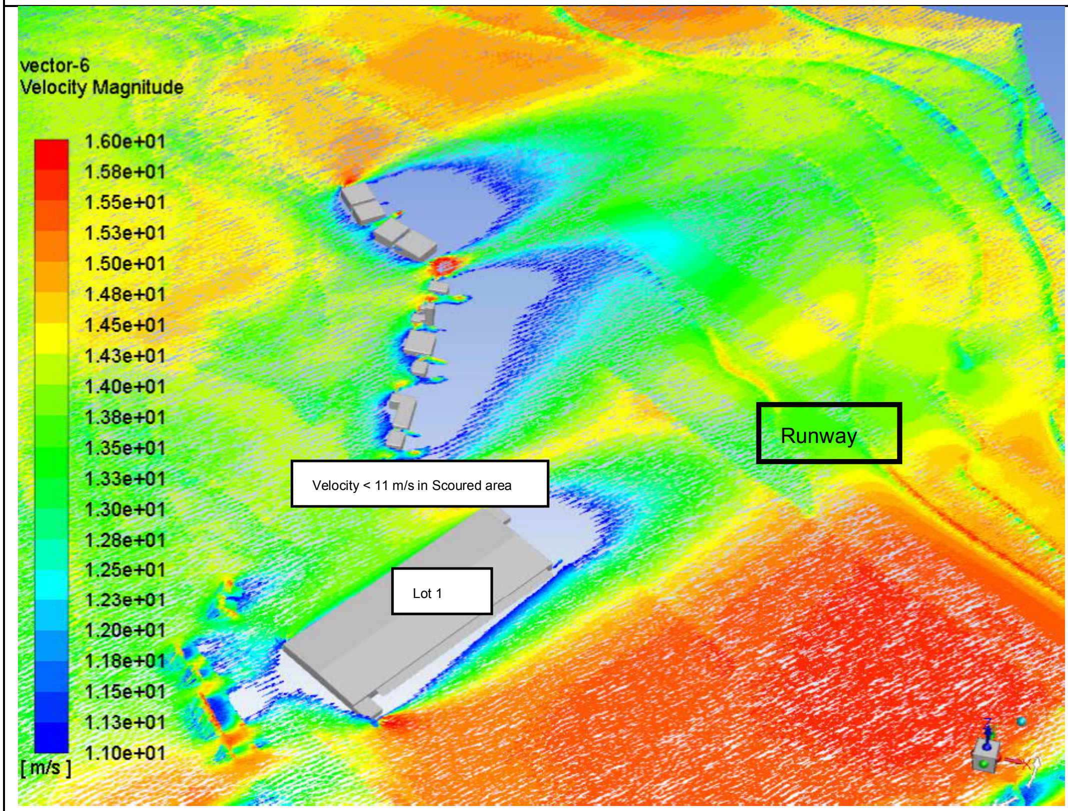


Figure 19 Velocity Vector Contoured by Velocity Magnitude (m/s) - Wind Angle = 225°

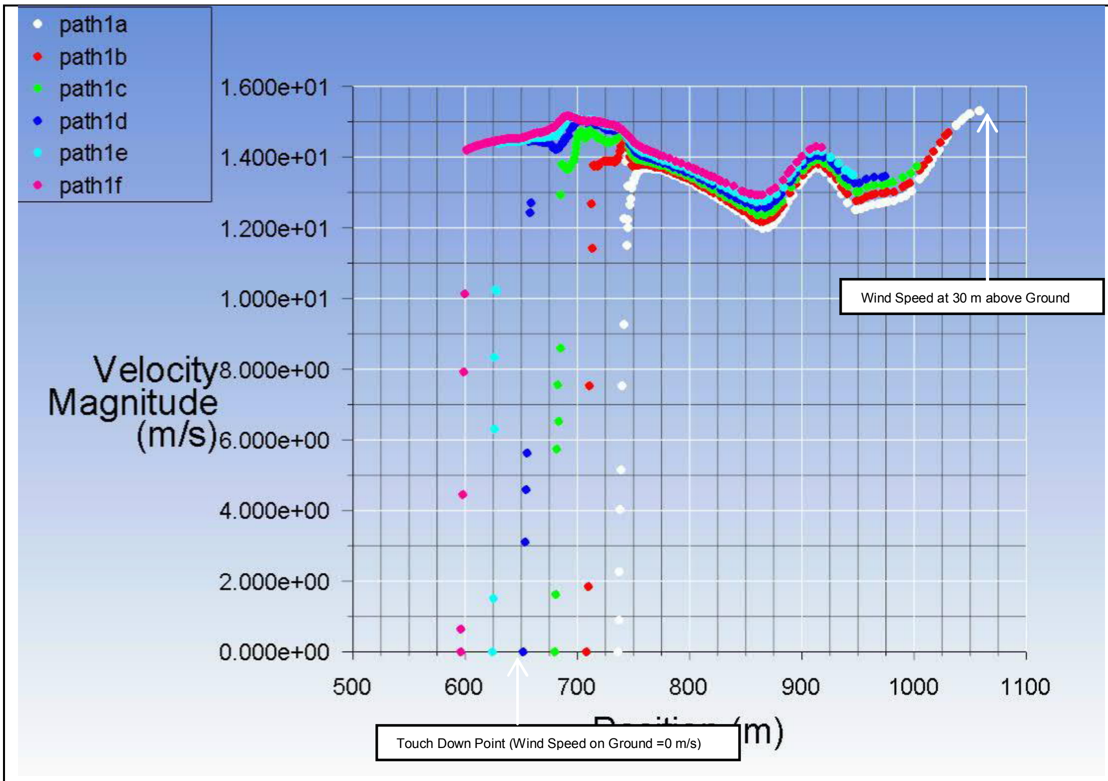


A: RL 10.5

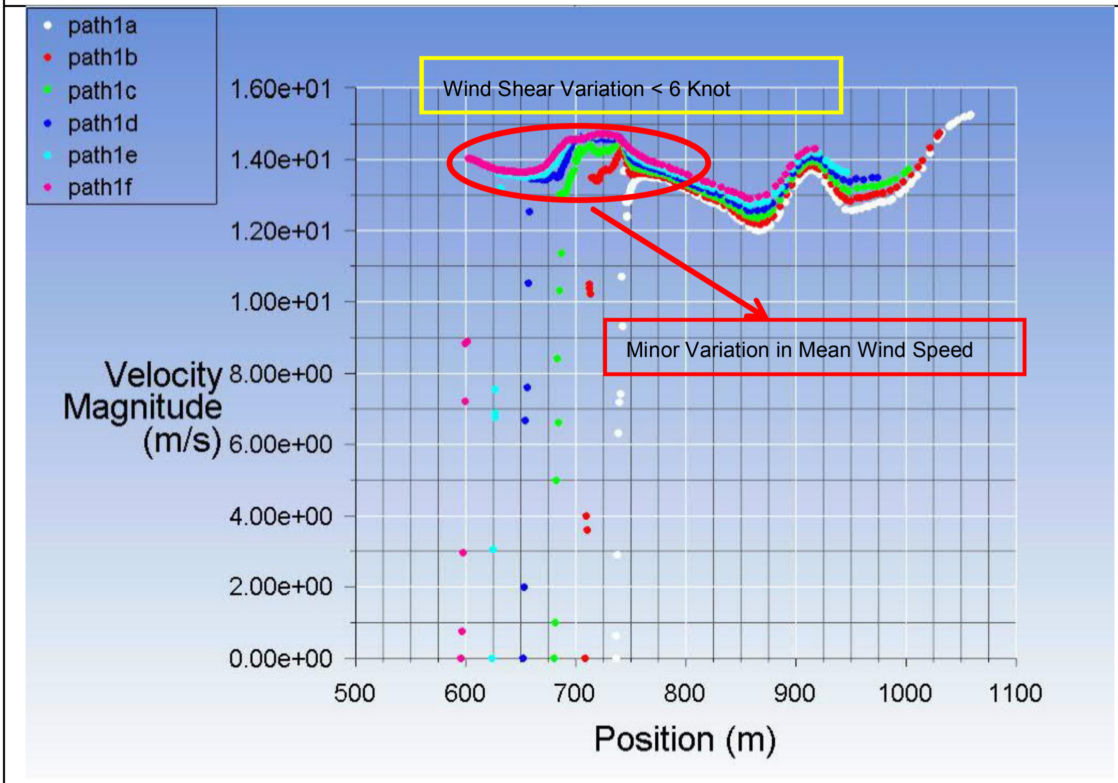


B: RL8.5 m

Figure 20 **Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11R/29L – Path 1 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 225°)**

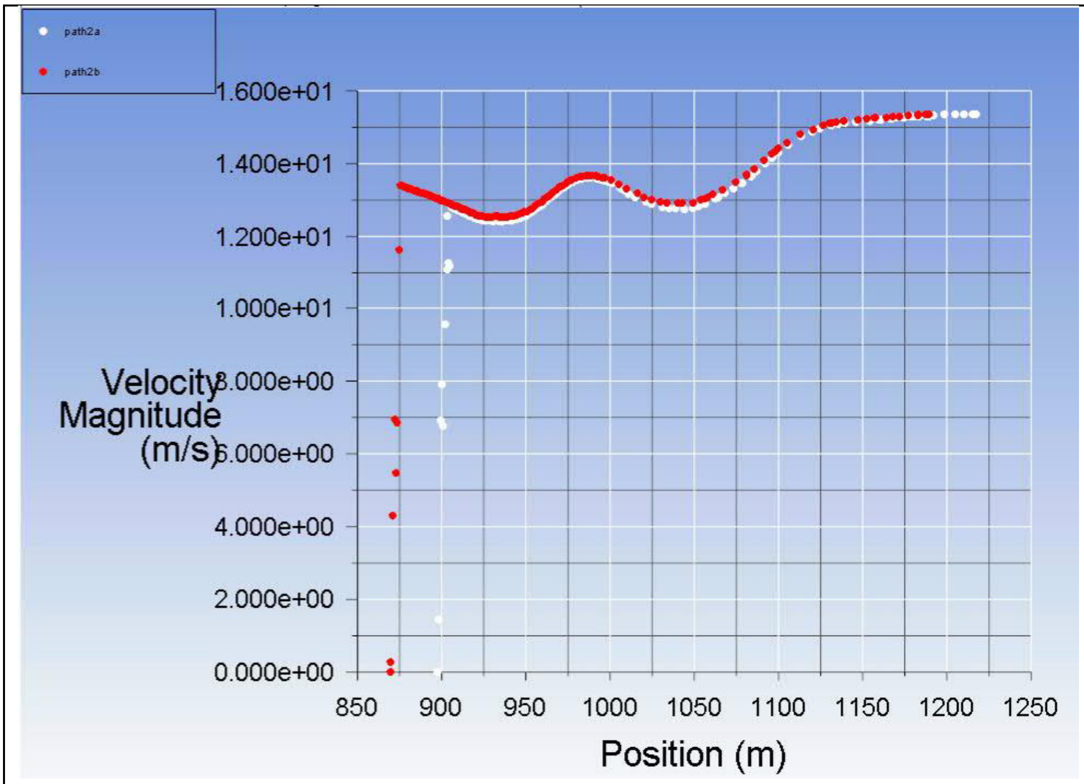


A: Current

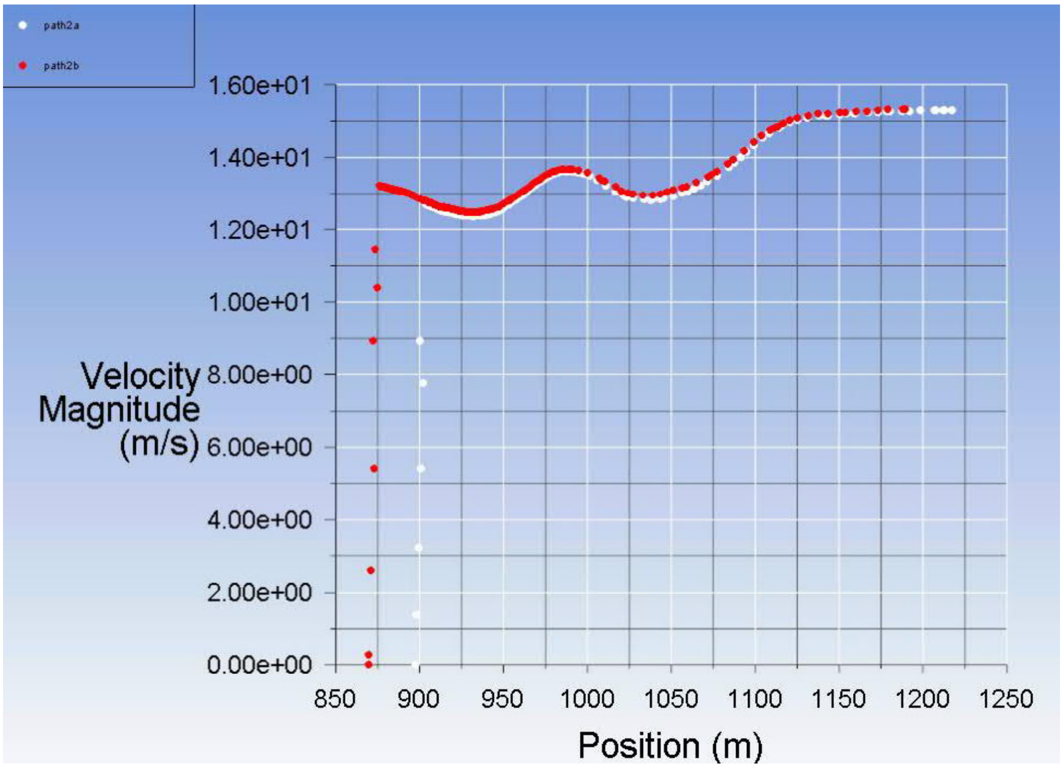


B: Post-MDP

Figure 21 Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11C/29C – Path 2 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 225°)

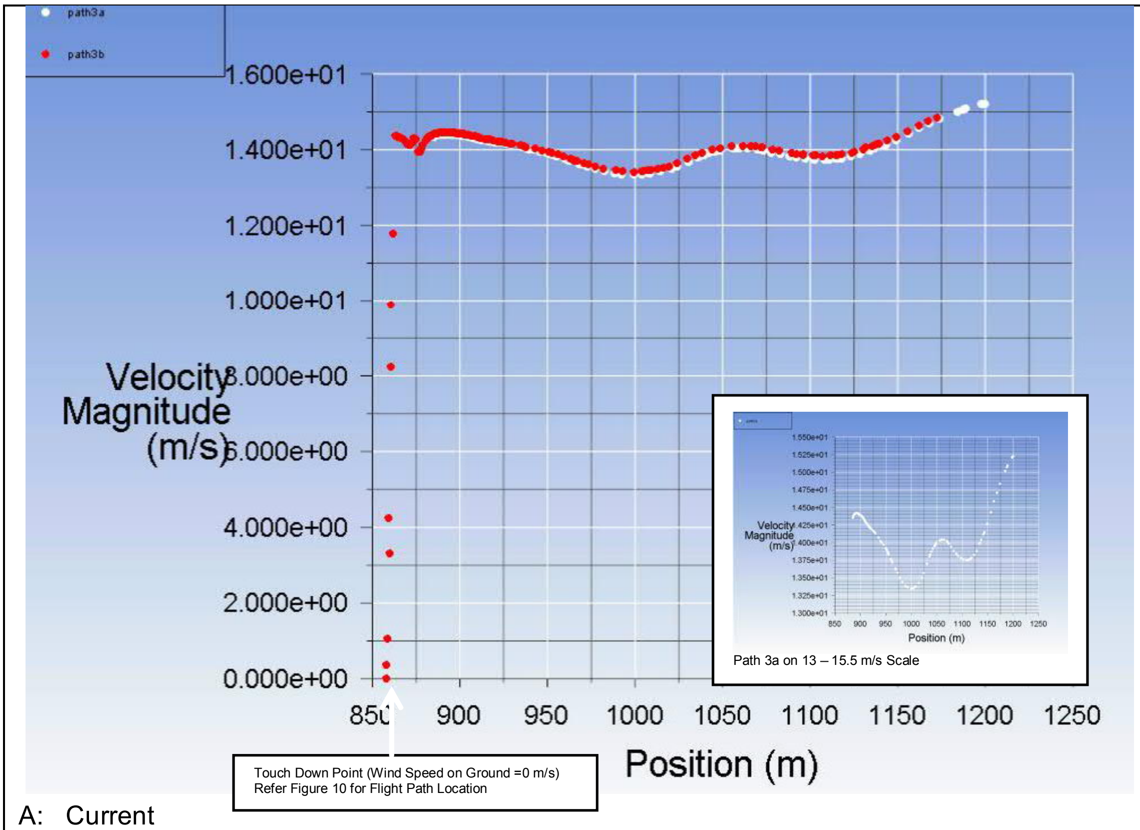


A: Current

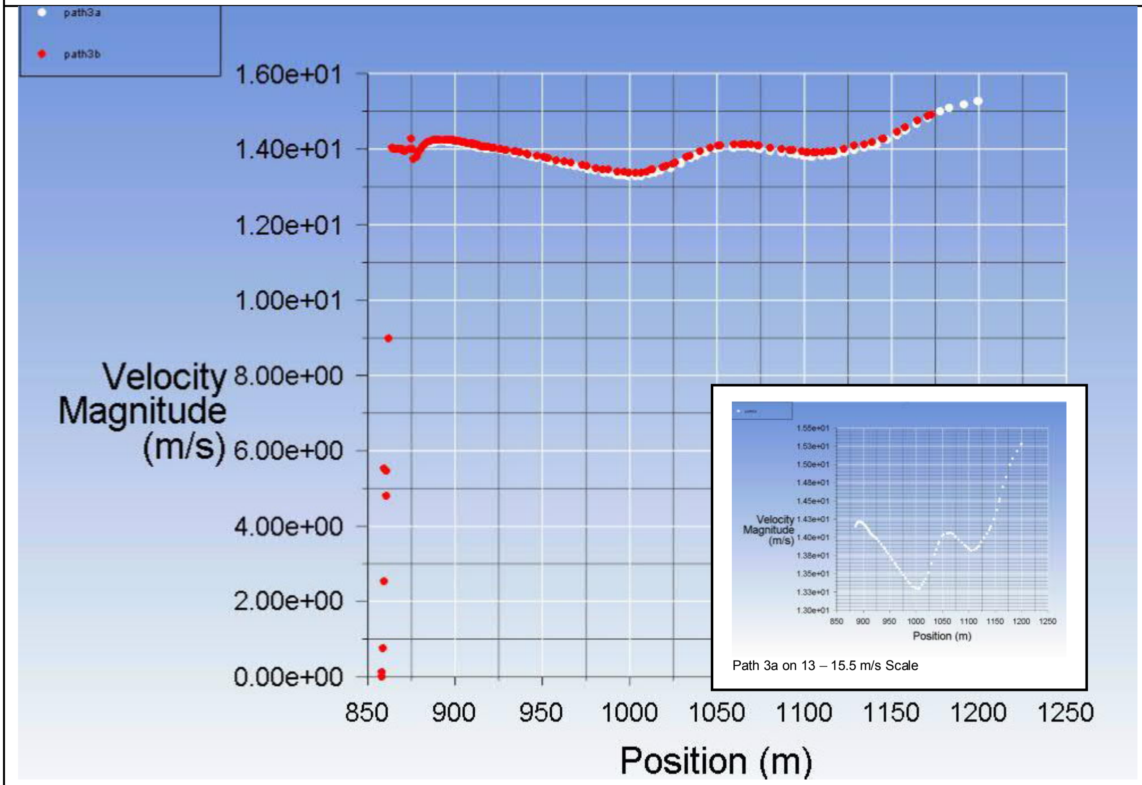


B: Post-MDP

Figure 22 Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11L/29R – Path 3 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 225°)



A: Current



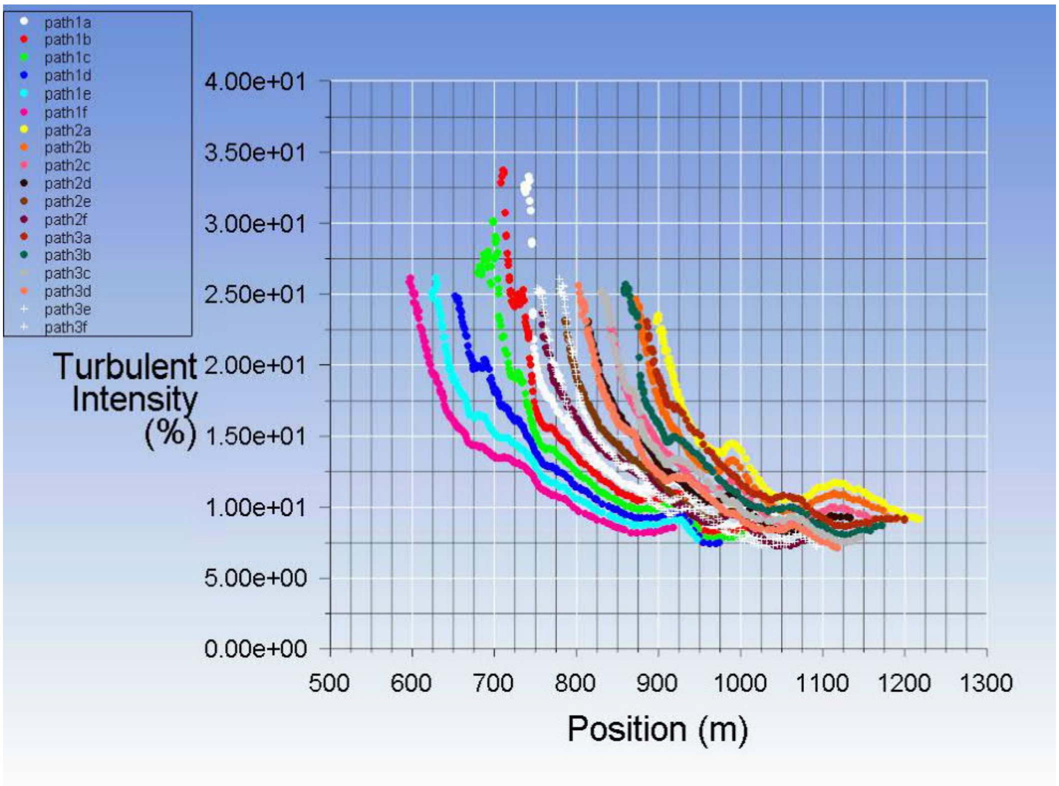
B: Post-MDP

5.2.1 Turbulence Assessment Wind Angle = 225°

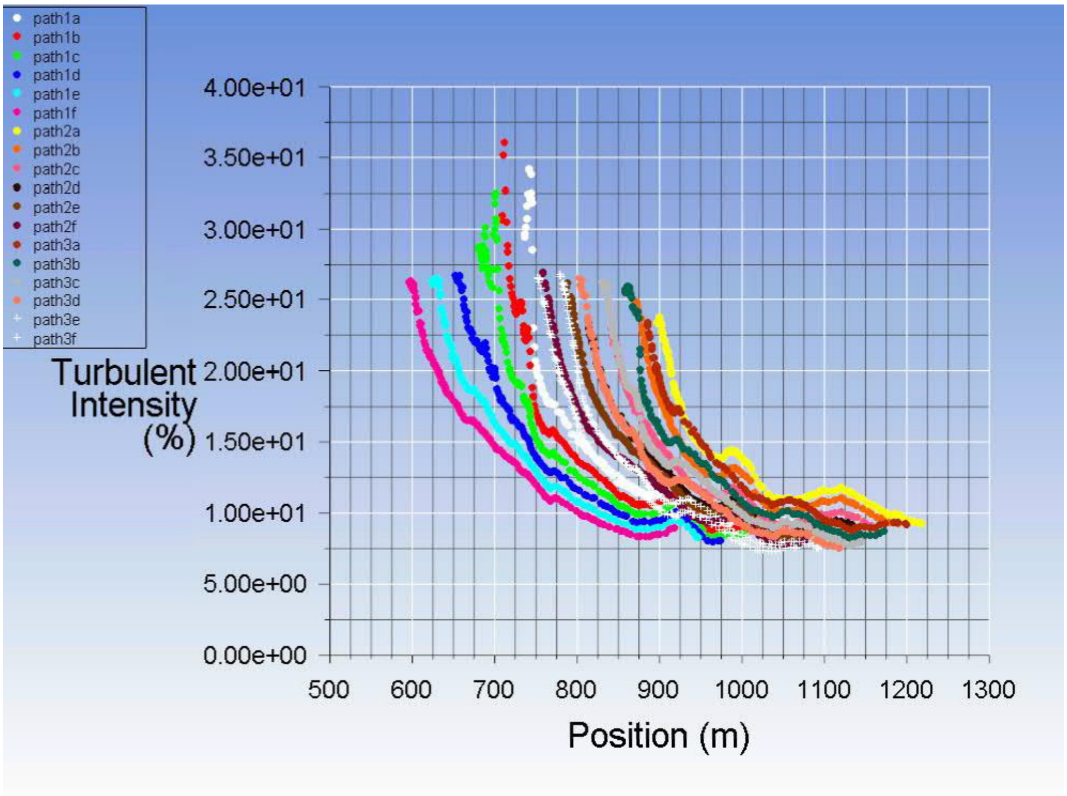
The turbulence intensity and turbulence or root-mean-square (RMS) value along the aircraft trajectory for the flight paths in **Figure 10** are shown in **Figure 23** and **Figure 24.** The following conclusions can be achieved from the above figures:

- The RMS (standard deviation) is above the 4 kt for an approaching wind of 25 kt at 10 m above ground for the current and post-MDP scenarios. The maximum RMS for the current and post-MDP scenarios is 8.25 and 8.3 kt respectively.
- An approaching mean wind speed of approximately 12.1 kt can generate a 4 kt turbulence for the current scenario under the south-westerly wind direction (Wind Angle = 225^{o}).
- An approaching mean wind speed of approximately 12 kt can generate a 4 kt turbulence for the post-MDP scenario under the south-westerly wind direction (Wind Angle = 225^{o}).

Figure 23 Turbulence Intensity along the Aircraft Trajectory at All Runways - DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 225°)

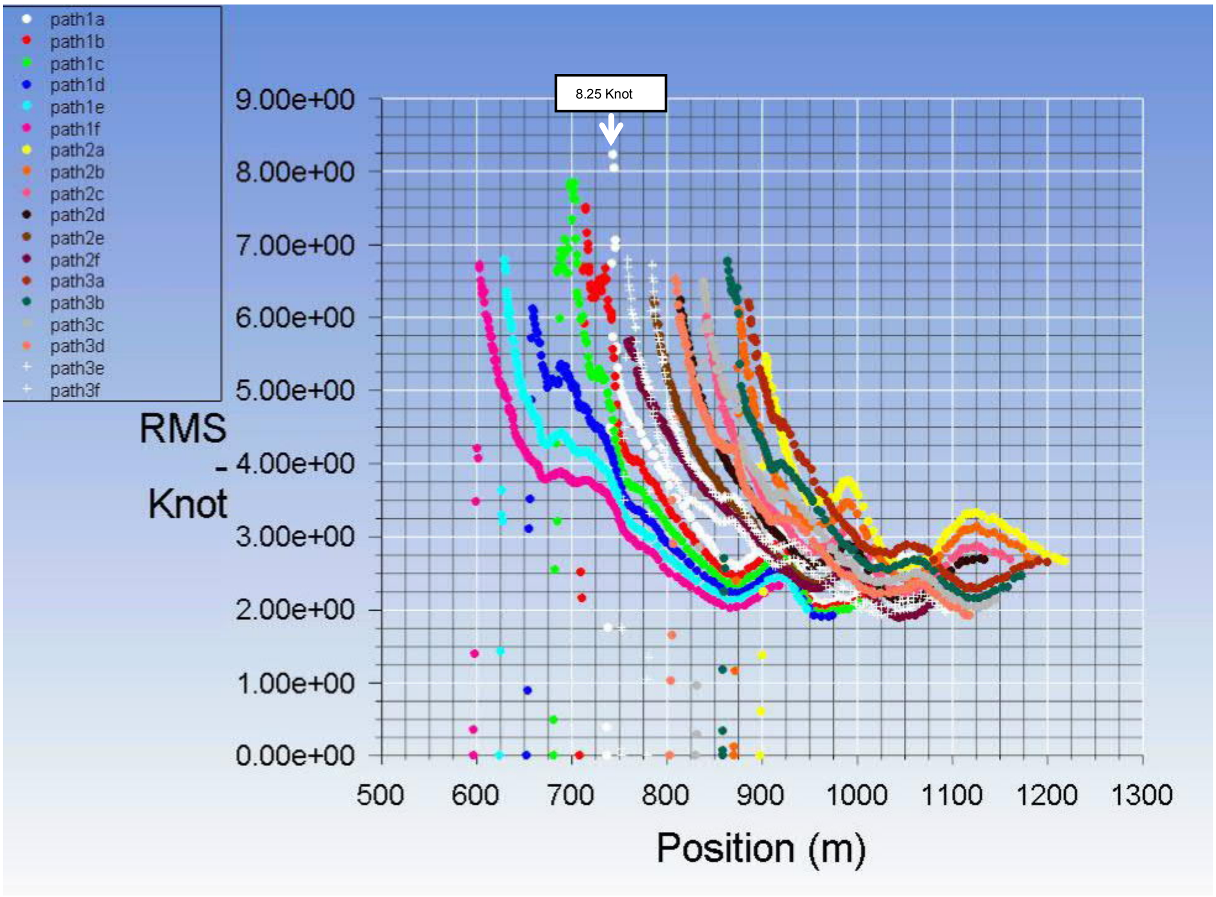


A:Curreny Scenario

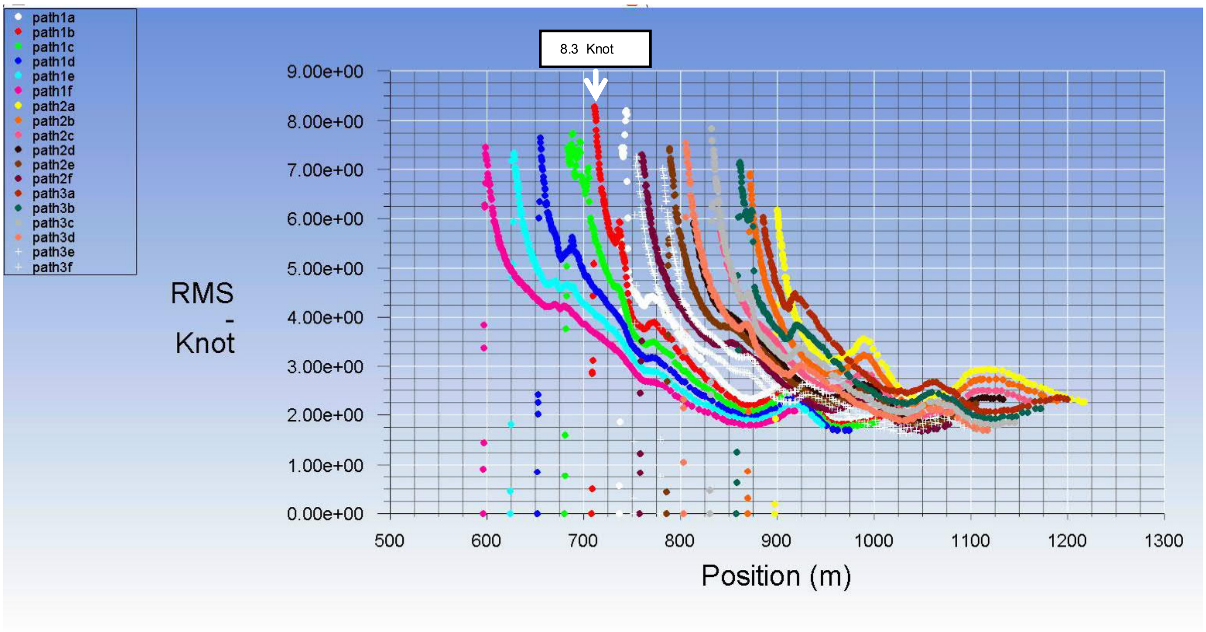


B:Post-MDP

Figure 24 RMS (Standard Deviation) Value in Knot along the Aircraft Trajectory at All Runways – DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 225°)



A:Current



B:Post-MDP

5.3 Wind Angle: South-Southwest (215°)

Figure 25 and Figure 26 show the wind speeds at various RLs. The following conclusions can be reached from the above figures:

- A comparison for the wind shear close to the ground shows that the proposed buildings slightly increase the existing shears upstream at Runway 11R/29L at most locations.

A comparison for the wind along the aircraft trajectory for the above paths is shown in **Figure 27** to **Figure 29**. The following conclusions can be reached from the above figures:

- The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories at a height below 60 m over a distance just below 100 m.
- The variation in the mean wind speed due to the post-MDP scenario is less than 6 kt along all analysed aircraft trajectories at a height below 60 m (200 ft) over a distance of at least 100 m due to the following:
  - Shape of the proposed warehouse. The dimension in line with wind is greater than its width by a factor 2:75:1 resulting in a small wake behind the proposed warehouse.
  - Proximity to runways (~365 to the closest runway – Refer **Figure 7**).
  - Relatively low building height (13.7 m max).
  - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the warehouses sit between the RL's 6.74 m).
  - Building layouts and features, canopies, etc.

Figure 25 Velocity Vector (m/s) at RL 10.5 m - DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 215°

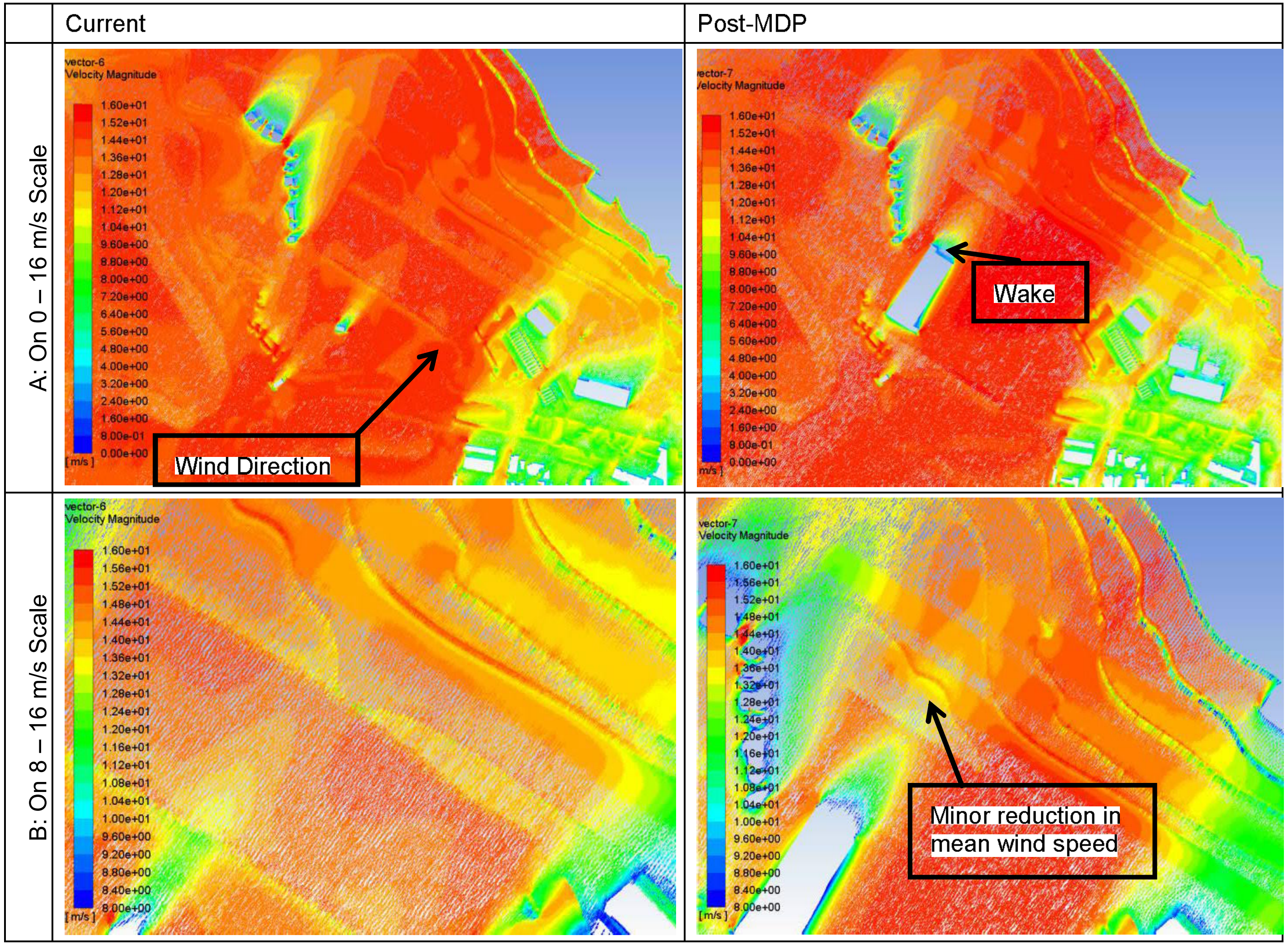
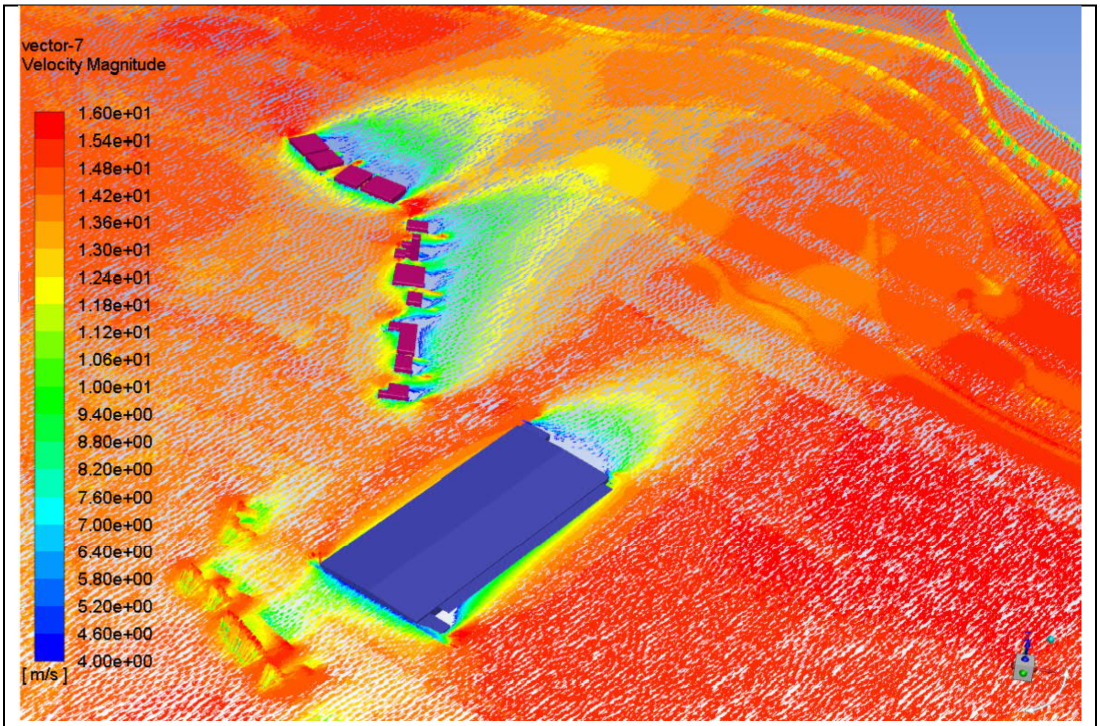
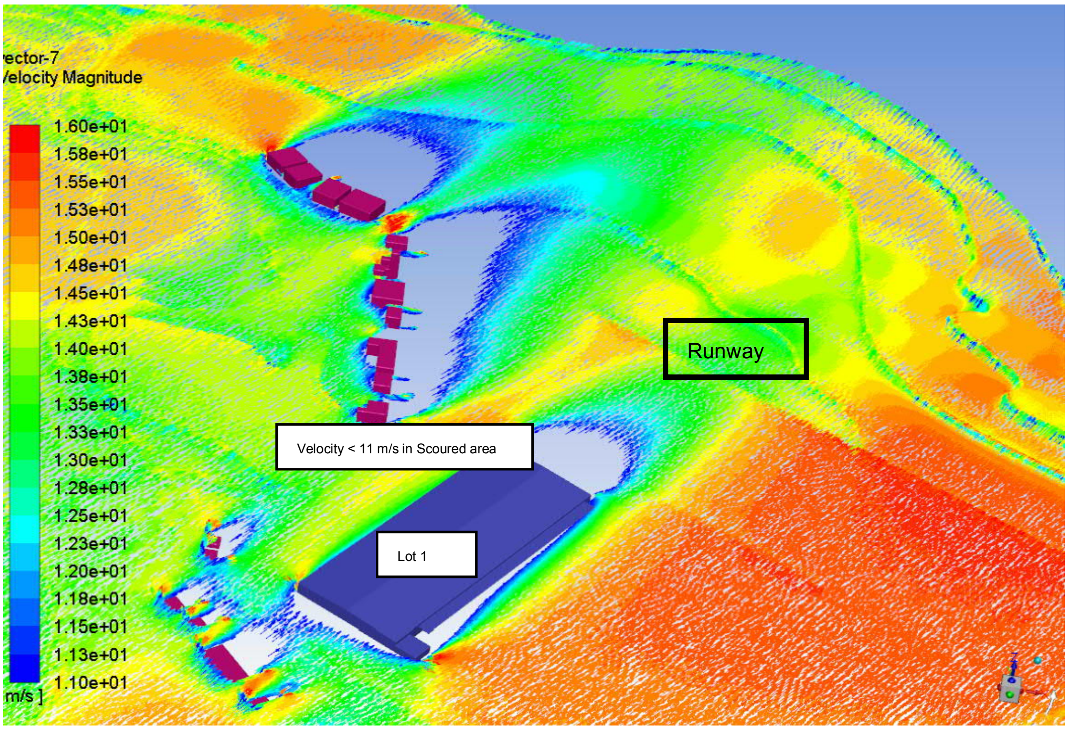


Figure 26 Velocity Vector Contoured by Velocity Magnitude (m/s) - Wind Angle = 215°



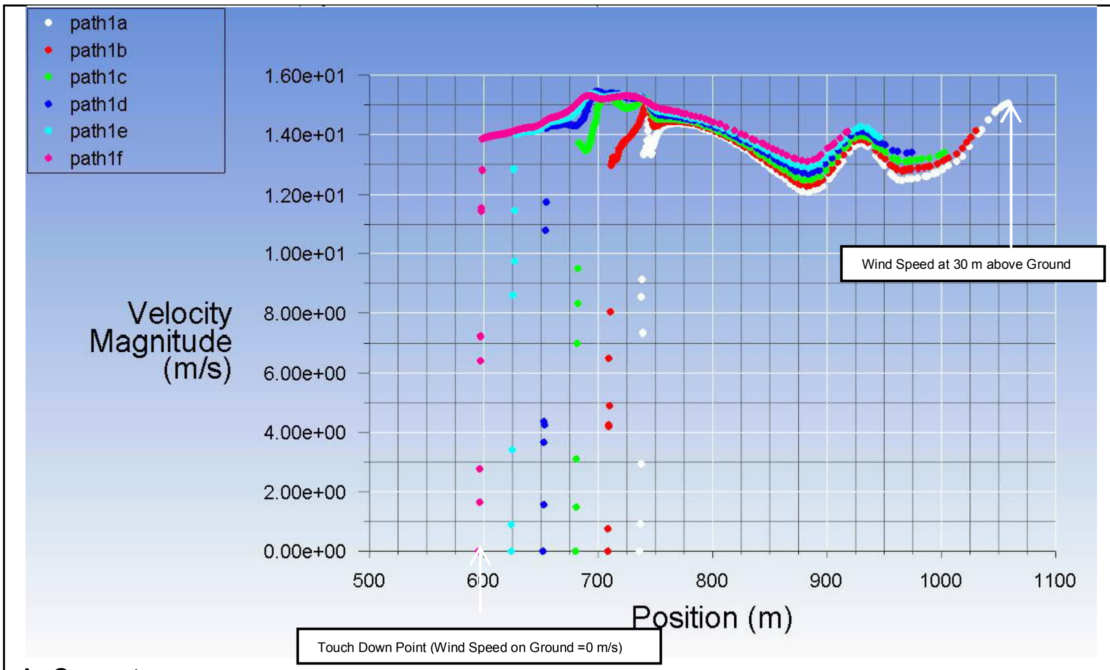
A: RL 10.5 (On 4 – 16 m/s Scale)



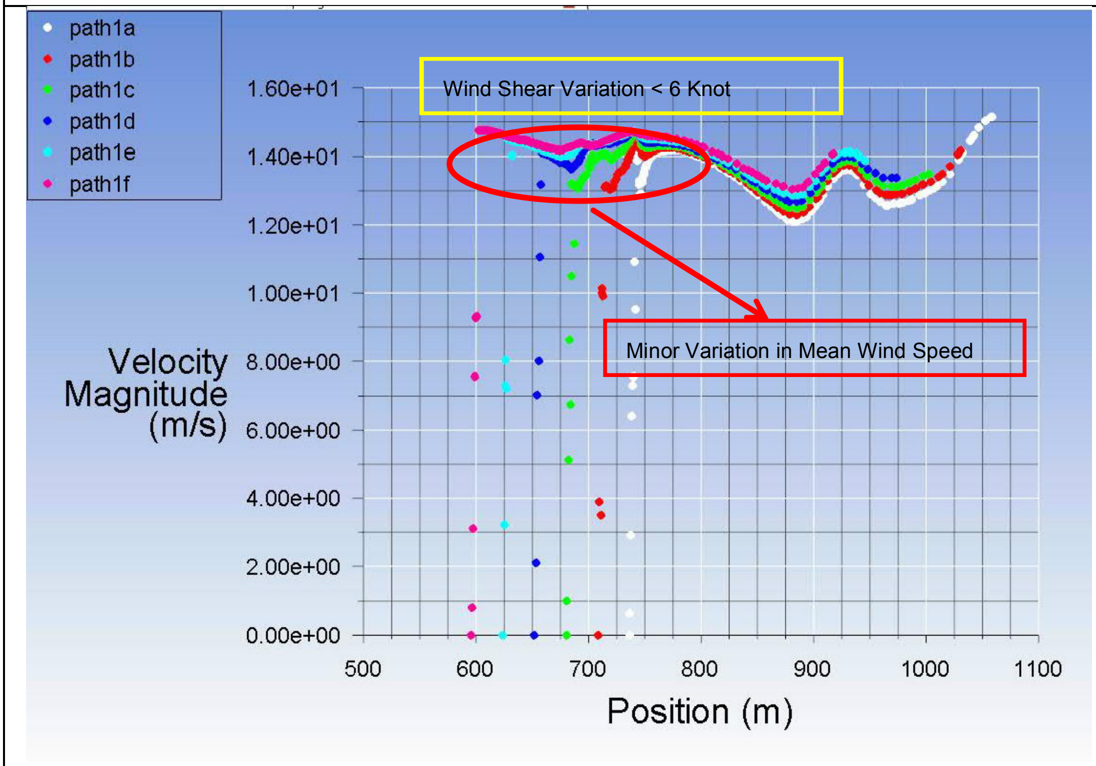
Velocity < 11 m/s in Scoured area

B: RL8.5 m (On 11 – 16 m/s Scale)

Figure 27 Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11R/29L – Path 1 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 215°)

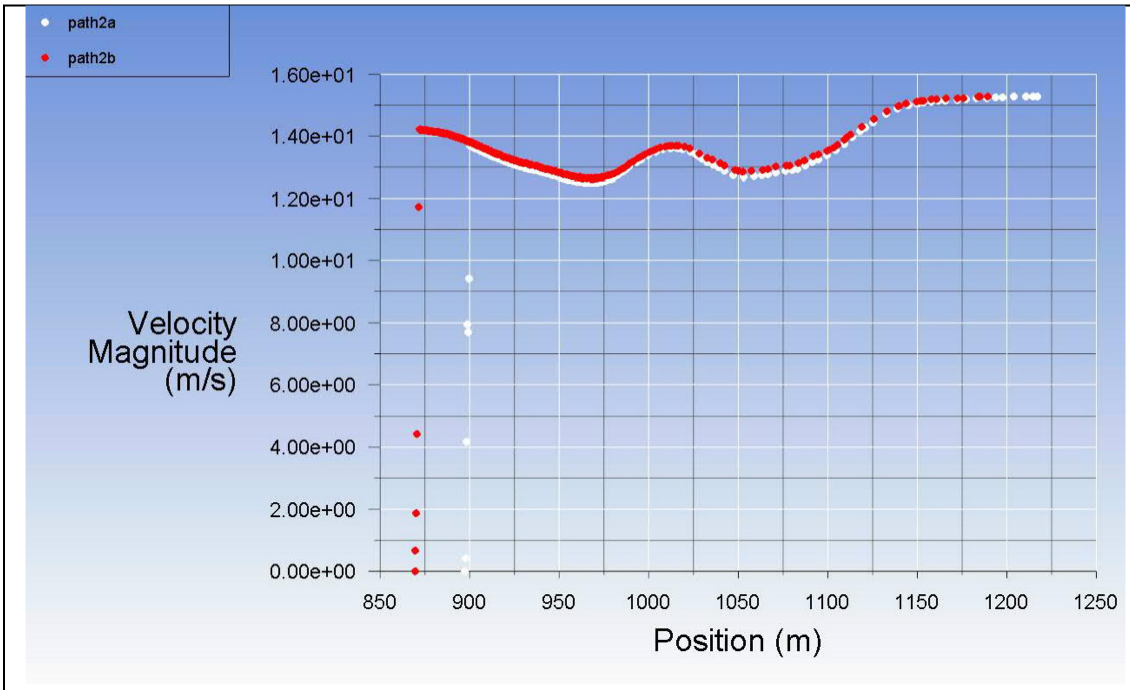


A: Current

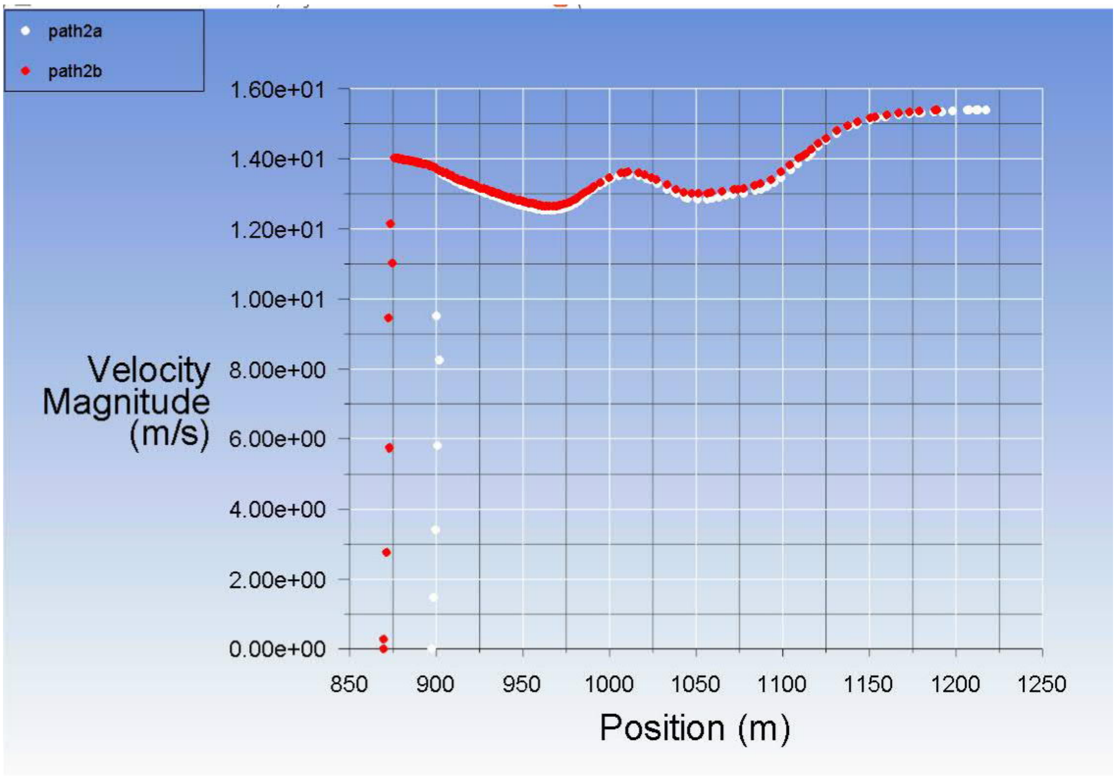


B: Post-MDP

Figure 28 **Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11C/29C – Path 2 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 215°)**

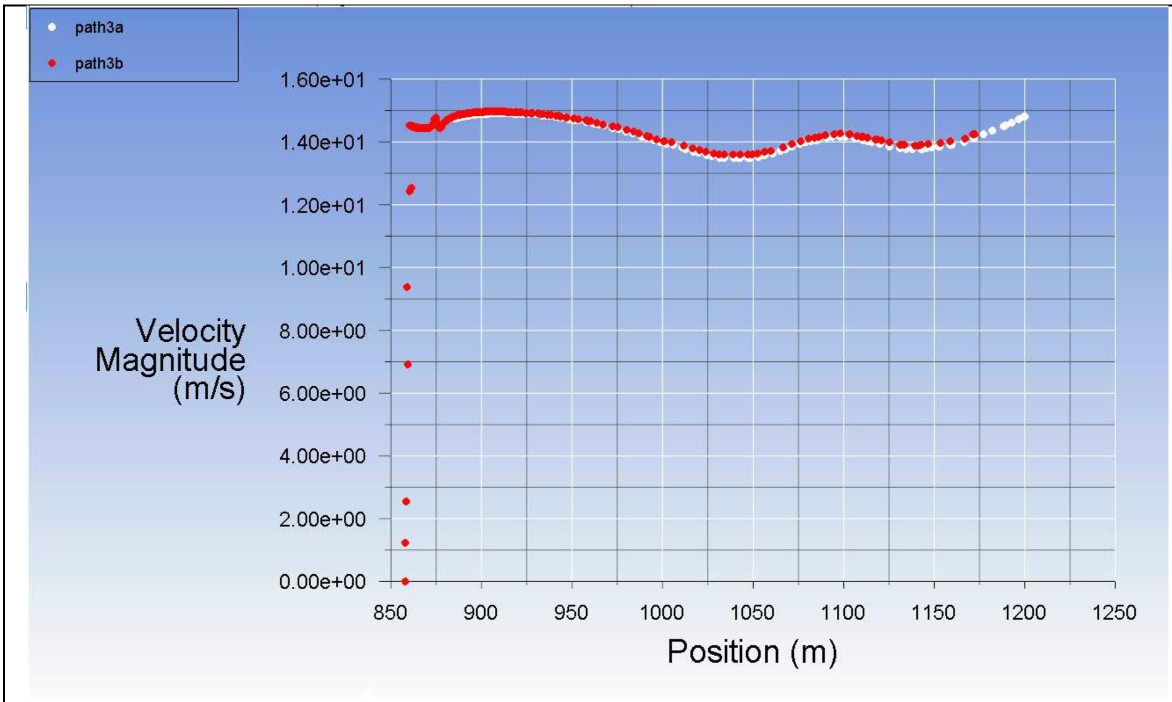


A: Current

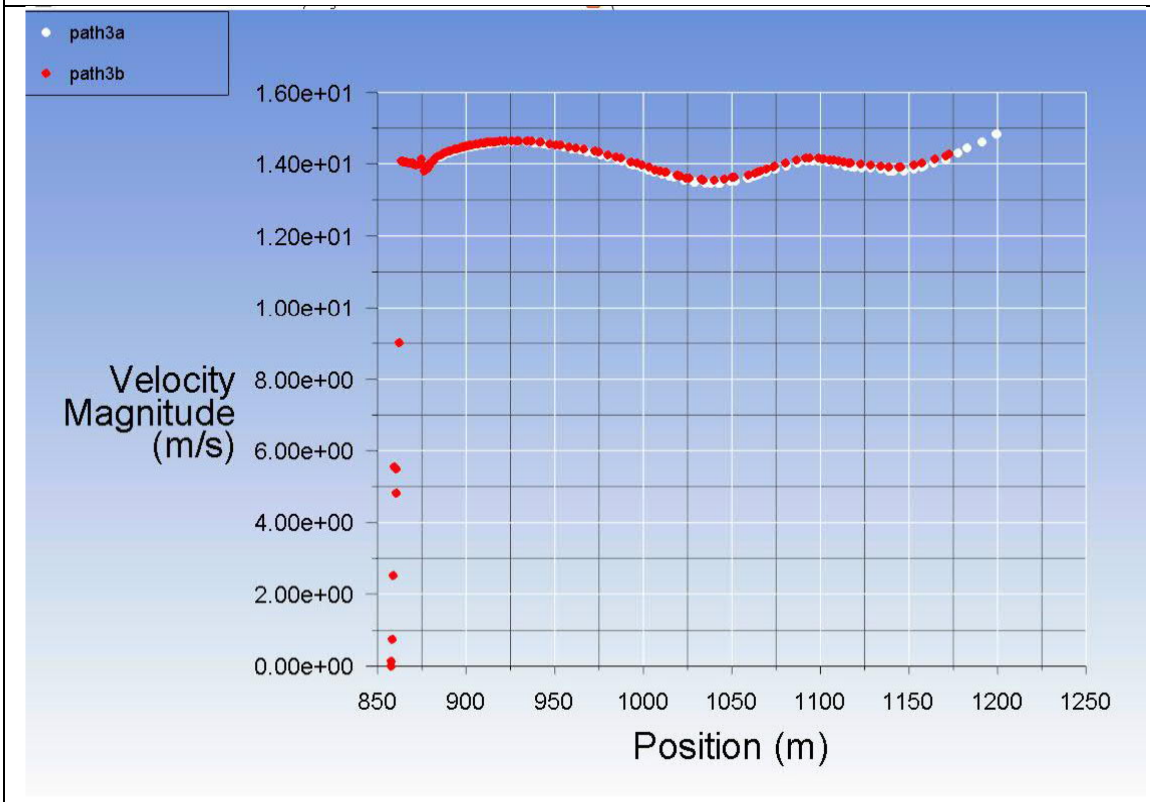


B: Post-MDP

Figure 29 **Comparison of the Velocity Magnitude (m/s) along the Aircraft Trajectory – Runway 11L/29R – Path 3 (DLES Turbulence Model, Approaching Wind = 25 Knot, Wind Angle = 215°)**



A: Current



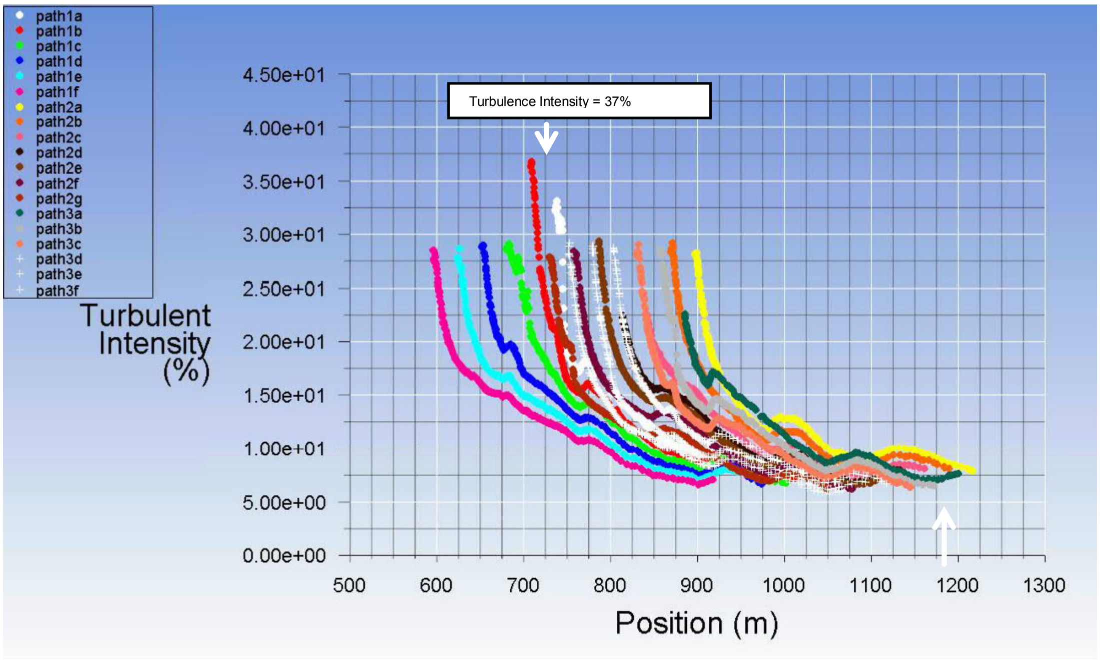
B:Post-MDP

5.3.1 Turbulence Assessment – Wind Angle = 215°

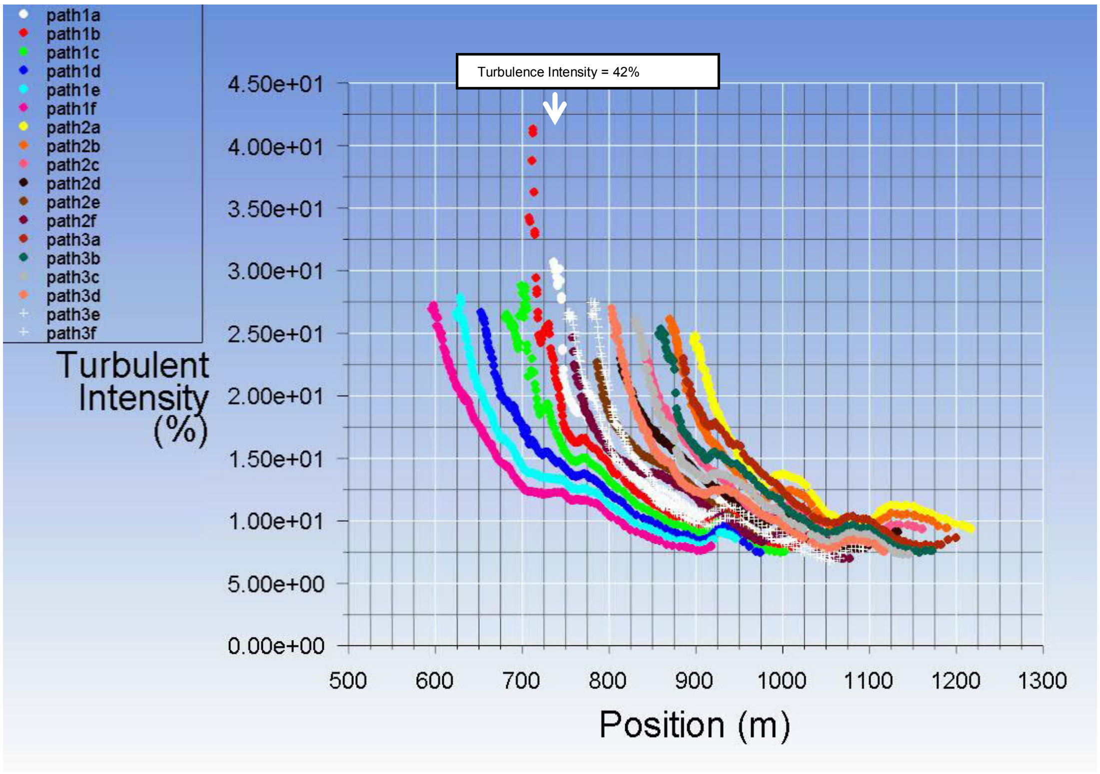
The turbulence intensity and turbulence or root-mean-square (RMS) value along the aircraft trajectory for the flight paths in **Figure 10** are shown in **Figure 30** and **Figure 31**. The following conclusions can be achieved from **Figure 15**:

- The RMS (standard deviation) is above the 4 kt for an approaching wind of 25 kt at 10 m above ground for the current and post-MDP scenarios. The maximum RMS for the current and post-MDP t scenarios is 8.35 and 8.7 kt respectively.
- An approaching mean wind speed of approximately 12.0 kt can generate a 4 kt turbulence for the current scenario.
- An approaching mean wind speed of approximately 11.5 kt can generate a 4 kt turbulence for the post-MDP scenario.

Figure 30 **Turbulence Intensity along the Aircraft Trajectory at All Runways - DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 215°)**

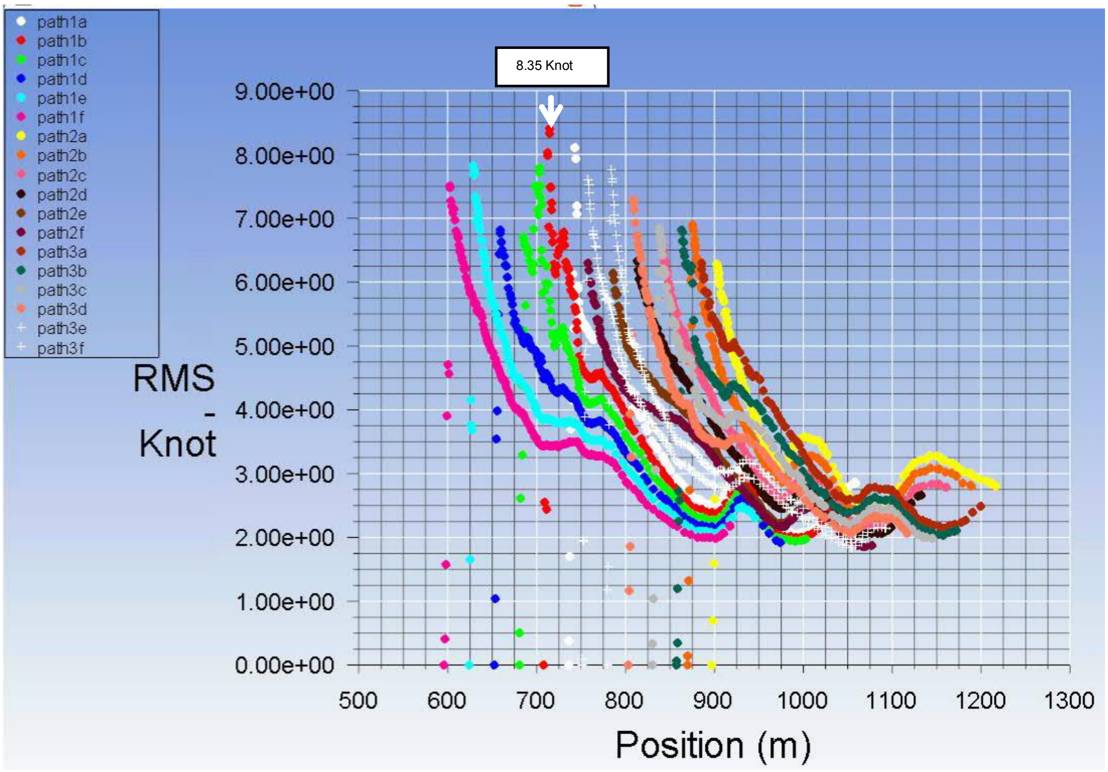


A:Current Scenario

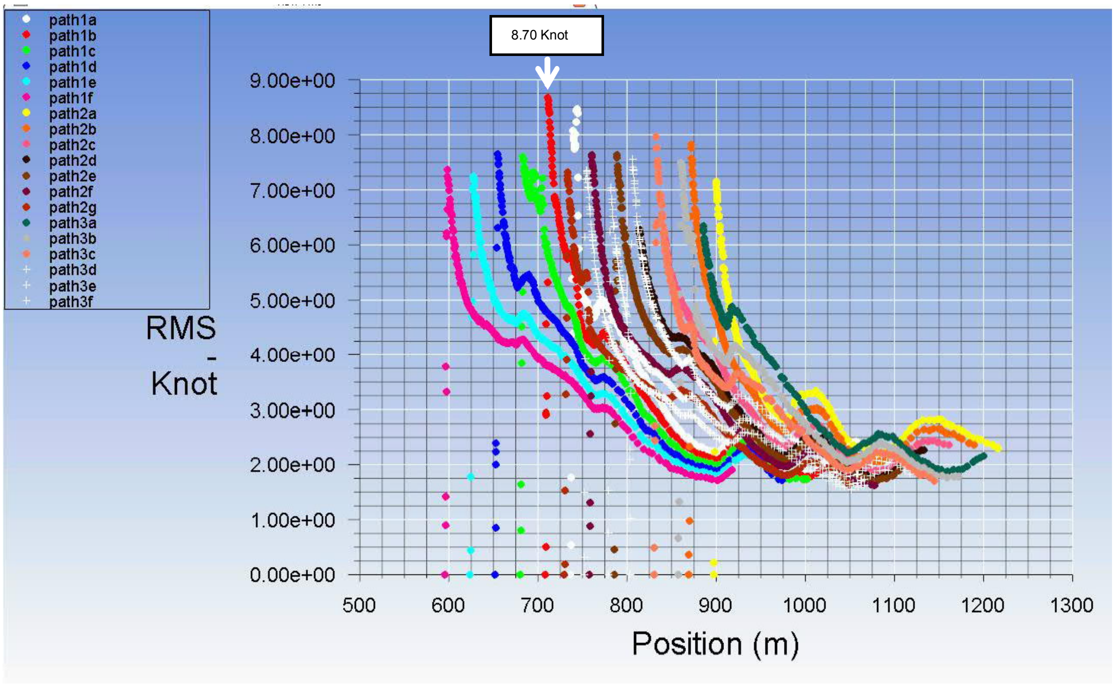


B:Post-MDP Scenario

Figure 31 RMS (Standard Deviation) Value in Knot along the Aircraft Trajectory at All Runways – DLES Turbulence Model (Approaching Wind = 25 Knot at 10 m above Ground, Wind Angle = 215°)



A:Current Scenario



B:Post-MDP Scenario

5.4 Summary Results of simulations

The trees and vegetation to the south were removed primarily to reduce computational time, noting that this removal makes the model more conservative as the addition of vegetation would typically reduce ground level wind speeds.

The following major conclusions are made from the simulations:

- The disturbance to the approaching mean wind speed for the post development scenario is highly localised due to the following:
  - The dimension in line with wind is greater than its width by a factor 2:75:1 resulting a small wake behind the proposed warehouse.
  - Proximity to runways (~365 to the closest runway – Refer Figure 7)
  - Relatively low building height (13.7m max)
  - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the warehouses sit between the RL's 6.74 m).
  - Building layouts and features, canopies, etc.
- The most critical cross-wind originates from SSW 215°.

5.4.1 Wind Shear

- Current Scenario: The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories at a height below 60 m over a distance just below 100 m.
- Post-MDP Scenario: The variation in the mean wind speed due to the proposed development is less than 6 kt along all analysed aircraft trajectories at a height below 60 m (200 ft) over a distance of at least 100 m.

5.4.2 Turbulence

Results of simulations are detailed in **Section 5.3** of this study and summarised for critical flightpaths in **Table 7** and **Table 8**.

- Current Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 12 knots.
  - There were 144 times in one year where the cross-wind speed exceeded 12 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 157.5° to 247.5°).
  - 1R/29L are operated during the daytime (6:00 am to 6:00 pm) ONLY. A 12 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 115 hours in one year.
- Post-MDP Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 11.5 knots for the most critical wind direction.
  - There were 170 times in 1 year where the cross-wind speed exceeded 12 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 157.5° to 247.5°).
  - 1R/29L are operated during the daytime (6:00 am to 6:00 pm) ONLY. A 12 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 136 hours in one year.

Table 7 Predicted Turbulence vs Approaching Cross-wind – Runway 11 R

Approaching Cross-wind	25.0 kt	20.0 kt	15.0 kt	12.0 kt	10.0 kt
Turbulence - Existing[1]	8.35	6.7	5.0	4.0	3.3
Turbulence - Proposed[2]	8.70	7.0	5.3	4.2	3.5

Note 1: The turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of 12 knots for the current scenario and 11.5 knots for the post development scenario taking into account all analysed critical wind directions.

6 MITIGATION OPTION FOR THE CURRENT AND POST-MDP STRUCTURES

Section 5 provided guidance as to the areas where the wind shear and/or turbulence acceptability criterion had the potential to be exceeded.

- The NASF B wind shear criterion is not triggered for all critical wind angles between S and SW.
- The NASF B turbulence criterion of 4 knots across a number of aircraft trajectories at heights below 60 m (200ft) is triggered at cross-winds of 12 knots for the current scenario and 11.5 and the post-MDP scenario at 11R.
- The proposed Lot 1 has a very minor impact on other runways.

With regards to the 11R/29L operations, the following comments are made:

- Runway 11L/29R is used for originating take off, full stop landing and “touch and go”.
- The actual number of movements on 11R/29L was 116,240 in 2014. 60% of the movements occurred on 29 L and 40% of the movements occurred on 11R.
- Runway 11R/29L is used during daytime only (6:00 am to 6:00 pm).
- Runway 11R/29L and Runway 11L/29R can be operated simultaneously but Runway 11C/29C is only operated singularly.
- Maintenance operation and runways closure for grass cutting are undertaken 8 times per year. The runway may be closed for 4 hours each time. An alternative runway is used during the maintenance operation as per the air traffic control direction.
- Other operational restrictions published in The En-route Supplement Australia (ERSA) are mostly related to noise abatement.

The recommended operational strategy therefore to mitigate building-induced turbulence for the project site is to amend operations so that Runway 11R/29L is not the duty runway when winds exceed 11.5 knots from the S to SW **or** to implement other operational risk mitigation acceptable to the airport operator and CASA.

The addition of the proposed development has a minor impact on this strategy, ie it increases the turbulence level by a modest 0.5 kt for the most critical flight path.

7 CONCLUSIONS

The following major conclusions have been reached based on results of simulations for the critical wind directions and assessment of Bankstown Airport Bureau of Meteorology (BoM) Weather Station data covering a 5-year period from 2011 to 2015 inclusive.

Existing Wind Conditions (obtained from the BoM Weather Station at Bankstown Airport)

Mean Wind Speed at 10 m Height above Floor Level

- There were 7 hours where the mean wind speed exceeded 25 kt taking into account wind directions between S and SW over the 5 year BoM record period.
- There were 99 hours where the mean wind speed exceeded 20 kt taking into account wind directions between S and SW over the 5 year BoM record period.

Runway 11R/29L and Runway 11L/29R operate during daylight only from 06:00 hrs to 18:00 hrs while 11C/29C operates 24 hours a day. The occurrence of the exceedance for 25 and 20 kt is reduced when only daylight hours are included in SLR's assessment (Refer **Section 3.2.1**)

Turbulence Exceedance at the Anemometer Location (Refer Figure 15 for Anemometer location)

- There were 329 occasions during the 5 year BoM record period (66 per year) where natural turbulence exceeded 4-kt taking into account ALL wind directions.
- There were 113 occasions during the 5 year BoM record period (approximately 23 per year) where natural turbulence exceeded 4-kt from S to SW.

It should be noted that while many of those exceedance "occasions" occurred on different days, some occurred in consecutive hours on the same day during the passage of major windstorm events.

Future Wind Conditions (Associated with the Post-MDP Scenario)

The following major conclusions have been reached based on results of CFD simulations for the critical wind directions:

Wind Shear

- In general the runways are currently exposed to southerly winds without a significant built environment upstream. The variation in the mean wind speed for the existing built environment is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2 and Path 3) at a height below 60 m (200 ft) over a distance just below 100 m.
- The post-MDP scenario has a small localised wake and very minor impact on the runways.
- The variation in the mean wind speed due to the proposed MDP is less than 6 kt along all analysed aircraft trajectories (Path 1, Path 2, Path 3) at a height below 60 m (200 ft) over a distance of at least 100 m due to the following:
  - Shape of the proposed warehouse. The dimension in line with wind is greater than its width by a factor 2:75:1 resulting in a small wake behind the proposed warehouse.
  - Proximity to runways (~365 m to the closest runway – Refer **Figure 7**)
  - Relatively low building height (13.7m max) above finished floor level
  - Site topography (eg the main runway is mostly at RL8 falling to 6m toward 11C while the project site sits between the RL's 6.3 and 6.74 m). The proposed warehouse sits at RL 6.74 m finished floor level.
  - Building layouts and features, canopies, etc.

Wind Turbulence

- Current Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 12 knots for the most critical wind direction.
  - There were 144 times in one year where the cross-wind speed exceeded 12 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 168.75° to 236.25°).
  - Runway 11R/29L operated during the daytime (6:00 am to 6:00 pm) ONLY. A 12 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 115 hours in one year.
- Post-MDP Scenario: the turbulence criterion of 4 knots across the aircraft trajectory at heights below 60 m (200ft) is triggered at cross-wind of approximately 11.5 knots for the most critical wind direction.
  - There were 170 times in 1 year where the cross-wind speed exceeded 11.5 knots taking into account wind directions between S 180° and SW 225° (where the angle bandwidth is ±11.25°. This covers wind directions from 168.75° to 236.25°).
  - Runway 11R/29L is operated during the daytime (6:00 am to 6:00 pm) ONLY. A 11.5 knots or higher mean wind speed from the South between S 180° and SW 225° occurred 136 hours in one year.

Summary Results

Results of simulations for the worst case scenario are summarised in below table:

Scenario	Compliance Criteria			Limiting Wind (kt) to satisfy Turbulence Criterion	Turbulence Exceedance Probability in one Year 24 Hrs[1,2]	Turbulence Exceedance Probability in One Year 6 am - 6 pm[1,2]
	Along Wind 7 kt	Cross Wind 6 kt	Turbulence 4 kt			
Current	Yes	Yes	No	12	144	115
Post - MDP	Yes	Yes	No	11.5	170	136

Note 1: The number of hours per annum that a 4-knot turbulence exceedance occurs is based on the mean wind speeds data recorded during the period 1999-2017 at BoM Station 66137. The calculation takes into account wind directions between S 180° and SW 225° where the angle bandwidth is ±11.25°. This covers wind directions from S 168.75° to SW 236.25°).

Note 2: The calculation of the number of exceedance is slightly conservative. For example for the post-PMD scenario, the calculation assumes that the turbulence criterion of 4 knots is triggered at cross-wind of 11.5 knots from S to SW. The criterion is triggered at cross wind of 15 kt at Wind Angle = 180° (Refer **Section 5.1.2**); 11.5 kt at Wind Angle =215° (Refer **Section 5.2.1**) and 12 kt at Wind Angle = 225° (Refer **Section 5.3.1**).

Recommendations

The recommended operational strategy therefore to mitigate building-induced turbulence for the project site is to amend operations so that Runway 29L is not the duty runway when winds exceed 11.0 kt from the S to SW **or** to implement other operational risk mitigation acceptable to the airport operator and CASA.

APPENDIX F

TRAFFIC AND TRANSPORT IMPACT ASSESSMENT

BANKSTOWN AIRPORT SITE WORKS AND WAREHOUSE MDP

TRAFFIC AND TRANSPORT IMPACT ASSESSMENT

FOR

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EXECUTIVE SUMMARY

Bitzios Consulting has been engaged by Bankstown Airport Ltd to undertake a traffic and transport impact assessment for the proposed Bankstown Airport Site Works and Warehouse Major Development Plan (MDP) development at Bankstown, NSW. This document summarises the outcomes of the assessment.

The South West Precinct (SWP) is located within the Airports' Commercial Zone south of the Aviation Zone and with frontage to Henry Lawson Drive and to Milperra Road. Lot 1 of the South SWP is expected to be approved by 2019 and includes 37,000 square meters of light industrial (warehouse) development. Lot 1 road works include the construction of roads internal to the SWP which provide a connection between Murray Jones Drive and Tower Road. This connection allows existing and future SWP traffic to enter or leave via either the Murray Jones Drive/Milperra Road intersection or via the Tower Road/Henry Lawson Drive intersection. The development is estimated to generate 126 vehicles/hour in the 2019 AM and PM peak periods. Background traffic is expected to grow between 1.3% and 1.4% per annum.

A calibrated and validated VISSIM microsimulation model created for assessing the Bankstown Airport 2019 Master Plan was used to assess the performance of the 2019 road network with the MDP development traffic. The VISSIM modelling results indicate that in 2019 the surrounding road network will perform at a similar Level of Service (LoS) without and with the development and that no improvements are warranted to be provided by the development for the external road network. In effect, the assessment has revealed that the impacts of the additional 126 peak hour trips added to the network are compensated by the ability to spread existing plus new development traffic via both the Murray Jones Drive and the Tower Road access points, which is being made possible by the construction of the new internal road connection under the MDP.

The MDP provides 193 parking spaces which is more than the 123 parking spaces required under the Bankstown Development Control Plan 2015 which is an appropriate guide for parking needs assessment for development at the Airport. The development site is located in the vicinity of M90 bus services which travels along on Milperra Road. The site is also located close to the off-road shared bicycle and pedestrian path adjacent to Henry Lawson Drive. Constructing footpaths as part of the proposed upgrade works along Tower Road and along a new Estate Road 01 under the MDP will provide access to bus stops and to the regional shared path along Henry Lawson Drive.

A construction traffic impact assessment was undertaken to assess the impact of construction traffic on the key access intersections. The relatively small volume of construction vehicles are not expected to have any significant impacts on the performance of the access intersections during the construction period. The relatively minor increase in delay at the Tower Road / Henry Lawson Drive intersection could be overcome by constructing the 4 lane section of Tower Road as 'early works', prior to site clearing commencing.

1. INTRODUCTION

1.1 BACKGROUND

1.1.1 About Bankstown Airport

Bankstown Airport is the second largest airport serving Sydney. The airport is situated on 313 hectares of land and has 3 parallel runways, several apron areas, a small passenger terminal and a business park. Whilst the airport primarily serves general, recreational and charter flights, it is also a major development site in its own right with significant land development potential.

The airport operates 24 hours per day and is the sixth busiest airport in Australia by number of aircraft movements. The airport is a major hub of Australian general aviation and is home to numerous fixed-wing and helicopter flying schools, charter operators, aircraft maintenance businesses, and private aircraft.

Bankstown Airport is owned by the Commonwealth Government and leased by Bankstown Airport Ltd.

1.1.2 2019 Master Plan (Under Development)

The Airports Act 1996 requires airports to prepare a master plan every 5 years for approval by the Federal Transport Minister. Section 72 of the Airports Act 1996 requires that the master plan must consider a period of 20 years with the 'environment strategy' related to a period of 5 years.

Under Section 70 of the Airports Act, a master plan is used to: *'establish the strategic direction for the* efficient and economic development at the air*port over the planning period of the plan'.* The master plan will be used to provide the framework for future development within the Airport.

Whilst a statutory requirement, the Master Plan is also intended to provide a strategic vision for Bankstown Airport. This Master Plan documents expected growth in aircraft movements, passenger movements and new development expected within the site. The Master Plan will also document the expected traffic and transport impacts associated with planned growth and identify what upgrades are required to manage or mitigate these impacts.

Transport to, from and within the Airport is also a key consideration in the Master Plan. A Ground Transport Plan is currently being prepared to support the master planning process and the street network identified in this report is consistent with the road network structure under development for the 2019 Master Plan.

1.1.3 Site Works and Warehouse MDP

The site subject is located within the Bankstown Airport SWP, near the Henry Lawson Drive/Milperra Road intersection. Figure 1.1 shows the location of the MDP. The MDP will comprise:

- Light industrial development (Warehouse): 37,000 square meters of floor space including 2 small (internal) offices and site works.

To service the development, it is also proposed to construct a road through the precinct that connects Milperra Road at its intersection with Murray Jones Drive and Tower Road at a new intersection east of Starkie Drive.

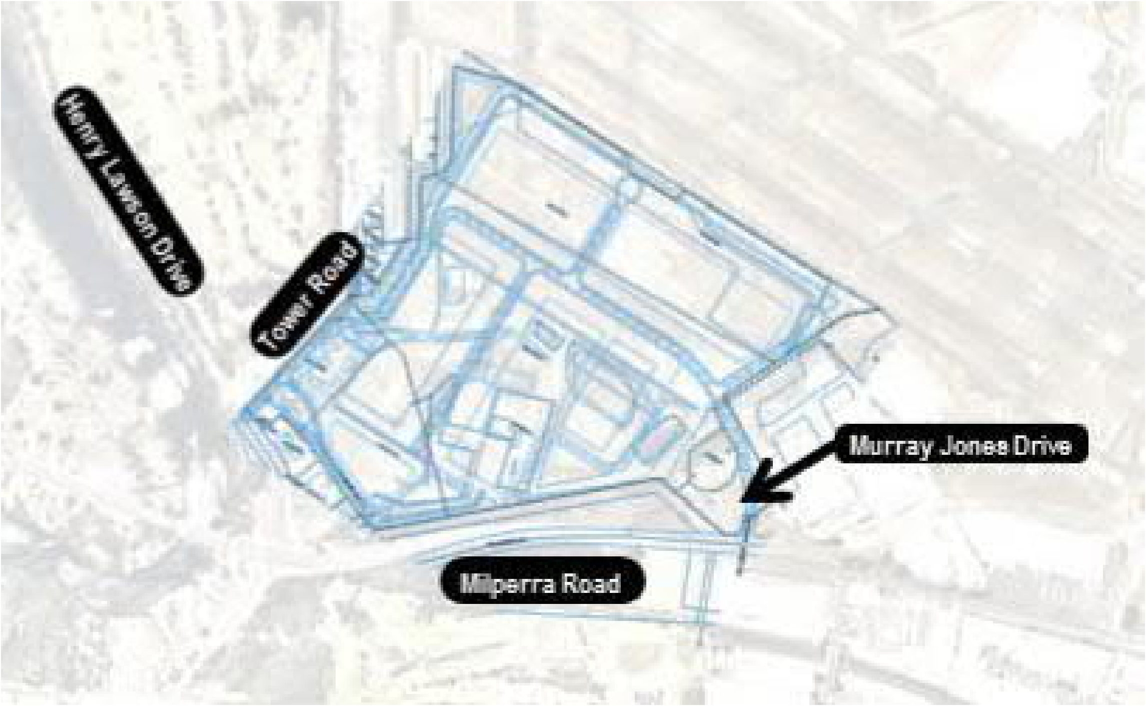


Figure 1.1: MDP Location

1.2 PURPOSE AND SCOPE OF THIS REPORT

Bitzios Consulting has been commissioned by Bankstown Airport Ltd to prepare a Traffic and Transport Assessment of the proposed Bankstown Airport Site Works and Warehouse Major Development Plan (MDP). The purpose of this study was to:

- develop an existing conditions traffic model for key roads and intersections surrounding the Bankstown Airport;
- identify the key access points for the development;
- estimate the additional traffic generated by the development based on Roads and Maritime's Guide to Traffic Generating Developments;
- investigate the impacts of the MDP traffic on the surrounding road network;
- assess the MDP's accessibility to public transport, walking and cycling networks and identify any links required to facilitate access to these networks; and
- identify the expected construction period impacts by the construction traffic generated.

1.3 STRUCTURE OF THIS REPORT

The contents of each of the following chapters are as follows:

- Chapter 2: discusses the existing transport network, traffic performance and congestion issues;
- Chapter 3: summarises the proposed MDP's development details;
- Chapter 4: contains the Construction period traffic impact assessment;
- Chapter 5: contains the Operational period traffic impact assessment;
- Chapter 6: provides a summary of parking requirements and proposed parking supply;
- Chapter 7: discusses public transport and active transport provisions and accessibility to these networks; and
- Chapter 8: provides the key conclusions of the impact assessment.

2. EXISTING TRANSPORT NETWORKS AND CONDITIONS

2.1 KEY ROADS AND INTERSECTIONS

2.1.1 Regional Road Network

Bankstown Airport is located near several major arterial roads which distribute traffic across the Greater Sydney Region, as shown in Figure 2.1. These major arterial roads include Milperra Road, Henry Lawson Drive and Marion Road.

The M5 to the south of the airport is the primary motorway link between the M7 in the west and the M1 in the east providing regional connections to and from Bankstown Airport. The airport precinct is accessed via 2 interchanges off the M5 at The River Road and at Henry Lawson Drive. These interchanges are within 3-4 kilometres from the airport's southern access onto Milperra Road providing proximate access to the regional motorway network.

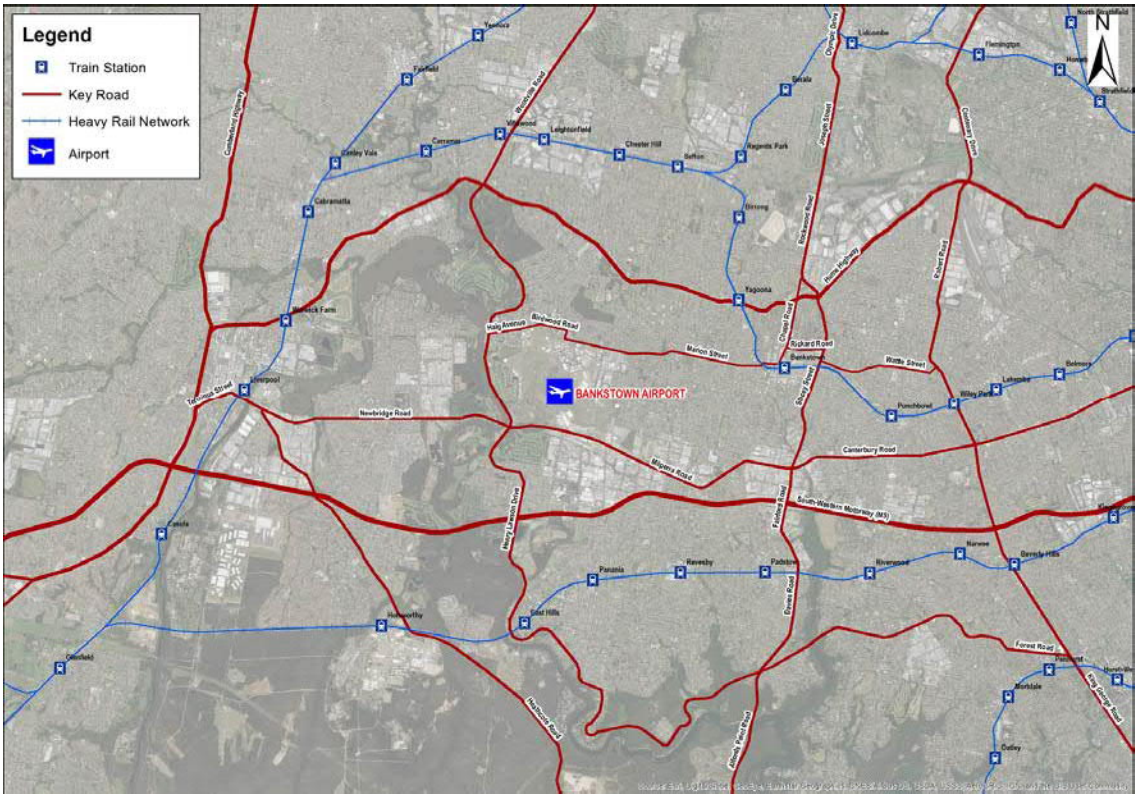


Figure 2.1: Regional Transport Infrastructure and Services

2.1.2 Local Road Network

The primary roads near the airport and serving the airport include:

- Milperra Road;
- Henry Lawson Drive;
- Edgar Street; and
- the Marion Street-Owen Road-Birdwood Road-Haig Avenue route.

Figure 2.2 shows these roads and their key intersections.

Figure 2.2: Airport and Surrounding Roads and Bus Services

Milperra Road

Milperra Road is under the control of Roads and Maritime and comprises of 3 traffic lanes in each direction with turn pockets at intersections. It is generally posted at 70 km/h and has a number of direct property accesses onto it which are restricted to left in/out movements and mostly located along its southern side. Its intersections, particularly its major intersections, are congested in peak periods. The alignment of Milperra Road is primarily straight and flat.

Henry Lawson Drive

Henry Lawson Drive is under the control of Roads and Maritime and typically includes a single lane in each direction north of its intersection with Tower Road. Between Tower Road and Newbridge Road – Milperra Road, Henry Lawson Drive provides multiple lanes for queue storage and intersection capacity needs. North of Tower Road, Henry Lawson Drive takes on a semi-rural character with no kerb and channel and a heavily treed driving environment. Directional signage for Bankstown Airport is located at the intersection of Henry Lawson Drive and Haig Avenue. Henry Lawson Drive is moderately trafficked all day with heavy traffic particularly in the afternoon and evening peak periods.

Edgar Street

Edgar Street is a local New South Wales Government road which is used as a through traffic route between Milperra Road and the Hume Highway as well as a collector road for light industrial development and residential development within its catchment. It's mostly a single lane each way with some unmarked on-street parking north of Eldridge Road and a school near Birdsall Avenue. Its long, mostly straight, wide alignment encourages its use as a through traffic alternative to Henry Lawson Drive. Edgar Street has localised congestion near its southern end for most of the day and particularly between 3.00 pm to 6.00 pm.

Marion Street-Owen Road-Birdwood Road-Haig Avenue Corridor

The Marion Street-Owen Road-Birdwood Road-Haig Avenue corridor borders the northern side of the Airport and is the primary access to the Airport Business Zone. The route is mostly 4 lanes wide with 2 lanes in each direction with the outer lanes used for on street parking in some locations.

Heading westwards and then northwards, Marion Street turns into Owen Road which has 1 lane in each direction plus parking lanes. Heading northwards and then westwards, Owen Road turns into Birdwood Road which has the same cross-sectional profile and has residential property accesses along its length. Further west, Birdwood Road passes through Georges Hall Village before becoming Haig Avenue which connects through to Henry Lawson Drive with a signalised intersection. This corridor experiences very little congestion throughout the day.

2.1.3 Key Intersections

Key intersections have been nominated based on their level of traffic volumes and congestion in proximity to the Airport and their relevance for access to Airport lands. These intersections include:

- Milperra Road/Edgar Street: 4-leg signalised intersection. A large proportion of traffic originating from the east and destined for the airport would pass through this intersection;
- Milperra Road/Nancy Ellis Leebold Drive: 3-leg signalised intersection which currently provides the primary access to the Airport's Southern Precinct;
- Milperra Road/Murray Jones Drive: Provides access to Airport businesses;
- Milperra Road/Henry Lawson Drive/Newbridge Road: The most heavily trafficked intersection in the area as the confluence between major north-south and east-west routes, in close proximity to the M5 interchange and with heavy turning movements. Airport-related traffic to/from the north and west would most likely pass through this intersection; and
- Henry Lawson Drive/Tower Road: Signalised intersection used primarily for access into the airport's Northern Precinct from the south and west and for access into the existing businesses in the SWP off Starkie Drive.
- Henry Lawson Drive/Haig Avenue: Signalised intersection used for access to the residential areas north of the Airport and with some potential usage by Airport-related trips to or from the Airport Business Zone.

2.1.4 Internal Roads, Access and Parking

Within the airport site itself, there is no continuous 'loop road' to provide access around the entire site. Whilst Tower Road does allow for access from Henry Lawson Drive to the northern business precinct, the most direct access to the northern, south-west and southern and south-east precincts is via the external road system and the separate access points which are provided for each precinct.

Currently access to the SWP is possible via Starkie Drive off Tower Road and via Murray Jones Drive off Milperra Road, although no internal road connection is provided between these intersections.

Parking is highly dispersed around the airport and typically involves free off-street parking associated with each of the businesses that occupy the site. A number of on-site parking spaces are provided at the Bankstown Airport Aerodrome located within the SWP. These spaces are accessible via Starkie Drive off Tower Road.

2.2 BASE YEAR (2017) TRAFFIC MODEL DEVELOPMENT

An existing condition traffic model was developed in VISSIM as a tool to support the assessment of the traffic impacts for the 2019 Airport Master Plan which is under development. The model includes the key roads and intersections around Bankstown Airport and the modelled network is shown in Figure 2.3. The model was calibrated and validated to Roads and Maritime's Traffic Modelling Guidelines, February 2013. The existing base case model represents the 2017 morning (AM) and afternoon (PM) peak conditions including:

- the AM peak between 7.30 am and 9.00 am; and
- the PM peak between 4.15 pm and 6.15 pm.

The model development, calibration and validation details are provided in Appendix A. Roads and Maritime has approved the base model and this correspondence is provided in Appendix E.

Figure 2.3: VISSIM Model Coverage

2.3 EXISTING TRAFFIC CONDITIONS

2.3.1 Overview

The 2017 base model performance replicates site observations and shows that, in general, key intersections near the MDP are congested in both of the peak periods modelled. Major road intersections in close proximity to the MDP include:

- Henry Lawson Drive / Milperra Road / Newbridge Road;
- Henry Lawson Drive / Tower Road; and
- Milperra Road / Murray Jones Drive.

Congestion in the area is essentially controlled by the capacity issues at the Henry Lawson Drive / Milperra Road / Newbridge Road intersection. The network issues observed during the site visits at the above intersections are replicated in the 2017 base model.

2.3.2 Major Traffic Movements

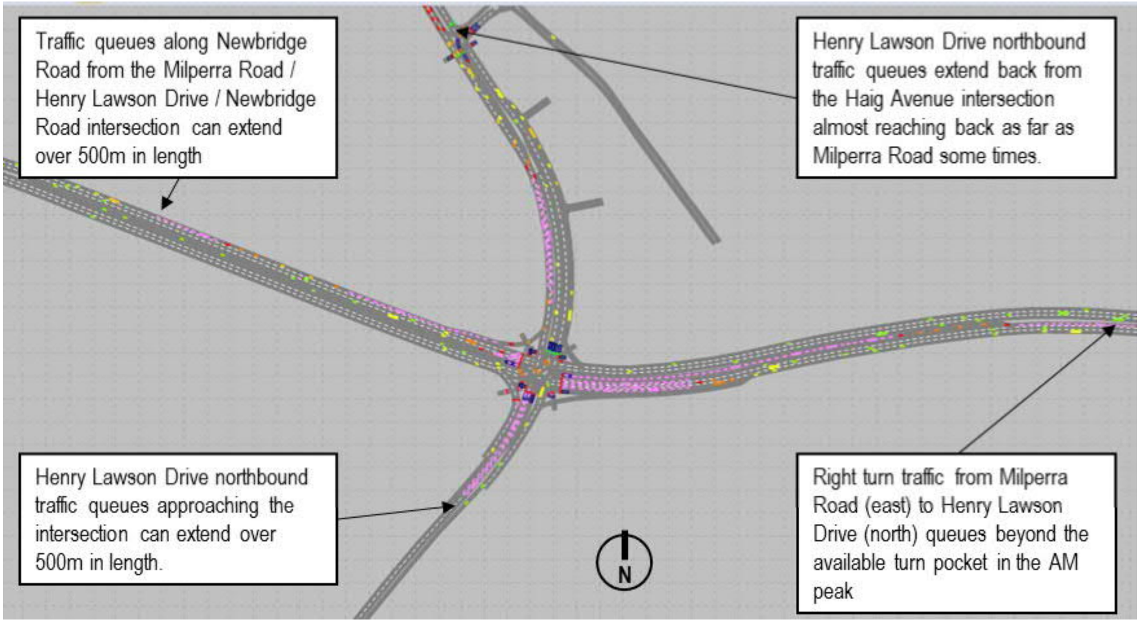
The AM and PM peak major traffic movements within the study area include:

- two-way peak traffic volumes on Milperra Road (east of Henry Lawson Drive) which vary between 3,350 and 3,560 vehicles/hour;
- two-way traffic volumes on the two-lane (one lane each direction) section of Henry Lawson Drive north of Milperra Road which vary between 2,260 and 2,460 vehicles/hour; and
- Milperra Road/ Henry Lawson Drive/Newbridge Road intersection which services in the order of 6,200 to 6,700 vehicles/hour in the AM and PM peak periods.

2.3.3 Henry Lawson Drive/Milperra Road/Newbridge Road

AM Peak

Long queues at the Henry Lawson Drive/Milperra Road/Newbridge Road intersection (Intersection 1 in Figure 2.3) are primarily created by traffic travelling to the north on Henry Lawson Drive. Both the southern and western approaches to this intersection generate long queues for movement to the north along Henry Lawson Drive. Right turning traffic from Milperra Road (east) queues past the extent of the single lane right turn bay, whilst left turn traffic from Newbridge Road queues out of its lane and impacts through traffic, extending queues along Newbridge Road as shown in Figure 2.4.



Traffic queues along Newbridge Road from the Milperra Road / Henry Lawson Drive / Newbridge Road intersection can extend over 500m in length

Henry Lawson Drive northbound traffic queues extend back from the Haig Avenue intersection almost reaching back as far as Milperra Road some times.

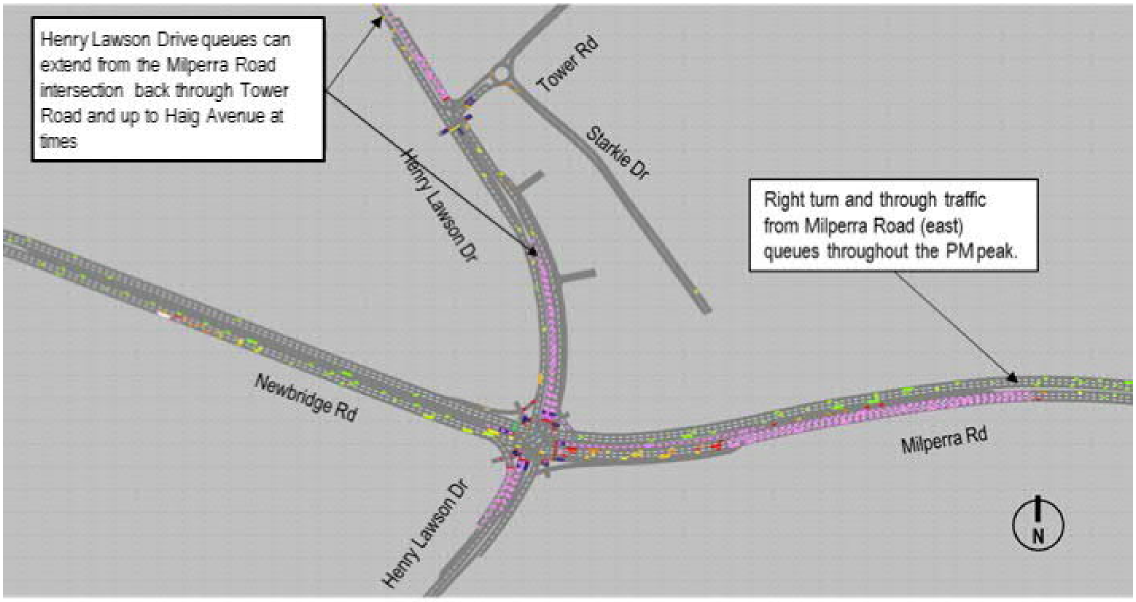
Henry Lawson Drive northbound traffic queues approaching the intersection can extend over 500m in length.

Right turn traffic from Milperra Road (east) to Henry Lawson Drive (north) queues beyond the available turn pocket in the AM peak

Figure 2.4: Henry Lawson Drive/Milperra Road/Newbridge Road Intersection Queues - AM Peak

PM Peak

Queues on Henry Lawson Drive extend back from Milperra Road, through the Henry Lawson Drive/Haig Avenue intersection and beyond. These queues affect traffic attempting to access Henry Lawson Drive via a left turn from Tower Road. Right turn traffic from Milperra Road into Henry Lawson Drive northbound also queues in the PM peak. The westbound through traffic on Milperra Road also generates long queues in the PM peak regularly extending to the Millperra Road intersection with Murray Jones Drive.



Henry Lawson Drive queues can extend from the Milperra Road intersection back through Tower Road and up to Haig Avenue at times

Right turn and through traffic from Milperra Road (east) queues throughout the PM peak.

Figure 2.5: Henry Lawson Drive/Milperra Road/Newbridge Road Intersection Queues - PM Peak

2.4 EXISTING PUBLIC TRANSPORT NETWORK

Five bus routes that operate within the vicinity of the Airport and these are:

- Bus Route 905: connecting Bankstown and Fairfield via Marion Street;
- Bus Route 911: connecting Bankstown and Auburn via a short section of Haig Avenue;
- Bus Route M90: connecting Liverpool and Burwood via Milperra Road and Newbridge Road;
- Bus Route 922: connecting Bankstown and Easthill via Henry Lawson Drive; and
- Bus Route 925: connecting Easthill and Lidcombe via Edgar Street.

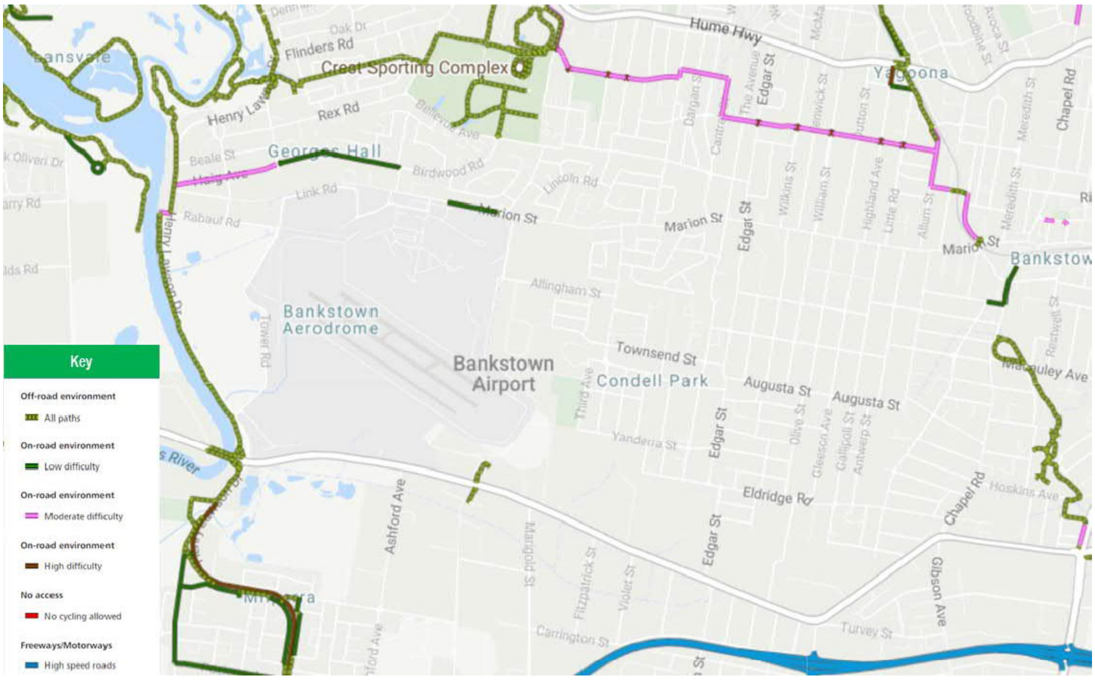
Currently only Bus Route M90 provides access to the SWP. The nearest bus stops are located on Milperra Road near Ashford Avenue which is located within 1 kilometre of the MDP development. The existing bus routes are shown in Figure 2.6.

Figure 2.6: Existing Bus Routes

2.5 EXISTING PEDESTRIAN AND CYCLIST NETWORKS

The Henry Lawson Drive corridor includes an off-road shared pedestrian and cyclist path located along the western side of the road and to both the north and the south of Milperra Road.

A short section of Marion Road has an on-road bicycle facility as well. This facility has been classified as 'low difficulty' as shown in Figure 2.7. There is also an 'off road' shared pedestrian and cycle path along the eastern side of Nancy Ellis Leebold Drive. Which connects to a north-south path into the light industrial area south of its intersection with Milperra Road.



Source: http://www.rms.nsw.gov.au/maps/cycleway_finder

Figure 2.7: Existing Cycle Routes and Shared Facilities near the Airport

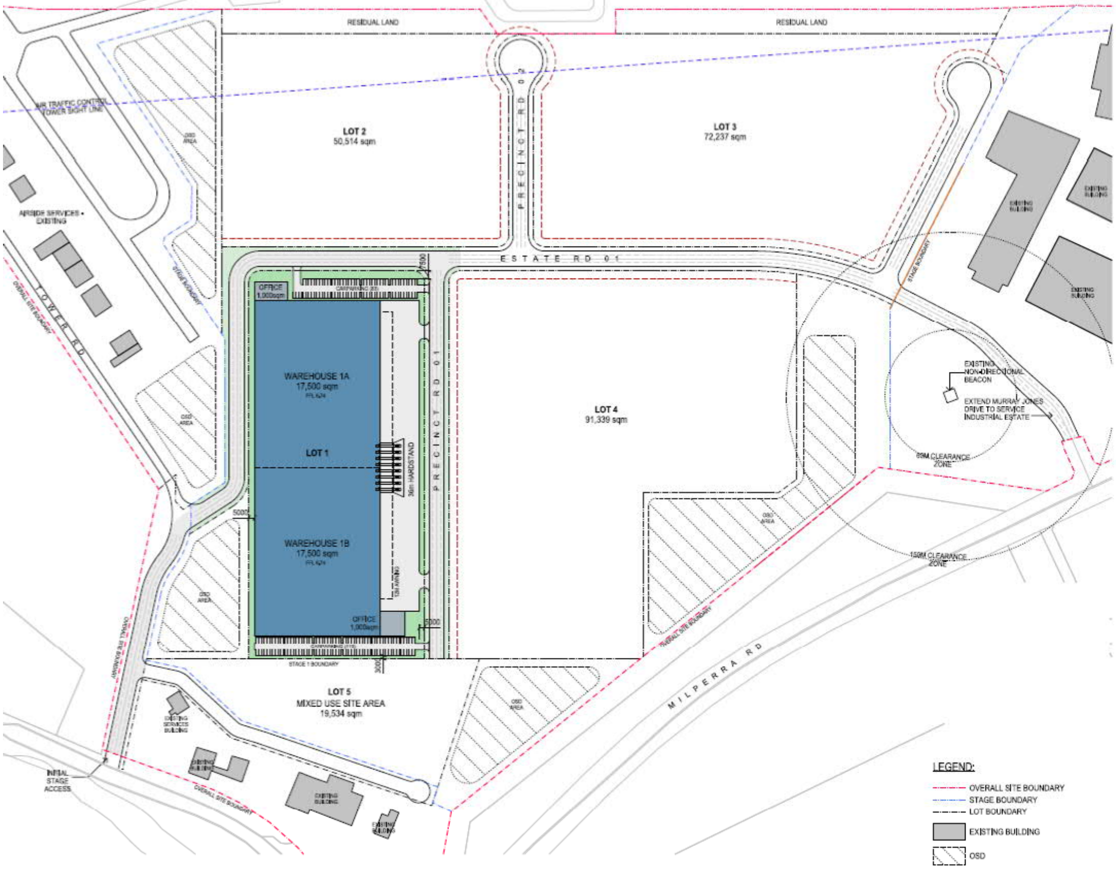
3. Site Works and Warehouse MDP

3.1 Development Plan

3.1.1 Land Uses

The MDP is for 4 single warehouses with 35,000 square meters of floor area with 2 x 1,000 square meter offices, resulting in a total floor area of 37,000 square meters.

Figure 3.1 shows a concept plan of the proposed development.



Note: The line dividing Lot 1 is notional only

Figure 3.1: Proposed Site Works and Warehouse MDP

A detailed plan is provided is Appendix B.

3.1.2 Internal Roads and Access Points

The development will be accessed via a new internal road referred to as “Estate Road 01” which connects at either end to:

- the existing signalised intersection of Milperra Road with Murray Jones Drive; and
- a new all movement priority intersection on Tower Road, north of the existing Starkie Drive intersection.

Associated roadworks also includes removing the existing Tower Road/Starkie Drive roundabout and converting it to an all movement priority intersection. In addition, the existing two-lane (one lane each way) section of Tower Road between Henry Lawson Drive and the new Estate Road 01 will be upgraded to 4 lanes (i.e. 2 lanes each way).

The access to the MPD development is provided on Precinct Road 01 via Estate Road 01 as shown in Figure 3.2.

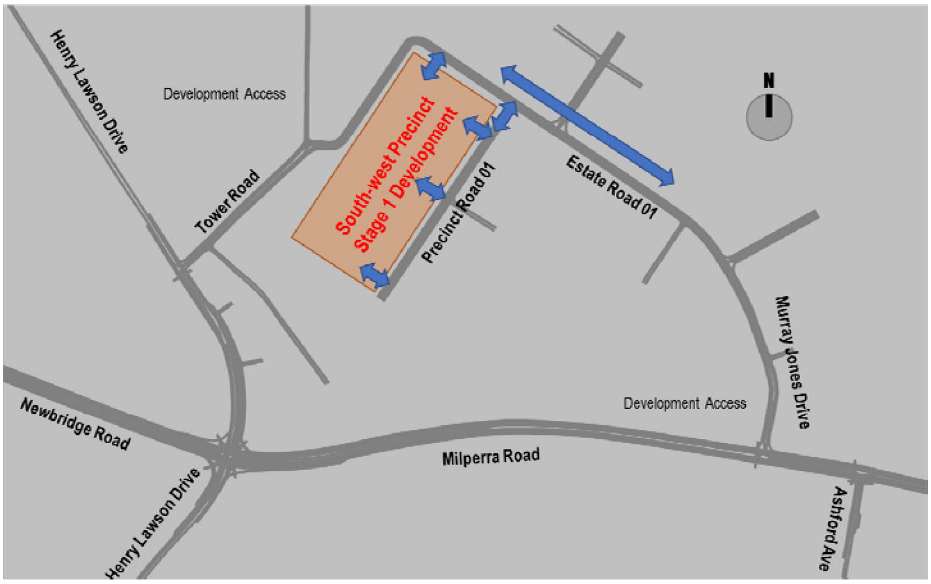


Figure 3.2: Proposed Internal Network and Access Points

3.2 TRAFFIC GENERATION

Traffic generation rates were based on surveys conducted by Roads and Maritime for 3 warehouse and light industrial estates around Sydney; as follows: Erskine Park Industrial Estate, Wonderland Business Park, and Riverwood Business Park.

The outcomes of these surveys are summarised in RMS technical direction TDT 2013/04a. The surveyed industrial park GFAs varied between 29,983 - 639,605 square meters. The data shows a correlation between the warehouse GFA and trip generation rates as shown in Figure 3.3. In general, the trip generation rate reduces as the size of the industrial development increases, which is expected. It is considered appropriate to base the traffic generation rate for the MDP on the rate applicable to the full development of the light industrial components of the SWP which is currently estimated at 160,000 square meters. On this basis, and considering Figure 3.3 the MDP development is estimated to generate 0.34 vehicular trips per 100 square meters GFA (in the AM peak and the PM peak).

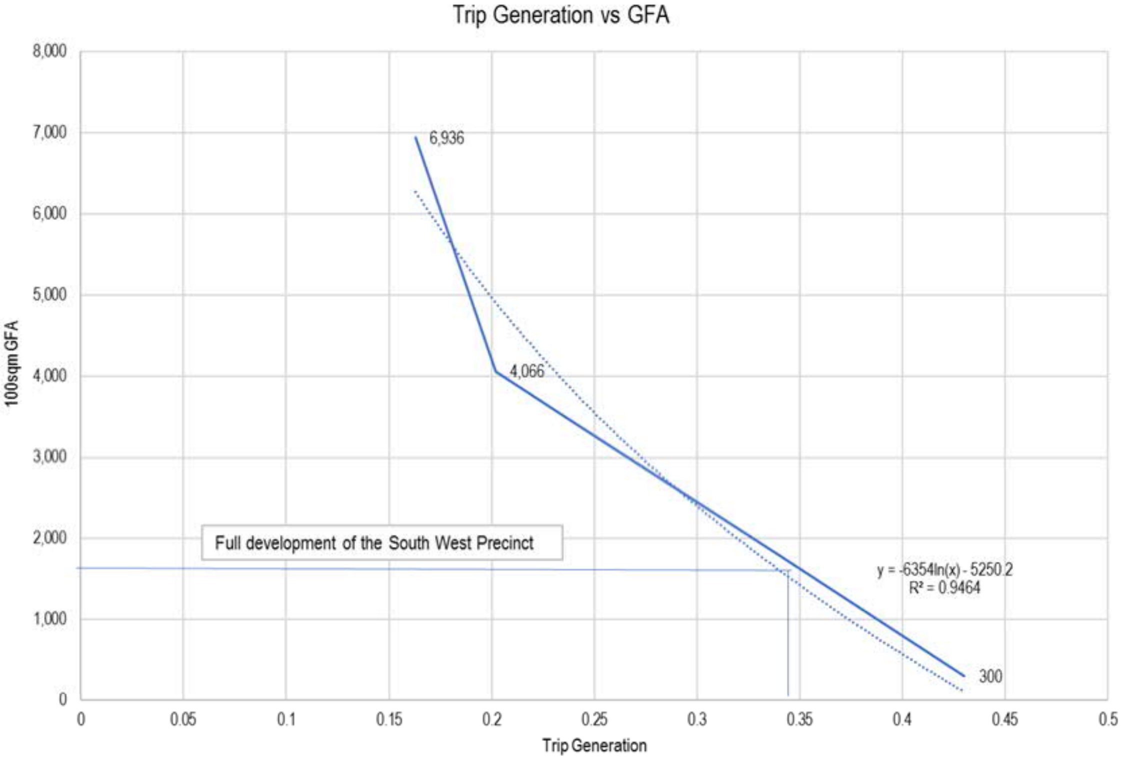


Figure 3.3: Comparative Traffic Generation Rates Based on TDT/04a (RMS)

The number of trips estimated to be generated by the MDP development and the "in" versus "out" directionality splits during the AM and PM peak periods are shown in Table 3.1 and Table 3.2.

Table 3.1: MDP Trip Generation and In/Out Splits - AM Peak

Land Use	Net Area (m^2)	Traffic Generation Rate	Total Trips	Trips In	Trips Out
Light Industrial (Warehouse)	37,000	0.34/100m^2	126	88	38

Table 3.2: MDP Trip Generation and In/Out Splits - PM Peak

Land Use	Net Area (m^2)	Traffic Generation Rate	Total Trips	Trips In	Trips Out
Light Industrial (Warehouse)	37,000	0.34/100m^2	126	38	88

3.3 JOURNEY TO WORK DATA ANALYSIS – TRIP DISTRIBUTION

The Australian Bureau of Statistics 2016 Journey to Work (JTW) data was analysed for the existing travel zones in the Airport area combined with local knowledge of key access routes for travel to/from general directions to formulate trip distribution assumptions. The Bureau of Transport Statistics (BTS) zone which covers the Bankstown Airport is highlighted in Figure 3.4.

Figure 3.4: Adopted BTS Zone for Future Trip Distribution Analysis

The AM peak trip distribution for trips to the Bankstown Airport Precinct is shown graphically Figure 3.5. From the JTW data (TZ 2011), the key trip origin/destinations include:

- Fairfield, Merrylands and Guilford – 10 percent;
- Liverpool, Bringelly, Green Valley – 13 percent;
- Bankstown and Hurstville – 19 percent;
- Campbelltown and Camden – 10 percent;
- Sutherland, Menai, Heathcote, Cronulla, Miranda – 8 percent; and
- Other suburbs – 37 percent.

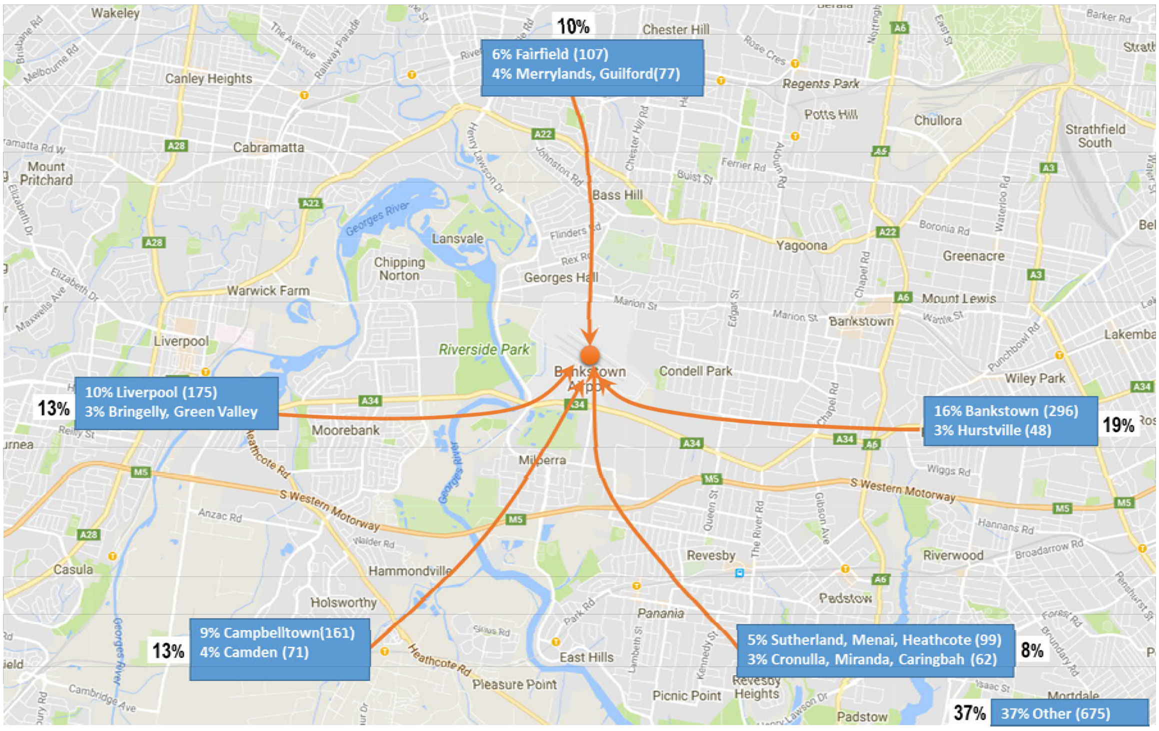


Figure 3.5: Trip Distribution to the Development - AM Peak In

3.4 2019 BACKGROUND TRAFFIC VOLUMES

Data from the Sydney Strategic Travel Model (STM) for year 2016 and year 2026 was analysed to determine the background traffic growth to be applied to through traffic movements in year 2017 to calculate year 2019 background traffic volumes. Background traffic is that traffic not associated with sites within the modelled study area.

The growth in a number of the key external trip movements during the AM and PM peak periods in the area are shown in Table 3.3 and Table 3.4. In summary, between 2016 and 2026 the external traffic demands are forecast to grow between 1.3% and 1.4% per year, on average, on the assumption that constraints outside of the study area will be relieved to an extent to allow this growth in demand to be reflected as growth in traffic getting through the study area in each peak period.

Table 3.3: AM Peak Background Growth Rate

Travel Pattern	Total 2016 AM Trips	Total 2026 AM Trips	AM Peak Growth	AM Peak p.a. Growth %
External zone to external zone trips	8,200	9,305	13%	1.3%

Table 3.4: PM Peak Background Growth Rate

Travel Pattern	Total 2016 AM Trips	Total 2026 AM Trips	AM Peak Growth	AM Peak p.a. Growth %
External zone to external zone trips	8,910	10,120	14%	1.4%

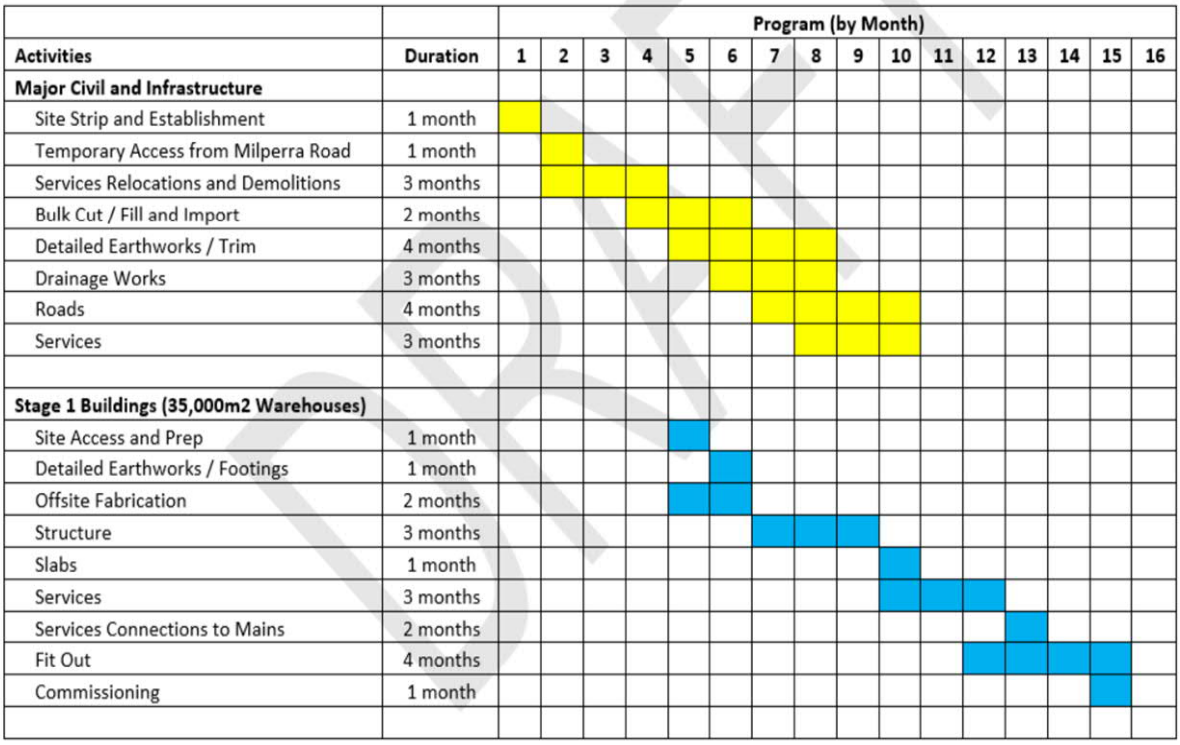
4. CONSTRUCTION PERIOD TRAFFIC IMPACT ASSESSMENT

4.1 CONSTRUCTION PROGRAM

The MDP construction period is expected to span 16 months. The program is divided into 2 major activities:

- Major Civil and Infrastructure (Civil) is expected to start first and run for about 10 months; and
- Building Works (Building) are expected to start about 4 months after the Major Civil and Infrastructure phase and are expected to continue tthroughout the end of the construction phase.

The provisional construction program is shown in Figure 4.1 and shows that both the Civil and Building works are expected to continue in parallel between month 5 and month ten.



		Program (by Month)															
Activities	**Duration**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Major Civil and Infrastructure																	
Site Strip and Establishment	1 month	🟨															
Temporary Access from Milperra Road	1 month		🟨														
Services Relocations and Demolitions	3 months		🟨	🟨	🟨												
Bulk Cut / Fill and Import	2 months				🟨	🟨	🟨										
Detailed Earthworks / Trim	4 months					🟨	🟨	🟨	🟨								
Drainage Works	3 months						🟨	🟨	🟨								
Roads	4 months							🟨	🟨	🟨	🟨						
Services	3 months								🟨	🟨	🟨						
Stage 1 Buildings (35,000m2 Warehouses)																	
Site Access and Prep	1 month					🟦											
Detailed Earthworks / Footings	1 month						🟦										
Offsite Fabrication	2 months					🟦	🟦										
Structure	3 months							🟦	🟦	🟦							
Slabs	1 month										🟦						
Services	3 months										🟦	🟦	🟦				
Services Connections to Mains	2 months													🟦			
Fit Out	4 months												🟦	🟦	🟦	🟦	
Commissioning	1 month															🟦	

Source: RPS

Figure 4.1: MDP Construction Program (Provisional)

4.2 TRAFFIC GENERATION

Light Vehicles

During the construction period the Civil and Building workers combined are expected to generate a total of 90 daily light vehicle trips:

- Civil Workers: 40 light vehicles/day; and
- Building Workers: 50 light vehicles/day.

It is also estimated that 33 percent of the total daily trips arrive to the site during the commuter AM peak (i.e. 30 vehicles/hour) and the same number depart the site during the commuter PM peak (i.e. 30 vehicles/hour).

Heavy Vehicles

It is assumed that the peak movements of heavy trucks will be limited for a short period of time during the import of fill to the site. It is estimated that about 150-250 heavy truck movements per day (30 tonne truck and dog trailer combinations) for a period of between 2 and 4 weeks. Assuming a 12-hour construction day, this means a maximum of 21 trucks/hour arrive to the site and the same number depart the site.

4.3 ACCESS TO THE SITE

The following assumptions were made while assigning traffic to the site access locations:

- light vehicles will access the site via both Tower Road and Murray Jones Drive; and
- heavy vehicles will access the site via Tower Road only. This is because significant works need to be undertaken for the link between the Murray Jones Drive access and the MDP site before heavy vehicle access to the site can be established.

4.4 CONSTRUCTION TRAFFIC SUMMARY

The peak period for the construction period traffic movements is considered to occur during the 'fill import' period when about 250 trucks movements are expected to take place in 12-hour periods per day over 4 weeks. The AM and PM peak traffic movements are summarised in Figure 4.2 and Figure 4.3.

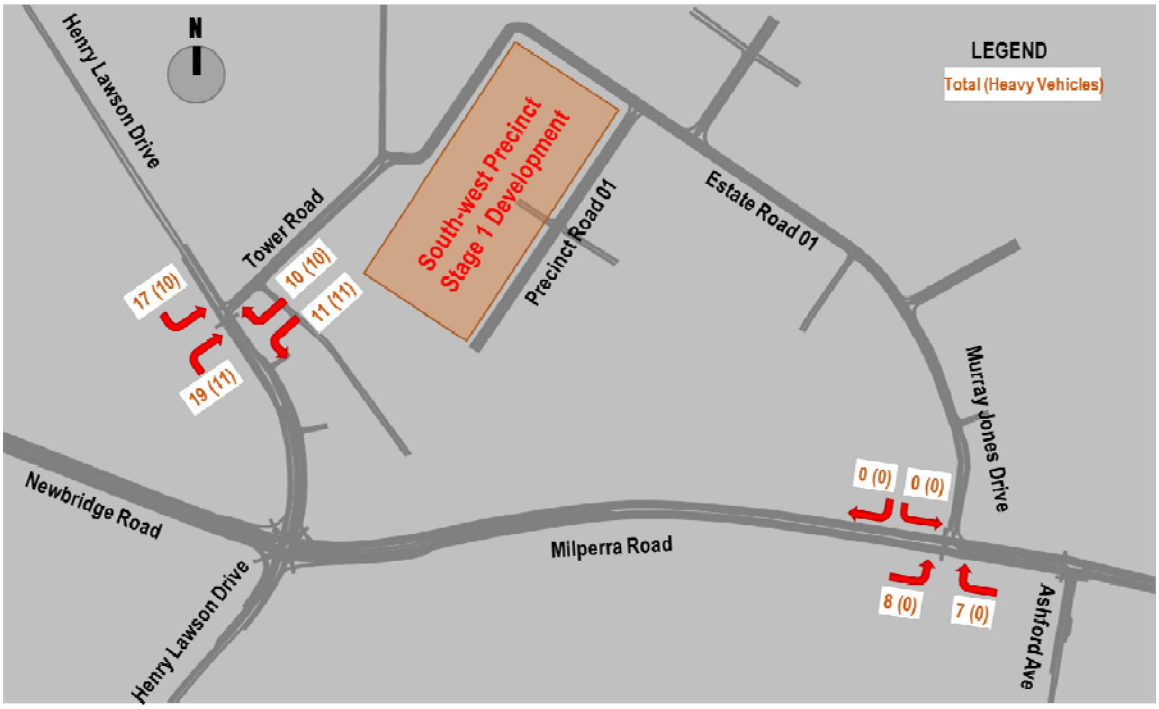


Figure 4.2: Construction Traffic Movements - AM Peak

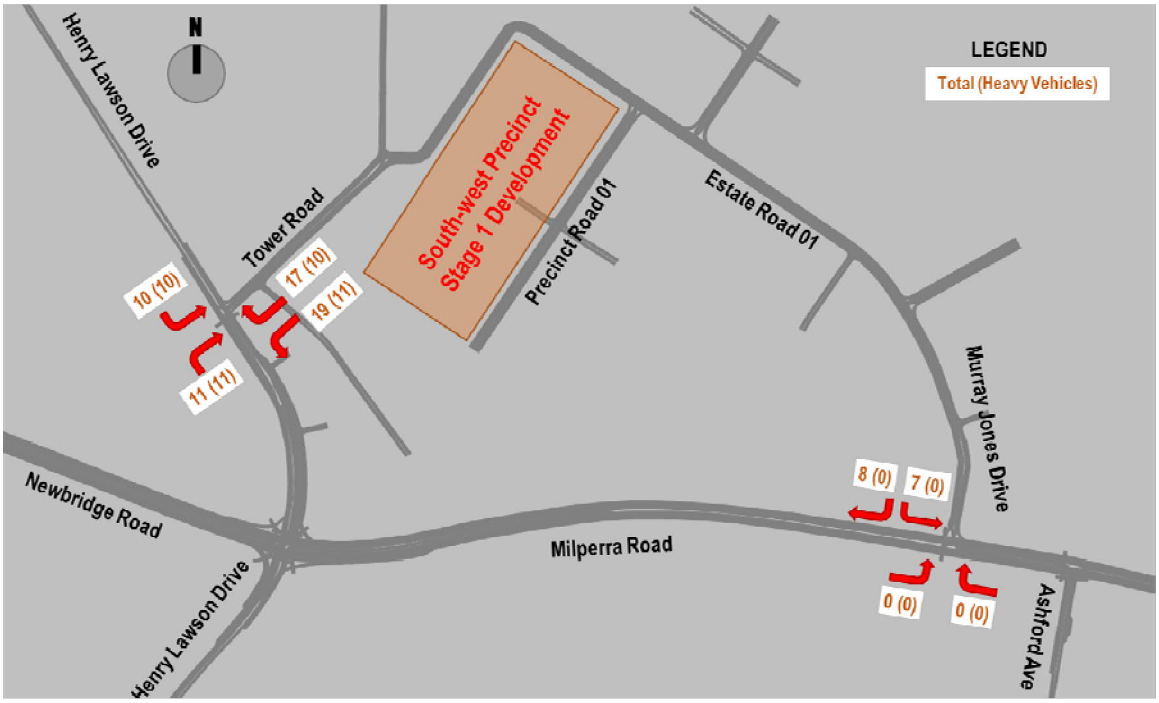


Figure 4.3: Construction Traffic Movements - PM Peak

4.5 2018 BASE CASE CONDITIONS

Given the relatively small volume of peak period traffic generated during the construction phase, the intersection assessment was limited to the following intersections:

- Milperra Road/Murray Jones Drive; and
- Henry Lawson Drive/Tower Road.

SIDRA models were created and used to assess the impact of construction vehicles on general traffic movements. The 'base case' AM and PM peak traffic performance at the Milperra Road/Murray Jones Drive intersection and at the Henry Lawson Drive/Tower Road intersection are summarised in Table 4.1 and Table 4.2. The base SIDRA models adequately reflect the existing traffic conditions at the 2 key intersections.

Table 4.1: Base Case Traffic Performance - AM Peak

Intersection	Intersection Traffic Volume	Average Intersection Delay (sec)	Average Intersection LoS	DoS	Longest 95%ile Queue (m)
Milperra Road/Murray Jones Drive	3,329	9	A	0.54	170
Henry Lawson Drive/Tower Road	2,949	32	C	1.00	379

Table 4.2: Base Case Traffic Performance - PM Peak

Intersection	Intersection Traffic Volume	Average Intersection Delay (sec)	Average Intersection LoS	DoS	Longest 95%ile Queue (m)
Milperra Road/Murray Jones Drive	3,725	9	A	0.47	128
Henry Lawson Drive/Tower Road	3,013	34	C	0.94	317

4.6 2018 WITH CONSTRUCTION TRAFFIC

Table 4.3 and Table 4.4 and provide the intersection modelling results with the construction period traffic added to the base case traffic. The additional construction traffic is expected to not have any substantial negative impacts on the performance of the key intersections in the AM and PM peak periods. The only exception is the Henry Lawson Drive/Tower Road intersection in the AM peak where the average delays to general traffic are predicted to increase by 10 seconds per vehicle.

Table 4.3: Base Plus Construction Traffic Performance - AM Peak

Intersection	Intersection Traffic Volume	Average Intersection Delay (sec)	Average Intersection LoS	DoS	Longest 95%ile Queue (m)
Milperra Road/Murray Jones Drive	3,343	9	A	0.54	172
Henry Lawson Drive/Tower Road	2,976	42	C	1.15	484

Table 4.4: Existing 2017 Plus Construction Traffic **Performance – PM Peak**

Intersection	Intersection Traffic Volume	Average Intersection Delay (sec)	Average Intersection LoS	DoS	Longest 95%ile Queue (m)
Milperra Road/Murray Jones Drive	3,741	9	A	0.472	128
Henry Lawson Drive/Tower Road	3,074	39	C	0.953	335

Overall, the construction period traffic will have a marginal impact at the Henry Lawson Drive/Tower Road intersection during construction. Given that this intersection is over capacity in the base case, an average 10 seconds per vehicle additional delay is not considered excessive for the relatively short construction period. A potential mitigation measure could involve constructing the upgrade of Tower Road between Estate Road 01 and Henry Lawson Drive as early works before site clearance works are initiated.

5. OPERATIONAL PERIOD TRAFFIC IMPACT ASSESSMENT

5.1 METHODOLOGY

In order to quantify the traffic performance within the study area, without and with the proposed MDP development, a detailed assessment of road network capacity was undertaken using the AM and PM peak VISSIM models developed for the Bankstown Airport 2019 Master Plan. The following scenarios were run:

- 2017 base model (for calibration and validation purposes);
- 2019 base model; and
- 2019 base plus development traffic.

The year 2019 VISSIM models were run 5 times using different seed values. The results reported are the average of 5 seed runs as requested by RMS. This section summarises the existing and future traffic performance within the study area.

Intersection Levels of Service (LoS) based on average delay has been used as the primary metric for impact assessment in accordance with the RMS Guide to Traffic Generating Developments, Issue 2.2, October 2002. LoS thresholds are summarised in Table 5.1.

Table 5.1: Intersection Level of Service Criteria

Level of Service (LoS)	Average Intersection Delay per vehicle (sec/veh)	Description
A	≤14	Good Operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity
F	70 and above	Unsatisfactory

The guideline recommends that for roundabouts and sign-controlled intersections, the LoS value is determined by the critical movement with the highest delay whereas for signalised intersections, the LoS is based on the average delay measured in seconds per vehicle.

5.2 2017 BASE CASE

5.2.1 Intersection Performance

The AM and PM peak performance of each key intersection within the study area is summarised in Table 5.2. The Milperra Road/Henry Lawson Drive intersection and the Milperra Road/Edgar Road intersection currently experience long delays, with these intersections currently operating at LoS F as shown in Table 5.2.

Long queues were observed on the Milperra Road approaches to these intersections in both the peak periods.

Access to the MDP development is provided via the Milperra Road/Murray Jones Drive intersection and via the Henry Lawson Drive/Tower Road intersection. Currently these intersections operate satisfactorily with LoS between A and C, as shown in Table 5.2.

Table 5.2: Intersection Level of Service - 2017 AM and PM

Intersection	Intersection Control	AM		PM	
		LoS	Volume	LoS	Volume
Henry Lawson Drive & Haig Avenue	🚦	B (15)	2,648	B (20)	2,568
Haig Avenue, Georges Crescent & Birdwood Road	🔄	A (4)	901	A (3)	857
Rabaul Road, Link Road & Tower Rd	GIVE WAY	A (1)	542	A (1)	495
Marion Street Drover Road	GIVE WAY	A (1)	367	A (1)	387
Marion Street & Airport Avenue	GIVE WAY	A (1)	1,197	A (1)	1,082
Marion Street & Birch Street	GIVE WAY	A (1)	1,468	A (3)	1,562
Marion & Manaham	🔄	A (5)	1,594	A (7)	1,530
Marion Street & Edgar Street	🚦	C (38)	2,730	D (45)	2,851
Edgar Street & Townsend Street	GIVE WAY	A (6)	1,505	D (55)	1,509
Edgar Street & Milperra Road & Queen St	🚦	F (87)	4,750	F (71)	4,882
Milperra Road & Marigold Street	🚦	A (12)	3,699	B (17)	3,885
Milperra Road & Nancy Ellis-Leebold Drive	🚦	A (11)	3,578	A (11)	3,903
Milperra Road & Ashford Avenue	🚦	B (18)	3,638	A (10)	3,810
Milperra Road & Murray Jones Drive	🚦	A (2)	3,321	A (7)	3,539
Milperra Road & Henry Lawson Drive & Newbridge Road	🚦	F (101)	6,163	F (98)	6,533
Henry Lawson Drive & Tower Road	🚦	C (41)	2,906	C (38)	2,862
Tower Road & Starkie Drive	🔄	A (2)	550	B (23)	647
Henry Lawson Drive & Bullecourt Avenue	🚦	B (27)	2,409	C (39)	2,353
Asford Avenue & Bullecourt Avenue	🔄	A (5)	1,604	A (3)	1,453
William Street & Marion Street	🚦	C (35)	2,546	C (35)	2,667
Edgar Street & Lancelot Street	🔄	B (21)	1,944	C (43)	1,979
Edgar St & Eldridge Rd (West)	🔄	B (20)	1,931	B (27)	1,900
Edgar St & Eldridge Rd (East)	🔄	B (18)	2,414	A (10)	2,418
Edgar St & Railway Pde	🚦	A (11)	1,618	D (49)	1,500

5.2.2 Travel Times on Milperra Road

The AM peak and PM peak travel times on Milperra Road between Edgar Road and Henry Lawson Drive are shown Figure 5.1 to Figure 5.4. Westbound traffic on Milperra Road experiences substantial delays at the Henry Lawson Drive intersection in both the AM and PM peak periods. Delays to eastbound traffic are reasonably long as well.

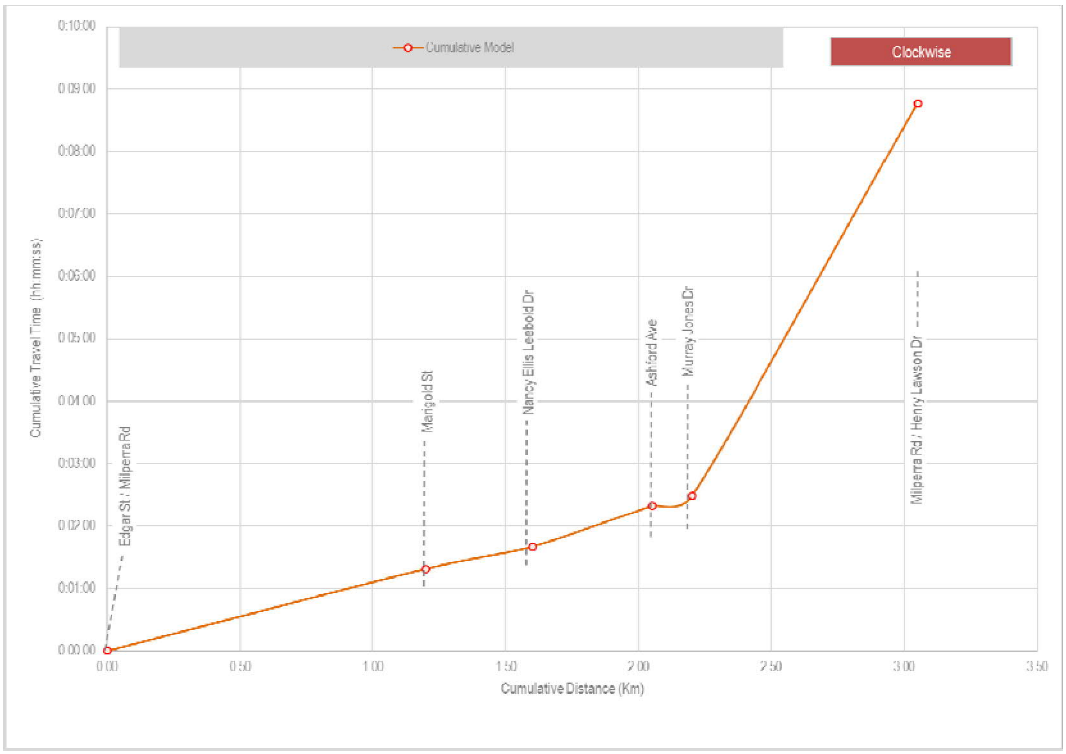


Figure 5.1: Travel Time on Milperra Road Westbound - AM Peak

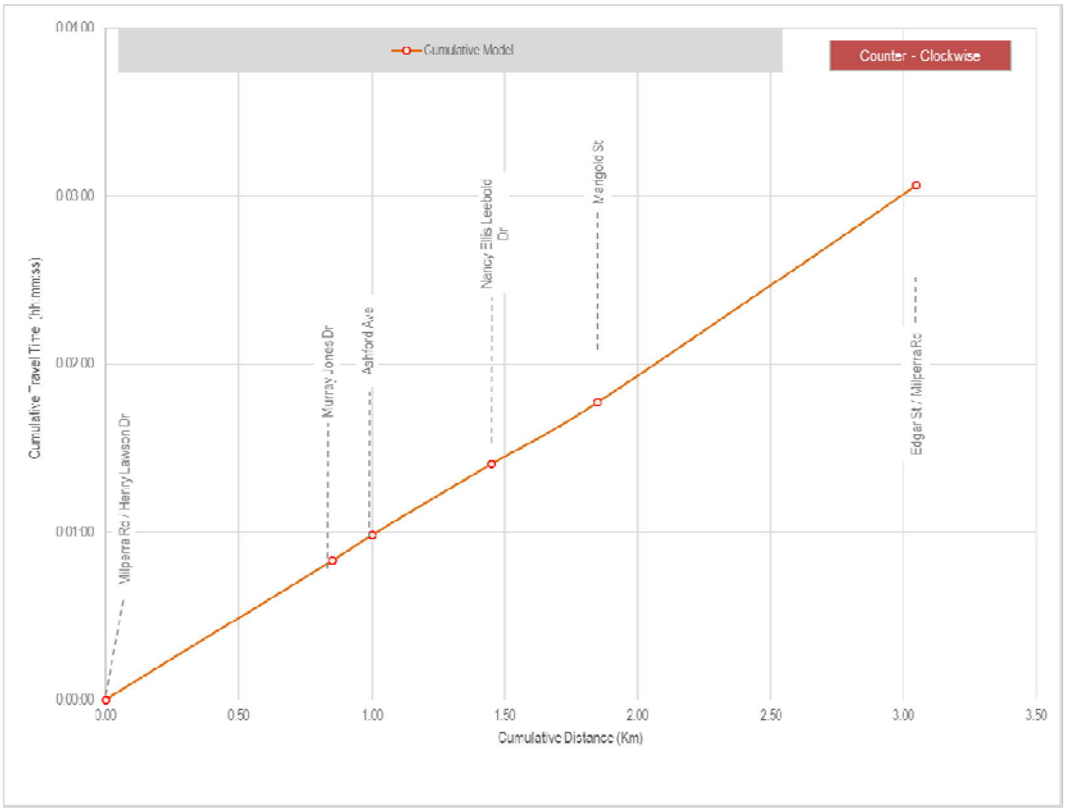


Figure 5.2: Travel Time on Milperra Road Eastbound - AM Peak

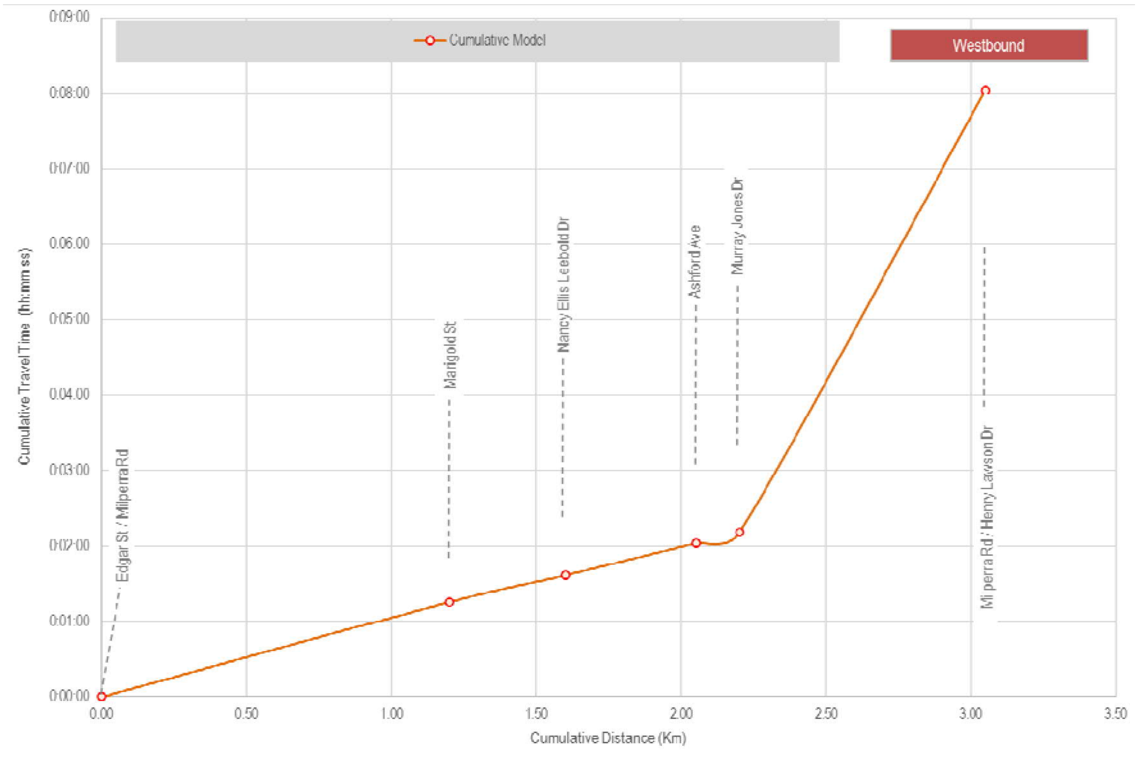


Figure 5.3: Travel Time on Milperra Road Westbound - PM Peak

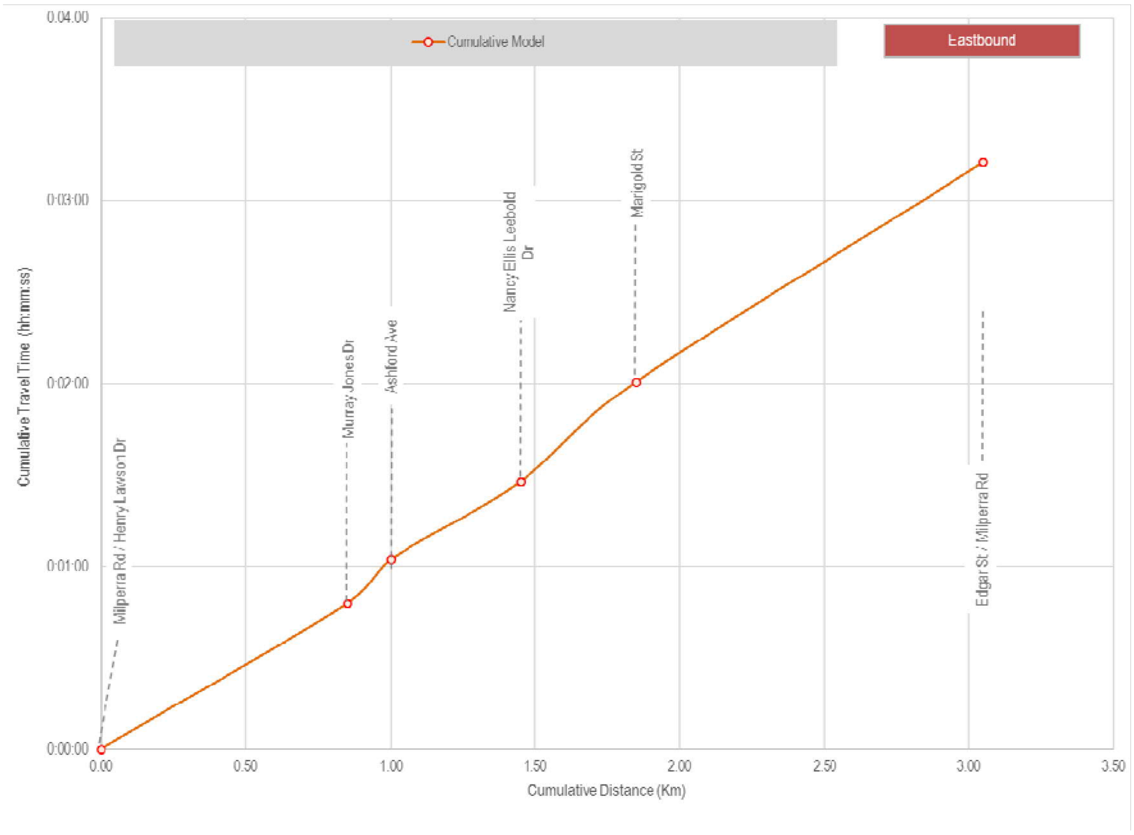


Figure 5.4: Travel Time on Milperra Road Eastbound - PM Peak

5.2.3 Henry Lawson Drive

The AM and PM peak northbound and southbound travel times on Henry Lawson Road between Tower Road and Haig Avenue are shown Figure 5.5 to Figure 5.8. Delays to the northbound traffic on Henry Lawson Drive between Tower Road and Haig Avenue are substantially longer in both the AM and PM peak periods compared to southbound delays due to congestion at the Henry Lawson Drive/Haig Avenue intersection.

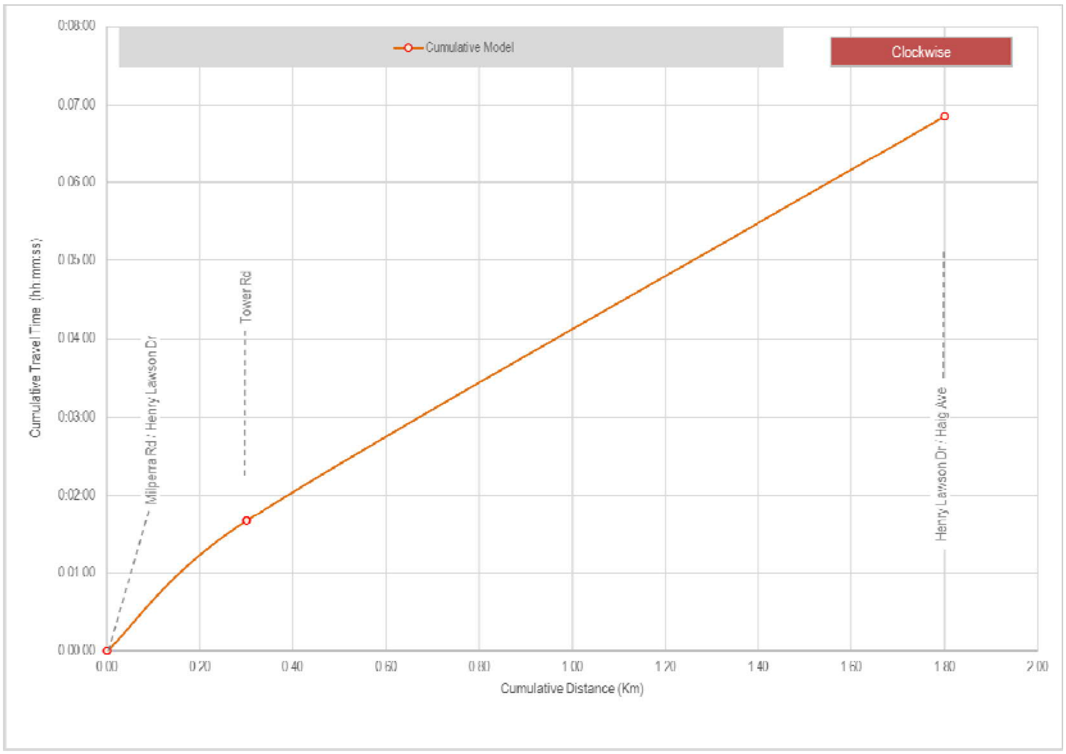


Figure 5.5: Travel Time on Henry Lawson Road Northbound - AM Peak

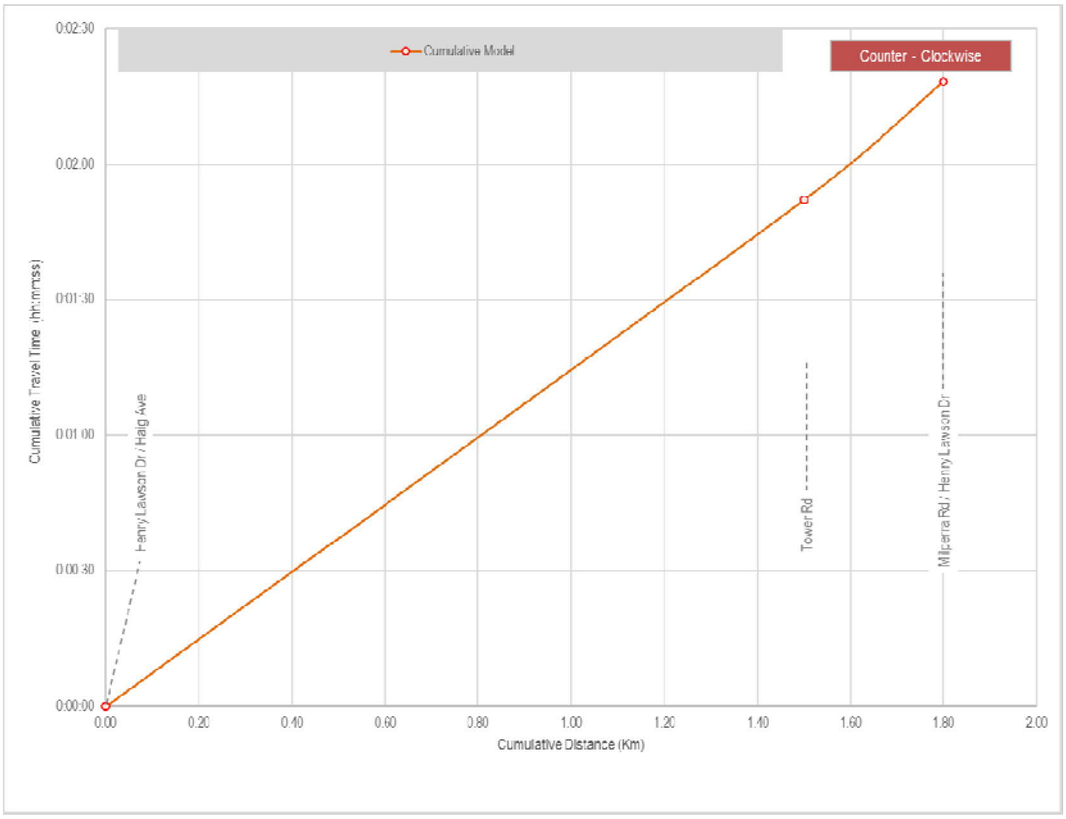


Figure 5.6: Travel Time on Henry Lawson Road Southbound - AM Peak

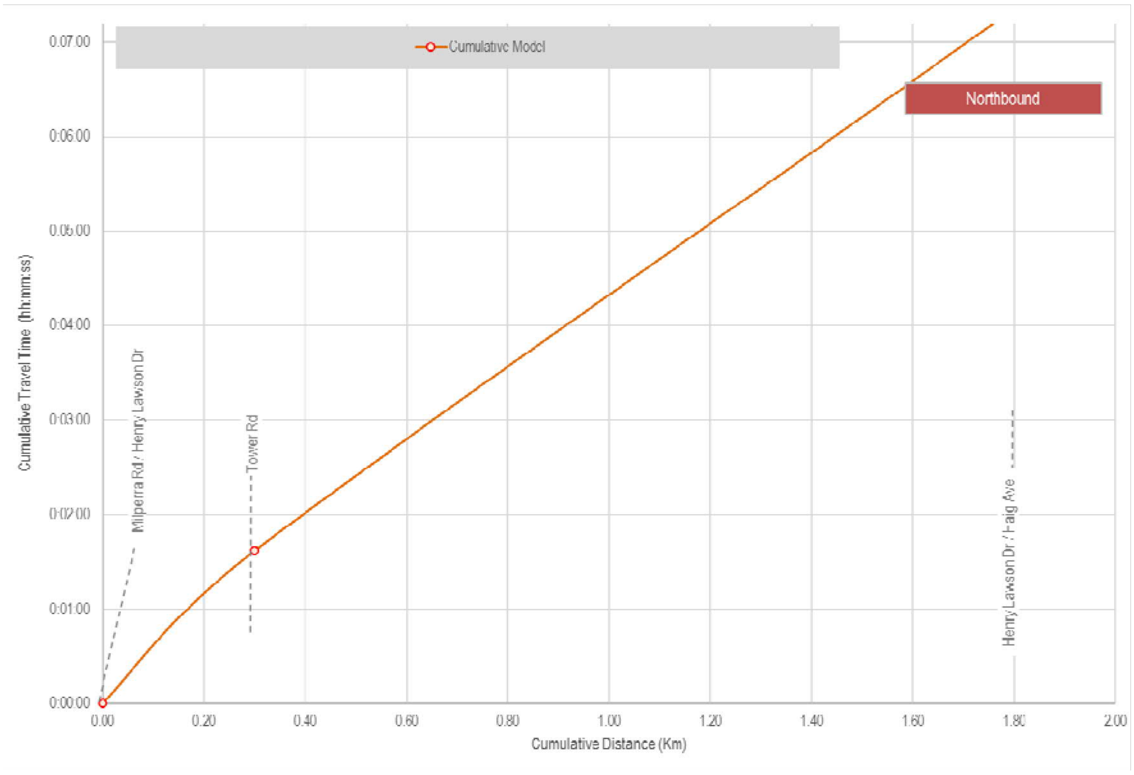


Figure 5.7: Travel Time on Henry Lawson Road Northbound - PM Peak

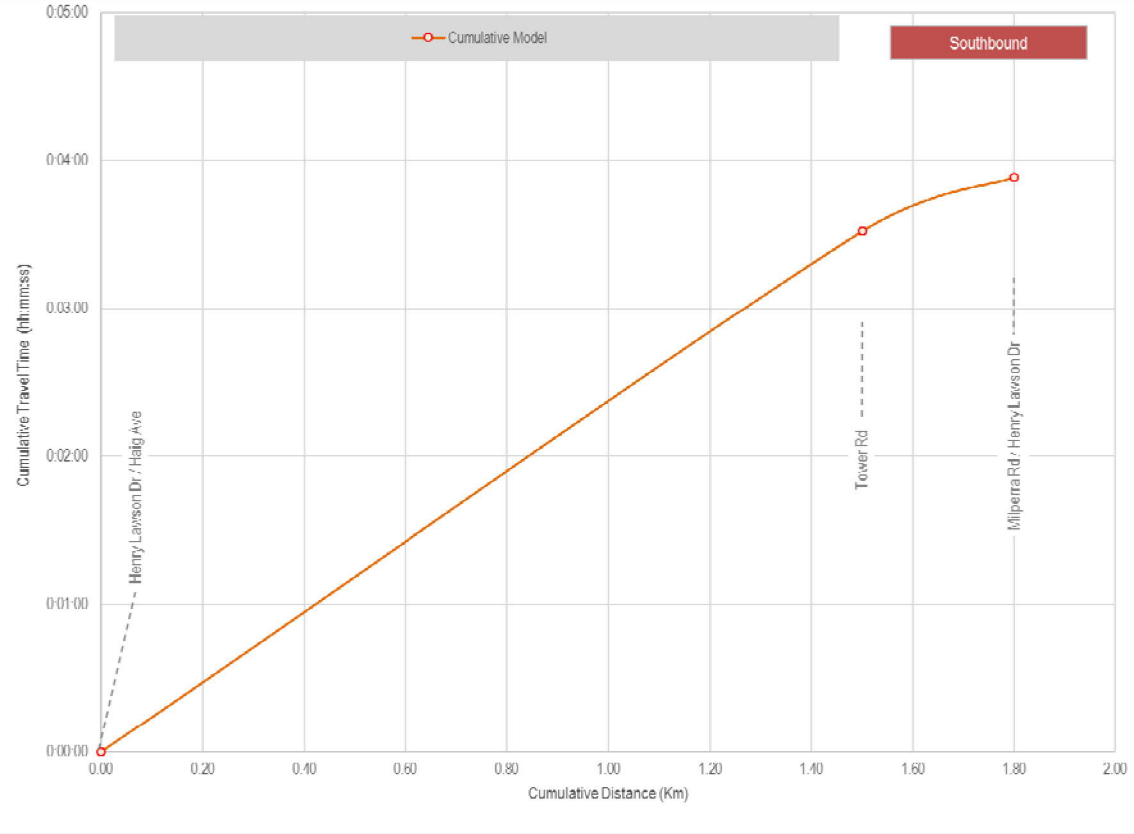


Figure 5.8: Travel Time on Henry Lawson Road Southbound - PM Peak

5.3 2019 BASE CASE

This section summarises the 2019 AM and PM Base Case traffic performance. The detailed intersection performance is provided in Appendix C.

5.3.1 Network Assumptions

Even through year 2017 modelling suggests significant capacity issues on Henry Lawson Drive north of Milperra Road and that the Milperra Road/Henry Lawson Drive intersection also operates at capacity in peak periods, it is understood that Roads and Maritime has no current plans to upgrade the intersection or the road corridor. It was therefore assumed that there would be no network upgrades introduced between 2017 and 2019.

5.3.2 2019 Traffic Volumes - AM and PM Peak

The AM and PM peak traffic volumes at key intersections within the network surrounding the development are shown in Figure 5.9 and Figure 5.10.

Base traffic volumes on Milperra Road are expected to grow between 2.2 - 4.1 percent in the period between 2017 and 2019. Traffic volumes on Henry Lawson Drive will also increase between 1.2 - 2.8 percent in the same period.

Traffic volumes at the Milperra Road/Henry Lawson Drive intersection is predicted to increase slightly (in the order of 0.2 percent) while the surrounding intersections to the east would experience more growth generally as these intersections have some residual capacity to absorb this background growth.

5.3.3 2019 Traffic Intersection Performance – AM and PM Peak

The 2019 traffic demands were modelling on the existing road network. Overall the modelling revealed that the current intersection and link configurations will accommodate the additional traffic generated between 2017 and 2019 with most of the key intersections expected to retain a similar LoS in 2019 as they did in 2017. The performance of key intersections in the vicinity of the MDP development, including the Milperra Road/Henry Lawson Drive intersection are expected to show similar operational performance.

The AM and PM peak intersection performance comparisons are provided in Table 5.3 and

Table 5.4.

Figure 5.9: Intersection Volumes Comparison, 2017 and 2019 - AM Peak

Figure 5.10: Intersection Volumes Comparison, 2017 and 2019 - PM Peak

Table 5.3 Intersection Level of Service Comparison - 2017 and 2019 AM Peak (Base Case)

Intersection	Intersection Control	2017 Base AM		2019 Base	
		LoS	Volume	LoS	Volume
Henry Lawson Drive & Haig Avenue	🚦	B (15)	2,648	B (15)	2,713
Haig Avenue, Georges Crescent & Birdwood Road	🔄	A (4)	901	A (5)	922
Rabaul Road, Link Road & Tower Rd	GIVE WAY	A (1)	542	A (1)	553
Marion Street Drover Road	GIVE WAY	A (1)	367	A (4)	385
Marion Street & Airport Avenue	GIVE WAY	A (1)	1,197	A (1)	1,219
Marion Street & Birch Street	GIVE WAY	A (1)	1,468	A (1)	1,492
Marion & Manaham	🔄	A (5)	1,594	A (5)	1,609
Marion Street & Edgar Street	🚦	C (38)	2,730	C (42)	2,773
Edgar Street & Townsend Street	GIVE WAY	A (6)	1,505	A (11)	1,505
Edgar Street & Milperra Road & Queen St	🚦	F (87)	4,750	F (96)	4,853
Milperra Road & Marigold Street	🚦	A (12)	3,699	A (12)	3,771
Milperra Road & Nancy Ellis-Leebold Drive	🚦	A (11)	3,578	A (11)	3,648
Milperra Road & Ashford Avenue	🚦	B (18)	3,638	B (21)	3,658
Milperra Road & Murray Jones Drive	🚦	A (2)	3,321	A (10)	3,329
Milperra Road & Henry Lawson Drive & Newbridge Road	🚦	F (101)	6,163	F (107)	6,266
Henry Lawson Drive & Tower Road	🚦	C (41)	2,906	C (39)	2,949
Tower Road & Starkie Drive	🔄	A (2)	550	A (2)	554
Henry Lawson Drive & Bullecourt Avenue	🚦	B (27)	2,409	B (24)	2,439
Asford Avenue & Bullecourt Avenue	🔄	A (5)	1,604	A (5)	1,608
William Street & Marion Street	🚦	C (35)	2,546	C (35)	2,571
Edgar Street & Lancelot Street	🔄	B (21)	1,944	B (24)	1,952
Edgar St & Eldridge Rd (West)	🔄	B (20)	1,931	B (15)	1,932
Edgar St & Eldridge Rd (East)	🔄	B (18)	2,414	B (16)	2,421
Edgar St & Railway Pde	🚦	A (11)	1,618	A (9)	1,600

Table 5.4 Intersection Level of Service Comparison - 2017 and 2019 PM Peak (Base Case)

Intersection	Intersection Control	2017		2019 Base	
		LoS	Volume	LoS	Volume
Henry Lawson Drive & Haig Avenue	🚦	B (20)	2,568	B (23)	2,639
Haig Avenue, Georges Crescent & Birdwood Road	🔄	A (3)	857	A (3)	896
Rabaul Road, Link Road & Tower Rd	GIVE WAY	A (1)	495	A (1)	503
Marion Street Drover Road	GIVE WAY	A (1)	387	A (1)	404
Marion Street & Airport Avenue	GIVE WAY	A (1)	1,082	A (1)	1,116
Marion Street & Birch Street	GIVE WAY	A (3)	1,562	A (2)	1,591
Marion & Manaham	🔄	A (7)	1,530	A (7)	1,564
Marion Street & Edgar Street	🚦	D (45)	2,851	D (49)	2,960
Edgar Street & Townsend Street	GIVE WAY	D (55)	1,509	E (70)	1,534
Edgar Street & Milperra Road & Queen St	🚦	F (71)	4,882	F (81)	5,038
Milperra Road & Marigold Street	🚦	B (17)	3,885	B (16)	4,043
Milperra Road & Nancy Ellis-Leebold Drive	🚦	A (11)	3,903	A (10)	4,054
Milperra Road & Ashford Avenue	🚦	A (10)	3,810	A (12)	3,888
Milperra Road & Murray Jones Drive	🚦	A (7)	3,539	B (16)	3,590
Milperra Road & Henry Lawson Drive & Newbridge Road	🚦	F (98)	6,533	F (101)	6,547
Henry Lawson Drive & Tower Road	🚦	C (38)	2,862	C (36)	2,903
Tower Road & Starkie Drive	🔄	B (23)	647	C (32)	669
Henry Lawson Drive & Bullecourt Avenue	🚦	C (39)	2,353	C (39)	2,366
Asford Avenue & Bullecourt Avenue	🔄	A (3)	1,453	A (3)	1,442
William Street & Marion Street	🚦	C (35)	2,667	C (35)	2,720
Edgar Street & Lancelot Street	🔄	C (43)	1,979	D (43)	2,005
Edgar St & Eldridge Rd (West)	🔄	B (27)	1,900	C (33)	1,838
Edgar St & Eldridge Rd (East)	🔄	A (10)	2,418	A (15)	2,384
Edgar St & Railway Pde	🚦	D (49)	1,500	E (59)	1,493

5.3.4 2019 Travel Time Comparison - AM and PM Peak

Modelled travel times routes on Milperra Road and on Henry Lawson Drive were compared for 2017 and 2019 for both peak periods, as shown Figure 5.11 to Figure 5.18. In general, the 2019 base travel times are marginally longer in both peak periods on both routes.

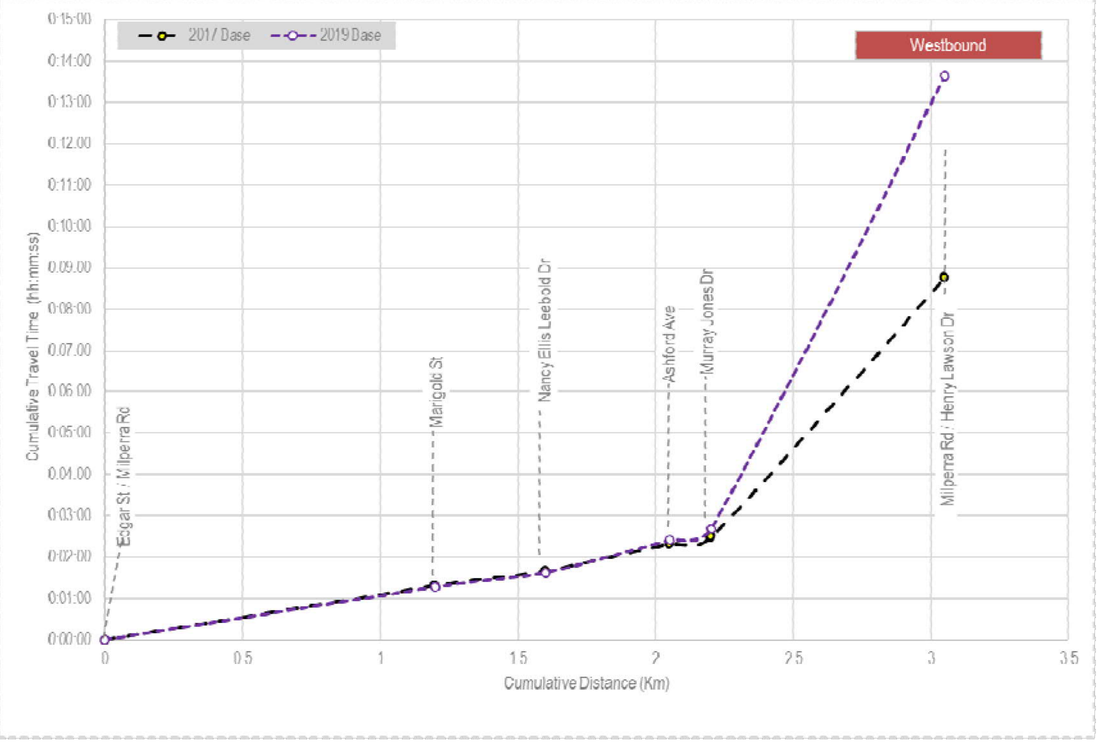


Figure 5.11: Travel Time on Milperra Road Westbound - AM Peak

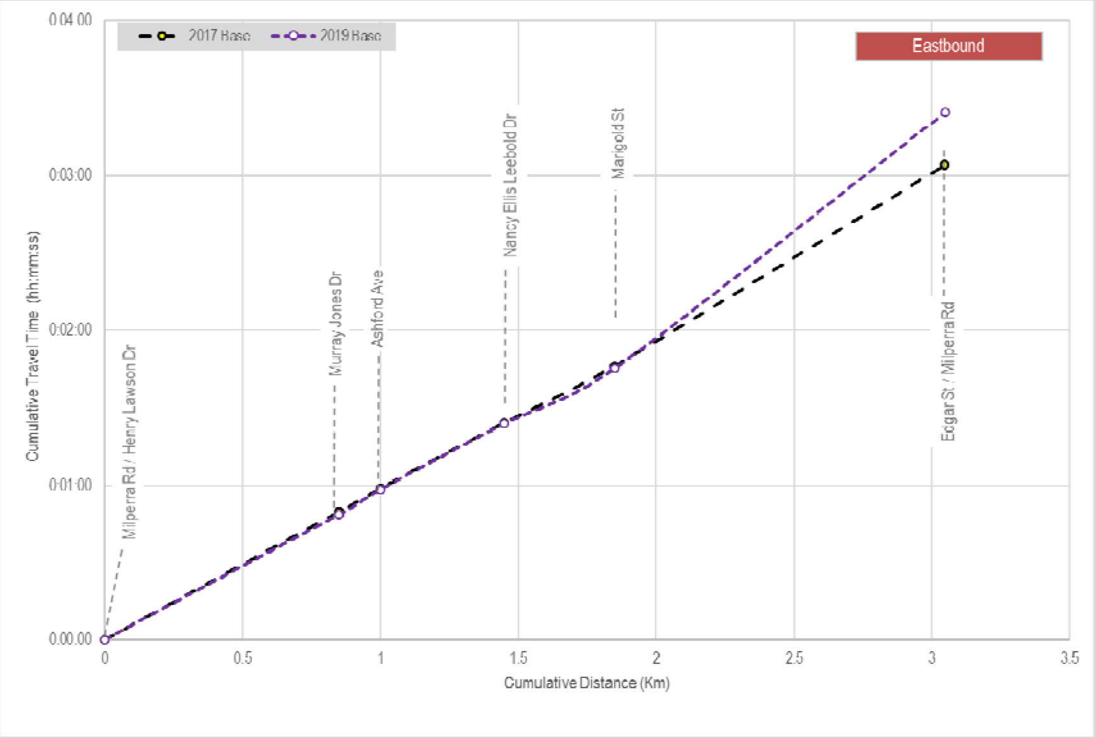


Figure 5.12: Travel Time on Milperra Road Eastbound - AM Peak

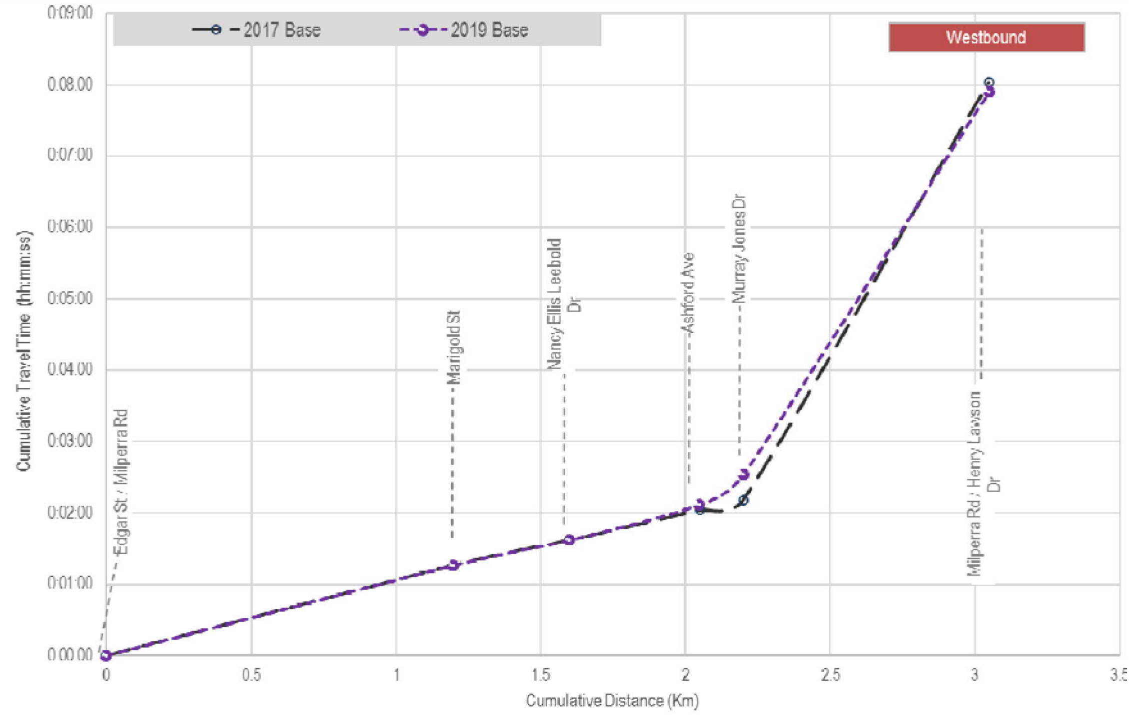


Figure 5.13: Travel Time on Milperra Road Westbound - PM Peak

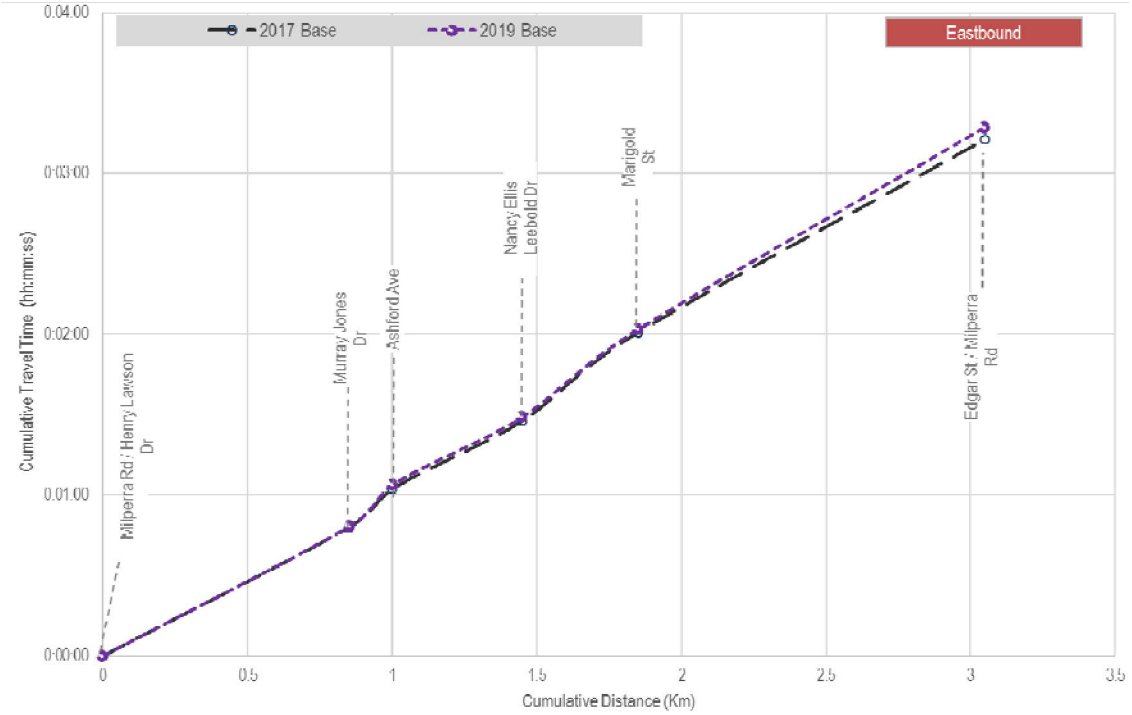


Figure 5.14: Travel Time on Milperra Road Eastbound - PM Peak

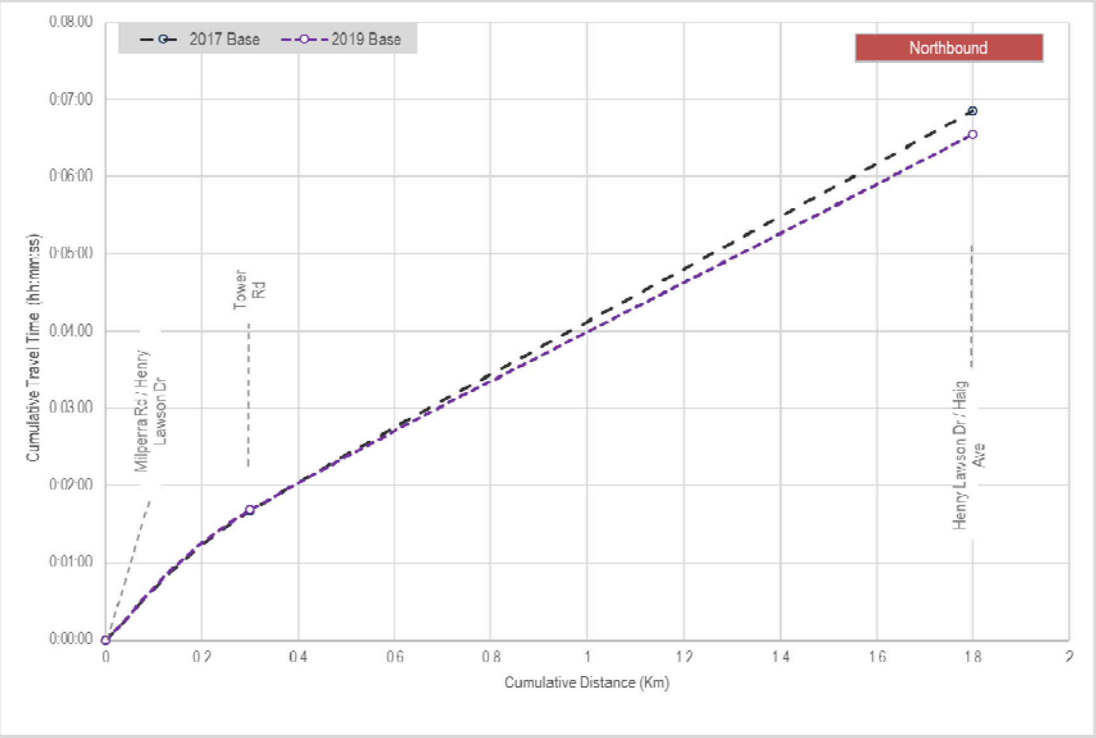


Figure 5.15: Travel Time on Henry Lawson Road Northbound - AM Peak

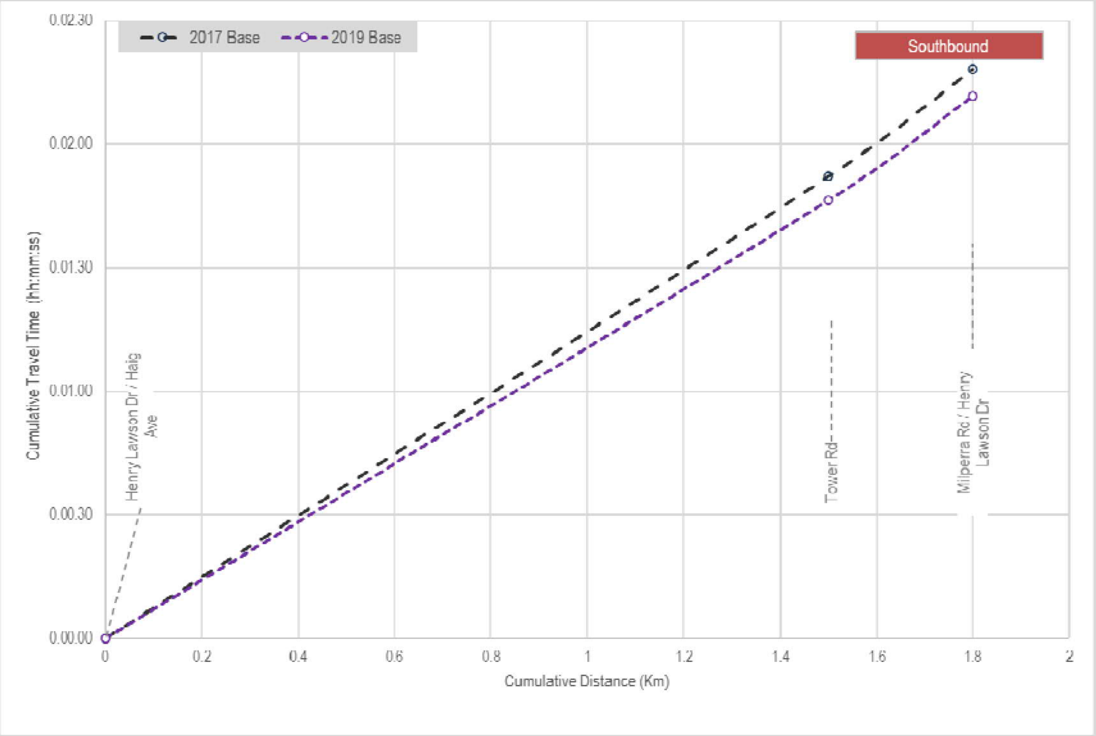


Figure 5.16: Travel Time on Henry Lawson Road Southbound - AM Peak

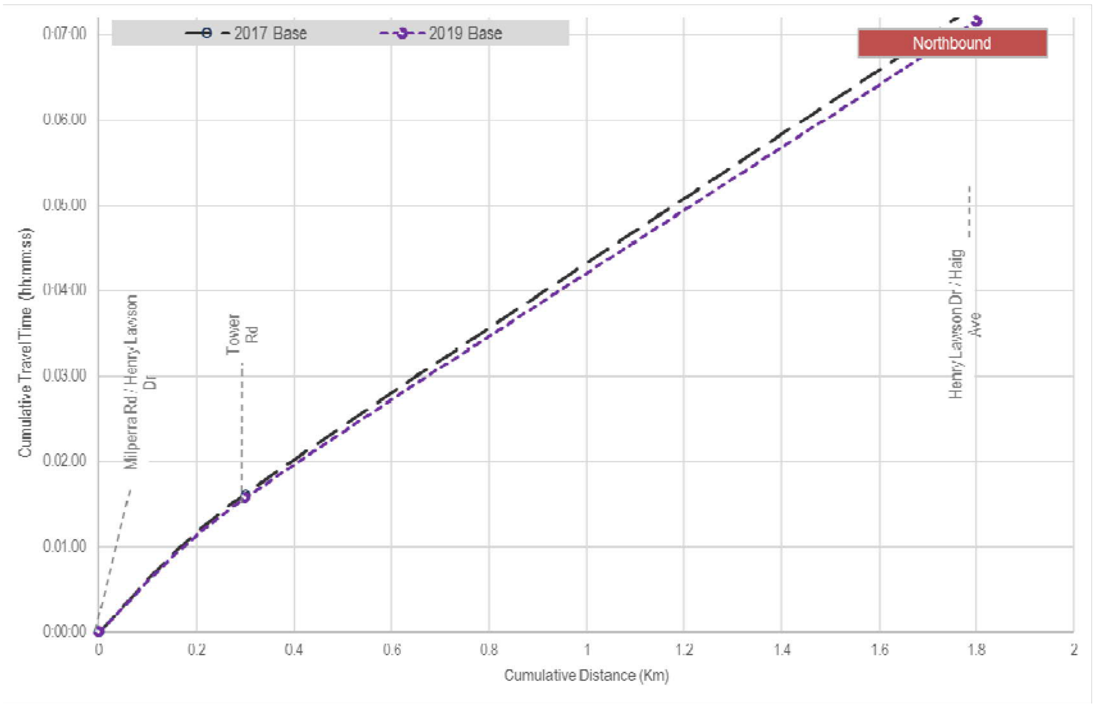


Figure 5.17: Travel Time on Henry Lawson Road Northbound - PM Peak

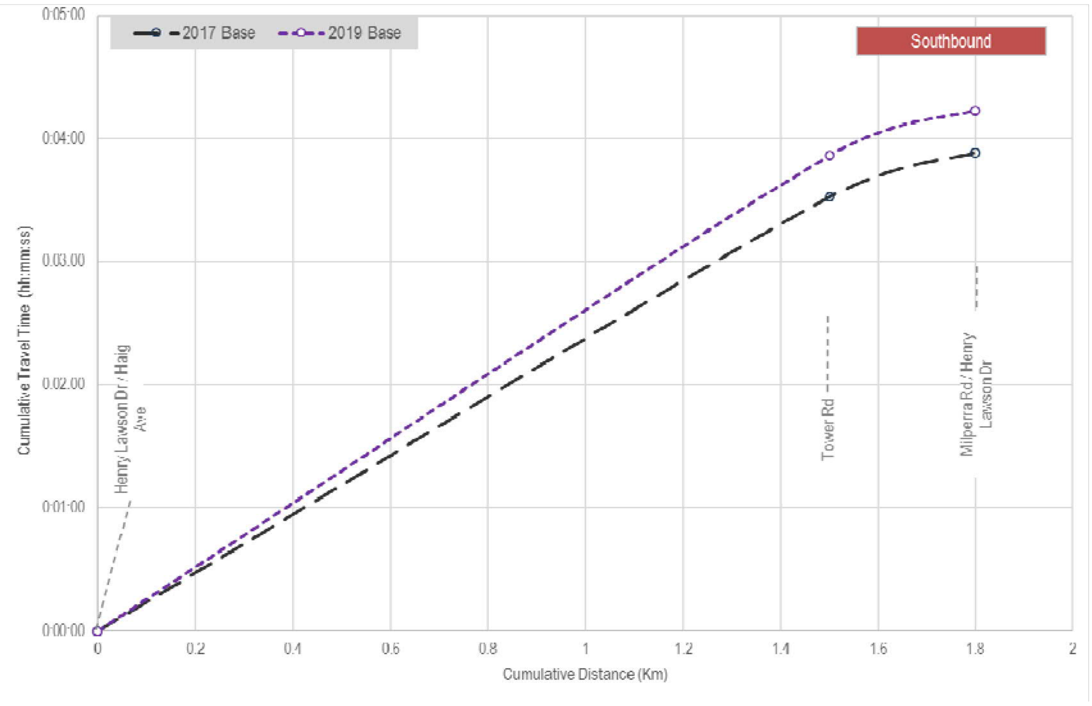


Figure 5.18: Travel Time on Henry Lawson Road Southbound - PM Peak

5.3.5 2019 Base Case Operational Performance Summary

The key findings are as follows:

- between 2017 and 2019 traffic volumes on key routes within the study area are expected to grow between 1 – 4 percent in total across the peak hours;
- VISSIM modelling shows that, in general, the traffic performance of most of the key intersections is expected to remain similar to 2017 conditions; and
- vehicles on Milperra Road and on Henry Lawson Drive are expected to experience a slight increase in travel times between 2017 and 2019.

5.4 2019 WITH DEVELOPMENT

5.4.1 Network Assumptions

The key network assumptions are as follows:

- Estate Road 01 will only be used to access the development. Vehicles that have an origin or a destination outside the SWP will not use Estate Road 01;
- the section of Tower Road between Henry Lawson Drive and the development access road will be upgraded from two lanes (one lane each way) to four lanes (two lanes each way) as shown in Figure 5.19;
- the new intersection at Tower Road with Estate Road 01 will be an all-movement priority intersection with traffic on Tower Road (west) and Estate Road 01 having priority over traffic on Tower Road (north) as shown in Figure 5.20;
- the Tower Road intersection with Starkie Drive is reconfigured from its current roundabout form to be an all-movement priority intersection with traffic on Tower Road having priority over traffic on Starkie Drive, as shown in Figure 5.21; and
- there will be no right turns for B-Doubles from Tower Road into Henry Lawson Drive.

Figure 5.19: South West Precinct - Access Arrangements

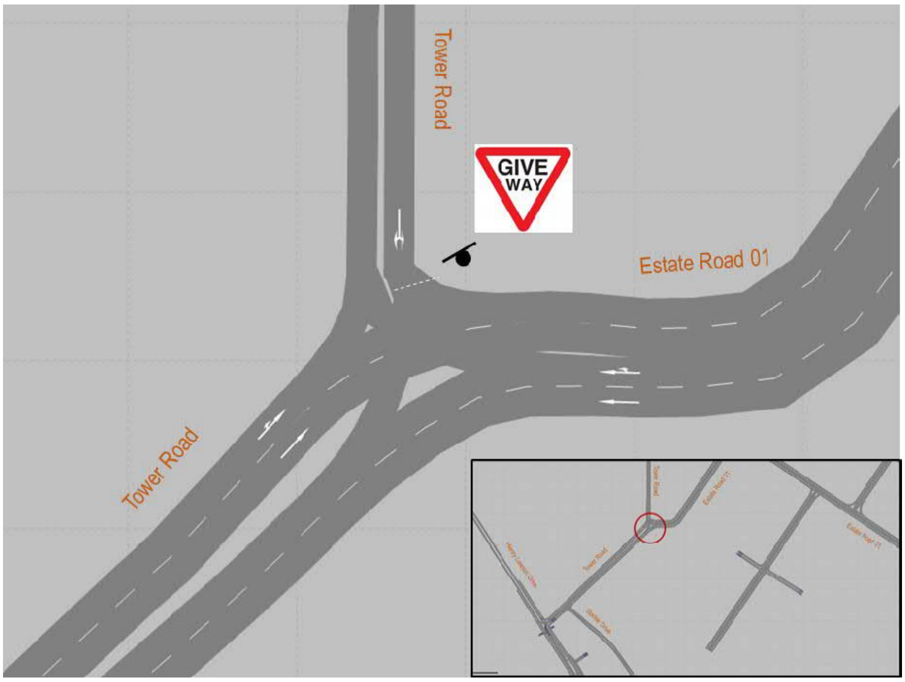


Figure 5.20: Tower Road/Estate Road 01 Intersection Details

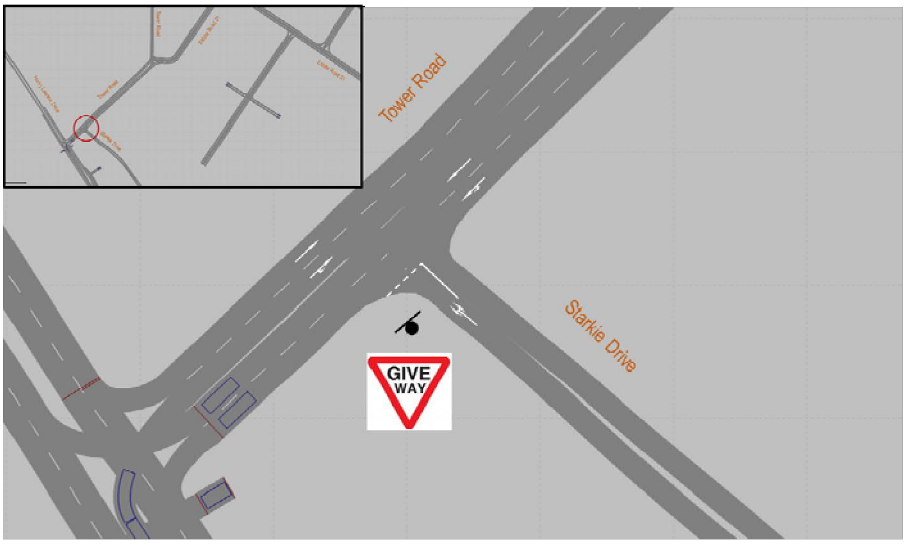


Figure 5.21: Tower Road/Starkie Drive Intersection Details

5.4.2 Development Traffic Volumes - AM and PM Peak

The MDP development traffic volumes at the key intersections in the vicinity of the development are shown in Figure 5.22 and Figure 5.23. The key observations include:

- in the AM peak, of the total development traffic, 39 percent is expected to access the site via the Henry Lawson Drive/Tower Road intersection with the remaining 61 percent using the Murray Jones Drive access at Milperra Road; and
- in the PM peak, access is split equally between the Henry Lawson Drive/Tower Road and the Milperra Road/Murray Jones Drive intersections.

These access distributions have been determined using route choice within the VISSIM models which accounts for the relative delays at each access point and the internal connection which allows either access point to be used.

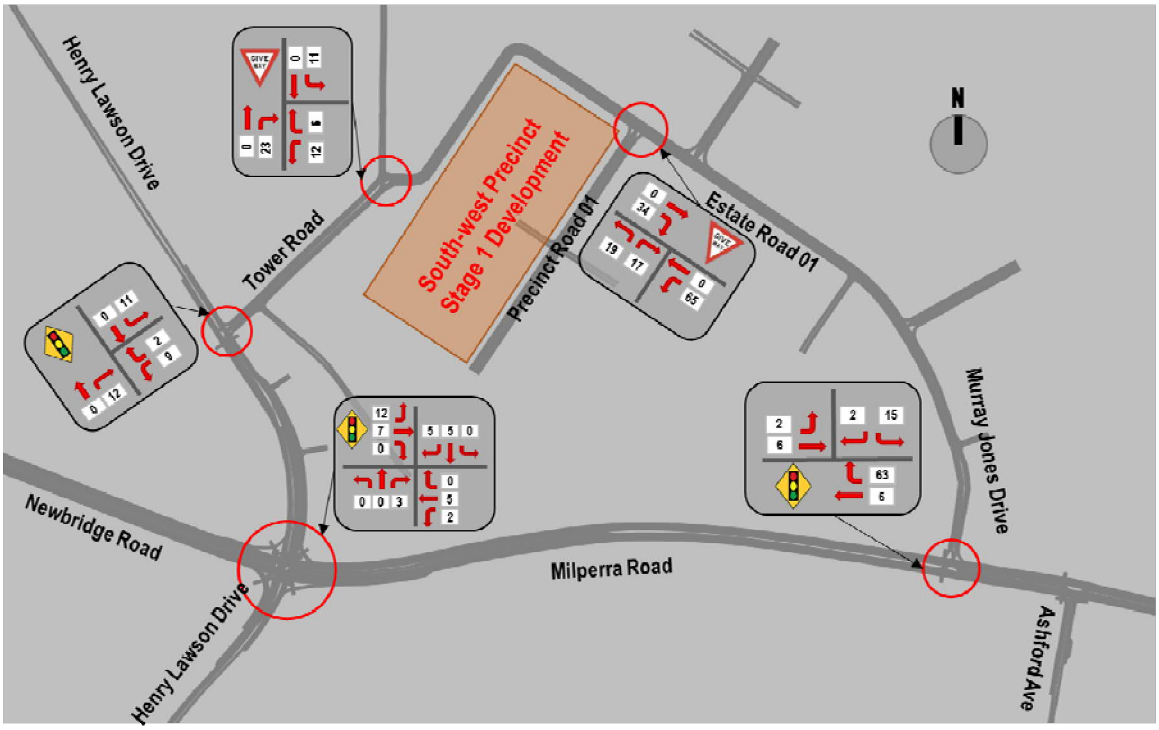


Figure 5.22: MDP Development Traffic - AM Peak

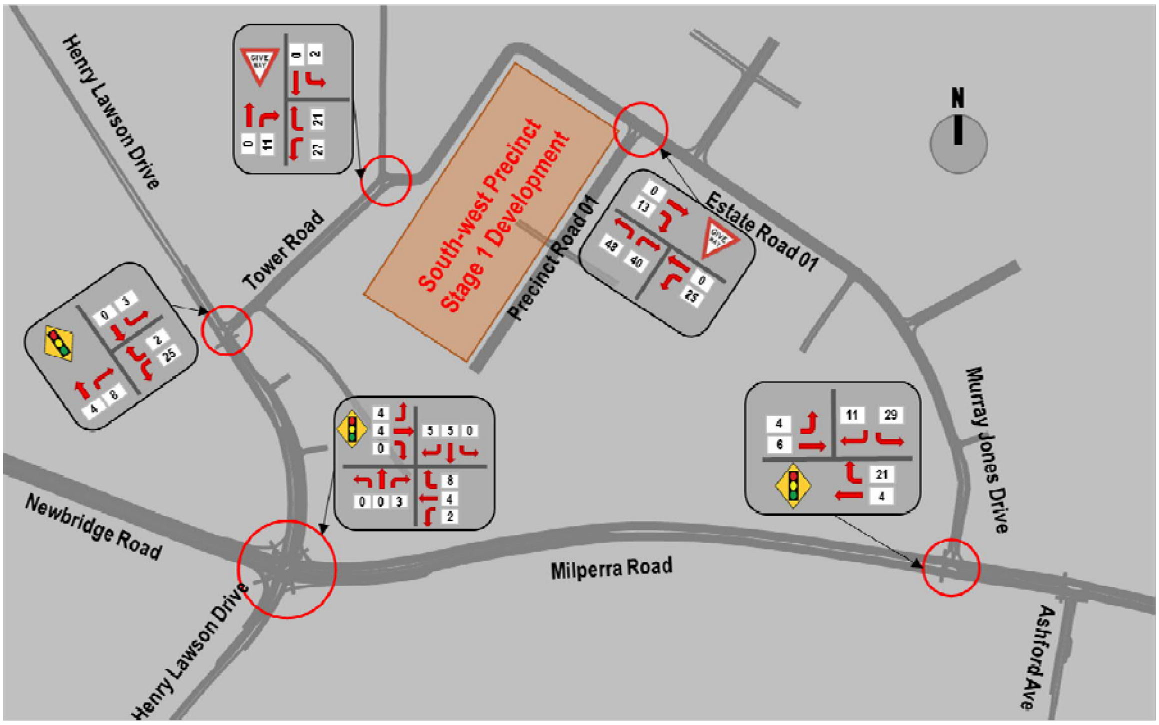


Figure 5.23: MDP Development Traffic - PM Peak

5.4.3 Intersection Performance

The methodology adopted to assess development impact was to identify any locations at which the LoS category worsened between the “2019 Base” case and the “2019 With Development” case.

The AM and PM peak intersection delay and LoS outputs are compared in Table 5.5 and Table 5.6.

The introduction of MDP traffic is expected to have no negative impacts on the performance of the major intersections within the study area.

The Milperra Road/Henry Lawson Drive intersection shows similar results between ‘base’ and ‘with development’ cases. Traffic delays at the Henry Lawson Drive/Tower Road intersection are expected to reduce slightly especially in the PM peak. This is attributed to reduced delays on the Tower Road approach because of the construction of an additional lane as part of the development works. Traffic delays at the Milperra Road/Murray Jones Drive are expected to remain similar in the AM peak but would increase slightly in the PM peak.

Overall, 126 additional peak hour trips are introduced by the development in each peak and, when split between the Murray Jones Drive/Milperra Road intersection and the Henry Lawson Drive/Tower Road intersection, and split between entry and exit movements, results in a negligible impact per signal-cycle at these intersections (e.g. 1-2 additional vehicles entering or leaving each intersection per cycle). Furthermore, the internal link to be constructed between Tower Road and Murray Jones Drive also provides some ability for existing Starkie Road development traffic to choose the most efficient access/egress location, reducing impacts on the external road system and particularly on the Henry Lawson Drive/Milperra Road/Newbridge Road intersection.

The 2019 with development detailed intersection performance is provided in Appendix D.

Table 5.5 Level of Service Comparison - 2019 Base and 2019 With Development - AM Peak

Intersection	Intersection Control	2019 Base		2019 With Development	
		LoS	Volume	LoS	Volume
Henry Lawson Drive & Haig Avenue	🚦	B (15)	2,713	B (16)	2,713
Haig Avenue, Georges Crescent & Birdwood Road	↻	A (5)	922	A (4)	941
Rabaul Road, Link Road & Tower Rd	GIVE WAY	A (1)	553	A (0)	553
Marion Street Drover Road	GIVE WAY	A (4)	385	A (5)	407
Marion Street & Airport Avenue	GIVE WAY	A (1)	1,219	A (1)	1,250
Marion Street & Birch Street	GIVE WAY	A (1)	1,492	A (1)	1,520
Marion & Manaham	↻	A (5)	1,609	A (5)	1,638
Marion Street & Edgar Street	🚦	C (42)	2,773	C (43)	2,787
Edgar Street & Townsend Street	GIVE WAY	A (11)	1,505	A (12)	1,509
Edgar Street & Milperra Road & Queen St	🚦	F (96)	4,853	F (97)	4,875
Milperra Road & Marigold Street	🚦	A (12)	3,771	A (12)	3,791
Milperra Road & Nancy Ellis-Leebold Drive	🚦	A (11)	3,648	A (12)	3,676
Milperra Road & Ashford Avenue	🚦	B (21)	3,658	B (16)	3,666
Milperra Road & Murray Jones Drive	🚦	A (10)	3,329	A (3)	3,343
Milperra Road & Henry Lawson Drive & Newbridge Road	🚦	F (107)	6,266	F (109)	6,279
Henry Lawson Drive & Tower Road	🚦	C (39)	2,949	C (40)	2,976
Tower Road & Starkie Drive	↻ / GIVE WAY	A (2)	554	A (2)	556
Henry Lawson Drive & Bullecourt Avenue	🚦	B (24)	2,439	C (29)	2,589
Asford Avenue & Bullecourt Avenue	↻	A (5)	1,608	A (5)	1,609
William Street & Marion Street	🚦	C (35)	2,571	C (35)	2,581
Edgar Street & Lancelot Street	↻	B (24)	1,952	B (24)	1,960
Edgar St & Eldridge Rd (West)	↻	B (15)	1,932	B (16)	1,942
Edgar St & Eldridge Rd (East)	↻	B (16)	2,421	B (16)	2,435
Edgar St & Railway Pde	🚦	A (9)	1,600	A (9)	1,612

Table 5.6 Level of Service Comparison - 2019 Base and 2019 With Development - PM Peak

Intersection	Intersection Control	2019 Base		2019 With Development	
		LoS	Volume	LoS	Volume
Henry Lawson Drive & Haig Avenue	🚦	B (23)	2,639	B (21)	2,644
Haig Avenue, Georges Crescent & Birdwood Road	⟲	A (3)	896	A (3)	885
Rabaul Road, Link Road & Tower Rd	GIVE WAY	A (1)	503	A (11)	451
Marion Street Drover Road	GIVE WAY	A (1)	404	A (1)	402
Marion Street & Airport Avenue	GIVE WAY	A (1)	1,116	A (1)	1,123
Marion Street & Birch Street	GIVE WAY	A (2)	1,591	A (2)	1,615
Marion & Manaham	⟲	A (7)	1,564	A (7)	1,579
Marion Street & Edgar Street	🚦	D (49)	2,960	D (52)	2,949
Edgar Street & Townsend Street	GIVE WAY	E (70)	1,534	E (70)	1,538
Edgar Street & Milperra Road & Queen St	🚦	F (81)	5,038	F (81)	5,041
Milperra Road & Marigold Street	🚦	B (16)	4,043	B (16)	4,040
Milperra Road & Nancy Ellis-Leebold Drive	🚦	A (10)	4,054	A (11)	4,030
Milperra Road & Ashford Avenue	🚦	A (12)	3,888	B (21)	3,810
Milperra Road & Murray Jones Drive	🚦	B (16)	3,590	B (24)	3,504
Milperra Road & Henry Lawson Drive & Newbridge Road	🚦	F (98)	6,567	F (96)	6,551
Henry Lawson Drive & Tower Road	🚦	C (36)	2,903	C (34)	2,910
Tower Road & Starkie Drive	⟲ / GIVE WAY	C (32)	669	B (16)	620
Henry Lawson Drive & Bullecourt Avenue	🚦	C (39)	2,366	C (32)	2,368
Asford Avenue & Bullecourt Avenue	⟲	A (3)	1,442	A (3)	1,448
William Street & Marion Street	🚦	C (35)	2,720	C (35)	2,711
Edgar Street & Lancelot Street	⟲	D (43)	2,005	D (52)	1,986
Edgar St & Eldridge Rd (West)	⟲	C (33)	1,838	B (28)	1,894
Edgar St & Eldridge Rd (East)	⟲	A (15)	2,384	A (11)	2,442
Edgar St & Railway Pde	🚦	E (59)	1,493	D (56)	1,514

5.4.4 Travel Time Comparisons

The 2019 Base and 2019 With Development travel times on the Milperra Road and Henry Lawson Drive routes are compared in Figure 5.24 to Figure 5.31. In general, '2019 base' travel times are similar to the 2019 With Development case travel times, with some slight faster and some slightly slower.

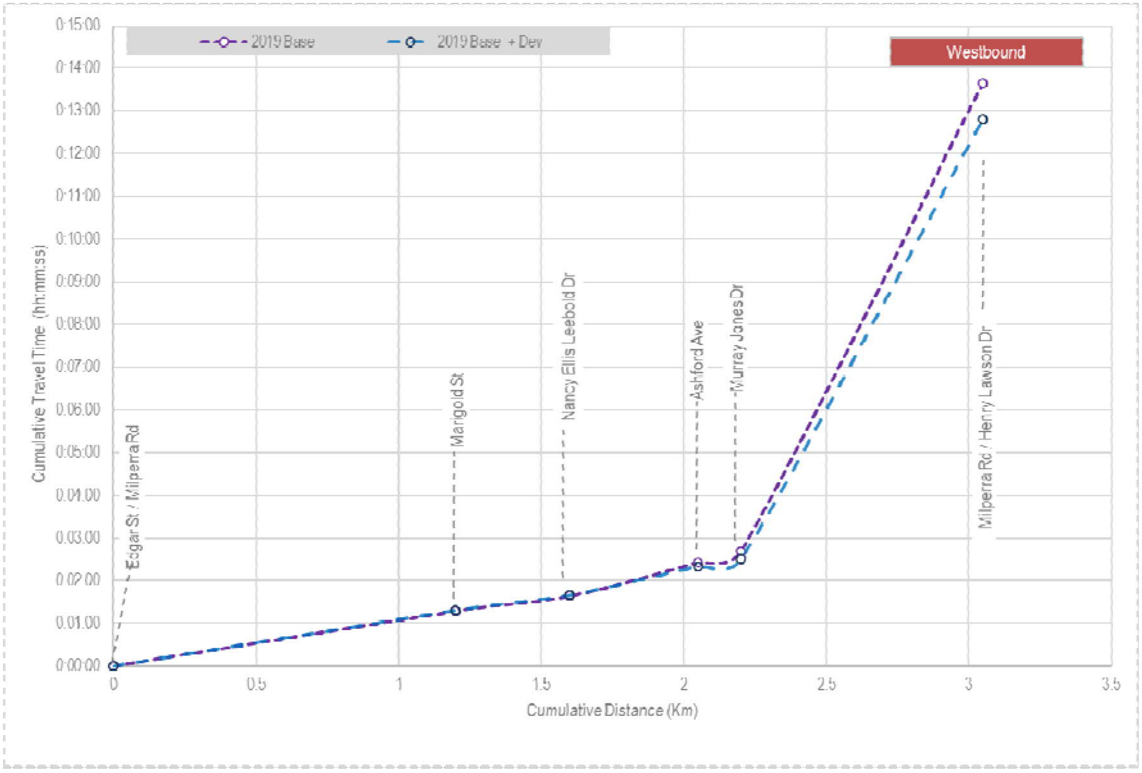


Figure 5.24: Travel Time on Milperra Road Westbound - AM Peak

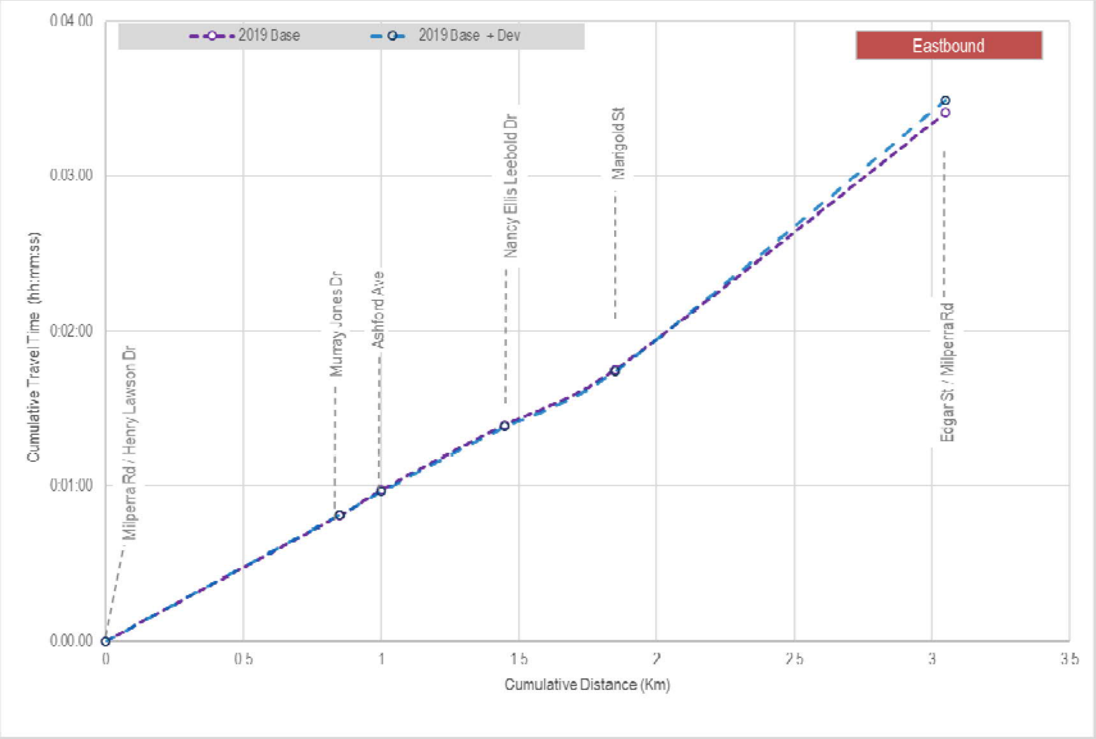


Figure 5.25: Travel Time on Milperra Road Eastbound - AM Peak

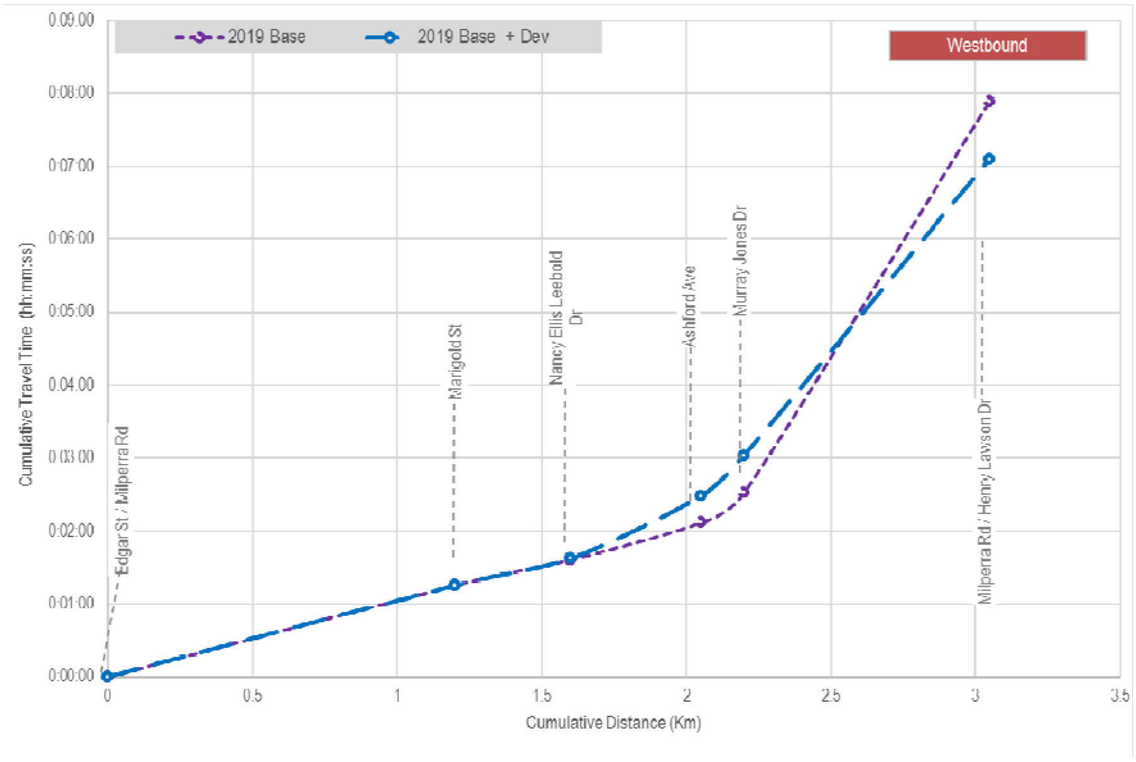


Figure 5.26: Travel Time on Milperra Road Westbound - PM Peak

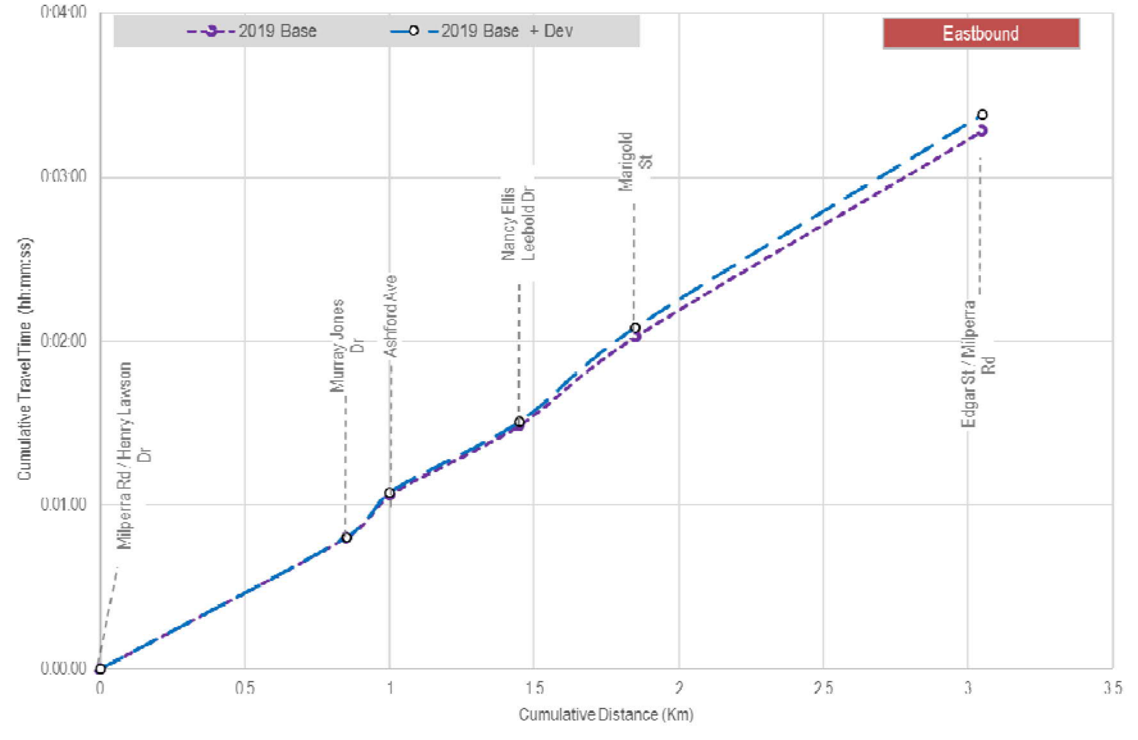


Figure 5.27: Travel Time on Milperra Road Eastbound - PM Peak

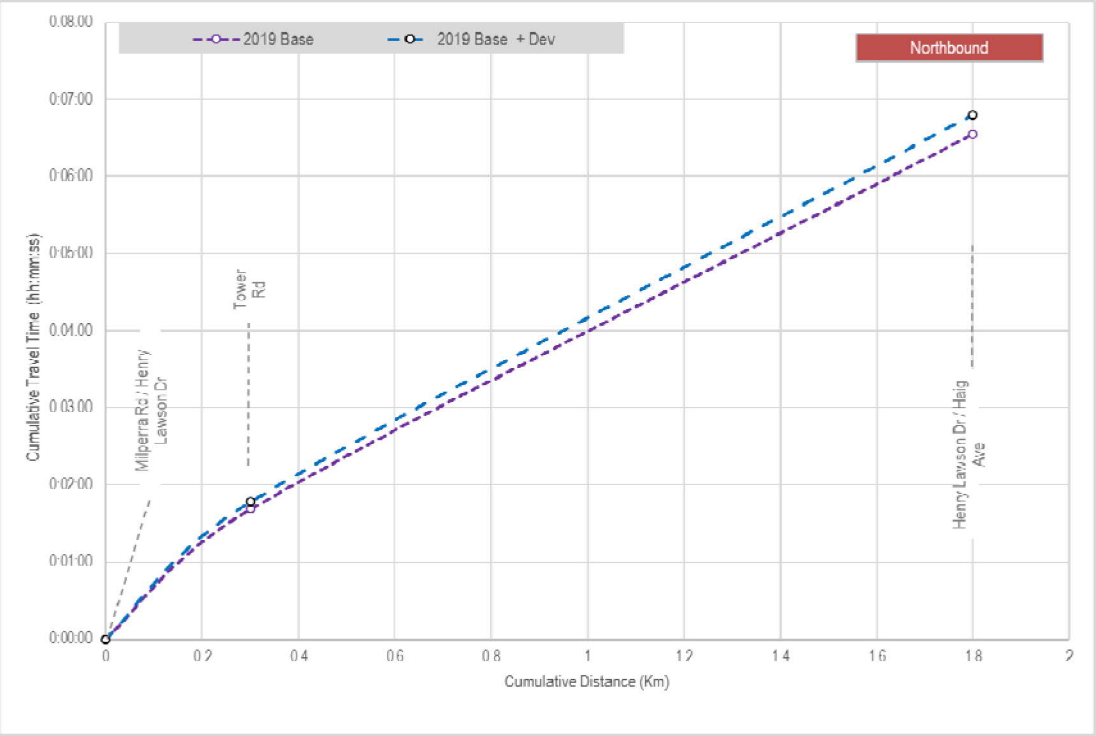


Figure 5.28: Travel Time on Henry Lawson Drive Northbound - AM Peak

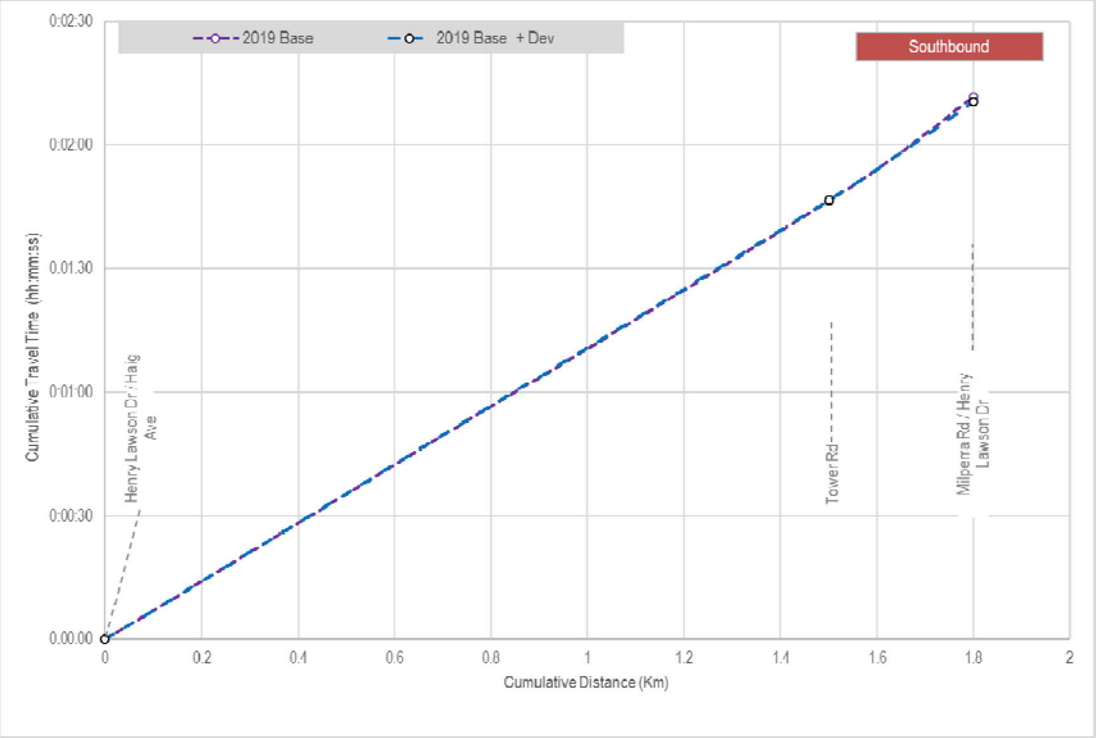


Figure 5.29: Travel Time on Henry Lawson Drive Southbound - AM Peak

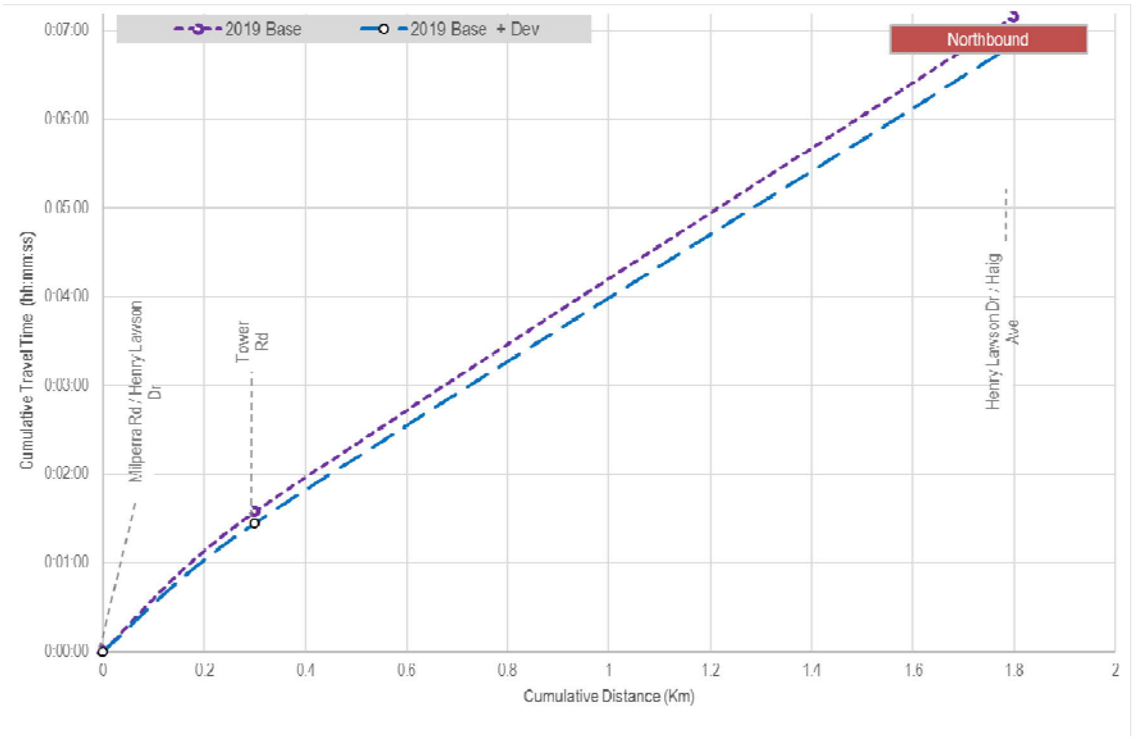


Figure 5.30: Travel Time on Henry Lawson Drive Northbound - PM Peak

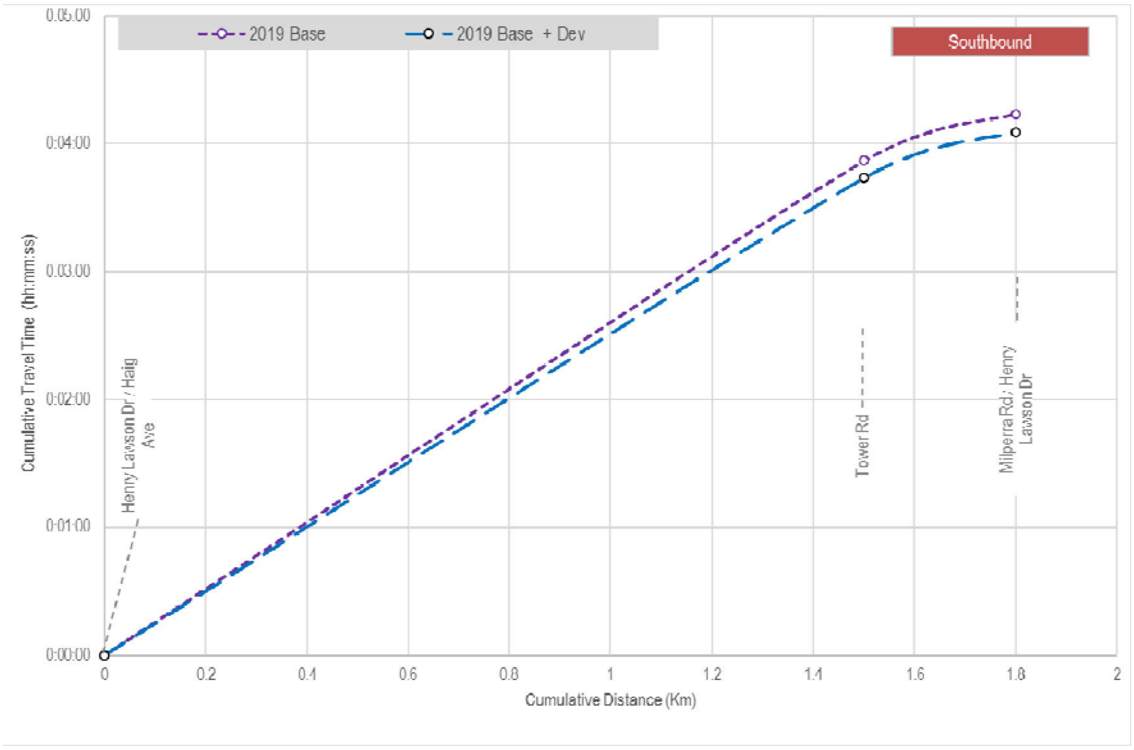


Figure 5.31: Travel Time on Henry Lawson Drive Southbound - PM Peak

6. PARKING

6.1 PARKING DEMAND AND SUPPLY

Table 6.1 outlines the parking requirements for industry and warehouse/distribution centre land uses based on Part B5, Parking in the Bankstown Development Control Plan (DCP) 2015. This is the most relevant basis for calculating parking requirements in this area.

Table 6.1 Parking Requirements and Provisions (MDP Development)

Parking Rate	Proposed GFA	Parking required	Parking provided
1 space per 300 m^2 GFA	37,000 m^2	123 spaces	193 spaces

The proposed MDP requires a minimum of 123 car parking spaces and 193 spaces are proposed. The location of the proposed parking spaces is shown in Figure 6.1.

Figure 6.1 also shows that the car parking spaces will be provided north and south of Lot 1 with 83 parking spaces in the north and the remaining in the south. The northern parking area will be accessible via both Precinct Road 01 and Estate Road 01 while the southern area will be accessible via Precinct Road 01 only. Figure 6.1 also indicates that two-way traffic circulation will be provided for access to the parking spaces.

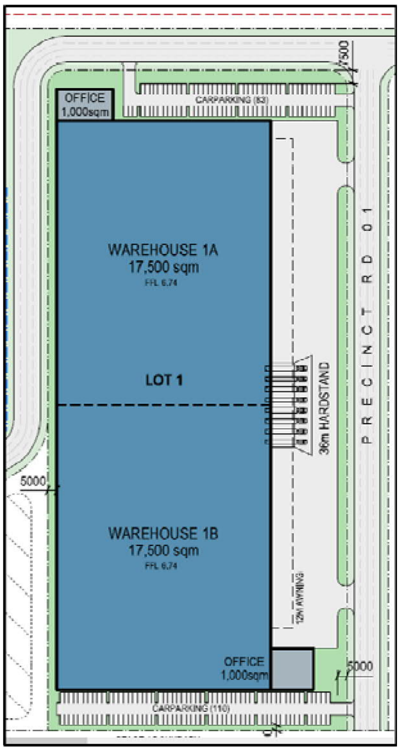


Figure 6.1: MDP Parking Provision

In addition to the light vehicle parking spaces, 8 heavy vehicle loading docks will be provided.

6.2 DESIGN COMPLIANCE

A detailed plan showing vehicles manoeuvring into and out of the parking/loading bays at entry and exit points will be provided during the detailed design stage. The following attributes will be assessed at that time in accordance with Australian Standards Off-Street Car Parking (AS2890.1) and Off-Street Car Parking for People with Disabilities (AS2890.6):

- assessment of all parking spaces meeting the minimum requirements in terms of length and widths of parking bays;
- aisle widths and turning areas; and
- heavy vehicle turn paths at intersections and access points.

7. PUBLIC TRANSPORT AND ACTIVE TRANSPORT

7.1 PUBLIC TRANSPORT STRATEGY

Figure 7.1 shows the location of the eastbound and westbound bus stops in relation to the proposed development. The M90 bus service is currently in operation near the site. Bus stops for eastbound travel are located within 900 metres of the site and bus stops for the westbound travel are located within 1,000 metres of the site as shown in Figure 7.1.

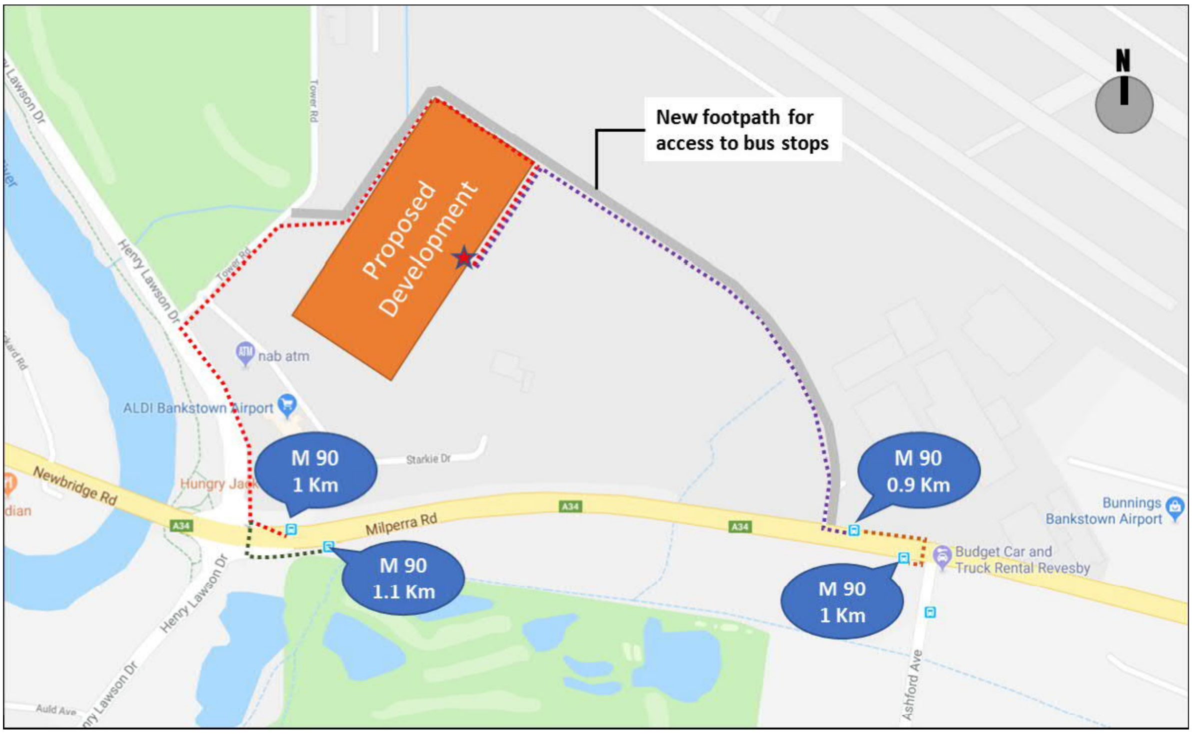


Figure 7.1: Location of Bus Stops in Proximity to the Site and Proposed Footpath

It should be noted that the stops located closer to the Milperra Road/Henry Lawson Drive intersection are not directly accessible from the development and would require pedestrians to walk to these stops via Tower Road and Henry Lawson Drive, although no footpaths exist in these locations. It is therefore recommended that the Estate Road 01 link be constructed with a footpath along its southern/western side for access to the stops near the Murray Jones Drive/Milperra Road intersection.

7.2 ACTIVE TRANSPORT STRATEGY

The proposed development is located 700m east of the closest dedicated shared cycle and pedestrian path along the western side of Henry Lawson Drive. From the site, pedestrians and cyclists would travel west along Tower Road, cross Henry Lawson Drive at the signalised pedestrian crossing and have direct access to the shared path. Figure 7.2 shows the location of the dedicated cycle and pedestrian shared path near the proposed site. To facilitate access to this path, the widening of Tower Road should include a footpath along its southern side to align with the signalise pedestrian crossing at the Tower Road/Henry Lawson Drive intersection.

The streets surrounding the MDP are expected to be 'bicycle friendly' with a relatively slow speed environment.

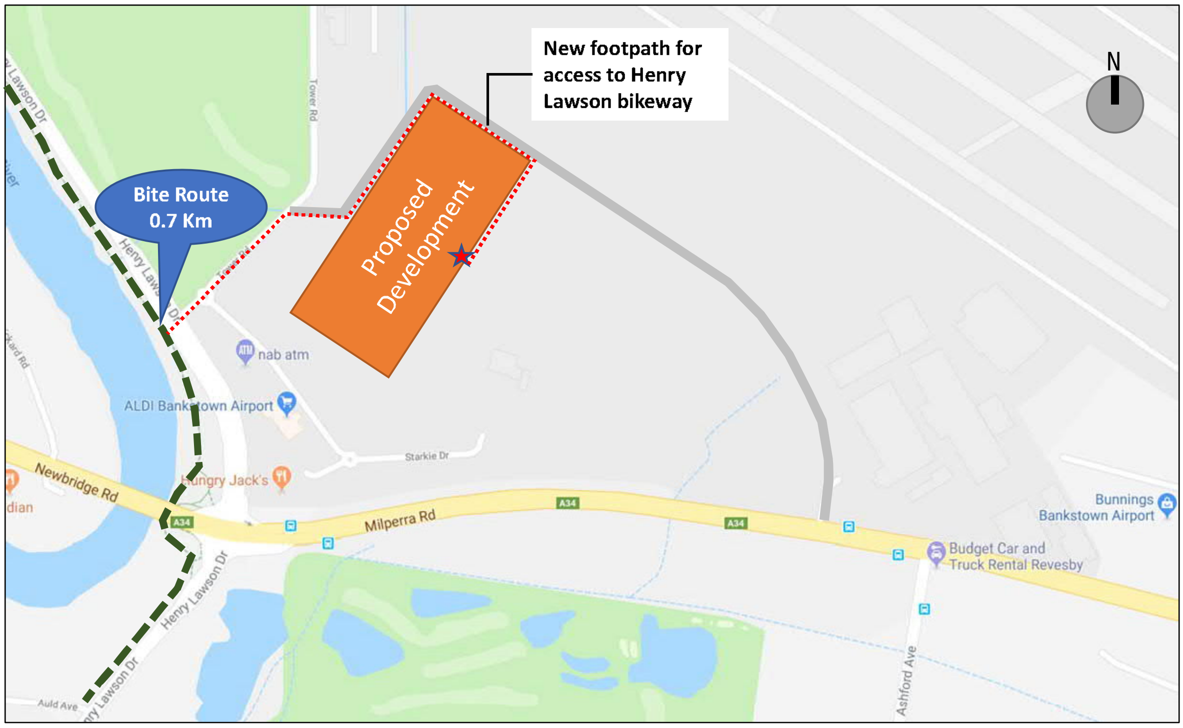


Figure 7.2: Regional Paths in Proximity to the Site and Proposed Path

8. CONCLUSIONS

8.1 TRAFFIC ASSESSMENT

8.1.1 Performance Summary

The key findings from the modelling and traffic impact assessment are as follows:

- the proposed MDP development will generate an additional 126 vehicles/hour in each peak hour which is not significant in the context of prevailing volumes;
- the additional traffic is not expected to have any significant impacts on the performance of key intersections within the study area given the upgrades listed in section 8.1.2. In general, the operational performance of key intersections would be similar in the 2019 base case to the 2019 with development case; and
- AM and PM peak travel times on the key routes of Milperra Road and Henry Lawson Drive in the vicinity of the development are expected to be similar in the 2019 base case and the 2019 with development case.

8.1.2 Upgrades as Part of the MDP

The modelling suggests that the proposed development will not have any significant negative impacts on the performance of the external road network. The following road upgrades are proposed as part of the development:

- new access on Tower Road in the form of an all-movement priority intersection;
- a new road – Estate Road 01 - which will link Tower Road with Murray Jones Drive;
- widening the section of Tower Road between Henry Lawson Drive and the access road from 2 lanes (1 lane each way) to 4 lanes (2 lanes each way). It is important to note that the benefit of the widening is only associated with the westbound approach to the Henry Lawson Drive intersection in order to reduce delays at the intersection. The additional lane in Tower Road eastbound is beneficial when a second right turn lane is introduced from Henry Lawson Drive into Tower Road, with further development in the future. However, there are likely to be efficiencies in widening both sides of Tower Road at the same time; and
- replacing the existing roundabout intersection with Starkie Drive to an all movement priority intersection to allow additional storage lane length to be provided on the Tower Road approach to the Henry Lawson Drive signals.

8.2 PUBLIC TRANSPORT AND ACTIVE TRANSPORT

Even at an optimistic modal share of 5% for active and public transport, these modes would account for less than 10 trips per peak hour. Nevertheless, to accommodate accessibility for these modes it is recommended to:

- construct a footpath on the southern/western side of Estate Road 01 between the development and Murray Jones Drive/Milperra Road for access to the bus stops near that intersection; and
- construct a footpath along the southern edge of Estate Road 01 and Tower Road to Henry Lawson Drive to provide pedestrian and cyclist access to the signalised crossing for access to the Henry Lawson Drive shared path.

9. POTENTIAL FUTURE WORKS

It is recognised that the MDP will "use up" some of the current residual spare capacity in the surrounding network, notwithstanding that the internal link connecting Tower Road to Murray Jones Drive introduces some benefits to the external network as well.

As the SWP is developed further beyond that proposed in the MDP there will be a requirement to upgrade the external road network surrounding the Airport to accommodate future background growth and SWP traffic generation. Approval for these future works is not being sought as part of this MDP, however BAL will continue to liaise with the relevant authorities in advance to identify and plan these works. The full development proposal of the SWP (currently) includes 3 additional lots for warehouse developments and 1 lot (Lot 5) for mixed used development. Full development of the SWP is expected to be completed by 2024.

Bankstown Airport, unlike other development areas, is in a unique position in that all development and associated road infrastructure upgrades are the responsibility of BAL, not each individual occupier of development sites.

To develop a preliminary understanding of the scale of the required works under background traffic growth and full development of the SWP, the VISSIM model was used to identify the future potential road upgrade requirements. The following potential upgrade needs were identified within the study area:

1. Henry Lawson Drive will require an additional traffic lane for northbound traffic between Tower Road and Haig Avenue;
2. Henry Lawson Drive/Tower Road intersection will require an extra lane for northbound traffic. Additional capacity will also be required for the southbound traffic with the existing two-lane section to be extended by about 225m and an extra short lane at the stopline. The southbound exit would also need to be increased from 2 to 3 lanes;
3. Milperra Road/Henry Lawson Drive intersection will require significant additional capacity. An additional right turn lane will be required for westbound traffic travelling north. The existing two-lane section on the southbound exit will also need to be extended by about 200m;
4. Edgar Street which has 2 traffic lanes (one-lane each way) currently experiences congestion in both the peak periods. An additional traffic lane will be required for southbound traffic between Marion Street and Eldridge Street. An additional traffic lane will also be required for the northbound traffic between Railway Parade and Marion Street; and
5. Milperra Road/Edgar Street intersection will require an additional right turn lane of 80m for the westbound traffic travelling north. An additional lane of 60m will also be required for the southbound through traffic. This will require the southbound exit to be widened to 2 lanes.
6. Milperra Road/Murray Jones Drive intersection will require an additional right turn lane into Murray Jones Drive.

Figure 9.1 shows the location of the potential upgrades.

BAL recognises that additional works will be required in the future and will work with Roads and Maritime and with Canterbury Bankstown Council to identify these works and associated funding and/or construction responsibilities.

It is important to note that the works proposed under the MDP development do not impact or preclude the expected future upgrades.

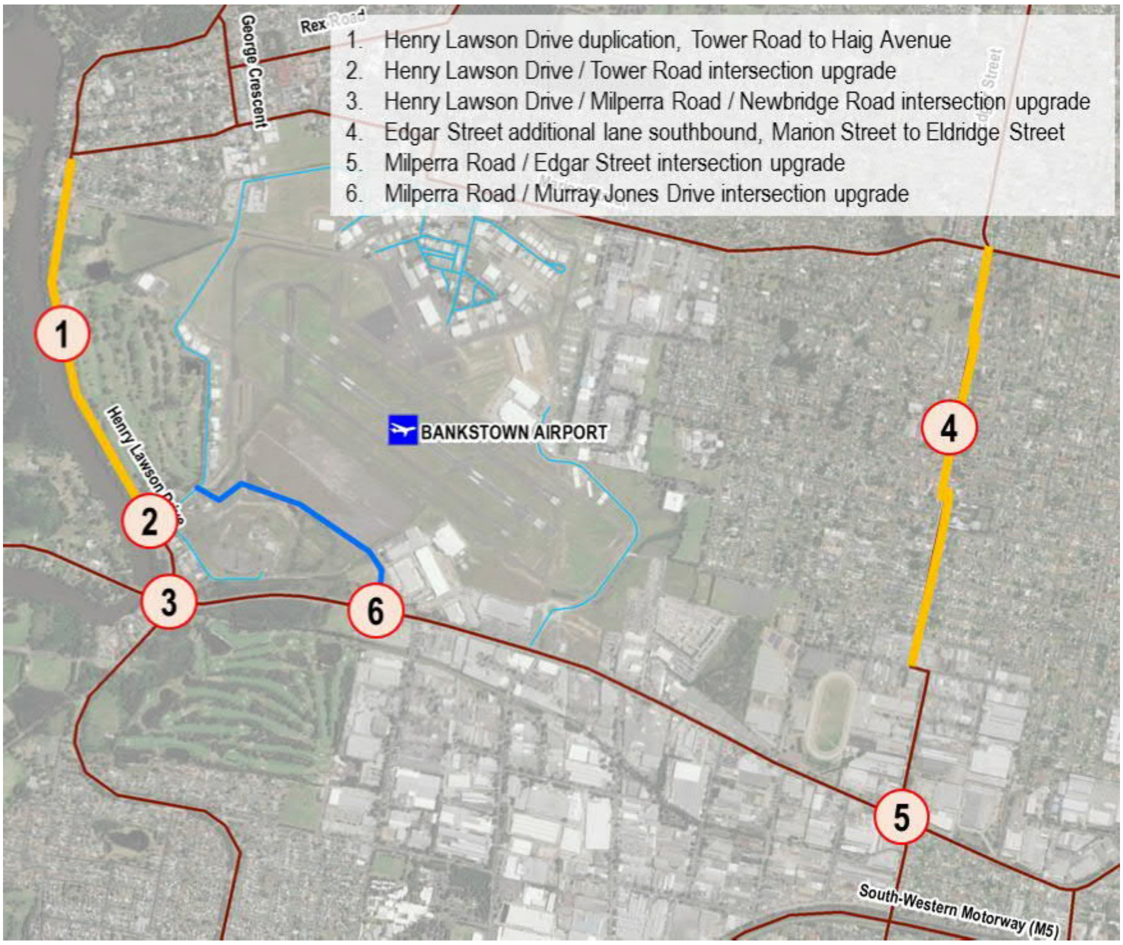


Figure 9.1: Locations of Potential Future Upgrades

APPENDIX A

BASE 2017 VISSIM MODEL CALIBRATION AND VALIDATION REPORT

Issue History

File Name	Prepared by	Reviewed by	Issued by	Date	Issued to
P3199.001T Bankstown Airport Major Development Plan Model Calibration and Validation	E. Secondes	A. Ahmed	A. Ahmed	27 September 2017	Robert Tims via email Robert.tims@altisproperty.com.au
P3199.002T Bankstown Airport Major Development Plan Model Calibration and Validation	C. Wills	A. Ahmed	A. Ahmed	11 December 2017	Robert Tims via email Robert.tims@altisproperty.com.au
P3199.003T Bankstown Airport Major Development Plan Model Calibration and Validation	M.N. Hassan	A. Ahmed	A. Ahmed	19 March 2018	Robert Tims via email Robert.tims@altisproperty.com.au
P3199.004T Bankstown Airport Major Development Plan Model Calibration and Validation	M.N. Hassan	A. Ahmed	A. Ahmed	16 April 2018	Robert Tims via email Robert.tims@altisproperty.com.au

Bankstown Airport Major Development Plan - Technical Note 2

1. INTRODUCTION

1.1 BACKGROUND

Bitzios Consulting has been engaged by Bankstown Airport Limited to develop an existing condition microsimulation model in VISSIM for key road network surrounding the Bankstown Airport. The model will be used to confirm and refine the infrastructure upgrades required to determine the most appropriate development staging and what traffic / transport infrastructure would be required for the proposed Bankstown Airport Major Development Plan (MDP).

This technical note documents the data collection, model development process (including all assumptions) as well as the calibration and validation of the 2017 base VISSIM model as per the RMS Traffic Modelling Guidelines.

1.2 STUDY AREA

The study area covers the road network around the Bankstown Airport MDP, and is bounded by Haig Avenue and Marion Street to the north, Edgar Street to the east, Milperra Road to the south and Henry Lawson Drive to the west. Figure 1.1 below shows the model coverage area.

Figure 1.1: The Study Area

The modelled area effectively depicts key roads and intersections within the study area as shown in Figure 1.2 below. All key side roads and pedestrians crossing signals are included.

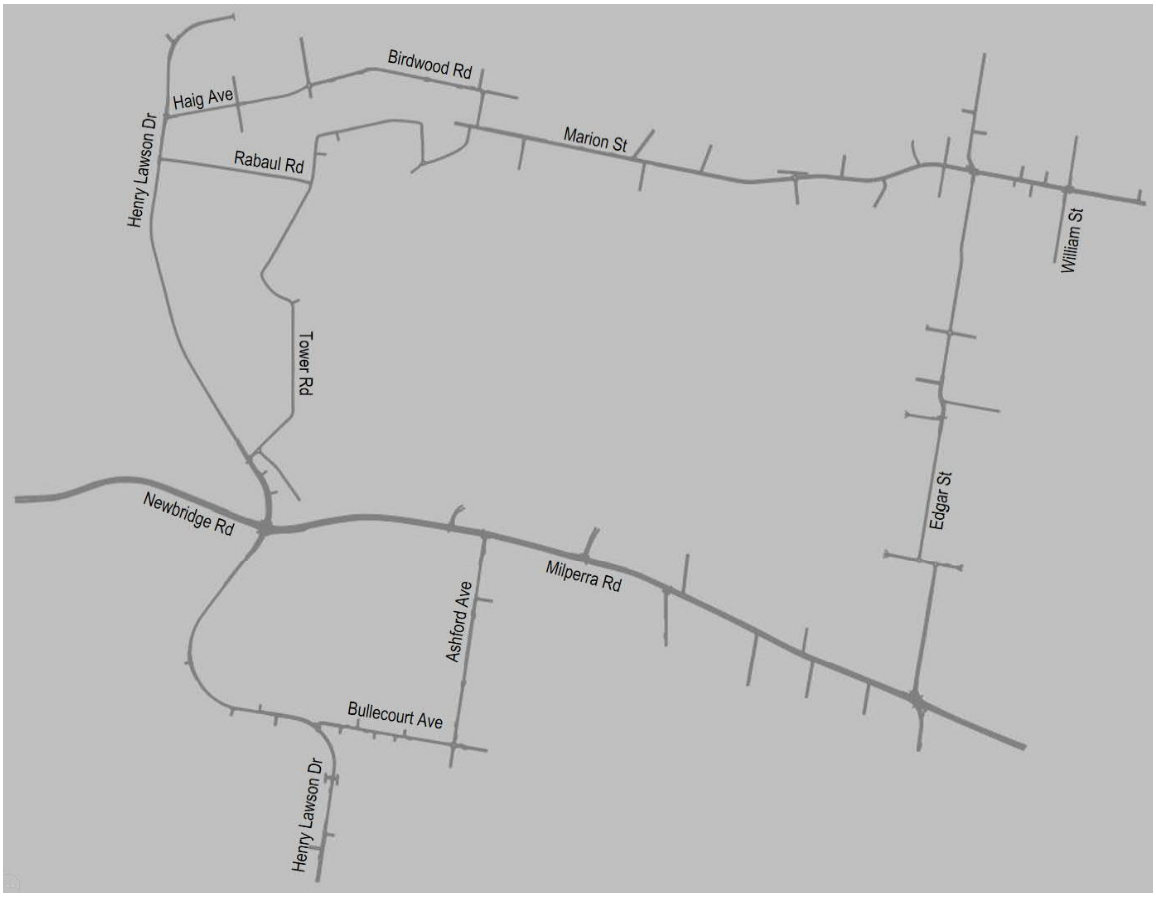


Figure 1.2: Modelled Area

2. DATA SOURCES

2.1 KEY DATA SETS

The traffic data used to develop the VISSUM model were compiled from several sources including:

- Intersection count data;
- RMS Sydney Strategic Travel Model (STM) 2016 matrices; and
- Intersection Diagnostic Monitor (IDM) signal data informing signal phasing.

2.2 INTERSECTION COUNTS

Intersection counts were taken by Traffic Data & Control for the Wednesday AM Peak (0730-0930), Thursday PM peak (1630-1830) at the following intersections:

1. Henry Lawson Drive / Haig Avenue;
2. Have Avenue / Georges Crescent;
3. Rabaul Road / Link Road / Tower Road;
4. Marion Street / Drover Road;
5. Marion Street / Airport Avenue;
6. Marion Street / Birch Street;
7. Marion Street / Manahan Street;
8. Marion Street / Edgar Street;
9. Edgar Street / Townsend Street;
10. Milperra Road / Edgar Street / Queen Street;
11. Milperra Road / Marigold Street;
12. Milperra Road / Nancy Ellis Leebold Drive;
13. Milperra Road / Ashford Avenue;
14. Milperra Road / Murray Jones Drive;
15. Milperra Road / Henry Lawson Drive / Newbridge Road;
16. Henry Lawson Drive / Tower Road;
17. Tower Road / Starkey Drive;
18. Henry Lawson Drive / Bullecourt Avenue;
19. Bullecourt Avenue / Ashford Avenue;
20. Marion Street / William Street;
21. Edgar Street / Eldridge Street (West);
22. Edgar Street / Eldridge Street (East);
23. Edgar Street / Railway Parade; and
24. Edgar Street / Lancelot Street.

This data included intersection counts for light vehicles, light trucks, heavy vehicles, bicycles and pedestrians. The intersection locations are shown in Figure 2.1.

Figure 2.1 Intersection Count Locations

2.3 BALANCED TRAFFIC COUNT

Engineering judgement was applied to manually balance the different data sets of traffic counts.

2.4 SCATS DATA

SCATS data was recorded by the Roads and Maritime Services on the 28th of June 2017 (Wednesday). Data was provided in the AM Peak (0730 – 0930) and PM Peak (1630 – 1830) every 15 minutes as listed in Table 2.1 below.

Table 2.1: TCS Intersections Within Study Area

TCS No	Intersection Name
515	Milperra Road / Henry Lawson Drive / Newbridge Road
853	Milperra Road / Edgar Street / Queen Street
997	Henry Lawson Drive / Bullecourt Avenue
1454	Marion Street / Edgar Street
1635	Milperra Road / Ashford Avenue
1963	Edgar Street / Upper Railway Parade
2235	Milperra Road / Murray Jones Drive
2236	Henry Lawson Drive / Haig Avenue
2809	Milperra Road / Marigold Street
3067	Marion Street / William Street
3377	Henry Lawson Drive / Tower Road
3847	Milperra Road / Nancy Ellis Leebold Drive

2.5 TRAVEL TIME SURVEYS

2.5.1 Section 1 - Henry Lawson Drive / Milperra Road / Edgar Street / Marion Street & Haig Street

Traffic surveys were conducted by Traffic Data and Control on Wednesday 28th of June for the AM and PM peak. Two-directional routes (clockwise and counter-clockwise) were chosen within the study area, with travel times between intersections recorded to determine the consistency of the model. The layout of the Section 1 travel time routes is shown in Figure 2.2.

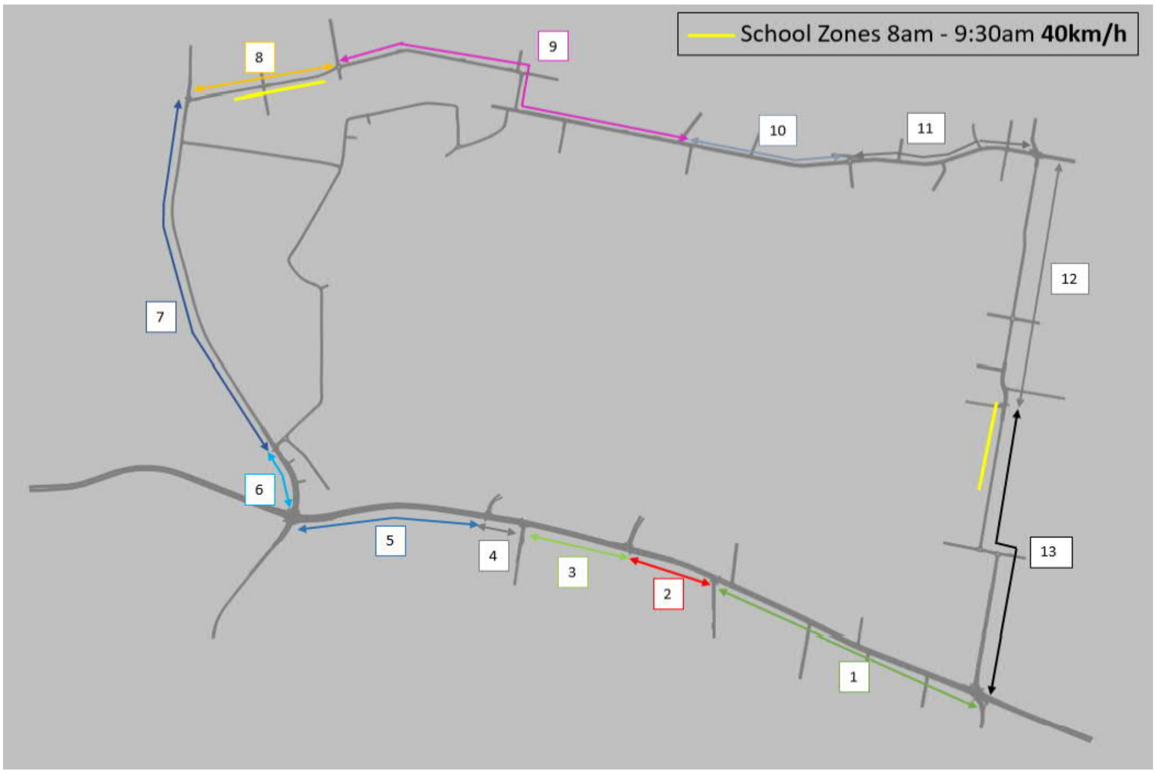


Figure 2.2 **Section 1 - Travel Time Routes**

2.5.2 Section 2 - Henry Lawson Drive / Bullecourt Avenue / Ashford Avenue & Milperra Road

Traffic surveys were conducted by Traffic Data and Control on Wednesday 14th of June for the AM and PM peak. Two-directional routes (clockwise and counter-clockwise) were chosen for the section to the south of Milperra Road. Travel times between intersections were recorded to determine the consistency of the model. The layout of the Section 2 travel time routes is shown in Figure 2.3.

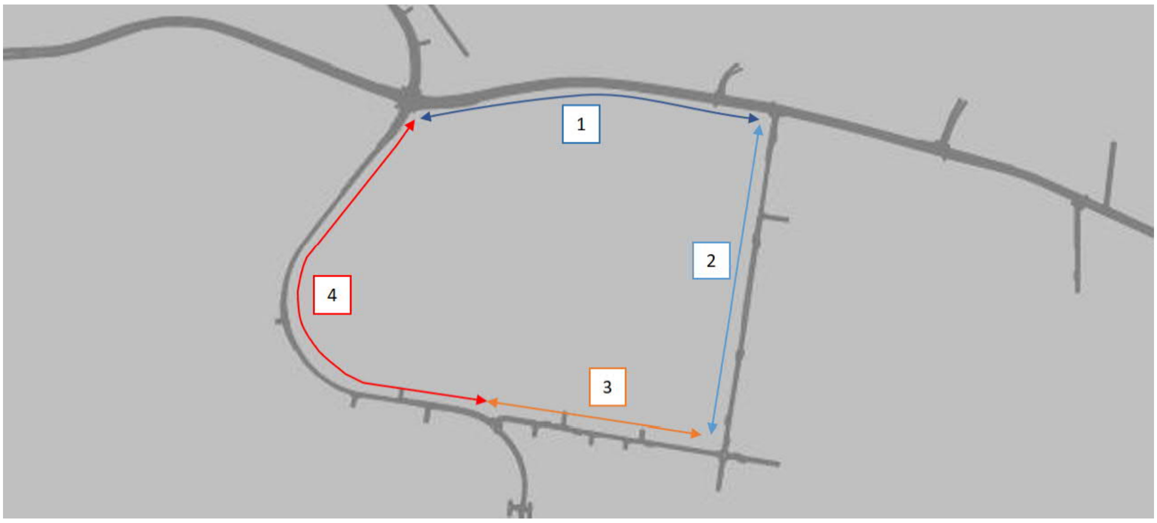


Figure 2.3: **Section 2 - Travel Time Routes**

2.6 SPEED LIMIT

The maximum speed limit within the study area is 70 km/hr. This is maintained along Milperra Road from the Milperra Road / Henry Lawson Drive / Newbridge Road intersection and continues past the Edgar St / Milperra Road intersection. Haig Avenue, Birdwood Road, Edgar Street, Henry Lawson Drive and Marion street maintain a speed limit of 60km/hr. Two (2) school zones are located on Birdwood Road near George Crescent and Edgar Street near Upper Railway Parade as shown in the Figure above. Local roads have a posted speed limit of 50 km/hr which include Marigold Street, Ashford Avenue, Bullecourt Avenue and Rabaul Road. The existing speed limits are illustrated in Figure 2.4.

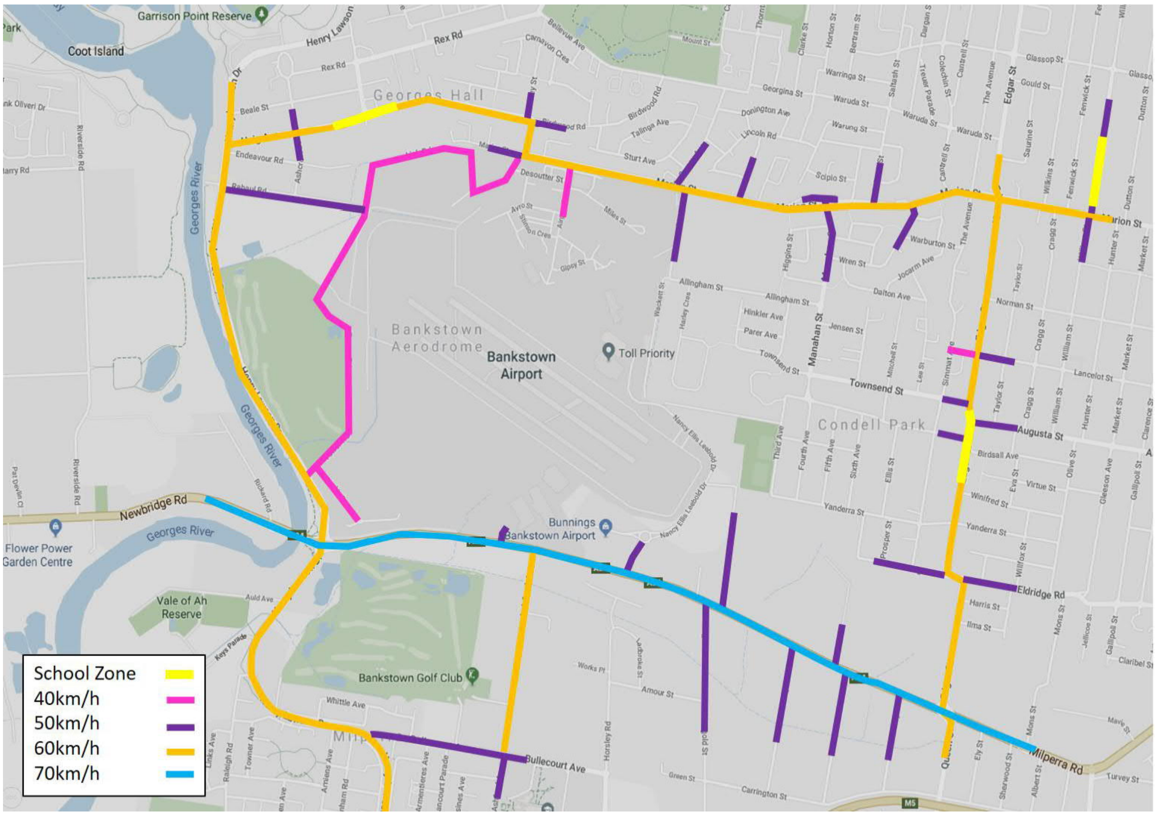


Figure 2.4 Speed limits within the area

3. VISSIM MODEL DEVELOPMENT

3.1 OVERVIEW

The VISSIM model network was developed in VISSIM version 9 software (VISSIM 9.00-04). The network was coded using knowledge obtained from the site visit and latest available aerials. Model parameters were left at the VISSIM defaults. Some of the key features of the model coding that should be noted include:

- Movements within intersections and approaching zebra crossings are controlled by 'Priority Rules' to demonstrate appropriate give-way behaviours;
- reduced speed areas were included in some locations to more accurately reflect vehicle behaviour while completing certain manoeuvres;
- vehicle inputs release vehicles into the models as per the existing posted speed limit;
- kerbside parking spaces were included in the model to simulate the friction caused by the on-street parallel parking.

The following aspects of the model development are more thoroughly explained below:

- public transport services;
- on-street parking restrictions;
- zone system and matrix formulation;
- demand profiling; and
- VisVAP signalling.

3.2 PUBLIC TRANSPORT SERVICES

The bus services modelled in the study corresponded to services collated from Transport for NSW and Google Maps and are listed below in Table 3.1. Frequencies and times of each bus route during the periods modelled were determined from the Transport for NSW website based on the September 2017 timetable.

Table 3.1: Bus Services Within Study Area

Route No	Route Description	Reference to Figure 3.1 and 3.2	Days of Operation
905	Fairfield to Bankstown	st	Operates everyday
	Bankstown to Fairfield	ts	Operates everyday
925	East Hills to Lidcombe via Bankstown	xv	Operates everyday
	Lidcombe to East Hills via Bankstown	vx	Operates everyday
DSA	Gibson Abenue near Archibald Street to Disability Services Autralia	xu	Operates once Mon to Fri
	Disability Services Autralia to Gibson Abenue near Archibald Street	ux	Operates once Mon to Fri
M90	Liverpool to Burwood	yw	Operates everyday
	Burwood to Liverpool	wy	Operates everyday
911	Auburn to bankstown via Georges Hall	ss	Operates Mon – Sat
922	Bankstown to East Hills via Milperra	ab	Operate everyday
	East Hills to Bankstown via Milperra	ba	Operate everyday

The bus stops within the study area are summarised in Table 3.2 below and correspond to Figure 3.1 and Figure 3.2.

Table 3.2 List of Bus Stops

TSN	Bus Stop Location	Reference to Figure 3.1 and 3.2	Bus Routes
Northbound Bus Stops			
2200504	Edgar St opp Ilma St, Condell Park	N1	925
220091	Elridge Rd at Edgar St, Condell Park	N2	925
220090	Elridge Rd near Willfox St, Condell Park	N3	925
2200282	Elridge Rd anear Olive St, Condell Park	N4	925
2200283	Bankstown Trotting Recretional Club, Elridge Rd, Condell Park	N5	925
2200284	Deverall Park, Ethel St, Condell Park	N6	925
2200215	Yanderra St near Sixth Av, Condell Park	N7	925
2200216	Deverall Park Netball Coourts Yanderra St, Condell Park	N8	925
2200217	Fourth Av near Tanderra St, Condell Park	N9	925
2200218	Fourth Av near Second Av, Condell Park	N10	925
2200219	Yanderra Sr near Railway Pde, Condell Park	N11	925
2200220	Manahan St at Townsend St, Condell Park	N12	925
2200221	Townsend St near Leemon St, Condell Park	N13	925
2200222	Townsend St near Mitchell St, Condell Park	N14	925
2200223	Townsend St near Lee St, Condell Park	N15	925
2200224	Townsend Sr ar Simmat Ave, Condell Park	N16	925
2200225	Condell Park Shops Lancelot St, Condell Park	N17	925
2200226	Clancelot St near Taylor St, Condell Park	N18	925
2200242	Manahan St opp Jensen St, Condell Park	N19	DSA
2200362	11 Harley Cres, Condell Park	N20	DSA, 925
Southbound Bus Stops			
2200210	Condell Park Public School, Edgar St, Condell Park	S1	DSA
2200211	Edgar St near Winifred St, Condell Park	S2	DSA
2200212	Edgar St at Yanderra St, Condell Park	S3	DSA
220092	Edgar St after Lima St, Condell Park	S4	DSA
220093	Edgar St before Milperra Rd, Condell Park	S5	DSA
221211	Milperra Rd after Edgar St, Revesby	S6	DSA, M90
2200187	Lancelot St near Taylor St, Condell Park	S7	925
2200188	Lancelot St at Edgar St, Condell Park	S8	925
2200189	Condell Park shops Lancelot St, Condell Park	S9	925
2200190	Simmat Ave before Townsend St, Condell Park	S10	925
2200191	Townsend St near Lee St Condell Park	S11	925
2200192	Townsend Sr near Mitcehll St, Condell Park	S12	925
2200193	Townsend St near Leemon St, Condell Park	S13	925
2200194	Townsend St before Manahan St, Condell Park	S14	925
2200195	Yanderra St near Railway Pde, Condell Park	S15	925
2200196	Fourth Av near Second Av, Condell Park	S16	925
2200197	Fourth Av near Yanderra St, Condell Park	S17	925
2200198	Deverall Park Netball Courts Yanderra St, Condell Park	S18	925
200199	Yanderra St near Sixth Av, Condell Park	S19	925
2200503	Ethel St opp Deverall Park, Condell Park	S20	925
2200285	Elridge Rd opp Bankstown Trotting Recreational Club, Condell Park	S21	925
2200286	Elridge Rd at Hubert St, Condell Park	S22	925
2200287	Elridge Rd near Willfox St, Condell Park	S23	925

TSN	Bus Stop Location	Reference to Figure 3.1 and 3.2	Bus Routes
Westbound Bus Stops			
2200160	Marion Street opp Thella-Kenway Reserve, Confell Park	W1	905
2200161	Edgar St Corner Shop Marion St, Bankstown	W2	905
2200162	Marion St before Wren St, Condell Park	W3	905
2200163	Marion St opp Saltash St, Condell Park	W4	905
2200164	Marion St after Manahan St, Condell Park	W5	905
2200165	Marion St opp Saric Ave, Condell Park	W6	905
2200166	Marion St opp Cumberland Ave, Condell Park	W7	905
2200167	Marion St before Birch St, Condell Park	W8	905
2200362	11 Harley Cres, Condell Park	W9	905, DSA
2200168	Marion St opp Namoi Lane, Bankstown Aerodrome	W10	905
2200169	Marion St opp Sturt Reserve, Bankstown Aerodrome	W11	905
2200170	Sydney Metro Airport Bankstown, Marion St, Bankstown Aerdrome	W12	905
2200171	Marion St opp Ayres Cres, Bankstown Aerodrome	W13	905
219811	Birdwood Rd, near Foley St, Georges Hall	W14	905
219812	Birdwood Rd near Lochiel Pl, Georges Hall	W15	905
2200172	Birdwood Rd opp Gillwarna Village, Georges Hall	W16	905
219880	Birdwood Rd before Georges Cres, Georges Hall	W17	905
219813	Georges Cres at Beale St, Georges Hall	W18	905
219814	Ashcroft St before Beale St, Georges Hall	W19	911
2212129	Milperra Rd before Daisy St, Revesby	W20	M90
2212130	Milperra Rd after Daisy St, Revesby	W21	M90
2212131	Milperra Rd opp Bankstown City Paceway, Revesby	W22	M90
2212132	Milperra Rd at Fitzpatrick St, Revesby	W23	M90
2212133	180 Milperra Rd, Revesby	W24	M90
2212134	Milperra Rd opp Woorand St, Revesby	W25	M90
2212153	Marigold Street, Ravesby	W26	M90
2212136	B and D Doord Amour St, Revesby	W27	M90
221445	Amour St at Horsley Dr, Milperra	W28	M90
221446	Horsley Rd opp Bullecourt Ave, Milperra	W29	M90
221416	Bullecourt Av near Horsley Rd, Milperra	W30	M90, 922
221417	University of Western Sydney Bullecourt Av, Milperra	W31	M90, 922
221419	Ashford Village and BP Service Station, Milperra	W32	M90, 922
221447	Kea Campers Ashford Av near Bullecourt Av, Milperra	W33	M90
221448	Mercedes Benz Ashford Av near Bullecourt Av, Milperra	W34	M90
221449	Sterling Trucks Ashford Av near Blaxland Pl, Milperra	W35	M90
221441	Milperra Rd at Ashford Ave, Milperra	W36	M90
221442	Milperra Rd before Henry Lawson Dr, Milperra	W37	M90
217011	Newbridge Rd opp Rickard Rd, Chipping Norton	W38	M90
221420	Bullecourt Ave before Dernancourt Pde	W39	922
221421	Bullecourt Ave after Keysor Pl	W 40	922
221423	Henry Lawson Dr opp Pozieres Ave	W41	922
Eastbound Bus Stops			
219813	Georges Cres at Beale St, Georges Hall	E1	905
219876	Haig Ave after Georges Cres, Georges Hall	E2	905
219861	Birdwood Rd after Georges Cres, Georges Hall	E3	905

TSN	Bus Stop Location	Reference to Figure 3.1 and 3.2	Bus Routes
Eastbound Bus Stops			
219820	Georges Hall Community Centre, Birdood Road, Georges Hall	E4	905
219821	Birdwood Rd near Lochiel Pl, Georges Hall	E5	905
21982	Birdwood Rd near Foley St, Georges Hall	E6	905
219823	Marion St at Ayers Cres, georges Hall	E7	905
219824	Marion St opp Airport Ave, Georges Hall	E8	905
219825	Sturt Reserve, Marion St, Georges Hall	E9	905
219826	Marion St at Namoi Lane, Georges Hall	E10	905
219827	Marion St at Cumberland Ave, Georges Hall	E11	905
219828	Marion St after Saric Ave, Georges Hall	E12	905
219988	Marion St opp Manahan St, Georges Hall	E13	905
219989	Marion St at Saltash St, Yagoona	E14	905
219990	Marion St opp Wren St, Yagoona	E15	905
2200173	Edgar St Corner Shop marion St, Bankstown	E16	905
2200174	Thella-Kenway Reserve, Mairon St, Bankstown	E17	905
221443	Milperra Rd after henry Lawson Drive, Milperra	E18	M90
2200154	Milperra Rd at Murray Hones Dr, Milperra	E19	M90
221450	Ashford Ave after Milperra Rd, Milperra	E20	M90
221451	Sterling Trucks Ashford Av neat Blaxland Pl, Milperra	E21	M90
221452	Mercedes Benz Ashford Av near Bullecourt Av, Milperra	E22	M90
221453	Kea Campers Ashford Av near Bullecourt Av, Milperra	E23	M90
221427	Ashford Village and BP Service Station, Milperra	E24	M90, 922
221428	University of Western Sydney Bullecourt Av, Milperra	E25	M90, 922
221454	Horsley Rd at Bullecourt Ave, Milperra	E26	M90
224455	Amour St after Horsley Dr, Milperra	E27	M90
2212137	B and D Doors Amour St, Revesby	E28	M90
2212152	Marigold Street, Revesby	E29	M90
221444	Milperra Rd at Woorand St, Milperra	E30	M90
2212135	Milperra Rd opp Fitzpatrick St, Revesby	E31	M90
2200156	Bankstown City Paceway, Milperra Rd, Condell Park	E32	M90
2200159	Milperra Rd before Queen St, Condell Park	E33	M90
221211	Milperra Rd after Edgar St, Revesby	E34	M90
217091	Newbridge Rd before Rickard Rd, Chipping Norton	E35	M90
221424	Henry Lawson Dr at Pozieres Ave	E36	922
221425	Henry Lawson Dr at Ganmain Cres	E37	922
221426	Bullecourt Ave at Keysor Pl	E38	922

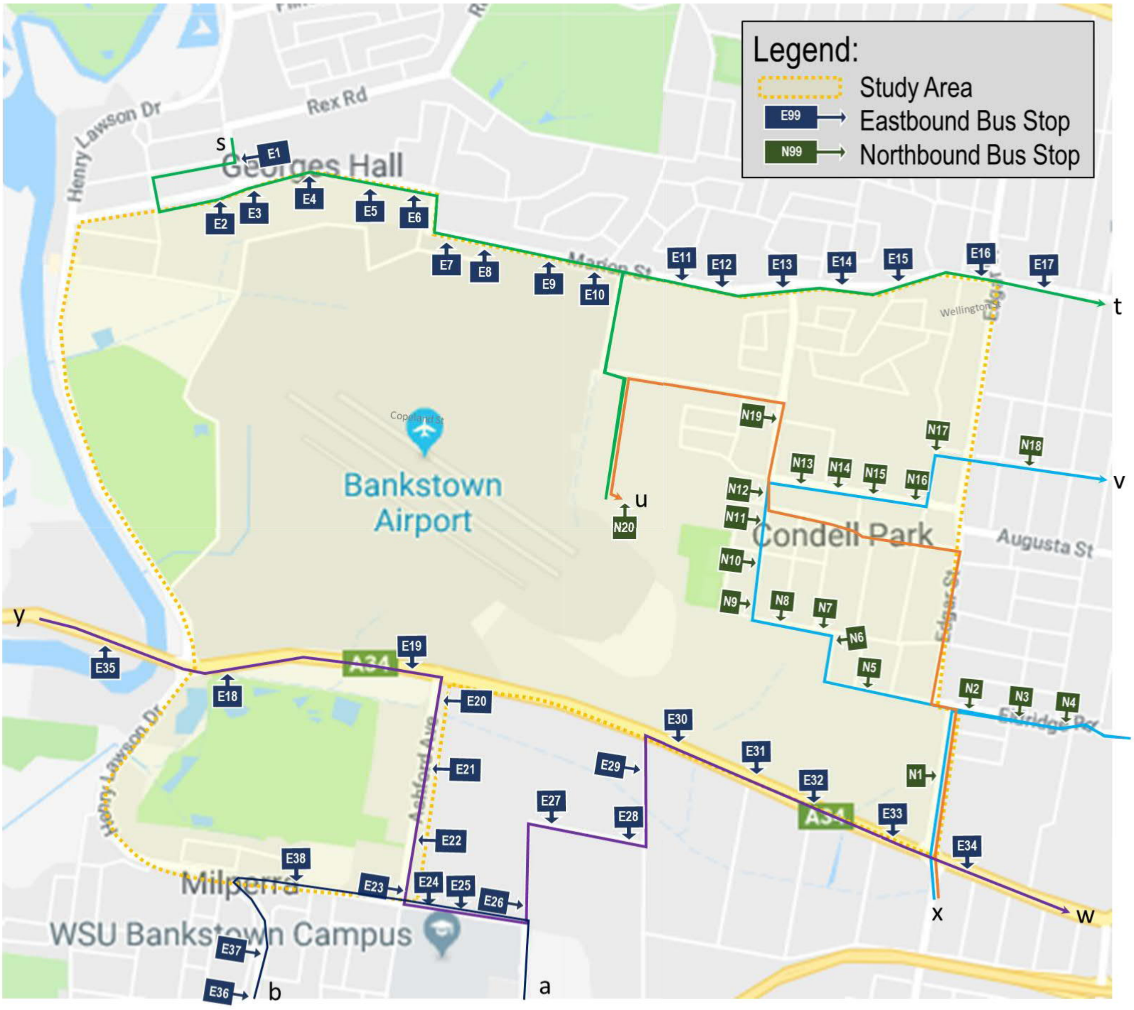


Figure 3.1: Eastbound & Northbound Bus Routes Overview Map

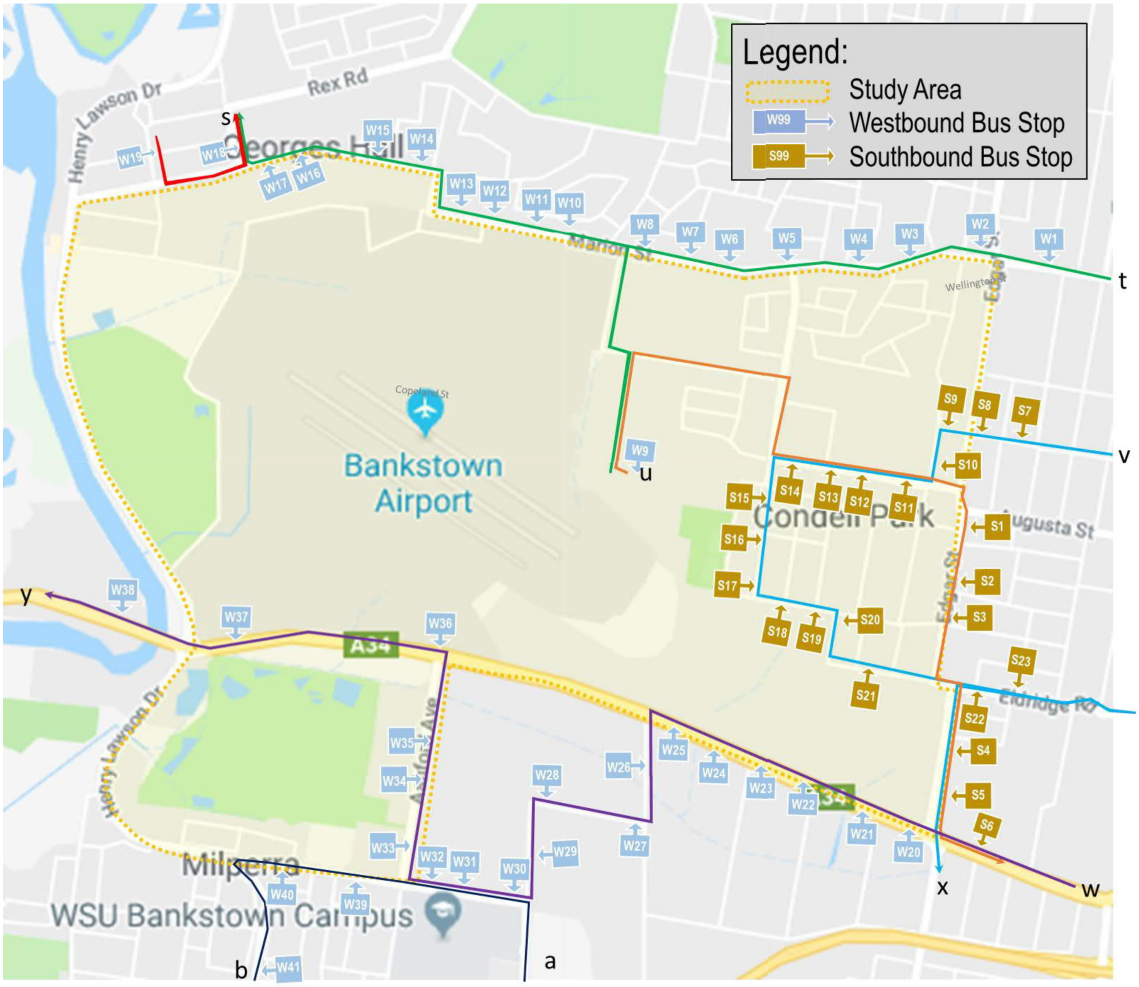


Figure 3.2: Westbound & Southbound Bus Routes Overview Map

3.3 ON-STREET PARKING RESTRICTIONS

The on-street parking restrictions are listed in Table 3.3 below that corresponds to Figure 3.3.

Table 3.3: Bus Services Within Study Area

ID No	Parking Restriction
1	No Stopping
2	Bus Zone
3	No Parking
4	No Parking, Clearway 6am – 10am, 3pm – 7pm, Monday – Friday
5	No Stopping, Clearway 6am – 10am, 3pm – 7pm, Monday – Friday
6	Unrestricted
7	Unrestricted, No Stopping, 6am – 9am, 3pm – 6pm, Monday – Friday
8	Unrestricted, Clearway 6am – 10am, 3pm – 7pm, Monday – Friday
9	Unrestricted, No Stopping, 6.30am – 9.30am, 3.30pm – 6.30pm, Monday – Friday
10	Unrestricted, No Parking, 6.30am – 9.30am, 3.30pm – 6.30pm, Monday – Friday
11	Unrestricted, Bus Zone, 6am – 9am Monday – Friday, 9am – 5pm Saturday
12	Unrestricted, 15-minute Parking, 8am – 3pm, Monday - Friday
13	Unrestricted, 1-hour Parking 8.30am – 6pm Monday – Friday, 8.30am – 12.30pm Saturday
14	Unrestricted, 10-minute Parking 7am – 6pm Monday – Friday
15	Unrestricted, No Parking, 8am – 9.30am, 2.30am – 4pm, School Days
16	Unrestricted, 10-minute Parking, 8am – 9.30am, 2.30am – 4pm, School Days
17	Unrestricted, No Parking, 7am – 9am, 3pm – 6pm, Monday – Friday
18	No Parking, Australian Post Vehicles Excepted
19	Taxi Zone
20	Unrestricted, No Parking 6.30am – 9.30am, Monday – Friday
21	Unrestricted, No Parking, 3pm – 6pm, Monday – Friday
22	No Parking, Vehicles Under 6m Excepted

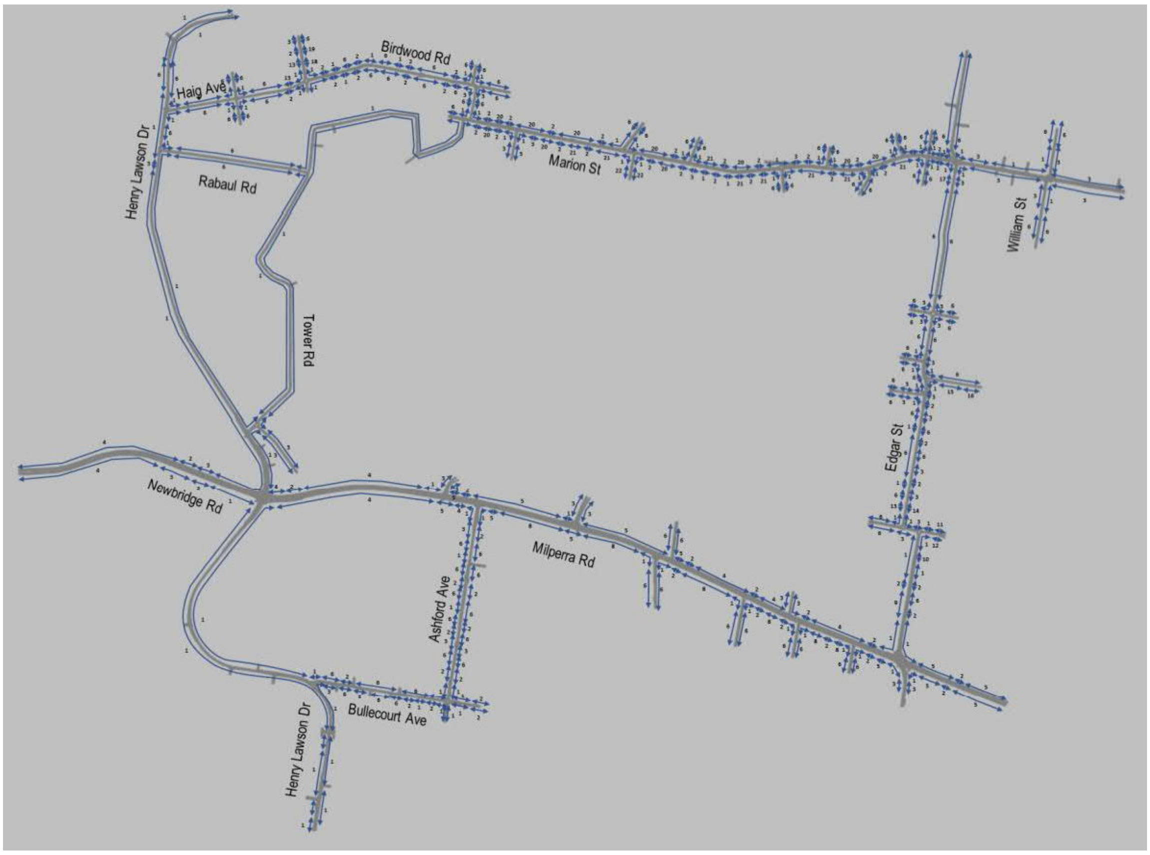


Figure 3.3 Parking Restrictions within the Study Area

3.4 ZONE SYSTEM AND MATRIX FORMULATION

A combination of traffic counts, site observation and cordon matrix from Sydney Strategic Travel Model (STM) for the study area, were used to estimate a "best guess" prior matrix. Each period's matrix was then run through the model with manual adjustments made to satisfactorily represent the base traffic patterns while achieving the model calibration criteria. The travel zones created in the VISSIM model is shown in Figure 3.4 that corresponds to the following road segments in Table 3.4 below.

Table 3.4: Travel Zones

Zone No	Road Name
1	Ashcroft Street (South)
2	Marion Street (West)
3	Birch Street (South)
4	Drover Road (South) / Airport Avenue (South)
5	Murray Jones Drive (North)
6	Eldridge Street (West) / Bankstown City Paceway Access / Woorang Street (North)
7	Manahan Street (South) / Wren Street (South) / The Avenue (South)
8	Lancelot Street (West)
9	Townsend Street (West) / Upper Railway Parade (West)
10	Nancy Ellis Leebold Drive (North)
11	Georges Crescent (South)
12	Townsend Street (West)
13	Tower Road (East)
14	Henry Lawson Drive (North)
15	Ashcroft Street (North)
16	Georges Crescent (North)
17	Foley Street (North)
18	Birdwood Road (East)
19	Surrey Avenue (North)
20	Cumberland Avenue (North)
21	Marion Street (North)
22	Saltash Street (North) / Cantrell Street (North) / The Avenue (North)
23	Edgar Street (North)
24	Marion Street (East)
25	Lancelot Street (East)
26	Augusta Street (East)
27	Eldridge Road (East)
28	Milperra Road (East)
29	Queen Street (South)
30	Daisy Street (South) / Violet Street (South) / Fitzpatrick Street (South)
31	Marigold Street (South)
32	Ashford Avenue (South)
33	Henry Lawson Drive (South)
34	Newbridge Road (West)
35	ALDI Bankstown Airport Access (East)
36	BP Gas Station (East)
37	Starkie Drive (South)
38	Link Road (East)
45	Bullecourt Avenue (East)
46	William Street (South)
47	William Street (North)
48	Wilkins Street
49	Fenwick Street
50	Cragg Street
51	Kardella Circuit
52	Industrial Employment Zone (off Ashford Avenue)
53	Eldridge Road (West)
54	Eldridge Road (East)

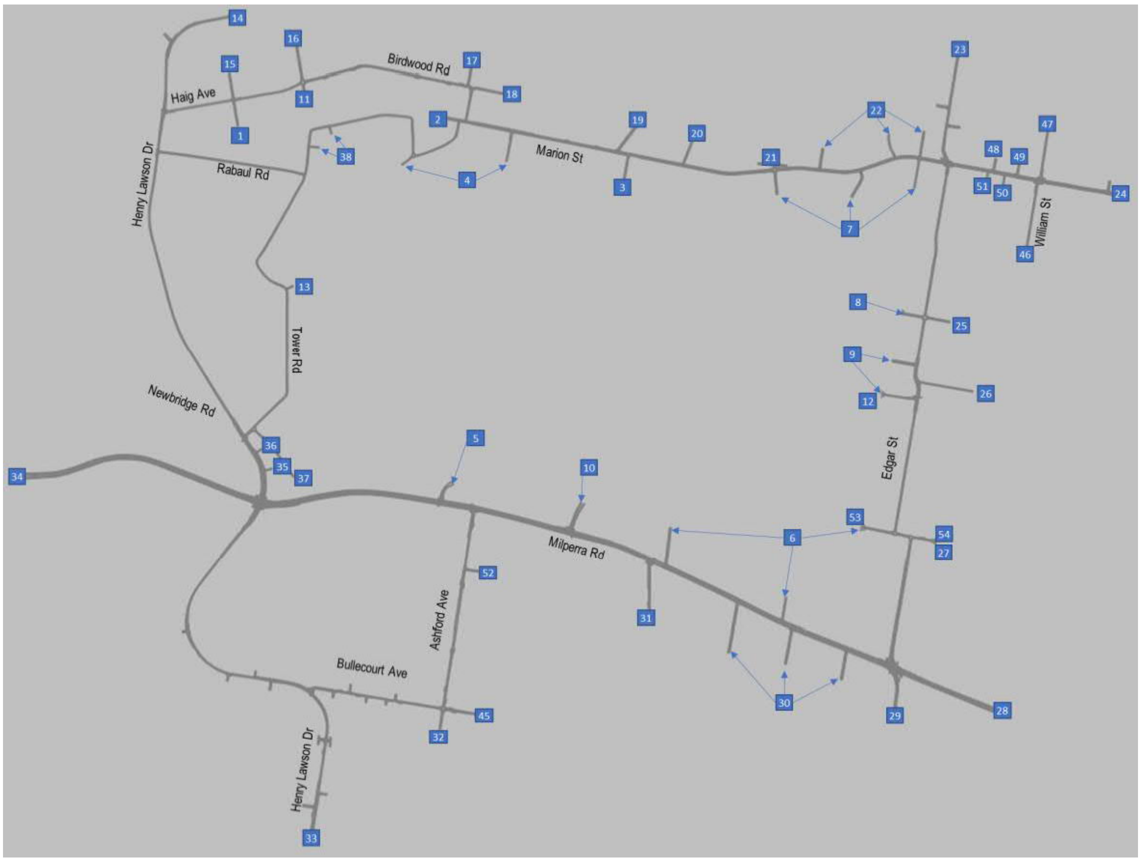


Figure 3.4 Travel zones in the VISSUM model

3.5 TRAFFIC COUNT DATA

The observed counts were combined from various sources and then manually balanced. The Weekday AM peak and PM peak hours balanced counts are shown in **Attachment A.**

3.6 TIME PERIODS AND PROFILES

3.6.1 Modelled Periods

The Weekday AM and PM peak periods were identified based on traffic survey data at all intersections in the study area. The model has been set up to include a 30-minute warm-up period, a 1-hour evaluation period and a 30-minute cool-down period, for both the peak periods. These are outlined in Table 3.5.

Table 3.5 Weekday AM and PM peak periods

Peak Periods	Warm Up	Peak Period	Cool Down
AM	7.00am – 7.30am	7.30am – 8.30am	8.30am – 9.00am
PM	4.15pm – 4.45pm	4.45pm – 5.45pm	5.45pm – 6.15pm

Results have been set up to be recorded in 15-minute intervals, while the majority of model inputs are also entered in 15-minute increments.

3.6.2 Demand Profiling

To ensure that the correct number of vehicles are released into the network as per defined time slices, a demand profile was constructed. Temporal traffic profiles were developed for 15-minute periods based on the surveyed traffic data at the key intersection of Milperra Road / Henry Lawson Drive.

The AM and PM peak demand profiles are presented in Table 3.6 and Table 3.7.

Table 3.6: Weekday AM Peak Traffic Demand Profile

Measure	Weekday AM Peak			
	7.30am–7.45am	7.45am – 8.00am	8.00am – 8.15am	8:15am – 8.30am
Demand Profile	24%	26%	25%	25%

Table 3.7: Weekday PM Peak Traffic Demand Profile

Measure	Weekday PM Peak			
	4.45pm–5.00pm	5.00pm – 5.15pm	5.15pm – 5.30pm	5:30pm – 5.45pm
Demand Profile	24%	26%	25%	25%

The demand profile for key inputs into the model were applied individually, based on the approach values to the nearest intersection. The locations where individual demand profiling is applied include:

- Henry Lawson Drive – southern approach to Henry Lawson Drive / Bullecourt Avenue;
- Henry Lawson Drive – northern approach to Henry Lawson Drive / Haig Avenue;
- Newbridge Road – western approach to Henry Lawson Drive / Milperra Road / Newbridge Road;
- Queen Street – southern approach to Queen Street / Milperra Road / Edgar Street;
- Milperra Road – eastern approach to Queen Street / Milperra Road / Edgar Street;
- Marion Street – eastern approach to Marion Street / Edgar Street; and
- Edgar Street – northern approach to Marion Street / Edgar Street.

Table 3.8: Peak Traffic Demand Profile – Key Model Inputs

Measure	Weekday AM Peak				Weekday PM Peak			
	7.30am–7.45am	7.45am – 8.00am	8.00am – 8.15am	8:15am – 8.30am	4.45pm–5.00pm	5.00pm – 5.15pm	5.15pm – 5.30pm	5:30pm – 5.45pm
Henry Lawson Drive (N)	25%	25%	23%	22%	28%	24%	23%	25%
Henry Lawson Drive (S)	25%	25%	24%	26%	25%	25%	29%	20%
Newbridge Road (W)	25%	25%	26%	24%	27%	26%	25%	23%
Queen St (S)	24%	27%	22%	27%	23%	30%	25%	22%
Milperra Road (E)	26%	25%	27%	23%	26%	24%	24%	26%
Marion Street (E)	22%	20%	27%	31%	26%	24%	26%	24%
Edgar Street (N)	21%	26%	28%	25%	20%	30%	23%	27%

3.6.3 Traffic Composition

Traffic composition used in the model was based on the analysis of traffic mix at the Milperra Road / Henry Lawson Drive signalised intersection. The traffic composition used in the model is summarised in Table 3.9.

Table 3.9: AM and PM Traffic Composition

Measure	AM Peak		PM Peak	
	Light	Heavy	Light	Heavy
Traffic Composition	90.4%	9.6%	95.0%	5.0%

3.6.4 Bus Dwell Time

A normal distribution of the minimum and maximum times has been assumed in VISSIM using the program setting. The maximum and minimum bus dwell times at bus stops is 30 seconds and 2 seconds respectively.

3.6.5 VisVAP Signalling

The signal groups within the model are partially actuated and controlled by VisVAP program, incorporating the signal behaviours reflected in the IDMs. The signal behaviour varies in an-hour blocks, depending on the average, observed phase timing from the IDMs.

SCATS's .LX files were interrogated to calculate intersection offsets:

- Progression Plan (PP) and Link Plan (LP) 4 were adopted for the AM peak model; and
- Progression Plan (PP) and Link Plan (LP) 2 were adopted for the PM peak model.

4. CALIBRATION

4.1 CRITERIA

The model was calibrated in accordance with the *RMS Traffic Modelling Guidelines 2013,* which stipulate the requirements for model calibration. Notable key criteria are:

- Satisfactory GEH values for all turn and link volumes; and
- A minimum R^2 value of 0.9 for turning volumes.

These criteria are elaborated on below.

4.2 GEH STATISTIC

The Geoffrey E. Havers (GEH) Statistic is an industry standard measure of variance between the observed count and modelled count, expressed by the following:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where M is the Modelled Volume and C is Observed Volume.

This expression effectively relates the severity of variance to the size of the observed volume and allows the variance from both large and small volumes to be assessed by the same measure.

The *RMS Traffic Modelling Guidelines 2013* (Table 11.1) uses the GEH Statistic as the main measurement of variance in microsimulation modelling and sets out the following requirements for calibration to turning movement and link volumes:

- 100% of turns and links with a GEH < 10; and
- 85% of turns and links with a GEH < 5.

The GEH results for the AM and PM base model in relation to these criteria are summarised in Table 4.1, while the detailed calculations for each movement are shown in **Attachment B**.

Table 4.1: AM and PM Base Model Turning Movement GEH Results

Measure	Weekday AM Peak	Weekday PM Peak
% of GEH < 10	100%	100%
% of GEH < 5	98.95%	95.81%

As indicated by the results in Table 4.1, the model satisfies the GEH calibration requirements in both peak periods.

Regression graphs with R-squared values for each turn movement for each peak model are shown in Figure 4.1 and Figure 4.2. R-squared values of 0.99 were achieved for both the peak periods.

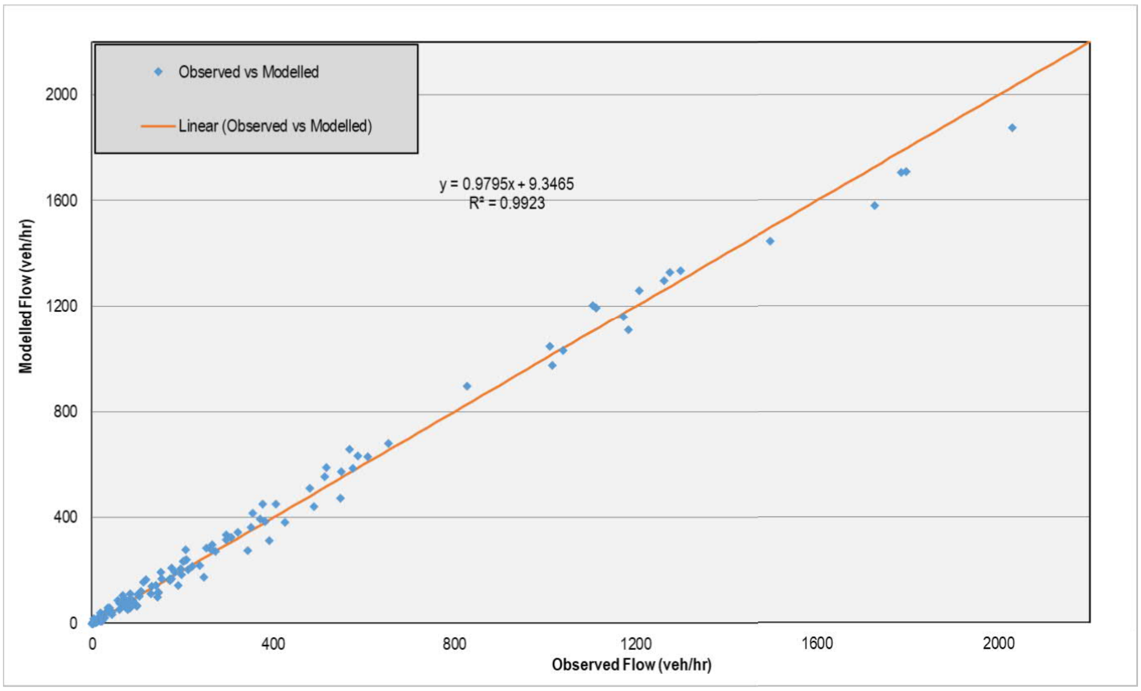


Figure 4.1: Weekday AM Peak Turn Counts Regression Graph (R-squared=0.9923)

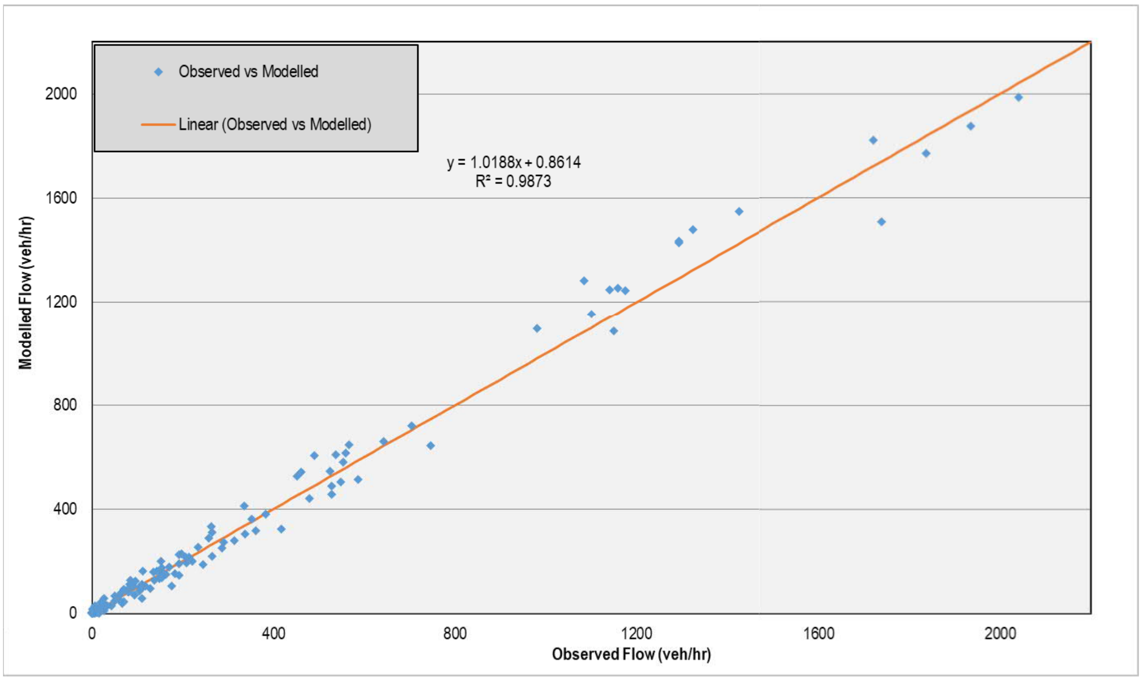


Figure 4.2: Weekday PM Peak Turn Counts Regression Graph (R-squared=0.9873)

4.3 MODEL STABILITY

4.3.1 Stability Testing

Model stability between runs/seed values is particularly important in microsimulation models and is demonstrate using a variety of network performance measures. The following network performance measures have been adopted to demonstrate model stability:

- Cumulative travel time across all vehicles (vehicle-hour travelled); and
- Total number of vehicles in the model.

Model outputs for each of the two measures are presented at 15-minute interval in Figure 4.3 through to **Error! Reference source not found.** Figure 4.6 across the following five seeds modelled:

- Run 1: Seed 5;
- Run 2: Seed 10;
- Run 3: Seed 15;
- Run 4: Seed 20; and
- Run 5: Seed 25

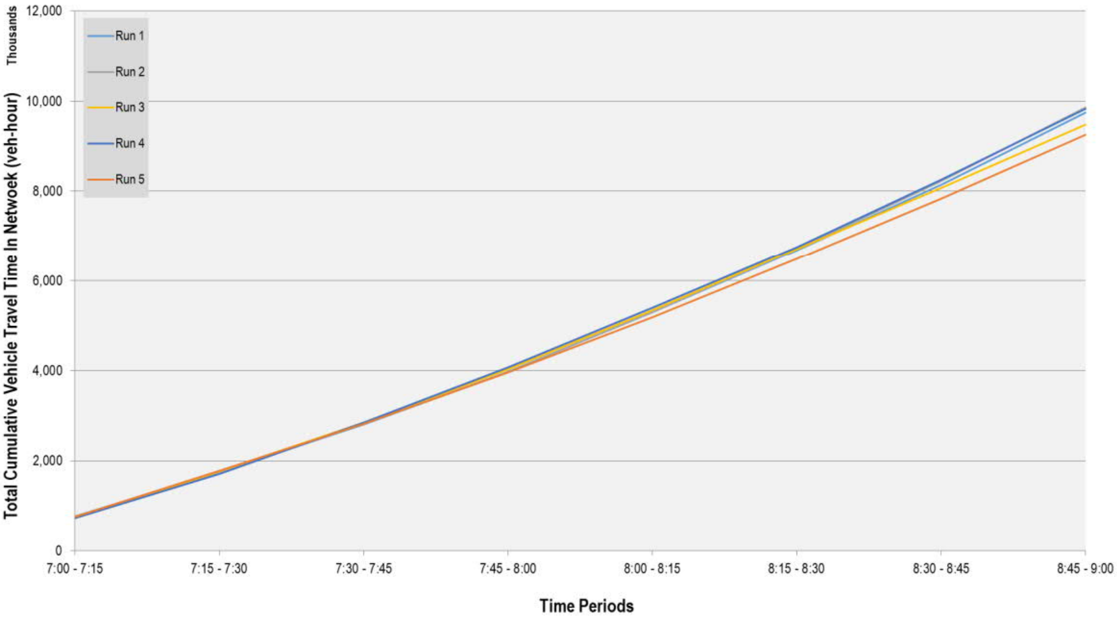


Figure 4.3: Weekday AM Peak Cumulative Travel Time

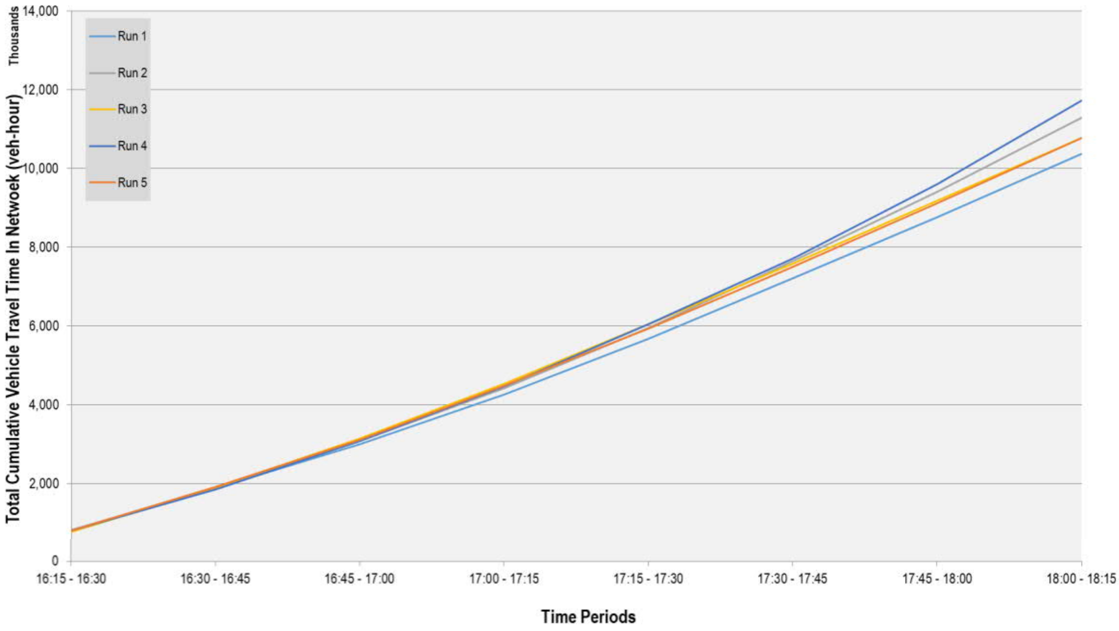


Figure 4.4: Weekday PM Peak Cumulative Travel Time

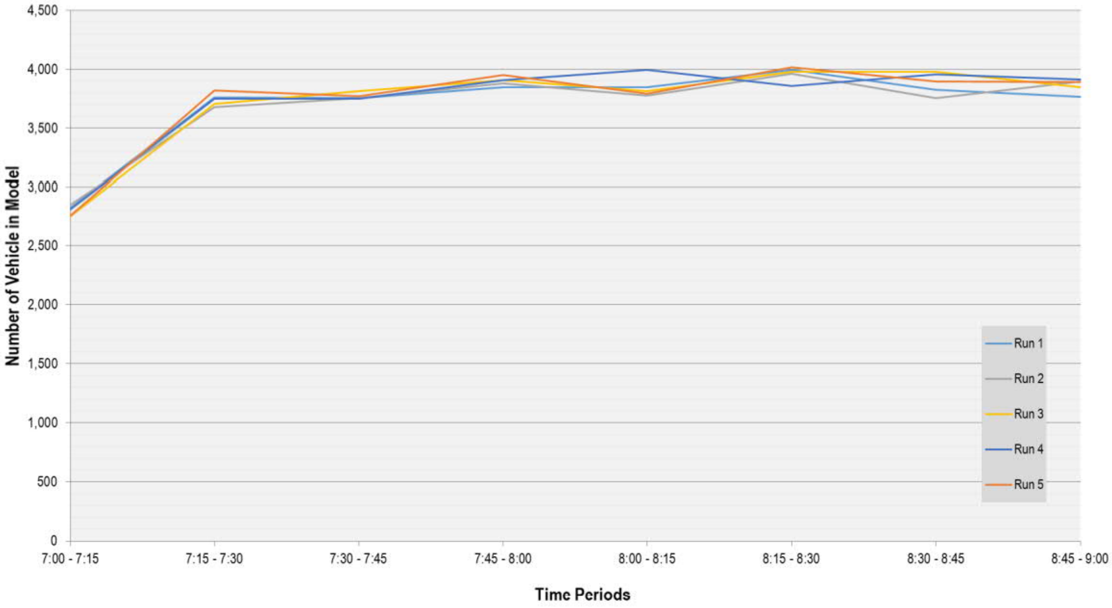


Figure 4.5: Weekday AM Peak Total Number of Vehicles in the Model

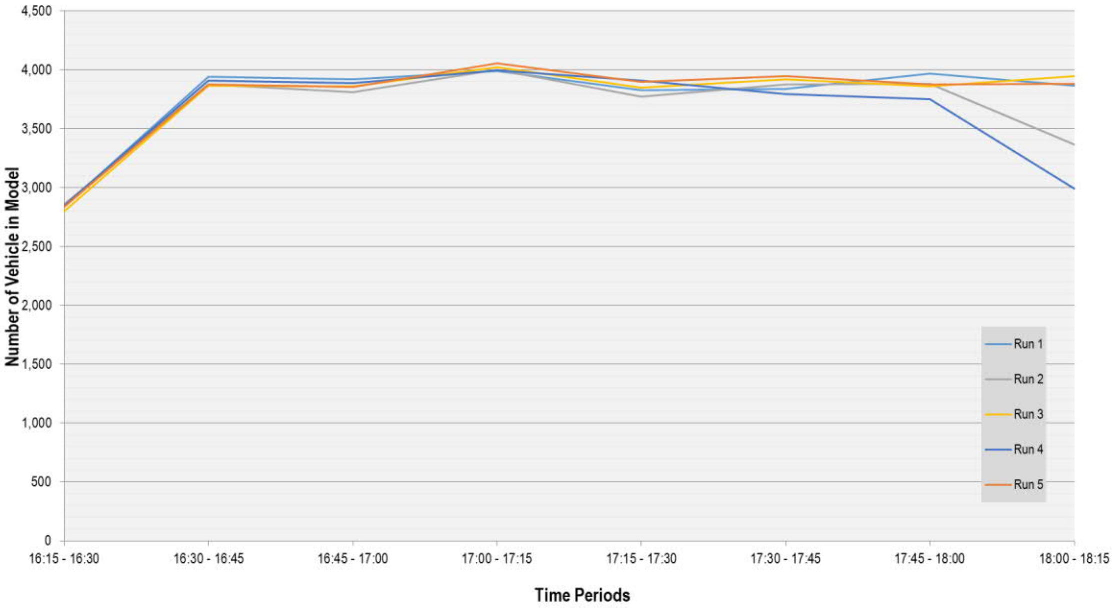


Figure 4.6: **Weekday PM Peak Total Number of Vehicles in the Model**

As evidenced by the above figures, the model behaviour across these two measures is quite consistent between seed runs. The models are therefore considered to be stable.

4.3.2 Median Seed

The median seed for each peak period has been identified by assessing the vehicle hours travelled (VHT) for each of the simulated runs. The weekday AM and PM peak median seeds are:

- Weekday AM Peak : Seed 5; and
- Weekday PM Peak : Seed 10.

All calibration and validation outputs reported are drawn from the median seed run.

5. VALIDATION

Following the calibration of the model to vehicle flows, the model was validated to average vehicle travel time and signal behaviour.

5.1 TRAVEL TIME VALIDATION

The RMS Modelling Guidelines require a comparison between the observed and modelled travel times. Travel time validation was undertaken for the following routes within the study area (as shown in Figure 2.2 and Figure 2.3):

- Milperra Road Route: Both directions between Henry Lawson Drive and Edgar Street;
- Henry Lawson Drive Route: Both Directions between Edinburgh Road both direction between Milperra Road and Haig Avenue;
- Marion Street / Haig Avenue: Both directions between Henry Lawson Drive and Edgar Street;
- Edgar Street: Both directions between Milperra Road and Marion Street; and
- Bullecourt Avenue Loop: Both directions between the Henry Lawson Drive / Milperra Road / Newbridge Road intersection, via Milperra Road, Ashford Avenue, Bullecourt Avenue and Henry Lawson Drive.

The RMS Modelling Guidelines consider the modelled travel time to validate (i.e. sufficiently resemble) the observed travel time when they lie within ±15% of the observed average. This is demonstrated for each route in each peak by the cumulative time vs. distance graphs in Figure 5.1 through to Figure 5.18. The travel time routes are validated well against the observed travel times in both the AM and PM peak periods. Generally, the modelled average travel times are within the 15% and +15% of the observed mean.

The travel time validation summary is provided in Attachment C.

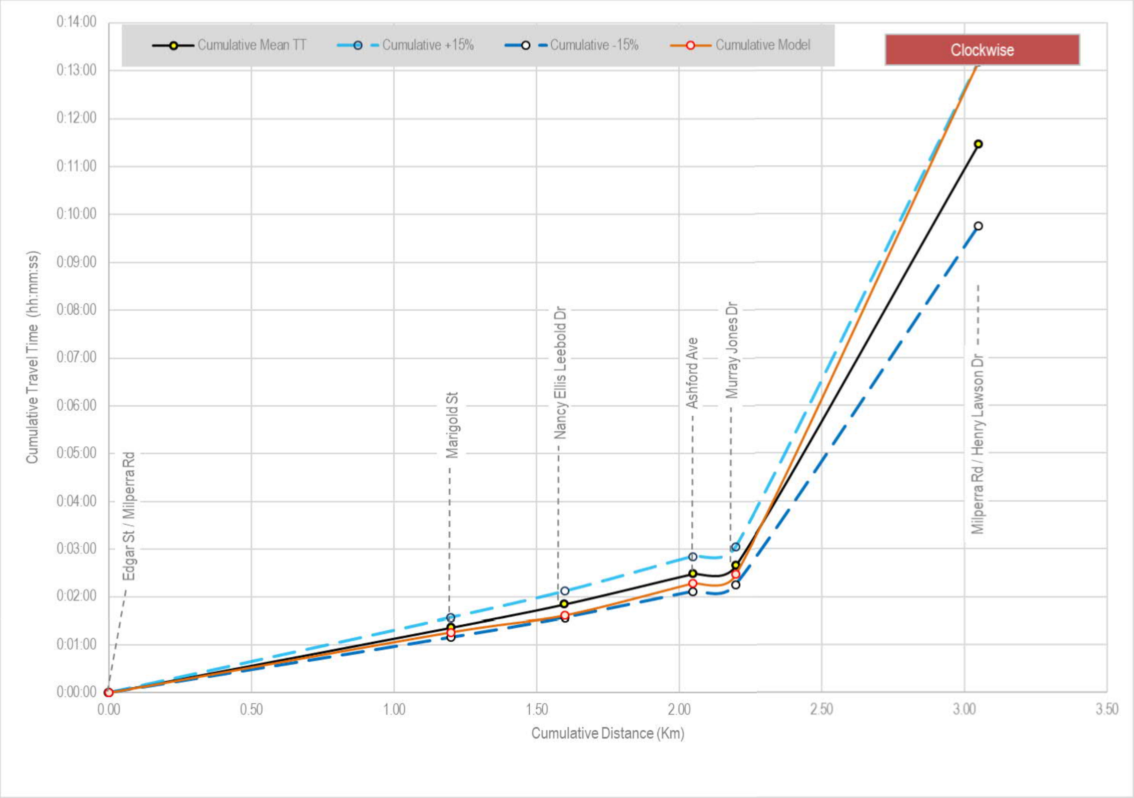


Figure 5.1: **Weekday AM Peak Travel Time Validation –Milperra Road Route Westbound**

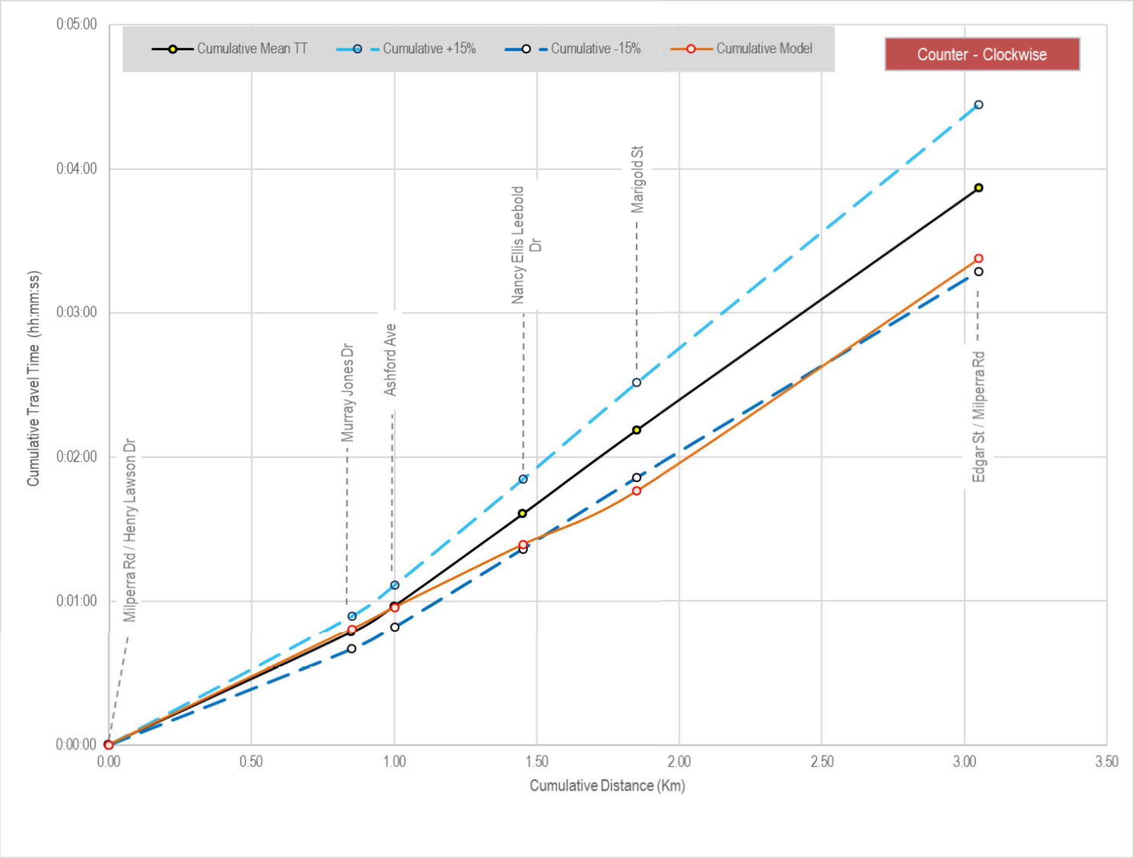


Figure 5.2: **Weekday AM Peak Travel Time Validation –Milperra Road Route Eastbound**

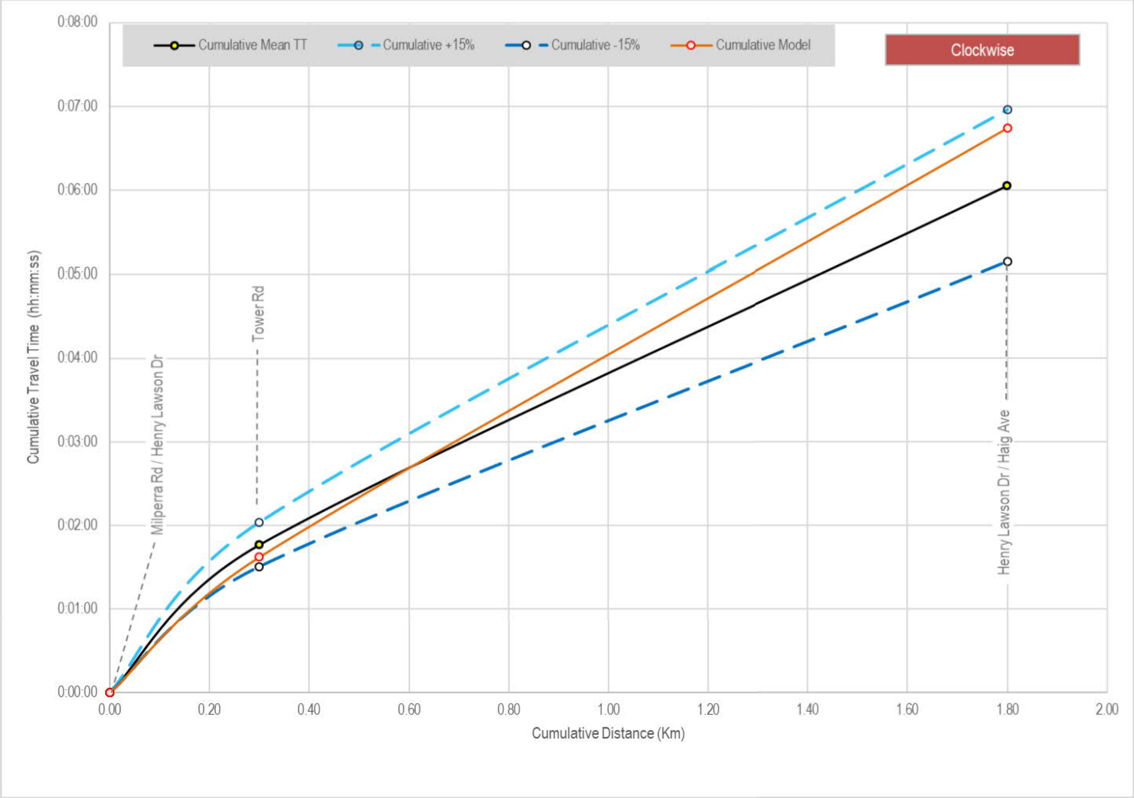


Figure 5.3: Weekday AM Peak Travel Time Validation – Henry Lawson Drive Northbound

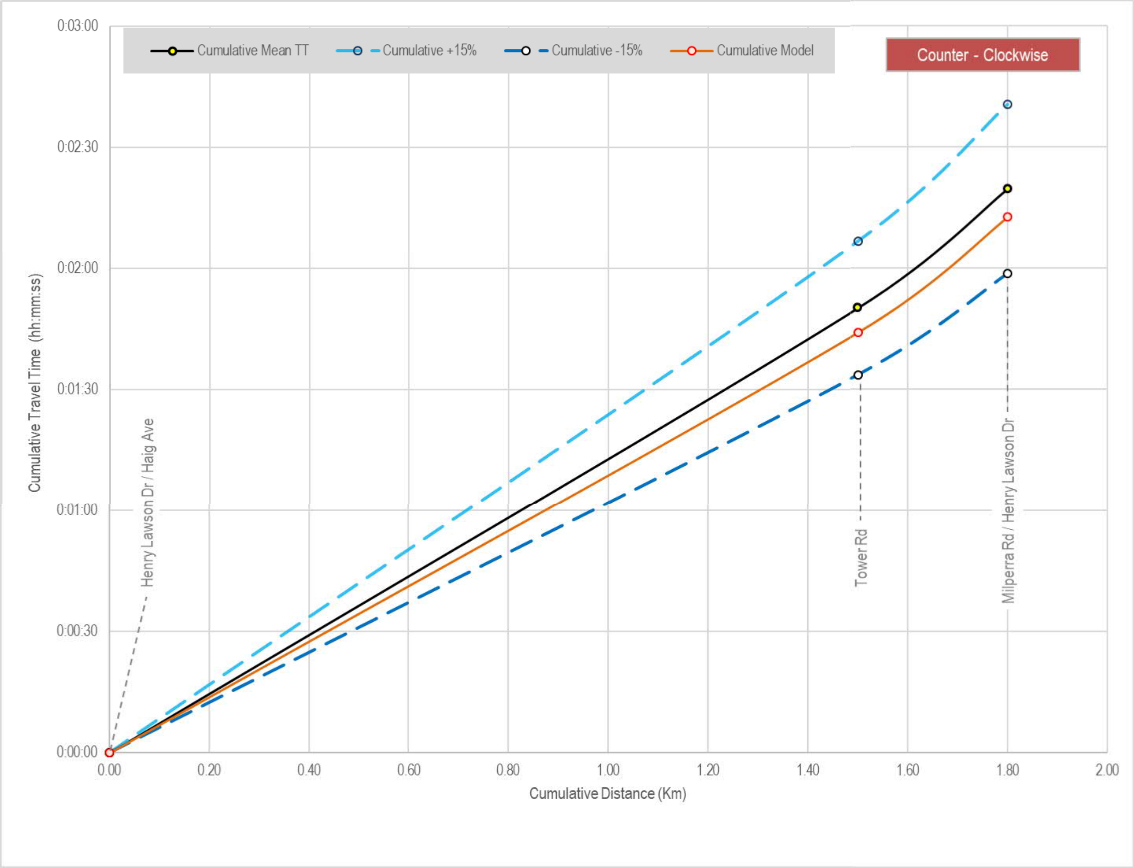


Figure 5.4: Weekday AM Peak Travel Time Validation – Henry Lawson Drive Southbound

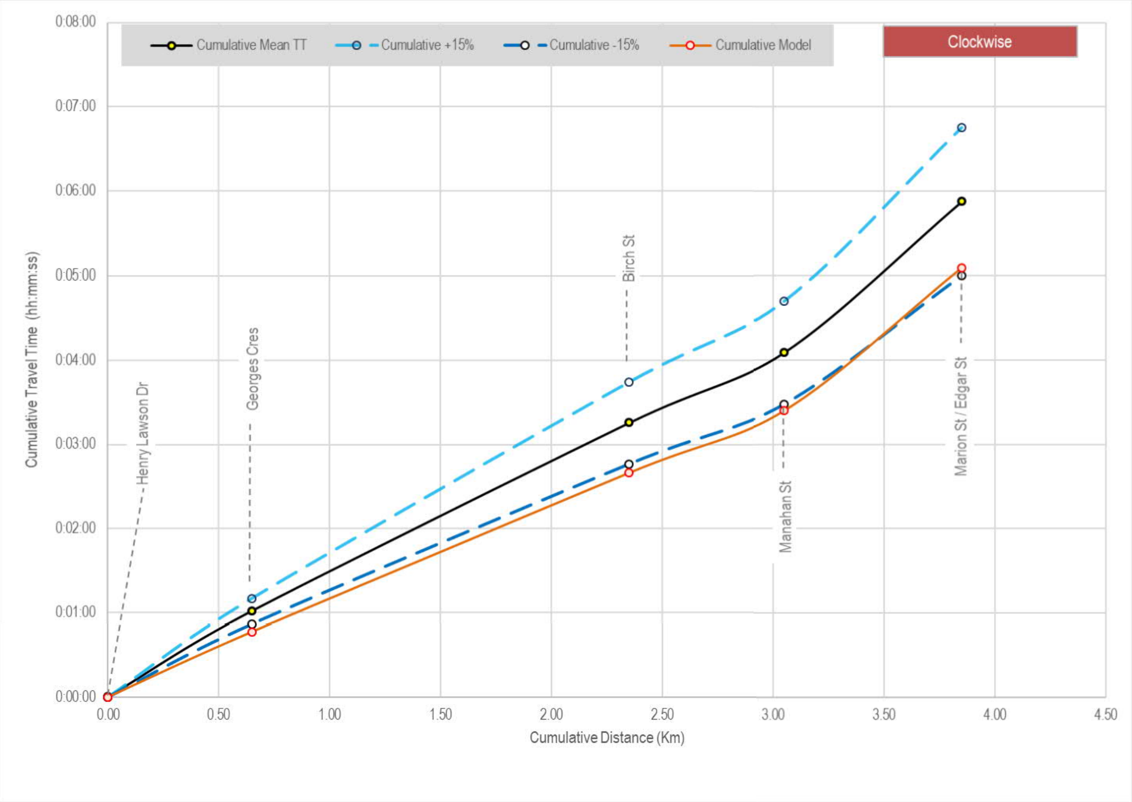


Figure 5.5: Weekday AM Peak Travel Time Validation –Marion Street / Haig Avenue Eastbound

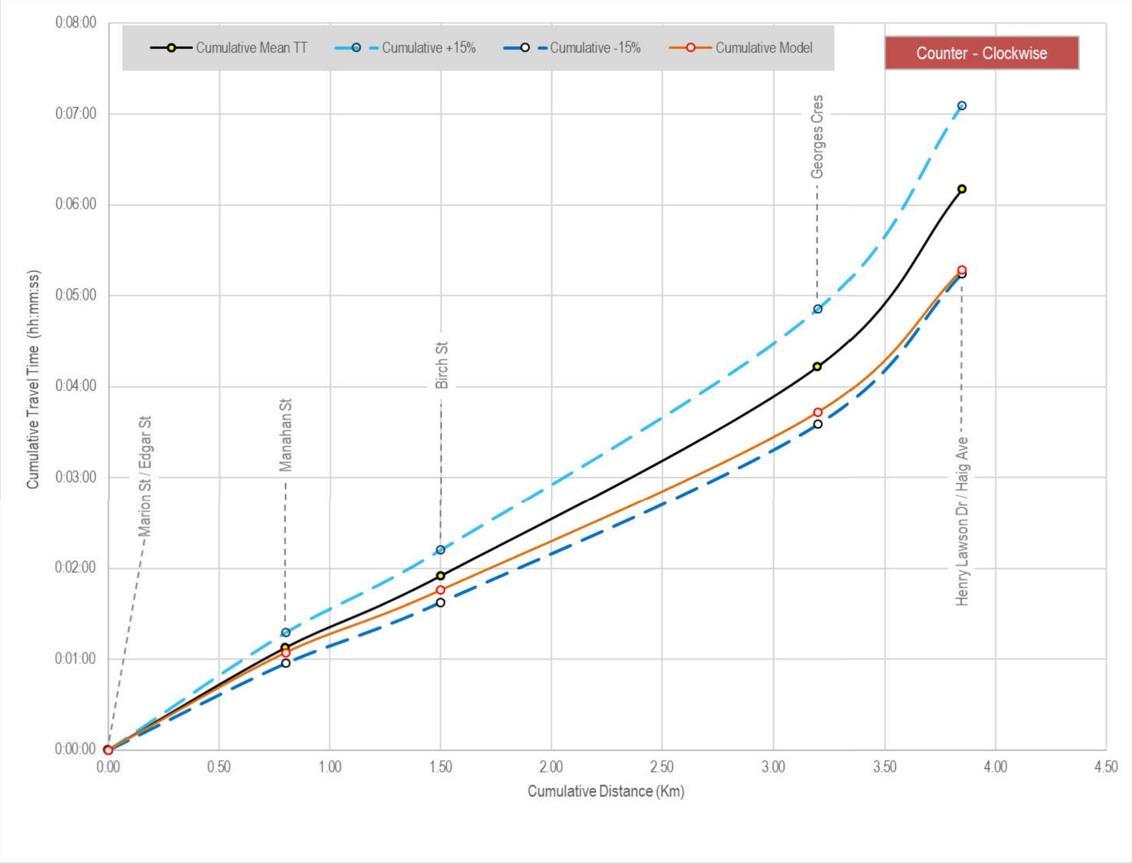


Figure 5.6: Weekday AM Peak Travel Time Validation –Marion Street / Haig Avenue Westbound

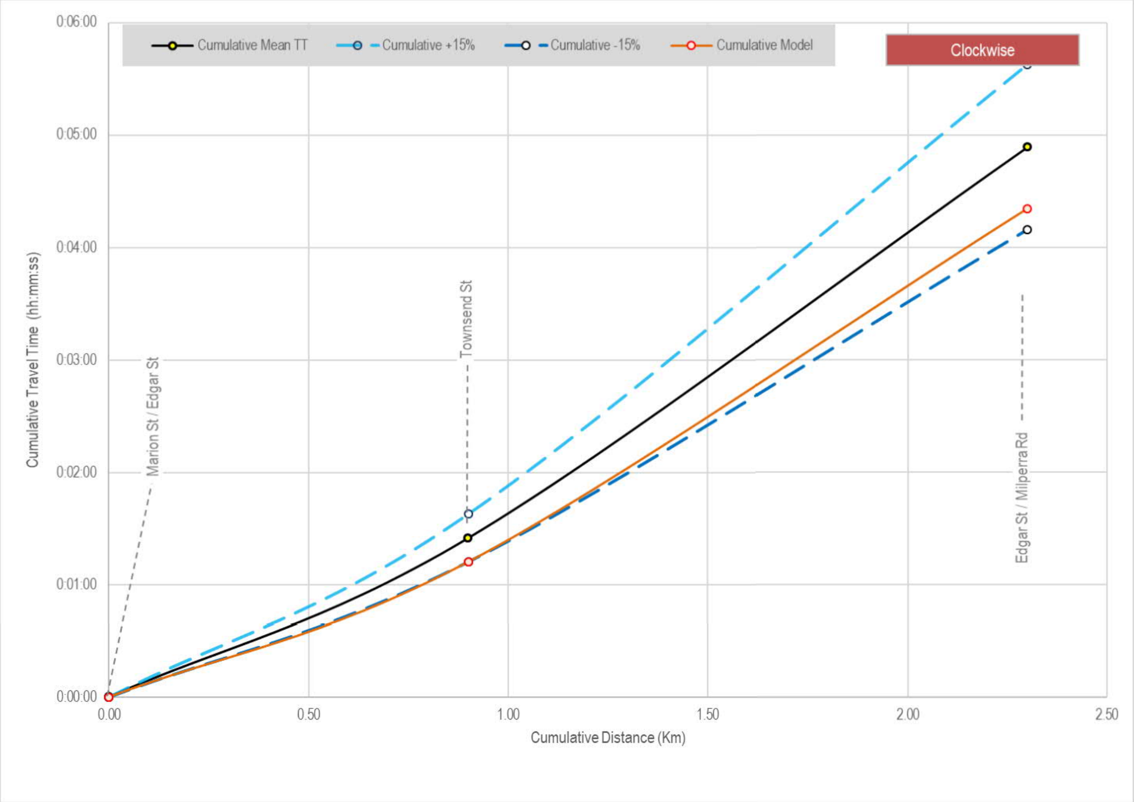


Figure 5.7: Weekday AM Peak Travel Time Validation – Edgar Street Southbound

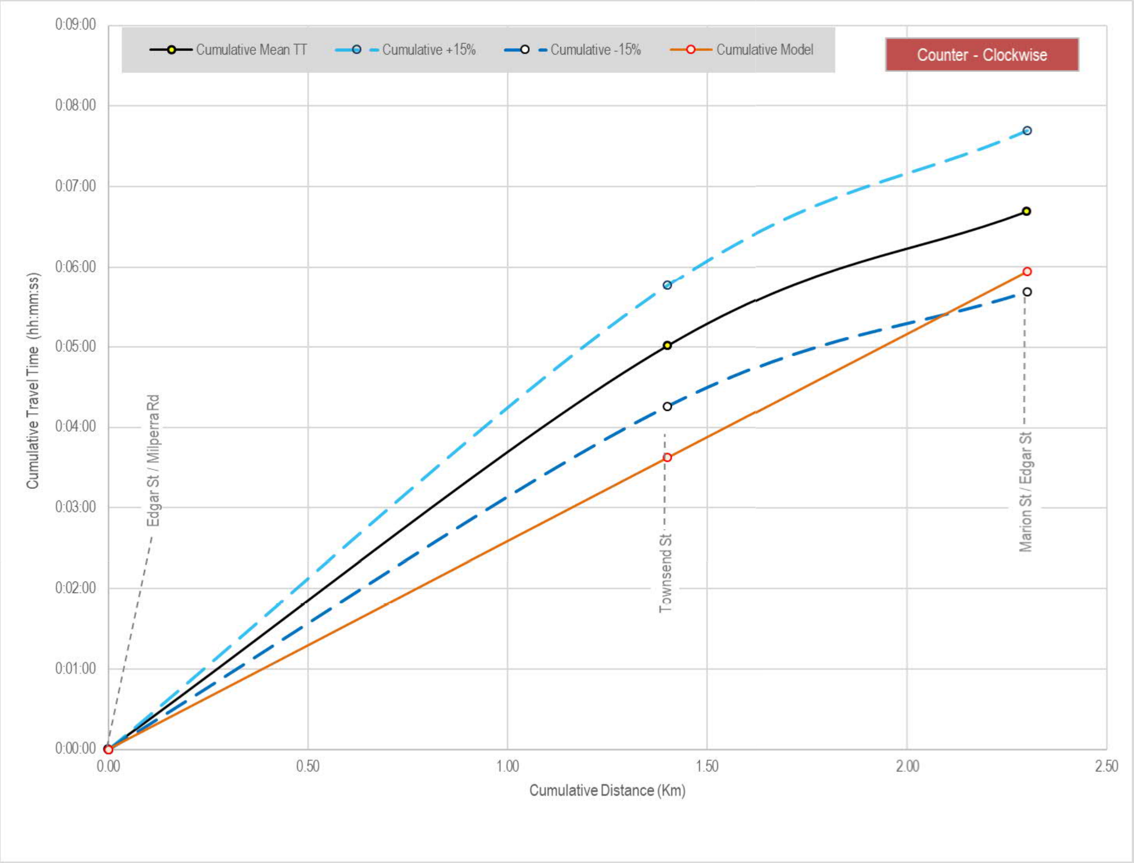


Figure 5.8: Weekday AM Peak Travel Time Validation – Edgar Street Northbound

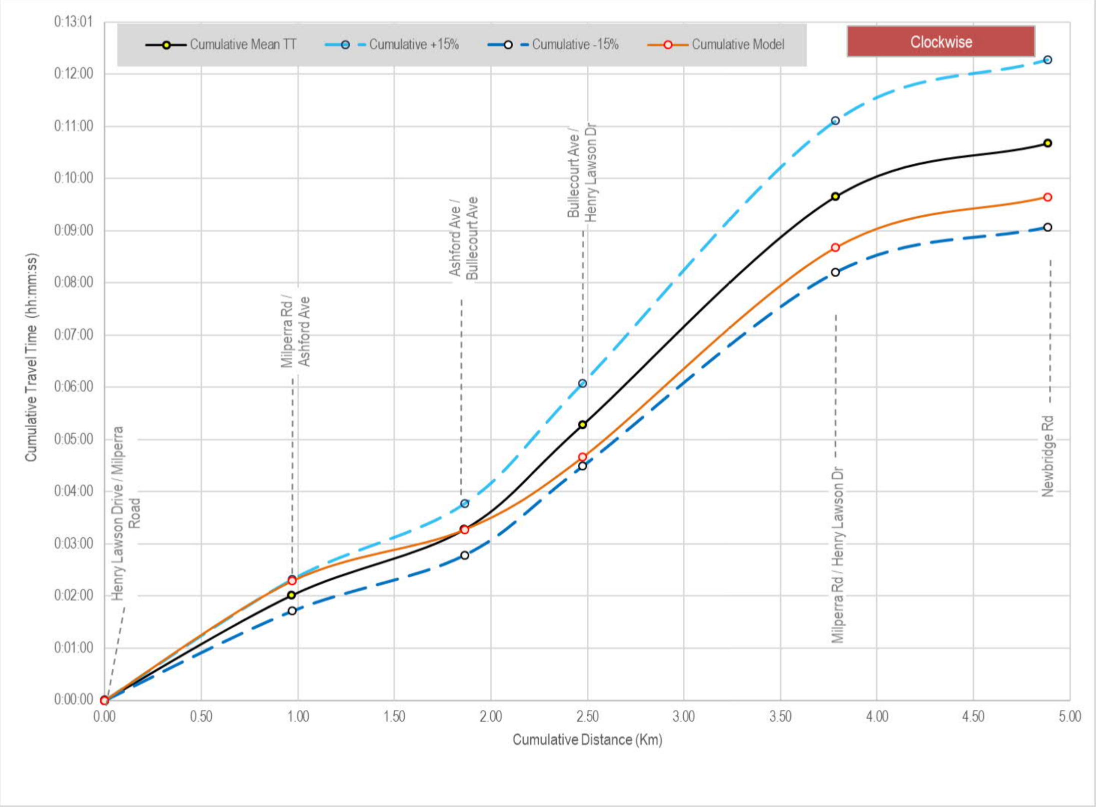


Figure 5.9: Weekday AM Peak Travel Time Validation – Bullecourt Avenue Loop Clockwise

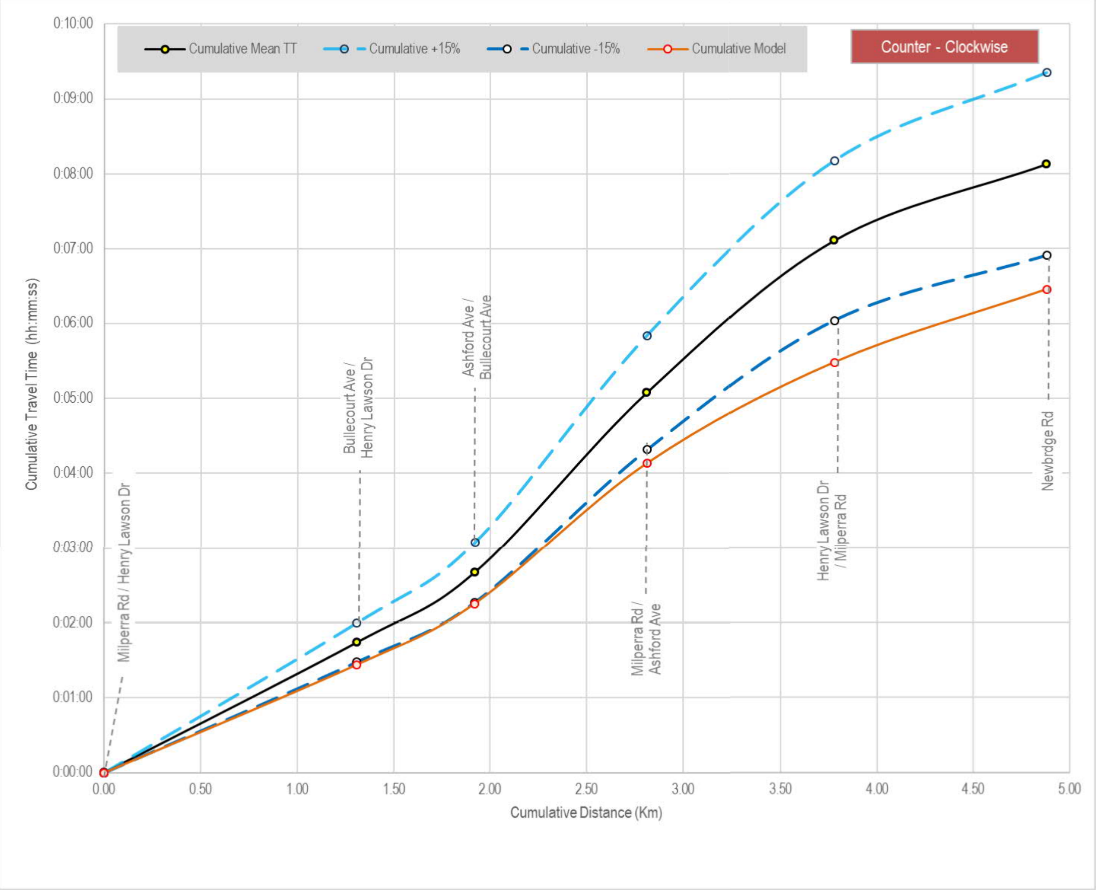


Figure 5.10: Weekday AM Peak Travel Time Validation – Bullecourt Avenue Loop Anti-Clockwise

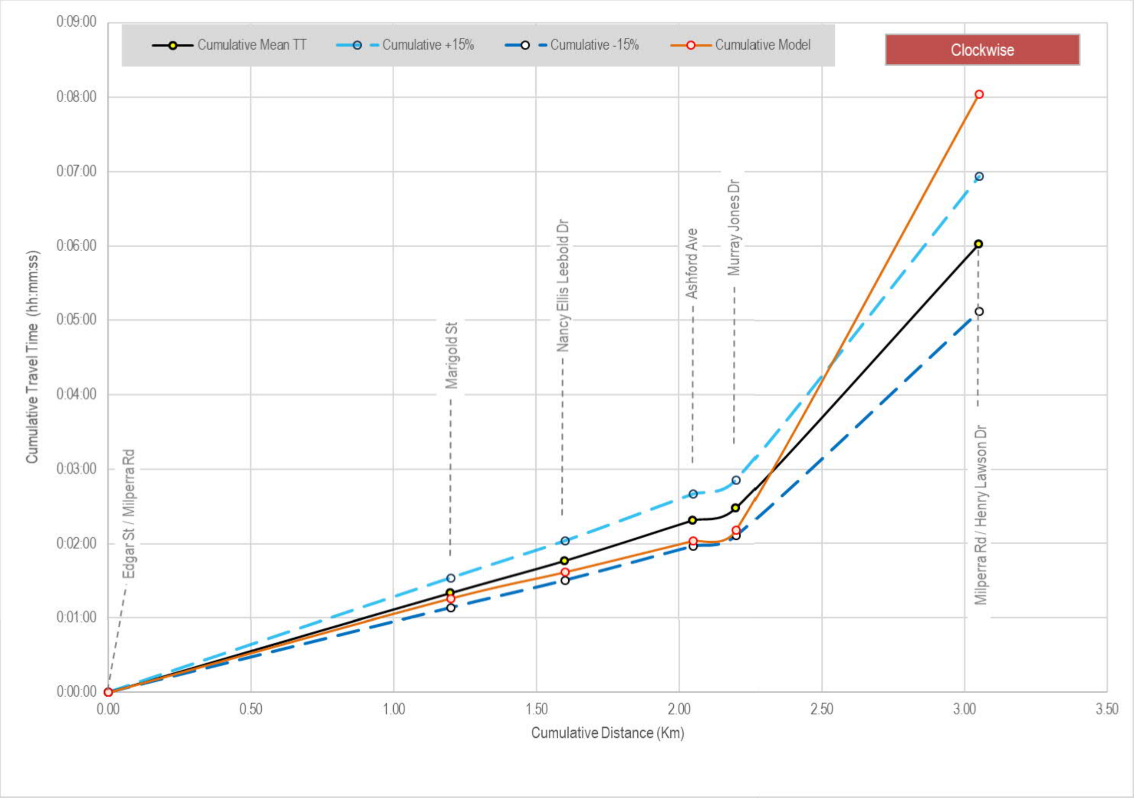


Figure 5.11: Weekday PM Peak Travel Time Validation –Milperra Road Route Westbound

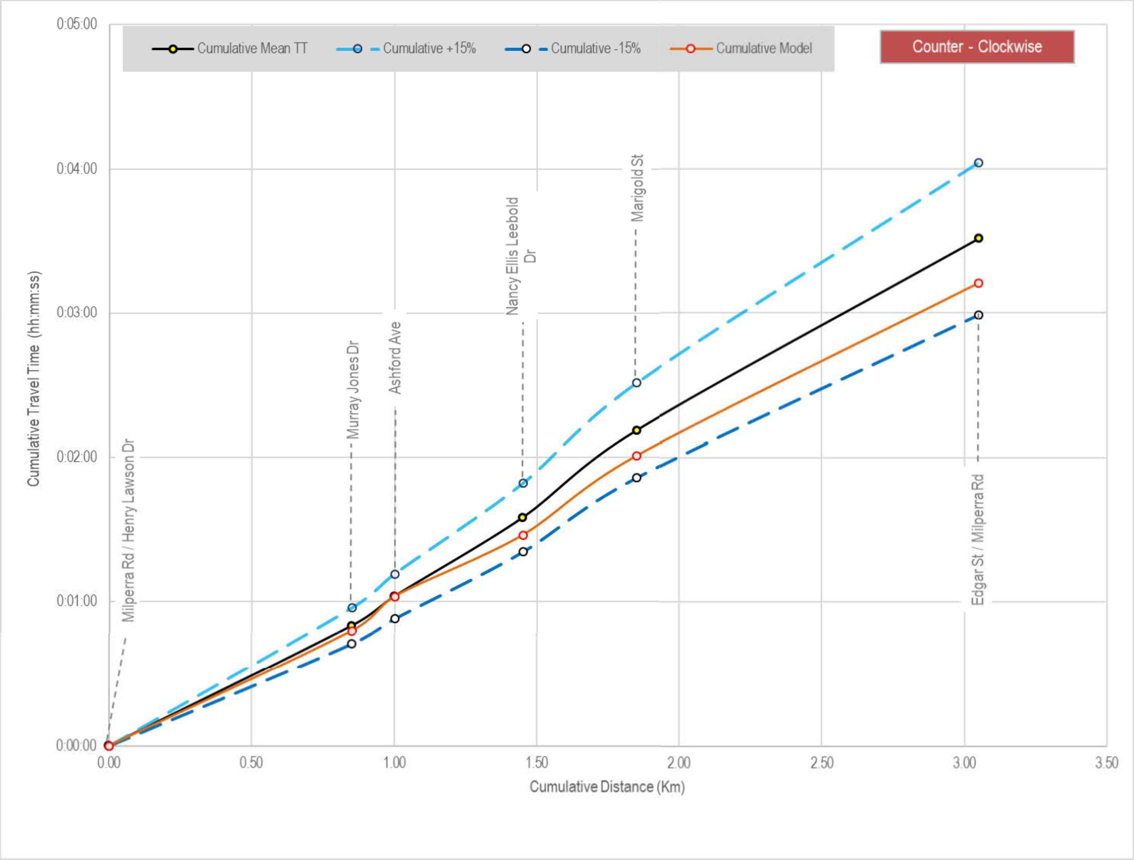


Figure 5.12: Weekday PM Peak Travel Time Validation –Milperra Road Route Eastbound

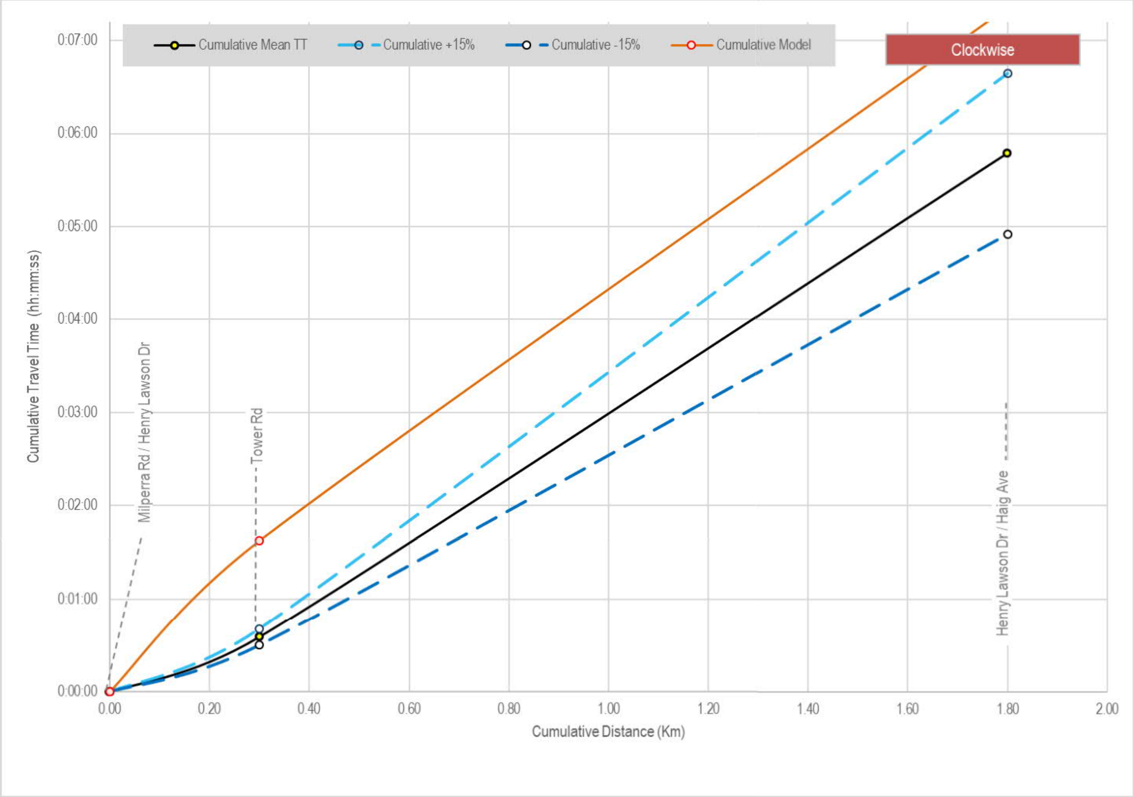


Figure 5.13: Weekday PM Peak Travel Time Validation – Henry Lawson Drive Northbound

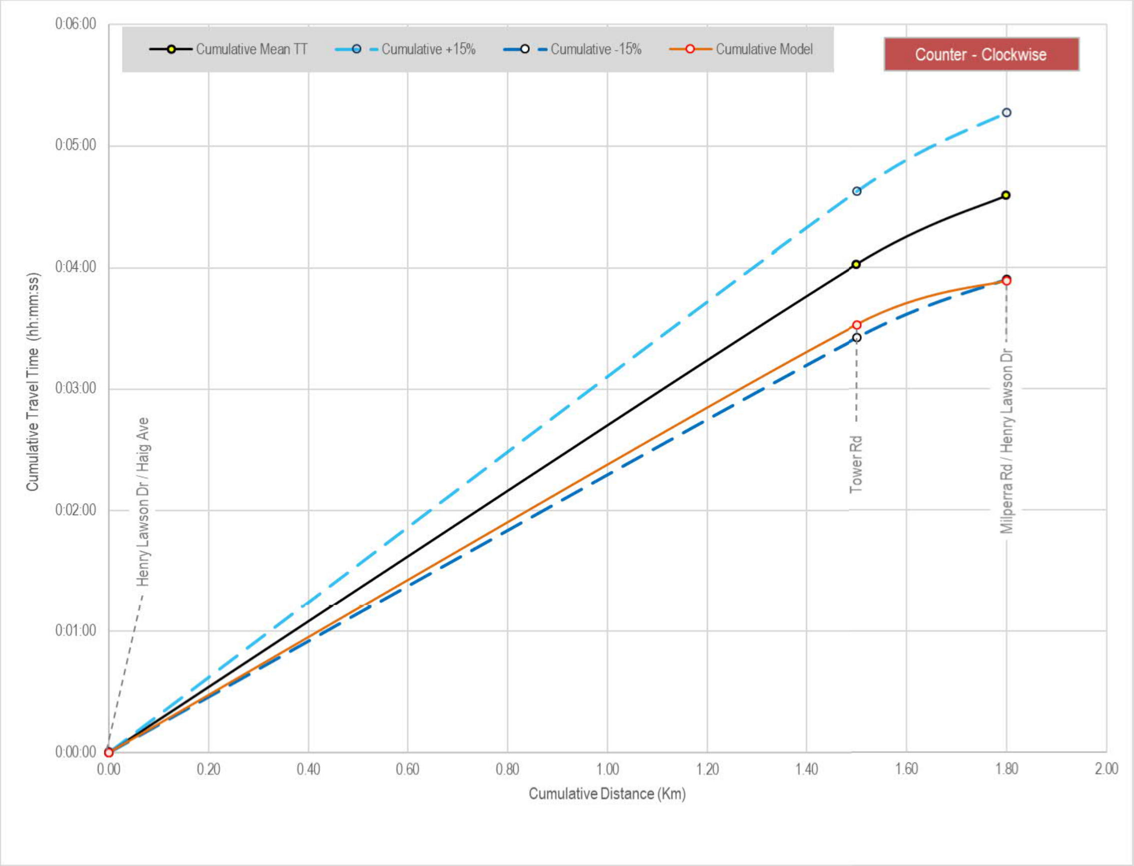


Figure 5.14: Weekday PM Peak Travel Time Validation – Henry Lawson Drive Northbound

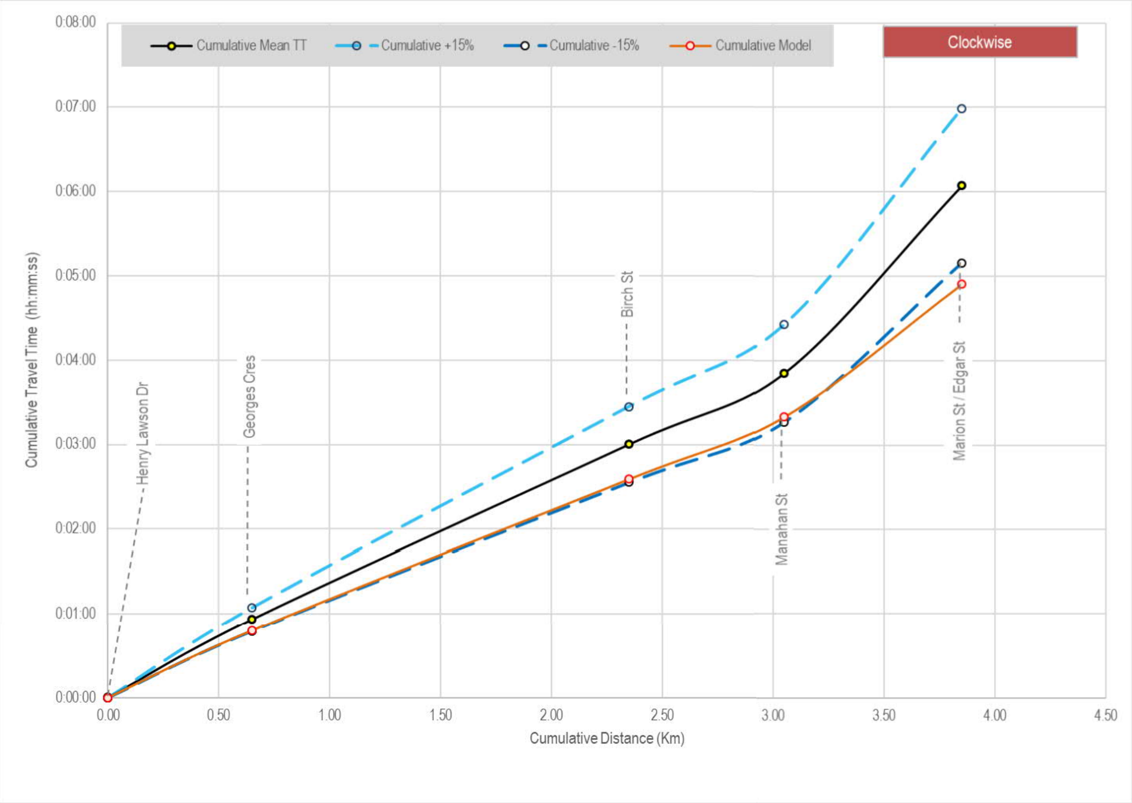


Figure 5.15: Weekday PM Peak Travel Time Validation –Marion Street / Haig Avenue Eastbound

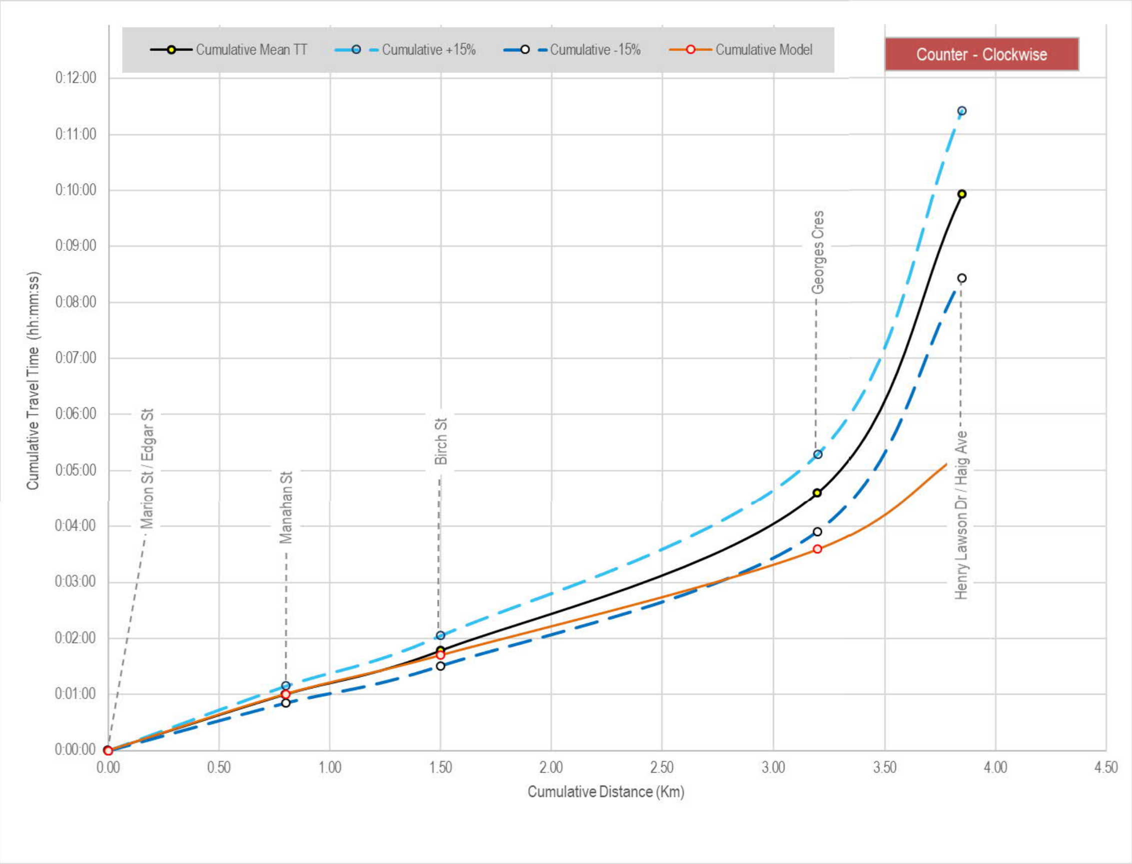


Figure 5.16: Weekday PM Peak Travel Time Validation –Marion Street / Haig Avenue Westbound

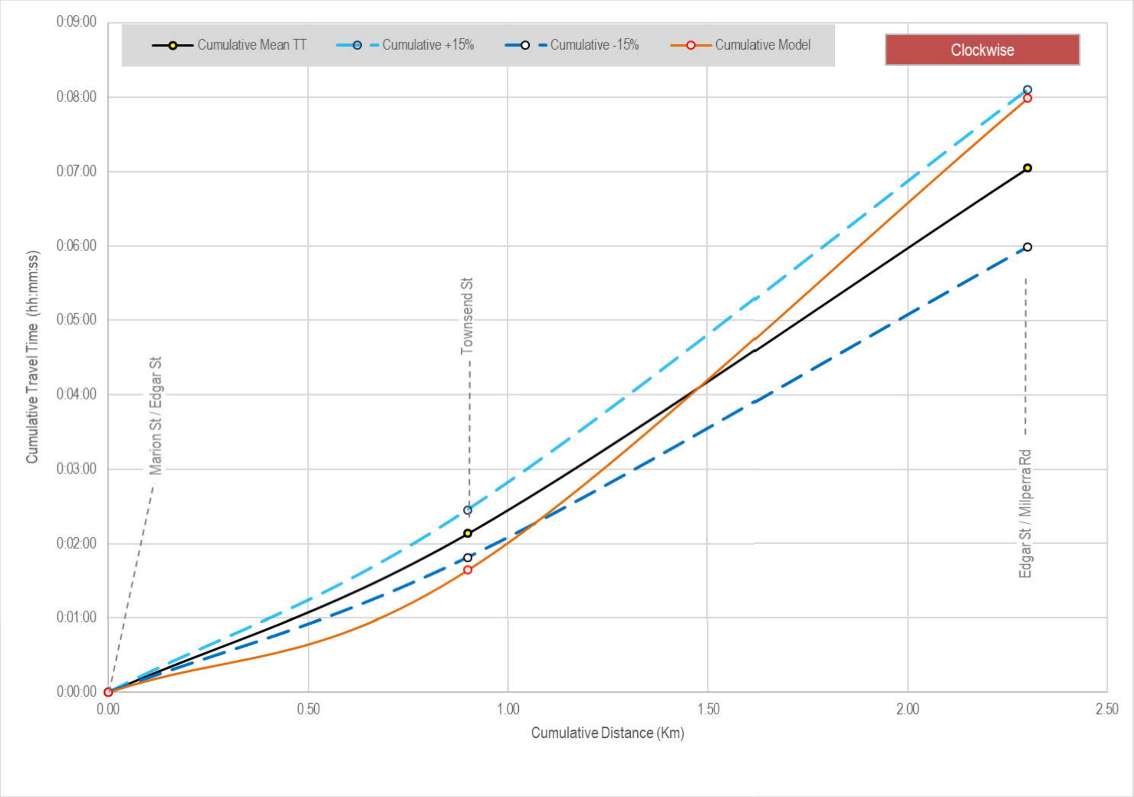


Figure 5.17: Weekday PM Peak Travel Time Validation – Edgar Street Southbound

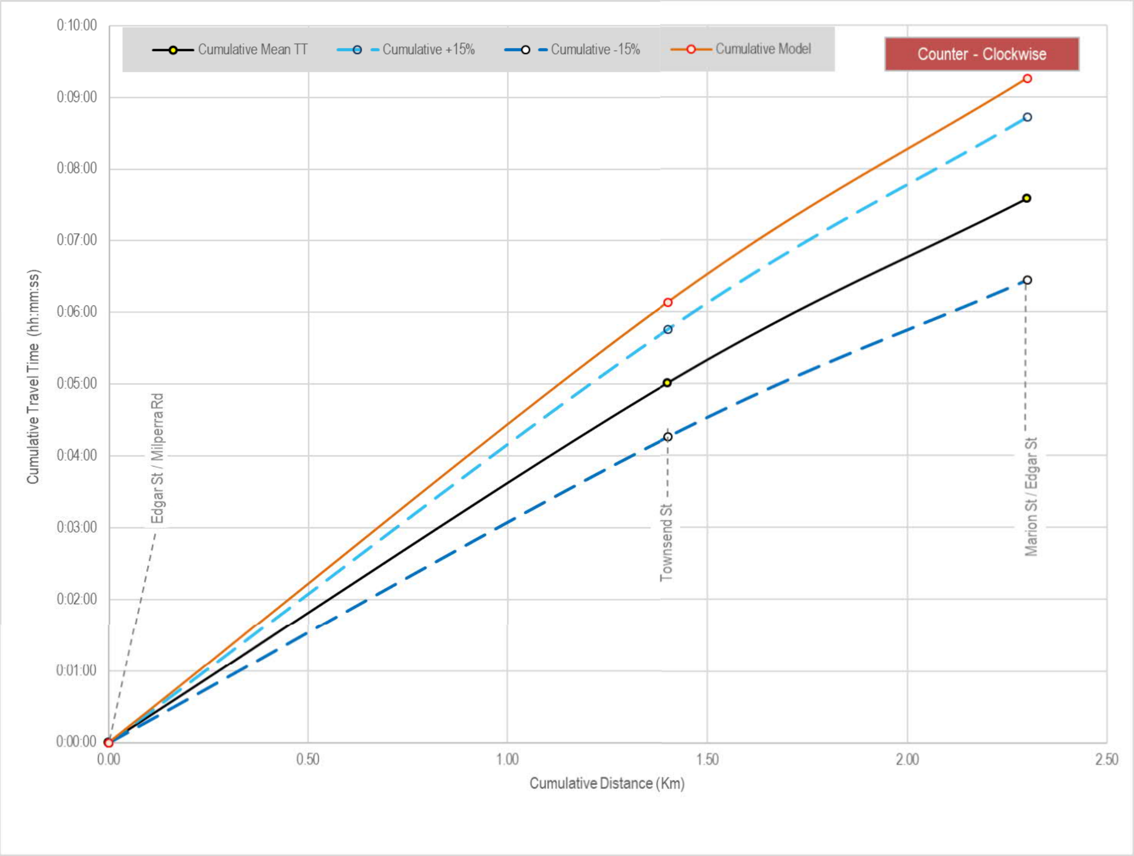


Figure 5.18: Weekday PM Peak Travel Time Validation – Edgar Street Northbound

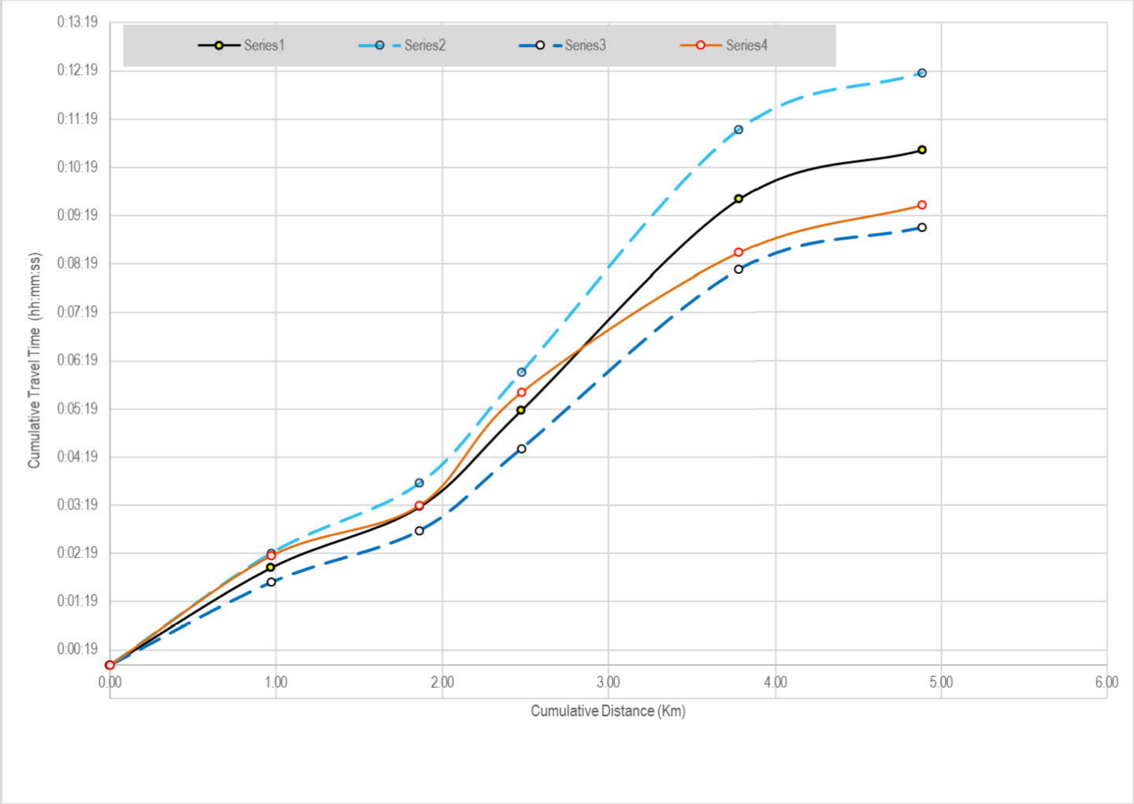


Figure 5.19: Weekday PM Peak Travel Time Validation – Bullecourt Avenue Loop Clockwise

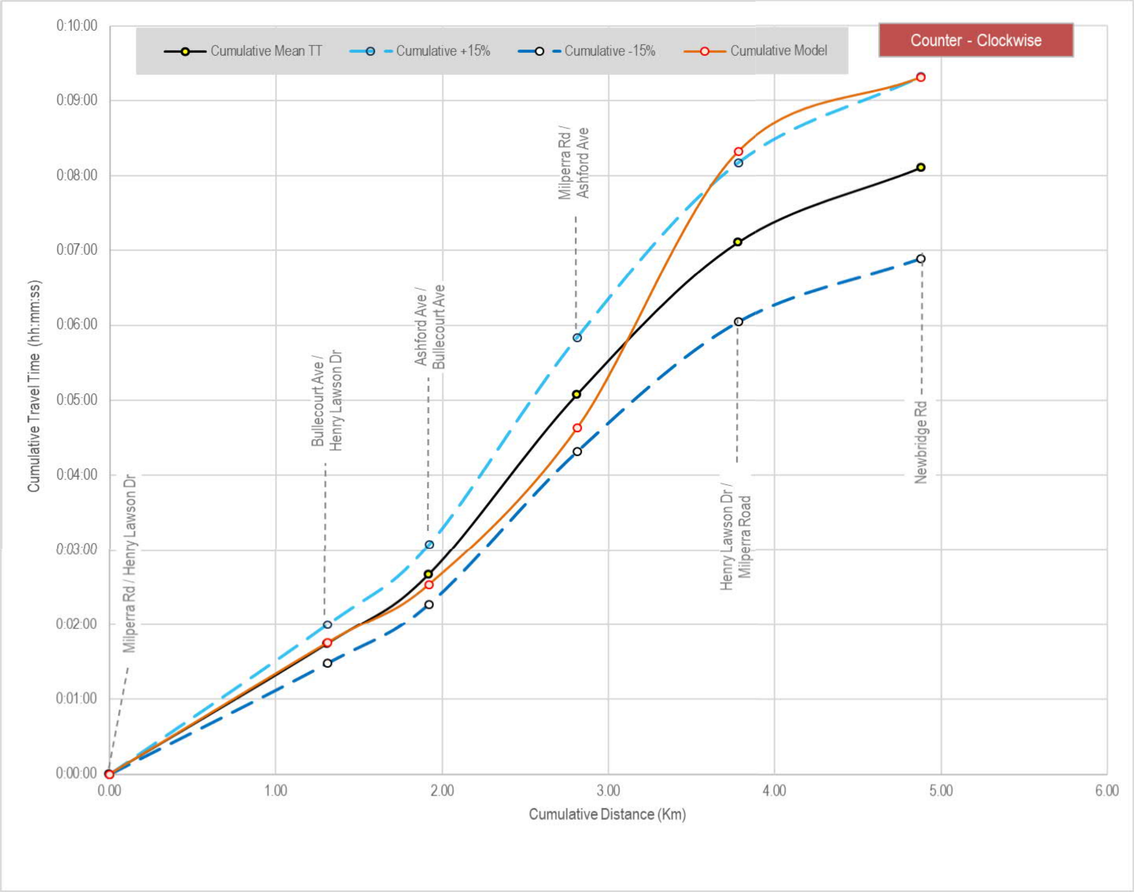


Figure 5.20: Weekday PM Peak Travel Time Validation – Bullecourt Avenue Loop Anti-Clockwise

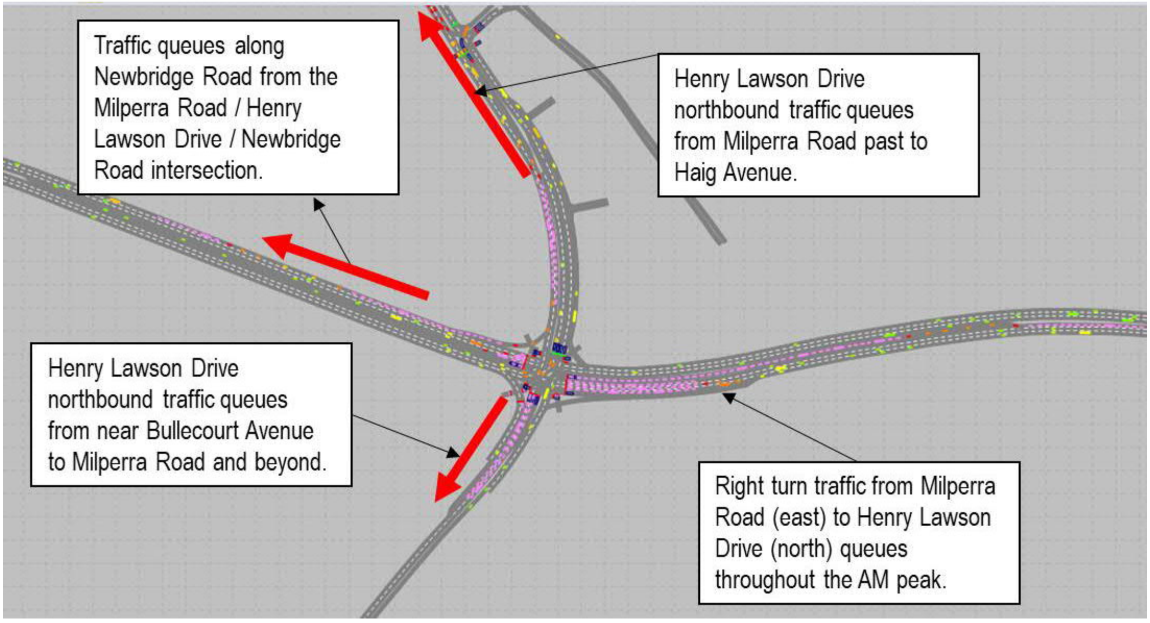
5.2 TYPICAL QUEUE LENGTHS

Traffic queues were observed at various points throughout the model simulation period. The key queues for each peak are outlined below.

5.2.1 AM Peak

Henry Lawson Drive, Milperra Road and Edgar Street are the key roads in the network on which traffic queues develop in the AM peak. Typical queues at these locations are shown in Figure 5.21 to Figure 5.23.

Queues at the Henry Lawson Drive / Milperra Road / Newbridge Road intersection are predominantly created by traffic travelling to the north on Henry Lawson Drive. Right turn traffic from Milperra Road queues past the extent of the dedicated right turn bay, whilst left turn traffic from Newbridge Road impacts through traffic, extending queues along Newbridge Road. The queues on Henry Lawson Drive extend from Haig Avenue in the north, through the Henry Lawson Drive / Milperra Road / Newbridge Road intersection, to Bullecourt Avenue.



Traffic queues along Newbridge Road from the Milperra Road / Henry Lawson Drive / Newbridge Road intersection.

Henry Lawson Drive northbound traffic queues from Milperra Road past to Haig Avenue.

Henry Lawson Drive northbound traffic queues from near Bullecourt Avenue to Milperra Road and beyond.

Right turn traffic from Milperra Road (east) to Henry Lawson Drive (north) queues throughout the AM peak.

Figure 5.21: Henry Lawson Drive / Milperra Road / Newbridge Road Intersection Queues – AM Peak

Figure 5.22: Henry Lawson Drive Queues – AM Peak

The Edgar Street / Eldridge Road roundabouts cause a bottleneck which can generate traffic queues for northbound and southbound traffic. The Milperra Road / Edgar Street / Queen Street intersection also experiences queueing in the AM peak, with right turn traffic from Milperra Road east and the northbound approach on Edgar Street displaying the longest queues.

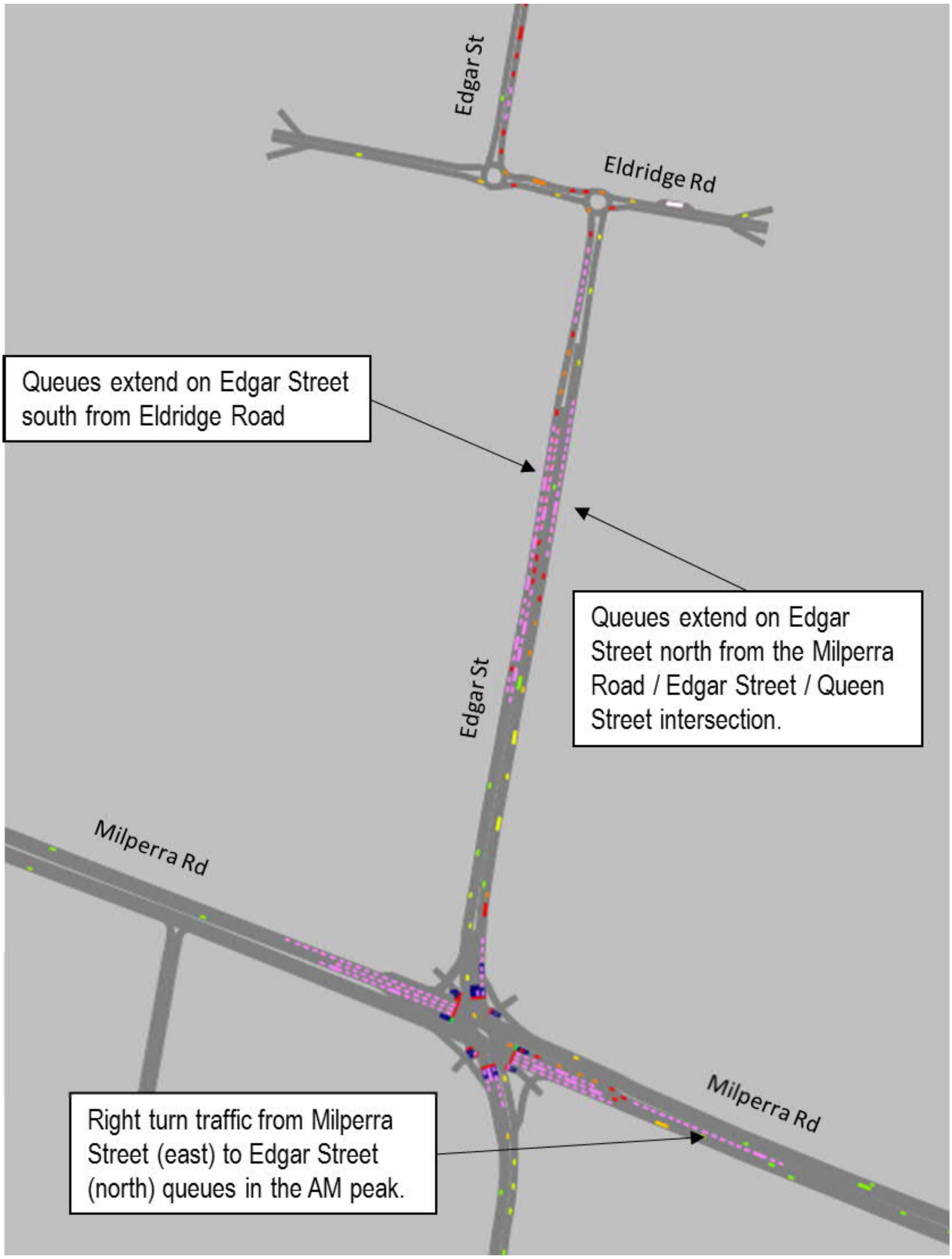
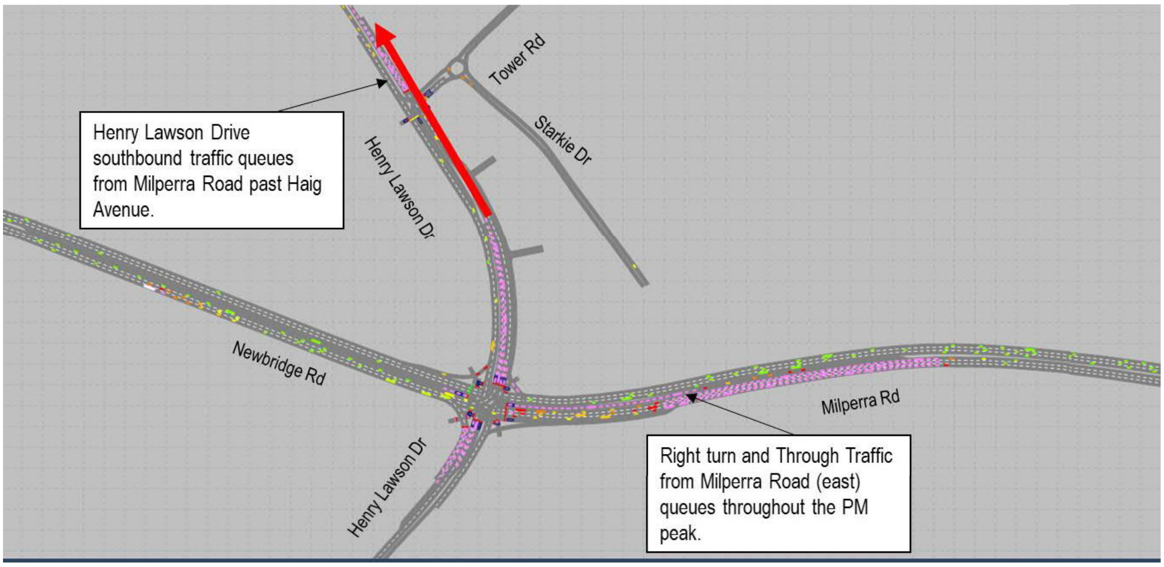


Figure 5.23: Milperra Road / Edgar Street / Queen Street Intersection Queues – AM Peak

5.2.2 PM Peak

Henry Lawson Drive, Milperra Road and Edgar Street are the key roads in the network on which traffic queues develop in the PM peak. Typical queues at these locations are shown in Figure 5.24 to Figure 5.26.

Queues at the Henry Lawson Drive / Milperra Road / Newbridge Road intersection are predominantly created by traffic travelling to the south on Henry Lawson Drive. The queues on Henry Lawson Drive extend from Milperra Road in the south, through the Henry Lawson Drive / Haig Avenue intersection and beyond. The queues impact the traffic attempting to access Henry Lawson Drive to from Tower Road and Starkie Drive. Right turn traffic from Milperra Road also queues in the PM peak, although the extent of these queues are not as severe as the PM peak.



Henry Lawson Drive southbound traffic queues from Milperra Road past Haig Avenue.

Right turn and Through Traffic from Milperra Road (east) queues throughout the PM peak.

Figure 5.24: Henry Lawson Drive / Milperra Road / Newbridge Road Intersection Queues – PM Peak

The queues on Henry Lawson Drive also impact the traffic on Haig Avenue, with queues and delays for vehicles experiences for vehicles turning left or right from Haig Avenue to Henry Lawson Drive.

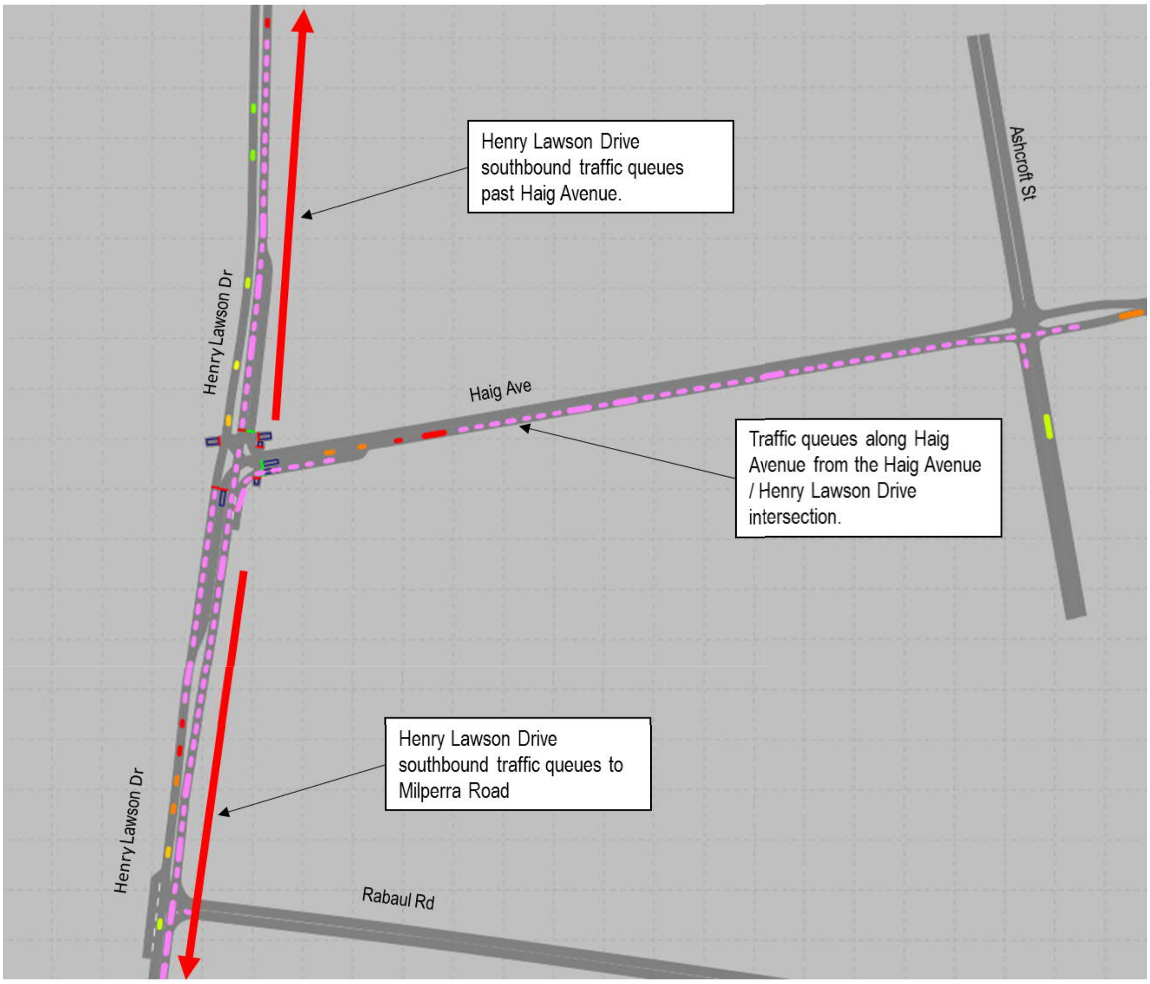
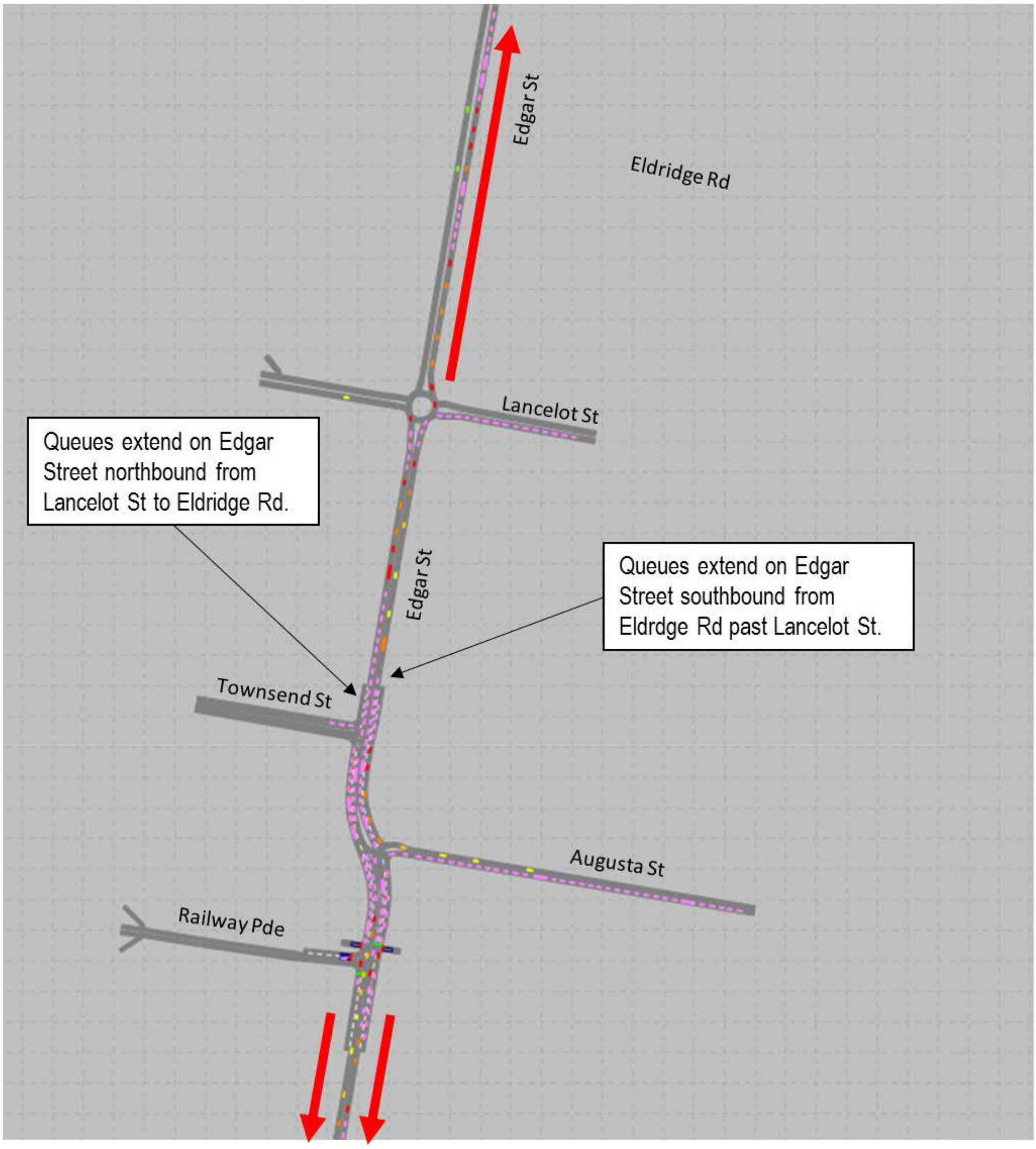


Figure 5.25: Henry Lawson Drive Queues – PM Peak

Edgar Street carries heavy traffic volumes in both directions, especially in the PM peak. The Lancelot Street roundabout, as well as the Eldridge Road roundabouts and merge points where two traffic lanes become one, cause queues and travel time delays.



Queues extend on Edgar Street northbound from Lancelot St to Eldridge Rd.

Queues extend on Edgar Street southbound from Eldrdge Rd past Lancelot St.

Figure 5.26: Milperra Road / Edgar Street / Queen Street Intersection Queues – PM Peak

5.3 SIGNAL TIME VALIDATION

5.3.1 Data Comparisons

SCATS data obtained from RMS have been compared with model signal times. As per the RMS Modelling Guidelines the following signal attributes were used in the comparison:

- Cycle Time: average modelled cycle time in one-hour period to be within 10 percent of observed average:
- Green Time: total of green time over each one-hour period to be within 10 percent of observed equivalent for each phase; and
- Call Frequency: call frequency if demand-dependent phases (including pedestrian phase calls) to be compared with observed data to ensure phase activation occurs to a similar level over each hour period.

A detailed comparison of modelled and observed Cycle Time, Phase Time and Offset for each intersection across the Weekday AM and Weekday PM peak is presented in Attachment D.

5.3.2 Cycle Time

Most of the VISSIM cycle times are within 10% of SCATS average cycle time. The exceptions are clearly identified in Attachment D. The exceptions are mainly either minor or resulting due to differences in cycle time.

5.3.3 Phase Time

Generally, the average phase times are within 10% of SCATS average phase times. There are some exceptions which are clearly identified in Attachment D. The exceptions are mainly either minor or resulting due to differences in cycle time.

5.3.4 Call Frequency

SCATS data was interrogated to find out which phases are called in most of the cycles. In order to simplify the VisVAP signal logic in VISSIM, it has been programmed in such a way that these phases are called in every cycle in VISSIM.

Phases which are not called in most of the cycles, are programmed as demand dependent.

6. CONCLUDING STATEMENT

In summary, the VISSIM models are deemed suitably calibrated and validated.

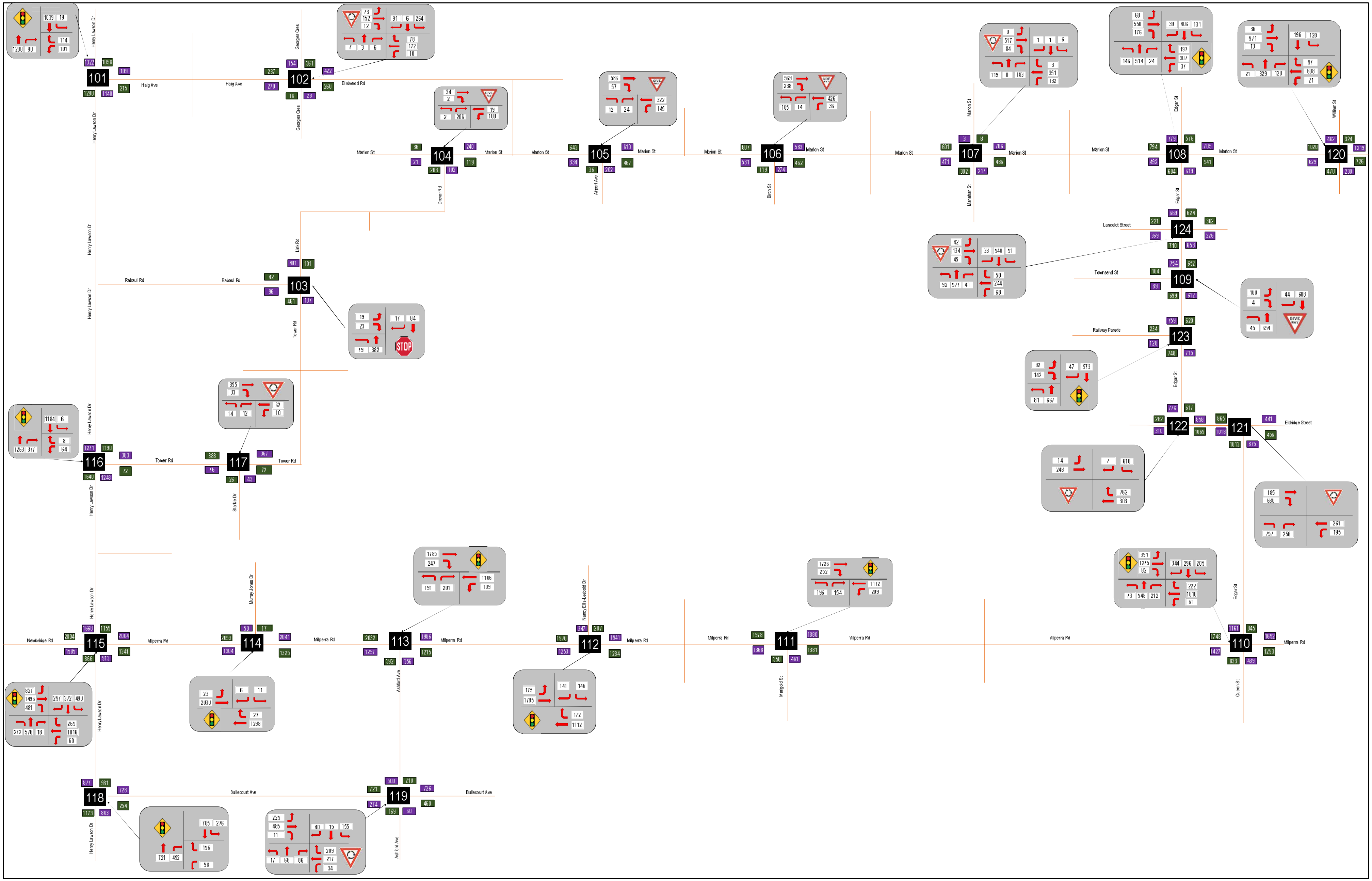
The models are considered fit for purpose of testing the benefits and impacts of proposed improvements in future year scenarios.

ATTACHMENT A

BALANCED TRAFFIC COUNT SUMMARY

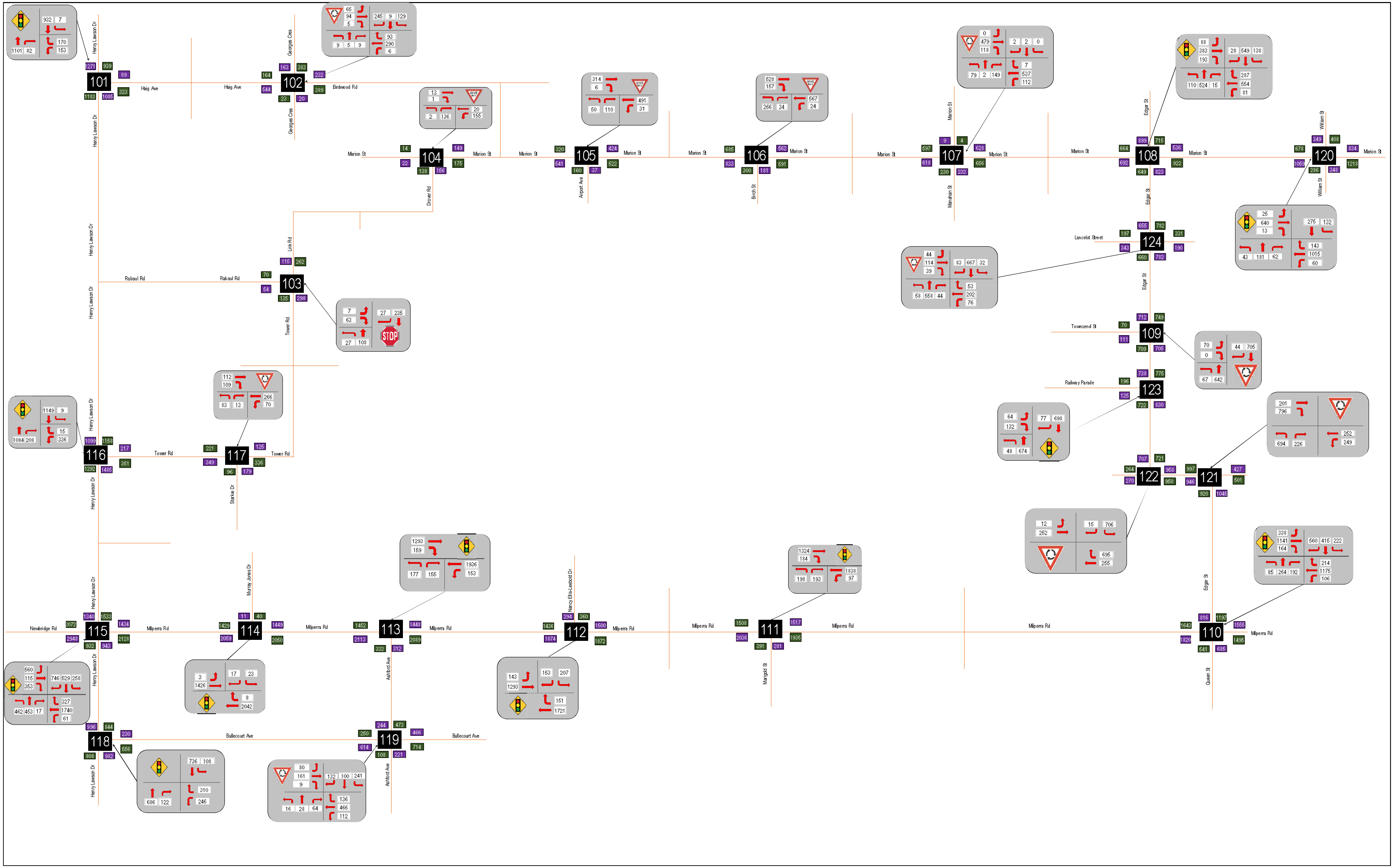
P3199 Bankstown Airport Major Development Plan

Stick Diagram - AM Peak All



P3199 Bankstown Airport Major Development Plan

Stick Diagram - PM Peak All



ATTACHMENT B

CALIBRATION AND VALIDATION SUMMARY

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

2

GEH Turn Summary 0800-0900		
>10	0	0.00%
>5, <=10	2	1.05%
<=5	189	98.95%

Time	ID	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,039	1,035	-4	-0.4%	✓ 0.1	Y	9.9	A	29
		Haig Avenue	101-3		Haig Ave [E]	L	19	40	21	110.5%	✓ 3.9	Y	2.5	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	114	149	35	30.7%	✓ 3.1	Y	55.7	D	16
			101-6		Henry Lawson Dr [S]	L	101	116	15	14.9%	✓ 1.4	Y	50.1	D	9
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	90	109	19	21.1%	✓ 1.9	Y	29.7	C	3
			101-8		Henry Lawson Dr [N]	T	1,208	1,195	-13	-1.1%	✓ 0.4	Y	11.0	A	41
				All			2,571	2,644					15.4	B	16
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	91	81	-10	-11.0%	✓ 1.1	Y	5.2	A	3
		Georges Crescent	102-2		Georges Cres [S]	T	6	11	5	83.3%	✓ 1.7	Y	5.4	A	3
		Birdwood Road	102-3		Birdwood Rd [E]	L	264	278	14	5.3%	✓ 0.9	Y	6.6	A	3
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	78	70	-8	-10.3%	✓ 0.9	Y	2.6	A	0
			102-5		Haig Ave [W]	T	172	161	-11	-6.4%	✓ 0.9	Y	3.0	A	0
			102-6		Georges Cres [N]	L	10	4	-6	-60.0%	✓ 2.3	Y	1.9	A	0
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	6	4	-2	-33.3%	✓ 0.9	Y	2.4	A	0
			102-8		Georges Cres [N]	T	3	0	-3	-100.0%	✓ 2.4	Y	0.0	A	0
			102-9		Haig Ave [W]	L	7	11	4	57.1%	✓ 1.3	Y	3.0	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	12	11	-1	-8.3%	✓ 0.3	Y	2.8	A	0
			102-11		Birdwood Rd [E]	T	152	205	53	34.9%	✓ 4.0	Y	2.2	A	0
			102-12		Georges Cres [N]	L	73	71	-2	-2.7%	✓ 0.2	Y	1.8	A	0
				All			874	907					4.0	A	1
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	17	29	12	70.6%	✓ 2.5	Y	2.1	A	0
		Link Road	103-2		Tower Rd [S]	T	84	56	-28	-33.3%	✓ 3.3	Y	0.1	A	0
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	382	358	-24	-6.3%	✓ 1.2	Y	0.0	A	0
			103-9		Rabaul Rd [W]	L	79	56	-23	-29.1%	✓ 2.8	Y	0.2	A	0
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	23	13	-10	-43.5%	✓ 2.4	Y	1.4	A	0
			103-12		Link Rd [N]	L	19	48	29	152.6%	! 5.0	N	4.2	A	0
				All			604	560					0.6	A	0
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	19	10	-9	-47.4%	✓ 2.4	Y	0.1	A	0
		Drover Road	104-6		Drover Rd [S]	L	100	69	-31	-31.0%	✓ 3.4	Y	-0.4	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	206	262	56	27.2%	✓ 3.7	Y	9.0	A	2
			104-8		Marion St [W]	L	2	1	-1	-50.0%	✓ 0.8	Y	15.1	B	2
			104-10	Marion St [W]	Drover Rd [S]	R	2	4	2	100.0%	✓ 1.2	Y	1.2	A	0
			104-11		Marion St [E]	T	34	42	8	23.5%	✓ 1.3	Y	7.9	A	0
							363	388					6.9	A	1
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	322	349	27	8.4%	✓ 1.5	Y	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	145	104	-41	-28.3%	✓ 3.7	Y	0.4	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	24	38	14	58.3%	✓ 2.5	Y	8.5	A	0
			105-9		Marion St [W]	L	12	9	-3	-25.0%	✓ 0.9	Y	2.7	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	57	91	34	59.6%	✓ 4.0	Y	2.3	A	1
			105-11		Marion St [E]	T	586	635	49	8.4%	✓ 2.0	Y	0.3	A	0
							1,146	1,226					0.7	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	426	402	-24	-5.6%	✓ 1.2	Y	0.3	A	0
		Birch Street	106-6		Birch St [S]	L	36	67	31	86.1%	✓ 4.3	Y	1.2	A	0
			106-7	Birch St [S]	Marion St [E]	R	14	14	0	0.0%	✓ 0.0	Y	5.4	A	0
			106-9		Marion St [W]	L	105	104	-1	-1.0%	✓ 0.1	Y	2.6	A	0
			106-10	Marion St [W]	Birch St [S]	R	238	221	-17	-7.1%	✓ 1.1	Y	2.4	A	1
			106-11		Marion St [E]	T	569	675	106	18.6%	✓ 4.3	Y	0.2	A	0
							1,388	1,503					0.9	A	0
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	1	0	-1	-100.0%	✓ 1.4	Y	0.0	A	0
			107-2		Manahan St [S]	T	1	0	-1	-100.0%	✓ 1.4	Y	0.0	A	0
			107-3		Marion St [E]	L	6	4	-2	-33.3%	✓ 0.9	Y	4.9	A	0
			107-4	Marion St [E]	Marion St [N]	R	3	0	-3	-100.0%	✓ 2.4	Y	0.0	A	1
			107-5		Marion St [W]	T	351	399	48	13.7%	✓ 2.5	Y	3.5	A	1
			107-6		Manahan St [S]	L	132	139	7	5.3%	✓ 0.6	Y	3.9	A	1
			107-7	Manahan St [S]	Marion St [E]	R	183	203	20	10.9%	✓ 1.4	Y	9.5	A	5
			107-8		Marion St [N]	T	0	0	0	#DIV/0!	✓ 0.0	Y	0.0	A	5
			107-9		Marion St [W]	L	119	157	38	31.9%	✓ 3.2	Y	10.3	A	5
			107-10	Marion St [W]	Manahan St [S]	R	84	112	28	33.3%	✓ 2.8	Y	2.4	A	1
			107-11		Marion St [E]	T	517	604	87	16.8%	✓ 3.7	Y	2.3	A	1
			107-12		Marion St [N]	L	0	0	0	#DIV/0!	✓ 0.0	Y	0.0	A	1
							1,397	1,618					4.4	A	2
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	39	62	23	59.0%	✓ 3.2	Y	101.6	F	28
		Edgar Street	108-2		Edgar St [S]	T	406	450	44	10.8%	✓ 2.1	Y	37.9	C	28
			108-3		Marion St [E]	L	131	112	-19	-14.5%	✓ 1.7	Y	29.7	C	29
			108-4	Marion St [E]	Edgar St [N]	R	197	187	-10	-5.1%	✓ 0.7	Y	45.6	D	23
			108-5		Marion St [W]	T	307	328	21	6.8%	✓ 1.2	Y	44.2	D	23
			108-6		Edgar St [S]	L	37	46	9	24.3%	✓ 1.4	Y	45.4	D	23
			108-7	Edgar St [S]	Marion St [E]	R	24	19	-5	-20.8%	✓ 1.1	Y	35.4	C	34
			108-8		Edgar St [N]	T	514	554	40	7.8%	✓ 1.7	Y	34.5	C	34
			108-9		Marion St [W]	L	146	126	-20	-13.7%	✓ 1.7	Y	30.4	C	34
			108-10	Marion St [W]	Edgar St [S]	R	176	165	-11	-6.3%	✓ 0.8	Y	42.2	C	40
			108-11		Marion St [E]	T	550	603	53	9.6%	✓ 2.2	Y	41.2	C	40
			108-12		Edgar St [N]	L	68	107	39	57.4%	✓ 4.2	Y	21.0	B	29
							2,595	2,759					39.7	C	30
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	44	37	-7	-15.9%	✓ 1.1	Y	3.3	A	0
		Townsend Street	109-2		Edgar St[S]	T	608	632	24	3.9%	✓ 1.0	Y	0.3	A	0
			109-8	Edgar St [S]	Edgar St [N]	T	654	681	27	4.1%	✓ 1.0	Y	17.6	B	8
			109-9		Townsend St [W]	L	45	41	-4	-8.9%	✓ 0.6	Y	4.8	A	4
			109-10	Townsend St [W]	Edgar St [S]	R	4	18	14	350.0%	✓ 4.2	Y	11.3	A	1
			109-12		Edgar St [N]	L	100	66	-34	-34.0%	✓ 3.7	Y	29.0	C	2
							1,455	1,475					9.9	A	3

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

2

GEH Turn Summary 0800-0900		
>10	0	0.00%
>5, <=10	2	1.05%
<=5	189	98.95%

Time	ID	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	344	277	-67	-19.5%	✓ 3.8	Y	34.9	C	45
		Milperra Road	110-2		Queen St [S]	T	296	330	34	11.5%	✓ 1.9	Y	93.0	F	206
		Queen St	110-3		Milperra Rd [E]	L	205	244	39	19.0%	✓ 2.6	Y	80.8	F	191
			110-4	Milperra Rd [E]	Edgar St [N]	R	222	231	9	4.1%	✓ 0.6	Y	406.3	F	250
			110-5		Milperra Rd [W]	T	1,010	1,107	97	9.6%	✓ 3.0	Y	66.4	E	249
			110-6		Queen St [S]	L	61	80	19	31.1%	✓ 2.3	Y	39.0	C	232
			110-7	Queen St [S]	Milperra Rd [E]	R	212	201	-11	-5.2%	✓ 0.8	Y	230.3	F	100
			110-8		Edgar St [N]	T	548	473	-75	-13.7%	✓ 3.3	Y	65.4	E	61
			110-9		Milperra Rd [W]	L	73	87	14	19.2%	✓ 1.6	Y	28.7	B	0
			110-10	Milperra Rd [W]	Queen St [S]	R	82	103	21	25.6%	✓ 2.2	Y	114.4	F	41
			110-11		Milperra Rd [E]	T	1,275	1,301	26	2.0%	✓ 0.7	Y	74.5	F	51
			110-12		Edgar Rd [N]	L	391	314	-77	-19.7%	✓ 4.1	Y	36.1	C	0
							4,719	4,748					90.6	F	114
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,172	1,222	50	4.3%	✓ 1.4	Y	6.7	A	7
		Marigold Street	111-6		Marigold Rd [S]	L	209	243	34	16.3%	✓ 2.3	Y	7.7	A	7
			111-7	Marigold St [S]	Milperra Rd [E]	R	154	168	14	9.1%	✓ 1.1	Y	62.5	E	26
			111-9		Milperra Rd [W]	L	196	205	9	4.6%	✓ 0.6	Y	52.8	D	26
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	252	260	8	3.2%	✓ 0.5	Y	38.9	C	15
			111-11		Milperra Rd [E]	T	1,726	1,597	-129	-7.5%	✓ 3.2	Y	1.1	A	1
							3,709	3,695					11.7	A	12
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [E]	R	141	141	0	0.0%	✓ 0.0	Y	102.1	F	28
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [W]	L	146	119	-27	-18.5%	✓ 2.3	Y	56.5	D	28
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	172	171	-1	-0.6%	✓ 0.1	Y	26.2	B	5
			112-5		Milperra Rd [W]	T	1,112	1,266	154	13.8%	✓ 4.5	Y	1.5	A	1
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,795	1,700	-95	-5.3%	✓ 2.3	Y	5.7	A	4
			112-12		Nancy Ellis Leebold Dr [N]	L	175	212	37	21.1%	✓ 2.7	Y	3.4	A	0
							3,541	3,609					10.5	A	8
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,106	1,287	181	16.4%	! 5.2	N	16.9	B	17
		Ashford Avenue	113-6		Ashford Ave [S]	L	109	114	5	4.6%	✓ 0.5	Y	17.7	B	17
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	201	228	27	13.4%	✓ 1.8	Y	71.0	F	35
			113-9		Milperra Rd [W]	L	191	207	16	8.4%	✓ 1.1	Y	54.9	D	35
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	247	203	-44	-17.8%	✓ 2.9	Y	33.8	C	11
			113-11		Milperra Rd [E]	T	1,785	1,688	-97	-5.4%	✓ 2.3	Y	1.6	A	1
							3,639	3,727					16.3	B	16
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	6	5	-1	-16.7%	✓ 0.4	Y	81.9	F	1
		Murray Jones Drive	114-3		Milperra Rd [E]	L	11	9	-2	-18.2%	✓ 0.6	Y	60.9	E	1
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	27	24	-3	-11.1%	✓ 0.6	Y	23.9	B	0
			114-5		Milperra Rd [W]	T	1,298	1,460	162	12.5%	✓ 4.4	Y	6.6	A	5
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	2,030	1,885	-145	-7.1%	✓ 3.3	Y	1.2	A	1
			114-12		Murray Jones Dr [N]	L	23	15	-8	-34.8%	✓ 1.8	Y	4.9	A	1
							3,395	3,398					4.0	A	2
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Milperra Rd [E]	R	297	323	26	8.8%	✓ 1.5	Y	90.8	F	29
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	372	350	-22	-5.9%	✓ 1.2	Y	35.9	C	15
		Newbridge Road	115-3		Newbridge Rd [W]	L	490	465	-25	-5.1%	✓ 1.1	Y	9.4	A	5
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	265	296	31	11.7%	✓ 1.9	Y	266.1	F	415
			115-5		Newbridge Rd [W]	T	1,016	1,079	63	6.2%	✓ 1.9	Y	180.2	F	152
			115-6		Henry Lawson Dr [S]	L	60	56	-4	-6.7%	✓ 0.5	Y	10.1	A	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	18	14	-4	-22.2%	✓ 1.0	Y	167.2	F	2
			115-8		Henry Lawson Dr [N]	T	576	577	1	0.2%	✓ 0.0	Y	156.6	F	185
			115-9		Newbridge Rd [W]	L	272	288	16	5.9%	✓ 1.0	Y	32.0	C	4
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	481	511	30	6.2%	✓ 1.3	Y	36.0	C	32
			115-11		Milperra Rd [E]	T	1,496	1,437	-59	-3.9%	✓ 1.5	Y	42.6	C	290
			115-12		Henry Lawson Dr [N]	L	827	835	8	1.0%	✓ 0.3	Y	59.5	E	283
							6,170	6,236					88.4	F	109
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,184	1,112	-72	-6.1%	✓ 2.1	Y	10.3	A	15
		Tower Road	116-3		Tower Rd [E]	L	6	15	9	150.0%	✓ 2.8	Y	13.7	A	15
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	8	3	-5	-62.5%	✓ 2.1	Y	66.2	E	12
			116-6		Henry Lawson Dr [S]	L	64	88	24	37.5%	✓ 2.8	Y	64.4	E	12
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	377	410	33	8.8%	✓ 1.7	Y	51.3	D	63
			116-8		Henry Lawson Dr [N]	T	1,263	1,263	0	0.0%	✓ 0.0	Y	53.1	D	156
							2,902	2,891					36.5	C	62
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	62	76	14	22.6%	✓ 1.7	Y	10.0	A	0
		Starkie Drive	117-6		Starkie Rd [S]	L	10	8	-2	-20.0%	✓ 0.7	Y	1.4	A	0
			117-7	Starkie Dr [S]	Tower Rd [E]	R	12	14	2	16.7%	✓ 0.6	Y	0.6	A	0
			117-9		Tower Rd [W]	L	14	15	1	7.1%	✓ 0.3	Y	5.3	A	0
			117-10	Tower Rd [W]	Starkie Rd [S]	R	33	48	15	45.5%	✓ 2.4	Y	1.2	A	0
			117-11		Tower Rd [E]	T	355	377	22	6.2%	✓ 1.1	Y	1.0	A	0
							486	538					2.4	A	0
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	705	673	-32	-4.5%	✓ 1.2	Y	15.3	B	19
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	276	244	-32	-11.6%	✓ 2.0	Y	6.7	A	19
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	156	173	17	10.9%	✓ 1.3	Y	82.1	F	36
		Counts with an * represent missing count data	118-6		Henry Lawson Dr [S]	L	98	85	-13	-13.3%	✓ 1.4	Y	40.3	C	36
			118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	452	414	-38	-8.4%	✓ 1.8	Y	34.4	C	46
			118-8		Henry Lawson Dr [N]	T	721	794	73	10.1%	✓ 2.7	Y	6.3	A	24
							2,408	2,383					20.5	B	31
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	40	19	-21	-52.5%	✓ 3.9	Y	2.9	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	15	20	5	33.3%	✓ 1.2	Y	4.4	A	0
			119-3		Bullecourt Ave [E]	L	155	205	50	32.3%	✓ 3.7	Y	3.5	A	0
		Counts with an * represent missing count data	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	209	252	43	20.6%	✓ 2.8	Y	2.5	A	0
			119-5		Bullecourt Ave [W]	T	217	227	10	4.6%	✓ 0.7	Y	2.3	A	0
			119-6		Ashford Ave [S]	L	34	34	0	0.0%	✓ 0.0	Y	1.4	A	0
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	86	88	2	2.3%	✓ 0.2	Y	3.6	A	0
			119-8		Ashford Ave [N]	T	66	61	-5	-7.6%	✓ 0.6	Y	3.6	A	0
			119-9		Bullecourt Ave [W]	L	17	26	9	52.9%	✓ 1.9	Y	3.9	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	11	19	8	72.7%	✓ 2.1	Y	6.5	A	5
			119-11		Bullecourt Ave [E]	T	485	414	-71	-14.6%	✓ 3.3	Y	6.5	A	5
			119-12		Ashford Ave [N]	L	225	214	-11	-4.9%	✓ 0.7	Y	5.9	A	5
							1,560	1,581					4.3	A	1

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

2

GEH Turn Summary 0800-0900		
>10	0	0.00%
>5, <=10	2	1.05%
<=5	189	98.95%

Time	ID	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
	206	William Street	120-2	William St [N]	William St [S]	T	196	200	4	2.0%	✓ 0.3	Y	41.6	C	19
		Marion Street	120-3		Marion St [E]	L	128	129	1	0.8%	✓ 0.1	Y	41.0	C	19
			120-4	Marion St [E]	William St [N]	R	97	94	-3	-3.1%	✓ 0.3	Y	40.0	C	17
			120-5		Marion St [W]	T	608	639	31	5.1%	✓ 1.2	Y	20.2	B	17
			120-6		William St [S]	L	21	21	0	0.0%	✓ 0.0	Y	24.7	B	17
		Counts with an * represent missing count data	120-7	William St [S]	Marion St [E]	R	120	121	1	0.8%	✓ 0.1	Y	43.4	D	37
			120-8		William St [N]	T	329	328	-1	-0.3%	✓ 0.1	Y	39.8	C	37
			120-9		Marion St [W]	L	21	15	-6	-28.6%	✓ 1.4	Y	40.2	C	37
			120-10	Marion St [W]	William St [S]	R	13	11	-2	-15.4%	✓ 0.6	Y	39.5	C	40
			120-11		Marion St [E]	T	971	991	20	2.1%	✓ 0.6	Y	36.3	C	40
			120-12		William St [N]	L	36	30	-6	-16.7%	✓ 1.0	Y	40.8	C	40
							2,540	2,579					33.9	C	28
	107	Edgar Street	124-1	EdgarSt [N]	Lancelot St [W]	R	33	56	23	69.7%	✓ 3.4	Y	13.5	A	18
		Lancelot Street	124-1		EdgarSt [S]	T	540	564	24	4.4%	✓ 1.0	Y	13.6	A	18
			124-1		Lancelot St [E]	L	51	34	-17	-33.3%	✓ 2.6	Y	12.0	A	18
			124-1	Lancelot St [E]	EdgarSt [N]	R	50	40	-10	-20.0%	✓ 1.5	Y	14.5	A	9
			124-1		Lancelot St [W]	T	244	222	-22	-9.0%	✓ 1.4	Y	14.9	A	9
			124-1		EdgarSt [S]	L	68	73	5	7.4%	✓ 0.6	Y	18.4	B	9
			124-1	EdgarSt [S]	Lancelot St [E]	R	41	34	-7	-17.1%	✓ 1.1	Y	32.7	C	94
			124-1		EdgarSt [N]	T	577	605	28	4.9%	✓ 1.2	Y	32.7	C	94
			124-1		Lancelot St [W]	L	92	100	8	8.7%	✓ 0.8	Y	30.2	C	94
			124-1	Lancelot St [W]	EdgarSt [S]	R	45	31	-14	-31.1%	✓ 2.3	Y	12.0	A	3
			124-1		Lancelot St [E]	T	134	108	-26	-19.4%	✓ 2.4	Y	12.2	A	3
			124-1		EdgarSt [N]	L	42	44	2	4.8%	✓ 0.3	Y	13.3	A	3
							1,917	1,911					21.1	B	31
	112	Edgar St	122-1	Edgar St [N]	Eldridge Rd [W]	R	7	0	-7	-100.0%	✓ 3.7	Y	0.0	A	87
		Eldridge Rd (West)	122-3		Eldridge Rd [E]	L	610	706	96	15.7%	✓ 3.7	Y	34.3	C	87
			122-4	Eldridge Rd [E]	Edgar St [N]	R	762	685	-77	-10.1%	✓ 2.9	Y	3.4	A	3
			122-5		Eldridge St [W]	T	303	341	38	12.5%	✓ 2.1	Y	3.6	A	3
			122-11	Eldridge Rd [W]	Eldridge Rd [E]	T	248	184	-64	-25.8%	✓ 4.4	Y	12.8	A	2
			122-12		Edgar St [N]	L	14	6	-8	-57.1%	✓ 2.5	Y	3.7	A	2
							1,944	1,922					15.7	B	31
	113	Edgar St	121-5	Eldridge Rd [E]	Eldridge Rd [W]	T	261	290	29	11.1%	✓ 1.7	Y	11.4	A	6
		Eldridge Rd (East)	121-6		Edgar St [S]	L	195	202	7	3.6%	✓ 0.5	Y	9.7	A	6
			121-7	Edgar St [S]	Eldridge Rd [E]	R	256	295	39	15.2%	✓ 2.3	Y	24.6	B	230
			121-9		Eldridge Rd [W]	L	757	735	-22	-2.9%	✓ 0.8	Y	25.4	B	230
			121-10	Eldridge Rd [W]	Edgar St [S]	R	680	692	12	1.8%	✓ 0.5	Y	6.7	A	16
			121-11		Eldridge St [E]	T	185	198	13	7.0%	✓ 0.9	Y	5.9	A	16
							2,334	2,412					15.3	B	84
	110	Edgar St	123-1	Edgar St [N]	Railway Pde [W]	R	47	64	17	36.2%	✓ 2.3	Y	9.9	A	4
		Railway Pde	123-2		Edgar St [S]	T	573	594	21	3.7%	✓ 0.9	Y	5.4	A	4
			123-8	Edgar St [S]	Edgar St [N]	T	667	630	-37	-5.5%	✓ 1.5	Y	5.8	A	4
			123-9		Railway Pde [W]	L	81	52	-29	-35.8%	✓ 3.6	Y	6.4	A	4
			123-10	Railway Pde [W]	Edgar St [S]	R	142	143	1	0.7%	✓ 0.1	Y	22.3	B	7
			123-12		Edgar St [N]	L	92	80	-12	-13.0%	✓ 1.3	Y	26.5	B	7
							1,602	1,563					8.4	A	5

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Run 2

GEH Turn Summary 0745-0845		
>10	0	0.00%
>5, <=10	8	4.19%
<=5	183	95.81%

Time	1	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	980	1,114	134	13.7%	✓ 4.1	Y	14.7	A	57
		Haig Avenue	101-3		Haig Ave [E]	L	7	4	-3	-42.9%	✓ 1.3	Y	7.6	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	170	190	20	11.8%	✓ 1.5	Y	49.1	D	17
			101-6		Henry Lawson Dr [S]	L	153	139	-14	-9.2%	✓ 1.2	Y	53.1	D	14
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	82	67	-15	-18.3%	✓ 1.7	Y	52.3	D	3
			101-8		Henry Lawson Dr [N]	T	1,101	1,054	-47	-4.3%	✓ 1.4	Y	14.5	A	47
				All			2,493	2,568					20.2	B	23
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	245	184	-61	-24.9%	✓ 4.2	Y	1.9	A	0
		Georges Crescent	102-2		Georges Cres [S]	T	9	10	1	11.1%	✓ 0.3	Y	0.7	A	0
		Birdwood Road	102-3		Birdwood Rd [E]	L	129	96	-33	-25.6%	✓ 3.1	Y	1.6	A	0
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	93	102	9	9.7%	✓ 0.9	Y	3.7	A	1
			102-5		Haig Ave [W]	T	290	275	-15	-5.2%	✓ 0.9	Y	3.5	A	1
			102-6		Georges Cres [N]	L	6	22	16	266.7%	✓ 4.3	Y	3.9	A	1
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	9	5	-4	-44.4%	✓ 1.5	Y	6.3	A	0
			102-8		Georges Cres [N]	T	5	2	-3	-60.0%	✓ 1.6	Y	7.5	A	0
			102-9		Haig Ave [W]	L	9	6	-3	-33.3%	✓ 1.1	Y	5.7	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	5	9	4	80.0%	✓ 1.5	Y	3.0	A	0
			102-11		Birdwood Rd [E]	T	94	70	-24	-25.5%	✓ 2.7	Y	2.3	A	0
			102-12		Georges Cres [N]	L	65	76	11	16.9%	✓ 1.3	Y	3.0	A	0
				All			959	857					2.8	A	0
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	27	61	34	125.9%	! 5.1	N	0.7	A	0
		Link Road	103-2		Tower Rd [S]	T	235	238	3	1.3%	✓ 0.2	Y	0.3	A	0
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	108	97	-11	-10.2%	✓ 1.1	Y	0.0	A	0
			103-9		Rabaul Rd [W]	L	27	13	-14	-51.9%	✓ 3.1	Y	0.2	A	0
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	63	58	-5	-7.9%	✓ 0.6	Y	2.6	A	0
			103-12		Link Rd [N]	L	7	28	21	300.0%	! 5.0	N	1.7	A	0
				All			467	495					0.6	A	0
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	20	34	14	70.0%	✓ 2.7	Y	0.1	A	0
		Drover Road	104-6		Drover Rd [S]	L	155	174	19	12.3%	✓ 1.5	Y	-0.5	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	136	157	21	15.4%	✓ 1.7	Y	1.6	A	0
			104-8		Marion St [W]	L	2	2	0	0.0%	✓ 0.0	Y	0.5	A	0
			104-10	Marion St [W]	Drover Rd [S]	R	1	15	14	1400.0%	✓ 4.9	Y	1.2	A	0
			104-11		Marion St [E]	T	13	5	-8	-61.5%	✓ 2.7	Y	1.7	A	0
							327	387					0.5	A	0
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	491	598	107	21.8%	✓ 4.6	Y	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	50	72	22	44.0%	✓ 2.8	Y	0.4	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	110	58	-52	-47.3%	! 5.7	N	8.1	A	0
			105-9		Marion St [W]	L	50	54	4	8.0%	✓ 0.6	Y	3.1	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	6	19	13	216.7%	✓ 3.7	Y	2.5	A	1
			105-11		Marion St [E]	T	314	281	-33	-10.5%	✓ 1.9	Y	0.2	A	0
							1,021	1,082					0.8	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	567	635	68	12.0%	✓ 2.8	Y	0.7	A	0
		Birch Street	106-6		Birch St [S]	L	24	26	2	8.3%	✓ 0.4	Y	2.2	A	0
			106-7	Birch St [S]	Marion St [E]	R	34	30	-4	-11.8%	✓ 0.7	Y	10.8	A	4
			106-9		Marion St [W]	L	266	222	-44	-16.5%	✓ 2.8	Y	10.0	A	4
			106-10	Marion St [W]	Birch St [S]	R	157	151	-6	-3.8%	✓ 0.5	Y	4.1	A	1
			106-11		Marion St [E]	T	528	457	-71	-13.4%	✓ 3.2	Y	0.1	A	0
							1,576	1,562					2.6	A	2
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	2	1	-1	-50.0%	✓ 0.8	Y	1.6	A	0
			107-2		Manahan St [S]	T	2	2	0	0.0%	✓ 0.0	Y	3.3	A	0
			107-3		Marion St [E]	L	0	1	1	#DIV/0!	✓ 1.4	Y	13.3	A	0
			107-4	Marion St [E]	Marion St [N]	R	7	2	-5	-71.4%	✓ 2.4	Y	10.9	A	7
			107-5		Marion St [W]	T	537	587	50	9.3%	✓ 2.1	Y	9.4	A	7
			107-6		Manahan St [S]	L	112	165	53	47.3%	✓ 4.5	Y	5.4	A	7
			107-7	Manahan St [S]	Marion St [E]	R	149	137	-12	-8.1%	✓ 1.0	Y	14.0	A	5
			107-8		Marion St [N]	T	2	1	-1	-50.0%	✓ 0.8	Y	4.6	A	5
			107-9		Marion St [W]	L	79	91	12	15.2%	✓ 1.3	Y	14.2	A	5
			107-10	Marion St [W]	Manahan St [S]	R	118	101	-17	-14.4%	✓ 1.6	Y	3.1	A	1
			107-11		Marion St [E]	T	479	442	-37	-7.7%	✓ 1.7	Y	2.6	A	1
			107-12		Marion St [N]	L	0	0	0	#DIV/0!	✓ 0.0	Y	0.0	A	1
							1,487	1,530					7.3	A	3
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	28	30	2	7.1%	✓ 0.4	Y	59.8	E	24
		Edgar Street	108-2		Edgar St [S]	T	549	509	-40	-7.3%	✓ 1.7	Y	33.7	C	24
			108-3		Marion St [E]	L	138	129	-9	-6.5%	✓ 0.8	Y	30.7	C	24
			108-4	Marion St [E]	Edgar St [N]	R	287	252	-35	-12.2%	✓ 2.1	Y	66.6	E	77
			108-5		Marion St [W]	T	554	585	31	5.6%	✓ 1.3	Y	66.6	E	77
			108-6		Edgar St [S]	L	81	91	10	12.3%	✓ 1.1	Y	63.3	E	77
			108-7	Edgar St [S]	Marion St [E]	R	15	16	1	6.7%	✓ 0.3	Y	44.8	D	23
			108-8		Edgar St [N]	T	524	513	-11	-2.1%	✓ 0.5	Y	32.2	C	23
			108-9		Marion St [W]	L	110	104	-6	-5.5%	✓ 0.6	Y	31.9	C	23
			108-10	Marion St [W]	Edgar St [S]	R	193	150	-43	-22.3%	✓ 3.3	Y	44.4	D	27
			108-11		Marion St [E]	T	383	366	-17	-4.4%	✓ 0.9	Y	44.8	D	27
			108-12		Edgar St [N]	L	88	106	18	20.5%	✓ 1.8	Y	14.9	A	18
							2,950	2,851					45.5	D	34
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	44	29	-15	-34.1%	✓ 2.5	Y	3.8	A	1
		Townsend Street	109-2		Edgar St[S]	T	705	762	57	8.1%	✓ 2.1	Y	7.1	A	0
			109-8	Edgar St [S]	Edgar St [N]	T	642	601	-41	-6.4%	✓ 1.6	Y	100.6	F	57
			109-9		Townsend St [W]	L	67	28	-39	-58.2%	! 5.7	N	55.0	D	42
			109-10	Townsend St [W]	Edgar St [S]	R	1	0	-1	-100.0%	✓ 1.4	Y	#N/A	#N/A	#N/A
			109-12		Edgar St [N]	L	70	89	19	27.1%	✓ 2.1	Y	172.5	F	32
							1,529	1,509					54.9	D	26

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Run 2

GEH Turn Summary 0745-0845		
>10	0	0.00%
>5, <=10	8	4.19%
<=5	183	95.81%

Time	1	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	587	524	-63	-10.7%	✓ 2.7	Y	48.1	D	47
		Milperra Road	110-2		Queen St [S]	T	417	343	-74	-17.7%	✓ 3.8	Y	55.3	D	58
		Queen St	110-3		Milperra Rd [E]	L	222	212	-10	-4.5%	✓ 0.7	Y	40.0	C	0
			110-4	Milperra Rd [E]	Edgar St [N]	R	214	205	-9	-4.2%	✓ 0.6	Y	432.5	F	254
			110-5		Milperra Rd [W]	T	1,175	1,234	59	5.0%	✓ 1.7	Y	65.3	E	253
			110-6		Queen St [S]	L	106	88	-18	-17.0%	✓ 1.8	Y	34.6	C	236
			110-7	Queen St [S]	Milperra Rd [E]	R	192	189	-3	-1.6%	✓ 0.2	Y	117.0	F	44
			110-8		Edgar St [N]	T	264	339	75	28.4%	✓ 4.3	Y	51.1	D	23
			110-9		Milperra Rd [W]	L	85	125	40	47.1%	✓ 3.9	Y	24.9	B	0
			110-10	Milperra Rd [W]	Queen St [S]	R	164	132	-32	-19.5%	✓ 2.6	Y	102.8	F	27
			110-11		Milperra Rd [E]	T	1,141	1,193	52	4.6%	✓ 1.5	Y	51.0	D	24
			110-12		Edgar Rd [N]	L	338	298	-40	-11.8%	✓ 2.2	Y	9.5	A	0
							4,905	4,882					70.6	F	76
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,838	1,738	-100	-5.4%	✓ 2.4	Y	7.6	A	8
		Marigold Street	111-6		Marigold Rd [S]	L	97	130	33	34.0%	✓ 3.1	Y	8.1	A	8
			111-7	Marigold St [S]	Milperra Rd [E]	R	193	222	29	15.0%	✓ 2.0	Y	88.2	F	49
			111-9		Milperra Rd [W]	L	198	237	39	19.7%	✓ 2.6	Y	59.4	E	49
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	184	143	-41	-22.3%	✓ 3.2	Y	36.9	C	6
			111-11		Milperra Rd [E]	T	1,324	1,415	91	6.9%	✓ 2.5	Y	10.2	A	16
							3,834	3,885					17.4	B	20
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [W]	R	153	194	41	26.8%	✓ 3.1	Y	81.9	F	36
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [E]	L	207	224	17	8.2%	✓ 1.2	Y	56.0	D	36
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	151	151	0	0.0%	✓ 0.0	Y	20.6	B	3
			112-5		Milperra Rd [W]	T	1,721	1,812	91	5.3%	✓ 2.2	Y	4.0	A	3
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,293	1,360	67	5.2%	✓ 1.8	Y	2.3	A	1
			112-12		Nancy Ellis Leebold Dr [N]	L	143	162	19	13.3%	✓ 1.5	Y	2.0	A	0
							3,668	3,903					10.8	A	9
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,936	1,892	-44	-2.3%	✓ 1.0	Y	4.6	A	5
		Ashford Avenue	113-6		Ashford Ave [S]	L	153	168	15	9.8%	✓ 1.2	Y	2.9	A	5
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	155	135	-20	-12.9%	✓ 1.7	Y	61.8	E	17
			113-9		Milperra Rd [W]	L	177	84	-93	-52.5%	! 8.1	N	57.4	E	17
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	159	154	-5	-3.1%	✓ 0.4	Y	42.5	C	8
			113-11		Milperra Rd [E]	T	1,293	1,377	84	6.5%	✓ 2.3	Y	6.7	A	6
							3,873	3,810					10.0	A	9
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	17	17	0	0.0%	✓ 0.0	Y	62.6	E	3
		Murray Jones Drive	114-3		Milperra Rd [E]	L	23	30	7	30.4%	✓ 1.4	Y	60.3	E	3
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	8	10	2	25.0%	✓ 0.7	Y	5.1	A	0
			114-5		Milperra Rd [W]	T	2,042	1,979	-63	-3.1%	✓ 1.4	Y	1.0	A	1
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	1,426	1,500	74	5.2%	✓ 1.9	Y	13.5	A	14
			114-12		Murray Jones Dr [N]	L	3	3	0	0.0%	✓ 0.0	Y	11.3	A	14
							3,519	3,539					7.1	A	4
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Newbridge Rd [W]	R	746	646	-100	-13.4%	✓ 3.8	Y	171.8	F	182
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	529	512	-17	-3.2%	✓ 0.7	Y	37.4	C	18
		Newbridge Road	115-3		Milperra Rd [E]	L	258	271	13	5.0%	✓ 0.8	Y	4.1	A	0
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	362	280	-82	-22.7%	✓ 4.6	Y	224.4	F	205
			115-5		Newbridge Rd [W]	T	1,740	1,532	-208	-12.0%	! 5.1	N	133.1	F	393
			115-6		Henry Lawson Dr [S]	L	61	67	6	9.8%	✓ 0.8	Y	20.9	B	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	17	3	-14	-82.4%	✓ 4.4	Y	169.6	F	1
			115-8		Henry Lawson Dr [N]	T	453	467	14	3.1%	✓ 0.7	Y	255.6	F	213
			115-9		Newbridge Rd [W]	L	462	506	44	9.5%	✓ 2.0	Y	64.3	E	38
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	353	356	3	0.8%	✓ 0.2	Y	61.9	E	42
			115-11		Milperra Rd [E]	T	1,159	1,260	101	8.7%	✓ 2.9	Y	38.0	C	42
			115-12		Henry Lawson Dr [N]	L	560	628	68	12.1%	✓ 2.8	Y	27.0	B	24
							6,700	6,533					97.8	F	89
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,149	1,110	-39	-3.4%	✓ 1.2	Y	31.3	C	214
		Tower Road	116-3		Tower Rd [E]	L	9	4	-5	-55.6%	✓ 2.0	Y	22.8	B	214
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	15	12	-3	-20.0%	✓ 0.8	Y	43.9	D	25
			116-6		Henry Lawson Dr [S]	L	336	392	56	16.7%	✓ 2.9	Y	20.6	B	25
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	208	183	-25	-12.0%	✓ 1.8	Y	39.3	C	10
			116-8		Henry Lawson Dr [N]	T	1,084	1,161	77	7.1%	✓ 2.3	Y	49.8	D	114
							2,801	2,862					37.9	C	91
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	266	293	27	10.2%	✓ 1.6	Y	31.8	C	14
		Starkie Drive	117-6		Starkie Rd [S]	L	70	48	-22	-31.4%	✓ 2.9	Y	20.5	B	14
			117-7	Starkie Dr [S]	Tower Rd [E]	R	13	8	-5	-38.5%	✓ 1.5	Y	16.7	B	5
			117-9		Tower Rd [W]	L	83	111	28	33.7%	✓ 2.8	Y	35.6	C	5
			117-10	Tower Rd [W]	Starkie Rd [S]	R	109	97	-12	-11.0%	✓ 1.2	Y	2.6	A	0
			117-11		Tower Rd [E]	T	112	90	-22	-19.6%	✓ 2.2	Y	1.9	A	0
							653	647					22.9	B	7
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	736	870	134	18.2%	✓ 4.7	Y	34.2	C	61
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	108	62	-46	-42.6%	✓ 5.0	Y	19.7	B	61
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	310	406	96	31.0%	! 5.1	N	80.7	F	135
		Counts with an * represent missing count data	118-6		Henry Lawson Dr [S]	L	246	207	-39	-15.9%	✓ 2.6	Y	67.8	E	135
			118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	122	147	25	20.5%	✓ 2.2	Y	47.0	D	8
			118-8		Henry Lawson Dr [N]	T	686	661	-25	-3.6%	✓ 1.0	Y	11.8	A	14
							2,208	2,353					39.3	C	55
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	132	107	-25	-18.9%	✓ 2.3	Y	2.6	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	100	65	-35	-35.0%	✓ 3.9	Y	2.3	A	0
			119-3		Bullecourt Ave [E]	L	241	257	16	6.6%	✓ 1.0	Y	2.7	A	0
		Counts with an * represent missing count data	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	136	97	-39	-28.7%	✓ 3.6	Y	4.3	A	1
			119-5		Bullecourt Ave [W]	T	466	494	28	6.0%	✓ 1.3	Y	3.6	A	1
			119-6		Ashford Ave [S]	L	112	110	-2	-1.8%	✓ 0.2	Y	3.0	A	1
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	64	60	-4	-6.3%	✓ 0.5	Y	4.3	A	0
			119-8		Ashford Ave [N]	T	28	21	-7	-25.0%	✓ 1.4	Y	3.0	A	0
			119-9		Bullecourt Ave [W]	L	16	27	11	68.8%	✓ 2.4	Y	3.7	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	9	10	1	11.1%	✓ 0.3	Y	2.1	A	0
			119-11		Bullecourt Ave [E]	T	161	132	-29	-18.0%	✓ 2.4	Y	2.0	A	0
			119-12		Ashford Ave [N]	L	80	67	-13	-16.3%	✓ 1.5	Y	1.6	A	0
							1,545	1,453					3.1	A	0

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Run 2

GEH Turn Summary 0745-0845		
>10	0	0.00%
>5, <=10	8	4.19%
<=5	183	95.81%

Time	1	Intersection	Movement Code	From	To	Turn	Observed	Modelled	Abs. Diff (Mod - Obs)	% Diff (Mod - Obs)	GEH	Accept	Delay (s)	LoS	Queue (m)
	206	William Street	120-2	William St [N]	William St [S]	T	275	299	24	8.7%	✓ 1.4	Y	75.1	F	62
		Marion Street	120-3		Marion St [E]	L	132	127	-5	-3.8%	✓ 0.4	Y	73.7	F	62
			120-4	Marion St [E]	William St [N]	R	143	159	16	11.2%	✓ 1.3	Y	26.1	B	24
			120-5		Marion St [W]	T	1,015	1,032	17	1.7%	✓ 0.5	Y	18.9	B	24
			120-6		William St [S]	L	60	56	-4	-6.7%	✓ 0.5	Y	16.7	B	24
		Counts with an * represent missing count data	120-7	William St [S]	Marion St [E]	R	62	59	-3	-4.8%	✓ 0.4	Y	60.7	E	28
			120-8		William St [N]	T	181	204	23	12.7%	✓ 1.7	Y	56.6	D	28
			120-9		Marion St [W]	L	43	34	-9	-20.9%	✓ 1.5	Y	44.4	D	28
			120-10	Marion St [W]	William St [S]	R	13	16	3	23.1%	✓ 0.8	Y	47.8	D	18
			120-11		Marion St [E]	T	640	657	17	2.7%	✓ 0.7	Y	27.4	B	18
			120-12		William St [N]	L	25	24	-1	-4.0%	✓ 0.2	Y	26.0	B	18
							2,589	2,667					34.7	C	33
	107	Edgar Street	0	EdgarSt [N]	Lancelot St [W]	R	83	63	-20	-24.1%	✓ 2.3	Y	31.0	C	58
		Lancelot Street	0		EdgarSt [S]	T	667	656	-11	-1.6%	✓ 0.4	Y	27.9	B	58
			0		Lancelot St [E]	L	32	35	3	9.4%	✓ 0.5	Y	28.3	B	58
			0	Lancelot St [E]	EdgarSt [N]	R	53	51	-2	-3.8%	✓ 0.3	Y	78.6	F	60
			0		Lancelot St [W]	T	202	195	-7	-3.5%	✓ 0.5	Y	74.6	F	60
			0		EdgarSt [S]	L	76	101	25	32.9%	✓ 2.7	Y	75.4	F	60
			0	EdgarSt [S]	Lancelot St [E]	R	44	60	16	36.4%	✓ 2.2	Y	51.7	D	181
			0		EdgarSt [N]	T	558	535	-23	-4.1%	✓ 1.0	Y	52.7	D	181
			0		Lancelot St [W]	L	58	93	35	60.3%	✓ 4.0	Y	50.4	D	181
			0	Lancelot St [W]	EdgarSt [S]	R	39	36	-3	-7.7%	✓ 0.5	Y	10.0	A	2
			0		Lancelot St [E]	T	114	112	-2	-1.8%	✓ 0.2	Y	8.4	A	2
			0		EdgarSt [N]	L	44	42	-2	-4.5%	✓ 0.3	Y	7.4	A	2
							1,970	1,979					42.9	C	75
	112	Edgar St	0	Edgar St [N]	Eldridge Rd [W]	R	15	12	-3	-20.0%	✓ 0.8	Y	46.3	D	340
		Eldridge Rd (West)	0		Eldridge Rd [E]	L	706	715	9	1.3%	✓ 0.3	Y	59.5	E	340
			0	Eldridge Rd [E]	Edgar St [N]	R	695	647	-48	-6.9%	✓ 1.9	Y	3.3	A	1
			0		Eldridge St [W]	T	255	210	-45	-17.6%	✓ 3.0	Y	2.0	A	1
			0	Eldridge Rd [W]	Eldridge Rd [E]	T	252	304	52	20.6%	✓ 3.1	Y	19.4	B	5
			0		Edgar St [N]	L	12	12	0	0.0%	✓ 0.0	Y	11.4	A	5
							1,935	1,900					27.2	B	116
	113	Edgar St	0	Eldridge Rd [E]	Eldridge Rd [W]	T	252	250	-2	-0.8%	✓ 0.1	Y	13.5	A	9
		Eldridge Rd (East)	0		Edgar St [S]	L	225	299	74	32.9%	✓ 4.6	Y	11.3	A	9
			0	Edgar St [S]	Eldridge Rd [E]	R	226	247	21	9.3%	✓ 1.4	Y	11.4	A	25
			0		Eldridge Rd [W]	L	694	604	-90	-13.0%	✓ 3.5	Y	13.9	A	25
			0	Eldridge Rd [W]	Edgar St [S]	R	723	794	71	9.8%	✓ 2.6	Y	6.5	A	22
			0		Eldridge St [E]	T	201	224	23	11.4%	✓ 1.6	Y	5.4	A	22
							2,321	2,418					10.1	A	18
	110	Edgar St	0	Edgar St [N]	Railway Pde [W]	R	77	83	6	7.8%	✓ 0.7	Y	25.3	B	31
		Railway Pde	0		Edgar St [S]	T	698	677	-21	-3.0%	✓ 0.8	Y	29.3	C	31
			0	Edgar St [S]	Edgar St [N]	T	674	542	-132	-19.6%	⚠ 5.4	N	78.6	F	183
			0		Railway Pde [W]	L	48	52	4	8.3%	✓ 0.6	Y	73.7	F	183
			0	Railway Pde [W]	Edgar St [S]	R	132	97	-35	-26.5%	✓ 3.3	Y	39.2	C	5
			0		Edgar St [N]	L	64	49	-15	-23.4%	✓ 2.0	Y	39.9	C	5
							1,693	1,500					49.4	D	73

ATTACHMENT C

TRAVEL TIME VALIDATION SUMMARY

Bankstown Airport Major Development Plan

Travel Time Data Analysis
AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Nancy Ellis Leebold Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Ashford Ave	7	0:00:38	0:00:44	0:00:33	0:00:12	0:00:09	0:00:48	0:00:29	0.45	0.45	0:00:38	0:00:44	0:00:33	0:00:40	0:00:40
Murray Jones Dr	7	0:00:10	0:00:12	0:00:09	0:00:01	0:00:01	0:00:11	0:00:09	0.15	0.60	0:00:49	0:00:56	0:00:42	0:00:11	0:00:52
Milperra Rd/Henry Lawson Dr	7	0:09:24	0:10:49	0:08:00	0:02:26	0:01:48	0:11:12	0:07:36	0.85	1.45	0:10:13	0:11:45	0:08:41	0:10:43	0:11:35
Tower Rd	7	0:01:46	0:02:02	0:01:30	0:00:26	0:00:19	0:02:05	0:01:27	0.30	1.75	0:11:59	0:13:47	0:10:12	0:01:37	0:13:12
Henry Lawson Dr/Haig Ave	7	0:04:17	0:04:56	0:03:39	0:00:52	0:00:39	0:04:56	0:03:39	1.50	3.25	0:16:17	0:18:43	0:13:50	0:05:07	0:18:19
Georges Cres	7	0:01:01	0:01:10	0:00:52	0:00:10	0:00:07	0:01:08	0:00:54	0.65	3.90	0:17:18	0:19:54	0:14:42	0:00:46	0:19:06
Birch St	7	0:02:14	0:02:34	0:01:54	0:00:08	0:00:06	0:02:20	0:02:08	1.70	5.60	0:19:32	0:22:28	0:16:36	0:01:53	0:20:59
Manahan St	7	0:00:50	0:00:58	0:00:43	0:00:05	0:00:04	0:00:54	0:00:46	0.70	6.30	0:20:22	0:23:25	0:17:19	0:00:44	0:21:44
Marion St/Edgar St	7	0:01:47	0:02:04	0:01:31	0:00:22	0:00:17	0:02:04	0:01:31	0.80	7.10	0:22:10	0:25:29	0:18:50	0:01:42	0:23:25
Townsend St	7	0:01:25	0:01:38	0:01:12	0:00:12	0:00:09	0:01:34	0:01:16	0.90	8.00	0:23:35	0:27:07	0:20:03	0:01:12	0:24:38
Edgar St/Milperra Rd	7	0:03:29	0:04:00	0:02:57	0:00:43	0:00:32	0:04:01	0:02:57	1.40	9.40	0:27:03	0:31:07	0:23:00	0:03:08	0:27:46
Marigold St	7	0:01:21	0:01:34	0:01:09	0:00:23	0:00:17	0:01:38	0:01:05	1.20	10.60	0:28:25	0:32:41	0:24:09	0:01:16	0:29:02
Nancy Ellis Leebold Dr	7	0:00:29	0:00:33	0:00:25	0:00:13	0:00:10	0:00:39	0:00:19	0.40	11.00	0:28:54	0:33:14	0:24:34	0:00:21	0:29:23

Bankstown Airport Major Development Plan

Travel Time Data Analysis

AM Peak (0730 - 0830)

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Nancy Ellis Leebold Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Marigold St	10	0:00:35	0:00:40	0:00:30	0:00:15	0:00:09	0:00:44	0:00:26	0.40	0.40	0:00:35	0:00:40	0:00:30	0:00:22	0:00:22
Edgar St/Milperra Rd	10	0:01:41	0:01:56	0:01:26	0:00:28	0:00:17	0:01:58	0:01:24	1.20	1.60	0:02:16	0:02:36	0:01:55	0:01:37	0:01:59
Townsend St	10	0:05:01	0:05:46	0:04:16	0:00:42	0:00:26	0:05:27	0:04:35	1.40	3.00	0:07:17	0:08:22	0:06:11	0:03:38	0:05:36
Marion St/Edgar St	10	0:01:41	0:01:56	0:01:26	0:00:29	0:00:18	0:01:59	0:01:23	0.90	3.90	0:08:57	0:10:18	0:07:37	0:02:19	0:07:56
Manahan St	10	0:01:08	0:01:18	0:00:57	0:00:07	0:00:04	0:01:12	0:01:03	0.80	4.70	0:10:05	0:11:36	0:08:34	0:01:04	0:09:00
Birch St	10	0:00:47	0:00:55	0:00:40	0:00:03	0:00:02	0:00:49	0:00:46	0.70	5.40	0:10:52	0:12:30	0:09:14	0:00:41	0:09:41
Georges Cres	10	0:02:18	0:02:39	0:01:58	0:00:08	0:00:05	0:02:23	0:02:13	1.70	7.10	0:13:11	0:15:09	0:11:12	0:01:58	0:11:39
Henry Lawson Dr/Haig Ave	10	0:01:57	0:02:15	0:01:40	0:00:42	0:00:26	0:02:23	0:01:31	0.65	7.75	0:15:08	0:17:24	0:12:52	0:01:34	0:13:13
Tower Rd	10	0:01:50	0:02:06	0:01:33	0:00:09	0:00:06	0:01:56	0:01:44	1.50	9.25	0:16:58	0:19:30	0:14:25	0:01:44	0:14:57
Milperra Rd/Henry Lawson Dr	10	0:00:29	0:00:34	0:00:25	0:00:10	0:00:06	0:00:35	0:00:23	0.30	9.55	0:17:27	0:20:04	0:14:50	0:00:28	0:15:26
Murray Jones Dr	10	0:00:47	0:00:54	0:00:40	0:00:03	0:00:02	0:00:49	0:00:45	0.85	10.40	0:18:14	0:20:58	0:15:30	0:00:48	0:16:14
Ashford Ave	10	0:00:11	0:00:13	0:00:10	0:00:07	0:00:04	0:00:16	0:00:07	0.15	10.55	0:18:25	0:21:11	0:15:40	0:00:09	0:16:23
Nancy Ellis Leebold Dr	10	0:00:38	0:00:44	0:00:32	0:00:19	0:00:12	0:00:50	0:00:26	0.45	11.00	0:19:04	0:21:55	0:16:12	0:00:26	0:16:49

Bankstown Airport Major Development Plan

Travel Time Data Analysis

AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Edgar St/Milperra Rd	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Marigold St	7	0:01:21	0:01:34	0:01:09	0:00:23	0:00:17	0:01:38	0:01:05	1.20	1.20	0:01:21	0:01:34	0:01:09	0:01:16	0:01:16
Nancy Ellis Leebold Dr	7	0:00:29	0:00:33	0:00:25	0:00:13	0:00:10	0:00:39	0:00:19	0.40	1.60	0:01:50	0:02:07	0:01:34	0:00:21	0:01:36
Ashford Ave	7	0:00:38	0:00:44	0:00:33	0:00:12	0:00:09	0:00:48	0:00:29	0.45	2.05	0:02:29	0:02:51	0:02:06	0:00:40	0:02:17
Murray Jones Dr	7	0:00:10	0:00:12	0:00:09	0:00:01	0:00:01	0:00:11	0:00:09	0.15	2.20	0:02:39	0:03:03	0:02:15	0:00:11	0:02:28
Milperra Rd/Henry Lawson Dr	6	0:08:48	0:10:07	0:07:29	0:02:26	0:01:57	0:10:45	0:06:52	0.85	3.05	0:11:27	0:13:10	0:09:44	0:10:43	0:13:11

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Milperra Rd/Henry Lawson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Murray Jones Dr	10	0:00:47	0:00:54	0:00:40	0:00:03	0:00:02	0:00:49	0:00:45	0.85	0.85	0:00:47	0:00:54	0:00:40	0:00:48	0:00:48
Ashford Ave	10	0:00:11	0:00:13	0:00:10	0:00:07	0:00:04	0:00:16	0:00:07	0.15	1.00	0:00:58	0:01:07	0:00:49	0:00:09	0:00:58
Nancy Ellis Leebold Dr	10	0:00:38	0:00:44	0:00:32	0:00:19	0:00:12	0:00:50	0:00:26	0.45	1.45	0:01:36	0:01:51	0:01:22	0:00:26	0:01:24
Marigold St	10	0:00:35	0:00:40	0:00:30	0:00:15	0:00:09	0:00:44	0:00:26	0.40	1.85	0:02:11	0:02:31	0:01:51	0:00:22	0:01:46
Edgar St/Milperra Rd	10	0:01:41	0:01:56	0:01:26	0:00:28	0:00:17	0:01:58	0:01:24	1.20	3.05	0:03:52	0:04:27	0:03:17	0:01:37	0:03:23

Bankstown Airport Major Development Plan

Travel Time Data Analysis

AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Milperra Rd/Henry Lawson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Tower Rd	7	0:01:46	0:02:02	0:01:30	0:00:26	0:00:19	0:02:05	0:01:27	0.30	0.30	0:01:46	0:02:02	0:01:30	0:01:37	0:01:37
Henry Lawson Dr/Haig Ave	7	0:04:17	0:04:56	0:03:39	0:00:52	0:00:39	0:04:56	0:03:39	1.50	1.80	0:06:04	0:06:58	0:05:09	0:05:07	0:06:45

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Henry Lawson Dr/Haig Ave	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Tower Rd	10	0:01:50	0:02:06	0:01:33	0:00:09	0:00:06	0:01:56	0:01:44	1.50	1.50	0:01:50	0:02:06	0:01:33	0:01:44	0:01:44
Milperra Rd/Henry Lawson Dr	10	0:00:29	0:00:34	0:00:25	0:00:10	0:00:06	0:00:35	0:00:23	0.30	1.80	0:02:19	0:02:40	0:01:58	0:00:28	0:02:13

Bankstown Airport Major Development Plan

Travel Time Data Analysis

AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Henry Lawson Dr/Haig Ave	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Georges Cres	7	0:01:01	0:01:10	0:00:52	0:00:10	0:00:07	0:01:08	0:00:54	0.65	0.65	0:01:01	0:01:10	0:00:52	0:00:46	0:00:46
Birch St	7	0:02:14	0:02:34	0:01:54	0:00:08	0:00:06	0:02:20	0:02:08	1.70	2.35	0:03:15	0:03:45	0:02:46	0:01:53	0:02:40
Manahan St	7	0:00:50	0:00:58	0:00:43	0:00:05	0:00:04	0:00:54	0:00:46	0.70	3.05	0:04:05	0:04:42	0:03:29	0:00:44	0:03:24
Marion St/Edgar St	7	0:01:47	0:02:04	0:01:31	0:00:22	0:00:17	0:02:04	0:01:31	0.80	3.85	0:05:53	0:06:46	0:05:00	0:01:42	0:05:06

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Marion St/Edgar St	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Manahan St	10	0:01:08	0:01:18	0:00:57	0:00:07	0:00:04	0:01:12	0:01:03	0.80	0.80	0:01:08	0:01:18	0:00:57	0:01:04	0:01:04
Birch St	10	0:00:47	0:00:55	0:00:40	0:00:03	0:00:02	0:00:49	0:00:46	0.70	1.50	0:01:55	0:02:12	0:01:38	0:00:41	0:01:46
Georges Cres	10	0:02:18	0:02:39	0:01:58	0:00:08	0:00:05	0:02:23	0:02:13	1.70	3.20	0:04:13	0:04:51	0:03:35	0:01:58	0:03:43
Henry Lawson Dr/Haig Ave	10	0:01:57	0:02:15	0:01:40	0:00:42	0:00:26	0:02:23	0:01:31	0.65	3.85	0:06:10	0:07:06	0:05:15	0:01:34	0:05:18

Bankstown Airport Major Development Plan

Travel Time Data Analysis
AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Marion St/Edgar St	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Townsend St	7	0:01:25	0:01:38	0:01:12	0:00:12	0:00:09	0:01:34	0:01:16	0.90	0.90	0:01:25	0:01:38	0:01:12	0:01:12	0:01:12
Edgar St/Milperra Rd	7	0:03:29	0:04:00	0:02:57	0:00:43	0:00:32	0:04:01	0:02:57	1.40	2.30	0:04:54	0:05:38	0:04:10	0:03:08	0:04:21

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Edgar St/Milperra Rd	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Townsend St	10	0:05:01	0:05:46	0:04:16	0:00:42	0:00:26	0:05:27	0:04:35	1.40	1.40	0:05:01	0:05:46	0:04:16	0:03:38	0:03:38
Marion St/Edgar St	10	0:01:41	0:01:56	0:01:26	0:00:29	0:00:18	0:01:59	0:01:23	0.90	2.30	0:06:42	0:07:42	0:05:41	0:02:19	0:05:57

Bankstown Airport Major Development Plan

Travel Time Data Analysis
AM Peak (0730 - 0830)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Davy Robinson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Henry Lawson Drive/Milperra Road	6	0:00:00	0:00:00	0:00:00	0:00:04	0:00:03	0:00:03	0:00:00	0.00	0.00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00
Milperra Rd/Ashford Ave	6	0:02:01	0:02:19	0:01:43	0:00:08	0:00:07	0:02:08	0:01:55	0.97	0.97	0:02:01	0:02:19	0:01:43	0:02:17	0:02:17
Ashford Ave/Bullecourt Ave	5	0:01:16	0:01:27	0:01:04	0:00:18	0:00:16	0:01:32	0:01:00	0.89	1.86	0:03:17	0:03:47	0:02:48	0:00:59	0:03:17
Bullecourt Ave/Henry Lawson Drive	5	0:02:00	0:02:18	0:01:42	0:00:21	0:00:18	0:02:18	0:01:42	0.61	2.48	0:05:17	0:06:05	0:04:30	0:01:23	0:04:40
Henry Lawson Drive/Milperra Road	5	0:04:22	0:05:02	0:03:43	0:00:21	0:00:18	0:04:41	0:04:04	1.31	3.79	0:09:40	0:11:07	0:08:13	0:04:01	0:08:41
Davy Robinson Dr	5	0:01:01	0:01:10	0:00:52	0:01:55	0:01:41	0:02:43	0:00:00	1.10	4.89	0:10:41	0:12:17	0:09:05	0:00:58	0:09:39

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Davy Robinson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Henry Lawson Drive/Milperra Road	3		0:00:00	0:00:00	0:00:09	0:00:10	0:00:10	0:00:00	0.00	0.00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00
Bullecourt Ave/Henry Lawson Dr	3	0:01:45	0:02:00	0:01:29	0:00:08	0:00:09	0:01:53	0:01:36	1.31	1.31	0:01:45	0:02:00	0:01:29	0:01:27	0:01:27
Ashford Ave/Bullecourt Ave	3	0:00:56	0:01:05	0:00:48	0:01:02	0:01:10	0:02:06	0:00:00	0.61	1.92	0:02:41	0:03:05	0:02:17	0:00:49	0:02:16
Milperra Rd/Ashford Ave	3	0:02:24	0:02:46	0:02:02	0:00:01	0:00:01	0:02:25	0:02:23	0.89	2.81	0:05:05	0:05:50	0:04:19	0:01:53	0:04:08
Henry Lawson/Milperra Rd	3	0:02:02	0:02:20	0:01:44	0:00:01	0:00:01	0:02:03	0:02:01	0.97	3.78	0:07:07	0:08:11	0:06:03	0:01:21	0:05:29
Davy Robinson Dr	3	0:01:01	0:01:10	0:00:52	0:01:22	0:01:33	0:02:34	0:00:00	1.10	4.88	0:08:08	0:09:21	0:06:55	0:00:58	0:06:28

Bankstown Airport Major Development Plan

Travel Time Data Analysis

PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Nancy Ellis Leebold Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Ashford Ave	6	0:00:33	0:00:38	0:00:28	0:00:22	0:00:18	0:00:51	0:00:15	0.45	0.45	0:00:33	0:00:38	0:00:28	0:00:25	0:00:25
Murray Jones Dr	6	0:00:10	0:00:11	0:00:08	0:00:01	0:00:01	0:00:11	0:00:09	0.15	0.60	0:00:43	0:00:49	0:00:36	0:00:08	0:00:34
Milperra Rd/Henry Lawson Dr	6	0:03:33	0:04:05	0:03:01	0:01:47	0:01:26	0:04:58	0:02:07	0.85	1.45	0:04:15	0:04:54	0:03:37	0:05:51	0:06:25
Tower Rd	6	0:00:36	0:00:41	0:00:30	0:00:15	0:00:12	0:00:47	0:00:24	0.30	1.75	0:04:51	0:05:35	0:04:07	0:01:37	0:08:03
Henry Lawson Dr/Haig Ave	6	0:05:12	0:05:59	0:04:25	0:00:33	0:00:27	0:05:39	0:04:45	1.50	3.25	0:10:03	0:11:33	0:08:32	0:05:44	0:13:46
Georges Cres	6	0:00:56	0:01:04	0:00:48	0:00:09	0:00:07	0:01:03	0:00:49	0.65	3.90	0:10:59	0:12:37	0:09:20	0:00:48	0:14:34
Birch St	6	0:02:04	0:02:23	0:01:46	0:00:05	0:00:04	0:02:08	0:02:00	1.70	5.60	0:13:03	0:15:00	0:11:05	0:01:48	0:16:22
Manahan St	6	0:00:51	0:00:59	0:00:43	0:00:05	0:00:04	0:00:55	0:00:47	0.70	6.30	0:13:54	0:15:59	0:11:49	0:00:45	0:17:07
Marion St/Edgar St	6	0:02:13	0:02:33	0:01:53	0:00:18	0:00:14	0:02:27	0:01:59	0.80	7.10	0:16:07	0:18:32	0:13:42	0:01:34	0:18:41
Townsend St	6	0:02:08	0:02:28	0:01:49	0:00:40	0:00:32	0:02:41	0:01:36	0.90	8.00	0:18:16	0:21:00	0:15:31	0:01:39	0:20:20
Edgar St/Milperra Rd	6	0:04:54	0:05:39	0:04:10	0:01:09	0:00:56	0:05:50	0:03:59	1.40	9.40	0:23:10	0:26:39	0:19:42	0:06:20	0:26:41
Marigold St	6	0:01:16	0:01:27	0:01:04	0:00:23	0:00:18	0:01:34	0:00:57	1.20	10.60	0:24:26	0:28:06	0:20:46	0:01:16	0:27:56
Nancy Ellis Leebold Dr	6	0:00:21	0:00:25	0:00:18	0:00:17	0:00:14	0:00:35	0:00:08	0.40	11.00	0:24:47	0:28:30	0:21:04	0:00:21	0:28:18

Bankstown Airport Major Development Plan

Travel Time Data Analysis

PM Peak (1645 - 1745)

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Nancy Ellis Leebold Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Marigold St	7	0:00:33	0:00:38	0:00:28	0:00:22	0:00:16	0:00:49	0:00:17	0.40	0.40	0:00:33	0:00:38	0:00:28	0:00:33	0:00:33
Edgar St/Milperra Rd	7	0:01:12	0:01:23	0:01:01	0:00:06	0:00:04	0:01:16	0:01:08	1.20	1.60	0:01:45	0:02:01	0:01:29	0:01:12	0:01:45
Townsend St	7	0:05:01	0:05:46	0:04:16	0:01:07	0:00:50	0:05:50	0:04:11	1.40	3.00	0:06:46	0:07:46	0:05:45	0:06:08	0:07:53
Marion St/Edgar St	7	0:02:34	0:02:57	0:02:11	0:00:33	0:00:24	0:02:59	0:02:10	0.90	3.90	0:09:20	0:10:44	0:07:56	0:03:07	0:11:01
Manahan St	7	0:01:00	0:01:09	0:00:51	0:00:04	0:00:03	0:01:03	0:00:57	0.80	4.70	0:10:20	0:11:53	0:08:47	0:01:01	0:12:01
Birch St	7	0:00:47	0:00:54	0:00:40	0:00:02	0:00:02	0:00:49	0:00:45	0.70	5.40	0:11:07	0:12:47	0:09:27	0:00:42	0:12:43
Georges Cres	7	0:02:49	0:03:15	0:02:24	0:01:13	0:00:54	0:03:43	0:01:55	1.70	7.10	0:13:56	0:16:02	0:11:51	0:01:53	0:14:36
Henry Lawson Dr/Haig Ave	7	0:05:19	0:06:07	0:04:32	0:02:31	0:01:52	0:07:12	0:03:27	0.65	7.75	0:19:16	0:22:09	0:16:22	0:01:44	0:16:20
Tower Rd	7	0:04:02	0:04:38	0:03:25	0:01:28	0:01:05	0:05:06	0:02:57	1.50	9.25	0:23:17	0:26:47	0:19:48	0:03:32	0:19:51
Milperra Rd/Henry Lawson Dr	7	0:00:34	0:00:39	0:00:29	0:00:13	0:00:10	0:00:44	0:00:24	0.30	9.55	0:23:51	0:27:26	0:20:16	0:00:22	0:20:13
Murray Jones Dr	7	0:00:48	0:00:55	0:00:41	0:00:11	0:00:08	0:00:56	0:00:40	0.85	10.40	0:24:39	0:28:21	0:20:57	0:00:48	0:21:01
Ashford Ave	7	0:00:14	0:00:16	0:00:12	0:00:06	0:00:04	0:00:19	0:00:10	0.15	10.55	0:24:53	0:28:37	0:21:09	0:00:14	0:21:15
Nancy Ellis Leebold Dr	7	0:00:26	0:00:29	0:00:22	0:00:14	0:00:10	0:00:36	0:00:15	0.45	11.00	0:25:19	0:29:07	0:21:31	0:00:26	0:21:41

Bankstown Airport Major Development Plan

Travel Time Data Analysis
PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Edgar St/Milperra Rd	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Marigold St	6	0:01:20	0:01:32	0:01:08	0:00:23	0:00:18	0:01:39	0:01:02	1.20	1.20	0:01:20	0:01:32	0:01:08	0:01:16	0:01:16
Nancy Ellis Leebold Dr	6	0:00:26	0:00:30	0:00:22	0:00:17	0:00:14	0:00:40	0:00:12	0.40	1.60	0:01:47	0:02:03	0:01:31	0:00:21	0:01:37
Ashford Ave	6	0:00:33	0:00:38	0:00:28	0:00:22	0:00:18	0:00:51	0:00:15	0.45	2.05	0:02:19	0:02:40	0:01:58	0:00:25	0:02:03
Murray Jones Dr	6	0:00:10	0:00:11	0:00:08	0:00:01	0:00:01	0:00:11	0:00:09	0.15	2.20	0:02:29	0:02:52	0:02:07	0:00:08	0:02:11
Milperra Rd/Henry Lawson Dr	6	0:03:33	0:04:05	0:03:01	0:01:47	0:01:26	0:04:58	0:02:07	0.85	3.05	0:06:02	0:06:56	0:05:08	0:05:51	0:08:03

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Milperra Rd/Henry Lawson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Murray Jones Dr	7	0:00:50	0:00:57	0:00:42	0:00:11	0:00:08	0:00:58	0:00:42	0.85	0.85	0:00:50	0:00:57	0:00:42	0:00:48	0:00:48
Ashford Ave	7	0:00:12	0:00:14	0:00:10	0:00:06	0:00:04	0:00:17	0:00:08	0.15	1.00	0:01:02	0:01:12	0:00:53	0:00:14	0:01:02
Nancy Ellis Leebold Dr	7	0:00:33	0:00:38	0:00:28	0:00:14	0:00:10	0:00:43	0:00:23	0.45	1.45	0:01:35	0:01:49	0:01:21	0:00:26	0:01:28
Marigold St	7	0:00:36	0:00:42	0:00:31	0:00:22	0:00:16	0:00:52	0:00:20	0.40	1.85	0:02:11	0:02:31	0:01:52	0:00:33	0:02:01
Edgar St/Milperra Rd	7	0:01:20	0:01:32	0:01:08	0:00:06	0:00:04	0:01:24	0:01:16	1.20	3.05	0:03:31	0:04:03	0:02:59	0:01:12	0:03:13

Bankstown Airport Major Development Plan

Travel Time Data Analysis

PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Milperra Rd/Henry Lawson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Tower Rd	6	0:00:36	0:00:41	0:00:30	0:00:15	0:00:12	0:00:47	0:00:24	0.30	0.30	0:00:36	0:00:41	0:00:30	0:01:37	0:01:37
Henry Lawson Dr/Haig Ave	6	0:05:12	0:05:59	0:04:25	0:00:33	0:00:27	0:05:39	0:04:45	1.50	1.80	0:05:47	0:06:39	0:04:55	0:05:44	0:07:21

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Henry Lawson Dr/Haig Ave	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Tower Rd	6	0:04:02	0:04:38	0:03:25	0:01:28	0:01:10	0:05:12	0:02:51	1.50	1.50	0:04:02	0:04:38	0:03:25	0:03:32	0:03:32
Milperra Rd/Henry Lawson Dr	6	0:00:34	0:00:39	0:00:29	0:00:13	0:00:10	0:00:44	0:00:24	0.30	1.80	0:04:36	0:05:17	0:03:54	0:00:22	0:03:53

Bankstown Airport Major Development Plan

Travel Time Data Analysis

PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Henry Lawson Dr/Haig Ave	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Georges Cres	6	0:00:56	0:01:04	0:00:48	0:00:09	0:00:07	0:01:03	0:00:49	0.65	0.65	0:00:56	0:01:04	0:00:48	0:00:48	0:00:48
Birch St	6	0:02:04	0:02:23	0:01:46	0:00:05	0:00:04	0:02:08	0:02:00	1.70	2.35	0:03:00	0:03:27	0:02:33	0:01:48	0:02:36
Manahan St	6	0:00:51	0:00:59	0:00:43	0:00:05	0:00:04	0:00:55	0:00:47	0.70	3.05	0:03:51	0:04:26	0:03:16	0:00:45	0:03:20
Marion St/Edgar St	6	0:02:13	0:02:33	0:01:53	0:00:18	0:00:14	0:02:27	0:01:59	0.80	3.85	0:06:05	0:06:59	0:05:10	0:01:34	0:04:55

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Marion St/Edgar St	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Manahan St	7	0:01:00	0:01:09	0:00:51	0:00:04	0:00:03	0:01:03	0:00:57	0.80	0.80	0:01:00	0:01:09	0:00:51	0:01:01	0:01:01
Birch St	7	0:00:47	0:00:54	0:00:40	0:00:02	0:00:02	0:00:49	0:00:45	0.70	1.50	0:01:47	0:02:03	0:01:31	0:00:42	0:01:42
Georges Cres	7	0:02:49	0:03:15	0:02:24	0:01:13	0:00:54	0:03:43	0:01:55	1.70	3.20	0:04:36	0:05:18	0:03:55	0:01:53	0:03:36
Henry Lawson Dr/Haig Ave	7	0:05:19	0:06:07	0:04:32	0:02:31	0:01:52	0:07:12	0:03:27	0.65	3.85	0:09:56	0:11:25	0:08:26	0:01:44	0:05:19

Bankstown Airport Major Development Plan

Travel Time Data Analysis

PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Marion St/Edgar St	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Townsend St	6	0:02:08	0:02:28	0:01:49	0:00:40	0:00:32	0:02:41	0:01:36	0.90	0.90	0:02:08	0:02:28	0:01:49	0:01:39	0:01:39
Edgar St/Milperra Rd	6	0:04:54	0:05:39	0:04:10	0:01:09	0:00:56	0:05:50	0:03:59	1.40	2.30	0:07:03	0:08:06	0:05:59	0:06:20	0:07:59

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Edgar St/Milperra Rd	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Townsend St	7	0:05:01	0:05:46	0:04:16	0:01:07	0:00:50	0:05:50	0:04:11	1.40	1.40	0:05:01	0:05:46	0:04:16	0:06:08	0:06:08
Marion St/Edgar St	7	0:02:34	0:02:57	0:02:11	0:00:33	0:00:24	0:02:59	0:02:10	0.90	2.30	0:07:35	0:08:43	0:06:27	0:03:07	0:09:16

Bankstown Airport Major Development Plan

Travel Time Data Analysis
PM Peak (1645 - 1745)

Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	95% Confidence Interval	Upper	Lower	Distance (Km)	Cumulative Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Davy Robinson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Milperra Rd/Ashford Ave	6	0:02:01	0:02:19	0:01:43	0:00:08	0:00:07	0:02:08	0:01:55	0.97	0.97	0:02:01	0:02:19	0:01:43	0:02:16	0:02:16
Ashford Ave/Bullecourt Ave	5	0:01:16	0:01:27	0:01:04	0:00:18	0:00:16	0:01:32	0:01:00	0.89	1.86	0:03:17	0:03:47	0:02:48	0:01:03	0:03:19
Bullecourt Ave/Henry Lawson Drive	5	0:02:00	0:02:18	0:01:42	0:00:21	0:00:18	0:02:18	0:01:42	0.61	2.48	0:05:17	0:06:05	0:04:30	0:02:21	0:05:40
Henry Lawson Drive/Milperra Road	5	0:04:22	0:05:02	0:03:43	0:00:21	0:00:18	0:04:41	0:04:04	1.31	3.79	0:09:40	0:11:07	0:08:13	0:02:54	0:08:34
Davy Robinson Dr	5	0:01:01	0:01:10	0:00:52	0:01:55	0:01:41	0:02:43	0:00:00	1.10	4.89	0:10:41	0:12:17	0:09:05	0:00:59	0:09:33

Counter Clockwise

Sections	Number of Runs	Mean TT	+15%	-15%	Standard Deviation	Confidence Interval	Upper	Lower	Distance (Km)	Distance (Km)	Cumulative Mean TT	Cumulative +15%	Cumulative -15%	Model	Cumulative Model
Davy Robinson Dr	-	-	-	-	-	-	-	-	0.00	0.00	0:00:00	0:00:00	0:00:00		0:00:00
Henry Lawson Drive/Milperra Road	3		0:00:00	0:00:00	0:00:09	0:00:10	0:00:10	0:00:00	0.00	0.00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00
Bullecourt Ave/Henry Lawson Dr	3	0:01:45	0:02:00	0:01:29	0:00:08	0:00:09	0:01:53	0:01:36	1.31	1.31	0:01:45	0:02:00	0:01:29	0:01:45	0:01:45
Ashford Ave/Bullecourt Ave	3	0:00:56	0:01:05	0:00:48	0:01:02	0:01:10	0:02:06	0:00:00	0.61	1.92	0:02:41	0:03:05	0:02:17	0:00:47	0:02:33
Milperra Rd/Ashford Ave	3	0:02:24	0:02:46	0:02:02	0:00:01	0:00:01	0:02:25	0:02:23	0.89	2.81	0:05:05	0:05:50	0:04:19	0:02:06	0:04:38
Henry Lawson/Milperra Rd	3	0:02:02	0:02:20	0:01:44	0:00:01	0:00:01	0:02:03	0:02:01	0.97	3.78	0:07:07	0:08:11	0:06:03	0:03:42	0:08:20
Davy Robinson Dr	3	0:01:00	0:01:09	0:00:51	0:01:22	0:01:33	0:02:33	0:00:00	1.10	4.88	0:08:07	0:09:20	0:06:54	0:00:59	0:09:19

ATTACHMENT D

TRAFFIC SIGNAL VALIDATION SUMMARY

Bankstown Airport Major Development Plan

Signal Time Comparison

AM Peak

Intersection (TCS)	Cycle / Phase	AM (07:30 - 08:30)				
		IDM			VISSIM	Within 10%?
		Avg.	10%	-10%		
Henry Lawson Drive / Haig Avenue (2236)	CT*	134	147	121	120	✗
	A	72	79	65	72	✓
	B	18	20	16	18	✓
	C	30	33	27	30	✓
Edgar Street / Marion Street (1454)	CT*	106	117	95	120	✗
	A	26	29	23	30	✗
	B	43	47	39	36	✗
	C	37	41	33	54	✗
Upper Railway Parade / Edgar Street (1963)	CT*	56	62	50	60	✓
	A	40	44	36	40	✓
	B	20	22	18	20	✓
Milperra Road / Edgar Street (853)	CT*	138	152	124	140	✗
	A	50	55	45	44	✗
	D	23	25	21	21	✗
	E	28	31	25	36	✗
	F	14	15	13	14	✗
	G	23	25	21	25	✓
Milperra Road / Marigold Street (2809)	CT*	145	160	131	140	✓
	A	76	84	68	73	✓
	B	21	23	19	24	✗
	C	27	30	24	28	✓
	D	16	18	14	15	✓
Milperra Road / Nancy Ellis Leebold Drive (3847)	CT*	131	144	118	140	✓
	A	93	102	84	93	✓
	B	21	23	19	21	✓
	C	26	29	23	26	✓
Milperra Road / Ashford Avenue (1635)	CT*	130	143	117	140	✓
	A	94	103	85	92	✓
	B	20	22	18	21	✓
	C	26	29	23	27	✓
Milperra Road / Murray Jones Drive (2235)	CT*	209	230	188	140	✗
	A	97	107	87	97	✓
	B	15	17	14	15	✓
	C	28	31	25	28	✓
Newbridge Road / Henry Lawson Drive / Milperra Road (515)	CT*	136	150	122	140	✓
	A	35	39	32	34	✓
	B	23	25	21	23	✓
	D	21	23	19	21	✓
	E	31	34	28	31	✓
	G	30	33	27	31	✓
Henry Lawson Drive / Tower Road (3377)	CT*	138	152	124	140	✓
	A	94	103	85	94	✓
	B	22	24	20	22	✓
	C	24	26	22	24	✓
Henry Lawson Drive / Bullecourt Avenue (TCS 3067)	CT*	120	132	108	140	✗
	A	81	89	73	90	✗
	B	20	22	18	26	✗
	C	19	21	17	24	✗
Marion Street / William Street (TCS 997)	CT*	120	132	108	120	✓
	A	65	72	59	65	✓
	B	36	40	32	36	✓
	C	19	21	17	19	✓

Bankstown Airport Major Development Plan

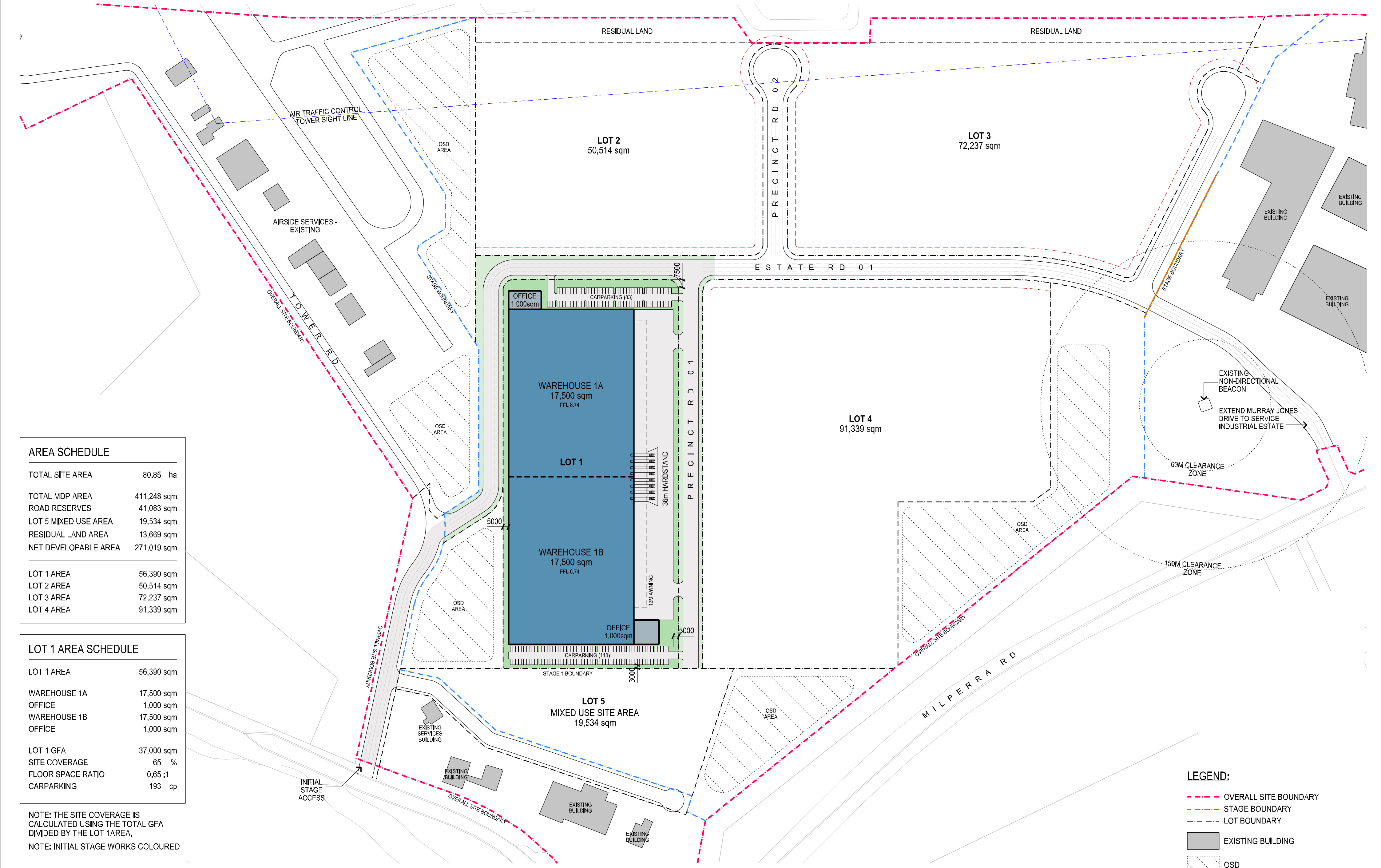
Signal Time Comparison

PM Peak

Intersection (TCS)	Cycle / Phase	PM (16:45 - 17:45)				
		IDM			VISSIM	Within 10%?
		Avg.	10%	-10%		
Henry Lawson Drive / Haig Avenue (2236)	CT*	135	149	122	120	✗
	A	72	79	65	68	✓
	B	18	20	16	20	✓
	C	30	33	27	32	✓
Edgar Street / Marion Street (1454)	CT*	105	116	95	120	✗
	A	43	47	39	30	✗
	B	42	46	38	36	✗
	C	35	39	32	54	✗
Upper Railway Parade / Edgar Street (1963)	CT*	54	59	49	60	✗
	A	40	44	36	40	✓
	B	20	22	18	20	✓
Milperra Road / Edgar Street (853)	CT*	138	152	124	140	✓
	A	49	54	44	47	✓
	D	26	29	23	21	✗
	E	26	29	23	35	✗
	F	17	19	15	15	✓
	G	22	24	20	22	✓
Milperra Road / Marigold Street (2809)	CT*	139	153	125	140	✓
	A	79	87	71	79	✓
	B	19	21	17	19	✓
	C	27	30	24	27	✓
	D	15	17	14	15	✓
Milperra Road / Nancy Ellis Leebold Drive (3847)	CT*	144	158	130	140	✓
	A	93	102	84	92	✓
	B	21	23	19	18	✗
	C	26	29	23	30	✗
Milperra Road / Ashford Avenue (1635)	CT*	133	146	120	141	✓
	A	94	103	85	93	✓
	B	20	22	18	19	✓
	C	26	29	23	29	✓
Milperra Road / Murray Jones Drive (2235)	CT*	233	256	210	140	✗
	A	97	107	87	97	✓
	B	15	17	14	15	✓
	C	28	31	25	28	✓
Newbridge Road / Henry Lawson Drive / Milperra Road (515)	CT*	151	166	136	140	✓
	A	38	42	34	43	✗
	B	15	17	14	13	✗
	D	32	35	29	30	✓
	E	24	26	22	25	✓
	G	31	34	28	29	✓
Henry Lawson Road / Tower Road (3377)	CT*	138	152	124	138	✓
	A	88	97	79	77	✗
	B	28	31	25	20	✗
	C	24	26	22	41	✗
Henry Lawson Drive / Bullecourt Avenue (TCS 3067)	CT*	120	132	108	140	✗
	A	75	83	68	79	✓
	B	16	18	14	20	✗
	C	29	32	26	41	✗
Marion Street / William Street (TCS 997)	CT*	114	125	103	120	✓
	A	70	77	63	73	✓
	B	28	31	25	30	✓
	C	16	18	14	17	✓

APPENDIX B

MAJOR DEVELOPMENT PLAN



AREA SCHEDULE

TOTAL SITE AREA	80.85 ha
TOTAL MDP AREA	411,248 sqm
ROAD RESERVES	41,083 sqm
LOT 5 MIXED USE AREA	19,534 sqm
RESIDUAL LAND AREA	13,669 sqm
NET DEVELOPABLE AREA	271,019 sqm
LOT 1 AREA	56,390 sqm
LOT 2 AREA	50,514 sqm
LOT 3 AREA	72,237 sqm
LOT 4 AREA	91,339 sqm

LOT 1 AREA SCHEDULE

LOT 1 AREA	56,390 sqm
WAREHOUSE 1A	17,500 sqm
OFFICE	1,000 sqm
WAREHOUSE 1B	17,500 sqm
OFFICE	1,000 sqm
LOT 1 GFA	37,000 sqm
SITE COVERAGE	65 %
FLOOR SPACE RATIO	0.65 :1
CARPARKING	193 cp

NOTE: THE SITE COVERAGE IS CALCULATED USING THE TOTAL GFA DIVIDED BY THE LOT 1AREA.

NOTE: INITIAL STAGE WORKS COLOURED

LEGEND:

- OVERALL SITE BOUNDARY
- STAGE BOUNDARY
- LOT BOUNDARY
- ▨ EXISTING BUILDING
- ▨ OSD

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ISSUE	REV.	DESCRIPTION	DATE
B		COORDINATION ISSUE	11.04.18
A		PRELIMINARY ISSUE	09.04.18

BANKSTOWN AIRPORT - SOUTH WEST PRECINCT

BANKSTOWN AIRPORT - SITE WORKS & WAREHOUSE MAJOR DEVELOPMENT PLAN

NORTH

DRAWING TITLE
MDP LAYOUT

DATE	SCALE	JOB NO.	DRAWING NO.	ISSUE
11.04.18	1:3000@A3	17202	SK 12	B

APPENDIX C

2019 BASE CASE DETAILED INTERSECTION PERFORMANCE

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Volumes	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,044	9	A	24
		Haig Avenue	101-3		Haig Ave [E]	L	40	3.6	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	154	59.1	E	17
			101-6		Henry Lawson Dr [S]	L	132	55.9	D	13
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	103	29.1	C	2
			101-8		Henry Lawson Dr [N]	T	1,223	10.6	A	41
				All			2,695	15.4	B	16
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	85	6.6	A	3
		Georges Crescent	102-2		Georges Cres [S]	T	12	5.1	A	3
		Birdwood Road	102-3		Birdwood Rd [E]	L	277	6.4	A	3
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	72	4.8	A	0
			102-5		Haig Ave [W]	T	178	3.2	A	0
			102-6		Georges Cres [N]	L	6	3.3	A	0
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	4	2.5	A	0
			102-8		Georges Cres [N]	T	4	2.0	A	0
			102-9		Haig Ave [W]	L	11	3.7	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	10	1.7	A	0
			102-11		Birdwood Rd [E]	T	203	2.7	A	0
			102-12		Georges Cres [N]	L	66	2.1	A	0
				All			928	4.4	A	1
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	23	2.8	A	0
		Link Road	103-2		Tower Rd [S]	T	57	0.1	A	0
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	360	0.0	A	0
			103-9		Rabaul Rd [W]	L	54	0.2	A	0
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	13	6.1	A	0
			103-12		Link Rd [N]	L	42	3.2	A	0
				All			548	0.5	A	0
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	8	0.1	A	0
		Drover Road	104-6		Drover Rd [S]	L	64	-0.4	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	269	4.2	A	1
			104-8		Marion St [W]	L	0	0.0	A	1
			104-10	Marion St [W]	Drover Rd [S]	R	4	1.4	A	0
			104-11		Marion St [E]	T	44	4.6	A	0
							389	3.4	A	0
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	355	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	102	0.4	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	28	8.7	A	0
			105-9		Marion St [W]	L	12	1.9	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	86	2.1	A	1
			105-11		Marion St [E]	T	642	0.3	A	0
							1,225	0.6	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	403	0.3	A	0
		Birch Street	106-6		Birch St [S]	L	65	1.1	A	0
			106-7	Birch St [S]	Marion St [E]	R	15	3.8	A	0
			106-9		Marion St [W]	L	103	2.7	A	0
			106-10	Marion St [W]	Birch St [S]	R	220	2.1	A	0
			106-11		Marion St [E]	T	675	0.2	A	0
							1,500	0.8	A	0
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	0	0.0	A	0
			107-2		Manahan St [S]	T	0	0.0	A	0
			107-3		Marion St [E]	L	4	5.1	A	0
			107-4	Marion St [E]	Marion St [N]	R	0	0.0	A	1
			107-5		Marion St [W]	T	397	3.8	A	1
			107-6		Manahan St [S]	L	140	2.7	A	1
			107-7	Manahan St [S]	Marion St [E]	R	197	10.9	A	6
			107-8		Marion St [N]	T	0	0.0	A	6
			107-9		Marion St [W]	L	161	10.4	A	6
			107-10	Marion St [W]	Manahan St [S]	R	115	2.8	A	1
			107-11		Marion St [E]	T	602	2.6	A	1
			107-12		Marion St [N]	L	0	0.0	A	1
							1,614	4.7	A	2
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	62	122.1	F	44
		Edgar Street	108-2		Edgar St [S]	T	458	45.0	D	44
			108-3		Marion St [E]	L	111	35.0	C	44
			108-4	Marion St [E]	Edgar St [N]	R	202	45.1	D	25
			108-5		Marion St [W]	T	332	45.3	D	25
			108-6		Edgar St [S]	L	48	43.9	D	25
			108-7	Edgar St [S]	Marion St [E]	R	19	53.2	D	34
			108-8		Edgar St [N]	T	567	33.7	C	34
			108-9		Marion St [W]	L	120	32.5	C	34
			108-10	Marion St [W]	Edgar St [S]	R	166	45.5	D	47
			108-11		Marion St [E]	T	585	44.9	D	47
			108-12		Edgar St [N]	L	103	21.1	B	37
							2,770	42.6	C	38
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	35	3.1	A	15
		Townsend Street	109-2		Edgar St[S]	T	644	0.4	A	11
			109-8	Edgar St [S]	Edgar St [N]	T	699	19.8	B	9
			109-9		Townsend St [W]	L	43	4.3	A	5
			109-10	Townsend St [W]	Edgar St [S]	R	16	38.1	C	6
			109-12		Edgar St [N]	L	64	47.8	D	6
							1,500	12.0	A	9
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	283	38	C	99
		Milperra Road	110-2		Queen St [S]	T	327	102	F	218
		Queen St	110-3		Milperra Rd [E]	L	234	87	F	204
			110-4	Milperra Rd [E]	Edgar St [N]	R	219	390	F	263
			110-5		Milperra Rd [W]	T	1,150	67	E	262
			110-6		Queen St [S]	L	84	36	C	245
			110-7	Queen St [S]	Milperra Rd [E]	R	202	210	F	91
			110-8		Edgar St [N]	T	483	78	F	79
			110-9		Milperra Rd [W]	L	96	44	D	0
			110-10	Milperra Rd [W]	Queen St [S]	R	98	114	F	37
			110-11		Milperra Rd [E]	T	1,349	78	F	62
			110-12		Edgar Rd [N]	L	321	35	C	17
							4,845	90	F	126

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Volumes	Delay (s)	LoS	Queue (m)
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,265	7.3	A	8
		Marigold Street	111-6		Marigold Rd [S]	L	249	10.0	A	8
			111-7	Marigold St [S]	Milperra Rd [E]	R	176	68.1	E	28
			111-9		Milperra Rd [W]	L	211	51.3	D	28
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	274	34.4	C	15
			111-11		Milperra Rd [E]	T	1,632	1.8	A	2
							3,806	12.4	A	13
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [E]	R	142	111.1	F	32
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [W]	L	120	66.6	E	32
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	174	28.3	B	5
			112-5		Milperra Rd [W]	T	1,303	1.6	A	1
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,742	4.9	A	3
			112-12		Nancy Ellis Leebold Dr [N]	L	210	2.9	A	0
							3,690	10.9	A	8
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,312	17.6	B	18
		Ashford Avenue	113-6		Ashford Ave [S]	L	120	18.7	B	18
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	229	89.1	F	47
			113-9		Milperra Rd [W]	L	205	73.8	F	47
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	202	28.8	B	7
			113-11		Milperra Rd [E]	T	1,751	1.3	A	1
							3,819	18.0	B	18
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	4	87.1	F	2
		Murray Jones Drive	114-3		Milperra Rd [E]	L	12	72.5	F	2
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	25	21.7	B	0
			114-5		Milperra Rd [W]	T	1,494	4.3	A	5
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	1,946	1.2	A	1
			114-12		Murray Jones Dr [N]	L	14	1.7	A	1
							3,494	3.0	A	2
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Milperra Rd [E]	R	327	88.3	F	30
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	379	38.3	C	17
		Newbridge Road	115-3		Newbridge Rd [W]	L	461	8.3	A	2
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	292	267.6	F	399
			115-5		Newbridge Rd [W]	T	1,035	209.3	F	284
			115-6		Henry Lawson Dr [S]	L	48	12.0	A	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	15	205.7	F	2
			115-8		Henry Lawson Dr [N]	T	571	184.0	F	243
			115-9		Newbridge Rd [W]	L	284	35.1	C	4
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	533	45.5	D	46
			115-11		Milperra Rd [E]	T	1,495	47.9	D	270
			115-12		Henry Lawson Dr [N]	L	855	57.6	E	260
							6,300	95.9	F	120
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,130	11	A	17
		Tower Road	116-3		Tower Rd [E]	L	18	12	A	17
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	3	73	F	11
			116-6		Henry Lawson Dr [S]	L	86	62	E	11
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	419	62	E	80
			116-8		Henry Lawson Dr [N]	T	1,289	50	D	151
							2,943.0	36.8	C	64.7
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	73	11.0	A	0
		Starkie Drive	117-6		Starkie Rd [S]	L	9	1.1	A	0
			117-7	Starkie Dr [S]	Tower Rd [E]	R	15	2.0	A	0
			117-9		Tower Rd [W]	L	14	11.0	A	0
			117-10	Tower Rd [W]	Starkie Rd [S]	R	47	1.5	A	0
			117-11		Tower Rd [E]	T	389	0.9	A	0
							546	2.6	A	0
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	701	16	B	21
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	260	6	A	21
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	178	100	F	41
		Counts with an * represent missing count data	118-6		Henry Lawson Dr [S]	L	93	55	D	41
			118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	395	39	C	39
			118-8		Henry Lawson Dr [N]	T	789	12	A	64
							2,416	25	B	41
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	23	3.3	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	24	3.1	A	0
			119-3		Bullecourt Ave [E]	L	200	3.5	A	0
		Counts with an * represent missing count data	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	252	2.9	A	0
			119-5		Bullecourt Ave [W]	T	225	2.5	A	0
			119-6		Ashford Ave [S]	L	35	1.9	A	0
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	87	3.0	A	0
			119-8		Ashford Ave [N]	T	60	3.2	A	0
			119-9		Bullecourt Ave [W]	L	29	2.6	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	21	7.3	A	7
			119-11		Bullecourt Ave [E]	T	428	7.7	A	7
			119-12		Ashford Ave [N]	L	203	7.7	A	7
							1,588	4.9	A	2
	206	William Street	120-2	William St [N]	William St [S]	T	198	42.2	C	20
		Marion Street	120-3		Marion St [E]	L	127	41.0	C	20
			120-4	Marion St [E]	William St [N]	R	97	40.8	C	18
			120-5		Marion St [W]	T	657	22.4	B	18
			120-6		William St [S]	L	21	19.8	B	18
		Counts with an * represent missing count data	120-7	William St [S]	Marion St [E]	R	118	45.7	D	39
			120-8		William St [N]	T	325	42.7	C	39
			120-9		Marion St [W]	L	16	39.3	C	39
			120-10	Marion St [W]	William St [S]	R	10	43.1	D	37
			120-11		Marion St [E]	T	976	35.0	C	37
			120-12		William St [N]	L	30	37.8	C	37
							2,574	34.3	C	28
	107	Edgar Street	124-1	EdgarSt [N]	Lancelot St [W]	R	58	11.8	A	37
		Lancelot Street	124-1		EdgarSt [S]	T	574	13.8	A	37
			124-1		Lancelot St [E]	L	34	12.9	A	37
			124-1	Lancelot St [E	EdgarSt [N]	R	49	21.2	B	19
			124-1		Lancelot St [W]	T	222	23.7	B	19
			124-1		EdgarSt [S]	L	73	23.9	B	19
			124-1	EdgarSt [S]	Lancelot St [E]	R	34	34.5	C	95
			124-1		EdgarSt [N]	T	617	35.1	C	95
			124-1		Lancelot St [W]	L	105	33.5	C	95
			124-1	Lancelot St [W	EdgarSt [S]	R	33	12.9	A	7
			124-1		Lancelot St [E]	T	108	13.7	A	7
			124-1		EdgarSt [N]	L	44	12.0	A	7
							1,949	23.4	B	39

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Volumes	Delay (s)	LoS	Queue (m)
	112	Edgar St	122-1	Edgar St [N]	Eldridge Rd [W]	R	0	0.0	A	150
		Eldridge Rd (West)	122-3		Eldridge Rd [E]	L	704	37.9	C	150
			122-4	Eldridge Rd [E]	Edgar St [N]	R	684	3.5	A	3
			122-5		Eldridge St [W]	T	328	3.0	A	3
			122-11	Eldridge Rd [W]	Eldridge Rd [E]	T	183	12.6	A	11
			122-12		Edgar St [N]	L	9	5.2	A	11
							1,908	16.9	B	55
	113	Edgar St	121-5	Eldridge Rd [E]	Eldridge Rd [W]	T	286	15.2	B	18
		Eldridge Rd (East)	121-6		Edgar St [S]	L	208	13.3	A	18
			121-7	Edgar St [S]	Eldridge Rd [E]	R	293	26.0	B	310
			121-9		Eldridge Rd [W]	L	724	26.7	B	310
			121-10	Eldridge Rd [W]	Edgar St [S]	R	685	7.3	A	23
			121-11		Eldridge St [E]	T	200	6.1	A	23
							2,395	16.8	B	117
	110	Edgar St	123-1	Edgar St [N]	Railway Pde [W]	R	67	12.5	A	9
		Railway Pde	123-2		Edgar St [S]	T	593	5.5	A	9
			123-8	Edgar St [S]	Edgar St [N]	T	645	6.2	A	4
			123-9		Railway Pde [W]	L	48	6.7	A	4
			123-10	Railway Pde [W]	Edgar St [S]	R	147	22.6	B	15
			123-12		Edgar St [N]	L	83	25.1	B	15
							1,582	8.8	A	9

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Rurning Vlolume	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,073	20	B	76
		Haig Avenue	101-3		Haig Ave [E]	L	5	10.2	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	185	54.7	D	21
			101-6		Henry Lawson Dr [S]	L	165	65.4	E	22
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	76	44.7	D	3
			101-8		Henry Lawson Dr [N]	T	1,135	12.7	A	44
				All			2,639	22.7	B	28
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	197	2.7	A	1
		Georges Crescent	102-2		Georges Cres [S]	T	11	2.6	A	1
		Birdwood Road	102-3		Birdwood Rd [E]	L	102	2.3	A	1
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	107	3.8	A	1
			102-5		Haig Ave [W]	T	285	3.2	A	1
			102-6		Georges Cres [N]	L	21	3.2	A	1
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	6	9.1	A	0
			102-8		Georges Cres [N]	T	2	6.5	A	0
			102-9		Haig Ave [W]	L	6	3.6	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	9	2.6	A	0
			102-11		Birdwood Rd [E]	T	74	3.0	A	0
			102-12		Georges Cres [N]	L	76	3.1	A	0
				All			896	3.1	A	0
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	57	0.8	A	0
		Link Road	103-2		Tower Rd [S]	T	250	0.2	A	0
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	104	0.0	A	0
			103-9		Rabaul Rd [W]	L	12	0.2	A	0
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	50	2.8	A	0
			103-12		Link Rd [N]	L	31	1.1	A	0
				All			503	0.6	A	0
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	36	0.2	A	0
		Drover Road	104-6		Drover Rd [S]	L	176	-0.4	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	171	1.5	A	0
			104-8		Marion St [W]	L	1	0.2	A	0
			104-10	Marion St [W]	Drover Rd [S]	R	14	2.0	A	0
			104-11		Marion St [E]	T	6	1.4	A	0
							404	0.5	A	0
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	604	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	74	0.5	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	53	6.0	A	0
			105-9		Marion St [W]	L	55	2.8	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	22	2.6	A	1
			105-11		Marion St [E]	T	308	0.2	A	0
							1,116	0.6	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	639	0.6	A	0
		Birch Street	106-6		Birch St [S]	L	32	2.1	A	0
			106-7	Birch St [S]	Marion St [E]	R	34	7.4	A	2
			106-9		Marion St [W]	L	219	7.2	A	3
			106-10	Marion St [W]	Birch St [S]	R	152	4.5	A	1
			106-11		Marion St [E]	T	476	0.2	A	0
							1,591	2.1	A	1
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	0	0	A	0
			107-2		Manahan St [S]	T	1	5	A	0
			107-3		Marion St [E]	L	3	5	A	0
			107-4	Marion St [E]	Marion St [N]	R	2	8	A	6
			107-5		Marion St [W]	T	607	9	A	6
			107-6		Manahan St [S]	L	163	6	A	6
			107-7	Manahan St [S]	Marion St [E]	R	137	15	B	5
			107-8		Marion St [N]	T	1	8	A	5
			107-9		Marion St [W]	L	86	14	A	5
			107-10	Marion St [W]	Manahan St [S]	R	106	3	A	1
			107-11		Marion St [E]	T	460	3	A	1
			107-12		Marion St [N]	L	0	0	A	1
							1,564	7	A	3
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	39	80.2	F	33
		Edgar Street	108-2		Edgar St [S]	T	525	40.4	C	33
			108-3		Marion St [E]	L	140	35.8	C	33
			108-4	Marion St [E]	Edgar St [N]	R	251	68.5	E	87
			108-5		Marion St [W]	T	592	68.7	E	87
			108-6		Edgar St [S]	L	99	66.6	E	87
			108-7	Edgar St [S]	Marion St [E]	R	17	97.6	F	33
			108-8		Edgar St [N]	T	537	35.9	C	33
			108-9		Marion St [W]	L	111	35.1	C	33
			108-10	Marion St [W]	Edgar St [S]	R	158	44.2	D	28
			108-11		Marion St [E]	T	385	43.8	D	28
			108-12		Edgar St [N]	L	105	14.8	A	19
							2,960	48.6	D	40
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	29	21	B	34
		Townsend Street	109-2		Edgar St[S]	T	750	29	B	20
			109-8	Edgar St [S]	Edgar St [N]	T	638	94	F	57
			109-9		Townsend St [W]	L	28	52	D	41
			109-10	Townsend St [W]	Edgar St [S]	R	0	#N/A	#N/A	#N/A
			109-12		Edgar St [N]	L	90	253	F	42
							1,534	70	E	39
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	521	49.1	D	54
		Milperra Road	110-2		Queen St [S]	T	349	60.3	E	71
		Queen St	110-3		Milperra Rd [E]	L	204	41.3	C	0
			110-4	Milperra Rd [E]	Edgar St [N]	R	205	443.6	F	297
			110-5		Milperra Rd [W]	T	1,308	90.8	F	297
			110-6		Queen St [S]	L	89	67.5	E	280
			110-7	Queen St [S]	Milperra Rd [E]	R	188	135.5	F	52
			110-8		Edgar St [N]	T	345	53.3	D	24
			110-9		Milperra Rd [W]	L	135	23.8	B	0
			110-10	Milperra Rd [W]	Queen St [S]	R	143	112.7	F	40
			110-11		Milperra Rd [E]	T	1,253	54.5	D	29
			110-12		Edgar Rd [N]	L	298	15.1	B	0
							5,038	80.8	F	90

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Running Vlolume	Delay (s)	LoS	Queue (m)
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,826	8.3	A	11
		Marigold Street	111-6		Marigold Rd [S]	L	134	9.0	A	11
			111-7	Marigold St [S]	Milperra Rd [E]	R	224	84.0	F	41
			111-9		Milperra Rd [W]	L	234	51.5	D	41
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	143	32.9	C	5
			111-11		Milperra Rd [E]	T	1,483	9.8	A	15
							4,043	16.4	B	18
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [W]	R	196	76.8	F	32
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [E]	L	216	56.6	D	32
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	155	18.2	B	2
			112-5		Milperra Rd [W]	T	1,903	3.8	A	3
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,429	2.3	A	1
			112-12		Nancy Ellis Leebold Dr [N]	L	155	2.2	A	0
							4,054	10.1	A	8
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,944	8.0	A	12
		Ashford Avenue	113-6		Ashford Ave [S]	L	164	5.4	A	12
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	136	59.9	E	17
			113-9		Milperra Rd [W]	L	67	62.4	E	17
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	145	44.6	D	8
			113-11		Milperra Rd [E]	T	1,431	7.9	A	7
							3,888	12.0	A	11
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	18	73.5	F	4
		Murray Jones Drive	114-3		Milperra Rd [E]	L	29	67.8	E	4
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	10	8.8	A	0
			114-5		Milperra Rd [W]	T	1,974	17.1	B	17
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	1,556	12.2	A	13
			114-12		Murray Jones Dr [N]	L	3	15.9	B	13
							3,590	15.6	B	9
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Newbridge Rd [W]	R	645	170	F	170
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	509	35	C	17
		Newbridge Road	115-3		Milperra Rd [E]	L	297	6	A	0
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	261	236	F	170
			115-5		Newbridge Rd [W]	T	1,528	132	F	399
			115-6		Henry Lawson Dr [S]	L	69	18	B	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	1	145	F	0
			115-8		Henry Lawson Dr [N]	T	449	290	F	361
			115-9		Newbridge Rd [W]	L	494	74	F	280
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	382	71	F	54
			115-11		Milperra Rd [E]	T	1,275	39	C	66
			115-12		Henry Lawson Dr [N]	L	636	37	C	49
							6,567	98	F	105
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,094	33	C	255
		Tower Road	116-3		Tower Rd [E]	L	5	25	B	255
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	9	39	C	26
			116-6		Henry Lawson Dr [S]	L	408	20	B	26
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	186	34	C	8
			116-8		Henry Lawson Dr [N]	T	1,200	45	D	110
							2,903	36	C	100
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	312	44.6	D	25
		Starkie Drive	117-6		Starkie Rd [S]	L	48	35.0	C	25
			117-7	Starkie Dr [S]	Tower Rd [E]	R	6	36.5	C	7
			117-9		Tower Rd [W]	L	106	46.9	D	7
			117-10	Tower Rd [W]	Starkie Rd [S]	R	94	3.8	A	0
			117-11		Tower Rd [E]	T	103	1.9	A	0
							669	31.8	C	11
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	865	28.1	B	50
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	71	11.3	A	50
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	408	85.5	F	173
		Counts with an * represent missing count	118-6		Henry Lawson Dr [S]	L	213	69.0	E	173
		data	118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	148	44.7	D	8
			118-8		Henry Lawson Dr [N]	T	660	18.7	B	37
							2,366	39.5	C	67
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	107	2.8	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	61	2.4	A	0
			119-3		Bullecourt Ave [E]	L	244	2.8	A	0
		Counts with an * represent missing count	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	82	4.2	A	1
		data	119-5		Bullecourt Ave [W]	T	505	4.2	A	1
			119-6		Ashford Ave [S]	L	110	3.4	A	1
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	59	3.6	A	0
			119-8		Ashford Ave [N]	T	22	3.4	A	0
			119-9		Bullecourt Ave [W]	L	26	4.3	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	14	1.5	A	0
			119-11		Bullecourt Ave [E]	T	136	1.9	A	0
			119-12		Ashford Ave [N]	L	68	1.9	A	0
							1,442	3.4	A	1
	206	William Street	120-2	William St [N]	William St [S]	T	298	68.4	E	54
		Marion Street	120-3		Marion St [E]	L	131	68.6	E	54
			120-4	Marion St [E]	William St [N]	R	153	33.2	C	30
			120-5		Marion St [W]	T	1,057	21.9	B	30
			120-6		William St [S]	L	55	18.4	B	30
		Counts with an * represent missing count	120-7	William St [S]	Marion St [E]	R	59	55.6	D	25
		data	120-8		William St [N]	T	198	51.1	D	25
			120-9		Marion St [W]	L	38	38.9	C	25
			120-10	Marion St [W]	William St [S]	R	17	73.5	F	20
			120-11		Marion St [E]	T	690	27.3	B	20
			120-12		William St [N]	L	24	24.9	B	20
							2,720	34.6	C	32
	107	Edgar Street	124-1	EdgarSt [N]	Lancelot St [W]	R	69	26	B	86
		Lancelot Street	124-1		EdgarSt [S]	T	670	28	B	86
			124-1		Lancelot St [E]	L	31	28	B	86
			124-1	Lancelot St [E]	EdgarSt [N]	R	52	84	F	63
			124-1		Lancelot St [W]	T	183	84	F	63
			124-1		EdgarSt [S]	L	97	84	F	63
			124-1	EdgarSt [S]	Lancelot St [E]	R	58	49	D	179
			124-1		EdgarSt [N]	T	569	50	D	179
			124-1		Lancelot St [W]	L	86	50	D	179
			124-1	Lancelot St [W]	EdgarSt [S]	R	36	11	A	3
			124-1		Lancelot St [E]	T	111	11	A	3
			124-1		EdgarSt [N]	L	44	11	A	3
							2,005	43	D	83

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Rurning Vlolume	Delay (s)	LoS	Queue (m)
	112	Edgar St	122-1	Edgar St [N]	Eldridge Rd [W]	R	12	57	D	418
		Eldridge Rd (West)	122-3		Eldridge Rd [E]	L	688	62	E	418
			122-4	Eldridge Rd [E]	Edgar St [N]	R	627	8	A	7
			122-5		Eldridge St [W]	T	206	5	A	7
			122-11	Eldridge Rd [W]	Eldridge Rd [E]	T	294	36	C	20
			122-12		Edgar St [N]	L	12	23	B	20
							1,838	33	C	148
	113	Edgar St	121-5	Eldridge Rd [E]	Eldridge Rd [W]	T	249	24.9	B	26
		Eldridge Rd (East)	121-6		Edgar St [S]	L	318	23.3	B	26
			121-7	Edgar St [S]	Eldridge Rd [E]	R	243	16.0	B	46
			121-9		Eldridge Rd [W]	L	587	18.2	B	46
			121-10	Eldridge Rd [W]	Edgar St [S]	R	766	7.3	A	26
			121-11		Eldridge St [E]	T	220	6.0	A	26
							2,384	14.7	A	33
	110	Edgar St	123-1	Edgar St [N]	Railway Pde [W]	R	83	34	C	38
		Railway Pde	123-2		Edgar St [S]	T	641	37	C	38
			123-8	Edgar St [S]	Edgar St [N]	T	562	91	F	233
			123-9		Railway Pde [W]	L	53	74	F	233
			123-10	Railway Pde [W]	Edgar St [S]	R	100	47	D	7
			123-12		Edgar St [N]	L	54	44	D	7
							1,493	59	E	92

APPENDIX D

2019 WITH DEVELOPMENT INTERSECTION PERFORMANCE

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Vloume	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,053	9	A	24
		Haig Avenue	101-3		Haig Ave [E]	L	40	3.6	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	163	63.2	E	20
			101-6		Henry Lawson Dr [S]	L	128	54.3	D	12
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	97	29.7	C	3
			101-8		Henry Lawson Dr [N]	T	1,183	10.4	A	37
							2,664	15.7	B	16
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	87	7.0	A	3
		Georges Crescent	102-2		Georges Cres [S]	T	12	5.7	A	3
		Birdwood Road	102-3		Birdwood Rd [E]	L	279	6.3	A	3
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	78	3.8	A	1
			102-5		Haig Ave [W]	T	184	3.5	A	1
			102-6		Georges Cres [N]	L	8	4.7	A	1
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	4	2.7	A	0
			102-8		Georges Cres [N]	T	4	3.3	A	0
			102-9		Haig Ave [W]	L	11	4.6	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	9	2.4	A	0
			102-11		Birdwood Rd [E]	T	206	2.5	A	0
			102-12		Georges Cres [N]	L	58	2.2	A	0
							939	4.4	A	1
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	22	2.2	A	0
		Link Road	103-2		Tower Rd [S]	T	69	0.1	A	0
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	350	0.0	A	0
			103-9		Rabaul Rd [W]	L	48	0.2	A	0
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	2	5.9	A	0
			103-12		Link Rd [N]	L	59	3.5	A	0
							551	0.6	A	0
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	8	0.1	A	0
		Drover Road	104-6		Drover Rd [S]	L	77	-0.4	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	272	4.0	A	0
			104-8		Marion St [W]	L	0	0.0	A	0
			104-10	Marion St [W]	Drover Rd [S]	R	4	2.0	A	0
			104-11		Marion St [E]	T	44	3.9	A	0
							404	3.0	A	0
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	375	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	101	0.5	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	29	8.6	A	0
			105-9		Marion St [W]	L	11	2.1	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	86	2.1	A	1
			105-11		Marion St [E]	T	640	0.3	A	0
							1,242	0.6	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	420	0.3	A	0
		Birch Street	106-6		Birch St [S]	L	66	1.1	A	0
			106-7	Birch St [S]	Marion St [E]	R	15	4.1	A	0
			106-9		Marion St [W]	L	103	3.0	A	0
			106-10	Marion St [W]	Birch St [S]	R	218	2.2	A	1
			106-11		Marion St [E]	T	673	0.2	A	0
							1,514	0.8	A	0
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	0	0.0	A	0
			107-2		Manahan St [S]	T	0	0.0	A	0
			107-3		Marion St [E]	L	4	9.5	A	0
			107-4	Marion St [E]	Marion St [N]	R	0	0.0	A	1
			107-5		Marion St [W]	T	411	3.7	A	1
			107-6		Manahan St [S]	L	137	2.7	A	1
			107-7	Manahan St [S]	Marion St [E]	R	203	12.7	A	7
			107-8		Marion St [N]	T	0	0.0	A	7
			107-9		Marion St [W]	L	164	12.2	A	7
			107-10	Marion St [W]	Manahan St [S]	R	113	2.6	A	1
			107-11		Marion St [E]	T	602	2.7	A	1
			107-12		Marion St [N]	L	0	0.0	A	1
							1,635	5.1	A	2
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	65	118.8	F	44
		Edgar Street	108-2		Edgar St [S]	T	455	46.7	D	44
			108-3		Marion St [E]	L	111	34.7	C	45
			108-4	Marion St [E]	Edgar St [N]	R	201	44.9	D	24
			108-5		Marion St [W]	T	336	44.4	D	24
			108-6		Edgar St [S]	L	54	42.2	C	24
			108-7	Edgar St [S]	Marion St [E]	R	20	53.7	D	32
			108-8		Edgar St [N]	T	561	33.4	C	32
			108-9		Marion St [W]	L	129	32.1	C	32
			108-10	Marion St [W]	Edgar St [S]	R	166	45.1	D	44
			108-11		Marion St [E]	T	584	44.6	D	44
			108-12		Edgar St [N]	L	104	20.4	B	35
							2,786	42.5	C	37
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	36	3.8	A	0
		Townsend Street	109-2		Edgar St[S]	T	655	0.4	A	0
			109-8	Edgar St [S]	Edgar St [N]	T	692	18.2	B	9
			109-9		Townsend St [W]	L	35	3.9	A	5
			109-10	Townsend St [W]	Edgar St [S]	R	16	17.6	B	2
			109-12		Edgar St [N]	L	69	31.1	C	3
							1,503	10.4	A	3
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	304	38.1	C	113
		Milperra Road	110-2		Queen St [S]	T	330	100.0	F	243
		Queen St	110-3		Milperra Rd [E]	L	236	82.6	F	229
			110-4	Milperra Rd [E]	Edgar St [N]	R	220	441.7	F	299
			110-5		Milperra Rd [W]	T	1,152	80.6	F	299
			110-6		Queen St [S]	L	84	51.5	D	282
			110-7	Queen St [S]	Milperra Rd [E]	R	201	223.7	F	106
			110-8		Edgar St [N]	T	480	88.5	F	80
			110-9		Milperra Rd [W]	L	98	50.7	D	0
			110-10	Milperra Rd [W]	Queen St [S]	R	99	120.6	F	29
			110-11		Milperra Rd [E]	T	1,360	82.3	F	64
			110-12		Edgar Rd [N]	L	328	43.0	C	7
							4,892	99.9	F	140

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Vloume	Delay (s)	LoS	Queue (m)
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,280	7.5	A	8
		Marigold Street	111-6		Marigold Rd [S]	L	244	10.1	A	8
			111-7	Marigold St [S]	Milperra Rd [E]	R	175	70.4	F	29
			111-9		Milperra Rd [W]	L	215	52.4	D	29
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	277	34.6	C	13
			111-11		Milperra Rd [E]	T	1,635	1.7	A	2
							3,826	12.5	A	13
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [E]	R	142	114.6	F	33
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [W]	L	120	63.6	E	33
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	173	27.7	B	5
			112-5		Milperra Rd [W]	T	1,333	1.7	A	1
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,753	5.7	A	4
			112-12		Nancy Ellis Leebold Dr [N]	L	209	3.0	A	0
							3,731	11.1	A	9
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,330	16.4	B	17
		Ashford Avenue	113-6		Ashford Ave [S]	L	134	15.2	B	17
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	215	79.1	F	38
			113-9		Milperra Rd [W]	L	174	70.4	F	38
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	86	23.4	B	1
			113-11		Milperra Rd [E]	T	1,772	1.2	A	1
							3,711	15.5	B	14
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	8	79.9	F	4
		Murray Jones Drive	114-3		Milperra Rd [E]	L	26	68.6	E	4
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	89	25.1	B	2
			114-5		Milperra Rd [W]	T	1,415	3.1	A	2
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	1,838	1.0	A	1
			114-12		Murray Jones Dr [N]	L	17	1.1	A	1
							3,393	3.2	A	2
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Milperra Rd [E]	R	329	92.4	F	31
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	507	47.7	D	25
		Newbridge Road	115-3		Newbridge Rd [W]	L	340	7.1	A	1
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	282	245.6	F	324
			115-5		Newbridge Rd [W]	T	1,025	210.1	F	216
			115-6		Henry Lawson Dr [S]	L	41	16.2	B	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	29	186.4	F	4
			115-8		Henry Lawson Dr [N]	T	581	174.9	F	247
			115-9		Newbridge Rd [W]	L	313	36.1	C	5
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	525	47.4	D	44
			115-11		Milperra Rd [E]	T	1,495	49.0	D	275
			115-12		Henry Lawson Dr [N]	L	835	58.7	E	263
							6,307	96.2	F	111
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,143	11.1	A	19
		Tower Road	116-3		Tower Rd [E]	L	15	10.4	A	19
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	5	58.9	E	10
			116-6		Henry Lawson Dr [S]	L	86	58.6	E	10
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	424	65.3	E	100
			116-8		Henry Lawson Dr [N]	T	1,264	46.1	D	131
							2,937	35.5	C	65
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	76	7.3	A	0
		Starkie Drive	117-6		Starkie Rd [S]	L	8	0.4	A	0
			117-7	Starkie Dr [S]	Tower Rd [E]	R	15	7.6	A	0
			117-9		Tower Rd [W]	L	14	5.2	A	0
			117-10	Tower Rd [W]	Starkie Rd [S]	R	49	1.1	A	0
			117-11		Tower Rd [E]	T	391	0.4	A	0
							553	1.7	A	0
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	701	19.3	B	28
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	375	9.1	A	28
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	225	142.6	F	88
		Counts with an * represent missing count data	118-6		Henry Lawson Dr [S]	L	104	79.9	F	88
			118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	398	41.2	C	50
			118-8		Henry Lawson Dr [N]	T	804	12.6	A	55
							2,607	32.2	C	55
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	36	3.5	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	31	2.9	A	0
			119-3		Bullecourt Ave [E]	L	64	2.7	A	0
		Counts with an * represent missing count data	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	203	3.0	A	0
			119-5		Bullecourt Ave [W]	T	274	2.8	A	0
			119-6		Ashford Ave [S]	L	35	2.1	A	0
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	88	3.1	A	0
			119-8		Ashford Ave [N]	T	57	3.4	A	0
			119-9		Bullecourt Ave [W]	L	35	2.6	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	13	7.9	A	7
			119-11		Bullecourt Ave [E]	T	564	7.0	A	7
			119-12		Ashford Ave [N]	L	190	7.7	A	7
							1,593	5.0	A	1
	206	William Street	120-2	William St [N]	William St [S]	T	198	42.2	C	20
		Marion Street	120-3		Marion St [E]	L	126	41.0	C	20
			120-4	Marion St [E]	William St [N]	R	95	44.7	D	19
			120-5		Marion St [W]	T	665	22.5	B	19
			120-6		William St [S]	L	21	20.0	B	19
		Counts with an * represent missing count data	120-7	William St [S]	Marion St [E]	R	118	45.7	D	39
			120-8		William St [N]	T	325	42.7	C	39
			120-9		Marion St [W]	L	15	39.3	C	39
			120-10	Marion St [W]	William St [S]	R	9	48.3	D	38
			120-11		Marion St [E]	T	976	35.6	C	38
			120-12		William St [N]	L	30	39.1	C	38
							2,579	34.7	C	29

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

AM Peak 0730-0830

Time	ID	Intersection	Movement Code	From	To	Turn	Turning Vloume	Delay (s)	LoS	Queue (m)
	107	Edgar Street	124-1	EdgarSt [N]	Lancelot St [W]	R	59	12.6	A	19
		Lancelot Street	124-1		EdgarSt [S]	T	580	15.2	B	19
			124-1		Lancelot St [E]	L	33	14.1	A	19
			124-1	Lancelot St [E	EdgarSt [N]	R	49	23.4	B	18
			124-1		Lancelot St [W]	T	222	27.5	B	18
			124-1		EdgarSt [S]	L	77	25.5	B	18
			124-1	EdgarSt [S]	Lancelot St [E]	R	34	31.3	C	93
			124-1		EdgarSt [N]	T	618	33.6	C	93
			124-1		Lancelot St [W]	L	103	32.3	C	93
			124-1	Lancelot St [W	EdgarSt [S]	R	33	12.2	A	4
			124-1		Lancelot St [E]	T	108	12.9	A	4
			124-1		EdgarSt [N]	L	44	12.0	A	4
							1,959	23.9	B	33
	112	Edgar St	122-1	Edgar St [N]	Eldridge Rd [W]	R	0	0.0	A	110
		Eldridge Rd (West)	122-3		Eldridge Rd [E]	L	723	36.3	C	110
			122-4	Eldridge Rd [E]	Edgar St [N]	R	685	3.7	A	4
			122-5		Eldridge St [W]	T	329	3.2	A	4
			122-11	Eldridge Rd [W]	Eldridge Rd [E]	T	181	13.5	A	2
			122-12		Edgar St [N]	L	10	6.7	A	2
							1,928	16.8	B	39
	113	Edgar St	121-5	Eldridge Rd [E]	Eldridge Rd [W]	T	286	17.0	B	13
		Eldridge Rd (East)	121-6		Edgar St [S]	L	212	16.3	B	13
			121-7	Edgar St [S]	Eldridge Rd [E]	R	289	27.1	B	377
			121-9		Eldridge Rd [W]	L	727	27.2	B	377
			121-10	Eldridge Rd [W]	Edgar St [S]	R	701	7.2	A	17
			121-11		Eldridge St [E]	T	203	6.2	A	17
							2,418	17.5	B	135
	110	Edgar St	123-1	Edgar St [N]	Railway Pde [W]	R	71	12.8	A	4
		Railway Pde	123-2		Edgar St [S]	T	614	5.8	A	4
			123-8	Edgar St [S]	Edgar St [N]	T	641	6.4	A	4
			123-9		Railway Pde [W]	L	50	5.7	A	4
			123-10	Railway Pde [W]	Edgar St [S]	R	148	23.0	B	7
			123-12		Edgar St [N]	L	78	24.0	B	7
							1,602	8.8	A	5

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Turning Volume	Delay (s)	LoS	Queue (m)
1800	90	Henry Lawson Drive	101-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,100	17	B	67
		Haig Avenue	101-3		Haig Ave [E]	L	9	10	A	0
			101-4	Haig Ave [E]	Henry Lawson Dr [N]	R	181	50	D	17
			101-6		Henry Lawson Dr [S]	L	144	57	D	16
			101-7	Henry Lawson Dr [S]	Haig Ave [E]	R	79	46	D	4
			101-8		Henry Lawson Dr [N]	T	1,130	13	A	43
				All			2,644	21	B	24
	93	Haig Avenue	102-1	Georges Cres [N]	Haig Ave [W]	R	197	2	A	0
		Georges Crescent	102-2		Georges Cres [S]	T	10	2	A	0
		Birdwood Road	102-3		Birdwood Rd [E]	L	103	2	A	0
			102-4	Birdwood Rd [E]	Georges Cres [N]	R	107	4	A	1
			102-5		Haig Ave [W]	T	265	3	A	1
			102-6		Georges Cres [N]	L	20	3	A	1
			102-7	Georges Cres [S]	Birdwood Rd [E]	R	6	6	A	0
			102-8		Georges Cres [N]	T	2	4	A	0
			102-9		Haig Ave [W]	L	6	6	A	0
			102-10	Haig Ave [W]	Georges Cres [S]	R	9	2	A	0
			102-11		Birdwood Rd [E]	T	80	3	A	0
			102-12		Georges Cres [N]	L	79	3	A	0
				All			885	3	A	0
	122	Rabaul Road	103-1	Link Rd [N]	Rabaul Rd [W]	R	91	21.6	B	54
		Link Road	103-2		Tower Rd [S]	T	175	7.7	A	54
		Tower Rd	103-8	Tower Rd [S]	Link Rd [N]	T	93	7.2	A	8
			103-9		Rabaul Rd [W]	L	14	52.2	D	8
			103-10	Rabaul Rd [W]	Tower Rd [S]	R	40	2.1	A	0
			103-12		Link Rd [N]	L	37	1.0	A	0
				All			451	11.2	A	16
	186	Marion Street	104-5	Marion St [E]	Marion St [W]	T	37	0.1	A	0
		Drover Road	104-6		Drover Rd [S]	L	174	-0.5	#N/A	0
			104-7	Drover Rd [S]	Marion St [E]	R	170	2.0	A	0
			104-8		Marion St [W]	L	1	0.1	A	0
			104-10	Marion St [W]	Drover Rd [S]	R	13	1.9	A	0
			104-11		Marion St [E]	T	7	3.3	A	0
							402	0.8	A	0
	97	Marion Street	105-5	Marion St [E]	Marion St [W]	T	590	0.1	A	0
		Airport Avenue	105-6		Airport Ave [S]	L	78	0.4	A	0
			105-7	Airport Ave [S]	Marion St [E]	R	64	5.2	A	0
			105-9		Marion St [W]	L	49	2.5	A	0
			105-10	Marion St [W]	Airport Ave [S]	R	11	3.6	A	1
			105-11		Marion St [E]	T	330	0.2	A	0
							1,123	0.6	A	0
	99	Marion Street	106-5	Marion St [E]	Marion St [W]	T	628	0.6	A	0
		Birch Street	106-6		Birch St [S]	L	31	1.7	A	0
			106-7	Birch St [S]	Marion St [E]	R	34	9.0	A	3
			106-9		Marion St [W]	L	221	7.8	A	3
			106-10	Marion St [W]	Birch St [S]	R	154	4.3	A	1
			106-11		Marion St [E]	T	508	0.2	A	0
							1,615	2.2	A	1
	101	Marion / Manaham	107-1	Marion St [N]	Marion St [W]	R	2	0.9	A	0
			107-2		Manahan St [S]	T	1	13.1	A	0
			107-3		Marion St [E]	L	2	7.1	A	0
			107-4	Marion St [E]	Marion St [N]	R	1	4.6	A	6
			107-5		Marion St [W]	T	594	8.6	A	6
			107-6		Manahan St [S]	L	160	6.8	A	6
			107-7	Manahan St [S]	Marion St [E]	R	135	14.6	A	5
			107-8		Marion St [N]	T	1	1.9	A	5
			107-9		Marion St [W]	L	86	16.0	B	5
			107-10	Marion St [W]	Manahan St [S]	R	110	3.5	A	1
			107-11		Marion St [E]	T	488	2.6	A	1
			107-12		Marion St [N]	L	0	0.0	A	1
							1,579	7.1	A	3
	106	Marion Street	108-1	Edgar St [N]	Marion St [W]	R	28	59	E	29
		Edgar Street	108-2		Edgar St [S]	T	527	42	C	29
			108-3		Marion St [E]	L	137	36	C	29
			108-4	Marion St [E]	Edgar St [N]	R	243	73	F	112
			108-5		Marion St [W]	T	573	74	F	112
			108-6		Edgar St [S]	L	104	78	F	112
			108-7	Edgar St [S]	Marion St [E]	R	20	57	E	27
			108-8		Edgar St [N]	T	527	33	C	27
			108-9		Marion St [W]	L	120	32	C	27
			108-10	Marion St [W]	Edgar St [S]	R	182	66	E	38
			108-11		Marion St [E]	T	382	49	D	38
			108-12		Edgar St [N]	L	108	20	B	28
							2,949	52	D	47
	108	Edgar Street	109-1	Edgar St [N]	Townsend St [W]	R	25	22	B	48
		Townsend Street	109-2		Edgar St[S]	T	745	39	C	29
			109-8	Edgar St [S]	Edgar St [N]	T	650	93	F	56
			109-9		Townsend St [W]	L	29	49	D	40
			109-10	Townsend St [W]	Edgar St [S]	R	0	#N/A	#N/A	#N/A
			109-12		Edgar St [N]	L	90	186	F	29
							1,538	70	E	41
	115	Edgar Street	110-1	Edgar St [N]	Milperra Rd [W]	R	530	44	D	45
		Milperra Road	110-2		Queen St [S]	T	350	57	D	61
		Queen St	110-3		Milperra Rd [E]	L	207	37	C	0
			110-4	Milperra Rd [E]	Edgar St [N]	R	204	466	F	348
			110-5		Milperra Rd [W]	T	1,295	90	F	347
			110-6		Queen St [S]	L	88	63	E	330
			110-7	Queen St [S]	Milperra Rd [E]	R	190	119	F	43
			110-8		Edgar St [N]	T	342	52	D	24
			110-9		Milperra Rd [W]	L	135	23	B	0
			110-10	Milperra Rd [W]	Queen St [S]	R	138	118	F	40
			110-11		Milperra Rd [E]	T	1,254	59	E	32
			110-12		Edgar Rd [N]	L	308	17	B	0
							5,041	81	F	100

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Turning Volume	Delay (s)	LoS	Queue (m)
	117	Milperra Road	111-5	Milperra Rd [E]	Milperra Rd [W]	T	1,818	8.1	A	10
		Marigold Street	111-6		Marigold Rd [S]	L	133	9.4	A	10
			111-7	Marigold St [S]	Milperra Rd [E]	R	224	79.3	F	37
			111-9		Milperra Rd [W]	L	233	47.7	D	37
			111-10	Milperra Rd [W]	Marigold Rd [S]	R	148	32.8	C	5
			111-11		Milperra Rd [E]	T	1,484	11.2	A	18
							4,040	16.5	B	17
	116	Milperra Road	112-1	Nancy Ellis-Leebold Dr [N]	Milperra Rd [W]	R	194	75	F	33
		Nancy Ellis-Leebold Drive	112-3		Milperra Rd [E]	L	208	56	D	33
			112-4	Milperra Rd [E]	Nancy Ellis Leebold Dr [N]	R	150	20	B	3
			112-5		Milperra Rd [W]	T	1,888	4	A	3
			112-11	Milperra Rd [W]	Milperra Rd [E]	T	1,434	3	A	1
			112-12		Nancy Ellis Leebold Dr [N]	L	156	3	A	0
							4,030	11	A	8
	83	Milperra Road	113-5	Milperra Rd [E]	Milperra Rd [W]	T	1,861	18	B	45
		Ashford Avenue	113-6		Ashford Ave [S]	L	162	16	B	45
			113-7	Ashford Ave [S]	Milperra Rd [E]	R	131	79	F	43
			113-9		Milperra Rd [W]	L	164	110	F	43
			113-10	Milperra Rd [W]	Ashford Ave [S]	R	57	50	D	3
			113-11		Milperra Rd [E]	T	1,436	9	A	8
							3,810	21	B	25
	85	Milperra Road	114-1	Murray Jones Dr [N]	Milperra Rd [W]	R	22	75.6	F	8
		Murray Jones Drive	114-3		Milperra Rd [E]	L	58	66.2	E	8
			114-4	Milperra Rd [E]	Murray Jones Dr [N]	R	26	12.4	A	0
			114-5		Milperra Rd [W]	T	1,956	28.9	B	36
			114-11	Milperra Rd [W]	Milperra Rd [E]	T	1,438	16.0	B	15
			114-12		Murray Jones Dr [N]	L	4	7.7	A	15
							3,504	24.4	B	15
	86	Milperra Road	115-1	Henry Lawson Dr [N]	Newbridge Rd [W]	R	658	165	F	163
		Henry Lawson Drive	115-2		Henry Lawson Dr [S]	T	595	63	E	36
		Newbridge Road	115-3		Milperra Rd [E]	L	187	4	A	0
			115-4	Milperra Rd [E]	Henry Lawson Dr [N]	R	275	129	F	68
			115-5		Newbridge Rd [W]	T	1,583	104	F	450
			115-6		Henry Lawson Dr [S]	L	27	23	B	0
			115-7	Henry Lawson Dr [S]	Milperra Rd [E]	R	8	213	F	1
			115-8		Henry Lawson Dr [N]	T	498	253	F	305
			115-9		Newbridge Rd [W]	L	428	68	E	181
			115-10	Newbridge Rd [W]	Henry Lawson Dr [S]	R	389	170	F	168
			115-11		Milperra Rd [E]	T	1,272	38	C	39
			115-12		Henry Lawson Dr [N]	L	632	17	B	12
							6,551	96	F	130
	87	Henry Lawson Drive	116-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	1,119	30	C	238
		Tower Road	116-3		Tower Rd [E]	L	8	24	B	238
			116-4	Tower Rd [E]	Henry Lawson Dr [N]	R	13	64	E	23
			116-6		Henry Lawson Dr [S]	L	374	20	B	23
			116-7	Henry Lawson Dr [S]	Tower Rd [E]	R	175	36	C	9
			116-8		Henry Lawson Dr [N]	T	1,221	42	C	73
							2,910	34	C	86
	88	Tower Road	117-5	Tower Rd [E]	Tower Rd [W]	T	277	18.8	B	2
		Starkie Drive	117-6		Starkie Rd [S]	L	45	5.6	A	2
			117-7	Starkie Dr [S]	Tower Rd [E]	R	6	13.0	A	4
			117-9		Tower Rd [W]	L	109	31.3	C	5
			117-10	Tower Rd [W]	Starkie Rd [S]	R	95	7.6	A	1
			117-11		Tower Rd [E]	T	88	0.2	A	1
							620	15.6	B	3
	204	Henry Lawson Drive	118-2	Henry Lawson Dr [N]	Henry Lawson Dr [S]	T	842	27	B	51
		Bullecourt Avenue	118-3		Bullecourt Ave [E]	L	161	10	A	51
			118-4	Bullecourt Ave [E]	Henry Lawson Dr [N]	R	313	71	F	66
		Counts with an * represent missing count data	118-6		Henry Lawson Dr [S]	L	224	55	D	66
			118-7	Henry Lawson Dr [S]	Bullecourt Ave [E]	R	149	40	C	6
			118-8		Henry Lawson Dr [N]	T	680	15	B	28
							2,368	32	C	38
	205	Asford Avenue	119-1	Ashford Ave [N]	Bullecourt Ave [W]	R	116	3	A	0
		Bullecourt Avenue	119-2		Ashford Ave [S]	T	38	3	A	0
			119-3		Bullecourt Ave [E]	L	169	3	A	0
		Counts with an * represent missing count data	119-4	Bullecourt Ave [E]	Ashford Ave [N]	R	180	4	A	1
			119-5		Bullecourt Ave [W]	T	409	4	A	1
			119-6		Ashford Ave [S]	L	110	4	A	1
			119-7	Ashford Ave [S]	Bullecourt Ave [E]	R	59	4	A	0
			119-8		Ashford Ave [N]	T	39	4	A	0
			119-9		Bullecourt Ave [W]	L	11	3	A	0
			119-10	Bullecourt Ave [W]	Ashford Ave [S]	R	35	2	A	0
			119-11		Bullecourt Ave [E]	T	205	2	A	0
			119-12		Ashford Ave [N]	L	71	3	A	0
							1,448	3	A	1
	206	William Street	120-2	William St [N]	William St [S]	T	297	68.5	E	54
		Marion Street	120-3		Marion St [E]	L	127	66.4	E	54
			120-4	Marion St [E]	William St [N]	R	154	35.6	C	33
			120-5		Marion St [W]	T	1,057	22.9	B	33
			120-6		William St [S]	L	55	18.4	B	33
		Counts with an * represent missing count data	120-7	William St [S]	Marion St [E]	R	59	63.6	E	27
			120-8		William St [N]	T	196	54.3	D	27
			120-9		Marion St [W]	L	41	37.2	C	27
			120-10	Marion St [W]	William St [S]	R	16	78.1	F	20
			120-11		Marion St [E]	T	687	27.7	B	20
			120-12		William St [N]	L	23	27.3	B	20
							2,711	35.5	C	34
	107	Edgar Street	124-1	EdgarSt [N]	Lancelot St [W]	R	64	42	C	273
		Lancelot Street	124-1		EdgarSt [S]	T	668	41	C	273
			124-1		Lancelot St [E]	L	33	41	C	273
			124-1	Lancelot St [E]	EdgarSt [N]	R	44	124	F	75
			124-1		Lancelot St [W]	T	161	112	F	75
			124-1		EdgarSt [S]	L	87	116	F	75
			124-1	EdgarSt [S]	Lancelot St [E]	R	60	48	D	175
			124-1		EdgarSt [N]	T	590	48	D	175
			124-1		Lancelot St [W]	L	90	47	D	175
			124-1	Lancelot St [W]	EdgarSt [S]	R	36	15	B	4
			124-1		Lancelot St [E]	T	112	15	A	4
			124-1		EdgarSt [N]	L	42	14	A	4
							1,986	52	D	132

P3199 Bankstown Airport Major Development Plan

VISSIM Data Analysis - Node

PM Peak 1645-1745

Time	1	Intersection	Movement Code	From	To	Turn	Turning Volume	Delay (s)	LoS	Queue (m)
	112	Edgar St	122-1	Edgar St [N]	Eldridge Rd [W]	R	12	59	E	451
		Eldridge Rd (West)	122-3		Eldridge Rd [E]	L	699	62	E	451
			122-4	Eldridge Rd [E]	Edgar St [N]	R	651	3	A	1
			122-5		Eldridge St [W]	T	215	2	A	1
			122-11	Eldridge Rd [W]	Eldridge Rd [E]	T	306	19	B	5
			122-12		Edgar St [N]	L	12	14	A	5
							1,894	28	B	152
	113	Edgar St	121-5	Eldridge Rd [E]	Eldridge Rd [W]	T	256	18	B	17
		Eldridge Rd (East)	121-6		Edgar St [S]	L	320	17	B	17
			121-7	Edgar St [S]	Eldridge Rd [E]	R	252	11	A	15
			121-9		Eldridge Rd [W]	L	609	13	A	15
			121-10	Eldridge Rd [W]	Edgar St [S]	R	776	7	A	23
			121-11		Eldridge St [E]	T	230	6	A	23
							2,442	11	A	18
	110	Edgar St	123-1	Edgar St [N]	Railway Pde [W]	R	79	29	B	45
		Railway Pde	123-2		Edgar St [S]	T	636	47	D	45
			123-8	Edgar St [S]	Edgar St [N]	T	586	73	F	142
			123-9		Railway Pde [W]	L	56	60	E	142
			123-10	Railway Pde [W]	Edgar St [S]	R	101	47	D	7
			123-12		Edgar St [N]	L	57	45	D	7
							1,514	56	D	65

APPENDIX E

BASE MODEL APPROVAL FROM RMS

NSW
GOVERNMENT
Transport
Roads & Maritime
Services

19 June 2018

Roads and Maritime Reference: SYD14/00500

Director
Bitzios Consulting
Studio 203, 3 Gladstone Street
Newtown NSW 2042

SOUTH WEST PRECINCT BANKSTOWN AIRPORT MAJOR DEVELOPMENT PLAN

Dear Mr Bitzios,

I refer to your letter of 19 February 2018 and meeting of 19 March 2018 between Roads and Maritime Services, Transport for NSW (TfNSW), Altis and Bitzios Consulting with regard to the proposed non-aviation uses (south west precinct) of the Major Development Plan at Bankstown Airport and in particular noting that you have sought 'approval in principle' from Roads and Maritime for the following guiding principles in developing a Transport Study for the South West precinct:

- Traffic impacts associated with the proposed business zone (150,000m^2) based on '*light industrial warehousing*' only.
- 40,000m^2 of '*light industrial warehousing*' can occur on the south western precinct of Bankstown Airport by making use of the existing access arrangements (i.e. Tower Road) and without external 'works in kind' upgrades to the external regional road network.

As you would be aware, concerns were raised by Roads and Maritime at the meeting of 19 March 2018 that traffic generating land uses (i.e. bulky goods development) were permissible uses under the business zone for the south west precinct. Roads and Maritime were of the view that should '*warehousing*' be the only land use sought for the entire south-west precinct (with the exception of the proposed 9,500m^2 of retail development) then advice should be sought from the Commonwealth Department of Infrastructure and Regional Development (DIRD). In particular advice should sought from DIRD on whether other land uses (notably traffic generating land uses) can be prohibited uses through planning amendments or at a minimum other land uses would require an amended transport study and legislative referral to DIRD for determination and referral to Roads and Maritime for comment.

Following consultation with the Commonwealth Department of Urban and Regional Development (DIRD), Roads and Maritime raise no objection is raised to '*warehousing*' being considered for the '*with development scenarios*' subject to the following:

- Relevant planning controls are amended to DIRD satisfaction that prohibit all land uses other than "*warehousing*" in the business zone at the south-west corner of the Airport (150,000m^2) with the exception of the proposed 9,500m^2 of retail development, which should be nominated as a separate zoning within the south west precinct.

- DIRD being satisfied that the prohibition of land uses other than '*warehousing*' is legally enforceable and any change in land use would require submission of a planning amendment and referral to DIRD for determination and referral to Roads and Maritime for comment.

- Warehousing being appropriately defined to DIRD and Roads and Maritime satisfaction.

It is noted that Bitzios Consulting is also seeking agreement from Roads and Maritime that no regional road network improvements are required for Stage 1 (40,000m^2) of industrial development (*light industrial warehousing* only) without the requirement for any road improvements external to Bankstown Airport. Roads and Maritime subject to the above conditions concurs that the traffic generated for Stage 1 (40,000m2) comprising solely of '*warehousing*' does not warrant any road works on the external classified road network.

As previously discussed, Altis may wish to reconsider a more conservative traffic generation rate inclusive of traffic generating developments (i.e. bulky goods retail) that would allow a lot more land use flexibility in the medium and long term with a package of road works and/or contributions (levies) to off-set the traffic generating impacts of the proposed development locked in regardless of land uses on the subject site. This would negate the need for any renegotiation of road works on the adjacent regional road network should Altis wish to pursue different land uses in the future.

If you wish to discuss this submission further, please contact James Hall – Senior Land Use Planner on 0418962609 or james.hall@rms.nsw.gov.au

Yours sincerely

Greg Flynn
Senior Manager Strategic Land Use
Sydney Planning

Transport
Roads & Maritime
Services

21 June 2018

Roads and Maritime Reference: SYD14/00500

Director
Bitzios Consulting
Studio 203, 3 Gladstone Street
Newtown NSW 2042

**SOUTH WEST PRECINCT BANKSTOWN AIRPORT
MAJOR DEVELOPMENT PLAN**

Dear Mr Bitzios,

I refer to the Roads and Maritime Services letter of 19 June 2018 (**TAB A**) with regard to the nominated land use (150,000m^2 of warehousing) and associated traffic impacts of Stage 1 (40,000m^2 of warehousing) proposed for the south-west precinct of Bankstown Airport and wish to provide supplementary advice concerning the base case VISSIM models.

Roads and Maritime reiterates the advice in an email of 25 May 2018 that the base case VISSIM models are '*fit for purpose*' for use to test the 'development scenarios".

If you wish to discuss this submission further, please contact James Hall – Senior Land Use Planner on 0418962609 or james.hall@rms.nsw.gov.au

Yours sincerely

Greg Flynn
Senior Manager Strategic Land Use
Sydney Planning

APPENDIX G

STORMWATER MANAGEMENT STRATEGY

Bankstown AirportBankstown Airport

27-Jun-2018

Bankstown Airport Site-Wide Flood and Stormwater Management Strategy

27-Jun-2018
Prepared for – Bankstown Airport Limited – ABN: 50 803 058 637

Bankstown Airport Site-Wide Flood and Stormwater Management Strategy

Client: Bankstown Airport Limited

ABN: 50 803 058 637

Prepared by

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27-Jun-2018

Job No.: 60548670

Quality Information

Document	Bankstown Airport Site-Wide Flood and Stormwater Management Strategy
Date	27-Jun-2018
Prepared by	Nick Bartho
Reviewed by	Rob Mason / Julia Beck

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
01	20 April 2018	Draft for Client Review	Robbie Williams Project Manager	Robbie Williams
02	10 May 2018	Final	Robbie Williams Project Manager	Robbie Williams
03	28-May-2018	For BAL and CBC Review	Robbie Williams Project Manager	Robbie Williams
04	14-Jun-2018	Final	Robbie Williams Project Manager	Robbie Williams
05	27-Jun-2018	Final	Robbie Williams Project Manager	Robbie Williams

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List of Abbreviations

Term	Description
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
BAL	Bankstown Airport Limited
BBWQIP	Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011)
CAP	Catchment Action Plan (for the Sub-Catchments of the Mid Georges River)
CBC	Canterbury Bankstown Council
DCP	Development Control Plan
DIRDC	Department of Infrastructure, Regional Development and Cities
EY	Exceedances per Year
GPT	gross pollutant trap
LGA	Local Government Area
LiDAR	Light Detection and Ranging
LPI	NSW Land and Property Information
MDP	Major Development Plan
MHWLS	Mean High Water Level Springs
MIKE 11	One-dimensional hydraulic modelling software
MP	Master Plan
OSD	On-site Detention
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RL	Reduced Level
TUFLOW	One- and two-dimensional hydraulic modelling software
WAE	Works As Executed
WSUD	Water Sensitive Urban Design

Executive Summary

1. Introduction

This report documents the methodology and outcomes of a site-wide flooding and stormwater investigation undertaken for Bankstown Airport (Airport).

The key outcome of the investigation is a site-wide strategy (Strategy) for managing flooding and trunk stormwater generally across the whole of the Airport in order to demonstrate how flooding, stormwater and water quality can be manage through an extensive range of development scenarios.

The investigation and Strategy development is intended to:

- Facilitate better communication, data sharing and collaboration around flooding and stormwater management issues between BAL and CBC;
- Forms the basis for agreement with Council on flood management approaches for the Airport site;
- Provide a framework for the assessment of future development proposals;
- Facilitate development approvals through the Department of Infrastructure, Regional Development and Cities (DIRDC);
- Form a key input into a Major Development Plan[1] (MDP) planned for the South West Precinct (SWP) at the Airport; and
- An update to the existing TUFLOW flood model for the Milperra local catchment for future use by BAL and CBC.

2. Background

The Airport is located approximately 26 km to the south-west of Sydney's CBD and within the local government area of the City of Canterbury-Bankstown. The Airport covers an area of approximately 313 ha and forms a significant part of the broader Milperra catchment. The Airport is estimated to contribute the approximately 50% of green space in the Milperra catchment at 200 ha.

There is an extensive existing system of piped drainage and open channels that provide drainage of runoff from and through the Airport. The Airport site forms a large catchment area that contributes runoff to the local Milperra catchment.

The Airport receives a significant amount of uncontrolled runoff from upslope catchments, including Council land, situated to its north and east. These upslope external catchments are primarily residential and comprise parts of the suburbs of Georges Hall, Bass Hill, Yagoona and Condell Park.

Drainage through the Airport discharges to the Georges River, either directly or via the Milperra Drain.

The Airport is subject to inundation following heavy rainfall from two key flood mechanisms:

- Local catchment flooding occurs as a result of short duration storms typically in the order of 2 hours or less over the local Milperra catchment; and
- Georges River flooding occurs as a result of heavy prolonged rainfall typically over multiple days falling on the broader Georges River catchment.

A large number of previous investigations relating to flooding, stormwater and/or water quality management for the Airport and surrounds have been undertaken, and are summarised herein.

Of particular relevance is the *Floodplain Risk Management Study and Plan for Sub-Catchments of the Mid Georges River* (BMT WBM, 2017) and associated development of the Milperra catchment TUFLOW[2] model. The TUFLOW model has been utilised as the basis for understanding local catchment flooding conditions and potential impacts.

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[1] The SWP Major Development Plan will be subject to a public consultation process

[2] TUFLOW model dated 13 July 2017 provided to BAL by CBC

Consultation with Council was undertaken during the study, initially to source relevant data, reports and the Milperra Catchment TUFLOW model, and later to discuss proposed methodologies and approach, as well as to present and discuss preliminary findings and Strategy direction. Specific discussion points, consultation outcomes and agreed positions with Council are noted herein.

3. Present Day Flooding Conditions

Assessment of local catchment flooding conditions was based on application of the Milperra Catchment TUFLOW model. Subsequent adjustments were made by BAL to the version of the model supplied by Council, primarily to improve the definition of piped drainage infrastructure within the Airport. The adjusted TUFLOW model was then rerun for a range of events up to and including the Probable Maximum Flood (PMF).

Overall the adjustments made to the TUFLOW model have only a minor impact on local catchment flooding conditions across the range of flood frequencies considered, and overland flooding was found to be largely consistent with that reported in BMT WBM (2015).

Flooding conditions as a result of large floods on the Georges River were primarily informed by synthesis of past flooding investigations. It is understood that further investigation of Georges River flooding conditions will be undertaken in future with the benefit of the updated Georges River TUFLOW flood model that is currently under development.

4. Site-Wide Flood and Stormwater Management Strategy

Objectives

The overarching objectives of the Strategy are to:

- Ensure that any future development within the Airport does not lead to increased adverse offsite flood risk to property and critical infrastructure;
- Ensure that planning controls at the Airport form part of a consistent and coordinated strategy to manage flood risks at the Airport; and
- Achieve relevant water quality objectives and adoption of WSUD principles to reduce the load of stormwater pollutants entering drainage lines downstream of the Airport.

To inform the Strategy the following scenarios were utilised for modelling:

- Increases to impervious areas and terrain adjustments for the South West Precinct (SWP) of the Airport as described in the Major Development Plan; and
- "Book end" increases to impervious areas to the balance of the Airport[1] .

Modelling

The Milperra catchment TUFLOW model was used to test various strategy options for scope of infrastructure works required to mitigate the impacts of "book end" and proposed development at the SWP.

As a result of the modelling, multiple mitigation options were identified, preferred option(s) have been nominated at this stage largely on the basis of prioritising precinct scale measures and minimising lot-based controls including on site detention (OSD). Preferred options were then refined using the TUFLOW model to assess performance and confirm proof-of-concept by demonstrating that flood management objectives can be satisfied. Bio-filtration devices were considered the most space-efficient means at achieving the desired pollutant load reduction targets as these devices provide relatively high treatment rates for a given footprint.

Selected options were combined into a preferred scheme for each major Airport catchment area as shown in Figure 13.

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[1] The "book end" scenario shows a total 113 hectares of additional impervious area across the Airport incl. the SWP in order to provide proof of concept. The actual additional impervious area in the draft 2019 Master Plan (representing the actual development contemplated by BAL over the 5 year Master Plan period) is 38 hectares which is 33% of the total "book end" area modelled. Modelling of, and demonstrating solutions for, "book end" impervious area at the Airport provides resilience and longevity to the Strategy since the Strategy provides for stormwater, flooding and water quality solutions for an additional 113 hectares of impervious area which is significantly beyond BAL's foreseeable development objectives.

It is noted that options have been developed to cater for a “proof of concept” scenario, and that implementation of specific infrastructure elements and relevant works would be dependent on realised development.

Flood Management Outcomes and Residual Impacts

The assessment has shown that the proposed Strategy can avoid any adverse offsite impacts for local catchment flood events up to the 100 year average recurrence interval (ARI).

Internal impacts are considered manageable with some drainage improvements, and flood hazard is shown to be generally compatible with “book-end” development as well as the Major Development Plan for the South West Precinct.

Sensitivity analyses were undertaken to assess the implications of recent development activities within the Airport, as well as the risk of increased runoff potential. Both issues are considered unlikely to have a significant bearing on the viability of the proposed Strategy.

Potential impacts on Georges River were modelled using the Milperra Catchment TUFLOW model and 12D modelling to ensure no change in flood storage.

Water Quality Outcomes

MUSIC modelling was undertaken to demonstrate that the adopted pollutant load reduction targets can be satisfied with the proposed Strategy based on use of precinct scale bio-filtration basins.

Consideration of Council Endorsed Flood and Catchment Management Measures

Two significant flood mitigation measures were included in BMT WBM (2017) that involve works within the Airport:

- Increase the size of existing detention basins.
- Construct a detention basin within Deverall Park.

In addition, a bioretention basin within Deverall Park was included in BMT WBM (2015).

BAL is willing to work with Council to investigate the feasibility of these projects.

Management of Strategy Implementation, Flood Model Updates and Development Assessment

A set of guidance tools has been developed to assist BAL in managing key aspects of Strategy implementation, and are provided in Appendix B. The tools comprise the following:

- Process Diagram
- Development Risk Screening Matrix
- Flood Risk Precinct Map

These tools are preliminary, with further development required prior to use. Council review and feedback should also be sought and considered prior to finalisation and use.

5. Future Work

Recommended future work includes the following:

1. Provision of this Strategy to Council for review and comment, with ongoing consultation as required into the future;
2. Further assessment of the South West Precinct MDP;
3. Future development proposals on land subject to Georges River flooding, using the Council adopted Georges River Model (or other suitable flood model);
4. Undertake conceptual design for key Strategy elements to confirm required footprint of works, identify and resolve potential space and infrastructure conflicts, as part of any construction documentation; and
5. Review and update of stormwater and flood management requirements within the updated Master Plan.

Note on Flood Frequency Terminology

The frequency of floods may be referred to in terms of their Average Recurrence Interval (ARI), Annual Exceedance Probability (AEP) or Exceedances per Year (EY). For example, for a flood having a 100 year ARI there will be a flood of equal or greater magnitude once in 100 years on average. For a flood having a 1% (or 1 in 100) AEP magnitude, there is a 1% chance that there will be floods of equal or greater magnitude in a given year. A flood magnitude of 1 EY will be equalled or exceeded on average once per year. The approximate correspondence between these three systems is:

Average Recurrence Interval (ARI), years	Annual Exceedance Probability (AEP), %	Exceedances per Year (EY)
100	1	0.01
50	2	0.02
20	5	0.05
2	~40	0.5

In this report floods are referred to in terms of ARI, primarily for consistency with previous flood studies that are relevant to the study area.

Reference is also made in the report to the Probable Maximum Flood (PMF). This flood occurs as a result of the Probable Maximum Precipitation (PMP). The PMP is the result of the optimum combination of the available moisture in the atmosphere and the efficiency of the storm mechanism as regards rainfall production. The PMP is used to estimate PMF discharges using a model which simulates the conversion of rainfall to runoff. The PMF is defined as the limiting value of floods that could reasonably be expected to occur and is therefore an extremely rare flood, generally considered to have an AEP less than 1 in 100,000 or 1 in 10^5.

1.0 Introduction

1.1 Study Purpose, Background and Objectives

The purpose of this report is to document the methodology and outcomes of a site-wide flooding and stormwater investigation undertaken for Bankstown Airport (Airport). This work was undertaken by AECOM for Bankstown Airport Limited (BAL).

Figure 1 shows the location of the Airport and several features important for understanding its regional and hydrologic context, including the Georges River to its west and local stormwater network that drains through the Airport and ultimately feeds into the river.

The key outcome of the investigation is a site-wide strategy (Strategy) for managing flooding and trunk stormwater generally across the whole of the Airport in order to facilitate any future development consistent with the current state of Airport land use planning. This includes consideration of:

- Existing flooding and drainage conditions, including:
    - Relevant sources of flooding, including both local catchment runoff and mainstream flooding along the Georges River.
    - Internal stormwater and water quality management issues and requirements within the Airport.
- Future development plans for the Airport, including both aviation and non-aviation requirements.
- Minimising the potential for adverse off-site flooding impacts.
- Consideration of relevant water quality objectives.
- Implementation of the Strategy and assessment of future development proposals within the Airport.

This investigation and Strategy development is intended to:

- Serve an important engagement function in terms of improving communication, data sharing and collaboration around flooding and stormwater management issues with Council;
- Form the a basis for agreement with Council on flood management approaches for the Airport site;
- Provide a basis for assessment of future development proposals;
- Assist with streamlining development concurrence and approvals through the Department of Infrastructure, Regional Development and Cities (DIRDC);
- Serve as a key input to concurrent Major Development Plan for the Airport's South West Precinct; and
- Provide an update to the existing flood model for the Milperra local catchment (herein referred to as the Milperra Catchment TUFLOW model) for future use by BAL and Council.

1.2 Stakeholder Consultation

Council is a key stakeholder for the Airport and particularly in terms of flooding and stormwater management issues. Consultation with Council was undertaken during the course of the investigation, including:

- Initial discussions to source relevant data, reports and the Milperra Catchment TUFLOW model (refer Section 2.6 for details).
- Subsequent discussions around methodology and approach, as well as to present and discuss preliminary findings and Strategy direction.

Further details of specific consultation outcomes and agreed positions are presented in Section 2.7 of this report.

1.3 Outline of Report

Chapter 2 provides relevant background information including a description of the Airport, sources of flooding and relevant drainage systems and contributing catchment areas. A summary of relevant previous studies, available information and data, and outcomes of Council consultation are also presented.

Chapter 3 describes existing flooding conditions within and surrounding the Airport, including discussion of the methodology and flood modelling approach that was used.

Chapter 4 presents the Strategy for the Airport and provides relevant background in terms of design principles and approach, key design criteria, “book end” development scenario to guide Strategy development, flood management outcomes and residual flood impacts, staging opportunities, and recommendations for future work to further refine the Strategy. Guidance for implementation of the Strategy is also provided.

Chapter 5 sets out recommendations for future work.

Chapter 6 provides a list of references.

Appendix A contains a plan showing the extent of drainage survey obtained to support the present investigation. This survey was undertaken by RPS in late 2017.

Appendix B contains guidance to assist BAL in managing key aspects of Strategy implementation, including development assessment and flood model updates.

2.0 Background

2.1 Site Overview

Bankstown Airport is located approximately 26 km to the south-west of Sydney's CBD. The Airport is situated within the local government area (LGA) of the City of Canterbury-Bankstown. Figure 1 shows the airport site boundary extents which cover approximately 313 ha in area.

Figure 1 also shows the extent of the South West Precinct in which a predominantly industrial development is currently being proposed, which measures approximately 46 ha in area and is broadly bounded by Milperra Road and Crown land to the south, Tower Road and Henry Lawson Drive to the west, and the existing Airport runway to the north.

Major watercourses in the vicinity of the Airport comprise the Georges River and Milperra Drain, which are described in more detail below.

2.2 Flooding Mechanisms

The Airport is subject to inundation following heavy rainfall from two key flood mechanisms:

- Georges River flooding
- Local catchment runoff

2.2.1 Georges River Flooding

The Georges River flows in a southerly direction to the west of the Airport (refer Figure 1). The contributing catchment upstream of the Airport is large (refer Figure 2). Upstream (south) of Campbelltown the catchment is relatively undeveloped and forested, however significant clearing for agriculture and urban development has occurred downstream of Campbelltown, in particular between Liverpool and Bankstown. The river is tidally influenced where it runs near the Airport, with the tidal limit extending upstream to the Liverpool Weir. Flooding along the Georges River in the vicinity of the Airport occurs in response to heavy prolonged rainfall over the greater catchment, typically in the order of 24 to 48 hours duration.

In the vicinity of the Airport, floodwaters surcharge the left (eastern) bank of the river and extend out across Henry Lawson Drive and the relatively low lying floodplain within the Airport and its surrounds. Backwater flooding from the river also occurs along Milperra Drain, and extending further upstream along the various drainage lines that feed into the Drain. The Airport is expected to be affected by the Georges River for floods at least as frequent as the 20 year ARI based on the findings of previous mainstream flooding investigations (e.g. Bewsher, 2004).

Further description and details regarding Georges River flooding is provided in Section 3.4.

The most recent assessment of Georges River flood behaviour is now relatively dated, based on a one-dimensional (1D) MIKE 11 hydraulic model developed as part of technical studies undertaken to inform the *Georges River Floodplain Risk Management Study* (Bewsher, 2004). The MIKE 11 model in turn relies on inputs dating back as far as the previous *Georges River Flood Study* by the NSW Public Works Department (PWD) in 1991. It is understood these flood models are currently being updated using contemporary two-dimensional (2D) modelling techniques, updated bathymetric and floodplain topographic survey and including review and possible update of the associated catchment hydrologic inputs. This work is referred to herein as the Georges River Flood Model Update.

Accordingly, the approach adopted by this present investigation towards assessment of Georges River flooding conditions and potential impacts of developing the South West Precinct was to undertake assessment based on achieving no net loss of floodplain storage. When detailed design of South West Precinct, and other high flood risk precincts, occurs further assessment will be completed to confirm consistency with the Strategy and the floodplain storage requirements.

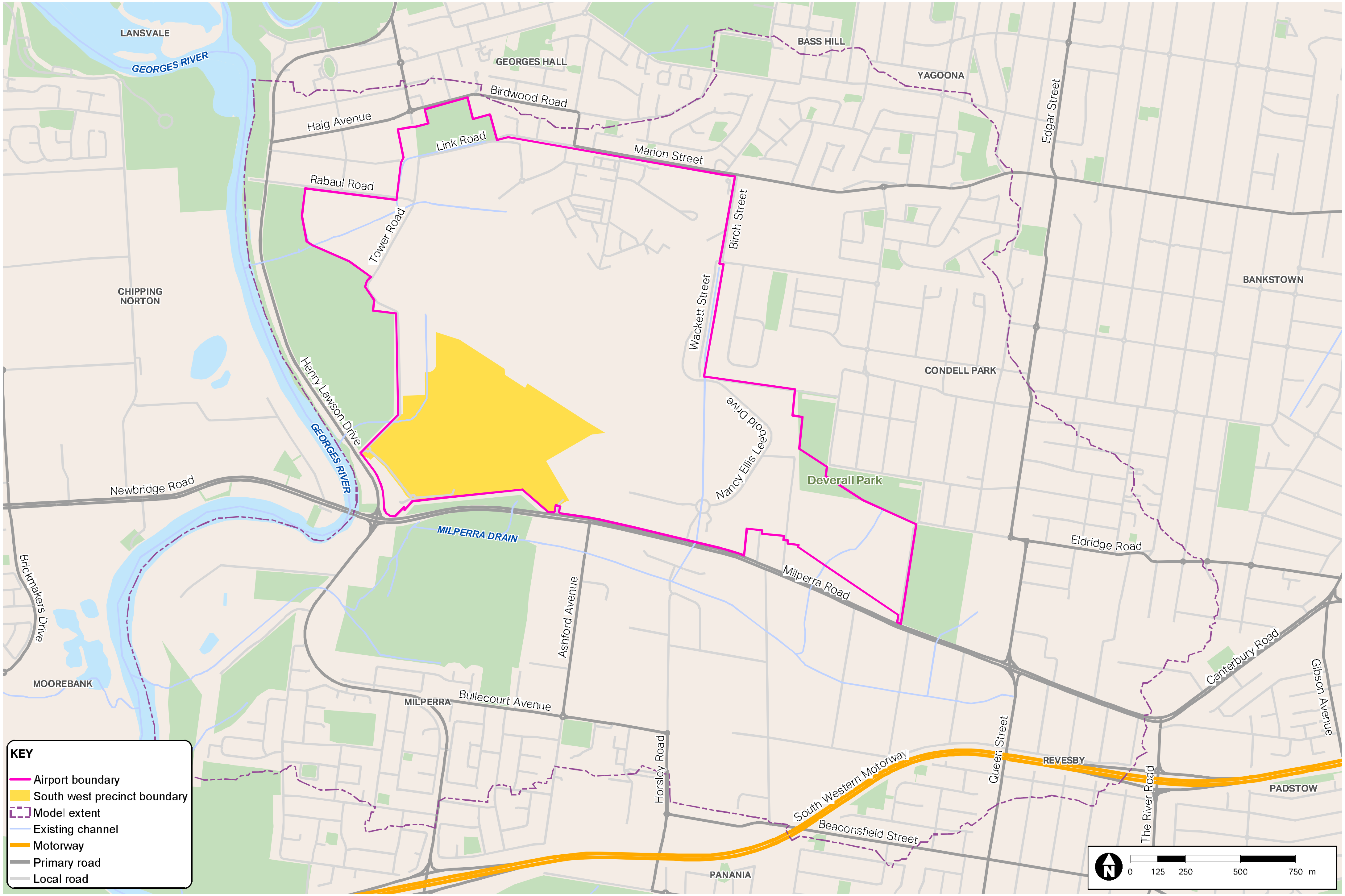

FIGURE 1:

LOCALITY MAP

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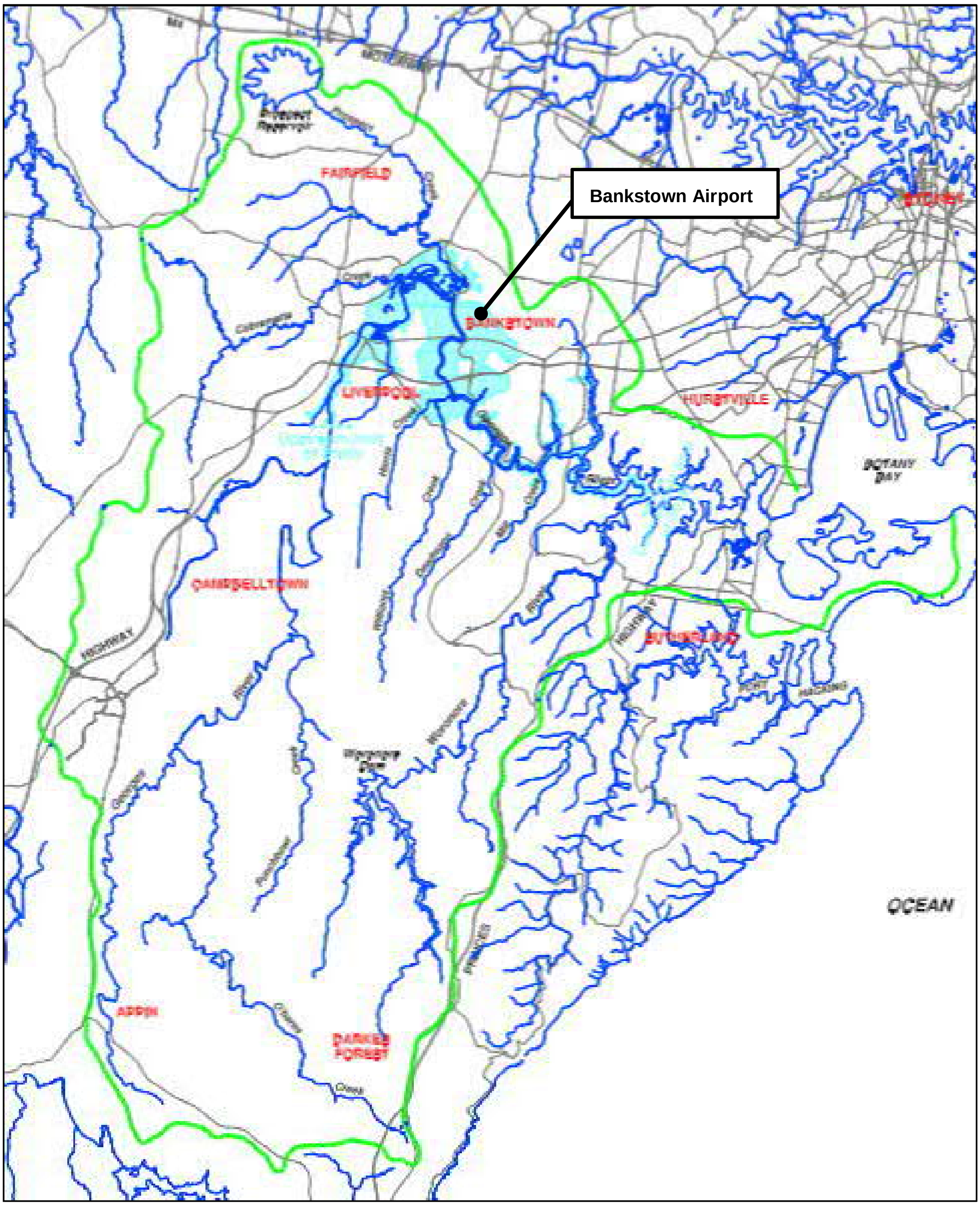
Figure 2 Georges River Catchment



Source: Extract from Figure 2.1 in Bewsher (2004)

2.2.2 Local Catchment Runoff

The Airport is also subject to flooding that occurs as a result of localised rainfall over the site and adjacent external developed areas to the north and east which comprise parts of the suburbs of Georges Hall, Bass Hill, Yagoona and Condell Park. Figure 3 shows the extent of the subcatchment areas that contribute runoff to the various drainage lines that pass through the Airport. All of these subcatchment areas form part of the Milperra catchment.

In the 100 year ARI event the Airport retains water, including uncontrolled runoff from a substantial upstream catchment including Council land, typically at depressions between the runways as shown in Figure 8.

The primary watercourse within the Milperra catchment is Milperra Drain which flows generally west before joining the Georges River.

Local overland flooding of the Airport and surrounds occurs as a result of short intense rainfall events in the order of 2 hours duration or less. As noted by BMT WBM (2015), it is unlikely that significant flooding of the local Milperra catchment will coincide with Georges River flooding of the same frequency and magnitude due to the vastly different catchment sizes and therefore different meteorological conditions necessary to generate flood-producing rainfall.

Council has recently finalised flood and flood risk management studies for the Milperra catchment (BMT WBM, 2015 and 2017). Flood behaviour was assessed using the TUFLOW software and a linked 1D-2D modelling approach that enables integrated analysis of both surface flows across the catchment and flows within the underground piped drainage network. This model and supporting documentation was made available by Council, and has therefore been adopted here as the basis for assessment of local catchment flooding conditions, understanding potential impacts of any Airport development, and Strategy development.

Further description of the Milperra Catchment TUFLOW model and adjustments made as part of the present investigation, as well as assessment of present day local catchment flooding conditions, is provided in Sections 3.2 and 3.3.

2.3 Existing Airport Drainage Systems

Figure 3 shows the extensive system of existing piped drainage and open channels that provide drainage of runoff from and through the Airport. The Airport site forms a large catchment area that contributes runoff to the local Milperra catchment, however the Airport also receives runoff from external upslope catchments situated to its north and east as previously mentioned. These external catchment areas at approximately 300 ha are around the same size as the Airport site.

Figure 3 identifies 7 inlets to the airport where flow from the external upstream catchment is discharged onto the airport both as controlled and uncontrolled flows.

Figure 3 identifies 5 primary outlets where stormwater is discharged from the Airport, labelled as Outlets A through E.

Outlet A drains the north-eastern precinct of the Airport, which consists of a mix of grassed open space and existing developed areas supporting a range of commercial, light industrial and aviation-related uses. A well-vegetated open channel conveys stormwater across the Airport boundary at Outlet A into the adjacent Georges River Golf Club. This channel ultimately discharges into the Georges River a short distance further downstream.

Outlets B and C drain the central precinct of the Airport, including the bulk of the runways and taxiways and adjacent airside development to the north, and proposed South West Precinct MDP area.

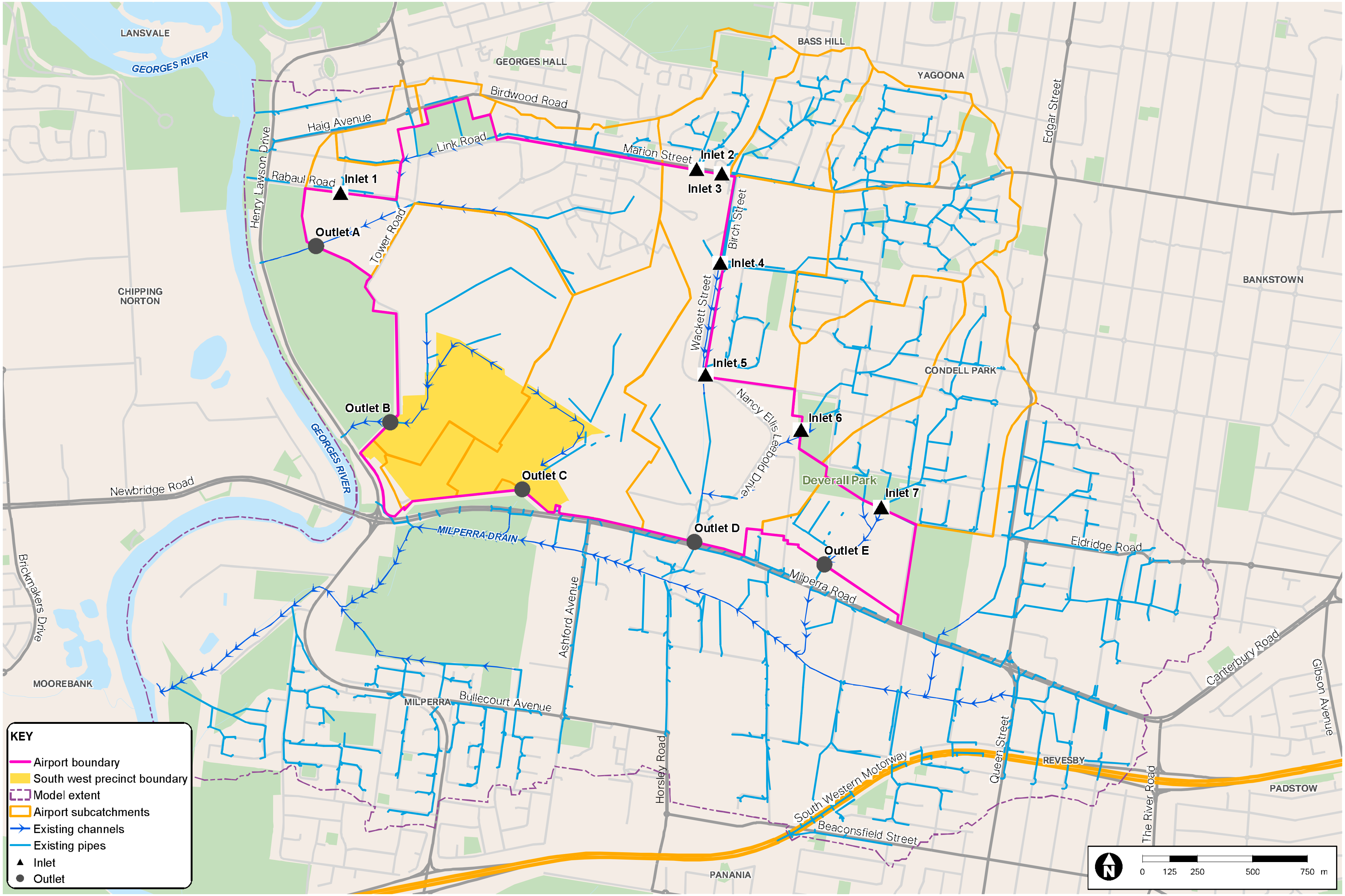


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FIGURE 3:

LOCAL CATCHMENT PLAN AND DRAINAGE SYSTEM

Outlet B comprises a triple cell pipe culvert under Tower Road, which discharges into a vegetated channel at the southern end of Georges River Golf Club. This channel ultimately discharges into the Georges River a short distance further downstream. Outlet C comprises a well-vegetated open channel where it crosses into the adjacent Crown reserve. This channel feeds into a box culvert under Milperra Road, which discharges into another vegetated channel running south across Crown reserve. This channel ultimately discharges into Milperra Drain a short distance further downstream.

Outlet D drains the eastern precinct of the Airport which extends from Marion Street in the north to Milperra Road in the south. The catchment comprises the area around the eastern end of the runways as well as existing development to the south (e.g. Bunnings and McDonald’s) and north (e.g. Toll Holdings and further north). The bulk of the external catchment areas north of Marion Street and east of Wackett Street also drains to this outlet. Stormwater is piped under Milperra Road at Outlet D and it discharges to Milperra Drain a short distance further downstream.

Outlet E drains the far eastern precinct of the Airport including the southern portion of Deverall Park and adjacent Pickles, BGC Bocce and Southern Steel sites. Outlet E comprises a triple cell pipe culvert extending under the adjacent industrial development sites along the northern side of Milperra Road. These culverts discharge to an open concrete lined channel south of the road, which ultimately connects to Milperra Drain.

It is understood that a number of underground on-site detention (OSD) systems have been constructed within the Airport over many years, however the location, configuration and condition of these systems is not known. It is noted that the influence of any existing OSD is ignored in the assessment of existing flooding conditions presented in this report. It is noted also that subsequent Strategy development considers flood and stormwater management measures that are not reliant on an understanding of existing OSD, nor on the operation of these devices.

Stormwater detention facilities for which details are known are limited including two existing surface basins located adjacent to Nancy Ellis Leebold Drive to the north of the McDonald’s site.

There are no known formal stormwater treatment devices within the Airport. Some informal treatment of stormwater would likely occur within the grass lined swales and channels in the lower part of the Airport.

2.4 Existing Site and Environmental Constraints

Other relevant existing site and environmental conditions that potentially constrain future development of the Airport, and in particular consideration of altered stormwater drainage arrangements, include:

- Existing Airport developments and infrastructure

  Existing developments will require consideration to ensure any adverse flooding impacts are avoided or are otherwise manageable for existing tenancies. Existing development may also preclude some shorter term works if existing lease arrangements are not sufficiently flexible.

- Crown land

  Figure 1 shows the location of Crown land along the southern side of the South West Precinct. Due to the complex approval requirements and sensitive ecological communities in this area it was considered desirable to avoid the need for future drainage works to extend into this land, and the primary impact is to constrain future invert levels to an elevation above existing surface levels along the Airport boundary. Existing levels vary between about 2.9 and 3.6 m AHD.

- Environmentally sensitive areas

  Figure 1 shows the location of mapped environmentally sensitive areas, including Deverall Park and part of the above-mentioned Crown land.

  Other areas of known sensitivity include the reach of open channel between Tower Road and Outlet A and adjacent overbank areas, as well as the existing open channel alongside Wackett Street and adjacent overbank areas. Both sites are understood to contain sensitive vegetation.

2.5 Previous Studies

A large number of previous investigations relating to flooding, stormwater and/or water quality management for the Airport and surrounds have been undertaken. Table 1 identifies those of high relevance to the present investigation and how these have been used or considered.

Table 1 Summary of Key Previous Studies

Previous Study/Report	Relevance	How Considered
Bankstown Airport – future development and land use planning:		
Bankstown Airport Master Plan 2014 (BAL, 2014)	This sets out future development and land use planning for the Airport.	The adopted future development scenario that informs the Strategy uses the 2014 Master Plan as a base.
Bankstown Airport – flood and stormwater management:		
Bankstown Airport Stormwater and Flood Management Strategy (URS, 2006)	This forms the current flood and stormwater strategy for the Airport. The report describes previous flood impact assessments undertaken for past development on the Airport, sets out a range of flood management and mitigation measures for future consideration, outlines current flood emergency management and evacuation, and sets out a proposed high-level design basis for future stormwater management infrastructure.	The report was used to develop an understanding of past/current management of stormwater and flooding issues.
Bankstown Airport – Stormwater and Flood Management Strategy (Molino Stewart, 2012)	This report reviewed the viability of the 2006 Strategy (URS, 2006) being applied to the 2014 Airport Master Plan. In general the viability was confirmed, with various recommendations for upgrading to reflect changes in practice, updating of future infrastructure plans, updating of emergency management and evacuation plans, and cooperation with Council on flood model development.	The report was used to develop an understanding of past/current management of stormwater and flooding issues as well as previous recommendations for improvement.
Milperra Catchment Flood Study Model Review at Bankstown Airport (BMT WBM, 2015)	This report summarises the findings of impact assessment of past Airport development on local catchment flooding.	Identifies residual flood impacts from past Airport development, which are discussed further in Section 0.
Studies undertaken with reference to broader catchment and/or floodplain		
Georges River Floodplain Risk Management Study and Plan (Bewsher, 2004)	This report informs best current understanding of Georges River flood behaviour, presents a flood damages assessment, reviews existing floodplain management measures and considers new/altered measures that could reduce flood risk, and	Reported flood behaviour was used to inform assessment of potential impacts of future Airport development on Georges River flooding.

Previous Study/Report	Relevance	How Considered
	documents the recommended floodplain risk management plan for implementation.	
Sea Level Rise Impact Assessment for the Georges River (Flood Mit, 2012)	This report describes potential Georges River flooding impacts for the Airport, which may occur due to sea level rise associated with future climate change.	Requires further consideration as part of future assessment of Georges River flooding conditions and impacts.
Milperra Catchment Flood Study (BMT WBM, 2015)	This report provides best current understanding of local catchment flood behaviour in the Milperra catchment.	The TUFLOW model developed as part of this study has been used to assess local catchment flooding conditions and impacts of future Airport development.
Floodplain Risk Management Study and Plan for Sub-Catchments of the Mid Georges River (BMT WBM, 2017)	This report presents a flood damages assessment, considers and priorities flood mitigation options that could reduce flood risk, and documents the recommended floodplain risk management plan for implementation.	Recommended floodplain risk management measures relevant to the Airport have been considered in development of the Strategy.
Catchment Action Plan for the Sub-Catchments of the Mid Georges River (BMT WBM, 2015)	This report, prepared in conjunction with BMT WBM (2017), outlines existing catchment and waterway conditions and future pressures and identifies opportunities for improvement through the preparation of a Catchment Action Plan (CAP) in the form of a prioritised list of actions for improved catchment and waterway management.	Recommended CAP measures relevant to the Airport have been considered in development of the Strategy.
Georges River Estuary Coastal Zone Management Plan (BMT WBM, 2013)	This report provides a strategic framework and action plan for the future management of the Georges River Estuary. However, the practical outcomes are essentially incorporated into the CAP (BMT WBM, 2015).	Refer CAP above.
Botany Bay and Catchment Water Quality Improvement Plan (SMCMA, 2011) (BBWQIP)	This report sets out relevant water quality objectives for new development in the Botany Bay catchment.	The Strategy adopts the relevant water quality objectives identified in SMCMA (2011).

2.6 Available Data

In addition to the previous studies listed in Section 2.5, the following information and data was available to inform the study:

- Milperra Catchment TUFLOW model (including data files but no previous results), obtained from Council in July 2017.

- Georges River MIKE 11 model, obtained from Council in September 2017.
- *Bankstown DCP 2015 - Part B12 Flood Risk Management* and *Bankstown Development Engineering Standards 2009*, sourced from Council's website.
- Survey files for selected areas of the Airport undertaken prior to commencement of the present investigation, received from RPS in August 2017.
- Additional topographic and drainage survey undertaken in September-October 2017, by RPS (refer Appendix A).
- Various spatial datasets, including:
  - Various data in CAD format relating to existing Airport infrastructure including drainage and utilities
  - Aerial photography sourced from LPI (dated 2014)
  - LiDAR sourced from LPI (dated 2013)
  - Constraint mapping, by Urbis (2017)

It is noted that various preliminary concept layouts and design inputs relating to the South West Precinct also formed inputs to this component of work. The final Strategy presented in this report has considered an earthworks/grading design for Stage 1 of the South West Precinct that is representative of the final concept design presented in AECOM (2018).

2.7 Consultation Outcomes

As previously mentioned, consultation with Council occurred during development of the Strategy. Key discussion points and agreed outcomes are summarised in Table 2.

Table 2 Outcomes of Council Consultation

Issue	Key discussion points and agreed outcomes
Baseline conditions for flood impact assessment	• Agreed that the current Floodplain Risk Management Study and Plan for the Sub-Catchments of the Mid Georges River has now been adopted by Council and should form the baseline conditions for flood impact assessment.
Approach to assessment of local catchment flooding conditions	• Agreed that Milperra Catchment TUFLOW model generally suitable for use, with only minor modifications necessary to build in additional detail (for example, additional piped drainage within the Airport).
Approach to assessment of Georges River flooding conditions	• Agreed that the Milperra Catchment TUFLOW model was limited due to its representation of the Georges River. • Agreed that a two stage assessment process was reasonable given the above, comprising: 1. Assessment and design development on the basis of ensuring no loss of existing flood storage below peak 100 year ARI Georges River flood levels. 2. Subsequent more detailed assessment and refinement (if necessary) using the Georges River TUFLOW Model Update once adopted by Council.
Need for On Site Detention (OSD)	• Council confirmed that the requirement for OSD or otherwise should be based on the level of flood affectation downstream of the Airport boundary. If no impact is demonstrated then OSD should not be required, however where impact is shown, OSD (or other suitable mitigation measures) will be required.
Relevant flood protection standard	• Agreed that governing requirement is the current 2014 Airport Master Plan, which specifies that all buildings have floor levels at 100 year ARI + 300 mm freeboard.

Issue	Key discussion points and agreed outcomes
Version of Australian Rainfall and Runoff (ARR) to be adopted	• Agreed that ARR 1987 version to be adopted.
Criteria for water quality consideration/assessment	• Council confirmed the pollutant load reduction targets identified in *SMCMA (2011)* are the relevant criteria. • Council noted preference for WSUD principles in design of new drainage infrastructure.
Key risk/concern areas for Council	• In particular flooding along Milperra Drain and areas to the north-west of the Airport around Rabaul Road, and as otherwise identified in BMT WBM (2017). • Council continuing to investigate Deverall Park for a potential flood detention basin. • Council also investigating channel improvements along the lower Milperra Drain in the vicinity of Bankstown Golf Course.

Council also indicated their willingness to be proactively involved in refinement of proposals for the South West Precinct to support the intention to achieve mutually beneficial outcomes where possible.

BAL has stated its commitment to ongoing engagement with Council as it progresses planning for potential development of the South West Precinct, as well as other areas of the Airport. It is understood Council will be given the opportunity to review and comment on this report as the next step in the engagement process.

3.0 Assessment of Present Day Flooding Conditions

3.1 General

This section outlines how baseline flooding conditions under present day conditions were established.

3.2 Milperra Catchment TUFLOW Model

3.2.1 Initial Model Version

The Milperra Catchment TUFLOW model, as documented in BMT WBM (2015), was used as the basis for assessing present day local catchment flooding conditions.

For a detailed description of model history and development, refer to BMT WBM (2015).

3.2.2 Model Review

A review was undertaken to confirm the suitability of the TUFLOW model for assessing localised flooding conditions within and surrounding the Airport. The review determined that the model was generally suitable for assessing local catchment flooding with only minor adjustments warranted for the purpose of the present investigation, primarily to address the following issues:

- The limited extent of existing piped drainage within the Airport that had been incorporated into the model (refer next section for details).
- Some minor discrepancies in material mapping used to define impervious surfaces across the Airport, when compared to current aerial photography.
- Minor model instabilities in various locations within the lower catchment, typically associated with initialisation of water levels at the start of simulations.

It is noted that some further model refinement may be warranted in future to address additional model instabilities noted along selected reaches of Milperra Drain. It would be prudent to address these prior to or at the time of future detailed design of trunk stormwater works within the Airport where tailwater conditions are intended to be sourced from the TUFLOW model.

The lack of a rigorous validation of the direct rainfall-on-grid hydrology is also noted. BMT WBM (2015) reports that insufficient data relating to historic storm events in the catchment is available to enable the model to be formally calibrated, with model parameters (including rainfall loss rates) assigned on the basis of judgement, experience and work undertaken within the LGA. This is considered reasonable and largely sufficient for the purpose of the present investigation. Sensitivity testing has been undertaken to assist in understanding the impact of potentially higher runoff generation on the site-wide Strategy presented in this report (refer Section 4.3.3.1 for details). However, it is recommended that future detailed design of trunk stormwater works within the Airport review the results of the TUFLOW model against alternative methods (e.g. an independent hydrologic model) to confirm that runoff volumes and peak flow rates resulting from both approaches are comparable.

3.2.3 Model Adjustments

The following adjustments were subsequently made to the TUFLOW model:

- Adjustments to several piped drainage elements were made to correct details obviously in error (e.g. backwards sloping pipes) or where WAE drawings or other relevant information was available.
- Triple cell culverts under Tower Road were modelled as uni-directional to account for flap gates installed on the outlet.
- Additional piped drainage within the Airport was incorporated into the model, based on additional survey undertaken as part of the present investigation. This survey was undertaken by RPS in September-October 2017. Appendix A contains a plan showing the extent of additional drainage survey.

Additional piped drainage was generally limited to elements of the larger trunk system. Some parts of the smaller reticulation network were also incorporated into the model to improve overall representation of inlet capacity.

- Material mapping refined in selected areas based on current aerial photography.
- TUFLOW engine updated from 2012 release to 2017 release, which provided access to additional software features and functionality not available in the 2012 version, as well as faster model run times. Backwards compatibility to 2012 was retained to maximise consistency with previous results.

  It is noted that the change in TUFLOW engine was tested and found to result in negligible change to model results for the events tested.
- Additional coincident flooding scenarios were also investigated – refer Section 3.2.6 for details.

Additional model adjustments were made to incorporate recently completed developments, with further details provided in Section 4.3.2.

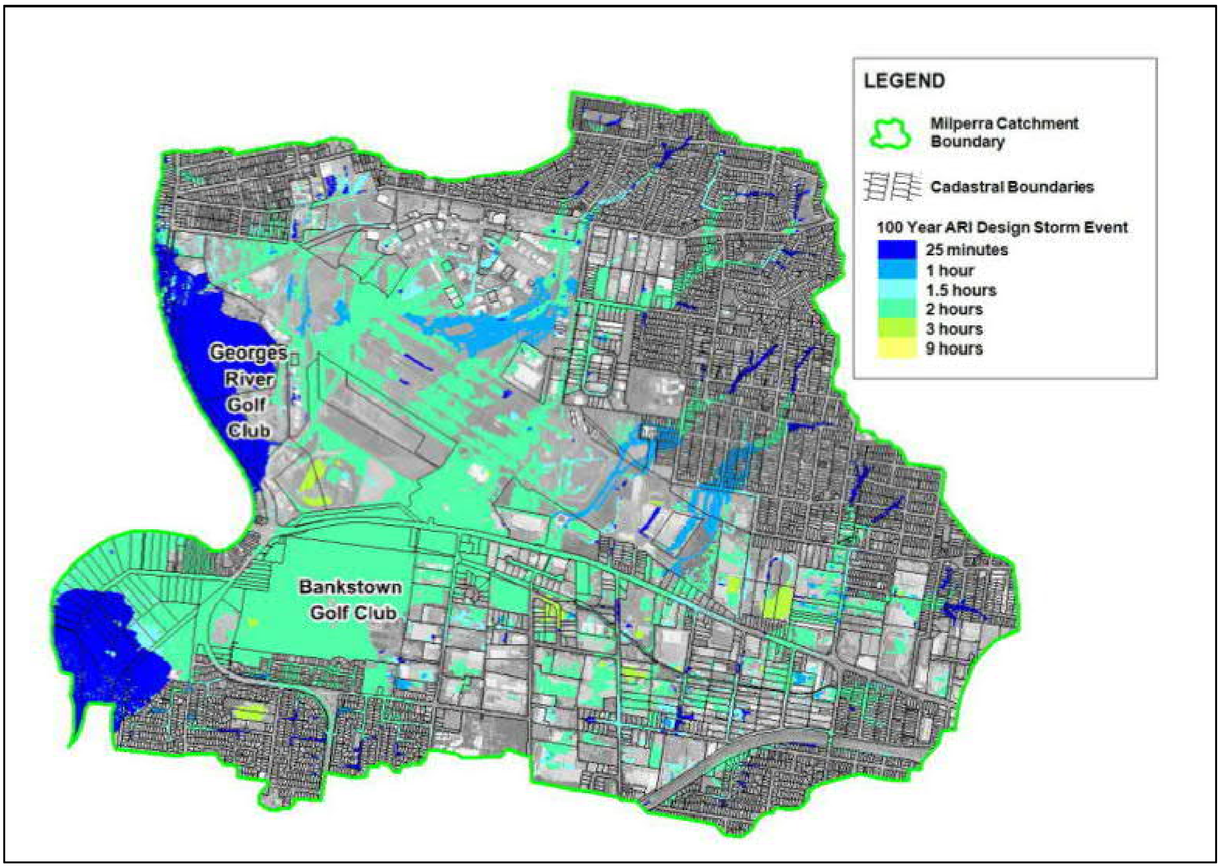
3.2.4 Design Rainfall Data

The Milperra Catchment TUFLOW model is based on design rainfall data from the 3rd edition of ARR, originally published in 1987 (Pilgrim, 1987). No consideration of the recently updated design rainfall data and associated methods in ARR 2016 has been made as part of the present investigation, which is consistent with advice from Council regarding flood planning in the Canterbury-Bankstown LGA.

3.2.5 Critical Storm Duration

The 2 hour storm duration was adopted as critical for all design events up to and including 100 year ARI, consistent with the approach adopted by BMT WBM (2015). This storm duration was found to maximise peak flood levels throughout most of the Airport site and immediate surrounds, with Figure 4 showing the spatial distribution of critical duration for the 100 year ARI design event.

Figure 4 Spatial Distribution of Critical Storm Duration for 100 year ARI Local Catchment Storm



Source: Extract from Figure 4.1 in BMT WBM (2015)

Where storm durations other than 2 hour are critical, differences in peak flood level when compared to the 2 hour event are small so that simplifying the assessment to consider only one storm duration was suitable for the purpose of the present investigation.

3.2.6 Coincident Georges River flooding

Coincident flooding conditions on the Georges River are represented in the Milperra Catchment TUFLOW model as a static tailwater level over the duration of the local catchment flood event, with some spatial variation along the river as appropriate. The frequency of flooding for the Georges River that was adopted for each local catchment storm event is shown in Figure 5, with the reduction in frequency intended to reflect the likely difference in response time and lack of coincidence of peaks given the vast difference in catchment sizes.

Figure 5 Coincident Georges River Flooding Conditions Adopted in BMT WBM (2015)

Design Flood Event	Design Rainfall Event in Milperra Catchment	Georges River Level (m AHD)
1 Year ARI	1 Year ARI	MHWLS (0.7)
2 Year ARI	2 Year ARI	MHWLS (0.7)
5 Year ARI	5 Year ARI	MHWLS (0.7)
10 Year ARI	10 Year ARI	MHWLS (0.7)
20 Year ARI	20 Year ARI	MHWLS (0.7)
50 Year ARI	50 Year ARI	20 Year ARI (4.6 to 5.5)
100 Year ARI	100 Year ARI	20 Year ARI (4.6 to 5.5)
200 Year ARI	200 Year ARI	100 Year ARI (5.6 to 6.3)
500 Year ARI	500 Year ARI	100 Year ARI (5.6 to 6.3)
1000 Year ARI	1000 Year ARI	100 Year ARI (5.6 to 6.3)
PMF	PMF	100 Year ARI (5.6 to 6.3)

MHWLS: Mean high water level springs

Source: Table 4-6 from BMT WBM (2015)

These coincident flooding conditions were generally adopted for the present investigation. However, an additional scenario was set up for the 100 year ARI to better understand local catchment flooding conditions in the absence of any significant runoff response in the Georges River. The local catchment storm was combined with a static tidal condition of Mean High Water Level Springs (MHWLS) of 0.7 m AHD for this purpose.

3.2.7 Blockage

All runs consider unblocked conditions at this stage of Strategy development.

Blockage is to be considered further, including modelling of partial structure blockages consistent with the scenarios set out in BMT WBM (2015), as part of future design development for significant Strategy elements.

Appropriate blockage factors for all inlet structures will also be developed as part of future design of any trunk stormwater works.

3.2.8 Climate Change

All runs consider current climatic conditions only at this stage of Strategy development.

Further discussion of the implications of an increase in rainfall intensity on local catchment flooding conditions that may occur as a result of future climate change is provided in Section 3.3.3, based on the findings of BMT WBM (2015).

3.2.9 Flood Mapping Methodology

The adopted rainfall on grid approach results in wetting of all cells in the TUFLOW model. To differentiate between shallow sheet flow and non-trivial flooding, results are typically shown only where depth exceeds a specified cutoff value. The methodology adopted by Council for its flood studies adopts 0.05 m as the cutoff value, and this has been retained for this present investigation.

3.3 Local Catchment Flooding Conditions

3.3.1 Presentation and Discussion of Results

Present day local catchment flooding conditions in terms of extents and depths of inundation are shown in several figures with brief discussion provided in Table 3.

Table 3 Summary of Local Catchment Flooding Conditions

Local Catchment Flood Event	Figure Reference	Description of Flooding Conditions within Airport
2 year ARI (Georges River tailwater: MHWLS)	Figure 6	• Runoff typically contained within existing drainage channels. • Some localised overland flooding of shallow depth, typically less than 0.25 m, particularly south of Marion Street extending through to the Airport runways. • Minor ponding adjacent to runways, with some shallow overtopping noted at north-west end of main runway.
100 year ARI (Georges River tailwater: MHWLS)	Figure 7	• Some surcharging of existing drainage channels noted. • Extensive uncontrolled runoff enters the Airport across Marion Street and in the vicinity of Kinch Reserve and Deverall Park. • Widespread overland flooding is evident across the Airport, typically less than 0.25 m deep. • Ponding areas adjacent to runways typically 0.5-0.75 m deep. Overtopping of runways noted at several locations.
100 year ARI (Georges River tailwater: 20 year ARI)	Figure 8	• Backwater influence from 20 year ARI Georges River flood evident within South West Precinct only. • More extensive overland flooding and additional surcharging of channels noted throughout the South West Precinct. • Other areas within Airport unchanged from results shown in Figure 8 and described above.
PMF (Georges River tailwater: 100 year ARI)	Figure 9	• Extensive overland flooding noted across entire Airport. • Large areas of South West Precinct subject to depths in excess of 1.5 m.

Flood hazard for the 100 year ARI local catchment flood (Georges River tailwater: 20 year ARI) is shown in Figure 10, with provisional hazard categorisation in accordance with Figure L2 of the *Floodplain Development Manual* (NSW Government, 2005).

This figure shows that areas of high hazard within the Airport are generally limited to existing drainage channels, with some exceptions including:

- Localised areas of high hazard flooding along internal roads, including sections of Nancy Ellis Leebold Drive.
- High hazard flooding in selected low-lying areas in the southern part of the South West Precinct.

It is noted that high hazard flooding does not necessarily constrain or restrict development, but does require consideration to ensure that the increased risk to personal safety and potential evacuation difficulties can be adequately managed.

3.3.2 Comparison to Previous Results

Overall the model adjustments outlined above have only minor impact on local catchment flooding conditions across the range of flood frequencies considered, and overland flooding was found to be largely consistent with that reported in BMT WBM (2015).

3.3.3 Implications of Future Climate Change

BMT WBM (2015) assessed the potential impact of a 10% increase in rainfall intensity on local catchment flooding for the 100 year ARI design event in the Milperra catchment, which is broadly consistent with current industry practice that typically considers increases in the range of 10 to 30% to understand the implications of future climate change on rainfall-driven flooding.

Increases in peak flood levels in the order of 0.05-0.1 m are predicted across much of the catchment. Within the Airport, increases are shown to be typically less than 0.05 m, up to a maximum of about 0.1 m in selected areas.

Consideration of the need for an additional climate change allowance to be incorporated into flood planning levels applied to Airport development should form part of a future review of Airport development standards. It is however noted that increases of up to 0.1 m are relatively small and occur in isolated areas, and could likely be reasonably accommodated within an existing freeboard allowance with only minor reduction in the overall level of protection afforded to development.

3.4 Georges River Flooding Conditions

3.4.1 Discussion

Based on flooding conditions reported in PWD (1991), peak Georges River flood levels applicable to the Airport are summarised in Table 4.

Table 4 Georges River Peak Flood Levels

Flood Event	Peak flood level range along western boundary of Airport (m AHD)	Peak flood level adjacent to South West Precinct (m AHD)
20 year ARI	4.9 to 5.1	5.0
50 year ARI	5.4 to 5.6	5.5
100 year ARI	5.9 to 6.0	6.0
PMF	10.4 to 10.5	10.5

Source: Interpretation of results presented in PWD (1991)

Figure 11 shows approximate extents and depths of inundation for the 100 year ARI Georges River flood. These results are indicative only and were generated using the Milperra Catchment TUFLOW model with a 100 year ARI tailwater condition applied in combination with a nominal local catchment storm. The approximate extent of the PMF within the Airport is also shown on this figure.

3.4.2 Implications of Future Climate Change

Flood Mit (2012) assessed the potential impact of three climate change scenarios on Georges River flooding for the 100 year ARI event. Potential sea level rise of 0.4 m (to year 2050) and 0.9 m (to year 2100) were assessed independently, whilst a sea level rise of 0.9 m was also assessed in combination with a potential 10% increase in rainfall intensities. The sea level rise scenarios were adopted for consistency with the NSW Government's former sea level rise planning benchmarks, and remain broadly consistent with current industry practice and the latest science around sea level rise.

Results were reported at only selected locations along the river, with the closest to the Airport being Milperra Bridge and Prospect Creek. These results indicate that the maximum increase in peak 100 year ARI flood level expected in the vicinity of the Airport for the three scenarios is about:

- 0.04 m for a 0.4 m rise in sea level;
- 0.10 m for a 0.9 m rise in sea level; and

- 0.45 m for a 0.9 m rise in sea level combined with a 10% increase in rainfall intensities.

It is understood that Council is yet to formally adopt any of these scenarios for flood planning purposes, with design flood levels still based on present day climatic conditions.

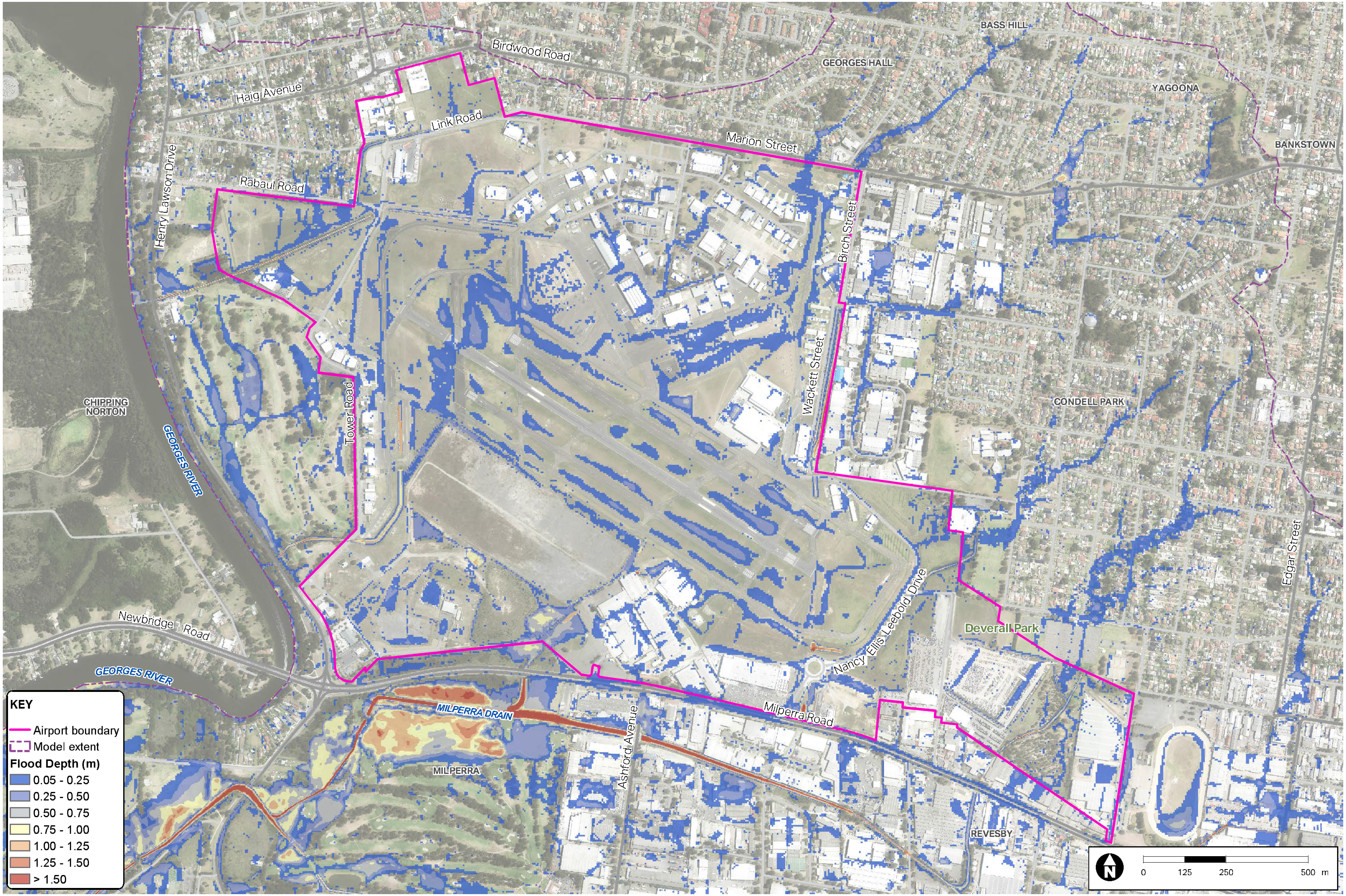


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FIGURE 6:

2 YEAR ARI LOCAL CATCHMENT FLOODING CONDITIONS - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

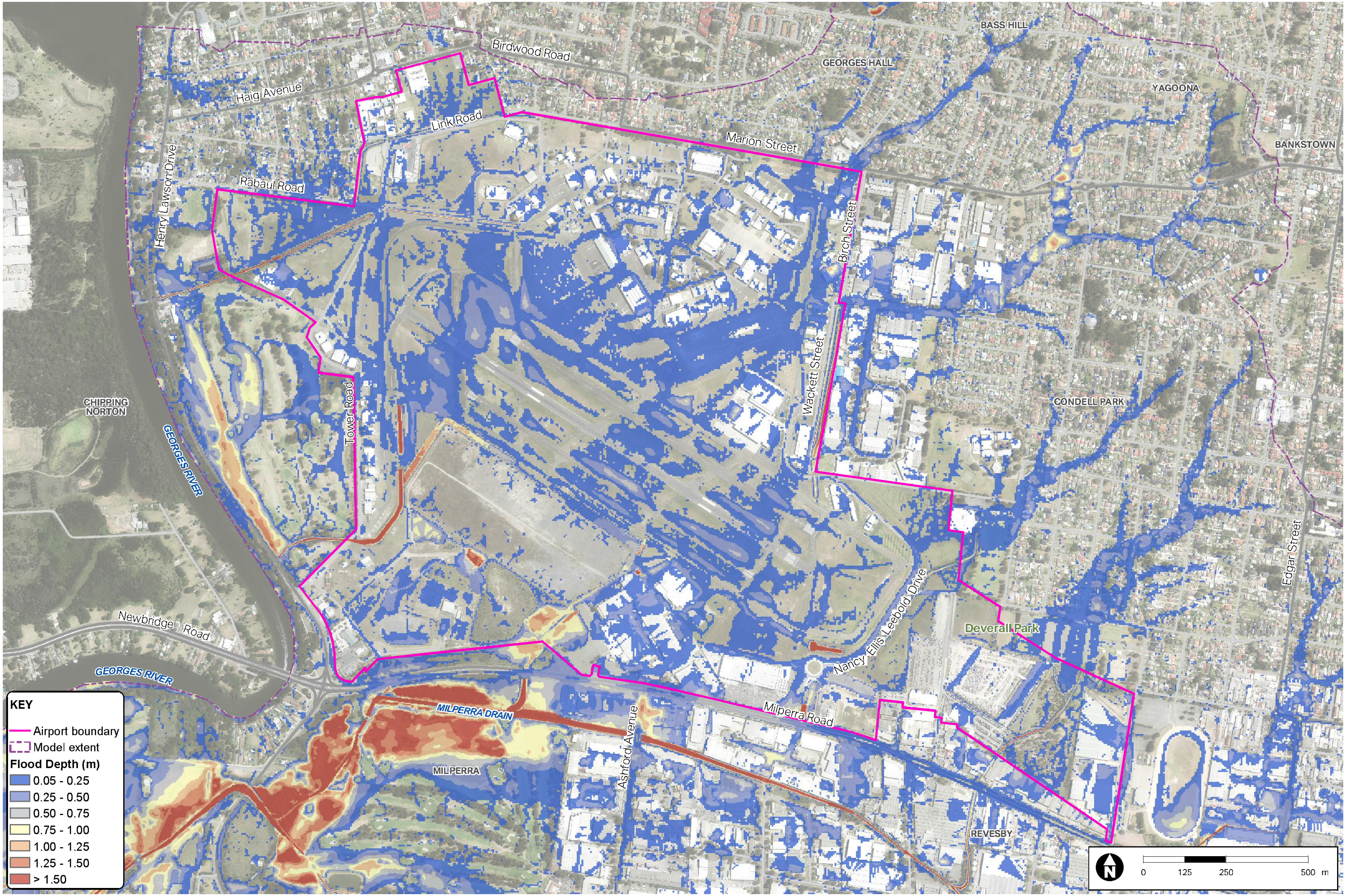

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FIGURE 7:

100 YEAR ARI LOCAL CATCHMENT FLOODING CONDITIONS (TAILWATER: MHWLS) - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

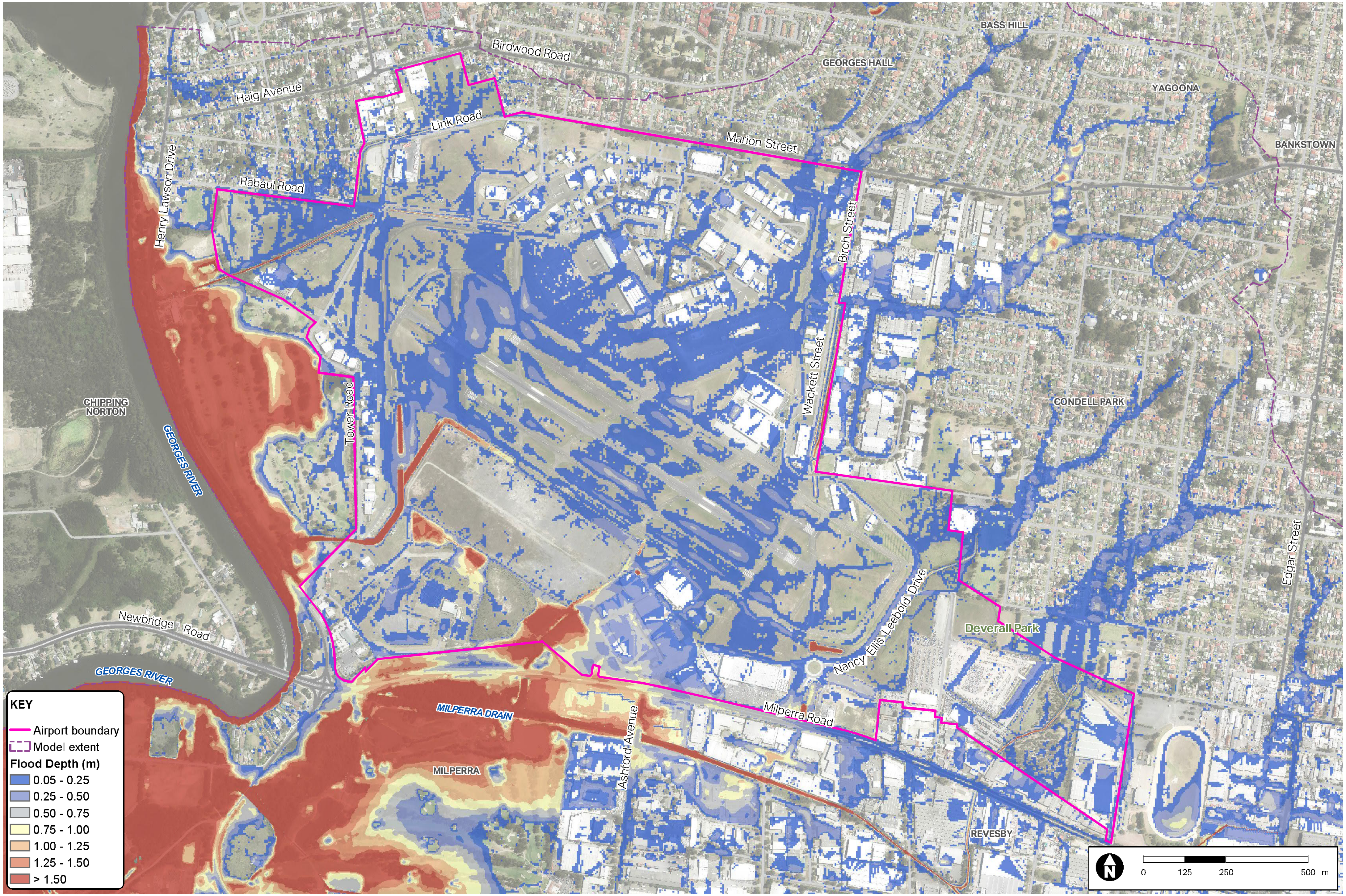

FIGURE 8:

100 YEAR ARI LOCAL CATCHMENT FLOODING CONDITIONS (TAILWATER: 20 YEAR ARI) - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

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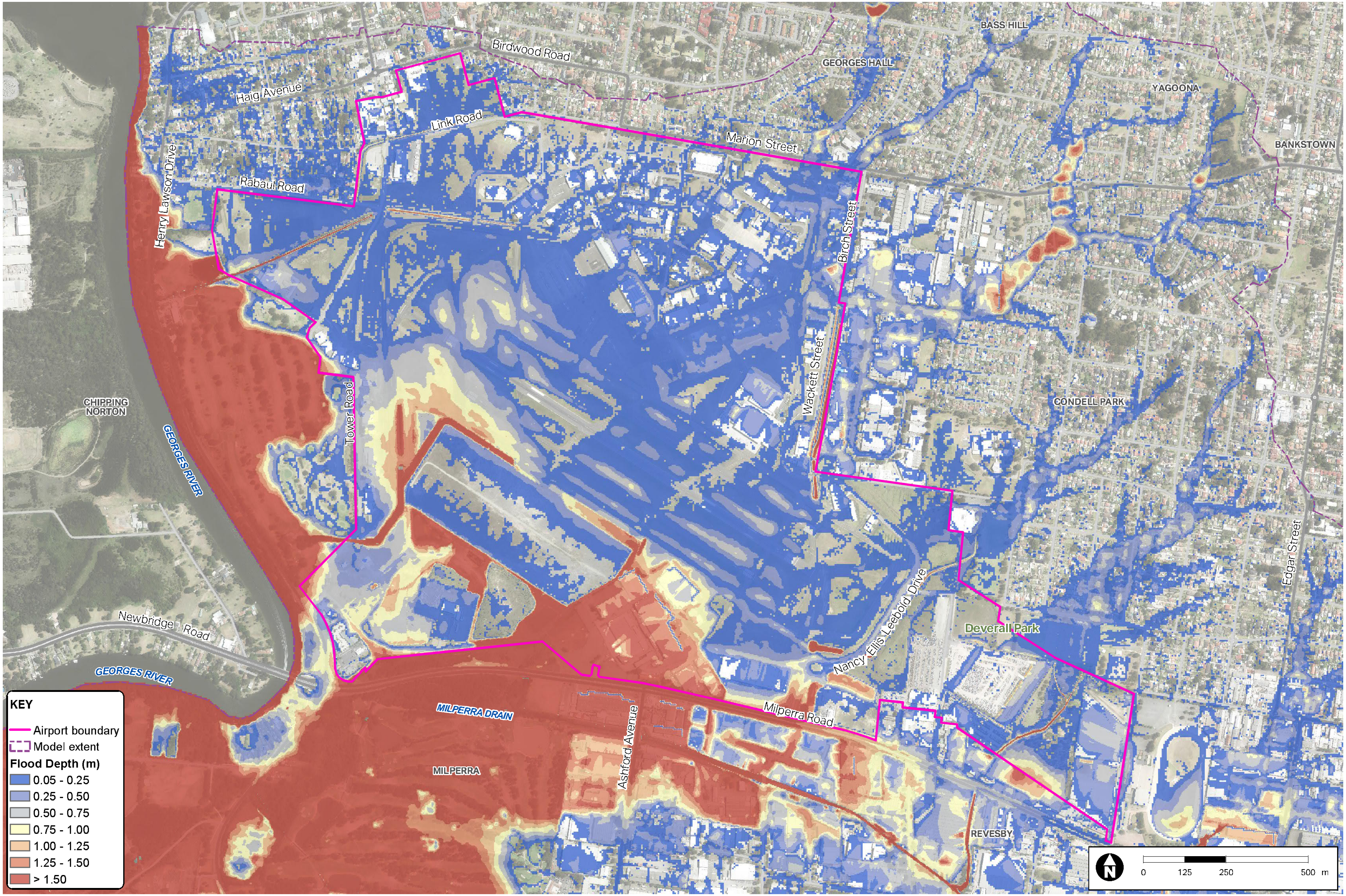

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FIGURE 9:

PMF LOCAL CATCHMENT FLOODING CONDITIONS - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

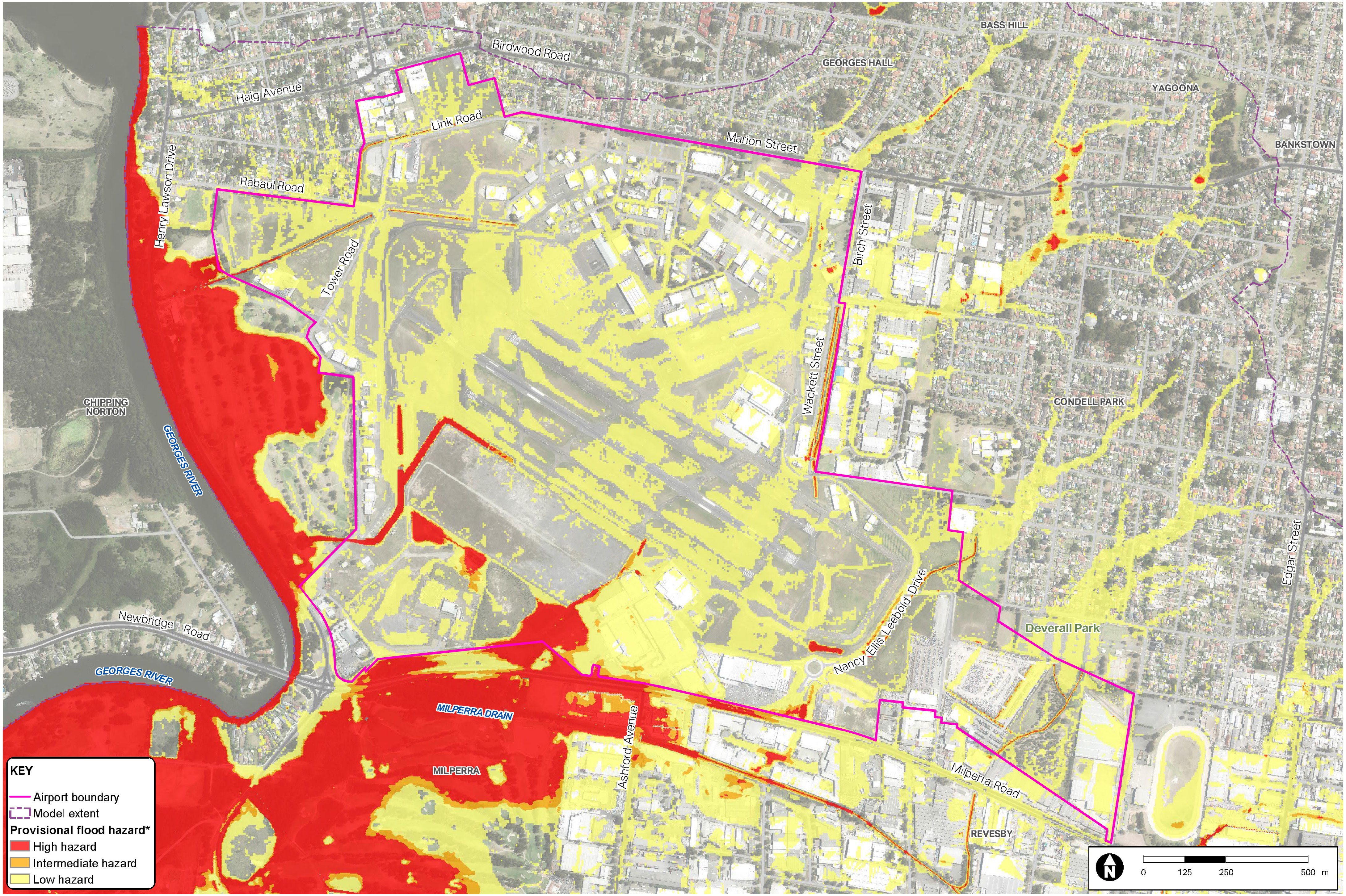

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FIGURE 10:

100 YEAR ARI LOCAL CATCHMENT PROVISIONAL FLOOD HAZARD (TAILWATER: 20 YEAR ARI) - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

**Per Figure L2 of the NSW Floodplain Development Manual 2005*

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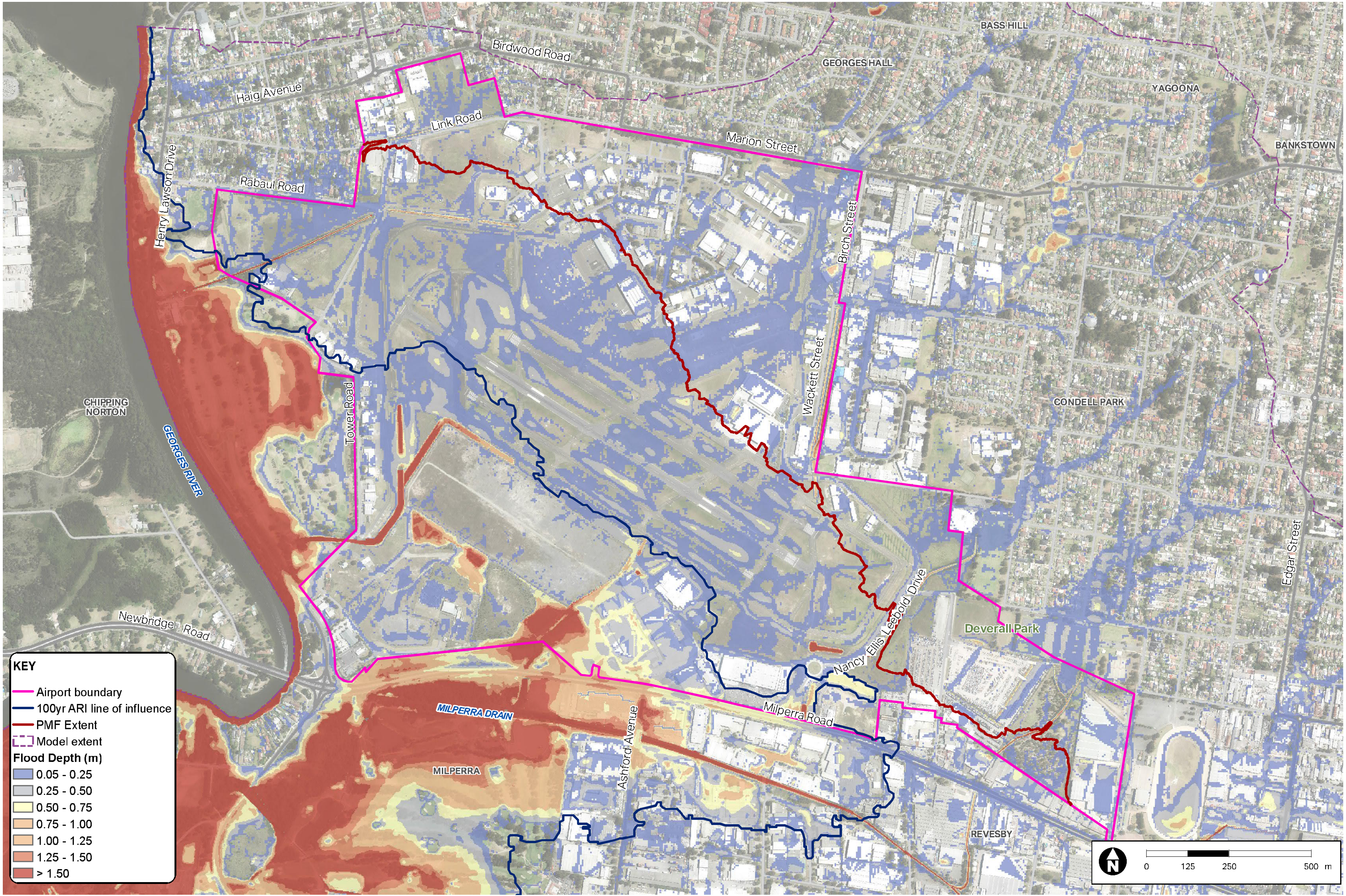

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FIGURE 11:

100 YEAR ARI GEORGES RIVER INDICATIVE FLOODING CONDITIONS - EXISTING CONDITIONS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

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4.0 Flood and Stormwater Management Strategy

4.1 Principles and Design Approach

4.1.1 Overview and Objectives

The overarching objective is to ensure that proposed future development within the Airport does not lead to adverse offsite flood risk to property and critical infrastructure and define planning controls proposed to achieve this outcome form part of a consistent and coordinated strategy to reduce flood risks.

Achievement of relevant water quality objectives and adoption of WSUD principles to reduce the post development load of stormwater pollutants entering drainage lines downstream of the Airport was also a fundamental design consideration.

4.1.2 Definition of “Book End” Development Scenario

A key consideration of the Strategy was to facilitate future development of the Airport in accordance with the Master Plan and Airports Act. From a stormwater modelling perspective, theoretical development can be represented within the Milperra Catchment TUFLOW model environment in various forms but most typically in terms of a change in ground level (e.g. to represent earthworks in the form of cut or filling) or change in surface material that results in a change in runoff potential (e.g. a change from grass to roadway will lead to an increase in runoff potential).

The “book end” development scenario adopted was built up using the current 2014 Airport Master Plan as a base and with assumptions about additional impervious area in order to illustrate that the storm water and flood impacts from a significant amount of development can be accommodated by the Strategy.

TUFLOW model adjustments to incorporate the future development scenario comprised:

- Site-Wide:
    - Changes to material mapping increase in imperviousness when compared to present day conditions.

      Impervious fraction assumptions as follows:

Land Use	Imperviousness
Airfield Pavement	100%
Aviation	90%
Community	80%
Industrial	90%
Low Occupancy	80%
Mixed Use	70%
Open Space	0%

- South West Precinct (Stage 1):
    - Preliminary 3D earthworks design model by AECOM was used to adjust the TUFLOW model topography. This included large depressed areas located in strategic positions that are intended to act as dual-purpose stormwater basins.
    - New/upgraded trunk piped drainage systems were developed to suit the proposed road/lot layout and provide drainage connectivity.
    - Building pads lifted above peak 100 year ARI flood levels. The final pad levels were set at RL 6.3 m AHD which incorporates a 300 mm freeboard allowance.

  - Residual areas of lots and roadways were generally set lower (around peak 20 year ARI flood levels) and are intended to act as flood storage and overland flow paths.

4.1.3 Key Criteria and Requirements

The criteria and requirements summarised in Table 5 were adopted. These were discussed and agreed to in principle with Council as part of the consultation process.

Table 5 Key Criteria and Requirements

Aspect	Key Criteria and Requirements
Water quantity management	• Minimise offsite flooding impacts to the extent practicable. • Onsite flooding conditions internal to Airport to not adversely impact use/operations of existing tenancies. • Ensure that any future development is compatible with flood risk. • Risk-based approach to assessing future development applications.
Water quality management	• Satisfy relevant pollutant load reduction targets for future development, as documented in the BBWQIP. Pollutant load reduction targets adopted for commercial/industrial developments as follows: - Gross pollutants 90% - Total suspended solids 80% - Total phosphorus 55% - Total nitrogen 40%

Applicable development standards included in the 2014 Airport Master Plan were also used to inform Strategy development where relevant.

4.1.4 Design Approach

4.1.4.1 Water Quantity Management – Floodplain Storage

Development within the Georges River floodplain storage area likely requires compensatory floodplain storage to offset filling works up to the peak 100 year ARI Georges River flood level of 6.0 m AHD, in order to demonstrate no adverse impact on flooding conditions, covering areas to the south of the Georges River 'Line of Influence' shown on Figure 11.

A balanced cut/fill has been achieved for the South West Precinct design. This was validated by using the Milperra Catchment TUFLOW model to simulate conditions at the peak of a 100 year ARI flood on the Georges River.

It is noted that floodplain conveyance is also potentially relevant to avoid adverse impacts on Georges River flood behaviour, which would require assessment at detailed design within Council's adopted George's River flood model.

It is also noted that the requirement to achieve a balanced cut/fill is likely to have significant implications for the redevelopment of any areas below the 1:100 which also lie within the the Georges River 'Line of Influence'.

4.1.4.2 Water Quantity Management – Local Catchment Runoff

Increasing the impervious area (comprising roads, hard stand, car parks and roofs) within the Airport will result in increased rates of stormwater runoff leaving the site and potentially worsening flooding on downstream property. Stormwater can be temporarily detained on site through OSD basins to mitigate these impacts. Whilst OSD and floodplain storage are different concepts, stormwater basins can potentially be configured to provide a dual function to manage these issues, which minimises land take.

OSD can be located as large basins at 'end-of-pipe' or be distributed through the upper catchment within landscaped areas or underground tanks.

The adopted approach is primarily looking for ‘end-of-pipe’ solutions. This approach allows for consolidated areas of detention which are located in the most space-efficient locations to allow for precinct-wide stormwater management. Provision of consolidated areas of detention are easier to manage and track than site-based OSD, and are also compatible with a staged construction whereby a smaller initial basin is expanded as development in the catchment upstream progresses.

Proximity to runways is an important consideration for siting open drainage on airports given the potential to attract birds and the consequent risk of bird strike. However, it was considered that proposed basins could be designed with minimum vegetation (i.e. grass only), short retention times, would only retain water in extreme rainfall events when Airport operations are likely to be restricted anyway, and to prevent permanent ponding of runoff, and accordingly minimise the risk of bird attraction.

4.1.4.3 Water Quality Management

Bio-filtration devices incorporating vegetated sand filters are considered the most efficient means at achieving the desired pollutant load reduction targets. These devices require a relatively small footprint, typically up to 1.5% of the upstream contributing catchment, to achieve the local pollution reduction targets. Other key features and constraints of well-designed bio-filtration systems that have been considered in Strategy development include:

- Bio-filtration basins require 1 m minimum level change between the inlet and outlet.
- Flat grades and downstream water levels constrain bio-filtration performance and require that bio-filtration basins are perched above downstream stormwater networks.
- Well-functioning and low maintenance bio-filtration basins need protection from high flow velocities and deep ponding.
- Bio-filtration basins can require less maintenance if sediment is captured upstream within sediment basins or gross pollutant traps.
- Bio-filtration can be located as large filters at 'end-of-pipe' or be distributed through the upper catchment within landscaped areas on-lots and within roadside parking bays.

Gross pollutant traps (GPT’s) are often used as pre-treatment for bio-filtration basins as they can simplify the management of litter and reduce sediment loads, which minimises maintenance requirements, however there are limited opportunities to deploy end-of-pipe GPT units within the Airport drainage system particularly at the downstream end of existing grassed channels. Strategy options considered therefore do not rely on the use of GPT’s to meet the pollutant load reduction targets. The existing grassed channels will offer a level of sediment management as the channel grades are typically very flat and would naturally encourage deposition of sediment upstream of basins. Active sediment management within the channels will be required as part of ongoing maintenance. GPT’s could however be considered on a case-by-case basis during future design development as part of a design optimisation exercise to minimise ongoing maintenance requirements. This could also include consideration of other potentially suitable pre-treatment devices such as trash racks.

4.2 Strategy Overview

Figure 12 presents an overview of the proposed Strategy, with description and commentary for each element provided in Table 6.
In summary, a range of options has been developed within each of the following Airport precincts:

- North West Precinct
- South West Precinct
- Eastern Precinct

- Deverall Park

Options have been developed to cater for a “book end and proof of concept development scenario, noting that specific infrastructure elements would only be implemented as needed to manage stormwater and flooding impacts associated with realised development.

For Deverall Park, it is noted that no further stormwater and/or flood management measures are considered necessary in this area on the basis that the full extent of developable land has already been activated. Further discussion in relation to proposed flood and water quality management measures for Deverall Park identified in BMT WBM (2017) is provided Section 4.5.2.

Where multiple options within a precinct have been identified, a preferred option(s) has been nominated at this stage largely on the basis of prioritising precinct scale, ‘end-of-pipe’ measures and minimising lot-based controls. Preferred options have been modelled using the TUFLOW model to assess performance and confirm proof-of-concept by demonstrating that flood management objectives can be satisfied (refer Section 4.3.1). It is noted the alternative measures nominated may ultimately be implemented, pending further concept development and feasibility assessment during subsequent design stages.

Table 7 provides a summary by catchment of estimated imperviousness under both existing and “book end” development conditions. Preferred option(s) required for flood and stormwater management within each catchment are also shown, along with alternative options.

Figure 12 and Table 6 show how Flooding and Stormwater can be managed at the Airport for:

- The SWP MDP; and
- “Book end” development scenario.

The “book end” scenario shows a total 113 hectares of additional impervious area across the Airport including the SWP in order to provide proof of concept. The actual additional impervious area in the draft 2019 Master Plan (representing the actual development contemplated by BAL over the 5 year Master Plan period) is 38 hectares which is only 33% of the total “book end” area modelled. Modelling of, and demonstrating solutions for, “book end” impervious area at the Airport provides resilience and longevity to the Strategy since the Strategy provides for stormwater, flooding and water quality solutions for an additional 113 hectares of impervious area which is significantly beyond BAL’s foreseeable development objectives.

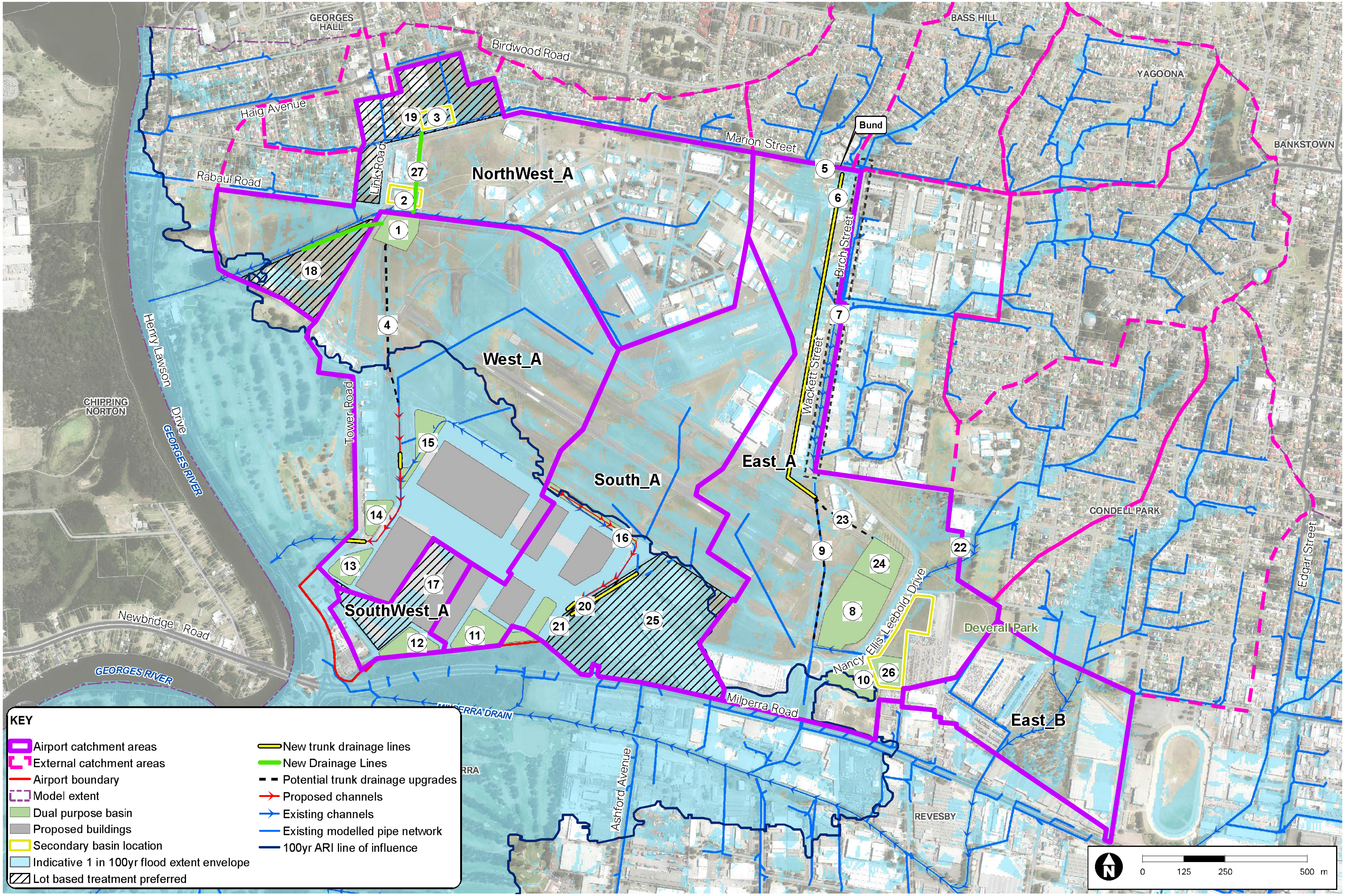

FIGURE 13:

PROPOSED FLOOD AND STORMWATER MANAGEMENT STRATEGY

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

Table 6 **Summary of Strategy Elements and Flooding/Stormwater Management Outcomes**

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
Options for North-West Precinct		
1	• Proposed end-of-pipe combined detention and bio-filtration basin to service the northern and north-western catchment. • Note that stormwater from north and west of Link Road currently discharges to the environmental protection lands and bypasses the proposed basin at 1. • A low flow diversion pipe (at 27) could be used to transfer additional flow from these areas to the proposed basin at 1. • It is noted that Basin 1 is highly constrained by flat grades. Bio-filtration must discharge at least 400 mm below surface level which requires the basin can discharge to a downstream invert at a similar level. This will likely require a long tail out drain to be feasible. 4 below could also provide this tail out function. Alternatively, a nonstandard bio-filtration basin design will be required to create shallow pipe conditions. • Alternatively, basin 1 could be replaced (or supplemented) with smaller, modular basins at 2 and 3 (see 2 and 3 below). This may avoid the need for an additional low flow diversion pipe and/or tail out drain.	• Provides stormwater quantity/quality management for North West catchment area including the PolAir site and removes the need for lot scale OSD and water quality measures in that catchment. • Any developments ahead of this basin may require lot scale OSD and water quality measures.
27		
2	• Basins at 2 and 3 form alternative (or supplementary) combined detention/bio-filtration basins to a single large basin at 1 (see 1 above). • Basin at 3 could be substituted with on-lot facilities comprising underground tanks or landscaped areas as required (see 19 below).	• Staging allows for parts of the catchment to be ‘unlocked’ for development without requiring the whole basin footprint up front. • Combined effect provides stormwater quality/quantity management for parts of the catchment.
3		
18	• Where basin 3 is not feasible, provide on-lot stormwater quality and OSD as required for site 19. This would also apply to site 18. Measures may be within underground tanks or landscaped areas.	• Provides stormwater quantity/quality management but avoids the topographic (depth based) constraints of constructing bio-filtration basins. • This modular approach could reduce or replace the need for larger

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
19		basins located at 'end-of-pipe'. - Only manages local stormwater (other treatment still required outside of these areas). - Costs may be passed on to site developer. - Allows sites to be developed ahead of 'end-of-pipe' basins.
4	Should lands for bio-filtration not be available at 2 and 3, low flows (up to 1 m^3/s) could be diverted south via new pipeline to bio-filtration basin at 15. - This pipe may also be required to collect treated stormwater from proposed bioretention within basin at 1.	- Diversion towards South West Precinct allows the basins there to provide stormwater detention in high flow events. In effect making the basins in South West Precinct work harder. - Bio-filtration basins can be scaled up as required.
Options for Eastern Precinct		
5	- Any development would be subject to high flows during rare storm events (approximately 10 m^3/s combined in a 100 year ARI event). Provide bund and on-lot flood detention basin along the northern boundary to capture and divert flood water around proposed buildings. The footprint is proposed to be the equivalent volume of a modular stormwater detention basin (approx. 250 m^3/Ha of site). - The captured overland flow is to be piped in a new trunk drainage line (see 6 and 7) to the existing trunk drainage pipes. - The basin at 8 would be required to offset additional detention for the piped flows and stormwater generated in the ultimate development scenario.	- Required to facilitate development of the site fronting Marion Street and prevent upstream flood impacts outside the Airport boundary. - Manages the uncontrolled overland flows entering the Airport via Marion Street. - Benefits downstream development by preventing uncontrolled flows from impacting tenancies along the eastern edge of the Airport.

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
6	• New trunk drainage is required to safely convey flows south. Note that the majority of overland flows arise from external catchment areas.	• Conveys flows captured at 5 and provide safe, trafficable conditions within Airport during flood events. • Additional trunk drainage line which can be utilised to reduce uncontrolled overland flow. • This long pipe run will be expensive to deliver to improve development opportunities within a relatively small area. • Could be substituted, in part, with improved surface channel capacity along eastern boundary. Refer to 7 below.
7	• Existing trunk drainage along the eastern site boundary is hydraulically inefficient. There is scope to reshape the existing channel and improve the channel drainage capacity. • Environmental sensitivity potentially constrains or prevents channel works.	• Alternative conveyance for flows captured at 5. • Increased capacity would potentially allow for additional flows from future airport development. • Potentially more cost effective than a pipe drainage upgrade at 6 (see 6 above), however requires potential environmental constraints to be resolved. Would also require upgrade of existing piped system between 5 and 7 (not yet assessed/costed). • These pipe works would be staged to coincide with road future works.
8	• Proposed end-of-pipe OSD and bio-filtration basin at 8 within area of low development potential. The basin here can be optimised to make the best use of the space available at the end of the runway. A basin here has been shown to effectively reduce downstream flood levels after development of the upper airport. The footprint could likely be further reduced/optimised. • Additional pipe capacity at 9 works in conjunction with basin at 8.	• Performs stormwater detention function for additional flows added from measures 5, 6 & 7.
9		• Additional conveyance at 9 prevents the additional flows from 5, 6, 7 manifesting offsite impacts along Wackett Street.

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
10	• End of pipe basin for stormwater quality and detention as nominated in BMT WBM (2017). Any implementation of OSD in this area should be discussed with Council and provides an opportunity for collaboration (i.e. design, cost, land allocation, etc.). Due to the location, the basin would primarily serve the catchment area outside the Airport but may be configured to provide benefit to the Airport. This basin could also be reshaped to enable development with road frontage.	• Stormwater quantity management of flows from both inside and outside the Airport. • Detention of external flows potentially used as an offset for additional runoff generated on the airport in the ultimate development scenario.
26	• Alternative location for basin at 10.	• Outcomes as per 10. • A water quality basin in this location would not be as effective as at 24. This would trigger the need for stormwater treatment on lots within the southern area of the Airport.
22	• Works required to deepen and widen the existing channel to concentrate uncontrolled runoff entering the site at Nancy Ellis Leebold Drive.	• Required to divert overland flow away from any future development and into stormwater basins. • Improves potential of land development currently in the overland flow path. • Undertake works when development of this area proceeds
23	• Low flow diversion pipe (at 23) to improve the function of large end-of-pipe stormwater quality basin at 24.	• Flows from Council land outside the airport and any future airport development discharging into 6 could be diverted through 23 and treated in 24. High flows would bypass via 9. • This allows for areas within the south of the site to discharge without stormwater quality management.
24		
Options for South West Precinct		

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
11	• End of pipe basin for stormwater quality management for South West Precinct. No OSD function is included. This basin may also provide a stormwater quality benefit to redevelopment in the Eastern precinct.	• Footprint shown is required primarily for floodplain storage. There is no potential for this basin to provide stormwater quality management to the runway area to the north, due to the very low level of pipes at 11. • In low flow events this basin provides stormwater quality treatment. • In large Georges River flood events the basin at 11 is flooded and provides compensatory floodplain storage.
12	• End of pipe basins at 12 and 13 for OSD and stormwater quality management for Stage 1 South West Precinct.	• In low flow events this basin provides stormwater quality treatment as well as detention to flows leaving the airport site via South West Precinct. • In large storms within the local catchment, the basins hold back flood waters from local storms. • In large Georges River flood events the basin at 12 is flooded and provides compensatory floodplain storage.
13		• In low flow events this basin provides stormwater quality treatment as well as detention to flows leaving the airport site via South West Precinct. • In larger local catchment events this basin primarily acts as detention for the upstream airport catchment. • The basin also provides compensatory floodplain storage.
14	• End of pipe basin providing OSD and stormwater quality management for the South West Precinct.	• This basin is envisaged as a combined stormwater quantity/quality management for the Tower Road Precinct.
16	• Local water quality basin to provide stormwater quality management before stormwater enters the existing channel at 20.	• Provides stormwater quality for runways and lot areas draining to this channel. Will provide some detention and conveyance for flows in larger events which overtop the runways upstream.

Item Ref. (1)	Strategy Element	Flooding / Stormwater Management Outcomes
20	• Retain existing channel, that drains at the southern edge of the runways is deep and has a very flat grade (0.3%) which precludes a large end of pipe basin at the southern boundary. No opportunity to discharge into basin at 11 or to provide stormwater treatment within the channel itself.	• Conveyance of low and high flow events
21	• Works required to deepen the existing channel between the Airport boundary and existing pipe headwall.	• Improved drainage function upstream of the existing stormwater pipes and proposed drainage beneath future road. • Works required as part of SWP entry road bridge works.
17	• On-lot water quality measures are required in these areas due to the site constraints (existing levels of drainage outlets, flat grades, OSD requirements etc).	• Provides stormwater quantity and quality management but avoids the topographic (depth based) constraints of large end-of-pipe bio-filtration basins. • Only manages local stormwater (other treatment still required outside of these areas). • These areas could be developed ahead of large basins. On-lot water quality facilities need to be designed as part of site design.
25		

Notes:

(1) Item Ref. is shown on Figure 12.

Table 7 Summary of Increase in Imperviousness and Preferred Controls by Catchment

Catchment Name (1)	Catchment Area (ha)	“Book End” Impervious Area (ha)			Additional Impervious Area from Master Plan 5 Year Strategy (ha)		Notional Storage Volume Required for “Book End” Development (m^3) (2)	Preferred Strategy (1)	Alternative Strategy (1)
		Existing	Future	Increase	Future	Increase		Required Controls	Required Controls
West_A	74	20	55	35 (175%)	32	12 (60%)	57,000	13,14,15	-
East_A	75	27	53	26 (96%)	37	8 (30%)	32,000	5, 6, 8, 9, 22, 23, 24	5, 7, 8, 9, 22, 23, 24

Catchment Name (1)	Catchment Area (ha)	“Book End” Impervious Area (ha)			Additional Impervious Area from Master Plan 5 Year Strategy (ha)		Notional Storage Volume Required for “Book End” Development (m^3) (2)	Preferred Strategy (1)	Alternative Strategy (1)
		Existing	Future	Increase	Future	Increase		Required Controls	Required Controls
East_B	22	13	13	0 (0%)	13	0 (0%)	-	-	-
NorthWest_A	69	27	49	22 (81%)	30	3 (11%)	11,000	1, 27	2,3,4,18,19
South_A	65	26	50	24 (92%)	34	8 (30%)	46,000	11,16,20,21,25	-
SouthWest_A	8	1	7	6 (600%)	7	6 (600%)	13,000	12	17

Notes:

(1) Refer to Figure 12 for catchment names and Item Ref. for controls.

(2) Notional “book end” storage volumes required for local catchment flood mitigation for 100 year ARI determined using TUFLOW model results.

To confirm the preferred options for each catchment moving forward, it is anticipated that further consideration will need to be given to the following:

- The ability to cater for current/known or potential future development proposals (including expandability);
- Flexibility regarding implementation and staging of works to accommodate future/unknown development proposals; and
- The outcomes of any agreement(s) with Council.

4.3 Flood Management Outcomes and Residual Impacts

4.3.1 Impact on Local Catchment Flooding

The performance of preferred options within each precinct was assessed using the Milperra Catchment TUFLOW model. Multiple iterations were necessary to refine options until their sizing (e.g. in terms of basin sizing and discharge controls, pipe sizing, etc) was sufficient to demonstrate proof-of-concept.

Residual impacts on local catchment flooding conditions are shown in several figures with brief discussion provided in Table 8. In summary, the model results show that for “book end” development of the site (which provides a proof of concept for the Strategy) the proposed Strategy can avoid any significant offsite impacts for local catchment flood events up to the 100 year ARI.

Table 8 Summary of Residual Flood Impacts

Local Catchment Flood Event	Figure Reference	Description of Residual Flood Impacts
2 year ARI (Georges River tailwater: MHWLS)	Figure 13	• Increases to peak flood levels within the Airport are typically less than 0.05 m to a maximum of about 0.1 m, and would likely be manageable with only minor local drainage improvements. • Increases to peak flood levels outside the Airport limited to areas south of Milperra Road, in the range 0.01-0.05 m. It is expected these impacts could be avoided through further design refinement and optimisation of proposed measures in the South West Precinct.
100 year ARI (Georges River tailwater: MHWLS)	Figure 14	• Increases to peak flood levels within the Airport are isolated and typically less than 0.05 m to a maximum of about 0.1 m, and would likely be manageable with only minor local drainage improvements. • Increases to peak flood levels outside the Airport are currently limited to the area immediately south of Deverall Park and a short length of channel downstream of Tower Road. The result at Deverall Park appears spurious, and it is expected that further model refinement will demonstrate no adverse impact in this area. It is also expected that the impact downstream of Tower Road can be avoided through proposed measures in the South West Precinct.
100 year ARI (Georges River tailwater: 20 year ARI)	Figure 15	• Increases to peak flood levels within the Airport are isolated and typically less than 0.05 m to a maximum of about 0.1 m, and would likely be manageable with only minor local drainage improvements. • Increases to peak flood levels outside the Airport are currently limited to the area immediately south of Deverall Park. This result appears spurious, and it is expected that further model refinement will

Local Catchment Flood Event	Figure Reference	Description of Residual Flood Impacts
		demonstrate no adverse impact in this area.

Provisional flood hazard for the 100 year ARI local catchment flood (Georges River tailwater: 20 year ARI) following implementation of the Strategy is shown in Figure 16.

This figure shows an increase in areas of high hazard within the Airport within newly created drainage channels and basins. However, there are reductions in high hazard overland flow elsewhere as a result of improved drainage capacity and control of floodwaters.

Flood hazard is shown to be generally compatible with the conceptual layout developed for the South West Precinct.

4.3.2 Incorporation of Recently Completed Developments

4.3.2.1 Toll Ambulance Facility

Recently completed development associated with the Toll Ambulance Facility (refer Figure 17 for location) was assessed in terms of potential impacts on 100 year ARI local catchment flooding.

Figure 17 shows that the there is no offsite impact from this development in the 100 year ARI local catchment flood, and therefore has no bearing on the viability of the proposed Strategy.

It is noted that the terrain modifications that were developed for this assessment should form part of the baseline Milperra Catchment TUFLOW model for future use.

4.3.3 Sensitivity Analyses

4.3.3.1 Impact of Increased Runoff Potential

A sensitivity analysis was undertaken to assess whether higher runoff generation than that resulting from the direct rainfall-on-grid hydrology currently implemented in the Milperra Catchment TUFLOW model is likely to have a significant bearing on the viability of the proposed Strategy. A storm event equivalent to a 10% increase in 100 year ARI rainfall intensities was used for this purpose.

Figure 18 shows that impacts as a result of the proposed Strategy for this event to be largely consistent with those for the 100 year ARI event (refer Figure 14 for comparison). This provides confidence that the Strategy as developed is robust and able to cater for some degree of hydrologic uncertainty.

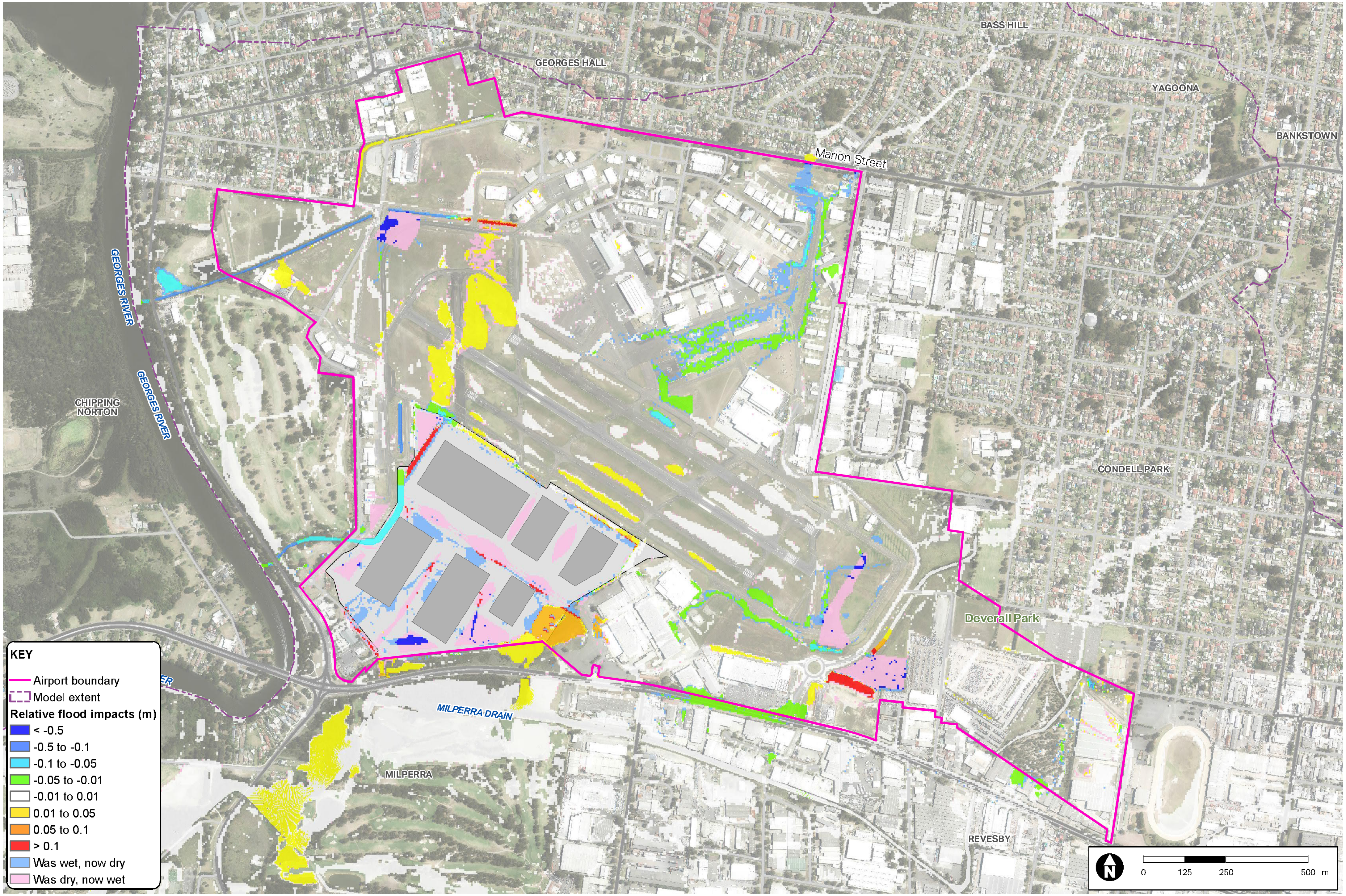

FIGURE 13:

2 YEAR ARI LOCAL CATCHMENT FLOOD - IMPACT OF STRATEGY ON PEAK FLOOD LEVELS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

AECOM

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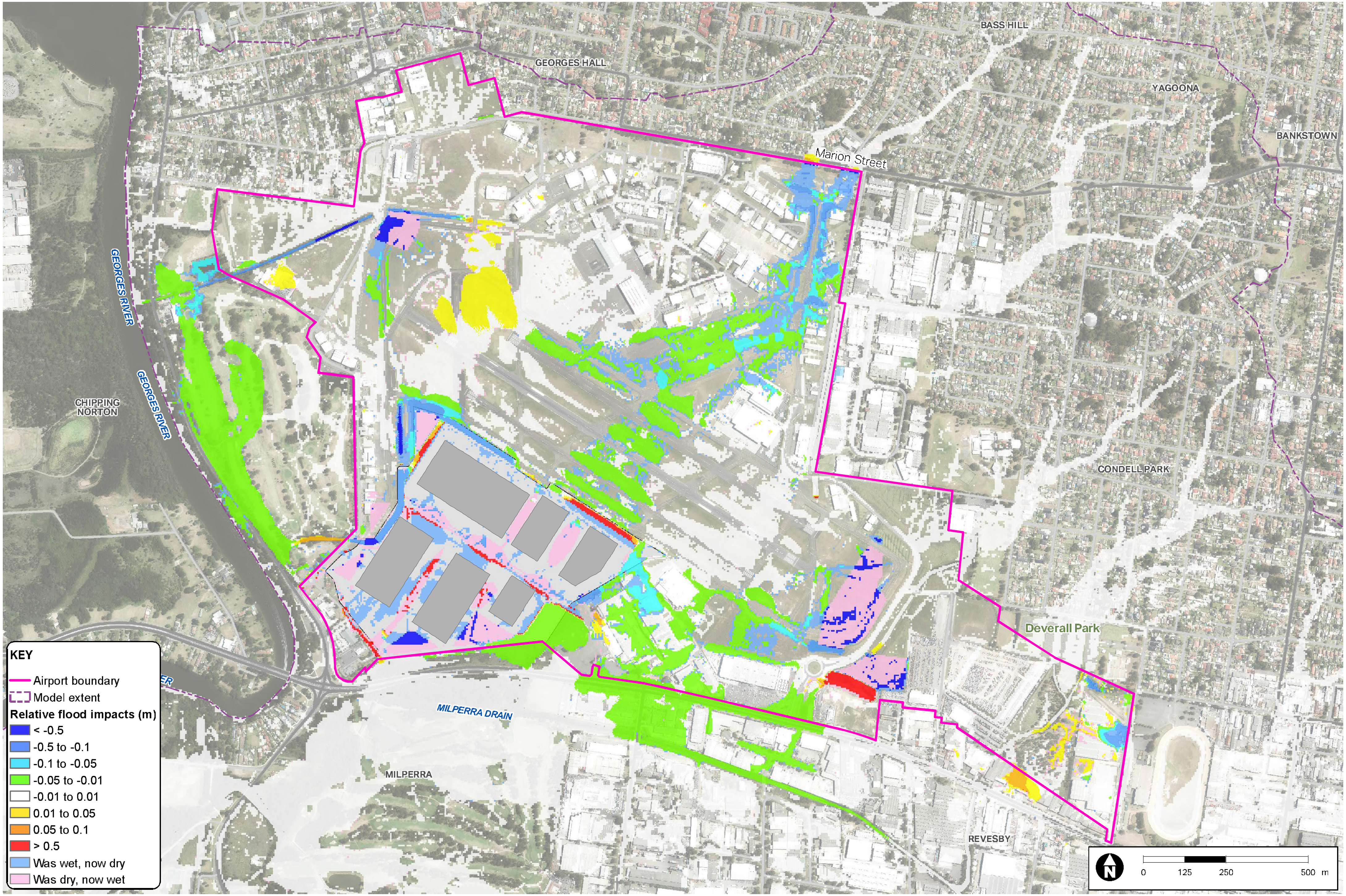

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FIGURE 14:

100 YEAR ARI LOCAL CATCHMENT FLOOD (TAILWATER: MHWLS) - IMPACT OF STRATEGY ON PEAK FLOOD LEVELS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

AECOM

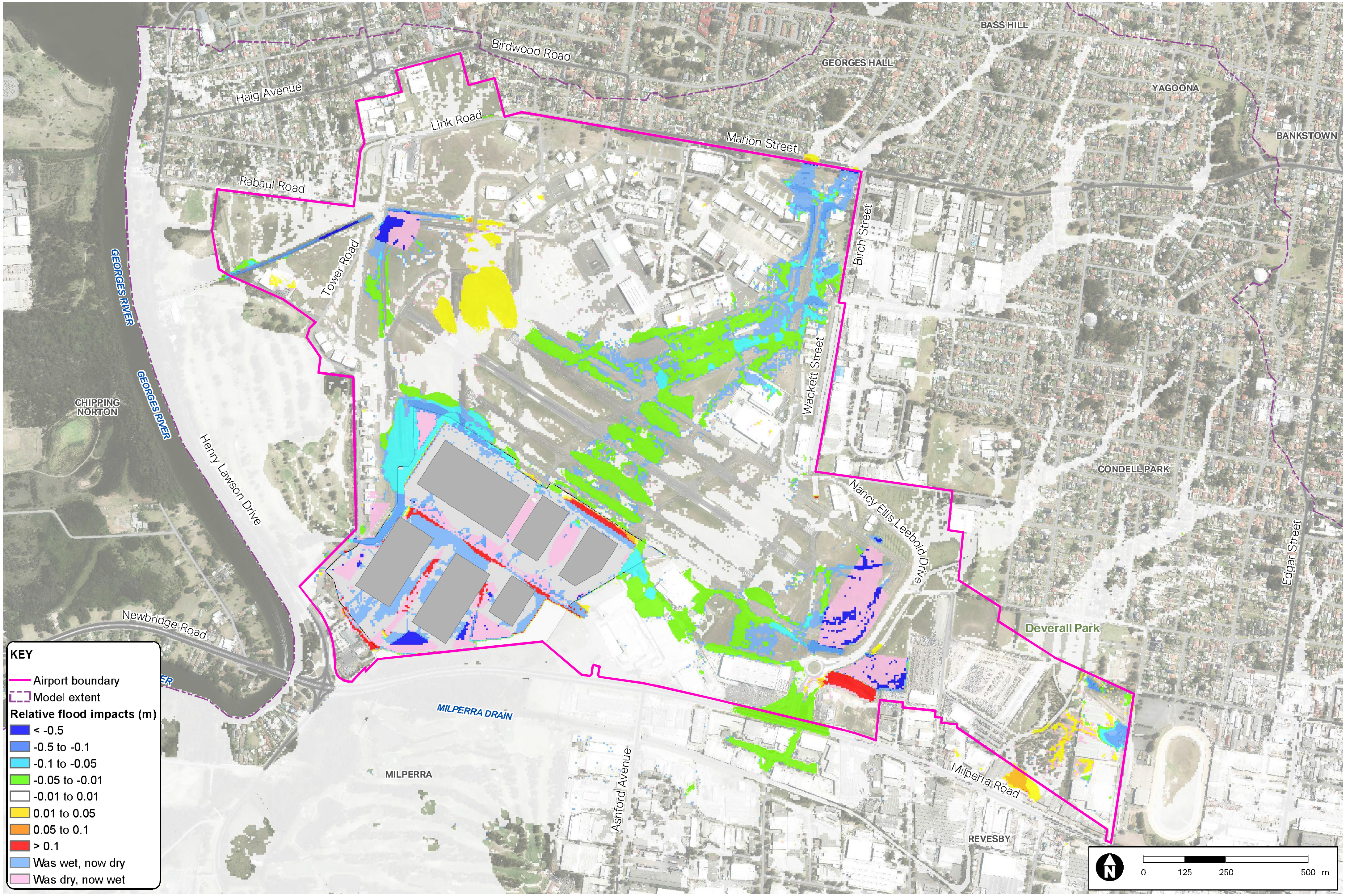

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FIGURE 15:

100 YEAR ARI LOCAL CATCHMENT FLOOD (TAILWATER: 20 YEAR ARI) - IMPACT OF STRATEGY ON PEAK FLOOD LEVELS

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

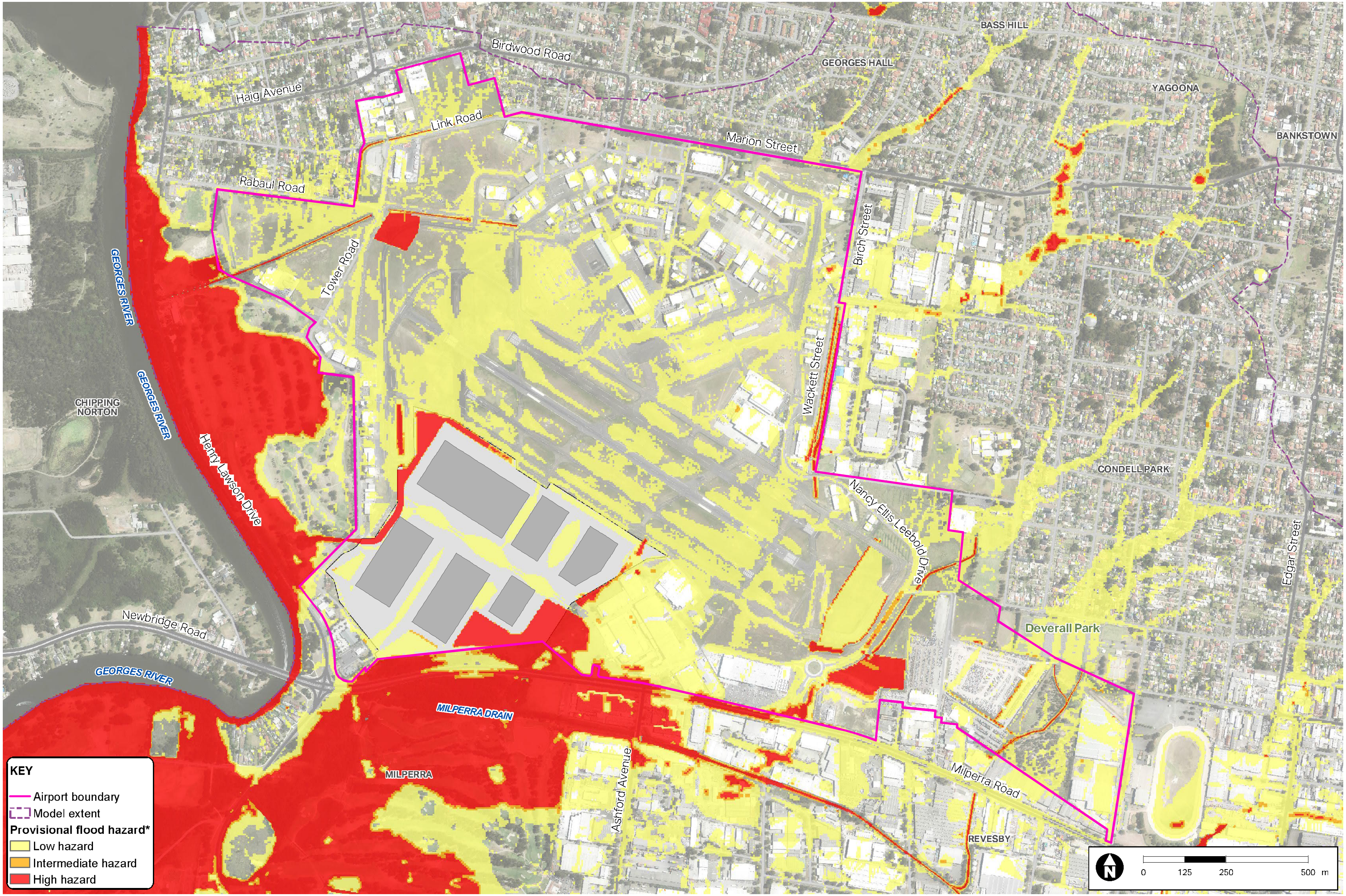

FIGURE 16:

100 YEAR ARI LOCAL CATCHMENT PROVISIONAL FLOOD HAZARD (TAILWATER: 20 YEAR ARI) - POST-STRATEGY IMPLEMENTATION

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

**Per Figure L2 of the NSW Floodplain Development Manual 2005*

AECOM

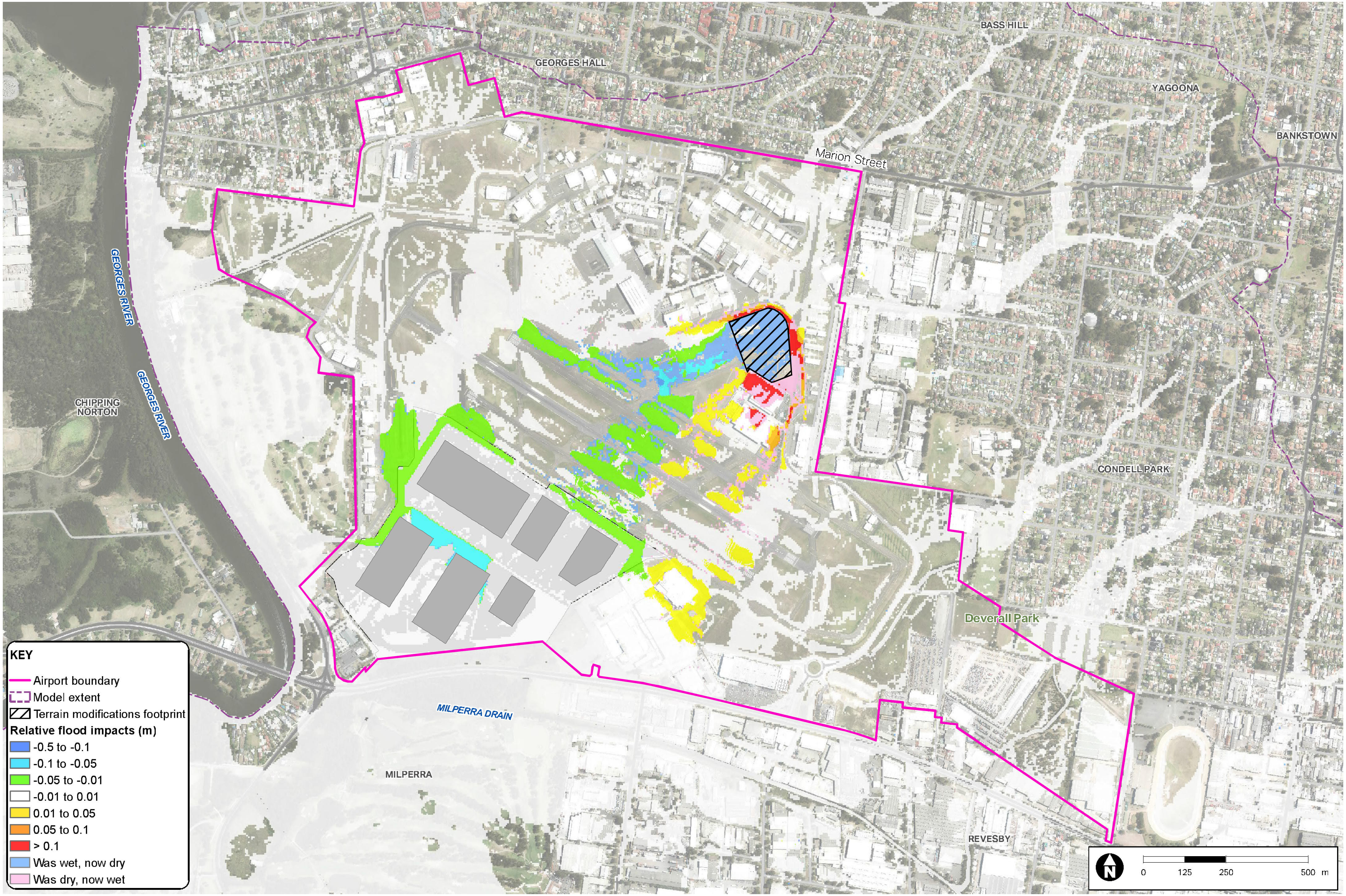

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FIGURE 17:

IMPACT OF TOLL AMBULANCE FACILITY ON PEAK FLOOD LEVELS - 100 YEAR ARI LOCAL CATCHMENT FLOOD (TAILWATER: 20 YEAR ARI)

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

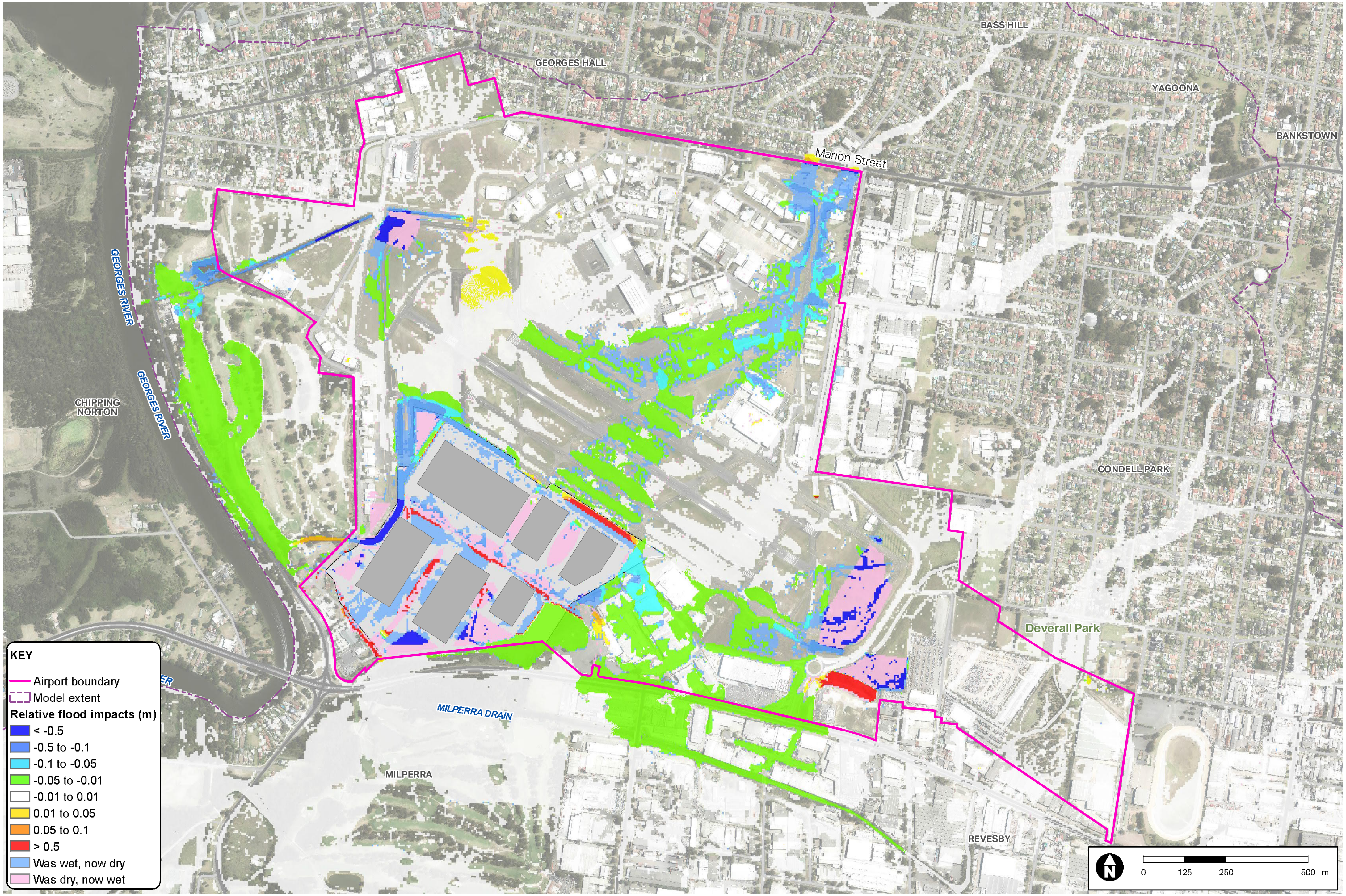

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FIGURE 18: SENSITIVITY ANALYSIS

IMPACT OF STRATEGY ON PEAK FLOOD LEVELS - 100 YEAR ARI + 10% LOCAL CATCHMENT FLOOD (TAILWATER: MHWLS)

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

AECOM

4.4 Water Quality Outcomes

The MUSIC software was used to assess the performance of preferred treatment options within each precinct in terms of stormwater pollutant load reduction. As for flooding, multiple model iterations were necessary to refine options until their sizing (e.g. in terms of bio-filtration area sizing) was sufficient to demonstrate proof-of-concept.

Table 9 provides a summary of the MUSIC model results, which demonstrates that the adopted post development pollutant load reduction targets for the “Book End” development scenario can be satisfied with the proposed Strategy.

Table 9 Summary of Post Development Pollutant Load Assessment for “Book End” development scenario

Pollutant	Future Airport Pollutant Generation – Untreated	Required Removal Target		Removal Achieved	
	(kg/yr)	(%)	(kg/yr)	(kg/yr)	(%)
Total Suspended Solids	359,000	80%	287,200	286,000	80%
Total Phosphorus	680	55%	374	429	63%
Total Nitrogen	3,870	40%	1,548	1,960	51%
Gross Pollutants	41,900	90%	37,710	41,900	100%

It is noted the proposed Strategy does not require dedicated stormwater quality improvement for selected future development areas (refer Areas 17, 18, 19 and 25 in Table 6 and Figure 12) in order to satisfy overall pollutant load reduction targets for the Airport. This relies on an ‘offsetting’ approach through treatment of stormwater generated offsite in the residential areas to the north of the Airport. The results in Table 9 demonstrate that this is a feasible stormwater treatment strategy. If pollutant offsetting is not pursued for these areas then on-lot stormwater treatment will be required on development sites within those areas to meet the overall pollutant load reduction targets for the Airport.

4.5 Consideration of Council Endorsed Flood and Catchment Management Measures

4.5.1 Overview

The *Floodplain Risk Management Study and Plan for Sub-Catchments of the Mid Georges River* (BMT WBM, 2017) was formally adopted by Council in mid-2017.

Two significant flood mitigation measures were included in the recommended floodplain management plan that involve works within the Airport:

1. Increase the Size of Existing Detention Basins at Bankstown Airport
2. Construct a Detention Basin within Deverall Park, Bankstown Airport

Details of these proposals are described in AECOM (2017).

In addition, a substantial bioretention basin within Deverall Park was included in the related *Catchment Action Plan for Sub-Catchments of the Mid Georges River (BMT WBM, 2015).*

The following sections provide comment on the suitability and feasibility of incorporating these proposals within the current site-wide planning exercise.

4.5.2 Works in Deverall Park

No further stormwater and/or flood management measures are considered necessary in this area for treatment of on-site catchments on the basis that the full extent of developable land has already been activated. There are no known flooding issues for the existing Airport developments adjacent to Deverall Park, and due to the relatively small area of Airport land that drains into Deverall Park the Airport has little impact on the quantity or quality of stormwater in the receiving drainage line.

BAL is prepared to work with Council and provide assistance to Council should Council wish to pursue the Deverall Park works further. BAL notes that any costs associated with design and / or implementation works and dedication of land would be subject to the relevant BAL Board, Council and DIRDC approval(s).

4.5.3 Works to Increase the Size of Existing Detention Basins

The proposed enlargement of the existing basin adjacent to McDonald's has been investigated along with several other potential basin locations and configurations within the lower Eastern Precinct of the Airport. Enlargement of the existing basin is identified as Item 10 on Figure 12 and in Table 6. It is noted that proposed earthworks have been assessed only for the eastern compartment (i.e. to the north of McDonald's), as the footprint of the western compartment was considered too small to provide a meaningful increase in flood storage volume.

Whilst the basin enlargement was found to provide some additional attenuation of flows and minor reduction in peak flood levels at Milperra Road, the additional storage volume that is possible at this location is much smaller than is necessary to manage flows from the upstream catchment especially if future development of the Airport is carried out. Accordingly, the preferred strategy option in this area is to consolidate the required flood storage into a single large basin on the western side of Nancy Ellis Leebold Drive (refer Item 8 on Figure 12 and in Table 6), rather than provide two separate basin footprints.

BAL is prepared to work with Council further on this matter and notes that any costs associated with design and / or implementation works and dedication of land would be subject to the relevant BAL Board, Council and DIRDC approval(s).

4.6 Strategy Implementation

4.6.1 Key Aspects

Table 10 sets out some of the key aspects future Strategy implementation not otherwise discussed above.

Table 10 Key Aspects of Strategy Implementation

Aspect	Key Points / Discussion
Design	• Concept design of proposed trunk drainage works are required early to confirm required footprint of works, identify and resolve potential space and infrastructure conflicts, and refine cost estimates. • Concept design process should also scope and undertake any critical site investigations (e.g. survey, geotechnical, utilities potholing, etc) to de-risk future delivery of works. • Detailed design could be undertaken as part of future D&C delivery.
Timing and Staging	• Upfront delivery of management measures is required to ensure no adverse impacts on flooding or water quality for initial developments. • A staged approach to delivery of trunk drainage infrastructure is certainly feasible to reduce upfront costs. Basin construction is well suited to staging. However, new/upgraded piped drainage is less suited to staging. • Opportunities for staging basins in the South West Precinct could be considered especially for proposed stormwater treatment areas incorporating bio-filtration. Staging of bio-filtration basins can also assist with protection of filter media and vegetation.
Funding	• Funding options for trunk drainage works could include consideration of an infrastructure contributions scheme or similar where works are

Aspect	Key Points / Discussion
	funded through charges levied on developers.
Asset / Flood Model Management and Maintenance	• Asset management plans, including requirements for routine monitoring and maintenance, will need to be reviewed and updated. • Bio-filtration basins introduce a new type of infrastructure to the Airport that require particular activities to be undertaken at regular intervals to ensure their ongoing performance. • Updates and maintenance of flood models is also required and relevant procedures and processes to ensure this occurs should be formally documented and agreed with Council. • Refer Section 4.6.2 and Appendix B for further details.
Auditing	• Auditing of flood and stormwater management performance and associated reporting and consultation (including to Council) will be necessary at regular intervals. • Auditing should occur at maximum 5 year intervals (to align with the frequency of Master Plan reviews), however more frequent review may be warranted depending on the nature and scale of Airport developments. • Refer Section 4.6.2 and Appendix B for further details.
Assessment of Future Development Proposals	• Submission requirements for future development proposals to be clearly established. A risk-based and graded approach based on consideration of flooding conditions/risk and development type/scale should be adopted, consistent with the intent of Council's current DCP. • Simplification of flood impact assessment requirements to be pursued where development can be shown to be consistent with the Site-Wide Strategy and where trunk flooding/stormwater controls are implemented ahead or concurrent with development. • Flexibility for out-of-sequence development to be retained, but would require higher level of flood impact assessment to demonstrate that alternative lot-based controls (e.g. OSD) can adequately manage stormwater/flooding issues to avoid offsite impacts. • Refer Section 4.6.2 and Appendix B for further details.

4.6.2 Management of Strategy Implementation, Flood Model Updates and Development Assessment

A set of guidance tools has been developed to assist BAL in managing key aspects of Strategy implementation, and are provided in Appendix B. The tools comprise the following:

- Process Diagram
- Development Risk Screening Matrix
- Flood Risk Precinct Map

These tools should be considered preliminary only, with some further development required prior to use. Council review and feedback should also be sought and considered prior to finalisation and use.

5.0 Future Work

Recommended future work includes the following:

1. Provision of this report to Council for review and comment, with ongoing consultation as required into the future.
2. Detailed design and assessment of the South West Precinct, and any future development proposals on land subject to Georges River flooding.
3. Undertake conceptual design for key Strategy elements to confirm required footprint of works, identify and resolve potential space and infrastructure conflicts, and refine cost estimates.

   As noted in this report, this should include:

   - Review of TUFLOW direct rainfall-on-grid hydrology and resulting peak flow rates against alternative methods (e.g. an independent hydrologic model) to confirm that runoff generation is not underestimated.
   - Review of the sensitivity of local catchment flooding conditions and impacts to ARR2016 and potential implications for sizing of infrastructure. This should be undertaken with a view to confirming whether this presents a future risk to Airport development, notwithstanding Council’s current position on the adoption of ARR2016.
   - Consideration of blockage, including modelling of partial structure blockages consistent with the scenarios set out in BMT WBM (2015), to assess whether blockage may impact on preferred management options. This should include recommendations for minimum blockage factors to be applied at new or modified inlet structures for future trunk stormwater works. Augmentation of inlet capacity in certain areas may also be warranted and should be considered as part of future concept design development.
   - Review of TUFLOW model instabilities to confirm suitability of model to inform concept design of proposed stormwater and flood management works within the Airport.
   - Consideration of the potential implications of not implementing OSD on existing internal drainage systems and localised flooding conditions.
   - Consideration of drainage works that may be necessary to ensure suitable Airport-wide flood evacuation routes are available, including from the proposed South West Precinct development.
4. Review and update of development standards and guidelines for design of stormwater infrastructure. This should be undertaken to feed in to the next update of the Airport Master Plan.

6.0 References

AECOM (2018). *South West Precinct Concept Design Report*. Draft report for Bankstown Airport Limited, dated January 2018.

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URS (2006). *Bankstown Airport Stormwater and Flood Management Strategy*. Final draft report prepared for BAC Airports, March 2006.

Appendix A

Extent of Drainage Survey (RPS, 2017)

ISO A1 594mm x 841mm

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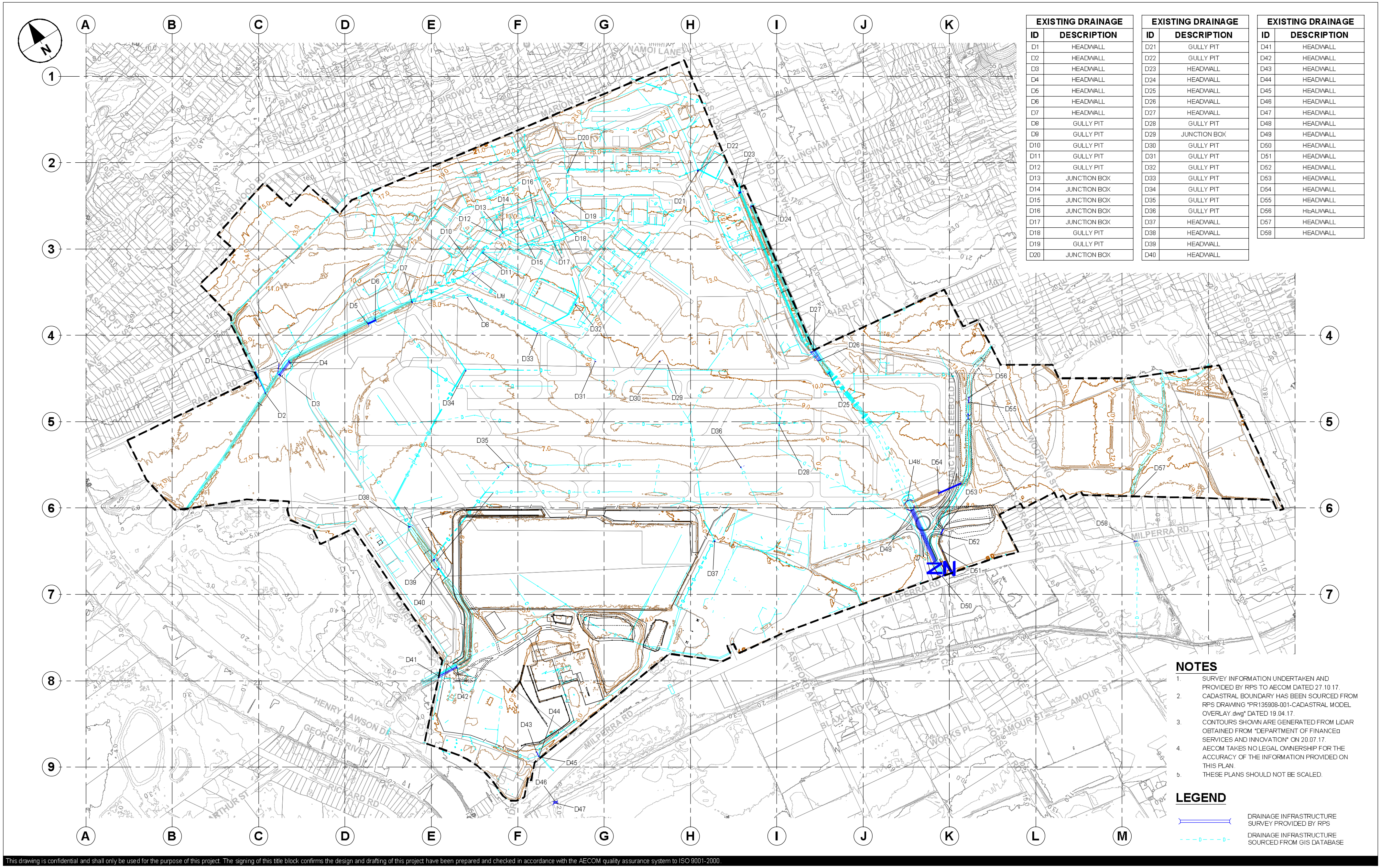
Filename: P:\605X\60548670\5. CAD\25-SKETCHES\PHASE-01\60548670-SKE-01-00-CI-0069.DWG



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D4	HEADWALL
D5	HEADWALL
D6	HEADWALL
D7	HEADWALL
D8	GULLY PIT
D9	GULLY PIT
D10	GULLY PIT
D11	GULLY PIT
D12	GULLY PIT
D13	JUNCTION BOX
D14	JUNCTION BOX
D15	JUNCTION BOX
D16	JUNCTION BOX
D17	JUNCTION BOX
D18	GULLY PIT
D19	GULLY PIT
D20	JUNCTION BOX

EXISTING DRAINAGE

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D25	HEADWALL
D26	HEADWALL
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EXISTING DRAINAGE

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D58	HEADWALL

NOTES

1. SURVEY INFORMATION UNDERTAKEN AND PROVIDED BY RPS TO AECOM DATED 27.10.17.
2. CADASTRAL BOUNDARY HAS BEEN SOURCED FROM RPS DRAWING "PR135908-001-CADASTRAL MODEL OVERLAY.dwg" DATED 19.04.17.
3. CONTOURS SHOWN ARE GENERATED FROM LiDAR OBTAINED FROM "DEPARTMENT OF FINANCE, SERVICES AND INNOVATION" ON 20.07.17.
4. AECOM TAKES NO LEGAL OWNERSHIP FOR THE ACCURACY OF THE INFORMATION PROVIDED ON THIS PLAN.
5. THESE PLANS SHOULD NOT BE SCALED.

LEGEND

═	DRAINAGE INFRASTRUCTURE SURVEY PROVIDED BY RPS
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AECOM

CONSULTANT

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A.B.N 20 093 846 925
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PROJECT

Bankstown Airport
South West Precinct

CLIENT

SYDNEY METRO AIRPORT
BANKSTOWN

SCALE BAR

0 125 250
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KEY PLAN

SAFETY IN DESIGN INFORMATION

ARE THERE ANY ADDITIONAL HAZARDS / RISKS NOT NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING?
☒ NO
☐ YES

PROJECT MANAGEMENT INITIALS

JC	RW	RM
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM		SURVEY	

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	21.11.2017	FOR INFORMATION
01	14.11.2017	FOR INFORMATION

PROJECT NUMBER

60548670

SHEET TITLE

SOUTH WEST PRECINCT
RPS SURVEY
CONTOUR PLAN

SHEET NUMBER

60548670-SKE-01-00-CI-0069

Appendix B

Strategy Implementation Guidance

Bankstown Airport – Flood Management Strategy Implementation, Flood Model Updates and Development Assessment – Rev 1

Introduction

A set of guidance tools has been developed to assist BAL in managing key aspects of Strategy implementation, and are provided as attachments. The tools comprise the following:

- Process Diagram
- Development Risk Screening Matrix
- Flood Risk Precinct Map

The following sections provide a description of these tools, their proposed use and intent. At this stage of Strategy development these tools should be considered preliminary only, with some further development and detailing required to capture a level of detail adequate for all parties, whilst ensuring also that development assessment is not overly onerous and streamlined to the extent possible.

Process Diagram

The Process Diagram provides an overall framework and describes key steps, activities and flow of information for two main aspects:

1. Management of Strategy Implementation and Flood Model Updates
2. Development Assessment Process

The proposed process for Item 1 outlines activities intended to ensure that details of constructed stormwater and flood related infrastructure are captured on a suitable asset register or database, and that tracking of water quality and flood mitigation measures is undertaken. The other key aspect concerns regular flood model updates, informed by both the asset database and Council data (for relevant works outside the Airport), to ensure that:

- an updated flood model is available for assessment of development proposals when required, and
- cumulative flooding impacts are monitored and reported, including regular consultation with Council.

In terms of the development assessment process, it is envisaged that assessment requirements could be determined on a risk-based approach that would see:

- A higher level of assessment, including flood modelling as required, for HIGH risk developments with the potential to adversely impact on flooding conditions, particularly outside the Airport boundary.
- A lower level of assessment, without flooding modelling, for LOW risk development for works that are of small scale, in areas of low flood risk and/or with overall low potential to adversely impact flooding condition.

A suggested categorisation and screening tool to assess overall development risk is provided below.

Development Risk Screening Matrix

The Development Risk Screening Matrix is intended to assist initial screening of development proposals into either a LOW or HIGH risk category, with consequential changes to the level of flood assessment and submission requirements, and consultation with Council.

Within the matrix, overall development risk is considered in terms of:

- Development type/scale

  In particular this considers whether the proposal involves significant changes to ground levels, buildings or other works that could impact overland flows and/or Georges River flooding.

  Examples of development types are also provided as supporting notes.

- Strategy compliance

  In terms of consistency with the technical assumptions that underpin the Strategy, as well as development timing relative to provision of trunk stormwater/flood management measures.

- Flood risk

  This is considered in relation to Flood Risk Precincts based on similar categorisation to that used by Council for development control purposes, as currently incorporated into BCC, 2015.

  Further discussion of flood risk precinct mapping is provided below.

Flood Risk Precinct Map

The Flood Risk Precinct Map shows risk precincts developed from TUFLOW model results generated as part of the present investigation, based on similar categorisation to that used by Council for development control purposes, namely:

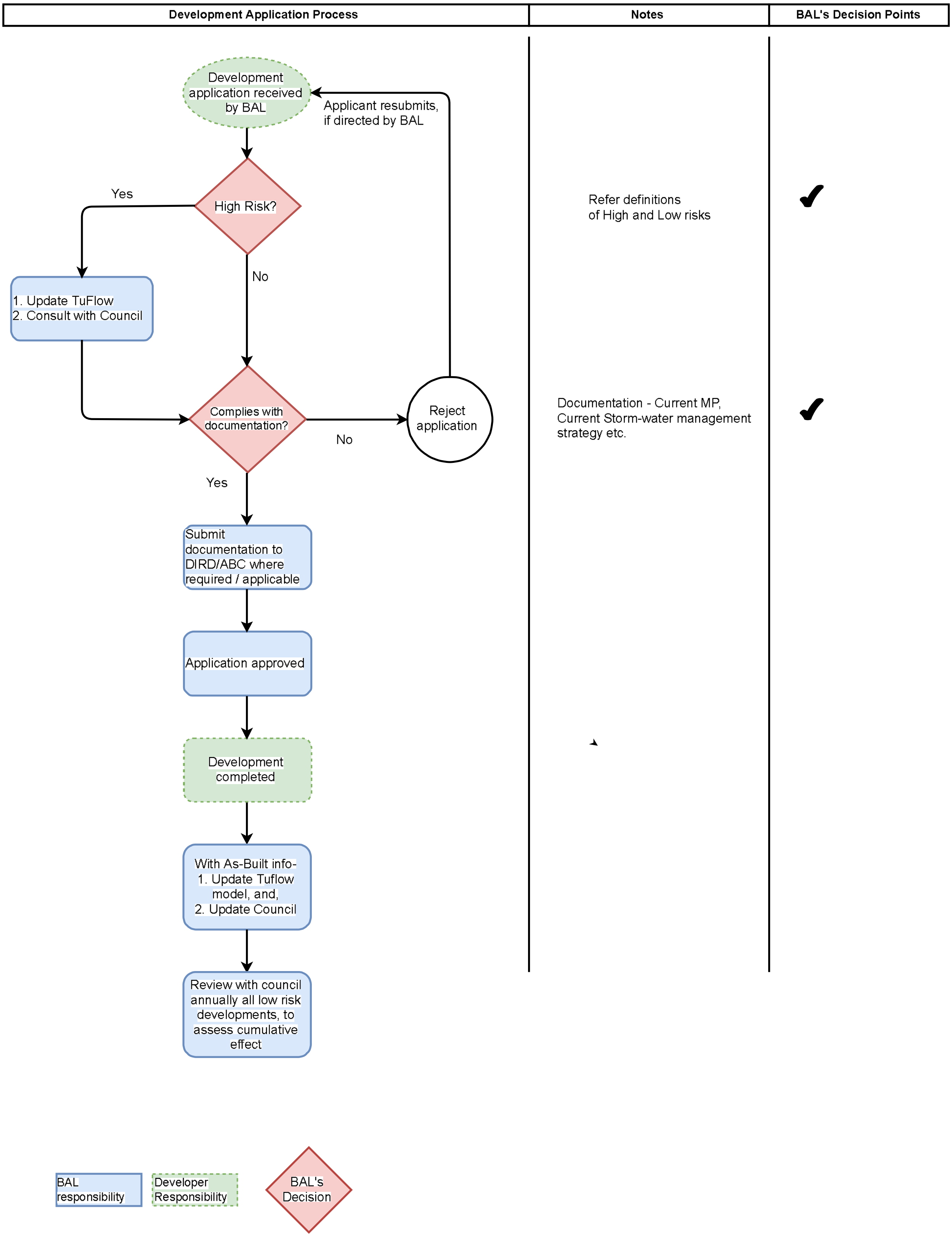
High Flood Risk	Land below the 100 year ARI flood that is subject to a high hydraulic hazard or where there are significant evacuation difficulties
Medium Flood Risk	Land below the 100 year ARI flood that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties
Low Flood Risk	All other land within the floodplain (i.e. within the PMF extent) which is not identified within either the High or Medium Flood Risk Precinct.

It is noted that the Overland Flow Risk category as used by Council has not been included as it is not considered to provide additional useful information for development screening purposes.

At this stage, the risk precinct mapping reflects local catchment flooding only, as access to Georges River flood mapping is not available and cannot be reliably generated using the Milperra Catchment TUFLOW model. For context, indicative extents of Georges River flooding for both the 100 year ARI and PMF events are shown. All land to the river side (i.e. south-west) of the 100 year ARI extent should be considered at least Medium Flood Risk, and all land between the 100 year ARI and PMF extents should be considered at least Low Flood Risk.

Finalisation of this Map for use should consider the following updates for consistency with Council mapping:

- Incorporation of flood risk precinct mapping for the Georges River.
- Rationalisation of High and Medium Flood Risk precincts to ensure continuity of flow paths and removal of small, isolated flood islands and pixelation effects that occur as a result of the rainfall-on-grid modelling approach.


Development Application Process
Notes
BAL's Decision Points
Development application received by BAL
Applicant resubmits, if directed by BAL
High Risk?
Yes
No
Refer definitions of High and Low risks
✓
1. Update TuFlow
2. Consult with Council
Complies with documentation?
No
Reject application
Documentation - Current MP, Current Storm-water management strategy etc.
✓
Yes
Submit documentation to DIRD/ABC where required / applicable
Application approved
Development completed
With As-Built info- 1. Update Tuflow model, and, 2. Update Council
Review with council annually all low risk developments, to assess cumulative effect
BAL responsibility
Developer Responsibility
BAL's Decision

1.0 Development Risk Screening Matrix:

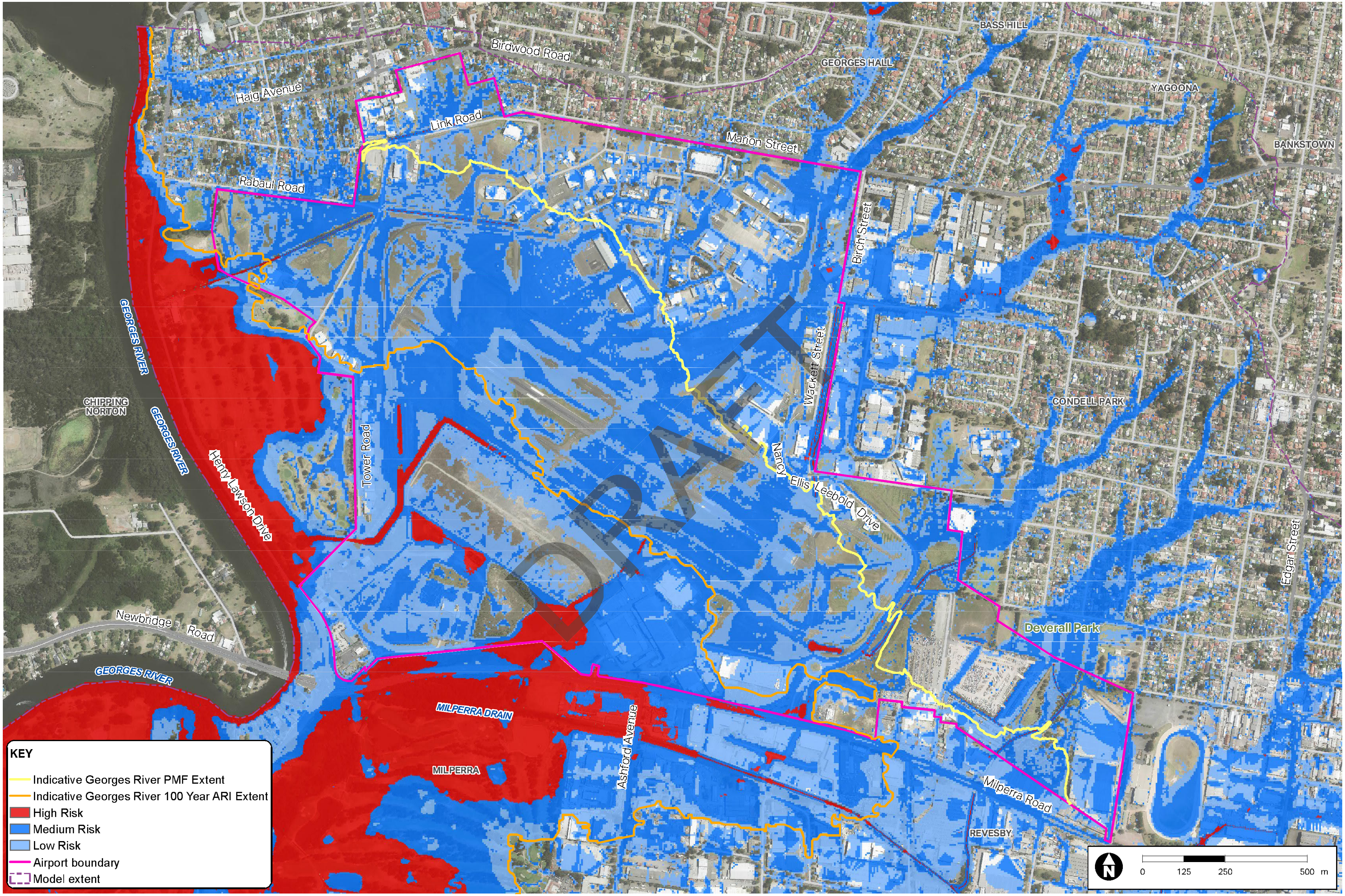
Development Type	Flood Risk Precinct [Note 3]	
	Low	High/Medium
A. Internal alterations or external at-grade/underground works involving no significant change in ground levels [Refer Note 1 for examples]	LOW	LOW
B. Change in building footprint or external works with significant change in ground levels [Refer Note 2 for examples]	LOW	HIGH

Notes

1. Examples of this development type may include:
   - building alterations or internal fitouts with no change to the existing building envelope
   - footpaths
   - carparking (at grade)
   - utility works
   - other minor/underground works

2. Examples of this development type may include:
   - building alterations involving change to the existing building envelope
   - new buildings
   - footpaths, carparking, utility works, other minor/underground works involving significant permanent change to ground levels

3. Refer separate map showing Preliminary Flood Risk Precincts.



AECOM GIS Printed:Date: 23/02/2018 \\ausyd1fp001\Projects\605X\60548670\4. Tech Work Area\4.99 GIS\02_Maps\20180222 Risk Precincts\G0XX_02_A3L_RiskPrecincts_20180222.mxd

BANKSTOWN AIRPORT

PRELIMINARY FLOOD RISK PRECINCTS - LOCAL CATCHMENT FLOODING ONLY

Flood model results presented on these maps have been specifically prepared for the Bankstown Airport Site-Wide Stormwater and Flood Management Strategy and should not be used for any other purpose.

**Per Figure L2 of the NSW Floodplain Development Manual 2005*

APPENDIX H

CONTAMINATION INVESTIGATION

Contamination Investigation

South West Precinct

Bankstown Airport

Bankstown Airport Limited

2 | Final

25 September 2018

Contamination Investigation - South West Precinct, Bankstown Airport

Project no:	IA179600
Document title:	Contamination Investigation – South West Precinct, Bankstown Airport
Document No.:	SMA-EN-SMA-RPT-000522
Revision:	2
Date:	25 September 2018
Client name:	Bankstown Airport Limited
Project manager:	Michael Stacey
Author:	Michael Stacey, Kyle McLean, Sath Dave
File name:	J:\IE\Projects\04_Eastern\IA179600\21 Deliverables\SWP Contamination Assessment\IA179600_SWP Contamination Investigation 250918.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
1	31.8.18	For Altis comment		MS	MS
2	25.9.18	Incorporating Altis comments	MS	MS	MS

Executive Summary

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by Bankstown Airport Limited (BAL) to undertake a contamination investigation of the proposed development site known as the South West Precinct (referred to hereinafter as the site) located on a portion of land at Bankstown Airport, NSW. The contamination investigation was not undertaken with the aviation museum lease area).

The objectives of the contamination investigation were as follows.

- Address the data gaps detailed in the Jacobs (25 June 2018) Preliminary Contamination Investigation – South West Precinct, Bankstown Airport (Jacobs, 2018a)
- Identify the nature and extent of any pre-existing potential contamination at the site that may be encountered during development
- Identify the nature and extent of potential contamination at the site that would deem the suite unsuitable for the proposed commercial/industrial land use on airport land.

The scope of works for the contamination investigation included the excavation of test pits and boreholes within the SWP footprint to facilitate soil sampling and groundwater well installation. Selected soil and groundwater samples were analysed for a range of common contaminant compounds including heavy metals, hydrocarbon compounds (TRH, BTEX, PAH), pesticides (OCP), polychlorinated biphenyls (PCB), volatile organic compounds (VOC), per- and polyfluoroalkyl substances (PFAS) and asbestos (presence/absence/gravimetric).

Based on site observations and the results of the laboratory analysis, some contamination is present at the site which will need to be considered in context of the development of the site and ongoing use.

Based on the results of this contamination investigation and previous studies as detailed in the Jacobs (2018a) PCI, the site in its current condition (subject to the results of the aviation museum investigation) is considered suitable for commercial/industrial land use subject to appropriate environmental management plans being implemented at the site during both construction and occupation to manage potential exposure to site occupants, adjacent land users and environmental receptors.

No contamination investigation has been undertaken within the aviation museum lease area. It is recommended that the investigation strategy detailed in the Jacobs (2018) PCI be undertaken prior to development of the site.

Contents

1 Introduction

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by Bankstown Airport Limited (BAL) to undertake a contamination investigation of the proposed development site known as the South West Precinct (referred to hereinafter as the site) located on a portion of land at Bankstown Airport, NSW.

The contamination investigation was undertaken within a portion of the site referred to as the investigation area. The results of the contamination investigation (as detailed in this report) are applicable to the investigation area (with the exception of the aviation museum lease area) only.

The location of the site and investigation area is presented as **Figure 1**.

This report details the works undertaken during the contamination investigation undertaken at the site, field observations and the sampling results and analysis with an assessment against the investigation levels detailed in the following guidelines:

- Airports (Environment Protection) Regulations 1997 (the Airport Regulations), Table 1 – areas of an airport generally (AEPR)
- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 as revised 2013 (NEPM 2013)
- HEPA (January, 2018) PFAS National Environmental Management Plan (PFAS NEMP)
- Western Australian Department of Health (May 2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WADOH, 2009).

The investigation was undertaken in general accordance with the Jacobs *Proposal for Contamination and Geotechnical Investigations – South West Precinct, Bankstown Airport* dated 9 May 2018 with the exception of investigations within the aviation museum lease area.

This report has been prepared in accordance (where applicable) with the requirements specified for a Detailed Site Investigation as detailed in the NSW EPA (1997) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.*

2 Objectives and Scope of Works

2.1 Objectives

The objectives of the contamination investigation were as follows.

- Address the data gaps detailed in the Jacobs (25 June 2018) Preliminary Contamination Investigation – South West Precinct, Bankstown Airport (Jacobs, 2018a)
- Identify the nature and extent of any pre-existing potential contamination at the site that may be encountered during development
- Identify the nature and extent of potential contamination at the site that would deem the suite unsuitable for the proposed commercial/industrial land use on airport land.

2.2 Scope of Works

The scope of works undertaken to address the objectives are detailed below. Sampling locations are presented on **Figure 2.**

Service locating for services by a qualified service locator and Dial Before You Dig Search

Excavation of test pits and boreholes within the SWP footprint to facilitate soil sampling and groundwater well installation. The numbers and types of excavation locations are detailed below:

- Test pits – 10 locations (western boundary - south western corner of SWP)
- Groundwater wells – 3 locations (western boundary - south western corner of SWP). It is proposed to utilize existing groundwater well (BAL-GW05) which is located adjacent to and down gradient of this area
- Test pits – 5 locations (western boundary - central portion of SWP)
- Test pits – 5 locations (western boundary - north western corner of SWP)
- Test pits – 20 locations (remaining area of SWP)
- Groundwater wells – 3 locations (in the vicinity of the fire incident and the Boeing site).

All test pits were excavated to 3.0 m below ground level (bgl), intersection with the water table or excavation method refusal (whichever was shallower). Soil samples from test pits were collected as grab samples from the surface of the site, directly from the centre of the excavator bucket at depths of approximately 0.5m and at 1.0m intervals or at other discrete locations where there is evidence of potential contamination (odorous or discoloured soils, erroneous waste or fill). Vapours within soil samples were also screened for volatile organic compounds (VOC) using a hand held photoionization detector (PID).

The following scope of works was undertaken to assess the presence/absence of asbestos containing materials (ACM) across selected areas of the site:

- 10 litres of material were excavated from each test pit location (20 test pits on the SWP and 10 test pits on the western corner of the SWP) and collected from both 0-1m and 1m-2m depth ranges. The 10 litre samples were spread out on black plastic sheeting, raked and inspected for potential asbestos containing materials (ACM)

- Where potential ACM was identified within the 10 litre samples, all observable potential ACM was collected and weighed.
- Where no potential ACM was identified in the 10 litre samples, a 500ml sample was collected from material within the top 300mm of the test pit for NATA accredited laboratory identification.

Test pits within the fire incident area targeted the interface between the current fill placement and the underlying historical surface level (noting the fire incident occurred in 2003 prior to fill placement).

Boreholes were drilled to facilitate construction of groundwater wells. Borehole locations were positioned downgradient of the area where the fire incident was suspected of occurring, along the eastern boundary adjacent to the former Boeing facility, up and down gradient of the western corner of SWP.

Boreholes were drilled with a rotary drill rig using solid flight augers. Boreholes were drilled to a maximum depth of 10m bgl, 2m below the observed water table or excavation method refusal.

Groundwater wells were constructed within each of the boreholes. Wells were constructed using factory decontaminated Class 18 UPVC 50mm screens (to 1 m above the observed water table to allow for seasonal fluctuations) and casing (to ground level). The borehole annulus was filled with graded sand to a level above the well screen and a bentonite/cement plug to ground level. The well was capped with a lockable cap and finished flush with surrounding surface levels using a road box.

Groundwater wells were developed following installation and sampled in accordance with industry standard methods. Groundwater wells were purged and sampled using low flow sampling techniques at least 48 hours after development. Groundwater levels and chemistry were monitored during purging and samples only collected once water chemistry and levels had stabilised. Vapours within groundwater wells were also monitored for VOC using a hand held PID.

Test pit and borehole locations were surveyed using a non-differential GPS. Heights of groundwater wells were surveyed to metres Australian Height Datum (AHD).

Soil and groundwater samples were analysed by a National Association of Testing Authorities (NATA) accredited laboratory. Selected samples were analysed for the following common contaminant compounds:

- 40 soil samples for heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (presence/absence)
- 23 soil samples for asbestos (gravimetric)
- 25 soil samples (19 primary + 6 QA/QC) for heavy metals, TRH, BTEX, PAH
- 10 soil samples (8 primary + 2 QA/QC) for PFAS extended suite (in the vicinity of the fire incident and plane parking areas)
- 2 soil samples for pH, cation exchange capacity (CEC) and % clay
- 5 groundwater samples (3 primary + 2 QA/QC) for dissolved heavy metals, TRH, low level PAHs, VOCs and PFAS extended suite (in the vicinity of the fire incident and Boeing site)
- 3 groundwater samples for dissolved heavy metals, TRH, low level PAHs, VOCs (western boundary – south western corner of SWP only)
- 1 trip spike and trip blank per soil and groundwater laboratory batch.

Preparation of an investigation report documenting the tasks completed, results and conclusions with respect to endorsed guidelines for commercial/industrial land use and the applicable limits specified within the NEPM (2013), AEPR (1997) and NEMP (2018) guidelines.

The report provides a statement as to whether the investigation area, in its current state, is suitable or can be made suitable for the proposed commercial/industrial land use from a contamination perspective and will propose remediation required to make the investigation area suitable, broad recommendations will be provided for remediation and/or management of contamination present within the investigation area in consideration of the proposed commercial use of the site and surrounding areas.

3 Data Quality Objectives

Data Quality Objectives (DQO) are an important component of any sampling and analysis programme as they outline the aims and objectives of the investigation program with respect to the integrity of the data collection and interpretation. In order to address the DQO and to ensure that they have been achieved the following seven-step process was undertaken. The DQO process has been adopted from the Australian Standard (AS 4482.1-2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds.*

Step 1 - State the Problem

The problem was potential contamination attributable to historical site usage above the NSW EPA endorsed guidelines for commercial/industrial land use, airport regulations and guidelines for the protection of beneficial groundwater users and receiving environments.

Step 2 - Identify the Decision Statement

The primary decision statement that the contamination investigation will attempt to resolve is:

> “Does contamination within the investigation area pose an unacceptable risk to human or environmental health which may prevent the development and operation of the site for commercial/industrial land use on airport land”?

Step 3 - Identify inputs to the decision

The following informational inputs were required to resolve the decision statement:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013) - Schedule B1 Guideline on Investigation levels for Soil and Groundwater (NEPC, 2013)
- Airports (Environment Protection) Regulations 1997 (the Airport Regulations)
- Western Australia Department of Health (May 2009) Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated Sites in Western Australia (WA Guidelines)
- HEPA (January, 2018) PFAS National Environmental Management Plan (PFAS NEMP).

Step 4 - Define the Boundaries of the Study

The investigation extended laterally across accessible areas of the investigation area for coverage and to target areas of environmental interest. All locations were extended vertically to the limit of the investigation or excavation method refusal.

Step 5 - Develop a Decision Rule

The purpose of this step was to define the parameter of interest, specify the action level and combine the outputs of the previous DQO steps into an “if…then…” decision rule that defines the conditions that would cause the decision maker to choose alternative actions.

The parameters of interest (or Contaminants of Concern) have been determined based on background information and to establish baseline chemical conditions and contaminant concentrations. The action level (Site Assessment Criteria) will be used to decide if the parameter represents a potentially unacceptable risk for commercial/industrial land use, human health and/or the environment. If the measured concentration of a compound exceeds the action levels in soils, water and vapour, then this is deemed to present a potential unacceptable risk considering the current land use, adjoining land use and environmental receptors. This also indicates that refinement of the Site Assessment Criteria (SAC) by undertaking Detailed Risk Assessment (DRA) is warranted. Should this DRA action value be exceeded, remediation will be required. In some instances (such as presence of free phase hydrocarbons), the development of the DRA can be by-passed and intervention through remediation applied directly.

Step 6 - Specify Acceptable Limits on Decision Errors

There were decided to be two types of errors:

a) Deciding that the investigation area is acceptable for commercial/industrial/airport use (i.e. no risk to site users and/or receptors) when it actually is not acceptable. The consequence of this error may be unacceptable health risk for site users, adjoining site users and receiving environments; or

b) Deciding that the site is unacceptable for commercial/industrial/airport use (i.e. risk to site users and/or receptors) when it actually is acceptable. The consequence of this error is that the client will pay for further investigation / remediation that are not necessary.

The more severe consequences are with decision error (a) since the risk of jeopardising human health and/or the environment outweighs the consequences of paying more for remediation. It will not be possible to conduct statistical hypothesis tests as the proposed sampling programme as part of this contamination investigation consists of the collection of one round of samples only.

Step 7 - Optimising the Design for Obtaining Data

The purpose of this step was to identify a resource-effective data collection design for generating data that are expected to satisfy the DQO.

The resource effective data collection design that was expected to satisfy the DQO is described in detail in **Sections 10** of this report. To ensure the design satisfies the DQO a comprehensive Quality Assurance and Quality Control Plan was implemented as described in **Section 11** of this report.

4 Site Information

The site information presented below is based on a review of readily available government information sources and information provided by BAL.

4.1 Site Identification

Based on information from NSW Department of Finance and Services, Land and Property Information Spatial Information Exchange (SIX), the site is located within the local government area (LGA) of Canterbury-Bankstown and comprises the following lots (whole or a portion of):

- Lots 303, 304, 305 and 306 deposited plan (DP) 1077440
- Lot 231 in DP 1132273
- Lot 500, DP 854664.

4.2 Site Zoning and Landuse

The current zoning of the site is SP2 – Air Transport Facility under the Bankstown Local Environment Plan (LEP) 2015. At the time of preparing this report, the site was largely an unused portion of land within the greater Bankstown Airport, with the exception of the portion of the site utilised as the aviation museum.

4.3 Geology

Review of the 1:100,000 Penrith Geological Sheet 9030 (Edition 1, 1991) indicated the site is within an area underlain by fluvial sediments. The sediments overlie Ashfield Shale of the Wianamatta Group. The fluvial sediments comprise clayey quartzose sand and clay. The Ashfield Shale comprises dark-grey to black claystone-siltstone and fine sandstone-siltstone laminite.

4.4 Soils

Review of the 1:100,000 Penrith Soil Landscape Series Sheet 9030 (1989) indicated that the area in which the site is located has been disturbed by human activity to a depth of at least 100 cm. The original soil has been removed, greatly disturbed or buried. Most of these areas have been levelled to slopes of less than 5%. Landfill includes soil, rock, building and waste materials. The original vegetation has been completely cleared.

The natural soils underlying these disturbed areas consist of fluvial sediments of the Berkshire group of soils. The Berkshire group of fluvial sediments are typically characterised by orange heavy clays and clayey sands, often mottled and with ironstone inclusions. Due to the depositional action of the fluvial sediments, they can exhibit marked differences in soil texture, colour, stoniness and calcium carbonate content.

4.5 Hydrogeology

Groundwater within the catchment occupied by the site is expected to flow to the west and south-west towards the Georges River. Shallow groundwater beneath the site is expected to be perched above the residual weathered bedrock and to be recharged predominantly by the infiltration of surface water falling onto the unsealed surfaces of the site.

The site is largely unsealed with the exception of the following:

- Access roads
- Aviation museum building
- Aviation museum car parking
- Aviation museum plane parking area
- Other miscellaneous buildings (e.g. former flying schools)
- Taxiways (western site boundary)

The majority of surface water (as rainwater) is likely to infiltrate directly into sub-soils with run-off directed to a number of storm water basins present across the site. A surface water drainage channel is located within the western portion of the site which discharges to the Georges River.

The Georges River is located less than 100m to the west and south west of the site.

4.6 Acid Sulfate Soils

Areas of the site are defined in the Liverpool Acid Sulfate Soil (ASS) Risk Map (Edition 2, 1997) as disturbed terrain with an elevation of 2 m to greater than 4 m AHD. Disturbed terrain is defined as filled areas, which often occur during reclamation of low-lying wetlands and floodplains for urban development. Other disturbed terrain includes areas which have been mined or dredged, or have undergone heavy ground disturbance through general urban development or construction of dams or levees.

No suspected ASS were observed in the material excavated during the contamination investigation because fill and natural soil did not exhibit the following characteristics (as defined in the ASSMAC 1998):

- Fill and soils did not exhibit a sulphurous smell
- There was no evidence of shell
- No jarositic horizons or substantial iron oxide mottling was observed; or
- Fill and soils were not classified as unripe muds (soft, buttery, blue grey or dark greenish grey) or estuarine silty sands or sands (mid to dark grey) or bottom sediments of estuaries or tidal lakes (dark grey to black).

The Bankstown Local Environment Plan (LEP) 2015 ASS map sheet defines the soils underlying the site as Class 3 and Class 5 ASS. Class 1 ASS are located adjacent to the Georges River (i.e. within 100m from the site).

The proposed development of the site is unlikely to include significant excavation works that will require dewatering and subsequent lowering of the local groundwater table. Some deeper excavation activities are likely to be required to facilitate construction of foundations. The volume of material to be removed from these deeper excavations for foundations is likely to be minor. If ASS are present within material excavated (although no ASS indicators were observed in the material excavated as part of the investigation), the volumes are likely to be minor and oxidation of sulphates (if present) are unlikely to have significant impact upon the environment.

5 Contamination Summary

A summary of contamination at the site is detailed in the Jacobs (25 June 2018) *Preliminary Contamination Investigation – South West Precinct, Bankstown Airport* (PCI, 2018)

The findings of the PCI (2018) are detailed below.

The PCI involved a review of available information in context of current nationally endorsed guideline documents and the *Airports (Environmental Protection) Regulations 1997* (AEPR).

Based on the information provided, significant investigation effort has historically (since 2005) been undertaken across SWP (not including the western portion of the site). Over 300 test pits and boreholes have been excavated across the site to assess contamination with over 400 samples submitted for laboratory analysis.

The results of the investigations undertaken indicated the following:

- Bonded and friable asbestos containing materials (ACMs) have been identified sporadically at the surface and buried in fill material and stockpiles present across the SWP. Friable asbestos was identified in one sample only.
- Benzo(a)pyrene contamination has been identified in stockpiled material at isolated locations across the SWP. The elevated benzo(a)pyrene concentrations are likely to be associated with bitumen identified within the material sampled.
- Localised hydrocarbon staining was present in the vicinity of the aviation museum.

The information review has also identified a number of data gaps with the respect to the SWP development areas as detailed below:

- Asbestos has been identified sporadically at the surface and buried in fill material and stockpiles present across the SWP. Previous investigations and remedial works undertaken at the SWP have detailed that measures will be required to manage the asbestos identified at the site including remediation action plans, unexpected finds protocols and validation (should earthworks be undertaken at the site). In accordance with the remediation hierarchies and preferred approaches for the management of asbestos on sites detailed in national guidance and supporting documents, the current proposed approach for the SWP is to manage the asbestos in soils in situ under appropriate management plans.
- Hydrocarbon stained areas have been previously observed surrounding the aviation museum associated with leaks from parked planes. The contamination status of these areas are not known and will require investigation and remediation/management (should contamination be identified)
- A fire incident (2003) was reported within the SWP. The presence of per- and polyfluoroalkyl substances (PFAS) contamination within this area is not known and will require investigation and remediation/management (should contamination be identified)
- The western corner of the SWP has not been investigated as part of previous studies. In consideration of the general airport use of this area and presence of a former spray painting facility, the western corner of the SWP will require investigation.
- A number of previous investigations were undertaken prior to the implementation of current national guidance for the assessment and management of contaminated sites. New national guidance requires

selected contaminant compounds to be assessed in different ways to that of the historical guideline values. To assess previous laboratory data in context of current guidelines, additional samples will need to be collected and analysed to allow for comparisons.

- Volatile organic compounds (VOC) are known to be present in groundwater to the east of the SWP (within the former Boeing site). Groundwater adjacent to the eastern boundary of the site will need to be investigated for VOC to assess potential vapour partitioning and associated risk (should elevated concentrations of VOC be identified). If vapour risks are identified, designs will need to include adequate measures to suitably reduce vapour risks to site occupants,

Jacobs findings from the information review are generally consistent with the conclusions and recommendations detailed in previous investigations (i.e. that the site in its current condition is considered suitable for commercial/industrial land use).

Based on the results of the investigations undertaken to date and subject to the results of the proposed investigations (the subject of this contamination investigation), the site in its current condition was considered suitable for commercial/industrial land use subject to appropriate environmental management plans being implemented at the site during both construction and occupation to manage potential exposure to site occupants, adjacent land users and environmental receptors.

6 Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) for the potential contamination exposure risks at the site has been developed. The purpose of the CSM is to identify known or potential sources of contamination, human health and environmental receptors including exposure mechanisms and pathways between the sources and receptors in consideration of current site conditions and proposed land use. A risk is present where there is a complete source – pathway – receptor linkage. The proposed investigation strategy to quantify potential risks have been included.

The identified potential sources, transport mechanisms, receptors and associated exposure mechanisms are summarised in **Table 6.1** below.

Table 6.1: Preliminary CSM

Source	Pathway	Receptor	Comments	Investigation Strategy
Asbestos and PAH impacted fill materials (Stage 1, Stage 2 and site stockpiles)	Inhalation (asbestos), dermal and ingestion (PAH) during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Proposed development strategy is to retain asbestos and PAH contaminated fill material on site. Any construction activities or future occupation of the site would require the implementation of appropriate management plans and measures to manage the exposure risks associated with these contaminated materials.	Limited investigations will be undertaken to confirm and validate the presence of these compounds. With respect to asbestos, this strategy is consistent with NEPM (2013 which states that "*Depending on the site-specific circumstances and the proposed remediation approach, conservative management of presumed asbestos contamination may avoid the need for a detailed site investigation".*
Other potential contamination within impacted fill materials (Stage 1, Stage 2 and site stockpiles). Impacted fill material needs to be assessed in accordance with current and applicable contaminated site guidelines	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Significant amount of sampling and analysis has been undertaken for materials within Stage 1, Stage 2 and site stockpiles. However, a number of compounds (namely selected heavy metals and hydrocarbons) are assessed differently by current guidelines compared to the guidelines used during earlier site investigations. The potential exposure risk associated with contamination needs to be validated for currency in accordance with current and applicable contaminated site guidelines.	20 test pit locations (including 6 locations targeting fire incident area – see below) across Stage 1, Stage 2 and site stockpiles. 20 soil samples to be analysed for heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (gravimetric). 10 soil samples for heavy metals, TRH, BTEX, PAH. 1 soil samples for pH, cation exchange capacity (CEC) and % clay.
Potential AFFF use during fire incident (2003)	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, future site occupants and groundwater	PFAS may be present in areas within and surrounding the location of the fire incident.	6 test pit locations targeting the fire incident area. 6 soil samples for PFAS extended suite. 3 groundwater wells in the vicinity of the fire incident area (also targeting VOC from Boeing site – see below).

				3 groundwater dissolved heavy metals, TRH, low level PAHs, VOCs and PFAS extended suite.
Potential PFAS from hydraulic leaks from planes	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, future site occupants and groundwater	PFAS from hydraulic leaks may be present in areas of former plane parking.	One test pit within former flying school plane parking areas within the western portion of the SWP). 1 soil samples for PFAS extended suite.
VOCs from Boeing Facility	Inhalation during occupation.	Future site occupants and groundwater	Solvent groundwater contamination known to be present on adjoining Boeing facility. Vapours could partition and accumulate in on-site structures (including services).	2 groundwater wells between the site boundary with the site and the Boeing facility. 3 groundwater dissolved heavy metals, TRH, low level PAHs, VOCs and PFAS extended suite.
Western Boundary - South western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations including flying schools and spray painting.	10 test pit locations. 10 soil samples to be analysed for heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (presence/absence). 5 soil samples for heavy metals, TRH, BTEX, PAH. 1 soil samples for pH, cation exchange capacity (CEC) and % clay. 3 groundwater wells in the vicinity of the former spray painting facility. 3 groundwater dissolved heavy metals, TRH, low level PAHs, VOCs.
Western Boundary - Central western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations including plane parking.	5 test pit locations. 5 soil samples to be analysed for heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (presence/absence). 3 soil samples for heavy metals, TRH, BTEX, PAH. 1 soil samples for PFAS extended suite.
Western Boundary - North western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations.	5 test pit locations. 5 soil samples to be analysed for heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (presence/absence). 3 soil samples for heavy

				metals, TRH, BTEX, PAH. 1 soil samples for pH, cation exchange capacity (CEC) and % clay.

7 Site Description

At the time of undertaking the contamination investigation, the site was largely a vacant portion of land, covered with grass and small shrubs and fenced off from airside areas of the airport.

Specific site features included:

- The aviation museum located within the central portion of the SWP.
- The northern portion of the SWP comprises a large flattened earthworks pad.
- The southern portion of the SWP is slightly raised above the northern portion and contains large stockpile areas within the eastern portion of this area.
- A number of retention ponds (or similar structures) are present to the west of the aviation museum within the southern portion of the SWP.
- A number of vacant buildings (former flying schools and spray painter) are located adjacent to the western boundary of the SWP.
- Areas within the north western portion of the SWP (north west of the storm water drain) are operational areas of the airport.
- A number of stockpiles containing demolition wastes are present within the site adjacent to the southern boundary.

Land use surrounding the site were observed as follows:

- North – Operational areas of the airport (taxiways and runways)
- East – Commercial operations including Quickstep Technologies (Composite Manufacturing), THA Nationwide (Vehicle Auctioneers) and Hopper Transport (Freight Forwarding)
- South – Vacant parcel of vegetated land between the site and Milperra Road. Retail area (located to the south west of the site) comprising a BP service station, ALDI supermarket and KFC and Hungry Jack restaurants
- West – Airport related commercial premises, Tower Road and the Georges River Golf Course.

8 Fieldwork – Soil Investigation

Jacobs undertook the contamination investigation of the investigation area between 9 and 27 June 2018. The site investigation and sampling was undertaken in accordance with documented Jacobs procedures by an experienced Jacobs environmental scientist.

8.1 Sampling Pattern

The sampling design proposed for this investigation is consistent with a judgmental sampling strategy as detailed in the NEPM (2013) guidelines. The NEPM (2013) guidelines state that:

> *"In judgemental sampling, the selection of samples (number, location, timing, etc.) is based on knowledge of the site and professional judgement. Sampling is localised to known or potentially contaminated areas identified from knowledge of the site either from the site history or an earlier phase of site investigation. Judgemental sampling is commonly used to investigate sub-surface contamination issues in site assessment".*

Soil sampling was undertaken across the site to address the investigation strategy detailed in the preliminary CSM (refer to Section 6).

A summary of the soil sampling program is detailed in **Table 8.1**.

Table 8.1: Soil Sampling Program

Site Location	Testpit / Borehole ID	Contaminants of Concern
Western boundary - south western corner of SWP	TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30	General contamination
Western boundary - central portion of SWP	TP31, TP32, TP33, TP34, TP35	General contamination
Western boundary - north western corner of SWP	TP36, TP37, TP38, TP39, TP40	General contamination
Remaining area of SWP	TP01, TP02, TP03, TP04, TP05, TP06, TP07, TP08, TP09, TP10, TP11, TP12, TP14, TP15, TP16, TP17, TP18, TP19	General contamination
Fire incident	TP14, TP15, TP16, TP17, TP18, TP19	General contamination and PFAS
Plane parking	TP26 and TP34	General contamination and PFAS
Asbestos (Gravimetric)	TP01, TP02, TP03, TP04, TP05, TP06, TP07, TP08, TP09, TP10, TP11, TP12, TP15, TP18, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30	General contamination and asbestos (gravimetric)

Table 8.2 details the departures from the sampling program as contained in the PCI (Jacobs, 2018a).

Table 8.2: Sampling Program Departures

Testpit ID	PCI Strategy	Reason Departure
TP13	General contamination and asbestos (gravimetric)	Location within aviation museum lease area. Access to lease area not granted.
TP20	General contamination and PFAS	Location within aviation museum lease area. Access to lease area not granted.
SS1, SS2, SS3, SS4	TRH	Location within aviation museum lease area. Access to lease area not granted.

Sampling locations are presented in **Figure 2.**

8.2 Depth Intervals of Sampling

8.2.1 Soil Contamination Investigation

For the soil contamination investigation, soil samples were collected as follows:

- As grab samples from the surface of the site and directly from the centre of the excavator bucket at depths of approximately 0.5 m and at 1.0 m intervals to a maximum depth of 3.0m below ground level (bgl), intersection with the water table or excavation method refusal (whichever was shallower), or at other discrete locations where there was evidence of potential contamination (odorous or discoloured soils, erroneous waste or fill).
- To assess PFAS soil contamination in the fire incident area, overlying fill materials were excavated to a level considered to be representative of site surfaces when the fire incident occurred (2003). This level was taken as the approximate surface level of the adjacent taxiway.

8.2.2 Asbestos Investigation

For the asbestos investigation, sampling intervals were as follows:

- 10 litres of representative material excavated from test pits was collected from both 0.0 – 1.0 m and 1.0 – 2.0 m depth ranges where fill material was observed. The 10 litre samples were spread out on black plastic sheeting, raked and inspected for potential ACM
- Where potential ACM was identified within the 10 litre samples, all observable potential ACM was collected and weighed.
- Where no potential ACM was identified in the 10 litre samples, a 500 ml sample was collected from material within the top 300 mm of the test pit.

8.3 Method of Sample Collection

8.3.1 Soil Contamination Investigation

All soil samples at depth were collected directly from the excavator bucket or as grab samples from surface soils. Samples were transferred to sample containers by Jacobs field staff by hand using disposable nitrile gloves.

Care was taken to ensure that representative samples were obtained from the depth required and that the integrity was maintained, particularly when dealing with potentially volatile and semi-volatile components.

8.3.2 Asbestos Investigation

Potential ACM as fragments of fibre cement sheeting were observed in test pits TP05 (between 0.9m and 1.1m), TP11 (between 0.0m and 1.0) and TP36 (between 0.0m and 0.5m). The potential ACM identified was collected for identification and bulk samples were collected as grab samples from material representing the top 300 mm of soil observed at the respective test pit locations.

8.4 Sample Containers, Method of Sample Storage and Handling

All soil samples for the soil investigation were placed in jars provided by the primary laboratory Australian Laboratory Services (ALS). Soil samples for PFAS analysis were placed in PFAS specific laboratory supplied sample containers. Zip lock bags were used to contain the bulk samples collected as part of the asbestos investigation. The jars and zip lock bags were completely filled with soil, labelled with the date, unique sampling point identification and sampler information.

The soil jars and zip lock bags once filled with sample and sealed, were immediately placed in an esky/cool box in which a cooling medium had been added to keep the samples below a temperature of approximately 4 ^{o}C. At the end of the sampling program the samples in the cool box were transported to the laboratory. Custody seals were placed on the esky / cool box for delivery to the laboratory.

8.5 Decontamination Procedures

Samples from test pits and surface samples were collected as grab samples from material at the centre of the excavator bucket or directly from the surface of the site using new disposable nitrile gloves, changed between sample locations. As such, no specific decontamination was required for the soil investigation.

8.6 Sample Logging and Documentation

Experienced Jacobs field staff completed soil logs during the field investigation. The logs recorded the following data:

- Sample number and depth
- Soil classification, colour, consistency or density, moisture content and obvious indications of contamination
- Depth of excavation
- Excavation refusal
- Method of excavation.

In addition, the physical attributes of samples such as soil/fill characteristics, obvious signs of contamination such as discolouration and/or odour were noted on the logs.

All samples, including QA samples, were transported to the primary laboratory under Chain-of-Custody (CoC) procedures and maintained in an ice-filled cool box. The CoC detailed the following information:

- Site identification
- The sampler
- Nature of the sample
- Collection time and date
- Analyses to be performed
- Sample preservation method.

8.7 Laboratory Analysis

Soil samples were selected for analysis based generally on providing vertical and lateral coverage of the site and on visual observations.

Selected soil samples were analysed for the following potential contaminants of concern.

Table 8.3: Analytical Schedule

Testpit ID	Suite A	Suite B	Suite C	Suite D	Testpit ID	Suite A	Suite B	Suite C	Suite D
TP01	X	X		X	TP22	X	X		X
TP02	X			X	TP23	X			X
TP03	X	X		X	TP24	X	X		X
TP04	X			X	TP25	X			X
TP05	X	X		X	TP26	X	X	X	X
TP06	X			X	TP27	X			X
TP07	X	X		X	TP28	X	X		X
TP08	X			X	TP29	X			X
TP09	X	X		X	TP30	X	X		X
TP10	X			X	TP31	X			
TP11	X	X		X	TP32	X	X		
TP12	X			X	TP33	X			
TP14	X		X		TP34	X	X	X	
TP15	X	X	X	X	TP35	X			
TP16	X		X		TP36	X	X		
TP17	X		X		TP37	X			
TP18	X		X	X	TP38	X	X		
TP19	X		X		TP39	X			
TP21	X			X	TP40	X	X		

Suite A - Heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos (presence/absence)
Suite B - Heavy metals, TRH, BTEX, PAH
Suite C – PFAS (extended Suite)
Suite D – Asbestos (gravimetric)

8.8 Analytical Parameters and Methods

Jacobs commissioned ALS as the primary laboratory and Envirolab as the secondary laboratory. Both ALS and Envirolab are NATA accredited for the testing undertaken.

The soil samples were analysed in accordance with NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013* (NEPC, 2013) guidelines using methods based on US Environment Protection Agency (US EPA) and American Public Health Association (APHA) approved analytical methods.

Asbestos identification was undertaken in accordance with the analytical methods detailed in the WADOH (2009) guidelines.

Specific PFAS analytical methods were based on the following:

- ISO 25101 – Water quality - Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) -- Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry
- ASTM D7979 – Standard Test Method for Determination of Perfluorinated Compounds in Water, Sludge, Influent, Effluent and Wastewater by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS).

9 Fieldwork - Groundwater Investigation

Five groundwater wells (GW01, GW02, GW03, GW04 and GW05) were installed to assess groundwater quality beneath and migrating onto the site and to identify any potential impacts to environmental receptors and beneficial groundwater users from the migration of contaminated groundwater (if present) onto and from the site. The groundwater investigation comprised:

- Construction of groundwater wells using new, Class 18, 50 mm UPVC with machine slotted screen sections, natural sand pack, bentonite seal and grout/bentonite to the surface. The wells were completed flush with the ground level with a gatic cover.
- Purging and sampling of existing groundwater well (BAL-GW05) located in the vicinity of the former spray painting building. Groundwater well BAL-GW05 is regularly sampled as part of an annual groundwater monitoring program undertaken at the airport and therefore did not require development.
- Survey of the groundwater wells to site datum to allow for the calculation of groundwater gradients.
- Measuring of water levels within all wells to assess depth to groundwater.
- Development, purging and sampling of all newly installed groundwater wells.

Sampling locations are presented in **Figure 2**.

9.1 Well Development and Sample Collection

Fieldwork was undertaken in accordance with documented Jacobs procedures by experienced staff. Groundwater wells were developed using a disposable, single use bailers.

Following development, the wells were allowed to stabilise for a minimum of 48 hours before being purged and sampled. The monitoring wells were purged prior to sampling in order to remove standing or stagnant water in the well and to ensure that samples collected were representative of the groundwater within the aquifer.

Monitoring wells were purged and sampled using a peristaltic pump. The pump had flow control to minimise drawdown and new dedicated, disposable polyethylene and silicon tubing was used for the collection of each sample. Care was taken to minimise the potential for volatile losses during sampling.

The electrodes of a calibrated water quality meter were used to measure pH, redox potential (Eh), electrical conductivity, dissolved oxygen and temperature in water purged from the wells. Samples were collected following stabilisation of these water quality parameters (generally ± 10%). A calibration certificate for the water quality meter is presented in **Appendix D.**

9.2 Decontamination Procedures

Dedicated, single use bailers and sample tubing was used to develop, purge and to sample all wells. All samples were collected using new disposable nitrile gloves, changed between sample locations.

9.3 Sample Containers

Laboratory supplied sample containers were used to contain the groundwater samples. Groundwater samples for PFAS analysis were placed in PFAS specific laboratory supplied sample containers. Sample containers were filled in order of volatility, with samples for the most volatile substances collected first.

9.4 Method of Sample Collection, Storage and Handling

All sample containers were labelled with the sample number, project number, date obtained and sampler and site name. This information was repeated on the CoC form.

Sample containers were filled in order of the most volatile substances. Care was taken to minimise disturbance of the sample to avoid aeration by minimising the distance between the outlet tubing and the container and tilting the container so that discharge flowed gently down the inner walls. Samples for dissolved heavy metals in groundwater were field filtered using 0.45 micron single use stericups.

Once filled, the caps were checked to ensure that they were secure (and that there were no air bubbles/head space within the glass vials and bottles) then placed within an esky / cool box in which a cooling medium had been added to keep the samples below a temperature of approximately 4 ^{o}C. Custody seals were placed on the esky / cool box for delivery to the laboratory.

9.5 Sample Logging and Documentation

While on site, the Jacobs field staff completed sampling field data sheets which document (where applicable):

- Time of sample collection
- Weather
- Unique sample identification number
- Sample location and depth
- Static Water Level
- Water quality screening results (DO, Temperature, Redox potential, pH and conductivity)
- Presence or absence of odour (nature and intensity)
- Colour of the water
- Presence or absence of sediment in the well
- Well condition and purging volumes.

All samples, including QA samples, were transported to the primary laboratory under CoC procedures and maintained in an ice-filled cooler. The CoC detailed the following information:

- Site identification
- The sampler
- Nature of the sample
- Collection date of the sample
- Analyses to be performed
- Sample preservation method.

9.6 Vapour Screening

Groundwater wells installed within the investigation area were screened for VOCs using a PID to assess the potential for vapour partitioning from the underlying groundwater. Following groundwater sampling, groundwater wells were left for approximately 24 hours for vapours (where present) to stabilise within the well. Prior to VOC screening, the well was dipped to assess groundwater levels. An extension to the PID was lowered to approximately 30cm above the standing water level and the top of the well was sealed with a foil plug. The peak and stable VOC concentrations were recorded over a period of approximately five minutes from each groundwater well.

9.7 Laboratory Analysis – Water

Groundwater samples were analysed for the following:

- 5 groundwater samples (3 primary + 2 QA/QC) for dissolved heavy metals, TRH, low level PAHs, VOCs and PFAS extended suite (in the vicinity of the fire incident and Boeing site)
- 3 groundwater samples for dissolved heavy metals, TRH, low level PAHs, VOCs (western boundary – south western corner of SWP only)

9.8 Analytical Parameters and Methods

Jacobs commissioned Eurofins as the primary laboratory. Eurofins are NATA accredited for the analysis undertaken.

The groundwater samples were analysed in accordance with NEPC (2013) using methods based on US EPA and APHA approved analytical methods.

Specific PFAS analytical methods were based on the following:

- ISO 25101 – Water quality - Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) -- Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry
- ASTM D7979 – Standard Test Method for Determination of Perfluorinated Compounds in Water, Sludge, Influent, Effluent and Wastewater by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS).

10 Quality Control Plan

Field and laboratory QA/QC requirements compliant with NEPC (2013) requirements (where applicable) were undertaken as part of the field work program as outlined below.

10.1 Field QA/QC Programme

Field QA/QC for this project consisted of the collection of blind replicate, split replicate, trip blank and trip spike samples.

10.1.1 Environmental Samples

Environmental samples or field samples were the representative soil and groundwater samples collected for analysis to determine aspects of their chemical composition.

10.1.2 Blind Replicate Samples

Blind replicate samples were provided by the collection of two environmental samples from the same location. These samples were preserved, stored, transported, prepared and analysed in an identical manner. As a minimum, the results of analyses on the blind replicate sample pair were assessed by calculating the Relative Percentage Differences (RPDs) between the results. The RPD was calculated as the difference between the results divided by their mean value and expressed as a percentage. If the RPD exceeded the value adopted for any analytes, additional investigation would be required, or justification provided for not conducting additional investigation.

Blind replicate samples were generally collected at a rate of one duplicate for every 20 environmental samples in accordance with AS 4482.1-2005.

10.1.3 Split Samples

Split samples provided a check on the analytical proficiency of the laboratories. Split samples were provided by the collection of two environmental samples from the same location. These samples were preserved, stored and transported in an identical manner. The spilt samples were analysed by the secondary laboratory. As a minimum, the results of analyses on the split replicate sample pair were assessed by calculating the RPDs between the results. The RPD was calculated as the difference between the results divided by their mean value and expressed as a percentage. If the RPD exceeded the value adopted for any analytes, additional investigation would be required, or justification provided for not conducting additional investigation.

Split replicate samples were generally collected at a rate of one duplicate for every 20 environmental samples in accordance with AS 4482.1-2005.

10.1.4 Trip Blanks

The trip blanks consisted of laboratory-supplied purge water and clean sand. The purpose of trip blanks was to detect potential contamination during sample transport. These samples were kept within eskies during sampling activities and were not opened in the field. Trip blanks were analysed at the laboratory as regular samples for BTEX compounds only.

Trip blanks were submitted with every batch of soil and water samples delivered to the respective primary laboratories.

10.1.5 Laboratory-Prepared Trip Spike

Laboratory-prepared trip spikes consisted of purge water or sand spiked with known concentrations of BTEX. These samples were submitted for BTEX analysis with the results compared with the known additions. Generally, samples were spiked with concentrations of 15, 15, 15 and 30 ppm of benzene, toluene, ethylbenzene and total xylenes respectively. The purpose of these samples was to monitor VOC losses during transit.

Trip spikes were submitted with every batch of soil and water samples delivered to the respective primary laboratories.

10.2 Laboratory QA/QC Programme

The reliability of test results from the analytical laboratories was monitored according to the QA/QC procedures used by the NATA accredited laboratory. The QA/QC programme employed by Eurofins (the primary laboratory) specified holding times, extraction dates, method descriptions, Chain of Custody (COC) requirements, analysis, LORs and acceptance criteria for the results. Laboratory QA/QC requirements undertaken by Eurofins and ALS are based on NEPM requirements and are outlined below (NEPC, 2013).

10.2.1 Laboratory Duplicate Samples

Laboratory duplicates provided data on analytical precision for each batch of samples.

Laboratory duplicates were performed at a rate of one duplicate for batches of 8-10 samples with an additional duplicate for each subsequent ten samples.

10.2.2 Laboratory Control Samples

Laboratory control samples consisted of a clean matrix (de-ionised water or clean sand) spiked with a known concentration of the analyte being measured. These samples monitored method recovery in clean samples and were used (where required) to evaluate matrix interference by comparison with matrix spikes.

10.2.3 Surrogates

For organic analyses, a surrogate was added at the extraction stage in order to verify method effectiveness. The surrogate was then analysed with the batch of samples and percentage recovery calculated.

10.2.4 Matrix Spike

Matrix spikes consisted of samples spiked with a known concentration of the analyte being measured, in order to identify properties of the matrix that may hinder method effectiveness. Samples were spiked with concentrations equivalent to 5 to 10 times the LOR and percentage recovery calculated.

10.2.5 Method Blanks

Method blanks (de-ionised water or clear sand) were carried through all stages of sample preparation and analysis at a rate of approximately 10%. Analyte concentrations in blanks should be less than the stated LOR. Reagent blanks were run if the method blank exceeded the LOR. The purpose of method blanks was to detect laboratory contamination.

10.3 Data Acceptance Criteria

The QA/QC Data will be assessed against the Data Acceptance Criteria (DAC) provided in **Table 10.1.**

Table 10.1: QA/QC Compliance Assessment

QA/QC Sample Type	Method of Assessment	Acceptable Range
Field QA/QC		
Blind duplicates and split replicate samples	The assessment of blind duplicate and split replicates are undertaken by calculating the Relative Percent Difference (RPD) of the replicate concentration compared with the original sample concentration. The RPD is defined as: $\text{RPD} = 100 \times \frac{\lvert X1 – X2 \rvert}{\text{Average}}$ Where: X1 and X2 are the concentration of the original and replicate samples.	Typical RPDs are noted in AS 4482.1-2005 as between 30 – 50%. Higher RPDs may be acceptable for heterogeneous material or where concentrations are close to the LOR (i.e. less than 10 times the LOR)
Blanks (Rinsate and Trip Blanks)	Each blank is analysed as per the original samples.	Analytical Result < LOR
Laboratory-prepared Trip Spike	The trip spike is analysed after returning from the field and the % recovery of the known spike is calculated.	RPDs between 70% - 130%
Laboratory QA/QC		
Laboratory Duplicates	Assessment as per Blind Replicates and Split Samples.	As per laboratory QC report
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known spike or addition to the sample. $\% \text{ Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; C = Calculated Concentration.	As per laboratory QC report
Method Blanks	Each blank is analysed as per the original samples.	Analytical Result < LOR
Note: LOR = Laboratory Level of Reporting (LOR) or the minimum detection limit for a particular analyte.		

11 Quality Assurance and Quality Control

For the purpose of assessing the quality of data presented in this report, Jacobs collected and analysed various Quality Control (QC) samples (blind duplicate and blind triplicate sample), trip spike and trip blank samples, while the laboratory completed their own internal QC. The current section of this report is focused on the presentation of the results of these QC samples, adherence to Quality Assurance (QA) systems and discussion of deviations, if any from the DAC.

11.1 Field Quality Assurance

All samples were collected by experienced Jacobs environmental scientists and engineers, under established Jacobs protocols. Adherence to Jacobs protocols by experienced field staff trained in sample collection and handling techniques ensures the quality and representativeness of the samples collected.

11.2 Field Quality Control

The following QC samples were collected for laboratory analysis.

- Blind Duplicate: QAQC1 (duplicate of soil sample TP09/0.0-0.1), QAQC3 (duplicate of soil sample TP18/0.5-0.6), QAQC5 (duplicate of soil sample TP18/2.9-3.0), QAQC7 (duplicate of soil sample TP36/2.9-3.0), QAQC9 (duplicate of soil sample TP34/0.0-0.1), QAQC11 (duplicate of soil sample TP34/0.-0.6).
- Split Replicate: QAQC2 (duplicate of soil sample TP09/0.0-0.1), QAQC4 (duplicate of soil sample TP18/0.5-0.6), QAQC6 (duplicate of soil sample TP18/2.9-3.0), QAQC8 (duplicate of soil sample TP36/2.9-3.0), QAQC10 (duplicate of soil sample TP34/0.0-0.1), QAQC12 (duplicate of soil sample TP34/0.-0.6)
- Trip spike sample for soil and water – QAQC-TS1 (soil), QAQC-TS2 (soil) and Trip Spike (water).
- Trip blank sample for soil and water – QAQC-TB1 (soil), QAQC-TB2 (soil) and Trip Blank (water).

Six blind duplicate soil samples and one blind duplicate water sample were analysed to assess the quality control during the field sampling program. This equates to 12% blind duplicate soil analysis and 20% blind duplicate water analysis. This blind duplicate analysis exceeds and therefore conforms to the Australian Standard (AS 4482.1 - 2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* requirement of 5%.

The Relative Percentage Differences (RPDs) for all analytes for the blind duplicates and spilt replicates taken during the soil and groundwater sampling program conformed to the DAC with the exception of:

- Perfluoro-n-pentanoic acid (PFPeA) – 60% RPD between primary soil sample TP34/0.0-0.1 (0.0022 mg/kg) and blind duplicate sample QAQC9 (0.0041 mg/kg)
- Perfluorobutanesulfonic acid (PFBS) – 58% RPD between primary soil sample TP34/0.0-0.1 (0.0202 mg/kg) and blind duplicate sample QAQC9 (0.0369 mg/kg)

RPDs calculate the difference in magnitude between two samples and do not take into account the minor differences in actual concentrations. With respect to the concentrations detected for the respective PFAS compounds, the concentrations detected within the samples represent values significantly lower than the site assessment criteria (where applicable). The samples collected from TP34/0.0-0.1 and blind duplicate pair was collected from fill material. It is inherently difficult to obtain representative duplicate samples from heterogeneous fill materials especially when they cannot be homogenised because of potential loss of volatiles.

As a conservative approach Jacobs have assessed soil quality using the higher reported concentration for the respective PFAS compounds. It is unlikely that the exceedances of the RPDs for selected PFAS compounds will affect the overall usability of the data set. RPD results for soil are presented in **Table C** and RPD results for groundwater are presented in **Table D.**

Six split replicate soil samples and one blind duplicate water sample were analysed to assess the quality control during the field sampling program. This equates to 12% blind duplicate soil analysis and 20% blind duplicate water analysis. This blind duplicate analysis exceeds and therefore conforms to the Australian Standard (AS 4482.1 - 2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* requirement of 5%.

The RPDs for all analytes for the split replicates taken during the soil and groundwater sampling program conformed to the DAC with the exception of:

- Perfluorooctanesulfonic acid (PFOS) – 60% RPD between primary soil sample TP34/0.0-0.1 (0.86 mg/kg) and split replicate sample QAQC10 (1.6 mg/kg)
- Perfluoropentane acid (PFPeS) – 53% RPD between primary soil sample TP34/0.0-0.1 (0.051 mg/kg) and split replicate sample QAQC10 (0.088 mg/kg)
- Perfluorononanoic acid (PFNA) – 114% RPD between primary soil sample TP34/0.0-0.1 (0.0003 mg/kg) and split replicate sample QAQC10 (0.0011 mg/kg)
- Perfluorohexanesulfonic acid (PFHxS) – 54% RPD between primary soil sample TP34/0.0-0.1 (0.691 mg/kg) and split replicate sample QAQC10 (1.2 mg/kg)

RPDs calculate the difference in magnitude between two samples and do not take into account the minor differences in actual concentrations. With respect to the concentrations detected for the respective PFAS compounds, the concentrations detected within the samples represent values significantly lower than the site assessment criteria (where applicable). The samples collected from TP34/0.0-0.1 and split replicate pair was collected from fill material. It is inherently difficult to obtain representative duplicate samples from heterogeneous fill materials especially when they cannot be homogenised because of potential loss of volatiles.

As a conservative approach Jacobs have assessed soil quality using the higher reported concentration for the respective PFAS compounds. It is unlikely that the exceedances of the RPDs for selected PFAS compounds will affect the overall usability of the data set. RPD results for soil are presented in **Table C** and RPD results for groundwater are presented in **Table D.**

One trip spike was submitted with each batch of soil and water samples delivered to the laboratory for analysis for contaminant compounds. The trip spike samples were analysed for BTEX only. The trip spikes for soil and water returned concentrations of BTEX within the acceptable range (70% - 130%) as outlined in the DAC.

One trip blank was submitted with each batch of soil and water samples delivered to the laboratory for analysis for contaminant compounds. The trip blank samples were analysed for BTEX only. The concentrations of BTEX compounds in the trip blank samples were below the respective laboratory LORs and therefore conformed to the DAC.

11.3 Laboratory QA

All analysis was undertaken by a NATA accredited laboratory using NATA accredited analytical methods. Laboratory batches applicable to the investigation are as follows:

- ALS – ES1820966, ES1821108, ES1821898, ES1822154
- Envirolab – 197378, 196518, 197377.

11.4 Laboratory QC

Laboratory QC data is presented in full in the laboratory certificates in **Appendix E**.

11.4.1 Laboratory Duplicates

RPDs for all laboratory duplicates for soil and groundwater samples conformed to the DAC.

RPDs for all laboratory duplicates for water samples conformed to the DAC.

11.4.2 Laboratory Control Samples

Recoveries for all laboratory control samples for soil and groundwater conformed to the DAC.

11.4.3 Surrogates

Recoveries for all laboratory surrogate samples for soil and groundwater conformed to the DAC.

11.4.4 Matrix Spikes

Recoveries for all matrix spike control samples in soil and groundwater conformed to the DAC with the exception of the recoveries for selected PAH compounds in groundwater sample GW02 from ALS laboratory batch ES1822154 as detailed below:

- Anthracene, Spike Recovery 64.7% (recovery less than the lower data quality objective of 68%)
- Perylene, Spike Recovery 70.4% (recovery less than the lower data quality objective of 71%)
- Phenanthrene, Spike Recovery 65.2% (recovery less than the lower data quality objective of 67%)
- Pyrene, Spike Recovery 69.4% (recovery less than the lower data quality objective of 70%).

The recorded matrix spike recoveries were only marginally lower than the respective laboratory data quality objectives. These marginally lower recoveries for only a small number of PAH compounds is unlikely to affect the usability of the data set.

11.4.5 Method Blanks

All method blanks for soil and groundwater reported analyte concentrations below the laboratory LOR and therefore conformed to the DAC.

11.4.6 Sample Holding Times

All soil and groundwater samples were extracted and analysed within the specified holding times with exception of the following:

- Laboratory prepared trip spike sample (QAQC_TS1) from laboratory batch ES1820966 - one day out of holding time.
- Laboratory prepared trip spike sample (QAQC_TS2) from laboratory batch ES15821108 - two days out of holding time.
- Laboratory prepared trip spike control sample from laboratory batch ES15821108 - three days out of holding time.
- Laboratory prepared trip blank sample (QAQC_TB2) from laboratory batch ES15821108 – one day out of holding time.
- Blind duplicate sample (QAQC7) from laboratory batch ES15821108 - two days out of holding time.

The laboratory results for the laboratory prepared trip spike and trip blank samples conformed to the DAC (i.e. acceptable RPDs for trip spike and trip spike control samples and analytical results below LOR for trip blank samples). RPDs between the primary sample (which was analysed within holding times) and blind replicate sample QAQC7 conformed to the DAC. Based on the above conformances with the respective DAC, analysis of the above samples outside of laboratory holding is unlikely to have affected the integrity of the samples and are unlikely to have affected the usability of the data set.

11.4.7 Sample Condition

All samples were received by the analytical laboratories in correctly preserved and chilled containers with no reported breakages. The individual sample receipts are presented with the laboratory reports in **Appendix E**.

11.5 QA/QC Assessment

It is concluded that laboratory data are of acceptable quality and are considered useable in making conclusions and recommendations regarding the site.

12 Site Assessment Criteria

To address potential health and environmental impacts within the site, Jacobs compared the analytical test results against a set of health and ecological based soil investigation levels to be referred to as Site Assessment Criteria (SAC) considered to be appropriate for the proposed land use and main potential receptors of concern (i.e. airport and commercial/industrial guidelines, given the current and proposed land use and that any potential exposure times to possible contaminants during construction activities have been considered as short term).

That is, the SAC have been set at levels that provide confidence that contaminant concentrations below the SAC will not adversely affect human health or terrestrial/aquatic ecosystems.

The SAC developed for the investigation was derived (where applicable) from the following guidelines.

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013) - Schedule B1 Guideline on Investigation levels for Soil and Groundwater (NEPC, 2013)
- Airports (Environment Protection) Regulations 1997 (the Airport Regulations)
- Western Australia Department of Health (May 2009) Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated Sites in Western Australia (WA Guidelines)
- HEPA (January 2018) PFAS National Environmental Management Plan.

12.1 Aesthetics

Aesthetics on sites relates to the presence of observable odours, discoloration and erroneous wastes materials in soil which could possibly indicate contamination. Such olfactory evidence can point to how receptors can be impacted by vapours on and migrating from the site. Odour threshold for organic substances can be exceeded in off-site settings (through groundwater transmission of hydrocarbons) and whilst may not represent a direct health risk, could possibly prompt civil action. Aesthetics was continually assessed during the investigation and reported on the field logs (where present).

12.2 Ecological Investigation Levels - Soil

The site and surrounding areas comprise land used for airport purposes. As such ecological investigation levels (EILs) were considered for a commercial/industrial land use as part of this investigation.

EILs were generated using the NEPC (2013) – Volume 2 – Table 1B (1-7). For the Project, it has been assessed that the EILs will apply to contaminants within the top 2 metres of soil at the surface / ground level which corresponds to the root zone and habitation zone of many species. Additionally, typical background concentrations were required to be calculated in order to derive selected EILs. To generate the EILs for the investigation, Jacobs have used the methodology as described in **Appendix A** and summarised below.

EILs were generated for heavy metals, DDT and naphthalene. As the soil conditions varied across the investigation area, Jacobs have taken the lower value calculated from samples BH01_3.0-3.1 (silty CLAY), BH06_3.0-3.1 (CLAY) and GW05_2.0-2.1 (SAND). The EILs were calculated (where appropriate) using the NEPC (2013) equation:

EIL = ABC[1] + ACL[2]

In context of the Airport Regulation for the protection of soil ecosystems, soil analytical results have also been compared against Table 2 – areas of environmental significance.

A summary of the adopted EILs is presented as **Table 12.1**.

Table 12.1: Ecological Investigation Levels (expressed as mg/kg).

Substance	Ecological Investigation Levels	Airport Regulations [4]
Arsenic	160 [1]	20
Cadmium	3 [2]	3
Chromium	670 [3]	50
Copper	140 [3]	60
Lead	1,808 [3]	300
Mercury	1 [2]	1
Nickel	55 [3]	60
Zinc	290 [3]	200
DDT	640 [1]	0.97
Naphthalene	370 [1]	-
Total PCB	-	1
Aldrin	-	0.05
Dieldrin	-	0.2

[1] Generic EILs for aged arsenic/DDT/Naphthalene from **Table 1B(5).**

[2] EILs from NEPM 1999 (no EILs specified for contaminants in NEPM 2013).

[3] EILs derived from NEPM 2013 equation ABC+ACL.

[4] Levels from the Airport Regulations Table 2 – areas of environmental significance

12.3 Ecological Screening Levels - Soil

Ecological Screening Levels (ESLs) are focused on petroleum hydrocarbon and total recoverable hydrocarbon (TRH) compounds and are compared against actual site conditions (sub-surface materials and depth) to assess the potential risk to terrestrial ecosystems. For the purposes of calculating the ESLs, the generic soil type (i.e. three broad classes of sands, silts or clays) and land use need to be defined.

For the purposes of this assessment Jacobs considered clays to be most representative for the soil profile at the site.

Given the current and ongoing land use of commercial/industrial, the corresponding land use and associated ESL were used to determine the assessment criteria.

In context of the Airport Regulation for the protection of soil ecosystems, soil analytical results for hydrocarbon compounds have also been compared against Table 2 – areas of environmental significance.

Table 12.2 summarises the ESL criteria for soils that have been adopted.

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[1] ABC is ambient background concentration (the soil concentration in a specified locality that is the sum of the naturally occurring background level and the contaminant levels that have been introduced from diffuse or non-point sources by general anthropogenic activity).

[2] ACL is added contaminant limit (the added concentration (above the ABC) of a contaminant above which further appropriate investigation and valuation of the impact on ecological values is required).

Table 12.2: ESLs for Petroleum Based Fractions (expressed as mg/kg).

Compound / Fraction	Ecological Screening Levels[1]	Airport Regulations [2]
F1 (C6 – C10)	215	-
F2 (>C10 – C16)	170	-
F3 (>C16 – C34)	2,500	-
F4 (>C34 – C40)	6,600	-
Benzene	95	0.5
Toluene	135	3
Ethylbenzene	185	5
Xylenes	95	5
Benzo(a)pyrene	0.7	-
TPH (C6 - C9)	-	100
TPH (>C6)	-	1,000
Total PAH	-	5

[1] Table 1B(6) ESLs for TPH fractions F1 – F4, BTEX and Benzo(a)pyrene in soils - NEPM (2013).

[2] Levels from the Airport Regulations Table 2 – areas of environmental significance

12.4 Health Investigation Levels - Soil

To address potential health impacts at the site, Jacobs compared the analytical testing results against a set of health based Soil Investigation Levels (SILs) appropriate for commercial/industrial land use in context of the current and future land use as an airport and have taken into consideration the potential for contamination in soil to impact upon groundwater and generate vapours which could impact upon on human receptors. The health based SILs are a combination of Health Investigation Levels (HILs) and Health Screening Levels (HSLs) as detailed in the NEPM (2013) and the Accepted Limit/Trigger Levels detailed in Table 1 – areas of an airport generally of the Airport Regulations (1997). The adopted SILs are summarised in **Table 12.3**.

HILs have been developed for a broad range of metals and organic substances. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of three metres below the surface for residential use.

HSLs have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSLs depend on specific soil physico-chemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 metres. Further details on their use are provided in Friebel and Nadebaum (2011a, 2011b & 2011c).

The HSLs defined within the NEPC (2013) relate only to the volatile fractions of the petroleum hydrocarbons range i.e. BTEX, naphthalene and TRH C6 – C10, TRH C10 – C16.

Jacobs has adopted the lower value from the following criteria given that exposure times to contamination (if present) during construction are expected to be short term:

- NEPC (2013) Health Investigation Level recommended from exposure setting ‘D’ which includes premises such as shops, offices, factories and industrial sites (i.e. sites with minimal exposure opportunities).
- Friebel, E & Nadebaum, P (September 2011) Technical Report No.10, Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document - HSL-D Commercial / Industrial Criteria and Intrusive Maintenance Worker (Table A4).

Table 12.3: Soil Investigation Levels (expressed mg/kg)

Contaminants	**Soil investigation levels (HILs / HSLs)**	
	Commercial / Industrial (D)	**Airport Regulations**
Metals/Metalloids		
Arsenic (total)	3,000 [1]	500
Cadmium	900 [1]	100
Chromium (III)	3,600 [1]	600,000
Copper	240,000 [1]	5,000
Lead	1,500 [1]	1,500
Mercury (inorganic)	730 [1]	75
Nickel	6,000 [1]	3,000
Zinc	400,000 [1]	35,000
Polycyclic Aromatic Hydrocarbons		
Carcinogenic PAHs (as B(a)P TEQ)	40 [1]	-
Naphthalene	11,000 [3]	-
B(a)P	-	5
Total PAHs	4,000 [1]	100
Total Recoverable Hydrocarbons		
TRH (C6-C9)	-	800
TRH (>C6)	-	5,000
>C16-C34	27,000 [3]	-
>C34-C40	38,000 [3]	-
Polychlorinated Biphenyls		
PCB	7 [1]	50
Organochlorine Pesticides		
DDT		1,000
DDD + DDE + DDT	3,600 [1]	-
Aldrin	-	50
Aldrin and dieldrin	45 [1]	20
Dieldrin	-	20
Chlordane	530 [1]	250
Endosulfan	2,000 [1]	-
Endrin	100 [1]	-

Contaminants	Soil investigation levels (HILs / HSLs)				
	Commercial / Industrial (D)				Airport Regulations
Heptachlor	50 [1]				50
HCB	80 [1]				-
Methoxychlor	2,500 [1]				-
Mirex	100 [1]				-
Toxaphene	160 [1]				-
F1, F2 and BTEX (Based on a CLAY Soil Type) [4, #]					
Depth (m)	0 – <1m	1 – <2m	2 – <4m	>4m	-
F1 (C6-C10*)	310	480	NL	NL	-
F2 (>C10-C16*)	20,000 [3]				-
Benzene	4	6	9	20	1
Toluene	99,000 [3]				130
Ethylbenzene	27,000 [3]				50
Xylenes	81,000 [3]				25

[1] NEPC (2013) Table 1 A(1) Health investigations levels for soil contaminants – Commercial / Industrial D.

[2] NEPC (2013) Table 1 A(3) Soil HSLs for vapour intrusion – commercial/industrial, 0 to <1, 1 - <2, 2 - <4, >4 m CLAY.

[3] HSL-D Commercial / Industrial Criteria and Intrusive Maintenance Workers detailed within Table A4, Friebel, E & Nadebaum, P 2011, Soil Health screening levels for direct contact, Technical Report 10.

[4] NEPC (2013) Table 1A(3) Soil HSLs for Vapour Intrusion (mg/kg) HSL D Commercial / Industrial.

NL – NL indicates the HSL is not limiting (see Footnote 5, Table 1A(3)).

TEQ – Toxic Equivalent.

[#] Soil Vapour as the primary Exposure Pathway to impact potential receptors.

12.5 Management Limits - Soil

Within NEPC (2013), management limits are applied to petroleum hydrocarbons which are considered in addition to the SAC (HILs, EILs, ESLs etc). These Management Limits reflect the nature and properties of petroleum hydrocarbons and their potential effects such as:

- formation of observable light non-aqueous phase liquids (LNAPL)
- fire and explosive hazards
- effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons.

The application of the management limits will require site specific factors to be considered in more detail. These factors include, but not limited to, depth of building basements and services (where applicable) and depth to groundwater in order to determine the maximum depth to which the limits should apply. When the management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

The presence of site TRH contamination at the levels of the management limits does not imply that there is no need for administrative notification or controls in accordance with jurisdiction requirements. Adopted management limits for petroleum hydrocarbons are detailed in **Table 12.4**.

Table 12.4: Management Limits for TPH fractions F1–F4 in soil (adapted from NEPC 2013 Schedule B1)

TPH fraction	Soil texture	Management Limits[1] (mg/kg dry soil)
		Commercial and Industrial
F1[2] C_6- C_{10}	*Fine*	800
F2[2] >C_{10}-C_{16}	*Fine*	1,000
F3 >C_{16}-C_{34}	*Fine*	5,000
F4 >C_{34}-C_{40}	*Fine*	10,000

[1] Management limits are applied after consideration of relevant ESLs and HSLs

[2] Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

12.6 Asbestos - Soil

The NEPM (2013) adopts guidelines for asbestos materials in soil as outlined in the WADOH (2009) guidelines. The WADOH (2009) guidelines were designed specifically to improve the characterisation of asbestos soil contamination and to manage human health risks now and into the future and specifically take the following practical positions into account:

- That overall, potential health impacts posed by different asbestos minerals, such as chrysotile and crocidolite, and fibre dimensions can be treated as equivalent
- ACM may pose a future free-fibre risk through its degradation, and therefore potential release of asbestos fibres
- The cancer risk from asbestos should be kept as low as practical and preferably no more than one occurrence in one million over a lifetime for the exposed population. Mesothelioma is used here as the most sensitive health impact of asbestos exposure.

The WADOH (2009) guideline values are based on extensive research by Swartjes and Tromp in the Netherlands (2008). The study resulted in the Netherlands introducing general regulatory investigation criteria of 0.01% w/w asbestos for fibrous asbestos and 0.1% w/w asbestos for non-friable ACM. The 0.01% criteria has the highest attendant risk (ie. Residential use) and is set at a level that should keep asbestos air levels below 0.001 fibres/millilitre (f/ml) and probably around 0.0001 f/ml. Using WHO (2000) risk figures for mesothelioma, 0.0001 f/ml corresponds to a lifetime risk of 10^{-6} to 10^{-5} in the exposed human population, which are risks that are considered broadly acceptable to the WADOH.

WADOH has used these Netherland figures and divided by a factor of 10 to derive the investigation criteria outlined in the WA guidelines. The factor of 10 takes into account the greater dryness and dust-generating potential of local soil and the fact that WADOH treats the mineralogical forms of asbestos as equivalent. The fibrous asbestos criterion applies to Friable Asbestos (FA) and Asbestos Fines (AF) due to their ability to generate asbestos fibre. WADOH applies even higher criteria for ACM, depending on the site use. These mirror the NEPM (2013) site uses and associated default exposure ratios.

Soil asbestos investigation criteria are outlined in **Table 12.5**.

Table 12.5: Soil Asbestos Investigation Criteria

Site Asbestos Investigation Criteria	Site Use
0.001% w/w asbestos for FA and AF	All site uses
0.05 % w/w asbestos for ACM	Commercial/Industrial
All forms of asbestos	No visible asbestos in surface soil [1]

[1] Investigation criteria from NEPM (2013)

Taking into account the current and proposed future land use for the site, Jacobs have adopted the soil asbestos investigation criteria for all land uses (for FA and AF), commercial/Industrial land use for ACM and no visible asbestos in surface soils as the SAC.

12.7 PFAS - Soil

12.7.1 Health Investigation Levels

The PFAS NEMP provides guideline values for the sum of PFOS and PFHxS and for PFOA in soil to be used for the assessment of potential human exposure through direct soil contact. The PFAS NEMP further notes that the guideline values should be used in conjunction with other lines of investigations to account for potential leaching, off-site transport, bioaccumulation and secondary exposure.

The soil guideline values are based on the NEPM (2013) Health Investigation Level (HIL) assumptions for specific land uses. All of the guideline values assume that 20% of the Food Standards Australia and New Zealand Tolerable Daily Intake (FSANZ TDI) is from the exposure scenario (i.e. up to 80% of exposure is assumed to come from other pathways). The guideline values and additional assumptions are as follows:

- Residential with garden / accessible soil: These values were derived based on standard NEPM assumptions for HIL—A including the consumption of up to 10 % plant produce grown on-site. These values are not protective of other food-based exposures such as consumption of eggs or home-slaughtered livestock.
- Residential with minimal opportunities for soil access: These values were derived based on standard NEPM assumptions in HIL-B. It is useful for considering risk to human receptors where consumption of home grown produce is not a foreseeable activity at that site and minimal opportunities exist for soil access.
- Public open space: These values were derived based on standard NEPM assumptions for HIL-C and apply for public open space such as parks, playgrounds, playing fields (eg. ovals), secondary schools and footpaths. These values do not apply to undeveloped public open space such as urban bushland and reserves.
- Industrial/ commercial: These values were derived based on standard NEPM assumptions for HIL—D. The values assume 8 hours spent indoors and 1 hour spent outdoors at a site such as a shop, office, factory or industrial site.

In terms of the investigation criteria for soil on the site, industrial/commercial HIL will be applied.

The adopted soil screening criteria for human health are summarised in **Table 12.6**.

Table 12.6: Investigation criteria for PFAS in soils and sediment for the protection of human health (mg/kg) (PFAS NEMP, HEPA 2018)

Exposure scenario	PFOS+ PFHxS	PFOA	Comment
On-site	20	50	Based on PFAS NEMP guideline values for commercial / industrial land use.

12.7.2 Ecological Investigation Levels

The PFAS NEMP includes soil guideline values for ecological protection for both direct exposure and indirect exposure. Direct exposure applies specifically to protection of organisms that live within, or are closely associated with, the soil while indirect exposure considers effects on organisms associated with bioaccumulation and / or off-site transport.

There are currently no acceptable published guideline values for direct exposure and therefore the PFAS NEMP recommends the use of the human health guideline values as an interim measure. For indirect exposure, the PFAS NEMP recommends the use of the 2017 Canadian Federal Environmental Quality Guidelines as interim criteria.

The adopted ecological investigation criteria are summarised in **Table 12.7**.

Table 12.7: Investigation criteria for soil for ecological protection (mg/kg) (PFAS NEMP, HEPA 2018)

Exposure scenario	Land use	PFOS	PFOA
Interim soil – ecological indirect exposure	Commercial and industrial	0.14	-

12.8 Groundwater

Groundwater investigation levels (GILs) are the concentrations of a contaminant in groundwater above which further investigation (point of extraction) or a response (point of use) is required. GILs are based on Australian water quality guidelines and drinking water guidelines and are applicable for assessing human health risk and ecological risk from direct contact (including consumption) with groundwater.

The NSW EPA has endorsed the use of the water quality trigger levels given in the Australia and New Zealand Environment and Conservation Council (2000) *Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC 2000) guidelines. These guidelines provide criteria for the protection of aquatic ecosystems (marine and fresh waters), primary industries, recreational water and drinking water.

The most likely environmental receptor of groundwater from the site would be the marine ecosystems of the Georges River located approximately 1 km to the west of the site. Based on information from the NSW Department of Environment, Climate Change and Water *NSW Water Quality and River Flow Objectives* (NSW DECCW, 2006) the Georges River is an estuarine environment down stream of Liverpool.

The NSW DECCW (2006) defines water quality objectives (WQO) for the Georges River. The areas surrounding the Georges River in the near vicinity of the site are characterised by urban developments. The NSW DECCW (2006) states that the WQO for the Georges River affected by urban development should be selected to protect aquatic ecosystems and recreational contact (both primary and secondary). It is noted in NSW DECCW (2006) that these WQOs may not be achievable in the short term and that the protection of primary recreational users may not be achievable.

From a review of the NSW Department of Primary Industries – Water Real Time Data database, no registered groundwater bores are located within a 0.5 km radius of the site. Based on the information above and the absence of known registered sensitive beneficial users of the groundwater down gradient from the site, the site assessment criteria (SAC) for groundwater should consider protection of environmental receptors. The most appropriate Groundwater Investigation Levels (GIL) are generally the 95% protection levels for marine water given in the ANZECC (2000) guidelines, although these are likely to be conservative in urbanised areas where waterways are degraded. Where the guideline does not provide these criteria or the guideline considers the 95% protection level is inappropriate, GILs have been sourced by using:

- The 99% protection levels for marine water ecosystems given in the ANZECC (2000) guidelines for contaminants considered to be bioaccumulative (e.g. cadmium, mercury, nickel)
- The 99% and 95% protection levels for freshwater ecosystems provided in the ANZECC (2000) guidelines (where applicable/available)
- NEPC (2013) prescribed GILs
- With respect to toluene and ethyl benzene the NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems.
- Nation Health and Medical Research Council (2011) Australian Drinking Water Guidelines (NHMRC, 2011)
- The Dutch (2000) groundwater intervention levels for Total Petroleum Hydrocarbons fractions. The aromatic solvents criteria of 150µg/L was adopted for TRH (C6-C9) fraction and the mineral oil criteria of 600µg/L was adopted for TPH (C10-C36) fraction.

Depth to groundwater measured during the monitoring was between 2.443 m and 3.303 m bgl. For the purposes of this assessment Jacobs have based the GILs and groundwater health screening levels (HSLs) on a depth of between 2 and 4 m (shallowest groundwater depth range provided in NEPC (2013).

In addition schedule 2 (Water pollution – accepted limits) of the Airports (Environment Protection) Regulations 1997 outline the accepted limit of concentrations of contaminants for freshwater and marine water. The adopted GILs are summarised in **Table 12.8**.

Table 12.8: Groundwater Investigation Levels (expressed as µg/L)

Contaminants	Contaminant	Ecosystem protection levels – Marine	Airport Regulations
Heavy Metals	Arsenic	24 [3]	50
	Cadmium	0.7 [2]	2.0
	Chromium	4.4 [1]	50
	Copper	1.3 [1]	5.0
	Lead	4.4 [1]	5.0
	Mercury	0.1 [2]	0.1
	Nickel	7 [2]	15
	Zinc	15 [1]	50

BTEX Compounds	Benzene	500 [2]	300
	Ethyl Benzene	140 [4]	-
	Naphthalene	50 [2]	-
	Toluene	300 [4]	-
	Xylene (o)	350 [3]	-
	Xylene Total	380 [4]	-
Total Petroleum Hydrocarbons (TRH)	TRH C_6-C_9	150 [5]	-
	TRH C_{10}-C_{36}	600 [5]	-
Polycyclic Aromatic Hydrocarbons (PAHs)	Benzo(a)pyrene	0.01 [6]	-
	Naphthalene	50 [2]	-

Notes:
[1] ANZECC (2000) 95% of species protected – marine
[2] ANZECC (2000) 99% of species protected –marine
[3] ANZECC (2000) 95% of species protected – fresh water
[4] NSW EPA (1994) Protection of aquatic ecosystems - fresh water
[5] Dutch (2000) groundwater intervention levels
[6] NHMRC 2011 Australian Drinking Water Guidelines

HSLs for groundwater apply to exposure to petroleum hydrocarbons through the dominant vapour inhalation exposure pathway only.

The groundwater HSLs are based on three-phase equilibrium theory and vapour is limited by the maximum solubility limit of the chemical in the soil pore water phase or the groundwater. The soil saturation concentration of a particular contaminant is the condition where pore water is at its solubility limit and soil vapour is at the maximum vapour concentration. When a calculated HSL in groundwater exceeds this limit, the vapour in the soil or above groundwater cannot result in an unacceptable vapour risk and is denoted as NL (not limiting) in the HSL tables (Tables 1 A(3) – 1A(5)). HSLs for groundwater have been developed for sand, silt and clay soils based on the US soil texture classification system (Friebel & Nadebaum 2011a). The HSLs assume a uniform soil profile and the soil texture making up the greatest proportion of the soil profile should be used in selecting the appropriate HSLs (Friebel & Nadebaum 2011a and 2011b). Based on observations during the drilling and soil sampling program undertaken at the site, clay has been selected as the major soil type underlying the site.

The heavier end fractions, >C_{16}-C_{34} and >C_{34}-C_{40} are not volatile and as such are not included within the groundwater HSLs for vapour intrusion.

The adopted criteria for vapour intrusion relevant for this investigation are summarised in **Table 12.9** below.

Table 12.9: Groundwater HSLs for vapour intrusion (mg/L)

Contaminants	**Groundwater investigation levels (HILs / HSLs)**
	Commercial / Industrial (D)
F1, F2 and BTEX (*Based on a CLAY Soil Type*) [1,]	
Depth (m)	*2 – <4*
F1 (TRH C_6-C_{10})	NL
F2 (TRH >C_{10}-C_{16})	NL
Benzene	30,000
Toluene	NL

Ethylbenzene	NL
Xylenes	NL
Naphthalene	NL

1 NEPC (2013) Table 1 A(4) Groundwater HSLs for vapour intrusion –Commercial / Industrial, 2 to <4m, CLAY.

Soil Vapour as the primary Exposure Pathway to impact potential receptors

NL – No Limit: No limit exists for these contaminants based on the function of the solubility limit, the soil vapour and groundwater.

12.9 PFAS - Water

12.9.1 Health Investigation Levels

The PFAS NEMP includes guidance values for the sum of PFOS and PFHxS and for PFOA in drinking water and recreational water for the protection of human health. These are based on the guidance issued by Department of Health (2017). The guideline values are presented in **Table 12.10**.

Table 12.10: Investigation criteria for groundwater and surface water for the protection of human health (µg/L) (Department of Health, 2017)

Exposure scenario	PFOS + PFHxS	PFOA
Recreational water	0.7	5.6

Based on a review of licensed groundwater wells, there are no wells down gradient of the site which are used for potable water use. It is unlikely that dams on adjoining properties would be used for potable water use considering potential bacterial contamination from fauna. Therefore, the guideline values for recreational water will be used as the Tier 1 risk screening criteria for surface water bodies.

12.9.2 Ecological Investigation Levels

The PFAS NEMP includes guideline values for PFOS and PFOA in surface water for the protection of aquatic ecosystems. These are based on the technical draft default guideline values developed by the Australia and New Zealand Environment Conservation Council (ANZECC).

The PFAS NEMP states that the draft guidelines do not account for effects which result from the bio-magnification of toxicants in air-breathing animals or in animals which prey on aquatic organisms.

It is noted that the PFAS NEMP includes investigation levels for the protection of aquatic ecosystems based on 99% species protection – high conservation value ecosystems, 95% species protection – slightly to moderately disturbed systems, 90% species protection – highly disturbed systems and 80% species protection - highly disturbed systems. In NSW the 95% species protection level – slightly to moderately disturbed ecosystems, is applied except for waterways that mainly flow through relatively undisturbed national parks, world heritage areas or wetlands of outstanding ecological significance where the 99% species protection values are applied (DEC, 2006). Therefore, the 95% species protection values have been adopted as the investigation criteria for surface water ecological protection direct toxicity. These values are presented in **Table** .

It is noted that the 95% species protection values may not adequately protect against bioaccumulation of PFAS in aquatic biota..

Table 12.11: Investigation criteria for surface water ecological protection direct toxicity (µg/L) (PFAS NEMP, HEPA 2018)

Exposure Scenario	PFOS	PFOA
Marine water direct toxicity, slightly to moderately disturbed ecosystems (95% species protection)	0.13	220

13 Results

13.1 Site Stratigraphy

Based on the review of available geotechnical information and results of the investigations, a geotechnical model was developed for the site. A brief description of each of the identified geotechnical units is provided below in order of increasing depth in **Table 13.1**.

Table 13.1: Summary of Geotechnical Units

Geotechnical Unit	Depth to Base of Unit (m)	Relevant Boreholes/ Test Pits	Summary Description
Unit X – Topsoil	0.1	TP32	SAND, fine grained, dark brown with fine to coarse grained subangular gravel. Topsoil generally absent across site.
Unit 1a – Engineered Fill	0 – 3.5	BH01 - BH10, TP01 - TP07, - TP19	Sandy Silty CLAY, Gravelly Sandy CLAY, Clayey SAND and Gravelly SAND - medium plasticity clay, sand is fine to coarse grained, gravel is fine to coarse grained, origin is shale, sandstone and various volcanics, trace of building debris including plastic, bricks, concrete, bitumen and slag.
Unit 1b – Uncontrolled Fill	0-7	BH11 - BH14, TP09 - TP12, TP21 – TP40	Stockpiled material - Sandy Silty CLAY, Gravelly Sandy CLAY, Clayey SAND and Gravelly SAND - medium plasticity clay, sand is fine to coarse grained, gravel is fine to coarse grained, origin is shale, sandstone and various volcanics, trace of building debris including plastic, bricks, concrete, bitumen and slag. Reworked or disturbed natural soils – SAND, Clayey SAND, sandy CLAY and Silty CLAY with trace of weathered rock gravel.
Unit 2a – Alluvium	2 – 15	All boreholes/test Pits excluding TP06, TP07 and TP11	Silty CLAY, High to very high plasticity, stiff to very stiff, moisture content approximately equal to or greater than plastic limit. Often interbedded with Unit 2b.
Unit 2b – Alluvium	2 – 15	All boreholes/test Pits excluding TP06, TP07 and TP11	Interbedded Sandy CLAY, low plasticity, stiff to very stiff, moisture greater than plastic limit, Clayey SAND and SAND, wet, medium dense to very dense. Very loose to loose or very soft to soft lenses less than 1.5m thick at depths below 10m were encountered at BH03, BH07, BH08.

13.2 Groundwater Flow Gradients

The heights (surveyed to site datum using a laser level) for all newly installed groundwater wells were surveyed to allow for the calculation of groundwater flow gradients. The position and heights (relative to site datum) of the groundwater wells and reduced groundwater levels are contained in **Table 13.2.**

Table 13.2: Groundwater Well Level Information

Well ID	Date Measured	Groundwater Level (m BTOC)	Relative Height (m TOC)	Relative Level of Groundwater (m)
GW01	23.7.18	3.089	5.89	2.801
GW02	23.7.18	4.043	6.01	1.967
GW03	23.7.18	3.7	6.10	2.4
GW04	23.7.18	4.807	5.67	0.863

GW05	23.7.18	Dry	4.88	
BAL-GW05	25.7.18	4.450	5.12	0.67

Notes:

- m BTOC – m below top of casing
- m TOC – m top of casing
- Relative level of groundwater reported as metres below site datum

The survey and groundwater level measurement indicated that there is a possible water shed between the eastern and western portions of the site. Reduced groundwater levels within the eastern portion of the site indicate groundwater flow direction in a general south to south easterly direction. Although accurate groundwater flow gradients could not be calculated by triangulation because well GW05 was dry, reduced groundwater levels within GW04 and BAL-GW05 and the proximity of the Georges River would suggest groundwater flow direction in a general south westerly direction towards the Georges River.

13.3 Aesthetics

A number of aesthetic issues (i.e. presence of erroneous wastes) were observed during the fieldwork program as detailed in **Table 13.3.**

Table 13.3: Aesthetic Issues

Investigation Location	Depth (mbgl)	Aesthetic Issues
TP01	0.4-1.8	Trace brick and plastic. Bitumen observed at 1.2mBGL
TP01	1.8-2.6	Trace concrete. Aluminium pipe observed at 2.3mBGL
TP02	0.3-0.5	Trace concrete and bitumen
TP02	0.5-1.4	Minor concrete and bitumen. Trace plastic
TP03	0.05-0.4	Electrical cable / wire observed
TP05	0.3-0.75	Trace bitumen
TP05	0.9-1.45	Concrete, tiles, brick and bitumen. Potential ACM
TP06	0.0-0.3	Trace bitumen
TP06	2.2-2.8	Terracotta, brick and tile
TP06	2.8-3.0	Plastic irrigation pipe
TP07	0.0-0.4	Waste, rio bar, plastic, bitumen, concrete and cap
TP07	0.4-0.9	Wood, concrete, bitumen, rock, PVC, glass and steel
TP07	0.9-2.7	Minor waste
TP08	1.3-1.85	Concrete
TP10	0.0-0.5	Minor tile, brick and bitumen
TP10	0.5-0.9	Brick pieces
TP10	0.9-2.2	Bricks, rocks, terracotta and concrete
TP11	0.7-1.2	Minor tile, brick, plastic, metal, rock, rubble, bitumen and insulation. Potential ACM observed from 0.0 to 1.0 mBGL
TP11	1.2-3.0	Minor tile, brick, plastic, metal, rock, rubble, bitumen and insulation
TP12	0.0-0.3	Refuse
TP14	0.4-2.1	Rio bar and brick pieces
TP15	0.4-0.8	Brick, tile and trace plastic
TP15	0.8-2.1	Brick, tile and trace plastic

TP16	0.4-2.4	Trace plastic, tile, glass and steel
TP17	0.0-0.4	Minor bitumen
TP17	0.4-2.0	Rock, brick, plastic, steel, trace glass and wood. Fabric and brick observed at 0.4mbgl.
TP18	0.8-1.5	Brick, gravel
TP18	1.5-1.9	Brick pieces
TP19	0.55-2.5	Bricks, PVC, concrete.
TP21	0.1-0.4	Trace plastic
TP21	0.4-0.6	Trace plastic
TP24	0.0-0.15	Bitumen
TP25	0.0-0.1	Concrete and trace brick pieces
TP25	0.1-0.2	PVC piping
TP28	0.0-0.1	Trace brick, bitumen/tar
TP28	0.1-0.15	Trace brick, bitumen/tar
TP29	0.15-0.75	Brick observed at 0.25 mBGL
TP36	0-1.0	Hardened black resin noted between 0 - 1 mBGL
TP38	0.0-0.5	Minor waste, bitumen, glass, plastic and rock pieces
TP39	0.0-0.9	Minor waste including brick, tile, plastic and wooden materials
TP39	0.9-1.5	Minor waste including brick, tile, plastic and rock
TP39	1.5-3.0	Trace plastic, brick, tile and rock
TP40	0.0-0.6	Minor waste including glass, plastic and rock
TP40	0.6-1.1	Minor brick, concrete, bitumen and gravel
TP40	1.1-3.	Trace waste including glass, tile and brick

Borehole and test pit logs are presented in **Appendix B**.

13.4 Vapour Screening

Vapours within groundwater wells GW01, GW02, GW03, GW04, GW05 were monitored for VOC using a hand held PID. The results of the vapour screening are detailed in **Table 13.4.**

Table 13.4: Aesthetic Issues

Groundwater Well	Date	Peak VOC (ppm)	Stable VOC (ppm)
GW01	27.7.18	7.4	2.5 to 2.1
GW02	27.7.18	1.7	1.7 to 1.6
GW03	27.7.18	0.5	0.5 to 0.4
GW04	27.7.18	1.1	0.6 to 0.3
GW05	27.7.18	6.5	0.9 to 0.8 (falling steadily)

The results of the vapour screening reported low concentrations of VOCs in the groundwater wells monitored. The results recorded are likely to indicate the significant quantities of vapours are not partitioning from groundwater beneath the site.

13.5 Soil Analytical Results

Soil analytical results from samples collected are presented below and in **Table A**. Laboratory certificates of analysis are presented in **Appendix E**.

13.5.1 Heavy Metals

Concentrations of all heavy metals in all soil samples analysed were below the SAC.

13.5.2 Total Recoverable Hydrocarbons (TRH)

The concentrations of TRH compounds in all soil samples analysed were below the SAC.

13.5.3 BTEX

The concentrations of BTEX compounds in all soil samples analysed were below the LOR and below the SAC.

13.5.4 Polycyclic Aromatic Hydrocarbons (PAHs)

Concentrations of all PAH compounds in all soil samples were below the SAC with the exception of concentrations in sample TP24/0-0.1 as detailed below:

- Benzo(a)pyrene concentrations (25.7 mg/kg) exceeded the ESL (0.7 mg/kg) and AEPR 1997 HIL (5 mg/kg)
- Total PAH concentrations (370 mg/kg) exceeded the AEPR 1997 HIL (100 mg/kg) and the AEPR 1997 EIL (5 mg/kg).

13.5.5 Organochlorine Pesticides (OCPs)

The concentrations of OCP compounds in all soil samples analysed were below the LOR and below the SAC.

13.5.6 Polychlorinated Biphenyls (PCB)

The concentrations of PCB compounds in all soil samples analysed were below the LOR and below the SAC.

13.5.7 Per- and poly-fluoroalkyl substances (PFAS)

The concentrations of PFAS compounds in all soil samples analysed were below the SAC with the exception of PFOS concentrations detected in the following samples:

- PFOS concentrations in TP34/0.0-0.1 (0.86 mg/kg) exceeded the EIL (0.14 mg/kg)
- PFOS concentrations in QAQC9 (blind duplicate of TP34/0.0-0.1) (1.06 mg/kg) exceeded the EIL (0.14 mg/kg)
- PFOS concentrations in QAQC10 (split replicate of TP34/0.0-0.1) (1.65 mg/kg) exceeded the EIL (0.14 mg/kg).

Sample locations exceeding the respective SAC are presented in **Figure 3.**

13.6 Asbestos Analytical Results

Soil analytical results from samples collected from 26 test pit locations (TP01, TP02, TP03, TP04, TP05, TP06, TP07, TP08, TP09, TP10, TP11, TP12, TP15, TP18, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29 and TP30) are presented below and in **Table A.** Laboratory certificates of analysis are presented in **Appendix E**.

13.6.1 Asbestos Analysis of Soil Bulk Samples

Asbestos analytical results for the soil bulk samples are presented below and in **Table A**. Laboratory certificates of analysis are presented in **Appendix E**.

Trace analysis of asbestos in all soil bulk samples analysed reported no detectable asbestos. Analysis for AF, FA and ACM for all samples analysed recorded results of no visible asbestos identified. Laboratory calculated concentrations for ACM, AF and FA and total asbestos in soil reported results below the laboratory limits of reporting (LOR).

13.6.2 Asbestos Concentration in Soil

Asbestos (based on visual observations during the fieldwork and laboratory identification) was identified in fragments of fibre cement sheet in the following samples:

- TP05-ACM/0.9-1.1 (sample comprised fragment of ACM only)
- TP11-ACM/0.0-1.1 (sample comprised fragment of ACM only)
- TP29/0.0-0.3 (fragment of ACM in soil sample)
- TP30/0.0-0.1 (fragment of ACM in soil sample)
- TP36-ACM/0.0-0.5 (sample comprised fragment of ACM only).

Sample locations exceeding the respective SAC are presented in **Figure 3.**

13.6.3 Inspection and Analysis of Surface Soils

A visual inspection of surface soils for potential ACM fragments was undertaken at each of the test pit locations (where possible) prior to the commencement of excavations. Where the surface of the site and surface soils were visible, no potential ACM fragments were observed at or in the near vicinity of the sampling locations.

13.7 Groundwater Analytical Results

Groundwater analytical results from samples collected from groundwater wells A1-GW1, A1-GW2 and A1-GW3 are presented below and in **Table B**. Laboratory certificates of analysis are presented in **Appendix E**.

13.7.1 General Water Quality Parameters

The general water quality parameters measured at the respective groundwater well locations are detailed in **Table 13.5**.

Table 13.5: General Groundwater Quality

Well ID	Electrical Conductivity	pH	Temp (ºC)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)

	(µS/cm)					
GW01	18593	5.73	20.8	39.2	12.0	0.99
GW02	26784	6.24	21.0	-0.5	4.9	0.39
GW03	26327	6.24	20.3	-124.7	4.9	0.40
GW04	3566	6.01	20.0	92.4	61.2	5.42
GW05	Well Dry					
BAL-GW05	347.5	5.88	19.1	133.3	14.1	1.31

Groundwater field data sheets are provided in **Appendix C**.

Field water quality parameters indicated the following with respect to groundwater beneath the site:

- Western portion of the site – Groundwater slightly acidic. The electrical conductivity of the groundwater indicated generally fresh water. Dissolved oxygen and redox potential indicated generally oxidising conditions
- Eastern portion of the site – Groundwater slightly acidic to pH neutral. The electrical conductivity of the groundwater indicated generally brackish to saline water quality. Dissolved oxygen and redox potential indicated generally reducing conditions.

13.7.2 Heavy Metals

Concentrations of all dissolved heavy metals in all samples were low or below the LOR and below the SAC with the following exceptions:

- Mercury concentrations exceeded the SAC of 0.1 µg/L in the groundwater sample analysed from GW04 (0.3 µg/L)
- Nickel concentrations exceeded the SAC of 7 µg/L and the airport regulations of 15 µg/L in the groundwater sample analysed from GW01 (17 µg/L)
- Nickel concentrations exceeded the SAC of 7 µg/L in the groundwater sample analysed from GW04 (15 µg/L)
- Zinc concentrations exceeded the SAC of 15 µg/L and the airport regulations of 50 µg/L in the groundwater sample analysed from GW04 (82 µg/L)
- Zinc concentrations exceeded the SAC of 15 µg/L in the groundwater sample analysed from GW01 (36 µg/L).

13.7.3 BTEX

Concentrations of all BTEX compounds in all samples analysed were below the SAC.

13.7.4 Total Recoverable Hydrocarbons (TRH)

Concentrations of all TRH compounds in all samples analysed were below the SAC.

13.7.5 Polycyclic Aromatic Hydrocarbons (PAHs)

Concentrations of all PAH compounds in all samples analysed were below the SAC.

13.7.6 Volatile Organic Compounds (VOCs)

Concentrations of all PAH compounds in all samples analysed were below the SAC.

13.7.7 Per- and poly-fluoroalkyl substances (PFAS)

Concentrations of all PFAS compounds in all samples analysed were below the SAC.

14 Discussion

14.1 Soil

Samples of soil / fill material collected from the test pits were analysed for contaminants of concern which could be associated with the former and current use of the site.

The following aesthetic issues were identified at the site:

- Potential ACM (later confirmed ACM by laboratory identification) was observed in fill material at depth (i.e. below the surface of the site) in test pits TP05, TP11, TP29, TP30 and TP36.
- Miscellaneous materials (i.e. general building wastes) were observed in TP01, TP02, TP03, TP05, TP06, TP07, TP08, TP10, TP11, TP12, TP14, TP15, TP16, TP17, TP18, TP19, TP21, TP24, TP25, TP28, TP29, TP36, TP23, TP39 and TP40.

No aesthetically unsuitable materials were observed in the natural soils underlying the fill material at the site.

Soil samples from test pits were selected for analysis to provide general vertical and lateral coverage of potential contaminant extents and were based on visual observations. The majority of soil samples recorded contaminant concentrations below the adopted SAC. A small number of samples reported concentrations of contaminant compounds above adopted ecological investigation and screening levels (i.e. PFOS in sample TP34/0.0-0.1 and B(a)P in sample TP24/0.0-0.1). In context of the likely development at the site (comprising commercial/industrial facilities with minimal landscaping opportunities), these exceedances are unlikely to impact upon the development or continued use of the site for airport related activities. Additionally, considering that the soil profile beneath the investigation area has been highly modified, the soils beneath the investigation area are unlikely to represent a sensitive terrestrial ecosystem.

B(a)P and total PAH concentrations in sample TP24/0.0-0.1 exceeded health investigation levels as defined by AEPR (1997). Bitumen was identified at this location and is likely to be the source of the elevated concentrations of PAHs detected within this sample. It is likely that bitumen observed in material from other test pit locations would also contain elevated PAH concentrations. Although concentrations were above health investigation levels, the PAH are likely to be bound within the matrix of the bitumen and would be generally unavailable to receptors (i.e. site users and receiving environments).

ACM was identified within fill material located across the investigation area. The ACM sampled comprised fragments of fibre cement sheeting and was in a good bonded condition (i.e. could not be crushed with hand force). Where ACM was observed, the fill material also contained quantities of other miscellaneous materials including general building wastes. Considering the location of where ACM was observed (locations across the site and not confined to one specific area) and the presence of building wastes within the majority of test pit locations, it is likely that ACM is scattered throughout the fill material present across the investigation area. In context of the likely development at the site (comprising commercial/industrial facilities with minimal landscaping opportunities), ACM impacted fill will require appropriate management during both construction activities and future occupation.

14.2 Groundwater

The groundwater monitoring results indicated that the concentrations of compounds detected in groundwater wells subjected to monitoring were below the adopted SAC and (AEPR 1997) limits with the exception of nickel and zinc detected in well GW01 and mercury, nickel and zinc detected in well GW04.

Concentrations of nickel and zinc exceeded the SAC in A1-GW3. Based on the reduced level survey and calculated groundwater flow gradients, A1-GW3 is located in an up gradient position. It is acknowledged that the groundwater flow gradients may be affected by rainfall events and localised flooding of the Georges River prior to undertaking the monitoring event. Elevated concentrations nickel and zinc (i.e. concentrations above the SAC) were not reported in A1-GW1 and A1-GW2. It may be possible that the elevated nickel and zinc in groundwater at this location may be associated with run-off from the adjoining bus facility (especially run-off from metal roofs located within the bus facility).

The concentrations of mercury, nickel and zinc detected within GW01 and GW04 were within one order of magnitude of the respective SACs. The concentrations of mercury and nickel were only marginally elevated in comparison the SAC. Concentrations of these metals were detected within the fill materials present within the investigation area. It is possible that these elevated metals concentrations in groundwater area associated with the fill material as no other source for these metals is present within and/or directly up gradient of the investigation area. Considering that the exceedances of the SAC were reported at two locations, the elevated concentrations of these metals in groundwater are likely to be localised. Additionally, the elevated concentrations of metals detected in GW04 were not detected above the SAC in downgradient groundwater wells. The absence of elevated concentrations of metals in down gradient wells is likely to indicate minimal if any impact from the site from mercury, nickel and/or zinc to the nearest groundwater receptor (i.e. the Georges River).

This marginal exceedance of the SAC for mercury, nickel and zinc on groundwater would not require specific remediation and/or management. However, any groundwater dewatering activities (if undertaken) would need to consider the groundwater quality beneath the site.

14.3 Revised Conceptual Site Model

Based on the results of the contamination investigation undertaken within the investigation area, the following revised CSM was developed identifying source-pathway-receptor linkages which were tested during the investigation to assess the risk of contamination (if present) impacting upon human health and environmental receptors in the context of the proposed commercial/industrial development.

The revised CSM for the site is presented as **Table 14.1**.

Table 14.1: Revised CSM

Source	Pathway	Receptor	Comments	Revised CSM
Asbestos and PAH impacted fill materials (Stage 1, Stage 2 and site stockpiles)	Inhalation (asbestos), dermal and ingestion (PAH) during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Proposed development strategy is to retain asbestos and PAH contaminated fill material on site. Any construction activities or future occupation of the site would require the implementation of appropriate management plans and measures to manage the exposure risks	Asbestos and PAH impacted fill material identified within fill material across the investigation area.

			associated with these contaminated materials.	
Other potential contamination within impacted fill materials (Stage 1, Stage 2 and site stockpiles). Impacted fill material needs to be assessed in accordance with current and applicable contaminated site guidelines	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Significant amount of sampling and analysis has been undertaken for materials within Stage 1, Stage 2 and site stockpiles. However, a number of compounds (namely selected heavy metals and hydrocarbons) are assessed differently by current guidelines compared to the guidelines used during earlier site investigations. The potential exposure risk associated with contamination needs to be validated for currency in accordance with current and applicable contaminated site guidelines.	Other contaminant compounds (i.e. heavy metals, TRH, BTEX, OCP and PCB) not detected in soil samples at concentrations above the adopted SAC within fill material across the investigation area.
Potential AFFF use during fire incident (2003)	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, future site occupants and groundwater	PFAS may be present in areas within and surrounding the location of the fire incident.	PFAS not detected in soil or groundwater samples at concentrations exceeding the adopted SAC within or adjacent to the fire incident area.
Potential PFAS from hydraulic leaks from planes	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, future site occupants and groundwater	PFAS from hydraulic leaks may be present in areas of former plane parking.	PFAS detected in one soil sample at concentrations exceeding ecological SAC collected from former plane parking area in the western portion of the investigation area.
VOCs from Boeing Facility	Inhalation during occupation.	Future site occupants and groundwater	Solvent groundwater contamination known to be present on adjoining Boeing facility. Vapours could partition and accumulate in on-site structures (including services).	VOCs not detected in groundwater samples at concentrations exceeding the adopted SAC adjacent to the eastern boundary of the investigation area (adjacent to the Boeing Facility). Low concentrations of VOC measured in vapour from groundwater wells.
Western Boundary - South western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations including flying schools and spray painting.	Contaminant compounds (heavy metals, TRH, BTEX, PAH, OCP and PCB) not detected in soil samples at concentrations exceeding the adopted SAC within the south western portion of the investigation area. Asbestos identified at two locations. Contaminant compounds (dissolved heavy metals, TRH, low level PAHs, VOCs) not detected in groundwater samples at concentrations exceeding the adopted SAC within the south western portion of the investigation area.

Western Boundary - Central western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations including plane parking.	Contaminant compounds (heavy metals, TRH, BTEX, PAH, OCP and PCB and asbestos) not detected in soil samples at concentrations exceeding the adopted SAC within the south western portion of the investigation area. PFAS detected in one soil sample at concentrations exceeding ecological SAC collected from former plane parking area in the western portion of the investigation area.
Western Boundary - North western portion of the SWP (not subject to previous investigations). Potential contamination from historical airport operations.	Inhalation, dermal and ingestion during excavation works associated with construction and occupation.	Construction workers, adjacent site users and future site occupants.	Possible contamination from historical airport operations.	Contaminant compounds (heavy metals, TRH, BTEX, PAH, OCP and PCB) not detected in soil samples at concentrations exceeding the adopted SAC within the south western portion of the investigation area. Asbestos identified at one location.

15 Conclusions and Recommendations

Jacobs have undertaken the contamination investigation of the investigation area (with the exception of the aviation museum lease area) contained within the SWP at Bankstown Airport, NSW.

Based on site observations and the results of the laboratory analysis, some contamination is present at the site which will need to be considered in context of the development of the site and ongoing use.

Based on the results of this contamination investigation and previous studies as detailed in the Jacobs (2018a) PCI, the site in its current condition (subject to the results of the aviation museum investigation) is considered suitable for commercial/industrial land use subject to appropriate environmental management plans being implemented at the site during both construction and occupation to manage potential exposure to site occupants, adjacent land users and environmental receptors.

No contamination investigation has been undertaken within the aviation museum lease area. It is recommended that the investigation strategy detailed in the Jacobs (2018) PCI be undertaken prior to development of the site.

16 Limitations

The sole purpose of this report and the associated services performed by Jacobs is to assess the condition of the site (with respect to soil and groundwater contamination) in accordance with the scope of services set out in the contract between Jacobs and Bankstown Airport Limited (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any), from observations made during the investigations and data from analytical laboratories. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

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Figures

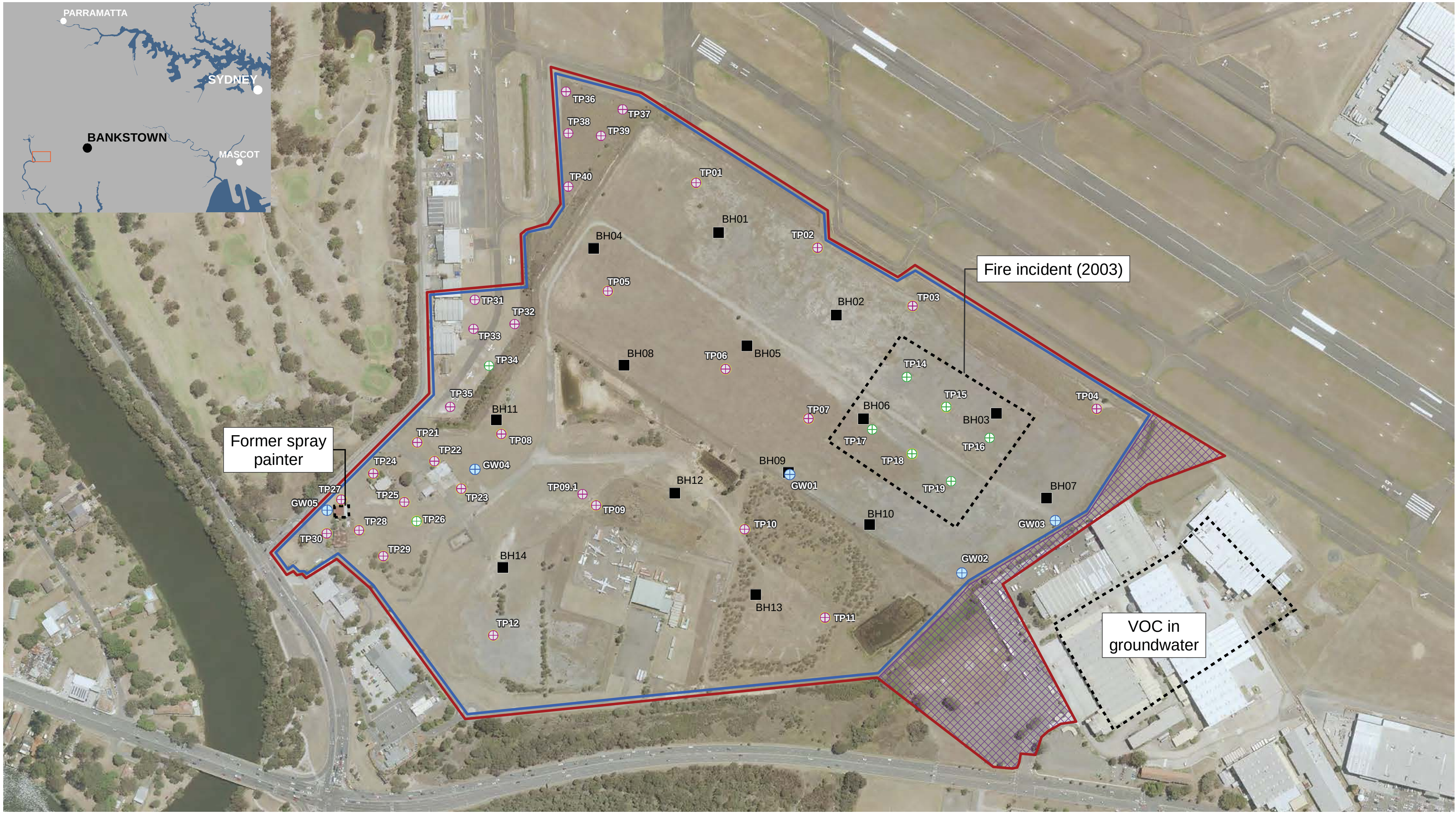
JACOBS NSW SPATIAL - GIS MAP file : IA179600_Site_Locality_F006_r1v1 | 16/08/2018

Legend

🟥 South West Precinct Boundary

🟦 Investigation area

Figure 1 | Site locality

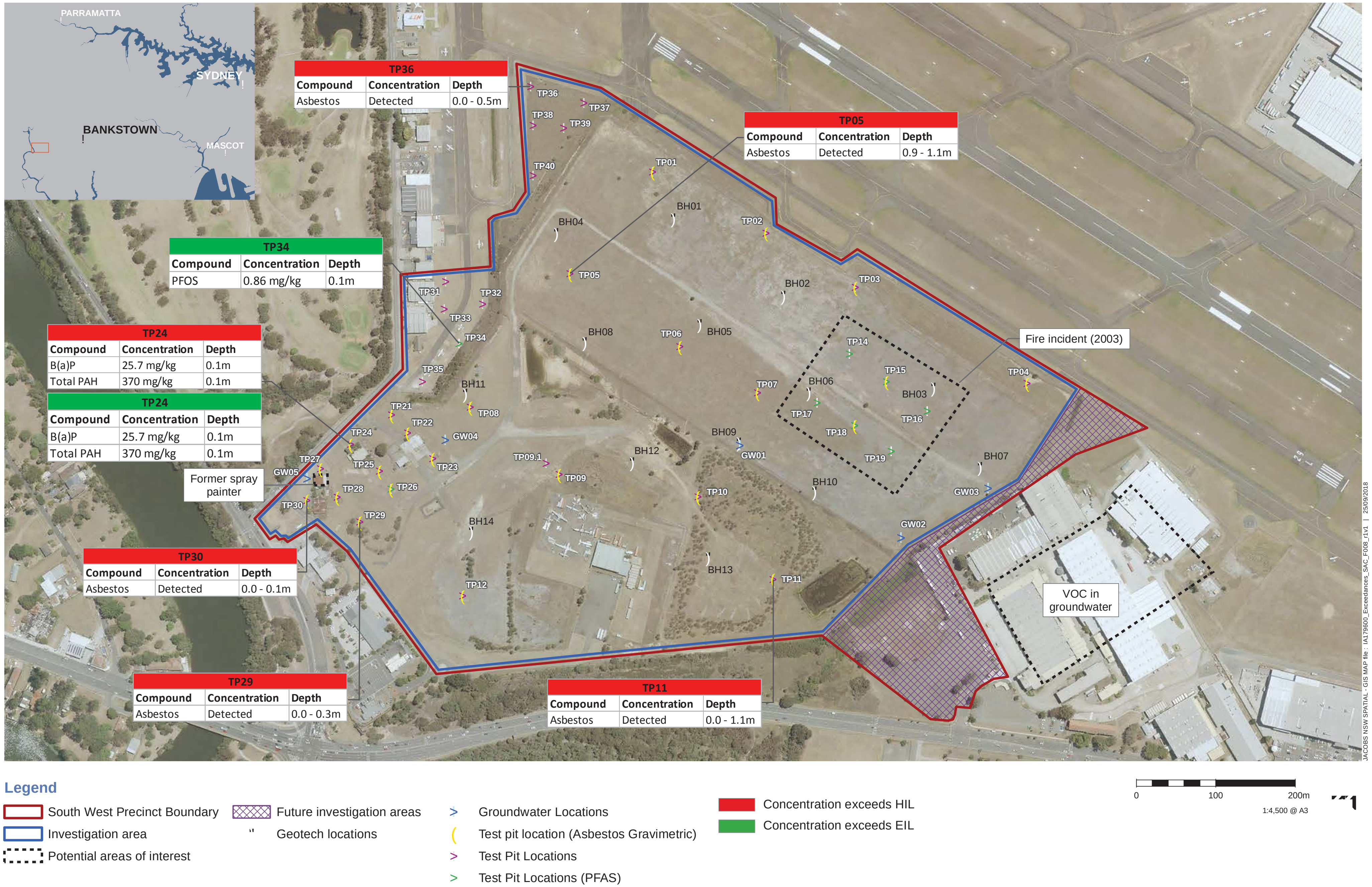


JACOBS NSW SPATIAL - GIS MAP file : IA179600_InvestigationLocationsServices_F003_r1v4 | 16/08/2018

Legend

🟥 South West Precinct Boundary	▨ Future investigation areas	⊕ Groundwater Locations
🟦 Investigation area	■ Geotech locations	○ Test Pit Location (Asbestos Gravimetric)
⬚ Potential areas of interest		⊕ Test Pit Locations
		⊕ Test Pit Locations (PFAS)

Figure 2 | South west precinct - Investigation locations



TP36		
Compound	Concentration	Depth
Asbestos	Detected	0.0 - 0.5m

TP05		
Compound	Concentration	Depth
Asbestos	Detected	0.9 - 1.1m

TP34		
Compound	Concentration	Depth
PFOS	0.86 mg/kg	0.1m

TP24		
Compound	Concentration	Depth
B(a)P	25.7 mg/kg	0.1m
Total PAH	370 mg/kg	0.1m

TP24		
Compound	Concentration	Depth
B(a)P	25.7 mg/kg	0.1m
Total PAH	370 mg/kg	0.1m

TP30		
Compound	Concentration	Depth
Asbestos	Detected	0.0 - 0.1m

TP29		
Compound	Concentration	Depth
Asbestos	Detected	0.0 - 0.3m

TP11		
Compound	Concentration	Depth
Asbestos	Detected	0.0 - 1.1m

Legend

- ▭ South West Precinct Boundary
- ▭ Investigation area
- ⬚ Potential areas of interest
- ▨ Future investigation areas
- " Geotech locations
- > Groundwater Locations
- (Test pit location (Asbestos Gravimetric)
- > Test Pit Locations
- > Test Pit Locations (PFAS)
- 🟥 Concentration exceeds HIL
- 🟩 Concentration exceeds EIL

Figure 3 | Exceedances of SAC

Tables

Table A: Soil Analytical Results

Table B: Groundwater Analytical Results

Table C: Soil QA/QC

Table D: Groundwater QA/QC

				Metals								Inorganics			
				Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Moisture	Moisture Content	Cation exchange capacity	pH (lab)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	pH Units
EQL				5	1	2	5	5	0.1	2	5	0.1	0.1	0.1	0.1
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker															
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.															
NEPM 2013 Table 7 Asbestos HSLs															
NEPM 2013 Table 1A(1) HIL D Soil				**3000[#1]**	**900**		**240000**	**1500[#2]**	**730[#3]**	**6000**	**400000**				
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m															
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m															
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m															
NEPM 2013 Table 1B(1-5) Calculated EIL Comm Ind Default (Aged)				**160[#4]**	**3**	**670**	**140**	**1808**	**1**	**55**	**290**				
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial															
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial															
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial															
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial commercial															
AEPR 1997 - Acceptable Limits				**500**	**100**	**600,000 - 500**	**5000**	**1500**	**75**	**3000**	**35,000**				
AEPR 1997 - Areas of ecological significance				**20**	**3**	**50**	**60**	**300**	**1**	**60**	**200**				
Field ID	**Location**	**Sample Depth**	**Sampled Date**												
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	<5	<1	6	36	21	<0.1	12	61	-	20.1	-	-
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	<5	<1	6	13	17	<0.1	5	26	-	12.2	-	-
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	<5	<1	9	20	30	<0.1	8	53	-	13.3	-	-
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	<5	<1	5	42	19	<0.1	16	71	-	8.2	-	-
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	5	<1	10	17	9	<0.1	4	18	-	13.2	10.1	7.1
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	<5	<1	12	15	12	<0.1	4	15	-	10.2	-	-
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	<5	<1	12	18	16	<0.1	8	52	-	10.2	-	-
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	<5	<1	11	12	32	<0.1	5	38	-	12.6	-	-
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	6	<1	10	16	17	<0.1	6	46	-	13	-	-
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	7	<1	9	24	21	<0.1	9	40	-	12	-	-
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	<5	<1	16	7	18	<0.1	4	12	-	14.4	-	-
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	<5	<1	11	<5	9	<0.1	<2	<5	-	9.4	-	-
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	<5	<1	9	10	18	<0.1	4	16	-	12.1	-	-
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	<5	<1	<2	<5	<5	<0.1	<2	<5	-	7.1	-	-
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	9	<1	9	15	41	<0.1	5	37	-	9.7	-	-
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	6	<1	11	27	46	0.2	12	71	-	13.1	-	-
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	7	<1	14	27	39	<0.1	12	77	-	13.4	-	-
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	<5	<1	8	13	15	<0.1	10	65	-	7.9	-	-
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	6	<1	19	13	16	<0.1	5	20	-	11.5	-	-
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	-	-	-	-	-	-	-	-	-	16.7	-	-
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	<5	<1	6	48	20	<0.1	31	166	-	8.3	-	-
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	7	<1	13	14	34	<0.1	5	39	-	12.4	-	-
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	-	-	-	-	-	-	-	-	-	18.7	-	-
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	6	<1	9	25	20	<0.1	12	64	-	8.3	-	-
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	-	-	-	-	-	-	-	-	-	20.1	-	-
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	5	<1	16	22	25	<0.1	11	64	-	11	-	-
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	<5	<1	10	12	21	<0.1	8	39	-	12.2	-	-
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	-	-	-	-	-	-	-	-	-	15.2	-	-
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	6	<1	7	33	57	0.2	7	85	-	7.7	-	-
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	-	-	-	-	-	-	-	-	-	20	-	-
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	6	<1	17	13	16	<0.1	11	34	-	11	-	-
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	-	-	-	-	-	-	-	-	-	20.1	-	-
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	5	<1	10	14	24	<0.1	6	35	-	12.9	-	-
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	<5	<1	8	12	17	<0.1	14	24	-	10.5	-	-
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	6	<1	21	6	15	<0.1	4	<5	-	22.3	-	-
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	<5	<1	9	16	43	<0.1	17	31	-	35	-	-
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	5	<1	18	11	19	<0.1	16	21	-	8.3	-	-
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	<5	<1	8	8	11	<0.1	<2	<5	-	14.3	-	-
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	<5	<1	6	16	22	<0.1	20	42	-	12.7	-	-
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	<5	<1	12	12	20	<0.1	12	34	-	37.3	-	-
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	<5	<1	13	6	13	<0.1	<2	<5	-	14.8	-	-
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	<5	<1	8	<5	8	<0.1	3	19	-	11.3	-	-
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	<5	1	20	18	37	<0.1	18	39	-	9.1	-	-
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	<5	<1	12	<5	10	<0.1	<2	<5	-	9.3	-	-
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	9	<1	16	21	38	<0.1	8	46	-	22.4	-	-
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	<5	<1	32	16	18	<0.1	24	52	-	5.2	-	-
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	<5	<1	6	<5	12	<0.1	<2	<5	-	12.1	3.7	5.8
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	<5	2	15	9	38	<0.1	4	49	-	7.3	-	-
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	<5	<1	5	<5	<5	<0.1	3	<5	-	8.4	-	-
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	<5	<1	18	<5	14	<0.1	3	<5	-	13.8	-	-
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	<5	1	13	10	36	<0.1	7	32	-	9.4	-	-
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	<5	<1	7	<5	6	<0.1	4	5	-	8.3	-	-
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	<5	<1	4	<5	<5	<0.1	<2	<5	-	9.5	-	-
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	<5	<1	<2	<5	<5	<0.1	<2	<5	-	4.7	-	-
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	<5	<1	19	8	26	<0.1	<2	<5	-	20.1	-	-
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	5	<1	17	17	24	<0.1	14	37	-	17.9	-	-
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	<5	<1	7	11	8	<0.1	<2	9	-	14.5	-	-
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	7	<1	12	31	28	<0.1	10	60	-	13.4	-	-
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	6	<1	14	15	14	<0.1	5	24	-	13.8	-	-
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	7	<1	20	14	23	<0.1	4	14	-	18.7	-	-
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	11	<1	11	29	28	<0.1	10	70	-	18.7	-	-
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	<5	<1	11	15	22	<0.1	8	29	-	12.6	-	-
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	<5	<1	8	19	32	<0.1	4	22	-	17.2	-	-
QAQC_TB1			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
QAQC_TB2			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-
QAQC1	TP09_0.0-0.1		10/07/2018	<5	<1	12	10	20	<0.1	4	15	-	11.7	-	-
QAQC10	QAQC10		16/07/2018	-	-	-	-	-	-	-	-	-	6.6	-	-
QAQC11	TP34_0.5-0.6		16/07/2018	<5	<1	5	<5	<5	<0.1	<2	<5	-	8.6	-	-
QAQC12	QAQC12		16/07/2018	<5	<1	3	<5	<5	<0.1	<2	<5	-	9	-	-
QAQC2	QAQC2		10/07/2018	<4	<0.4	13	10	19	<0.1	5	15	12	-	-	-
QAQC3	TP18_0.5-0.6		12/07/2018	8	<1	6	31	55	0.1	6	56	-	12.5	-	-
QAQC4	QAQC4		12/07/2018	6	<0.4	8	33	50	0.2	6	54	10	-	-	-
QAQC5	TP18_2.9-3.0		12/07/2018	-	-	-	-	-	-	-	-	-	19.9	-	-
QAQC6	QAQC6		12/07/2018	-	-	-	-	-	-	-	-	17	-	-	-
QAQC9	TP34_0.0-0.1		16/07/2018	-	-	-	-	-	-	-	-	-	6.2	-	-

Statistical Summary

	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Moisture	Moisture Content	Cation exchange capacity	pH (lab)
Maximum Concentration	11	2	32	48	57	0.2	31	166	17	37.3	10.1	7.1
Average Concentration	4	0.53	11	15	21	0.058	7.4	33	13	13		
Standard Deviation	2.2	0.22	5.4	10	13	0.033	6.1	29	3.6	5.8		

Env Stds Comments

#1:Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Shedule B7).

#2:Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.

#3:Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.

#4:Refer Table 1B(5)

Note: Calculated EILS are derived from the NEPM 2013 Ecological Investigation Methodology (Appendix A).

				TRH - NEPM 2013 Fractions							TPH - NEPM 1999 Fractions					BTEXN							
				TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Naphthalene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				10	50	100	100	50	10	50	10	50	100	100	50	0.2	0.5	0.5	0.5	0.2	0.5	0.5	0.5
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker				**82000**	**62000**	**85000**	**120000**									**1100**	**85000**	**29000**	**120000**				**130000**
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.				**26000**	**20000**	**27000**	**38000**									**430**	**27000**	**11000**	**99000**				**81000**
NEPM 2013 Table 7 Asbestos HSLs																							
NEPM 2013 Table 1A(1) HIL D Soil																							
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m									**260[#1]**	**NL[#2]**						**3**	**NL[#2]**	**NL[#2]**	**NL[#2]**				**230**
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m									**370[#1]**	**NL[#2]**						**3**	**NL[#2]**	**NL[#2]**	**NL[#2]**				**NL[#2]**
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m									**630[#1]**	**NL[#2]**						**3**	**NL[#2]**	**NL[#2]**	**NL[#2]**				**NL[#2]**
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)																		**370[#3]**					
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial						**1700**	**3300**		**215**	**170**						**75**	**165**		**135**				**180**
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial						**3500**	**10000**		**700**	**1000**													
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial																							
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial																							
AEPR 1997 - Acceptable Limits											**800**				**5000**	**1**	**50**		**130**				**25**
AEPR 1997 - Areas of ecological significance											**100**				**1000**	**0.5**	**5**		**3**				**5**
Field ID	**Location**	**Sample Depth**	**Sampled Date**																				
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	<10	<50	120	110	230	<10	<50	<10	<50	<100	120	120	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	<10	<50	860	230	1090	<10	<50	<10	<50	580	360	940	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC_TB1			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.5	<1	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC_TB2			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.5	<1	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC1	TP09_0.0-0.1		10/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC10	QAQC10		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC11	TP34_0.5-0.6		16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC12	QAQC12		16/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC2	QAQC2		10/07/2018	<25	<50	<100	<100	<50	<25	<50	<25	<50	<100	<100	-	<0.2	<1	<0.1	<0.5	-	<2	<1	<1
QAQC3	TP18_0.5-0.6		12/07/2018	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5
QAQC4	QAQC4		12/07/2018	<25	<50	<100	<100	<50	<25	<50	<25	<50	<100	<100	-	<0.2	<1	<0.1	<0.5	-	<2	<1	<1
QAQC5	TP18_2.9-3.0		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC6	QAQC6		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC9	TP34_0.0-0.1		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Maximum Concentration	<25	<50	860	230	1090	<25	<50	<25	<50	580	360	940	<0.2	<1	<1	<0.5	<0.2	<2	<1	<1
Average Concentration	5.2	25	64	54	45	5.2	25	5.2	25	58	56	42	0.1	0.26	0.25	0.25	0.1	0.27	0.26	0.26
Standard Deviation	1.3	0	102	24	136	1.3	0	1.3	0	67	40	118	0	0.044	0.057	0	0	0.13	0.044	0.044

Env Stds Comments

#1:To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#2:Derived soil HSL exceeds soil saturation concentraiton

#3:Refer Table 1B(5)

				PAHs																		
				Benzo[b+j]fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ (half LOR)	Benzo(b+j) & Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total)	Total +ve PAHs
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	50
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																						
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.																						
NEPM 2013 Table 7 Asbestos HSLs																						
NEPM 2013 Table 1A(1) HIL D Soil																					**$4000^{\#1}$**	
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m																						
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m																						
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m																						
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)																						
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial									**0.7**													
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial																						
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial																						
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial commercial																						
AEPR 1997 - Acceptable Limits									**5**												**100**	
AEPR 1997 - Areas of ecological significance																					**5**	
Field ID	**Location**	**Sample Depth**	**Sampled Date**																			
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.7	1.3	-
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	36.7	2.2	<0.5	10.1	30.1	**25.7**	39.6	-	15.9	14.6	29.6	3.9	69	1.7	13.8	57	59.5	370	-
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
QAQC_TB1			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC_TB2			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC1	TP09_0.0-0.1		10/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
QAQC10	QAQC10		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC11	TP34_0.5-0.6		16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
QAQC12	QAQC12		16/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
QAQC2	QAQC2		10/07/2018	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<50
QAQC3	TP18_0.5-0.6		12/07/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
QAQC4	QAQC4		12/07/2018	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	0.2	0.1	-	0.2	<0.1	0.2	<0.1	<0.1	0.1	0.2	-	1200
QAQC5	TP18_2.9-3.0		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC6	QAQC6		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC9	TP34_0.0-0.1		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Maximum Concentration	36.7	2.2	<0.5	10.1	30.1	25.7	39.6	0.2	15.9	14.6	29.6	3.9	69	1.7	13.8	57	59.5	370	1200
Average Concentration	0.85	0.27	0.24	0.4	0.72	0.65	1.2		0.49	0.49	0.71	0.3	1.3	0.27	0.46	1.1	1.2	6.3	
Standard Deviation	4.7	0.25	0.035	1.2	3.8	3.2	4.9		2	1.8	3.7	0.46	8.7	0.19	1.7	7.2	7.5	47	

Env Stds Comments

#1:Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (should meet BaP TEQ HIL) & napthalene (should meet relevant HSL)

				Polychlorinated Biphenyls	Organochlorine Pesticides																								Halogenated Benzenes
				PCBs (Sum of total)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Hexachlorobenzene
				mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL				0.1	0.05	50	50	50	50	50	50	50	50	50	200	50	50	50	50	50	50	50	50	50	50	50	50	200	50
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																													
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.																													
NEPM 2013 Table 7 Asbestos HSLs																													
NEPM 2013 Table 1A(1) HIL D Soil				**7**[#1]				**45000**		**530000**						**3600000**		**2000000**				**100000**				**50000**		**2500000**	**80000**
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m																													
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m																													
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m																													
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)															**640000**[#2]														
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial																													
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial																													
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial commercial																													
AEPR 1997 - Acceptable Limits				**50**			**50,000**	**20,000**		**250,000**					**1,000,000**		**20,000**									**50,000**			
AEPR 1997 - Areas of ecological significance				**1**			**50**	**200**							**970**														
Field ID	**Location**	**Sample Depth**	**Sampled Date**																										
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Maximum Concentration	<0.1	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<50
Average Concentration	0.05	0.025	25	25	25	25	25	25	25	25	25	100	25	25	25	25	25	25	25	25	25	25	25	25	100	25
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure to all PCBs (inc dioxin like PCBs) should be undertaken

#2:Refer Table 1B(5)

				Asbestos						
				Asbestos (Fines and Fibrous FA+AF	Sample Weight	Description	Approved Identifier	Asbestos	Asbestos (Trace)	Asbestos Type
				% (w/w)	mg	Comment	Comment	g/kg	Fibres	Comment
EQL				0.001	10			0.1	5	
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker										
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.										
NEPM 2013 Table 7 Asbestos HSLs				**0.001**[#1]						
NEPM 2013 Table 1A(1) HIL D Soil										
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m										
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m										
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m										
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)										
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial										
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial										
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial										
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial commercial										
AEPR 1997 - Acceptable Limits										
AEPR 1997 - Areas of ecological significance										
Field ID	**Location**	**Sample Depth**	**Sampled Date**							
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	-	-	-	-	-	-	-
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	<0.001	626,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	-	-	-	-	-	-	-
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	<0.001	694,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	-	11,200	1[#8]	1[#11]	0[#14]	1[#14]	1
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	-	-	-	-	-	-	-
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	<0.001	696,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	-	62,200	1[#8]	1[#11]	0[#14]	1[#14]	1
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	-	78,800	1[#8]	1[#11]	0[#14]	1[#14]	1
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	<0.001	578,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	-	-	-	-	-	-	-
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	<0.001	659,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	-	13,600	1[#6]	1[#11]	0[#14]	1[#14]	1
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	23,500	1[#5]	1[#10]	1[#13]	-	1[#15]
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	-	-	-	-	-	-	-
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	<0.001	669,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	-	-	-	-	-	-	-
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	<0.001	682,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	-	14,900	1[#6]	1[#11]	0[#14]	1[#14]	1
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	<0.001	582,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	-	15,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	-	20,500	1[#6]	1[#11]	0[#14]	1[#14]	1
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	<0.001	640,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	-	-	-	-	-	-	-
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	<0.001	735,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	-	11,200	1[#6]	1[#11]	0[#14]	1[#14]	1
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	<0.001	598,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	-	-	-	-	-	-	-
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	-	9120	1[#6]	1[#11]	0[#14]	1[#14]	1
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	14,400	1[#4]	1[#10]	1[#13]	-	1[#12]
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	<0.001	766,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	-	12,700	1[#6]	1[#11]	0[#14]	1[#14]	1
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	<0.001	686,000	1[#7]	1[#9]	0[#14]	1[#14]	1
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	-	75,600	1[#8]	1[#11]	0[#14]	1[#14]	1
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	-	-	-	-	-	-	-
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	-	84,200	1[#8]	1[#11]	0[#14]	1[#14]	1
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	<0.001	670,000	1[#7]	1[#9]	0[#14]	1[#14]	1
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	-	-	-	-	-	-	-
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	-	-	-	-	-	-	-
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	<0.001	669,000	1[#7]	1[#9]	0[#14]	1[#14]	1
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	-	23,600	1[#6]	1[#11]	0[#14]	1[#14]	1
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	-	-	-	-	-	-	-
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	<0.001	560,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	-	15,400	1[#6]	1[#11]	0[#14]	1[#14]	1
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	-	-	-	-	-	-	-
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	-	-	-	-	-	-	-
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	<0.001	558,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	-	10,900	1[#8]	1[#11]	0[#14]	1[#14]	1
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	-	-	-	-	-	-	-
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	<0.001	630,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	-	60,600	1[#8]	1[#11]	0[#14]	1[#14]	1
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	-	-	-	-	-	-	-
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	-	12,900	1[#6]	1[#11]	0[#14]	1[#14]	1
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	<0.001	629,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	-	12,400	1[#6]	1[#11]	0[#14]	1[#14]	1
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	<0.001	724,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	-	-	-	-	-	-	-
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	-	16,900	1[#6]	1[#9]	0[#14]	1[#14]	1
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	<0.001	571,000	1[#6]	1[#9]	0[#14]	1[#14]	1
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	-	11,200	1[#6]	1[#9]	0[#14]	1[#14]	1
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	<0.001	629,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	-	-	-	-	-	-	-
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	-	12,300	1[#6]	1[#9]	0[#14]	1[#14]	1
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	<0.001	685,000	1[#8]	1[#11]	0[#14]	1[#14]	1
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	-	14,600	1[#6]	1[#9]	0[#14]	1[#14]	1
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	<0.001	813,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	-	-	-	-	-	-	-
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	-	-	-	-	-	-	-
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	-	14,900	1[#6]	1[#9]	0[#14]	1[#14]	1
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	<0.001	594,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	-	-	-	-	-	-	-
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	<0.001	547,000	1[#1]	1[#11]	1[#14]	1[#14]	1[#15]
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	-	17,100	1[#6]	1[#9]	0[#14]	1[#14]	1
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	-	103,000	1[#2]	1[#11]	1[#13]	1[#14]	1[#15]
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	<0.001	662,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	-	-	-	-	-	-	-
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	-	148,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	-	56,200	1[#6]	1[#11]	0[#14]	1[#14]	1
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	-	-	-	-	-	-	-
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	-	157,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	-	230,000	1[#6]	1[#11]	0[#14]	1[#14]	1
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	-	-	-	-	-	-	-
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	-	65,600	1[#6]	1[#11]	0[#14]	1[#14]	1
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	-	-	-	-	-	-	-
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	-	58,600	1[#6]	1[#11]	0[#14]	1[#14]	1
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	-	-	-	-	-	-	-
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	25,100	1[#3]	1[#10]	1[#13]	-	1[#15]
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	-	14,200	1[#6]	1[#11]	0[#14]	1[#14]	1
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	-	54,200	1[#6]	1[#11]	0[#14]	1[#14]	1
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	-	-	-	-	-	-	-
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	-	61,600	1[#6]	1[#11]	0[#14]	1[#14]	1
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	-	81,200	1[#6]	1[#11]	0[#14]	1[#14]	1
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	-	-	-	-	-	-	-

Statistical Summary

Maximum Concentration	<0.001	813000	1	1	1	1	1
Average Concentration	0.0005	296560	1	1	0.077	1	1
Standard Deviation	0	305488	0	0	0.27	0	0

Env Stds Comments

#1:Applies where FA & AF are quantified by gravimetric procedures. Screening level not applicable to free fibres.

Data Comments

#1 Mid brown sandy soil with one piece of fibrous asbestos cement sheeting approx 2 x 2 x 1 mm.
#2 Mid brown sandy soil with one piece of asbestos cement sheeting approx 5 x 5 x 2 mm.
#3 Three pieces of asbestos cement sheeting approximately 40x25x5mm
#4 One piece of asbestos cement sheeting approximately 40x30x5mm
#5 One piece of asbestos cement sheeting approximately 70x60x5mm
#6 Mid brown sandy soil.
#7 Mid grey sandy soil.
#8 Mid brown clay soil.
#9 S.SPOONER
#10 A. SMYLIE
#11 G.MORGAN
#12 Ch + Am
#13 Yes
#14 No*
#15 Ch
#16 No

				Per- and Poly-fluoroalkyl Substances (PFAS)																														
				Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorooctanesulfonamide (PFOSA)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoro-n-pentanoic acid (PFPeA)	Perfluorononanoic acid (PFNA)	Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorododecanoic acid (PFDoA)	Perfluorodecanoic acid (PFDA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorotetradecanoic aicd (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)	Perfluorobutanoic acid	1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2)	N-ethyl perfluorooctane sulfonamido acetic acid	N-ethyl perfluorooctane sulfonamide	N-methyl perfluorooctanesulfonamido ethanol	N-ethyl perfluorooctanesulfonamido ethanol	N-Methyl perfluorooctane sulfonamide	N-methyl perfluorooctane sulfonamido acetic acid	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	1	0.0005	0.0005	0.0005	0.0005	0.0002	0.0005	0.5	0.0005	0.5	0.0002	0.0002	0.0002	0.0002
CRCCARE No. 10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																																		
CRCCARE No. 10 Table 4 HSL-D (direct contact) Comm./Ind.																																		
NEPM 2013 Table 7 Asbestos HSLs																																		
NEPM 2013 Table 1A(1) HIL D Soil																																		
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 0-1m																																		
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 1-2m																																		
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion - 2-4m																																		
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)																																		
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																																		
NEPM 2013 Table 1B(7) ML, Coarse Soil, Commercial/Industrial																																		
PFAS NEMP 2018 = Soil Human Health Screening Values Industrial/Commercial					**50**																													**20**
PFAS NEMP 2018 - Interim Soil - ecological indirect exposure - industrial commercial				**0.14**																														
AEPR 1997 - Acceptable Limits																																		
AEPR 1997 - Areas of ecological significance																																		
Field ID	**Location**	**Sample Depth**	**Sampled Date**																															
TP01_0.0-0.1	TP01	0-0.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.0-0.3	TP01	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP01_0.5-0.6	TP01	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.0-0.3	TP02	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP02_0.5-0.6	TP02	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_0.0-0.1	TP03	0-0.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_0.0-0.3	TP03	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP03_2.0-2.1	TP03	2-2.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP04_0.0-0.1	TP04	0-0.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP04_0.0-0.3	TP04	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.1	TP05	0-0.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_0.0-0.3	TP05	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_1.0-1.1	TP05	1-1.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP05_ACM_0.9-1.1	TP05		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.1	TP06	0-0.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP06_0.0-0.3	TP06	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.1	TP07	0-0.1	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.0-0.3	TP07	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP07_0.5-0.6	TP07	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_0.0-0.3	TP08	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP08_1.0-1.1	TP08	1-1.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.0-0.1	TP09	0-0.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.0-0.3	TP09	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP09_0.2-0.3	TP09	0.2-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_0.0-0.3	TP10	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP10_1.0-1.1	TP10	1-1.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.0-0.3	TP11	0-0.3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_0.5-0.6	TP11	0.5-0.6	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_2.9-3.0	TP11	2.9-3	11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP11_ACM_0.0-1.1	TP11		11/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.0-0.3	TP12	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP12_0.5-0.6	TP12	0.5-0.6	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_0.0-0.3	TP14	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_1.0-1.1	TP14	1-1.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14_2.2-2.3	TP14	2.2-2.3	13/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
TP15_0.0-0.1	TP15	0-0.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_0.0-0.3	TP15	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.0-2.1	TP15	2-2.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP15_2.4-2.5	TP15	2.4-2.5	13/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
TP16_0.0-0.3	TP16	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_0.5-0.6	TP16	0.5-0.6	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP16_2.4-2.5	TP16	2.4-2.5	12/07/2018	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	0.0006	0.0006	0.0006
TP17_0.0-0.3	TP17	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_0.5-0.6	TP17	0.5-0.6	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_1.0-1.1	TP17	1-1.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP17_2.6-2.7	TP17	2.6-2.7	12/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
TP18_0.0-0.3	TP18	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_0.5-0.6	TP18	0.5-0.6	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP18_2.9-3.0	TP18	2.9-3	12/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
TP19_0.0-0.3	TP19	0-0.3	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.0-2.1	TP19	2-2.1	12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP19_2.7-2.8	TP19	2.7-2.8	12/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
TP21_0.0-0.1	TP21	0-0.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP21_0.0-0.3	TP21	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.1	TP22	0-0.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.0-0.3	TP22	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP22_0.5-0.6	TP22	0.5-0.6	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP23_0.0-0.1	TP23	0-0.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP23_0.0-0.3	TP23	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.1	TP24	0-0.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_0.0-0.3	TP24	0-0.3	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP24_2.0-2.1	TP24	2-2.1	10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP25_0.0-0.1	TP25	0-0.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP25_0.0-0.3	TP25	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_0.0-0.1	TP26	0-0.1	9/07/2018	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	0.0004	0.0004	0.0004
TP26_0.0-0.3	TP26	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP26_1.0-1.1	TP26	1-1.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP27_0.2-0.3	TP27	0.2-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.0-0.1	TP28	0-0.1	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.0-0.3	TP28	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP28_0.5-0.6	TP28	0.5-0.6	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.0-0.3	TP29	0-0.3	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP29_0.5-0.6	TP29	0.5-0.6	9/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_0.0-0.1	TP30	0-0.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_0.0-0.3	TP30	0-0.3	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30_2.0-2.1	TP30	2-2.1	13/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP31_0.0-0.1	TP31	0-0.1	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP32_0.5-0.6	TP32	0.5-0.6	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP32_1.0-1.1	TP32	1-1.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP33_0.0-0.1	TP33	0-0.1	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP34_0.0-0.1	TP34	0-0.1	17/07/2018	0.86	0.0396	0.0004	0.051	0.0022	0.0003	0.0411	0.691	0.0176	<0.0002	<0.0002	0.041	0.0202	<0.0002	<0.0005	0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	1.76	1.67	1.55
TP34_0.5-0.6	TP34	0.5-0.6	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP35_0.0-0.1	TP35	0-0.1	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP35_2.0-2.1	TP35	2-2.1	17/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36_0.5-0.6	TP36	0.5-0.6	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36_2.9-3.0	TP36	2.9-3	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP36_ACM_0.0-0.5	TP36		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP37_0.0-0.1	TP37	0-0.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP38_0.0-0.1	TP38	0-0.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP38_1.0-1.1	TP38	1-1.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP39_2.0-2.1	TP39	2-2.1	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP40_0.5-0.6	TP40	0.5-0.6	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP40_2.9-3.0	TP40	2.9-3	16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC_TB1			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC_TB2			4/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC1	TP09_0.0-0.1		10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC10	QAQC10		16/07/2018	1.65	0.0569	0.0003	0.0753	0.0027	0.0004	0.0521	1.42	0.028	<0.0002	<0.0002	0.0749	0.0242	<0.0002	<0.0005	<0.0002	0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	3.38	3.23	3.07
QAQC11	TP34_0.5-0.6		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC12	QAQC12		16/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC2	QAQC2		10/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC3	TP18_0.5-0.6		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC4	QAQC4		12/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QAQC5	TP18_2.9-3.0		12/07/2018	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	<0.0002	<0.0002	<0.0002
QAQC6	QAQC6		12/07/2018	<0.0001	<0.0001	<0.001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.0002	<0.005	<0.0005	<0.0005	<0.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.001	<1	<0.005	<1	<0.0002	<0.0001	-	<0.0001
QAQC9	TP34_0.0-0.1		16/07/2018	1.06	0.0423	<0.0002	0.0714	0.0041	<0.0002	0.0529	0.826	0.0274	<0.0002	<0.0002	0.0612	0.0369	<0.0002	<0.0005	0.0003	0.0002	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.5	<0.0005	<0.5	<0.0002	2.18	2.05	1.89

Statistical Summary

Maximum Concentration	1.65	0.0569	<0.001	0.0753	0.0041	0.0004	0.0529	1.42	0.028	<0.0005	<0.0005	0.0749	0.0369	<0.0002	<0.005	<0.0005	<0.0005	<1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.001	<1	<0.005	<1	<0.0002	3.38	3.23	3.07
Average Concentration	0.3	0.012	0.00018	0.017	0.00083	0.00014	0.012	0.24	0.0062	0.00011	0.00011	0.015	0.0068	0.0001	0.00044	0.00014	0.00013	0.47	0.00023	0.00023	0.00023	0.00023	0.0001	0.00027	0.27	0.00044	0.27	0.0001	0.61	0.63	0.54
Standard Deviation	0.57	0.021	0.00014	0.03	0.0014	0.0001	0.022	0.47	0.011	0.000043	0.000043	0.028	0.013	0	0.00065	0.000071	0.000054	0.12	0.000058	0.000058	0.000058	0.000058	0	0.000072	0.072	0.00065	0.072	0	1.2	1.1	1

			BTEXN								TRH - NEPM 2013 Fractions							TPH - NEPM 1999 Fractions					Metals							
			Benzene	Ethylbenzene	Naphthalene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total	TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH C10 - C36 (Sum of total)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			1	2	0.1	2	0.001	2	2	2	20	100	100	100	100	0.02	0.05	20	50	100	50	50								
Airports Regulations 1997 - Accepted Limits - Marine Water/Freshwater			300	140		300												150				600	50	2.01	50	5	5	0.1	15	50
NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems																														
NHMRC 2008 Health Guideline X10			10	3000		8000				6000													70	20	500	20,000	100	10	200	
NHMRC 2008 Recreational Water Quality/ Aesthetics X10																														30,000
ANZECC 2000 FW 95%									350														24							
ANZECC 2000 MW 99%			500		50																			0.7				0.1	7	
ANZECC 2000 MW 95%																									27.4	1.3	4.4			15
USEPA Region 9 for tap water x 10																														
NEMP 2018 Fresh/Marine water 95% guidelines																														
Site	Location	Sample Date																												
Bankstown Swp	GW01	27/07/2018	<1	<2	<0.1	<2	<0.001	<2	<2	<2	<20	<100	<100	<100	<100	<0.02	<0.1	<20	<50	<100	<50	<50	<1	<0.1	<1	<1	<1	<0.1	17	36
	GW02	27/07/2018	<1	<2	<0.1	<2	<0.001	<2	<2	<2	<20	<100	<100	<100	<100	<0.02	<0.1	<20	<50	<100	<50	<50	<1	<0.1	<1	<1	<1	<0.1	2	10
	GW03	27/07/2018	<1	<2	<5 - 0.3	<2	0.007	5	2	7	30	<100	<100	<100	<100	0.02	<0.1	<20	<50	<100	<50	<50	<1	<0.1	<1	<1	<1	<0.1	6	7
	GW04	27/07/2018	<1	<2	<0.1	<2	<0.001	<2	<2	<2	<20	<100	<100	<100	<100	<0.02	<0.1	<20	<50	<100	<50	<50	<1	0.3	<1	<1	<1	0.3	15	82
	BAL_GW05	25/07/2018	<1	<2	<5	<2	<0.001	<2	<2	<2	<20	<100	<100	<100	<100	<0.02	<0.1	<20	<50	<100	<50	<50	<1	<0.1	<1	<1	<1	<0.1	<1	6
Statistical Summary																														
Maximum Concentration			<1	<2	<5	<2	0.007	5	2	7	30	<100	<100	<100	<100	0.02	<0.1	<20	<50	<100	<50	<50	<1	0.3	<1	<1	<1	0.3	17	82

			PAHs																			Semi Volatile Organic Compounds			Volatile Organic Compounds			
			Benzo[b+j]fluoranthene	2-methylnaphthalene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total)	Benzo(e)pyrene	Coronene	Perylene	1,1-dichloropropene	cis-1,4-Dichloro-2-butene	Pentachloroethane	trans-1,4-Dichloro-2-butene
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			0.0001	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.05	0.1	0.1	0.1	5	5	5	5
Airports Regulations 1997 - Accepted Limits - Marine Water/Freshwater																					3000			2.01				
NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems																												
NHMRC 2008 Health Guideline X10																												
NHMRC 2008 Recreational Water Quality/ Aesthetics X10																					1							
ANZECC 2000 FW 95%																												
ANZECC 2000 MW 99%																												
ANZECC 2000 MW 95%																												
USEPA Region 9 for tap water x 10																												
NEMP 2018 Fresh/Marine water 95% guidelines																												
Site	Location	Sample Date																										
Bankstown Swp	GW01	27/07/2018	<0.0001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<5	<5	<5	<5
	GW02	27/07/2018	<0.0001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<5	<5	<5	<5
	GW03	27/07/2018	<0.0001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<5	<5	<5	<5
	GW04	27/07/2018	<0.0001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<5	<5	<5	<5
	BAL_GW05	25/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																												
Maximum Concentration			<0.0001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<5	<5	<5	<5

			Chlorinated Hydrocarbons																												Halogenated Benzenes								
			1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			5	5	5	5	5	5	5	5	5	5	5	5	5	5	0.05	5	50	5	50	5	5	5	5	5	5	5	5	50	5	5	5	5	5	5	5	5	5
Airports Regulations 1997 - Accepted Limits - Marine Water/Freshwater																						610											2.5	2.5	4				
NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems																																							
NHMRC 2008 Health Guideline X10								300			600						30													3			15000		400				3000
NHMRC 2008 Recreational Water Quality/ Aesthetics X10																																		200					
ANZECC 2000 FW 95%																																	160	260	60				
ANZECC 2000 MW 99%																																							
ANZECC 2000 MW 95%																																							
USEPA Region 9 for tap water x 10																										0.28	6.6												
NEMP 2018 Fresh/Marine water 95% guidelines																																							
Site	Location	Sample Date																																					
Bankstown Swp	GW01	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5
	GW02	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5
	GW03	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5
	GW04	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5
	BAL_GW05	25/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																																							
Maximum Concentration			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5

Table B - Groundwater Analytical Summary

			Per- and Poly-fluoroalkyl Substances (PFAS)																														
			Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorooctanesulfonamide (PFOSA)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoro-n-pentanoic acid (PFPeA)	Perfluorononanoic acid (PFNA)	Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorododecanoic acid (PFDoA)	Perfluorodecanoic acid (PFDA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorobutanesulfonic acid (PFBS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)	Perfluorobutanoic acid	1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS	1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS	1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS	1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2	N-ethyl perfluorooctane sulfonamido acetic acid	N-ethyl perfluorooctane sulfonamide	N-methyl perfluorooctanesulfonamido ethanol	N-ethyl perfluorooctanesulfonamido ethanol	N-Methyl perfluorooctane sulfonamide	N-methyl perfluorooctane sulfonamido acetic acid	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS
			µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			0.01	0.01	0.02	0.00002	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00002	0.02	0.02	0.05	0.02	0.02	0.1	0.05	0.05	0.05	0.05	0.02	0.05	0.05	0.05	0.05	0.02	0.01	0.01	0.01
Airports Regulations 1997 - Accepted Limits - Marine Water/Freshwater																																	
NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems																																	
NHMRC 2008 Health Guideline X10																																	
NHMRC 2008 Recreational Water Quality/ Aesthetics X10																																	
ANZECC 2000 FW 95%																																	
ANZECC 2000 MW 99%																																	
ANZECC 2000 MW 95%																																	
USEPA Region 9 for tap water x 10																																	
NEMP 2018 Fresh/Marine water 95% guidelines			0.13	220																													
Site	Location	Sample Date																															
Bankstown Swp	GW01	27/07/2018	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.12	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.05
	GW02	27/07/2018	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.12	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.05
	GW03	27/07/2018	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.12	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	0.09	0.09	0.09
	GW04	27/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BAL_GW05	25/07/2018	<0.01	<0.01	<0.02	<0.00002	<0.02	<0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.00002	<0.02	<0.02	<0.05	<0.02	<0.02	<0.1	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	0.05	0.05	0.05
Statistical Summary																																	
Maximum Concentration			<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	<0.00005	<0.05	<0.05	<0.12	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	0.09	0.09	0.09

			Monocyclic Aromatic Hydrocarbons								Solvents					Halogenated Hydrocarbons				
			1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Carbon disulfide	Vinyl acetate	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			5	5	5	5	5	5	5	5	50	50	50	5	50	5	0.05	50	5	50
Airports Regulations 1997 - Accepted Limits - Marine Water/Freshwater																				
NSW EPA (1994) threshold concentrations for the protection of aquatic ecosystems																				
NHMRC 2008 Health Guideline X10																				
NHMRC 2008 Recreational Water Quality/ Aesthetics X10																100	100			
ANZECC 2000 FW 95%																				
ANZECC 2000 MW 99%																				
ANZECC 2000 MW 95%																				
USEPA Region 9 for tap water x 10																				
NEMP 2018 Fresh/Marine water 95% guidelines																				
Site	Location	Sample Date																		
Bankstown Swp	GW01	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<5	<50	<5	<50	<50	<5	<50
	GW02	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<5	<50	<5	<50	<50	<5	<50
	GW03	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<5	<50	<5	<50	<50	<5	<50
	GW04	27/07/2018	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<5	<50	<5	<50	<50	<5	<50
	BAL_GW05	25/07/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																				
Maximum Concentration			<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<5	<50	<5	<50	<50	<5	<50

Table C: SWP SOIL RPD TABLE

		Lab Report Number	ES1820966	ES1820966		ES1820966	196518		ES1820966	ES1820966		ES1820966	196518		ES1820966	ES1820966		ES1820966	196518		ES1821108	ES1821108		ES1821108	197378		ES1821108	ES1821108		ES1821108	197378		ES1821108	ES1821108		ES1821108	197378	
		Field ID	TP09_0.0-0.1	QAQC1	RPD	TP09_0.0-0.1	QAQC2	RPD	TP18_0.5-0.6	QAQC3	RPD	TP18_0.5-0.6	QAQC4	RPD	TP18_2.9-3.0	QAQC5	RPD	TP18_2.9-3.0	QAQC6	RPD	TP36_2.9-3.0	QAQC7	RPD	TP36_2.9-3.0	QAQC8	RPD	TP34_0.0-0.1	QAQC9	RPD	TP34_0.0-0.1	QAQC10	RPD	TP34_0.5-0.6	QAQC11	RPD	TP34_0.5-0.6	QAQC12	RPD
		Sampled Date/Time	10/07/2018 15:00	10/07/2018 15:00		10/07/2018 15:00	10/07/2018 15:00		12/07/2018 15:00	12/07/2018 15:00		12/07/2018 15:00	12/07/2018 15:00		12/07/2018 15:00	12/07/2018 15:00		12/07/2018 15:00	12/07/2018 15:00		16/07/2018 15:00	16/07/2018 15:00		16/07/2018 15:00	16/07/2018 15:00		17/07/2018 15:00	17/07/2018 15:00		17/07/2018 15:00	17/07/2018 15:00		17/07/2018 15:00	17/07/2018 15:00		17/07/2018 15:00	17/07/2018 15:00	
ChemName	**Units**	**EQL**																																				
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0							<0.5	<0.5	0	<0.5	<0.5	0							<0.5	<0.5	0	<0.5	<0.5	0
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	1.2	1.2	0	**1.2**	**<0.5**	**82**	1.2	1.2	0	**1.2**	**<0.5**	**82**							1.2	1.2	0	**1.2**	**<0.5**	**82**							1.2	1.2	0	**1.2**	**<0.5**	**82**
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							0.86	1.06	21	**0.86**	**1.6**	**60**						
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							0.0396	0.0423	7	0.0396	0.047	17						
Perfluorooctanesulfonamide (PFOSA)	mg/kg	0.0002 : 0.001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.001	0							0.0004	<0.0002	67	0.0004	<0.01	0						
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							**0.051**	**0.0714**	**33**	**0.051**	**0.088**	**53**						
Perfluoro-n-pentanoic acid (PFPeA)	mg/kg	0.0002													<0.0002	<0.0002	0	<0.0002	<0.0002	0							**0.0022**	**0.0041**	**60**	0.0022	0.0027	20						
Perfluorononanoic acid (PFNA)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							0.0003	<0.0002	40	**0.0003**	**0.0011**	**114**						
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							0.0411	0.0529	25	0.0411	0.053	25						
Perfluorohexanesulfonic acid (PFHxS)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							0.691	0.826	18	**0.691**	**1.2**	**54**						
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							**0.0176**	**0.0274**	**44**	**0.0176**	**0.025**	**35**						
Perfluorododecanoic acid (PFDoA)	mg/kg	0.0002 : 0.0005 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0005	0							<0.0002	<0.0002	0	<0.0002	<0.005	0						
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002 : 0.0005 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0005	0							<0.0002	<0.0002	0	<0.0002	<0.005	0						
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							**0.041**	**0.0612**	**40**	**0.041**	**0.068**	**50**						
Perfluorobutanesulfonic acid (PFBS)	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							**0.0202**	**0.0369**	**58**	0.0202	0.027	29						
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002													<0.0002	<0.0002	0	<0.0002	<0.0002	0							<0.0002	<0.0002	0	<0.0002	<0.002	0						
Perfluorotetradecanoic aicd (PFTeDA)	mg/kg	0.0005 : 0.005 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.005	0							<0.0005	<0.0005	0	<0.0005	<0.005	0						
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002 : 0.0005 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0005	0							0.0002	0.0003	40	0.0002	<0.005	0						
Perfluoroundecanoic acid (PFUnA)	mg/kg	0.0002 : 0.0005 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0005	0							<0.0002	0.0002	0	<0.0002	<0.005	0						
Perfluorobutanoic acid	µg/kg	1 : 0.2 (Interlab)													<1	<1	0	<1	<0.2	0							<1	<1	0	<1	1	0						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	mg/kg	0.0005 : 0.0001 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.0001	0							<0.0005	<0.0005	0	<0.0005	<0.001	0						
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	mg/kg	0.0005 : 0.0001 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.0001	0							<0.0005	<0.0005	0	<0.0005	<0.001	0						
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	mg/kg	0.0005 : 0.0001 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.0001	0							<0.0005	<0.0005	0	<0.0005	<0.001	0						
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2)	mg/kg	0.0005 : 0.0001 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.0001	0							<0.0005	<0.0005	0	<0.0005	<0.001	0						
N-ethyl perfluorooctane sulfonamido acetic acid	mg/kg	0.0002													<0.0002	<0.0002	0	<0.0002	<0.0002	0							<0.0002	<0.0002	0	<0.0002	<0.002	0						
N-ethyl perfluorooctane sulfonamide	mg/kg	0.0005 : 0.001 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.001	0							<0.0005	<0.0005	0	<0.0005	<0.01	0						
N-methyl perfluorooctanesulfonamido ethanol	µg/kg	0.5 : 1 (Interlab)													<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<10	0						
N-ethyl perfluorooctanesulfonamido ethanol	mg/kg	0.0005 : 0.005 (Interlab)													<0.0005	<0.0005	0	<0.0005	<0.005	0							<0.0005	<0.0005	0	<0.0005	<0.01	0						
N-Methyl perfluorooctane sulfonamide	µg/kg	0.5 : 1 (Interlab)													<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<10	0						
N-methyl perfluorooctane sulfonamido acetic acid	mg/kg	0.0002													<0.0002	<0.0002	0	<0.0002	<0.0002	0							<0.0002	<0.0002	0	<0.0002	<0.002	0						
Sum of PFAS	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							1.76	2.18	21	**1.76**	**3.1**	**55**						
Sum of PFAS (WA DER List)	mg/kg	0.0002													<0.0002	<0.0002	0	<0.0002									1.67	2.05	20	1.67								
Sum of PFHxS and PFOS	mg/kg	0.0002 : 0.0001 (Interlab)													<0.0002	<0.0002	0	<0.0002	<0.0001	0							1.55	1.89	20	**1.55**	**2.8**	**57**						
Arsenic	mg/kg	5 : 4 (Interlab)	<5	<5	0	<5	<4	0	6	8	29	6	6	0							<5	<5	0	<5	<4	0							<5	<5	0	<5	<4	0
Cadmium	mg/kg	1 : 0.4 (Interlab)	<1	<1	0	<1	<0.4	0	<1	<1	0	<1	<0.4	0							<1	<1	0	<1	<0.4	0							<1	<1	0	<1	<0.4	0
Chromium (III+VI)	mg/kg	2 : 1 (Interlab)	9	12	29	9	13	36	7	6	15	7	8	13							7	7	0	7	5	33							4	5	22	4	5	22
Copper	mg/kg	5 : 1 (Interlab)	10	10	0	10	10	0	33	31	6	33	33	0							11	13	17	11	7	44							<5	<5	0	<5	<1	0
Lead	mg/kg	5 : 1 (Interlab)	18	20	11	18	19	5	57	55	4	57	50	13							8	9	12	8	5	46							<5	<5	0	<5	3	0
Mercury	mg/kg	0.1	<0.1	<0.1	0	<0.1	<0.1	0	0.2	0.1	67	0.2	0.2	0							<0.1	<0.1	0	<0.1	<0.1	0							<0.1	<0.1	0	<0.1	<0.1	0
Nickel	mg/kg	2 : 1 (Interlab)	4	4	0	4	5	22	7	6	15	7	6	15							<2	2	0	<2	2	0							<2	<2	0	<2	2	0
Zinc	mg/kg	5 : 1 (Interlab)	16	15	6	16	15	6	85	56	41	**85**	**54**	**45**							9	10	11	9	6	40							<5	<5	0	<5	<1	0
Moisture Content	%	1 : 0.1 (Dupe)																									8.3	6.2	29	8.3								
Moisture Content	%	1	12.1	11.7	3	12.1			7.7	12.5	48	7.7									14.5	15.8	9	14.5									9.5	8.6	10	9.5		
Moisture Content	%	0.1													20	19.9	1	20																				
TRH >C6 - C10	mg/kg	10 : 25 (Interlab)	<10	<10	0	<10	<25	0	<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0
TRH >C10 - C16	mg/kg	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0
TRH >C16 - C34	mg/kg	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0
TRH >C34 - C40	mg/kg	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0
TRH >C10 - C40 (Sum of total)	mg/kg	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0
TRH >C6 - C10 less BTEX (F1)	mg/kg	10 : 25 (Interlab)	<10	<10	0	<10	<25	0	<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0
TRH >C10 - C16 less Naphthalene (F2)	mg/kg	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0
TPH C6 - C9	mg/kg	10 : 25 (Interlab)	<10	<10	0	<10	<25	0	<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0							<10	<10	0	<10	<25	0
TPH C10 - C14	mg/kg	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0							<50	<50	0	<50	<50	0
TPH C15 - C28	mg/kg	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0
TPH C29-C36	mg/kg	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0							<100	<100	0	<100	<100	0
TPH C10 - C36 (Sum of total)	mg/kg	50	<50	<50	0	<50			<50	<50	0	<50									<50	<50	0	<50									<50	<50	0	<50		
Benzene	mg/kg	0.2	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0							<0.2	<0.2	0	<0.2	<0.2	0							<0.2	<0.2	0	<0.2	<0.2	0
Ethylbenzene	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1	0	<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0
Naphthalene	mg/kg	1 : 0.1 (Interlab)	<1	<1	0	<1	<0.1	0	<1	<1	0	<1	<0.1	0							<1	<1	0	<1	<0.1	0							<1	<1	0	<1	<0.1	0
Naphthalene	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Toluene	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0							<0.5	<0.5	0	<0.5	<0.5	0							<0.5	<0.5	0	<0.5	<0.5	0
Total BTEX	mg/kg	0.2	<0.2	<0.2	0	<0.2			<0.2	<0.2	0	<0.2									<0.2	<0.2	0	<0.2									<0.2	<0.2	0	<0.2		
Xylene (m & p)	mg/kg	0.5 : 2 (Interlab)	<0.5	<0.5	0	<0.5	<2	0	<0.5	<0.5	0	<0.5	<2	0							<0.5	<0.5	0	<0.5	<2	0							<0.5	<0.5	0	<0.5	<2	0
Xylene (o)	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1	0	<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0
Xylene Total	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1	0	<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0							<0.5	<0.5	0	<0.5	<1	0
Benzo[b+j]fluoranthene	mg/kg	0.5	<0.5	<0.5	0	<0.5			<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5		
Acenaphthene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Acenaphthylene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Anthracene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Benz(a)anthracene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Benzo(a) pyrene	mg/kg	0.5 : 0.05 (Interlab)	<0.5	<0.5	0	<0.5	<0.05	0	<0.5	<0.5	0	<0.5	0.1	0							<0.5	<0.5	0	<0.5	<0.05	0							<0.5	<0.5	0	<0.5	<0.05	0
Benzo(a)pyrene TEQ (half LOR)	mg/kg	0.5	0.6	0.6	0	0.6	<0.5	18	0.6	0.6	0	0.6	<0.5	18							0.6	0.6	0	0.6	<0.5	18							0.6	0.6	0	0.6	<0.5	18
Benzo(g,h,i)perylene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	0	<0.5			<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5		
Chrysene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	0.2	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Dibenz(a,h)anthracene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Fluoranthene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	0.2	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Fluorene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Phenanthrene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	0.1	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
Pyrene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	<0.1	0	<0.5	<0.5	0	<0.5	0.2	0							<0.5	<0.5	0	<0.5	<0.1	0							<0.5	<0.5	0	<0.5	<0.1	0
PAHs (Sum of total)	mg/kg	0.5	<0.5	<0.5	0	<0.5			<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5									<0.5	<0.5	0	<0.5		

			Lab Report Number	ES1820966	ES1821108
			Field ID	QAQC_TB1	QAQC_TB2
			Sampled_Date/Time	4/07/2018 15:00	4/07/2018 15:00
			Sample Type	Trip_B	Trip_B
	ChemName	**Units**	**EQL**		
BTEXN	Benzene	mg/kg	0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	<0.5	<0.5
	Naphthalene	mg/kg	0.1	<1	<1
	Toluene	mg/kg	0.5	<0.5	<0.5
	Total BTEX	mg/kg	0.2	<0.2	<0.2
	Xylene (m & p)	mg/kg	0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5	<0.5	<0.5
	Xylene Total	mg/kg	0.5	<0.5	<0.5

Table D:
SWP GROUNDWATER RPD Table

			Lab Report Number	ES1822154	ES1822154		ES1822154	197377	
			Field ID	GW03	QAQC1	**RPD**	GW03	QAQC2	**RPD**
			Sampled Date/Time	27/07/2018 15:00	27/07/2018 15:00		27/07/2018 15:00	27/07/2018 15:00	
Chem Group	**ChemName**	**Units**	**LOR**						
Semi Volatile Organic Compounds	Benzo(e)pyrene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	Coronene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	Perylene	µg/L	0.1	<0.1	<0.1	0	<0.1		
Metals	Arsenic (Filtered)	µg/l	1	<1	<1	0	<1	<1	0
	Cadmium (Filtered)	µg/l	0.1	<0.1	<0.1	0	<0.1	<0.1	0
	Chromium (III+VI) (Filtered)	µg/l	1	<1	<1	0	<1	<1	0
	Copper (Filtered)	µg/l	1	<1	<1	0	<1	<1	0
	Lead (Filtered)	µg/l	1	<1	<1	0	<1	<1	0
	Mercury (Filtered)	µg/l	0.1 : 0.05 (Interlab)	<0.1	<0.1	0	<0.1	<0.05	0
	Nickel (Filtered)	µg/l	1	6	7	15	6	6	0
	Zinc (Filtered)	µg/l	5 : 1 (Interlab)	7	7	0	7	8	13
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20 : 10 (Interlab)	30	40	29	**30**	**<10**	**100**
	TRH >C10 - C16	µg/L	100 : 50 (Interlab)	<100	<100	0	<100	<50	0
	TRH >C16 - C34	µg/L	100	<100	<100	0	<100	<100	0
	TRH >C34 - C40	µg/L	100	<100	<100	0	<100	<100	0
	TRH >C10 - C40 (Sum of total)	µg/L	100	<100	<100	0	<100		
	TRH >C6 - C10 less BTEX (F1)	mg/l	0.02 : 0.01 (Interlab)	0.02	0.03	40	0.02	<0.01	67
	TRH >C10 - C16 less Naphthalene (F2)	mg/l	0.1 : 0.05 (Interlab)	<0.1	<0.1	0	<0.1	<0.05	0
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20 : 10 (Interlab)	<20	20	0	<20	<10	0
	TPH C10 - C14	µg/L	50	<50	<50	0	<50	<50	0
	TPH C15 - C28	µg/L	100	<100	<100	0	<100	<100	0
	TPH C29-C36	µg/L	50 : 100 (Interlab)	<50	<50	0	<50	<100	0
	TPH C10 - C36 (Sum of total)	µg/L	50	<50	<50	0	<50		
BTEXN	Benzene	µg/L	1	<1	<1	0	<1	<1	0
	Ethylbenzene	µg/L	2 : 1 (Interlab)	<2	<2	0	<2	<1	0
	Naphthalene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1 - 1	0
	Naphthalene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1 - 1	0
	Naphthalene	µg/L	0.1 : 1 (Interlab)	0.3	0.3	0	**0.3**	**<1 - 1**	**108**
	Toluene	µg/L	2 : 1 (Interlab)	<2	<2	0	<2	<1	0
	Total BTEX	mg/l	0.001	0.007	0.007	0	0.007		
	Xylene (m & p)	µg/L	2	5	5	0	5	4	22
	Xylene (o)	µg/L	2 : 1 (Interlab)	2	2	0	2	2	0
	Xylene Total	µg/L	2	7	7	0	7		
PAHs	Benzo[b+j]fluoranthene	mg/l	0.0001	<0.0001	<0.0001	0	<0.0001		
	2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	3-methylcholanthrene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	7,12-dimethylbenz(a)anthracene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	Acenaphthene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Acenaphthylene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Anthracene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Benz(a)anthracene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Benzo(a) pyrene	µg/L	0.05 : 1 (Interlab)	<0.05	<0.05	0	<0.05	<1	0
	Benzo(g,h,i)perylene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	0	<0.1		
	Chrysene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Dibenz(a,h)anthracene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Fluoranthene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Fluorene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Indeno(1,2,3-c,d)pyrene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Phenanthrene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	Pyrene	µg/L	0.1 : 1 (Interlab)	<0.1	<0.1	0	<0.1	<1	0
	PAHs (Sum of total)	µg/L	0.05	0.3	0.3	0	0.3		
Chlorinated Hydrocarbons	1,1,1,2-tetrachloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,1,1-trichloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,1,2,2-tetrachloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,1,2-trichloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,1-dichloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,1-dichloroethene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2,3-trichloropropane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2-dibromo-3-chloropropane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2-dichloroethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2-dichloropropane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,3-dichloropropane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	2,2-dichloropropane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Bromodichloromethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Bromoform	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Carbon tetrachloride	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Chlorodibromomethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Chloroethane	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
	Chloroform	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Chloromethane	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
	cis-1,2-dichloroethene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	cis-1,3-dichloropropene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Dibromomethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Hexachlorobutadiene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Trichloroethene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Tetrachloroethene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	trans-1,2-dichloroethene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	trans-1,3-dichloropropene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Vinyl chloride	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
Volatile Organic Compounds	1,1-dichloropropene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	cis-1,4-Dichloro-2-butene	µg/L	5	<5	<5	0	<5		
	Pentachloroethane	µg/L	5	<5	<5	0	<5		
	Styrene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	trans-1,4-Dichloro-2-butene	µg/L	5	<5	<5	0	<5		
Halogenated Benzenes	1,2,3-trichlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2,4-trichlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,2-dichlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,3-dichlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	1,4-dichlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	2-chlorotoluene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	4-chlorotoluene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Bromobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Chlorobenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
Halogenated Hydrocarbons	1,2-dibromoethane	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	Bromomethane	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
	Dichlorodifluoromethane	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
	Iodomethane	µg/L	5	<5	<5	0	<5		
	Trichlorofluoromethane	µg/L	50 : 10 (Interlab)	<50	<50	0	<50	<10	0
Monocyclic Aromatic Hydrocarbons	1,2,4-trimethylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	3	0
	1,3,5-trimethylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	2	0
	Isopropylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	n-butylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	n-propylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	p-isopropyltoluene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	sec-butylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
	tert-butylbenzene	µg/L	5 : 1 (Interlab)	<5	<5	0	<5	<1	0
Solvents	Methyl Ethyl Ketone	µg/L	50	<50	<50	0	<50		
	2-hexanone (MBK)	µg/L	50	<50	<50	0	<50		
	4-Methyl-2-pentanone	µg/L	50	<50	<50	0	<50		
	Carbon disulfide	µg/L	5	<5	<5	0	<5		
	Vinyl acetate	µg/L	50	<50	<50	0	<50		

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix A – NEPM 2013 Ecological Investigation Limits Methodology

NEPM 2013 Ecological Investigation Limits Methodology

Ecological investigation levels (EILs) for the protection of terrestrial ecosystems have been derived for common contaminants in soil based on a species sensitivity distribution (SSD) model developed for Australian conditions. EILs have been derived for As, Cu, CrIII, DDT, naphthalene, Ni, Pb and Zn.

EILs apply principally to contaminants in the top 2 metres of soil at the finished surface/ground level which corresponds to the root zone and habitation zone of many species. In arid regions, where the predominant species may have greater root penetration, specific considerations may result in their application to 3 metres depth.

The methodology assumes that the ecosystem is adapted to the ambient background concentration (ABC) for the locality and that it is only adding contaminants over and above this background concentration which has an adverse effect on the environment.

The ABC of a contaminant is the soil concentration in a specified locality that is the sum of the naturally occurring background level and the contaminant levels that have been introduced from diffuse or non-point sources by general anthropogenic activity not attributed to industrial, commercial, or agricultural activities, for example, motor vehicle emissions.

The preferred method to determine the ABC is to measure the ABC at an appropriate reference site. This approach is essential in areas where there is a high naturally occurring background level such as will occur in mineralised areas.

An added contaminant limit (ACL) is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required. **The EIL is derived by summing the ACL and the ABC.**

ACLs are based on the soil characteristics of pH, CEC and clay content. Empirical relationships that can model the effect of these soil properties on toxicity are used to develop soil-specific values. These soil-specific values take into account the biological availability of the element in various soils. In this approach different soils will have different contaminant EILs rather than a single generic EIL for each contaminant.

The adopted soil characteristics (pH, clay content and cation exchange capacity) have been selected from samples BH01_3.0-3.1 (silty CLAY), BH06_3.0-3.1 (CLAY) and GW05_2.0-2.1 (SAND) as the sample locations provided appropriate coverage of the site and the selected samples were considered to be representative of the natural conditions across the site and that the soil at these locations were unlikely to be impacted by anthropogenic sources due to the sample depths.

Table 1.1: Calculating the ACL – BH01_3.0-3.1

ACLs	mg/kg								
	BH01_3.0-3.1	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
pH	5.1				190				290
CEC	10.2				280			290	
% clay	30			660					
Generic	-	-	-			1800	-		

Table 1.2: Calculating the ACL – BH06_3.0-3.1

ACLs	mg/kg								
	BH06_3.0-3.1	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
pH	6.9				400				1100
CEC	21.6				300			460	
% clay	52			660					
Generic	-	-	-			1800	-		

Table 1.3: Calculating the ACL – GW05_2.0-2.1

ACLs	mg/kg								
	GW05_2.0-2.1	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
pH	6.0				280				360
CEC	1.6				140			55	
% clay	20			660					
Generic		160	3			1800	-		

Information derived from **Table 1B(1)** *Soil-specific added contaminant limits for aged zinc in soils*, **Table 1B(2)** *Soil-specific added contaminant limits for aged copper in soils,* **Table 1B(3)** *Soil-specific added contaminant limits for aged chromium III and nickel in soils,* **Table 1B(4)** *Generic added contaminant limits for lead in soils (commercial/industrial) irrespective of their physicochemical properties (NEPM 2013***.**

Table 2.1.: Calculating the ABC

ABC	mg/kg							
	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
BH01_3.0-3.1	<5	<1	7	10	10	<0.1	3	14
BH06_3.0-3.1	9	<1	26	24	29	<0.1	10	22
GW05_2.0-2.1	<5	<1	7	<5	<5	<0.1	<2	<5

The EIL is derived by summing the ACL and the ABC. The following rounding rules are applicable to EILs:

- <1 to nearest 0.1
- 1 to <10 to nearest integer
- 10 to < 100 to nearest 5
- 100 to <1000 to nearest 10
- ≥1000 to nearest 100

The EIL have been calculated for the Site using the lowest criteria for each compound from each of the three reference locations (BH01_3.0-3.1, BH06_3.0-3.1 and GW05_2.0-2.1).

Table 3.1: Calculating the EIL

EILs	mg/kg									
	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	DDT	Naphthalene
ABC + ACL			670 [3]	140 [3]	1808 [3]		55 [3]	290 [3]		
NEPM 2013	160 [1]								640 [1]	370 [1]
NEPM 1999		3 [2]				1 [2]				

[1] Generic EILs for aged arsenic, DDT and Naphthalene from **Table 1B(5)** for commercial/industrial land use**.**

[2] EILs from NEPM 1999 (no EILs specified for contaminants in NEPM 2013).

[3] EILs derived from NEPM 2013 equation ABC+ACL.

Appendix B – Borehole Logs

JACOBS

Location ID: TP01

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP01_0.0-0.1	●	0	A	0			▨	FILL: clayey sand, fine to coarse, black/brown with rootlets and angular fine to coarse gravel (shale).		D	
						0.2	▨				
						0.4	▨	FILL: gravelly sand, fine to medium, orange/brown with gravel and trace brick, plastic and rock. Minor bitumen observed at 1.2 mBGL.	L/MD	D	
TP01_0.5-0.6	●	0	A	0			▨				
						0.6	▨				
						0.8	▨				
						1.0	▨				
TP01_1.0-1.1	●	0	A	0			▨				
						1.2	▨				
						1.4	▨				
						1.6	▨				
						1.8	▨	FILL: sandy clay, low to high plasticity, brown/red/grey/olive with gravel/shale and trace concrete pieces.	St	Sl-M	
						2.0	▨				
TP01_2.0-2.1	●	0	A	0			▨				
						2.2	▨				
							▨	Aluminium pipe observed at 2.3mBGL.			
						2.4	▨				
						2.6	▤	sandy CLAY, medium to high plasticity, light brown/grey/red. Red/Grey mottling observed at 2.7mBGL.	St	SM	
						2.8	▤				
TP01_2.9-3.0	●	0	A	0			▤				
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

╳ = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP02

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass/Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP02_0.0-0.1	●	0	A	0.0				FILL: clayey sand, fine, dense, brown with fine to coarse angular gravel and rootlets.	D	D	
								FILL: sandy clay, low plasticity, firm, brown with fine to coarse angular gravel and rootlets.	D	SL M	
						0.2					
								FILL: sandy clay, low plasticity, hard, light brown/light grey with gravel and trace concrete, rootlets and bitumen.	D	D	
						0.4					
								FILL: gravelly sandy clay, fine to medium coarse, with minor concrete, bitumen and trace plastic.		D	
TP02_0.5-0.6	●	0	A	0.0							
						0.6					
						0.8					
						1.0					
						1.2					
						1.4					
								CLAY, high plasticity, hard, light brown with trace decomposed roots and subrounded gravel	Vst/H	SL M	
						1.6					
								silty CLAY, high plasticity, very stiff, grey & red with mottling.		SL M	
						1.8					
						2.0					
TP02_2.0-2.1	●	0	A	0.0							
						2.2					
						2.4					
								sandy CLAY, medium to high plasticity, very stiff, grey and red with mottling.	Vst	SL M	
						2.6					
						2.8					
TP02_2.9-3.0	●	0	A	0.0							
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP03

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass/Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 13/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP03_0.0-0.1	●	0	A	0				FILL: gravelly clayey sand, fine to medium coarse, medium dense, with clay, shale and rootlets. Gravel is comprised of shale pieces.	D	D	
						0.2		FILL: gravelly clayey sand, fine to medium coarse, medium dense, with clay, gravel comprised of shale and rootlets. electrical cable/wire observed.	D	SL M	
						0.4		FILL: sandy clay/clayey sand, low plasticity, compact, light brown with gravel and shale throughout horizon.	CO	D	
TP03_0.5-0.6	●	0	A	0							
						0.6					
						0.8					
						1.0		sandy CLAY, low plasticity, hard, light brown/orange/brown with grey/orange pieces of clay.	D	D	
TP03_1.0-1.1	●	0	A	0							
						1.2					
						1.4		sandy CLAY, low to medium plasticity, hard, light brown/orange/brown with grey/orange mottling.	L-MD	SL/M	
						1.6					
						1.8		sandy CLAY, low plasticity, hard, orange/brown with grey/orange mottling.	L-MD	SL/M	
						2.0					
TP03_2.0-2.1	●	0	A	0							
						2.2					
						2.4					
						2.6		sandy CLAY, low plasticity, hard, orange/brown with grey/orange mottling.	L-MD	SL/M	
						2.8					
TP03_2.9-3.0	●	0	A	0							
						3.0					
						3.2					
						3.4					

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS™

Location ID: TP04

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 13/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA						SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP04_0.0-0.1	●	0	A	0		FILL: sandy clay/clayey sand, fine to medium coarse/low plasticity, very dense with rootlets. Clay pieces subangular/angular.	VD	D	
TP04_0.0-0.3	●	0	A	0					
						sandy CLAY, low plasticity, hard/very stiff, brown/red/grey/light brown.	D	SL M	
TP04_0.5-0.6	●	0	A	0					
TP04_1.0-1.1	▮	0	A	0					
TP04_1.0-1.5	▮	0	A	0					
						sandy CLAY/clayey SAND, low plasticity, fine/compact, soft, grey/light orange/brown with orange mottling.	CO	SL M	
TP04_2.9-3.0	●	0	A	0					

ground water depth (m): 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.4

graphic log

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP05

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP05_0.0-0.1 TP05_0.0-0.3	● ●	0 0	A A	0 0		0.2	FILL: sandy clay/clayey sand, fine to medium, low plasticity, brown with unconsolidated rock/gravel and rootlets.	St	D	
TP05_0.5-0.6	●	0	A	0		0.4 0.6	FILL: sandy clay, very stiff to hard, brown/orange/grey with fine to coarse gravel and trace bitumen.	Vst-H	D	
						0.8	FILL: gravelly clayey sand, fine to medium coarseness, compact/hard with gravel/shale and sandstone.	H/CO	D	
TP05_0.9-1.1	●					1.0 1.2 1.4	FILL: sandy clayey gravel, compact, brown to grey with with clay pieces and concrete, tiles, brick and bitumen. PACM observed.	Co	D	
						1.6 1.8	sandy CLAY, medium plasticity, stiff to very stiff, light brown/ brown with orange/grey mottling.	St	SL.M	
TP05_2.0-2.1	●	0	A	0		2.0 2.2	sandy CLAY, medium plasticity, stiff to very stiff, light brown/brown/orange with red/grey mottling.	St	SL.M	
						2.4	clayey SAND, fine coarsness, compact, grey with subangular/sub round gravel.	CO	D	
TP05_2.5-2.6	●	0	A	0		2.6 2.8	sandy CLAY, low to medium plasticity, firm, green/olive brown with trace finely grained sub angular gravel.	MD	D-SL.M	
TP05_2.9-3.0	●	0	A	0		3.0	sandy CLAY, medium plasticity, firm/stiff, brown/red/orange grey	St	SL.M	
						3.2 3.4				

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP06

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP06_0.0-0.1	●	0	A	0			▨	FILL: sandy clay, low plasticity, firm, brown with unconsolidated rootlets, brick, concrete and trace fine to medium coarse angular gravel and bitumen	MD	SL.M	
TP06_0.0-0.3	●	0	A	0			▨				
						0.2	▨				
							▨	FILL: clayey sand, fine to medium coarse, with gravel and low plasticity clay pieces.		D	
						0.4	▨				
TP06_0.5-0.6	●	0	A	0			▨				
						0.6	▨				
						0.8	▨				
						1.0	▨				
TP06_1.0-1.1	●	0	A	0			▨				
						1.2	▨				
						1.4	▨				
							▨	clay content increasing.		D	
						1.6	▨				
						1.8	▨				
							▨	FILL: clayey sand, very fine, loose, grey with soft/light brown/highly plastic clay pieces.	L	SL.M	
						2.0	▨				
TP06_2.0-2.1	●	0	A	0			▨				
						2.2	▨				
							▨	FILL: sandy clay, low plasticity, hard, with gravel, terracotta, brick and tile.	H	SL.M	
						2.4	▨				
TP06_2.5-2.6	●	0	A	0			▨				
						2.6	▨				
						2.8	▨				
							▨	FILL: clay, medium to high plasticity, stiff/very stiff, orange/brown/grey with gravel pieces.	St/vSt	SL.M	
TP06_2.9-3.0	●	0	A	0			▨				
						3.0	▨	Plastic irrigation pipe observed.			
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP07

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP07_0.0-0.1	●	0	A	0			▨	FILL: gravelly sandy clay, low plasticity, hard, brown with gravel.	H	Sl.M/D	
						0.2	▨				
							▨	waste, rio bar, plastic, bitumen, concrete and cap observed.			
						0.4	▨				
							▨	FILL: gravelly sand, fine to medium coarseness, compact with gravel and clay pieces.	Co	D	
TP07_0.5-0.6	●	0	A	0			▨				
						0.6	▨				
							▨	wood, concrete, bitumen, rock, PVC, glass and steel observed.			
						0.8	▨				
							▨	FILL: clayey sand with gravel/rock and minor waste.	St	Sl.M	
						1.0	▨				
TP07_1.0-1.1	●	0	A	0			▨				
						1.2	▨				
						1.4	▨				
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP07_2.0-2.1	●	0	A	0			▨				
						2.2	▨				
						2.4	▨				
						2.6	▨				
							▨	FILL: clay, medium plasticity, stiff/very stiff, green/brown with gravel and rock.	St	D	
						2.8	▨				
TP07_2.9-3.0	●	0	A	0			▨				
						3.0					
						3.2					
						3.4					

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP08

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: -	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP08_0.0-0.1	●	0	A	2.6			▨	FILL: clay, low to medium plasticity, hard, grey/red with minor sand.	H	SL.M	
						0.2	▨	FILL: clayey sand, fine coarseness, dense, dark grey.	D	SL.M	
TP08_0.5-0.6	●	0	A	0.9		0.4 0.6 0.8 1.0	▨	FILL: sandy clay, very stiff, light brown and grey with minor weather sandstone and gravel.	Vst	D	
TP08_1.0-1.1	●	0	A	1.9		1.2	▨			D	
						1.4 1.6 1.8	▨	FILL: sandy clay, low plasticity, very stiff, light grey/brown with orange mottle. Concrete observed.			
TP08_2.0-2.1 TP08_2.0-2.2	◐ ▮	0 0	A A	1.3 0		2.0 2.2	▤	CLAY, low to medium plasticity, hard, brown with grey/red mottling and minor sands.	H		
						2.4 2.6	▤	CLAY, low plasticity, hard, brown with grey/red mottling and minor sands/weathered rock. Increasing in sand content.	H		
						2.8	░	clayey SAND, hard, compact, light grey/red/orange with weathered sandstone.	H	D	
TP08_2.9-3.0	●	0	A	1.0		3.0	▤	sandy CLAY, medium plasticity, stiff/very stiff, with sand/weathered materials.	Vst	M	
						3.2 3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP09

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 10/7/18 - 10/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP09_0.0-0.1	●	0	A	0	QAQC1/QAQC2			FILL: sandy clay, low plasticity, firm, brown with bitumen, rootlets and minor fine angular gravel.		D	
						0.2					
TP09_0.2-0.3	●	0	A	0				FILL: sand, fine coarseness, compact, grey/yellow		D	
								sandy CLAY, medium plasticity, very stiff/hard, light orange/brown/grey.	Vst	M	
						0.4					
TP09_0.5-0.6	●	0	A	0				clay plasticity decreasing to low and orange/grey/red colouring intensified to 1.8mBGL.			
						0.6					
						0.8					
						1.0					
TP09_1.0-1.1	●	0	A	0.1							
						1.2					
						1.4					
						1.6					
						1.8					
								sandy CLAY, very low to low plasticity, very stiff/hard, grey/red/orange/yellow mottling.	D	SL-M	
						2.0					
TP09_2.0-2.1	●	0	A	0.1							
						2.2		maroon mottling observed at 1.8 mbgl.			
						2.4					
						2.6					
						2.8					
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP10

Sheet 1 of 1

Project: Southwest Precinct **Client: Bankstown Airport Limited**

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 10/7/18 - 10/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP10_0.0-0.1	●	0	A	0.1			▨	FILL: sandy clay/clayey sand, fine grained, compact/stiff, (yellow/brown) with gravel, rootlets and minor tile, brick and bitumen.	Co/S	D	
TP10_0.0-0.3	●	0	A	0.1		0.2	▨				
						0.4	▨				
TP10_0.4-0.5	●	0	A	0			▨				
						0.6	▨	FILL: sandy clay/weathered sandstone, absence of plasticity, hard, red/orange/grey/light orange with brick pieces.	H	D	
TP10_1.0-1.1	●	0	A	0		0.8	▨				
						1.0	▨	FILL: clayey sand, compact, brown/grey with terracotta piping, clay pieces, concrete and fine to coarse gravel.	CO	D	
						1.2	▨	large section of concrete observed at 1.1mBGL.			
						1.4	▨	dark grey bricks/rocks/terracotta and concrete observed at 1.4mBGL.			
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP10_2.0-2.1	●	0	A	0			▨				
						2.2	⁙	SAND, fine grained, compact, yellow/orange	CO	D	
						2.4	⁙	SAND, fine grained, compact, yellow with increasing orange fraction.	CO	M	
						2.6	⁙				
TP10_2.5-2.6	●	0	A	0		2.8	⁙	SAND, fine grained, compact, yellow with increasing orange fraction.	CO	W	
								Pooling water observed at 2.8 mBGL. Possible water table at this depth.			
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP11

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 11/7/18 - 11/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP11_0.0-0.1	●	1	A	0.1			▨	FILL: sandy clay, low plasticity, soft to firm with rootlets and gravel.	S/F	Sl.M	
TP11_0.0-0.3	●	1	A	0		0.2	▨				
						0.4	▨	heterogenous fill observed throughout 0.0 - 0.7 mBGL.			
TP11-ACM_0.0-1.0	●	1-2		1-2			▨				
TP11_0.5-0.6	●	1	A	0		0.6	▨				
						0.8	▨	FILL: clayey sand, fine to medium grained, medium dense, with minor tile, brick, plastic, metal, rock, rubble, bitumen and insulation. potential ACM observed from 0.0 to 1.0 mBGL.	MD	D	
						1.0	▨				
TP11_1.0-1.1	●	1	A	0			▨				
						1.2	▨	FILL: clayey sand, fine to medium grained with minor tile, brick, plastic, metal, rock, rubble, bitumen and insulation. Materials appear heterogenous.	MD	D-SL.M	
						1.4	▨				
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP11_2.0-2.1	●	1	A	0.1			▨				
						2.2	▨				
						2.4	▨				
						2.6	▨				
						2.8	▨				
TP11_2.9-3.0	●	1	A	0.1			▨				
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP12

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 9/7/18 - 9/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP12_0.0-0.1	●	0	A	2.4		0.2	▨	FILL: clayey sand, fine grained, loose to medium dense, black with shale pieces/refuse	L/MD	D	
TP12_0.5-0.6	●	0	A	1.4		0.4 0.6	▨	FILL: sand, fine grained, medium dense, light brown with small/large piecies of sandstone rock/gravel.	MD	D	
TP12_1.0-1.1	●	0	A	1.1		0.8 1.0 1.2	▤	sandy CLAY, low to medium plasticity, very stiff/hard, light brown/orange/brown.	Vst/H	SL.M	
						1.4	▤	sandy CLAY, low to medium plasticity, very stiff/hard, light brown/orange/brown with minor grey and red colouration.	Vst/H	SL.M	
						1.6	▤	sandy CLAY, medium plasticity, very stiff/hard, light brown/orange/brown with grey and red colouration.	Vst/H	SL.M	
TP12_2.0-2.1	●	0	A	0.9		1.8 2.0 2.2 2.4	▤	sandy CLAY, medium plasticity, very stiff/hard, light brown/orange/brown with grey and red colouration.	Vst/H	SL.M	
						2.6	▤	sandy CLAY, low plasticity, very stiff/hard, light brown/orange/brown with grey and red mottling.	H	D	
TP12_2.9-3.0	●	0	A	1.0		2.8 3.0	▤	sandy CLAY, low plasticity, very stiff/hard, light brown/orange/brown with grey/red mottling and trace weathered sandstone/gravel.	H	D	
						3.2 3.4					

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP14

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass/Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 13/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP14_0.0-0.1	●	0	A	0				FILL: clayey sandy gravel, fine to coarse, medium dense, dark brown/black, angular with rootlets.	MD	D	
								FILL: clayey sandy gravel, fine to coarse, medium dense, dark brown/black, angular with rootlets.	MD	SL.M - M	
						0.2					
						0.4		FILL: sandy clay/clayey sand, low plasticity/firm, medium coarse grained/hard/compact, light brown with rocks and gravel throughout.	Co	D	
TP14_0.5-0.6	●	0	A	0							
						0.6		Rio Bar observed at 0.6 mBGL.			
						0.8		Heterogenity in materials throughout soil horizon			
						1.0					
TP14_1.0-1.1	●	0	A	0							
								Trace brick pieces observed at 1.1 mBGL.			
						1.2					
						1.4					
						1.6					
						1.8					
						2.0					
TP14_2.0-2.1	●	0	A	0				large grey angular rock pieces observed at 2.0 mBGL.			
								sandy CLAY, medium plasticity, stiff, light brown/grey.	St	SL-M	
						2.2					
TP14_2.2-2.3	●	0	A	0							
								sandy CLAY, low - medium plasticity, firm, light brown/grey.	F	SL.M	
						2.4					
						2.6		sandy CLAY, low to medium plasticity, firm, light orange/grey.	F	SL.M	
						2.8					
TP14_2.9-3.0	●	0	A	0							
						3.0					
						3.2					
						3.4					

VISUAL RANKING

- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING

- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP15

Sheet 1 of 1

Project: Southwest Precinct | **Client: Bankstown Airport Limited**

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 12/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP15_0.0-0.1	●	0	A	0			▨	FILL: gvravelly clayey sand, fine to medium, medium dense, dark brown/black with trace fine to coarse angular shale and minor rootlets.	MD	D	
TP15_0.0-0.3	●	0	A	0							
						0.2					
							▨	FILL: gvravelly clayey sand, fine to medium coarse, medium dense/compact, dark brown/black with fine to coarse angular shale and minor rootlets.	MD/Co	D	
						0.4					
							▨	FILL: clay, low plasticity, hard, brown with sand fractions, gravel, brick, tile and trace plastic.	H	D	
TP15_0.5-0.6	●	0	A	0							
						0.6					
						0.8					
							▨	FILL: sandy clay, low plasticity, hard, brown with gravel, brick, tile and trace plastic.	H	D/SL.M	
						1.0					
TP15_1.0-1.1	●	0	A	0							
						1.2		brown colouration increasing within profile.			
						1.4					
						1.6					
						1.8					
						2.0					
TP15_2.0-2.1	●	0	A	0							
							▨	FILL: sandy clay, medium to high plasticity, firm to stiff, grey/orange/brown. large pieces of white sandstone and tree bark observed 2.2 mBGL.	F/St	SL.M	
						2.2					
						2.4					
TP15_2.4-2.5	●	0	A	0			░	sandy CLAY/CLAY, medium to high plasticity, firm/stiff, grey/red with orange mottling	F/St	SL.M	
						2.6					
						2.8					
							░	sandy CLAY/CLAY, medium to high plasticity, firm/stiff, grey/orange/red.	F/St	SL.M	
TP15_2.9-3.0	●	0	A	0							
						3.0					
						3.2					
						3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP16

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 12/7/18 - 12/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP16_0.0-0.1	●	0	A	0			▨	FILL: sandy clayey gravel, fine to coarse, angular, black	L	D	
						0.2	▨	FILL: sandy clay/clay, medium to high plasticity, firm/stiff, light brown/grey/orange with trace rock.	F/St	SL.M	
						0.4	▨	FILL: sandy gravelly clay, compact, brown with minor fine to coarse angular rock/shale and trace plastic, tile, glass and steel.	Co	D	
TP16_0.5-0.6	●	0	A	0			▨				
						0.6	▨				
						0.8	▨				
						1.0	▨				
TP16_1.0-1.1	●	0	A	0			▨				
						1.2	▨				
						1.4	▨				
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP16_2.0-2.1	●	0	A	0			▨				
						2.2	▨				
						2.4	▤	sandy CLAY/CLAY, medium to high plasticity, stiff/very stiff, light brown/grey	St/Vst	SL.M	
TP16_2.4-2.5	●	0	A	0			▤				
						2.6	▤				
						2.8	▤	sandy CLAY, medium to high plasticity, stiff/hard, grey/light brown	St/H	SL.M	
TP16_2.9-3.0	●	0	A	0			▤				
						3.0					
						3.2					
						3.4					

VISUAL RANKING	
0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING	
A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)		
VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)		
VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP17

Sheet 1 of 1

Project: Southwest Precinct		**Client: Bankstown Airport Limited**	
Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 12/7/18 - 12/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP17_0.0-0.1	●	0	A	0			▨	FILL: sandy clay, low to medium plasticity, soft/firm, brown with minor fine to coarse angular gravel, rock and bitumen	S/F	SL.M	
TP17_0.0-0.3	●	0	A	0		0.2	▨				
TP17_0.5-0.6	●	0	A	0		0.4 0.6	▨	FILL: gravelly clayey sand, fine to coarse, compact, brown with gravel, rock, brick, plastic, steel, clay pieces, trace glass and wood. fabric and brick observed at 0.4 mBGL.	Co	D/ SL.M	
TP17_1.0-1.1	●	0	A	0		0.8 1.0 1.2 1.4 1.6 1.8	▨				
TP17_2.0-2.1	●	0	A	0		2.0	▨	FILL: silty sandy clay, highly plastic, firm, green/brown/grey with trace roots.	F	SL.M	
TP17_2.6-2.7	●	0	A	0		2.2 2.4	░	sandy CLAY, clayey gravelly SAND, low plasticity, compact/hard with rock	Co/H	D	
						2.6 2.8	░	sandy CLAY, low to medium plasticity, hard, grey with light brown mottling	H	SL.M	
TP17_2.9-3.0	●	0	A	0		3.0	░	sandy CLAY, medium to high plasticity, hard, grey with light brown mottling	H	SL.M	
						3.2 3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP18

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 12/7/18 - 12/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP18_0.0-0.1	●	0	A	0			▨	FILL: gravelly sand, fine, medium dense/dense, black/dark grey with shale. Angular fine to coarse gravels observed through soil horizon.	MD/D	D	
						0.2 0.4	▨	FILL: clay, high plasticity, stiff, light brown/grey.	St	D	
TP18_0.5-0.6	●	0	A	0	QAQC3/QAQC4	0.6	▨	FILL: sand, fine, medium dense/loose, dark brown with minor gravel and clay pieces.	MD/L	D	
						0.8	▨	FILL: clay/sandy clay, low plasticity, hard, white/red/brown with rock, brick, gravel and sand fractions.	H	D	
TP18_1.0-1.1	●	0	A	0		1.0 1.2 1.4	▨				
						1.6 1.8	▨	FILL: clay/sandy clay, low plasticity, hard white/red/brown/black with rock, brick, gravel and increased sand fractions.	H	D	
TP18_2.0-2.1	●	0	A	0		2.0 2.2 2.4 2.6 2.8	▨	FILL: clay/sandy clay, medium to high plasticity, stiff, light brown/orange/brown with sandstone pieces,	St	D	
TP18_2.9-3.0	●	0	A	0	QAQC5/QAQC6	3.0	⋯	sandy CLAY/CLAY, medium to high plasticity, very stiff/hard, light brown/orange/grey.	Vst/H	D	
						3.2 3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

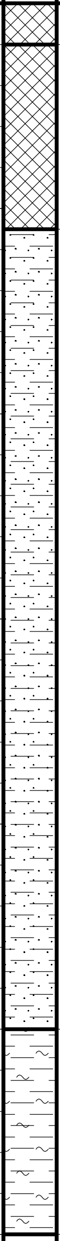
Location ID: TP19

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass/Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 12/7/18 - 12/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS



FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP19_0.0-0.1	●	0	A	0				FILL: gravelly sand, fine, medium dense/loose with fine to medium coarse angular gravel pieces and minor rootlets.	MD/L	D	
TP19_0.0-0.3	●	0	A	0		0.2		FILL: clay/sandy clay, high plasticity, stiff/hard, light orange/brown and grey mottling.	St/H	SL.M	
						0.4					
TP19_0.5-0.6	●	0	A	0		0.6		sandy CLAY/clayey SAND, brown/light brown with gravel, brick and rocks.	C	D	
						0.8		PVC conduit observed			
						1.0					
TP19_1.0-1.1	●	0	A	0							
						1.2					
						1.4					
						1.6		concrete observed at 1.5 mBGL.			
						1.8		large sandstone piece observed at 1.8 mBGL.			
						2.0					
TP19_2.0-2.1	●	0	A	0							
						2.2					
						2.4					
						2.6		silty CLAY/CLAY, medium plasticity, very stiff, brown/green/grey/brown.	Vst	D/SL.M	
TP19_2.7-2.8	●	0	A	0		2.8		plasticity increasing with depth with orange/brown colouration intensifying.			
TP19_2.9-3.0	●	0	A	0		3.0					
						3.2					
						3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP21

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 10/7/18 - 10/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP21_0.0-0.1	●	0	A	0.1				FILL: sand, fine grained, loose/medium dense, brown with gravel and rootlets.	MD	D	
TP21_0.0-0.3	●	0	A	0.1				FILL: clayey sand, fine grained, medium dense, brown with gravel and rootlets.	MD	SL.M	
						0.2		FILL: sand, fine to medium coarse, compact, dark grey with trace plastic.	Co	M	
						0.4		FILL: clayey sand, fine, compact with minor unconsolidated clay and trace plastic	Co	D	
TP21_0.5-0.6	●	0	A	0							
						0.6		sandy CLAY, low to medium plasticity, stiff, light brown, trace orange.	St	SL.M	
								Trace light grey soils observed at 0.7 mBGL.			
						0.8					
								Trace light grey/brown soils observed at 0.9 mBGL.			
						1.0					
TP21_1.0-1.1	●	0	A	0.1							
						1.2					
						1.4					
						1.6					
						1.8					
								Trace light grey/light brown soils and grey/orange mottling observed at 1.9 mBGL. Plasticity increasing.			
						2.0					
TP21_2.0-2.1	●	0	A	0							
						2.2					
								light grey/light brown with minor orange/red mottling observed at 2.3 mBGL. Plasticity increasing.			
						2.4					
								Trace light grey/light brown soils and minor orange/yellow/brown mottling observed at 2.5 mBGL. High Plasticity.			
						2.6					
						2.8					
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP22

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions:	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 10/7/18 - 10/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP22_0.0-0.1	●	0	A	0.1				FILL: sand, fine, medium dense with trace fine variable gravels and rootlets.	MD	D	
TP22_0.0-0.3	●	0	A	0.1		0.2		FILL: clayey sand, fine, medium dense with trace fine variable gravels and rootlets.	MD	D	
								FILL: clayey sand, fine, medium dense with trace fine variable gravels and rootlets.	MD	D	
						0.4		FILL: sand, very fine, compacted, grey	Co	D	
TP22_0.5-0.6	●	0	A	0		0.6		sandy CLAY, medium plasticity, stiff, light brown/trace orange/grey	St	SL.M	
						0.8					
						1.0					
TP22_1.0-1.1	●	0	A	0							
						1.2					
						1.4		sandy CLAY, low to medium plasticity, stiff, light orange/brown/light grey	St	SL.M	
						1.6		sandy CLAY, low to medium plasticity, stiff/very stiff, light grey/light orange/brown with red/orange mottle.	St/Vst	SL.M	
						1.8					
						2.0					
TP22_2.0-2.1	●	0	A	0.1							
						2.2		sandy CLAY, low to medium plasticity, stiff, light grey/light orange/brown with red/orange mottle.	St	SL.M-M	
						2.4					
						2.6					
						2.8					
TP22_2.9-3.0	●	0	A	0.1		3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP23

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 09/07/18 - 09/07/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP23_0.0-0.1	●	0	A	0				FILL: clayey sand, loose/medium dense, brown with rootlets and trace medium coarse/coarse angular gravel.	L/MD	D	
TP23_0.0-0.3	●										
						0.2		FILL: sandy clay, low to medium plasticity, firm, brown/minor grey/black	F/St	SL.M	
								sandy CLAY, low plasticity, firm/stiff, light orange/brown with orange/light grey mottle.	F/St	SL.M	
						0.4					
TP23_0.5-0.6	●	0	A	0							
						0.6		minor red inclusions observed at 0.6 mBGL.			
								hard/very stiff at 0.7 mBGL.	H/Vst		
						0.8					
						1.0					
TP23_1.0-1.1	●	0	A	0							
						1.2		light orange/brown/grey with minor red inclusions observed at 1.1 mBGL.		SL.M	
						1.4					
						1.6					
						1.8					
						2.0					
						2.2		light grey/grey/red mottle observed with trace light orange/brown soil at 2.2 mBGL.			
						2.4					
								grey/red mottle observed at 2.5 mBGL.	St/Vst	SL.M	
						2.6					
								moisture and plasticity increasing up to 2.7 mBGL.			
						2.8					
TP23_2.9-3.0	●	0	A	0				red/maroon trace light orange/brown mottling and an increase in weathered gravel observed at 2.9 mBGL.			
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

Location ID: TP24

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass/Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 10/7/18 - 10/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP24_0.0-0.1	●	0	A	0				FILL: gravelly sand, fine grained, medium dense/dense, brown with fine to coarse angular gravel and bitumen.	MD/D	D	
						0.2		FILL: clayey sand, fine grained, dense, dark brown with trace minor rootlets and trace gravel.	D	SL.M	
								sandy CLAY, low plasticity, very stiff/hard, light brown/brown/orange.	Vst/H	SL.M	
						0.4					
TP24_0.5-0.6	●	0	A	0				sandy CLAY, low plasticity, firm/stiff, light orange/brown/minor orange.	F/St	SL.M	
						0.6					
						0.8					
						1.0		light grey, light brown and minor red soil observed at 1 mBGL.			
						1.2					
								sandy CLAY, low plasticity, very stiff, light orange/brown/minor orange.	Vst	SL.M	
						1.4					
						1.6		grey and red mottle with trace orange/brown observed at 1.6 mBGL. Grey clays increased plasticity when compared to red clays.			
						1.8					
						2.0					
TP24_2.0-2.1	●	0	A	0				red/maroon/trace yellow/brown soils observed between 2.0 to 3.0 mBGL.			
						2.2					
						2.4					
						2.6					
						2.8					
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP25

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 9/7/18 - 9/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP25_0.0-0.1	●	0	A	0.1				FILL: sand, fine grained, loose, light brown with rock, concrete and trace brick pieces.			
TP25_0.0-0.3	●	0	A	1.7				FILL: sand, fine grained, loose/medium dense, dark brown with minor rootlets and gravel. PVC piping observed at 0.15 mBGL.	L/MD	D	
						0.2		FILL: clayey sand, fine grained, loose/medium dense, dark brown with minor rootlets and gravel.	L/MD	D	
						0.4		sandy CLAY, low to medium plasticity, firm/stiff, light brown.	F/St	SL.M	
TP25_0.5-0.6	●	0	A	0.1				sandy CLAY, low to medium plasticity, firm/stiff, light brown/trace orange.	F/St	SL.M	
						0.6					
						0.8		sandy CLAY, low plasticity, hard, light orange/brown with trace grey.	H	D	
						1.0		sandy CLAY, low plasticity, hard, light orange/brown with minor grey.	H	D	
TP25_1.0-1.1	●	0	A	0							
						1.2					
						1.4					
						1.6					
						1.8		sandy CLAY, low plasticity, hard, light grey with minor brown/red	H	D	
						2.0		sandy CLAY, low to medium plasticity, hard, light grey with minor brown/red and trace ferrous weathered rock/gravel.	H	SL.M	
TP25_2.0-2.1	●	0	A	0.1							
						2.2					
						2.4					
						2.6		sandy CLAY, medium to high plasticity, Very stiff/Hard, light grey, red and minor orange/brown.	Vst/H	SL.M	
						2.8					
TP25_2.9-3.0	●	0	A	0.1		3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP26

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 9/7/18 - 9/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP26_0.0-0.1	●	0	A	0.9				FILL: sand, medium coarse, loose/medium dense, brown with rootlets and minor fine angular gravel.	L/MD	SL.M	
								FILL: sand, medium coarse, loose/medium dense, dark brown/black with minor rootlets and minor fine angular gravel.	L/MD	SL.M	
TP26_0.2-0.3	●	0	A	0.5		0.2					
								SAND, fine, loose/medium dense, light grey	L/MD	D	
						0.4		sandy CLAY, low plasticity, stiff/very stiff, orange/ light orange/brown with trace rotten wood.	St/Vst	D	
TP26_0.5-0.6	●	0	A	0.3							
						0.6		sandy CLAY, low plasticity, firm, light grey/light brown/red	F	D/SL.M	
						0.8					
								sandy CLAY, low plasticity, firm, light grey with minor red	F	D/SL.M	
						1.0					
TP26_1.0-1.1	●	0	A	0.2							
						1.2		sandy CLAY, low plasticity, firm, light grey/light brown with minor red	F	D/SL.M	
						1.4					
						1.6		sandy CLAY, low plasticity, stiff/very stiff, light grey with minor red	St/Vst	SL.M	
						1.8					
						2.0					
TP26_2.0-2.1	●	0	A	0.3							
						2.2					
						2.4					
						2.6		sandy CLAY, medium to high plasticity, stiff/very stiff, light grey with minor red and trace orange	Vst	SL.M	
						2.8					
TP26_2.9-3.0	●	0	A	0.3							
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

╳ = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP27

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions:	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 13/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP27_0.0-0.1	●	0	A	0			FILL: sand/gravelly sand, fine, dense, brown with rootlets and angular fine to coarse gravel pieces.	D	D	
TP27_0.2-0.3	●	0	A	0		0.2				
TP27_0.2-0.3	●	0	A	0			FILL: sand, fine, dense, brown/grey with trace clay.	D	Sl.M/M	
						0.4	sandy CLAY, low plasticity, very stiff, light brown/grey and minor orange. Plasticity increasing with depth to medium.	Vst	SL.M	
TP27_0.5-0.6	●	0	A	0		0.6				
						0.8				
						1.0				
TP27_1.0-1.1	●	0	A	0		1.2				
						1.4				
						1.6				
						1.8	sandy CLAY, low to medium plasticity, hard/very stiff, light brown/grey and minor orange/red.	H/Vst	SL.M	
						2.0				
TP27_2.0-2.1	●	0	A	0		2.2				
						2.4	sandy CLAY, low plasticity, hard/very stiff, light brown/grey and minor orange/red. highly weathered sandstone observed at 2.6 mBGL.	H/Vst	SL.M	
						2.6				
						2.8				
TP27_2.9-3.0	●	0	A	0		3.0	sandy CLAY/clayey SAND, fine grained, compact/hard, light grey minor orange/yellow.	Co/H	SL.M	
						3.2				
						3.4				

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP28

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 9/7/18 - 9/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP28_0.0-0.1	●	0	A	0.2				FILL: sand, fine grained, loose, brown, with minor trace angular gravel and trace brick, bitumen/tar	L	D	
TP28_0.0-0.3	●	0	A	2.4				FILL: sand, fine grained, medium dense, brown, with minor trace angular gravel and trace brick/bitumen/tar	MD	D	
						0.2		FILL: clayey sand, fine grained, medium dense, brown/orange and trace rootlets.	MD	D	
								FILL: sand, fine grained, dense, grey/greyish brown.	D	D	
TP28_0.3-0.4	●	0	A	3.8		0.4		FILL: sand, fine grained, compact, dark brown.	Co	D	
								clayey SAND, fine, compact, pale light brown/orange.	Co	D	
TP28_0.5-0.6	●	0	A	0.4		0.6		sandy CLAY, very low plasticity, soft, light pale brown with orange	S	D	
						0.8		sandy CLAY, very low plasticity, soft, light brown with orange/red	S	D	
						1.0					
TP28_1.0-1.1	●	0	A	0.3		1.2		sandy CLAY, low plasticity, hard, light brown with red/grey mottling with minor ferrous weathered rock.	H	D	
						1.4					
						1.6					
						1.8					
						2.0					
						2.2					
						2.4		sandy CLAY, low plasticity, hard, light brown with red/grey mottling and minor weathered sandstone.	H	M	
						2.6					
						2.8					
						3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

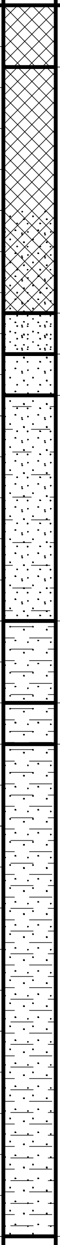
VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP29

Sheet 1 of 1

Project: Southwest Precinct		**Client: Bankstown Airport Limited**	
Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 9/7/18 - 9/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS



FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP29_0.0-0.1	●	0	A	1.2			FILL: clayey sand, fine, medium dense, brown with trace plastic, rock, shale, rootlets and fine to coarse angular gravel.	MD	D	
						0.2	FILL: CLAY, heterogenous, fine, soft, brown brick observed at 0.25 mBGL.	S	SL.M	
						0.4				
TP29_0.5-0.6	●	0	A	1.7		0.6	SAND, fine, compact, white. rootlets observed at 0.65 mBGL.	Co	D	
						0.8	SAND, fine, compact, grey.	Co	D	
TP29_1.0-1.1	●	0	A	1.3		1.0	clayey SAND, fine, compact, light brown/orange/light orange.	Co	D	
						1.2				
						1.4				
TP29_2.0-2.1 TP29_1.5-1.7	●	0 0	A A	2.6 0.0		1.6	sandy CLAY, medium plasticity, firm, light orange/brown and grey mottling,	F	SL.M	
						1.8	sandy CLAY, low plasticity, stiff, light orange/brown and grey mottling,	St	SL.M	
							sandy CLAY, low to medium plasticity, very stiff/hard, light orange/brown and grey/red/orange mottling,	Vst/H	SL.M	
						2.0				
						2.2				
						2.4				
						2.6				
						2.8				
TP29_2.9-3.0	●	0	A	1.9		3.0				
						3.2				
						3.4				

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP30

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Gravel	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 13/7/18 - 13/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP30_0.0-0.1	●	0	A	0				FILL: gravelly sand, fine, very dense, dark brown with minor rootlets.	VD	D	
TP30_0.0-0.3	●	0	A	0		0.2		FILL: sand, fine, compact, brown with trace angular fine gravel.	Co	D	
						0.4		FILL: sand, fine, very dense, yellow minor orange	VD	SL.M	
TP30_0.5-0.6	●	0	A	0		0.6		clayey SAND, fine, very dense/compact, light brown/orange/brown with minor orange	VD/Co	SL.M	
						0.8 1.0		sandy CLAY, low plasticity, very stiff/hard, light brown/orange and minor grey.	Vst/H	SL.M	
TP30_1.0-1.1	●	0	A	0		1.2 1.4 1.6 1.8		sandy CLAY, low plasticity, very stiff/hard, light brown/orange and grey/orange mottle. Transition from sandy CLAY to clayey SAND at 2.3 - 2.4 mBGL.	Vst/H	SL.M	
TP30_2.0-2.1	●	0	A	0		2.0 2.2 2.4					
						2.6		clayey SAND, fine, compact, grey/red with minor to trace orange.	Co	SL.M	
						2.8		SAND, fine, compact, grey/red with minor to trace orange.	C	SL.M	
TP30_2.9-3.0	●	0	A	0		3.0					
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

╳ = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP31

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 7/7/18 - 7/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP31_0.0-0.1	●	0	A	0.1			▨	FILL: sand, fine, medium dense, brown with rootlets and minor fine to medium coarse angular gravel.	MD	D	
							▨	FILL: sand, fine, medium dense, brown with minor rootlets and fine to coarse subangular gravel	MD	D	
						0.2	▨	FILL: sand, very fine, medium dense/dense, light grey.	MD/D	D	
						0.4	▨				
TP31_0.5-0.6	●	0	A	0.1		0.6	▨	FILL: sand, fine, dense/very dense, brown with minor yellow/brown with minor unconsolidated clays.	D/VD	D	
						0.8		sandy CLAY, low plasticity, stiff, grey/brown/red and light orange/brown mottling with minor weathered sandstone.	St	SL.M	
TP31_1.0-1.1	●	0	A	0		1.0					
						1.2					
						1.4		sandy CLAY, low plasticity, stiff, grey/brown/red and grey/red mottling with minor weathered sandstone.	St	SL.M	
						1.6					
						1.8		sandy CLAY, very low plasticity, stiff/very stiff, grey/brown/red and grey/red mottling with minor weathered sandstone.	St/Vst	SL.M/M	
TP31_2.0-2.1	●	0	A	0		2.0					
						2.2					
						2.4					
						2.6					
						2.8					
TP31_2.9-3.0	●	0	A	0		3.0		clayey SAND, fine to medium coarse, compact, grey with red mottling.	Co	M	
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP32

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 16/7/18 - 16/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP32_0.0-0.1	●	0	A	0			TOPSOIL: sand, fine, loose/medium dense, dark brown with sub angular fine to coarse subgravel and rocks.	L/MD	D	
						0.2	SAND, very fine, loose, grey.	L	D	
						0.4	SAND, fine, dense, brown.	D	SL.M	
TP32_0.5-0.6	●	0	A	0		0.6	SAND, fine, compact, yellow.	Co	SL.M	
						0.8	sandy CLAY, very low plasticity, hard, yellow/brown with minor grey/orange mottle.	H	D	
TP32_1.0-1.1	●	0	A	0		1.0 1.2				
						1.4 1.6 1.8	sandy CLAY, very low plasticity, hard, yellow/brown with minor grey/red mottle.	H	D	
TP32_2.0-2.1	●	0	A	0		2.0 2.2 2.4	sandy CLAY, low plasticity, hard, yellow/brown with minor grey/red mottle.	H	D	
						2.6 2.8	sandy CLAY, low plasticity, hard, yellow/brown with minor grey/red mottle. Sand fraction increasing below 2.5 mBGL.	H	SL.M-M	
TP32_2.9-3.0	●	0	A	0		3.0				
						3.2 3.4				

VISUAL RANKING

0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING

A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP33

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 17/7/18 - 17/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP33_0.0-0.1	●	0	A	0				SAND, fine, medium dense, dark brown with rootlets.	MD	D	
						0.2		SAND, very fine, dense, light grey with trace dark grey	D	D	
						0.4		SAND, fine, dense, light grey with minor yellow	D	SL.M	
TP33_0.5-0.6	●	0	A	0		0.6		SAND, fine, dense, light grey with minor yellow/brown yellow.	D	SL.M	
								sandy CLAY, low plasticity, soft, light pale brown with orange.	S	SL.M	
TP33_1.0-1.1	●	0	A	0		0.8 1.0 1.2		sandy CLAY, low plasticity,stiff, light grey minor brown red.	St	SL.M	
TP33_2.0-2.1	●	0	A	0		1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0		sandy CLAY, very low plasticity,stiff/very stiff, red/light grey and orange mottle. Sandstone increasing in soil horizon post 2.0 mBGL.	St/Vst	SL.M	
						3.2 3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP34

Sheet 1 of 1

Project: Southwest Precinct | **Client: Bankstown Airport Limited**

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 17/7/18 - 17/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP34_0.0-0.1	●	0	A	0	QAQC9/QAQC10		FILL: sandy clay, low plasticity, hard, red/brown with minor fine subangular gravel and rootlets.	H	D	
							FILL: sand, fine, medium dense, brown	MD	D/SL.M	
						0.2	FILL: sand, very fine, loose/medium dense, light grey.	VF	D	
						0.4	FILL: sand, fine, loose/medium dense, yellow brown with fine to medium coarse sub rounded/sub angular gravel.	L/MD	D	
TP34_0.5-0.6	●	0	A	0	QAQC11/QAQC12	0.6				
						0.8	clayey SAND/sandy CLAY, very low plasticity, soft-firm/very dense, light pale brown/grey with orange fraction.	S/VD	SL.M	
							sandy CLAY, low plasticity, soft/firm, orange/light orange/brown and grey mottle.	S/F	SL.M	
						1.0				
TP34_1.0-1.1	●	0	A	0						
						1.2	sandy CLAY, low plasticity, soft/firm, orange/light orange/brown and red/grey mottle.	S/F	SL.M	
						1.4	highly weathered sandstone observed from 1.1 mBGL.			
						1.6	sandy CLAY, low plasticity, firm/stiff, minor orange/light orange/brown and red/light grey mottle.	F/St	SL.M	
						1.8	sandy CLAY, low plasticity, stiff/very stiff, minor orange/light orange/brown and red/light grey mottle.	St/Vst	SL.M	
						2.0				
TP34_2.0-2.1	●	0	A	0						
						2.2				
						2.4				
						2.6	sandy CLAY, very low plasticity, stiff/very stiff, minor orange/light orange/brown and red/light grey mottle. Sand fraction increasing at depth.	St/Vst	SL.M	
						2.8	clayey SAND/sandy CLAY, very low plasticity, stiff/very stiff, minor orange/light orange/brown and red/light grey mottle. Sand fraction increasing at depth.	St/Vst	M	
TP34_2.9-3.0	●	0	A	0		3.0				
						3.2				
						3.4				

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP35

Sheet 1 of 1

Project: Southwest Precinct | **Client: Bankstown Airport Limited**

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 17/7/18 - 17/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP35_0.0-0.1	●	0	A	0				FILL: clayey gravelly sand, fine, compact, light brown/dark grey with fine to coarse subangular rock.	Co	D	
								FILL: sand, fine, dense, dark grey	D	D	
						0.2					
						0.4					
TP35_0.5-0.6	●	0	A	0				FILL: sand, fine, compact, yellow/light brown/brown/orange.	D	D	
						0.6					
						0.8					
						1.0					
TP35_1.0-1.1	●	0	A	0				sandy CLAY, low plasticity, firm, brown/orange/light grey with minor light grey/red fraction.	F	D	
						1.2					
								sandy CLAY, low plasticity, firm, brown/orange/light grey with minor light grey/red fraction.	F	SL.M	
						1.4					
								sandy CLAY, low to medium plasticity, firm, brown with grey/red fraction.	F	SL.M	
						1.6					
						1.8					
						2.0					
TP35_2.0-2.1	●	0	A	0							
						2.2					
						2.4					
						2.6					
								Very low plasticity becoming clayey sand at 2.6 mBGL.			
						2.8					
								clayey SAND, fine to medium coarse, compact, grey with minor red.	Co	SL.M	
TP35_2.9-3.1	●	0	A	0		3.0					
						3.2					
						3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP36

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: -	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP36_0.0-0.1	●	0	A	0.1			▨	FILL: sandy silty clay, low plasticity, soft, brown/dark brown with rootlets and minor fine to coarse angular gravel pieces.	S	M	
TP36_0.0-0.3	●	0	A	0.1		0.2	▨				
TP36-ACM_0.0-0.5	●	0	A	0			▨				
						0.4	▨	FILL: sandy silty clay, low plasticity, soft, brown/dark brown with rootlets and minor fine to coarse angular gravel pieces. Increasing sand fraction.	S	M	
TP36_0.5-0.6	●	0	A	0.1		0.6	▨	FILL: sandy silty clay, low plasticity, soft, brown/dark brown with rootlets and minor glass, rubber, plastic tubing and fine to coarse angular gravel pieces. Increasing sand fraction. Hardened black resin noted between 0 - 1 mBGL.	S	M	
						0.8	▨	FILL: sandy silty clay, low plasticity, very soft, dark grey/dark brown with rootlets and minor fine to coarse angular gravel pieces. Increasing sand fraction.	VS	M/VM	
						1.0	▨				
TP36_1.0-1.1	●	1	A	0.2			▨				
						1.2	▨				
						1.4	▨				
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP36_2.0-2.1	●	0	A	0.1			▨				
						2.2	▨				
						2.4	▨				
						2.6	▨				
						2.8	▤	sandy CLAY, low plasticity, firm, grey/orange/brown and red/orange mottle with minor weathered sandstone fraction.	F	M	
TP36_2.9-3.0	●	0	A	0.1	QAQC7/QAQC8	3.0	▤				
						3.2					
						3.4					

VISUAL RANKING	
0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING	
A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)		
VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)		
VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

Location ID: TP37

JACOBS

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 16/7/18 - 16/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP37_0.0-0.1	●	0	A	0.1				FILL: clayey sand/sandy clay, low plasticity/fine, soft/medium dense with fine to medium coarse angular gravel and trace rock/rootlets and brick pieces.	S/MD	SL.M	
TP37_0.0-0.3	●	0	A	0.1							
						0.2					
						0.4		FILL: sandy clay, low plasticity, hard, brown/light brown and grey/red with fine sands.	H	D	
TP37_0.5-0.6	●	0	A	0.1							
						0.6					
								sandy CLAY, low to medium plasticity, stiff, red/orange/grey	St	D/SL.M	
						0.8					
						1.0					
TP37_1.0-1.1	●	0	A	0.1							
						1.2		sandy CLAY, low plasticity, stiff, red/orange/grey	St	D/SL.M	
						1.4					
						1.6					
								sandy CLAY, low plasticity, soft/firm, grey/brown/red/orange with light brown mottle and trace weathered sandstone.	S/F	D/SL.M	
						1.8					
						2.0		sandy CLAY, low plasticity, soft/firm, grey/brown/red/orange with light brown mottle and trace weathered sandstone.	S/F	M/VM	
TP37_2.0-2.1	●	0	A	0							
						2.2					
						2.4					
						2.6					
								sandy CLAY, low plasticity, soft, grey/brown/red/orange with light brown mottle and weathered sandstone.	S/F	W	
						2.8					
TP37_2.9-3.0	●	0	A	0		3.0					
						3.2					
						3.4					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

ENV 1 MODIFIED IA179600 - TEST PIT LOGS.GPJ 29/8/18

Location ID: TP38

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 16/7/18 - 16/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP38_0.0-0.1	●	0	A	0			FILL: clayey sand/sandy clay, fine, dense, brown with rootlets, minor waste, bitumen, glass, plastic and rock pieces.	D	SL.M	
						0.2				
						0.4				
TP38_0.5-0.6	●	0	A	0.1		0.6	sandy CLAY, medium plasticity, stiff/very stiff, grey/brown/red with minor weathered sandstone.	D	SL.M	
						0.8				
						1.0				
TP38_1.0-1.1	●	0	A	0						
						1.2				
						1.4				
						1.6				
						1.8	sandy CLAY, low plasticity, firm, grey/brown/red with grey/light orange/brown mottling and minor weathered sandstone.	F	SL.M	
						2.0				
TP38_2.0-2.1	●	0	A	0						
						2.2				
						2.4				
						2.6	sandy CLAY, low plasticity, soft/firm, grey/brown/red with grey/orange/light brown mottling and minor weathered sandstone.	S/F	M	
						2.8	sandy CLAY, low plasticity, soft/firm, grey/brown/red with grey/orange/light brown mottling and minor weathered sandstone. Sand coarseness increasing with depth.	S/F	M	
						3.0	sandy CLAY, low to medium plasticity, soft, grey with might light orange/brown mottling. Sand fraction observed as medium coarse. Groundwater/Pooled water observed at 3.0 mBGL.	S	W	
TP38_3.1-3.2	●	0	A	0		3.2				
						3.4				

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP39

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 16/7/18 - 16/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION			COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/density	moisture condition	drilling method, well construction, water and additional observations
TP39_0.0-0.1	●	0	A	0.1			FILL: clayey sand, fine grained, dense, brown/dark brown with rootlets, gravel and minor waste including brick, tile, plastic and wooden materials.	D	D/SL.M	
TP39_0.0-0.3	●	0	A	0		0.2				
						0.4				
TP39_0.5-0.6	●	0	A	0		0.6				
						0.8				
							FILL: clayey sand, fine grained, dense, dark grey with rootlets, gravel and minor waste including brick, tile, plastic and wooden materials.	D	SL.M	
						1.0				
TP39_1.0-1.1	●	0	A	0						
						1.2				
						1.4				
							FILL: silty sandy clay, low to high plasticity, soft, dark grey with rootlets and minor gravel, rock and trace plastic, tile, brick and rock. Clay plasticity increasing with depth.	S	SL/M	
						1.6				
						1.8				
						2.0				
TP39_2.0-2.1	●	0	A	0						
						2.2				
						2.4				
						2.6				
						2.8				
						3.0				
TP39_3.0-3.1	●	0	A	0			sandy CLAY, high plasticity, soft, grey with light orange/grey/orange mottling.	S	VM/W	
						3.2				
						3.4				

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

Location ID: TP40

Sheet 1 of 1

Project: Southwest Precinct

Client: Bankstown Airport Limited

Location: Bankstown, NSW	Bore dia: 0.5	Surface Conditions: Grass	RL (mAHD):
Job No: IA179600	Driller: Rockwell Drilling Services	Northings: mN	Logged: SD
Start - Finish Date: 16/7/18 - 16/7/18	Rig: 5 Tonne Excavator	Eastings: mE	Checked: MS

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP40_0.0-0.1	●	0	A	0			▨	FILL: clayey sand, fine grained, dense, brown with gravel and minor waste including glass, plastic, rock and clay pieces.	D	D	
TP40_0.0-0.3	●	0	A	0		0.2	▨				
						0.4	▨				
TP40_0.5-0.6	●	0	A	0		0.6	▨				
							▨	FILL: clayey sand/sandy clay, fine grained/low plasticity, dense/very dense/very stiff, brown with minor brick, concrete, bitumen and gravel.	D/VD/Vst	D	
						0.8	▨				
						1.0	▨				
TP40_1.0-1.1	●	0	A	0			▨				
						1.2	▨	FILL: sandy clay, low to high plasticity, soft, greenish brown/dark brown with minor gravel, rock and trace waste including glass, tile and brick. clayey sands observed through-out soil horizon.	S	SL.M/M	
						1.4	▨				
						1.6	▨				
						1.8	▨				
						2.0	▨				
TP40_2.0-2.1	●	0	A	0			▨				
						2.2	▨				
						2.4	▨				
						2.6	▨	large shale boulder observed at 2.5 mBGL.			
						2.8	▨				
TP40_2.9-3.0	●	0	A	0		3.0	▨				
						3.2					
						3.4					

VISUAL RANKING

0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING

A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)

QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample

× = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet

Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

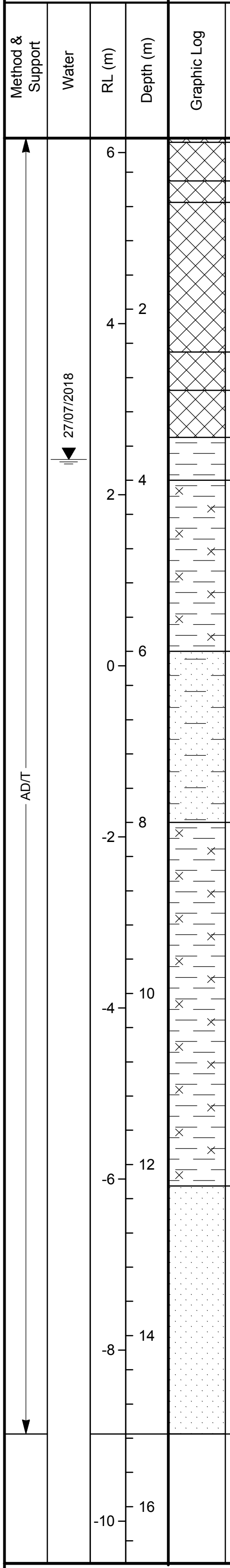
Piezometer Installation Details

BH07

Project:	South West Precinct - Bankstown Airport			**Page:**	1 of 1
Client:	Bankstown Airport Limited	**Location:**	Bankstown Airport South West Precinct	**Project No:**	IA179600

Contractor:	Rockwell Drilling	**Easting:**	314162.9	**Elevation:**	6.17	**Started:**	17/07/2018
Plant:	Hanjin D&B-D80	**Northing:**	6244166.9	**Datum:**	AHD	**Finished:**	17/07/2018
Logged by:	BR **Checked by:** MF	**Grid:**	MGA94 Zone 56	**Inclination:**	-90°	**Orientation:**	

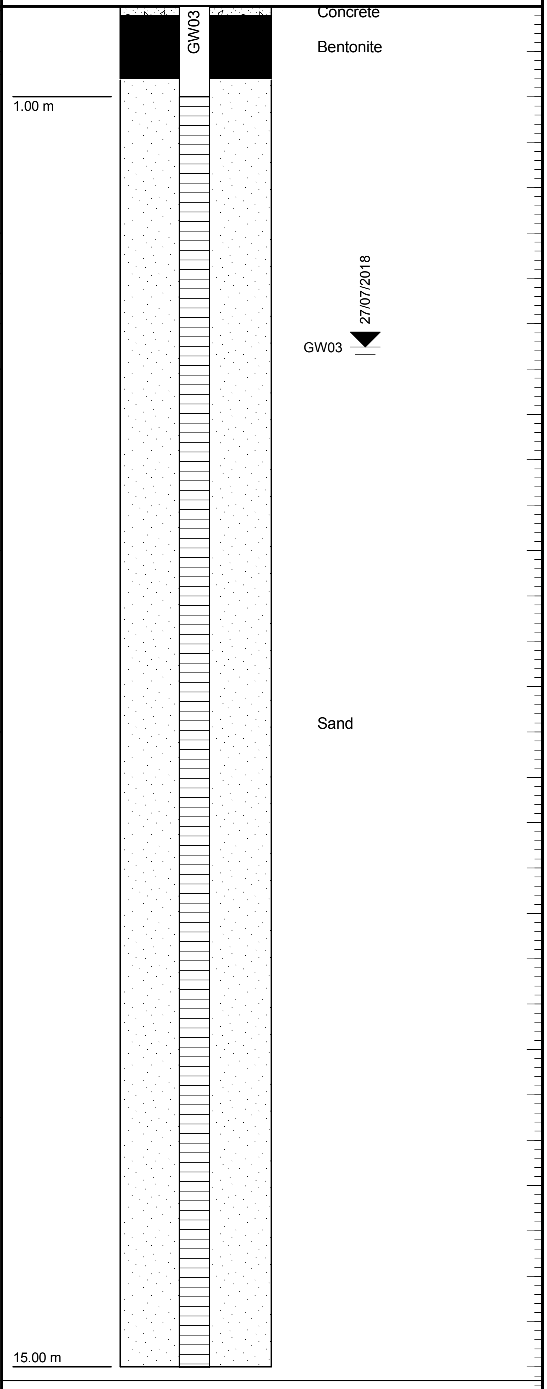
DRILLING / MATERIAL SUBSTANCE



Description of Strata ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, major defect type)
FILL: Silty GRAVEL: medium grained, subangular, dark brown (igenous rock).
FILL: Silty CLAY: high plasticity, pale grey.
FILL: Clayey GRAVEL: medium grained, angular, dark brown (igneous rock).
FILL: Clayey SAND: fine to medium grained, dark brown, trace of medium grained, angular, igneous rock gravel.
FILL: CLAY: high plasticity, pale brown.
FILL: Clayey SAND: fine to medium grained, yellow and dark brown, trace of medium grained, angular, igneous rock gravel.
CLAY: high plasticity, pale grey and red brown.
Silty CLAY: medium to high plasticity, pale grey and yellow brown
Clayey SAND: fine to medium grained, pale grey and pale brown
Silty CLAY: medium to high plasticity, pale grey and yellow brown 10.00m: with some fine grained sand
SAND: fine to medium grained, pale brown, with some clay.
Hole Terminated at 15.15 m Target depth. Elevation surveyed.

INSTALLATION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL
GW03	Standpipe Piezometer		15.00 m -8.83 m



DRILLING

NMLC	NMLC Coring	HQ	HQ Coring	TCR	% core run recovered
NQ	NQ Coring	PQ	PQ Coring	RQD	% core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS

▼ = Water level (static) ▽ = Water level (during drilling)

Piezometer Installation Details

BH09

Project:	South West Precinct - Bankstown Airport			**Page:**	1 of 1
Client:	Bankstown Airport Limited	**Location:**	Bankstown Airport South West Precinct	**Project No:**	IA179600

Contractor:	Rockwell Drilling	**Easting:**	313859.1	**Elevation:**	5.97	**Started:**	13/07/2018
Plant:	Hanjin D&B-D80	**Northing:**	6244197.2	**Datum:**	AHD	**Finished:**	13/07/2018
Logged by:	PH **Checked by:** MF	**Grid:**	MGA94 Zone 56	**Inclination:**	-90°	**Orientation:**	

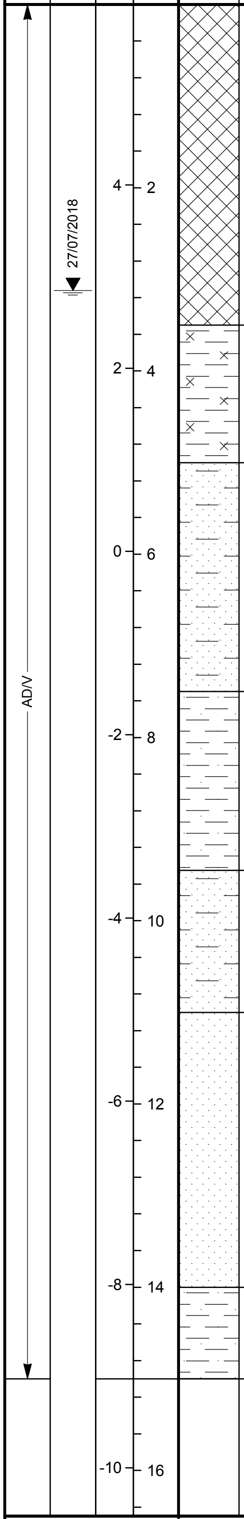
DRILLING — MATERIAL SUBSTANCE — INSTALLATION DETAILS

Method & Support | Water | RL (m) | Depth (m) | Graphic Log

Description of Strata

ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, major defect type)

ID	Type	Stick Up & RL	Tip Depth & RL
GW01	Standpipe Piezometer		10.00 m -4.03 m



FILL: Sandy CLAY: medium plasticity, grey, yellow and brown, sand is fine to medium grained, with some fine to medium grained subangular gravel (iron oxide nodules, concrete, sandstone, siltstone and volcanic rock).

Silty CLAY: high plasticity, grey mottled yellow-brown.

Sandy CLAY/Clayey SAND: low plasticity, medium grained, yellow-brown, grey and red-brown.

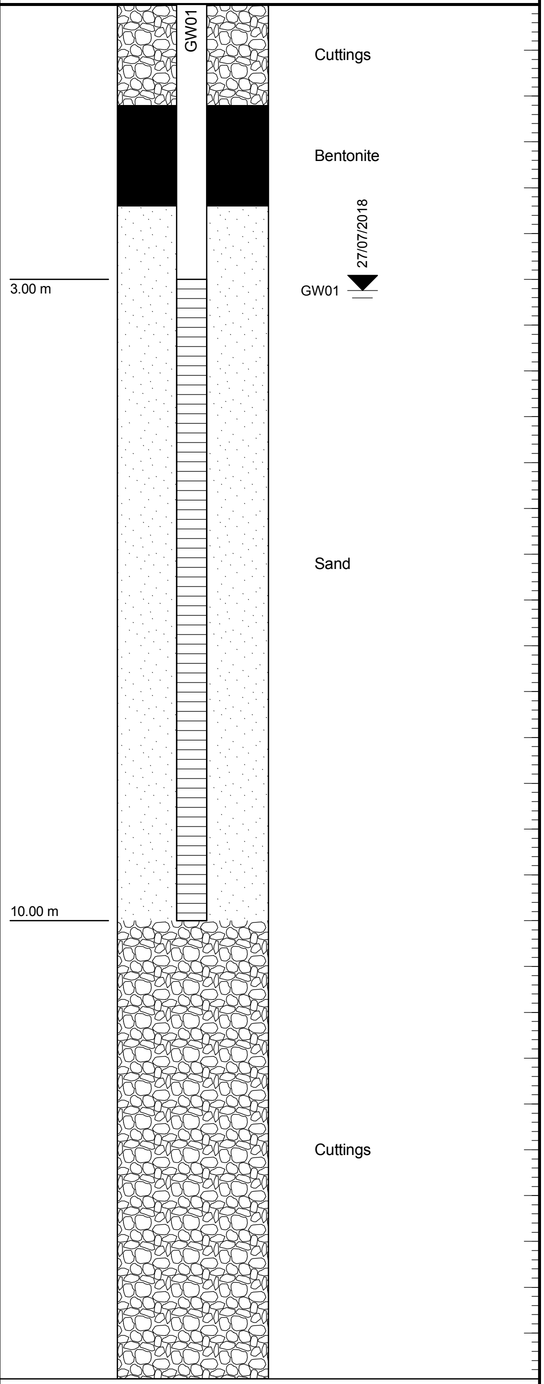
Sandy CLAY: low plasticity, yellow-brown, sand is medium grained.

Clayey SAND: medium grained, grey and yellow-brown.

SAND: fine to medium grained, orange-brown, with some fines.

Sandy CLAY: low plasticity, orange-brown, sand is fine to medium grained.

Hole Terminated at 15.00 m
Target depth. Reduced Level estimated from survey drawing.



DRILLING

NMLC	NMLC Coring	HQ	HQ Coring	TCR	% core run recovered
NQ	NQ Coring	PQ	PQ Coring	RQD	% core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS

▼ = Water level (static) ▽ = Water level (during drilling)

Piezometer Installation Details

GW02

Project:	South West Precinct - Bankstown Airport			**Page:**	1 of 1
Client:	Bankstown Airport Limited	**Location:**	Bankstown Airport South West Precinct	**Project No:**	IA179600

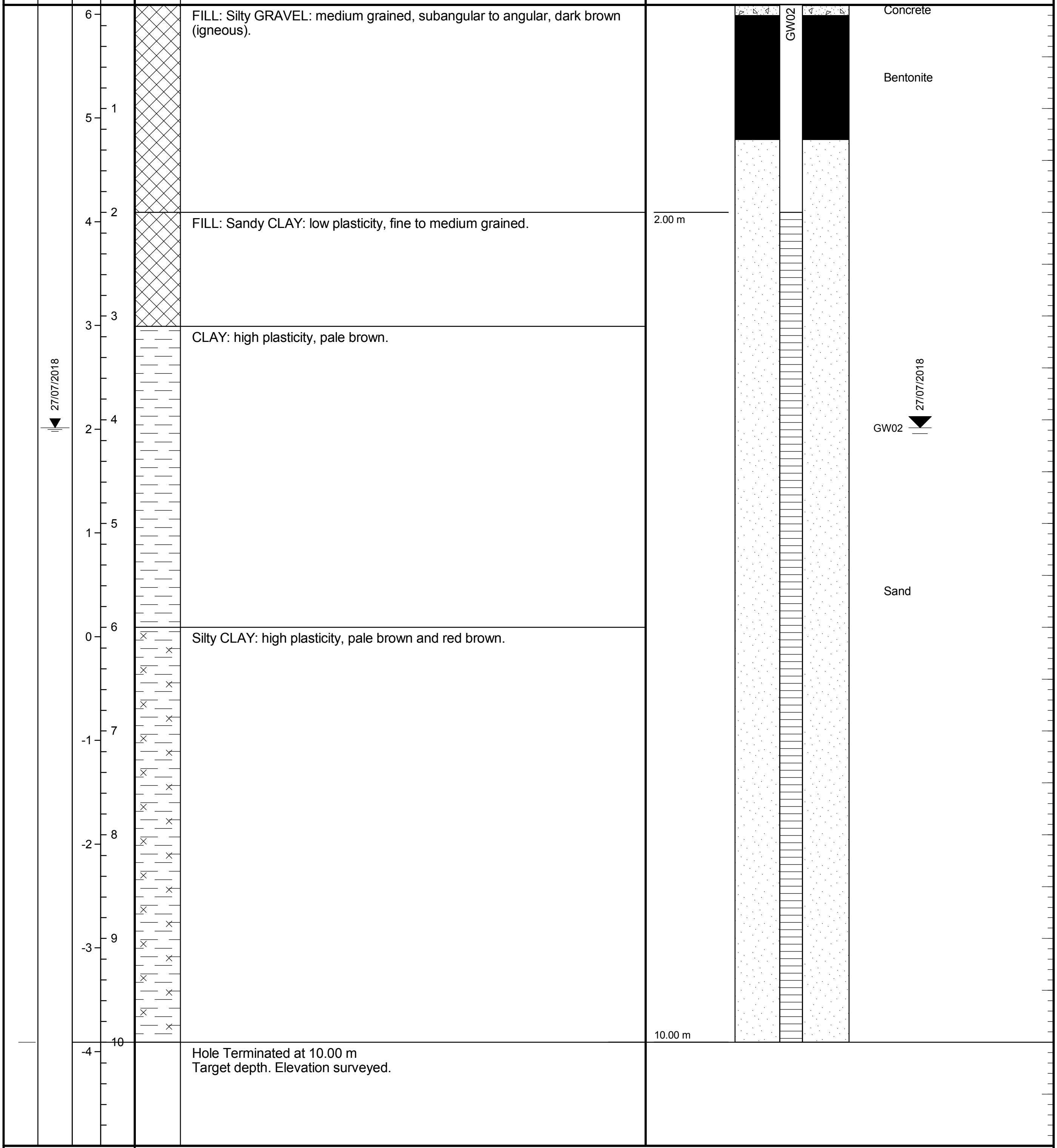
Contractor:	Rockwell Drilling	**Easting:**	314065.0	**Elevation:**	6.09	**Started:**	16/07/2018
Plant:	Hanjin D&B-D80	**Northing:**	6244078.0	**Datum:**	AHD	**Finished:**	16/07/2018
Logged by:	BR **Checked by:** MF	**Grid:**	MGA94 Zone 56	**Inclination:**	-90°	**Orientation:**	

DRILLING | MATERIAL SUBSTANCE | INSTALLATION DETAILS

Description of Strata

ROCK TYPE : Colour, Grain size, Structure
(texture, fabric, mineral composition, hardness
alteration, cementation, major defect type)

ID	Type	Stick Up & RL	Tip Depth & RL
GW02	Standpipe Piezometer		10.00 m -3.91 m



FILL: Silty GRAVEL: medium grained, subangular to angular, dark brown (igneous).

FILL: Sandy CLAY: low plasticity, fine to medium grained.

CLAY: high plasticity, pale brown.

Silty CLAY: high plasticity, pale brown and red brown.

Hole Terminated at 10.00 m
Target depth. Elevation surveyed.

DRILLING

NMLC	NMLC Coring	HQ	HQ Coring	TCR	% core run recovered
NQ	NQ Coring	PQ	PQ Coring	RQD	% core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS

▼ = Water level (static) ▽ = Water level (during drilling)

Piezometer Installation Details

GW04

Project:	South West Precinct - Bankstown Airport			**Page:**	1 of 1
Client:	Bankstown Airport Limited	**Location:**	Bankstown Airport South West Precinct	**Project No:**	IA179600

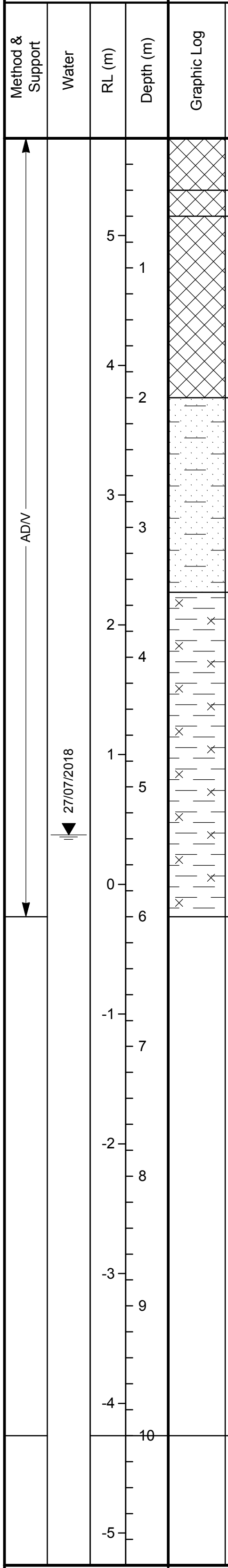
Contractor:	Rockwell Drilling	**Easting:**	313488.8	**Elevation:**	5.75	**Started:**	10/07/2018
Plant:	Hanjin D&B-D80	**Northing:**	6244200.0	**Datum:**	AHD	**Finished:**	10/07/2018
Logged by:	PH **Checked by:** MF	**Grid:**	MGA94 Zone 56	**Inclination:**	-90°	**Orientation:**	

DRILLING

MATERIAL SUBSTANCE

Description of Strata

ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, major defect type)



FILL: SAND: medium grained, grey and yellow-brown, trace of silt.

FILL: Sandy CLAY: low plasticity, mottled grey and orange, sand is fine to medium grained.

FILL: Silty CLAY: medium plasticity, mottled grey, red and orange, with some fine grained sand and fine grained subangular gravel (iron oxide nodules)

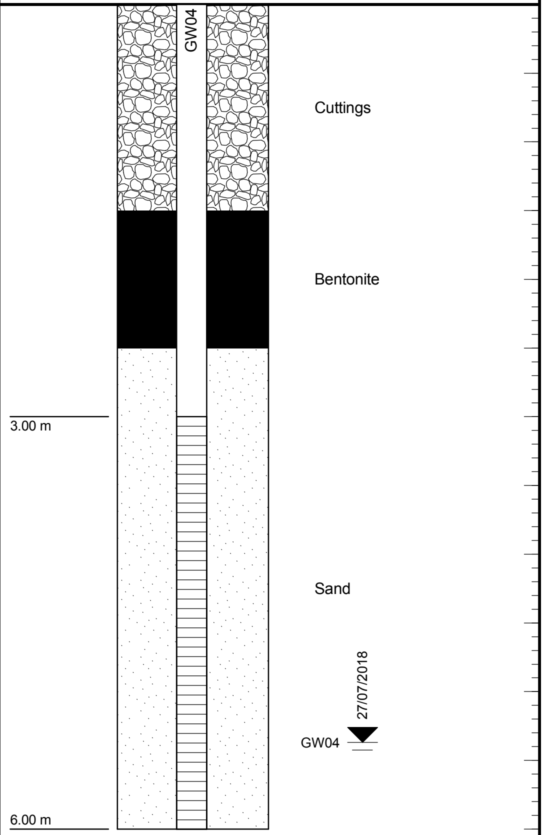
Clayey SAND/Sandy CLAY: fine to medium grained, low plasticity, mottled grey, red and orange

Silty CLAY: medium to high plasticity, mottled grey and red, trace of fine grained subangular gravel (iron oxide nodules)

Hole Terminated at 10.00 m
Target depth. Elevation surveyed.

INSTALLATION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL
GW04	Standpipe Piezometer		6.00 m -0.25 m



DRILLING

NMLC	NMLC Coring	HQ	HQ Coring	TCR	% core run recovered
NQ	NQ Coring	PQ	PQ Coring	RQD	% core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS

▼ = Water level (static)

▽ = Water level (during drilling)

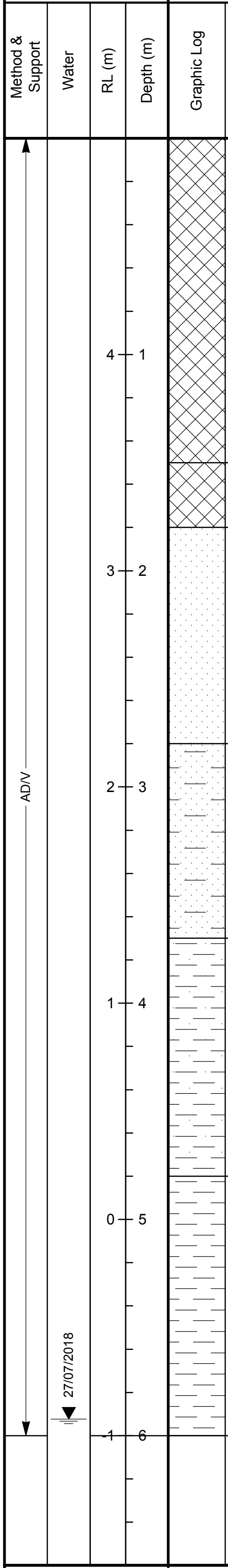
JACOBS Piezometer Installation Details

GW05

Project:	South West Precinct - Bankstown Airport			**Page:**	1 of 1
Client:	Bankstown Airport Limited	**Location:**	Bankstown Airport South West Precinct	**Project No:**	IA179600

Contractor:	Rockwell Drilling	**Easting:**	313316.7	**Elevation:**	5.00	**Started:**	20/07/2018
Plant:	Hanjin D&B-D80	**Northing:**	6244151.0	**Datum:**	AHD	**Finished:**	20/07/2018
Logged by:	BR **Checked by:** MF	**Grid:**	MGA94 Zone 56	**Inclination:**	-90°	**Orientation:**	

DRILLING | MATERIAL SUBSTANCE | INSTALLATION DETAILS



Description of Strata

ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, major defect type)

FILL: CLAY: medium to high plasticity, brown and red-brown.

FILL: Silty CLAY: high plasticity, grey.

SAND: fine grained, grey with some clay.

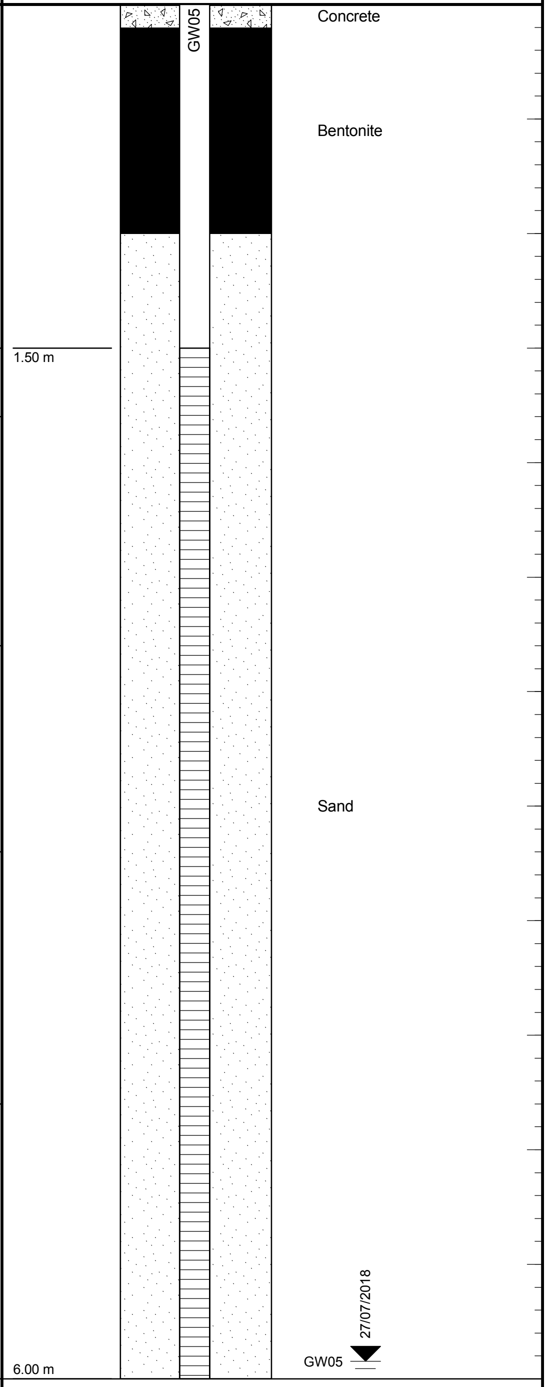
Clayey SAND: fine to medium grained.

Sandy CLAY: low plasticity, grey.

CLAY: high plasticity, grey, trace of fine grained sand and silt.

Hole Terminated at 6.00 m
Target depth. Elevation surveyed.

ID	Type	Stick Up & RL	Tip Depth & RL
GW05	Standpipe Piezometer		6.00 m -1.00 m



DRILLING

NMLC NMLC Coring
NQ NQ Coring
HQ HQ Coring
PQ PQ Coring
TCR % core run recovered
RQD % core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

Appendix C – Groundwater Field Data Sheets

O.

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : GW01

JACOBS

Project No : 1A179600 **Project Name :** SWP

Gauging

Date : 23.7.18
Performed By : S.D
Gauging Method : IM - Sinalst
Well Diameter : 50mm
Time : 11:49
Bore Depth : 8.780
LNAPL Present : Y / [✓ N]
SWL : 3.089
Depth to LNAPL :
(If yes, thickness) :
Comments : Bottom silted - well installed to ~15m.
DNAPL Present : Y / [✓ N]
(If yes, thickness) :
Maintainance required :
Visual confirmation with bailer : Y / [✓ N]
Photo Number :

Purging / Development

Date : 23.7.18
Performed By : S.D/KM
Well Diameter : 50mm
Purge Method : IM - Solinst
Time Started :
SWL (start) :
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
Discharge Rate :
Bore Depth (end) :
Comments :
NAPL Present : Y / N
(If yes, thickness) :

24.7.18
SWL - 3.121
B.D - 8.780

Sampling

Date :
Performed By :
Well Diameter :
Sampling Method :
Time Started :
Sampling Depth :
Time Stopped :
SWL (start) :
Tubing Type :
SWL (end) :
Comments :

Duplicate Sample Collected? Y / N
Duplicate Sample ID :

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen ~~(ppm)~~ %	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
12:18	5	10557	6.42	19.9	85.8	15.2	1.33	/	Brown, turbid N.O
12:21	11	12149	6.17	20.7	49.9	18.9	1.62	/	" "
12:25	18	121922	6.13	20.8	37.6	33.4	2.84	/	" "
12:40	~33	14337	6.06	20.9	36.7	32.7	2.78	/	
1:41	~56	17016	5.84	21.2°	43.1	5.3	0.46	—	
8 53	126L 176	15698	5.88	20.1	81.0	37	3.05	—	
9:14	246	17568	5.85	20.4	54.2	59.1	5.03		
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

SWL
4.762
9.744

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
8.780 m (-) 3.089 (=) 5.691

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
5.4691 (X) 1.96 (=) 11.15 L

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : GW02

JACOBS

Project No : 1A17900
Project Name : SWP

Gauging

Date : 23.7.18
Performed By : SD
Gauging Method : 1M - Smalz.
Well Diameter : 50mm
Time : 2:40
Bore Depth : 9.477
LNAPL Present : Y / [✓ N]
SWL : 4.043
Depth to LNAPL : –
(If yes, thickness) :
Comments :
DNAPL Present : Y / [✓ N]
(If yes, thickness) :
Maintainance required :
Visual confirmation with bailer : Y / [✓ N]
Photo Number :

Purging / Development

Date : 23.7.18
Performed By : S.D
Well Diameter : 50mm
Purge Method : 1M smalfs.
Time Started : 2:48
SWL (start) :
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
Discharge Rate :
Bore Depth (end) :
Comments :
NAPL Present : Y / N
(If yes, thickness) :

Sampling

Date :
Performed By :
Well Diameter :
Sampling Method :
Time Started :
Sampling Depth :
Time Stopped :
SWL (start) :
Tubing Type :
SWL (end) :
Comments :

Duplicate Sample Collected? Y / N
Duplicate Sample ID :

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen ~~(ppm)~~	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
3:00	10L	25.82	6.54	21.9	97.9	24.3	1.96	–	N
3:22	20L	27.65	6.40	21.1	76.2	22.5	1.80	–	N
3:34	30L	27.56	6.44	21.1	76.2	36.6	2.92	–	N
3:43	40L	27.83	6.42	21.0	78.0	35.6	2.81	–	N
10:00	180	25754	6.28	21.6	78.4	11.7	0.83	–	water clearing to cloudy
10:16	280	26668	6.33	21.7	74.5	18.4	1.44		Cloudy to Sl. Cloudy
10:24	340	26692	6.30	21.7	70.3	11.7	6.94		
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

24/7

SWL
5.700
9.200

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
9.477 m (-) 4.043 (=) 5.434

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
5.434 (X) 1.96 (=) 10.65 L

10.65
~ 33L to remove.

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : GW03 **JACOBS**

Project No : IA179600 **Project Name :** SWP

Gauging

Date : 23.7.18 Performed By : SD
Gauging Method : IM Sinalst Well Diameter : mw
Time : Bore Depth : 13.724 LNAPL Present : Y / [✓ N]
SWL : 3.7 IM Sinalst Depth to LNAPL : — (If yes, thickness) :
Comments : S.W.L was not working when developing DNAPL Present : Y / [✓ N]
(If yes, thickness) :
Maintainance required : Visual confirmation with bailer : Y / [✓ N]
Photo Number :

Purging / Development

Date : 23.7.18 Performed By : SD Well Diameter : 50mm
Purge Method : v Bailer
Time Started : SWL (start) : Volume Removed : Bore Depth (start) :
Time Stopped : SWL (end) : Discharge Rate : Bore Depth (end) :
Comments : Smalst did not work. NAPL Present : Y / N
(If yes, thickness) :

3.699.

Sampling

Date : Performed By : Well Diameter :
Sampling Method :
Time Started : Sampling Depth :
Time Stopped : SWL (start) :
Tubing Type : SWL (end) :
Comments :

Duplicate Sample Collected? Y / N Duplicate Sample ID :

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
	30 L	23385	6.5	20.1	29.1	16.1	1.31	—	
~2Lmin alp	80L	24340	6.27	21.4	7.5	16.2	1.29	—	
	90L	25821	6.27	21.2	10.7	19.1	2.32	—	
	166L	26245	6.24	21.3	24.9	28.6	1.85	—	now cloudy
	230L	26589	6.19	21.3	39.3	15.5	1.24	—	—
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

whale pump

not turbid.
next day
SWL 3.699
B.D - 14.224

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
13.724 m (-) 3.700 (=) 10.024

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
10.024 (X) 1.96 (=) 19.64 L

59L to remove

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : GW07 **JACOBS**

Project No : IA179600 **Project Name :** SUP

Gauging

Date : 23.7.18 Performed By : SD / KM.
Gauging Method : RE IM – Solinst Well Diameter :
Time : 10:45 Bore Depth : 5.888 LNAPL Present : Y / [✓ N]
SWL : 4.807 Depth to LNAPL : (If yes, thickness) :
Comments : DNAPL Present : Y / [✓ N]
(If yes, thickness) :
Maintainance required : Visual confirmation with bailer : Y / [✓ N]
Photo Number :

Purging / Development

Date : 23 7.18 Performed By : KM/SO Well Diameter : 50
Purge Method : Bailer
Time Started : 10.55 SWL (start) : 4.807 Volume Removed : Bore Depth (start) : 5.888
Time Stopped : SWL (end) : Discharge Rate : Bore Depth (end) :
Comments : Going dry after ~3L. 5.745. Slow recharge. Left to recharge @ 2.7Litres only ~3L removed. NAPL Present : Y / N
(If yes, thickness) :

24.7.18
depth to water
5.580
Post
Swl
5.765

Sampling

Date : Performed By : Well Diameter :
Sampling Method :
Time Started : Sampling Depth :
Time Stopped : SWL (start) :
Tubing Type : SWL (end) :
Comments :

Duplicate Sample Collected? Y / N Duplicate Sample ID :

Field Analyses

	Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen % ~~(ppm)~~	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
	11 02	2.5	5058	6.15	19.1	164.9	61.6	5.60	—	Light brown Cloudy. N.O
24.7.18	8:22	~350 ~750ml	6008	5.96	18.8	124.6	57	5.36	—	" .
	Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations								
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

5.888
4.807
1.081

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
m (-) (=) 1.081.

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
1.081 (X) 1.96 (=) 2.1187L

WBS 1

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : GW05

JACOBS

Project No : 1A179600

Project Name : SWP

Gauging

Date : 23.7.18
Performed By : SD & KM
Gauging Method : IM - Solinst.
Well Diameter : 50
Time : 10:19 AM.
Bore Depth : 5.917
LNAPL Present : Y / [✓ N]
SWL : N/A
Depth to LNAPL :
(If yes, thickness) :
Comments : No water in well.
DNAPL Present : Y / [✓ N]
(If yes, thickness) :
Maintainance required :
Visual confirmation with bailer : Y / [✓ N]
Photo Number :

Purging / Development

Date :
Performed By :
Well Diameter :
Purge Method :
Time Started :
SWL (start) :
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
Discharge Rate :
Bore Depth (end) :
Comments :
NAPL Present : Y / N
(If yes, thickness) :

Sampling

Date :
Performed By :
Well Diameter :
Sampling Method :
Time Started :
Sampling Depth :
Time Stopped :
SWL (start) :
Tubing Type :
SWL (end) :
Comments :

Duplicate Sample Collected? Y / N
Duplicate Sample ID :

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
________ m (-) ________ (=) ________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
________ (X) ________ (=) ________ L

Well samping / [illegible] D

GW01

PN: 1A179600 Project : SWP

Date : 27.7.18 Performed by S.D

Time : 830AM

50mm : WD

Gauging method : IM S [illegible].

SWL : 3.121

BD : 9.734

TD - WL = WC

9.734 - 3.121 = 6.6.13

6.613 × 1.96 = 12.96L per well volume.

PID peak reading 7.4. @ first reading, -

Stable ~ 2.1 - 2.2 - 2.5 (3-4 mins

~~SAMP~~ SAMPLING + PURGING

SWL 3.093

TIME	VOLUME	EC	PH	TEMP	ORP MV REDOX	DO %	Mg	SWL	Co
12:51	800ml	19337	5.85	21.0		6.2	0.51	3.125	de
	-1L	18874	5.78	20.9	28.2	12.3	1.04	3.140 1L	de
12:58	2L	18709	5.73	20.9	34.5	12.0	0.99		de
1:01	3L	18654	5.72	20.8	38.0	11.6	0.98	3.157	de
								3.168	
1:05	4L			20.8	39.2	12.0	0.99	getting again darker	de
1:10	5L	18593	5.73						

Sampled.

beep @ 3.172 when kept

complete.

Well Sampling / PID

GW02

PN: 1A119600

27.7.18

PN: SWP
Performed by S.D

Gauging.
Time 8:50AM
IM Sinalst
SWL: 4.077
BD: 10.218

- 50mm Diameter

- PID setup.
- reading appeared as 0.0 then 0.1 then 0 for 2-3 mins - appears that tubing may be loose. - attempted to check fuel for shine but no reading.

GAUGING + SAMPLING + PURGING

TIME	VOLUME ~~[illegible]~~	~~PH~~ ~~RH~~ EC	PH	TEMP	ORP mV REDOX	% DO	Mg/L	SWL
11:49	1L	26300	6.28	21.0	7.8	5.1	0.41	~~5.920~~
11:59	3L	26614	6.25	21.0	0.2	5.1	0.41	4.083
12:04	4L	26738	6.24	21.1	-0.2	5.1	0.41	4.0.9
12:09	5.3L	26795	6.24	21.1	-0.4	5.0	0.40	4.097
12:44	6.0L-6.2L	26784	6.24	21.0	-0.5	4.9	0.39	

sampled.

bat[illegible]y
does n
work prop
SWL = ~~0~~0.0

when
keeping
stand.
checked
repeatedly
sampled.

Comments
~~swl~~ Sinalst appears to be glitchy — ok at 12:10
retrying P.I.D reading
P.I.D recheck
P.I.D peak 1.7PPM.
subsequent 2 mins peak @ 1.1PPM.

GW02

SAMPLING
GAUGING

27. 7.18

GW03

PN : 1A179600
TIME 9:25
SWL : 3.758
BD : 14.212

Project : SWP
IM Sinclair St - Gauging.
Performed by S.D

[illegible]

PID : 1MIN : 0.5
2MIN : 0.4
: Foil cone loose test inside well head
0.2.

conversion factor

14.21.2 - 3.758 = 10.454 x 1.96 = 20.4L.

WQM.
tubing ~ 8M.

Comms	TIME	VOLUME(L)	EC 3%	PH +/- 0.05	TEMP +/-	REDOX +/- 10%	DO %	DO mg/L	SWL
	10:39	500ml.	25368	6.26	20.8	-86.5	5.5	0.45	3.762
slightly cloudy.			26140 ✓	6.24 ✓	20.16	-105.4	4.3 ✓	0.5	3.773 ✓
slightly cloudy	10:44	1.5L	26690 ✓	6.24 ✓	20.3	-116.8 ✓	4.2 ✓	0.34 ✓	3.760 ✓
slightly " + organic odour	10:49	3L	26864 ✓	6.24 ✓	20.3	-122.3 ✓	4.7 ✓	0.38 ✓	3.760 ✓
" -	10:54	4.1L	26321 ✓	6.24	20.3	-124.7	4.9 ✓	0.40 ✓	3.760
"	10:57.	5.1L							sampled.

START TIME : 10:39
SWL start : 3.762
END : 3.762.
SAMPLED : QAQC1, QAQ2, GW03

QAQC1, QAQC2

~~Well development~~ Well sampling. / PID

GW04

PN : WARRING NONG IA179600 PN : SWP

27·7·18 Performed by : SD [redacted]

Gauging.
Time 8AM - 50mm. well diameter
IM smalst - method.
SWL - 5.369.
BD - 5.889.

conversion factor
↓

Total well depth - WL = WC

×1.96

5.889 - 5.369. = 0.520 - 52cm. = 1L

PID : 1.1 peak - realised 0.6 also. again.
average 0.3 - 0.6

Sampling

Bailer sample

---

1 set of parameters

20°C
61.2 DO %
5.42 ~~%~~ mg/L
3.93 SPC
3566 ec
6.01 PH
92.4 ORP

very little to check after sampling

bailed dry with no water left in well.

Well purging/sampling   GW05

25.7.18 GW05 - ~7:45AM.

Gauging

SWL : 5.875

BD : 5.923 - too little to sample. 5cm of water

↓ bailer would not collect.

purging & development - not undertaken.

PID : 0.0 - when opening well lid.

0.047 × 1.96 = 0.09 L ~ 90ml.

LNAPL-DNAPL bailer test - N

PID reading 6.5 peak PPM, stable at 0.9 PPM

-0.8PPM falling slowly ↓.

Appendix D – Calibration Certificate

ThermoFisher
SCIENTIFIC

The world leader
in serving science

RENTALS

Equipment Certification Report – Isobutylene

Isobutylene for Minirae PID 2000/3000/Lite:

Bottle Size: 34 L

Current Capacity: 250 PSI

Capacity on return: __________ PSI

Lot #: 168524 Cyl 179

Exp Date: DEC, 2018

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Return	Item
☑	☐	Isobutylene bottle
☑	☐	Regulator (ID: __________) REG713SE
☑	☐	Tubing
☑	☐	Carry Case

Date: 29/06/2018

Signed:

TFS Reference	CS009087	Return Date: / /	
Customer Reference		Return Time:	
Equipment ID	REG713SE	Condition on return:	
Equipment Serial No.			

"We do more than give you great equipment… We give you great solutions!"

ThermoFisher SCIENTIFIC

The world leader
in serving science

RENTALS

Equipment Report - MiniRAE 3000 PID

This Gas Meter has been performance checked and calibrated as follows:

Lamp	Compound	Concentration	Zero	Span	Traceability Lot #	Pass?
10.6 eV	Isobutylene	100 ppm	0.0 ppm	100.0 ppm	389261	☑

Alarm Limits

High	100 ppm
Low	50 ppm

Bump Test

Date	Target Gas	Reading	Pass?
29/06/2018	100.0 ppm	100.2 ppm	☑

☑ Battery Status ____100%___________
☑ 10 minutes test complete
☑ Spare battery status (Min 5.5 volts)
☑ Electrical Safety Tag attached (AS/NZS 3760)

☑ Performance check (pump, lamp, sensor)
☑ Data cleared
☑ Filters checked

Tag No: 000209

Valid to: 11/08/2018

Date: 29/06/2018

Signed:

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☑	☐	MiniRAE 2000 PID / Operational Check / Battery Status ___100%______
☑	☐	Lamp _10.6 eV, Compound Set to: isobutylene_ C/factor: ____1______
☑	☐	Protective yellow rubber boot
☑	☐	Inlet probe (attached to PID)
☑	☐	Spare water trap filter(s) Qty ____2____ +2
☑	☐	Charger 240V to 12V1250mA
☑	☐	Cradle and Travel Charger
☑	☐	Instruction Manual behind foam on the lid of case ¨
☑	☐	Quick Guide Sheet behind foam on the lid of case ¨
☑	☐	Spare Alkaline Battery Compartment with batteries
☑	☐	Inline Moisture trap Filter Guide Laminated
☑	☐	Calibration regulator & tubing (optional)
☐	☐	Data cable and Software CD (optional)
☑	☐	Carry Case
☑	☐	Check to confirm electrical safety (tag must be valid)

Date: 29/06/2018

Signed:

TFS Reference	CS009087	Return Date: / /
Customer Reference		Return Time:
Equipment ID	PID3000-78	Condition on return:
Equipment Serial No.	592919110	

"We do more than give you great equipment… We give you great solutions!"

28/06/2018

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Oil / Water Interface Meter

Instrument **Solinst Interface Meter (60M)**
Serial No. **122 009772-1**

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Sarah Lian**

Calibration date: **28/06/2018**

Next calibration due: **27/08/2018**

Oil / Water Interface Meter

Instrument **Interface Meter (60M)**
Serial No. **122 009741-1**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	couple of cuts that have been patched up with vulcan tape
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: M.W. **Michelle Wagner**

Calibration date: **23/07/2018**

Next calibration due: **19/01/2019**

19/7/18

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument **YSI Quatro Pro Plus**
Serial No. **10H100319**

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		307928	pH 7.02
2. pH 4.00		pH 4.00		307927	pH 4.09
3. pH 10.00		pH 10.00		320322	pH 9.70
3. mV		234mV		311903/306263	233.8mV
4. EC		2.76mS		306341	2.74mS
5. D.O		0.00ppm		5253	0.03ppm
6. Temp		20.1°C		MultiTherm	19.3°C

Calibrated by: Sarah Lian

Calibration date: **19/07/2018**

Next calibration due: **18/08/2018**

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RENTALS

Equipment Report – Solinst Model 122 Interface Meter

This Meter has been performance checked / calibrated* as follows:

Cleaned/Tested **Pass?** ☑ **Yes** ☐ **No**

☑ Probe

☑ Tape/Reel

☑ Performance Test & Battery Voltage Check (8.5 v) 8.0v minimum

Date: 24/07/2018 Checked by: Jerry

Signed:

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Received	Returned	Item
☑	☐	☐	Operations check OK
☑	☐	☐	Plastic Box / Bag
☑	☐	☐	Spare 9V Battery Qty 1 (9.0 v)
☑	☐	☐	Probe Cleaning Brush
☑	☐	☐	Instruction leaflet
☑	☐	☐	Tape Guide
☐	☐	☐	

Processors Signature/ Initials

Quote Reference	CS009253	Condition on return
Customer Ref		
Equipment ID	SOL122-28	
Equipment serial no.	250527	
Return Date	/ /	
Return Time		

"We do more than give you great equipment… We give you great solutions!"

Appendix E – Laboratory Certificates

Environmental

CERTIFICATE OF ANALYSIS

Work Order : **ES1820966**
Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : Michael Stacey
Address : 100 CHRISTIE STREET P O BOX 164
ST LEONARDS NSW, AUSTRALIA 2065
Telephone : +61 02 9928 2100
Project : IA179600_SWP
Order number : IA179600
C-O-C number : ----
Sampler : KYLE MCLEAN
Site : ----
Quote number : SY/322/18
No. of samples received : 84
No. of samples analysed : 82

Page : 1 of 58
Laboratory : Environmental Division Sydney
Contact : Brenda Hong
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : (02) 8784 8504
Date Samples Received : 16-Jul-2018 15:30
Date Analysis Commenced : 18-Jul-2018
Issue Date : 23-Jul-2018 16:05

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Ch' Chrysotile (white asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- EP071: Results of sample TP24_0.0-0.1 have been confirmed by re-extraction and re-analysis.
- EP080: The trip spike and its control have been analysed for volatile TPH and BTEX only. The trip spike and control were prepared in the lab using reagent grade sand spiked with petrol. The spike was dispatched from the lab and the control retained.
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly.**
- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP01_0.0-0.1	TP01_0.5-0.6	TP02_0.5-0.6	TP03_0.0-0.1	TP03_2.0-2.1
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	ES1820966-001	ES1820966-002	ES1820966-003	ES1820966-004	ES1820966-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	----	----	----	----	7.1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.1	12.2	13.3	8.2	13.2
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	----	No	----	No
Asbestos Type	1332-21-4	-	--	----	----	-	----	-
Sample weight (dry)	----	0.01	g	----	----	11.2	----	62.2
APPROVED IDENTIFIER:	----	-	--	----	----	G.MORGAN	----	G.MORGAN
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	<0.1
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	6.8
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	0.1
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	3.1
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	10.1
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	30.4
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	6	6	9	5	10
Copper	7440-50-8	5	mg/kg	36	13	20	42	17
Lead	7439-92-1	5	mg/kg	21	17	30	19	9
Nickel	7440-02-0	2	mg/kg	12	5	8	16	4
Zinc	7440-66-6	5	mg/kg	61	26	53	71	18
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP01_0.0-0.1**	**TP01_0.5-0.6**	**TP02_0.5-0.6**	**TP03_0.0-0.1**	**TP03_2.0-2.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-001**	**ES1820966-002**	**ES1820966-003**	**ES1820966-004**	**ES1820966-005**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP01_0.0-0.1**	**TP01_0.5-0.6**	**TP02_0.5-0.6**	**TP03_0.0-0.1**	**TP03_2.0-2.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-001**	**ES1820966-002**	**ES1820966-003**	**ES1820966-004**	**ES1820966-005**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**108**	**----**	**101**	**----**	**105**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP01_0.0-0.1**	**TP01_0.5-0.6**	**TP02_0.5-0.6**	**TP03_0.0-0.1**	**TP03_2.0-2.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-001**	**ES1820966-002**	**ES1820966-003**	**ES1820966-004**	**ES1820966-005**
				Result	Result	Result	Result	Result
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**108**	**----**	**112**	**----**	**114**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**86.6**	**----**	**95.5**	**----**	**107**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**70.2**	**66.9**	**71.6**	**72.0**	**65.4**
2-Chlorophenol-D4	93951-73-6	0.5	%	**73.2**	**69.3**	**73.4**	**67.6**	**67.8**
2.4.6-Tribromophenol	118-79-6	0.5	%	**70.7**	**66.6**	**66.6**	**64.0**	**63.3**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**83.9**	**81.1**	**77.1**	**77.7**	**79.2**
Anthracene-d10	1719-06-8	0.5	%	**82.6**	**79.2**	**81.5**	**76.4**	**77.2**
4-Terphenyl-d14	1718-51-0	0.5	%	**75.2**	**72.2**	**85.3**	**69.6**	**70.3**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**105**	**85.3**	**97.3**	**101**	**98.2**
Toluene-D8	2037-26-5	0.2	%	**95.5**	**90.2**	**86.0**	**89.1**	**84.5**
4-Bromofluorobenzene	460-00-4	0.2	%	**94.5**	**92.3**	**87.2**	**88.5**	**84.0**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	**TP04_0.0-0.1**	**TP05_0.0-0.1**	**TP05_1.0-1.1**	**TP06_0.0-0.1**	**TP07_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-006**	**ES1820966-007**	**ES1820966-008**	**ES1820966-009**	**ES1820966-010**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**10.2**	**10.2**	**12.6**	**13.0**	**12.0**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	----	**No**	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	----	**No**	----	----
Asbestos Type	1332-21-4	-	--	**-**	----	**-**	----	----
Sample weight (dry)	----	0.01	g	**78.8**	----	**13.6**	----	----
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	----	**G.MORGAN**	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**6**	**7**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**12**	**12**	**11**	**10**	**9**
Copper	7440-50-8	5	mg/kg	**15**	**18**	**12**	**16**	**24**
Lead	7439-92-1	5	mg/kg	**12**	**16**	**32**	**17**	**21**
Nickel	7440-02-0	2	mg/kg	**4**	**8**	**5**	**6**	**9**
Zinc	7440-66-6	5	mg/kg	**15**	**52**	**38**	**46**	**40**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP04_0.0-0.1**	**TP05_0.0-0.1**	**TP05_1.0-1.1**	**TP06_0.0-0.1**	**TP07_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-006**	**ES1820966-007**	**ES1820966-008**	**ES1820966-009**	**ES1820966-010**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP04_0.0-0.1**	**TP05_0.0-0.1**	**TP05_1.0-1.1**	**TP06_0.0-0.1**	**TP07_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-006**	**ES1820966-007**	**ES1820966-008**	**ES1820966-009**	**ES1820966-010**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**91.4**	----	**78.2**	**91.8**	**112**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**79.1**	----	**73.4**	**76.0**	**107**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**76.9**	----	**97.1**	**70.9**	**120**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**68.4**	**75.4**	**69.5**	**68.7**	**68.4**
2-Chlorophenol-D4	93951-73-6	0.5	%	**66.9**	**69.3**	**68.6**	**67.4**	**67.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**63.1**	**64.7**	**48.0**	**50.2**	**49.9**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP04_0.0-0.1**	**TP05_0.0-0.1**	**TP05_1.0-1.1**	**TP06_0.0-0.1**	**TP07_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-006**	**ES1820966-007**	**ES1820966-008**	**ES1820966-009**	**ES1820966-010**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**77.4**	**78.3**	**79.8**	**77.4**	**77.0**
Anthracene-d10	1719-06-8	0.5	%	**75.6**	**72.8**	**75.5**	**74.6**	**74.6**
4-Terphenyl-d14	1718-51-0	0.5	%	**69.0**	**74.8**	**71.8**	**69.7**	**69.2**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**101**	**97.5**	**100**	**105**	**101**
Toluene-D8	2037-26-5	0.2	%	**84.1**	**84.0**	**82.4**	**112**	**85.3**
4-Bromofluorobenzene	460-00-4	0.2	%	**84.7**	**83.2**	**82.3**	**106**	**83.6**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP07_0.5-0.6**	**TP08_1.0-1.1**	**TP09_0.0-0.1**	**TP09_0.2-0.3**	**TP10_1.0-1.1**
			Client sampling date / time	11-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-011**	**ES1820966-012**	**ES1820966-013**	**ES1820966-014**	**ES1820966-015**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**14.4**	**9.4**	**12.1**	**7.1**	**9.7**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	----	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	----	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	----	**-**
Sample weight (dry)	----	0.01	g	**14.9**	**15.0**	**20.5**	----	**11.2**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	----	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	**9**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**16**	**11**	**9**	<2	**9**
Copper	7440-50-8	5	mg/kg	**7**	<5	**10**	<5	**15**
Lead	7439-92-1	5	mg/kg	**18**	**9**	**18**	<5	**41**
Nickel	7440-02-0	2	mg/kg	**4**	<2	**4**	<2	**5**
Zinc	7440-66-6	5	mg/kg	**12**	<5	**16**	<5	**37**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP07_0.5-0.6**	**TP08_1.0-1.1**	**TP09_0.0-0.1**	**TP09_0.2-0.3**	**TP10_1.0-1.1**
			Client sampling date / time	11-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-011**	**ES1820966-012**	**ES1820966-013**	**ES1820966-014**	**ES1820966-015**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP07_0.5-0.6**	**TP08_1.0-1.1**	**TP09_0.0-0.1**	**TP09_0.2-0.3**	**TP10_1.0-1.1**
			Client sampling date / time	11-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-011**	**ES1820966-012**	**ES1820966-013**	**ES1820966-014**	**ES1820966-015**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**92.3**	**112**	----	**98.6**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	**95.2**	**98.0**	----	**95.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	**118**	**124**	----	**99.5**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**69.0**	**70.2**	**70.0**	**68.3**	**65.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**67.5**	**68.9**	**68.4**	**67.2**	**67.8**
2.4.6-Tribromophenol	118-79-6	0.5	%	**50.9**	**50.2**	**50.3**	**48.8**	**61.7**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Client sample ID	**TP07_0.5-0.6**	**TP08_1.0-1.1**	**TP09_0.0-0.1**	**TP09_0.2-0.3**	**TP10_1.0-1.1**
			Client sampling date / time	11-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-011**	**ES1820966-012**	**ES1820966-013**	**ES1820966-014**	**ES1820966-015**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**77.3**	**79.4**	**80.0**	**77.2**	**72.6**
Anthracene-d10	1719-06-8	0.5	%	**75.4**	**76.9**	**76.3**	**75.0**	**77.9**
4-Terphenyl-d14	1718-51-0	0.5	%	**70.3**	**72.2**	**71.4**	**70.2**	**80.3**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**96.8**	**102**	**97.0**	**106**	**104**
Toluene-D8	2037-26-5	0.2	%	**79.3**	**84.4**	**76.8**	**87.0**	**83.4**
4-Bromofluorobenzene	460-00-4	0.2	%	**79.1**	**82.1**	**77.0**	**84.2**	**81.6**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**TP11_0.5-0.6**	**TP11_2.9-3.0**	**TP12_0.5-0.6**	**TP14_1.0-1.1**	**TP15_0.0-0.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-016**	**ES1820966-017**	**ES1820966-018**	**ES1820966-019**	**ES1820966-020**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**13.1**	**13.4**	**7.9**	**11.5**	**8.3**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	----	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	----	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	----	**9.12**	**12.7**	**75.6**	**84.2**
APPROVED IDENTIFIER:	----	-	--	----	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	**7**	<5	**6**	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**11**	**14**	**8**	**19**	**6**
Copper	7440-50-8	5	mg/kg	**27**	**27**	**13**	**13**	**48**
Lead	7439-92-1	5	mg/kg	**46**	**39**	**15**	**16**	**20**
Nickel	7440-02-0	2	mg/kg	**12**	**12**	**10**	**5**	**31**
Zinc	7440-66-6	5	mg/kg	**71**	**77**	**65**	**20**	**166**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**0.2**	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**TP11_0.5-0.6**	**TP11_2.9-3.0**	**TP12_0.5-0.6**	**TP14_1.0-1.1**	**TP15_0.0-0.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	12-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-016**	**ES1820966-017**	**ES1820966-018**	**ES1820966-019**	**ES1820966-020**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	**0.6**	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	**0.7**	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	**1.3**	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP11_0.5-0.6**	**TP11_2.9-3.0**	**TP12_0.5-0.6**	**TP14_1.0-1.1**	**TP15_0.0-0.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-016**	**ES1820966-017**	**ES1820966-018**	**ES1820966-019**	**ES1820966-020**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**116**	**118**	**114**	**104**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	**104**	**75.7**	**108**	**79.9**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	**92.1**	**89.5**	**106**	**83.3**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**67.4**	**71.3**	**73.3**	**70.9**	**74.7**
2-Chlorophenol-D4	93951-73-6	0.5	%	**66.5**	**69.7**	**71.6**	**69.8**	**73.6**
2.4.6-Tribromophenol	118-79-6	0.5	%	**50.0**	**52.7**	**52.0**	**50.9**	**53.2**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	**TP11_0.5-0.6**	**TP11_2.9-3.0**	**TP12_0.5-0.6**	**TP14_1.0-1.1**	**TP15_0.0-0.1**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	12-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-016**	**ES1820966-017**	**ES1820966-018**	**ES1820966-019**	**ES1820966-020**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**75.6**	**79.1**	**82.0**	**79.8**	**82.6**
Anthracene-d10	1719-06-8	0.5	%	**75.7**	**77.8**	**79.3**	**76.4**	**81.4**
4-Terphenyl-d14	1718-51-0	0.5	%	**69.9**	**72.2**	**73.8**	**71.5**	**75.9**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**99.0**	**102**	**104**	**97.8**	**104**
Toluene-D8	2037-26-5	0.2	%	**79.9**	**81.1**	**82.2**	**77.8**	**81.4**
4-Bromofluorobenzene	460-00-4	0.2	%	**80.0**	**78.6**	**80.5**	**77.4**	**80.3**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP15_2.0-2.1**	**TP16_0.5-0.6**	**TP17_0.5-0.6**	**TP17_1.0-1.1**	**TP18_0.5-0.6**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-021**	**ES1820966-022**	**ES1820966-023**	**ES1820966-024**	**ES1820966-025**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**12.4**	**8.3**	**11.0**	**12.2**	**7.7**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	**No**	**No**	----	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	----	**No**	**No**	----	**No**
Asbestos Type	1332-21-4	-	--	----	**-**	**-**	----	**-**
Sample weight (dry)	----	0.01	g	----	**23.6**	**15.4**	----	**10.9**
APPROVED IDENTIFIER:	----	-	--	----	**G.MORGAN**	**G.MORGAN**	----	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**7**	**6**	**5**	<5	**6**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**13**	**9**	**16**	**10**	**7**
Copper	7440-50-8	5	mg/kg	**14**	**25**	**22**	**12**	**33**
Lead	7439-92-1	5	mg/kg	**34**	**20**	**25**	**21**	**57**
Nickel	7440-02-0	2	mg/kg	**5**	**12**	**11**	**8**	**7**
Zinc	7440-66-6	5	mg/kg	**39**	**64**	**64**	**39**	**85**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	**0.2**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP15_2.0-2.1**	**TP16_0.5-0.6**	**TP17_0.5-0.6**	**TP17_1.0-1.1**	**TP18_0.5-0.6**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-021**	**ES1820966-022**	**ES1820966-023**	**ES1820966-024**	**ES1820966-025**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP15_2.0-2.1**	**TP16_0.5-0.6**	**TP17_0.5-0.6**	**TP17_1.0-1.1**	**TP18_0.5-0.6**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-021**	**ES1820966-022**	**ES1820966-023**	**ES1820966-024**	**ES1820966-025**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**79.4**	**87.9**	----	**78.7**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	**96.1**	**85.9**	----	**80.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	**93.2**	**80.1**	----	**87.9**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**74.7**	**71.9**	**70.7**	**70.9**	**72.6**
2-Chlorophenol-D4	93951-73-6	0.5	%	**73.3**	**70.6**	**69.9**	**69.8**	**72.2**
2.4.6-Tribromophenol	118-79-6	0.5	%	**54.1**	**51.0**	**50.4**	**49.0**	**52.0**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP15_2.0-2.1**	**TP16_0.5-0.6**	**TP17_0.5-0.6**	**TP17_1.0-1.1**	**TP18_0.5-0.6**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-021**	**ES1820966-022**	**ES1820966-023**	**ES1820966-024**	**ES1820966-025**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**84.1**	**80.1**	**80.3**	**80.4**	**81.3**
Anthracene-d10	1719-06-8	0.5	%	**81.7**	**79.2**	**78.1**	**77.4**	**80.1**
4-Terphenyl-d14	1718-51-0	0.5	%	**75.3**	**73.3**	**72.3**	**72.0**	**73.8**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**80.5**	**87.9**	**85.8**	**86.6**	**86.9**
Toluene-D8	2037-26-5	0.2	%	**77.9**	**84.9**	**83.5**	**83.8**	**84.0**
4-Bromofluorobenzene	460-00-4	0.2	%	**79.9**	**87.3**	**86.8**	**86.1**	**87.2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP19_2.0-2.1**	**TP21_0.0-0.1**	**TP22_0.0-0.1**	**TP22_0.5-0.6**	**TP23_0.0-0.1**
			Client sampling date / time	12-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-026**	**ES1820966-027**	**ES1820966-028**	**ES1820966-029**	**ES1820966-030**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**11.0**	**12.9**	**10.5**	**22.3**	**35.0**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	----	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	----	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	----	**-**
Sample weight (dry)	----	0.01	g	**60.6**	**12.9**	**12.4**	----	**16.9**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	----	**S.SPOONER**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	**5**	<5	**6**	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**17**	**10**	**8**	**21**	**9**
Copper	7440-50-8	5	mg/kg	**13**	**14**	**12**	**6**	**16**
Lead	7439-92-1	5	mg/kg	**16**	**24**	**17**	**15**	**43**
Nickel	7440-02-0	2	mg/kg	**11**	**6**	**14**	**4**	**17**
Zinc	7440-66-6	5	mg/kg	**34**	**35**	**24**	<5	**31**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Client sample ID	**TP19_2.0-2.1**	**TP21_0.0-0.1**	**TP22_0.0-0.1**	**TP22_0.5-0.6**	**TP23_0.0-0.1**
			Client sampling date / time	12-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-026**	**ES1820966-027**	**ES1820966-028**	**ES1820966-029**	**ES1820966-030**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**TP19_2.0-2.1**	**TP21_0.0-0.1**	**TP22_0.0-0.1**	**TP22_0.5-0.6**	**TP23_0.0-0.1**
			Client sampling date / time	12-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-026**	**ES1820966-027**	**ES1820966-028**	**ES1820966-029**	**ES1820966-030**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	**120**
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	**120**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	**120**
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	**110**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	**230**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**72.2**	**75.8**	**70.6**	----	**68.6**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**85.2**	**86.3**	**72.4**	----	**63.8**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**72.3**	**67.1**	**69.9**	----	**63.2**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**73.0**	**73.3**	**75.8**	**71.5**	**75.7**
2-Chlorophenol-D4	93951-73-6	0.5	%	**71.6**	**71.8**	**75.1**	**70.0**	**76.6**
2.4.6-Tribromophenol	118-79-6	0.5	%	**59.2**	**52.0**	**54.2**	**49.7**	**66.8**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP19_2.0-2.1**	**TP21_0.0-0.1**	**TP22_0.0-0.1**	**TP22_0.5-0.6**	**TP23_0.0-0.1**
			Client sampling date / time	12-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-026**	**ES1820966-027**	**ES1820966-028**	**ES1820966-029**	**ES1820966-030**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**81.1**	**81.5**	**84.9**	**81.9**	**80.6**
Anthracene-d10	1719-06-8	0.5	%	**82.2**	**79.6**	**82.7**	**78.6**	**82.5**
4-Terphenyl-d14	1718-51-0	0.5	%	**75.9**	**73.5**	**75.9**	**72.8**	**88.3**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**85.8**	**90.0**	**90.3**	**94.7**	**78.6**
Toluene-D8	2037-26-5	0.2	%	**84.0**	**83.8**	**85.6**	**91.6**	**76.3**
4-Bromofluorobenzene	460-00-4	0.2	%	**85.6**	**88.2**	**85.9**	**95.5**	**78.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP24_0.0-0.1**	**TP24_2.0-2.1**	**TP25_0.0-0.1**	**TP26_0.0-0.1**	**TP26_1.0-1.1**
			Client sampling date / time	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-031**	**ES1820966-032**	**ES1820966-033**	**ES1820966-034**	**ES1820966-035**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**8.3**	**14.3**	**12.7**	**37.3**	**14.8**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	----	**No**	**No**	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	----	**No**	**No**	----
Asbestos Type	1332-21-4	-	--	**-**	----	**-**	**-**	----
Sample weight (dry)	----	0.01	g	**11.2**	----	**12.3**	**14.6**	----
APPROVED IDENTIFIER:	----	-	--	**S.SPOONER**	----	**S.SPOONER**	**S.SPOONER**	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**5**	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**18**	**8**	**6**	**12**	**13**
Copper	7440-50-8	5	mg/kg	**11**	**8**	**16**	**12**	**6**
Lead	7439-92-1	5	mg/kg	**19**	**11**	**22**	**20**	**13**
Nickel	7440-02-0	2	mg/kg	**16**	<2	**20**	**12**	<2
Zinc	7440-66-6	5	mg/kg	**21**	<5	**42**	**34**	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP24_0.0-0.1**	**TP24_2.0-2.1**	**TP25_0.0-0.1**	**TP26_0.0-0.1**	**TP26_1.0-1.1**
			Client sampling date / time	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-031**	**ES1820966-032**	**ES1820966-033**	**ES1820966-034**	**ES1820966-035**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	**2.2**	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	**1.7**	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**57.0**	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	**10.1**	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**69.0**	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	**59.5**	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	**30.1**	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	**29.6**	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**36.7**	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	**14.6**	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**25.7**	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**13.8**	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	**3.9**	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**15.9**	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	**370**	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	**39.6**	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**39.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**39.6**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP24_0.0-0.1**	**TP24_2.0-2.1**	**TP25_0.0-0.1**	**TP26_0.0-0.1**	**TP26_1.0-1.1**
			Client sampling date / time	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-031**	**ES1820966-032**	**ES1820966-033**	**ES1820966-034**	**ES1820966-035**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**580**	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	**360**	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**940**	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**860**	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	**230**	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**1090**	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	----	----	**0.0004**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP24_0.0-0.1**	**TP24_2.0-2.1**	**TP25_0.0-0.1**	**TP26_0.0-0.1**	**TP26_1.0-1.1**
			Client sampling date / time	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-031**	**ES1820966-032**	**ES1820966-033**	**ES1820966-034**	**ES1820966-035**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	----	----	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	----	----	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	----	----	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	----	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	----	----	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	----	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	----	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	----	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	----	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	----	----	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	----	----	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	TP24_0.0-0.1	TP24_2.0-2.1	TP25_0.0-0.1	TP26_0.0-0.1	TP26_1.0-1.1
			Client sample ID	**TP24_0.0-0.1**	**TP24_2.0-2.1**	**TP25_0.0-0.1**	**TP26_0.0-0.1**	**TP26_1.0-1.1**
			Client sampling date / time	10-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
				ES1820966-031	**ES1820966-032**	**ES1820966-033**	**ES1820966-034**	**ES1820966-035**
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	----	----	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	----	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	----	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	----	----	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	----	----	**0.0004**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	----	----	**0.0004**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	----	----	**0.0004**	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**75.4**	----	**66.6**	**92.2**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**64.1**	----	**63.5**	**87.4**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**65.0**	----	**76.2**	**117**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**70.3**	**71.2**	**71.4**	**72.6**	**71.0**
2-Chlorophenol-D4	93951-73-6	0.5	%	**70.6**	**69.6**	**70.6**	**71.2**	**69.7**
2.4.6-Tribromophenol	118-79-6	0.5	%	**52.5**	**50.7**	**51.8**	**52.5**	**49.4**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**80.6**	**80.7**	**80.3**	**81.5**	**81.2**
Anthracene-d10	1719-06-8	0.5	%	**70.9**	**78.4**	**77.4**	**79.4**	**78.1**
4-Terphenyl-d14	1718-51-0	0.5	%	**77.8**	**71.8**	**71.8**	**73.2**	**72.1**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**103**	**87.2**	**86.4**	**88.6**	**92.9**
Toluene-D8	2037-26-5	0.2	%	**96.7**	**85.6**	**83.5**	**80.8**	**87.0**
4-Bromofluorobenzene	460-00-4	0.2	%	**99.5**	**88.9**	**85.4**	**86.0**	**91.5**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	----	----	**94.0**	----
13C8-PFOA	----	0.0002	%	----	----	----	**90.0**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP27_0.2-0.3**	**TP28_0.0-0.1**	**TP28_0.5-0.6**	**TP29_0.5-0.6**	**TP30_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-036**	**ES1820966-037**	**ES1820966-038**	**ES1820966-039**	**ES1820966-040**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**11.3**	**9.1**	**9.3**	**22.4**	**5.2**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	**No**	----	**No**	**Yes**
Asbestos (Trace)	1332-21-4	5	Fibres	----	**No**	----	**No**	**No**
Asbestos Type	1332-21-4	-	--	----	**-**	----	**-**	**Ch**
Sample weight (dry)	----	0.01	g	----	**14.9**	----	**17.1**	**103**
APPROVED IDENTIFIER:	----	-	--	----	**S.SPOONER**	----	**S.SPOONER**	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**9**	<5
Cadmium	7440-43-9	1	mg/kg	<1	**1**	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**8**	**20**	**12**	**16**	**32**
Copper	7440-50-8	5	mg/kg	<5	**18**	<5	**21**	**16**
Lead	7439-92-1	5	mg/kg	**8**	**37**	**10**	**38**	**18**
Nickel	7440-02-0	2	mg/kg	**3**	**18**	<2	**8**	**24**
Zinc	7440-66-6	5	mg/kg	**19**	**39**	<5	**46**	**52**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP27_0.2-0.3**	**TP28_0.0-0.1**	**TP28_0.5-0.6**	**TP29_0.5-0.6**	**TP30_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-036**	**ES1820966-037**	**ES1820966-038**	**ES1820966-039**	**ES1820966-040**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP27_0.2-0.3**	**TP28_0.0-0.1**	**TP28_0.5-0.6**	**TP29_0.5-0.6**	**TP30_0.0-0.1**
			Client sampling date / time	13-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-036**	**ES1820966-037**	**ES1820966-038**	**ES1820966-039**	**ES1820966-040**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**73.1**	**62.8**	----	**69.2**	**98.3**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**64.6**	**64.8**	----	**66.7**	**81.2**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**74.9**	**82.6**	----	**89.4**	**84.8**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**72.2**	**71.0**	**72.1**	**72.7**	**70.2**
2-Chlorophenol-D4	93951-73-6	0.5	%	**71.2**	**70.0**	**71.5**	**74.7**	**69.6**
2.4.6-Tribromophenol	118-79-6	0.5	%	**50.0**	**49.5**	**48.2**	**65.5**	**46.3**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	TP27_0.2-0.3	TP28_0.0-0.1	TP28_0.5-0.6	TP29_0.5-0.6	TP30_0.0-0.1
			Client sampling date / time	13-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	ES1820966-036	ES1820966-037	ES1820966-038	ES1820966-039	ES1820966-040
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**82.3**	**79.6**	**81.8**	**78.6**	**79.3**
Anthracene-d10	1719-06-8	0.5	%	**79.1**	**76.9**	**78.8**	**82.6**	**76.4**
4-Terphenyl-d14	1718-51-0	0.5	%	**72.8**	**71.3**	**72.9**	**87.5**	**70.8**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**90.2**	**90.0**	**88.2**	**94.9**	**89.4**
Toluene-D8	2037-26-5	0.2	%	**84.5**	**84.0**	**84.1**	**89.0**	**87.3**
4-Bromofluorobenzene	460-00-4	0.2	%	**89.2**	**90.1**	**88.4**	**92.4**	**88.7**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**TP30_2.0-2.1**	**TP01_0.0-0.3**	**TP02_0.0-0.3**	**TP03_0.0-0.3**	**TP04_0.0-0.3**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-041**	**ES1820966-042**	**ES1820966-043**	**ES1820966-044**	**ES1820966-045**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.8**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**12.1**	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	----	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	----	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	----	**626**	**694**	**696**	**578**
APPROVED IDENTIFIER:	----	-	--	----	**S.SPOONER**	**S.SPOONER**	**S.SPOONER**	**G.MORGAN**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	----	<0.0004	<0.0004	<0.0004	<0.0004
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	----	<0.001	<0.001	<0.001	<0.001
ø **Asbestos Containing Material**	1332-21-4	0.1	g	----	<0.1	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	----	<0.01	<0.01	<0.01	<0.01
ø **Weight Used for % Calculation**	----	0.0001	kg	----	**0.626**	**0.694**	**0.696**	**0.578**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	----	<0.0004	<0.0004	<0.0004	<0.0004
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**2.4**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.4**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**3.7**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**14.4**	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**6**	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Lead	7439-92-1	5	mg/kg	**12**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP30_2.0-2.1**	**TP01_0.0-0.3**	**TP02_0.0-0.3**	**TP03_0.0-0.3**	**TP04_0.0-0.3**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-041**	**ES1820966-042**	**ES1820966-043**	**ES1820966-044**	**ES1820966-045**
				Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS - Continued								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**TP30_2.0-2.1**	**TP01_0.0-0.3**	**TP02_0.0-0.3**	**TP03_0.0-0.3**	**TP04_0.0-0.3**
			Client sampling date / time	13-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-041**	**ES1820966-042**	**ES1820966-043**	**ES1820966-044**	**ES1820966-045**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**76.6**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**80.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**63.2**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**91.4**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**82.8**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**77.3**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**130**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	**105**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**105**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP05_0.0-0.3**	**TP06_0.0-0.3**	**TP07_0.0-0.3**	**TP08_0.0-0.3**	**TP09_0.0-0.3**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-046**	**ES1820966-047**	**ES1820966-048**	**ES1820966-049**	**ES1820966-050**
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	**659**	**669**	**682**	**582**	**640**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**S.SPOONER**	**S.SPOONER**	**S.SPOONER**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.659**	**0.669**	**0.682**	**0.582**	**0.640**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP10_0.0-0.3**	**TP11_0.0-0.3**	**TP12_0.0-0.3**	**TP14_0.0-0.3**	**TP15_0.0-0.3**
			Client sampling date / time	10-Jul-2018 00:00	11-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	12-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-051**	**ES1820966-052**	**ES1820966-053**	**ES1820966-054**	**ES1820966-055**
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	**735**	**598**	**766**	**686**	**670**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	**S.SPOONER**	**S.SPOONER**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.735**	**0.598**	**0.766**	**0.686**	**0.670**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Analytical Results

Sub-Matrix: **SOIL** **(**Matrix: **SOIL)**			*Client sample ID*	**TP16_0.0-0.3**	**TP17_0.0-0.3**	**TP18_0.0-0.3**	**TP19_0.0-0.3**	**TP21_0.0-0.3**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-056**	**ES1820966-057**	**ES1820966-058**	**ES1820966-059**	**ES1820966-060**
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	**669**	**560**	**558**	**630**	**629**
APPROVED IDENTIFIER:	----	-	--	**S.SPOONER**	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	**S.SPOONER**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.669**	**0.560**	**0.558**	**0.630**	**0.629**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP22_0.0-0.3**	**TP23_0.0-0.3**	**TP24_0.0-0.3**	**TP25_0.0-0.3**	**TP26_0.0-0.3**
			Client sampling date / time	10-Jul-2018 00:00	09-Jul-2018 00:00	10-Jul-2018 00:00	09-Jul-2018 00:00	09-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-061**	**ES1820966-062**	**ES1820966-063**	**ES1820966-064**	**ES1820966-065**
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**-**
Sample weight (dry)	----	0.01	g	**724**	**571**	**629**	**685**	**813**
APPROVED IDENTIFIER:	----	-	--	**S.SPOONER**	**S.SPOONER**	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.724**	**0.571**	**0.629**	**0.685**	**0.813**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP28_0.0-0.3**	**TP29_0.0-0.3**	**TP30_0.0-0.3**	**TP14_2.2-2.3**	**TP15_2.4-2.5**
			Client sampling date / time	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-066**	**ES1820966-067**	**ES1820966-068**	**ES1820966-071**	**ES1820966-072**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	**16.7**	**18.7**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No***	**No**	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	----	----
Asbestos Type	1332-21-4	-	--	**-**	**Ch**	**-**	----	----
Sample weight (dry)	----	0.01	g	**594**	**547**	**662**	----	----
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**G.MORGAN**	----	----
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	**0.0021**	<0.0004	----	----
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	----	----
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	----	----
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	----	----
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.594**	**0.547**	**0.662**	----	----
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	----	----	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP28_0.0-0.3**	**TP29_0.0-0.3**	**TP30_0.0-0.3**	**TP14_2.2-2.3**	**TP15_2.4-2.5**
			Client sampling date / time	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-066**	**ES1820966-067**	**ES1820966-068**	**ES1820966-071**	**ES1820966-072**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	----	----	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	----	----	<0.0005	<0.0005

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP28_0.0-0.3**	**TP29_0.0-0.3**	**TP30_0.0-0.3**	**TP14_2.2-2.3**	**TP15_2.4-2.5**
			Client sampling date / time	09-Jul-2018 00:00	09-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00	13-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-066**	**ES1820966-067**	**ES1820966-068**	**ES1820966-071**	**ES1820966-072**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	----	----	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	----	----	**78.0**	**77.0**
13C8-PFOA	----	0.0002	%	----	----	----	**79.0**	**74.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP16_2.4-2.5**	**TP17_2.6-2.7**	**TP18_2.9-3.0**	**TP19_2.7-2.8**	**QAQC1**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-073**	**ES1820966-074**	**ES1820966-075**	**ES1820966-076**	**ES1820966-077**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**20.1**	**15.2**	**20.0**	**20.1**	----
Moisture Content	----	1.0	%	----	----	----	----	**11.7**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	----	<5
Cadmium	7440-43-9	1	mg/kg	----	----	----	----	<1
Chromium	7440-47-3	2	mg/kg	----	----	----	----	**12**
Copper	7440-50-8	5	mg/kg	----	----	----	----	**10**
Lead	7439-92-1	5	mg/kg	----	----	----	----	**20**
Nickel	7440-02-0	2	mg/kg	----	----	----	----	**4**
Zinc	7440-66-6	5	mg/kg	----	----	----	----	**15**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	----	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	----	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	----	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP16_2.4-2.5**	**TP17_2.6-2.7**	**TP18_2.9-3.0**	**TP19_2.7-2.8**	**QAQC1**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-073**	**ES1820966-074**	**ES1820966-075**	**ES1820966-076**	**ES1820966-077**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	10	mg/kg	----	----	----	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	----	----	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	----	----	----	<100
C29 - C36 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	----	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	----	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	----	----	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	----	----	----	<100
>C34 - C40 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	----	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg	----	----	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	----	----	----	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	----	----	----	----	<0.5
Naphthalene	91-20-3	1	mg/kg	----	----	----	----	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0002**	<0.0002	<0.0002	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0004**	<0.0002	<0.0002	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP16_2.4-2.5**	**TP17_2.6-2.7**	**TP18_2.9-3.0**	**TP19_2.7-2.8**	**QAQC1**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	10-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-073**	**ES1820966-074**	**ES1820966-075**	**ES1820966-076**	**ES1820966-077**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP16_2.4-2.5	TP17_2.6-2.7	TP18_2.9-3.0	TP19_2.7-2.8	QAQC1
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	12-Jul-2018 00:00	10-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	ES1820966-073	ES1820966-074	ES1820966-075	ES1820966-076	ES1820966-077
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0006**	<0.0002	<0.0002	<0.0002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0006**	<0.0002	<0.0002	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0006**	<0.0002	<0.0002	<0.0002	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	----	----	----	**75.4**
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	----	----	**79.2**
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	----	----	**64.1**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	----	----	**90.9**
Anthracene-d10	1719-06-8	0.5	%	----	----	----	----	**82.1**
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	----	----	**75.8**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	----	----	**125**
Toluene-D8	2037-26-5	0.2	%	----	----	----	----	**103**
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	----	----	**105**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**79.0**	**89.0**	**88.0**	**90.5**	----
13C8-PFOA	----	0.0002	%	**81.5**	**87.0**	**95.5**	**90.5**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)	*Client sample ID*			**QAQC3**	**QAQC5**	**QAQC_TB1**	**QAQC_TS1**	**Trip Spike Control**
	Client sampling date / time			12-Jul-2018 00:00	12-Jul-2018 00:00	04-Jul-2018 00:00	03-Jul-2018 00:00	03-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1820966-078**	**ES1820966-079**	**ES1820966-080**	**ES1820966-081**	**ES1820966-082**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	**19.9**	----	----	----
Moisture Content	----	1.0	%	**12.5**	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**8**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**6**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**31**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**55**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**6**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**56**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**0.1**	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	QAQC3	QAQC5	QAQC_TB1	QAQC_TS1	Trip Spike Control
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	04-Jul-2018 00:00	03-Jul-2018 00:00	03-Jul-2018 00:00
				ES1820966-078	**ES1820966-079**	**ES1820966-080**	**ES1820966-081**	**ES1820966-082**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	**0.2**	**0.2**
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	**8.3**	**9.7**
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<0.5	**1.0**	**1.1**
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	<0.5	**5.2**	**6.0**
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	**2.0**	**2.3**
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	<0.2	**16.7**	**19.3**
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	<0.5	**7.2**	**8.3**
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	<0.0002	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	QAQC3	QAQC5	QAQC_TB1	QAQC_TS1	Trip Spike Control
Client sampling date / time				12-Jul-2018 00:00	12-Jul-2018 00:00	04-Jul-2018 00:00	03-Jul-2018 00:00	03-Jul-2018 00:00
				ES1820966-078	ES1820966-079	ES1820966-080	ES1820966-081	ES1820966-082
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**QAQC3**	**QAQC5**	**QAQC_TB1**	**QAQC_TS1**	**Trip Spike Control**
			Client sampling date / time	12-Jul-2018 00:00	12-Jul-2018 00:00	04-Jul-2018 00:00	03-Jul-2018 00:00	03-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1820966-078**	**ES1820966-079**	**ES1820966-080**	**ES1820966-081**	**ES1820966-082**
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	<0.0002	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	<0.0002	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	<0.0002	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**77.3**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**80.7**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**67.1**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**92.6**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**85.1**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**78.0**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**126**	----	**124**	**102**	**110**
Toluene-D8	2037-26-5	0.2	%	**103**	----	**100**	**106**	**112**
4-Bromofluorobenzene	460-00-4	0.2	%	**104**	----	**99.8**	**104**	**111**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	**83.5**	----	----	----
13C8-PFOA	----	0.0002	%	----	**83.5**	----	----	----

Analytical Results

Sub-Matrix: **SOLID** (Matrix: **SOLID)**			Client sample ID	**TP05_ACM_0.9-1.1**	**TP11_ACM_0.0-1.1**	**----**	**----**	**----**
			Client sampling date / time	11-Jul-2018 00:00	11-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES1820966-069**	**ES1820966-070**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	**Yes**	**Yes**	**----**	**----**	**----**
Asbestos Type	1332-21-4	-	--	**Ch**	**Ch + Am**	**----**	**----**	**----**
Sample weight (dry)	----	0.01	g	**23.5**	**14.4**	**----**	**----**	**----**
APPROVED IDENTIFIER:	----	-	--	**A. SMYLIE**	**A. SMYLIE**	**----**	**----**	**----**

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	*Client sample ID - Client sampling date / time*	*Analytical Results*
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	TP02_0.5-0.6 - 11-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP03_2.0-2.1 - 13-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP04_0.0-0.1 - 13-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP05_1.0-1.1 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP07_0.5-0.6 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP08_1.0-1.1 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP09_0.0-0.1 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP10_1.0-1.1 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP11_2.9-3.0 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP12_0.5-0.6 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP14_1.0-1.1 - 13-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP15_0.0-0.1 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP16_0.5-0.6 - 12-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP17_0.5-0.6 - 12-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP18_0.5-0.6 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP19_2.0-2.1 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP21_0.0-0.1 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP22_0.0-0.1 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP23_0.0-0.1 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP24_0.0-0.1 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP25_0.0-0.1 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP26_0.0-0.1 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP28_0.0-0.1 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP29_0.5-0.6 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP30_0.0-0.1 - 13-Jul-2018 00:00	Mid brown sandy soil with one piece of asbestos cement sheeting approx 5 x 5 x 2 mm.
EA200: Description	TP01_0.0-0.3 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP02_0.0-0.3 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP03_0.0-0.3 - 13-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP04_0.0-0.3 - 13-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP05_0.0-0.3 - 11-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP06_0.0-0.3 - 11-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP07_0.0-0.3 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP08_0.0-0.3 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP09_0.0-0.3 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP10_0.0-0.3 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP11_0.0-0.3 - 11-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP12_0.0-0.3 - 09-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP14_0.0-0.3 - 13-Jul-2018 00:00	Mid grey sandy soil.

Sub-Matrix: **SOIL**

Method: Compound	*Client sample ID - Client sampling date / time*	*Analytical Results*
EA200: Description	TP15_0.0-0.3 - 12-Jul-2018 00:00	Mid grey sandy soil.
EA200: Description	TP16_0.0-0.3 - 12-Jul-2018 00:00	Mid grey sandy soil.
EA200: Description	TP17_0.0-0.3 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP18_0.0-0.3 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP19_0.0-0.3 - 12-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP21_0.0-0.3 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP22_0.0-0.3 - 10-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP23_0.0-0.3 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP24_0.0-0.3 - 10-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP25_0.0-0.3 - 09-Jul-2018 00:00	Mid brown clay soil.
EA200: Description	TP26_0.0-0.3 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP28_0.0-0.3 - 09-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP29_0.0-0.3 - 09-Jul-2018 00:00	Mid brown sandy soil with one piece of fibrous asbestos cement sheeting approx 2 x 2 x 1 mm.
EA200: Description	TP30_0.0-0.3 - 13-Jul-2018 00:00	Mid brown sandy soil.

Sub-Matrix: **SOLID**

Method: Compound	*Client sample ID - Client sampling date / time*	*Analytical Results*
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	TP05_ACM_0.9-1.1 - 11-Jul-2018 00:00	One piece of asbestos cement sheeting approximately 70x60x5mm
EA200: Description	TP11_ACM_0.0-1.1 - 11-Jul-2018 00:00	One piece of asbestos cement sheeting approximately 40x30x5mm

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

QUALITY CONTROL REPORT

Work Order : **ES1820966**

Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : Michael Stacey
Address : 100 CHRISTIE STREET P O BOX 164
ST LEONARDS NSW, AUSTRALIA 2065
Telephone : +61 02 9928 2100
Project : IA179600_SWP
Order number : IA179600
C-O-C number : ----
Sampler : KYLE MCLEAN
Site : ----
Quote number : SY/322/18
No. of samples received : 84
No. of samples analysed : 82

Page : 1 of 31

Laboratory : Environmental Division Sydney
Contact : Brenda Hong
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : (02) 8784 8504
Date Samples Received : 16-Jul-2018
Date Analysis Commenced : 18-Jul-2018
Issue Date : 23-Jul-2018

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1808883)									
ES1820935-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.3	7.5	10.8	0% - 20%
ES1821051-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	5.9	5.3	10.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1809273)									
ES1820846-035	Anonymous	EA055: Moisture Content	----	0.1	%	3.8	4.0	3.06	No Limit
ES1820846-054	Anonymous	EA055: Moisture Content	----	0.1	%	9.3	10.2	9.30	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1809274)									
ES1820966-005	TP03_2.0-2.1	EA055: Moisture Content	----	0.1	%	13.2	13.4	1.55	0% - 50%
ES1820966-016	TP11_0.5-0.6	EA055: Moisture Content	----	0.1	%	13.1	12.2	6.76	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1809275)									
ES1820966-025	TP18_0.5-0.6	EA055: Moisture Content	----	0.1	%	7.7	8.0	3.89	No Limit
ES1820966-036	TP27_0.2-0.3	EA055: Moisture Content	----	0.1	%	11.3	10.2	10.9	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1809276)									
ES1820966-074	TP17_2.6-2.7	EA055: Moisture Content	----	0.1	%	15.2	15.0	1.46	0% - 20%
ES1821051-002	Anonymous	EA055: Moisture Content	----	0.1	%	20.8	20.9	0.00	0% - 20%
ED007: Exchangeable Cations (QC Lot: 1814303)									
ES1820966-005	TP03_2.0-2.1	ED007: Exchangeable Sodium Percent	----	0.1	%	30.4	30.5	0.368	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	6.8	6.6	1.99	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	3.1	3.0	0.00	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	10.1	9.9	1.76	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1813139)									
ES1820966-003	TP02_0.5-0.6	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	9	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1813139) - continued									
ES1820966-003	TP02_0.5-0.6	EG005T: Nickel	7440-02-0	2	mg/kg	8	20	80.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	20	25	21.7	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	30	34	11.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	53	83	43.7	0% - 50%
ES1820966-008	TP05_1.0-1.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	11	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	6	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	7	31.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	12	17	34.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	32	27	18.3	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	38	36	7.73	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1813307)									
ES1820736-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	5	22.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	6	33.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	6	107	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	12	11	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	38	26	35.0	No Limit
ES1820736-041	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	24	36	39.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	30	25	17.6	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	37	49	26.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	52	74	34.5	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1813309)									
ES1820966-020	TP15_0.0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	31	24	25.7	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	48	52	8.01	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	20	20	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	166	138	18.4	0% - 20%
ES1820966-030	TP23_0.0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	7	26.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	17	16	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	12	33.9	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1813309) - continued									
ES1820966-030	TP23_0.0-0.1	EG005T: Lead	7439-92-1	5	mg/kg	43	29	37.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	31	23	32.3	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1813451)									
ES1820966-040	TP30_0.0-0.1	EG005T: Nickel	7440-02-0	2	mg/kg	24	21	14.0	0% - 50%
		EG005T: Copper	7440-50-8	5	mg/kg	16	15	6.74	No Limit
ES1821111-005	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	35	34	3.55	No Limit
ES1820966-040	TP30_0.0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	32	27	16.8	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	18	15	13.3	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	52	48	8.77	0% - 50%
ES1821111-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	18	16	13.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	10	23.5	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	15	23.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	48	26	58.7	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1813138)									
ES1820966-003	TP02_0.5-0.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.00	No Limit
ES1820966-008	TP05_1.0-1.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1813308)									
ES1820736-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1820736-041	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1813310)									
ES1820966-020	TP15_0.0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1820966-030	TP23_0.0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1813452)									
ES1820966-040	TP30_0.0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1821111-005	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1806730)									
ES1820966-001	TP01_0.0-0.1	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1820966-017	TP11_2.9-3.0	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1806741)									
ES1820966-022	TP16_0.5-0.6	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1820966-036	TP27_0.2-0.3	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1806731)									
ES1820966-001	TP01_0.0-0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1806731) - continued									
ES1820966-001	TP01_0.0-0.1	EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1820966-017	TP11_2.9-3.0	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1806742)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1806742) - continued									
ES1820966-022	TP16_0.5-0.6	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1820966-036	TP27_0.2-0.3	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1806742) - continued									
ES1820966-036	TP27_0.2-0.3	EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806728)									
ES1820966-001	TP01_0.0-0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1820966-017	TP11_2.9-3.0	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	0.6	0.7	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	0.7	0.7	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806728) - continued									
ES1820966-017	TP11_2.9-3.0	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	1.3	1.9	37.5	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806740)									
ES1820966-022	TP16_0.5-0.6	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1820966-036	TP27_0.2-0.3	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806740) - continued									
ES1820966-036	TP27_0.2-0.3	EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806888)									
ES1820736-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1820736-041	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1806888) - continued									
ES1820736-041	Anonymous	EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1806729)									
ES1820966-001	TP01_0.0-0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820966-017	TP11_2.9-3.0	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1806739)									
ES1820966-022	TP16_0.5-0.6	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820966-036	TP27_0.2-0.3	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1806887)									
ES1820736-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820736-041	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1807620)									
ES1821042-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1808275)									
ES1820966-001	TP01_0.0-0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1820966-011	TP07_0.5-0.6	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1808276)									
ES1820966-021	TP15_2.0-2.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1820966-031	TP24_0.0-0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1808649)									
ES1820845-077	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1821003-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1806729)									
ES1820966-001	TP01_0.0-0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1806729) - continued									
ES1820966-001	TP01_0.0-0.1	EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820966-017	TP11_2.9-3.0	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1806739)									
ES1820966-022	TP16_0.5-0.6	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820966-036	TP27_0.2-0.3	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1806887)									
ES1820736-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1820736-041	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1807620)									
ES1821042-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1808275)									
ES1820966-001	TP01_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1820966-011	TP07_0.5-0.6	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1808276)									
ES1820966-021	TP15_2.0-2.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1820966-031	TP24_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1808649)									
ES1820845-077	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1821003-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 1807620)									
ES1821042-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1808275)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1808275) - continued									
ES1820966-001	TP01_0.0-0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1820966-011	TP07_0.5-0.6	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1808276)									
ES1820966-021	TP15_2.0-2.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1820966-031	TP24_0.0-0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1808649)									
ES1820845-077	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1821003-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1808649) - continued									
ES1821003-002	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 1813291)									
ES1820846-031	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0008	32.4	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1820846-051	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0003	0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 1813292)									
ES1820736-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0006	0.0006	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1820736-041	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 1813291)									
ES1820846-031	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 1813291) - continued									
ES1820846-031	Anonymous	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1820846-051	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 1813292)									
ES1820736-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1820736-041	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813291)									
ES1820846-031	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813291) - continued									
ES1820846-031	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1820846-051	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813292)									
ES1820736-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1820736-041	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813292) - continued									
ES1820736-041	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 1813291)									
ES1820846-031	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1820846-051	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 1813292)									
ES1820736-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1820736-041	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 1813292) - continued									
ES1820736-041	Anonymous	EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED007: Exchangeable Cations (QCLot: 1814303)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	98.0	76	120
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	95.8	75	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	93.3	80	120
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	96.6	80	120
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1813139)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	92.4	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.7	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	84.8	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	97.6	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	96.5	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	95.8	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	107	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1813307)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	100	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	97.0	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	90.4	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	98.0	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.4	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	100	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	118	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1813309)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	95.0	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	97.4	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	90.2	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	95.6	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	97.9	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.5	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	120	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1813451)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	98.1	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	92.0	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.4	76	128

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1813451) - continued								
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	97.2	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	107	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	94.3	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	105	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813138)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	74.9	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813308)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	85.0	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813310)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.8	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813452)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.8	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1806730)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	80.0	62	126
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1806741)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	120	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1806731)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	101	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.7	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	98.8	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	102	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	103	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	103	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	104	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	99.8	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	104	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	108	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	105	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.4	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	108	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	107	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	101	54	130

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 1806742)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	97.9	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.7	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	97.7	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.6	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.3	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.0	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	96.0	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	92.8	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.1	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	91.5	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	80.8	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	82.8	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	89.6	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	89.9	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	92.0	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	86.7	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806728)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	100	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	98.4	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	95.5	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	98.1	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	101	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	101	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	102	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	104	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	93.3	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	96.5	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	91.4	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	99.0	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	97.5	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	90.8	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	91.8	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	87.5	63	121

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806740)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	107	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	99.3	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	100	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	100.0	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	106	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	104	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	102	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	104	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	91.7	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	101	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	91.8	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	99.8	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	95.2	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	76.2	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	79.8	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	69.6	63	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806888)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	121	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	111	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	114	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	116	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	119	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	117	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	122	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	124	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	104	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	114	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	103	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	115	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	107	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	105	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	106	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	106	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806729)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	95.1	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	98.3	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	92.4	71	129

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806739)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	96.2	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	95.5	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	96.1	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806887)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	86.7	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	86.9	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	93.1	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1807620)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	89.4	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808275)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	88.0	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808276)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	76.9	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808649)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	114	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806729)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	93.1	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	99.9	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	75.6	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806739)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	92.8	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	96.0	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	90.6	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806887)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	103	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	88.9	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	99.5	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1807620)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	91.3	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808275)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	94.8	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808276)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	79.8	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808649)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	119	68	128
EP080: BTEXN (QCLot: 1807620)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	101	62	116

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080: BTEXN (QCLot: 1807620) - continued								
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	104	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	94.2	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	101	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	101	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	111	63	119
EP080: BTEXN (QCLot: 1808275)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	83.2	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	84.1	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	82.4	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	84.1	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	86.8	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	80.4	63	119
EP080: BTEXN (QCLot: 1808276)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	79.5	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	78.5	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	78.4	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	80.2	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	81.3	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	84.2	63	119
EP080: BTEXN (QCLot: 1808649)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	106	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	114	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	102	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	102	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	104	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	110	63	119
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813291)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.0	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	68.8	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813292)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813292) - continued								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	68.4	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.4	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	62.8	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.6	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813291)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	70.2	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	72.9	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813292)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	59.3	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.0	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.4	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.2	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.4	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813291)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.2	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.0	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.8	58	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813291) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.6	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813292)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.5	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.8	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.0	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.3	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.6	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813291)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.8	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.0	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	122	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	84.0	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813292)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.4	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	70.8	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	78.8	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	110	60	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1813139)							
ES1820966-003	TP02_0.5-0.6	EG005T: Arsenic	7440-38-2	50 mg/kg	91.1	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	94.9	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	99.4	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	101	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 1813139) - continued							
ES1820966-003	TP02_0.5-0.6	EG005T: Lead	7439-92-1	250 mg/kg	95.0	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	106	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	106	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1813307)							
ES1820736-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	94.0	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	98.2	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	94.1	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	90.1	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.5	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	97.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	108	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1813309)							
ES1820966-020	TP15_0.0-0.1	EG005T: Arsenic	7440-38-2	50 mg/kg	93.6	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.7	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	97.2	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	95.6	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	95.7	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	80.8	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	97.8	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1813451)							
ES1820966-040	TP30_0.0-0.1	EG005T: Arsenic	7440-38-2	50 mg/kg	97.9	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	93.2	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	81.4	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	96.3	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	108	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	73.7	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	90.8	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813138)							
ES1820966-003	TP02_0.5-0.6	EG035T: Mercury	7439-97-6	5 mg/kg	89.7	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813308)							
ES1820736-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	99.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813310)							
ES1820966-020	TP15_0.0-0.1	EG035T: Mercury	7439-97-6	5 mg/kg	87.8	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1813452)							
ES1820966-040	TP30_0.0-0.1	EG035T: Mercury	7439-97-6	5 mg/kg	92.2	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1806730)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1806730) - continued							
ES1820966-001	TP01_0.0-0.1	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	104	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1806741)							
ES1820966-022	TP16_0.5-0.6	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	90.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1806731)							
ES1820966-001	TP01_0.0-0.1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	105	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	106	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	103	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	106	70	130
		EP068: Endrin	72-20-8	2 mg/kg	95.2	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	99.8	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1806742)							
ES1820966-022	TP16_0.5-0.6	EP068: gamma-BHC	58-89-9	0.5 mg/kg	101	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	106	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	98.7	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	101	70	130
		EP068: Endrin	72-20-8	2 mg/kg	83.6	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	90.2	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806728)							
ES1820966-001	TP01_0.0-0.1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	99.3	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	114	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806740)							
ES1820966-022	TP16_0.5-0.6	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	93.8	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	106	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1806888)							
ES1820736-002	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	99.6	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	117	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806729)							
ES1820966-001	TP01_0.0-0.1	EP071: C10 - C14 Fraction	----	523 mg/kg	94.5	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	115	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	120	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806739)							
ES1820966-022	TP16_0.5-0.6	EP071: C10 - C14 Fraction	----	523 mg/kg	93.0	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	112	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	114	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806887)							
ES1820736-002	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	104	73	137

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1806887) - continued							
ES1820736-002	Anonymous	EP071: C15 - C28 Fraction	----	2319 mg/kg	121	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	121	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1807620)							
ES1821042-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	76.6	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808275)							
ES1820966-001	TP01_0.0-0.1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	91.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808276)							
ES1820966-021	TP15_2.0-2.1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	77.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1808649)							
ES1820845-077	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	96.6	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806729)							
ES1820966-001	TP01_0.0-0.1	EP071: >C10 - C16 Fraction	----	860 mg/kg	90.8	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	108	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	105	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806739)							
ES1820966-022	TP16_0.5-0.6	EP071: >C10 - C16 Fraction	----	860 mg/kg	89.2	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	104	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	99.8	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1806887)							
ES1820736-002	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	103	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	125	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	118	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1807620)							
ES1821042-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.3	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808275)							
ES1820966-001	TP01_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	90.9	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808276)							
ES1820966-021	TP15_2.0-2.1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	77.7	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1808649)							
ES1820845-077	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	99.6	70	130
EP080: BTEXN (QCLot: 1807620)							
ES1821042-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	78.7	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	74.9	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	74.0	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 1807620) - continued							
ES1821042-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	75.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	78.9	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	72.4	70	130
EP080: BTEXN (QCLot: 1808275)							
ES1820966-001	TP01_0.0-0.1	EP080: Benzene	71-43-2	2.5 mg/kg	87.1	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	80.9	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	82.6	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	80.7	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	83.3	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	79.5	70	130
EP080: BTEXN (QCLot: 1808276)							
ES1820966-021	TP15_2.0-2.1	EP080: Benzene	71-43-2	2.5 mg/kg	72.0	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	71.9	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	71.0	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	72.4	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	73.4	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	72.0	70	130
EP080: BTEXN (QCLot: 1808649)							
ES1820845-077	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	76.2	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	77.0	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	81.3	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	77.5	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	83.3	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	83.5	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813291)							
ES1820846-031	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	119	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	115	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	77.2	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	80.0	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	107	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813292)							
ES1820736-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	81.2	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	111	50	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813292) - continued							
ES1820736-002	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	105	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	85.2	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	120	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	84.8	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813291)							
ES1820846-031	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	70.6	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	88.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	74.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	84.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.8	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	128	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	125	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	107	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	62.4	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	59.2	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	71.2	30	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813292)							
ES1820736-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	82.0	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	111	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	93.2	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	122	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	112	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	114	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	114	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	123	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	86.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	70.0	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	91.5	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813291)							
ES1820846-031	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	90.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.2	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	95.4	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	65.7	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	83.6	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	80.4	30	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813291) - continued							
ES1820846-031	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	81.2	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813292)							
ES1820736-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	96.8	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	107	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	102	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	80.3	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	101	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	125	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	115	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813291)							
ES1820846-031	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	85.2	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	73.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	126	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	55.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813292)							
ES1820736-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	119	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	124	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	124	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	106	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1820966**	Page	: 1 of 20
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Telephone	: (02) 8784 8504
Project	: IA179600_SWP	Date Samples Received	: 16-Jul-2018
Site	: ----	Issue Date	: 23-Jul-2018
Sampler	: KYLE MCLEAN	No. of samples received	: 84
Order number	: IA179600	No. of samples analysed	: 82

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method **Container /** Client Sample ID(s)		*Extraction / Preparation* *Date extracted*	*Due for extraction*	**Days overdue**	*Analysis* *Date analysed*	*Due for analysis*	**Days overdue**
EP080: BTEXN							
Soil Glass Jar - Unpreserved							
QAQC_TS1,	Trip Spike Control	18-Jul-2018	17-Jul-2018	**1**	18-Jul-2018	17-Jul-2018	**1**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*		***Sample Date***	*Extraction / Preparation* ***Date extracted***	*Due for extraction*	*Evaluation*	*Analysis* ***Date analysed***	*Due for analysis*	*Evaluation*
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
TP03_2.0-2.1,	TP30_2.0-2.1	**13-Jul-2018**	**18-Jul-2018**	20-Jul-2018	✓	**18-Jul-2018**	18-Jul-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)								
TP16_2.4-2.5, TP18_2.9-3.0, QAQC5	TP17_2.6-2.7, TP19_2.7-2.8,	**12-Jul-2018**	**----**	----	----	**18-Jul-2018**	26-Jul-2018	✓
HDPE Soil Jar (EA055)								
TP14_2.2-2.3,	TP15_2.4-2.5	**13-Jul-2018**	**----**	----	----	**18-Jul-2018**	27-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
TP08_1.0-1.1, TP23_0.0-0.1, TP26_0.0-0.1, TP28_0.0-0.1, TP29_0.5-0.6	TP12_0.5-0.6, TP25_0.0-0.1, TP26_1.0-1.1, TP28_0.5-0.6,	**09-Jul-2018**	**----**	----	----	**18-Jul-2018**	23-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
TP09_0.0-0.1, TP10_1.0-1.1, TP22_0.0-0.1, TP24_0.0-0.1, QAQC1	TP09_0.2-0.3, TP21_0.0-0.1, TP22_0.5-0.6, TP24_2.0-2.1,	**10-Jul-2018**	**----**	----	----	**18-Jul-2018**	24-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055)								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)		**Sample Date**	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C) - Continued								
TP01_0.0-0.1, TP02_0.5-0.6, TP05_1.0-1.1, TP07_0.0-0.1, TP11_0.5-0.6,	TP01_0.5-0.6, TP05_0.0-0.1, TP06_0.0-0.1, TP07_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**----**	----	----	**18-Jul-2018**	25-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
TP15_0.0-0.1, TP16_0.5-0.6, TP17_1.0-1.1, TP19_2.0-2.1,	TP15_2.0-2.1, TP17_0.5-0.6, TP18_0.5-0.6, QAQC3	**12-Jul-2018**	**----**	----	----	**18-Jul-2018**	26-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
TP03_0.0-0.1, TP04_0.0-0.1, TP27_0.2-0.3, TP30_2.0-2.1	TP03_2.0-2.1, TP14_1.0-1.1, TP30_0.0-0.1,	**13-Jul-2018**	**----**	----	----	**18-Jul-2018**	27-Jul-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag - Subsampled by ALS (EA200) TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP28_0.0-0.1, TP29_0.5-0.6	**09-Jul-2018**	**----**	----	----	**19-Jul-2018**	05-Jan-2019	✓
Snap Lock Bag - Subsampled by ALS (EA200) TP09_0.0-0.1, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP24_0.0-0.1	**10-Jul-2018**	**----**	----	----	**19-Jul-2018**	06-Jan-2019	✓
Snap Lock Bag - Subsampled by ALS (EA200) TP02_0.5-0.6, TP05_1.0-1.1, TP07_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**----**	----	----	**19-Jul-2018**	07-Jan-2019	✓
Snap Lock Bag - Subsampled by ALS (EA200) TP16_0.5-0.6, TP17_0.5-0.6, TP18_0.5-0.6	**12-Jul-2018**	**----**	----	----	**19-Jul-2018**	08-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP08_0.0-0.3, TP12_0.0-0.3, TP23_0.0-0.3, TP25_0.0-0.3, TP26_0.0-0.3, TP28_0.0-0.3, TP29_0.0-0.3	**09-Jul-2018**	**----**	----	----	**18-Jul-2018**	05-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP09_0.0-0.3, TP10_0.0-0.3, TP21_0.0-0.3, TP22_0.0-0.3, TP24_0.0-0.3	**10-Jul-2018**	**----**	----	----	**18-Jul-2018**	06-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP01_0.0-0.3, TP02_0.0-0.3, TP05_0.0-0.3, TP06_0.0-0.3, TP07_0.0-0.3, TP11_0.0-0.3	**11-Jul-2018**	**----**	----	----	**18-Jul-2018**	07-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP15_0.0-0.1, TP15_0.0-0.3, TP16_0.0-0.3, TP17_0.0-0.3, TP18_0.0-0.3, TP19_0.0-0.3	**12-Jul-2018**	**----**	----	----	**18-Jul-2018**	08-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP19_2.0-2.1	**12-Jul-2018**	**----**	----	----	**19-Jul-2018**	08-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1, TP30_0.0-0.1, TP03_0.0-0.3, TP04_0.0-0.3, TP14_0.0-0.3, TP30_0.0-0.3	**13-Jul-2018**	**----**	----	----	**18-Jul-2018**	09-Jan-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation*			*Analysis*		
			Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA200N: Asbestos Quantification (non-NATA)								
Snap Lock Bag: Separate bag received (EA200N)								
TP08_0.0-0.3, TP23_0.0-0.3, TP26_0.0-0.3, TP29_0.0-0.3	TP12_0.0-0.3, TP25_0.0-0.3, TP28_0.0-0.3,	**09-Jul-2018**	**----**	----	----	**18-Jul-2018**	05-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200N)								
TP09_0.0-0.3, TP21_0.0-0.3, TP24_0.0-0.3	TP10_0.0-0.3, TP22_0.0-0.3,	**10-Jul-2018**	**----**	----	----	**18-Jul-2018**	06-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200N)								
TP01_0.0-0.3, TP05_0.0-0.3, TP07_0.0-0.3,	TP02_0.0-0.3, TP06_0.0-0.3, TP11_0.0-0.3	**11-Jul-2018**	**----**	----	----	**18-Jul-2018**	07-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200N)								
TP15_0.0-0.3, TP17_0.0-0.3, TP19_0.0-0.3	TP16_0.0-0.3, TP18_0.0-0.3,	**12-Jul-2018**	**----**	----	----	**18-Jul-2018**	08-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200N)								
TP03_0.0-0.3, TP14_0.0-0.3,	TP04_0.0-0.3, TP30_0.0-0.3	**13-Jul-2018**	**----**	----	----	**18-Jul-2018**	09-Jan-2019	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
TP03_2.0-2.1,	TP30_2.0-2.1	**13-Jul-2018**	**19-Jul-2018**	10-Aug-2018	✓	**19-Jul-2018**	10-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) TP08_1.0-1.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**19-Jul-2018**	05-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	05-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1	**10-Jul-2018**	**19-Jul-2018**	06-Jan-2019	✓	**19-Jul-2018**	06-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**19-Jul-2018**	06-Jan-2019	✓	**20-Jul-2018**	06-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**19-Jul-2018**	07-Jan-2019	✓	**19-Jul-2018**	07-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	08-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**19-Jul-2018**	09-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	09-Jan-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) TP08_1.0-1.1	**09-Jul-2018**	**19-Jul-2018**	06-Aug-2018	✓	**19-Jul-2018**	06-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**19-Jul-2018**	06-Aug-2018	✓	**20-Jul-2018**	06-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1	**10-Jul-2018**	**19-Jul-2018**	07-Aug-2018	✓	**19-Jul-2018**	07-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**19-Jul-2018**	07-Aug-2018	✓	**20-Jul-2018**	07-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**19-Jul-2018**	08-Aug-2018	✓	**19-Jul-2018**	08-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**19-Jul-2018**	09-Aug-2018	✓	**20-Jul-2018**	09-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1	**13-Jul-2018**	**19-Jul-2018**	10-Aug-2018	✓	**19-Jul-2018**	10-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**19-Jul-2018**	10-Aug-2018	✓	**20-Jul-2018**	10-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP28_0.0-0.1, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP08_1.0-1.1, TP12_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP21_0.0-0.1, TP22_0.0-0.1, TP24_0.0-0.1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP09_0.0-0.1, TP10_1.0-1.1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP01_0.0-0.1, TP02_0.5-0.6, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP16_0.5-0.6, TP17_0.5-0.6, TP18_0.5-0.6, TP19_2.0-2.1	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP15_0.0-0.1	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP27_0.2-0.3, TP30_0.0-0.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP28_0.0-0.1, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP08_1.0-1.1, TP12_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP21_0.0-0.1, TP22_0.0-0.1, TP24_0.0-0.1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP09_0.0-0.1, TP10_1.0-1.1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP01_0.0-0.1, TP02_0.5-0.6, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP16_0.5-0.6, TP17_0.5-0.6, TP18_0.5-0.6, TP19_2.0-2.1	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP15_0.0-0.1	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP27_0.2-0.3, TP30_0.0-0.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**18-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	**Sample Date**	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		**Date extracted**	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* *Date extracted*	 *Due for extraction*	 *Evaluation*	*Analysis* *Date analysed*	 *Due for analysis*	 *Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**18-Jul-2018**	23-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**18-Jul-2018**	24-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**18-Jul-2018**	25-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**18-Jul-2018**	26-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons - Continued							
TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**18-Jul-2018**	27-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**18-Jul-2018**	23-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**18-Jul-2018**	24-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**18-Jul-2018**	25-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**18-Jul-2018**	26-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)		**Sample Date**	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
TP15_0.0-0.1, TP16_0.5-0.6, TP17_1.0-1.1, TP19_2.0-2.1,	TP15_2.0-2.1, TP17_0.5-0.6, TP18_0.5-0.6, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
TP03_0.0-0.1, TP04_0.0-0.1, TP27_0.2-0.3, TP30_2.0-2.1	TP03_2.0-2.1, TP14_1.0-1.1, TP30_0.0-0.1,	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**18-Jul-2018**	27-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071)								
TP03_0.0-0.1, TP04_0.0-0.1, TP27_0.2-0.3, TP30_2.0-2.1	TP03_2.0-2.1, TP14_1.0-1.1, TP30_0.0-0.1,	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**19-Jul-2018**	27-Aug-2018	✓

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) QAQC_TS1, Trip Spike Control	**03-Jul-2018**	**18-Jul-2018**	17-Jul-2018	✗	**18-Jul-2018**	17-Jul-2018	✗
Soil Glass Jar - Unpreserved (EP080) QAQC_TB1	**04-Jul-2018**	**18-Jul-2018**	18-Jul-2018	✓	**18-Jul-2018**	18-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP08_1.0-1.1, TP12_0.5-0.6, TP23_0.0-0.1, TP25_0.0-0.1, TP26_0.0-0.1, TP26_1.0-1.1, TP28_0.0-0.1, TP28_0.5-0.6, TP29_0.5-0.6	**09-Jul-2018**	**18-Jul-2018**	23-Jul-2018	✓	**18-Jul-2018**	23-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP09_0.0-0.1, TP09_0.2-0.3, TP10_1.0-1.1, TP21_0.0-0.1, TP22_0.0-0.1, TP22_0.5-0.6, TP24_0.0-0.1, TP24_2.0-2.1, QAQC1	**10-Jul-2018**	**18-Jul-2018**	24-Jul-2018	✓	**18-Jul-2018**	24-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP01_0.0-0.1, TP01_0.5-0.6, TP02_0.5-0.6, TP05_0.0-0.1, TP05_1.0-1.1, TP06_0.0-0.1, TP07_0.0-0.1, TP07_0.5-0.6, TP11_0.5-0.6, TP11_2.9-3.0	**11-Jul-2018**	**18-Jul-2018**	25-Jul-2018	✓	**18-Jul-2018**	25-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP15_0.0-0.1, TP15_2.0-2.1, TP16_0.5-0.6, TP17_0.5-0.6, TP17_1.0-1.1, TP18_0.5-0.6, TP19_2.0-2.1, QAQC3	**12-Jul-2018**	**18-Jul-2018**	26-Jul-2018	✓	**18-Jul-2018**	26-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP03_0.0-0.1, TP03_2.0-2.1, TP04_0.0-0.1, TP14_1.0-1.1, TP27_0.2-0.3, TP30_0.0-0.1, TP30_2.0-2.1	**13-Jul-2018**	**18-Jul-2018**	27-Jul-2018	✓	**18-Jul-2018**	27-Jul-2018	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) TP26_0.0-0.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP16_2.4-2.5, TP17_2.6-2.7, TP18_2.9-3.0, TP19_2.7-2.8, QAQC5	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP14_2.2-2.3, TP15_2.4-2.5	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) TP26_0.0-0.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP16_2.4-2.5, TP17_2.6-2.7, TP18_2.9-3.0, TP19_2.7-2.8, QAQC5	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP14_2.2-2.3, TP15_2.4-2.5	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) TP26_0.0-0.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP16_2.4-2.5, TP17_2.6-2.7, TP18_2.9-3.0, TP19_2.7-2.8, QAQC5	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP14_2.2-2.3, TP15_2.4-2.5	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) TP26_0.0-0.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP16_2.4-2.5, TP17_2.6-2.7, TP18_2.9-3.0, TP19_2.7-2.8, QAQC5	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP14_2.2-2.3, TP15_2.4-2.5	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) TP26_0.0-0.1	**09-Jul-2018**	**19-Jul-2018**	05-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP16_2.4-2.5, TP17_2.6-2.7, TP18_2.9-3.0, TP19_2.7-2.8, QAQC5	**12-Jul-2018**	**19-Jul-2018**	08-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP14_2.2-2.3, TP15_2.4-2.5	**13-Jul-2018**	**19-Jul-2018**	09-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓

Matrix: **SOLID**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag: Separate bag received (EA200) TP05_ACM_0.9-1.1, TP11_ACM_0.0-1.1	**11-Jul-2018**	**----**	----	----	**20-Jul-2018**	07-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations	ED007	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	8	80	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	8	79	**10.13**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	10	79	**12.66**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	7	58	**12.07**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Exchangeable Cations	ED007	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	58	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Exchangeable Cations	ED007	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	58	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Mercury by FIMS	EG035T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	79	**5.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	58	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	* EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Fibrous Asbestos, Asbestos Fines and sample weight and calculation of percentage concentrations per NEPM protocols. Asbestos (Fines and Fibrous FA+AF) is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Asbestos Identification in Bulk Solids	EA200	SOLID	In house: Referenced to AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES1820966**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mstacey@globalskm.com	E-mail	: Brenda.Hong@alsglobal.com
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: IA179600_SWP	Page	: 1 of 6
Order number	:	Quote number	: ES2018SINKNI0010 (SY/322/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: KYLE MCLEAN		

Dates

Date Samples Received	: 16-Jul-2018 15:30	Issue Date	: 17-Jul-2018
Client Requested Due Date	: 23-Jul-2018	Scheduled Reporting Date	: **23-Jul-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: -1.4 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 84 / 82

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Proactive Holding Time Report
    - Requested Deliverables
- **Clay content analysis has not been added for samples TP03_2.0-2.1 anmd TP30_2.0-2.1 as no seperate snap lock bags were received for these samples.**
- **Extra samples TP17_2.0-2.1 and TP30_0.5-0.6 received by ALS, these samples have been placed on hold.**
- **Samples QAQC2, QAQC4 and QAQC6 have been forwarded to Envirolab as per COC request.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Asbestos and clay content analysis will be conducted by ALS Newcastle.**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method *Client sample ID*	Sample Container Received	Preferred Sample Container for Analysis
Asbestos Identification in Soils : EA200		
TP02_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP05_1.0-1.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP07_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP08_1.0-1.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP09_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP10_1.0-1.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP11_2.9-3.0	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP12_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP16_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP17_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP18_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP21_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP22_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP23_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP24_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP25_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP26_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP28_0.0-0.1	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag
TP29_0.5-0.6	- Snap Lock Bag - Subsampled by ALS	- Snap Lock Bag - ACM/Asbestos Grab Bag

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - ED008 Def Exchangeable Cations with pre-treatment -	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - S-11 OC/PCB	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES1820966-001	11-Jul-2018 00:00	TP01_0.0-0.1		✓				✓	✓
ES1820966-002	11-Jul-2018 00:00	TP01_0.5-0.6		✓					✓
ES1820966-003	11-Jul-2018 00:00	TP02_0.5-0.6		✓	✓			✓	✓

			SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - ED008 Def Exchangeable Cations with pre-treatment -	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - S-11 OC/PCB	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES1820966-004	13-Jul-2018 00:00	TP03_0.0-0.1		✓					✓
ES1820966-005	13-Jul-2018 00:00	TP03_2.0-2.1	✓	✓	✓	✓		✓	✓
ES1820966-006	13-Jul-2018 00:00	TP04_0.0-0.1		✓	✓			✓	✓
ES1820966-007	11-Jul-2018 00:00	TP05_0.0-0.1		✓					✓
ES1820966-008	11-Jul-2018 00:00	TP05_1.0-1.1		✓	✓			✓	✓
ES1820966-009	11-Jul-2018 00:00	TP06_0.0-0.1		✓				✓	✓
ES1820966-010	11-Jul-2018 00:00	TP07_0.0-0.1		✓				✓	✓
ES1820966-011	11-Jul-2018 00:00	TP07_0.5-0.6		✓	✓				✓
ES1820966-012	09-Jul-2018 00:00	TP08_1.0-1.1		✓	✓			✓	✓
ES1820966-013	10-Jul-2018 00:00	TP09_0.0-0.1		✓	✓			✓	✓
ES1820966-014	10-Jul-2018 00:00	TP09_0.2-0.3		✓					✓
ES1820966-015	10-Jul-2018 00:00	TP10_1.0-1.1		✓	✓			✓	✓
ES1820966-016	11-Jul-2018 00:00	TP11_0.5-0.6		✓					✓
ES1820966-017	11-Jul-2018 00:00	TP11_2.9-3.0		✓	✓			✓	✓
ES1820966-018	09-Jul-2018 00:00	TP12_0.5-0.6		✓	✓			✓	✓
ES1820966-019	13-Jul-2018 00:00	TP14_1.0-1.1		✓	✓			✓	✓
ES1820966-020	12-Jul-2018 00:00	TP15_0.0-0.1		✓	✓			✓	✓
ES1820966-021	12-Jul-2018 00:00	TP15_2.0-2.1		✓					✓
ES1820966-022	12-Jul-2018 00:00	TP16_0.5-0.6		✓	✓			✓	✓
ES1820966-023	12-Jul-2018 00:00	TP17_0.5-0.6		✓	✓			✓	✓
ES1820966-024	12-Jul-2018 00:00	TP17_1.0-1.1		✓					✓
ES1820966-025	12-Jul-2018 00:00	TP18_0.5-0.6		✓	✓			✓	✓
ES1820966-026	12-Jul-2018 00:00	TP19_2.0-2.1		✓	✓			✓	✓
ES1820966-027	10-Jul-2018 00:00	TP21_0.0-0.1		✓	✓			✓	✓
ES1820966-028	10-Jul-2018 00:00	TP22_0.0-0.1		✓	✓			✓	✓
ES1820966-029	10-Jul-2018 00:00	TP22_0.5-0.6		✓					✓
ES1820966-030	09-Jul-2018 00:00	TP23_0.0-0.1		✓	✓			✓	✓
ES1820966-031	10-Jul-2018 00:00	TP24_0.0-0.1		✓	✓			✓	✓
ES1820966-032	10-Jul-2018 00:00	TP24_2.0-2.1		✓					✓
ES1820966-033	09-Jul-2018 00:00	TP25_0.0-0.1		✓	✓			✓	✓
ES1820966-034	09-Jul-2018 00:00	TP26_0.0-0.1		✓	✓		✓	✓	✓
ES1820966-035	09-Jul-2018 00:00	TP26_1.0-1.1		✓					✓
ES1820966-036	13-Jul-2018 00:00	TP27_0.2-0.3		✓				✓	✓
ES1820966-037	09-Jul-2018 00:00	TP28_0.0-0.1		✓	✓			✓	✓
ES1820966-038	09-Jul-2018 00:00	TP28_0.5-0.6		✓					✓
ES1820966-039	09-Jul-2018 00:00	TP29_0.5-0.6		✓	✓			✓	✓
ES1820966-040	13-Jul-2018 00:00	TP30_0.0-0.1		✓	✓			✓	✓
ES1820966-041	13-Jul-2018 00:00	TP30_2.0-2.1	✓	✓		✓			✓
ES1820966-071	13-Jul-2018 00:00	TP14_2.2-2.3		✓			✓		
ES1820966-072	13-Jul-2018 00:00	TP15_2.4-2.5		✓			✓		
ES1820966-073	12-Jul-2018 00:00	TP16_2.4-2.5		✓			✓		

			SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - ED008 Def Exchangeable Cations with pre-treatment -	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - S-11 OC/PCB	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES1820966-074	12-Jul-2018 00:00	TP17_2.6-2.7		✓			✓		
ES1820966-075	12-Jul-2018 00:00	TP18_2.9-3.0		✓			✓		
ES1820966-076	12-Jul-2018 00:00	TP19_2.7-2.8		✓			✓		
ES1820966-077	10-Jul-2018 00:00	QAQC1		✓					✓
ES1820966-078	12-Jul-2018 00:00	QAQC3		✓					✓
ES1820966-079	12-Jul-2018 00:00	QAQC5		✓			✓		

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	(On Hold) SOIL No analysis requested	SOIL - EA200N Asbestos in Soils - (<1kg samples ONLY)	SOIL - EP080 BTEXN
ES1820966-042	11-Jul-2018 00:00	TP01_0.0-0.3		✓	
ES1820966-043	11-Jul-2018 00:00	TP02_0.0-0.3		✓	
ES1820966-044	13-Jul-2018 00:00	TP03_0.0-0.3		✓	
ES1820966-045	13-Jul-2018 00:00	TP04_0.0-0.3		✓	
ES1820966-046	11-Jul-2018 00:00	TP05_0.0-0.3		✓	
ES1820966-047	11-Jul-2018 00:00	TP06_0.0-0.3		✓	
ES1820966-048	11-Jul-2018 00:00	TP07_0.0-0.3		✓	
ES1820966-049	09-Jul-2018 00:00	TP08_0.0-0.3		✓	
ES1820966-050	10-Jul-2018 00:00	TP09_0.0-0.3		✓	
ES1820966-051	10-Jul-2018 00:00	TP10_0.0-0.3		✓	
ES1820966-052	11-Jul-2018 00:00	TP11_0.0-0.3		✓	
ES1820966-053	09-Jul-2018 00:00	TP12_0.0-0.3		✓	
ES1820966-054	13-Jul-2018 00:00	TP14_0.0-0.3		✓	
ES1820966-055	12-Jul-2018 00:00	TP15_0.0-0.3		✓	
ES1820966-056	12-Jul-2018 00:00	TP16_0.0-0.3		✓	
ES1820966-057	12-Jul-2018 00:00	TP17_0.0-0.3		✓	
ES1820966-058	12-Jul-2018 00:00	TP18_0.0-0.3		✓	
ES1820966-059	12-Jul-2018 00:00	TP19_0.0-0.3		✓	
ES1820966-060	10-Jul-2018 00:00	TP21_0.0-0.3		✓	
ES1820966-061	10-Jul-2018 00:00	TP22_0.0-0.3		✓	
ES1820966-062	09-Jul-2018 00:00	TP23_0.0-0.3		✓	
ES1820966-063	10-Jul-2018 00:00	TP24_0.0-0.3		✓	
ES1820966-064	09-Jul-2018 00:00	TP25_0.0-0.3		✓	
ES1820966-065	09-Jul-2018 00:00	TP26_0.0-0.3		✓	

			(On Hold) SOIL No analysis requested	SOIL - EA200N Asbestos in Soils - (<1kg samples ONLY)	SOIL - EP080 BTEXN
ES1820966-066	09-Jul-2018 00:00	TP28_0.0-0.3		✓	
ES1820966-067	09-Jul-2018 00:00	TP29_0.0-0.3		✓	
ES1820966-068	13-Jul-2018 00:00	TP30_0.0-0.3		✓	
ES1820966-080	04-Jul-2018 00:00	QAQC_TB1			✓
ES1820966-081	03-Jul-2018 00:00	QAQC_TS1			✓
ES1820966-082	03-Jul-2018 00:00	Trip Spike Control			✓
ES1820966-083	17-Jul-2018 00:00	TP17_2.0-2.1	✓		
ES1820966-084	17-Jul-2018 00:00	TP30_0.5-0.6	✓		

Matrix: **SOLID**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOLID - EA200B Asbestos Identification in Bulk Solids (Excluding
ES1820966-069	11-Jul-2018 00:00	TP05_ACM_0.9-1.1	✓
ES1820966-070	11-Jul-2018 00:00	TP11_ACM_0.0-1.1	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)		
- A4 - AU Tax Invoice (INV)	Email	au-ap@jacobs.com
KYLE MCLEAN		
- *AU Certificate of Analysis - NATA (COA)	Email	kyle.mclean@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kyle.mclean@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kyle.mclean@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	kyle.mclean@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	kyle.mclean@jacobs.com
- Chain of Custody (CoC) (COC)	Email	kyle.mclean@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	kyle.mclean@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	kyle.mclean@jacobs.com
Michael Stacey		
- *AU Certificate of Analysis - NATA (COA)	Email	mstacey@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mstacey@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mstacey@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mstacey@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	mstacey@globalskm.com
- Chain of Custody (CoC) (COC)	Email	mstacey@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	mstacey@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	mstacey@globalskm.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS

OFFICE: North Sydney

PROJECT: IA179600_SWP

ORDER NUMBER:

PROJECT MANAGER: Michael Stacey **CONTACT PH:** 02 9032 1467

SAMPLER: Kyle McLean **SAMPLER MOBILE:** 0402 536796

COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):**

Email Reports to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

Email Invoice to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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☑ Standard TAT **(List due date):**

☐ Non Standard or urgent TAT **(List due date):**

ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No [✓ N/A]

[✓ Free ice] / frozen ice bricks present upon receipt? [✓ Yes] No N/A

Random Sample Temperature on Receipt: -1.4 °C

Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
	M. Chan 16/7/18		
DATE/TIME:	DATE/TIME: 15:30	DATE/TIME:	DATE/TIME:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Heavy Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) / TRH / BTEXN / PAH (S-26)	OC / PCB (S-11)	PFAS - Full suite (EP231X)	Asbestos in Soils (EA200N)	Asbestis ID in soils P/A (EA200)	TRH C6 - C40 (TRH only)	- 1:5 Leach)EN34) / - pH 1:5 (EA002) / - CEC (ED008 Def) / - % Clay EA150H-C)	BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP01 _ 0.0 - 0.1	11/7/18	S	NA	1	X	X							
2	TP01 _ 0.5 - 0.6	↓	↓	↓	1	X								
3	TP02 _ 0.5 - 0.6	↓	↓	↓	1	X	X			X				
4	TP03 _ 0.0 - 0.1	13/7/18	↓	↓	2	X								
5	TP03 _ 2.0 - 2.1	↓	↓	↓	2	X	X			X		X		
6	TP04 _ 0.0 - 0.1	↓	↓	↓	2	X	X			X				
7	TP05 _ 0.0 - 0.1	11/7/18	↓	↓	1	X								
8	TP05 _ 1.0 - 1.1	↓	↓	↓	1	X	X			X				
9	TP06 _ 0.0 _ 0.1	↓	↓	↓	1	X	X							Clay content + Asbestos
10	TP07 _ 0.0 - 0.1	↓	↓	↓	1	X	X							Newcastle
11	TP07 _ 0.5 - 0.6	↓	↓	↓	1	X				X				
12	TP08 _ 1.0 _ 1.1	9/7/18	S	NA	1	X	X			X				QAQC2, QAQC4, QAQC6 → Envirolab
				TOTAL										

Environmental Division
Sydney
Work Order Reference
ES1820966

Telephone : + 61-2-8784 8555

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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PROJECT: IA179600_SWP

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CONTACT PH: 02 9032 1467

SAMPLER: Kyle McLean

SAMPLER MOBILE: 0402 536796

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Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

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DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
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13	TP09 - 0.0-0.1	10/7/18	S	NA	1	X	X			X				
14	TP09 - 0.2-0.3				1	X								
15	TP10 - 1.0-1.1	↓			1	X	X			X				
16	TP11 - 0.5-0.6	11/7/18			1	X								
17	TP11 - 2.9-3.0	↓			1	X	X			X				
18	TP12 - 0.5-0.6	9/7/18			1	X	X			X				
19	TP14 - 1.0-1.1	13/7/18			2	X	X			X				
20	TP15 - 0.0-0.1	12/7/18			2	X	X			X				
21	TP15 - 2.0-2.1				2	X								
22	TP16 - 0.5-0.6				2	X	X			X				
-	~~TP16~~		↓											
23	TP17 - 0.5-0.6	↓	S	↓ NA	1	X	X			X				
				TOTAL										

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SAMPLER: Kyle McLean
SAMPLER MOBILE: 0402 536796
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Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
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24	TP17 - 1.0-1.1	12/7/18	S	NA	1	X								
25	TP18 - 0.5-0.6	↓	↓	↓	1	X	X			X				
	~~TP18~~													
26	TP19 - 2.0-2.1				2	X	X			X				
	~~TP19~~													
27	TP21 - 0.0-0.1	10/7/18			1	X	X			X				
28	TP22 - 0.0-0.1	↓			1	X	X			X				
29	TP22 - 0.5-0.6				1	X								
30	TP23 - 0.0-0.1	9/7/18			1	X	X			X				
31	TP24 - 0.0-0.1	10/7/18			1	X	X			X				
32	TP24 - 2.0-2.1	↓			1	X								
33	TP25 - 0.0-0.1	9/7/18	S	NA	1	X	X			X				
				TOTAL										

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COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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34	TP26 - 0.0 - 0.1	9/7/18	S	NA	[illegible]	X	X	X		X				
35	TP26 - 1.0 - 1.1	↓	↓	↓	1 ↓	X								
	~~TP26~~				~~1~~									
36	TP27 - 0.2 - 0.3	13/7/18			1	X	X							No asbestos bag.
37	TP28 - 0.0 - 0.1	9/7/18			1	X	X			X				
38	TP28 - 0.5 - 0.6	↓			1	X								
39	TP29 - 0.5 - 0.6				1	X	X			X				
40	TP30 - 0.0 - 0.1	13/7/18			2	X	X			X				
41	TP30 - 2.0 - 2.1	↓			1	X						X		
42	TP01 - 0.0 - 0.3	11/7/18			1				X					
43	TP02 - 0.0 - 0.3	↓	↓	↓	1 ↓				X					
44	TP03 - 0.0 - 0.3	13/7/18	S	NA	1				X					
				TOTAL										

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Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS

OFFICE: North Sydney

PROJECT: IA179600_SWP

ORDER NUMBER:

PROJECT MANAGER: Michael Stacey

CONTACT PH: 02 9032 1467

SAMPLER: Kyle McLean

SAMPLER MOBILE: 0402 536796

COC emailed to ALS? (YES / NO)

EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

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☐ Non Standard or urgent TAT **(List due date):**

ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Heavy Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) / TRH / BTEXN / PAH (S-26)	OC / PCB (S-11)	PFAS - Full suite (EP231X)	Asbestos in Soils (EA200N)	Asbestis ID in soils P/A (EA200)	TRH C6 - C40 (TRH only)	- 1:5 Leach)EN34) / - pH 1:5 (EA002) / - CEC (ED008 Def) / - % Clay EA150H-C)	BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
45	TP04 - 0.0-0.3	13/7/8	S	NA	1				X					
46	TP05 - 0.0-0.3	11/7/18							X					
47	TP06 - 0.0-0.3								X					
48	TP07 - 0.0-0.3	↓							X					
49	TP08 - 0.0-0.3	9/7/18							X					
50	TP09 - 0.0-0.3	10/7/18							X					
51	TP10 - 0.0-0.3	10/7/18							X					
52	TP11 - 0.0-0.3	11/7/18							X					
53	TP12 - 0.0-0.3	9/7/18							X					
54	TP14 - 0.0-0.3	13/7/18							X					
55	TP15 - 0.0-0.3	12/7/18	↓		↓				X					
56	TP16 - 0.0-0.3	12/7/18	S	NA ↓	1				X					
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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OFFICE: North Sydney

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SAMPLER: Kyle McLean **SAMPLER MOBILE:** 0402 536796

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COC: 1 2 3 4 5 6 7

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Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
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57	TP17-0.0-0.3	12/7/18	S	NA	1				X					
58	TP18-0.0-0.3								X					
59	TP19-0.0-0.3	↓							X					
60	TP21-0.0-0.3	10/7/18							X					
61	TP22-0.0-0.3	↓							X					
62	TP23-0.0-0.3	9/7/18							X					
63	TP24-0.0-0.3	10/7/18							X					
64	TP25-0.0-0.3	9/7/18							X					
65	TP26-0.0-0.3	↓							X					
-	~~TP27-0.0-0.3~~	13/7/18							X					
66	TP28-0.0-0.3	9/7/18	↓	↓	↓				X					
67	TP29-0.0-0.3	↓	S	NA	1				X					
				TOTAL										

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ALS environmental

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68	TP30_0.0-0.3	13/7/18	S	NA	1				X					
69	TP05_ACM_0.9-1.1	11/7/18								X				ACM sample.
70	TP11-ACM_0.0-1.1	11/7/18								X				ACM sample.
71	TP14_2.2-2.3	13/7/18						X						
72	TP15-2.4-2.5	13/7/18						X						
73	TP16-2.4-2.5	12/7/18						X						
74	TP17_2.6-2.7	12/7/18						X						
75	TP18_2.9-3.0	12/7/18			↓			X						
76	TP19_2.7-2.8	12/7/18			1			X						
77	QAQC1	10/7/18			1	X								
* FWD	QAQC2	10/7/18	↓	↓	1	X								Send to Envirolab
78	QAQC3	12/7/18	S	NA	1	X								
				TOTAL										

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Other comment:

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DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:

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*	FWD	QAQC4	12/7/18	S	NA	1	X								Send to Envirolab
	~~79~~	~~QAQC5.~~	~~12/7/18~~			~~1~~			~~X~~						
*	FWD	QAQC6	12/7/18			1			X						Send to Envirolab
	80	QAQC-TB1	9/7/18			1								X	
	81	QAQC-TS1	9/7/18	S	NA	1								X	
		TP17_2.0-2.1	12/7/18												
		TP30-0.5-0.6	13/7/18												
					TOTAL										

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CERTIFICATE OF ANALYSIS

Work Order : **ES1821108**
Amendment : **1**
Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : Michael Stacey
Address : 100 CHRISTIE STREET P O BOX 164
ST LEONARDS NSW, AUSTRALIA 2065
Telephone : +61 02 9928 2100
Project : IA179600_SWP
Order number : IA179600
C-O-C number : ----
Sampler : KYLE MCLEAN
Site : ----
Quote number : SY/322/18
No. of samples received : 25
No. of samples analysed : 23

Page : 1 of 22
Laboratory : Environmental Division Sydney
Contact : Brenda Hong
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : (02) 8784 8504
Date Samples Received : 17-Jul-2018 14:40
Date Analysis Commenced : 19-Jul-2018
Issue Date : 03-Aug-2018 14:39

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Gerrad Morgan	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Ch' Chrysotile (white asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- EG005: Poor precision was obtained for Copper on sample ES1820981-1. Results have been confirmed by re-extraction and reanalysis.
- EP080: The trip spike and its control have been analysed for volatile TPH and BTEX only. The trip spike and control were prepared in the lab using reagent grade sand spiked with petrol. The spike was dispatched from the lab and the control retained.
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP31_0.0-0.1**	**TP32_0.5-0.6**	**TP32_1.0-1.1**	**TP33_0.0-0.1**	**TP34_0.0-0.1**
			Client sampling date / time	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-001**	**ES1821108-002**	**ES1821108-003**	**ES1821108-004**	**ES1821108-005**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**7.3**	**8.4**	**13.8**	**9.4**	**8.3**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	----	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	----	**No**	**No**
Asbestos Type	1332-21-4	-	--	**-**	**-**	----	**-**	**-**
Sample weight (dry)	----	0.01	g	**148**	**56.2**	----	**157**	**230**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	----	**G.MORGAN**	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	**2**	<1	<1	**1**	<1
Chromium	7440-47-3	2	mg/kg	**15**	**5**	**18**	**13**	**7**
Copper	7440-50-8	5	mg/kg	**9**	<5	<5	**10**	<5
Lead	7439-92-1	5	mg/kg	**38**	<5	**14**	**36**	**6**
Nickel	7440-02-0	2	mg/kg	**4**	**3**	**3**	**7**	**4**
Zinc	7440-66-6	5	mg/kg	**49**	<5	<5	**32**	**5**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP31_0.0-0.1**	**TP32_0.5-0.6**	**TP32_1.0-1.1**	**TP33_0.0-0.1**	**TP34_0.0-0.1**
			Client sampling date / time	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-001**	**ES1821108-002**	**ES1821108-003**	**ES1821108-004**	**ES1821108-005**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP31_0.0-0.1**	**TP32_0.5-0.6**	**TP32_1.0-1.1**	**TP33_0.0-0.1**	**TP34_0.0-0.1**
			Client sampling date / time	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-001**	**ES1821108-002**	**ES1821108-003**	**ES1821108-004**	**ES1821108-005**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	----	----	----	**0.0202**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	----	----	----	**0.0510**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	----	----	----	**0.691**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	----	----	----	**0.0410**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	----	----	----	**0.860**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	TP31_0.0-0.1	TP32_0.5-0.6	TP32_1.0-1.1	TP33_0.0-0.1	TP34_0.0-0.1
Client sampling date / time				17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00
				ES1821108-001	**ES1821108-002**	**ES1821108-003**	**ES1821108-004**	**ES1821108-005**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	----	----	----	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	----	----	----	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	----	----	----	**0.0022**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	----	----	----	**0.0411**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	----	----	----	**0.0176**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	----	----	----	**0.0396**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	----	----	----	**0.0003**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	----	----	----	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	----	----	----	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	----	----	----	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	----	----	----	**0.0002**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	----	----	----	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	----	----	----	**0.0004**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	----	----	----	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	----	----	----	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	----	----	----	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	----	----	----	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	----	----	----	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	----	----	----	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP31_0.0-0.1**	**TP32_0.5-0.6**	**TP32_1.0-1.1**	**TP33_0.0-0.1**	**TP34_0.0-0.1**
			Client sampling date / time	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1821108-001**	**ES1821108-002**	**ES1821108-003**	**ES1821108-004**	**ES1821108-005**
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	----	----	----	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	----	----	----	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	----	----	----	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	----	----	----	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	----	----	----	**1.76**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	----	----	----	**1.55**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	----	----	----	**1.67**
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**81.2**	**104**	----	**71.4**	**102**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**100**	**137**	----	**80.0**	**106**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**82.6**	**105**	----	**64.5**	**90.2**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**94.8**	**97.9**	**87.2**	**90.5**	**97.3**
2-Chlorophenol-D4	93951-73-6	0.5	%	**99.1**	**99.8**	**87.2**	**95.6**	**101**
2.4.6-Tribromophenol	118-79-6	0.5	%	**89.7**	**87.3**	**85.1**	**95.4**	**98.4**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**93.4**	**95.7**	**97.0**	**104**	**82.1**
Anthracene-d10	1719-06-8	0.5	%	**105**	**108**	**103**	**99.2**	**108**
4-Terphenyl-d14	1718-51-0	0.5	%	**92.5**	**93.9**	**88.9**	**87.5**	**104**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**100**	**96.7**	**96.6**	**98.3**	**97.2**
Toluene-D8	2037-26-5	0.2	%	**110**	**107**	**110**	**114**	**117**
4-Bromofluorobenzene	460-00-4	0.2	%	**109**	**104**	**106**	**104**	**112**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	----	----	----	**101**
13C8-PFOA	----	0.0002	%	----	----	----	----	**100**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP34_0.5-0.6**	**TP35_0.0-0.1**	**TP35_2.0-2.1**	**TP36_0.5-0.6**	**TP36_2.9-3.0**
			Client sampling date / time	17-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-006**	**ES1821108-007**	**ES1821108-008**	**ES1821108-009**	**ES1821108-011**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**9.5**	**4.7**	**20.1**	**17.9**	**14.5**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	**No**	----	**No**	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	**No**	----	**No**	----
Asbestos Type	1332-21-4	-	--	----	**-**	----	**-**	----
Sample weight (dry)	----	0.01	g	----	**65.6**	----	**58.6**	----
APPROVED IDENTIFIER:	----	-	--	----	**G.MORGAN**	----	**G.MORGAN**	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**5**	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**4**	<2	**19**	**17**	**7**
Copper	7440-50-8	5	mg/kg	<5	<5	**8**	**17**	**11**
Lead	7439-92-1	5	mg/kg	<5	<5	**26**	**24**	**8**
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	**14**	<2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	**37**	**9**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	----	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	----	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP34_0.5-0.6**	**TP35_0.0-0.1**	**TP35_2.0-2.1**	**TP36_0.5-0.6**	**TP36_2.9-3.0**
			Client sampling date / time	17-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-006**	**ES1821108-007**	**ES1821108-008**	**ES1821108-009**	**ES1821108-011**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	----	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	----	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	----	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	----	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Client sample ID				**TP34_0.5-0.6**	**TP35_0.0-0.1**	**TP35_2.0-2.1**	**TP36_0.5-0.6**	**TP36_2.9-3.0**
Client sampling date / time				17-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-006**	**ES1821108-007**	**ES1821108-008**	**ES1821108-009**	**ES1821108-011**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**75.7**	----	**89.5**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	**95.3**	----	**103**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	**78.7**	----	**85.7**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**91.6**	**96.7**	**96.6**	**96.5**	**94.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**94.7**	**98.8**	**98.2**	**102**	**98.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**86.1**	**84.6**	**83.1**	**99.0**	**78.8**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Client sample ID	**TP34_0.5-0.6**	**TP35_0.0-0.1**	**TP35_2.0-2.1**	**TP36_0.5-0.6**	**TP36_2.9-3.0**
			Client sampling date / time	17-Jul-2018 00:00	17-Jul-2018 00:00	17-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1821108-006**	**ES1821108-007**	**ES1821108-008**	**ES1821108-009**	**ES1821108-011**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**101**	**93.8**	**98.1**	**92.3**	**83.5**
Anthracene-d10	1719-06-8	0.5	%	**104**	**100**	**101**	**104**	**96.9**
4-Terphenyl-d14	1718-51-0	0.5	%	**91.0**	**98.0**	**94.2**	**107**	**106**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**101**	**97.3**	**97.8**	**96.9**	**101**
Toluene-D8	2037-26-5	0.2	%	**111**	**108**	**114**	**110**	**109**
4-Bromofluorobenzene	460-00-4	0.2	%	**103**	**99.8**	**105**	**101**	**100**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP37_0.0-0.1**	**TP38_0.0-0.1**	**TP38_1.0-1.1**	**TP39_2.0-2.1**	**TP40_0.5-0.6**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-012**	**ES1821108-013**	**ES1821108-014**	**ES1821108-015**	**ES1821108-016**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**13.4**	**13.8**	**18.7**	**18.7**	**12.6**
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	----	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	----	**No**	**No**
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Sample weight (dry)	----	0.01	g	**14.2**	**54.2**	----	**61.6**	**81.2**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	----	**G.MORGAN**	**G.MORGAN**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**7**	**6**	**7**	**11**	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**12**	**14**	**20**	**11**	**11**
Copper	7440-50-8	5	mg/kg	**31**	**15**	**14**	**29**	**15**
Lead	7439-92-1	5	mg/kg	**28**	**14**	**23**	**28**	**22**
Nickel	7440-02-0	2	mg/kg	**10**	**5**	**4**	**10**	**8**
Zinc	7440-66-6	5	mg/kg	**60**	**24**	**14**	**70**	**29**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP37_0.0-0.1**	**TP38_0.0-0.1**	**TP38_1.0-1.1**	**TP39_2.0-2.1**	**TP40_0.5-0.6**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-012**	**ES1821108-013**	**ES1821108-014**	**ES1821108-015**	**ES1821108-016**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP37_0.0-0.1**	**TP38_0.0-0.1**	**TP38_1.0-1.1**	**TP39_2.0-2.1**	**TP40_0.5-0.6**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-012**	**ES1821108-013**	**ES1821108-014**	**ES1821108-015**	**ES1821108-016**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**61.6**	**74.7**	----	**67.0**	**77.2**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**69.9**	**90.2**	----	**67.6**	**87.6**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**71.0**	**79.8**	----	**61.2**	**75.8**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**93.0**	**93.6**	**92.2**	**99.4**	**90.9**
2-Chlorophenol-D4	93951-73-6	0.5	%	**96.6**	**96.7**	**92.3**	**98.9**	**91.3**
2.4.6-Tribromophenol	118-79-6	0.5	%	**83.4**	**78.2**	**83.2**	**93.1**	**79.1**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **SOIL** **(**Matrix: **SOIL)**			*Client sample ID*	**TP37_0.0-0.1**	**TP38_0.0-0.1**	**TP38_1.0-1.1**	**TP39_2.0-2.1**	**TP40_0.5-0.6**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-012**	**ES1821108-013**	**ES1821108-014**	**ES1821108-015**	**ES1821108-016**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.5	%	**93.2**	**99.3**	**100**	**89.9**	**103**
Anthracene-d10	1719-06-8	0.5	%	**110**	**104**	**106**	**110**	**107**
4-Terphenyl-d14	1718-51-0	0.5	%	**95.6**	**89.9**	**90.1**	**96.5**	**93.8**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**113**	**95.2**	**91.6**	**95.4**	**95.2**
Toluene-D8	2037-26-5	0.2	%	**125**	**107**	**106**	**103**	**104**
4-Bromofluorobenzene	460-00-4	0.2	%	**119**	**98.1**	**95.6**	**94.4**	**95.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**TP40_2.9-3.0**	**QAQC9**	**QAQC11**	**QAQC7**	**QAQC_TB2**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	04-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-017**	**ES1821108-018**	**ES1821108-020**	**ES1821108-022**	**ES1821108-024**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	**6.2**	----	----	----
Moisture Content	----	1.0	%	**17.2**	----	**8.6**	**15.8**	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	<5	<5	----
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	----
Chromium	7440-47-3	2	mg/kg	**8**	----	**5**	**7**	----
Copper	7440-50-8	5	mg/kg	**19**	----	<5	**13**	----
Lead	7439-92-1	5	mg/kg	**32**	----	<5	**9**	----
Nickel	7440-02-0	2	mg/kg	**4**	----	<2	**2**	----
Zinc	7440-66-6	5	mg/kg	**22**	----	<5	**10**	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	**0.6**	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**TP40_2.9-3.0**	**QAQC9**	**QAQC11**	**QAQC7**	**QAQC_TB2**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	04-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-017**	**ES1821108-018**	**ES1821108-020**	**ES1821108-022**	**ES1821108-024**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	<100	<100	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	<50	<50	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	<50	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	**0.0369**	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	**0.0714**	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	**0.826**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	**0.0612**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	**1.06**	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**TP40_2.9-3.0**	**QAQC9**	**QAQC11**	**QAQC7**	**QAQC_TB2**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	04-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-017**	**ES1821108-018**	**ES1821108-020**	**ES1821108-022**	**ES1821108-024**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	**0.0041**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	**0.0529**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	**0.0274**	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	**0.0423**	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	**0.0002**	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	**0.0003**	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	**TP40_2.9-3.0**	**QAQC9**	**QAQC11**	**QAQC7**	**QAQC_TB2**
			Client sampling date / time	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	16-Jul-2018 00:00	04-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821108-017**	**ES1821108-018**	**ES1821108-020**	**ES1821108-022**	**ES1821108-024**
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	**2.18**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	**1.89**	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	**2.05**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**90.5**	----	**92.1**	**75.5**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**91.5**	----	**95.6**	**82.2**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**84.0**	----	**73.9**	**68.5**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**95.1**	----	**101**	**91.7**	----
Anthracene-d10	1719-06-8	0.5	%	**102**	----	**107**	**90.4**	----
4-Terphenyl-d14	1718-51-0	0.5	%	**88.6**	----	**90.9**	**78.1**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**98.5**	----	**102**	**102**	**102**
Toluene-D8	2037-26-5	0.2	%	**111**	----	**106**	**104**	**105**
4-Bromofluorobenzene	460-00-4	0.2	%	**102**	----	**98.9**	**107**	**99.2**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	**94.5**	----	----	----
13C8-PFOA	----	0.0002	%	----	**105**	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

Compound	CAS Number	LOR	Unit	QAQC_TS2	Trip Spike Control 2	----	----	----
			Client sampling date / time	03-Jul-2018 00:00	03-Jul-2018 00:00	----	----	----
				ES1821108-025	ES1821108-026	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	**7.1**	**6.8**	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	**0.8**	**0.8**	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	**4.4**	**4.1**	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	**1.6**	**1.6**	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	**13.9**	**13.3**	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	**6.0**	**5.7**	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**97.9**	**81.6**	----	----	----
Toluene-D8	2037-26-5	0.2	%	**110**	**97.7**	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**108**	**96.7**	----	----	----

Analytical Results

Sub-Matrix: **SOLID**
(Matrix: **SOLID**)

			Client sample ID	**TP36_ACM_0.0-0.5**	**----**	**----**	**----**	**----**
			Client sampling date / time	16-Jul-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**ES1821108-010**	--------	--------	--------	--------
				Result	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	**Yes**	----	----	----	----
Asbestos Type	1332-21-4	-	--	**Ch**	----	----	----	----
Sample weight (dry)	----	0.01	g	**25.1**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	**A. SMYLIE**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	TP31_0.0-0.1 - 17-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP32_0.5-0.6 - 16-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP33_0.0-0.1 - 17-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP34_0.0-0.1 - 17-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP35_0.0-0.1 - 17-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP36_0.5-0.6 - 16-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP37_0.0-0.1 - 16-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP38_0.0-0.1 - 16-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP39_2.0-2.1 - 16-Jul-2018 00:00	Mid brown sandy soil.
EA200: Description	TP40_0.5-0.6 - 16-Jul-2018 00:00	Mid brown sandy soil.

Sub-Matrix: **SOLID**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	TP36_ACM_0.0-0.5 - 16-Jul-2018 00:00	Three pieces of asbestos cement sheeting approximately 40x25x5mm

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order : **ES1821108**
Amendment : **1**

Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : Michael Stacey
Address : 100 CHRISTIE STREET P O BOX 164
ST LEONARDS NSW, AUSTRALIA 2065
Telephone : +61 02 9928 2100
Project : IA179600_SWP
Order number : IA179600
C-O-C number : ----
Sampler : KYLE MCLEAN
Site : ----
Quote number : SY/322/18
No. of samples received : 25
No. of samples analysed : 23

Page : 1 of 18

Laboratory : Environmental Division Sydney
Contact : Brenda Hong
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : (02) 8784 8504
Date Samples Received : 17-Jul-2018
Date Analysis Commenced : 19-Jul-2018
Issue Date : 03-Aug-2018

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Gerrad Morgan	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1814054)									
ES1821106-011	Anonymous	EA055: Moisture Content	----	0.1	%	12.0	12.5	4.10	0% - 50%
ES1821108-002	TP32_0.5-0.6	EA055: Moisture Content	----	0.1	%	8.4	8.4	0.00	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1814055)									
ES1821108-012	TP37_0.0-0.1	EA055: Moisture Content	----	0.1	%	13.4	13.8	2.35	0% - 50%
ES1821108-021	QAQC12	EA055: Moisture Content	----	0.1	%	9.0	8.5	5.83	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1843963)									
EM1812014-001	Anonymous	EA055: Moisture Content	----	0.1	%	4.4	3.7	17.9	0% - 20%
EP1808885-005	Anonymous	EA055: Moisture Content	----	0.1	%	41.4	41.4	0.00	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1817636)									
ES1820981-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	9	38.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	4	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	110	# 86	24.2	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	28	38	32.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	26	34	25.3	No Limit
ES1821108-004	TP33_0.0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	6	68.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	3	71.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	10	<5	65.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	36	16	74.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	32	13	83.9	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1817638)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1817638) - continued									
ES1821108-015	TP39_2.0-2.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	13	20.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	10	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	11	9	20.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	29	28	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	28	23	16.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	70	96	31.2	0% - 50%
ES1821110-017	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	34	32	5.69	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	20	23	15.1	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	21	25	18.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	9	27.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	44	57	26.4	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1844888)									
ES1821108-022	QAQC7	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	5	31.9	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	13	10	27.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	9	6	32.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	10	8	21.4	No Limit
ES1822344-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	208	203	2.35	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	107	128	18.1	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	5	45.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	92	76	19.2	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	185	152	19.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	127	109	14.8	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1817637)									
ES1820981-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1821108-004	TP33_0.0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1817639)									
ES1821108-015	TP39_2.0-2.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1821110-017	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1844889)									
ES1821108-022	QAQC7	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1822344-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1812839)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1812839) - continued									
ES1821108-001	TP31_0.0-0.1	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1812840)									
ES1821108-001	TP31_0.0-0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1812837)									
ES1821108-012	TP37_0.0-0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1812837) - continued									
ES1821108-012	TP37_0.0-0.1	EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1821108-001	TP31_0.0-0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840379)									
ES1822292-007	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840379) - continued									
ES1822292-007	Anonymous	EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1812838)									
ES1821108-012	TP37_0.0-0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1821108-001	TP31_0.0-0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1813231)									
ES1821108-001	TP31_0.0-0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1821108-012	TP37_0.0-0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1816643)									
ES1821389-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1840380)									
ES1822292-007	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1840487)									
ES1822274-010	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1812838)									
ES1821108-012	TP37_0.0-0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1821108-001	TP31_0.0-0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1813231)									
ES1821108-001	TP31_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1821108-012	TP37_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1816643)									
ES1821389-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840380)									
ES1822292-007	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840380) - continued									
ES1822292-007	Anonymous	EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840487)									
ES1822274-010	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 1813231)									
ES1821108-001	TP31_0.0-0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1821108-012	TP37_0.0-0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1816643)									
ES1821389-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 1840487)									
ES1822274-010	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 1813293)									
ES1821233-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0005	0.0003	32.6	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0011	0.0011	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 1813293) - continued									
ES1821233-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.122	0.108	12.0	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0012	0.0011	9.32	No Limit
EB1817114-016	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0005	0.0008	43.2	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0100	0.0090	11.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0379	0.0336	12.2	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 1813293)									
ES1821233-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EB1817114-016	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0007	<0.0005	28.3	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0008	0.0009	19.4	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0018	0.0019	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0012	<0.0012	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813293)									
ES1821233-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	0.0005	0.0006	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1813293) - continued									
ES1821233-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1817114-016	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0005	0.0015	99.8	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0012	<0.0012	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0012	<0.0012	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0012	<0.0012	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0012	<0.0012	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 1813293)									
ES1821233-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1817114-016	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 1817636)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	106	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	100	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	106	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	102	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	106	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	122	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1817638)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	104	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	100	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	104	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	103	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	99.4	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	107	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	114	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1844888)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	102	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	98.0	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	106	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	106	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	106	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	112	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1817637)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	81.2	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1817639)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.7	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1844889)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	81.3	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1812839)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	86.0	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1812840)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	82.9	69	113

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 1812840) - continued								
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	82.8	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.6	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	81.3	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	82.1	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.4	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	103	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	104	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	102	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.3	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	89.6	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.0	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	88.2	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	98.5	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1812837)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	96.9	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	97.0	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	92.7	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	98.8	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	90.4	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	92.0	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	95.1	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	96.2	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	95.0	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	95.3	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	92.4	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	97.5	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	95.3	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	94.1	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	91.2	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	89.2	63	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840379)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840379) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	124	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	121	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	119	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	125	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	118	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	118	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	127	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	126	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	110	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	114	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	97.5	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	116	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	116	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	102	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	101	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	99.7	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1812838)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	91.7	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	95.9	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	85.5	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1813231)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	115	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1816643)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	104	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840380)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	100	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	102	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	87.2	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840487)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	94.8	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1812838)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	90.7	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	95.5	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	84.3	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1813231)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	122	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1816643)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1816643) - continued								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	111	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840380)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	98.7	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	99.3	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	78.6	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840487)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	103	68	128
EP080: BTEXN (QCLot: 1813231)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	110	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	106	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	106	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	106	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	104	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	92.9	63	119
EP080: BTEXN (QCLot: 1816643)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	110	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	108	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	103	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	104	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	102	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	100	63	119
EP080: BTEXN (QCLot: 1840487)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	94.5	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	102	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	99.8	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	103	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	99.6	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	98.6	63	119
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813293)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	66.4	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.6	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	63.6	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	54	125

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813293)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	55.8	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.2	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.2	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.2	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	63.6	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	69.2	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813293)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.6	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	76.4	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.6	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.0	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.2	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813293)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.4	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	64.0	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	92.4	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	60	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 1817636)							
ES1820981-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	102	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 1817636) - continued							
ES1820981-001	Anonymous	EG005T: Chromium	7440-47-3	50 mg/kg	98.0	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	84.6	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	109	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	112	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1817638)							
ES1821108-015	TP39_2.0-2.1	EG005T: Arsenic	7440-38-2	50 mg/kg	89.9	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.6	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	98.5	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	98.5	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	96.9	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	93.4	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	117	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1844888)							
ES1821108-022	QAQC7	EG005T: Arsenic	7440-38-2	50 mg/kg	94.3	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	102	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	101	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1817637)							
ES1820981-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	92.0	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1817639)							
ES1821108-015	TP39_2.0-2.1	EG035T: Mercury	7439-97-6	5 mg/kg	87.3	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1844889)							
ES1821108-022	QAQC7	EG035T: Mercury	7439-97-6	5 mg/kg	90.3	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1812839)							
ES1821108-001	TP31_0.0-0.1	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	85.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1812840)							
ES1821108-001	TP31_0.0-0.1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	106	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	105	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	104	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	102	70	130
		EP068: Endrin	72-20-8	2 mg/kg	97.8	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	97.3	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1812837)							
ES1821108-001	TP31_0.0-0.1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	91.8	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	96.4	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840379)							
ES1822292-007	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	93.6	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	112	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1812838)							
ES1821108-001	TP31_0.0-0.1	EP071: C10 - C14 Fraction	----	523 mg/kg	106	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	116	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	114	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1813231)							
ES1821108-001	TP31_0.0-0.1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	104	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1816643)							
ES1821389-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	90.1	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840380)							
ES1822292-007	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	94.7	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	106	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	114	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840487)							
ES1822274-010	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	96.1	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1812838)							
ES1821108-001	TP31_0.0-0.1	EP071: >C10 - C16 Fraction	----	860 mg/kg	97.6	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	110	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	115	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1813231)							
ES1821108-001	TP31_0.0-0.1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	102	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1816643)							
ES1821389-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	91.0	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840380)							
ES1822292-007	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	107	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	112	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	99.7	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840487)							
ES1822274-010	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	98.1	70	130
EP080: BTEXN (QCLot: 1813231)							
ES1821108-001	TP31_0.0-0.1	EP080: Benzene	71-43-2	2.5 mg/kg	93.6	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 1813231) - continued							
ES1821108-001	TP31_0.0-0.1	EP080: Toluene	108-88-3	2.5 mg/kg	93.6	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	94.1	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	91.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	90.2	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	76.9	70	130
EP080: BTEXN (QCLot: 1816643)							
ES1821389-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	86.5	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	87.8	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	84.0	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.5	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	82.6	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	74.0	70	130
EP080: BTEXN (QCLot: 1840487)							
ES1822274-010	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	90.4	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	99.1	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	92.5	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	97.7	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	93.5	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	94.6	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1813293)							
ES1821233-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	67.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	87.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	90.8	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	113	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	88.4	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813293)							
ES1821233-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	47.3	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	85.2	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	78.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	96.0	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	75.2	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	68.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	82.4	50	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1813293) - continued							
ES1821233-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	105	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	97.6	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	91.6	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	77.2	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1813293)							
ES1821233-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	67.6	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	80.1	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	103	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	77.9	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	92.0	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	58.4	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	103	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1813293)							
ES1821233-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	118	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	69.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	88.0	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	125	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1821108**	Page	: 1 of 10
Amendment	: **1**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Telephone	: (02) 8784 8504
Project	: IA179600_SWP	Date Samples Received	: 17-Jul-2018
Site	: ----	Issue Date	: 03-Aug-2018
Sampler	: KYLE MCLEAN	No. of samples received	: 25
Order number	: IA179600	No. of samples analysed	: 23

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	ES1820981--001	Anonymous	**Copper**	7440-50-8	24.2 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES1821233--001	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA055: Moisture Content (Dried @ 105-110°C)						
Soil Glass Jar - Unpreserved QAQC7	----	----	----	01-Aug-2018	30-Jul-2018	**2**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons						
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	----	----	----
EP080/071: Total Petroleum Hydrocarbons						
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	----	----	----
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	31-Jul-2018	30-Jul-2018	**1**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	----	----	----
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	31-Jul-2018	30-Jul-2018	**1**
EP080: BTEXN						
Soil Glass Jar - Unpreserved QAQC_TS2	19-Jul-2018	17-Jul-2018	**2**	20-Jul-2018	17-Jul-2018	**3**
Soil Glass Jar - Unpreserved Trip Spike Control 2	20-Jul-2018	17-Jul-2018	**3**	20-Jul-2018	17-Jul-2018	**3**
Soil Glass Jar - Unpreserved QAQC_TB2	19-Jul-2018	18-Jul-2018	**1**	20-Jul-2018	18-Jul-2018	**2**
Soil Glass Jar - Unpreserved QAQC7	31-Jul-2018	30-Jul-2018	**1**	31-Jul-2018	30-Jul-2018	**1**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) QAQC9	**16-Jul-2018**	**----**	----	----	**19-Jul-2018**	30-Jul-2018	✓
HDPE Soil Jar (EA055) TP34_0.0-0.1	**17-Jul-2018**	**----**	----	----	**19-Jul-2018**	31-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**----**	----	----	**19-Jul-2018**	30-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA055) QAQC7	**16-Jul-2018**	**----**	----	----	**01-Aug-2018**	30-Jul-2018	✗
Soil Glass Jar - Unpreserved (EA055) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**----**	----	----	**19-Jul-2018**	31-Jul-2018	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200) TP32_0.5-0.6, TP36_0.5-0.6, TP37_0.0-0.1, TP38_0.0-0.1, TP39_2.0-2.1, TP40_0.5-0.6	**16-Jul-2018**	**----**	----	----	**19-Jul-2018**	12-Jan-2019	✓
Snap Lock Bag: Separate bag received (EA200) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.0-0.1, TP35_0.0-0.1	**17-Jul-2018**	**----**	----	----	**19-Jul-2018**	13-Jan-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG005T: Total Metals by ICP-AES							
HDPE Soil Jar (EG005T) TP34_0.0-0.1	**17-Jul-2018**	**20-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	13-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) QAQC7	**16-Jul-2018**	**01-Aug-2018**	12-Jan-2019	✓	**01-Aug-2018**	12-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**20-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	12-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**20-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	13-Jan-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
HDPE Soil Jar (EG035T) TP34_0.0-0.1	**17-Jul-2018**	**20-Jul-2018**	14-Aug-2018	✓	**23-Jul-2018**	14-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) QAQC7	**16-Jul-2018**	**01-Aug-2018**	13-Aug-2018	✓	**02-Aug-2018**	13-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**20-Jul-2018**	13-Aug-2018	✓	**23-Jul-2018**	13-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**20-Jul-2018**	14-Aug-2018	✓	**23-Jul-2018**	14-Aug-2018	✓
EP066: Polychlorinated Biphenyls (PCB)							
HDPE Soil Jar (EP066) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP32_0.5-0.6, TP36_0.5-0.6, TP37_0.0-0.1, TP38_0.0-0.1, TP39_2.0-2.1, TP40_0.5-0.6	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP066) TP31_0.0-0.1, TP33_0.0-0.1, TP35_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP068A: Organochlorine Pesticides (OC)							
HDPE Soil Jar (EP068) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP32_0.5-0.6, TP36_0.5-0.6, TP37_0.0-0.1, TP38_0.0-0.1, TP39_2.0-2.1, TP40_0.5-0.6	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP068) TP31_0.0-0.1, TP33_0.0-0.1, TP35_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
HDPE Soil Jar (EP075(SIM)) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✗	**01-Aug-2018**	09-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	28-Aug-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
HDPE Soil Jar (EP080) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	30-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✗	**01-Aug-2018**	09-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✗	**31-Jul-2018**	30-Jul-2018	✗
Soil Glass Jar - Unpreserved (EP080) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓

Matrix: **SOIL**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
HDPE Soil Jar (EP080) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	30-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP071) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✘	**01-Aug-2018**	09-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✘	**31-Jul-2018**	30-Jul-2018	✘
Soil Glass Jar - Unpreserved (EP080) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓
EP080: BTEXN							
HDPE Soil Jar (EP080) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) QAQC_TS2	**03-Jul-2018**	**19-Jul-2018**	17-Jul-2018	✘	**20-Jul-2018**	17-Jul-2018	✘
Soil Glass Jar - Unpreserved (EP080) Trip Spike Control 2	**03-Jul-2018**	**20-Jul-2018**	17-Jul-2018	✘	**20-Jul-2018**	17-Jul-2018	✘
Soil Glass Jar - Unpreserved (EP080) QAQC_TB2	**04-Jul-2018**	**19-Jul-2018**	18-Jul-2018	✘	**20-Jul-2018**	18-Jul-2018	✘
Soil Glass Jar - Unpreserved (EP080) TP32_0.5-0.6, TP32_1.0-1.1, TP36_0.5-0.6, TP36_2.9-3.0, TP37_0.0-0.1, TP38_0.0-0.1, TP38_1.0-1.1, TP39_2.0-2.1, TP40_0.5-0.6, TP40_2.9-3.0, QAQC11	**16-Jul-2018**	**19-Jul-2018**	30-Jul-2018	✓	**20-Jul-2018**	30-Jul-2018	✓
Soil Glass Jar - Unpreserved (EP080) QAQC7	**16-Jul-2018**	**31-Jul-2018**	30-Jul-2018	✘	**31-Jul-2018**	30-Jul-2018	✘
Soil Glass Jar - Unpreserved (EP080) TP31_0.0-0.1, TP33_0.0-0.1, TP34_0.5-0.6, TP35_0.0-0.1, TP35_2.0-2.1	**17-Jul-2018**	**19-Jul-2018**	31-Jul-2018	✓	**20-Jul-2018**	31-Jul-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) QAQC9	**16-Jul-2018**	**19-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) QAQC9	**16-Jul-2018**	**19-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) QAQC9	**16-Jul-2018**	**19-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) QAQC9	**16-Jul-2018**	**19-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) QAQC9	**16-Jul-2018**	**19-Jul-2018**	12-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓
HDPE Soil Jar (EP231X) TP34_0.0-0.1	**17-Jul-2018**	**19-Jul-2018**	13-Jan-2019	✓	**20-Jul-2018**	28-Aug-2018	✓

Matrix: **SOLID**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag: Separate bag received (EA200) TP36_ACM_0.0-0.5	**16-Jul-2018**	**----**	----	----	**20-Jul-2018**	12-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	6	52	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	6	57	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	6	58	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	57	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	58	**5.17**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	30	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	57	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	58	**5.17**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	30	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	57	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	58	**5.17**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	30	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Asbestos Identification in Bulk Solids	EA200	SOLID	In house: Referenced to AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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Ph: 08 8359 0890 E: adelaide@alsglo... ...om
☐BRISBANE 32 Shand Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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Ph: 07 7471 5600 E: gladstone@alsglobal.com

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS
OFFICE: Level 7, 177 Pacific Highway, North Sydney
PROJECT: IA179600_SWP
ORDER NUMBER:
PROJECT MANAGER: Michael Stacey CONTACT PH: 02 9032 1467
SAMPLER: Kyle McLean SAMPLER MOBILE: 0402 536796
COC emailed to ALS? (YES / NO) EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com
Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 6.3 °C
Other comment:

RELINQUISHED BY: K. MCLEAN
DATE/TIME: 17/7/18

RECEIVED BY:
DATE/TIME: 17/7/18 1440

RELINQUISHED BY:
DATE/TIME:

RECEIVED BY:
DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	~~Dissolved~~ Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) / TRH / BTEXN PAH ~~(W-05)~~ S-26	OC/PCB ~~PAH - Ultra trace~~ ~~(EP132 (PAH))~~ S-11	Asbestos in ~~VOCs~~ (EP074) soils - EA200N	PFAS - Full suite ~~(EP231X)~~ (28) EP231X (solids)	Asbestos 10 in soils (P/A)	pH, CEC, % clay, ~~heavy metals~~ (8)		BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP31-0.0-0.1	17/7/18	•S	NA	2	X	X			X				
2	TP32-0.5-0.6	16/7/18	•		2	X	X			X				
3	TP32-1.0-1.1	16/7/18	•		1	X								
4	TP33-0.0-0.1	17/7/18	•		2	X	X			X				
5	TP34-0.0-0.1	↓	•		3	X	X		X	X				
6	TP34-0.5-0.6				1	X								
7	TP35-0.0-0.1		•		2	X	X			X				
8	TP35-2.0-2.1	↓			2	X					X			
9	TP36-0.5-0.6	16/7/18	•		2	X	X			X				
10	TP36-ACM-0.0-0.5		•		2					X				
11	TP36-2.9-3.0				1	X								
12	TP37-0.0-0.1	↓	•		2	X	X			X				
				TOTAL										

Subcontract Lab / Split WO
Lab / Analysis: Asbestos → Newcastle
Organised by / Date:
Relinquished by / Date:
Connote / Courier:
WO No:
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1821108

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plasti
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfu
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS
OFFICE: Level 7, 177 Pacific Highway, North Sydney
PROJECT: IA179600_SWP
ORDER NUMBER:
PROJECT MANAGER: Michael Stacey **CONTACT PH:** 02 9032 1467
SAMPLER: Kyle McLean **SAMPLER MOBILE:** 0402 536796
COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):**
Email Reports to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**
Email Invoice to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☑ Standard TAT **(List due date):**
☐ Non Standard or urgent TAT **(List due date):**

ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 6-3 °C
Other comment:

RELINQUISHED BY: K. MCLEAN	**RECEIVED BY:** SOOSYgyu AS	**RELINQUISHED BY:**	**RECEIVED BY:**
DATE/TIME: 17/7/18	DATE/TIME: 17/7/18 1440	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Dissolved Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) / TRH / BTEXN PAH ~~(W-06)~~ S-26	OC / PCB ~~PAH - Ultra trace (EP132 (PAH))~~ S-11	Asbestos in ~~VOCs (EP074)~~ soils - EA200N	PFAS - Full suite (EP231X) - solids	Asbestos ID in soils (P/A)	% Clay, pH CEC		BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	TP38 - 0.0-0.1	16/7/18	S	NA	2	X	X			X				
~~14~~	~~TP38 - 1.0-1.1~~				1	X								
15	TP39 - 2.0-2.1				2	X	X			X				
16	TP40 - 0.5-0.6				2	X	X			X				
17	TP40 - 2.9-3.0				1	X								
18	QAQC9	17/7/18			1				X					
19	QAQC10				1				X					
20	QAQC11				1	X								
21	QAQC12				1	X								
22	QAQC7	16/7/18												
23	QAQC8	16/7/18												
24	QAQC-TB2 ~~TSA~~	16/7/18											X	Trip Blank
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

25 QAQC-TS2 26 TSC2 X Trip Spike

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES1821108**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mstacey@globalskm.com	E-mail	: Brenda.Hong@alsglobal.com
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: IA179600_SWP	Page	: 1 of 3
Order number	:	Quote number	: ES2018SINKNI0010 (SY/322/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: KYLE MCLEAN		

Dates

Date Samples Received	: 17-Jul-2018 14:40	Issue Date	: 18-Jul-2018
Client Requested Due Date	: 24-Jul-2018	Scheduled Reporting Date	: **24-Jul-2018**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 6.3 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 26 / 24

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Clay content, pH and CEC analysis has not been added for sample TP35_2.0-2.1 as no seperate snap lock bag was received for this sample.**
- **Two asbestos bags have been received for sample TP37_0.0-0.1, as they appear to be different samples the asbestos analysis has been placed on hold until the sample IDs are confirmed.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method *Client sample ID*	**Sample Container Received**	**Preferred Sample Container for Analysis**
PAH/Phenols (SIM) : EP075(SIM)		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved
Pesticides by GCMS : EP068		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved
Polychlorinated Biphenyls (PCB) : EP066		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved
Total Mercury by FIMS : EG035T		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved
TRH - Semivolatile Fraction : EP071		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved
TRH Volatiles/BTEX : EP080		
TP34_0.0-0.1	- HDPE Soil Jar	- Soil Glass Jar - Unpreserved

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

ES1821108-026 : [03-Jul-2018] : Trip Spike Control 2

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - S-11 OC/PCB	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES1821108-001	17-Jul-2018 00:00	TP31_0.0-0.1		✓	✓		✓	✓
ES1821108-002	16-Jul-2018 00:00	TP32_0.5-0.6		✓	✓		✓	✓
ES1821108-003	16-Jul-2018 00:00	TP32_1.0-1.1		✓				✓
ES1821108-004	17-Jul-2018 00:00	TP33_0.0-0.1		✓	✓		✓	✓
ES1821108-005	17-Jul-2018 00:00	TP34_0.0-0.1		✓	✓	✓	✓	✓
ES1821108-006	17-Jul-2018 00:00	TP34_0.5-0.6		✓				✓
ES1821108-007	17-Jul-2018 00:00	TP35_0.0-0.1		✓	✓		✓	✓
ES1821108-008	17-Jul-2018 00:00	TP35_2.0-2.1		✓				✓
ES1821108-009	16-Jul-2018 00:00	TP36_0.5-0.6		✓	✓		✓	✓
ES1821108-011	16-Jul-2018 00:00	TP36_2.9-3.0		✓				✓
ES1821108-012	16-Jul-2018 00:00	TP37_0.0-0.1		✓	✓		✓	✓
ES1821108-013	16-Jul-2018 00:00	TP38_0.0-0.1		✓	✓		✓	✓
ES1821108-014	16-Jul-2018 00:00	TP38_1.0-1.1		✓				✓
ES1821108-015	16-Jul-2018 00:00	TP39_2.0-2.1		✓	✓		✓	✓
ES1821108-016	16-Jul-2018 00:00	TP40_0.5-0.6		✓	✓		✓	✓
ES1821108-017	16-Jul-2018 00:00	TP40_2.9-3.0		✓				✓
ES1821108-018	16-Jul-2018 00:00	QAQC9		✓		✓		
ES1821108-019	16-Jul-2018 00:00	QAQC10		✓		✓		
ES1821108-020	16-Jul-2018 00:00	QAQC11		✓				✓
ES1821108-021	16-Jul-2018 00:00	QAQC12		✓				✓
ES1821108-022	16-Jul-2018 00:00	QAQC7	✓					
ES1821108-023	16-Jul-2018 00:00	QAQC8	✓					

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EP080 BTEXN
ES1821108-024	04-Jul-2018 00:00	QAQC_TB2	✓
ES1821108-025	03-Jul-2018 00:00	QAQC_TS2	✓
ES1821108-026	03-Jul-2018 00:00	Trip Spike Control 2	✓

Matrix: **SOLID**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOLID - EA200B Asbestos Identification in Bulk Solids (Excluding
ES1821108-010	16-Jul-2018 00:00	TP36_ACM_0.0-0.5	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)

- A4 - AU Tax Invoice (INV)	Email	au-ap@jacobs.com

KYLE MCLEAN

- *AU Certificate of Analysis - NATA (COA)	Email	kyle.mclean@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kyle.mclean@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kyle.mclean@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	kyle.mclean@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	kyle.mclean@jacobs.com
- Chain of Custody (CoC) (COC)	Email	kyle.mclean@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	kyle.mclean@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	kyle.mclean@jacobs.com

Michael Stacey

- *AU Certificate of Analysis - NATA (COA)	Email	mstacey@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mstacey@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mstacey@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mstacey@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	mstacey@globalskm.com
- Chain of Custody (CoC) (COC)	Email	mstacey@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	mstacey@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	mstacey@globalskm.com

Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1821898**	Page	: 1 of 3
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Project	: IA179600_SWP	Date Samples Received	: 25-Jul-2018 17:40
Order number	: IA179600	Date Analysis Commenced	: 26-Jul-2018
C-O-C number	: ----	Issue Date	: 01-Aug-2018 17:19
Sampler	: KYLE MCLEAN		
Site	: ----		
Quote number	: SY/322/18		
No. of samples received	: 3		
No. of samples analysed	: 3		

NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H^+ + Al^{3+}).

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**BH01_3.0-3.1**	**BH06_3.0-3.1**	**GW05_2.0-2.1**	**----**	**----**
			Client sampling date / time	20-Jul-2018 00:00	19-Jul-2018 00:00	20-Jul-2018 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1821898-001**	**ES1821898-002**	**ES1821898-003**	**--------**	**--------**
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.1**	**6.9**	**6.0**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**13.5**	**18.4**	**5.0**	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	**30**	**52**	**20**	----	----
EA152: Soil Particle Density								
ø **Soil Particle Density (Clay/Silt/Sand)**	----	0.01	g/cm3	**2.64**	**2.63**	**2.64**	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	<0.1	**1.1**	<0.1	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**6.6**	**13.5**	**1.4**	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.2**	**0.2**	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g	**3.4**	**6.8**	**0.2**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**10.2**	**21.6**	**1.6**	----	----
Exchangeable Sodium Percent	----	0.1	%	**32.9**	**31.6**	**13.4**	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**9**	<5	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	**7**	**26**	**7**	----	----
Copper	7440-50-8	5	mg/kg	**10**	**24**	<5	----	----
Lead	7439-92-1	5	mg/kg	**10**	**29**	<5	----	----
Nickel	7440-02-0	2	mg/kg	**3**	**10**	<2	----	----
Zinc	7440-66-6	5	mg/kg	**14**	**22**	<5	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----

Environmental

QUALITY CONTROL REPORT

Work Order : **ES1821898**

Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : Michael Stacey
Address : 100 CHRISTIE STREET P O BOX 164
ST LEONARDS NSW, AUSTRALIA 2065
Telephone : +61 02 9928 2100
Project : IA179600_SWP
Order number : IA179600
C-O-C number : ----
Sampler : KYLE MCLEAN
Site : ----
Quote number : SY/322/18
No. of samples received : 3
No. of samples analysed : 3

Page : 1 of 5

Laboratory : Environmental Division Sydney
Contact : Brenda Hong
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : (02) 8784 8504
Date Samples Received : 25-Jul-2018
Date Analysis Commenced : 26-Jul-2018
Issue Date : 01-Aug-2018

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
\# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1831561)									
ES1821898-002	BH06_3.0-3.1	EA002: pH Value	----	0.1	pH Unit	6.9	6.9	0.00	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 1833312)									
ES1821745-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	4.9	5.2	7.14	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1832679)									
ES1821831-004	Anonymous	EA055: Moisture Content	----	0.1	%	10.1	11.2	10.00	0% - 50%
ES1821970-002	Anonymous	EA055: Moisture Content	----	0.1	%	7.3	6.4	12.2	No Limit
ED007: Exchangeable Cations (QC Lot: 1840442)									
ES1821898-001	BH01_3.0-3.1	ED007: Exchangeable Sodium Percent	----	0.1	%	32.9	32.1	2.42	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	6.6	6.6	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	3.4	3.2	3.99	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	10.2	10.0	1.56	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1839947)									
ES1821834-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	6	30.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	5	79.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	9	38.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	26	34.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	41	50	19.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	19	21	10.8	No Limit
ES1822061-003	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	28	26	5.11	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	16	14	16.8	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1839947) - continued									
ES1822061-003	Anonymous	EG005T: Arsenic	7440-38-2	5	mg/kg	7	5	35.1	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	46	38	18.6	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	2300	2700	15.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	601	567	5.73	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1839948)									
ES1821834-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1822061-003	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.1	0.1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
ED007: Exchangeable Cations (QCLot: 1840442)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	91.0	76	120
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	105	75	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	118	80	120
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	115	80	120
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1839947)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	109	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	104	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	101	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	106	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	106	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	109	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	115	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1839948)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	87.7	70	105

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 1839947)							
ES1821834-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	103	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	103	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	107	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	106	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	112	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1839948)							
ES1821834-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	97.8	70	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1821898**	Page	: 1 of 5
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Telephone	: (02) 8784 8504
Project	: IA179600_SWP	Date Samples Received	: 25-Jul-2018
Site	: ----	Issue Date	: 01-Aug-2018
Sampler	: KYLE MCLEAN	No. of samples received	: 3
Order number	: IA179600	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002) BH06_3.0-3.1		**19-Jul-2018**	**26-Jul-2018**	26-Jul-2018	✓	**26-Jul-2018**	26-Jul-2018	✓
Soil Glass Jar - Unpreserved (EA002) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**27-Jul-2018**	27-Jul-2018	✓	**27-Jul-2018**	27-Jul-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) BH06_3.0-3.1		**19-Jul-2018**	**----**	----	----	**27-Jul-2018**	02-Aug-2018	✓
Soil Glass Jar - Unpreserved (EA055) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**----**	----	----	**27-Jul-2018**	03-Aug-2018	✓
EA150: Soil Classification based on Particle Size								
Snap Lock Bag (EA150H) BH06_3.0-3.1		**19-Jul-2018**	**----**	----	----	**01-Aug-2018**	15-Jan-2019	✓
Snap Lock Bag (EA150H) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**----**	----	----	**01-Aug-2018**	16-Jan-2019	✓
EA152: Soil Particle Density								
Snap Lock Bag (EA152) BH06_3.0-3.1		**19-Jul-2018**	**----**	----	----	**01-Aug-2018**	15-Jan-2019	✓
Snap Lock Bag (EA152) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**----**	----	----	**01-Aug-2018**	16-Jan-2019	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) BH06_3.0-3.1		**19-Jul-2018**	**31-Jul-2018**	16-Aug-2018	✓	**31-Jul-2018**	16-Aug-2018	✓
Soil Glass Jar - Unpreserved (ED007) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**31-Jul-2018**	17-Aug-2018	✓	**31-Jul-2018**	17-Aug-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) BH06_3.0-3.1		**19-Jul-2018**	**31-Jul-2018**	15-Jan-2019	✓	**31-Jul-2018**	15-Jan-2019	✓
Soil Glass Jar - Unpreserved (EG005T) BH01_3.0-3.1,	GW05_2.0-2.1	**20-Jul-2018**	**31-Jul-2018**	16-Jan-2019	✓	**31-Jul-2018**	16-Jan-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) BH06_3.0-3.1	**19-Jul-2018**	**31-Jul-2018**	16-Aug-2018	✓	**31-Jul-2018**	16-Aug-2018	✓
Soil Glass Jar - Unpreserved (EG035T) BH01_3.0-3.1, GW05_2.0-2.1	**20-Jul-2018**	**31-Jul-2018**	17-Aug-2018	✓	**31-Jul-2018**	17-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations	ED007	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	* EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1821898**

Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mstacey@globalskm.com	E-mail	: Brenda.Hong@alsglobal.com
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: IA179600_SWP	Page	: 1 of 2
Order number	:	Quote number	: ES2018SINKNI0010 (SY/322/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: KYLE MCLEAN		

Dates

Date Samples Received	: 25-Jul-2018 17:40	Issue Date	: 26-Jul-2018
Client Requested Due Date	: 02-Aug-2018	Scheduled Reporting Date	: **02-Aug-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: -0.1 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Clay Content analysis to be conducted by ALS Newcastle.
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA150H-C Clay Content by Hydrometer	SOIL - ED008 Def Exchangeable Cations with pre-treatment -	SOIL - S-02 8 Metals (incl. Digestion)
ES1821898-001	20-Jul-2018 00:00	BH01_3.0-3.1	✓	✓	✓	✓	✓
ES1821898-002	19-Jul-2018 00:00	BH06_3.0-3.1	✓	✓	✓	✓	✓
ES1821898-003	20-Jul-2018 00:00	GW05_2.0-2.1	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)		
- A4 - AU Tax Invoice (INV)	Email	au-ap@jacobs.com
KYLE MCLEAN		
- *AU Certificate of Analysis - NATA (COA)	Email	kyle.mclean@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kyle.mclean@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kyle.mclean@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	kyle.mclean@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	kyle.mclean@jacobs.com
- Attachment - Report (SUBCO)	Email	kyle.mclean@jacobs.com
- Chain of Custody (CoC) (COC)	Email	kyle.mclean@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	kyle.mclean@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	kyle.mclean@jacobs.com
Michael Stacey		
- *AU Certificate of Analysis - NATA (COA)	Email	mstacey@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mstacey@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mstacey@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mstacey@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	mstacey@globalskm.com
- Attachment - Report (SUBCO)	Email	mstacey@globalskm.com
- Chain of Custody (CoC) (COC)	Email	mstacey@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	mstacey@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	mstacey@globalskm.com

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com
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Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS
OFFICE: Level 7, 177 Pacific Highway, North Sydney
PROJECT: IA179600_SWP
ORDER NUMBER:
PROJECT MANAGER: Michael Stacey
CONTACT PH: 02 9032 1467
SAMPLER: Kyle McLean
SAMPLER MOBILE: 0402 536796
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com
Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
[✓ Free ice] / frozen ice bricks present upon receipt? [✓ Yes] No N/A
Random Sample Temperature on Receipt: -0.1 °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
K. Mclean	M. Chan		
DATE/TIME: 25.7.18 ~~24.7.18~~	DATE/TIME: 25/7/18 17:40	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	~~Dissolved Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) / TRH / BTEXN (W-05)~~	~~PAH - Ultra trace (EP132 (PAH))~~	~~VOCs (EP074)~~	~~PFAS - Full suite (EP231X)~~	Heavy metal (8)	% clay CEC pH		BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH01-3.0-3.1	20/7/18	S	NA	3					X	X			
2	BH06-3.0-3.1	19/7/18	S	NA	3					X	X			
3	GW05-2.0-2.1	20/7/18	S	NA	3					X	X			
				TOTAL										

Subcon / Forward Lab / Split WO
Lab / Analysis: clay content
Organised By / Date: Newcastle
Relinquished By / Date:
Connote / Courier:
WO No:
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1821898
Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order	: **ES1822154**	Page	: 1 of 10
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Project	: IA179600	Date Samples Received	: 27-Jul-2018 15:48
Order number	: IA179600	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 03-Aug-2018 16:23
Sampler	: KYLE MCLEAN		
Site	: ----		
Quote number	: SY/322/18		
No. of samples received	: 7		
No. of samples analysed	: 7		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EG035: Positive Hg result for ES1822154 #4 has been confirmed by reanalysis.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEX compounds spiked at 20 ug/L.
- Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0003**	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.017**	**0.002**	**0.006**	**0.015**	**0.007**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.036**	**0.010**	**0.007**	**0.082**	**0.007**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	**0.0003**	<0.0001
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	5	µg/L	<5	<5	<5	<5	<5
Isopropylbenzene	98-82-8	5	µg/L	<5	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L	<5	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L	<5	<5	<5	<5	<5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	50	µg/L	<50	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	<50	<50	<50
2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	<50	<50	<50
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	5	µg/L	<5	<5	<5	<5	<5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	CAS Number	LOR	Unit	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EP074E: Halogenated Aliphatic Compounds - Continued								
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	5	µg/L	<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L	<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EP074F: Halogenated Aromatic Compounds - Continued								
1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	<5	<5	<5
EP074G: Trihalomethanes								
Chloroform	67-66-3	5	µg/L	<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L	<5	<5	<5	<5	<5
Dibromochloromethane	124-48-1	5	µg/L	<5	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L	<5	<5	<5	<5	<5
EP074H: Naphthalene								
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	**20**
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	**30**	<20	**40**
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	**20**	<20	**30**
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	**5**	<2	**5**
ortho-Xylene	95-47-6	2	µg/L	<2	<2	**2**	<2	**2**
^ **Total Xylenes**	----	2	µg/L	<2	<2	**7**	<2	**7**
^ **Sum of BTEX**	----	1	µg/L	<1	<1	**7**	<1	**7**
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EP132B: Polynuclear Aromatic Hydrocarbons								
3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
7.12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	83-32-9	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	208-96-8	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	120-12-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g.h.i)perylene	191-24-2	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	218-01-9	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Coronene	191-07-1	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(a.h)anthracene	53-70-3	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	206-44-0	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	86-73-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1.2.3.cd)pyrene	193-39-5	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	91-20-3	0.1	µg/L	<0.1	<0.1	**0.3**	<0.1	**0.3**
Perylene	198-55-0	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	85-01-8	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	129-00-0	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
^ Sum of PAHs	----	0.05	µg/L	<0.05	<0.05	----	<0.05	----
^ Sum of PAHs	----	0.05	µg/L	----	----	**0.3**	----	**0.3**
^ Benzo(a)pyrene TEQ (zero)	----	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.05	<0.05	**0.09**	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.05	<0.05	<0.05	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.2	<0.2	<0.2	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.05	<0.05	<0.05	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.12	<0.12	<0.12	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.12	<0.12	<0.12	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.12	<0.12	<0.12	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.12	<0.12	<0.12	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.12	<0.12	<0.12	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**GW01**	**GW02**	**GW03**	**GW04**	**QAQC1**
			Client sampling date / time	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00	27-Jul-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES1822154-001**	**ES1822154-002**	**ES1822154-003**	**ES1822154-004**	**ES1822154-005**
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.05	<0.05	<0.05	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.05	<0.05	**0.09**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.05	<0.05	**0.09**	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.05	<0.05	**0.09**	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	5	%	**113**	**105**	**104**	**107**	**101**
Toluene-D8	2037-26-5	5	%	**105**	**124**	**94.1**	**99.2**	**103**
4-Bromofluorobenzene	460-00-4	5	%	**106**	**122**	**97.6**	**95.3**	**106**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**102**	**94.9**	**93.3**	**96.2**	**91.2**
Toluene-D8	2037-26-5	2	%	**97.5**	**114**	**85.2**	**91.0**	**93.9**
4-Bromofluorobenzene	460-00-4	2	%	**96.6**	**114**	**91.7**	**88.9**	**101**
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**78.5**	**93.3**	**94.7**	**96.1**	**89.0**
Anthracene-d10	1719-06-8	0.1	%	**78.5**	**77.5**	**78.5**	**81.5**	**72.3**
4-Terphenyl-d14	1718-51-0	0.1	%	**80.6**	**74.9**	**73.7**	**73.0**	**67.2**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**109**	**95.6**	**111**	----	----
13C8-PFOA	----	0.02	%	**64.7**	**66.3**	**69.4**	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**Trip Spike**	**Trip Blank**	----	----	----
			Client sampling date / time	18-Jul-2018 00:00	20-Jul-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES1822154-006**	**ES1822154-007**	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	**16**	<1	----	----	----
Toluene	108-88-3	2	µg/L	**16**	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	**14**	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	**14**	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	**16**	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L	**30**	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	**76**	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	**19**	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**100**	**100**	----	----	----
Toluene-D8	2037-26-5	2	%	**94.5**	**88.4**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**97.0**	**86.1**	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	78	133
Toluene-D8	2037-26-5	79	129
4-Bromofluorobenzene	460-00-4	81	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1822154**	Page	: 1 of 15
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Project	: IA179600	Date Samples Received	: 27-Jul-2018
Order number	: IA179600	Date Analysis Commenced	: 31-Jul-2018
C-O-C number	: ----	Issue Date	: 03-Aug-2018
Sampler	: KYLE MCLEAN		
Site	: ----		
Quote number	: SY/322/18		
No. of samples received	: 7		
No. of samples analysed	: 7		

NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini		Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1843773)									
ES1822154-001	GW01	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.017	0.017	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.036	0.034	6.44	No Limit
ES1822278-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1843774)									
ES1822154-002	GW02	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1822222-023	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Styrene	100-42-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	<5	0.00	No Limit
		EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	<5	0.00	No Limit
		EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	<5	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 1843100) - continued									
ES1822154-001	GW01	EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	<5	0.00	No Limit
EP074B: Oxygenated Compounds (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	<50	0.00	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	<50	0.00	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	<50	0.00	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	<50	0.00	No Limit
EP074C: Sulfonated Compounds (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Carbon disulfide	75-15-0	5	µg/L	<5	<5	0.00	No Limit
EP074D: Fumigants (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.00	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.00	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.00	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.00	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.00	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.00	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP074E: Halogenated Aliphatic Compounds (QC Lot: 1843100) - continued									
ES1822154-001	GW01	EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.00	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.00	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.00	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.00	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.00	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.00	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.00	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.00	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.00	No Limit
EP074G: Trihalomethanes (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.00	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.00	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.00	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.00	No Limit
EP074H: Naphthalene (QC Lot: 1843100)									
ES1822154-001	GW01	EP074: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1840306)									
ES1822154-001	GW01	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.00	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843098)									
EB1818365-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1822306-007	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1843099)									
ES1822154-001	GW01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1840306)									
ES1822154-001	GW01	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843098)									
EB1818365-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1822306-007	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1843099)									
ES1822154-001	GW01	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1843098)									
EB1818365-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1822306-007	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP080: BTEXN (QC Lot: 1843099)									
ES1822154-001	GW01	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840296)									
ES1822154-001	GW01	EP132: Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP132: 3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: 2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: 7.12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Acenaphthene	83-32-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Acenaphthylene	208-96-8	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Anthracene	120-12-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(g.h.i)perylene	191-24-2	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Chrysene	218-01-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Coronene	191-07-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1840296) - continued									
ES1822154-001	GW01	EP132: Dibenz(a.h)anthracene	53-70-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Fluoranthene	206-44-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Fluorene	86-73-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Indeno(1.2.3.cd)pyrene	193-39-5	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Naphthalene	91-20-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Perylene	198-55-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Phenanthrene	85-01-8	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Pyrene	129-00-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 1842235)									
ES1822230-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 1842235)									
ES1822230-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1842235)									
ES1822230-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 1842235) - continued									
ES1822230-002	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 1842235)									
ES1822230-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 1842235)									
ES1822230-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 1843773)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.9	85	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.1	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	88.3	85	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.8	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	87.1	83	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	89.6	82	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	89.8	81	117
EG035F: Dissolved Mercury by FIMS (QCLot: 1843774)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	94.0	83	105
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 1843100)								
EP074: Styrene	100-42-5	5	µg/L	<5	10 µg/L	109	73	119
EP074: Isopropylbenzene	98-82-8	5	µg/L	<5	10 µg/L	106	76	118
EP074: n-Propylbenzene	103-65-1	5	µg/L	<5	10 µg/L	103	69	119
EP074: 1.3.5-Trimethylbenzene	108-67-8	5	µg/L	<5	10 µg/L	104	74	116
EP074: sec-Butylbenzene	135-98-8	5	µg/L	<5	10 µg/L	100	73	119
EP074: 1.2.4-Trimethylbenzene	95-63-6	5	µg/L	<5	10 µg/L	100	74	116
EP074: tert-Butylbenzene	98-06-6	5	µg/L	<5	10 µg/L	100	72	116
EP074: p-Isopropyltoluene	99-87-6	5	µg/L	<5	10 µg/L	100	71	119
EP074: n-Butylbenzene	104-51-8	5	µg/L	<5	10 µg/L	99.8	65	123
EP074B: Oxygenated Compounds (QCLot: 1843100)								
EP074: Vinyl Acetate	108-05-4	50	µg/L	<50	100 µg/L	103	61	134
EP074: 2-Butanone (MEK)	78-93-3	50	µg/L	<50	100 µg/L	114	74	130
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L	<50	100 µg/L	117	66	132
EP074: 2-Hexanone (MBK)	591-78-6	50	µg/L	<50	100 µg/L	113	65	137
EP074C: Sulfonated Compounds (QCLot: 1843100)								
EP074: Carbon disulfide	75-15-0	5	µg/L	<5	10 µg/L	96.8	73	127
EP074D: Fumigants (QCLot: 1843100)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	95.2	68	122
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	109	76	118
EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	100	62	120
EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	105	60	114
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	114	69	117
EP074E: Halogenated Aliphatic Compounds (QCLot: 1843100)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP074E: Halogenated Aliphatic Compounds (QCLot: 1843100) - continued								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	97.2	61	138
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	99.4	67	130
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	96.2	69	129
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	85.7	56	140
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	98.8	61	139
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	99.7	69	131
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	104	70	124
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	71.8	70	128
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	107	74	118
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	112	74	120
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	104	77	119
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	101	67	119
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	100	73	119
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	102	62	120
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	109	73	123
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	97.6	76	118
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	114	73	119
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	112	72	126
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	111	71	129
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	104	72	124
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	10 µg/L	107	66	114
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	109	60	120
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	110	71	128
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	116	70	124
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	112	74	126
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	101	72	126
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	115	66	136
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	96.8	58	130
EP074F: Halogenated Aromatic Compounds (QCLot: 1843100)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	109	79	117
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	105	76	116
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	104	73	119
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	104	73	119
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	99.5	75	117
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	104	74	118
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	108	75	117
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	93.3	61	125
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	103	67	123
EP074G: Trihalomethanes (QCLot: 1843100)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP074G: Trihalomethanes (QCLot: 1843100) - continued								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	108	72	120
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	104	64	118
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	111	65	115
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	115	74	126
EP074H: Naphthalene (QCLot: 1843100)								
EP074: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	110	72	122
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840306)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	92.4	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	93.4	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	103	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843098)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	113	75	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843099)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	82.3	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840306)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	105	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	99.8	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	86.4	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843098)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	115	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843099)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	83.1	75	127
EP080: BTEXN (QCLot: 1843098)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	98.5	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	103	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	94.7	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	95.4	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	101	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	114	70	120
EP080: BTEXN (QCLot: 1843099)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	89.8	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	88.7	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	87.4	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	88.7	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	88.4	72	122

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 1843099) - continued								
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	100	70	120
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840296)								
EP132: 3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	2 µg/L	81.8	60	120
EP132: 2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	2 µg/L	87.0	59	123
EP132: 7.12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	2 µg/L	80.0	36	144
EP132: Acenaphthene	83-32-9	0.1	µg/L	<0.1	2 µg/L	68.1	64	122
EP132: Acenaphthylene	208-96-8	0.1	µg/L	<0.1	2 µg/L	67.6	64	126
EP132: Anthracene	120-12-7	0.1	µg/L	<0.1	2 µg/L	72.7	65	127
EP132: Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	2 µg/L	80.8	64	130
EP132: Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	2 µg/L	86.0	64	126
EP132: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L	<0.1	2 µg/L	81.9	62	126
EP132: Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	2 µg/L	82.6	62	126
EP132: Benzo(g.h.i)perylene	191-24-2	0.1	µg/L	<0.1	2 µg/L	83.6	56	126
EP132: Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	2 µg/L	82.5	68	130
EP132: Chrysene	218-01-9	0.1	µg/L	<0.1	2 µg/L	80.8	66	130
EP132: Coronene	191-07-1	0.1	µg/L	<0.1	2 µg/L	84.1	35	133
EP132: Dibenz(a.h)anthracene	53-70-3	0.1	µg/L	<0.1	2 µg/L	83.7	58	128
EP132: Fluoranthene	206-44-0	0.1	µg/L	<0.1	2 µg/L	76.3	65	127
EP132: Fluorene	86-73-7	0.1	µg/L	<0.1	2 µg/L	# 59.5	64	124
EP132: Indeno(1.2.3.cd)pyrene	193-39-5	0.1	µg/L	<0.1	2 µg/L	84.0	57	127
EP132: Naphthalene	91-20-3	0.1	µg/L	<0.1	2 µg/L	80.4	54	128
EP132: Perylene	198-55-0	0.1	µg/L	<0.1	2 µg/L	82.6	66	130
EP132: Phenanthrene	85-01-8	0.1	µg/L	<0.1	2 µg/L	71.9	65	129
EP132: Pyrene	129-00-0	0.1	µg/L	<0.1	2 µg/L	76.3	66	128
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1842235)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	78.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	95.8	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	95.4	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	96.0	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	87.2	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	89.8	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1842235)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	103	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	71.2	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	117	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	94.2	70	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1842235) - continued								
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	90.0	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	98.2	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	97.2	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	78.4	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	80.6	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	92.8	70	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1842235)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	113	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	92.6	70	150
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	99.7	70	150
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	1.25 µg/L	89.3	70	150
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	91.4	70	150
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	111	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	79.8	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1842235)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	113	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	71.4	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	99.4	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	79.8	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 1843773)							
ES1822154-004	GW04	EG020A-F: Arsenic	7440-38-2	1 mg/L	123	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	112	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	114	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	113	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	124	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	113	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	114	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1843774)							
ES1822154-003	GW03	EG035F: Mercury	7439-97-6	0.01 mg/L	92.3	70	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 1843100)							
ES1822154-001	GW01	EP074: 1.1-Dichloroethene	75-35-4	25 µg/L	92.8	70	130
		EP074: Trichloroethene	79-01-6	25 µg/L	96.9	70	130
EP074F: Halogenated Aromatic Compounds (QCLot: 1843100)							
ES1822154-001	GW01	EP074: Chlorobenzene	108-90-7	25 µg/L	92.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1840306)							
ES1822154-003	GW03	EP071: C10 - C14 Fraction	----	200 µg/L	149	74	150
		EP071: C15 - C28 Fraction	----	300 µg/L	87.0	77	153
		EP071: C29 - C36 Fraction	----	200 µg/L	81.4	67	153
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843098)							
EB1818365-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	107	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1843099)							
ES1822154-001	GW01	EP080: C6 - C9 Fraction	----	325 µg/L	95.3	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1840306)							
ES1822154-003	GW03	EP071: >C10 - C16 Fraction	----	250 µg/L	120	74	150
		EP071: >C16 - C34 Fraction	----	350 µg/L	78.1	77	153
		EP071: >C34 - C40 Fraction	----	150 µg/L	67.4	67	153
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843098)							
EB1818365-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	107	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1843099)							
ES1822154-001	GW01	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	96.1	70	130
EP080: BTEXN (QCLot: 1843098)							
EB1818365-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	94.7	70	130
		EP080: Toluene	108-88-3	25 µg/L	99.9	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	100	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	104	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	107	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	111	70	130
EP080: BTEXN (QCLot: 1843099)							
ES1822154-001	GW01	EP080: Benzene	71-43-2	25 µg/L	97.2	70	130
		EP080: Toluene	108-88-3	25 µg/L	99.2	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	103	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	103	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP080: BTEXN (QCLot: 1843099) - continued							
ES1822154-001	GW01	EP080: ortho-Xylene	95-47-6	25 µg/L	104	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	103	70	130
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1840296)							
ES1822154-002	GW02	EP132: 3-Methylcholanthrene	56-49-5	2 µg/L	72.7	59	115
		EP132: 2-Methylnaphthalene	91-57-6	2 µg/L	76.5	46	120
		EP132: 7.12-Dimethylbenz(a)anthracene	57-97-6	2 µg/L	65.5	21	135
		EP132: Acenaphthene	83-32-9	2 µg/L	63.4	62	114
		EP132: Acenaphthylene	208-96-8	2 µg/L	77.6	61	119
		EP132: Anthracene	120-12-7	2 µg/L	# 64.7	68	116
		EP132: Benz(a)anthracene	56-55-3	2 µg/L	70.3	67	122
		EP132: Benzo(a)pyrene	50-32-8	2 µg/L	75.1	72	114
		EP132: Benzo(b+j)fluoranthene	205-99-2 205-82-3	2 µg/L	71.0	69	119
		EP132: Benzo(e)pyrene	192-97-2	2 µg/L	72.9	71	119
		EP132: Benzo(g.h.i)perylene	191-24-2	2 µg/L	69.5	49	133
		EP132: Benzo(k)fluoranthene	207-08-9	2 µg/L	73.0	71	124
		EP132: Chrysene	218-01-9	2 µg/L	72.6	70	118
		EP132: Coronene	191-07-1	2 µg/L	69.9	29	138
		EP132: Dibenz(a.h)anthracene	53-70-3	2 µg/L	68.6	60	122
		EP132: Fluoranthene	206-44-0	2 µg/L	67.1	65	121
		EP132: Fluorene	86-73-7	2 µg/L	63.0	63	118
		EP132: Indeno(1.2.3.cd)pyrene	193-39-5	2 µg/L	68.9	57	123
		EP132: Naphthalene	91-20-3	2 µg/L	67.1	53	115
		EP132: Perylene	198-55-0	2 µg/L	# 70.4	71	118
		EP132: Phenanthrene	85-01-8	2 µg/L	# 65.2	67	120
		EP132: Pyrene	129-00-0	2 µg/L	# 69.4	70	117
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 1842235)							
ES1822230-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	93.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	91.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	122	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	109	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	90.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	125	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1842235)							
ES1822230-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	99.3	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	112	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	90.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	99.0	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 1842235) - continued							
ES1822230-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	76.4	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	108	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	108	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	81.0	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	61.8	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	66.0	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	107	50	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 1842235)							
ES1822230-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	103	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	77.9	50	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	83.8	50	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	1.25 µg/L	64.3	50	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	75.5	50	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	73.8	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	77.4	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 1842235)							
ES1822230-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	113	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	113	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	114	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	81.6	50	130

Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1822154**	Page	: 1 of 8
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Telephone	: (02) 8784 8504
Project	: IA179600	Date Samples Received	: 27-Jul-2018
Site	: ----	Issue Date	: 03-Aug-2018
Sampler	: KYLE MCLEAN	No. of samples received	: 7
Order number	: IA179600	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP132B: Polynuclear Aromatic Hydrocarbons	QC-1840296-002	----	**Fluorene**	86-73-7	59.5 %	64-124%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EP132B: Polynuclear Aromatic Hydrocarbons	ES1822154--002	GW02	**Anthracene**	120-12-7	64.7 %	68-116%	**Recovery less than lower data quality objective**
EP132B: Polynuclear Aromatic Hydrocarbons	ES1822154--002	GW02	**Perylene**	198-55-0	70.4 %	71-118%	**Recovery less than lower data quality objective**
EP132B: Polynuclear Aromatic Hydrocarbons	ES1822154--002	GW02	**Phenanthrene**	85-01-8	65.2 %	67-120%	**Recovery less than lower data quality objective**
EP132B: Polynuclear Aromatic Hydrocarbons	ES1822154--002	GW02	**Pyrene**	129-00-0	69.4 %	70-117%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	24-Aug-2018	✓
EP074A: Monocyclic Aromatic Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP074B: Oxygenated Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074C: Sulfonated Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074D: Fumigants							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074G: Trihalomethanes							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP074H: Naphthalene							
Amber VOC Vial - Sulfuric Acid (EP074) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)	**Sample Date**	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	03-Aug-2018	✓	**02-Aug-2018**	10-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	03-Aug-2018	✓	**02-Aug-2018**	10-Sep-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Trip Spike	**18-Jul-2018**	**01-Aug-2018**	01-Aug-2018	✓	**01-Aug-2018**	01-Aug-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) Trip Blank	**20-Jul-2018**	**01-Aug-2018**	03-Aug-2018	✓	**01-Aug-2018**	03-Aug-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	10-Aug-2018	✓	**01-Aug-2018**	10-Aug-2018	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP132) GW01, GW02, GW03, GW04, QAQC1	**27-Jul-2018**	**01-Aug-2018**	03-Aug-2018	✓	**01-Aug-2018**	10-Sep-2018	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) GW01, GW02, GW03	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) GW01, GW02, GW03	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) GW01, GW02, GW03	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) GW01, GW02, GW03	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) GW01, GW02, GW03	**27-Jul-2018**	**----**	----	----	**01-Aug-2018**	23-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Volatile Organic Compounds	EP074	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	WATER	In house: Referenced to USEPA 3640 (GPC Cleanup), 8270D GCMS Capillary column, SIM mode. This method is compliant with NEPM (2013) Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sep. Funnel Extraction /Acetylation of Phenolic Compounds	ORG14-AC	WATER	In house: Referenced to USEPA 3510 (Extraction) / In-house (Acetylation): A 1L sample is extracted into dichloromethane and concentrated to 1 mL with echange into cyclohexane. Phenolic compounds are reacted with acetic anhydride to yield phenyl acetates suitable for ultra-trace analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1822154**

Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Michael Stacey	Contact	: Brenda Hong
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mstacey@globalskm.com	E-mail	: Brenda.Hong@alsglobal.com
Telephone	: +61 02 9928 2100	Telephone	: (02) 8784 8504
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: IA179600	Page	: 1 of 2
Order number	:	Quote number	: ES2018SINKNI0010 (SY/322/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: KYLE MCLEAN		

Dates

Date Samples Received	: 27-Jul-2018 15:48	Issue Date	: 31-Jul-2018
Client Requested Due Date	: 03-Aug-2018	Scheduled Reporting Date	: **03-Aug-2018**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 17.6'C
Receipt Detail	:	No. of samples received / analysed	: 7 / 7

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Proactive Holding Time Report
    - Requested Deliverables
- **Sample QAQC2 has been forwarded to Envirolab as per COC request.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP074 (water) Volatile Organic Compounds	WATER - EP080 BTEXN	WATER - EP132(PAH) Ultra Trace Polynuclear Aromatic Compounds	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - W-05 TRH/BTEXN/8 Metals
ES1822154-001	27-Jul-2018 00:00	GW01	✓		✓	✓	✓
ES1822154-002	27-Jul-2018 00:00	GW02	✓		✓	✓	✓
ES1822154-003	27-Jul-2018 00:00	GW03	✓		✓	✓	✓
ES1822154-004	27-Jul-2018 00:00	GW04	✓		✓		✓
ES1822154-005	27-Jul-2018 00:00	QAQC1	✓		✓		✓
ES1822154-006	18-Jul-2018 00:00	Trip Spike		✓			
ES1822154-007	20-Jul-2018 00:00	Trip Blank		✓			

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

INVOICE ONLY (JACOBS)		
- A4 - AU Tax Invoice (INV)	Email	au-ap@jacobs.com
KYLE MCLEAN		
- *AU Certificate of Analysis - NATA (COA)	Email	kyle.mclean@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kyle.mclean@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kyle.mclean@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	kyle.mclean@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	kyle.mclean@jacobs.com
- Chain of Custody (CoC) (COC)	Email	kyle.mclean@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	kyle.mclean@jacobs.com
- EDI Format - XTab (XTAB)	Email	kyle.mclean@jacobs.com
Michael Stacey		
- *AU Certificate of Analysis - NATA (COA)	Email	mstacey@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mstacey@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mstacey@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mstacey@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	mstacey@globalskm.com
- Chain of Custody (CoC) (COC)	Email	mstacey@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	mstacey@globalskm.com
- EDI Format - XTab (XTAB)	Email	mstacey@globalskm.com

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐BRISBANE 32 Shand Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680
Ph: 07 7471 5600 E: gladstone@alsglobal.com

☐MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐MUDGEE 27 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541
Ph: 024423 2063 E: nowra@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS

OFFICE: Level 7, 177 Pacific Highway, North Sydney

PROJECT: ~~IA144102~~ IA179600

ORDER NUMBER:

PROJECT MANAGER: Michael Stacey

CONTACT PH: 02 9032 1467

SAMPLER: Kyle McLean

SAMPLER MOBILE: 0402 536796

COC emailed to ALS? (YES / NO)

EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

Email Invoice to (will default to PM if no other addresses are listed): **PM + kyle.mclean@jacobs.com**

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)

☒ Standard TAT (**List due date**):

☐ Non Standard or urgent TAT (**List due date**):

ALS QUOTE NO.: ~~SY/371/18~~ TO BE CONFIRMED

SY/322/18

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No [✓ N/A]

Free ice / frozen ice bricks present upon receipt? Yes No [✓ N/A]

Random Sample Temperature on Receipt: 17.6 °C

Other comment:

RELINQUISHED BY: SATHD	**RECEIVED BY:** Sep M. - ALS Crows Nest	**RELINQUISHED BY:**	**RECEIVED BY:** 50 Stephen A-d- 17.6°C
DATE/TIME: 27.7.18	**DATE/TIME:** 27/07/18 15~~4~~8	**DATE/TIME:**	**DATE/TIME:** 27/7/ 1910

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: 3:48

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	**SAMPLE ID**	**DATE / TIME**	**MATRIX**	**TYPE & PRESERVATIVE** (refer to codes below)	**TOTAL CONTAINERS**	W-05	EP132(PAH)	EP074 (water)	EP231X					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	GW01	27.7.18	W		6	X	X	X	X					HOLD ANALYSIS
2	GW02	"	W		6	X	X	X	X					"
3	GW03	"	W		6	X	X	X	X					"
4	GW04	"	W		5	X	X	X						"
5	QAQC1	"	W		6	X	X	X						Potential PFAS
-	QAQC2	"	W		6	X	X	X						Potential PFAS analysis
	Sub~~contract~~ Trip Spike Lab / Split WO													
	Trip Blank: QAQC2 → Envirolab				Please email COC to sath.dave@jacobs.com									
	Date:				and confirm suite with kyle m									
	Date:													
	Courier:													
	WO No:													
	Attach By PO / Internal Sheet:													
				TOTAL										

Extra C

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial S[illegible] = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; [illegible] Soils; B = Unpreserved Bag.

Environmental Division
Sydney
Work Order Reference
ES1822154

Telephone : + 61-2-8784 8555

Fadi Soro

From: Sepan Mahamad
Sent: Monday, 30 July 2018 10:57 AM
To: Fadi Soro; Samples Sydney
Subject: RE: Analysis confirmation

Also, sample QAQC2 needs to be sent to Envirolab.

Thanks

Kind Regards,

Sepan Mahamad
Client Services Officer, Environmental
Sydney

T +61 2 9437 9978
M +61 438 511 003
sepan.mahamad@alsglobal.com
Shop 2, 36 Hume St
Crows Nest NSW 2065 AUSTRALIA

From: Sepan Mahamad
Sent: Monday, 30 July 2018 10:56 AM

To: Fadi Soro <fadi.soro@alsglobal.com>; Samples Sydney <Samples.Sydney@alsglobal.com>
Subject: FW: Analysis confirmation

Hi Fadi,

Please go ahead with analysis for ES1822154 as per the confirmation below. The samples were initially on hold and dropped off in Smithfield (from Crows Nest) on Friday 27/07. Also, please run the ts and tb samples for BTEX.

Thanks.

Kind Regards,

Sepan Mahamad

Client Services Officer, Environmental
Sydney

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M +61 438 511 003
sepan.mahamad@alsglobal.com
Shop 2, 36 Hume St
Crows Nest NSW 2065 AUSTRALIA

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From: Dave, Sath [mailto:Sath.Dave@jacobs.com]
Sent: Monday, 30 July 2018 9:25 AM
To: McLean, Kyle <Kyle.McLean@jacobs.com>; Sepan Mahamad <Sepan.Mahamad@alsglobal.com>
Cc: Stacey, Michael <Michael.Stacey@jacobs.com>
Subject: RE: Analysis confirmation

- Additionally the Trip Spike/Trip Blank were not on the COC.

Could you please run these samples only for BTEX.

Kind regards,

Sath

From: McLean, Kyle
Sent: Monday, 30 July 2018 9:21 AM
To: Sepan Mahamad <Sepan.Mahamad@alsglobal.com>
Cc: Dave, Sath <Sath.Dave@jacobs.com>; Stacey, Michael <Michael.Stacey@jacobs.com>
Subject: RE: Analysis confirmation

Hi Sepan,

The COC is fine, please proceed with analysis as per the lab quote.

Also please send QAQC2 to Envirolab. This is a triplicate so needs to be analysed by another lab. In this case Envirolab.

Regards

Kyle McLean
Jacobs
Consultant - Environmental Scientist
ANZ Infrastructure & Environment
+61 402 536 796
+61 2 9032 1907
Kyle.Mclean@jacobs.com

177 Pacific Highway
North Sydney NSW 2060 Australia
www.jacobs.com

PO Box 632, North Sydney, 2059.

From: Sepan Mahamad [mailto:Sepan.Mahamad@alsglobal.com]
Sent: Friday, 27 July 2018 4:36 PM
To: McLean, Kyle <Kyle.McLean@jacobs.com>
Subject: [EXTERNAL] RE: Analysis confirmation

Hi Kyle,

Please see attached updated project reference and quote reference.

Please note that my office hours are 11am – 5.30pm Monday to Friday. For assistance outside of this time please contact **ALSEnviro.Sydney@alsglobal.com**.

Kind Regards,

Sepan Mahamad

Client Services Officer, Environmental
Sydney

T +61 2 9437 9978
M +61 438 511 003
sepan.mahamad@alsglobal.com
Shop 2, 36 Hume St
Crows Nest NSW 2065 AUSTRALIA

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From: Sepan Mahamad
Sent: Friday, 27 July 2018 16:01
To: 'McLean, Kyle' <Kyle.McLean@jacobs.com>
Subject: Analysis confirmation

Hi Kyle,

Sath just dropped off some samples at our Crows Nest office and wanted to confirm if the analyses written on the attached CoC is correct. Can you please let me know when you get a chance?

Thank you

Please note that my office hours are 11am - 5.30pm Monday to Friday. For assistance outside of this time please contact **ALSEnviro.Sydney@alsglobal.com**.

Kind Regards,

Sepan Mahamad

Client Services Officer, Environmental
Sydney

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Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 196518

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	Kyle Mclean
Address	Level 7, 177 Pacific Highway, North Sydney, NSW, 2060

Sample Details

Your Reference	**IA179600_SWP**
Number of Samples	3 Soil
Date samples received	18/07/2018
Date completed instructions received	18/07/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	25/07/2018
Date of Issue	23/07/2018

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Results Approved By

Giovanni Agosti, Group Technical Manager
Jeremy Faircloth, Organics Supervisor
Phalak Inthakesone, Organics Development Manager, Sydney
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		196518-1	196518-2
Your Reference	UNITS	QAQC2	QAQC4
Date Sampled		10/07/2018	12/07/2018
Type of sample		Soil	Soil
Date extracted	-	19/07/2018	19/07/2018
Date analysed	-	20/07/2018	20/07/2018
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	113	115

svTRH (C10-C40) in Soil			
Our Reference		196518-1	196518-2
Your Reference	UNITS	QAQC2	QAQC4
Date Sampled		10/07/2018	12/07/2018
Type of sample		Soil	Soil
Date extracted	-	19/07/2018	19/07/2018
Date analysed	-	20/07/2018	20/07/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	78	78

PAHs in Soil			
Our Reference		196518-1	196518-2
Your Reference	UNITS	QAQC2	QAQC4
Date Sampled		10/07/2018	12/07/2018
Type of sample		Soil	Soil
Date extracted	-	19/07/2018	19/07/2018
Date analysed	-	20/07/2018	20/07/2018
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.2
Pyrene	mg/kg	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1
Total +ve PAH's	mg/kg	<0.05	1.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	96	94

Acid Extractable metals in soil			
Our Reference		196518-1	196518-2
Your Reference	UNITS	QAQC2	QAQC4
Date Sampled		10/07/2018	12/07/2018
Type of sample		Soil	Soil
Date prepared	-	19/07/2018	19/07/2018
Date analysed	-	19/07/2018	19/07/2018
Arsenic	mg/kg	<4	6
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	13	8
Copper	mg/kg	10	33
Lead	mg/kg	19	50
Mercury	mg/kg	<0.1	0.2
Nickel	mg/kg	5	6
Zinc	mg/kg	15	54

Moisture				
Our Reference		196518-1	196518-2	196518-3
Your Reference	UNITS	QAQC2	QAQC4	QAQC6
Date Sampled		10/07/2018	12/07/2018	12/07/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	19/07/2018	19/07/2018	19/07/2018
Date analysed	-	20/07/2018	20/07/2018	20/07/2018
Moisture	%	12	10	17

PFAS in Soils Extended		
Our Reference		196518-3
Your Reference	UNITS	QAQC6
Date Sampled		12/07/2018
Type of sample		Soil
Date prepared	-	19/07/2018
Date analysed	-	19/07/2018
Perfluorobutanesulfonic acid	µg/kg	<0.1
Perfluoropentanesulfonic acid	µg/kg	<0.1
Perfluorohexanesulfonic acid - PFHxS	µg/kg	<0.1
Perfluoroheptanesulfonic acid	µg/kg	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	<0.1
Perfluorodecanesulfonic acid	µg/kg	<0.2
Perfluorobutanoic acid	µg/kg	<0.2
Perfluoropentanoic acid	µg/kg	<0.2
Perfluorohexanoic acid	µg/kg	<0.1
Perfluoroheptanoic acid	µg/kg	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1
Perfluorononanoic acid	µg/kg	<0.1
Perfluorodecanoic acid	µg/kg	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5
Perfluorododecanoic acid	µg/kg	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5
Perfluorotetradecanoic acid	µg/kg	<5
4:2 FTS	µg/kg	<0.1
6:2 FTS	µg/kg	<0.1
8:2 FTS	µg/kg	<0.1
10:2 FTS	µg/kg	<0.1
Perfluorooctane sulfonamide	µg/kg	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1
N-Ethyl perfluorooctanesulfon amide	µg/kg	<1
N-Me perfluorooctanesulfonamid oethanol	µg/kg	<1
N-Et perfluorooctanesulfonamid oethanol	µg/kg	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2
EtPerfluorooctanesulf amid oacetic aci	µg/kg	<0.2
Surrogate $^{13}C_8$ *PFOS*	%	125
Surrogate $^{13}C_2$ *PFOA*	%	97
Extracted ISTD $^{13}C_3$ *PFBS*	%	93
Extracted ISTD $^{18}O_2$ *PFHxS*	%	76
Extracted ISTD $^{13}C_4$ *PFOS*	%	89
Extracted ISTD $^{13}C_4$ *PFBA*	%	95
Extracted ISTD $^{13}C_3$ *PFPeA*	%	90

PFAS in Soils Extended		
Our Reference		196518-3
Your Reference	UNITS	QAQC6
Date Sampled		12/07/2018
Type of sample		Soil
Extracted ISTD $^{13}C_2$ *PFHxA*	%	78
Extracted ISTD $^{13}C_4$ *PFHpA*	%	83
Extracted ISTD $^{13}C_4$ *PFOA*	%	82
Extracted ISTD $^{13}C_5$ *PFNA*	%	85
Extracted ISTD $^{13}C_2$ *PFDA*	%	82
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	78
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	62
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	88
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	62
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	74
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	76
Extracted ISTD $^{13}C_8$ *FOSA*	%	79
Extracted ISTD d_3 *N MeFOSA*	%	55
Extracted ISTD d_5 *N EtFOSA*	%	58
Extracted ISTD d_7 *N MeFOSE*	%	80
Extracted ISTD d_9 *N EtFOSE*	%	78
Extracted ISTD d_3 *N MeFOSAA*	%	64
Extracted ISTD d_5 *N EtFOSAA*	%	64
Total Positive PFHxS & PFOS	µg/kg	<0.1
Total Positive PFOS & PFOA	µg/kg	<0.1
Total Positive PFAS	µg/kg	<0.1

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-035	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.1 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.
Org-035_2	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.1 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date extracted	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Date analysed	-			20/07/2018	[NT]	[NT]	[NT]	[NT]	20/07/2018	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	128	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	128	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	130	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	128	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	125	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	128	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	129	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	106	[NT]	[NT]	[NT]	[NT]	114	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date extracted	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Date analysed	-			20/07/2018	[NT]	[NT]	[NT]	[NT]	20/07/2018	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	106	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
TRH $>C_{10}$ -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	106	[NT]
TRH $>C_{16}$ -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH $>C_{34}$ -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
Surrogate o-Terphenyl	%		Org-003	83	[NT]	[NT]	[NT]	[NT]	103	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date extracted	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Date analysed	-			20/07/2018	[NT]	[NT]	[NT]	[NT]	20/07/2018	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	106	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	96	[NT]	[NT]	[NT]	[NT]	119	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Date analysed	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	113	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	106	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	118	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Date analysed	-			19/07/2018	[NT]	[NT]	[NT]	[NT]	19/07/2018	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	90	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	119	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	117	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	132	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-035	<5	[NT]	[NT]	[NT]	[NT]	99	[NT]
4:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
6:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
8:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	77	[NT]
10:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
N-Ethyl perfluorooctanesulfon amide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
N-Me perfluorooctanesulfonamid oethanol	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
N-Et perfluorooctanesulfonamid oethanol	µg/kg	5	Org-035	<5	[NT]	[NT]	[NT]	[NT]	107	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	107	[NT]
EtPerfluorooctanesulf amid oacetic aci	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	96	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-035	101	[NT]	[NT]	[NT]	[NT]	89	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-035_2	102	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-035	115	[NT]	[NT]	[NT]	[NT]	110	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-035	85	[NT]	[NT]	[NT]	[NT]	87	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-035	96	[NT]	[NT]	[NT]	[NT]	107	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-035	103	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-035	98	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-035	104	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-035	99	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-035	89	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-035	92	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-035	86	[NT]	[NT]	[NT]	[NT]	84	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-035	71	[NT]	[NT]	[NT]	[NT]	71	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-035	44	[NT]	[NT]	[NT]	[NT]	71	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-035	93	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-035	92	[NT]	[NT]	[NT]	[NT]	82	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-035	91	[NT]	[NT]	[NT]	[NT]	84	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-035	118	[NT]	[NT]	[NT]	[NT]	122	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-035	74	[NT]	[NT]	[NT]	[NT]	80	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-035	60	[NT]	[NT]	[NT]	[NT]	81	[NT]
Extracted ISTD d_5 *N EtFOSA*	%		Org-035	62	[NT]	[NT]	[NT]	[NT]	87	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-035	72	[NT]	[NT]	[NT]	[NT]	92	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-035	71	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-035	76	[NT]	[NT]	[NT]	[NT]	75	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Extracted ISTD d5 *N EtFOSAA*	%		Org-035	77	[NT]	[NT]	[NT]	[NT]	74	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

ALS environmental

CHAIN OF CUSTODY

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☐ PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐ SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐ TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS

OFFICE: North Sydney

PROJECT: IA179600_SWP

ORDER NUMBER:

PROJECT MANAGER: Michael Stacey CONTACT PH: 02 9032 1467

SAMPLER: Kyle McLean SAMPLER MOBILE: 0402 536796

COC emailed to ALS? (YES / NO) EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? No N/A

Free ice / frozen ice bricks present upon receipt? No N/A

Random Sample Temperature on Receipt:

Other comment:

RELINQUISHED BY:	RECEIVED BY: ELS JE	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME: 18/7/18 15:00	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).									Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Heavy Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) / TRH / BTEXN / PAH (S-26)	OC / PCB (S-11)	PFAS - Full suite (EP231X)	Asbestos in Soils (EA200N)	Asbestos ID in soils P/A (EA200)	TRH C6 - C40 (TRH only)	- 1:5 Leach (EN34) / - pH 1:5 (EA002) / - CEC (ED008 Def) / - % Clay EA150H-C)	BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
68	TP30_0.0-0.3	13/7/18	S	NA	1				X					
~~69~~	~~TP05_ACM_0.9-1.1~~	~~11/7/18~~	↓	↓	↓					~~X~~				~~ACM sample.~~
70	TP11_ACM_0.0-1.1	11/7/18								X				ACM sample.
71	TP14_2.2-2.3	13/7/18						X						
72	TP15_2.4-2.5	13/7/18						X						
73	TP16_2.4-2.5	12/7/18						X						
74	TP17_2.6-2.7	12/7/18						X						
75	TP18_2.9-3.0	12/7/18			↓			X						
76	TP19_2.7-2.8	12/7/18			1			X						
77	QAQC1	10/7/18			1	X								
(1) * FWD	QAQC2	10/7/18	↓	↓	1	X								Send to Envirolab
78	QAQC3	12/7/18	S	NA	1	X								
					TOTAL									

Envirolab Services
ENVIROLAB GROUP
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 196518
Date Received: 18/7/18
Time Received: 15:00
Received By: JE
Temp: [✓ Cool]/Ambient
Cooling: [✓ Ice]/Icepack
Security: [✓ Intact]/Broken/None

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐ Non Standard or urgent TAT (List due date):

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FOR LABORATORY USE ONLY: (Circle)

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Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt:

Other comment:

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY: JE

DATE/TIME: 18/7/18

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: 196518

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).									Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Heavy Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) / TRH / BTEXN / PAH (S-26)	OC / PCB (S-11)	PFAS - Full suite (EP231X)	Asbestos in Soils (EA200N)	Asbestis ID in soils P/A (EA200)	TRH C6 - C40 (TRH only)	- 1:5 Leach (EN34) / - pH 1:5 (EA002) / - CEC (ED008 Def) / - % Clay EA150H-C)	BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
② * FWD	QAQC4	12/7/18	S	NA	1	X								Send to Envirolab
~~79~~	~~QAQC5.~~	~~12/7/18~~			~~1~~			~~X~~						
③ * FWD	QAQC6	12/7/18			1			X						Send to Envirolab
80	QAQC-TB1	9/7/18	↓		1								X	
81	QAQC-TS1	9/7/18	S	NA	1								X	
	TP17_2.0-2.1	12/7/18												
	TP30-0.5-0.6	13/7/18												
					TOTAL									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 197378

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	Kyle Mclean, Michael Stacey
Address	Level 7, 177 Pacific Highway, North Sydney, NSW, 2060

Sample Details

Your Reference	IA179600_SWP
Number of Samples	3 Soil
Date samples received	31/07/2018
Date completed instructions received	31/07/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	07/08/2018
Date of Issue	07/08/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Giovanni Agosti, Group Technical Manager
Phalak Inthakesone, Organics Development Manager, Sydney
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		197378-2	197378-3
Your Reference	UNITS	QAQC12	QAQC8
Date Sampled		-	16/07/2018
Type of sample		Soil	Soil
Date extracted	-	01/08/2018	01/08/2018
Date analysed	-	02/08/2018	02/08/2018
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	111	107

svTRH (C10-C40) in Soil			
Our Reference		197378-2	197378-3
Your Reference	UNITS	QAQC12	QAQC8
Date Sampled		-	16/07/2018
Type of sample		Soil	Soil
Date extracted	-	01/08/2018	01/08/2018
Date analysed	-	01/08/2018	01/08/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	85	86

PAHs in Soil			
Our Reference		197378-2	197378-3
Your Reference	UNITS	QAQC12	QAQC8
Date Sampled		-	16/07/2018
Type of sample		Soil	Soil
Date extracted	-	01/08/2018	01/08/2018
Date analysed	-	02/08/2018	02/08/2018
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	100	98

Acid Extractable metals in soil			
Our Reference		197378-2	197378-3
Your Reference	UNITS	QAQC12	QAQC8
Date Sampled		-	16/07/2018
Type of sample		Soil	Soil
Date prepared	-	01/08/2018	01/08/2018
Date analysed	-	02/08/2018	02/08/2018
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	5	5
Copper	mg/kg	<1	7
Lead	mg/kg	3	5
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	2	2
Zinc	mg/kg	<1	6

Moisture				
Our Reference		197378-1	197378-2	197378-3
Your Reference	UNITS	QAQC10	QAQC12	QAQC8
Date Sampled		-	-	16/07/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	01/08/2018	01/08/2018	01/08/2018
Date analysed	-	02/08/2018	02/08/2018	02/08/2018
Moisture	%	6.0	8.6	15

PFAS in Soils Extended		
Our Reference		197378-1
Your Reference	UNITS	QAQC10
Date Sampled		-
Type of sample		Soil
Date prepared	-	02/08/2018
Date analysed	-	06/08/2018
Perfluorobutanesulfonic acid	µg/kg	27
Perfluoropentanesulfonic acid	µg/kg	88
Perfluorohexanesulfonic acid - PFHxS	µg/kg	1,200
Perfluoroheptanesulfonic acid	µg/kg	68
Perfluorooctanesulfonic acid PFOS	µg/kg	1,600
Perfluorodecanesulfonic acid	µg/kg	<2
Perfluorobutanoic acid	µg/kg	1
Perfluoropentanoic acid	µg/kg	2.7
Perfluorohexanoic acid	µg/kg	53
Perfluoroheptanoic acid	µg/kg	25
Perfluorooctanoic acid PFOA	µg/kg	47
Perfluorononanoic acid	µg/kg	1.1
Perfluorodecanoic acid	µg/kg	<5
Perfluoroundecanoic acid	µg/kg	<5
Perfluorododecanoic acid	µg/kg	<5
Perfluorotridecanoic acid	µg/kg	<5
Perfluorotetradecanoic acid	µg/kg	<5
4:2 FTS	µg/kg	<1
6:2 FTS	µg/kg	<1
8:2 FTS	µg/kg	<1
10:2 FTS	µg/kg	<1
Perfluorooctane sulfonamide	µg/kg	<10
N-Methyl perfluorooctane sulfonamide	µg/kg	<10
N-Ethyl perfluorooctanesulfon amide	µg/kg	<10
N-Me perfluorooctanesulfonamid oethanol	µg/kg	<10
N-Et perfluorooctanesulfonamid oethanol	µg/kg	<10
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<2
EtPerfluorooctanesulf amid oacetic aci	µg/kg	<2
Surrogate $^{13}C_8$ *PFOS*	%	95
Surrogate $^{13}C_2$ *PFOA*	%	90
Extracted ISTD $^{13}C_3$ *PFBS*	%	118
Extracted ISTD $^{18}O_2$ *PFHxS*	%	107
Extracted ISTD $^{13}C_4$ *PFOS*	%	109
Extracted ISTD $^{13}C_4$ *PFBA*	%	116
Extracted ISTD $^{13}C_3$ *PFPeA*	%	128

PFAS in Soils Extended		
Our Reference		197378-1
Your Reference	UNITS	QAQC10
Date Sampled		-
Type of sample		Soil
Extracted ISTD $^{13}C_2$ *PFHxA*	%	119
Extracted ISTD $^{13}C_4$ *PFHpA*	%	87
Extracted ISTD $^{13}C_4$ *PFOA*	%	119
Extracted ISTD $^{13}C_5$ *PFNA*	%	97
Extracted ISTD $^{13}C_2$ *PFDA*	%	123
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	110
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	88
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	76
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	108
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	123
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	119
Extracted ISTD $^{13}C_8$ *FOSA*	%	92
Extracted ISTD d_3 *N MeFOSA*	%	59
Extracted ISTD d_5 *N EtFOSA*	%	53
Extracted ISTD d_7 *N MeFOSE*	%	89
Extracted ISTD d_9 *N EtFOSE*	%	79
Extracted ISTD d_3 *N MeFOSAA*	%	114
Extracted ISTD d_5 *N EtFOSAA*	%	113
Total Positive PFHxS & PFOS	µg/kg	2,800
Total Positive PFOS & PFOA	µg/kg	1,600
Total Positive PFAS	µg/kg	3,100

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-035	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.1 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.
Org-035_2	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.1 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

Client Reference: IA179600_SWP

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date extracted	-			01/08/2018	[NT]	[NT]	[NT]	[NT]	01/08/2018	[NT]
Date analysed	-			02/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	94	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	93	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	95	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	113	[NT]	[NT]	[NT]	[NT]	111	[NT]

Client Reference: IA179600_SWP

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date extracted	-			01/08/2018	[NT]	[NT]	[NT]	[NT]	01/08/2018	[NT]
Date analysed	-			01/08/2018	[NT]	[NT]	[NT]	[NT]	01/08/2018	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
TRH $>C_{10}$ -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH $>C_{16}$ -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH $>C_{34}$ -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
Surrogate o-Terphenyl	%		Org-003	88	[NT]	[NT]	[NT]	[NT]	92	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date extracted	-			01/08/2018	[NT]	[NT]	[NT]	[NT]	01/08/2018	[NT]
Date analysed	-			02/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	107	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	99	[NT]	[NT]	[NT]	[NT]	120	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			01/08/2018	[NT]	[NT]	[NT]	[NT]	01/08/2018	[NT]
Date analysed	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	107	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	106	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	126	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			02/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
Date analysed	-			06/08/2018	[NT]	[NT]	[NT]	[NT]	06/08/2018	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	68	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	102	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	116	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	104	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-035	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-035	<5	[NT]	[NT]	[NT]	[NT]	117	[NT]
4:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
6:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
8:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	125	[NT]
10:2 FTS	µg/kg	0.1	Org-035	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
N-Ethyl perfluorooctanesulfon amide	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
N-Me perfluorooctanesulfonamid oethanol	µg/kg	1	Org-035	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
N-Et perfluorooctanesulfonamid oethanol	µg/kg	5	Org-035	<5	[NT]	[NT]	[NT]	[NT]	114	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	105	[NT]
EtPerfluorooctanesulf amid oacetic aci	µg/kg	0.2	Org-035	<0.2	[NT]	[NT]	[NT]	[NT]	95	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-035	114	[NT]	[NT]	[NT]	[NT]	111	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-035_2	97	[NT]	[NT]	[NT]	[NT]	105	[NT]
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-035	99	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-035	88	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-035	95	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-035	103	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-035	121	[NT]	[NT]	[NT]	[NT]	111	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-035	115	[NT]	[NT]	[NT]	[NT]	109	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-035	111	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-035	117	[NT]	[NT]	[NT]	[NT]	106	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-035	121	[NT]	[NT]	[NT]	[NT]	113	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-035	112	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-035	107	[NT]	[NT]	[NT]	[NT]	105	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-035	99	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-035	98	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-035	97	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-035	106	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-035	84	[NT]	[NT]	[NT]	[NT]	72	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-035	106	[NT]	[NT]	[NT]	[NT]	88	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-035	59	[NT]	[NT]	[NT]	[NT]	55	[NT]
Extracted ISTD d_5 *N EtFOSA*	%		Org-035	69	[NT]	[NT]	[NT]	[NT]	65	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-035	100	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-035	117	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-035	99	[NT]	[NT]	[NT]	[NT]	82	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-035	100	[NT]	[NT]	[NT]	[NT]	86	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

PFAS_S_EXT1: Sample required dilution due to high levels of contaminants. PQLs have been adjusted accordingly.

5171-172

Fadi Soro

From: Sepan Mahamad
Sent: Tuesday, 31 July 2018 11:32 AM
To: Fadi Soro
Subject: RE: ES1821108 - samples to Envirolab

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 197378
Date Received: 31/7/18
Time Received: 15:00
Received By: MT
Temp: [✓ Cool]/Ambient 10-5
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Thanks Fadi.

Please forward the following samples to Envirolab:

① ES1821108-019 (QAQC10) to be analysed for PFAS Full suite
② ES1821108-021 (QAQC12) to be analysed for S-26 (TPH, BTEX, PAH, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)
③ ES1821108-023 (QAQC8) to be analysed for S-26 (TPH, BTEX, PAH, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)

Also, please organise analysis of sample ES1821108-022 (QAQC7) **at ALS** for S-26 (TPH, BTEX, PAH, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg). An amendment is okay, no need to rebatch.

Thanks

Please note that my office hours are 11am - 5.30pm Monday to Friday. For assistance outside of this time please contact ALSEnviro.Sydney@alsglobal.com.

Kind Regards,

Sepan Mahamad
Client Services Officer, Environmental
Sydney

ALS
T +61 2 9437 9978
M +61 438 511 003
sepan.mahamad@alsglobal.com
Shop 2, 36 Hume St
Crows Nest NSW 2065 AUSTRALIA

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www.alsglobal.com

From: Fadi Soro
Sent: Monday, 30 July 2018 16:17
To: Sepan Mahamad <Sepan.Mahamad@alsglobal.com>
Subject: RE: ES1821108 - samples to Envirolab

Hey Sep,

For sample #19 we have ¾ of a PFAS jar remaining and for samples #21-23 we pretty much have a full 150ml soil jar remaining.

Regards

Fadi

From: Sepan Mahamad
Sent: Monday, 30 July 2018 2:48 PM
To: Fadi Soro <fadi.soro@alsglobal.com>
Subject: ES1821108 - samples to Envirolab

Hi Fadi,

Can you please track down the following samples and advise how much volume is remaining in each? The client may want to send them off to Envirolab. Thanks

ES1821108 – 019, 021, 022, 023

Kind Regards,

Sepan Mahamad

Client Services Officer, Environmental
Sydney

197378

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☐ ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐ BRISBANE 32 Shand Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐ GLADSTONE 46 Callemondah Drive Clinton QLD 4680
Ph: 07 7471 5600 E: gladstone@alsglobal.com

☐ MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com

☐ MELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐ MUDGEE 27 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐ NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐ NOWRA 4/13 Geary Place North Nowra NSW 2541
Ph: 024423 2063 E: nowra@alsglobal.com

☐ PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐ SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐ TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS

OFFICE: Level 7, 177 Pacific Highway, North Sydney

PROJECT: IA179600_SWP

ORDER NUMBER:

PROJECT MANAGER: Michael Stacey **CONTACT PH:** 02 9032 1467

SAMPLER: Kyle McLean **SAMPLER MOBILE:** 0402 536796

COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):**

Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: SY/322/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
[✓ Free ice] / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 6.5 °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
K. MCLEAN			
DATE/TIME: 17/7/18	DATE/TIME: 17/7/18 1440	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	~~Dissolved~~ Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) / TRH / BTEXN ~~(NH4)~~ PAH S-26	OC/PCB ~~PAH - Ultra trace (EP132 (PAH))~~ S-11	Asbestos in ~~NOCS (EP0TA)~~ soils - EA200	PFAS - Full suite ~~(EP231X-OS)~~ EP231X (soil)	Asbestos ID in soils (P/A)	pH, CEC, % clay, ~~heavy~~ metals (?)		BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP31-0.0-0.1	17/7/18	S	NA	2	X	X			X				
2	TP32-0.5-0.6	16/7/18			2	X	X			X				
3	TP32-1.0-1.1	16/7/18			1	X								
4	TP33-0.0-0.1	17/7/18			2	X	X			X				
5	TP34-0.0-0.1	↓			3	X	X		X	X				
6	TP34-0.5-0.6				1	X								
7	TP35-0.0-0.1				2	X	X			X				
8	TP35-2.0-2.1	↓			2	X					X			
9	TP36-0.5-0.6	16/7/18			2	X	X			X				
10	TP36-ACM-0.0-0.5	↓			2					X				
11	TP36-2.9-3.0				1	X								
12	TP37-0.0-0.1	↓			2	X	X			X				
				TOTAL										

Internal Lab / Split WO
Lab / Analysis: Asbestos → Newcastle
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No:
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1821108

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

197378.

ALS Environmental

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ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: JACOBS	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No [✓ N/A] Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: 6.3 Other comment:
OFFICE: Level 7, 177 Pacific Highway, North Sydney			
PROJECT: IA179600_SWP	ALS QUOTE NO.: SY/322/18	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	
ORDER NUMBER:			
PROJECT MANAGER: Michael Stacey	CONTACT PH: 02 9032 1467		
SAMPLER: Kyle McLean	SAMPLER MOBILE: 0402 538796		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com			
Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com			

RELINQUISHED BY: K. MCLEAN DATE/TIME: 17/7/18	RECEIVED BY: 50... 275 DATE/TIME: 17/7/18 1440	RELINQUISHED BY: DATE/TIME:	RECEIVED BY: DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Dissolved Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) / TRH / BTEXN ~~(W-06)~~ S-26 PAH	OC / PCB ~~TAH - Ultra trace (EP132 (PAH))~~ S-11	Asbestos in ~~VOCs (EP074)~~ soils - ER200N	PFAS - Full suite (EP231X) - Soil	Asbestos ID in soils (P/A)	% clay, pH CEC		BTEX only	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	TP38 - 0.0 - 0.1	16/7/18	S	NA	2	X	X			X				
~~14~~	~~TP38 - 1.0 - 1.1~~				~~1~~	X								
15	TP39 - 2.0 - 2.1				2	X	X			X				
16	TP40 - 0.5 - 0.6				2	X	X			X				
17	TP40 - 2.9 - 3.0				1	X								
18	QAQC 9	17/7/18			1				X					
① 19	QAQC 10				1				X					
20	QAQC 11				1	X								
② 21	QAQC 12				1	X								
22	QAQC 7	16/7/18												
③ 23	QAQC 8	16/7/18												
24	QAQC - TB2 ~~[illegible]~~	16/7/18											X	Trip Blank
				TOTAL										

ENVIROLAB

~~Envirolab Services~~
~~12 Ashley St~~
~~Chatswood NSW 2067~~
~~Ph: (02) 9910 6200~~
~~Job No:~~
~~Date Received:~~
~~Time Received:~~
~~Received By:~~
~~Temp: Cool/Ambient~~ 10.5
~~Cooling: Ice/Icepack~~
~~Security: Intact/Broken/None~~

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

25 QAQC-TS2 26 TSC2 X Trip Spike

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 197377

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	Kyle Mclean, Michael Stacey
Address	Level 7, 177 Pacific Highway, North Sydney, NSW, 2060

Sample Details

Your Reference	**IA179600**
Number of Samples	1 Water
Date samples received	31/07/2018
Date completed instructions received	31/07/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	07/08/2018
Date of Issue	07/08/2018

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Results Approved By
Jaimie Loa-Kum-Cheung, Senior Chemist
Jeremy Faircloth, Organics Supervisor
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

VOCs in water		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
Date extracted	-	03/08/2018
Date analysed	-	06/08/2018
Dichlorodifluoromethane	µg/L	<10
Chloromethane	µg/L	<10
Vinyl Chloride	µg/L	<10
Bromomethane	µg/L	<10
Chloroethane	µg/L	<10
Trichlorofluoromethane	µg/L	<10
1,1-Dichloroethene	µg/L	<1
Trans-1,2-dichloroethene	µg/L	<1
1,1-dichloroethane	µg/L	<1
Cis-1,2-dichloroethene	µg/L	<1
Bromochloromethane	µg/L	<1
Chloroform	µg/L	<1
2,2-dichloropropane	µg/L	<1
1,2-dichloroethane	µg/L	<1
1,1,1-trichloroethane	µg/L	<1
1,1-dichloropropene	µg/L	<1
Cyclohexane	µg/L	<1
Carbon tetrachloride	µg/L	<1
Benzene	µg/L	<1
Dibromomethane	µg/L	<1
1,2-dichloropropane	µg/L	<1
Trichloroethene	µg/L	<1
Bromodichloromethane	µg/L	<1
trans-1,3-dichloropropene	µg/L	<1
cis-1,3-dichloropropene	µg/L	<1
1,1,2-trichloroethane	µg/L	<1
Toluene	µg/L	<1
1,3-dichloropropane	µg/L	<1
Dibromochloromethane	µg/L	<1
1,2-dibromoethane	µg/L	<1
Tetrachloroethene	µg/L	<1
1,1,1,2-tetrachloroethane	µg/L	<1
Chlorobenzene	µg/L	<1
Ethylbenzene	µg/L	<1
Bromoform	µg/L	<1

VOCs in water		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
m+p-xylene	µg/L	4
Styrene	µg/L	<1
1,1,2,2-tetrachloroethane	µg/L	<1
o-xylene	µg/L	2
1,2,3-trichloropropane	µg/L	<1
Isopropylbenzene	µg/L	<1
Bromobenzene	µg/L	<1
n-propyl benzene	µg/L	<1
2-chlorotoluene	µg/L	<1
4-chlorotoluene	µg/L	<1
1,3,5-trimethyl benzene	µg/L	2
Tert-butyl benzene	µg/L	<1
1,2,4-trimethyl benzene	µg/L	3
1,3-dichlorobenzene	µg/L	<1
Sec-butyl benzene	µg/L	<1
1,4-dichlorobenzene	µg/L	<1
4-isopropyl toluene	µg/L	<1
1,2-dichlorobenzene	µg/L	<1
n-butyl benzene	µg/L	<1
1,2-dibromo-3-chloropropane	µg/L	<1
1,2,4-trichlorobenzene	µg/L	<1
Hexachlorobutadiene	µg/L	<1
1,2,3-trichlorobenzene	µg/L	<1
Surrogate Dibromofluoromethane	%	115
Surrogate toluene-d8	%	106
Surrogate 4-BFB	%	89

vTRH(C6-C10)/BTEXN in Water		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
Date extracted	-	03/08/2018
Date analysed	-	06/08/2018
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	4
o-xylene	µg/L	2
Naphthalene	µg/L	1
Surrogate Dibromofluoromethane	%	115
Surrogate toluene-d8	%	106
Surrogate 4-BFB	%	89

svTRH (C10-C40) in Water		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
Date extracted	-	03/08/2018
Date analysed	-	03/08/2018
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Surrogate o-Terphenyl	%	92

PAHs in Water		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
Date extracted	-	03/08/2018
Date analysed	-	06/08/2018
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	79

HM in water - dissolved		
Our Reference		197377-1
Your Reference	UNITS	QAQC2
Date Sampled		27/07/2018
Type of sample		Water
Date prepared	-	02/08/2018
Date analysed	-	02/08/2018
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	<1
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	6
Zinc-Dissolved	µg/L	8

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	03/08/2018	[NT]
Date analysed	-			06/08/2018	[NT]	[NT]	[NT]	[NT]	06/08/2018	[NT]
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cyclohexane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	121	[NT]
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	78	[NT]
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
m+p-xylene	µg/L	2	Org-013	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Styrene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
o-xylene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-013	115	[NT]	[NT]	[NT]	[NT]	111	[NT]
Surrogate toluene-d8	%		Org-013	108	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate 4-BFB	%		Org-013	87	[NT]	[NT]	[NT]	[NT]	109	[NT]

Client Reference: IA179600

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	03/08/2018	[NT]
Date analysed	-			06/08/2018	[NT]	[NT]	[NT]	[NT]	06/08/2018	[NT]
TRH C_6 - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	94	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	115	[NT]	[NT]	[NT]	[NT]	111	[NT]
Surrogate toluene-d8	%		Org-016	108	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate 4-BFB	%		Org-016	87	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	03/08/2018	[NT]
Date analysed	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	03/08/2018	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	128	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	117	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	129	[NT]
TRH $>C_{10}$ - C_{16}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	128	[NT]
TRH $>C_{16}$ - C_{34}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	117	[NT]
TRH $>C_{34}$ - C_{40}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	129	[NT]
Surrogate o-Terphenyl	%		Org-003	108	[NT]	[NT]	[NT]	[NT]	110	[NT]

QUALITY CONTROL: PAHs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			03/08/2018	[NT]	[NT]	[NT]	[NT]	03/08/2018	[NT]
Date analysed	-			06/08/2018	[NT]	[NT]	[NT]	[NT]	06/08/2018	[NT]
Naphthalene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	73	[NT]
Acenaphthylene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Phenanthrene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	73	[NT]
Anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	74	[NT]
Pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	77	[NT]
Benzo(a)anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	73	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-012	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	91	[NT]	[NT]	[NT]	[NT]	79	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	[NT]
Date prepared	-			02/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
Date analysed	-			02/08/2018	[NT]	[NT]	[NT]	[NT]	02/08/2018	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	102	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory:
please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053
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CLIENT: JACOBS
OFFICE: Level 7, 177 Pacific Highway, North Sydney
PROJECT: ~~IA144102~~ IA179600
ORDER NUMBER:
PROJECT MANAGER: Michael Stacey **CONTACT PH:** 02 9032 1467
SAMPLER: Kyle McLean **SAMPLER MOBILE:** 0402 536796
COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):**
Email Reports to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com
Email Invoice to (will default to PM if no other addresses are listed): PM + kyle.mclean@jacobs.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☒ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: SY/371/18 TO BE CONFIRMED
SY/322/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
Free ice / frozen ice bricks present upon receipt? Yes No [✓ N/A]
Random Sample Temperature on Receipt: 17.6 °C
Other comment:

RELINQUISHED BY: SATHD	**RECEIVED BY:** Sep M. - ALS Crows Nest	**RELINQUISHED BY:**	**RECEIVED BY:** [illegible] Ad. 17.6C
DATE/TIME: 27.7.18 3:48	**DATE/TIME:** 27/07/18 1548	**DATE/TIME:**	**DATE/TIME:** 27/7/ 1910

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).				Additional Information
LAB ID	**SAMPLE ID**	**DATE / TIME**	**MATRIX**	**TYPE & PRESERVATIVE** (refer to codes below)	**TOTAL CONTAINERS**	W-05 Btex, TRH, 8M	EP132 (PAH)	(VOC) EP074 (water)	EP231X PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	GW01	27.7.18	W		6	X	X	X	X	HOLD ANALYSIS
2	GW02	"	W		6	X	X	X	X	"
3	GW03	"	W		6	X	X	X	X	"
4	GW04	"	W		5	X	X	X		"
5	QAQC1	"	W		6	X	X	X		Potential PFAS
① -	QAQC2	"	W		6	X	X	X		Potential PFAS Analysis

~~Sub~~Trip Spike and Lab / Split WO
Trip Blank QAQC2 → Envirolab
[illegible] Date:
[illegible] Date:
[illegible]
WO No:
Attach By PC, Interlab Sheet:

Please email COC to sath.dave@jacobs.com and confirm suite with kyle m

TOTAL

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial S[illegible] = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; AS[illegible] Soils; B = Unpreserved Bag.

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 197377
Date Received: 31/7/18
Time Received: 15:00
Received By: MT
Temp: [✓ Cool]/Ambient 10.5
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Environmental Division
Sydney
Work Order Reference
ES1822154

Telephone : + 61-2-8784 8555

From:	Sepan Mahamad
Sent:	Monday, 30 July 2018 10:57 AM
To:	Fadi Soro; Samples Sydney
Subject:	RE: Analysis confirmation

Also, sample QAQC2 needs to be sent to Envirolab.

Thanks

197377

Kind Regards,

Sepan Mahamad

Client Services Officer, Environmental
Sydney

T +61 2 9437 9978
M +61 438 511 003
sepan.mahamad@alsglobal.com
Shop 2, 36 Hume St
Crows Nest NSW 2065 AUSTRALIA

From: Sepan Mahamad
Sent: Monday, 30 July 2018 10:56 AM

APPENDIX I

ECOLOGICAL IMPACT ASSESSMENT

BANKSTOWN AIRPORT - SOUTH WEST PRECINCT SITE WORKS AND WAREHOUSE MAJOR DEVELOPMENT PLAN

Ecological Impact Assessment

For:

Bankstown Airport Limited

May 2018

Final

cumberland ecology

PO Box 2474
Carlingford Court 2118

Document No. SMA-EN-BAL-RPT-000507

Version	Date Issued	Amended by	Details
1	23/04/2018	VO/GK	Draft
2	28/05/2018	VO	Final

Approved by: David Robertson

Position: Director

Signed: David Robertson

Date: *29 May, 2018*

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Executive Summary

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been engaged by Altis Property Partners on behalf of Bankstown Airport Limited (BAL) to review the Ecological Assessment by ACS Environmental Pty Ltd (ACS Environmental, 2015) in preparation of a new Flora and Fauna Assessment (FFA) to support maintenance activities and the proposed development of the South West Precinct at Bankstown Airport (hereafter referred to as the 'subject site'). The FFA is required to:

- Support an application to the Airport Building Controller (ABC) to undertake vegetation and water detention basin maintenance works; and
- Support the South-West Precinct Site Works and Warehouse Major Development Plan (MDP), which seeks consent for civil works including site grading, construction of detention basins, roads and a warehouse building totalling 37,000 square metres with ancillary offices and carparking.

The *Airports Act 1996* (Airports Act) requires Bankstown Airport to prepare an MDP for the Minister of Infrastructure and Transport to approve, or refuse to approve, for certain works as described in the Act, prior to commencing development. This includes consideration of potentially significant impacts to the environment, including species, populations or ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the *NSW Biodiversity Conservation Act 2016* (BC Act).

Flora and fauna surveys were conducted by Cumberland Ecology on 22 March 2018, and the evenings of 2, 3 and 4 April 2018. The survey on 22 March 2018 involved recording floristic information, including quadrat surveys and vegetation mapping, and fauna habitat assessments. On 3, 4 and 5 April 2018, targeted surveys for the Green and Golden Bell Frog (*Litoria aurea*), which is listed as endangered under the BC Act and EPBC Act, were undertaken, using active search methods, and call play-back within suitable wetland habitat. The survey also identified the existing conditions for native fauna, including aquatic species with potential to utilise the dams and drainage line present on the subject site.

The results of the flora surveys determined that the vast majority of the subject site comprises exotic dominated grassland, with small occurrences of young regenerating Acacia dominated vegetation that has grown from fill, regrowth Swamp Oaks and a single remnant native Smooth-barked Apple (*Angophora costata*) tree. The vegetation is highly disturbed, as it has mostly regrown from fill since 2008, and is regularly slashed. None of the vegetation communities present are consistent with threatened ecological communities. This is consistent with the findings detailed in the ACS Environmental, 2015 report.

No threatened flora species were recorded within the subject site despite extensive targeted surveys, and none are considered likely to occur. The findings are consistent with the findings detailed in the ACS Environmental, 2015 report. The threatened flora species previously recorded elsewhere at Bankstown Airport - *Hibbertia puberula subspecies glabrescens (Hibbertia sp* Bankstown*), Hibbertia fumana* and *Acacia pubescens* - were not recorded on the subject site, and are considered unlikely based on the lack of native groundcover species, and dense exotic grass cover present. The entire subject site was previously filled, and all of the vegetation communities present are considered to be artificial.

Fauna habitats are highly limited on the subject site, and are likely to support only 'hardy' natives, including common urban birds, and species associated with farm dams, such as eels and turtles.

No threatened fauna species have been recorded from the subject site, although several threatened fauna species have been recorded from the locality and some have limited potential to occur due to the presence of some limited foraging habitat.

Potential habitat for the Green and Golden Bell Frog was identified, based on the presence of suitable wetland and shelter habitats, however, the species was not detected, despite targeted surveys, and is considered unlikely to occur. This is consistent with the findings detailed in the ACS Environmental, 2015 report.

Additional threatened fauna species considered to have potential to occur include 8 bird species, the Grey-headed Flying-fox and seven (7) microchiropteran bat (microbat) species. The habitat to be removed constitutes limited foraging habitat only for all of the threatened species, and some potential roosting or breeding habitat for the microbats, in the form of derelict buildings.

Nonetheless, the habitat present for these threatened fauna species is considered marginal, and the removal of exotic and regrowth vegetation is unlikely to represent a significant area of habitat for these species. The bird and bat species are highly mobile and would forage over a much broader area.

A range of mitigation measures have been recommended, to minimise the impacts of the proposed development on native flora and fauna, particularly threatened species. Measures include; vegetation protection (for off-site impacts to adjoining areas), erosion, sediment and pollution control, clearing/demolition supervision, dam dewatering supervision and weed control.

Provided that the aforementioned mitigation measures are implemented, it is considered unlikely that the proposed development will significantly impact on threatened species, populations or ecological communities, as listed under the BC Act or EPBC Act.

Chapter 1

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been engaged by Altis Property Partners on behalf of Bankstown Airport Limited (BAL) to review the Ecological Assessment by ACS Environmental Pty Ltd (ACS Environmental, 2015) in preparation of a new Flora and Fauna Assessment (FFA) to support maintenance activities and the proposed development of the South West Precinct at Bankstown Airport (hereafter referred to as the 'subject site'). The FFA is required to:

- Support an application to the Airport Building Controller (ABC) to undertake vegetation and water detention basin maintenance works; and
- Support the South-West Precinct Site Works and Warehouse Major Development Plan (MDP), which seeks consent for civil works including site grading, construction of detention basins, roads and a warehouse building totalling 37,000 square metres with ancillary offices and carparking.

The purpose of this report is to present a FFA that describes the current biodiversity values of the subject site and assesses the potential impacts of the proposed development on flora and fauna, particularly threatened species, populations and communities that are listed under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In line with the Bankstown Airport, the specific objectives of this FFA are to:

- Describe the vegetation communities on the subject site;
- Describe fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the BC Act and/or EPBC Act) existing on the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the BC Act and/or EPBC Act) or migratory species listed under the EPBC Act within the subject site;

- Assess the potential impact of the project on threatened communities, flora and fauna, as listed under the BC Act and EPBC Act as well as migratory species listed under the EPBC Act; and

- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values

1.2 Background

1.2.1 Site Description

The subject site comprises a circa 46.1 ha parcel of land fronting Milperra Road and Henry Lawson Drive, within Bankstown Airport (see **Figure 1.1**). It is bounded by Starkie Drive to the east and south, and Tower Road to the west and north-west. Bankstown Airport is located directly adjacent the north to north-eastern boundary of the subject site. The subject site is located in the Canterbury-Bankstown Local Government Area (LGA).

Bankstown Airport is largely cleared of native vegetation, and predominantly retains grassland that is regularly mown.

In 2008 major civil works were undertaken on the subject site where borrow pits and dams were created to offset any water run-off due to the new civil works, a circa 20 ha pad was created and fill from other developments on the airport were moved onto the site.

1.2.2 Proposed Development

The South-West Precinct Site Works and Warehouse Major Development Plan (MDP) will seek approval for:

- Civil works including site grading, construction of detention basins and roads

- A warehouse building totalling 37,000 square metres with ancillary offices and carparking.

The Site Area Plan (Sheet No. 60569579-SKE—00-1000-CL-0008) prepared by AECOM (2 May 2018), should be referenced for further details of the development layout.

1.3 Relevant Legislation

1.3.1 Approval Pathway

The *Airports Act 1996* (Airports Act) requires Bankstown Airport to prepare an MDP for the Minister of Infrastructure and Transport to approve, or refuse to approve, for certain works as described in the Act, prior to commencing development.

Bankstown Airport is a federally leased airport located on Commonwealth Land, and as such, approval for the proposed development is not required under the EPBC Act and the BC Act.

However, the MDP must consider the likelihood of the proposed development having a significant impact on the environment.

1.3.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation and is administered by the Commonwealth Department of the Environment and Energy (DoEE). It is designed to protect national environmental assets, known as Matters of National Environmental Significance (MNES), which include threatened species of flora and fauna, threatened ecological communities, migratory species as well as other protected matters. Among other things, it defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna and communities.

As approval of the MDP is approved under the Airports Act, approval under the EPBC Act is not required. However, as the MDP is required to consider the potential impacts of the proposed development on threatened and migratory species, the listings for these species under the EPBC Act is considered within this assessment.

1.3.3 Biodiversity Conservation Act 2016 and associated legislation

There have been number of recent changes to NSW biodiversity legislation. Under the NSW Land Management and Biodiversity Conservation (LMBC) reform, the NSW Parliament passed the following two Acts in November 2016:

- *Biodiversity Conservation Act 2016* (BC Act), which replaces the *Threatened Species Conservation Act 1995* (TSC Act), the *Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974*; and
- *Local Land Services Amendment Act 2016* (LLSA Act), which replaces the *Native Vegetation Act 2003* and the *Native Vegetation Regulation 2005*.

These reforms commenced on 25 August 2017. All species, populations and ecological community listings under the TSC Act – repealed have been transferred to the BC Act. These listings are considered within this assessment as the MDP is required to consider the potential impacts of the proposed development on threatened species.

1.3.4 Biosecurity Act 2015

Under the NSW *Biosecurity Act 2015* (Biosecurity Act) all weeds are required to be controlled by all persons under a "General Biosecurity Duty". The General Biosecurity Duty means that all public and private land owners or managers and all other people who deal with weed species (biosecurity matters) must use the most appropriate approach to prevent, eliminate, or minimise the negative impact (biosecurity risk) of those weeds (DPI 2017).

State-wide management of weeds under the new legislation is directed by the NSW Invasive Species Plan (NSW Local Land Services 2017). This assigns weed responses to four categories:

- Prevention of new weeds establishing;
- Eradication of small and localised infestations where feasible;
- Containment of larger infestation to stop wider spread; and
- Protection of key assets such as threatened plants and agricultural land, to prevent their damage or degradation by weed invasion.

Under the Biosecurity Act some weed species have been prioritised for management by specific regulations and controls under the act. These are known as State Level Priority Weeds.

The state has been divided into 11 regions (each covering a number of LGAs) under the Act, with each region managed by a Regional Weeds Committee. Management actions for weeds within a region are detailed within a Regional Strategic Weed Management Plan. Within each region, additional weed species to the State Level Priority Weeds have been prioritised for management. These species are known as Regional Priority Weeds. A further set of weeds are identified within the Regional Strategic Weed Management Plans as being “other weeds of regional concern”.

The Biosecurity Act provides powers to Local Control Authorities to take action in relation to these weeds in particular circumstances, for example where a weed threatens a high value asset, and prevention, elimination or reduction of the risk is feasible and reasonable. Examples of high values assets include the Environment, Human Health, and Agriculture.

All land within the subject site occurs within the Greater Sydney Local Land Services region, and weed management within the region is to be undertaken under the direction of the South East Regional Strategic Weed Management Plan (Greater Sydney LLS 2017). Appendix 1 of the Weed Management Plan outlines the State Priority Weeds, Regional Priority Weeds, and other weeds of regional concern.

1.3.5 Alignment with the Bankstown Airport Master Plan

The MDP must provide sufficient detail to satisfy the Department of Infrastructure & Regional Development & Cities (DIRDC) that there is benefit to the airport and the surrounding community, and that the proposed development is consistent with the Bankstown Airport Master Plan. The current Master Plan for Bankstown Airport is the *2014 Bankstown Airport Master Plan*. The Site Works and Warehouse MDP is required to reference this Master Plan, and ensure consistency with the Master Plan. In addition, Bankstown Airport is seeking to align the Site Works and Warehouse MDP with the *draft 2019 Bankstown Airport Master Plan* that is currently being prepared by AECOM. Thus, the Site Works and Warehouse MDP will also reference the intent of the *draft 2019 Bankstown Airport Master Plan.*

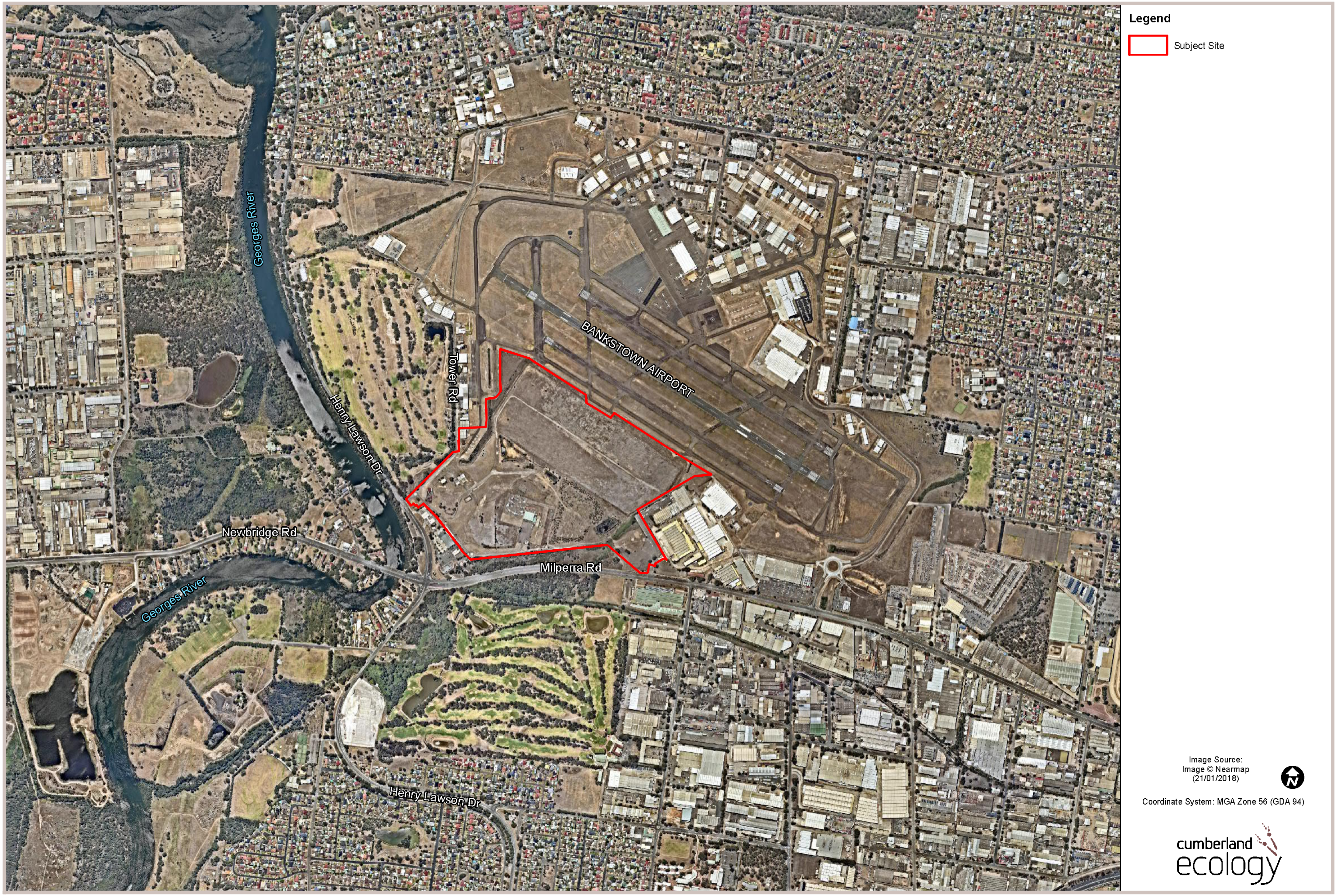

Image Source:
Image © Nearmap
(21/01/2018)

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

Figure 1.1. Location of the subject site

I:\...\18022\Figures\RP1\20180511\Figure 1.1. Location_subject site

Chapter 2

Methodology

2.1 Database Analysis and Literature Review

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Bionet Atlas (OEH 2018) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2018). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the BC Act within the locality of the subject site. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject site.

The lists generated from these databases were reviewed against available vegetation mapping and aerial photographs of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site, as shown in Table A.1 and Table A.2 in Appendix A.

In addition to the databases listed above, the following documents associated with the proposed project were reviewed:

- Ecological Assessments in relation to a previous proposed major development plan at Bankstown Airport by ACS Environmental Pty Ltd (ACS Environmental, 2015);
- Bankstown Airport: Hibbertia fumana Management Plan (SMA-EN-BAL-PLN-000705) (Cumberland Ecology 2018); and
- Management Plan for *Hibbertia puberula* subspecies *glabrescens* occurring at Bankstown Airport (SMA-EN-BAL-PLN-000704) (KMH Environmental 2017).

2.2 Flora Survey

Flora surveys were undertaken across the subject site on 22 March 2018 by a botanist from Cumberland Ecology. Surveys included vegetation mapping, plot surveys, random meander surveys, and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2018). The flora species list is included in Table B.1 in Appendix B.

2.2.1 Vegetation Mapping

Existing vegetation mapping available from "the Native Vegetation of the Sydney Metropolitan Area" (OEH 2016) was reviewed prior to the site inspection in order to determine existing vegetation communities that occur on the subject site. Cumberland Ecology conducted vegetation surveys to revise and update the vegetation mapping prepared by OEH. The vegetation within the subject site was ground-truthed to examine and verify the mapping including the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the OEH mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) unit and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site.

Vegetation was categorised into communities taking into account condition of vegetation (i.e. disturbance history), and where communities contained native species, they were matched, if feasible, to defined native vegetation units.

2.2.2 Flora Quadrat Survey

Two 20 x 20m flora plots were located in areas consisting of native vegetation communities. The location of these plots (Q1 and Q2) is shown in **Figure 2.1**. These plots were assessed according to the Biodiversity Assessment Methodology (BAM). This included recording the following:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m plot;
- Cover of High Threat Exotic weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with steams <5cm DBH; and

  - The total length in metres of fallen logs over 10 cm in diameter.

- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and

- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

The location of the flora quadrats are shown in **Figure 2.1**.

2.2.3 Targeted Threatened Flora Surveys

Based on the results of the desktop assessment, targeted searches were conducted for the following threatened species are known to occur within Bankstown Airport:

- *Acacia pubescens*, a species listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act;

- *Hibbertia fumana*, a species listed as Critically Endangered under the BC Act; and

- *Hibbertia puberula subspecies glabrescens* (Hibbertia sp Bankstown) which is listed as Critically Endangered under the EPBC Act, and the BC Act.

An additional three species were targeted during the survey, based on the potential habitat present, as shown in Table A.1 is Appendix A.

Targeted searches involved meanders within areas of potential/marginal habitat for a minimum of 6 person hours.

2.2.4 Random Meander Survey

Random meander surveys were undertaken throughout the subject site in accordance with the methods described in CSIRO "Management of Endangered Plants" (Cropper 1993) to record characteristic flora species occurring throughout parts of the subject site. The indicative random meander surveys are shown in **Figure 2.1**.

2.3 Wetland Assessment

Wetland assessments were undertaken within the subject site by an ecologist from Cumberland Ecology on 22 March 2018. Five wetland assessments were conducted in artificial dams or water bodies in the subject site, based on the complexity of habitat features, including; emergent vegetation, fringing vegetation, depth of water and gradient of banks, the presence of rocks or logs, and the presence of known predatory species, such as *Gambusia holbrookii* (Mosquito Fish).

Each wetland assessment included an assessment of foraging, breeding, and shelter habitat for amphibian species, in particular the Green and Golden Bell Frog, noting the presence of the following features important to the species:

- Cover of fringing vegetation (low (<10%) = 1, moderate (10-39%) = 2, high (40-100%) = 3);
- Cover of emergent vegetation (low (<10%) = 1, moderate (10-39%) = 2, high (40-100%) = 3);
- Presence of Grassland or woodland around the dam (grassland = 1, woodland = 2, grassland and woodland mosaic = 3);
- Varying water depth (absent = 0, present = 1);
- Submerged rocks and logs (absent = 0, present = 1);
- Rocks and/or logs for basking/shelter on dam edge (absent = 0, present = 1);
- Presence of *Gambusia holbrooki* (absent = 1, present = 0); and
- Turbid water (turbid = 0, clear = 1).

Each variable was allocated a score as shown above and each water body was allocated a score out of 15. Habitat was then assessed to a quality category as shown below:

- Score < 8 = Low quality habitat;
- Score 8-12 = Moderate quality habitat; and
- Score > 12 = High quality habitat.

All dams that were identified as moderate or high quality were subjected to targeted surveys. The results of the habitat assessments are shown in Table C.1 in Appendix C.

A photograph was taken at each wetland assessment point. The location of each wetland assessment point is shown in **Figure 2.1**.

2.4 Fauna Survey

An initial fauna survey was undertaken within the subject site by an ecologist from Cumberland Ecology on 22 March 2018. The initial survey included a fauna habitat assessment and incidental observations. Due to the presence of potential habitat being identified for the threatened amphibian species; Green and Golden Bell Frog (*Litoria aurea*), which is listed as endangered under the BC Act and EPBC Act, targeted surveys were additionally conducted on the evenings of 2, 3 and 4 April 2018. Further details of each of the survey methods are provided below. All fauna recorded during surveys are listed in Table B.2 in Appendix B.

2.4.1 Habitat Assessment

A fauna habitat assessment was conducted of the subject site which included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The fauna habitat assessment also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.4.2 Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the subject site.

2.4.3 Targeted surveys for Green and Golden Bell Frog

Following the initial wetland assessment a basking survey was conducted by an ecologist on 22 March. The basking survey involved active searches for basking or sheltering frogs, during the warm afternoon, when the sun was shining. Basking surveys were performed at each wetland, for a period of 30 minutes at each location (45 minutes at the largest dam).

Additionally, three evening surveys were conducted for the Green and Golden Bell Frog by two ecologists within each of the wetlands identified as moderate to high quality habitat. Survey generally followed the National Guidelines for Amphibian Surveys (DEWHA 2010). The methods included:

- Spotlighting for eye-shine to detect foraging individuals;
- Call play-back followed by quiet listening, to detect calling males; and
- Active searches of wetland vegetation.

The survey was repeated for a period of 30 minutes (45 minutes at the largest dam) at each wetland location over three evenings.

2.5 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The field survey undertaken by Cumberland Ecology added to the existing database and has helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. Not all flora species present within planted garden areas were recorded during surveys, as these comprised exotic ornamental species with no conservation significance. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora and likely impact on native vegetation.

In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present on a site that were active during the time of the survey. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the subject site. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values for threatened fauna within the subject site.

Figure 2.1. Survey locations

I:\...\18022\Figures\RP1\20180511\Figure 2.1. Survey locations

Chapter **3**

Results

3.1 Vegetation Mapping

Flora surveys undertaken by Cumberland Ecology indicate that the vast majority of the subject site comprises exotic dominated grassland, with small occurrences of young regrowth (grown from fill) native vegetation, regrowth and a single remnant native *Angophora costata* (Smooth-barked Apple) tree.

The vegetation communities and areas they cover within the subject site are detailed in **Table 3.1** below. The distribution of these communities across the subject site is shown in **Figure 3.2**. The species composition and condition of vegetation communities is described under sub-headings below.

Table 3.1 Vegetation communities within the subject site

Vegetation Community	BC Act Status	EPBC Act Status	Total Area (ha)
Exotic dominated grassland	not listed	not listed	42.49
Acacia scrub (regrowth)	not listed	not listed	1.96
Freshwater Wetland	not listed	not listed	1.34
Swamp Oak regrowth	not listed	not listed	0.26
Remnant Angophora costata	not listed	not listed	0.02
TOTAL			**46.08***

**All areas have been rounded to the nearest hundredth.*

3.1.1 Exotic Dominated Grassland

BC Act Status: Not listed

EPBC Act Status: Not listed

The vast majority of the subject site contains exotic dominated grassland. The community generally lacks a canopy, midstorey and shrub layer, due to the continued slashing that has occurred. However, some regenerating shrub species are present, and including low density occurrences of some natives; *Callistemon pinifolius* (Pine-leaved Bottlebrush) and *Melaleuca thymifolia* (Thyme Honey-myrtle). The ground layer is dominated by exotic grasses, including; *Eragrostis curvula* (African Lovegrass), *Cenchrus clandestinus* (Kikuyu) and the naturalised species *Cynodon dactylon* (Couch), and exotic herbs, including; *Plantago lanceolata* (Lambs Tongue), *Senecio madagascariensis* (Fireweed), *Taraxacum officinale* (Dandelion).

A photograph of this community is shown as **Photograph 3.1**.

Photograph 3.1 Exotic dominated grassland in the centre of the subject site (Q2)

3.1.2 Acacia Scrub (regrowth)

BC Act Status: Not Listed

EPBC Act Status: Not Listed

Acacia regrowth occurs on wind-rows/stockpiles that were created when fill was applied to the subject site in 2008. It is considered that the flora present have regrown from soil seed banks in the fill, as no planting has occurred on the site (Pers Comm BAL Environmental Manager). The regrowth community is dominated by a large shrub layer of Acacia sp. which are a mix of locally endemic and non-endemic species, including; *Acacia floribunda* (White Sally), *Acacia saligna* (Golden Wreath Wattle), *Acacia parvipinnula* (Silver-stemmed Wattle) and *Acacia falcata*. The understorey is dominated by exotic herbs, including *Sida rhombifolia* (Paddy's Lucerne), *Verbena bonariensis* (Purpletop) and *Plantago lanceolata*, and exotic grasses; *Eragrostis curvula* (African Lovegrass), *Cenchrus clandestinus* (Kikuyu) and the naturalised species *Cynodon dactylon* (Couch). Despite the presence of the native Acacias, the community does not conform to any described native vegetation unit within the Sydney Metropolitan mapping (OEH 2016).

A photograph of this community is shown as **Photograph 3.2**.

Photograph 3.2 Acacia scrub (regrowth) in the centre of the subject site (Q1)

3.1.3 Freshwater Wetland

BC Act Status: Not listed

EPBC Act Status: Not Listed

Five wetland areas occur in the subject site, including artificially constructed dams and a drainage line, running along the western boundary of the subject site.

The wetland areas in the subject site are not considered to conform to the listing of Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which is an EEC listed under the BC Act (NSW Scientific Committee 2011a). Artificial wetlands created on previously dry land for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community, and as the wetlands in the subject site have all been artificially constructed on previously dry land, they do not comprise this EEC.

The community largely comprises vegetation in damp areas around dams and drainage lines a wetland and includes fringing vegetation dominated by native reeds; *Juncus usitatus, Phragmites australis* (Common Reed) and *Typha orientalis* (Typha), as well as exotic herbs and grasses found in the adjoining exotic and regrowth communities.

A photograph of this community is shown as **Photograph 3.3**.

Photograph 3.3 Freshwater wetland at Dam 1 on the subject site

3.1.4 Swamp Oak Regrowth

BC Act Status: Not Listed

EPBC Act Status: Not Listed

A narrow strip of Swamp Oak forest occurs in the south east of the subject site, associated with a drainage line. Adjoining this area, on low-lying land, some saplings also occur. The canopy and shrub layer is exclusively dominated by *Casuarina glauca* (Swamp Oak). The understorey is dominated by exotic grasses, as described for the Exotic Dominated Grassland community.

This simplified community does not conform to the TEC; Swamp Oak Floodplain Forest, as listed under the BC Act, due to a lack of indicative species, and it being present in a constructed landscape, outside of the natural floodplain (NSW Scientific Committee 2011b). The lack of Eucalypt species in the canopy, does not indicate the presence of River-flat Eucalypt Forest, listed as endangered under the BC Act, despite the community being previously recorded to the south of the subject site (ACS Environmental, 2015).

The patch present does not meet the minimum condition for listing as Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland endangered ecological community under the EPBC Act, due to the small size (below the minimum size of 0.5ha), the high proportion of exotic understorey species and not being contiguous to a large patch of native vegetation.

A photograph of this community is shown as **Photograph 3.4**.

Photograph 3.4 Swamp Oak regrowth in the south of subject site (Q3)

3.1.5 Remnant Angophora costata

BC Act Status: Not Listed

EPBC Act Status: Not Listed

A single mature remnant *Angophora costata* (Smooth-barked Apple) tree is present in the south west of the subject site. This tree is the only mature remnant present on the subject site, and the canopy 'drip zone' has been mapped in Figure 3.1.

A photograph of this community is shown as **Photograph 3.5**.

Photograph 3.5 Remnant Angophora costata in the south west of the subject site

3.2 Flora Species

In total, 73 flora species were recorded throughout the subject site during surveys. Species present within the subject site consist of:

- 21 locally native species; and
- 52 exotics species (including both weeds and non-endemic exotics).

3.2.1 Threatened Flora Species

No threatened flora species were recorded within the subject site despite targeted surveys. The vegetation in the subject site is highly disturbed and is comprised mostly of exotic vegetation within previously cleared areas.

A total of six threatened flora species have been recorded within the locality of the subject site and have some a moderate potential to occur on the subject site. An analysis of the likelihood of occurrence on the subject site for these threatened flora species is provided in Appendix A.

Species with potential to occur include species that can be associated with disturbed habitats, as well as woodland, including; *Wahlenbergia multicaulis* (Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield) and *Hibbertia puberula* which are listed as endangered under the BC Act; *Hibbertia fumana* and *Hibbertia puberula subspecies glabrescens* (Hibbertia sp Bankstown), which are listed as critically endangered under the BC Act, *Epacris purpurascens var. purpurascens* and *Acacia pubescens* (Downy Wattle), which are both listed as vulnerable under the BC Act. *Hibbertia puberula ssp. glabrescens* and *Acacia pubescens* is also listed as critically endangered under the EPBC Act.

However, the subject site is considered to be too disturbed for these threatened flora species to naturally occur, due to the extent of fill that has previously been applied to the subject site, the dominance of exotic grasses and herbs, and impacts including regular mowing.

3.2.2 Listed Weeds

A total of three (3) weeds recorded within the subject site are listed as state priority weeds, or regional priority weeds listed under the Greater Sydney Regional Strategic Weed Management Plan 2017-2012 operating under *Biosecurity Act 2015.* Two (2) of these species are also nationally listed Weeds of National Significance (WoNs). A further six (6) weeds are other weeds of regional concern listed under the Greater Sydney Regional Strategic Weed Management Plan 2017-2012. These weed species are identified in **Table 3.2**.

Table 3.2 Listed Weeds Recorded

Species Name	Common Name	Status	WoNS
Asparagus asparagoides	Asparagus Fern	SP	Yes
Senecio madagascariensis	Fireweed	SP	yes
Olea europaea subsp. cuspidata	African Olive	RP	
Araujia sericifera	Moth Vine	OWRC	
Cenchrus clandestinum	Kikuyu	OWRC	
Cinnamomum camphora	Camphor Laurel	OWRC	
Cotoneaster glaucophyllus	Cotoneaster	OWRC	
Eragrostis curvula	African Love Grass	OWRC	
Ligustrum sinense	Broad-leaved Privet	OWRC	

Key: SP (State Priority Weed), RP (Regional Priority Weed), OWRC (Other weed of regional concern)

3.3 Fauna

3.3.1 Fauna Habitat

The majority of the subject site is comprised of exotic grassland; therefore, the habitat value is highly limited for fauna. Some hardy, common bird species such as the Australian Magpie (*Gymnorhina tibicen*) and the Galah (*Eolophus roseicapilla*) are likely to utilise the grassland and regrowth vegetation, to some extent. As the subject site is securely fenced, it is unlikely that native mammals, such as kangaroos, would utilise the grasslands present.

The patches of regrowth Swamp Oak and regrowth Acacia scrub provide some habitat for fauna, including foraging habitat for small birds, the Grey-headed Flying-fox (*Pteropus poliocephalus*) and potentially microbats. No hollows were recorded from the trees in the subject site, which significantly limits the utility of the area as habitat for native fauna species.

Areas of wetland habitat are present in the subject site that may provide limited habitat for aquatic and semi-aquatic fauna. Species most likely to utilise this area are commonly occurring fish, frogs, turtles, reptiles and eels. These dams provide some suitable habitat for a number of frog species, due to the presence of permanent water, fringing aquatic vegetation and other habitat features that provide shelter. Based on the assessments of the habitat value of each dam and drainage line, low to moderate quality habitat is present for the threatened Green and Golden Bell Frog, as shown in **Table 3.3**. The results of each habitat attribute is presented in Table C.1 in Appendix C. The presence of Mosquito Fish (identified in all wetland areas, except wetland 2) a predatory fish species, greatly reduces the habitat suitability of the dams (although it does not discount their presence).

Table 3.3 Wetland Habitat Assessment Results

Wetland Area No.	Final Score	Assessed Quality
1	11	Moderate
2	10	Moderate
3	7	Low
4	2	Low
5	10	Moderate

** Habitat assessment based on final score, where <8 = Low quality, 8-12 = Moderate quality, >12 = High quality habitat.*

A number of derelict buildings are present in the south western corner of the subject site, and these could potentially provide roosting habitat for a number of microchiropteran bat species (microbats) that roost in structures as well as caves. Due to the severe state of disrepair, the buildings were not considered safe to inspect thoroughly on the day of survey. It is considered that there is a moderate potential for threatened microbats known from the area, including; Eastern Bentwing-bat (*Miniopterus orianae oceanensis* (formerly *M. schreibersii oceanensis*), Little Bentwing-bat (*Miniopterus australis*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) and Southern Myotis (*Myotis macropus*) to have potential to occur.

3.3.2 Fauna Species

A total of three (3) native bird species were recorded within the subject site during the survey by Cumberland Ecology. These species were common urban bird species including; Noisy Miner (*Manorina melanocephala*), Australian Raven (*Corvus coronoides*) and Sulphur-crested Cockatoo (*Cacatua galerita*).

Four amphibian species were recorded from the dams in the subject site: Eastern Dwarf Tree Frog (*Litoria fallax*), Peron's Tree Frog (*Litoria peronii*), Striped Marsh Frog (*Limnodynastes peronii*) and Common Froglet (*Crinia signifera*). No Green and Golden Bell Frogs were recorded from the subject site, despite conditions being ideal for detection.

The Longfin Eel (*Anguilla reinhardtii*) was recorded from Wetland Assessment Point 2, and the exotic *Gambusia holbrooki* (Plague minnow) was recorded from Wetland Assessment

Points 1, 2 and 3. This species is known to predate on the eggs and early stage tadpoles of the Green and Golden Bell Frog, and is likely to reduce the likelihood of this species occurring in these wetland areas.

No threatened fauna species were recorded within the subject site. An analysis of the likelihood of occurrence within the subject site for all threatened fauna species recorded within the locality or that have the potential to occur due to the presence of suitable habitat was undertaken (see Appendix A). The analysis determined that 14 threatened fauna species have the potential to utilise the subject site. These faunal groups have been discussed further below.

Additionally, one species, the White-throated Needletail (*Hirundapus caudacutus*), listed as migratory under the EPBC Act may potentially pass through the locality.

A discussion of threatened species and their likely occurrence within the subject site is provided below.

i. Raptors

Four raptor species have some potential to occur on the subject site, including; Spotted Harrier (*Circus assimilis*), Little Eagle (*Hieraaetus morphnoides*), Square-tailed Kite (*Lophoictinia isura*) and Eastern Osprey (*Pandion cristatus*). All four species are listed as vulnerable under the BC Act, and are not listed under the EPBC Act.

Potential foraging habitat for these raptor species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of the large home ranges of these species, which can be up to 100 km^2. Occurrence of these species is likely to be limited to fly-overs as part of a wider foraging range.

ii. Woodland Birds

Four woodland bird species have some potential to occur on the subject site, including; Varied Sittella (*Daphoenositta chrysoptera*), Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Scarlet Robin (*Petroica boodang*), Flame Robin (*Petroica phoenicea*). All four species are listed as vulnerable under the BC Act, and are not listed under the EPBC Act.

Potential foraging habitat for these species occurs on the subject site, in the form of regenerating Acacia scrub, and the single flowering angophora present. These woodland bird species would be likely to utilise a larger area as part of a foraging range, and are unlikely to nest on the subject site.

iii. Grey-headed Flying-fox

The Grey-headed Flying-fox is listed as vulnerable under the BC Act and EPBC Act. The habitat within the subject site offers a very small area of potential foraging habitat for this species.

This species roosts in large "camps" that support many thousands of individuals. The location of these camps is well known, with the nearest camp located north of Parramatta over 16km to the north (Ku-ring-gai Bat Conservation Society 2017). No suitable roosting habitat is present as a camp is not within or nearby the subject site. The species has the potential to utilise the subject site for foraging purpose, but would likely do so only on occasion as part of a much broader foraging range.

iv. Microbats

Seven microbat species have been recorded in the locality, and have potential to forage on the subject site. Potential roosting habitat is present, in the form of derelict buildings with cavities in the roof and other parts of the structure, for each of these species, which are known to roost in buildings (some also in tree hollows) including; Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*, Little Bentwing-bat (*Miniopterus australis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Eastern Bentwing-bat (*Miniopterus orianae oceanensis*), Southern Myotis (*Myotis macropus*), and Greater Broad-nosed Bat (*Scoteanax rueppellii*). These microbat species are all listed as vulnerable under the BC Act. None are listed under the EPBC Act.

v. Migratory Species

The White-throated Needletail is listed as migratory under the EPBC Act may potentially pass through the locality. This is an aerial species that may forage aerially above the subject site on occasion. No breeding habitat occurs in Australia for this species.

Figure 3.1. Vegetation of the subject site

Chapter 4

Impact Assessment

For the purposes of this impact assessment it is presumed that all the vegetation in the subject site will be cleared.

The proposed development will result in:

- Demolition of existing buildings and improvements;
- Removal of vegetation, the vast majority of which is Exotic Dominated Grassland;
- Draining and removal / rework of existing dams / water detention pits.

The potential impacts to biodiversity are considered in detail below.

4.1 Ecological Communities

The main vegetation community to be impacted is Exotic Dominated Grassland. The proposed development will require the clearing of the site of Exotic Dominated Grassland.

Wetland vegetation will also be removed which totals circa 1.34 ha. However, this community is associated with constructed dams and is not highly diverse, and therefore the conservation significance is reduced.

Swamp Oak regrowth will be removed, which totals circa 0.26 ha. This community is associated with small drainage lines. A single mature *Angophora costata* tree, with a canopy spread of circa 0.02 ha, will be removed. Additionally, areas of Acacia scrub regrowth will be removed, totalling circa 1.96 ha, which has regrown on fill stockpiles.

The removal of these communities from the subject site will not have a significant detrimental impact on the biodiversity values of the subject site or locality as the vegetation offers little ecological value, other than a small area of sub-optimal foraging habitat for native fauna species, primarily birds and microchiropteran bats.

No EECs listed under either the BC Act or the EPBC Act are present in the subject site, and no impacts to EECs are predicted to occur.

4.2 Flora Species

No threatened flora species have been recorded from the subject site or are considered likely to occur, due to the extent of disturbance that has occurred.

The threatened flora species previously recorded elsewhere at Bankstown Airport; *Hibbertia puberula subspecies glabrescens, Hibbertia fumana* and *Acacia pubescens*, were not recorded on the subject site, and were considered unlikely based on the lack of native groundcover species, and dense exotic grass cover present. The entire subject site was previously filled, and all of the vegetation communities present are considered to be artificial.

Therefore, the proposed development is unlikely to impact on any threatened flora species listed under the BC Act or EPBC Act, or impact suitable habitat for threatened species. No Assessments of Significance are required for these threatened flora species.

4.3 Fauna

No threatened fauna species have been recorded from the subject site due to the lack of suitable habitat and the extent of previous disturbance. Several threatened fauna species have been recorded from the locality and some have limited potential to occur due to the presence of suitable foraging habitat.

Potential habitat for the Green and Golden Bell Frog was identified, based on the presence of suitable wetland and shelter habitats, however, the species was not detected, despite targeted surveys. The closest records for the species are not recent, and it is considered likely that a viable population is no longer present in Western Sydney, or close to the subject site. For these reasons, it is considered that the proposed development will not have a significant impact on Green and Golden Bell Frog.

Additional threatened fauna species considered to have potential to occur include eight (8) bird species, the Grey-headed Flying-fox and 7 microchiropteran bat species. The habitat to be removed constitutes foraging habitat only for all of the threatened species, and some potential roosting or breeding habitat for the microbats, in the form of derelict buildings, will be removed.

The total area of potential foraging habitat to be modified/removed for these threatened species is circa 46.1 ha (includes grasslands) for microchiropteran bats, and circa 2.2 ha (excludes grasslands and wetlands) for birds and the Grey-headed Flying-fox. The removal of derelict buildings and sheds will remove some potential roosting habitat for a number of ‘cave’ dependant microbats. The potential for bats to be roosting was not able to be verified, but will be managed through the implementation of mitigation measures prior to and during construction, as described in Section 5.3.

Nonetheless, the habitat present for these threatened fauna species is considered marginal, and the removal of exotic and regrowth vegetation is unlikely to represent a significant area of habitat for these species. The bird and bat species are highly mobile, and would forage over a much broader area.Assessments of significance for these potentially occurring threatened fauna species are included in Appendix D. The assessments indicate that no significant impacts are likely to occur as a result of the proposal.

Chapter 5

Mitigation Measures

A number of mitigation measures are recommended for the proposed development. These measures should be implemented to minimise impacts to the ecological values of the subject site and adjoining properties.

5.1 Vegetation Protection

The subject site is securely fenced and works will not be undertaken outside of the security fencing. Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of subject site boundaries.

5.2 Erosion, Sedimentation and Pollution Control

All native trees and shrubs will be cleared and grubbed across the entire subject site. In order to minimise soil erosion, sediment and pollution impacting on adjoining areas (off-site) of habitat for flora and fauna, a number of mitigation measures are proposed:

- Retain groundcover vegetation, until construction commences;
- On commencement of construction, install erosion and sediment control devices, where required, to limiting sediment leaving the site;
- Cover stockpiles when not in use to prevent erosion from heavy rainfall; and
- Install pollution traps and efficient removal of pollution to an off-site location would help to minimise pollution impacts.

5.3 Flora and Fauna Management Procedures

Flora and Fauna Management procedures are required to be prepared prior to any clearing or dam dewatering works. The procedures will specify the required methods for fauna protection prior to, during and post construction, and will address the following:

5.3.1 Clearing/demolition Supervision

Due to the presence of some potential habitat features within the subject site (e.g. derelict buildings suitable for roosting by microbats), it is recommended that an ecologist be present for demolition works undertaken. An ecologist is not required to supervise the removal of exotic dominated grasslands, Swamp Oak regrowth or regrowth Acacia scrub.

Pre-clearing surveys will be conducted for cave-dependant microbats immediately prior to building demolition. The survey will aim to carefully examine the creviced identified in buildings, where access is possible. As it is unlikely that access to all buildings will be possible, due to safety concerns, the strategy for demolition will be to act as a 'spotter-catcher'. This will involve an ecologist being present throughout the demolition process, and guiding the machinery operator as the building is carefully disassembled. Generally, the roof can be carefully lifted or 'peeled' off the frame, which exposes the beams and roof cavity. Microbats will generally leave at the commencement of construction activities, on as the roofing is removed. It is advised that winter is avoided for demolition, due to the potential for species that go into 'torpor', or a state of light hibernation, over the winter, which includes the Eastern Bentwing-bat, which is listed as vulnerable under the BC Act.

5.3.2 Dam Dewatering Supervision

The dams on the subject site should be dewatered prior to excavation/ filling, and the dewatering process will be supervised by the Bankstown Airport Environment and Heritage Manager with the support of the aquatic ecologist where required to minimise impacts on native aquatic fauna that may be present.

Prior to dewatering BAL will prepare a dewatering procedure to outline the necessary steps to be followed during dam dewatering to minimise impacts on native aquatic fauna.

The Longfin Eel (*Anguilla reinhardtii*) has been recorded from a dam in the subject site, and other native aquatic fauna may occur. All native fish or other species present in the dams should be relocated to a suitable location. However, it is recognised that due to the potential for contamination in the soil and waterbodies from Polyfluoro Alkyl Substances (PFAS), all fauna may need to be euthanised, rather than translocated to another waterbody to prevent spread of potential diseases from sickly natives.

The exotic *Gambusia holbrooki* (Plague minnow) has been recorded from three wetland areas (all excluding the dry, concrete lined basin, and the drainage line on the western side of the subject site), and these should be appropriately euthanized.

It should be noted that licence applications will be required for offsite translocation of native fauna including a licence to Department of Primary Industries – Fisheries and Office of Environment and Heritage. Licence applications may take up to 6 weeks for approval from the relevant departments.

5.4 Weed Control Measures

Where practicable weed species occurring within the subject site should be managed in order to prevent further spread. Woody weeds will be removed for disposal off site.

Topsoil containing weeds will either be encapsulated or removed off site for appropriate disposal.

5.5 Landscape Management

As part of the final landscaping design, species will be selected that are either locally endemic, or non-natives that are not known to be invasive to bushland. The species selected maximum height restrictions for the development. The list should comply with the approved Bankstown Airport species list and Canterbury - Bankstown Council lists.

Chapter 6

Conclusions

The proposed development will result in the removal of circa 46.08 ha of vegetation within the subject site. This is comprised of circa 42.49 ha of Exotic Dominated Grassland, circa 1.34 ha of Freshwater wetland, circa 1.96 ha of Acacia scrub (regrowth), circa 0.26 ha of Swamp Oak regrowth and a single remnant *Angophora costata* tree.

No EECs listed under the BC Act or EPBC Act are present within the subject site.

As the subject site is highly disturbed it is not considered to be suitable habitat for any threatened flora species and none were detected during surveys. Several threatened flora species have been recorded from the locality, however due to the extensive disturbance of the subject site, they are not considered likely to occur.

The vegetated parts of the subject site may provide some suitable foraging habitat for threatened bird or bat species. Due to the small area, the available habitat is unlikely to be important to any threatened species in the area, as it would likely only be utilised periodically as part of a much broader foraging range. Furthermore, mitigation measures have been recommended during the clearing process in order to reduce any impacts on fauna species. The impact assessment conducted has indicated that the proposed development is unlikely to have a significant impact on any of the threatened species that have the potential to occur within the subject site as only a small area of foraging habitat (and potential roosting habitat for microbat species) will be removed for threatened fauna species.

The dams on the subject site should be dewatered prior to filling, and the dewatering process will be supervised by the Bankstown Environment and Heritage Manager with the support of an ecologist, where required to minimise impacts on native aquatic fauna that may be present. A dewatering procedure will be prepared to outline the necessary steps to be followed during dam dewatering to minimise impacts on native aquatic fauna.

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Appendix A

Assessment of the Likelihood of Occurrence of Threatened Flora and Fauna on the Subject Site

Table 6.1 **Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site**

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
<u>Animalia</u>						
Amphibia						
Myobatrachidae	Red-crowned Toadlet	*Pseudophryne australis*	V		Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	Unlikely
Hylidae	Green and Golden Bell Frog	*Litoria aurea*	E	V	The species is found in a wide range of water bodies except fast moving streams. It commonly inhabits disturbed sites such abandoned quarries and mines, though generally breeds in habitats that include still, shallow, unpolluted water bodies, that are unshaded, contain aquatic plants are free of Mosquito fish and other predators, with a range of diurnal shelter sites (emergent aquatic vegetation).	Moderate
Aves						

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
Apodidae	White-throated Needletail	*Hirundapus caudacutus*		C,J,K	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Moderate
Ciconiidae	Black-necked Stork	*Ephippiorhynchus asiaticus*	E		Occurs in floodplain wetlands of major coastal rivers along with minor floodplains, coastal sandplain wetlands and estuaries. Species builds nest in high in trees close to water.	Moderate
	Black Bittern	*Ixobrychus flavicollis*	V		Inhabits terrestrial and estuarine wetlands, generally in areas containing permanent water and dense vegetation. The species can occur in flooded grassland, woodland, rainforest, and mangroves. It feeds on frogs, reptiles, fish, and invertebrates such as snails, dragonflies, shrimp and crayfish. It roosts during the day on the ground amongst dense reeds or within trees. It nests in branches overhanging water.	Low
Accipitridae	Spotted Harrier	*Circus assimilis*	V		Occurs throughout mainland Australia except in densely forested or wooded habitats of the coast, escarpment, and ranges. It inhabits open grassy woodland, shrubland, and grassland. It nests in	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
				trees and preys on terrestrial mammals, birds, and reptiles, and will occasionally consume carrion.	
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	C	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water.	Moderate
Little Eagle	*Hieraaetus morphnoides*	V		The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland, or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch.	Moderate
Square-tailed Kite	*Lophoictinia isura*	V		Found in a variety of timbered habitats including dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially honeyeaters and targets predominately nestlings and insects occurring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses.	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
	Eastern Osprey	*Pandion cristatus*	V		Found in littoral and coastal habitats and terrestrial wetlands. They generally are found in coastal areas though will travel inland along major water courses. They visit a wide range of wetland habitats including inshore waters, reefs, bays, coastal cliffs, estuaries, mangrove swamps, broad rivers, reservoirs, large lakes, and water holes. They feed on fish over clear, open water, and nest in trees or dead trees, generally within one kilometre of the ocean.	Moderate
Scolopacidae	Latham's Snipe	*Gallinago hardwickii*		C,J,K	Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Unlikely
Psittacidae	Little Lorikeet	*Glossopsitta pusilla*	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees	Low

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	
	Swift Parrot	*Lathamus discolor*	E	CE	In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon, and E. albens. Breeds in Tasmania in spring and summer.	Low
	Turquoise Parrot	*Neophema pulchella*	V		Found at the edges of eucalypt woodland adjacent to clearings, timbered ridges and creeks in farmland. Associated with coastal scrubland, open forest and timbered grassland. Nests in hollow-bearing trees, logs or posts.	Low
Strigidae	Powerful Owl	*Ninox strenua*	V		In NSW the Powerful Owl lives in forests and woodlands occurring in the coastal, escarpment, tablelands and western slopes environments.	Low

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					Specific habitat requirements include eucalypt forests and woodlands on productive sites on gentle terrain; a mosaic of moist and dry types, with mesic gullies and permanent streams; presence of leafy sub canopy trees or tall shrubs for roosting; presence of large old trees to provide nest hollows. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials.	
Tytonidae	Masked Owl	*Tyto novaehollandiae*	V		Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats.	Low
Neosittidae	Varied Sittella	*Daphoenositta chrysoptera*	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Inhabits most of mainland Australia except the treeless deserts and open grasslands.	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
Artamidae	Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V		Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	Moderate
Petroicidae	Scarlet Robin	*Petroica boodang*	V		Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	Moderate
	Flame Robin	*Petroica phoenicea*	V		Breeds in upland tall, moist, eucalypt forests and woodlands, often on ridges and slopes. Groundlayer of breeding habitat is dominated by native grasses. It occasionally occurs in	Moderate

Table 6.1 **Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site**

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					herbfields, heathlands, shrublands, and sedgelands at high altitudes. In winter the species migrates to drier, more open habitats in the lowlands. The species forages from low perches, pouncing on small invertebrates on the ground or off logs, and other coarse woody material.	
Mammalia						
Phascolarctidae	Koala	*Phascolarctos cinereus*	V	V	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred feed species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Unlikely
Pteropodidae	Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Moderate
Emballonuridae	Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	
Molossidae	Eastern Freetail-bat	*Mormopterus norfolkensis*	V		Found in dry sclerophyll forest, woodland, swamp forest and mangrove forests east of the Great dividing Range. Primarily roosts in tree hollows but will also utilise man-made structures.	Moderate
Vespertilionidae	Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	The species is associated with areas dominated by sandstone escarpments; sandstone cliffs and fertile woodland valley habitat occurring in close proximity to each other is important for the species. It roosts in cliff/escarpment areas and forages in fertile forest. Roosting is predominately in arch caves with dome roofs, but has been observed in disused mines shafts, overhangs, and disused Fairy Martin nests.	Moderate
	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
Little Bentwing-bat	*Miniopterus australis*	V		Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Moderate
Eastern Bentwing-bat	*Miniopterus orianae oceanensis* (formerly *M. schreibersii oceanensis*	V		Forages above the canopy and eats mostly moths. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Moderate
Southern Myotis	*Myotis macropus*	V		Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Moderate
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		Found mainly in the gullies and river systems that drain the Great Dividing Range. Usually roosts in tree hollows and buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					the direct flight of this species as it searches for beetles and other large, slow-flying insects.	
Gastropoda						Unlikely
Camaenidae	Cumberland Plain Land Snail	*Meridolum corneovirens*	E		Primarily inhabits Cumberland Plain Woodland. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Lives in a very small area on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains.	
Plantae						
Flora						
Apocynaceae	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd,	*Marsdenia viridiflora subsp. viridiflora*	E		Found in open shale woodland in vine thickets.	Low

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
	Liverpool and Penrith local government areas					
Campanulaceae	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	*Wahlenbergia multicaulis*	E		Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open.	Moderate
Convolvulaceae	Narrow-leafed Wilsonia	*Wilsonia backhousei*	V		Occurs on margins of salt marshes and lakes.	Unlikely
Dilleniaceae		*Hibbertia puberula*	E		Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps.	Moderate
	Hibbertia sp. Bankstown	*Hibbertia puberula subsp. glabrescens*	CE	CE	Known to occur from only two populations; one at Bankstown Airport and one at Moorebank, in	Moderate

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					Sydney's southern suburbs. Soil at the Bankstown Airport site is a sandy (Tertiary) alluvium with a high silt content.	
		Hibbertia stricta subsp. furcatula	E		Habitat of the Southern Sydney population is broadly dry eucalypt forest and woodland. This population appears to occur mainly on upper slopes and above the Woronora River gorge escarpment, at or near the interface between the Lucas Heights soil landscape and Hawkesbury sandstone.	Low
		Hibbertia fumana	CE		Found at only two locations, being Bankstown Airport and Moorebank. The Bankstown population is found is grassland and the Moorebank population is generally found in areas of woodland with a more open understorey, in a long intergrade between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest.	Moderate
Ericaceae		*Epacris purpurascens var. purpurascens*	V		Found in a range of habitat types, most of which have a strong shale soil influence.	Moderate
	Woronora Beard-heath	*Leucopogon exolasius*	V	V	Found along the upper Georges River area and in Heathcote National Park. Occurs in woodland on sandstone.	Unlikely

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
Fabaceae (Mimosoideae)	Downy Wattle	*Acacia pubescens*	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occur in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Moderate
Myrtaceae	Netted Bottle Brush	*Callistemon linearifolius*	V		Grows in dry sclerophyll forest on the coast and adjacent ranges.	Unlikely
	Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	V	V	Occurs in dry grassy woodland on shallow soils of slopes and ridges. Prefers infertile soils derived from granite or metasedimentary rock on the lower slopes of the landscape.	Unlikely
Proteaceae	Small-flower Grevillea	*Grevillea parviflora subsp. parviflora*	V	V	Grows in light sandy or clay soils over thin shales, often with lateritic ironstone gravels and nodules. Is known to occur in Shale/Sandstone Transition Forest.	Low
	Nodding Geebung	*Persoonia nutans*	E	E	Northern populations are confined to Aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests.	Low

Table 6.1 Threatened Flora and Fauna Recorded in the Locality (10km radius) and an Assessment of their Likelihood of Occurrence on the Subject Site

	Common Name	Scientific Name	NSW Status	EPBC Act Status	Habitat Requirements	Likelihood of occurrence
					Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	
Thymelaeaceae	Spiked Rice-flower	*Pimelea spicata*	E	E	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.	Low

Key: P = Protected, V = Vulnerable, E = Endangered, CE = Critically Endangered

Appendix B

Flora and Fauna Species Recorded on the Subject Site

Table 6.2 Flora species recorded on the subject site

Family		Scientific name	Common name	Q1		Q2		Q3		RMS1	RMS2	RMS3	RMS4	RMS5	RMS6
				C	A	C	A	C	A	R	R	R	R	R	R
Alliaceae	*	*Nothoscordum gracile*	Onion Weed								X		X	X	X
Apiaceae		*Centella asiatica*	Indian Pennywort												X
Apiaceae	*	*Hydrocotyle bonariensis*								X	X				X
Apocynaceae	*	*Araujia sericifera*	Moth Vine					<0.25	5				X		
Apocynaceae	*	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush								X				
Araliaceae	*	*Hedera helix*	English Ivy										X		
Asparagaceae	*	*Asparagus asparagoides*	Bridal Creeper									X	X	X	
Asteraceae	*	*Ageratina adenophora*	Crofton Weed											X	X
Asteraceae	*	*Bidens pilosa*	Cobbler's Pegs							X			X	X	X
Asteraceae	*	*Chrysanthemoides monilifera*								X				X	
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane					1	50	X	X	X		X	X
Asteraceae	*	*Hypochaeris radicata*	Catsear							X		X			X
Asteraceae	*	*Senecio madagascariensis*	Fireweed			0.5	30			X	X	X	X		
Asteraceae	*	*Silybum marianum*	Variegated Thistle	1	20					X				X	X
Asteraceae	*	*Taraxacum officinale*	Dandelion			0.5	25				X	X	X	X	

Table 6.2 Flora species recorded on the subject site

Family		Scientific name	Common name	Q1		Q2		Q3		RMS1	RMS2	RMS3	RMS4	RMS5	RMS6
				C	A	C	A	C	A	R	R	R	R	R	R
Brassicaceae	*	*Brassica fruticulosa*	Twiggy Turnip							X			X		X
Brassicaceae	*	*Capsella bursa-pastoris*	Shepherd's Purse												X
Casuarinaceae		*Casuarina glauca*	Swamp Oak					30	15	X	X	X	X	X	
Chenopodiaceae		*Einadia polygonoides*	Knotweed Goosefoot												X
Convolvulaceae		*Calystegia sepium*								X					
Convolvulaceae		*Polymeria calycina*		<0.25	5					X					
Cyperaceae	*	*Cyperus brevifolius*						1	30	X	X				
Euphorbiaceae	*	*Ricinus communis*	Castor Oil Plant											X	
Fabaceae (Faboideae)		*Hardenbergia violacea*	False Sarsaparilla							X					
Fabaceae (Faboideae)	*	*Trifolium spp.*	A Clover								X		X		
Fabaceae (Faboideae)	*	*Vicia sativa*	Common vetch							X					
Fabaceae (Mimosoideae)		*Acacia binervata*	Two-veined Hickory	0.5	1					X					
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle							X					
Fabaceae (Mimosoideae)		*Acacia falcata*		0.5	1					X		X		X	

Table 6.2 Flora species recorded on the subject site

Family		Scientific name	Common name	Q1		Q2		Q3		RMS1	RMS2	RMS3	RMS4	RMS5	RMS6
				C	A	C	A	C	A	R	R	R	R	R	R
Fabaceae (Mimosoideae)		*Acacia floribunda*	White Sally	1	10					X					
Fabaceae (Mimosoideae)		*Acacia parvipinnula*	Silver-stemmed Wattle	3	1					X					
Fabaceae (Mimosoideae)	*	*Acacia saligna*	Golden Wreath Wattle	30	10					X	X	X	X		X
Fabaceae (Mimosoideae)		*Acacia ulicifolia*	Prickly Moses									X			
Gentianaceae	*	*Centaurium tenuiflorum*	Branched Centaury, Slender centaury					<0.25	20				X	X	
Juncaceae		*Juncus usitatus*									X				X
Lauraceae	*	*Cinnamomum camphora*	Camphor Laurel											X	
Lythraceae	*	*Lagerstroemia indica*											X		
Malaceae	*	*Cotoneaster glaucophyllus*												X	
Malvaceae	*	*Abutilon grandifolium*		<0.25	1					X					
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow					<0.25	10				X		
Malvaceae	*	*Pavonia hastata*													X
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne	5	100					X		X	X	X	X
Myrtaceae		*Angophora costata*	Smooth-barked Apple										X		
Myrtaceae		*Callistemon pinifolius*	Pine-leaved Bottlebrush			1	30								

Table 6.2 Flora species recorded on the subject site

Family		Scientific name	Common name	Q1		Q2		Q3		RMS1	RMS2	RMS3	RMS4	RMS5	RMS6
				C	**A**	**C**	**A**	**C**	**A**	**R**	**R**	**R**	**R**	**R**	**R**
Myrtaceae		*Kunzea ambigua*	Tick Bush								X	X			
Myrtaceae		*Melaleuca thymifolia*	Thyme Honey-myrtle			2	50								
Oleaceae	*	*Ligustrum sinense*	Small-leaved Privet											X	
Oleaceae	*	*Olea europaea*	Common Olive					<0.25	2						
Onagraceae	*	*Ludwigia peruviana*		0.1	5					X	X				X
Oxalidaceae	*	*Oxalis corniculata*	Creeping Oxalis										X	X	X
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues	1	30	0.5	25	<0.25	20	X	X		X	X	
Plantaginaceae	*	*Plantago major*	Large Plantain												X
Poaceae	*	*Avena sativa*	Oats										X		
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass					5	100						X
Poaceae	*	*Briza subaristata*				1	30							X	
Poaceae	*	*Cenchrus clandestinus (syn. Pennisetum clandestinum)*	Kikuyu	15	500	10	500			X	X	X	X		X
Poaceae	*	*Chloris gayana*	Rhodes Grass							X	X			X	X
Poaceae		*Cynodon dactylon*	Common Couch	25	1000	5	300	10	500	X	X	X	X	X	X
Poaceae	*	*Eragrostis curvula*	African Lovegrass	10	250	20	1000	10	500	X	X	X	X	X	
Poaceae	*	*Paspalum dilatatum*	Paspalum	3	100	1	50	3	200	X	X	X	X		X
Poaceae		*Phragmites australis*	Common Reed								X				

Table 6.2 Flora species recorded on the subject site

Family		Scientific name	Common name	Q1		Q2		Q3		RMS1	RMS2	RMS3	RMS4	RMS5	RMS6
				C	A	C	A	C	A	R	R	R	R	R	R
Poaceae	*	*Setaria spp.*										X			
Poaceae	*	*Setaria viridis*	Green Pigeon Grass			1	30	3	200		X		X	X	X
Polygonaceae		*Persicaria decipiens*	Slender Knotweed								X			X	
Polygonaceae	*	*Polygonum aviculare*	Wireweed												X
Polygonaceae	*	*Rumex conglomeratus*	Clustered Dock							X	X				X
Primulaceae	*	*Lysimachia arvensis*	Scarlet Pimpernel									X	X		
Rubiaceae	*	*Richardia humistrata*											X		
Solanaceae	*	*Solanum linnaeanum*	Apple of Sodom												X
Solanaceae	*	*Solanum nigrum*	Black-berry Nightshade										X		X
Typhaceae		*Typha orientalis*	Broad-leaved Cumbungi								X	X			
Ulmaceae	*	*Ulmus parvifolia*	Chinese Elm										X		
Verbenaceae	*	*Verbena bonariensis*	Purpletop	1	30					X	X	X		X	

Key: Q = 20x20m Quadrats: C = Cover, A = Abundance

RMS = Random Meander Survey: R = Recorded.

Table 6.3 Fauna Species Recorded

Family	Species Name	Common Name	Location of Record			
			Subject Site	Wetland 1	Wetland 2	Wetland 5
Anguillidae	*Anguilla reinhardtii*	Longfin Eel			X	
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog		X	X	
Hylidae	*Litoria peronii*	Peron's Tree Frog				X
Limnodynastidae	*Limnodynastes peronii*	Striped Marsh Frog		X		X
Myobatrachidae	*Crinia signifera*	Common Froglet		X		X
Corvidae	*Corvus coronoides*	Australian Raven	X			
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	X			
Meliphagidae	*Manorina melanocephala*	Noisy Miner	X			

Note: X = recorded in survey area

Appendix C

Wetland Habitat Assessment Results

Table 6.4 Wetland Habitat Assessment Results

Wetland Area No.	Habitat Value Scores								
	Fringing Vegetation Cover	Emergent Vegetation Cover	Vegetation Around Dam	Shallow Dam Edges	Varying Water Depth	Submerged Rocks/Logs	Plague Minnow	Turbidity	Final Score
1	3	2	3	1	1	0	0	0	**10**
2	3	2	3	1	1	0	0	0	**10**
3	2	1	1	1	1	0	0	0	**6**
4	0	0	1	0	0	0	1	0	**2**
5	1	3	3	1	0	0	1	1	**10**

** Habitat assessment based on final score, where <8 = Low quality, 8-12 = Moderate quality, >12 = High quality habitat.*

#Habitat Value Scores Based on:

Cover of fringing vegetation (low (<10%) = 1, moderate (10-39%) = 2, high (40- 100%) = 3);

Cover of emergent vegetation (low (<10%) = 1, moderate (10-39%) = 2, high (40- 100%) = 3);

Grassland or woodland around the dam (grassland = 1, woodland = 2, grassland and woodland mosaic = 3);

Varying water depth (absent = 0, present = 1);

Submerged rocks and logs (absent = 0, present = 1);

Rocks and/or logs for basking/shelter on dam edge (absent = 0, present = 1);

Presence of Plague Minnow (Gambusia holbrooki) (absent = 1, present = 0); and

Turbid water (turbid = 0, clear = 1).

Appendix D

Assessments of Significance

D.1 Microbats

The following Assessments of Significance apply to the following species of microchiropteran bats (microbats) known to occur in the locality:

- Eastern Bentwing-bat (*Miniopterus orianae oceanensis* (formerly *M. schreibersii oceanensis*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- East-coast Freetail-bat (*Mormopterus norfolkensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Little Bentwing-bat (*Miniopterus australis*)
- Southern Myotis (*Myotis macropus*); and
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Marginal foraging habitat will be removed for these bat species through vegetation clearing on the subject site. No hollows are present, and therefore roosting habitat is absent for the hollow-dependant species. Potential roosting habitat for cave-dwelling species has been identified within crevices within the structure of derelict buildings on the subject site. However, despite that lack of detailed survey data to confirm their absence, no evidence of habitat use, such as the presence of guano (faeces) was noted during the site inspection. As part of the mitigation measures for the subject site, clearing supervision is proposed, and development of a Bat Management Plan if individuals are found to roost in the building structures.

Extensive foraging habitat will be retained for these species throughout the locality, with riparian habitat retained along the Georges River riparian area. The proximate areas of riparian habitat will continue to provide foraging resources for the fishing bat and insectivorous bat species. For these reasons, it is not likely that the proposal will affect the life cycle of these species such that a viable local population is placed at risk of extinction.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

i. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

ii. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

NA

c. *in relation to the habitat of a threatened species or ecological community:*

i. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

iii. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*

The proposal will remove all available foraging habitat for these species of microbat on the subject site, which consists of circa 46.1 ha of regrowth woodland, degraded wetlands and grasslands. A number of derelict buildings, which represent potential habitat for 'cave-roosting' bat species known from the locality will be removed by the Proposal. Additionally, a total of circa 46.1 ha of sub-optimal foraging habitat, in the form of grassland and degraded regrowth and wetland communities will be removed.

No area of potential habitat for these highly mobile bat species will become isolated or fragmented.

It is unlikely that this habitat represents a significant area of habitat for these species, as no evidence of roosting was recorded (although a thorough inspection was not possible), and furthermore they are more likely to utilise the better quality habitats in the locality, such as the Georges River riparian zone.

d. *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

No area of Outstanding Natural Biodiversity has been identified on the subject site.

e. *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Clearing of native vegetation is a listed key threatening processes under the BC Act. Limited mature trees occur on the subject site, which would provide optimal foraging habitat for this species, and the removal of regrowth vegetation, degraded wetlands and grassland, is unlikely to exacerbate the effects of this key threatening process on these species.

Conclusion

The proposed development will remove a relatively small area of sub-optimal foraging habitat for these microbat species, and some potential roosting habitat in the form of derelict buildings for ‘cave-roosting’ species. However, clearing surveys will ensure that no roosting microbats are injured during the demolition, and better quality foraging habitat is present in adjoining areas, which will be retained for these species. For these reasons, no significant impact on microbats is likely as a result of the proposal.

D.2 Grey-headed Flying-fox

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The subject site consists only of potential foraging habitat for the Grey-headed Flying-fox as this species roosts in camps, the locations of which are well-known in the Sydney region. No camps occur on or adjoining the subject site, and the closest know location is in Strathfield Park, approximately 13 km to the north east. The proposed development is unlikely to place a local population of the species at risk of extinction as it will result in the removal of a small area of low quality foraging habitat.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    i. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

    ii. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

NA

c. *in relation to the habitat of a threatened species or ecological community:*

    i. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

iii. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*

All the potential foraging habitat present on the subject site for this species will be removed, which includes circa 2.2 ha of regrowth vegetation.

No area of potential habitat for this highly mobile bat species will become isolated or fragmented.

It is unlikely that this habitat represents a significant area of habitat for this species, as the area of potential foraging habitat is small in area, and is not mature vegetation, and no roosting habitat is present. The Grey-headed Flying-fox is more likely to utilise the better quality habitats in the locality, such as the Georges River riparian zone.

d. *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

No area of Outstanding Natural Biodiversity has been identified on the subject site.

e. *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Clearing of native vegetation is a listed key threatening processes under the TSC Act. Limited mature trees occur on the subject site, which would provide optimal foraging habitat for this species, and the removal of regrowth vegetation is unlikely to exacerbate the effects of this key threatening process on this species.

Conclusion

The proposed development will remove a relatively small area of sub-optimal foraging habitat, in the form of regrowth vegetation and a single mature Angophora tree, for this species. However, no roosting habitat will be impacted, and better quality foraging habitat is present in adjoining areas, which will be retained for this species. For these reasons, no significant impact on the Grey-headed Flying-fox is likely as a result of the proposal.

D.3 Raptors

The following Assessments of Significance apply to the following species of raptors known to occur in the locality:

- Spotted Harrier (Circus assimilis);

- Little Eagle (Hieraaetus morphnoides);
- Square-tailed Kite (Lophoictinia isura);
- Eastern Osprey (Pandion cristatus).

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The subject site consists of marginal potential foraging habitat for threatened raptors, although no nesting habitat, in the form of stick nests, were observed. The proposed development is unlikely to place a local population of the species at risk of extinction as it will result in the removal of a small area of low quality foraging habitat.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

   i. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

   ii. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

NA

c. *in relation to the habitat of a threatened species or ecological community:*

   i. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

   ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

   iii. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*

All the potential foraging habitat present on the subject site for these species will be removed, which includes circa 2.2 ha of regrowth vegetation. However, due to the lack of mature trees with hollows, the diversity of prey species is likely to be very limited on the subject site.

No area of potential habitat for these highly mobile bird species will become isolated or fragmented.

It is unlikely that this habitat represents a significant area of habitat for these species, as the area of potential foraging habitat is small in area, and is not mature vegetation, and no nesting habitat is present. The raptors are more likely to utilise the better quality habitats in the locality, such as the Georges River riparian zone.

d. *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

No area of Outstanding Natural Biodiversity has been identified on the subject site.

e. *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Clearing of native vegetation is a listed key threatening processes under the TSC Act. Limited mature trees occur on the subject site, which would provide optimal foraging habitat for these species, and the removal of regrowth vegetation is unlikely to exacerbate the effects of this key threatening process on these species.

Conclusion

The proposed development will remove a relatively small area of sub-optimal foraging habitat, in the form of regrowth vegetation and a single mature Angophora tree, for these raptor species. However, no nesting habitat will be impacted, and better quality foraging habitat is present in adjoining areas, which will be retained. For these reasons, no significant impact on raptors is likely as a result of the proposal.

D.4 Woodland Birds

The following Assessments of Significance apply to the following species of woodland birds known to occur in the locality:

- Varied Sittella (*Daphoenositta chrysoptera*);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*);
- Scarlet Robin (*Petroica boodang*);
- Flame Robin (*Petroica phoenicea*).

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The subject site consists of marginal potential foraging habitat for threatened woodland birds, although no nests were observed. The proposed development is unlikely to place a local population of the species at risk of extinction as it will result in the removal of a small area of low quality foraging habitat.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

  i. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

  ii. *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

NA

c. *in relation to the habitat of a threatened species or ecological community:*

  i. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

  ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

  iii. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*

All the potential foraging habitat present on the subject site for these species will be removed, which includes circa 2.2 ha of regrowth vegetation. However, due to the lack of mature trees and intact woodland, is likely to be very limited on the subject site.

No area of potential habitat for these highly mobile bird species will become isolated or fragmented.

It is unlikely that this habitat represents a significant area of habitat for these species, as the area of potential foraging habitat is small in area, and is not mature vegetation, and no nesting habitat is present. The birds are more likely to utilise the better quality habitats in the locality, such as the Georges River riparian zone.

d. *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

No area of Outstanding Natural Biodiversity has been identified on the subject site.

e. *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Clearing of native vegetation is a listed key threatening processes under the TSC Act. Limited mature trees occur on the subject site, which would provide optimal foraging habitat for these species, and the removal of regrowth vegetation is unlikely to exacerbate the effects of this key threatening process on these species.

Conclusion

The proposed development will remove a relatively small area of sub-optimal foraging habitat, in the form of regrowth vegetation and a single mature Angophora tree, for these woodland bird species. However, no nesting habitat will be impacted, and better quality foraging habitat is present in adjoining areas, which will be retained. For these reasons, no significant impact on woodland birds is likely as a result of the proposal.

APPENDIX J

HERITAGE IMPACT ASSESSMENT

AECOM Imagine it. Delivered.

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22 June 2018

Foster Walker
Environment and Heritage Manager
Bankstown Airport Limited
PO Box 6450
Wetherill Park NSW 1851

Dear Foster,

Re: Updated Aboriginal archaeological due diligence assessment for proposed development works within the South West Precinct, Bankstown Airport

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Bankstown Airport Limited (BAL) to prepare an updated Aboriginal archaeological due diligence assessment for proposed development works (“the Project”) within the South West Precinct (SWP) of Bankstown Airport, in Bankstown, Sydney, NSW (Figure 1). This assessment supersedes a previous Aboriginal cultural heritage assessment undertaken for the withdrawn Bankstown Business Estate preliminary Master Development Plan (pMDP) (Everick Heritage Consultants, 2015) but utilises the Aboriginal community consultation undertaken as part of that assessment. AECOM understands that the findings of this updated due diligence assessment will inform the Major Development Plan (MDP) being prepared for the Project.

The purpose of this assessment is to identify Aboriginal heritage constraints within the Project Site and to provide BAL with appropriate management advice. The contents of this letter report have been compiled with reference to the NSW Office of Environment and Heritage’s (OEH) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010). This code has been developed to assist proponents in exercising due diligence when carrying out activities that may harm Aboriginal objects.

2.0 Proposed Activity (The Project)

Bankstown Airport is the premier general aviation airport in New South Wales and a major commercial centre in Sydney. The Airport is operated by BAL, a company wholly owned by First State Superannuation. BAL’s vision is to continue to operate and develop the Airport to be “… a dynamic, integrated aviation and commercial centre for Sydney, including a home for emergency services, general aviation, training, logistics and destination retail.”

The South West Precinct (SWP) of Bankstown Airport is primarily an unused and undeveloped portion of the Airport. Much of this area is not required for aviation operations. BAL proposes to develop a portion of the SWP, through the undertaking of site works and the construction of a warehouse building.

The Project triggers a Major Development Plan (MDP) assessment pursuant to the *Airports Act 1996* (Airports Act), due to the expected construction cost exceeding $20 million and the significant, positive impact the Project will have on the local and regional community The Project will address historical issues associated with the SWP, including site-wide flooding, site contamination and outstanding work permits while also providing employment and a much needed land use.

The Project involves site works and the development of a warehouse within the SWP. The MDP will facilitate the first stage of a major industrial/logistic and innovation precinct for Bankstown Airport, with the specific elements of the project being:

- An overall layout concept, including earthworks and site works, site-wide stormwater and flood mitigation, and addressing historic site contamination issues
- A new internal road network connecting to Murray Jones Drive and Tower Road; and
- Construction of a warehouse building of approximately 37,000 square metres in area, including ancillary office administration facilities, heavy vehicle loading dock and hardstand areas, at-grade employee and visitor car parking, and associated landscaping areas.

The construction program is estimated to take place over 15 months. The Project Site will be securely fenced and construction will take into consideration airport-specific risks such as aviation security, height of construction equipment, communication and navigation surveillance and foreign object debris. A Project-specific Construction Environmental Management Plan (CEMP) will be prepared and include airport-specific considerations. The CEMP will form the basis for the environmental management of the development of the Project. The CEMP will document the environmental controls to be required of all contractors operating on the construction of the Project.

3.0 Project Site

The Project Site, shown on **Figure 1**, comprises an irregularly-shaped 41.6 ha parcel of land within the SWP of Bankstown Airport. It is bounded by the following:

- South-west – Starkie Drive, a Crown reserve conservation area (adjacent Milperra Road)
- South – The junction of Milperra Road and Murray Jones Drive
- South-east – Adjacent the de Havilland site and associated administration and hangar buildings
- North-east – Adjacent to the airport airside boundary (Taxiway B and run-up bay)
- North-west – Adjacent to the airport airside boundary (Taxiway G)

The majority of the Project Site is vacant and undeveloped, excepting for the existing Non-Directional Beacon, located in the southern portion of the site, and the site of the former aviation museum. The Project Site is relatively flat (draining to the south-west), excepting for a raised plateau area in the north-eastern portion of the site (former fill platform). Existing stormwater detention basins, sediment controls and grassed-swales are also located within the Project Site. Much of the site is clear of vegetation.

Access to the Project Site is via the extension of Murray Jones Drive to the south and Tower Road to the north-west. Development surrounding the Project Site includes:

- Bankstown Airport Aviation Zone to the north-east
- Tower Road aviation premises to the west (and the adjacent Georges River Golf Course on the western side of Tower Road
- Bankstown Golf Course and adjacent Milperra industrial precinct to the south
- The de Havilland site aviation site to the south-east

The existing Air Traffic Control Tower, located to the west of the Project Site, is listed on the Commonwealth Heritage List (Place ID 106118).

4.0 Applicable Legislation & Policy

4.1.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Bankstown Airport is located on Commonwealth Government land and is therefore subject to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act details requirements for managing matters of national environmental significance, such as threatened flora and fauna species, approvals of activities involving Commonwealth Government land and activities by Commonwealth Government agencies.

Section 26 of EPBC Act requires that actions on Commonwealth land be assessed for the likelihood that they will have a significant impact on the environment. The term ‘environment’ has a broader coverage than matters of National Environmental Significance (NES) (Part 3, Division 1) under the EPBC Act and relates to environmental matters that are not necessarily formally listed.

The Act defines the environment as:

a. Ecosystems and their constituent parts, including people and communities; and
b. Natural and physical resources; and
c. The qualities and characteristics of locations, places and areas; and
d. Heritage values of places; and
e. The social, economic and cultural aspects of a thing mentioned in paragraph (a), (b), (c) or (d).

Any actions which will, or are likely to significantly impact the environment need to be assessed. If potentially significant impacts are identified, opportunities for their avoidance, reduction or management must be sought. A referral under the EPBC Act may also need to be considered.

Figure 1: Project Site

4.1.2 Airports Act 1996, Airports Regulations 1997 & Airports (Environment Protection) Regulations 1997

BAL is required by the Airports Act and *Airports (Environment Protection) Regulations 1997* (AEPR) to develop and implement an Airport Environmental Strategy (AES) which details how environmental impacts associated with operating the Airport are to be minimised. The Airports Act and AEPR aim to establish an environmental management regime that focuses on a cooperative approach – supporting and ensuring compliance with environmental standards on Commonwealth Government leased airports.

This AES includes the following (as required by section 71(2)(h) of the Airports Act):

- Identification of the current environmental status of the Airport, including areas of environmental significance
- Environmental management objectives for the Airport
- Sources of environmental impacts associated with the Airport operations
- Measures to prevent and minimise environmental impacts associated with the operation of the Airport
- Studies, reviews and monitoring of current and future activities including timeframes and reporting
- Details and outcomes of the stakeholder consultation undertaken to prepare this AES.

In addition to the Airports Act objectives, the AEPR:

- Sets standards and imposes duties relating to environmental pollution
- Authorise the monitoring and remediation of breaches of environmental standards
- Require continuous improvement in environmental performance of activities at the Airport

Section 4.04 of Division 2 of the AEPR requires the operator of an undertaking at an airport to take all reasonable and practicable measures to ensure that the carrying out of that undertaking will not have adverse consequences for “sites of indigenous significance” defined under Section 5.01 the *Airport Regulations 1997* as follows:

- “site of Indigenous significance” means a site that has value:
  a. of customary significance to Aboriginal or Torres Strait Islander people; or
  b. of significance of the anthropological or archaeological understanding of Australian Aboriginal history and society

Section 5.02 of the *Airport Regulations 1997* requires an AES to specify any areas within an airport site that have been identified as sites of Indigenous significance, following consultation with:

a. any relevant indigenous communities or organisations; and
b. any relevant Commonwealth or State body.

Section 2.7 of the 2014 Bankstown Airport AES indicates that no sites of Indigenous significance have been identified on, or adjacent to, Bankstown Airport. Moreover, it notes that all development proposals within the airport site will be subject to environmental impact assessments that will consider whether that proposal is likely to affect an area that has the potential to contain sites of indigenous significance.

5.0 Data Sources

Information regarding the known and potential Aboriginal heritage values of the Project Site was obtained from:

- A review of the landscape context of the Project Site, with particular consideration to its Aboriginal archaeological implications;
- Updated searches of the following statutory and non-statutory heritage registers:
  - World Heritage List (statutory);
  - National Heritage List (statutory);
  - Commonwealth Heritage List (statutory);
  - Register of the National Estate (non-statutory);
  - NSW State Heritage Register (statutory);
  - Schedule 5 of the Bankstown Local Environmental Plan 2015 (statutory); and

  - ➢ OEH's Aboriginal Heritage Information Management System (AHIMS) (statutory).
- A review of the regional and local Aboriginal archaeological context of the Project Site;
- A review of the findings of past Aboriginal heritage investigations within the Project Site; and
- A visual inspection of the Project Site by AECOM senior heritage specialist Dr Andrew McLaren on 18 June 2018.

6.0 Landscape Context

Consideration of the landscape context of the Project Site is predicated on the now well-established proposition that the nature and distribution of Aboriginal archaeological materials are closely connected to the environments in which they occur. Environmental variables such as topography, geology, hydrology and the composition of local floral and faunal communities will have played an important role in influencing how Aboriginal people moved within and utilised their respective Country. Among other things, such variables will have affected the availability of suitable camp sites, drinking water and raw materials for the production of stone and organic implements, as well as economic[1] plant and animal resources. At the same time, an assessment of historical and current land use activities, as well as geomorphic processes such as soil erosion and bioturbation, is critical to understanding the formation and integrity of archaeological deposits, as well as levels of subsurface archaeological potential.

Summary information on the landscape context of the Project Site is provided **Table 1**.

Table 1: Review of landscape context of Project Site

Environmental Variable	Key Observations
Topography	While the natural topography of the Project Site has been grossly modified by historical land use activities, available reference materials suggest that most, if not all, of the land within this area formerly comprised part of an extensive level to very gently-inclined left bank terrace of the Georges River, potentially of Tertiary antiquity (Smith & Clark, 1991: 37). Regional archaeological data indicate that elevated landform elements adjacent to rivers (e.g., terraces / levees / source-bordering dunes) were often favoured locales for Aboriginal occupation, with excavated archaeological finds assemblages from such contexts (e.g., AHMS, 2013; Jo McDonald CHM, 2005c, 2005b, 2006b; Williams et al., 2014, 2012) attesting to intensive and/or repeated occupation over long periods of time.
Hydrology	The Project Site, as shown on Figure 1, is located to the immediate east of the Georges River, an intermediate tide-dominated drowned valley estuary (Roy et al., 2001). From its headwaters near Appin, the river flows northward to Liverpool before flowing eastward through multiple Local Government Areas (LGAs) to Botany Bay. Major tributaries include Bunburry Curran Creek, O'Hares Creek, Cabramatta Creek, Prospect Creek, Harris Creek, Deadmans Creek, Williams Creek, Salt Pan Creek and the Woronora River. The Georges River, as documented in numerous research and consultancy-based investigations, has long history of flooding (see, in particular, Maddocks, 2001). Flood risk mapping for the City of Canterbury Bankstown identifies the majority of land within the Project Site as having a moderate to high riverine flood risk. Archaeologically, this is a particularly important observation given that landscapes prone to flooding are liable impart bias on the preservation of Aboriginal archaeological materials and features. As Brown (1997: 280) has highlighted, the factors responsible for this bias include the erosion and destruction of sites by channel activity as well as sediment deposition which acts to bury/preserve sites but also renders them invisible. More broadly, existing archaeological survey data for the Cumberland Plain indicate a strong trend for the presence of open artefact sites along watercourses, specifically, on creek banks and 'flats' (i.e., flood/drainage plains), terraces and bordering lower slopes. Although this distribution pattern can be attributed in part to geomorphic dynamics and archaeological sampling bias, with extensive fluvial erosion activity along watercourses resulting in higher levels of surface visibility and, by extension, concentrated survey effort, an occupational emphasis on watercourses is supported by the results of numerous subsurface investigations (e.g., AMBS, 2000; Craib et al., 1999; GML, 2012, 2016; Jo McDonald CHM, 2001, 2003, 2005a, 2006a, 2006b, 2007, 2009a, 2009b). Collectively, these

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[1] I.e., edible or otherwise useful

Environmental Variable	Key Observations
	investigations have demonstrated that assemblage size and complexity tend to vary significantly in relation to stream order and landform, with larger, more complex[2] assemblages concentrated on elevated, low gradient landform elements adjacent to higher order watercourses.
Geology	Reference to the Penrith 1:100 000 Geological Map Sheet (9030) indicates that the surface geology of the Project Site comprises alluvial sediments of probable Tertiary antiquity (Ta). Reference to Smith & Clark (1991: 37 indicates that these sediments, which occur as river terraces adjacent to the Georges River in the Holsworthy-Liverpool, consist of up to 15m of clayey sand, silt and clay. In contrast to two of the Cumberland Plain's best known Tertiary alluvial formations - the Rickabys Creek Gravel (Tr) and St. Marys formations (Ts) - the Aboriginal archaeological potential of the Ta unit (i.e., with respect to the availability of stones suitable for flaked stone tool manufacture) remains unclear. However, it is noted that at least one exposure of this unit was observed to contain fragments of silcrete (Smith & Clark (1991: 37), a locally and regionally common raw material in excavated and surface recorded stone artefact assemblages. Outside of the Project Site, locally-occurring gravel deposits associated with Georges River and its major tributaries can be identified as potentially significant sources of lithic raw materials for Aboriginal people camping within or travelling through the greater Bankstown area (including the Project Site).
Soils	Soils within the Project Site have been mapped by Bannerman And Hazelton (2011) as consisting almost exclusively as those of the Disturbed Terrain soil landscape (xx). Bannerman and Hazelton (2011: 43) describe the soils of this landscape as consisting of artificial fill of variable composition, with original soils removed, greatly disturbed or buried. Soils associated with the Richmond soil landscape (ri) have been mapped in the westernmost portion of the site adjacent to the Georges River. Soils associated with this landscape have been described as consisting of poorly structured orange to red clay loams, clays and sands (Bannerman and Hazelton, 2011: 88).
Flora & Fauna	Native vegetation within the Project Site has been extensively modified as a result of historical land use activities. Vegetation today consists predominantly largely of managed exotic grassland. However, some small occurrences of young native and non-native regrowth (grown from fill) and a single remnant native *Angophora costata* (Smooth-barked Apple) tree are also present. Historical clearance notwithstanding, existing native vegetation mapping for the Cumberland Plain suggests that the Project Site would once have been covered in a mixture of woodland and open forest communities, with at least two distinct vegetation communities occurring within the site: Alluvial Woodland and Shale/Gravel Transition Forest. Alluvial Woodland is typically dominated by Cabbage Gum (*Eucalyptus amplifolia*) and Forest Red Gum (*E. tereticornis*), with Apple Box (Angophora floribunda) occurring less frequently (Tozer, 2003). Parramatta Green Wattle (*Acacia parramattensis*), Swamp Oak (Casuarina glauca) and Flax-leaved Paperbark (*Melaleuca linariifolia*) can also occur. A shrub stratum is usually evident though is often sparse and dominated by Blackthorn (*Bursaria spinosa*). A dense ground cover of grasses such as Basket-grass (*Oplismenus aemulus*), Weeping grass (*Microlaena stipoides*), Bordered Panic (*Entolasia marginata*) and Forest Hedgehog Grass (*Echinopogon ovatus*) is also typical as is the presence of herb species such as Forest Nightshade (*Solanum prinophyllum*), Whiteroot (*Pratia purpurascens*) and Native Wandering Jew (*Commelina cyanea*). Concentrated on elevated landform elements underlain by Tertiary alluvium, Shale/Gravel Transition Forest is an open-forest community dominated by Broad-leaved Red Ironbark (*E.fibrosa*), with Grey Box (*E. moluccana*) and Forest Red Gum (*E. tereticornis*) occurring less frequently. A small tree stratum of White Feather Honey Myrtle (*Melaleuca decora*) is frequently present. A sparse shrub stratum is also usually present and contains species such as Blackthorn (*Bursaria spinose*), Gorse Bitter Pea (*Daviesia ulicifolia*) and Peach Heath (*Lissanthe strigose*). Common ground stratum species for this community include Weeping Grass (*Microlaena stipoides*), Poison Rock Fern (*Cheilanthes sieberi*), Kangaroo Grass (*Themeda australis*), Stinkweed (*Opercularia diphylla*), Many-flowered Mat-rush (*Lomandra multiflora*), Threeawn Speargrass (*Aristida vagans*), Whiteroot (*Pratia purpurascens*) and Sprawling Bluebell (*Wahlenbergia gracilis*).

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[2] Those containing a wider variety of raw materials and technological types and/or higher mean artefact densities and features such as knapping floors.

Environmental Variable	Key Observations
	While available historical records provide only limited insight into Aboriginal exploitation of plants across the Cumberland Plain, and Sydney Region more broadly (see, in particular, Attenbrow, 2010: 76-78 and Kohen, 1986: 36-52), it can be confidently asserted that the original vegetation communities of the Project Site and its environs will have supplied Aboriginal people camping within or travelling through this area with an extensive array of edible and otherwise useful plant species. Recorded native vegetation communities and locally occurring watercourses would likewise have supported a large and diverse range of economic terrestrial, aquatic and avian fauna.
Land Disturbance	Together with field observations, available documentary sources indicate that the land within the Project Site has been grossly disturbed through a range of historical land use activities, with the most severe impacts to natural soils occurring as a result of extensive cut-and-fill activities. Areas of grossly modified terrain are considered to be of low Aboriginal archaeological sensitivity.

6.1 Heritage Register Searches

Searches of relevant statutory and non-statutory heritage registers were undertaken on 20 June 2018. The results of these searches, which indicate that there are no sites of Indigenous significance located within the Project Site, are presented in Table 1 below.

Table 2: Register search results

Heritage register	Results
World Heritage List	None
National Heritage List	None
Commonwealth Heritage List	None
Register of National Estate	None
NSW State Heritage Register	None
Schedule 5 of Blacktown LEP 2015	None
AHIMS Database	None (for further detail refer to Section 6.2.8)

6.2 Archaeological Context

This section describes the archaeological context of the Project Site on a regional and local scale. Archaeological data of relevance to this area, including the results of previous Aboriginal heritage investigations within the SWP, are reviewed in order to contextualise the results of the current assessment.

6.2.1 Regional Context

6.2.2 The Cumberland Plain

Concentrated archaeological investigation of the Aboriginal archaeological record of Sydney's Cumberland Plain can be traced to the early-to-mid 1980s, a period marked by a rapid growth in residential and other forms of development across the Plain. Intensive development activities since this time have secured the Cumberland Plain's place as one of the most intensively investigated archaeological regions in Australia, with thousands of Aboriginal archaeological investigations involving survey and/or excavation having now been undertaken, the majority as part of larger environmental impact assessments associated with residential development and affiliated infrastructure projects. Unsurprisingly, these investigations have varied significantly in scale and scope, ranging from targeted small-scale surveys to complex, multi-phase survey and excavation projects over large areas. Nonetheless, together they have revealed a rich and diverse record of past Aboriginal occupation, with thousands of Aboriginal archaeological sites now registered on OEH's Aboriginal Heritage Information Management System (AHIMS) database. Key investigation themes are detailed in brief below.

6.2.3 Open Artefact Sites: Distribution, Contents & Definition

Surface and subsurface distributions of stone artefacts, variously referred to as open artefact sites, open sites and open camp sites are the most common and widely distributed form of Aboriginal archaeological site on the

Cumberland Plain (see Attenbrow, 2010: Plate 12; Przywolnik, 2007: 46, Table 4.2). Other site types, such as scarred trees, quarries, grinding grooves and rock shelters with deposit and/or art or PAD, have also been identified but are comparatively rare. Accordingly, open artefact sites remain the most intensively investigated component of the Aboriginal archaeological record of the Cumberland Plain, with site distribution and the technology of associated flaked stone artefact assemblages, in particular, comprising key research topics (e.g., AMBS, 2000; Craib et al., 1999; Jo McDonald CHM, 2001, 2003, 2005a, 2006a, 2006b, 2006c, 2007, 2009a, 2009b; Kohen, 1986; White & McDonald, 2010).

Existing archaeological survey data for the Cumberland Plain indicate a strong trend for the presence of open artefact sites along watercourses, specifically, on creek banks and 'flats' (i.e., flood/drainage plains), terraces and bordering lower slopes. Although this distribution pattern can be attributed in part to geomorphic dynamics and archaeological sampling bias, with extensive fluvial erosion activity along watercourses resulting in higher levels of surface visibility and, by extension, concentrated survey effort, an occupational emphasis on watercourses is supported by the results of numerous subsurface investigations (e.g., AMBS, 2000; Craib et al., 1999; GML, 2012, 2016; Jo McDonald CHM, 2001, 2003, 2005a, 2006a, 2006b, 2007, 2009a, 2009b). Collectively, these investigations have demonstrated that assemblage size and complexity tend to vary significantly in relation to stream order and landform, with larger, more complex[3] assemblages concentrated on elevated, low gradient landform elements adjacent to higher order watercourses. Artefact distributions associated with major creek lines and confluences tend to consist of localised high density artefact concentrations set within lower density artefact scatters. Outside of these contexts, surface and subsurface artefact distributions have typically been found to be sparse and discontinuous and are often referred to as 'background scatter', being "artefactual material which is insufficient in number or in association with other material to suggest focussed activity in a particular location" (Douglas and McDonald, 1993).

Flaked stone artefacts dominate archaeological finds assemblages from recorded open artefact sites on the Cumberland Plain, with heat shattered rock also well represented. Items such as complete and broken grindstones, hammerstones and edge-ground hatchet heads have also been recorded though comparatively infrequently. With the notable exception of 'knapping floors'[4], a relatively common component of the Aboriginal archaeological record of the Cumberland Plain, associated archaeological features (e.g., hearths, ground ovens and heat treatment pits) have likewise proven elusive (but see AHMS, 2013; GML, 2016; McDonald and Rich, 1994; Jo McDonald CHM, 2009a for examples). Investigated knapping floors across the Plain have varied considerably in size and complexity, with the largest and most complex examples identified through excavation as opposed to surface survey (e.g., Jo McDonald CHM, 2001, 2005a, 2006b, 2007). Backed artefacts (i.e., Bondi points, geometric microliths and elouera) are a common feature of knapping floors and most of these features were likely specifically associated with their production. In common with regions such as the Hunter Valley (e.g., Hiscock, 1993; Moore, 2000), available evidence supports the suggestion that backed artefact manufacture on the Cumberland Plain was a highly structured or systematic activity.

Although relevant to a variety of site types, geomorphic processes such as soil erosion and colluvial/fluvial aggradation are of particular relevance to the identification and definition of open artefact sites. As in other archaeological contexts (e.g., Dean-Jones & Mitchell, 1993), the visibility of open artefact sites across Sydney's Cumberland Plain can, for the most part, be attributed to such processes, which have variously exposed or obscured them. Critically, surface artefacts invariably represent only a fraction of the total number of artefacts present within recorded surface open artefact sites across the Plain, with a typical surface to subsurface artefact ratio of 1:25 proposed (Jo McDonald CHM, 2005b: 35). Artefact exposure, unsurprisingly, is highest on erosional surfaces and lowest on depositional ones. At the same time, in many areas, surface artefacts have been shown through dispersed testing programs to form part of more-or-less continuous subsurface distributions of artefacts, albeit with highly variable artefact densities linked to environmental variables such as distance to water, stream order and landform (e.g., White & McDonald, 2010). The presence or absence of surface artefacts on the Cumberland Plain, therefore, is not a reliable indicator of Aboriginal archaeological sensitivity.

6.2.4 Flaked Stone Artefact Technology

Virtually indestructible, flaked stone artefacts are a ubiquitous element of the Aboriginal archaeological record of the Cumberland Plain and have assumed a prominent position in archaeological reconstructions of past Aboriginal land use across the region. To date, hundreds, if not thousands, of surface-collected and excavated

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[3] Those containing a wider variety of raw materials and technological types and/or higher mean artefact densities and features such as knapping floors.

[4] Following White (1997: 8), knapping floors can be defined as activity areas "where primacy was given the systematic reduction of stone, with or without additional activities being carried out"

flaked stone assemblages from across the Cumberland Plain have been analysed, with individual assemblage sizes, research questions, aims, analytical methodologies and terminological schemes varying significantly between researchers and projects. Studies to date have ranged from basic descriptive accounts of assemblage composition in typological terms to detailed reconstructions of past stone reduction and quarrying behaviours through rigorous technological analyses. Particularly informative analyses in the context of the Cumberland Plain include those conducted by Jo McDonald CHM (2001, 2003, 2005a, 2006a, 2006b, 2006c, 2007, 2009a, 2009b) as part of archaeological salvage projects associated with development activities within the Rouse Hill Development Area (RHDA), the former Australian Defence Industries (ADI) site at St Marys and the Colebee Release Area (CRA). Technological analyses of stone artefact assemblages recovered from fluvial sand bodies adjacent to the Parramatta (Jo McDonald CHM, 2005b, 2005c, 2006b) and Hawkesbury Rivers (AHMS 2013; Williams et al. 2012) have likewise proven highly informative, particularly with respect to the documentation of diachronic changes in raw material use and stone artefact technologies.

Available technological and typological data for surface collected and excavated flaked stone artefact assemblages from the Cumberland Plain suggest that the majority of these assemblages belong to what is known as the 'Australian small-tool tradition', a term coined by Gould (1969) to describe what was then thought to be the first appearance, in the mid-Holocene[5], of a new suite of flaked stone tool forms in the Aboriginal archaeological record of Australia, including backed artefacts, adzes and points (both unifacially and bifacially flaked). Complex, hierarchically-organised reduction sequences associated with the production of these tools contrast markedly with the simple sequences of earlier periods (Moore, 2011). Tools of the Australian small-tool tradition, it has been suggested, formed part of a portable, standardised and multifunctional tool kit aimed specifically at risk reduction (Hiscock, 1994, 2002, 2006). Stone artefact assemblages from late Pleistocene and early Holocene contexts, in contrast, are described by archaeologists as belonging to the 'Australian core tool and scraper tradition', a term first used by Bowler *et al.* (1970) to describe the Pleistocene assemblages recovered from Lake Mungo in western New South Wales. Bowler *et al.* (1970) saw the main components of these assemblages - core tools, steep-edged scrapers and flat scrapers - as characteristic of early Australian Aboriginal assemblages and as being of a distinctly different character to those associated with the proceeding small-tool tradition. In southeastern Australia, including the Cumberland Plain, the Australian 'small-tool' and 'core tool and scraper' traditions are most commonly described in terms of McCarthy's (1967) ERS, with 'Capertian' assemblages assigned to the latter tradition and 'Bondaian' assemblages, the former.

Flaked stone artefact assemblages from excavated and surface collected/recorded open artefact sites on the Cumberland Plain attest to the exploitation of a diverse range of lithic raw materials (Corkill, 1999, 2005). However, two rock types - silcrete and silicified tuff (also known as indurated mudstone) - dominate the region's existing stone artefact record. Other, less commonly exploited raw materials represented in excavated and surface collected/recorded assemblages include quartz, quartzite, petrified wood, chert and various fine-grained volcanics. Alongside silcrete and silicified tuff, these materials occur variously in a number of geological formations and units across the Cumberland Plain (for a detailed review see Corkill 1999). Oft-cited sources include the Tertiary St Marys (Ts) and Rickabys Creek Gravel (Tr) formations, as well as the various unconsolidated Pleistocene units that line as terraces the present day and abandoned channels of the Nepean-Hawkesbury River (e.g., the Cranebrook Formation (Qpc)). Holocene gravel banks along the same river system have likewise been identified as a potentially significant raw material source.

In common with the Sydney region as a whole (Attenbrow, 2010:120-121), various excavated assemblages from the body and peripheries of the Cumberland Plain (e.g., Jo McDonald CHM, 2001a, 2005a; Williams *et al.,* 2012, 2014) attest to a shift, over time, in the relative significance of particular raw materials for flaked stone artefact manufacture, principally silcrete and silicified tuff but also quartz. An 'early' (i.e., Pre-Bondaian) emphasis on the procurement and reduction of silicified tuff, for example, appears to have given way to a 'later' (i.e., Bondaian) emphasis on silcrete. Quartz use, meanwhile, appears to have peaked in the late Holocene. For the Cumberland Plain, these changes have been linked, in particular, to broader changes in settlement organisation, with a decline in levels of residential mobility over time prompting more intensive use of locally available stone (Jo McDonald CHM, 2005a).

In the northwestern portion of the Cumberland Plain, the Tertiary St Marys Formation has been singled out as a particularly important source of silcrete for flaked stone artefact manufacture. Mapped at various localities across the Mulgoa Creek, South Creek and Eastern Creek catchments, the best known and most intensively investigated

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[5] More recent research into the chronology of backed artefacts and points in Australia (e.g., Hiscock & Attenbrow 1998, 2004; Hiscock 1993b) has demonstrated a long history of production and use for these implement types, with both types now known to have been produced, albeit in small numbers, in the early Holocene and likely in the late Pleistocene as well.

outcrops of this formation occur on Plumpton Ridge, a low but locally prominent ridgeline separating the floodplains of Eastern and Bells Creek between the suburbs of Plumpton and Riverstone. The subject of numerous archaeological investigations since the early 1980s (e.g., Australian Museum Business Services, 2002; Baker, 1996; Barry, 2005; McDonald, 1986), Jo McDonald CHM's (2006c) large-scale archaeological salvage works across what is now Stonecutters Ridge Golf Club unequivocally identified Plumpton Ridge as a major Aboriginal quarry site. At the same time, they highlighted a number of important trends in relation to the procurement and reduction of silcrete obtained from this source. Trends in the relative frequencies of raw material types, artefact types and the size of silcrete artefacts in local excavated assemblages, for example, were attributed to a process of 'distance-decay' (Jo McDonald CHM's 2006c: 61).

Procurement evidence at documented Aboriginal quarry sites across the Cumberland Plain, including Plumpton Ridge, has to date consisted of varying surface and/or subsurface densities of flaked stone artefacts in direct spatial association with naturally occurring Tertiary gravel deposits (silcrete dominant). Topographic indicators of 'open cut' mining activities, such as localised circular/semi-circular depressions or trenches (cf. Binns & McBryde, 1972; Jones & White, 1988; McBryde, 1973, 1984), have yet to be identified, though this is unsurprising given the nature of the lithic deposits being quarried. Alongside those from the ADI:EPI and ADI-FF2 quarry sites within the former ADI site (Jo McDonald CHM, 2006a, 2008a), excavated flaked stone artefact assemblages from the SA25 and SA26 sample areas on the upper eastern flank of Plumpton Ridge, detailed in Jo McDonald CHM, 2006c, have provided a robust technological 'signature' for Aboriginal quarry sites on the Cumberland Plain. Amongst other activities, such as limited tool production / discard and later stage core reduction, stone procurement / reduction activities at exploited stone sources appear to have included 'primary' or early stage clast reduction as well as deliberate heat treatment and fracturing (Jo McDonald CHM, 2006c).

Backed artefacts dominate the retouched components of the majority of dated and undated Bondaian assemblages from the Plain and, as such, the technology of their manufacture has received considerable analytical and interpretive attention. Studies by Jo McDonald CHM (2001, 2003, 2005a, 2006a, 2006b, 2007, 2009a, 2009b), in particular, have demonstrated that backed artefact manufacture on the Cumberland Plain was a highly structured or systematic activity involving a complex system of raw material procurement, transportation, preparation and reduction. Differences in the technological character of recovered cores across the region attest to a significant degree of variability in the methods used by Aboriginal knappers to produce flakes for backed artefact manufacture. However, certain techniques (e.g., asymmetric alternating flaking and Hiscock's (1993) 'tranchet technique') are particularly well represented. Evidence for the deliberate heat treatment of silcrete blanks, both as part of systematic backed artefact manufacture activities and other reduction activities, is abundant and widespread, with excavated and surface collected assemblages attesting to the use of heat at various points in the reduction process. As in other contexts (e.g., Hiscock 1993), the thermal alteration of Cumberland Plain silcrete appears to have significantly improved the flaking quality of the stone, increasing the lustre and smoothness of fracture surfaces.

6.2.5 Chronology of Occupation

In common with the Sydney region as a whole, evidence for late Pleistocene/early Holocene (i.e., Pre-Bondaian/Early Bondaian) Aboriginal occupation of the Cumberland Plain is sparse, with confirmed or potential evidence from these periods obtained from only a limited (<20) number of sites / landscapes. Well documented examples include Rouse Hill sites RH/CC2 (Jo McDonald CHM, 2001), RH/SC5 (Jo McDonald CHM, 2002b), RH/CD12 (Jo McDonald CHM, 2002a) and RHCD7 (Jo McDonald CHM, 2007); Richmond site RMI (Jo McDonald CHM, 1997a); PT12 near Pitt Town (Williams *et al.*, 2012, 2014); Jamisons Creek, Emu Plains (Kohen *et al.*, 1984); Power Street Bridge 2, Doonside (McDonald, 1993), Regentville RS1, Regentville (Koettig & Hughes, 1995; McDonald *et al.,* 1996), the Parramatta CBD (AHMS 2013; Austral Archaeology, 2007; Jo McDonald CHM, 2005b, 2005c, 2006b), the Windsor Museum site (Austral Archaeology, 2011; Williams *et al.* 2012; Williams *et al.* 2014) and the Cranebrook Terrace, near Penrith (Williams et al., 2017). While early Holocene occupation of the Cranebrook Terrace has recently been demonstrated by Williams et al. (2017), claims of a *c.*40 ka year old date for five 'flaked pebbles' recovered from the same geomorphological unit (Nanson *et al.* 1987) have been widely questioned, with legitimate concerns raised over the artefactual status of these pebbles, their provenance and association with available dates. For most sites, late Pleistocene/early Holocene occupation has been inferred on the basis of the technological and typological characteristics of recovered flaked stone artefact assemblages as opposed to radiometric dates.

At present, the oldest securely dated archaeological site on the Cumberland Plain is the PT12 sand body site at Pitt Town, with compliance-based archaeological excavations across a source-bordering dune at this site, which overlooks the Hawkesbury River, producing a suite of OSL dates suggestive of Aboriginal occupation from at least 36,000 years ago (and potentially earlier) (Williams *et al.* 2012, 2014). Closer to the coast, Late Pleistocene/early

Holocene occupation of a sandy fluvial terrace adjacent to the Parramatta River (i.e., the Parramatta Sand Sheet) has been by proposed by Jo McDonald CHM (2005b, 2005c, 2006b) and seems likely on the basis of available radiometric dates and assemblage characteristics.

In stark contrast to the late Pleistocene and early Holocene periods, evidence for mid-to-late Holocene Aboriginal occupation of the Cumberland Plain abounds, with hundreds of excavated sites containing, or consisting exclusively, of archaeological materials of this antiquity. Together with available radiometric dates and the technological characteristics of associated lithic assemblages, the dominance of mid-to-late Holocene sites and artefacts across the Plain has been interpreted by some (e.g., Jo McDonald CHM, 2005a, 2005c; McDonald, 2008) as a product of a steady increase, over time, in the Aboriginal population of the Plain. However, the probable influence of other factors, such as the better preservation of younger archaeological deposits, the difficulties of dating open site assemblages from this region and an increased emphasis on backed artefact production has also been acknowledged (see, in particular, White, 2017).

Critical to any discussion concerning the antiquity of Aboriginal occupation across the Cumberland Plain are the well-documented difficulties surrounding the dating of open artefact sites with active ‘biomantles’ (*sensu* Paton et al. 1995; see Dean-Jones & Mitchell, 1993; Balek 2002; Hofman 1986; Johnson et al. 2005; Johnson 1989; Paton et al. 1995; Peacock & Fant 2002; Stein 1983). On the Cumberland Plain, the term biomantle is typically used as a collective descriptor for the ‘A’ soil horizons of the Plain’s dominant texture contrast or duplex soil profiles[6], which tend to be relatively thin (<30 cm) and exhibit extensive evidence of bioturbation in the form of roots, open/infilled burrows, live insects and/or earthworms and stone lines[7]. However, it is noted that the uppermost portions of underlying ‘B’ soil horizons can also exhibit such evidence and form part of the biomantle (e.g., AECOM, 2015a). As highlighted by Dean-Jones & Mitchell (1993) and others (e.g., Balek, 2002; Johnson, 1989), excavated finds assemblages from archaeological sites with active biomantles are subject to a range of interpretive constraints, with intact depositional stratigraphy unlikely to be preserved and inset archaeological features (e.g., hearths and heat treatment pits) representing the only reliable means of dating (with any specificity) intercepted archaeological events (Mitchell, 2009: 4). Any stone artefacts discarded at the surface in landscapes with active biomantles are likely, over time, to have been incorporated into the soil profile through bioturbation, with depth of artefact burial ultimately corresponding to the base of major biological activity (i.e., the base of the biomantle). Where biomantles remain relatively undisturbed, horizontal patterns of artefact discard may be preserved. However, in heavily disturbed contexts, the preservation of such patterning is unlikely (Mitchell 2009: 4).

For archaeologists working on the Cumberland Plain, the analytical and interpretive constraints posed by intensive bioturbation have, in combination with a real paucity of dateable features, led to a reliance on the dating of excavated archaeological finds assemblages through relative means, specifically, through consideration of the typological and technological composition of associated flaked stone artefact assemblages and reference to a modified version of McCarthy’s (1967) ESR, the broad temporal parameters of which are now well established. While offering a useful chronological framework within which to assess diachronic changes in stone artefact technologies and raw material use, the largely undated and palimpsest character of the Plain’s lithic record represents a significant analytical and interpretive obstacle for period-specific reconstructions of Aboriginal mobility regimes (cf. Cowan, 1999).

Well dated assemblages from sites retaining stratified deposit(s) are rare, with the most comprehensively dated sequences to date coming from deep fluvial sand bodies adjacent to the Hawkesbury and Parramatta Rivers (i.e., AHMS, 2013; Jo McDonald CHM, 2005c; Williams et al., 2012, 2014). While the preservation and dating potential offered by such bodies has been amply demonstrated, the same cannot be said of alluvial valley fill sequences outside of these major river valley contexts, with comparatively little research directed towards investigating the age, genesis or evolution of alluvial valley fill sequences within the Cumberland Plain’s numerous creek valleys, nor their potential for preserving at depth (i.e., within buried paleosols) Aboriginal archaeological materials of varying ages, including those of Late Pleistocene/Early Holocene antiquity (but see AHMS, 2015; Barham, 2005, 2007; Jo McDonald CHM, 2005a for notable exceptions). Nonetheless, the limited work that has been conducted in this regard suggests considerable research potential, particularly with respect with the development of chronological frameworks for contextualising and interpreting the flaked stone artefact assemblages recovered from such sequences.

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[6] These profiles are characterised by loamy topsoils and silty clay to clay subsoils, with boundaries between these two units typically clear to abrupt. Clayey subsoils have formed by *in situ* weathering of the parent material, while topsoils are derived from a combination of *in situ* weathering and the deposition of colluvially and/or fluvially transported materials.

[7] Stone lines, where present, typically occur at the interface between the A and B horizons.

6.2.6 Site Distribution and Occupation Models

A number of Aboriginal site distribution and occupations models have been proposed for the Cumberland Plain over the past four decades, with early models (e.g., Kohen, 1986; Smith, 1989) based principally, or exclusively, on surface evidence and more recent models (e.g., AMBS, 2000; Jo McDonald CHM, 1997b) taking into account both surface and excavated evidence. As indicated in **Table 3**, Aboriginal site distribution on the Cumberland Plain has been linked to a variety of environmental factors, with proximity to water, stream order, landform and geology (including proximity to known stone sources) variously highlighted as key determinants.

Table 3 Aboriginal site distribution and occupation models for the Cumberland Plain

Researcher(s)	Year	Summary of model
Dallas and Witter	1983	• Sites closer to silcrete and other raw material sources will tend to contain more cores and waste chips and less utilised material than sites which are located further away. They will also contain more block fractured pieces, a higher frequency of cortex, and the artefacts will generally be larger than those at sites not associated with raw material sources; • In areas of raw material abundance, artefacts will be discarded earlier in the reduction sequence and will generally be larger and occur in a variety of forms; • Raw material abundance, quality and size will influence assemblage variability; and • Sites located away from raw material sources will exhibit a wider variety of activities and a higher number of utilized pieces than those closer to them.
Kohen	1986	• Proximity to water and geological context key determinants for site location; • Sites can be categorized as one of three types according to their function: o camping sites, which have a wide range of activities represented in the archaeological record; o woodworking sites, where there is a high proportion of implements to debitage present; and o hunting sites, which contain a relatively small number of unworked flakes and are sometimes associated with backed blades. • Greatest proportion of sites located on Wianamatta Shale substrates. • Number of artefacts found at a site and site size more closely correlated to the nature and degree of disturbance at a site than any behavioural factors. The more disturbed the site, the greater the visibility and hence the greater quantity of artefacts recorded. • Sites with high artefact densities tend to be found within 100m of permanent water sources.
Smith	1989	• Sites are most likely to occur in association with water sources. Permanency of the water source, however, is not a determining factor for site location, with a significant quantity of sites found along temporary creek lines. • Sites on the Londonderry Clay/Rickabys Creek Formation are likely to be found in association with gravel exposures. • Sites dominated by silcrete are less likely to be found west of Marsden Park and South Creek than east of those areas. Isolated finds in these areas are also less likely to be made from silcrete. • Sites east of South Creek are likely to be principally stone tool and silcrete manufacturing and processing sites. • Sites in the northern Cumberland Plain are expected to have a lower frequency of implements than those in the south. • Woodland areas will typically contain sites at lower densities than open forest areas. • Surface sites appear to be more common than subsurface sites, and undisturbed stratified sites are rare due to the degree of disturbance. • Sites with over 50 artefacts are rare, although very large sites (500+ artefacts) do occur. There is no apparent patterning to the occurrence of these large sites. The pattern of distribution of site size appears to be determined predominantly by visibility. • Sites cannot be divided neatly into 'single use' categories, as most sites were the location of numerous activities.

Jo McDonald CHM	1997b	• The size (density and complexity) of archaeological features will vary according to permanence of water (i.e., stream order), landscape unit and proximity to lithic resources in the following way: o In the headwaters of upper tributaries (i.e., first order creeks) archaeological evidence will be sparse and represent little more than a background scatter; o In the middle reaches of minor tributaries (second order creeks) will be archaeological evidence for sparse but focussed activity (e.g., one-off camp locations, single episode knapping floors); o In the lower reaches of tributary creeks (third order creeks) will be archaeological evidence for more frequent occupation. This will include repeated occupation by small groups, knapping floors (perhaps used and re-used), and evidence of more concentrated activities; o On major creeklines will be archaeological evidence for more permanent or repeated occupation. Site will be complex and may even be stratified; o Creek conjunctions may provide foci for site activity; the size of the confluence (in terms of stream ranking nodes) could be expected to influence the size of the site; o Ridgetop locations between drainage lines will usually contain limited archaeological evidence although isolated knapping floors or other forms of one-off occupation may be in evidence in such a location • Naturally occurring silcrete will have been exploited and evidence for extraction activities (decortication, testing and limited knapping) would be found in such locations; and • Sites in close proximity to an identified stone source would cover a range of size and cortex characteristics. As one moves away from the resource, the general size of artefacts in the assemblage should decrease, as should the percentage of cortex.
AMBS	2000	• Spatial patterning in chipped stone artefact distributions adjacent to major creek lines can - in certain instances - be accommodated under a three-tiered model of ‘Activity Overprint Zones’ incorporating ‘complex’, ‘dispersed’ and ‘sparse’ zones. • Complex zones will exhibit overlapping knapping floors and high density concentrations of artefacts indicative of repeated, long-term occupation events. • Dispersed zones may include knapping floors. However, these are typically spatially discrete due to less frequent occupation. • Sparse zones will exhibit consistently low frequencies/densities of artefacts. Artefact discard in these zones is likely to have resulted from discard in the context of use or loss rather than manufacture. • Flaked stone artefact production and maintenance will leave a more obtrusive archaeological signature than resource extraction (e.g., food collection and processing). These activities will also occur closer to the residential core while resource extraction will typically occur away from it.

Jo McDonald CHM	2005a	• Most areas - even those with sparse or no surface manifestations - contain sub-surface archaeological deposits; • Where lithic concentrations are found in stable and aggrading landscapes, they are largely intact and have the potential for internal structural integrity. Sites in alluvium (shallow and deep) possess potential for stratification; • While ploughing occurs in many parts of the Plain, this only affects the deposit up to c.30 cm depth, and even then ploughed knapping floors have been located which are still relatively intact; • Contrary to earlier models for the region, many areas contain extremely high artefact densities, with variability appearing to depend on the range of lithic activities present. Densities in excess of 400-600 artefacts/metre square are not uncommon; • The complexity of the Cumberland Plain's archaeological record is far greater than was previously identified on the basis of surface recording and more limited test excavation. The time span of Aboriginal occupation has been demonstrated to be far greater than was originally thought; and • Gross patterning is identifiable on the basis of environmental factors: archaeological landscapes on permanent water are more complex than sites on ephemeral or temporary water lines.

White and McDonald's (2010) analysis of lithic artefact distribution in the Rouse Hill Development Area (RHDA) provides a suitably robust dataset for assessing the validity of some of the key predictions of the models outlined above. Based on the results of over a decade of intensive test excavation in the RHDA, this study remains the most comprehensive of its type currently available for the Cumberland Plain. As indicated, Aboriginal site distribution on the Cumberland Plain has been linked to a variety of environmental factors, with distance to water, stream order, landform and geology (including proximity to known stone sources) variously highlighted as important influences. White and McDonald's (2010) analysis both supports and negates various aspects of the postulated relationships between these factors and Aboriginal site patterning on the Cumberland Plain. Key findings can be summarised as follows:

- Artefact distributions do not, as implied by the models of Kohen (1986) and Smith (1989), form bounded 'sites' but rather 'landscapes'.
- Artefact distribution does, as variably expressed by AMBS (2000), Kohen (1986), Jo McDonald CHM (1997b, 2005) and Smith (1989), appear to vary with proximity to water, albeit to different extents based on stream order.
- Artefact density does, as suggested by Jo McDonald CHM (1997b, 2005), appear to vary significantly with stream order.
- Artefact density does, as suggested by Jo McDonald CHM (1997b, 2005), appear to vary significantly with landform.
- Aboriginal archaeological sites on the Cumberland Plain cannot, as proposed by Jo McDonald CHM (2005), be adequately characterized on the basis of surface evidence alone. Most areas, regardless of surface indications, contain subsurface archaeological deposit(s).
- The orientation of open land surfaces appears to have influenced the selection of artefact discard locations in the lower portions of valleys, with generally higher densities on lower slopes facing north and north-east.
- Distance from known silcrete sources does not, on present evidence at least, appear to have influenced intensity of artefact discard (cf. Dallas & Witter 1983).
- Trends in artefact density and distribution indicate long-term, large scale patterns. Short term models of settlement organization are insufficient to account for these artefact distributions; and
- Social and/or symbolic factors may have influenced site selection along with the distributions of economic and other resources.

More recently, AHMS (2015), employing a comparable analytical methodology to White and McDonald (2010), undertook an analysis of lithic artefact distribution across sixteen northwestern Cumberland Plain landscapes subject to dispersed testing and/or targeted open area salvage excavations. The dataset for this analysis, which sought, in common with White and McDonald's (2010) study, to identify patterns in artefact discard[8] comprised 2,988 artefacts from 345 dispersed test pits (1 m^2) along multiple pipeline corridors. In common with White and McDonald (2010: 32-33), AHMS found that artefact distribution within their sampled landscapes varied significantly in relation to both stream order and landform, with mean artefact densities highest in 3rd order landscapes (16.7 artefacts/m^2) and on terraces (16.9 artefacts/m^2). Interestingly, however, the mean artefact density for 3rd order landscapes in AHMS's (2015) dataset (i.e., 16.7 artefacts/m^2) was found to exceed that for 4th order landscapes in the RHDA dataset (13.9 artefacts/m^2). The mean artefact density for creek flats in AHMS's dataset (7.8 artefacts/m^2) was likewise found to exceed its counterpart in the RHDA dataset (3.8 artefacts/m^2), suggesting that creek flats in AHMS's sampled landscapes may have been more favoured for occupation than those in the RHDA or, alternatively, that creek flats in the RHDA had been subject to more intensive flood-erosion activity (resulting in a greater loss of artefacts).

In keeping with White and McDonald's (2010: 34) results, AHMS found that in 2nd order landscapes, artefact density was highest within 50 m of water. Distance to water in 4th order landscapes was not assessed by AHMS. However, in a comparable finding to White and McDonald's (2010: 34, Table 9) 4th order dataset, AHMS found that in 3rd order landscapes, artefact density was highest between 51 and 100 m from water. Consideration of 1st and 3rd order landscapes in combination likewise showed that mean artefact density was highest between 51 and 100 m of water, suggesting, in combination with the above, that landform elements located at a slightly greater distance to creeks (and particularly larger creeks) were favoured for sustained/repeated occupation[9]. While limited to lower slopes, AHMS' analysis of artefact distribution in relation to slope aspect revealed both similarities and differences with the RHDA dataset, with southeast-facing lower slopes in AHMS's sampled landscapes exhibiting the highest mean artefact density (as opposed to north/northeast-facing slopes in the RHDA dataset), followed by northeast-facing lower slopes. Finally, AHMS's analysis of artefact distribution in relation to distance to known silcrete sources produced an entirely different result to White and McDonald's (2010: 35, Table 12) analysis of the same relationship, with the latter revealing a pattern of increasing artefact density with increasing distance from known sources. In AHMS' dataset, artefact density was highest within 2-3 km of known silcrete sources. However, outside of this finding, no clear patterning was evident, suggesting, in line with White and McDonald's (2010) findings, that distance to known silcrete sources likely had little influence over artefact discard rates.

6.2.7 Local Context

6.2.8 AHIMS Database

The AHIMS database, administered by OEH, contains records of all Aboriginal objects reported to the Director General of the Department of Premier and Cabinet in accordance with Section 89A of the National Parks and Wildlife Act 1974. It also contains information about Aboriginal places, which have been declared by the Minister to have special significance with respect to Aboriginal culture. Previously recorded Aboriginal objects and declared Aboriginal places are known as 'Aboriginal sites'.

A search of the AHIMS database on 15 June 2018 for a 5 x 5 km area centred on the Project Site (AHIMS search area) returned 19 site entries (Appendix A). Previously recorded sites include one open artefact site, one area of Potential Archaeological Deposit (PAD) and seventeen modified trees. However, it is noted that all but one of the modified trees identified within the AHIMS search area are listed on AHIMS as "Not a Site". Information held by AECOM indicates that all these trees, all of which are located within the Riverlands Golf Course to the southeast of the Project Site, were initially identified as Aboriginal scarred trees by the Bankstown Bushland Society (2015) but subsequently reassessed by OEH as naturally-scarred trees.

Consideration of the location of the three 'valid' Aboriginal sites within the AHIMS search area indicates that **none** are located within or adjacent to the Project Site.

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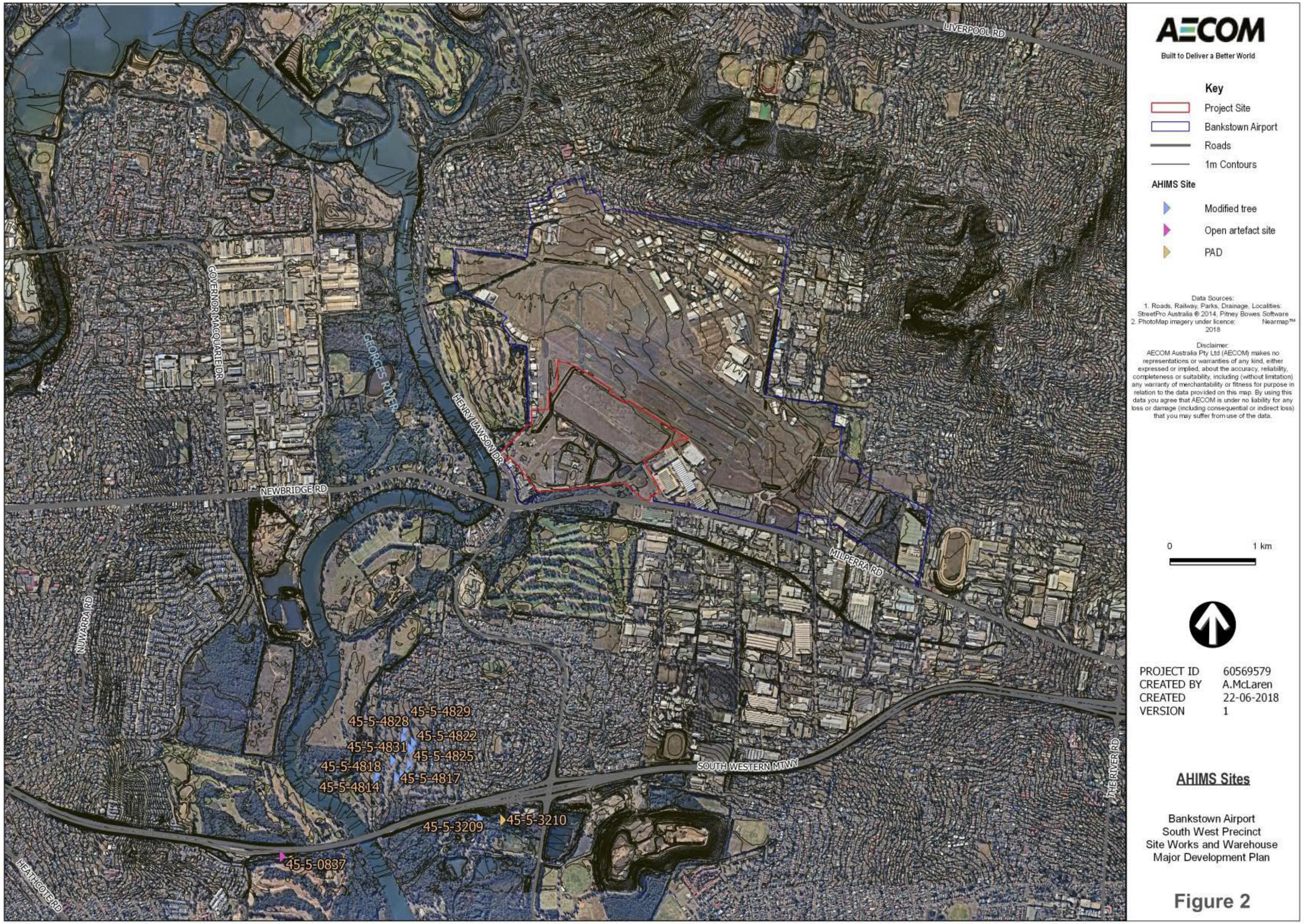
[8] And, by extension, past Aboriginal land use preferences

[9] For the RHDA, White and McDonald (2010: 33) attributed a comparable finding to factors such as allowing animals to drink and catching a cool breeze



Data Sources:
1. Roads, Railway, Parks, Drainage, Localities: StreetPro Australia ® 2014, Pitney Bowes Software
2. PhotoMap imagery under licence: Nearmap™ 2018

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PROJECT ID 60569579
CREATED BY A.McLaren
CREATED 22-06-2018
VERSION 1

AHIMS Sites

Bankstown Airport
South West Precinct
Site Works and Warehouse
Major Development Plan

Figure 2

Figure 2: AHIMS Sites

6.2.9 Bankstown Locality

Existing AHIMS data indicate that a numerous Aboriginal archaeological investigations have been carried out in the greater Bankstown area over the past four decades. As in other parts of the Cumberland Plain, the majority of these investigations have been limited to survey. However, a number of investigations involving test and/or salvage excavation programs have also been undertaken. Excluding those undertaken within the Project Site itself, which are discussed in Section 6.2.10, the results of a selection of Aboriginal heritage investigations undertaken in the greater Bankstown area are summarised in Table 4 below.

Taken together, the results of previous surface and subsurface investigations within the greater Bankstown area have painted a picture of past Aboriginal occupation and land use consistent with that of the Cumberland Plain as a whole, collectively attesting to an occupational emphasis on low gradient landform elements and rockshelters adjacent to higher order watercourses, as well as an emphasis on the procurement, transport, pre-processing (i.e., heat treatment) and reduction of silcrete.

Table 4: Previous Aboriginal heritage investigations

Consultant	Year	Project	Investigation type	Location relative to the Project Site	Summary of investigation & results	Reference
J.P White & C.Wieneke	1972	Research excavation	Excavation	6.3 km southeast	Excavation of Aboriginal rockshelter site on the southern side of Henry Lawson Drive, close to Little Salt Pan Creek and the Georges River. Excavations undertaken within and below shelter. Approximately four square metres of deposit removed from inside shelter, reaching a maximum depth of 50 cm. Intercepted midden deposit dominated by oyster shell (Crassostrea Commercialis), which accounted for “90% or more” of all shell samples. Fish, bird and mammal bone also recovered, as well as more than 2,800 flaked stone artefacts. Retouched component of assemblage dominated by backed artefacts. Charcoal sample from base of midden within shelter returned date of 870±95 years BP (SUA-59).	White & Wieneke, 1972
L.Haglund	1984	F5 freeway - King Georges Rd to Heathcote Rd	Survey	c.1.5km south	Pedestrian survey of section of then proposed F5 freeway between King Georges Road, Beverly Hills, to Heathcote Rd, Moorebank. Two open artefacts sites identified during survey, one of which comrpised an extensive low-density artefact scatter. Raw materials included silcrete, silicified tuff, quartz and volcanic. Retouched implements limited to two scarpers.	Haglund, 1984
P. Packard & G.Dunnett	1990	Proposed Sand Extraction Operation	Excavation	1.7 km northwest	Test excavation program undertaken on basis of earlier preliminary site survey, which identified three isolated artefacts and the potential for subsurface deposit(s) (including burials). Total of 15 trenches measuring *c*. 5 (L) x 0.6 (W) x >1 m (D) mechanically excavated across the site. No Aboriginal objects identified. Absence of Aboriginal archaeological materials attributed to age of sampled alluvium, which was suggested to post-date European settlement of the catchment.	Packard & Dunnett, 1990
L.Haglund	1992	F5 Casula Link	Survey	c.6-10 km southwest	Pedestrian survey of existing road reserve, some adjoining surfaces and margins of Hume Highway. Five previously recorded artefact	Haglund, 1992

Consultant	Year	Project	Investigation type	Location relative to the Project Site	Summary of investigation & results	Reference
					scatters revisited during survey. All identified in association with Maxwells Creek. Two areas of PAD also identified.	
ERM	2002	Rezoning of Boral Moorebank Site	Survey	1.6 km southwest	Targeted pedestrian survey of Boral's Moorebank site. Two open artefact sites, comprising one artefact scatter and one isolated artefact, identified on Georges River floodplain, within the 100 year flood line. Both located in disturbed contexts. Raw materials included silcrete and silicified tuff. Recorded silicified tuff artefacts included exhausted core.	ERM, 2002
Austral Archaeology	2003	Bankstown Airport, South East Development Precinct	Survey	0.25 km east	Pedestrian survey of South East Development Precinct. Study area divided into three survey units for the purposes of assessment, one of which (SU3) was not physically inspected due to the fact that "development had impacted on 100% of the visible ground surface" in this area (Austral Archaeology, 2003: 23). No Aboriginal sites or areas of surface archaeological potential identified during survey. Study area, in general, assessed as highly modified / disturbed.	Austral Archaeology, 2003
AHMS	2013	Redevelopment of New Brighton Golf Course and part of former Greenwood Golf Course	Survey and test excavation	2.2 km southwest	Survey and test excavation within New Brighton Golf Course and former Greenwood Golf Course. Three areas of subsurface archaeological sensitivity - designated as Sensitive Areas 1, 2 and 3 - subject to testing. Total of 56 test pits excavated across these areas. Single flaked stone artefact, comprising a small complete silcrete flake, recovered from test pit B2 in Area 3 on the Georges Creek floodplain. Artefact recovered from introduced fill layer. Coarse grey sand layer identified at depth across the Georges River floodplain (i.e., Sensitive Areas 2 and 3) interpreted as having been deposited at a time of higher sea levels around 6 ka.	AHMS, 2013

6.2.10 Project Site

Physical assessments of the Aboriginal heritage values of the Project Site to date have included visual inspections by the Gandangara Local Aboriginal Land Council (Gandangara LALC) and Everick Heritage Consultants (Everick). The results of these investigations are detailed below.

In 2013, Leda Holdings Pty Ltd (Leda) commissioned the Gandangara LALC to undertake an inspection of the then Bankstown Hyperdome Master Plan site, which effectively corresponds to the current Project Site. The Gandangarra LALC's report on this inspection, attached as Appendix B, indicates that a single potential flaked stone artefact was identified in the northeastern corner of the site, adjacent to an artificial drainage channel. This potential artefact, which has not been registered on the AHIMS database, was removed by the attending Gandangara LALC site officer or officers and placed into storage at the Gandangara LALC's site office in Liverpool. As a result of their inspection, the LALC concluded that there was a "reasonable likelihood" for the presence of Aboriginal objects in the natural soils of the subject site and recommended that Leda consider further investigation to determine the location of any such soils. The LALC further recommended monitoring of ground disturbance works in areas of natural soils and advised that the identification of any Aboriginal objects during the proposed works would require a stoppage of works and consultation with both OEH and the LALC.

As a follow-up to Gandangara LALC's 2013 site inspection, in 2015, Everick Heritage Consultants (Everick) was commissioned by Leda to undertake an Aboriginal cultural heritage assessment for the Bankstown Business Estate Master Development Plan project (Everick Heritage Consultants, 2015). As part of this assessment, a visual inspection of the Project Site was undertaken by Everick Director Tim Robins and Gandangara LALC site officer Brad Maybury on 31 August 2015. On the basis of this inspection and a desktop review of the landscape context of the Project Site, which included a consideration of the nature and extent of past ground disturbance activities across this area, Everick noted the following:

- The photograph of the potential artefact identified by the Gandangara LALC in 2013 does not permit a conclusive determination of cultural modification as only one face of the stone is shown;
- Extensive disturbance to all natural soils within the Project Area has occurred, with documented evidence of 150 000m^3 of importation activities and a further 30 000m^3 of cut and fill having been completed.
- No Aboriginal objects were identified in the area of Gandangara LALC's initial find as a result of the survey undertaken, despite high ground surface visibility conditions. Potential artefact-bearing A horizon soils in this area have been stripped and mounded on the northern boundary of the site or otherwise removed from this area. Accordingly, this area has no potential to contain further Aboriginal heritage;
- No further Aboriginal cultural heritage objects or sites were identified during survey;
- The Project Site does not contain any areas of subsurface Aboriginal archaeological potential owing to extensive disturbance of all natural soils; and
- All of the Project Site has been disturbed in a manner which constitutes 'disturbance' within the meaning of OEH's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*.

In consideration of the above, Everick concluded that further Aboriginal archaeological investigations within the Project Site were unwarranted and provided series of cautionary recommendations for Aboriginal heritage, the principal ones being the use of unexpected finds procedures for any Aboriginal objects or potential human skeletal remains identified during the proposed works. In correspondence with Everick, the Gandangara LALC reiterated their earlier recommendation for monitoring of ground disturbance works within any areas of natural soils (see Appendix C). Their advice regarding unexpected finds and consultation with OEH and LALC was likewise reiterated.

7.0 Visual Inspection

A visual inspection of the Project Site was undertaken on 18 June 2018 by AECOM archaeologist Dr Andrew McLaren. The primary purpose of this inspection, carried out under the supervision of BAL's Environment and Heritage Manager Foster Walker, was to establish whether ground disturbance works associated with the Project will, or are likely to, harm Aboriginal objects. During the visual inspection, notes were taken regarding Ground Surface Visibility (GSV), Ground Integrity (GI, i.e. land condition), Aboriginal archaeological sensitivity and impact risk. Impact risk was determined on the basis of archaeological sensitivity, as well as the nature of the proposed works.

Consistent with the findings of Everick's 2015 assessment, visual inspection confirmed that the land within the Project Site has been grossly modified as a result of historical land use activities, with the most severe impacts to the integrity of natural soil profiles occurring as a result of extensive cut-and-fill earthworks. These earthworks have substantially altered the natural topography of the site, which now consists largely of artificial landforms. Outside of obvious artificial landforms, extant land surfaces were assessed in the field as retaining little to no integrity as a result of a range of ground disturbance activities including dam construction, utility installation, the construction of buildings, carparks and truck washing facilities, erosion and levelling (inferred). GSV across the Project Site was variable but, in general, fair.

No Aboriginal objects were identified during the visual inspection nor were any areas of subsurface Aboriginal archaeological sensitivity or potential. Natural soils across the Project Site are inferred to have been buried, removed or otherwise grossly disturbed.

Plate 1: View toward artificial platform mound in southeastern portion of site (Source: A.McLaren, 2018)

Plate 2: Sectional view of artificial platform mound housing the aviation museum (Source: A.McLaren, 2018))

Plate 3: Area of gully erosion adjacent to detention dam in central portion of Project Site. Note virtual absence of overlying A horizon soils in vicinity, presumably removed through earthworks (Source: A.McLaren, 2018).

Plate 4: View across artificial platform occupying northern half of Project Site (Source: A.McLaren, 2018)

Plate 5: View across part of substantial drainage channel bordering the above artificial platform to the west (Source: A.McLaren, 2018)

8.0 Key Findings

The key findings of this assessment are as follows:

1. Searches of relevant statutory and non-statutory heritage lists, registers, schedules and databases indicate that the Project Site does not contain any registered sites of Indigenous significance (as defined under Section 5.01 the Airport Regulations 1997);
2. The visual inspection undertaken for this assessment confirms Everick's (2015) earlier finding that land within the Project Site has been grossly modified as a result of historical land use activities, with the most severe impacts to the integrity of natural soil profiles occurring as a result of extensive cut-and-fill earthworks;
3. Natural soils across the Project Site are inferred to have been buried, removed or otherwise grossly disturbed.
4. No Aboriginal objects were identified during the visual inspection component of this assessment;
5. In view of findings (1) through (4), the subsurface Aboriginal archaeological potential or sensitivity of land within the Project Site is considered to be negligible.

9.0 Recommendations

On the basis of the above key findings, the following recommendations are made:

1. No further Aboriginal heritage works or reporting are considered warranted for the Project;
2. In the unlikely event that Aboriginal objects, including possible human remains, are identified at any point during the life of Project, the procedure outlined in Appendix D should be followed.
3. Although considered unlikely, should ground disturbance works associated with the Project intercept any areas of natural soils across the Project Site, the Gandangara LALC should be notified as soon as practicable and afforded the opportunity to inspect these areas for Aboriginal objects. Should any such

objects be identified, the procedure outlined in Appendix D should be followed. This recommendation is in keeping with the Gandangara LALC's previous recommendation for monitoring in areas of natural soils.

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Yours faithfully,

Dr Andrew P McLaren
Archaeologist
andrew.mclaren@aecom.com

Mobile: 0403 753 165
Direct Dial: +61 2 8934 0547
Direct Fax: +61 2 8934 0001

Appendix A: AHIMS Search Results

AHIMS Web Services (AWS)

Search Result

Purchase Order/Reference : 60569579

Client Service ID : 351296

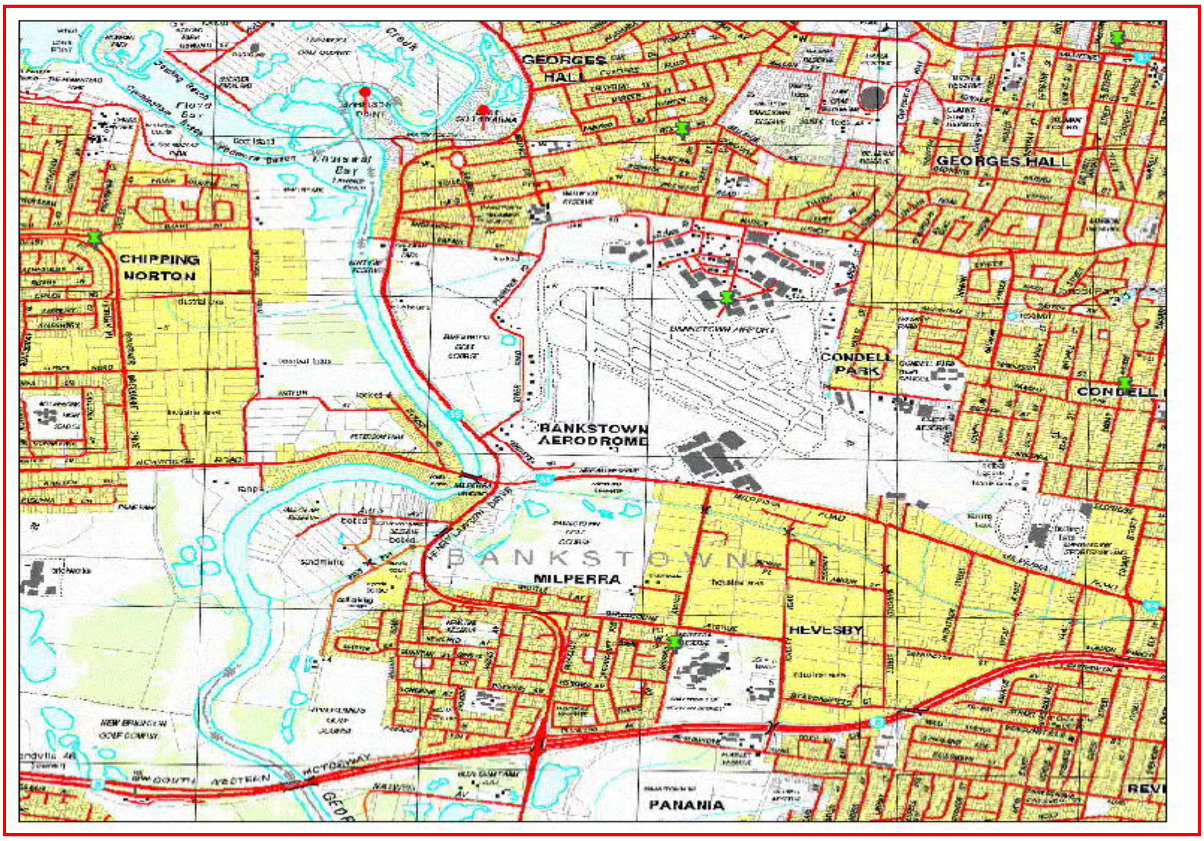
AECOM Australia Pty Ltd (previously HLA-Envirosciences)
Level 21 420 George Street
SYDNEY New South Wales 2000
Attention: Andrew Peter Mclaren
Email: andrew.mclaren@aecom.com

Date: 15 June 2018

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 311249 - 316249, Northings : 6241722 - 6246722 with a Buffer of 0 meters. Additional Info : Due Diligence Assessment, conducted by Andrew Peter Mclaren on 15 June 2018.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

19	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 60569579

Client Service ID : 351296

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-0837	Toll Plaza Site 1;TPS 1;	AGD	56	311900	6241580	Open site	Valid	Artefact : -	Open Camp Site	2132
	Contact	**Recorders**	F Cain					**Permits**		
45-5-3209	SPL 2	AGD	56	313051	6241800	Open site	Valid	Modified Tree (Carved or Scarred) : 2		
	Contact Searle	**Recorders**	Biosis Pty Ltd - Sydney					**Permits**		
45-5-3210	SPL 3	AGD	56	313187	6241793	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact Searle	**Recorders**	Biosis Pty Ltd - Sydney					**Permits**		
45-5-4814	Scar Tree 11	GDA	56	312550	6242220	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4816	Scar Tree 8	GDA	56	312672	6242236	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4817	Scar Tree 9	GDA	56	312672	6242225	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4818	Scar Tree 10	GDA	56	312560	6242248	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4819	Riverlands Scar Tree 7	GDA	56	312704	6242251	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4822	Riverlands Scar Tree 1	GDA	56	312771	6242427	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4823	Riverlands Scar Tree 2	GDA	56	312770	6242434	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		

Report generated by AHIMS Web Service on 15/06/2018 for Andrew Peter Mclaren for the following area at Datum :GDA, Zone : 56, Eastings : 311249 - 316249, Northings : 6241722 - 6246722 with a Buffer of 0 meters. Additional Info : Due Diligence Assessment. Number of Aboriginal sites and Aboriginal objects found is 19

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4824	Riverlands Scar Tree 3	GDA	56	312759	6242392	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4825	Riverlands Scar Tree 4	GDA	56	312750	6242402	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4826	Riverlands Scar Tree 5	GDA	56	312745	6242310	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4827	Riverlands Scar Tree 6	GDA	56	312736	6242256	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4828	Riverlands Scar Tree 13	GDA	56	312722	6242511	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4829	Riverlands Scar Tree 12	GDA	56	312732	6242569	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4830	Riverlands Scar Tree 14	GDA	56	312718	6242459	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4831	Riverlands Scar Tree 15	GDA	56	312712	6242455	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		
45-5-4832	Riverlands Scar Tree 16	GDA	56	312649	6242331	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103636
	Contact	**Recorders**	Dummy Organisation for AHIMS APP Users,Doctor.Paul Wynn					**Permits**		

Report generated by AHIMS Web Service on 15/06/2018 for Andrew Peter Mclaren for the following area at Datum :GDA, Zone : 56, Eastings : 311249 - 316249, Northings : 6241722 - 6246722 with a Buffer of 0 meters. Additional Info : Due Diligence Assessment. Number of Aboriginal sites and Aboriginal objects found is 19

Appendix B: 2013 Gandangara LALC Correspondence with LEDA

GANDANGARA
local aboriginal land council

Gemma Wawn
Development Manager
Leda Holdings Pty Ltd
Level 11, 5 Hunter Street
SYDNEY NSW 2000

Date: 5 November 2013

Via email and Post: *g.wawn@ledaholdings.com.au*

Dear Ms Wawn,

RE: Aboriginal Assessment - Proposed Bankstown Hyper Dome, Bankstown Airport (*Updated*)

We write in regard to the Gandangara Local Aboriginal Land Council (**GLALC**) conducting a cultural heritage inspection on Wednesday 21 August 2013, to the above mentioned property to consider any Aboriginal heritage concerns for the properties.

As you may be aware, the GLALC was established and operates within the provisions of the NSW *Aboriginal Land Rights Act 1983* ("ALRA") and currently represents a membership of 631 Aboriginal persons who reside within or have an association with the GLALC area. In accordance with Section 52 of the ALRA the GLALC has a statutory function to "*take action to protect the culture and heritage of Aboriginal persons in the Council's area*".

The GLALC understands that the proponent proposes to undertake an extensive development on the property for mixed use purposes. Due to the current surface of the property being covered in grass and imported fill, the assessment of the likelihood of Aboriginal sites being present on the site was limited. However, during the inspection a single Aboriginal artifact was discovered in the eastern corner of the site close to an exposed drainage "cut" (location indicated at **Annexure A**).

The stone artifact located on the property is possibly a silcrete flake (photo attached at **Annexure B**) and is in a fair condition. The stone artefact is currently securely stored at the Gandangara office at 103 Moore Street, Liverpool NSW.

Given the close proximity to a natural waterway and the presence of a single artifact, we have concluded that there is a reasonable likelihood of Aboriginal objects being present in the natural soils located on the property.

The GLALC recommend the following:

Recommendation 1:

The GLALC advises that Leda Holdings consider further Archaeological investigation to determine the location of the natural soils and the likelihood of Aboriginal objects being present on the property.

Recommendation 2:

The GLALC be present in the any ground disturbance works that takes place within the natural soils on the property, to determine if any Aboriginal objects are present in the proposed works area.

Recommendation 3:

The GLALC advises that if any Aboriginal objects (such as human or animal bone, shell material or stone artefacts) are unearthed during the proposed works, all works must cease and the NSW Office of Environment and Heritage and GLALC be contacted immediately.

If you would like to discuss this issue further please don't hesitate to contact the GLALC office on 9602 5280 during business hours.

Yours sincerely,

Mikael Smith
Chief Operating Officer

Enc:

1. Annexure "A" – Map – Approximate site location of Artefact
2. Annexure "B" – Indicative measurement of Artefact

Appendix C: 2015 Gandangara LALC Correspondence with Everick Heritage Consultants

Tim Robins

From: Brad Maybury <BMaybury@glalc.org.au>
Sent: Wednesday, 7 October 2015 2:12 PM
To: Tim Robins
Subject: RE: Bankstown Airport Business Estate

Follow Up Flag: Follow up
Flag Status: Completed

Hi Tim,

Bankstown Airport Business Estate Recommendation:

That Gandangara LALC be present in any ground disturbance work that takes place within the natural soils on the property by way of a visual inspection, to determine if any Aboriginal objects are present in the proposed work area.

The GLALC advises that if any Aboriginal objects such as human or animal bones, shell material or stone artefacts are unearthed during the proposed work, all work must cease and the NSW Office of Environment and Heritage be contacted immediately.

Also, can you send through the details for invoicing please.

Regards
Brad Maybury
Cultural and Heritage Officer -Gandangara Local Aboriginal Land Council
103 Moore St LIVERPOOL, NSW, 2170 I PO Box 1038 Liverpool BC 1871
Ph: (02) 9602 5280 I Fax: (02) 9602 2741E BMaybury@glalc.org.au. www.glalc.org.au
Think Green - please consider the environment before printing this email

I acknowledge the Traditional Custodians of this land and pay my respects to Elders both past and present.

Marumali: 02 9602 9677
114 Family Practice: 02 9601 0700
Gandangara Transport Services: 02 9608 0968

From: Tim Robins [mailto:t.robins@everick.net.au]
Sent: Wednesday, 30 September 2015 2:43 PM
To: Brad Maybury
Subject: RE: Bankstown Airport Business Estate

Hi Brad,

I just write to confirm our meeting tomorrow at 11.30am. I look forward to meeting you then.

Regards,

Tim Robins BA(Hons), LLB, Grad Dip Legal Prac.

Appendix D: Unexpected finds procedures for Aboriginal objects and potential human skeletal remains

Management of Previously Unrecorded Aboriginal Objects

Should a suspected Aboriginal object be identified at any point throughout the life of the Project, the following standard procedure should be adopted:

1. All works in the immediate vicinity of the find must cease immediately;
2. An Exclusion Zone of at least 10 m should be established around the find and demarcated using temporary high-visibility fencing or the like;
3. BAL's Environment and Heritage Manager should be notified of the find;
4. A suitably qualified Aboriginal heritage specialist should be engaged to inspect and identify the find;
5. If confirmed as an Aboriginal object, the Gandangara LALC should be notified and afforded the opportunity to inspect the find and terrain surrounding it (subject to OH&S requirements);
6. A meeting of BAL, the Gandangara LALC and the Aboriginal heritage specialist should convened within 48 hours to discuss and agree on an appropriate management strategy for the object;
7. If archaeological salvage is required, this should occur within 72 hours of (6); and
8. Upon completion of salvage works, an AHIMS site card and Aboriginal Site Impact Recording form (ASIR form) should be prepared and submitted to the AHIMS registrar as soon as practicable.

Human Skeletal Remains

In the event that potential human skeletal remains are identified at any point during the life of the drilling program, the following standard procedure should be followed.

1. All work in the vicinity of the remains should cease immediately;
2. The location should be cordoned off and the NSW Police notified.
3. If the Police suspect the remains are Aboriginal, they will contact the Office of Environment and Heritage and arrange for a forensic anthropologist or archaeological expert to examine the site.

Subsequent management actions will be dependent on the findings of the inspection undertaken under Point 3.

- If the remains are identified as modern and human, the area will become a crime scene under the jurisdiction of the NSW Police;
- If the remains are identified as pre-contact or historic Aboriginal, OEH and the Gandangara LALC are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy will be developed in consultation with OEH and the Gandangara LALC;
- If the remains are identified as historic non-Aboriginal, the site is to be secured and the NSW Heritage Division contacted; and
- If the remains are identified as non-human, work can recommence immediately.

AECOM Imagine it. Delivered.

South-West Precinct Site works and
Warehouse Major Development Plan
Bankstown Airport Limited
16-Jul-2018

Statement of Heritage Impact

Bankstown Airport - South-West Precinct Site works and Warehouse Major Development Plan

Statement of Heritage Impact

Bankstown Airport - South-West Precinct Site works and Warehouse Major Development Plan

Client: Bankstown Airport Limited

ABN: 50 083 058 637

Prepared by

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16-Jul-2018

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Ref	6056979
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Reviewed by	Luke Kirkwood

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Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	07-May-2018	For client review	Dr Susan Lampard Senior Heritage Specialist	S. Lampard.
B	16-Jul-2018	Final	Dr Susan Lampard Senior Heritage Specialist	S. Lampard.

Table of Contents

Executive Summary

Bankstown Airport Limited (BAL) and Altis Property Partners (APP) propose the development of approximately 40 hectares of land within Bankstown Airport. Due to its history and the scale of development proposed, a Major Development Plan (MDP) is required to be prepared and approval in accordance with the requirements of the *Airports Act 1996*. Bankstown Airport has been identified as meeting the criteria for listing on the Commonwealth Heritage List (CHL) constituted under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the draft *Bankstown Airport: Heritage Management Plan* (AECOM, 2018). This Statement of Heritage Impact (SoHI) therefore is required to determine whether the proposal would constitute a significant impact to the heritage values of Bankstown Airport identified within the endorsed Heritage Management Strategy (HMS) (Godden Mackay Logan, 2005) and the draft Heritage Management Plan (HMP). This SOHI will accompany the MDP application for approval by the Minister for Infrastructure and Transport.

The Project site is located in the south western corner of Bankstown Airport. The Project site is largely underdeveloped – there being a small number of 1980s and 1990s hangars of no heritage significance. Also contained within the Project site is the Australian Aviation Museum (AAM), which is housed in a relocated Bellman hangar. The hangar is not related to the World War II development or use of the site, having been relocated to Bankstown around 1994, and therefore does not contribute to the heritage significance of Bankstown Airport. This Bellman hangar is owned by AAM, who should satisfy themselves as to the heritage significance of this hangar and develop appropriate mitigation measures.. Likewise, while not within the ownership of BAL, the collection of the Australian Aviation Museum is likely to hold heritage significance. No identified heritage items in the ownership of BAL are located within the Project site.

No impacts to identified heritage items have been identified associated with the MDP and as MDP does not contravene the endorsed HMS or the draft HMP, it is therefore considered that the MDP would not impact on the heritage values of the Bankstown Airport. Should the MDP be approved, BAL should endeavour to ensure the collection and, if significant, Bellman hangar owned by AAM is relocated to a suitable, safe location where they can be accessed by the public.

1.0 Introduction

1.1 Purpose of the Heritage Impact Assessment

Bankstown Airport Limited (BAL) and Altis Property Partners (APP) propose the development of approximately 40 hectares of land within Bankstown Airport (Project site). Due to its history and the scale of development proposed, a Major Development Plan (MDP) is required to be prepared and approval in accordance with the requirements of the *Airports Act 1996*. Bankstown Airport has been identified as meeting the criteria for listing on the Commonwealth Heritage List (CHL) constituted under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the draft *Bankstown Airport: Heritage Management Plan* (AECOM, 2018). This Statement of Heritage Impact (SoHI) therefore is required to determine whether the proposal would constitute a significant impact to the heritage values of Bankstown Airport identified within the Heritage Management Plan (HMP). This SOHI will accompany the MDP application for approval by the Minister for Infrastructure and Transport.

The Indigenous archaeological potential of the area is addressed separately (Everick Heritage Consultants, 2018b, 2018a).

1.2 Project Description

Bankstown Airport is Sydney's major general aviation airport. It is the third most active general aviation facility in Australia and the fifth most active overall. It caters for charter and private business flights, flight training, freight, emergency and aeromedical services and recreational flights. It operates on a 24/7 basis and currently averages around 220,000 movements per annum with capacity for up to 450,000.

The Site Works and Warehouse MDP cover an area of approximately 40 hectares. Bankstown Airport Limited (BAL)/Altis Property Partners (APP) propose to develop this area. Due to its history and the scale of development proposed, a Major Development Plan (MDP) is required to be prepared and approval in accordance with the requirements of the *Airports Act 1996* (refer Section 2.1.2.1).

When fully developed, the MDP would allow for the development of approximately 150,000 square metres of light industrial Gross Floor Area (GFA), approximately 10,000 square metres of additional retail GFA, and a refurbishment and repositioning of the existing retail offering.

The Site Works and Warehouse MDP includes:

- An overall development concept for the Logistics Hub, addressing site wide drainage, site works, external road connections, internal road and allotment layouts
- An initial stage of light industrial development of up to 40,000 square metres (gross leasable floor area)

As part of this process, it is proposed to close out the existing Work Permits relating to the platform, stockpile, drainage and borrow pits, etc.

1.3 Site Location

Bankstown Airport is located within the Bankstown Local Government Area (LGA), in the Parish of Bankstown, County Cumberland. Bankstown Airport is bound on the south by Milperra Road, on the west by the Riverwood Golf Course, on the north by Link Road and Marion Street and on the east by Birch Street, Wackett Street, Deverall Park and the Bankstown Trotting Club. The location and boundaries are shown in Figure 1.

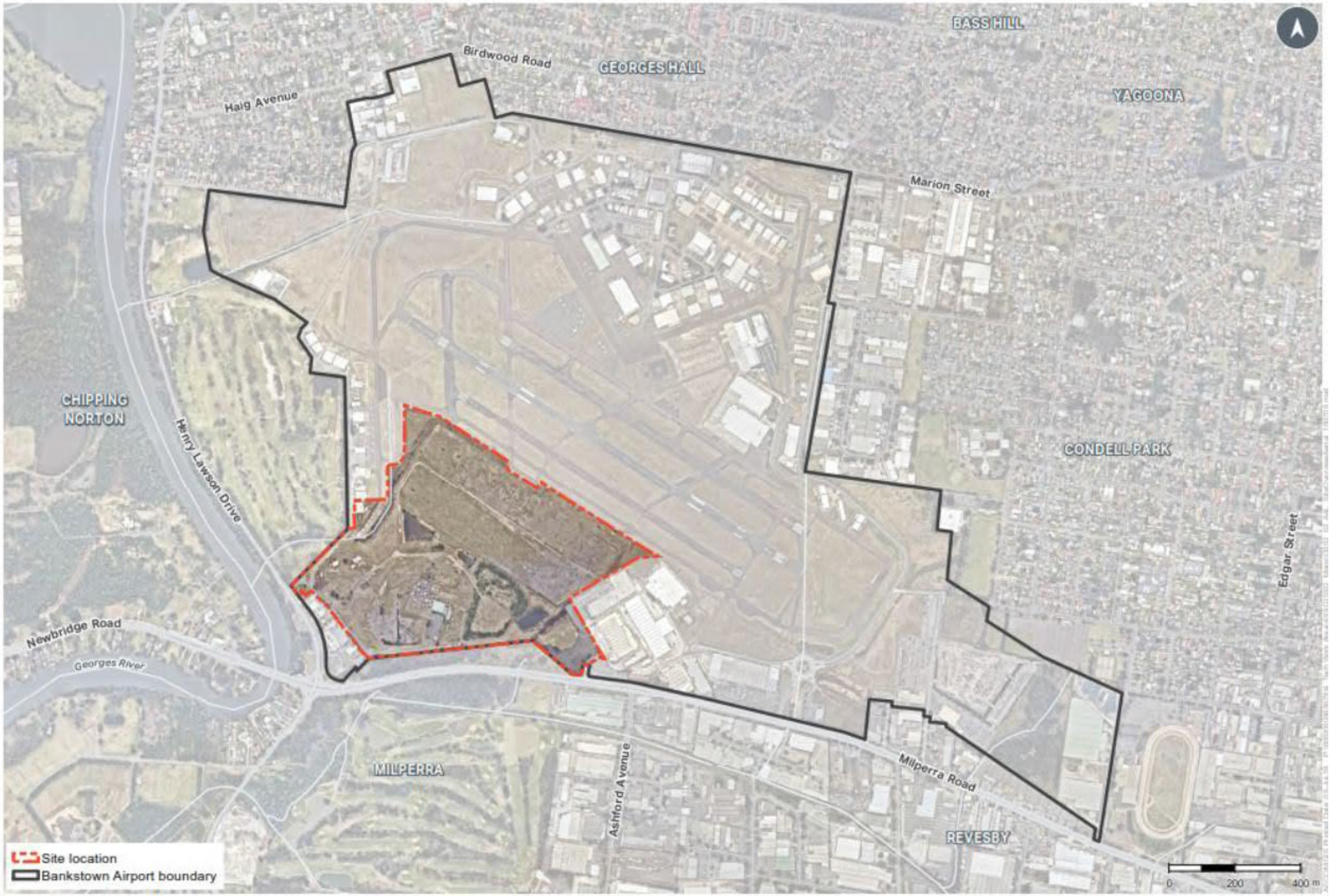


Figure 1 Location and boundaries of Bankstown Airport

1.4 Heritage Status

Bankstown Airport, as a whole, is listed on one statutory heritage register: the *Bankstown Local Environmental Plan 2015* (LEP) as item #I18. As Bankstown Airport is Commonwealth land, the LEP poses no statutory constraints.

Bankstown Airport Air Traffic Control Tower is listed on the Commonwealth Heritage List (Place ID #106118 Department of the Environment and Energy (Comm), 2016) as an individual item of significance within the Bankstown Airport. The identified heritage values of the Tower are managed under a HMP (Lovell Chen, 2017). The Bankstown Airport Air Traffic Control Tower falls outside the Project site.

Bankstown Airport is also identified as an Indicative Place on the non-statutory Register of the National Estate (RNE) (Place ID#103900). Identification on the RNE does not impose any statutory constraints.

1.5 Methodology

The SOHI relies on the information contained within the HMP. As such, no additional research was undertaken. The following tasks were completed:

- Familiarisation with the MDP and Project site;
- Site inspection to confirm values of the Project site;
- Assessment of impacts associated with the options using the guideline *Significant Impact Guidelines 1.2: Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* (Department of Sustainability Environment Water Population and Communities, 2013);
- Consideration of appropriate mitigation measures (if required); and
- Summarisation of the above into a plain-English report.

1.5.1 Significance Assessment Under the EPBC Act

The assessment of heritage significance has been undertaken using the EPBC Act heritage significance criteria, as outlined in Table 1. The EPBC Act requires the assessment of the natural, Indigenous and historical values of a place. The assessment was undertaken using the guideline "*Identifying Commonwealth Heritage Values and Establishing a Heritage Register: A guideline for Commonwealth agencies*" (Australian Heritage Council, 2010).

Table 1 EBPC Act heritage significance criteria

Criterion A *The place has significant heritage value because of the place's importance in the course or pattern of Australia's natural or cultural history.*
Criterion B *The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.*
Criterion C *The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.*
Criterion D *The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:* *i. A class of Australia's natural or cultural places; or* *ii. A class of Australia's natural or cultural environments.*
Criterion E *The place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.*
Criterion F *The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.*
Criterion G *The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.*
Criterion H *The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.*
Criterion I *The place has significant heritage value because of the place's importance as part of Indigenous tradition.*

1.5.2 Impact assessment

The Department of Sustainability Environment Water Population and Communities (2013:11-13) provides guidance on how to judge the severity of impacts. It is necessary to collectively consider the likelihood, scale, intensity, duration and frequency of impacts. The following categories are provided to make a distinction between different levels of severity:

- Severe: Severe impacts generally have two or more of the following characteristics: permanent/ irreversible; medium-large scale; moderate-high intensity.
- Moderate: Moderate impacts generally have two or more of the following characteristics: medium-long term; small-medium scale; moderate intensity.
- Minor: Minor impacts generally have two or more of the following characteristics: short term/ reversible; small-scale/localised; low intensity.

This Statement of Heritage Impact (SoHI) has used the NSW *Statements of Heritage Impact* (NSW Heritage Office, 2002) to formulate the heritage impact statement provided in Section 0.

1.6 Documentation and References

BAL has engaged AECOM to prepare a new HMP (AECOM, 2018). This HMP will replace the current Heritage Management Strategy (HMS) (Godden Mackay Logan, 2005). As such, this SoHI references both the HMS and the HMP.

1.7 Acknowledgments

AECOM would like to acknowledge the assistance of BAL Environment and Heritage Manager in the preparation of this report.

2.0 Statutory Controls

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) defines ‘environment’ as both natural and cultural environments and therefore includes Indigenous and non-Indigenous cultural heritage items. Under the EPBC Act, protected heritage items are listed on the National Heritage List (NHL) (items of significance to the nation) or the Commonwealth Heritage List (CHL) (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). The RNE has been suspended and is no longer a statutory list; however, it remains as an archive.

The EPBC Act requires actions on Commonwealth land (Section 26) and actions undertaken by a Commonwealth agency (Section 28) be assessed for the likelihood that these actions will have a significant impact on the environment. The term ‘environment’ has a broader coverage relates to environmental matters, including heritage, that are not necessarily formally listed.

Any actions which will, or are likely to significantly impact the environment need to be assessed. If potentially significant impacts are identified, opportunities for their avoidance, reduction or management must be sought. A referral under the EPBC Act may also need to be considered.

The operation of the EPBC Act is modified when the site in question is a Commonwealth listed airport by the *Airport Act 1996*. The interaction between the EPBC Act and the *Airport Act 1996* is outlined in Section 2.1.2.

2.1.2 Airports Act 1996

The *Airports Act 1996* regulates all airport activity within Australia and its territories. The corresponding *Airports (Environment Protection) Regulations 1997* outline the environmental impact management requirements for the development and operation of all privatised airports throughout Australia. These regulations:

- set standards and impose duties relating to environmental pollution;
- authorise the monitoring and remediation of breaches of environmental standards;
- support better environmental outcomes on leased Commonwealth airports and
- ensure that proper assessment process is undertaken for any Commonwealth property with heritage values, or potential for heritage significance.

Bankstown Airport Limited (BAL) is also required, under the Act, to prepare a five year plan for the management of environmental issues that arise from the operation of and activities at Bankstown Airport. BAL is also required to prepare an Environmental Strategy addressing sustainability, environmental management and reporting. Bankstown Airport currently has in place an Environmental Management System (EMS) which details the practices and procedures by which Bankstown Airport maintains and protects the quality of the natural, built and social environment. This includes a *draft Heritage Management Plan* (AECOM 2018).

Under the Airport Act, major development requires the preparation of a MDP, which is approved by the Australian Government minister responsible for the transport portfolio. The requirement under the EPBC Act for approval of actions on Commonwealth land that are likely to have a significant impact on the environment, does not apply in relation to development carried out under an approved MDP. That is, an action which is the subject of a MDP, does not need to be referred under the EPBC Act.

However, under section 160 of the EPBC Act, the Australian Government transport minister is required to seek the advice of the Australian Government minister responsible for the environment portfolio before approving a MDP. The transport minister must refer the MDP to the environment minister prior to the required public consultation period. During the consultation period, the environment minister provides advice on the approach to the assessment of the impacts of the proposal under the EPBC Act. Following the public comment period, any additional documentation regarding the potential environmental impacts is assessed by the transport minister, who must inform the environment minister the outcome of the decision and how the environment minister’s advice was taken into account (Department of Sustainability Environment Water Population and Communities, 2013:Appendix D)

2.1.2.1 Major Development Plan Approvals Process

The *Airports Act 1996* requires BAL to prepare a Major Development Plan (MDP) for the Minister of Infrastructure and Regional Development to approve, or refuse to approve, for certain works as described in the Act, prior to commencing work. Under section 89 of the Act, the Project qualifies as a Major Airport Development, which is a project requiring a MDP, because it involves the construction of a building where the cost of the building exceeds $20 million.

The requirements of a MDP and the public consultation process are described in Part 5, Division 4 of the Act. Once a draft MDP has been prepared, it must be published and generally made available for public comment for a period of 60 business days.

2.2 Other statutory considerations

New South Wales (NSW) State legislation does not apply by virtue of the site being Commonwealth land. The *Bankstown Local Environmental Plan 2015*, however, is of general relevance to the site and is therefore referenced below.

2.2.1 Bankstown Local Environmental Plan 2015

Part 5, Section 5.10 of the Bankstown LEP addresses heritage conservation within the area covered by this LEP. The objectives of the LEP are to conserve the heritage significance of heritage items within Bankstown. All heritage items listed on the LEP are included in Schedule 5. The Bankstown Airport is identified in Schedule 5 of the LEP as an item of local significance with the item number #I18. The listing imposes no statutory requirements or limitations to Commonwealth land.

2.2.2 Bankstown Airport Master Plan 2014

Since the privatisation of the Airport in 2003, two Master Plans have been prepared. The *2004/05 Bankstown Airport Master Plan* was approved on 7 March 2005. The current Master Plan was approved on 19 December 2014. This Master Plan will remain in force for a period of five years from the date of approval, or until it is replaced by the 2019 Master Plan (which is currently being prepared – see section 2.2.3).

The 2014 Master Plan outlines the strategic direction for the Airport's development over a 20 year period and details BAL’s aviation and non-aviation development concept. The 2014 Master Plan also addresses key issues such as road traffic, infrastructure, environmental management and heritage protection and provided a five year implementation plan.

The 2014 Master Plan also incorporates the following for the first time:

- A five year ground transport plan for the Airport
- A socio economic impact assessment of the Master Plan
- An Airport Environment Strategy which presented BAL's objectives for and approach to management of the environment of the Airport
- An implementation plan for the first five years of the Master Plan.

2.2.3 Draft Bankstown Airport Master Plan 2019

The draft 2019 Bankstown Airport Master Plan is being prepared in parallel to, and in alignment with, the MDP.

The draft 2019 Master Plan will set out future directions for the Airport and describes future aviation operations, use of land, investment in facilities and infrastructure, and management of environmental and noise impacts. It will also:

- Provide stakeholders with a clear statement of BAL’s vision and objectives for the Airport
- Present a land use plan which balances long term aviation requirements with new non-aviation developments

- Provide sufficient flexibility for BAL to adjust its plans to accommodate a changing commercial and operating environment.
- Reflect the local Canterbury-Bankstown Council and NSW planning frameworks

2.3 Non-Statutory Considerations

2.3.1 Register of the National Estate

The Register of the National Estate (RNE) is a list of important historic, Indigenous and natural places throughout Australia. It was a statutory register until February 2012. From February 2012 all references to the RNE were removed from the EPBC Act. The RNE is now maintained as a publicly available non-statutory archive. Bankstown Airport is identified as an Indicative Place on the RNE (Place ID#103900). Identification on the RNE does not impose any statutory constraints.

2.3.2 The Burra Charter

The Burra Charter: The Australian ICOMOS Charter for Places of Cultural Significance (ICOMOS (Australia), 2013) sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places. A copy of the charter can be accessed online at http://icomos.org/australia.

3.0 Heritage Assessment

3.1 Site Description

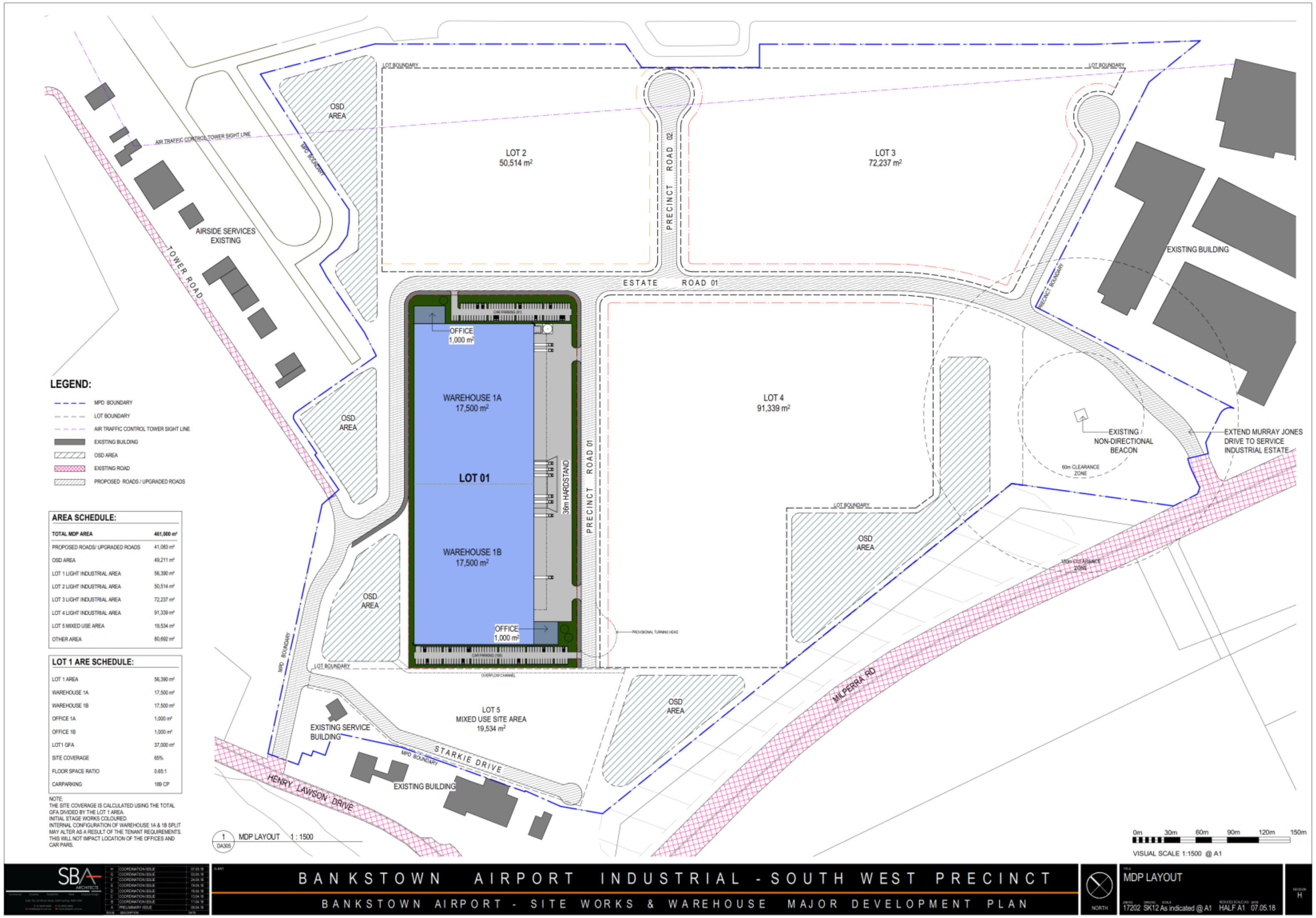
The Project site covers an area of approximately 40 hectares in the south western corner of Bankstown Airport and is adjacent to the existing road network of Henry Lawson Drive to the west via Tower Road and/or Starkie Drive, and Milperra Road to the south. The Bankstown Airport aviation zone is located immediately to the north-east and the Georges River Golf Course is located to the west (Figure 2).

Existing internal roads, services, light industrial and retail buildings are generally located outside the MDP area to the west, south-west and south-eastern sides of the site, with an existing non-directional beacon located adjacent to the proposed new Estate Road western entrance at Milperra Road.

The proposed site of the MDP has either a generally level topography or gradual developed gradients with areas consisting of both altered and natural landforms.

The majority of the site has been cleared of substantial vegetation, with some minor vegetation remaining within the eastern portion site. Existing stormwater detention basins and grassed-swales are also located within the Project site.

Identified protected heritage building items are located to the north and east of the Project site and are not affected by the proposed development. The Australian Aviation Museum (AAM) is housed within a Bellman hangar that has been relocated from a country airfield in 1994. As such, it does not pertain to the World War II history of the site and does not contribute to the heritage significance of Bankstown Airport. The hangar has not been identified as holding heritage value within the context of Bankstown Airport in the HMP and therefore the removal of the hangar would not constitute an impact to the heritage values of the site. The Bellman hangar and collection of the Australian Aviation Museum is not owned by BAL and was therefore outside the scope of this SoHI, however, the collection is likely to hold heritage value. It is understood that BAL is working with the AAM to relocate the Museum and its collection to a suitable location. AAM should satisfy themselves of the significance of the Bellman hangar and initiate appropriate mitigation measures.



AREA SCHEDULE:

TOTAL MDP AREA	**461,000 m²**
PROPOSED ROADS/ UPGRADED ROADS	41,083 m²
OSD AREA	49,211 m²
LOT 1 LIGHT INDUSTRIAL AREA	56,390 m²
LOT 2 LIGHT INDUSTRIAL AREA	50,514 m²
LOT 3 LIGHT INDUSTRIAL AREA	72,237 m²
LOT 4 LIGHT INDUSTRIAL AREA	91,339 m²
LOT 5 MIXED USE AREA	19,534 m²
OTHER AREA	80,692 m²

LOT 1 ARE SCHEDULE:

LOT 1 AREA	56,390 m²
WAREHOUSE 1A	17,500 m²
WAREHOUSE 1B	17,500 m²
OFFICE 1A	1,000 m²
OFFICE 1B	1,000 m²
LOT1 GFA	37,000 m²
SITE COVERAGE	65%
FLOOR SPACE RATIO	0.65:1
CARPARKING	189 CP

NOTE:
THE SITE COVERAGE IS CALCULATED USING THE TOTAL GFA DIVIDED BY THE LOT 1 AREA.
INITIAL STAGE WORKS COLOURED.
INTERNAL CONFIGURATION OF WAREHOUSE 1A & 1B SPLIT MAY ALTER AS A RESULT OF THE TENANT REQUIREMENTS. THIS WILL NOT IMPACT LOCATION OF THE OFFICES AND CAR PARS.

ISSUE	DESCRIPTION	DATE
H	COORDINATION ISSUE	07.05.18
G	COORDINATION ISSUE	03.05.18
F	COORDINATION ISSUE	24.04.18
E	COORDINATION ISSUE	19.04.18
D	COORDINATION ISSUE	16.04.18
C	COORDINATION ISSUE	13.04.18
B	COORDINATION ISSUE	11.04.18
A	PRELIMINARY ISSUE	09.04.18

Figure 2 **Proposed South Western Precinct Plan**

3.2 Historical Overview

3.2.1 General

Appendix A of the HMP (AECOM, 2018) contains a comprehensive survey of the historical development of Bankstown Airport, which, for the sake of brevity, will not be reproduced here. A brief summary is provided below, with the reader being referred to the HMP for details.

The earliest recorded exploration of the Bankstown area by Europeans occurred in October of 1795 when Matthew Flinders and George Bass piloted the 'Tom Thumb' up the Georges River (Flinders, 1814). Land grants were given in the following years. Early settlers had disputes with the Aboriginal inhabitants, with attacks on the settlers at Bankstown and Liverpool. After an attack on Frederick Meredith and William Bond on their land grants near Punchbowl in 1809, there were reprisals, notably a massacre at Cataract Gorge in 1816, after which the remaining Aboriginals fled to the Burragorang Valley (Kass, 2005).

The river provided access for small boats to the Liverpool area (Keating, 1996), but in general development of Bankstown was quite slow: the area was not as fertile as for example Parramatta and Camden. The railway came to Bankstown in 1909, more than fifty years after it reached Parramatta and Liverpool. The suburb developed after World War I (NSW Heritage Office, 2003:9), clustered around the railway station, but the site of the later aerodrome remained rural. Some areas were heavily timbered and there were a few market gardens, dairies and poultry farms (Brew, 2001:Appendix G:59).

The development of an aerodrome at Bankstown was suggested as early as 1929 (The Sun, 4 September 1929:14). Mascot at the time, was small and surrounded by swamps, but the need became urgent at the outbreak of World War II. The formal proclamation of the Bankstown airfield project occurred under the *National Security Act* on 7 June 1940.

The station itself was formed as a separate entity on 2 December 1940, when RAAF Headquarters was established at Bankstown in order to control operations at the new air base and `take charge of works and facilities'. This was quartered in the first section of the Airport Avenue building, the present day Building 62.

In mid-1940, tenders were issued for 28 new buildings to be erected by the end of July 1940, as outlined in a memorandum dated 2 June 1940. The buildings were numbered 1, 9-10, 14, 15, 21-31, 34, 36-27A, 39-40, 42-44, 48, 58, 60 and 62. It would appear that work was carried out in two stages. The first stage was to be completed by the end of July 1940 and the second stage by 15 August 1940. Tenders for the first three Bellman hangars (15, 16, 17) were submitted in September 1940 (Beudeker, 2003:10).

The most important early unit at Bankstown was No 2 Aircraft Park, established for the assembly of aircraft. The nucleus of this was formed from No 1 Aircraft Park at Laverton on 1 May 1940. It moved to Bankstown on 19 December 1940. Aircraft Parks were establishments where aircraft, having been assembled, were stored pending dispatch to squadrons or training units.

The first dismantled aircraft – 13 Avro Ansons – arrived on 12 January 1940, and were erected in the erection hangar. This was done even before the hangar was itself completed (on 3 March 1940), when the first Bellman Hangar (Hangar 15) was also completed. The Bellman Hangar was erected in 20 days.

Bankstown also housed British and United States military facilities during the war, however, its greatest contribution to the war effort remained the assembly of aircraft.

Following the end of World War II, Bankstown Airport was determined to be surplus to Defence requirements and was transitioned into a civilian airfield. During World War II a civilian aviation industry had been established to support the war effort and this industry was ideally placed to take advantage of the growing demand for air travel and pilot training. Bankstown Airport remains important to these two functions.

3.2.2 South West Precinct

On resumption for aviation purposes at the outbreak of World War II, the Project site was cleared. An aerial from 1943 indicates that the land was largely unused – there are several small structures, which were probably part of the camouflage trials that were undertaken at the site (AECOM, 2018: Appendix A) (Figure 3). These features fall outside of the Project site. Subsequent aerials indicate the area was kept clear of vegetation, but was never heavily utilised (Figure 4, Figure 5). The Bankstown Airport Control Tower was constructed to the north of the MDP area in 1969, coming in to commission in 1970 (Lovell Chen, 2017). The Georges River Golf Course was established to the north west in the late 1970s, while on the Project site, a small number of hangars were built around the periphery. The Australian Aviation Museum was opened by then Prime Minister Paul Keating in 1994 (Museums & Galleries of NSW, 2018). AAM was established in a Bellman hangar that was relocated from an unknown country airfield .

In summary, no substantial historical uses of heritage significance have been identified within the Project site.

Figure 3 1943 aerial showing location of MDP. Source: Six Maps

Figure 4 **1961 aerial showing location of MDP. Source: provided by BAL**

Figure 5 **1980 aerial showing location of MDP. Source: provided by BAL**

3.3 Assessment of Heritage Significance

The Bankstown Airport HMP has assessed the heritage significance of the site as a whole. This assessment can be found within the HMP. Within the context of this impact assessment for the MDP, it is considered appropriate to assess the heritage significance of the Project site in isolation from the broader site.

Table 2 Heritage Values Significance Assessment Summary of the Project site against EPBC Act criteria

Criterion	Historical Heritage
Criterion A *The place has significant heritage value because of the place's importance in the course or pattern of Australia's natural or cultural history*	The Project site **DOES NOT MEET** Criterion A at a Commonwealth level for historical heritage values. The Project site was resumed as part of the World War II Bankstown Airport facilities, but were never used to any significant degree until the 1980s and 1990s. The provenance of the relocated Bellman hangar in which the AAM is housed is unknown and cannot therefore be considered to hold heritage value within the context of Bankstown Airport. As an Bellman hangar, it may hold individual significance. The AAM should satisfy itself of the significance of the hangar, such an assessment being outside the scope of BAL's responsibilities. The Project site contains no original heritage assets.
Criterion B *The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history*	The Project site **DOES NOT MEET** Criterion B at the Commonwealth threshold. While Bellman hangars are becoming increasingly rare and uncommon, the uncertain provenance of the hangar, in conjunction with its relocation, has eroded the significance of the item to negligible. The Project site contains no heritage assets.
Criterion C *The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history*	The Project site **DOES NOT MEET** Criterion C at a Commonwealth level for historical heritage values. The Project site does not hold information that could be yielded by further study
Criterion D *The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:* i. A class of Australia's natural or cultural places; or ii. A class of Australia's natural or cultural environments	The Project site **DOES NOT MEET** criterion D at the Commonwealth threshold. The Project site contains no heritage assets.
Criterion E *The place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group*	The Project site **DOES NOT MEET** Criterion E at a Commonwealth level for historical heritage values. The Project site holds no aesthetically appealing characteristics.
Criterion F *The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period*	The Project site **DOES NOT MEET** criterion F at the Commonwealth threshold. The Project site holds no creative or technically significant elements
Criterion G *The place has significant heritage value because of the place's strong or special association with a particular community*	The Project site area **DOES NOT MEET** Criterion G at a Commonwealth level for historical heritage values. The area has not been identified as holding strong or

Criterion	Historical Heritage
or cultural group for social, cultural or spiritual reasons	special associations
Criterion H *The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history*	The Project site **DOES NOT MEET** Criterion H at a Commonwealth level for historical heritage values. The Project site has not been identified with significant persons or groups of importance to Australia's cultural history, having been sparsely used
Criterion I *The place has significant heritage value because of the place's importance as part of Indigenous tradition*	Refer to Everick 2018a and 2018b for the Indigenous values of the MDP area

3.4 Statement of Heritage Significance

Bankstown Airport was established as part of the Australian response to the outbreak of World War II. Hangars relating to the World War II operations are present within the Airport Business Zone, particularly at the southern end of Airport Avenue, Gipsy Road, Kestrel Place, Cirrus Place, Rearwin Place and Druine Place. The draft *Heritage Management Plan* (AECOM 2018) indicates that the site meets the criteria for listing on the Commonwealth Heritage List.

Section 3.3 assessed the Project site in isolation from Bankstown Airport more broadly and determined that the Project site holds no historical heritage significance under any of the criteria established under the EPBC Act. The Bellman hangar, erected at the site in the early 1990s is owned by AAM and is outside the direct responsibility of BAL. As a non-original hangar, with no direct links to the World War II development or use of the site, the removal of the hangar would not impact on the heritage values of Bankstown Airport. The hangar may have individual significance, which should be investigated and appropriately managed by AAM.

4.0 Heritage Impacts Analysis

4.1 Description of the Proposal

The Site Works and Warehouse MDP covers an area of approximately 40 hectares. Bankstown Airport Limited (BAL)/Altis Property Partners (APP) propose to develop this area. Due to its history and the scale of development proposed, a Major Development Plan (MDP) is required to be prepared and approval in accordance with the requirements of the *Airports Act 1996*.

When fully developed, the MDP would allow for the development of approximately 150,000 square metres of light industrial Gross Floor Area (GFA), approximately 10,000 square metres of additional retail GFA, and a refurbishment and repositioning of the existing retail offering.

The Site Works and Warehouse MDP includes:

- An overall development concept for the Logistics Hub, addressing site wide drainage, site works, external road connections, internal road and allotment layouts
- An initial stage of light industrial development of up to 40,000 square metres (gross leasable floor area)

As part of this process, it is proposed to close out the existing Work Permits relating to the platform, stockpile, drainage and borrow pits, etc.

4.2 Impact Assessment

The MDP would result in the removal of the existing hangars constructed in the 1980s and 1990s and the relocation of the AAM Bellman hangar and its collection. As a non-original hangar, with no direct links to the World War II development or use of the site, the removal of the hangar would not impact on the heritage values of Bankstown Airport. The hangar may have individual significance, which should be investigated and appropriately managed by the owner, AAM. As no heritage values have been identified within the Project site, there would be no heritage impacts.

Further, the MDP does not contravene the heritage management policies contained within the HMS and draft HMP.

Policies within the HMS that permit development of the Project site include:

- The management, development and ongoing use of Bankstown Airport should respect all identified heritage values (Godden Mackay Logan, 2005:77).
    - No identified heritage values would be impacted by the MDP.
- Future development concepts and options for Bankstown Airport should respect and appropriately conserve identified heritage values as expressed and embodied in the site as a whole and significant elements (Godden Mackay Logan, 2005:77).
    - No identified heritage values associated with the site as a whole or significance elements would be impacted by the MDP.

Policies within the draft HMP that permit development within the Project site include:

- Policy 5 - Consider the heritage values of Bankstown Airport when considering changes to the Airport. When planning changes to Bankstown Airport, every attempt should be made to avoid impacting items identified as of high and moderate heritage significance.
    - The MDP avoids impacts to any items of identified heritage significance, not just those of high and moderate heritage significance;
- Policy 6 - Proposed changes or development should be considered within the context of Bankstown Airport as a whole. Piecemeal or incremental change must be avoided. Future site development and expansion of Bankstown Airport should be based on sound urban design and planning principles where cultural heritage resources are taken into account and the amenity of Bankstown Airport and its intrinsic urban qualities are further enhanced.

  - The Bankstown Airport Master Plan ensures that development at Bankstown Airport is considered as a whole and is not piecemeal or incremental.
- Policy 38 - New buildings and facilities should be placed to limit the impact on the heritage significance of Bankstown Airport.
  - The policy references a figure showing areas appropriate for development (figure number to be finalised), which includes the Project site. The Project site is therefore an appropriate location for the development of the MDP;
- Policy 40 - All new development must be subject to a Statement of Heritage Impact and should seek to minimise impacts to the heritage significance of Bankstown Airport.
  - This document is the required Statement of Heritage Impact, which concludes the impacts on the significance of Bankstown Airport have been avoided.

4.3 Heritage Impact Statement

No impacts to identified heritage items have been identified associated with the MDP. The MDP does not contravene the endorsed HMS or the draft HMP. It is therefore considered that the MDP would not impact on the heritage values of the Bankstown Airport.

4.4 Mitigation and Management

While outside the ownership and scope of BAL's responsibility, it has been identified that the collection of the Australian Aviation Museum probably holds heritage significance. Secondly, the relocated Bellman hangar may hold significance separate to the Bankstown Airport site. BAL should endeavour to ensure the collection and Bellman hangar, if significant, is relocated to a suitable, safe location where it can be publically accessed.

5.0 Conclusion and Recommendations

No impacts to identified heritage items have been identified associated with the MDP and as MDP does not contravene the endorsed HMS or the draft HMP, it is therefore considered that the MDP would not impact on the heritage values of the Bankstown Airport. Should the MDP be approved, BAL should endeavour to ensure the AAM collection and Bellman hangar, if significant, is relocated to a suitable, safe location where it can be publically accessed.

6.0 References

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APPENDIX K

AIR QUALITY IMPACT ASSESSMENT

Bankstown Airport Ltd
26-Jun-2018

Bankstown Airport Site Works and Warehouse MDP

Air Quality Impact Assessment

26-Jun-2018
Prepared for – Bankstown Airport Ltd – ABN: N/A

Quality Information

Document Bankstown Airport Site Works and Warehouse MDP

Ref

Date 26-Jun-2018

Prepared by Paul Wenta

Reviewed by David Rollings

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
1	26-Jun-2018	Final	David Rollings Associate Director - Air Quality	

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1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was engaged to undertake a qualitative desktop Air Quality Impact Assessment (AQIA) of the proposed Bankstown Airport Southwest Precinct (the Precinct) site works and warehouse construction.

The scope of the assessment included the following:

- Identification of relevant ambient air quality criteria;
- Discussion of existing air quality based on available Office of Environment and Heritage (OEH) data;
- Discussion of local meteorology and climate conditions based on available Bureau of Meteorology (BoM) data;
- Identification of potential sources of air emissions from surrounding land uses;
- A qualitative risk assessment of particulate emissions from demolition, earthmoving and construction activities; and
- Provision of recommendations including suggestion of potential safeguards.

The AQIA has been prepared with consideration given to the following guidelines:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, 2016*. This document was generally referenced as a source of factors needing to be considered when assessing air quality projects.
- *Guidance on the assessment of dust from demolition and construction, UK Institute of Air Quality Management (IAQM), 2014*. This document provides a qualitative risk assessment process for the potential impact of dust generated from demolition, earthmoving and construction activities.

2.0 Location

The Precinct, as shown in **Figure 1** below, is located approximately 20 kilometres west southwest of the Sydney CBD, bounded by Milperra Road and Bankstown Golf Club to the south; the Georges River Golf Course, Henry Lawson Drive and the Georges River to the west; the Milperra/Revesby industrial area to the southeast; and the Bankstown airport runway and taxiways to the north and northeast. The closest residential areas to the Precinct are located approximately 275m to the southwest of the Precinct southern boundary.

Figure 1 **Location of Bankstown Airport South West Precinct**

3.0 Proposed Works

Proposed works to be carried out in the Precinct include:

- Demolition of ten existing structures (Aviation museum and redundant buildings);
- Deletion/relocation of existing utilities to allow for earthworks and site works;
- Clearing all vegetation, trees, etc. to allow for development;
- Closing out of the existing Work Permits relating to the platform, stockpile, drainage and borrow pits, etc;
- Bench and levelling of the site to create new levels for the pads, roads, detention basins etc;
- Utility servicing of the site to lot boundaries;
- Construction of a new road from Murray Jones Drive to Tower Road;
- Realignment of Starkie Drive (if necessary to maintain access for existing retail tenants); and
- Construction of new detention basins.

The scale of the proposed demolition, earthworks and construction activities are:

- Site area approximately 461,000 m^2;
- Estimated total demolition volume between 15,000 and 20,000 m^3;
- Estimated earthworks volume between 340,000 and 370,000 m^3;
- Construction of 40,000 m^2 of industrial buildings;
- Between 150 and 250 heavy vehicle movements during fill import; and
- Between 40 and 50 concrete truck deliveries during construction.

4.0 Air Quality Criteria

4.1 Principal Pollutants of Concern

Given the nature of the local area and the activities to be undertaken, the principal pollutant of concern included in this assessment is fine particulate matter.

4.1.1 Fine Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter refers to the many types and sizes of particles suspended in the air we breathe.

Particles with an aerodynamic diameter less than or equal to 10 micrometres (PM_{10}) tend to remain suspended in the air for longer periods than larger particles and can penetrate human lungs.

Particulate matter is unique among atmospheric pollutants in that it is not defined on the basis of its chemical composition; it includes a broad range of chemical species. Particulate matter can be emitted from natural sources (bushfires, dust storms and pollens) or as a result of human activities such as combustion activities (motor vehicle emissions, power generation and incineration), excavation works, bulk material handling, crushing operations, unpaved roads and use of wood heaters.

Exposure to particulate matter has been linked to a variety of health effects, including respiratory problems (e.g. coughing, aggravated asthma, chronic bronchitis) and heart attacks. If the particles contain toxic materials (such as lead, cadmium, zinc) or live organisms (such as bacteria or fungi), toxic effects or infection can occur from the inhalation of the dust.

Fine particulates (those with diameters less than or equal to 2.5 micrometres, known as $PM_{2.5}$) are typically generated from vehicle exhaust, bushfires and some industrial activities, and can remain suspended in the air for days or weeks. As these fine particulates can travel further into human lungs than the larger particulates and are often made up of heavy metals and carcinogens, fine particulates are considered to pose a greater risk to health.

4.1.2 Assessment Criteria

In order to determine the potential effects of general air quality in the air shed, ambient pollutant concentrations can be compared to relevant impact assessment criteria. In NSW, the criteria are specified in *Table 7.1; Impact assessment criteria* of the NSW Environment Protection Authority (EPA) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016) and represent maximum allowable pollution levels at the boundary of the premises. The criteria for the fine particulate matter are reproduced in **Table 1** below.

Table 1 Regulatory air quality criteria ($\mu g/m^3$)

Pollutant of Concern	Standard $\mu g/m^3$	Averaging Period	Agency
PM_{10}	50	24-hour	DoE (2016)
	25	Annual	DoE (2016)
$PM_{2.5}$	25	24 hour	DoE (2016)
	8	Annual	DoE (2016)

DoE – Department of the Environment

4.2 Air Quality Monitoring Data

The NSW EPA operates several ambient air quality monitoring sites across the Sydney region. The sites nearest to Bankstown Airport are located at Chullora (6 kilometres to the northeast) and Liverpool (7 kilometres to the west). The data from these two sites for the four year period from 2014 to 2017 is summarised in the following sections.

4.2.1 Particulate Matter (PM_{10})

Table 2 presents the PM_{10} data for the Chullora site for the years 2014 to 2017.

Table 2 Chullora EPA Monitoring Location Ambient PM_{10} Concentrations; 2014-2017

Statistic	24 hour average PM_{10} Concentration - µg/m3			
	2014	2015	2016	2017
Maximum 24 hour concentration	40.0	64.6	63.5	63.0
24 hour Criterion	50			
24 hour exceedance count	0	1	1	4
Statistic	**Annual average PM_{10} Concentration - µg/m3**			
	2014	**2015**	**2016**	**2017**
Annual Average	18.1	17.5	18.1	20.1
Annual Average Criterion	25			

The data shows no exceedances of the 24 hour criterion for 2014, one exceedance for each of the years 2015 and 2016 and four exceedances for 2017. OEH *Annual Air Quality Statements* for 2015, 2016 and 2017 indicate that the 2015 and 2016 exceedances and two of the 2017 exceedances were due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms. The 2017 *Annual Air Quality Statement* also indicates that two of the exceedances were due to non-exceptional events, one of which in March was due to a fire at a nearby recycling plant.

Annual average values show a relatively small range of concentrations with all years below the annual average criterion.

Table 3 presents the PM_{10} data for the Liverpool site for the years 2014 to 2017.

Table 3 Liverpool EPA Monitoring Location Ambient PM_{10} Concentrations; 2014-2017

Statistic	24 hour average PM_{10} Concentration - µg/m3			
	2014	2015	2016	2017
Maximum 24 hour concentration	40.8	68.6	68.7	74.0
24 hour Criterion	50			
24 hour exceedance count	0	1	3	2
Statistic	**Annual average PM_{10} Concentration - µg/m3**			
	2014	**2015**	**2016**	**2017**
Annual Average	19.1	18.5	19.6	20.8
Annual Average Criterion	25			

The data shows no exceedances of the 24 hour criterion for 2014, one exceedance for 2015, three exceedances for 2016 and two exceedances for 2017. OEH *Annual Air Quality Statements* for 2015, 2016 and 2017 indicate that the exceedances were all due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms.

Annual average values show a relatively small range of concentrations with all years below the annual average criterion.

Figure 2 displays the daily average PM_{10} data for the Chullora and Liverpool sites for the years 2014 to 2017.

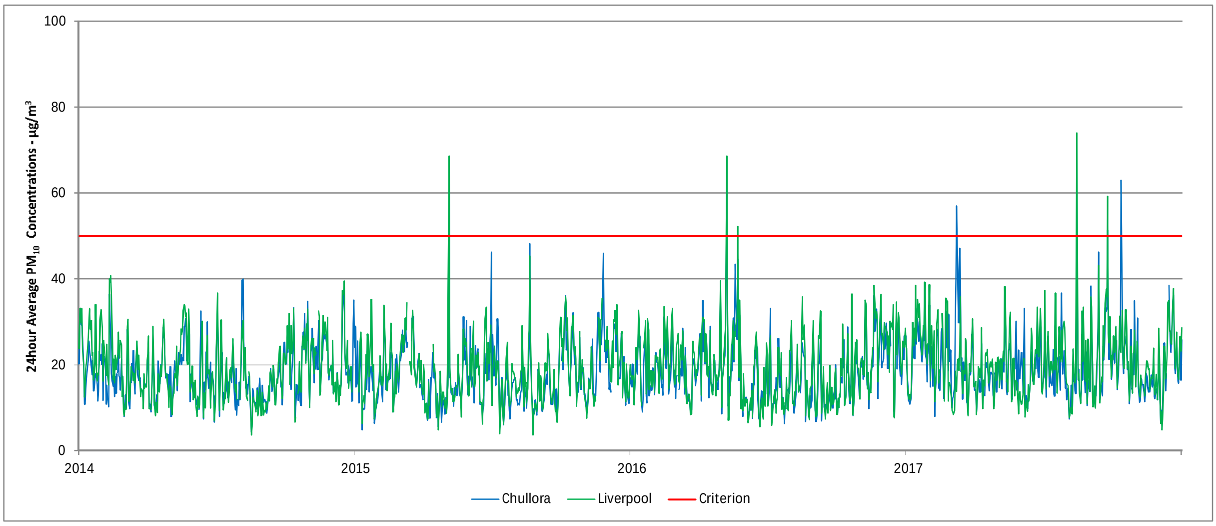


Figure 2 **OEH Chullora and Liverpool PM_{10} 24 hour Average Monitoring Data; 2014-2017**

4.2.2 Particulate Matter ($PM_{2.5}$)

Table 4 presents the $PM_{2.5}$ data for the Chullora site for the years 2014 to 2017.

Table 4 **Chullora EPA Monitoring Location Ambient $PM_{2.5}$ Concentrations; 2014-2017**

Statistic	24 hour average $PM_{2.5}$ Concentration - µg/m3			
	2014	2015	2016	2017
Maximum 24 hour concentration	23.1	37.2	49.4	44.6
24 hour Criterion	25			
24 hour exceedance count	0	1	5	8
Statistic	Annual average $PM_{2.5}$ Concentration - µg/m3			
	2014	2015	2016	2017
Annual Average	9.0	8.0	8.0	9.5
Annual Average Criterion	8			

The data shows no exceedances of the 24 hour criterion for 2014, one exceedance for 2015, five exceedances for 2016 and eight exceedances for 2017. OEH *Annual Air Quality Statements* for 2015, 2016 and 2017 indicate that all the 2015 and 2016 exceedances and four of the 2017 exceedances were due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms. The 2017 *Annual Air Quality Statement* also indicates that the four exceedances in March were due to a localised fire at a nearby recycling plant.

Annual average values for 2015 and 2016 are equal to the criterion, with 2014 and 2017 above the criterion.

Table 5 presents the $PM_{2.5}$ data for the Liverpool site for the years 2014 to 2017.

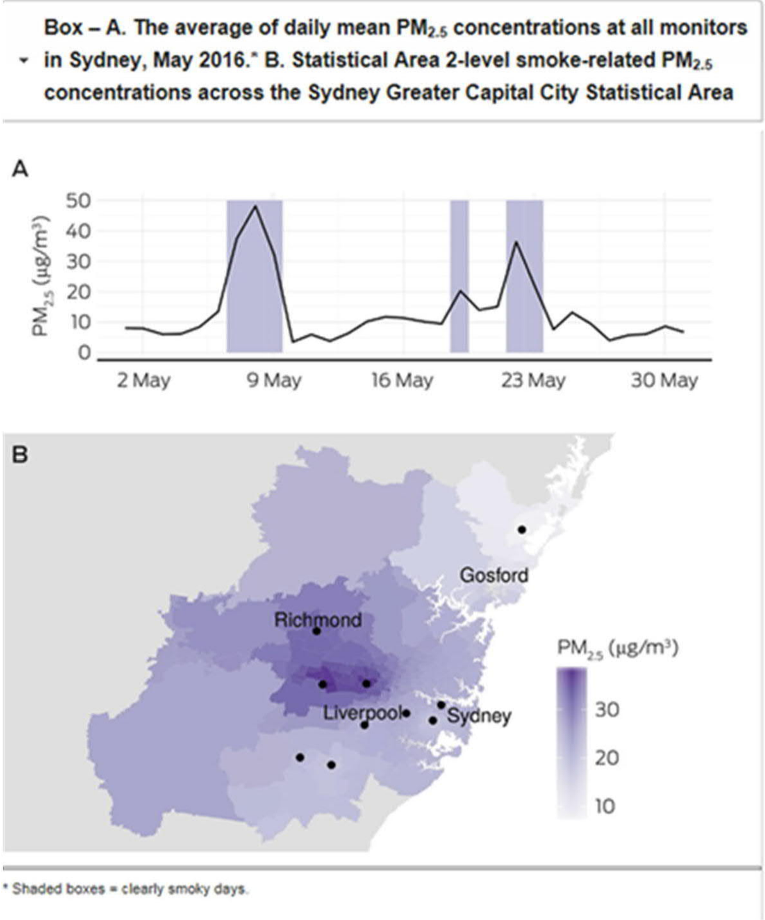
Table 5 Liverpool EPA Monitoring Location Ambient $PM_{2.5}$ Concentrations; 2014-2017

Statistic	**24 hour average $PM_{2.5}$ Concentration - µg/m3**			
	2014	**2015**	**2016**	**2017**
Maximum 24 hour concentration	24.3	32.2	50.8	56.4
24 hour Criterion	**25**			
24 hour exceedance count	0	2	4	3
Statistic	**Annual average $PM_{2.5}$ Concentration - µg/m3**			
	2014	**2015**	**2016**	**2017**
Annual Average	8.6	8.5	8.7	8.9
Annual Average Criterion	**8**			

The data shows no exceedances of the 24 hour criterion for 2014, two exceedances for 2015, four exceedances for 2016 and three exceedances for 2017. OEH *Annual Air Quality Statements* for 2015, 2016 and 2017 indicate that the exceedances were all due to exceptional events which are defined as events related to bushfires, hazard reduction burns and dust storms.

All annual average values are above the criterion.

In addition, in regard to the 2016 24 hour criteria exceedances at both locations, **Figure 3** (reproduced from the Medical Journal of Australia) shows the extent of high ambient $PM_{2.5}$ associated with hazard reduction burning during the month of May 2016.



Box – A. The average of daily mean $PM_{2.5}$ concentrations at all monitors in Sydney, May 2016.* B. Statistical Area 2-level smoke-related $PM_{2.5}$ concentrations across the Sydney Greater Capital City Statistical Area

* Shaded boxes = clearly smoky days.

Figure 3 Smoke Related $PM_{2.5}$ Concentrations in May 2016

Figure 4 displays the daily average $PM_{2.5}$ data for the Chullora and Liverpool sites for the years 2014 to 2017.

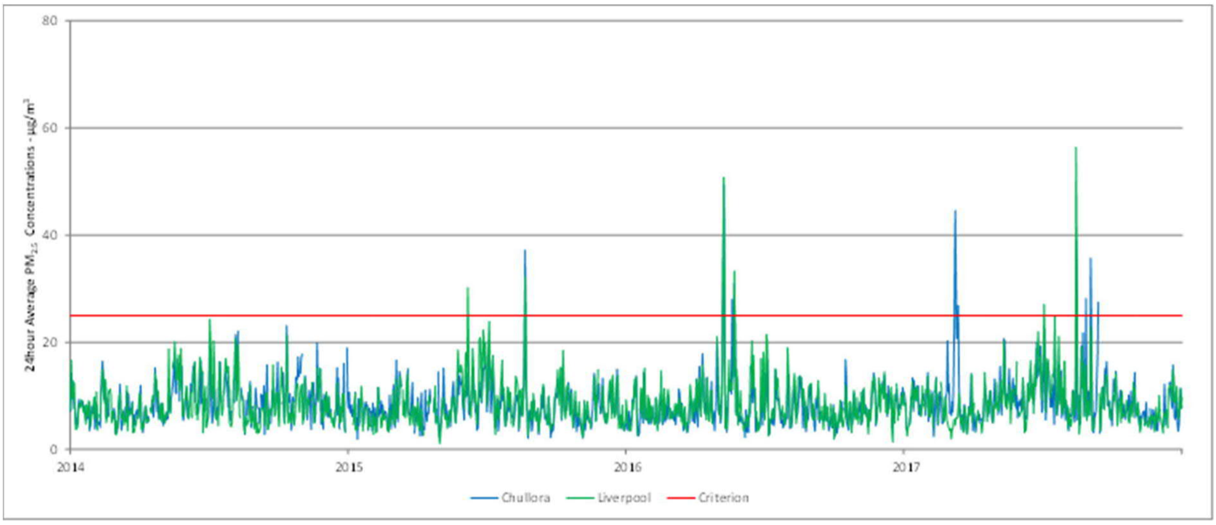


Figure 4 **OEH Chullora and Liverpool $PM_{2.5}$ 24 hour Average Monitoring Data; 2014-2017**

5.0 Factors Affecting Pollution Dispersion

There are a range of factors affecting dispersion of pollution. The main parameters that are relevant to this AQIA are:

- Meteorology;
- Terrain; and
- Existing sources of pollution.

The following sections analyse these factors in terms of their potential influence of air pollution dispersion around the Precinct.

5.1 Meteorology

Meteorology defines the direction of pollution transport along with the rate of mixing and hence dispersion in the atmosphere. An analysis of the meteorology aids in the understanding of whether pollution from a source is likely to influence a particular location.

The Bureau of Meteorology (BOM) operates a network of monitoring stations around the state. Local meteorological data was taken from the monitoring location at Bankstown Airport.

Historical meteorological data including average temperatures; rainfall; relative humidity; wind speed and wind roses showing the average monthly wind conditions at 9am and 3pm were obtained from the BOM website (*http://www.bom.gov.au/climate/averages/tables/cw_066137.shtml;* accessed 16 April 2018). The Bankstown Airport weather station provided up to 50 years of temperature and rainfall data between 1968 and 2018 and 42 years of wind data between 1968 and 2010 with available data provided in **Figures 5** to **8** and **Table 6** below.

The warmest temperatures at Bankstown Airport occur in summer, with the average maximum temperature recorded in January (28.4^{o}C). July is the coldest month with an average minimum temperature of 5.1^{o}C. Rainfall is highest in February (mean rainfall of 102.1mm) and lowest in September (mean rainfall of 42.9mm). Annual average rainfall is 871.8mm. Wind data shows the following patterns:

- January to March - morning winds are variable with calm conditions from 26 to 35%. Afternoon winds increase in strength changing to predominantly east and southeast with low (3%) calm conditions.
- April to June - morning winds are light and predominantly from the west with calm conditions of 33%. Afternoon winds increase in strength changing to predominantly from the southeast in April, variable in May and south and west in June with moderate (8 to 13%) calm conditions.
- July to September, morning winds are light and predominantly from the west with calm conditions from 23 to 35%. Afternoon winds increase in strength changing to predominantly from the east in September with moderate (3 to 12%) calm conditions.
- October to December, morning winds are light and variable with calm conditions from 19 to 23%. Afternoon winds increase in strength changing to predominantly east and southeast with low (2%) calm conditions.

The meteorological data indicates variable wind patterns throughout the year with a summer easterly/winter westerly wind pattern. Given the predominant winds and the surrounding landuse, there are no indications of any potential air quality impacts due to prevailing meteorology.

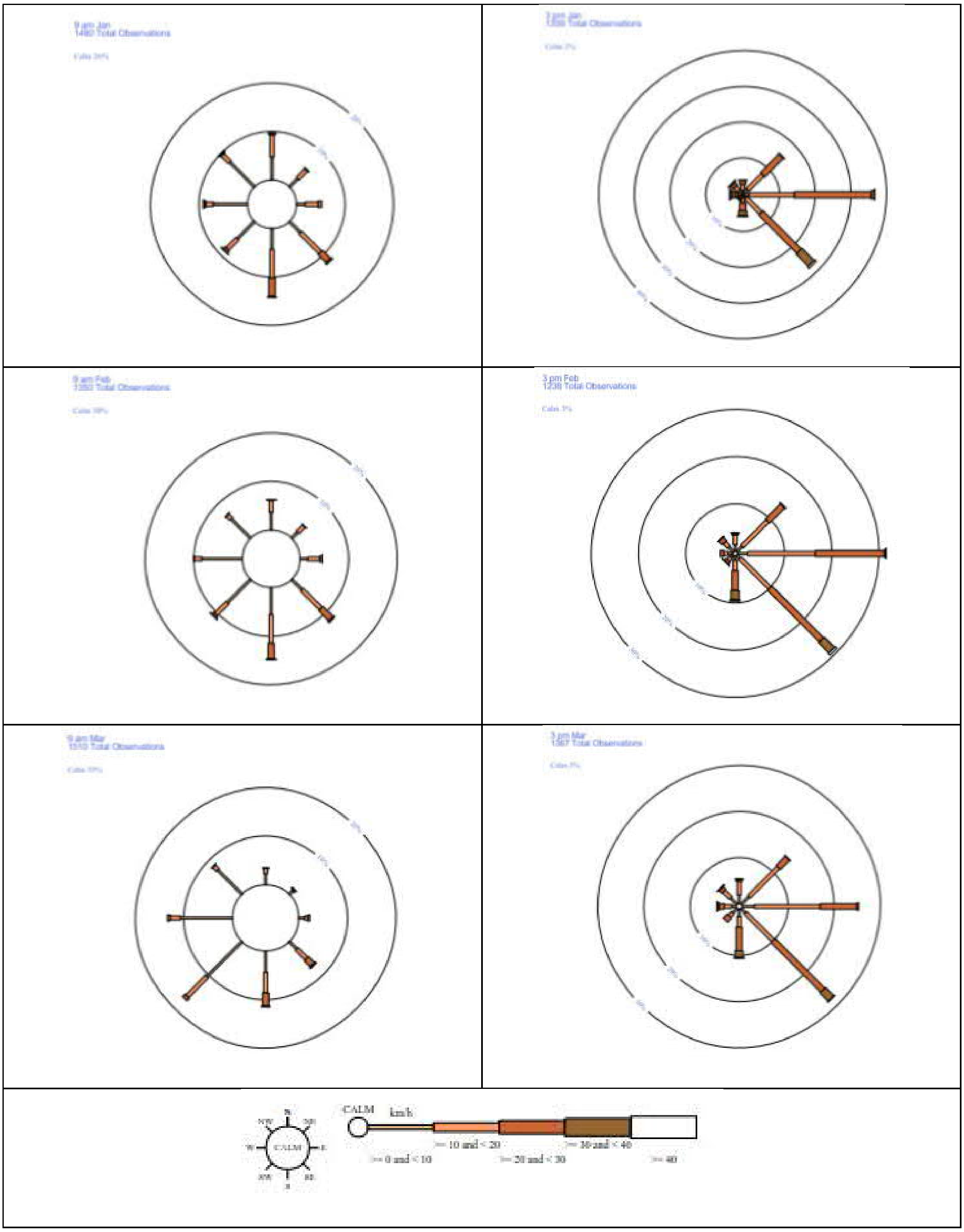


Figure 5 9 am and 3 pm Wind Roses; Bankstown Airport; January to March; 1968–2010

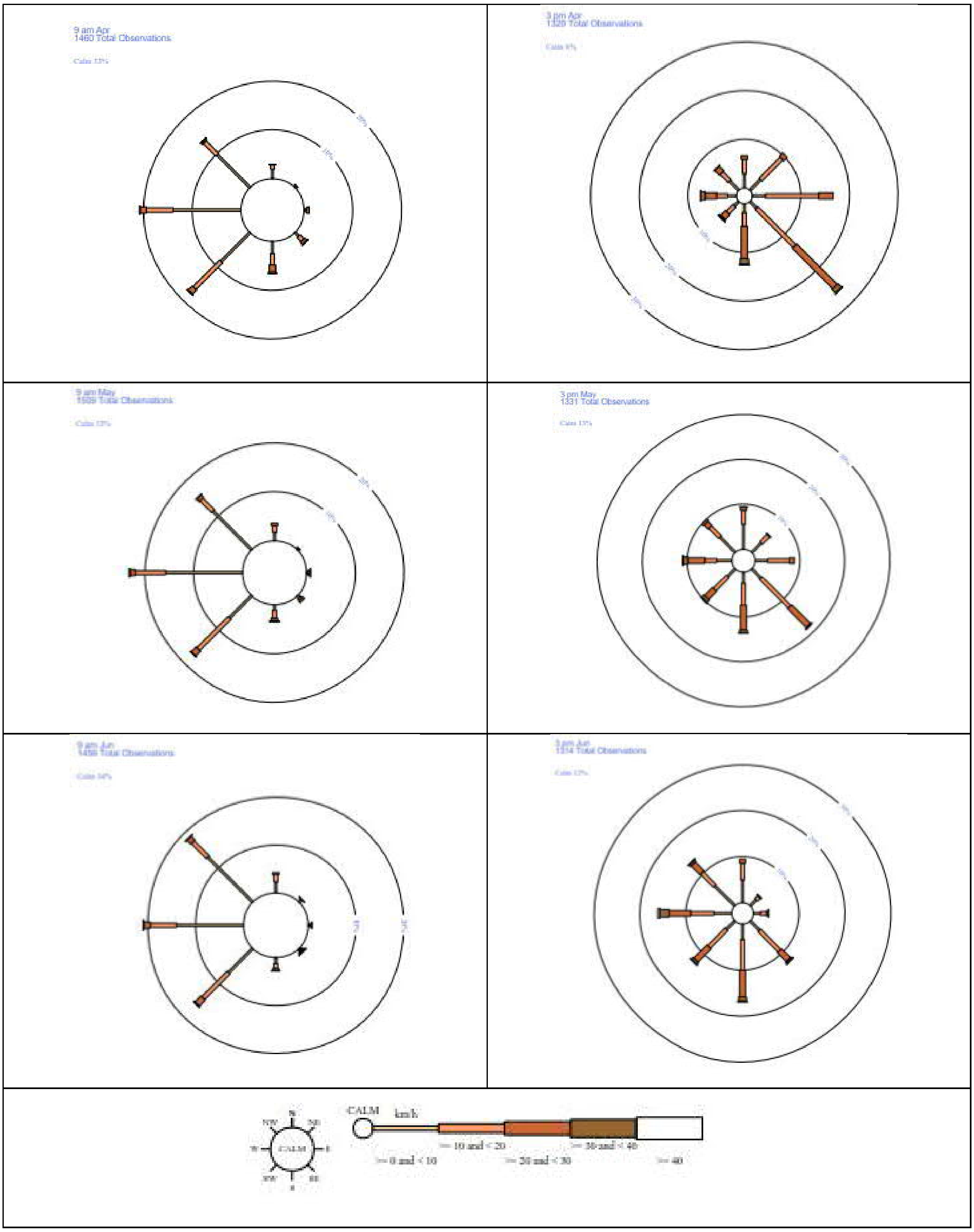


Figure 6 9 am and 3 pm Wind Roses; Bankstown Airport; April to June; 1968–2010

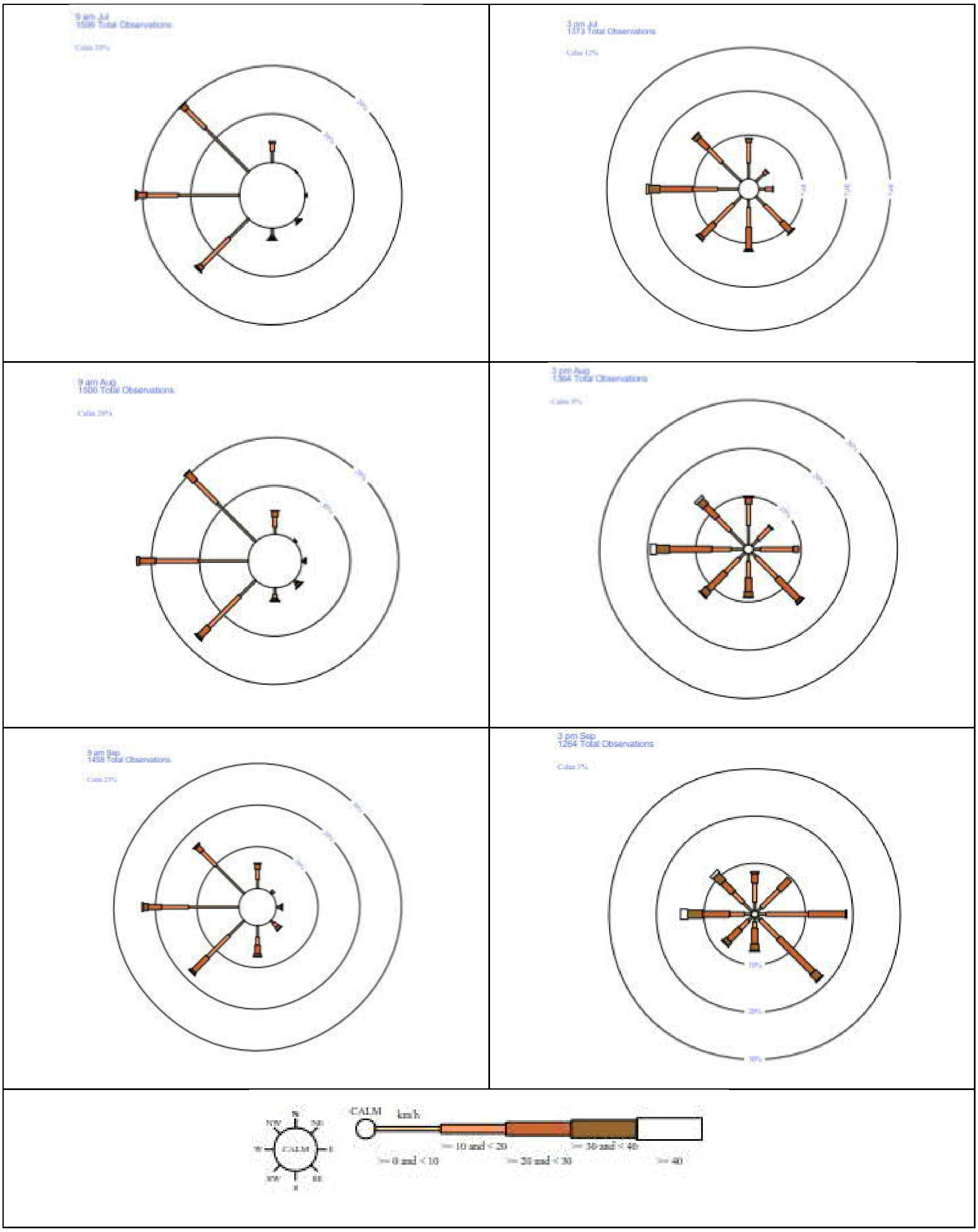


Figure 7 9 am and 3 pm Wind Roses; Bankstown Airport; July to September; 1968–2010

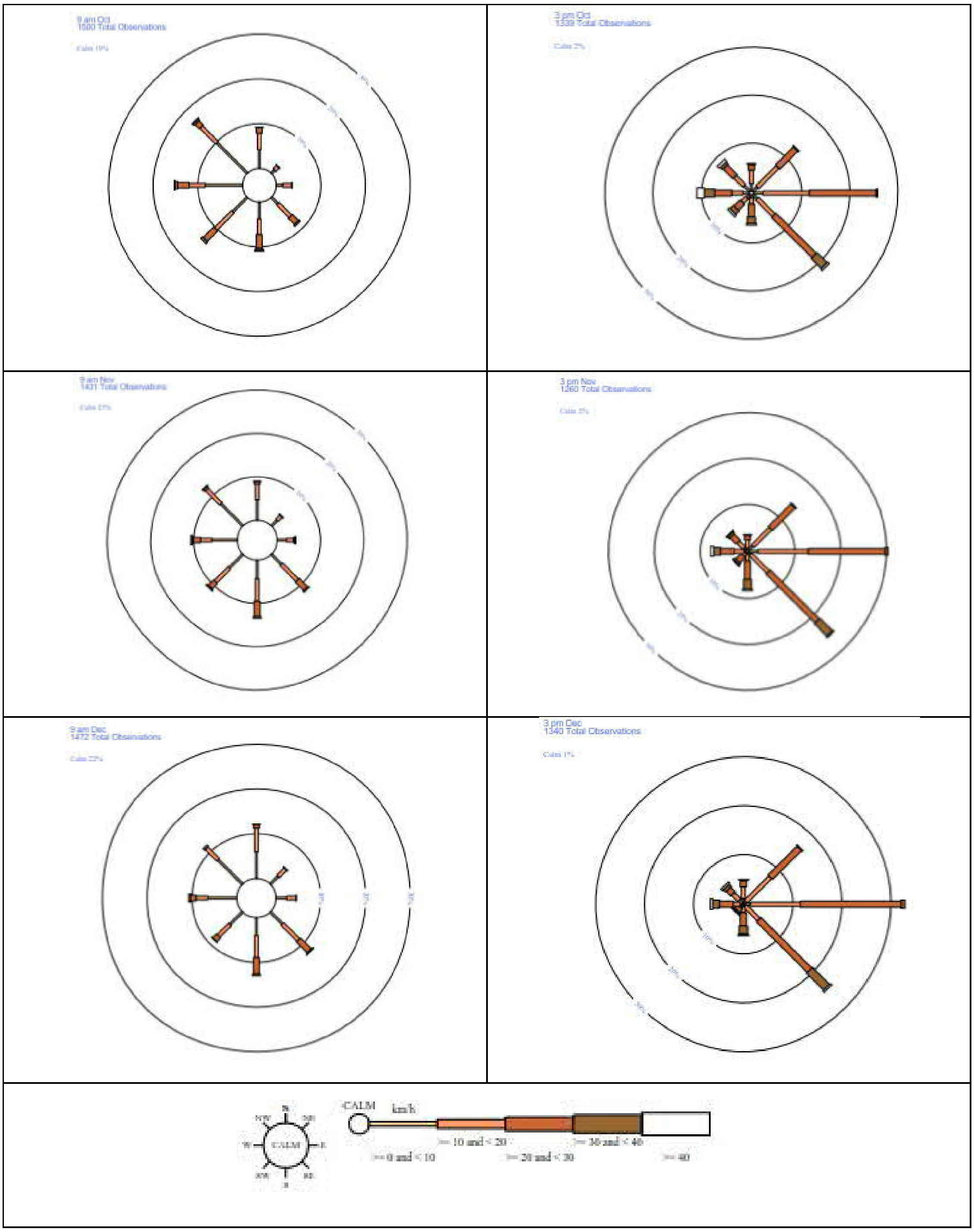


Figure 8 9 am and 3 pm Wind Roses; Bankstown Airport; October to December; 1968–2010

Table 6 Climate Statistics, Bankstown Airport; 1968 – 2018

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature													
Mean maximum temperature (°C)	28.4	27.9	26.3	23.7	20.5	17.8	17.3	19.0	21.7	23.9	25.4	27.5	23.3
Mean minimum temperature (°C)	18.2	18.2	16.3	12.7	9.5	6.8	5.1	6.0	8.7	11.8	14.4	16.7	12.0
Rainfall													
Mean rainfall (mm)	91.8	102.1	98.7	86.0	65.7	80.9	43.9	50.3	42.9	58.4	76.5	67.5	871.8
Decile 5 (median) rainfall (mm)	73.7	76.0	77.9	67.6	57.6	56.3	33.1	24.6	34.1	39.2	68.6	65.4	887.0
Mean number of days of rain ≥ 1 mm	8.0	7.9	8.5	6.8	6.7	6.7	5.2	4.6	5.3	6.6	8.0	7.1	81.4
9 am conditions													
Mean 9am temperature (°C)	22.2	21.6	20.2	17.4	13.8	10.7	9.6	11.6	15.1	18.2	19.3	21.4	16.8
Mean 9am relative humidity (%)	72	77	77	75	79	80	78	70	64	62	67	67	72
Mean 9am wind speed (km/h)	8.2	7.4	6.6	6.7	6.7	6.6	6.6	9.0	10.3	10.6	9.7	9.1	8.1
Calms 9am (%)	26	30	35	33	33	34	35	28	23	19	23	22	28
3 pm conditions													
Mean 3pm temperature (°C)	26.8	26.4	25.0	22.6	19.5	17.0	16.4	18.0	20.2	22.1	23.5	25.9	22.0
Mean 3pm relative humidity (%)	54	57	55	54	55	55	50	44	45	48	52	51	52
Mean 3pm wind speed (km/h)	20.9	19.0	17.6	15.3	12.9	13.6	14.1	17.6	19.9	20.9	21.6	22.6	18.0
Calms 3pm (%)	2	3	3	8	13	12	12	5	3	2	2	1	5

http://www.bom.gov.au/climate/averages/tables/cw_066137.shtml; accessed 16 April 2018

5.2 Terrain

The Precinct is situated in the south western hinterland of the Sydney basin. The terrain is generally flat with slightly undulating terrain sloping toward the Georges River which is located immediately west of the Precinct and aligned in a northwest/southeast direction. The local relief surrounding the Precinct is minor and is not expected to influence the dispersion of air pollutants possibly emitted during the demolition and construction activities.

5.3 Landuse

The Precinct is situated in a recreational/light industrial area dominated by golf courses to the northwest and south, a light industrial area to the southeast and the airport to the north. No major industrial pollution sources are located in the proximity of the Precinct with road and aviation traffic the only likely pollution sources.

6.0 UK IAQM Assessment Process

The IAQM guidance process is a four-step risk based assessment of dust emissions associated with demolition, including land clearing and earth moving, and construction activities. The IAQM assessment process is described in the following sections.

6.1 Step 1 - Screening Assessment

An assessment will normally be required where there is a "human receptor" within:

- 350 m from the boundary of a site; or
- 50 m from the route used by construction vehicles on public roads up to 500 m from a site entrance.

6.2 Step 2 - Dust Impact Assessment

Step 2 in the IAQM is a risk assessment tool designed to appraise the potential for dust impacts due to unmitigated dust emissions from a construction project. The key components of the risk assessment are defining the dust emission magnitudes (Step 2A), the surrounding area sensitivity (Step 2B), and then combining these in a risk matrix (Step 2C) to determine an overall risk of dust impacts.

6.2.1 Step 2A - Dust Emission Magnitude

Dust emission magnitudes are estimated according to the scale of works being undertaken classified as Small, Medium or Large. The IAQM guidance provides examples of demolition, earthworks, construction and trackout to aid classification, which have been reproduced in **Table 7** below.

Table 7 Examples of Small, Medium and Large demolition and construction activities

Activity		Small	Medium	Large
Demolition	Total building volume (m^3)	<20,000	20,000–50,000	>50,000
Earthworks	Total site area (m^2)	<2,500	2,500–10,000	>10,000
	Number of heavy earth moving vehicles active at one time	<5	5-10	>10
	Total material moved (tonnes)	<20,000	20,000–100,000	>100,000
Construction	Total building volume (m^3)	<25,000	25,000–100,000	>100,000
Trackout	Number of heavy vehicle movements per day	<10	10-50	>50

The dust emission magnitudes for demolition, earthworks, construction, and trackout for the proposed works, based on the IAQM guidance, have been determined to respectively be Small, Large, Large and Large with the relevant cells in **Table 7** highlighted.

6.2.2 Step 2B – Surrounding Area Sensitivity

The IAQM methodology classifies the surrounding area sensitivity to dust soiling and human health impacts due to particulate matter effects to be classified as high, medium, or low. The classifications are determined according to matrix tables for both dust soiling and human health impacts, which are reproduced in **Table 8** and **Table 9** respectively below. Factors used in the matrix tables to determine the surrounding area sensitivity are described as follows:

- Receptor sensitivity (for individual receptors in the area):
  - *High sensitivity – locations where members of the public are likely to be exposed for eight hours or more in a day. (e.g. private residences, hospitals, schools, or aged care homes).*
  - *Medium sensitivity - places of work where exposure is likely to be eight hours or more in a day.*

  - *Low sensitivity – locations where exposure is transient – e.g. one or two hours maximum. For example parks, footpaths, shopping streets, playing fields.*
- Number of receptors of each sensitivity type in the area;
- Distance from source; and
- Annual mean PM_{10} concentration (only applicable to the human health impact matrix).

Table 8 provides the IAQM guidance sensitivity levels from dust soiling effects on people and property.

Table 8 Surrounding Area Sensitivity to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Annual average PM_{10} concentrations for the Chullora and Liverpool OEH monitoring locations are shown in **Table 2** and **Table 3** respectively. Both stations return annual average PM_{10} concentrations of between 17.5 and 20.8 µg/m^3. The IAQM guidance provides sensitivities for the following annual average PM_{10} ranges: >32, 28-32, 24-28 and <24 µg/m^3.

Table 9 below provides the IAQM guidance sensitivity levels for human health impacts for an annual average PM_{10} concentration of <24 µg/m^3.

Table 9 Surrounding Area Sensitivity to Human Health Impacts for Annual Average PM_{10} concentration <24 µg/m^3

Receptor Sensitivity	Number of Receptors	Distance from the source (m)				
		<20	<50	<100	<200	<350
High	>100	Medium	Low	Low	Low	Low
	10-100	Low	Low	Low	Low	Low
	1-10	Low	Low	Low	Low	Low
Medium	>10	Low	Low	Low	Low	Low
	1-10	Low	Low	Low	Low	Low
Low	>1	Low	Low	Low	Low	Low

There are no residential areas, schools, hospitals or aged care homes within 350 metres of the Precinct with the predominant landuse light industrial and recreational resulting in a maximum classification of the receptor sensitivity as medium with the likely number of receptors being >10.

The surrounding area sensitivity is derived for each of the four activities: demolition, earthworks, construction and trackout for dust soiling effects on people and property and human health impacts.

Table 10 provides the surrounding area sensitivity for each activity (demolition, earthworks, construction and trackout), as determined from **Table 8** and **Table 9**, using a medium receptor sensitivity and the lowest distance from source (<20 metres).

Table 10 Sensitivity Definition Outcomes for Demolition, Earthworks, Construction and Trackout

Potential Impact	Surrounding Area Sensitivity			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low

6.2.3 Step 2C - Unmitigated Risks of Impacts

The dust emission magnitude as determined in Step2A (**Section 6.2.1**) is combined with the sensitivity as determined in Step 2B (**Section 6.2.2**) to determine the risk of impacts with no mitigation applied. **Table 11**, **Table 12**, **Table 13** and **Table 14**, reproduced from the IAQM guidance, respectively provide the risk of dust impacts from demolition, earthworks, construction and trackout for each scale of activity as listed in **Table 7**.

Table 11 Risk of Dust Impacts from Demolition

Surrounding Area Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table 12 Risk of Dust Impacts from Earthworks

Surrounding Area Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 13 Risk of Dust Impacts from Construction

Surrounding Area Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 14 Risk of Dust Impacts from Trackout

Surrounding Area Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Table 15 provides a summary of the unmitigated impact risk for each activity (demolition, earthworks, construction and trackout) for dust soiling and human health for the scale of activity as determined in **Table 7**.

Table 15 Summary of Unmitigated Impact Risk

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Scale of activity (Table 7)	Small	Large	Large	Large
Dust Soiling	Low	Medium	Medium	Medium
Human Health	Negligible	Low	Low	Low

The highest unmitigated impact predicted is medium for earthworks, construction and trackout.

6.3 Step 3 – Management Strategies

The outcome of Step 2C is used to determine the level of management that is required to ensure that dust impacts on surrounding sensitive receptors are maintained at an acceptable level. A high or medium-level risk rating means that suitable management measures must be implemented during the project.

Recommended site-specific and in-principle management measures are described in **Section 7.0** below. The implementation of these measures should result in minimal risk of dust impacts on surrounding receptors.

6.4 Step 4 – Reassessment

The final step of the IAQM methodology is to determine whether there are significant residual impacts, post mitigation, arising from a proposed development. The guidance states:

> *For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".*

It is anticipated that the project will not constitute an atypical case and that with implementation of the proposed mitigation measures described in **Section 7.0** below, the residual effect (impacts) will be "not significant" in regard to dust soiling and human health impacts.

7.0 Conclusion and Recommendations

The general dispersion parameters such as meteorology, terrain and surrounding land use demonstrate that due to the general wind conditions of the area blowing parallel to or away from the Precinct and the lack of any complex terrain or additional sources of pollution, there is expected to be minimal air quality impacts associated with the proposed site works.

The unmitigated risk of air quality impacts during demolition, earthworks and construction have been predicted to be medium for dust soiling on people and property and low for human health. To minimise the predicted level of risk, the following precautionary management and mitigation measures are recommended:

- Minimise exposed surfaces, such as stockpiles and cleared areas, including partial covering of stockpiles where practicable;
- Implement dust suppression measures, such as watering of exposed soil surfaces, dust mesh, water trucks and sprinklers to minimise dust generation;
- Avoid dust generating activities and water stockpiles and exposed areas during adverse weather conditions such as high winds and dry periods;
- Establish hard surfaced haul routes which are regularly damped down and cleaned;
- Perform regular visual inspections to identify areas that may require watering;
- Establish defined site entry and exit points to minimise tracking of soil on surrounding roads;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport; and
- Regular dust observations of active excavation or stockpiling areas be undertaken to ensure visible dust is not moving offsite. Records of observations should be compiled to enable the demonstration that dust is being managed in an ongoing manner. Records should include (as a minimum) the following:
    - Observation date and time;
    - Area being inspected;
    - Level of dust being generated;
    - Meteorological conditions when observation occurred; and
    - Any mitigation measures undertaken.

Air quality impacts from ongoing operations, predominantly associated with traffic associated with warehouse operations, are expected to be negligible.

In conclusion, as current air quality meets relevant EPA criteria, in combination with the lack of any complex meteorology, terrain or major sources of pollution, with the implementation of appropriate management and mitigation measures there should not be any air quality issues requiring consideration in regard to the proposed works.

8.0 References

Environment Protection Authority, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, 2016.

UK Institute of Air Quality Management (IAQM), Guidance on the assessment of dust from demolition and construction, 2014.

http://www.bom.gov.au/climate/averages/tables/cw_066137.shtml (accessed 16 April 2018)

http://www.environment.nsw.gov.au/AQMS/search.htm (accessed 16 April 2018)

APPENDIX L

NOISE AND VIBRATION IMPACT ASSESSMENT

AECOM Imagine it. Delivered.

Bankstown Airport Limited

13-Jul-2018

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Bankstown Airport South-West Precinct Project Site Works and Warehouse

Construction and Operation Noise and Vibration Impact Assessment

Bankstown Airport South-West Precinct Project Site Works and Warehouse

Construction and Operation Noise and Vibration Impact Assessment

Client: Bankstown Airport Limited

ABN: 50 083 058 637

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			Name/Position	Signature
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Table of Contents

Executive Summary

Bankstown Airport Limited (BAL) commissioned AECOM Australia Pty Ltd (AECOM) to conduct a construction and operational noise and vibration impact assessment for the proposed first stage South-West Precinct (SWP) and initial warehouse development.

The specific elements of the project comprise:

- An overall layout concept, including earthworks and site works, site-wide stormwater and flood mitigation, and addressing historic site contamination issues.
- A new internal road network, including connections to Murray Jones Drive and Tower Road.
- Construction of a warehouse building of approximately 37,000 square metres in area, including ancillary office administration facilities, heavy vehicle loading dock and hardstand areas, at-grade employee and visitor car parking, and associated landscaping areas.

Nearby noise and vibration sensitive receivers were identified and unattended noise measurements were completes to characterise the existing noise environment. The noise levels were used to establish construction Noise Management Levels (NMLs) and operational project noise trigger levels.

Construction noise

Construction scenarios for the first stage of light industrial development of the SWP were developed in consultation with AECOM's civil engineering team and the proposed equipment has been detailed within this report. Three distinct construction stages were used in a computer-based noise model to determine the potential changes to noise levels. Construction impacts were then assessed at all receivers at various locations across the project area. Predicted noise levels at all assessment receivers are expected to be below the nominated NMLs for this project and as a result, no further consideration assessment is required.

An assessment of the likely construction traffic movements as a result of the SWP have been assessed in accordance with the relevant criteria outlined in the EPA's *NSW Road Noise Policy, 2011* (RNP). This assessment concluded that the increase in noise levels as a result of construction traffic along Henry Lawson Drive and Milperra Road are not expected to be above the 2 dB screening criteria. Therefore, no further consideration of construction traffic is required.

Operational noise

An operational noise assessment was carried out in accordance with the EPA's *Noise Policy for Industry, 2017* (NPfI). Likely operational scenarios during the daytime and night-time were assessed at all receiver locations across the project area against the project noise trigger levels. In addition, likely maximum noise events from operational activities within the proposed warehouse building were used to assess sleep disturbance at all assessment residential receivers.

Results show predicted operational noise emissions from the proposed warehouse building comply with the project noise trigger levels at all locations and for all noise-enhancing meteorological conditions.

Therefore, the operation of the warehouse is considered to comply with the criteria outlined in the NPfI, and no further mitigation is considered necessary.

An assessment of the likely operational road traffic was conducted in accordance with the RNP. This assessment has been undertaken for the first stage of development of the SWP. This assessment indicates that the likely operational traffic for all roads external to the SWP are predicted to be below the 2 dB screening criteria. Therefore, no further consideration assessment is required, in accordance with the RNP.

Construction and operational vibration

Based on the indicative construction activities in addition to the distance to the nearest receiver of the proposed SWP construction works, it has been concluded that the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and needs not to be considered further for operational and construction activities.

Aircraft noise assessment

Based on the location of the SWP with respect to the most up-to-date Bankstown Airport 2033/34 ANEF chart, the location of the first stage of the SWP indicates that the development would be ‘acceptable’ for light industrial usage and ‘conditionally acceptable’ for commercial usage.

Prior to construction of the warehouse building, it is recommended that aircraft noise levels across the site should be predicted or measured using a methodology provided in the AS 2021. This would inform the assessment of constructions necessary to achieve internal sound design levels recommended in AS 2021 for the specific space. This process should be applied to individual spaces within a building (e.g. office spaces within an industrial building), even if the building type as a whole is considered ‘acceptable’.

1.0 Introduction

Bankstown Airport is Sydney's major general aviation airport. It is the third most active general aviation facility in Australia and the fifth most active overall. It caters for charter and private business flights, flight training, freight, emergency and aeromedical services and recreational flights. It operates on a 24/7 basis and currently averages around 220,000 movements per annum with capacity for up to 450,000.

The South West Precinct (SWP) of Bankstown Airport is a predominantly unused and undeveloped portion of the Airport. BAL proposes to commence development of the SWP, through the undertaking of site works and the construction of a warehouse building. This proposed development (the Project) triggers a Major Development Plan (MDP) assessment pursuant to the Airports Act 1996 (Airports Act). The Project will facilitate the first stage of a major industrial/logistic and innovation precinct for Bankstown Airport, which has the potential to support both aviation and non-aviation commercial activities. The specific elements of the project comprise:

- An overall layout concept, including earthworks and site works, site-wide stormwater and flood mitigation, and addressing historic site contamination issues.
- A new internal road network, including connections to Murray Jones Drive and Tower Road.
- Construction of a warehouse building of approximately 37,000 square metres in area, including ancillary office administration facilities, heavy vehicle loading dock and hardstand areas, at-grade employee and visitor car parking, and associated landscaping areas.

Bankstown Airport Limited (BAL) has commissioned AECOM Australia Pty Ltd (AECOM) to conduct a construction and operation noise and vibration impact assessment for the South-West Precinct and Warehouse.

1.1 Relevant Guidelines

- *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change (DECC), 2009.
- *NSW Road Noise Policy* (RNP), Department of Environment Climate Change and Water (DECCW), 2011.
- *Noise Policy for Industry (NPfI),* Environmental Protection Authority (EPA), 2017.
- Australian Standard (AS) International Electrotechnical Commission (IEC) 61672.1-2004 *Electroacoustics - Sound level meters - Specifications*, 2004.
- Australian Standard AS 2021:2015 *Acoustics – Aircraft noise intrusion – Building siting and construction*.

1.2 Scope of works

The scope of this acoustic assessment was to:

- Identify nearby noise sensitive receivers potentially affected by the construction and operation of the project;
- Establish construction and operational noise management levels based upon the measured background noise levels and ICNG and the NPfI;
- Undertake a construction and operational noise impact assessment at nearby sensitive receivers, in accordance with ICNG and NPfI;
- Undertake a construction and operational traffic noise assessment in accordance with the RNP;
- Consider aircraft noise impacts in accordance with AS 2021;
- Consider potential operational and construction vibration impacts; and

- Recommend indicative construction and operational noise mitigation measures if required to meet established noise management levels.

1.3 Operational and construction vibration

Vibration criteria are set primarily according to whether the particular activities of interest are continuous or intermittent in nature, whether they occur during the daytime or night-time and the type of receiver to be assessed e.g. commercial or residential.

The effects of vibration in buildings can be divided into three main categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed, i.e. human disturbance or discomfort;
- Those in which the integrity of the building or the structure itself may be prejudiced; and
- Those where the building contents may be affected.

Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage.

The nearest residential receivers (vibration sensitive) are located approximately 160 metres from the SWP site. The existing nearby industrial developments are located approximately 50 metres from the SWP site, and are neither noise nor vibration sensitive.

At such distances, the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and needs not to be considered further for operational and construction activities.

2.0 Existing Acoustic Environment

2.1 Site description

The proposed SWP site is located on the south-western side of Bankstown Airport, adjacent to the existing road network of Henry Lawson Drive to the west via Tower road and/or Starkie Drive, and Milperra Road to the south. Residential premises are located to the south and south-west of the site in the suburbs of Milperra and Chipping Norton. Industrial premises are located to the south-east along Milperra Road and extending south into the suburb of Milperra and Revesby.

There are two active recreational receivers located at Bankstown Golf Club and Georges River Golf Course to the south and north-west of the proposed development respectively.

Georges River Grammar School is located to the north of Bankstown Airport.

The acoustic environment is dominated by road traffic noise from Milperra Road and Henry Lawson Drive in addition to aircraft noise from Bankstown Airport and industrial noise from surrounding industry.

2.2 Receivers

2.2.1 Noise catchment areas

To assist in determining noise criteria for the receivers surrounding the Project, two Noise Catchment Areas (NCAs) were identified. The noise environment within each NCA is considered to be comparable and can be used to develop assessment criteria for similar noise environments. The NCAs are shown in below in Table 1 and in Figure 1

Table 1 Noise catchment areas

NCA	Description
NCA1	Residences to the south-west of the proposed development, located along the Georges River in the suburb of Chipping Norton.
NCA2	Residences located to the south of the proposed development, to the south of Bankstown Golf Club in the suburb of Milperra.

2.2.2 Representative receivers

Residential and non-residential receivers potentially affected by the construction and operation of the project have been identified and are listed in and shown in Figure 1.

The nearest residential receivers are located along Rickard Road on the south side of the Georges River, approximately 160 metres from the SWP site boundary. The nearest industrial receiver is located to the south of Milperra Road, approximately 50 metres from the site boundary.

Figure 1 Site map showing NCAs, noise monitoring locations, and representative receiver locations

Table 2 **Residential and non-residential receivers**

Receiver number	Usage	Address
Residential receivers		
R1	Residential	42 Rickard Road, Chipping Norton
R2	Residential	62 Rickard Road, Chipping Norton
R3	Residential	78 Rickard Road, Chipping Norton
R4	Residential	497 Henry Lawson Drive, Milperra
R5	Residential	42 Whittle Avenue, Milperra
R6	Residential	12 Whittle Avenue, Milperra
Non-residential receivers		
N1	Active recreation area	Bankstown Golf Club, 70 Ashford Avenue, Milperra
N2	Industrial	268 Milperra Road, Milperra
N3	Active recreation area	Georges River Golf Course
N4	School and active recreation area	Georges River Grammar

2.3 Noise monitoring

Ambient noise monitoring was conducted at two locations within the study area in January and February 2018. This included both long term monitoring and short-term attended measurements.

2.3.1 Instrumentation

Details of the noise loggers used for long term monitoring are presented in Table 3. The noise logging locations are presented in Figure 1.

Table 3 **Noise monitoring details**

Logger	Address	Model	Serial number
NL1	NCA1 - 40 Rickard Road, Chipping Norton	Rion NL-21	00265112
NL2	NCA2 - 3 Keysor Place, Milperra	ARL 315	15-299-444

The sound level meter used to conduct attended noise measurements was a Bruel & Kjaer 2250 (Serial Number 3009329). All the acoustic instrumentation employed during the noise measurements comply with the requirements of AS IEC 61672.1-2004 Electroacoustics – Sound level meters – Specifications and were calibrated prior to and after the monitoring session with a drift in calibration not exceeding ± 0.5 dB.

All instruments used were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last 2 years).

2.3.2 Unattended continuous noise monitoring

Unattended noise monitoring was undertaken from 31 January 2018 to 9 February 2018 at two locations considered to be representative of the noise sensitive receivers within the Project area.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample period respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level. The L_{Aeq} is essentially the energy averaged sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

The assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level, or simply the background level.

Graphical representations of the logging results are provided in Appendix B.

A summary of the measured L_{A90} background noise levels and existing L_{Aeq} ambient noise levels is presented in Table 4.

Table 4 Existing Background and ambient noise levels, dB(A)

Measurement location	Rating background level			Ambient noise levels		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
NL1	47	44	41	54	51	51
NL2	45	39	32	57	53	48

Notes:

1. In accordance with the NPfI, time of day is defined as follows :
   Day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
   Evening – the period from 6 pm to 10 pm.
   Night – the remaining periods.

2.3.3 Attended noise monitoring

Attended monitoring was conducted at the two unattended monitoring locations on 31 January 2018. Each measurement was conducted over a 15 minute period. Weather conditions were overcast on the day of monitoring, with light to moderate winds. The attended measurement data is presented in Table 5.

Table 5 Attended noise monitoring results

Monitoring location	Date	Time	Description	Measurements, dB(A)			
				$L_{Amax, 15min}$	$L_{A10, 15min}$	$L_{Aeq, 15min}$	$L_{90, 15min}$
NL1	31/01/18	13:43	• Road traffic noise from New Bridge Road dominant, 58 dB(A) • Occasional light aircraft flyover, clearly audible • Moderate wind noise in surrounding trees	79	60	59	53
NL2	31/01/18	13:12	• Road traffic noise from Bullecourt Avenue dominant • Aircraft noise clearly audible • Bird Noise • Moderate gusting winds	73	59	55	47

3.0 Noise Criteria

3.1 Construction noise management levels

The EPA’s Interim Construction Noise Guideline (ICNG) provides the basis for construction noise assessments in NSW and is used to establish construction noise management levels (NMLs).

The ICNG recommends that a quantitative assessment is carried out for all *‘major construction projects that are typically subject to the EIA process’*. Additionally, the ICNG recommends that qualitative assessment is only used on short-term infrastructure maintenance works that are not likely to affect an individual or sensitive land use for more than three weeks in total. As the proposed works are expected to continue for a period of more than three weeks, and are within fairly close proximity to sensitive receivers, a quantitative assessments, based on ‘reasonable’ worst case construction scenarios, has been carried out for this work. Predicted construction noise levels at nearby receivers are compared to the levels provided in Section 4 of the ICNG.

Where an exceedance of the NMLs is predicted, the ICNG advises that receivers can be considered ‘noise affected’ and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details.

Where construction noise levels reach 75 dB(A) residential receivers can be considered as ‘highly noise affected’ and the proponent should, in consultation with the community, consider restricting hours to provide respite periods.

The ICNG defines what is considered to be feasible and reasonable as follows:

> *Feasible*
>
> *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*
>
> *Reasonable*
>
> *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.*

Table 6 sets out management levels for noise at residences and how they are to be applied.

Table 6 Noise management levels at residences

Time of day	Management level, $L_{Aeq\ (15min)}$ dB(A)[1]	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL +10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL +5 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

3.2 Construction hours

Construction hours are defined as follows in the ICNG:

- Standard hours: 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday;
- Out of hours: before 7 am and after 6 pm Monday to Friday, before 8 am and after 1 pm Saturday, and all Sunday and public holidays.

No work is generally expected to be required outside of standard construction hours.

The construction works are proposed to be scheduled during in standard hours. Provided below are the applicable NMLs for this project, based on the RBLs in Table 4 and noise management levels in Table 6.

Table 7 Construction noise management levels at residential receivers

Noise management levels			
Noise catchment area	RBL, $L_{A90, 15min}$	Noise management $L_{Aeq, 15min}$ dB(A)	Highly noise affected level $L_{Aeq, 15min}$ dB(A)
NCA1	47	57	75
NCA2	45	55	75

The NMLs for non-residential receivers are provided below. These NMLs apply only during the hours in which the properties are in use.

Table 8 Construction noise management levels for non-residential receivers

Noise management levels	
Land use	Management noise level $L_{Aeq, 15min}$ dB(A)
Active recreation area	65
Industrial premises	75
Offices, retail outlets	70
School	55[1]

Notes:

1. Based on an internal noise level of 45 dB outlined in the ICNG, where a conservative estimate of 10 dB has been assumed between internal and external noise levels.

3.2.1 Sleep disturbance

Where construction works are planned to extend over more than two consecutive nights, and where a quantitative assessment method is used, the analysis should cover the maximum noise level, and the extent of the number of times that the maximum noise level exceeds the RBL.

It is understood that works are not proposed to be conducted outside of standard construction hours; therefore a sleep disturbance assessment for construction is not required and therefore has not been conducted.

3.2.2 Construction road traffic noise criteria

The roads listed in Table 9 will likely be used by construction traffic. The road type and whether residential receivers are located on the road in that area are also indicated in Table 9.

Table 9 Roads used by construction traffic

Road	Type	Residential receivers
Henry Lawson Drive	Arterial	Yes
Newbridge Road/Milperra Road	Arterial	Yes

Noise from construction traffic on public roads is not covered by the ICNG. However the ICNG does refer to the *Environmental Criteria for Road Traffic Noise*, now superseded by the *NSW Road Noise Policy (RNP)*, for the assessment of noise arising from construction traffic on public roads.

To assess noise impacts from construction traffic an initial screening test should be undertaken by evaluating whether existing road traffic noise levels will increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is equal to or greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected in accordance with the RNP.

3.3 Operational noise trigger levels

The NPfI provides noise trigger levels for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures. The assessment procedure for industrial noise sources has two components that must be considered:

- Controlling intrusive noise impacts in the short term for residences; and
- Maintaining noise level amenity for residences and other land uses.

3.3.1.1 Intrusive noise impacts

The NPfI states that the intrusiveness of an industrial noise source may generally considered acceptable if the level of noise from the source (L_{Aeq} level), measured over a 15 minute period, does not exceed the background noise level measured by more than 5 dB. The rating background level (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Fact Sheet B of the NPfI. Adjustments are to be applied to the level of noise produced if the noise at the receiver contains annoying characteristics such as tonality or impulsiveness.

The project intrusiveness noise levels are presented in Table 11.

Table 10 Project intrusiveness noise levels

Noise catchment area	Time of day[1]	RBL, dB(A)	Intrusiveness noise level RBL + 5 ($L_{Aeq,15min}$)
NCA1	Day	47	52
	Evening	44	49
	Night	41	46
NCA2	Day	45	50
	Evening	39	44
	Night	32	37

Notes:

1. In accordance with the NPfI time of day is defined as follows :

Day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
Evening – the period from 6 pm to 10 pm
Night – the remaining periods.

3.3.1.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from all industrial noise sources in an area should not normally exceed the acceptable levels specified in Table 2.2 of the NPfI. As per the definitions of receiver types in Table 2.3 of the NPfI, residences within each Noise Catchment Area (NCA) are classed as being in the following receiver categories according to Table 11 below.

Table 11 Protecting noise amenity receiver categories

Noise catchment area	Receiver category
NCA1	Urban residential
NCA2	Suburban residential

The project amenity level for a project is equal to the recommended amenity level – 5 dB. In addition, the project amenity level is converted from a period to 15 minutes by adding 3 dB. Therefore the relevant noise amenity level for each type of receiver is shown below in Table 12.

Table 12 Recommended L_{Aeq} noise levels from industrial noise sources.

Type of receiver	Indicative noise amenity area	Time of day	Recommended amenity noise level, $L_{Aeq\ (period)}$	Project amenity noise level, $L_{Aeq,15min}$
Residential	Suburban	Day	55	53
		Evening	45	43
		Night	40	38
	Urban	Day	60	58
		Evening	50	48
		Night	45	43
Active recreational area	All	When in use	55	53
Industrial premises	All	When in use	70	68
School classroom – internal	All	Noisiest 1-hour period when in use	45	43
Commercial premises	All	When in use	65	63

3.3.1.3 Project noise trigger levels

The project noise trigger level is the lower (that is, the most stringent) value of the intrusiveness and amenity noise levels. Provided in Table 13 are the established project noise trigger levels for the assessment locations in close proximity to the SWP. Table 13 presents the project noise trigger levels for the day, evening and night-time periods.

Table 13 Operational noise criteria

Noise catchment area	Assessment period	RBL (L_{A90}), dB(A)	Intrusive noise levels $L_{Aeq,\ 15min}$	Amenity noise levels $L_{Aeq,\ 15min}$	Project noise trigger levels $L_{Aeq,\ 15min}$
NCA1	Day	47	52	58	52
	Evening	44	49	48	48
	Night	41	46	43	43
NCA2	Day	45	50	53	50
	Evening	39	44	43	43
	Night	32	37	38	37
N1	When in use	-	-	55	53
N2	When in use	-	-	70	68
N3	When in use	-	-	55	53
N4 - classroom	Noisiest 1-hour period when in use	-	-	45	43
N4 - playground	Noisiest 1-hour period when in use	-	-	55	53

3.3.2 Tonality and NPfI modifying factors

The NPfI provides guidance and project noise trigger levels for assessing noise emissions from sources with “annoying characteristics” such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. Penalties of up to a maximum of 10 dB(A) may be applied where the subject noise has such characteristics at the receiver.

3.3.3 Maximum noise level assessment

The NPfI requires the potential for sleep disturbance to be assessed by considering maximum noise level events during the night-time period.

Where the subject development/premises night-time noise levels at a residential receiver location exceed the following screening levels:

- $L_{Aeq,\ 15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- $L_{A,max}$ 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a detailed maximum noise level even assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in

Table 14 Night-time sleep disturbance criteria

Noise catchment area	Measured night-time RBL, $L_{A90,\ 15min}$	Sleep disturbance screening levels	
		$L_{Aeq,\ 15min}$	L_{AFmax}
NCA1	41	46	56
NCA2	32	40	52

3.3.4 Operational road traffic noise criteria

The main roads providing access to the proposed SWP are:

Freeways or motorways / arterial roads

1. Henry Lawson Drive
2. Milperra Road

Table 15 and Table 16 present the road traffic noise criteria from the RNP for land use developments with a potential to create additional traffic on existing freeways or motorways/ arterial roads or sub-arterial roads. The external noise criteria are applied 1 m from the external facade of the affected residential buildings.

Table 15 Road traffic noise criteria - arterial roads

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 am–10 pm)	Night (10 pm–7 am)
Freeway/ arterial/ sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq, (15 hour)}$ 60 (external)	$L_{Aeq, (9 hour)}$ 55 (external)

Table 16 Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments

Existing sensitive land use	Assessment criteria – dB(A)	
	Day (7 am–10 pm)	Night (10 pm–7 am)
1. School classrooms	$L_{Aeq, (1 hour)}$ 40 (internal) when in use	-
4. Open space (active use)	$L_{Aeq, (15 hour)}$ 60 (external) when in use	-

To assess noise impacts from traffic generated by the site, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels will increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is equal to or greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

4.0 Construction Noise Assessment

4.1 Construction stages and scheduling

Construction works to take place as part of the SWP are outlined in Table 17. These works were based on the information provided in the letter titled *Bankstown Airport – South-West Precinct – MDP Construction Advice* provided to AECOM by RPS Group, dated 18 April 2018. It is understood that subsequent warehouses will be constructed at a later date and as such, should be assessed separately as development of the overall precinct progresses.

For the construction noise impact assessment, three construction scenarios were considered. These scenarios are shown in Table 17. The modelled scenario includes all equipment that could be reasonably assumed to be operating at the same time for an entire 15 minute period. Table 18 shows the construction equipment for each construction scenario and their sound power levels.

Table 17 Construction stages and scheduling

Construction scenario	Activities	Approximate duration	Timing
1. Services relocation and demolition	• Site establishment • Services relocations and demolitions	Four months	Daytime – Standard hours
2. Detailed earthworks	• Bulk cut / fill and import • Detailed earthworks / trim	Five months	Daytime – Standard hours
3. Structure and slab	• Erection of structure on site • Pouring of concrete slabs	Four months	Daytime – Standard hours

4.2 Plant and equipment levels

Table 18 presents the typical sound power levels of the construction equipment to be used in each modelled scenario. These sound power levels are typical values taken from data provided in Australian Standard AS2436-2010, “Guide to noise and vibration control on construction, demolition and maintenance sites”, the UK Department for Environment, Food and Rural Affairs (DEFRA) “Update of noise database for prediction of noise on construction and open sites” noise database and AECOM’s noise database. It was assumed that equipment is modern and in good working order.

Table 18 Typical sound power levels of construction equipment

Equipment	Sound power level, dB(A)	Construction scenario		
		Services relocation and demolition	Detailed earthworks	Structure and Slab
Excavators	94	●	●	
Backhoes	102	●	●	
Dump trucks	107	●	●	
Articulated dump trucks	109	●	●	
Truck and dog	98	●	●	
Wheel tractor scrapers	118		●	
Compactors	108		●	
Rollers	107		●	
Graders	112		●	
Water carts	100		●	
Mobile cranes	98	●		●
Concrete boom pumps	105			●
Concrete mixers	89			●
Telehandlers	92			●
Scissor lifts	100			●
Boom lifts	97			●

4.3 Noise modelling methodology

Noise levels due to the construction activities shown in Section 4.1 and 4.2 were predicted at nearby noise sensitive receivers using SoundPLAN 7.3 (industry standard) noise modelling software. The CONCAWE method was originally developed for predicting the long-distance propagation of noise from petrochemical complexes. It is especially suited to predicting noise propagation over large distances because it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

The noise model was created to represent 'reasonable' worst periods of construction works.

The following features were included in the noise model:

- Ground topography
- Ground absorption and reflection
- Receivers
- Construction noise sources.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

4.3.1 Construction modelling assumptions

The following assumptions were made in modelling all construction noise scenarios:

- For all construction scenarios all equipment would be operating at the same time, which is unlikely, and is a conservative assumption.
- Equipment was assumed to be operating at the closest point in the site to each receiver, in order to present the worst case scenario for each receiver. In reality the equipment would only be closest point to each receiver for a limited period of the durations presented in Table 17.
- Neutral atmospheric conditions i.e. relatively calm, no wind.

4.4 Predicted construction noise impacts

Predicted construction noise levels associated with the SWP are presented in Table 19. Construction noise contours calculated at 1.5 m above ground level are presented in Appendix C. These contours are indicative only and should not be referred to for noise levels at specific receivers; rather reference should be made to Table 19.

Table 19 Predicted construction noise levels

Receiver	NML, dB(A)	Services relocation and demolition		Detailed earthworks		Structure and slab	
		Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)	Predicted noise level, dB(A)	Exceedance, dB(A)
Residential receivers							
R1	57	42	-	48	-	44	-
R2	57	44	-	49	-	45	-
R3	57	43	-	49	-	44	-
R4	55	35	-	40	-	35	-
R5	55	36	-	41	-	34	-
R6	55	35	-	41	-	33	-
Non-residential receivers							
N1	65	42	-	48	-	41	-
N2	75	39	-	45	-	39	-
N3	65	50	-	55	-	51	-
N4	55	34	-	39	-	35	-

4.4.1 Discussion of results

The construction activities were assessed against the NMLs. The construction activities are predicted to comply with the nominated NMLs at all representative receiver locations for each construction scenario. It can therefore be concluded that noise impacts associated with the construction works for this initial stage of the SWP are compliant with the ICNG and no further mitigation is required.

4.5 Construction traffic assessment

Construction activities were based on the letter titled *Bankstown Airport – South-West Precinct – MDP Construction Advice* provided to AECOM by RPS Group, dated 18 April 2018. Construction traffic movements in this document were used to conservatively assess the following number of vehicle movements:

- 250 truck movements per daytime period
- 50 light vehicle movements per daytime period

Table 20 below presents the existing daytime 15 hour traffic flows along sections of Milperra Road and Henry Lawson Drive close to the proposed development. It has been conservatively assessed that all proposed construction vehicles will travel along each section of both roads.

Table 20 Existing traffic flows and additional traffic flows due to construction traffic

Road	Existing daytime 15 hour flow[1]		Additional daytime 15 hour flow		Relative noise increase, dB(A)
	Light	Heavy	Light	Heavy	
Milperra Road (West of Henry Lawson Drive)	52986	6871	50	250	0.1
Milperra Road (Between Henry Lawson Drive and Estate Road 01)	38570	5002	50	250	0.1
Milperra Road (Between New Estate Road and Ashford Avenue)	40177	5210	50	250	0.1
Henry Lawson Drive (South of Milperra Road)	22806	2957	50	250	0.2
Henry Lawson Drive (Between Milperra Road and Tower Road)	34896	4525	50	250	0.1
Henry Lawson Drive (North of Tower Road)	29017	3763	50	250	0.1

Notes:

1. 15 hour traffic volumes were sourced from "*P3199.001S Traffic Volume for Noise Calculations.xlsx*", by Bitzios Consulting dated 26 April 2018.
2. Existing traffic flows refer to traffic flows if the development does not go ahead.
3. Additional traffic flows refer to the additional traffic flows generated during the construction phase of the SWP.

The results presented in Table 20 indicate that the predicted noise increases on both roads are significantly lower than the 2 dB(A) screening criteria presented in the RNP. As a result, no further consideration of construction traffic is required.

5.0 Operational Noise Assessment

5.1 Assessment methodology

Noise emissions from the proposed warehouse within the SWP development were predicted to nearby receiver locations based upon typical operational noise from warehouse facilities. The typical scenarios were modelled to assess the potential for noise emissions as a result of the first stage of development, to impact nearby sensitive receiver locations, and achieve the required project noise trigger presented in Section 3.3. The predicted noise levels are presented in Section 5.10 for typical daytime and night-time operations.

5.2 Modelling

Noise levels from the proposed operations of the warehouse developments have been predicted at nearby noise sensitive receivers using SoundPLAN 7.3 (industry standard) noise modelling software. The operational noise levels were predicted using an implementation of CONCAWE[1] algorithms in the SoundPLAN noise propagation software. Both neutral and worst case meteorological conditions have been assumed, with the following parameters:

- Neutral meteorological conditions – Pasquill-Gillford stability category D with wind speed up to 0.5 m/s at 10 metres;
- Enhanced meteorological conditions – Pasquill-Gillford stability category D with wind speed up to 3 m/s at 10 metres.

The modelling includes:

- Ground topography;
- Buildings and structures;
- All identified noise producing items within the project site modelled as point or line sources where appropriate;
- All sources are modelled to assume a ‘reasonable’ worst case 15 minute period scenario; and
- Ground absorption.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

The noise models take into account significant noise sources and locations, screening effects, receiver locations, ground topography and noise attenuation due to geometrical spreading, air absorption, ground absorption and the effects of the prevailing weather conditions. The noise model was based on ground topography, general site layouts and indicative plant equipment sound power levels.
All predicted noise levels are free field and 1.5 m above ground level at the most-affected point within a residential property boundary within 30 m of the nearest facade.

5.3 Noise producing operational equipment

This section discusses the typical sources of noise emission from a warehouse facility. The activities are generally categorised into the following two groups:

- Steady-state or quasi steady-state noise, which is typically continuous and consistent noise. As the number of truck activities on the proposed site is assumed to be constant within each assessment period for the facility, the assessment considered noise from trucks as being quasi-steady state; and,

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[1] CONCAWE – The oil companies’ international study group for conservation of clean air and water – Europe (established in 1963) Report 4/81 “The propagation of noise from petroleum and petrochemical complexes to neighbouring communities”.

- Discrete noise, which occurs infrequently and for short durations of time. This type of noise includes forklift and truck reversing alarms, car door slams etc.

5.4 Building services plant noise

At this stage the specific developments within the site are not known. As such, a selection of typical mechanical and electrical plant based upon similar warehouse facilities was used. Mechanical plant servicing the offices is to be included in the noise model. These plant items have been selected for modelling at this preliminary stage, and further detailed assessment of each site should be undertaken prior to construction. Noise from mechanical plant is considered to be steady state noise. The cumulative noise impact from the SWP was assessed against the project noise trigger levels outlined in Section 3.3.

If either the number of plant items increases, or the assumed sound power level is higher than that of the individual proposed unit to be used in the development, then a reassessment of the potential noise impacts is recommended.

The mechanical plant proposed with associated sound power levels are presented in Table 21 below.

Table 21 Mechanical plant quantity per warehouse and sound power levels

Mechanical plant designation	Quantity	Overall sound power level, dB(A)	Octave band frequency – Hz, dB							
			63	125	250	500	1000	2000	4000	8000
Office condenser unit	1 per office building	82	63	74	76	82	73	72	70	68
Toilet exhaust fan	1 per office building	81	89	90	85	75	73	71	69	69

5.5 Truck and forklift noise levels

The noise levels presented in Table 22 were used for trucks and forklifts as part of the warehouse operations:

Table 22 Truck and forklift sound power levels

Source description ($L_{Aeq, 15 minute}$)	Overall sound power level, dB(A)	Octave band frequency – Hz, dB							
		63	125	250	500	1000	2000	4000	8000
Typical B-Double idling	97	99	95	97	95	92	89	85	80
Typical B-Double manoeuvring and entering/leaving (loaded)	102	96	101	104	99	97	94	88	82
Typical forklift	92	97	88	90	88	87	85	74	66

Tonal reversing alarms have a large range of sound power levels, however, they are typical ranges for the types of usage. For typical trucks for logistics usage, the maximum sound power level typically ranges up to 110 dB(A), and at a tone between 1200 Hz to 2500 Hz [2].

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[2] Burgess, M, *Review of alternatives to 'beeper' alarms for construction equipment*, University of NSW (ADFA), 8 May 2009, Source: http://www.environment.nsw.gov.au/resources/noise/beeperalarm.pdf

5.6 Traffic movements

The breakdown of car and truck movements has been based upon similar assessed sites, in addition to the information supplied in the document "*P3199.001S Traffic Volume for Noise Calculations.xlsx*", by Bitzios Consulting on 26 April 2018 (the traffic report).

In the absence of individual car and truck movements for each development, the bi-directional traffic flows along Estate Road 01 presented in the traffic report were used to predict the number of vehicle movements generated as a result of the operation of the warehouse. It is conservatively assumed that all vehicles travelling along Estate Road 01 will be vehicle movements from the operation of the warehouse. Traffic volumes along Estate Road 01 are presented below in Table 23. These values were rounded up to the nearest whole number.

Table 23 Summary of traffic volumes on Estate Road 01 provided in traffic report

Daytime peak, 1 hour		Daytime peak, 15 minutes		Night-time peak, 1 hour		Night-time peak, 15 minutes	
Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
112	14	28	4	101	13	26	4

Using the information in Table 23, a reasonable worst-case light and heavy vehicle movements was assumed for the warehouse operating within the proposed development. This information is provided below in Table 24. It is also noted that a single vehicle movement consists of a vehicle entering *or* leaving the site (i.e. a truck entering the site and leaving the site is counted as two movements). These values were rounded up to the nearest whole number.

Table 24 Assumed peak period on-site vehicle movements for proposed development

Site	Daytime truck movements (15 mins)	Night-time truck movements (15 mins)	Daytime car movements (15 mins)	Night-time car movements (15 mins)
Warehouse	4	4	28	26

The following information and assumptions are also relevant as part of the noise impact assessment:

- Upon arriving at the site the truck drivers may or may not turn their engines off depending on length of wait. In this assessment it has been assumed that the same number of trucks that enter the site will idle once they have pulled into the allocated loading dock position;
- Forklifts are assumed to be outside the building for 7 minutes in every 15 minutes when loading and unloading trucks; and
- No truck re-fuelling facilities are located on site.

5.6.1 Reversing alarms

It was assumed that forklifts would be fitted with broadband type alarms, whilst trucks were assumed to have tonal reversing alarms.

5.7 Hours of operation

This assessment has been based upon 24 hour operation of the facility.

5.8 Meteorological conditions

Noise levels were predicted at the noise sensitive receivers during the following meteorological conditions, as presented in Table 25.

Table 25 Standard and noise-enhancing meteorological conditions

Meteorological conditions	Meteorological parameters
Standard meteorological conditions	Day/evening/night: stability categories A-D with wind speed up to 0.5 m/s at 10 m AGL.
Noise-enhancing meteorological conditions	Daytime/evening: stability categories A-D with light winds (up to 3 m/s at 10 m AGL). Night-time: stability categories A-D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

The highest predicted noise levels out of the two worst case meteorological conditions have been presented in the results.

5.9 Operational scenarios

As the operations of the warehouse are currently not known, a reasonable worst case 15 minute period was assessed against the project noise trigger levels. The 15-minute operation for each individual warehouse was assumed to be roughly the same. It was assumed that L_{Aeq} noise sources from the proposed warehouse developments would be relatively similar during the evening and night periods. For daytime and night-time scenarios the following noise modelling was undertaken:

Daytime scenario for warehouse

1. Office mechanical plant (condenser unit and toilet exhaust fan per office building) ;
2. Trucks idling;
3. Truck movements, from Table 24 during a 15 minute period;
4. Two forklifts operating at around loading area for 7 minutes of the 15 minute period;
5. Light vehicle movements from Table 24 during a 15 minute period; and
6. One meteorological condition modelled as per Table 25.

Evening and night-time scenario for warehouse

1. Office mechanical plant (condenser unit and toilet exhaust fan per office building) ;
2. Trucks idling;
3. Truck movements, from Table 24 during a 15 minute period;
4. One forklift operating at around loading area for 7 minutes of the 15 minute period;
5. Light vehicle movements from Table 24 during a 15 minute period; and
6. Two meteorological conditions modelled as per Table 25.

5.10 Predicted operational noise impacts for the SWP

5.10.1 L_{Aeq} noise levels

The predicted noise levels and environmental noise limits for the SWP are presented in Table 26 to

Table 28. A graphical representation of results is shown in Appendix D.

Table 26 Noise levels at all representative receiver locations during daytime

Receiver	Project noise trigger levels, dB(A)	Neutral conditions		Worst case meteorological conditions	
		Result	Exceed	Result	Exceed
R1	52	33	-	35	-
R2	52	34	-	36	-
R3	52	33	-	35	-
R4	50	27	-	30	-
R5	50	30	-	33	-
R6	50	31	-	34	-
N1	53	38	-	40	-
N2	68	44	-	46	-
N3	53	42	-	43	-
N4 – classrooms[1]	43	25	-	28	-
N4 – playground[1]	53	25	-	28	-

Notes:

1. Assessed only during school hours.

Table 27 Noise levels at representative receiver locations during evening

Receiver	Project noise trigger levels, dB(A)	Neutral conditions		Worst case meteorological conditions	
		Result	Exceed	Result	Exceed
R1	48	39	-	42	-
R2	48	42	-	43	-
R3	48	40	-	42	-
R4	43	33	-	36	-
R5	43	34	-	37	-
R6	43	34	-	37	-
N1	53	41	-	44	-
N2	68	52	-	54	-
N3	53	49	-	50	-

Table 28 Noise levels at representative residential receiver locations during night-time

Receiver[1]	Project noise trigger levels, dB(A)	Neutral conditions		Worst case meteorological conditions	
		Result	Exceed	Result	Exceed
R1	43	33	-	35	-
R2	43	34	-	36	-
R3	43	33	-	35	-
R4	37	27	-	30	-
R5	37	30	-	33	-
R6	37	31	-	34	-

Notes:

1. Only residential receivers were assessed during the night-time period.

5.10.2 Discussion of results

The operation of the SWP was assessed against the project noise trigger levels. The predicted noise levels at each representative receiver were below the project noise trigger levels for each operational scenario, and in both neutral and noise-enhancing meteorological conditions. It can therefore be concluded that the operation of the SWP is considered to comply with the NPfI and thus no further mitigation is considered necessary.

5.10.3 Annoying characteristics correction

As the actual operations of the tenants are not currently known, a detailed assessment of tonality and NPfI modifying factors was not included within this assessment.

However, the ambient noise levels presented in Section 2.3.3 show that the predicted noise levels are significantly below the existing ambient noise levels. It is considered unlikely that any noise emission from the site will be considered to contain "annoying" characteristics at nearby receiver locations. It should also be noted that in accordance with the NPfI "annoying" characteristics are typically assessed at the receiver location and not at the source.

During the Development Application (DA) and design phase of each individual lot, an assessment of the potential for individual sites to produce noise containing tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content should be undertaken.

5.10.3.1 Sleep disturbance

The operation of the trucks and forklifts are identified as the noise sources with the greatest potential for causing sleep disturbance, through the use of air brakes and reversing beepers. The predicted $L_{A1\ (1\ minute)}$ noise levels were based upon attended measurements undertaken during previous noise assessments at similar facilities. An average increase from L_{Aeq} to L_{max} was found to be 8 dB(A) for general forklift operations. As such 8 dB(A) was added to the L_{Aeq} sound power level of the forklift operations. The mechanical plant associated with the warehouse operations is a relatively constant noise source, and as such there would not be a significant variation between the L_{AFmax} and $L_{Aeq\ (15\ minute)}$ noise levels.

An assessment of a typical truck operations was undertaken, with reversing beepers modelled with a L_{AFmax} sound power level of 110 dB(A), and air brake events modelled with a L_{AFmax} sound power level of 116 dB(A). These were assessed to determine the impact on nearby residential receiver locations.

The night-time sleep disturbance assessment was undertaken under noise-enhancing meteorological conditions, and the results are presented in Table 29.

Table 29 Predicted LA1 noise levels at representative sensitive receiver locations during night time

Receiver[1]	Criteria		Predicted L_{AFmax} with worst case meteorological conditions	
	Screening Level	Awakening Reaction	Result	Exceed
R1	56	60 - 65	40	-
R2	56	60 - 65	41	-
R3	56	60 - 65	41	-
R4	52	60 - 65	45	-
R5	52	60 - 65	46	-
R6	52	60 - 65	46	-

Notes:

1. Only residential receivers were assessed for sleep disturbance.

The results of the sleep disturbance assessment show that the predicted L_{AFmax} is below the screening level criteria for all residential receiver locations. As a result, the maximum noise levels associated with the operation of the SWP are considered to comply with the NPfI, and no further investigation is required.

5.11 Operational road traffic noise assessment

The impact of additional vehicles operating on public roads during the operational phase of the project was assessed separately.

As the specific usage of the individual developments is not known at this point in time, the existing traffic flows and net increase in traffic flows including the breakdown of car and truck movements was based upon the information supplied in the document "*P3199.001S Traffic Volume for Noise Calculations.xlsx*", by Bitzios Consulting on 26 April 2018 (the traffic report).

It is concluded that if the proposed development was to go ahead (i.e. the first stage of development), traffic on surrounding roads would increase as detailed in Table 30. Relative noise increase resulting from the operation of the first stage of the SWP is presented in Table 30.

Table 30 Existing traffic flows, additional traffic flows due to operational traffic

Road	Existing traffic flows[1]		Additional traffic		Relative noise increase, dB(A)	
	Daytime, 15 hour	Night-time, 9 hour	Daytime, 15 hour	Night-time, 9 hour	Daytime, 15 hour	Night-time, 9 hour
Milperra Road (West of Henry Lawson Drive)	59857	14216	503	120	0.0	0.0
Milperra Road (Between Henry Lawson Drive and Estate Road 01)	43572	10349	891	212	0.1	0.1
Milperra Road (Between New Estate Road and Ashford Avenue)	45387	10780	742	176	0.1	0.1
Henry Lawson Drive (South of Milperra Road)	25764	4298	262	44	0.0	0.0
Henry Lawson Drive (Between Milperra Road and Tower Road)	39422	6577	117	20	0.0	0.0
Henry Lawson Drive (North of Tower Road)	32780	5469	152	25	0.0	0.0

Notes:

1. Daytime and night-time traffic volumes were sourced from "*P3199.001S Traffic Volume for Noise Calculations.xlsx*", by Bitzios Consulting dated 26 April 2018.
2. Existing traffic flows refer to traffic flows if the development does not go ahead.
3. Additional traffic flows refer to the additional traffic flows generated by the SWP if the first stage of development goes ahead.

For all roads that are external to the SWP, the maximum predicted increase in noise level is 0.1 dB(A) during both daytime and night-time peak periods, therefore any increase in traffic noise levels would be imperceptible at nearby sensitive receiver locations.

6.0 Aircraft Noise Assessment

6.1 Aircraft noise – Land-use acceptability

AS 2021 provides a standard for use in land use planning, and the siting and construction of buildings in the vicinity of airports. The application of AS 2021 is intended to provide guidance for land-use and for building constructions to mitigate aircraft noise in the vicinity of airports. In some areas, assessment using AS 2021 is explicitly required through local and/or state planning policy.

6.2 Australian Standard AS 2021:2015

AS 2021 contains detailed guidelines for assessing maximum levels of aircraft noise intrusion based on the location of a building with respect to Australian Noise Exposure Forecast (ANEF) contours. The ANEF contours provide a guide to annualised daily noise exposure, based on forecast aircraft movements, noise levels, frequency, time of day and available flight paths. The suitability of the site for a given building type is then ranked as either:

- Acceptable
- Conditionally acceptable
- Unacceptable

Based on the acceptability of the site for the proposed building use, AS 2120 provides further detailed procedures to determine the noise reduction required of the building construction to control and satisfy maximum internal noise levels due to aircraft flyovers.

For a light industrial building type (e.g. warehouses) and commercial building type (e.g. office), the conditions for site acceptability in relation to ANEF zoning is listed in Table 1.

Table 31 Building site acceptability based on ANEF zones (AS 2021)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF

Where a location is deemed ‘acceptable’, no further assessment is required.

Where the location of a building type is deemed ‘conditionally acceptable’, aircraft noise levels expected across the site should be predicted or measured using a methodology provided in the standard, in order to assess constructions necessary to achieve internal sound design levels. This process may also be applied to individual spaces within a building (e.g. office spaces within an industrial building), if desired, even if the building type as a whole is considered acceptable.

6.3 Site assessment

Figure 2 presents the location of the SWP site with respect to the most up-to-date Bankstown Airport 2033/34 ANEF chart. Figure 2 indicates that the SWP site is located between the ANEF 20 and ANEF 30 contour. Based on this, the location of the first stage of the SWP indicates that the development would be ‘acceptable’ for light industrial usage and ‘conditionally acceptable’ for commercial usage.

At this stage of the of the design process for the MDP, the final usage and location of commercial spaces, offices, etc. have not been finalised. As such, during the design development of the warehouses and ancillary spaces (e.g. offices), it is recommended that aircraft noise levels across the site should be predicted or measured using a methodology provided in the AS 2021. This would inform the assessment of constructions necessary to achieve internal sound design levels recommended in AS 2021 for the specific space. This process should be applied to individual spaces within a building (e.g. office spaces within an industrial building), even if the building type as a whole is considered ‘acceptable’.

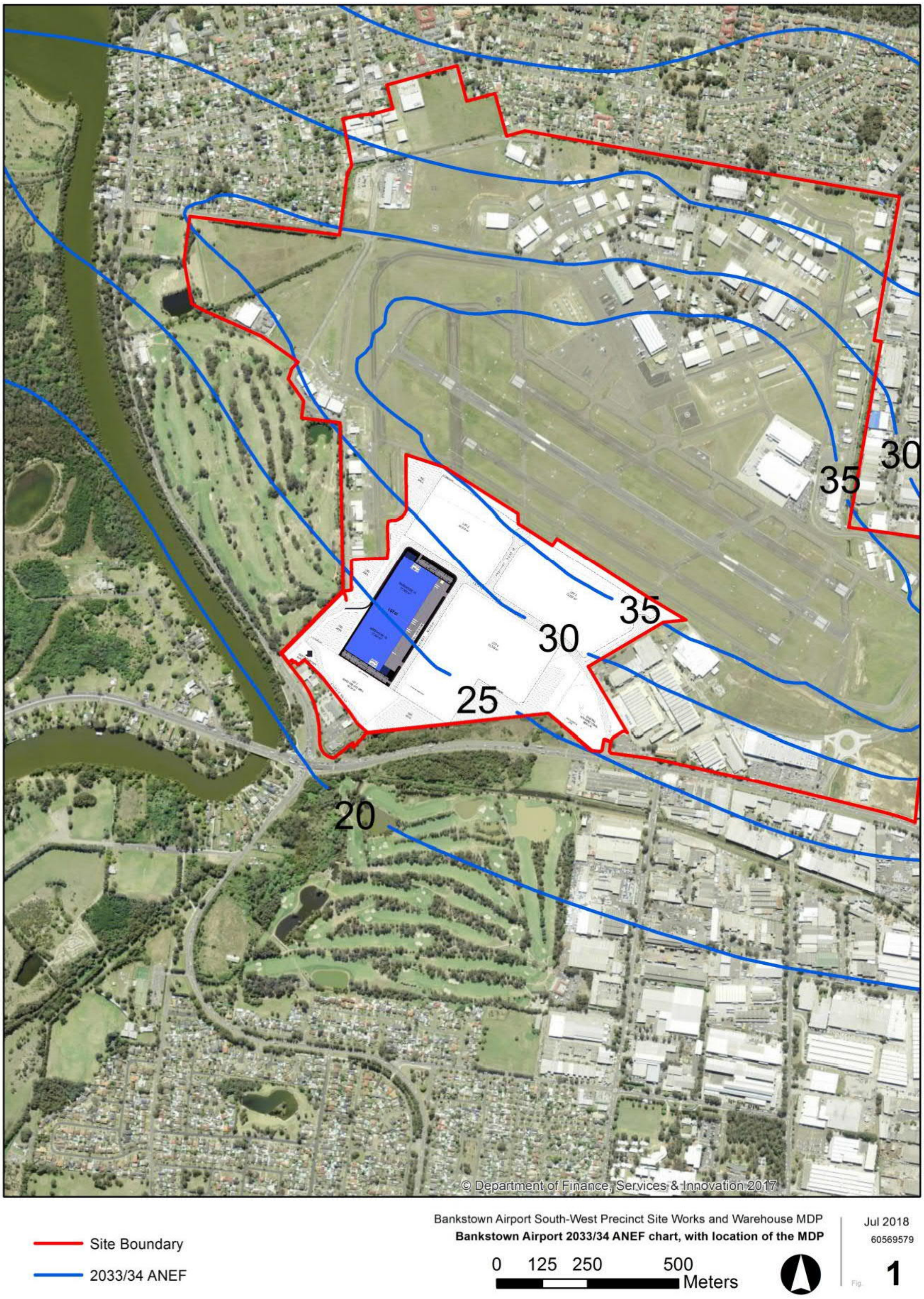


Figure 2 Details of Bankstown Airport 2033/34 ANEF chart, with location of the proposed SWP

7.0 Conclusion

This report presents the results of an operational noise and vibration impact assessment for the proposed Bankstown Airport South-West Precinct Site Works and MDP.

This acoustic assessment details the appropriate environmental criteria, the likely environmental noise levels from the construction and operation of the first stage of the SWP, and a discussion of the compliance of these activities with the relevant criteria.

Construction noise

The proposed construction activities for the first stage of development have been assessed against the NMLs. These construction activities are predicted to comply with the recommended NMLs at all receiver locations during all construction stages.

An assessment of the likely construction traffic indicated that noise increases on both Milperra Road and Henry Lawson Drive are predicted to be well below the 2 dB screening criteria. Therefore, no further consideration assessment is required, in accordance with the RNP.

Operational noise

Results show predicted operational noise emissions from the SWP comply with the project noise trigger levels at all locations and for all noise-enhancing meteorological conditions.

Therefore, the operation of the proposed warehouse is considered to comply with the criteria outlined in the NPfI, and no further mitigation is considered necessary.

An assessment of the likely operational road traffic was conducted in accordance with the RNP. This assessment has been undertaken for the first stage of development of the SWP. This assessment indicates that the likely operational traffic for all roads external to the SWP is predicted to be below the 2 dB screening criteria. Therefore, no further consideration assessment is required, in accordance with the RNP.

Aircraft noise assessment

Based on the location of the SWP with respect to the most up-to-date Bankstown Airport 2033/34 ANEF chart, , the location of the first stage of the SWP indicates that the development would be ‘acceptable’ for light industrial usage and ‘conditionally acceptable’ for commercial usage.

Prior to construction of the warehouse buildings, it is recommended that aircraft noise levels across the site should be predicted or measured using a methodology provided in the AS 2021. This would inform the assessment of constructions necessary to achieve internal sound design levels recommended in AS 2021 for the specific space. This process should be applied to individual spaces within a building (e.g. office spaces within an industrial building), even if the building type as a whole is considered ‘acceptable’.

Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [Leq]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Lmax	The maximum sound pressure level measured over the measurement period
Lmin	The minimum sound pressure level measured over the measurement period
L10	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L10.

L90	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L90.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L90 sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The Leq sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the EPA’s Noise Policy for Industry and the EPA’s Road Noise Policy

Appendix B

Unattended Noise Monitoring Summaries

40 Rickard Road, Chipping Norton - 31/01/18 - 09/02/18

Logger Setup

Logger Type: Rion NL21

Serial No : 00265112

Address: 60 Rickard Road, Chipping Norton

Location: Front of Fence

Facade / Free Field: Free Field

Environment: Moderate wind noise in addition to road traffic noise from Newbridge Road dominating noise environment at approx 58 dB(A). Occasional aircraft flyover can be clearly audible

Logger Setup Photo

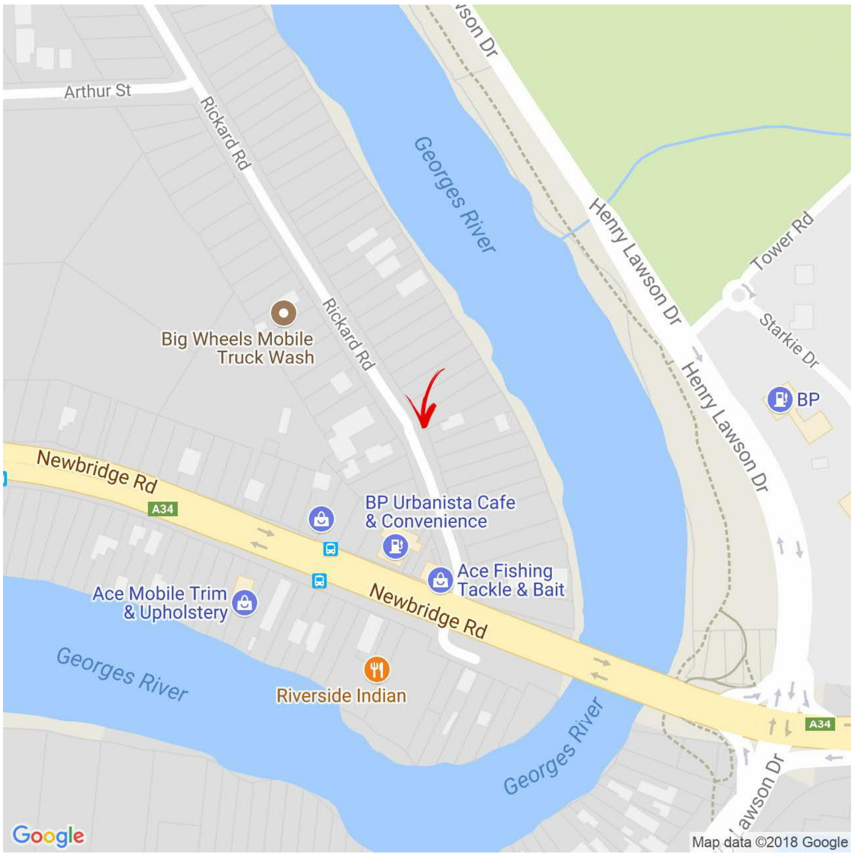
INP Noise Level, dB(A)

	Log Average	**RBL**
Day	54	47
Evening	51	44
Night	51	41

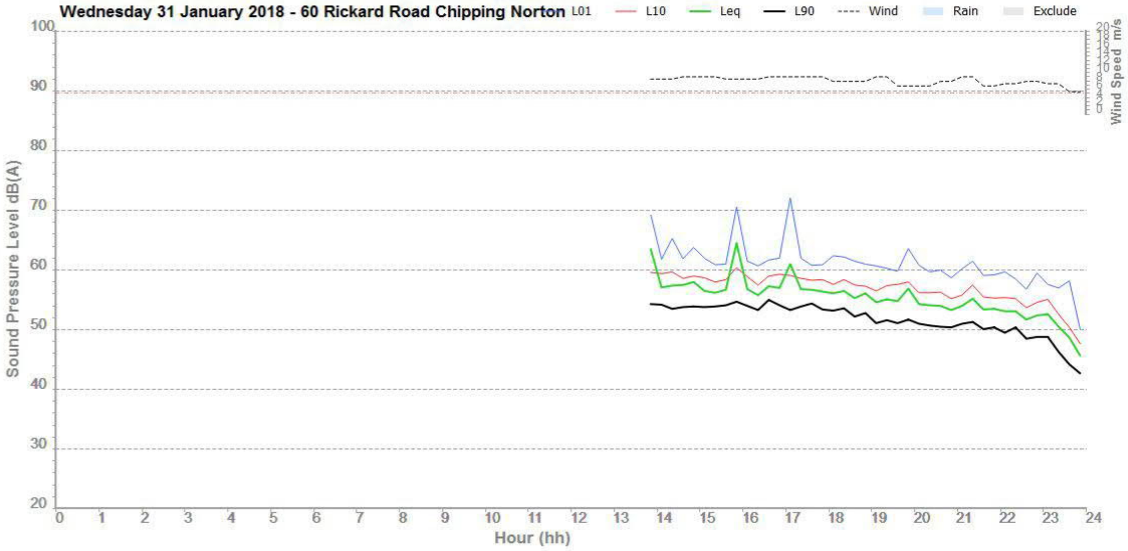
RNP Noise Level, dB(A)

	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map



Logger Graphs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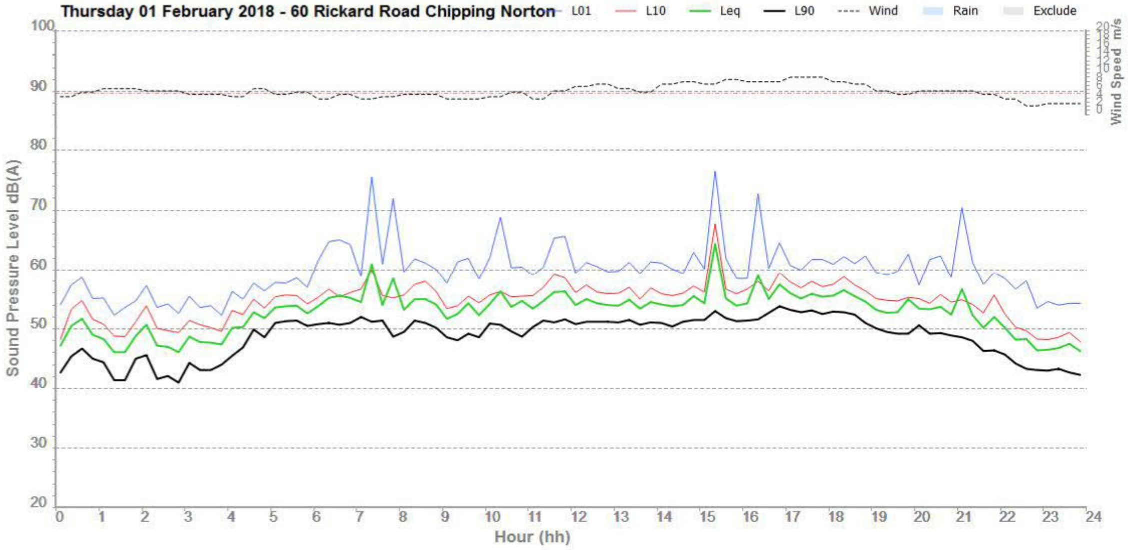
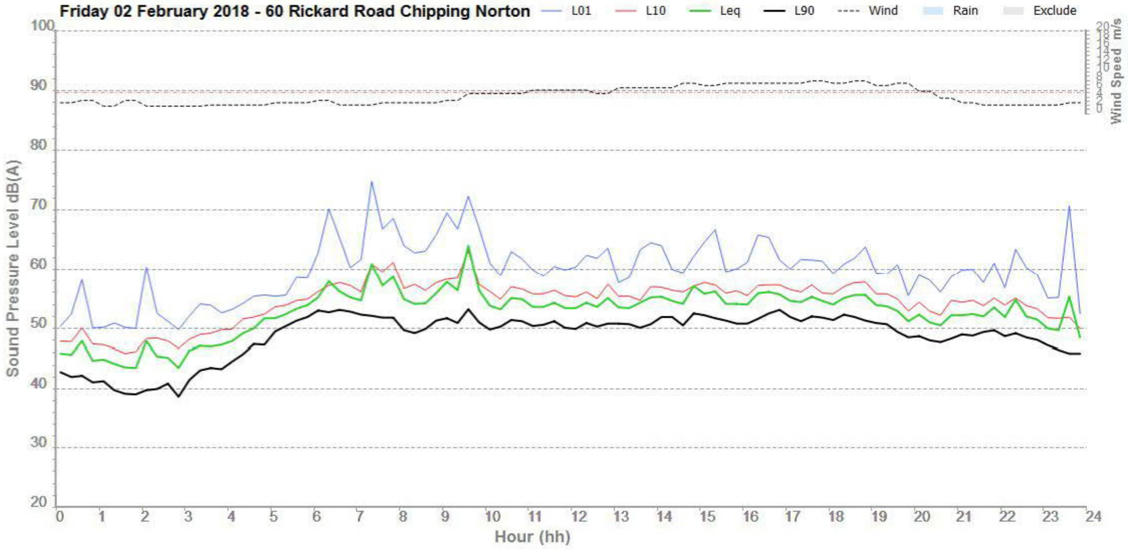
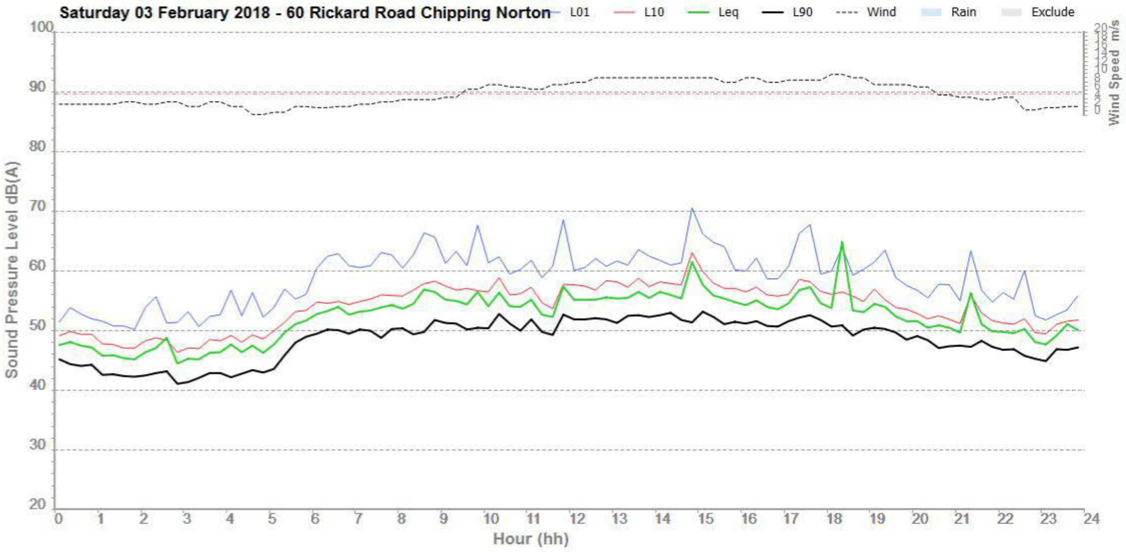
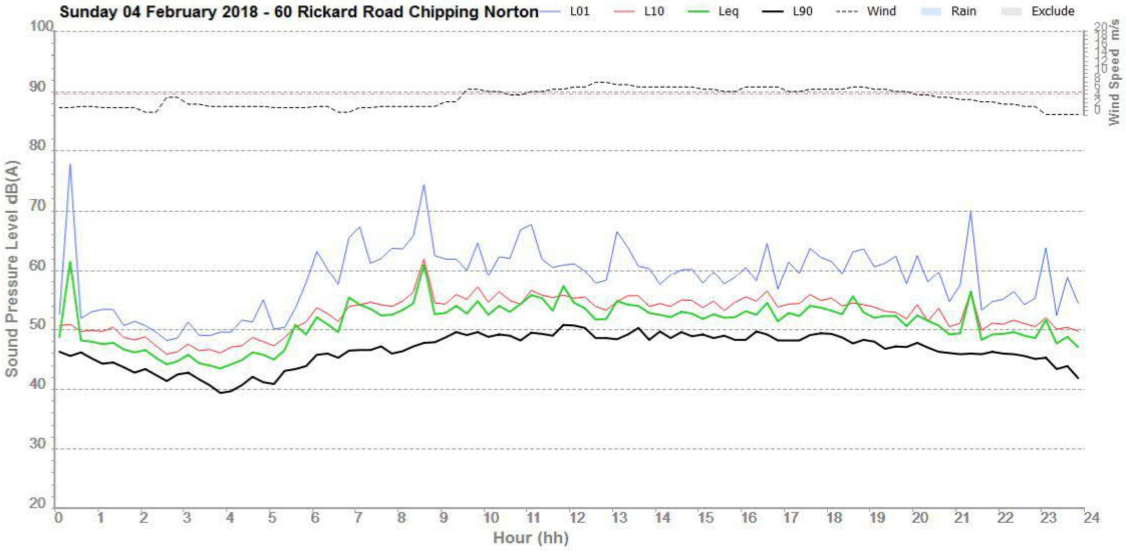
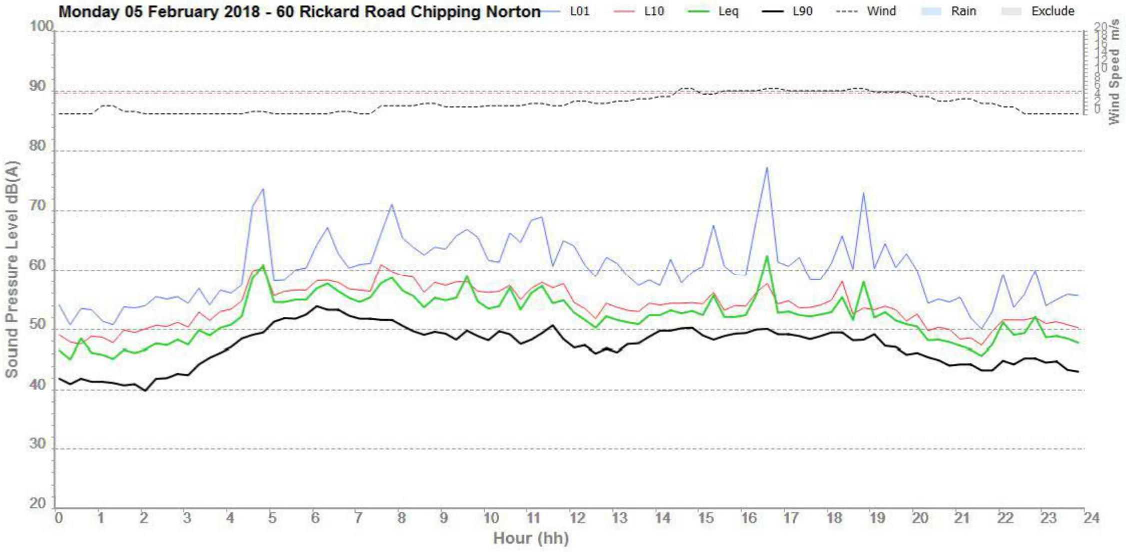

Thursday 01 February 2018 - 60 Rickard Road Chipping Norton


Friday 02 February 2018 - 60 Rickard Road Chipping Norton

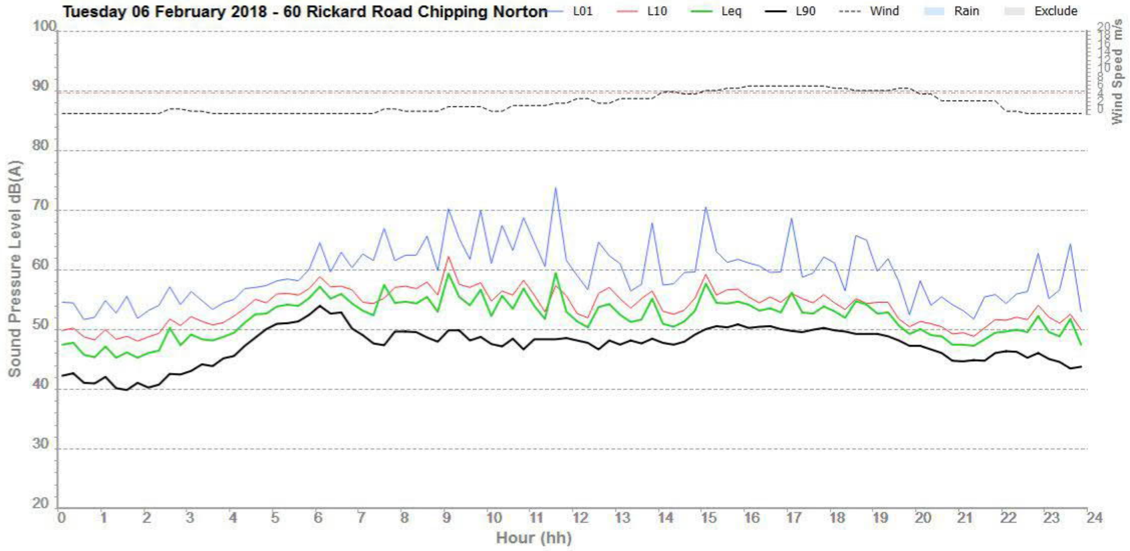
Logger Graphs

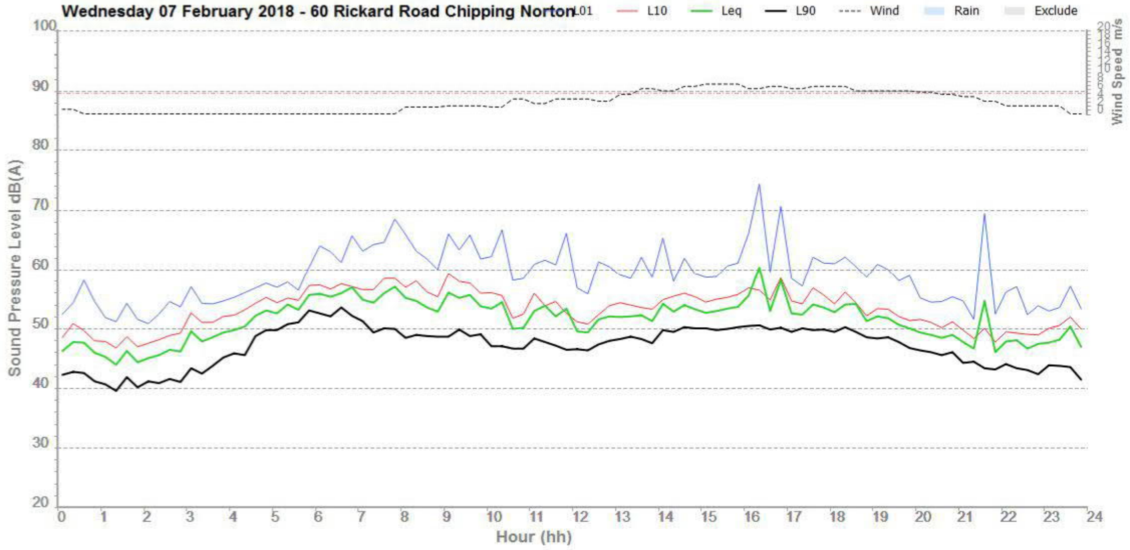

Saturday 03 February 2018 - 60 Rickard Road Chipping Norton

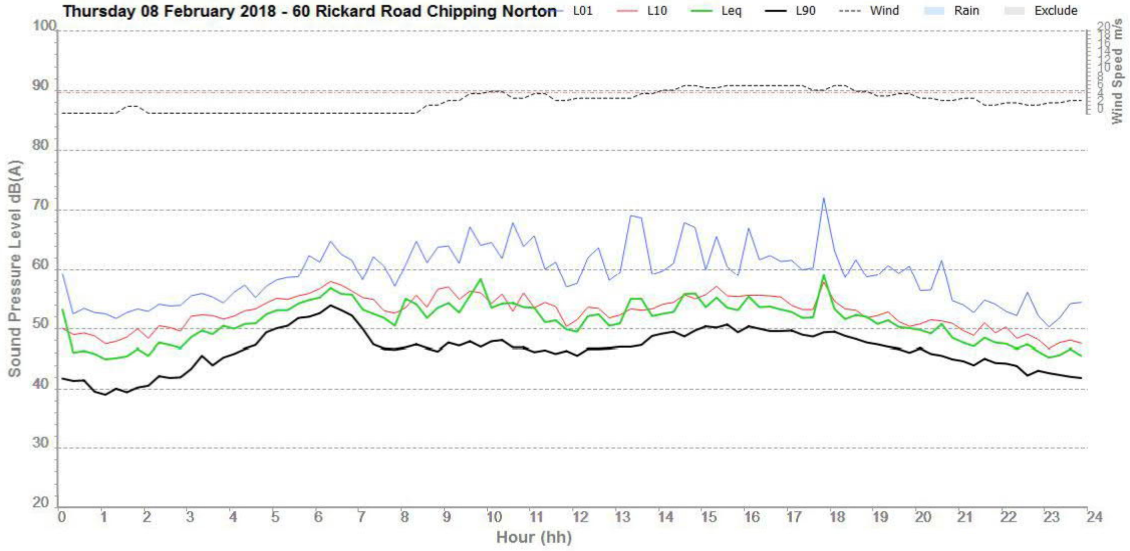

Sunday 04 February 2018 - 60 Rickard Road Chipping Norton


Monday 05 February 2018 - 60 Rickard Road Chipping Norton

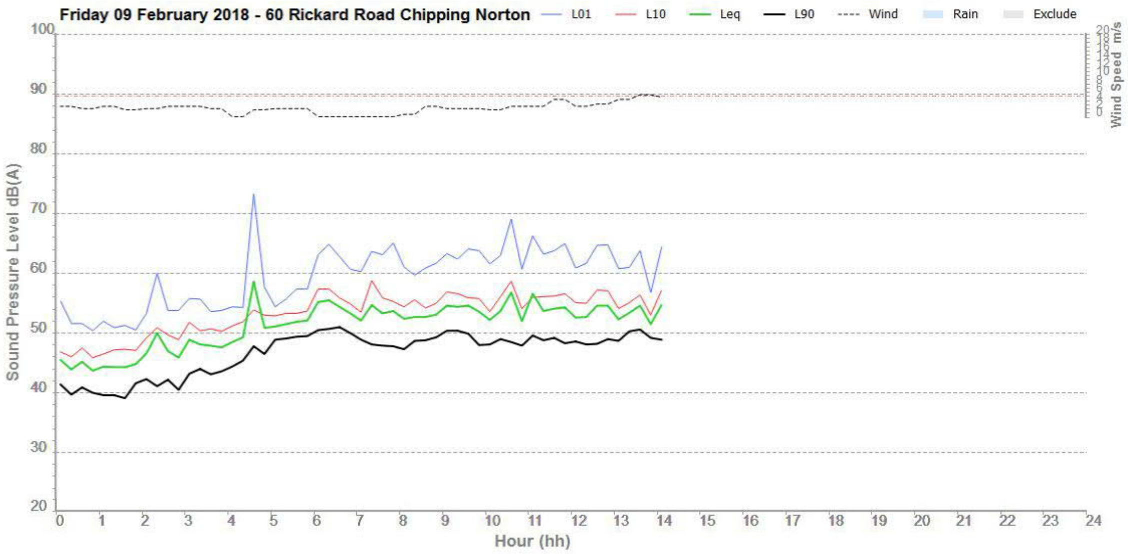
Logger Graphs


Tuesday 06 February 2018 - 60 Rickard Road Chipping Norton


Wednesday 07 February 2018 - 60 Rickard Road Chipping Norton


Thursday 08 February 2018 - 60 Rickard Road Chipping Norton

Logger Graphs



3 Keysor Place, Milperra - 31/01/18 - 04/02/18

Logger Setup

Logger Type: ARL 315

Serial No : 15-299-444

Address: 5-7 Keysor Place , Milperra

Location: Front Yard

Facade / Free Field: Free Field

Environment: Noise environment dominated by road traffic noise from Bullecourt Avenue. Additional aircraft noise clearly audible as well as bird noise. Moderate gusting winds also.

Logger Setup Photo

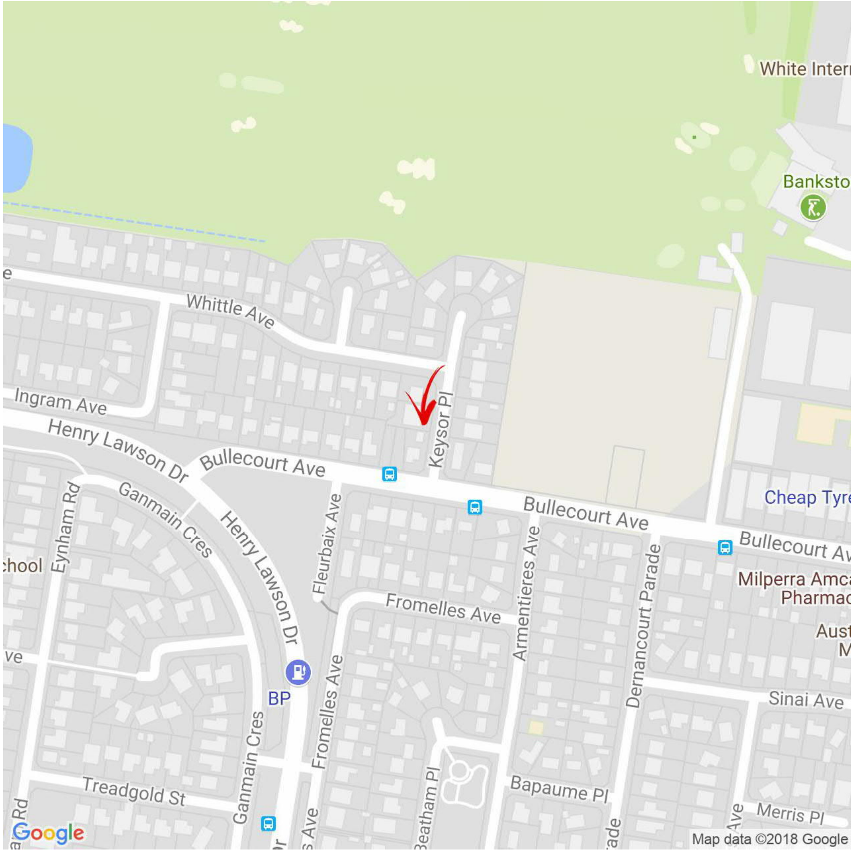
INP Noise Level, dB(A)

	Log Average	RBL
Day	57	45
Evening	53	39
Night	48	32

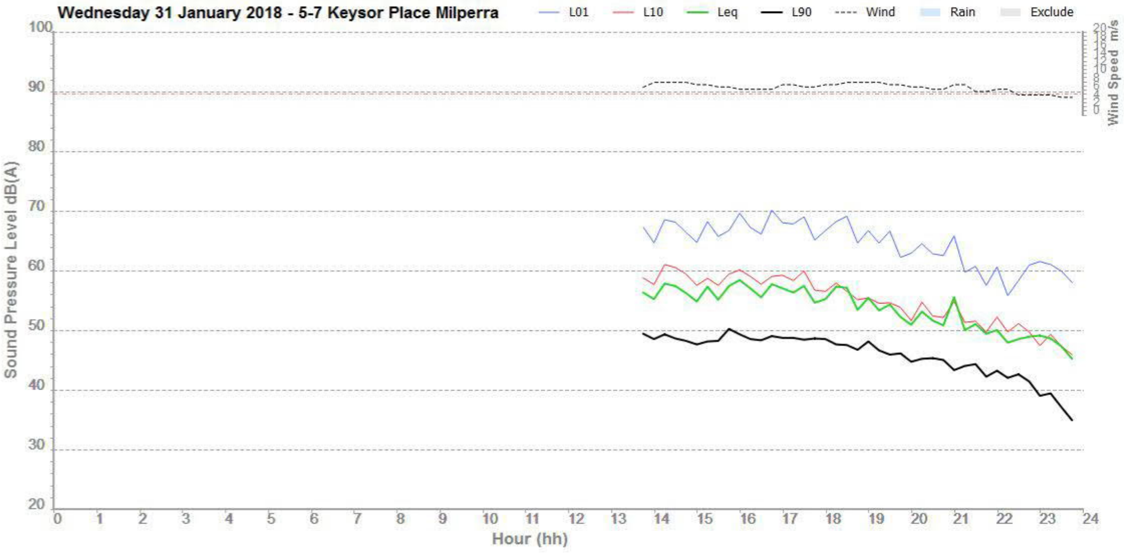
RNP Noise Level, dB(A)

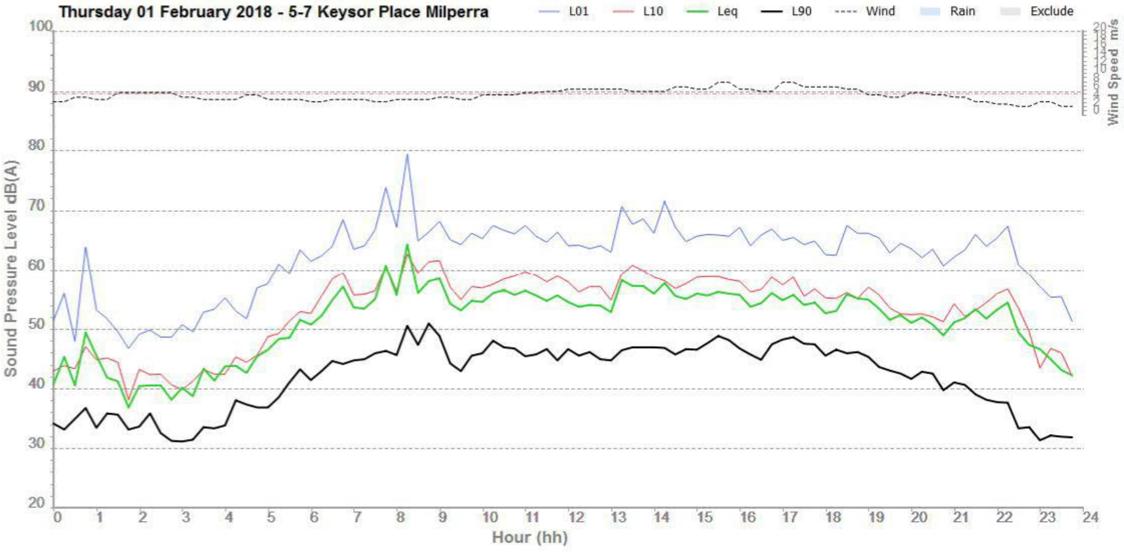
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

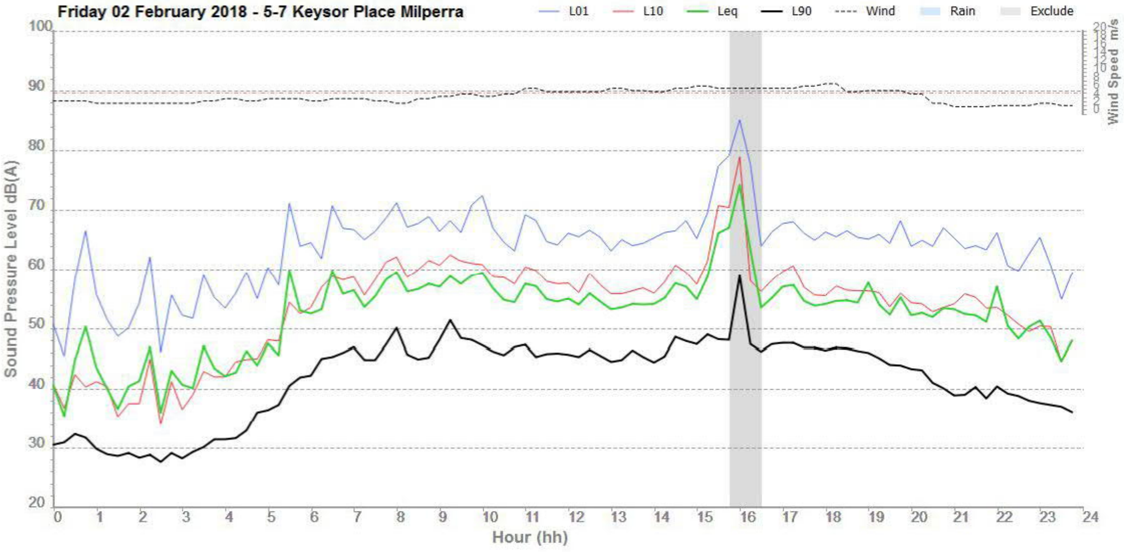
Logger Location Map



Logger Graphs







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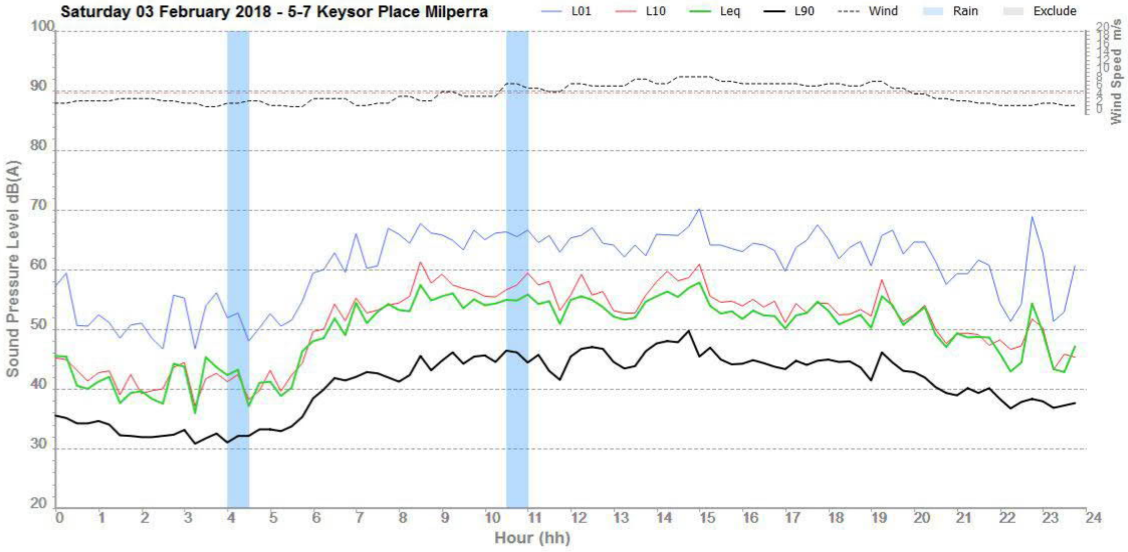
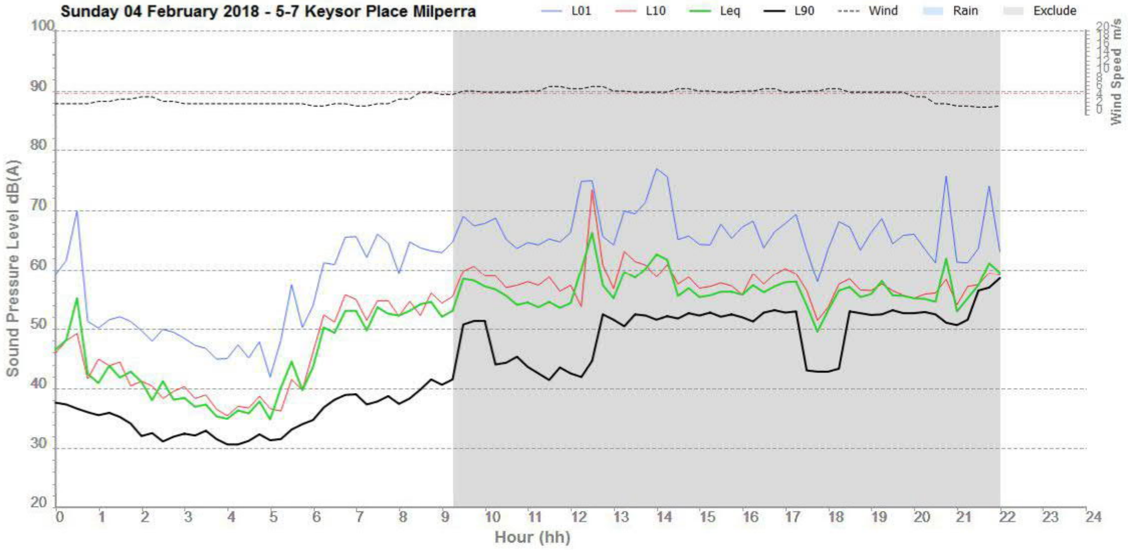




Appendix C

Construction Noise Contour Maps

Sound Pressure Level L_{Aeq}

🟦	🟩	🟨	🟧	🟥
55 - 60	60 - 65	65 - 70	70 - 75	75 - 80

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Construction Noise Contours - Services Relocation and Demolition

0 75 150 300
Meters

Jul 2018

60569579

Fig. 1

AECOM

Sound Pressure Level L_{Aeq}

🟦	🟩	🟨	🟧	🟥
55 - 60	60 - 65	65 - 70	70 - 75	75 - 80

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Construction Noise Contours - Detailed Earthworks

Jul 2018

60569579

0 75 150 300 Meters

Fig. **2**

AECOM

Sound Pressure Level L_{Aeq}

- 🟦 55 - 60
- 🟩 60 - 65
- 🟨 65 - 70
- 🟧 70 - 75
- 🟥 75 - 80

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Construction Noise Contours - Structures and Slab

0 75 150 300 Meters

Jul 2018

60569579

Fig. 3

Appendix D

Operational Noise Contour Maps

AECOM

Sound Pressure Level L_{Aeq}

43 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Operational Noise Contours - Daytime - Neutral Weather Conditions

0 100 200 400 Meters

Jul 2018

60569579

Fig. 1

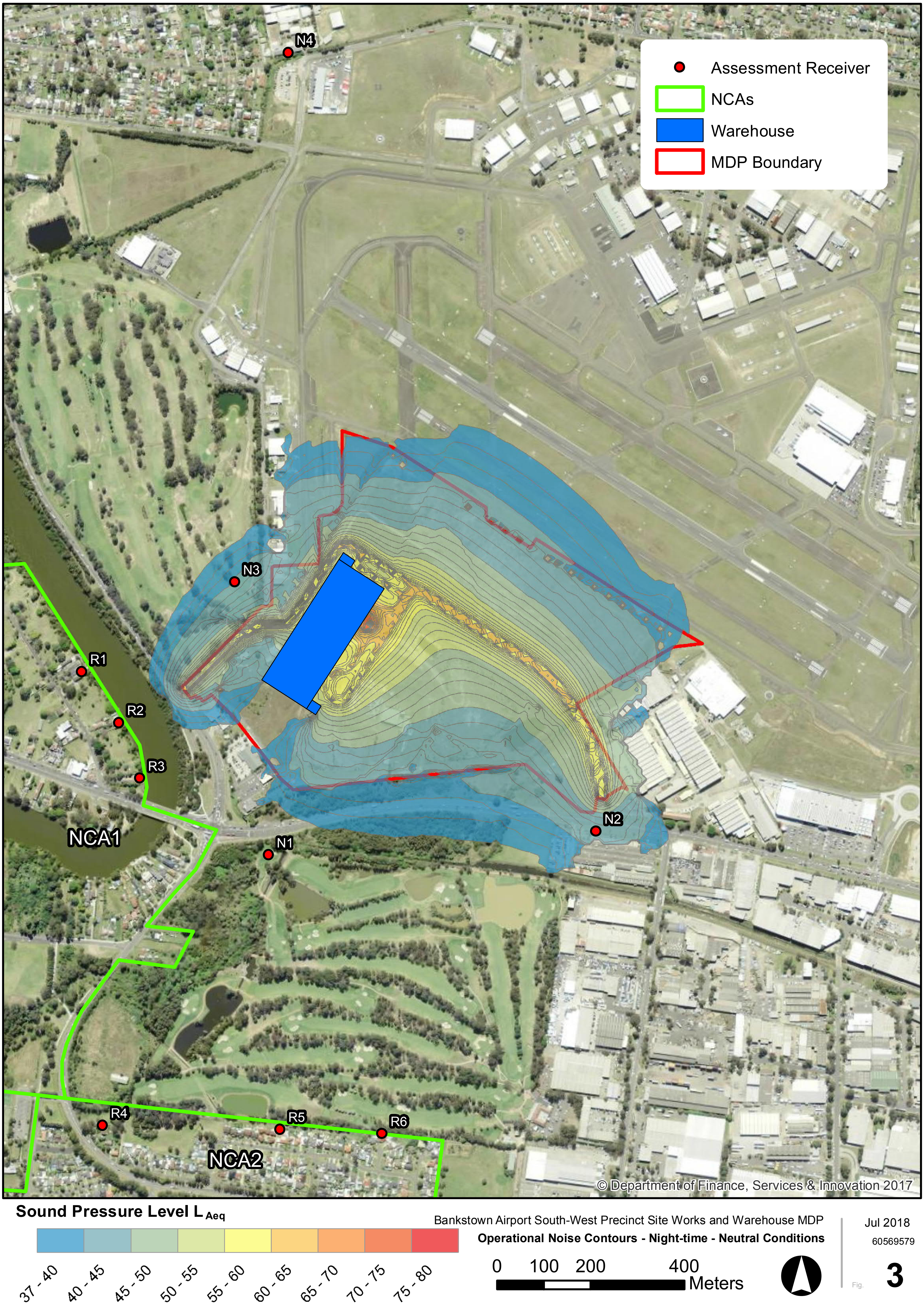
Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Operational Noise Contours - Daytime - Worst-case Conditions

Jul 2018

60569579

Fig. 2



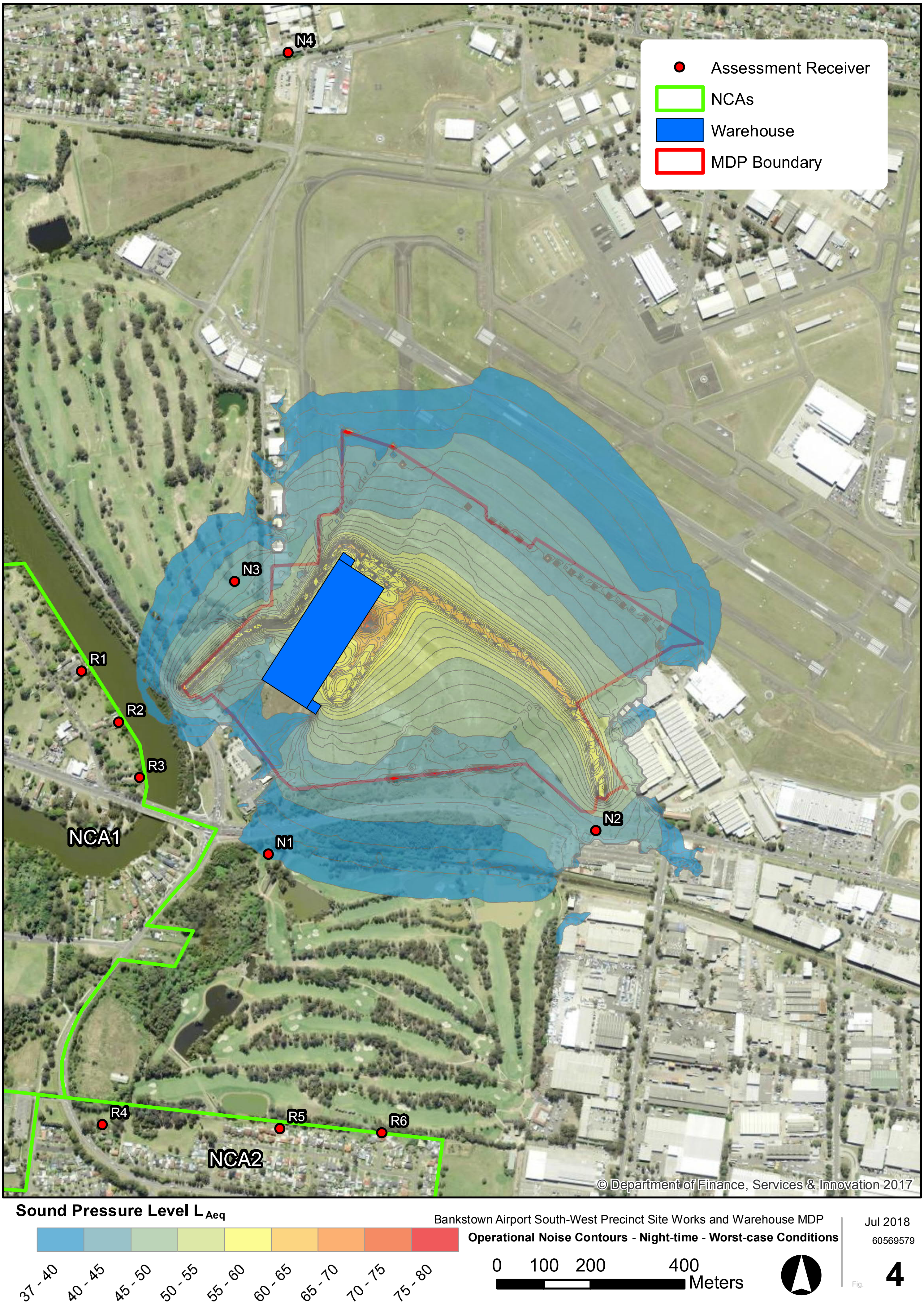
Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Operational Noise Contours - Night-time - Neutral Conditions

Jul 2018

60569579

Fig. 3



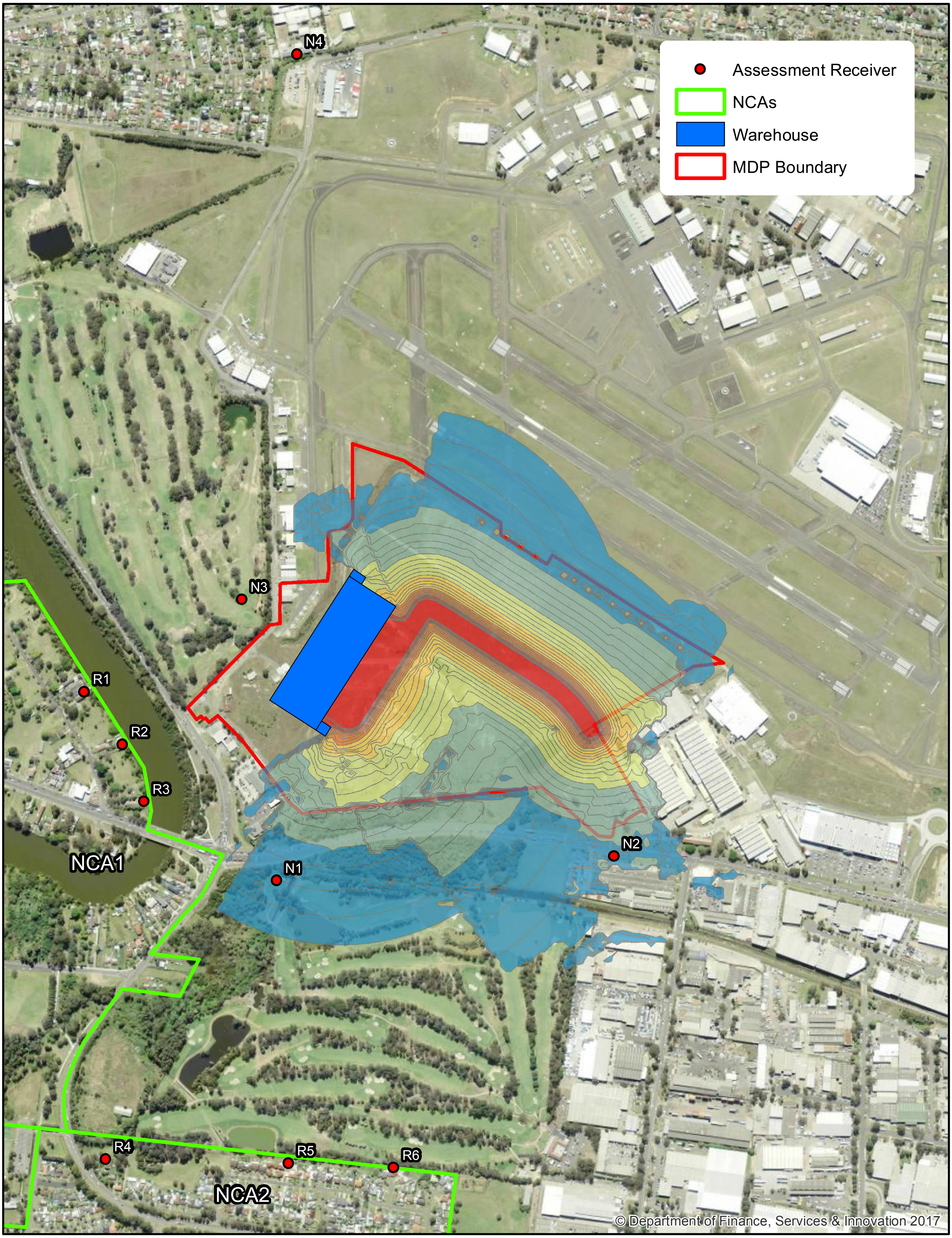
Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Operational Noise Contours - Night-time - Worst-case Conditions

Jul 2018

60569579

Fig. 4



Sound Pressure Level L_{Amax}

52 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80
🟦	🟩	🟨	🟨	🟧	🟥

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Operational Noise Contours - Sleep Disturbance Assessment

0 100 200 400
Meters

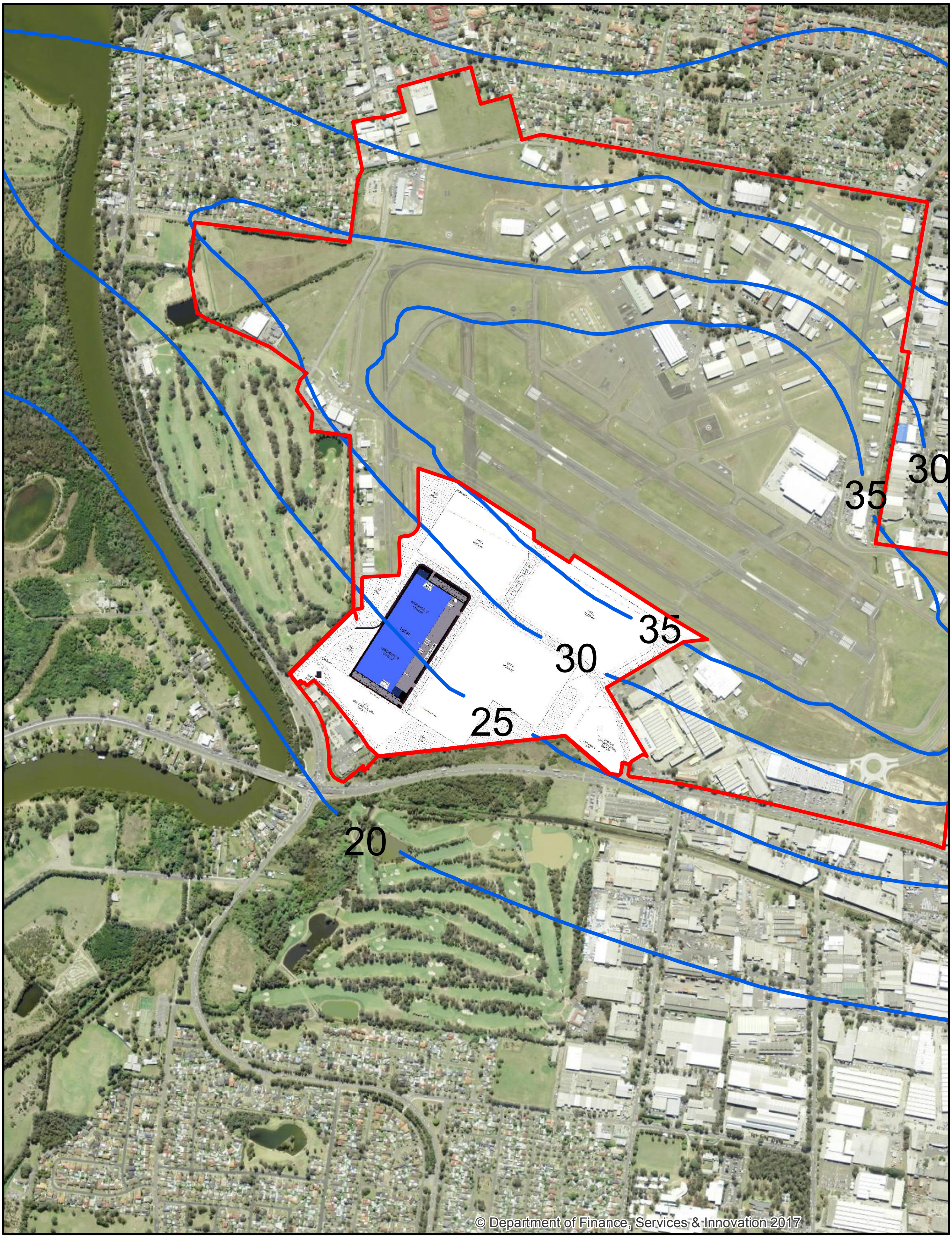
Jul 2018

60569579

Fig. 5

Appendix E

Bankstown Airport 2033/34 ANEF



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Site Boundary

2033/34 ANEF

Bankstown Airport South-West Precinct Site Works and Warehouse MDP

Bankstown Airport 2033/34 ANEF chart, with location of the MDP

0 125 250 500 Meters

Jul 2018

60569579

Fig. 1