Lotsearch Report

Appendix D

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Address: Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Date: 25 Feb 2021 16:32:17

Reference: LS018176 EP

Report Buffer: 1000m

Dataset Listing

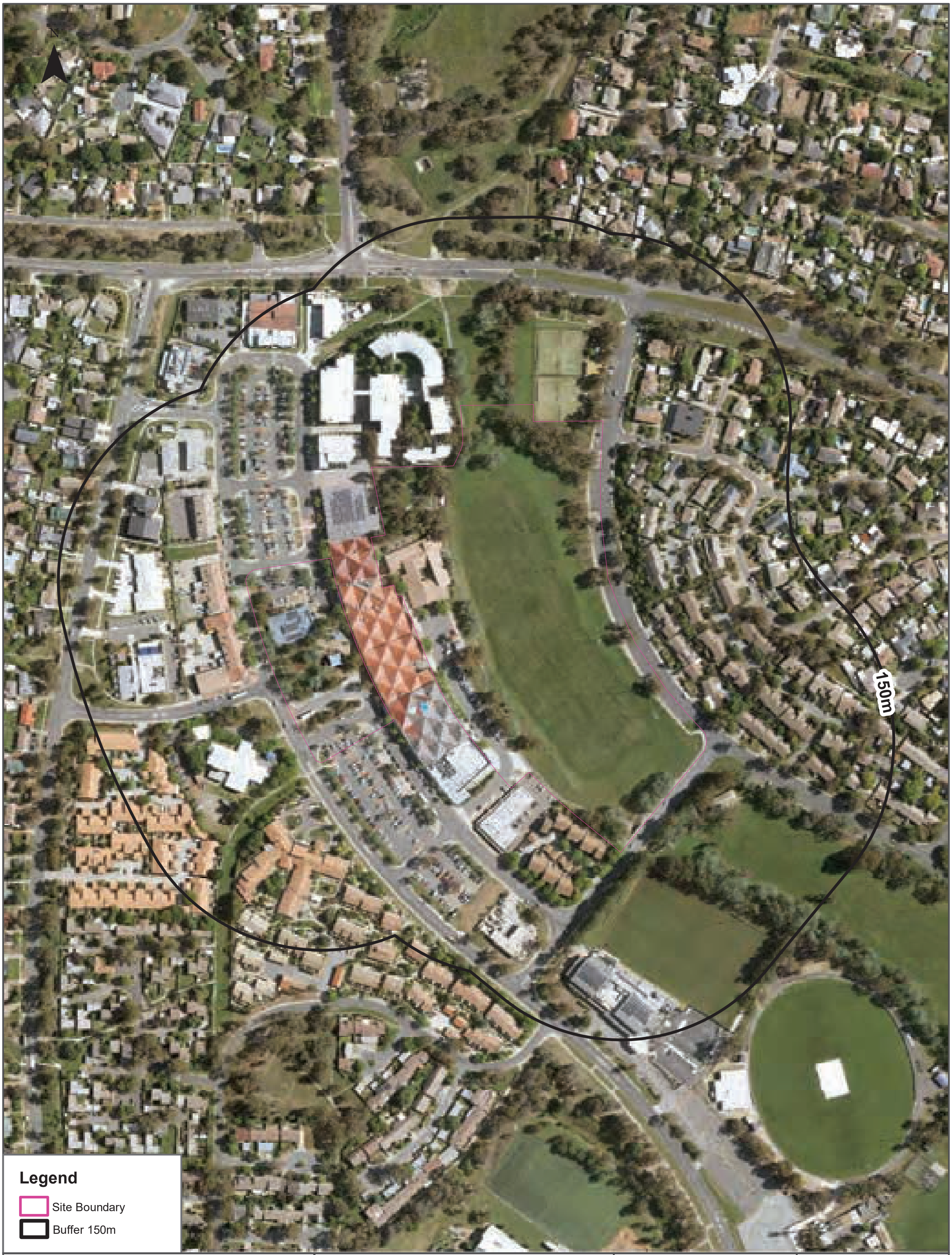
Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Land Administration Databases	ACT Government	07/12/2020	07/12/2020	Quarterly	-	-	-
Register of Contaminated Sites	ACT Government - Environment Protection Authority	17/02/2021	17/02/2021	Monthly	0	2	2
National Waste Management Facilities Database	Geoscience Australia	11/02/2021	07/03/2017	Quarterly	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	15/02/2021	15/03/2012	Quarterly	0	2	2
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	05/02/2021	05/02/2021	Monthly	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	05/02/2021	05/02/2021	Monthly	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	03/02/2021	03/02/2021	Monthly	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	15/02/2021	15/02/2021	Monthly	0	0	0
EPA Authorisations	Environment Protection Authority	17/02/2021	17/02/2021	Monthly	0	2	6
EPA Agreements	Environment Protection Authority	17/02/2021	17/02/2021	Monthly	0	0	0
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	4	88	89
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	-	38	42
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	0	1	1
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	-	4	5
Features of Interest	ACT Government	25/01/2021	25/01/2021	Quarterly	1	13	44
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1	1	1
Hydrogeological Landscapes Units	ACT Government - Environment, Planning and Sustainable Development Directorate	04/01/2018	22/11/2017	As required	1	1	1
Groundwater Boreholes (ACT)	ACT Government	25/01/2021	25/01/2021	Quarterly	0	0	2
Groundwater Boreholes (Bureau of Meteorology)	Commonwealth of Australia (Bureau of Meteorology)	20/11/2017	25/08/2017	Annually	0	0	4
Geological Units 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		Annually	2	-	4
Geological Structures 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		Annually	0	-	3
Atlas of Australian Soils	ABARES	19/05/2017	17/02/2011	As required	1	1	1
Soil Landscapes	NSW Office of Environment & Heritage	12/08/2014		None planned	1	-	3
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1	1	1
Territory Plan Zones	ACT Government - Environment, Planning and Sustainable Development Directorate	25/01/2021	25/01/2021	Quarterly	5	17	87

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Territory Plan Overlays (Areas)	ACT Government - Environment, Planning and Sustainable Development Directorate	25/01/2021	25/01/2021	Quarterly	2	5	34
Territory Plan Overlays (Lines)	ACT Government - Environment, Planning and Sustainable Development Directorate	18/03/2019	18/03/2019	Quarterly	0	1	3
Commonwealth Heritage List	Australian Government Department of Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	0	0	0
National Heritage List	Australian Government Department of Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	0	0	1
Heritage Sites	ACT Government - Environment, Planning and Sustainable Development Directorate	25/01/2021	25/01/2021	Quarterly	0	0	2
Bushfire Prone Areas	ACT Government - Environment, Planning and Sustainable Development Directorate	25/01/2021	25/01/2021	Quarterly	1	1	1
Bushfire Abatement Zones	ACT Government - Environment, Planning and Sustainable Development Directorate	25/01/2021	25/01/2021	Quarterly	0	0	0
Bushfire Operational Plan - Access Management	ACT Government - Environment, Planning and Sustainable Development Directorate	07/01/2020	07/01/2020	Quarterly	0	0	0
Bushfire Operational Plan - Fuel Management	ACT Government - Environment, Planning and Sustainable Development Directorate	07/01/2020	07/01/2020	Quarterly	0	1	6
Flood 1 percent Annual Exceedance Probability	ACT Government - Environment, Planning and Sustainable Development Directorate	09/03/2018	18/01/2017	Annually	0	0	0
Vegetation Communities	ACT Government	03/02/2021	21/12/2018	Annually	2	3	49
Vegetation Subformation	ACT Government	14/01/2019	14/01/2019	Annually	2	2	4
Threatened Woodland	ACT Government	05/02/2021	19/11/2020	Annually	0	0	0
Tree Register	ACT Government	25/01/2021	25/01/2021	Quarterly	0	0	0
Important Wetlands	ACT Government	25/01/2021	25/01/2021	Quarterly	0	0	0
Groundwater Dependent Ecosystems Atlas	Bureau of Meteorology	14/08/2017	15/05/2017	Annually	0	0	2
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	25/02/2021	25/02/2021	Weekly	-	-	-

Aerial Imagery 2020

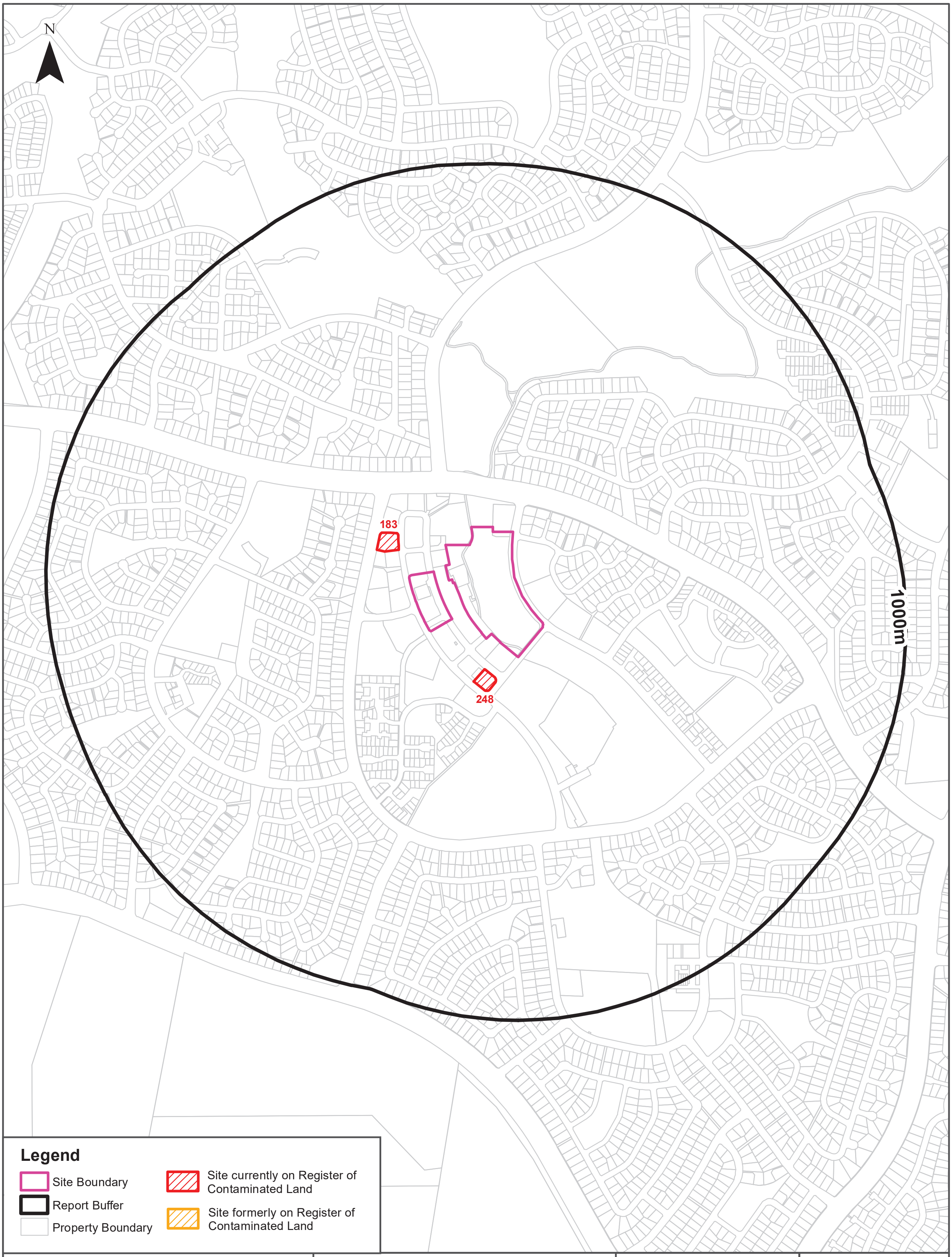
Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale: 0 40 80 120 160 Meters	Data Sources: Aerial Imagery © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Contaminated Sites Register

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- ▨ Site currently on Register of Contaminated Land
- ▨ Site formerly on Register of Contaminated Land

Scale:

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Contaminated Land

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Register of Contaminated Sites

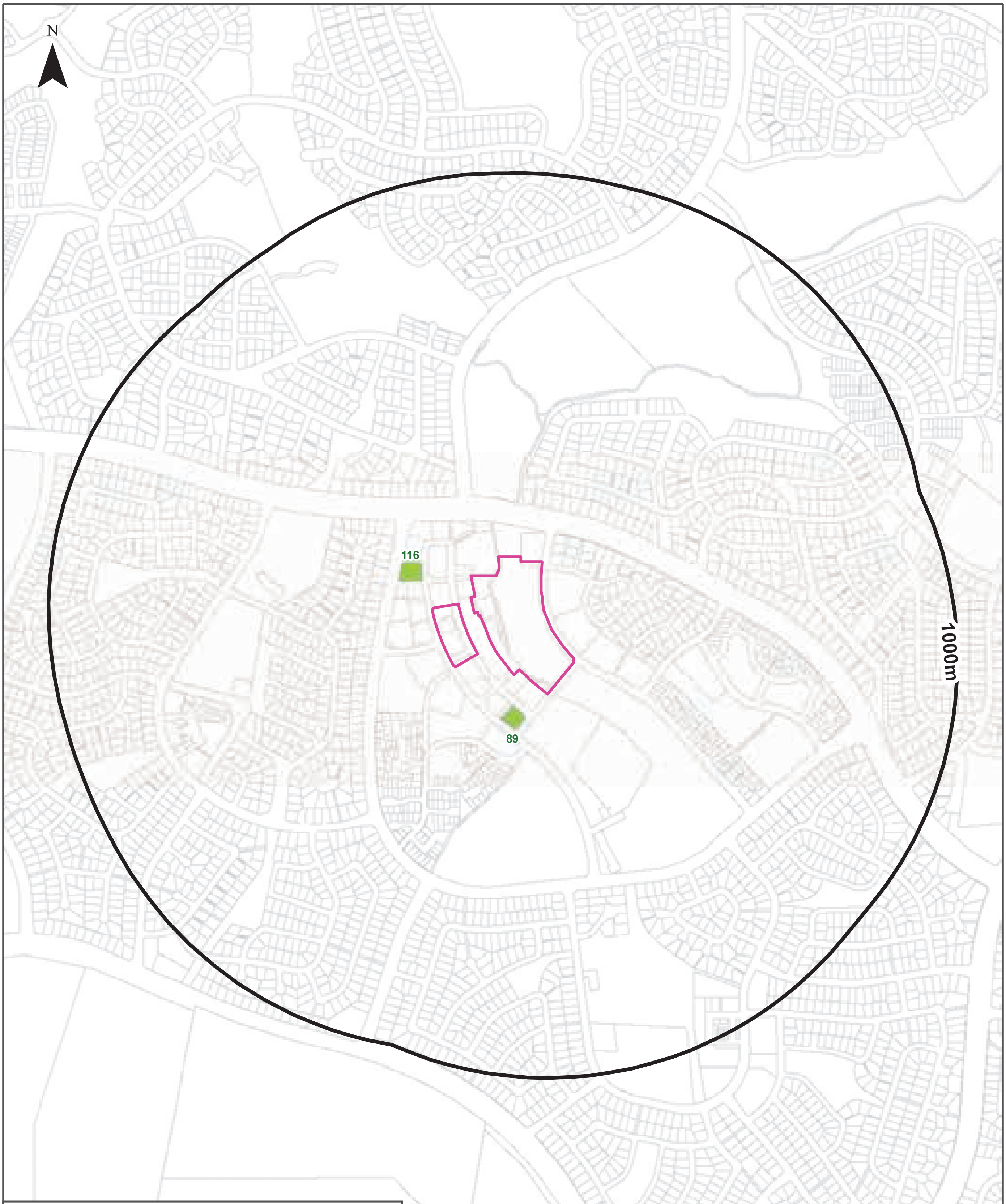
Records from the ACT Register of Contaminated Sites within the report buffer:

Map Id	Site Description	Notification	District	Division	Section	Block	Status	Loc Conf	Dist	Direction
183	Active 7-Eleven Service Station	76(2)	Belconnen	Holt	52	1	Site currently on EPA Register	Premise Match	76m	North West
248	Active Caltex Service Station	76(2)	Belconnen	Holt	53	1	Site currently on EPA Register	Premise Match	83m	South

ACT Register of Contaminated Sites Data Source: ACT Government Environment Protection Authority

Waste Management & Liquid Fuel Facilities

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

□ Site Boundary	🟩 National Liquid Fuel Facility
□ Report Buffer	▨ Waste Management Facility
□ Property Boundary	

Scale:

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Waste Management and Liquid Fuel Facilities

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

National Waste Management Site Database

Sites on the National Waste Management Site Database within the report buffer:

Site Id	Owner	Name	Address	Suburb	Postcode	Landfill	Reprocess	Transfer	Loc Conf	Distance	Direction
N/A	No records in buffer										

Waste Management Facilities Data Source: Australian Government Geoscience Australia

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist (m)	Direction
116	7-Eleven Pty Ltd	Holt	88 Hardwick Crescent	Holt	Petrol Station	Operational		13/07/2012	Premise Match	77m	North West
89	Caltex	Caltex Woolworths Holt	1 Hardwick Crescent	Holt	Petrol Station	Operational		25/07/2011	Premise Match	84m	South

National Liquid Fuel Facilities Data Source: Geoscience Australia

PFAS Investigation and Management Programs

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Defence PFAS Investigation and Management Program Investigation Sites

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Defence PFAS Investigation and Management Program Management Sites

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Location Confidence	Distance	Direction
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Defence 3 Year Regional Contamination Investigation Program

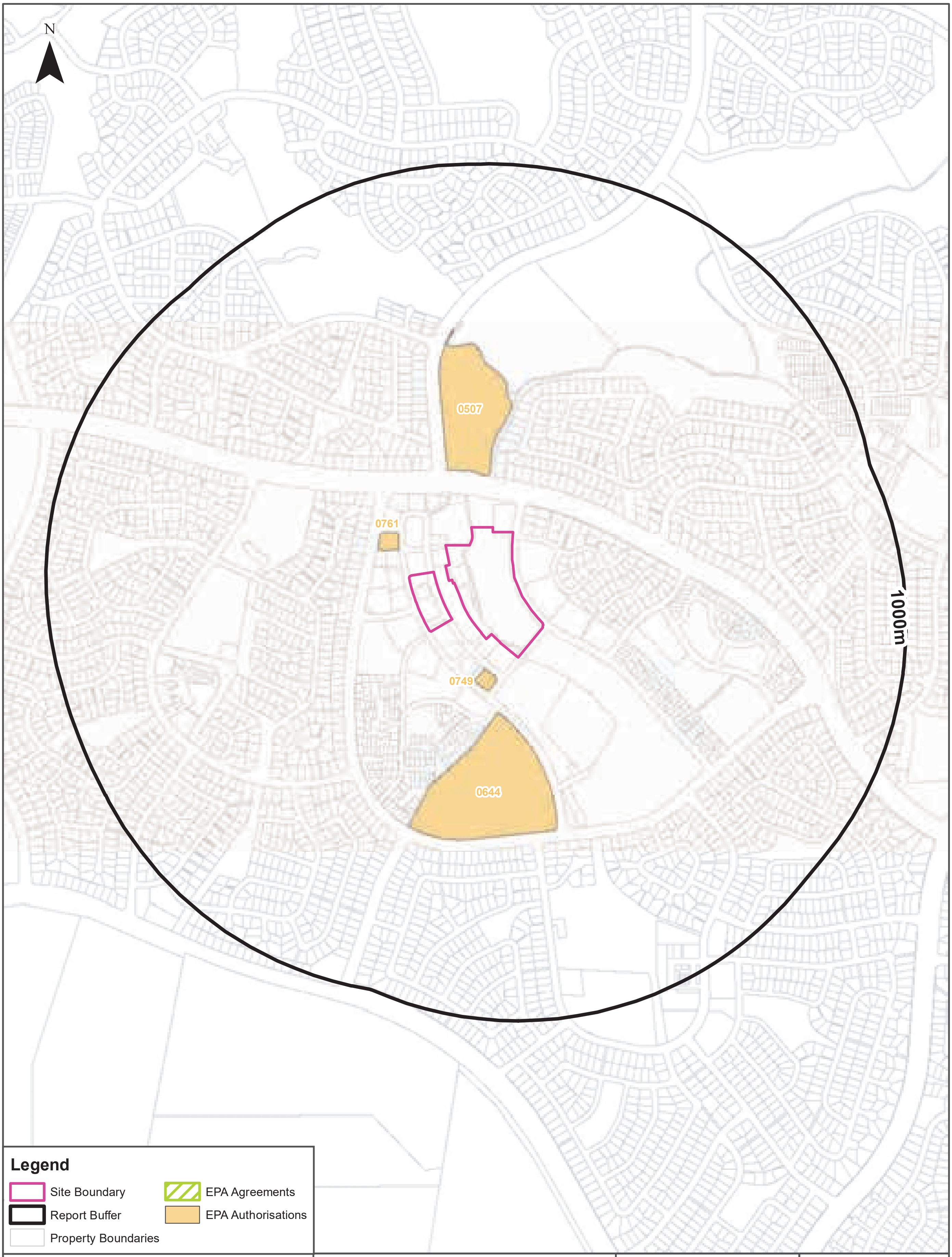
Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Authorisations and Agreements

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

▭ Site Boundary
▨ EPA Agreements
▭ Report Buffer
🟧 EPA Authorisations
▭ Property Boundaries

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

EPA Authorisations & Agreements

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

EPA Authorisations

EPA Authorisations within the report buffer:
Note. Please click on ID Number to activate a hyperlink to online documentation. If link does not work, no documentation is accessible via the EPA.

ID Number	Activity	Business / Individual Name	Grant Date	Expiry Date	Status	Loc Conf	Distance	Direction
0761	Petroleum storage (Activity 30)	7-Eleven Stores Pty Ltd - HOLT	3/4/2010		Current	Premise Match	76m	North West
0749	Petroleum storage (Activity 30)	Caltex Petroleum Pty Ltd - HOLT	10/19/2011		Current	Premise Match	83m	South
0507	Extraction of Material from waterways; Greater than 100m3 (Activity 1)	Canberra Urban Parks and PLaces	3/31/2005	1/12/2007	Ceased	Premise Match	138m	North
0644	Placement of soil on land (Activity 7)	Trevaskis, Greame	10/3/2008		Expired	Premise Match	161m	South
0388	Commercial use of chemicals (Activity 29)	Lawn Doctor ACT Pty Ltd	10/8/2002	8/28/2013	Ceased	Suburb/Area Match	-	-
0410	Operation of crushing, grinding and separation (Activity 43)	Advanced Demolition and Recycling Pty Ltd	5/13/2003		Ceased	Suburb/Area Match	-	-

EPA Authorisations Data Source: ACT Government Environment Protection Authority

EPA Agreements

Note. Due to the lack of premise details within the documentation, this list does not include the following agreement:
Land development

EPA Agreements within the report buffer:
Note. Please click on ID Number to activate a hyperlink to online documentation. If link does not work, no documentation is accessible via the EPA.

ID Number	Agreement Type	Business / Individual Name	Grant Date	Expiry Date	Status	Loc Conf	Distance	Direction
N/A	No records in buffer							

EPA Agreements Data Source: ACT Government Environment Protection Authority

Historical Business Directories

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

- ▭ Site Boundary
- ▭ Buffer 150m
- ▭ Property Boundary
- ● Business directory records mapped to a specific premise
- 🟩 Business directory records mapped to a road intersection
- ▲ Business directory records mapped to a road corridor
- ▨ Business directory records mapped to a general area

Scale:

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Business Directory Records 1950-1991 Premise or Road Intersection Matches

Universal Business Directory records from years 1950, 1961, 1970, 1982 and 1991, mapped to a premise or road intersection, within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	MEDICAL PRACTITIONERS.	Hughson B Kippax Health Centre., Kippax Pl Holt	6664	1991	Premise Match	0m	On-site
	HEALTH CENTRES &/OR CLINICS.	Kippax Health Centre., Kippax Pl Holl	6062	1991	Premise Match	0m	On-site
	MEDICAL PRACTITIONERS	Hughson, B., Kippax Health Centre, Holt., Canberra .(A.C.T.)	4376	1982	Premise Match	0m	On-site
	HEALTH CENTRES &/OR CLINICS	Kippax Health Centre, Kippax Pl.. Holt., Canberra .(A.C.T.)	3678	1982	Premise Match	0m	On-site
2	CAFES, TEA ROOMS &/OR COFFEE LOUNGES.	Aloha Coffee Lounge., Shop 31 Kippax Fair Holt	1636	1991	Premise Match	0m	South West
	TAKE-AWAY FOODS	Aloha Coffee Lounge., Shop 31 Kippax Fair Holt	8117	1991	Premise Match	0m	South West
	GIFT SHOPS.	Asian Arts., Shop 9 Kippax Fair Holt	2199	1991	Premise Match	0m	South West
	JEWELLERS - RETAIL.	Asian Arts., Shop 9 Kippax Fair Holt	4659	1991	Premise Match	0m	South West
	GROCERS &/OR GENERAL STOREKEEPERS	Asian Food Mart, Kippax Fair Holt	5731	1991	Premise Match	0m	South West
	PET SHOPS.	Beconnen Pet Centre., Shop 27 Kippax Fair Holt	8745	1991	Premise Match	0m	South West
	ANIMAL &/OR BIRD DEALERS & SUPPLIES	Belconnen Pet Centre., Shop 27 Kippax Fair Holt	1307	1991	Premise Match	0m	South West
	ANIMAL &/OR BIRD FOOD SUPPLIES.	Belconnen Pet Centre., Shop 27 Kippax Fair Holt	1313	1991	Premise Match	0m	South West
	AQUARIUM STOCK &/OR SUPPLIES.	Belconnen Pet Centre., Shop 27 Kippax Fair Holt	1338	1991	Premise Match	0m	South West
	FRUITERERS &/OR GREENGROCERS.	Big Top Fruit & Vegetable Market., Shop 13 Kippax Fair Holt	4514	1991	Premise Match	0m	South West
	HOBBY &/OR HANDICRAFT SUPPLIES.	Bilbos Wool Barn., Shop 21 Kippax Fair Holl	6175	1991	Premise Match	0m	South West
	KNITTED GOODS & KNITTING SUPPLIES.	Bilbos Wool Barn., Shop 21 Kippax Fair Holt	4833	1991	Premise Match	0m	South West
	BUILDING SOCIETIES.	Canberra Building Society., Shop 7 Kippax Fair Holt	353	1991	Premise Match	0m	South West
	SHOPPING CENTRES.	Centre Management Kippax Fair., Holt	3179	1991	Premise Match	0m	South West
	RESTAURANTS.	Chinese Inn Restaurant., Shop 30 Kippax Fair Holt	984	1991	Premise Match	0m	South West
	TAKE-AWAY FOODS	Chinese Inn Restaurant., Shop 30 Kippax Fair Holt	8137	1991	Premise Match	0m	South West
	BANKS.	Civic Advance Bank Kippax Fair., Holt	747	1991	Premise Match	0m	South West
	BANKS.	Commonwealth Banking Corporation Kippax Fair., Holt	763	1991	Premise Match	0m	South West
	FOOTWEAR RETAILERS.	Frawleys Shoes., Shop 26 Kippax Fair Holt	4447	1991	Premise Match	0m	South West
	VIDEO CASSETTE LIBRARIES	Global Video., Shop 23 Kippax Fair Holt	5486	1991	Premise Match	0m	South West

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
2	HAIRDRESSERS - LADIES &/OR BEAUTY SALONS.	Hair Focus., Shop 19 Kippax Fair Holt	5889	1991	Premise Match	0m	South West
	HAIRDRESSERS - MENS.	Hair Focus., Shop 19 Kippax Fair Holt	5991	1991	Premise Match	0m	South West
	BAKERS	Kippax Bakery., Shop 15 Kippax Fair Holt	715	1991	Premise Match	0m	South West
	CAKE SHOPS &/OR PASTRYCOOKS.	Kippax Bakery., Shop 15 Kippax Fair Holt	1724	1991	Premise Match	0m	South West
	PIE MAKERS.	Kippax Bakery., Shop 15 Kippax Fair Holt	8894	1991	Premise Match	0m	South West
	TAKE-AWAY FOODS	Kippax Fair Coffee & Take Away., Shop 29 Kippax Fair Holt	8189	1991	Premise Match	0m	South West
	BOOKSELLERS RETAIL.	Kippax Fair Newsagency., Shop 20 Kippax Fair Holt	122	1991	Premise Match	0m	South West
	NEWSAGENTS.	Kippax Fair Newsagency., Shop 20 Kippax Fair Holt	3689	1991	Premise Match	0m	South West
	BUTCHERS - RETAIL.	Kippax Meat Centre., Shop 12 Kippax Fair Holt	1567	1991	Premise Match	0m	South West
	CHEMISTS - ANALYTICAL.	Kippax Pharmacy., Shop 8 Kippax Fair Holl	5075	1991	Premise Match	0m	South West
	PHOTOGRAPHIC DEVELOPING, PRINTING &/OR COLOURING SERVICES.	Kippax Pharmacy., Shop 8 Kippax Fair Holt	8821	1991	Premise Match	0m	South West
	DRESS FABRIC RETAILERS	Marie's Fabrics., Shop 28 Kippax Fair Holt	7238	1991	Premise Match	0m	South West
	BANKS.	National Australia Bank Kippax Fair., Holt	788	1991	Premise Match	0m	South West
	DELICATESSENS.	Pisces Delicatessen., Shop 32 Kippax Fair Holt	7031	1991	Premise Match	0m	South West
	GIFT SHOPS.	Rustic Living., Shop 5 Kippax Fair Holt	2254	1991	Premise Match	0m	South West
	KITCHENWARE RETAILERS.	Rustic Living., Shop 5 Kippax Fair Holt	4829	1991	Premise Match	0m	South West
	SUPERMARKETS	Supabarn Kippax Fair., Holt	8063	1991	Premise Match	0m	South West
	BANKS.	Westpac Banking Corporation., Shop 6 Kippax Fair Holt	795	1991	Premise Match	0m	South West
	DRY CLEANERS & PRESSERS	60 Minute Cleaners, Shop 14, Kippax Fair, Holt., Canberra .(A.C.T.)	2236	1982	Premise Match	0m	South West
	FLORISTS - RETAIL	A.C.T. Flowers, Kippax Fair. Holt., Canberra . (A.C.T.)	2820	1982	Premise Match	0m	South West
	CAFES, TEA ROOMS'&/OR COFFEE LOUNGES	Aloha Milk Bar, Shop 31, Kippax Fair, Holt., Canberra .(A.C.T.)	1243	1982	Premise Match	0m	South West
	TAKE-AWAY FOODS	Aloha Milk Bar, Shop 31, Kippax Fair, Holt., Canberra .(A.C.T.)	6821	1982	Premise Match	0m	South West
	ANIMAL &/OR BIRD DEALERS	Belconnen Pet Centre, Shop 27, Kippax Fair, Holt., Canberra .(A.C.T.)	249	1982	Premise Match	0m	South West
	ANIMAL &/OR BIRD FOOD SUPPIIES	Belconnen Pet Centre, Shop 27, Kippax Fair, Holt., Canberra .(A.C.T.)	257	1982	Premise Match	0m	South West
	AQUARIUMS & SUPPIIES	Belconnen Pet Centre, Shop 27, Kippax Fair, Holt., Canberra .(A.C.T.)	271	1982	Premise Match	0m	South West
	TAKE-AWAY FOODS	Burgermaster, The, Shop 29, Kippax Fair, Holt., Canberra .(A.C.T.)	6829	1982	Premise Match	0m	South West
	BUILDING SOCIETIES	Canberra Co-Operative Permanent Budding Society Ltd.. Shop 7, Kippax Fair, Holt, ., Canberra .(A.C.T.)	1072	1982	Premise Match	0m	South West
	SEWING MACHINE SALES &/OR SERVICE	Canberra Sewing Centre, Shop 2, Kippax Fair, Holt., Canberra .(A.C.T.)	6477	1982	Premise Match	0m	South West
	RESTAURANTS	Chinese Inn Restaurant, Shop 30, Kippax Fair, Holt., Canberra .(A.C.T.)	6042	1982	Premise Match	0m	South West
	BANKS	Commercial Banking Co. of Sydney Ltd., 48 Hardwick Cr., Holt., Canberra .(A.C.T.)	567	1982	Premise Match	0m	South West

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
2	CLOTHING - RETAIL - BABY &/OR CHILDRENS WEAR	Fossey's, Shop 11, Kippax Fair, Holt., Canberra .(A.C.T.)	1584	1982	Premise Match	0m	South West
	CLOTHING - RETAIL - LADIES &/OR GIRLS WEAR	Fossey's, Shop 11, Kippax Fair, Holt., Canberra .(A.C.T.)	1614	1982	Premise Match	0m	South West
	CLOTHING - RETAIL - MENS &/OR BOYS WEAR	Fossey's, Shop 11, Kippax Fair, Holt., Canberra .(A.C.T.)	1671	1982	Premise Match	0m	South West
	BOOT &/OR SHOE RETAILERS	Frawleys Shoes. Shop 26, Kippax Fair. Holt., Canberra .(A.C.T.)	805	1982	Premise Match	0m	South West
	HAIRDRESSERS - LADIES &/OR BEAUTY SALONS	Hair Focus, Shop 19, Kippax Fair, Holt., Canberra .(A.C.T.)	3548	1982	Premise Match	0m	South West
	HAIRDRESSERS - MENS	Hair Focus, Shop 19, Kippax Fair, Holt., Canberra .(A.C.T.)	3623	1982	Premise Match	0m	South West
	WINE &/OR SPIRIT MERCHANTS -RETAIL	Higgins Food Store O. Delicatessen, Shopping Centre. Higgins., Canberra .(A.C.T.)	7524	1982	Premise Match	0m	South West
	NEWSAGENTS	Higgins Newsagency, Shopping Centre. Higgins., Canberra .(A.C.T.)	5122	1982	Premise Match	0m	South West
	PASTRYCOOKS &/OR CAKE SHOPS	Hot Bake Kitchen, Shop 15, Kippax Fair, Holt., Canberra .(A.C.T.)	5405	1982	Premise Match	0m	South West
	PIE MAKERS	Hot Bake Kitchen, Shop 15, Kippax Fair, Holt., Canberra .(A.C.T.)	5566	1982	Premise Match	0m	South West
	BAKERS - BREAD	Hot Bake Kitchen. Shop 15, Kippax Fair, Holt., Canberra .(A.C.T.)	526	1982	Premise Match	0m	South West
	NEWSAGENTS	Kippax Fair Newsagency, Shop 20, Kippax Fair, Holt., Canberra .(A.C.T.)	5126	1982	Premise Match	0m	South West
	FRUITERERS &/OR GREENGROCERS	Kippax Fruit Centre, Shop 13, Kippax Far, Holt., Canberra .(A.C.T.)	2918	1982	Premise Match	0m	South West
	BUTCHERS - RETAIL	Kippax Meat Market, Shop 12, Kippax Fair, Holt., Canberra .(A.C.T.)	1162	1982	Premise Match	0m	South West
	CHEMISTS - PHARMACEUTICAL	Kippax Pharmacy, Shop 8, Kippax Fair, Holt., Canberra .(A.C.T.)	1488	1982	Premise Match	0m	South West
	DRAPERS - RETAIL	Knit Wit, Shop 22, Kippax Fair, Holt., Canberra .(A.C.T.)	2187	1982	Premise Match	0m	South West
	SEWING MACHINE SALES &/OR SERVICE	Knit Wit, Shop 22, Kippax Fair, Holt., Canberra .(A.C.T.)	6479	1982	Premise Match	0m	South West
	DRESS FABRIC RETAILERS	Knit Wit, Shop 22. Kippax Fair. Holt., Canberra .(A.C.T.)	2217	1982	Premise Match	0m	South West
	MIXED BUSINESSES	Latham Snack Bar, Shopping Centre. Latham., Canberra .(A.C.T.)	4507	1982	Premise Match	0m	South West
	CLOTHING - RETAIL - BABY &/OR CHILDRENS WEAR	MacDonald's Children Wear, Shop 28. Kippax Fair, Holt., Canberra .(A.C.T.)	1588	1982	Premise Match	0m	South West
	KITCHENWARE RETAILERS	Rustic Living, Shop 5, Kippax Fair, Holt., Canberra .(A.C.T.)	4124	1982	Premise Match	0m	South West
	GIFT SHOPS	Rustic Living, Shop 5. Kippax Fair, Holt., Canberra .(A.C.T.)	3183	1982	Premise Match	0m	South West
	HEALTH FOODS - RETAIL	Sanitarium Health Food Centre; Shop 18, Kippax Fair, Holt., Canberra .(A.C.T.)	3696	1982	Premise Match	0m	South West
	ENGRAVERS - JEWELLER	Stubbs & Walton, Kiosk 1, Kippax Fair, Holt., Canberra .(A.C.T.)	2682	1982	Premise Match	0m	South West
	JEWELLERS &/OR WATCHMAKERS - RETAIL	Stubbs & Walton, Kiosk 1, Kippax Fair, Holt., Canberra .(A.C.T.)	4077	1982	Premise Match	0m	South West
	KEY CUTTING SPECIALISTS	Stubbs & Walton, Kiosk 1, Kippax Fair, Holt., Canberra .(A.C.T.)	4115	1982	Premise Match	0m	South West
	CLOTHING - RETAIL - LADIES &/OR GIRLS WEAR	Trudy's Fashions, Shop 25, Kippax Fair, Holt., Canberra .(A.C.T.)	1651	1982	Premise Match	0m	South West
	TRAVEL AGENCIES &/OR BOOKING OFFICES	Wales Travel Service. Shop 6, Kippax Fair. Holt., Canberra .(A.C.T.)	7264	1982	Premise Match	0m	South West
	CYCLE DEALERS &/OR ACCESSORIES	Willis Sports Store, Shop 24, Kippax Fair, Holt., Canberra .(A.C.T.)	1893	1982	Premise Match	0m	South West

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
2	SPORTING &/OR TRAVEL GOODS RETAIL	Willis Sports Store, Shop 24, Kippax Fair, Holt., Canberra .(A.C.T.)	6652	1982	Premise Match	0m	South West
	TOY DEALERS - RETAIL	Willis Sports Store. Shop 24, Kippax Fair, Holt., Canberra .(A.C.T.)	7164	1982	Premise Match	0m	South West
	DEPARTMENTAL STORES	Young's, Shop 16, Kippax Fair, Holt., Canberra . (A.C.T.)	2084	1982	Premise Match	0m	South West
3	VIDEO CASSETTE LIBRARIES	Astro Video., 100 Hardwick Cr Holt	5478	1991	Premise Match	37m	West
	HARDWARE - RETAIL.	Kippax Hardware Centre., 4/102 Hardwick Cr Holt	6050	1991	Premise Match	37m	West
4	ASSOCIATIONS &/OR SOCIETIES.	West Canberra Football Club., 76 Hardwick Cr Holt	602	1991	Premise Match	109m	North West

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Business Directory Records 1950-1991 Road or Area Matches

Universal Business Directory records from years 1950, 1961, 1970, 1982 and 1991, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
5	VIDEO CASSETTE LIBRARIES	B To B Video., Shop 7 Hardwick Cr Holt	5483	1991	Road Match	0m
	BAKERS	Bakers Dozen. Shop 8., Hardwick Cr Holt	701	1991	Road Match	0m
	CAKE SHOPS &/OR PASTRYCOOKS.	Bakers Dozen., Shop 8 Hardwick Cr Holt	1716	1991	Road Match	0m
	MOTOR GARAGES & SERVICE STATIONS.	Caltei All Star Service Station., Hardwick Cr Halt	4164	1991	Road Match	0m
	MOTOR CAR HIRE SERVICES.	Caltex All Star Service Station., Hardwick Cr Holt	3894	1991	Road Match	0m
	HEALTH CENTRES &/OR CLINICS.	Come Alive Health & Fitness Centre., Hardwick Cr Holl	6060	1991	Road Match	0m
	GYMNASIUMS.	Come Alive Health & Fitness Centre., Hardwick Cr Holt	5840	1991	Road Match	0m
	SQUASH COURTS	Come Alive Health & Fitness Centre., Hardwick Cr Holt	1992	1991	Road Match	0m
	RESTAURANTS.	Hong Kong Restaurant Shop 3., Hardwick Cr Holt	7652	1991	Road Match	0m
	TAKE-AWAY FOODS	Hong Kong Restaurant., Shop 3 Hardwick Cr Holt	8174	1991	Road Match	0m
	AUCTIONEERS - REAL ESTATE.	Hooker L. J. Kippax., 3 Hardwick Cr Holt	633	1991	Road Match	0m
	PROPERTY MANAGEMENT.	Hooker L. J. Kippax., 3 Hardwick Cr Holt	8327	1991	Road Match	0m
	REAL ESTATE AGENTS	Hooker L. J. Kippax., 3 Hardwick Cr Holt	8493	1991	Road Match	0m
	MOTOR WHEEL ALIGNING & BALANCING SERVICES.	Kippai Tyres., Hardwick Cr Holt	3624	1991	Road Match	0m
	GARDEN SUPPLIES - RETAIL.	Kippax Garden Centre & Florist., 1A Hardwick Cr Holt	2152	1991	Road Match	0m
	NURSERYMEN.	Kippax Garden Centre & Florist., 1A Hardwick Cr Holt	3759	1991	Road Match	0m
	FLORISTS - RETAIL	Kippax Garden Centre & Rorist., 1A Hardwick Cr Holt	4378	1991	Road Match	0m
	GOVERNMENT DEPARTMENTS - COMMONWEALTH.	Kippax Post Office., 4 Hardwick Cr Holt	2383	1991	Road Match	0m
	TAVERNS - LICENSED	Kippax Tavern., 188 Hardwick Cr Holt	2962	1991	Road Match	0m

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
5	TYRE DEALERS &/OR RETREADERS &/OR VULCANISERS.	Kippax Tyres., Hardwick Cr Holl	2476	1991	Road Match	0m
	TAKE-AWAY FOODS	Mama Ria Pizza., 6 Hardwick Cr Holt	8200	1991	Road Match	0m
	MOTOR GARAGES & SERVICE STATIONS.	Mobil Self Serve - Feluga Pty. Ltd., Hardwick Cr Holt	4210	1991	Road Match	0m
	TAVERNS - LICENSED	Moby Dick's Tavern., Shop 2 Hardwick Cr Holt	2964	1991	Road Match	0m
	RESTAURANTS.	Pizza Hut., Hardwick Cr Holt	7707	1991	Road Match	0m
	TAKE-AWAY FOODS	Pizza Hut., Hardwick Cr Holt	8225	1991	Road Match	0m
	HAIRDRESSERS - LADIES &/OR BEAUTY SALONS.	Sculptures Hair Design., Shop 5 Hardwick Cr Holt	5949	1991	Road Match	0m
	HAIRDRESSERS - MENS.	Sculptures Hair Design., Shop 5 Hardwick Cr Holt	6019	1991	Road Match	0m
	TOTALISATOR AGENCIES.	Tab., 2 Hardwick Cr Holt	7470	1991	Road Match	0m
	ASSOCIATIONS &/OR SOCIETIES.	West Belconnen Leagues Club., Hardwick Cr Holt	600	1991	Road Match	0m
	TAKE-AWAY FOODS	Woodys Steak & Pizza Family Restaurant., Hardwick Cr Hoit	8267	1991	Road Match	0m
	RESTAURANTS.	Woodys Steak & Pizza Family Restaurant., Hardwick Cr Holt	7759	1991	Road Match	0m
	MOTOR GARAGES &/OR. ENGINEERS &/OR SERVICE STATIONS	All Star Service Station, Hardwick Cr.. Holt., Canberra .(A.C.T.)	4785	1982	Road Match	0m
	BANKS	Bank of New South Wales Ltd., Hardwick Cr.. Holt., Canberra .(A.C.T.)	554	1982	Road Match	0m
	MOTOR GARAGES &/OR. ENGINEERS &/OR SERVICE STATIONS	Holt Kippax Service Centre, Hardwick Cr.. Holt., Canberra .(A.C.T.)	4862	1982	Road Match	0m
	GOVERNMENT DEPARTMENTS - COMMONWEALTH	Kippax Post Office, 4 Hardwick Cr.. Holt., Canberra .(A.C.T.)	3283	1982	Road Match	0m
	TOTALISATOR AGENCY BRANCHES	T.A.B., 2 Hardwick Cr., Holt., Canberra .(A.C.T.)	7108	1982	Road Match	0m
6	RESTAURANTS.	Bellows Restaurant The., 3 Luke St Holt	959	1991	Road Match	27m
	BUILDING SOCIETIES	Civic Co-Operative Permanent Building Society Ltd.. Luke St., Holt., Canberra .(A.C.T.)	1079	1982	Road Match	27m
7	SCHOOLS &/OR COLLEGES - PRIVATE &/OR PUBLIC.	Cranleigh Special School., Starke St Holt	7935	1991	Road Match	103m
	SCHOOLS &/OR COLLEGES - PRIVATE &/OR PUBLIC.	Gininderra High School., Starke St Holt	7947	1991	Road Match	103m
	SCHOOLS &/OR COLLEGES - PRIVATE &/OR PUBLIC	Cranleigh Special School, Starke St.. Holt., Canberra .(A.C.T.)	6287	1982	Road Match	103m
	SCHOOLS &/OR COLLEGES - PRIVATE &/OR PUBLIC	Gininderra High School, Starke St., Holt., Canberra .(A.C.T.)	6299	1982	Road Match	103m

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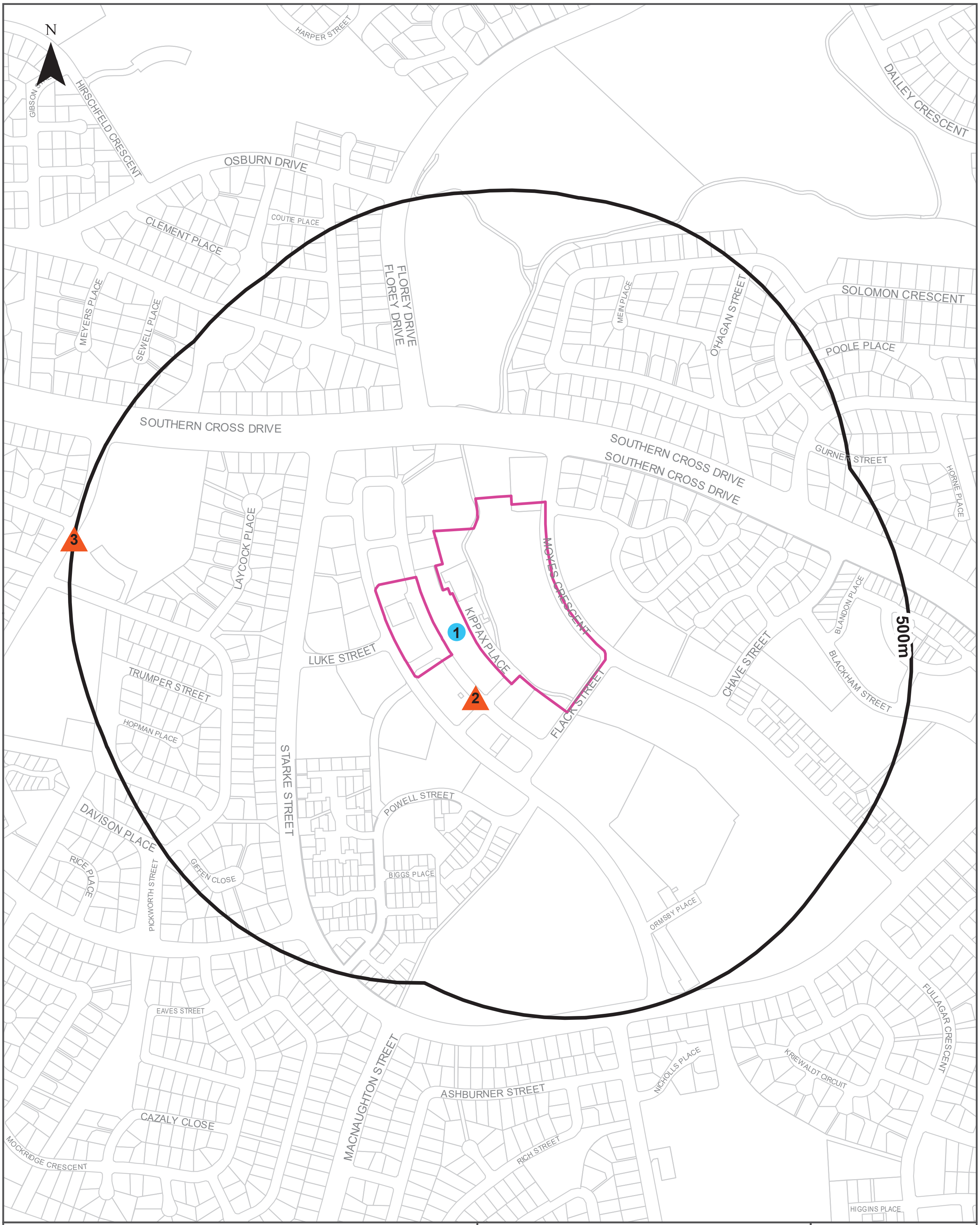
Dry Cleaners, Motor Garages & Service Stations

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

▭ Site Boundary	● Business directory records mapped to a specific premise
▭ Buffer 500m	🟩 Business directory records mapped to a road intersection
▭ Property Boundary	▲ Business directory records mapped to a road corridor
	▨ Business directory records mapped to a general area

Scale:

0 120 240 360 480
Meters

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Dry Cleaners, Motor Garages & Service Stations 1950-1991 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories for years 1950, 1961, 1970, 1982 and 1991, mapped to a premise or road intersection, within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	DRY CLEANERS & PRESSERS	60 Minute Cleaners, Shop 14, Kippax Fair, Holt., Canberra .(A.C.T.)	2236	1982	Premise Match	0m	South West

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Dry Cleaners, Motor Garages & Service Stations 1950-1991 Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories for years 1950, 1961, 1970, 1982 and 1991, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
2	MOTOR GARAGES & SERVICE STATIONS.	Caltei All Star Service Station., Hardwick Cr Halt	4164	1991	Road Match	0m
	MOTOR GARAGES & SERVICE STATIONS.	Mobil Self Serve - Feluga Pty. Ltd., Hardwick Cr Holt	4210	1991	Road Match	0m
	MOTOR GARAGES &/OR. ENGINEERS &/OR SERVICE STATIONS	All Star Service Station, Hardwick Cr.. Holt., Canberra . (A.C.T.)	4785	1982	Road Match	0m
	MOTOR GARAGES &/OR. ENGINEERS &/OR SERVICE STATIONS	Holt Kippax Service Centre, Hardwick Cr.. Holt., Canberra . (A.C.T.)	4862	1982	Road Match	0m
3	MOTOR GARAGES & SERVICE STATIONS.	Holt Auto Port Beaurepaire Cr Holt.,	4198	1991	Road Match	455m

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Aerial Imagery 2014

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Scale: 0 40 80 120 160 Meters	Data Sources: Aerial Imagery © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Aerial Imagery 2008

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Scale:
0 40 80 120 160
Meters

Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 55

Date: 24 February, 2021

Aerial Imagery 2004

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

▢ Site Boundary

▢ Buffer 150m

Scale: 0 40 80 120 160 Meters	Data Sources: Aerial Imagery © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Aerial Imagery 1997

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Scale:

Data Source Aerial Imagery:
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Coordinate System:
GDA 1994 MGA Zone 55

Date: 26 February 2021

Aerial Imagery 1992

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary

⬛ Buffer 150m

Scale:

Data Source Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 55

Date: 24 February, 2021

Aerial Imagery 1985

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

- ▢ Site Boundary
- ▢ Buffer 150m

Scale:
0 40 80 120 160
Meters

Data Source Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 55

Date: 24 February, 2021

Aerial Imagery 1981

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary

⬛ Buffer 150m

Scale:

Data Source Aerial Imagery:
© Office of the Surveyor-General, ACT

Coordinate System:
GDA 1994 MGA Zone 55

Date: 26 February 2021

Aerial Imagery 1978

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary

⬛ Buffer 150m

Scale:

Data Source Aerial Imagery:
© Office of the Surveyor-General, ACT

Coordinate System:
GDA 1994 MGA Zone 55

Date: 26 February 2021

Aerial Imagery 1973

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary
⬛ Buffer 150m

Scale:

Data Source Aerial Imagery:
© Office of the Surveyor-General, ACT

Coordinate System:
GDA 1994 MGA Zone 55

Date: 02 March 2021

Aerial Imagery 1967

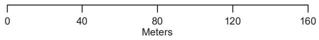
Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary

⬛ Buffer 150m

Scale:



Data Source Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 55

Date: 24 February, 2021

Aerial Imagery 1961

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪	Site Boundary
⬛	Buffer 150m

Scale:

Data Source Aerial Imagery:
© Office of the Surveyor-General, ACT

Coordinate System:
GDA 1994 MGA Zone 55

Date: 02 March 2021

Aerial Imagery 1961

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

🟪 Site Boundary

⬛ Buffer 150m

Scale:

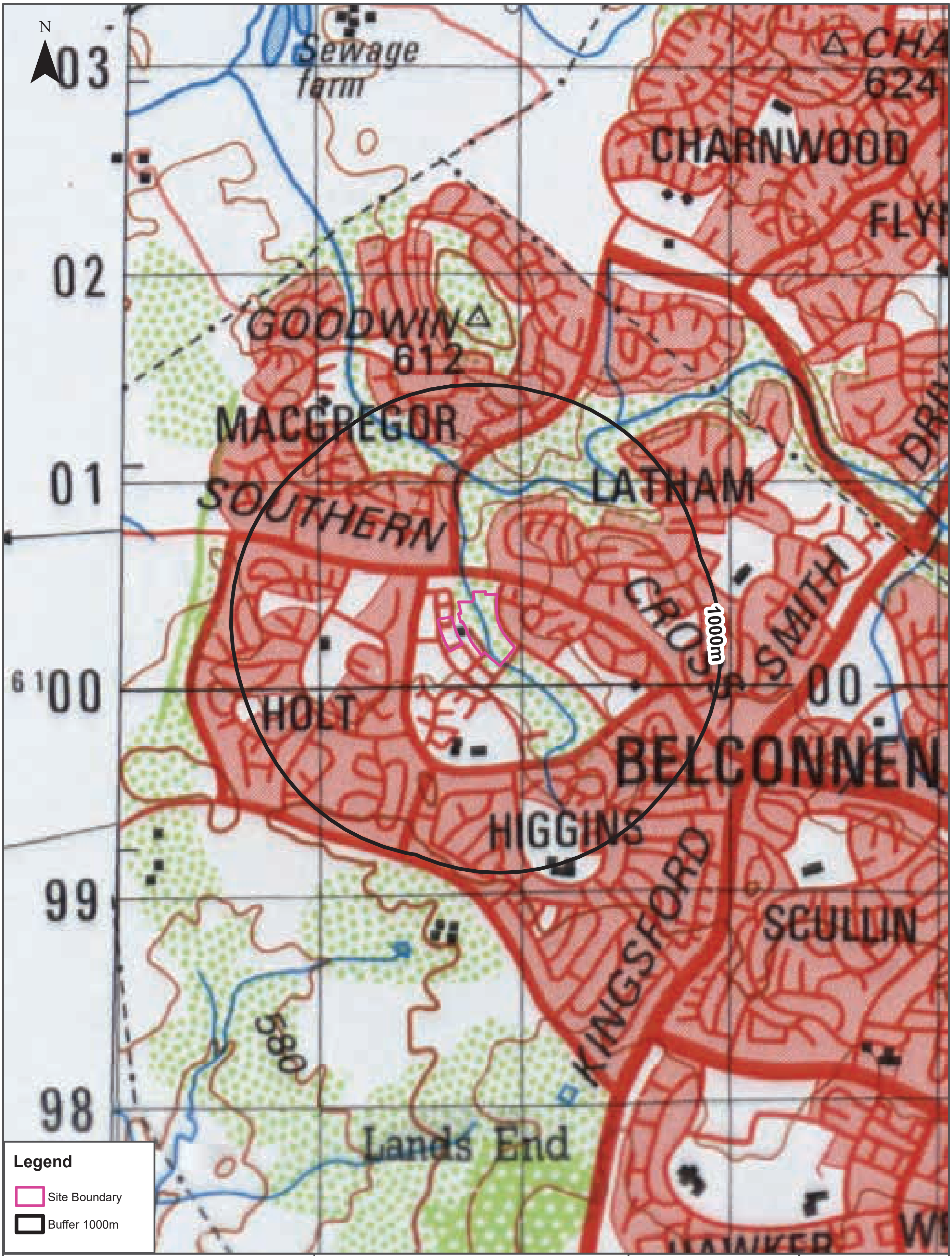
Data Source Aerial Imagery:
© Office of the Surveyor-General, ACT

Coordinate System:
GDA 1994 MGA Zone 55

Date: 26 February 2021

Historical Map 1987

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

🟪 Site Boundary

⬛ Buffer 1000m

Scale:
0 200 400 800 1,200
Meters

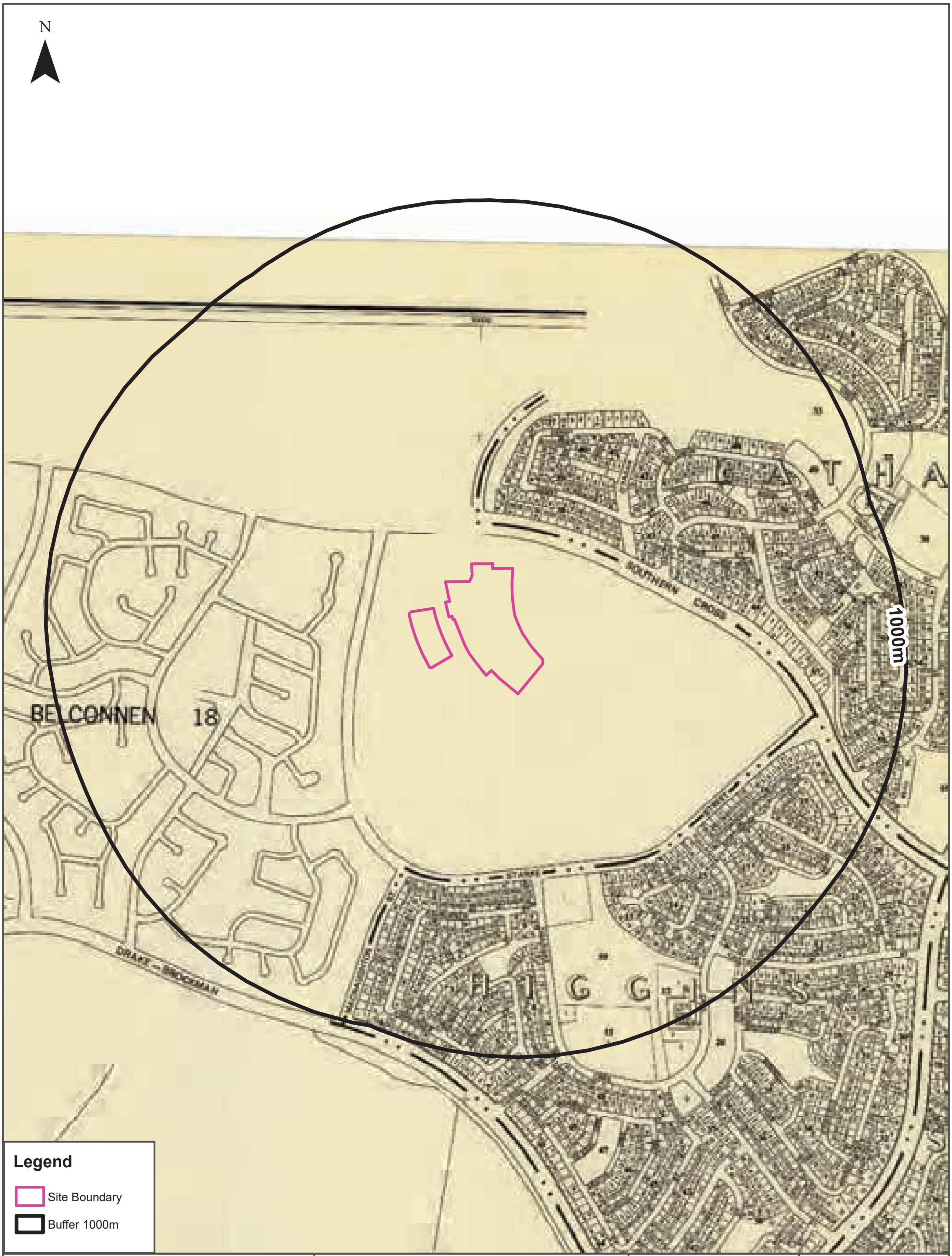
Data Sources: NATMAP 1:100,000 Topographic Maps
Geoscience Australia

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Historical Map 1969

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- 🟪 Site Boundary
- ⬛ Buffer 1000m

Scale:

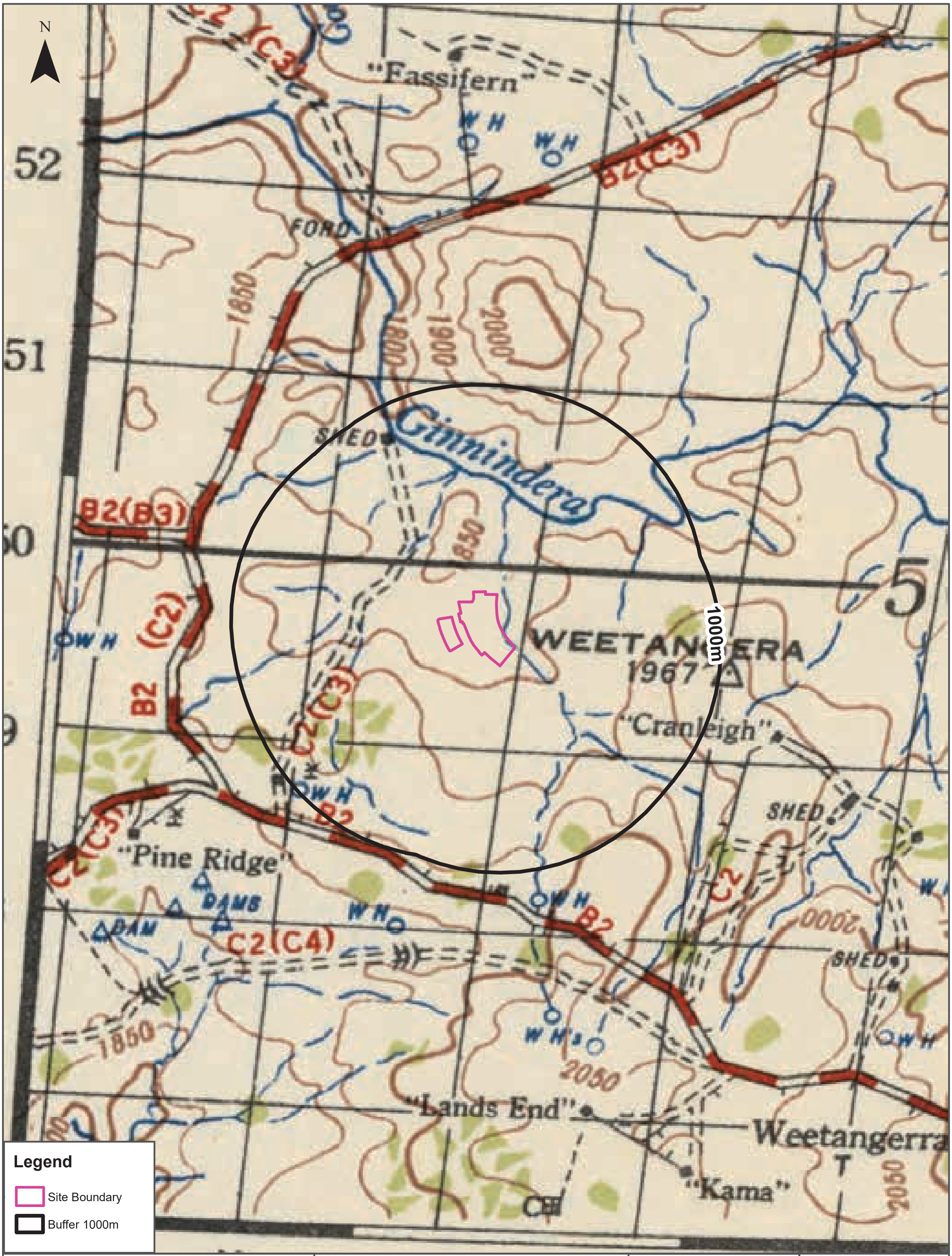
Data Sources: Canberra 1969 - Sheet 9
Compiled and drawn by Survey Branch,
Dept. of the Interior, Canberra, A.C.T.

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Historical Map c.1942

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

🟪	Site Boundary
⬛	Buffer 1000m

Scale:

0 200 400 800 1,200
Meters

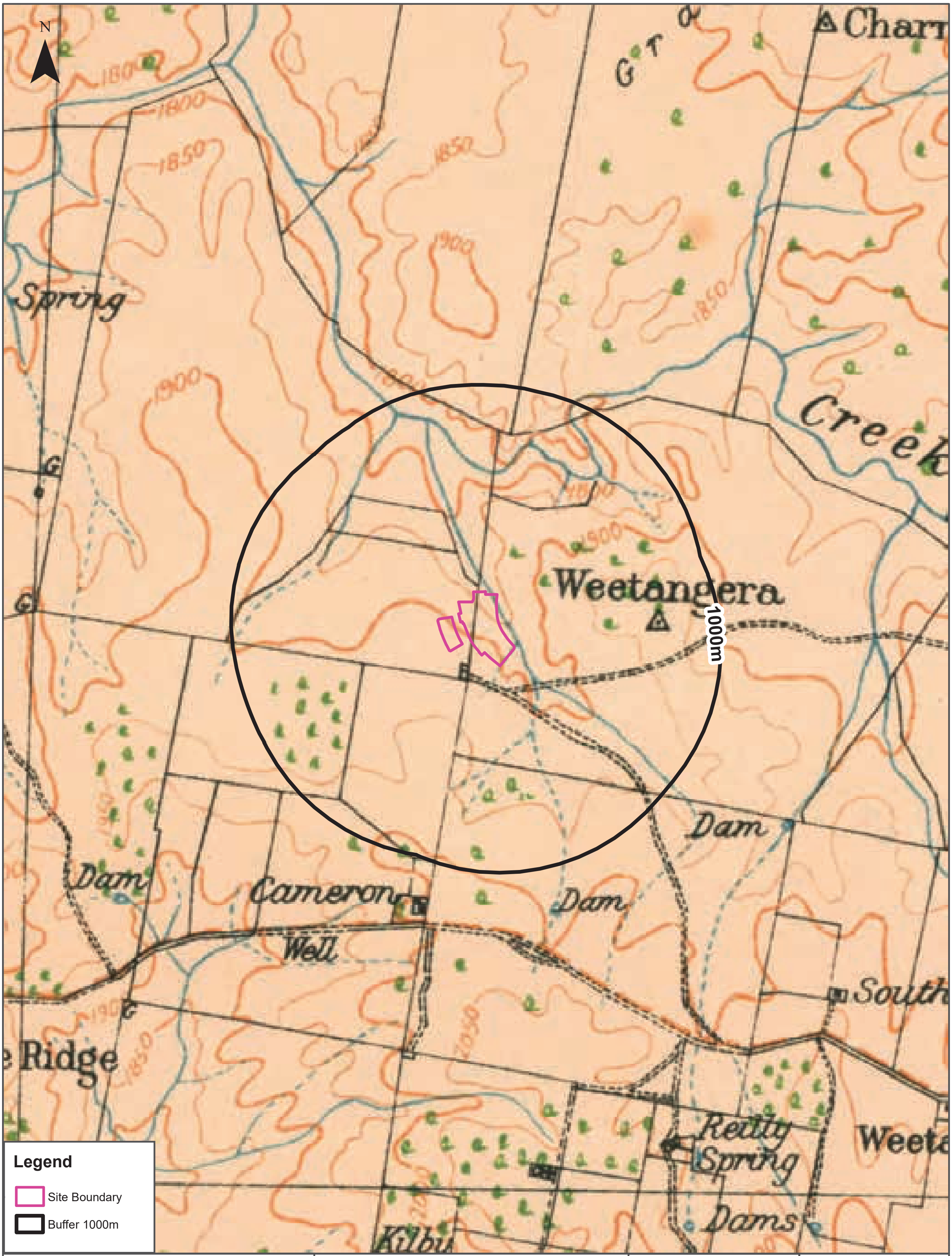
Data Sources: Australia 1:63360
Prepared by Commonwealth Section Imperial General Staff

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Historical Map c.1914

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



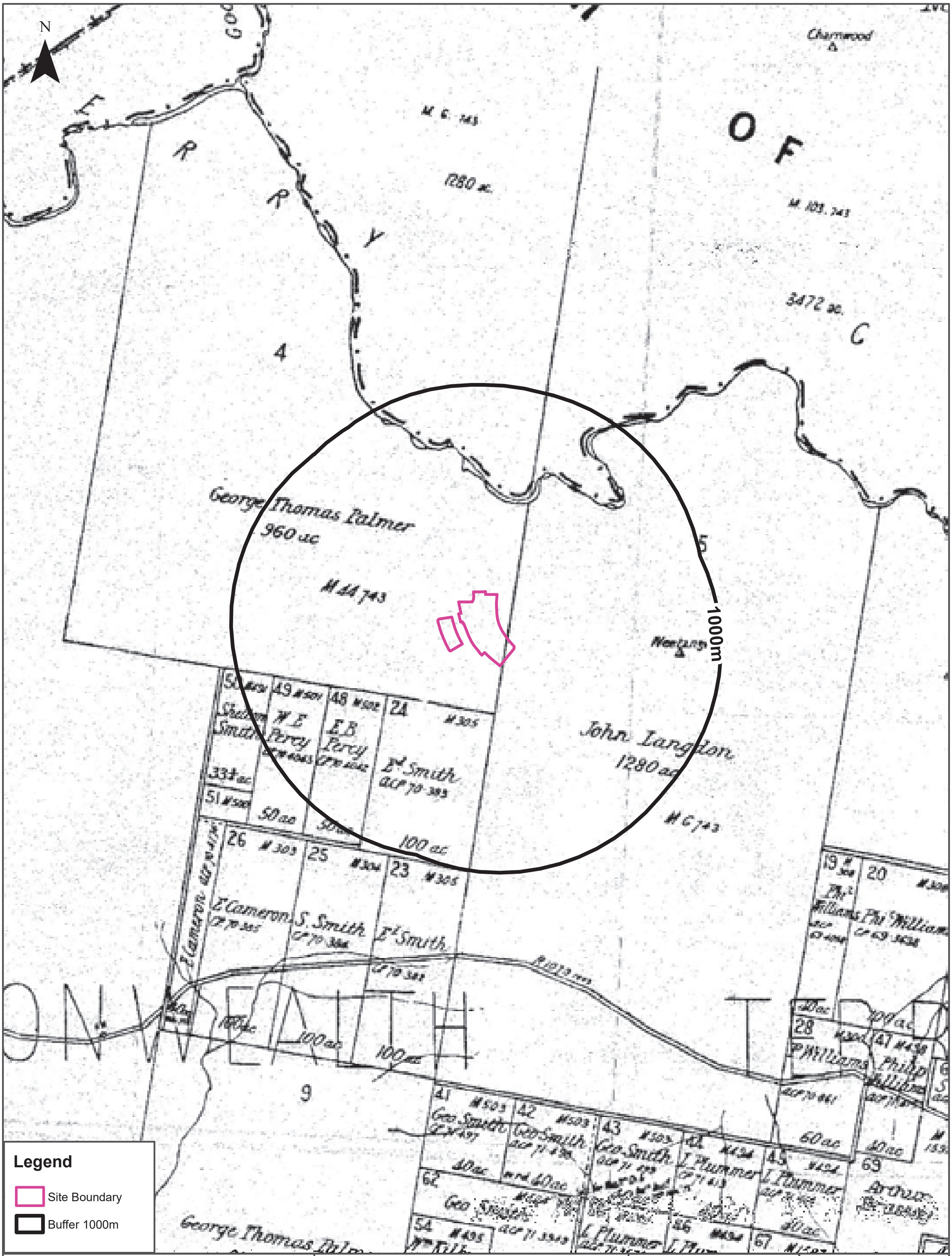
Legend

- 🟪 Site Boundary
- ☐ Buffer 1000m

Scale: 0 200 400 800 1,200 Meters	Data Sources: Canberra, Federal Territory & N.S.W. Commonwealth Department of Defence Prepared by Commonwealth Section, Imperial General Staff	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Historical Map 1912

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale:

0 200 400 800 1,200
Meters

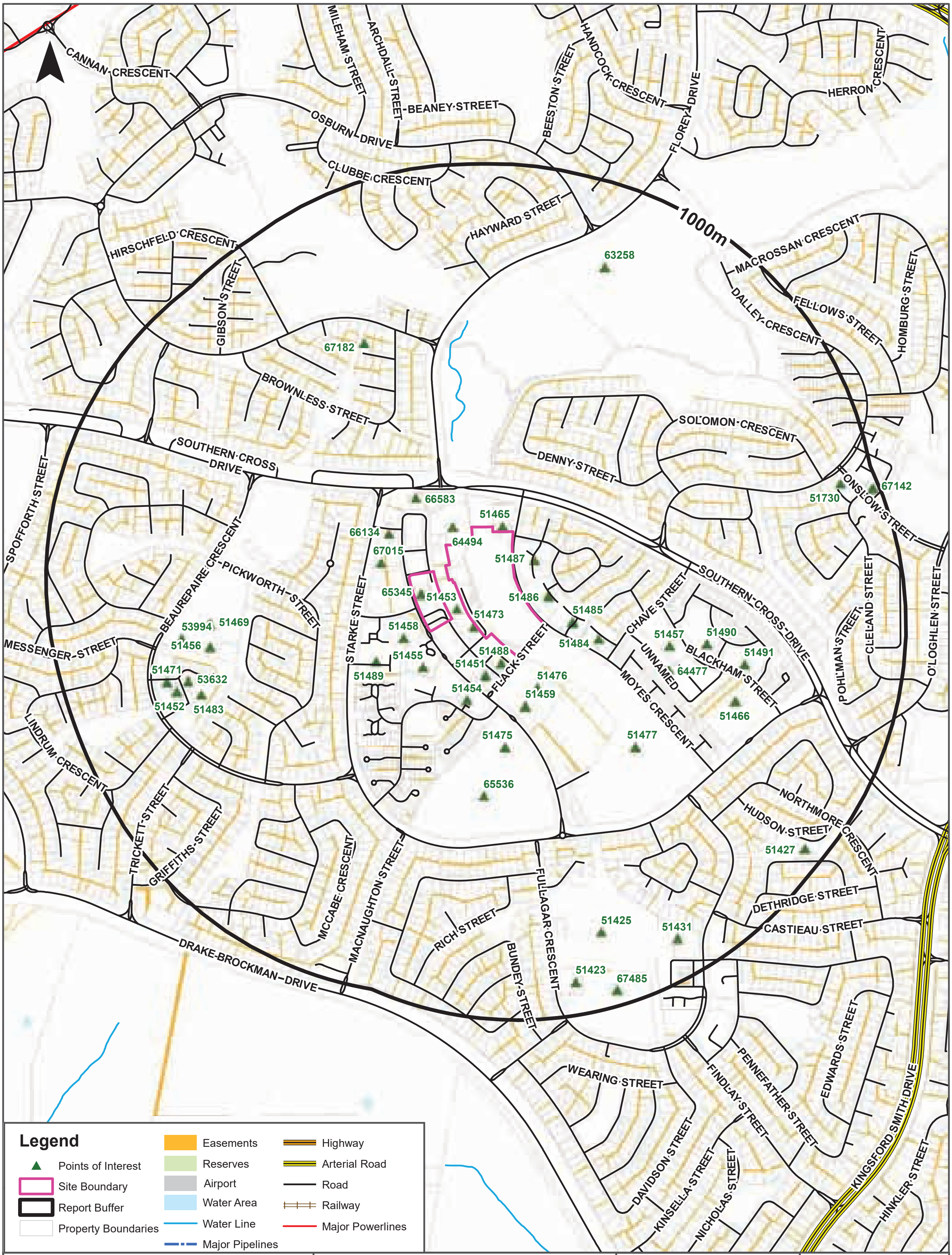
Data Sources: Parish of Weetangera
ACTMapi © Australian Capital Territory

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Topographic Features

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System: GDA 1994 MGA Zone 55

Date: 25 February 2021

Topographic Features

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Features of Interest

What Features of Interest exist within the report buffer?

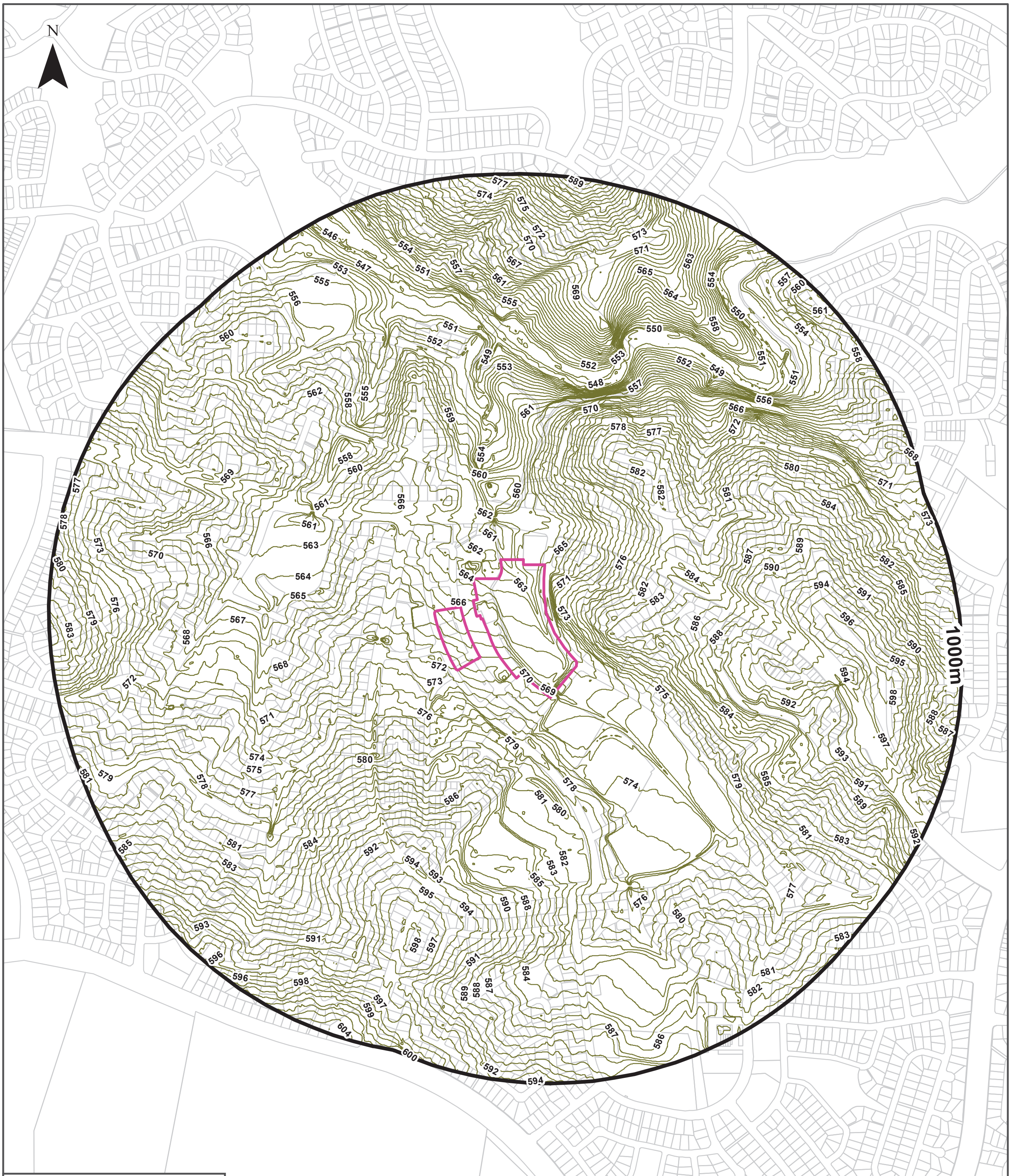
Map Id	Feature Type	Name	Description	Distance	Direction
65345		Library	COMMUNITY USE	0m	Onsite
51473	BUILDING	Medical Centre	HEALTH FACILITY - BABY HEALTH CLINIC, CONSULTING ROOM	7m	South
51465		Tennis Courts	OUTDOOR RECREATION FACILITY - ARCHERY, BOWLING GREEN	12m	North
51453	BUILDING	Kippax Fair	COMMERCIAL USE	22m	South West
51488	BUILDING	Zara Gardens	MULTI-UNIT DEVELOPMENT	43m	South
64494		Parkview	APARTMENT - FLATS, HOME UNITS	46m	North West
51486	BUILDING	Beaumont Terrace	MULTI-UNIT DEVELOPMENT	57m	East
51487	BUILDING	Berkeley Gardens	MULTI-UNIT DEVELOPMENT	58m	North East
51458	BUILDING	Uniting Church	PLACE OF WORSHIP - CHAPEL, CHURCH, MOSQUE, SHRINE, TEMPLE	73m	South West
51485	BUILDING	Bellevue Terrace	MULTI-UNIT DEVELOPMENT	80m	East
67015	BUILDING	Portsea	MULTI-UNIT DEVELOPMENT	86m	West
51451	BUILDING	Garage	SERVICE STATION	98m	South
51476		Football Oval	PLAYING FIELD - UNFENCED OVAL	100m	South East
51455	BUILDING	Kalparrin Hostel	RETIREMENT COMPLEX, SPECIAL CARE ESTABLISHMENT	104m	South West
66134		Garage	SERVICE STATION	125m	North West
51459	BUILDING	West Belconnen Leagues Club	COMMUNITY USE	138m	South
66583	BUILDING	Ochre Health Medical Centre	HEALTH FACILITY - BABY HEALTH CLINIC, CONSULTING ROOM	151m	North West
51484	BUILDING	Maranatha Mews	MULTI-UNIT DEVELOPMENT	156m	South East
51489	BUILDING	Hampton Gardens	MULTI-UNIT DEVELOPMENT	171m	South West
51454	BUILDING	Masonic Home Units	RETIREMENT COMPLEX, SPECIAL CARE ESTABLISHMENT	179m	South
51475		Oval	PLAYING FIELD - UNFENCED OVAL	252m	South
51457	BUILDING	RC Parish Centre	PLACE OF WORSHIP - CHAPEL, CHURCH, MOSQUE, SHRINE, TEMPLE	352m	East
64477	BUILDING	Blackham Terrace	APARTMENT - FLATS, HOME UNITS	365m	South East
65536	BUILDING	Kingsford Smith School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	396m	South
51477		Playing Fields	PLAYING FIELD - UNFENCED OVAL	407m	South East
51490	BUILDING	Aspen Ridge	MULTI-UNIT DEVELOPMENT	452m	East
51469	BUILDING	Holt Primary School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	563m	West
51491	BUILDING	Woodland Park	MULTI-UNIT DEVELOPMENT	563m	East
51466	BUILDING	Cranleigh Special School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	566m	South East

Map Id	Feature Type	Name	Description	Distance	Direction
51456	BUILDING	Playcentre	CHILD CARE CENTRE - ADJUNCT CARE, CRECHE, LONG DAY CARE	578m	West
67182	BUILDING	Stanthorpe	MULTI-UNIT DEVELOPMENT	585m	North West
51483	BUILDING	Merrang Court	MULTI-UNIT DEVELOPMENT	644m	West
53994	BUILDING	Pre-School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	648m	West
53632	LOCALITY (BOUNDED), TOWN, VILLAGE, DIVISION	HOLT	DIVISION	665m	West
51452	BUILDING	Shops	COMMERCIAL USE	704m	West
51471	BUILDING	Holt Medical Centre	HEALTH FACILITY - BABY HEALTH CLINIC, CONSULTING ROOM	721m	West
63258	BUILDING	Umbagong District Park	UNCATEGORIZED	768m	North
51425		Oval	PLAYING FIELD - UNFENCED OVAL	793m	South
51431	BUILDING	Murndal Court	APARTMENT - FLATS, HOME UNITS	892m	South East
51730	BUILDING	Onslow Court	MULTI-UNIT DEVELOPMENT	902m	East
51423	BUILDING	Pre-School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	911m	South
51427	RESERVE,PARK,NATIONAL PARK,CONSERVATION PARK,COMMON	Park	PARKLAND - BOTANIC GARDENS AND PUBLIC ARBORETUM	945m	South East
67485	BUILDING	The Henry	APARTMENT - FLATS, HOME UNITS	959m	South
67142	BUILDING	La Belle Apartments	MULTI-UNIT DEVELOPMENT	979m	East

Features of Interest Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Elevation Contours (2015 - 1m)

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- ▭ Site Boundary
- ▭ Report Buffer
- ▭ Property Boundaries
- — Elevation Contour (m)

Automatically generated 1m contours of the ACT derived from 1m hydro-flattened DEM. Major lakes and dams within the ACT were assigned an elevation to produce a hydro-flattened DEM. 1m DEMs derived from 4ppm and 8ppm LiDAR were used as the input DEMs and polygons of major water bodies were used to determine the extent of lakes within the DEM extent. The input DEM defines the classified Australian Height Datum (AHD) LiDAR point cloud data as a 1 meter Digital Elevation Model (DEM). The Water Features data were digitised in 1995 from the following map sources - 1:10,000 Plan Series, 1:2,500 Cadastre, 1:2,500 Detail, 1:1,000 Detail and traced from Topobase. The mean elevation of each of these polygons was used to hydro -flatten the corresponding water bodies in the DEM. Contours were generated from the DEM using ESRI ArcGIS Contour tool.

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Hydrogeology & Groundwater

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Hydrogeology

Description of aquifers on-site:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Description of aquifers within the report buffer:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)

Hydrogeological Landscapes Units

Unit No	Landscape Name	Land Salinity	Stream Salinity	Stream EC	Salt Store	Salt Availability	Salt Mobility	Hazard Impact	Hazard Likelihood	Hazard Overall	Distance	Direction
7	Gungahlin	Low	Moderate	Moderate	Moderate	Low	Low	Limited	Moderate	Low	0m	Onsite

Hydrogeology & Groundwater

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Groundwater Boreholes (ACT)

Please note that this dataset does not include investigation and/or monitoring bores associated with possible contaminated sites in the search area. If you require more information please contact the Environmental Quality team via email environment.protection@act.gov.au or phone via Access Canberra 13 22 81.
Boreholes from an ACT Government Data Source within 2km of the site:

Bore Id	Bore Type	Method	Date	Bore Depth To	Bit Diameter	1st Water Intersection Depth From	1st Water Intersection Depth To	Final Static GW Level IM	1st Est Yield	Final Yield	Dist	Direction
116	Abstraction	Rotary	28/05/2004	40.00	175	25.0	26.0	9.00	0.50	0.90	1684m	North
23	Abstraction		01/01/1970								1742m	West

Boreholes (ACT) Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Hydrogeology & Groundwater

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Groundwater Boreholes (Bureau of Meteorology)

Boreholes (Bureau of Meteorology) within 2km of the site:

Hydro ID	State Bore ID	Drilled Date	Final Depth	Drilled Depth	Elevevation	Distance	Direction
80000738	341	28/05/2004	40.00	40.00	549.95	1684m	North
80000639	69				580.02	1742m	West
80000379	512	18/05/1979	77.42	77.42	579.70	1794m	West
10013706	410750				547.71	1885m	North

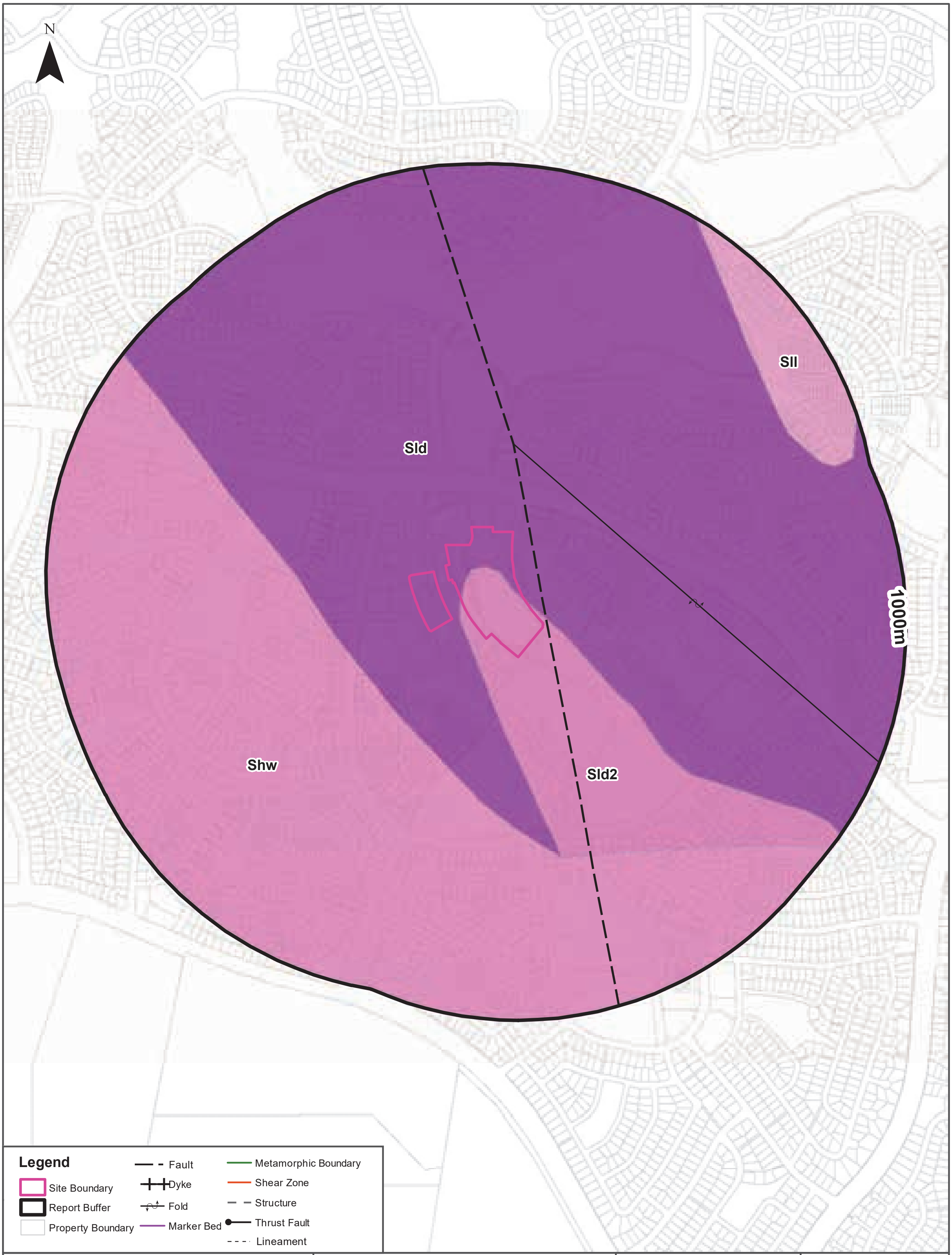
Driller's Logs (Bureau of Meteorology)

Drill log data relevant to the Boreholes (Bureau of Meteorology) within 2km of the site:

Hydro ID	State Bore ID	Drillers Log	Distance	Direction
80000379	512	0.00m-0.30m Topsoil 0.30m-2.44m Clay 2.44m-15.85m Decomposed granite 15.85m-60.96m Porphyry 60.96m-62.48m Mudstone 62.48m-77.11m Porphyry granite 77.11m-78.03m Mudstone 78.03m-91.44m Porphyry granite	1794m	West

Geology 1:250,000

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale:

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Geology

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Geological Units (1:250,000 scale)

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Member	Era	Period	Dataset
Sld	Rhyodacitic ignimbrite and minor volcaniclastic and argillaceous sediments	Deakin Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000
Sld2	Tuffaceous and quartz sandstone and minor shale	Deakin Volcanics	Laidlaw Volcanic Suite		unnamed member	Palaeozoic	Silurian	1:250,000

What are the Geological Units within the report buffer?

Symbol	Description	Unit Name	Group	Sub Group	Member	Era	Period	Dataset
Shw	Green to purple dacite ignimbrite and bedded tuff, minor andesite, volcaniclastic sediment and limestone	Walker Volcanics	Hawkins Volcanic Suite			Palaeozoic	Silurian	1:250,000
Sld	Rhyodacitic ignimbrite and minor volcaniclastic and argillaceous sediments	Deakin Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000
Sld2	Tuffaceous and quartz sandstone and minor shale	Deakin Volcanics	Laidlaw Volcanic Suite		unnamed member	Palaeozoic	Silurian	1:250,000
Sll	Dark to light grey porphyritic rhyodacite ignimbrite	Laidlaw Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000

Geological Structures (1:250,000 scale)

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

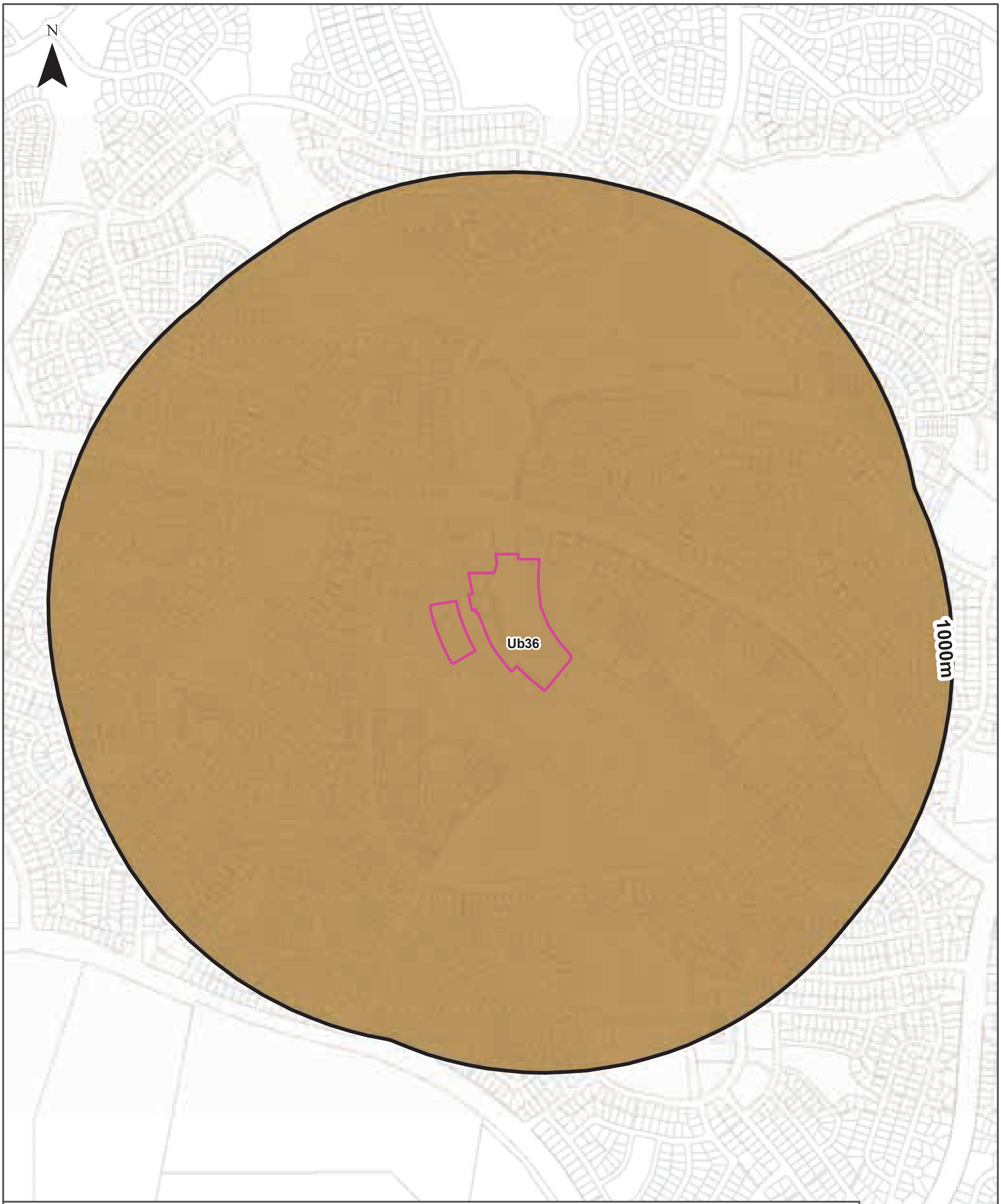
What are the Geological Structures within the report buffer?

Feature	Name	Description	Map Sheet	Dataset
Fault		Fault, Accurate	SCRA	1:250,000
Fault		Fault, Approximate	SCRA	1:250,000
Fold		syncline, Accurate	SCRA	1:250,000

Geological Data Source : NSW Department of Industry, Resources & Energy

Atlas of Australian Soils

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

□ Site Boundary
■ Report Buffer
□ Property Boundary

Australian Soil Classification Orders

■ Anthroposol
■ Calcarosol
■ Chromosol
■ Dermosol
■ Ferrosol
■ Hydrosol
■ Kandosol
■ Kurosol
■ Organosol
■ Podosol
■ Rudosol
■ Sodosol
■ Tenosol
■ Vertosol
■ Lake
□ No Data

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Soils

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Atlas of Australian Soils

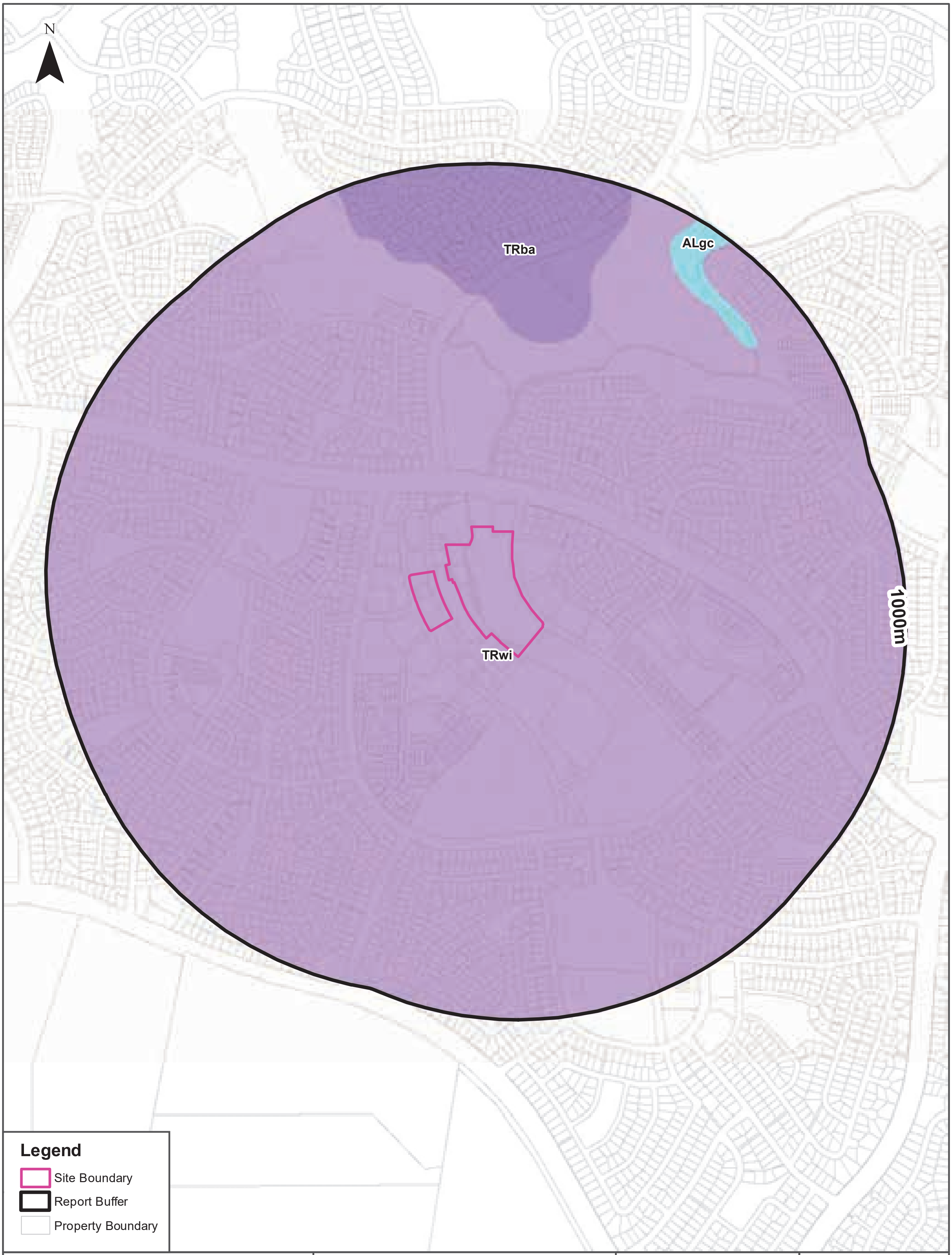
Australian soil types within the dataset buffer:

Symbol	Soil Order	Map Unit Description	Distance
Ub36	Sodosol	Areas of subdued relief at moderate elevations (1800 3000 ft), broad valleys of low hilly (rolling) to hilly topography with undulating basins and some low residual ridges and hills, buried and layered soil materials occur: chief soils of the low hilly to hilly areas are hard neutral yellow mottled soils (Dy3.42) with yellow earths (Gn2.25 and Gn2.75) and sometimes with (Dd1.43) soils in the lower- lying and seasonally wet situations. Associated are: undulating basins of (Dy3.42 and Dy3.43) and/or (Gn2.15 and Gn2.25) soils; residual ridges and hills with slopes of (Dr2.22 and Dr2.42) and/or (Dy3.22 and Dy3.42) soils often in complexes with red and yellow earths (Gn2. 15 and Gn2.25) especially in depositional sites, and with (Um4.2) soils and rock outcrops on hill tops; stream terraces of variable width of (Um1) soils on present flood-plains, (Um6.11) soils on the lower terrace, and (Gn2) so,ils on the next higher terrace remnants; and scarps of undescribed soils along some stream valleys. Other soils may occur.	0m

Atlas of Australian Soils: CSIRO

Soil Landscapes

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Soils

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Soil Landscapes

What are the onsite Soil Landscapes?

Soil Code	Name	Group	Process	Map Sheet	Scale
TRwi	WILLIAMSDALE		TRANSFERRAL	Canberra	1:100,000

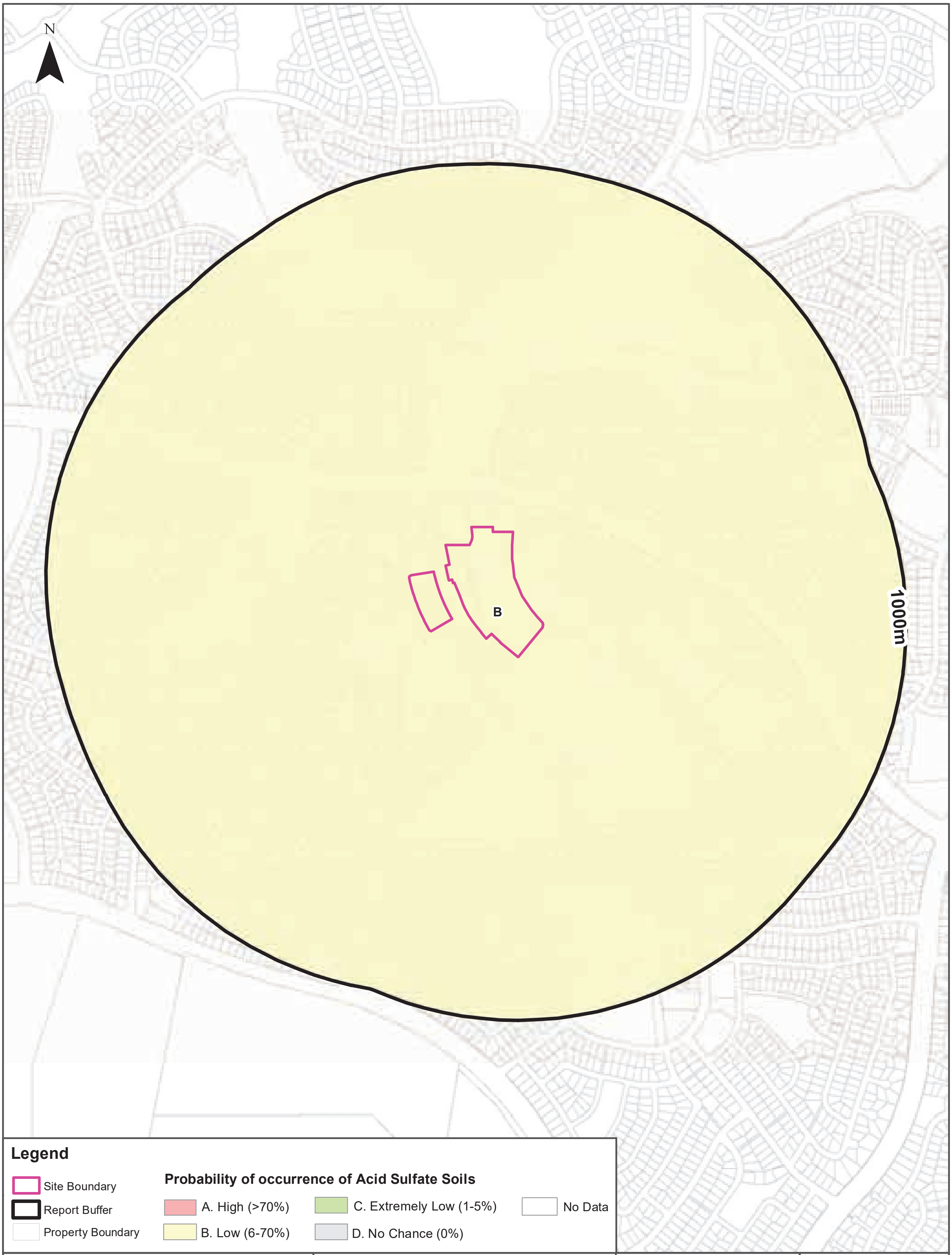
What are the Soil Landscapes within the report buffer?

Soil Code	Name	Group	Process	Map Sheet	Scale
ALgc	GINNINDERRA CREEK		ALLUVIAL	Canberra	1:100,000
TRba	BURRA		TRANSFERRAL	Canberra	1:100,000
TRwi	WILLIAMSDALE		TRANSFERRAL	Canberra	1:100,000

Soils Landscapes Data Source : NSW Office of Environment and Heritage

Atlas of Australian Acid Sulfate Soils

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale: 0 100 200 400 600 Meters	Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Acid Sulfate Soils

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Atlas of Australian Acid Sulfate Soils

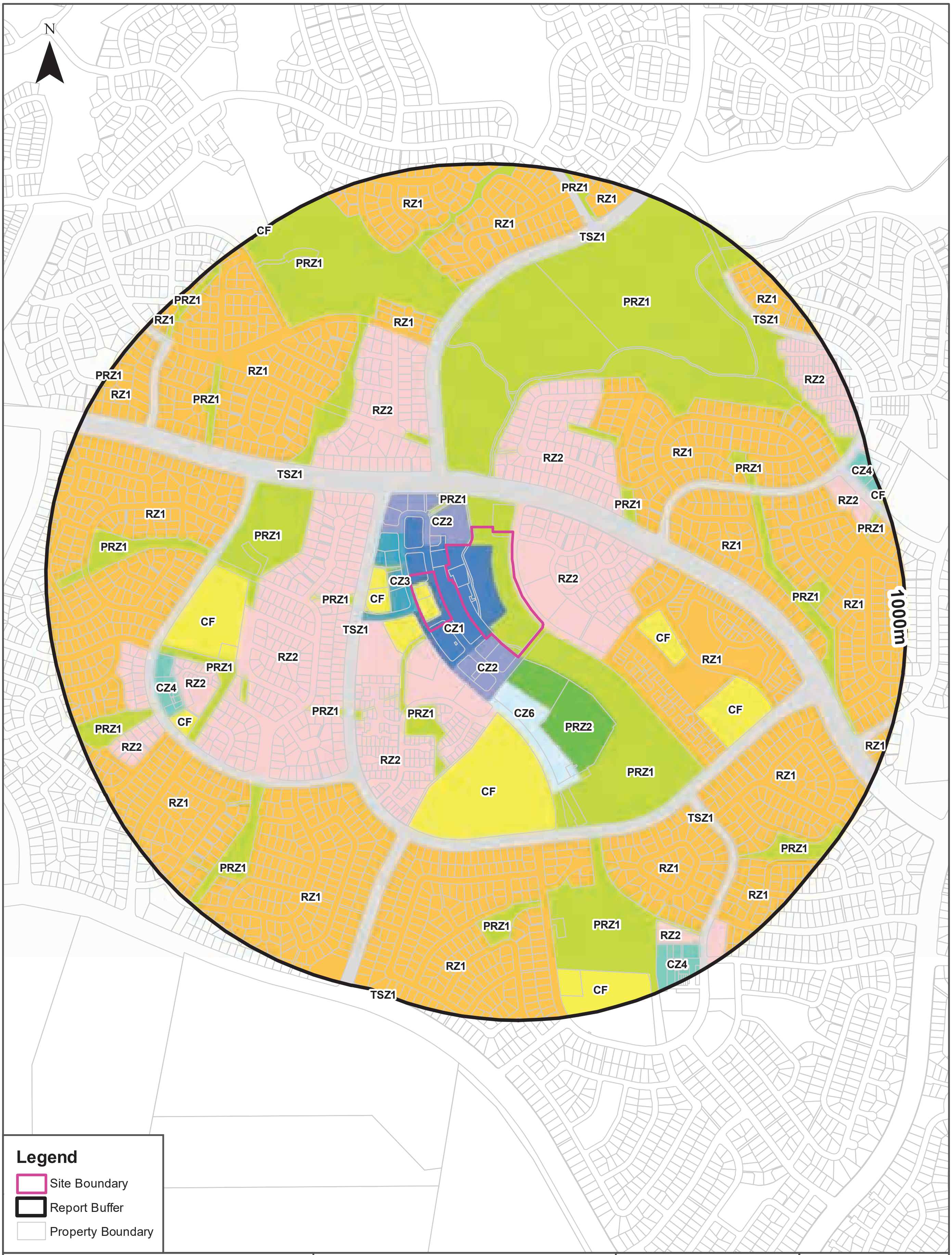
Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

Territory Plan Zones

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate	Coordinate System: GDA 1994 MGA Zone 55	Date: 25 February 2021

Planning

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Territory Plan Zones

What Plan Zones exist within the report buffer?

Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	Onsite
CZ1	CORE ZONE		361	CN2020-19	03/09/2020	0m	Onsite
CZ1	CORE ZONE		TA2008-04	NI2008-298	01/08/2008	0m	Onsite
CF	COMMUNITY FACILITIES		361	CN2020-19	03/09/2020	0m	Onsite
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	0m	Onsite
CZ2	BUSINESS ZONE	Precinct 'b'	TP 2008	NI2008-27	31/03/2008	0m	South
CZ2	BUSINESS ZONE		TA2008-04	NI2008-298	01/08/2008	0m	North West
CZ3	SERVICES ZONE		TP 2008	NI2008-27	31/03/2008	0m	West
PRZ2	RESTRICTED ACCESS RECREATION ZONE		TP 2008	NI2008-27	31/03/2008	14m	South East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	16m	South West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	16m	South West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	23m	South West
PRZ1	URBAN OPEN SPACE		V361	CN2020-19	03/09/2020	29m	West
CF	COMMUNITY FACILITIES		V361	CN2020-19	03/09/2020	58m	West
PRZ1	URBAN OPEN SPACE		361	CN2020-19	03/09/2020	70m	North
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	74m	South West
CZ6	LEISURE AND ACCOMMODATION		TP 2008	NI2008-27	31/03/2008	75m	South
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	103m	North East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	133m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	133m	North East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	136m	West
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	137m	North
PRZ2	RESTRICTED ACCESS RECREATION ZONE		TP 2008	NI2008-27	31/03/2008	147m	South East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	153m	West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	161m	South
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	186m	East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	190m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	246m	North West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	254m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	257m	South West

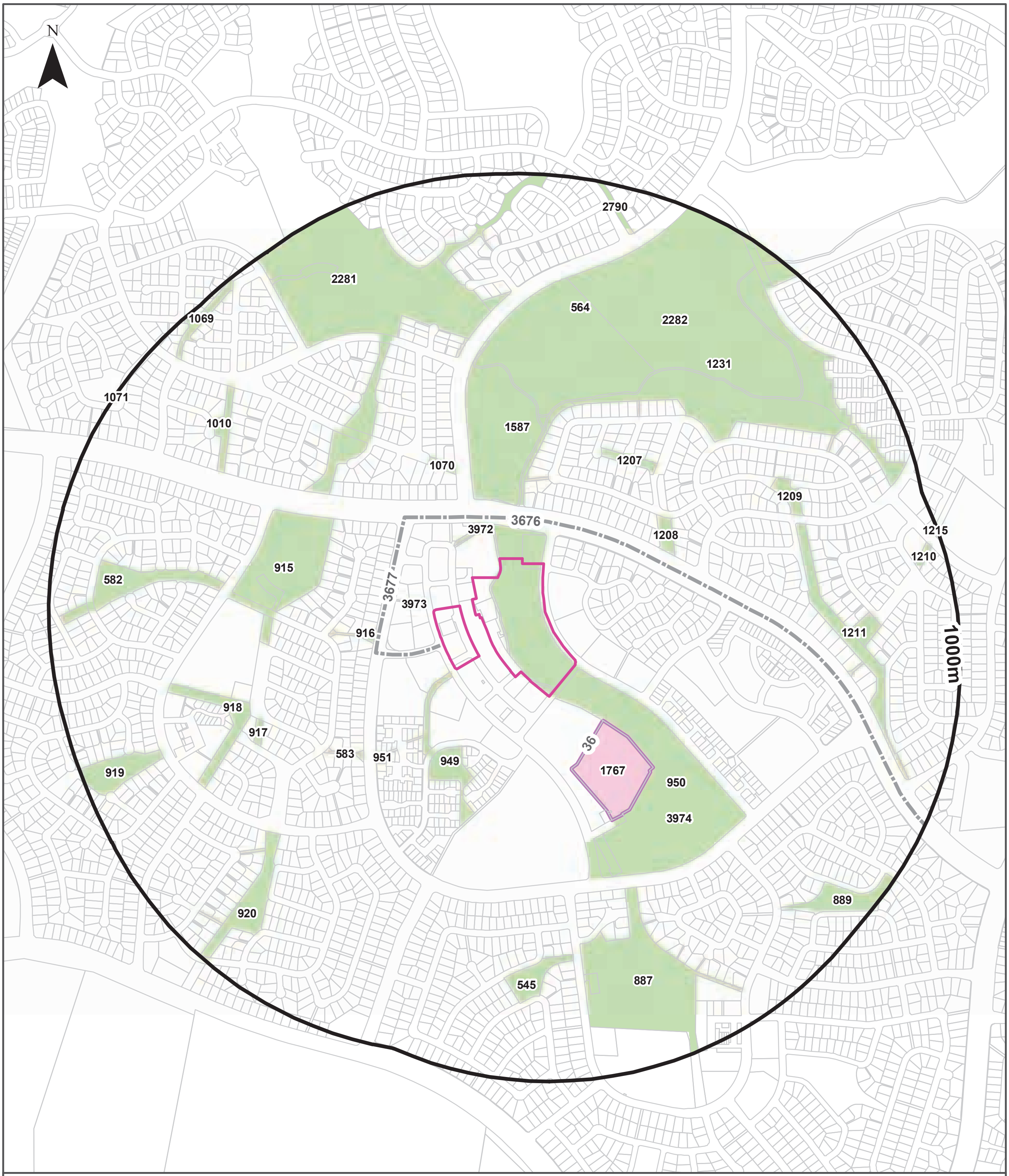
Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	299m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	304m	West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	314m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	315m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	319m	South West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	406m	North West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	414m	East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	440m	West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	453m	North West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	470m	South West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	482m	South East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	503m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	504m	West
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	506m	South East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	508m	South West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	517m	South
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	524m	West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	536m	South
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	544m	South East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	547m	West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	583m	West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	617m	South East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	619m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	625m	South West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	626m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	652m	North West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	657m	East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	671m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	672m	South
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	674m	South West
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	678m	West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	716m	East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	746m	West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	773m	South West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	781m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	783m	West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	813m	South East

Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	817m	South East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	840m	North West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	862m	East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	864m	North East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	864m	South
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	877m	South East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	883m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	888m	North
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	900m	South East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	900m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	917m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	924m	North West
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	937m	East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	942m	East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	973m	East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	974m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	982m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	990m	North West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	991m	East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	993m	North West

Territory Plan Zones Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Territory Plan Overlays

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- 🟥 Site Boundary
- ⬛ Report Buffer
- ☐ Property Boundary
- ┄ Inter-town Public Transport
- ┄ Main Avenues & Approach Routes
- ▨ Future Urban Areas
- ▨ Special Requirements
- 🟧 National Land
- 🟥 Kingston Foreshore
- 🟪 Public Land
- 🟩 Wilderness Area
- 🟩 National Park
- 🟩 Nature Reserve
- 🟨 Special Purpose Reserve
- 🟩 Urban Open Space
- ⬜ Cemetery or Burial Ground
- 🟦 Protection of Water Supply
- 🟦 Lake
- 🟪 Sport and Recreation Reserve
- 🟨 National Land Proposed for Urban Development

Scale:

0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Planning

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Territory Plan Overlays (areas)

What Plan Overlays (areas) exist within the report buffer?

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
950	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	Onsite
3974	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	Onsite
949	Pe	Urban Open Space.	TP 2008	NI2008-27	16m	South West
3973	Pe	Urban Open Space.	361	CN2020-19	29m	West
3972	Pe	Urban Open Space.	361	CN2020-19	70m	North
2282	Pe	Urban Open Space.	TP 2008	NI2008-27	133m	North East
1231	Pe	Urban Open Space.	TP 2008	NI2008-27	133m	North East
1767	Pi	Sport and recreation reserve.	TP 2008	NI2008-27	147m	South East
916	Pe	Urban Open Space.	TP 2008	NI2008-27	153m	West
1587	Pe	Urban Open Space.	TP 2008	NI2008-27	229m	North
1070	Pe	Urban Open Space.	TP 2008	NI2008-27	246m	North West
951	Pe	Urban Open Space.	TP 2008	NI2008-27	257m	South West
1208	Pe	Urban Open Space.	TP 2008	NI2008-27	299m	North East
915	Pe	Urban Open Space.	TP 2008	NI2008-27	304m	West
1207	Pe	Urban Open Space.	TP 2008	NI2008-27	315m	North East
583	Pe	Urban Open Space.	TP 2008	NI2008-27	319m	South West
2281	Pe	Urban Open Space.	TP 2008	NI2008-27	406m	North West
564	Pe	Urban Open Space.	TP 2008	NI2008-27	500m	North
917	Pe	Urban Open Space.	TP 2008	NI2008-27	508m	South West
918	Pe	Urban Open Space.	TP 2008	NI2008-27	524m	West
887	Pe	Urban Open Space.	TP 2008	NI2008-27	536m	South
582	Pe	Urban Open Space.	TP 2008	NI2008-27	547m	West
1209	Pe	Urban Open Space.	TP 2008	NI2008-27	619m	North East
920	Pe	Urban Open Space.	TP 2008	NI2008-27	625m	South West
1211	Pe	Urban Open Space.	TP 2008	NI2008-27	626m	East
1010	Pe	Urban Open Space.	TP 2008	NI2008-27	652m	North West
545	Pe	Urban Open Space.	TP 2008	NI2008-27	672m	South
919	Pe	Urban Open Space.	TP 2008	NI2008-27	783m	West
889	Pe	Urban Open Space.	TP 2008	NI2008-27	813m	South East
2790	Pe	Urban Open Space.	TP 2008	NI2008-27	883m	North

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
1210	Pe	Urban Open Space.	TP 2008	NI2008-27	917m	East
1069	Pe	Urban Open Space.	TP 2008	NI2008-27	924m	North West
1215	Pe	Urban Open Space.	TP 2008	NI2008-27	982m	East
1071	Pe	Urban Open Space.	TP 2008	NI2008-27	990m	North West

Territory Plan Overlays (lines)

What Plan Overlays (lines) exist within the report buffer?

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
3677	IPT	Inter-town Public Transport.	TA2017-03	NI2017-265	7m	West
3676	IPT	Inter-town Public Transport.	TA2017-03	NI2017-265	103m	East
36	PUBLAN	Public Land	TP 2008	NI2008-27	147m	South East

Territory Plan Overlay Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Heritage Items

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 26 February 2021

Heritage

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch

National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
106151	Taglietti Schools - Flynn, Latham, Giralang and Gowrie	Bingle St, Flynn ACT	8/01/000/0543	Historic	Nomination now ineligible for PPAL		992m	South East

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch

Heritage Sites

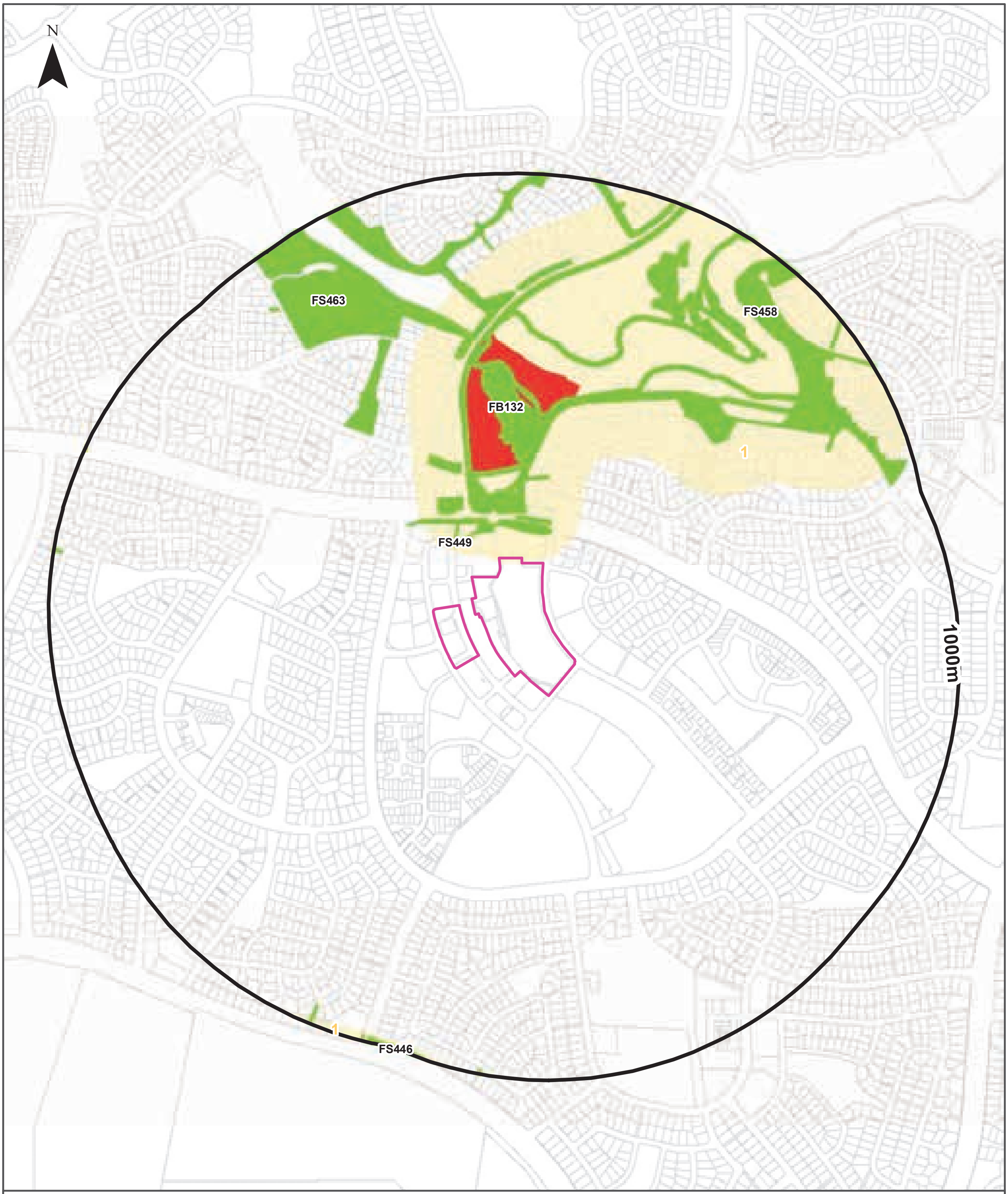
What Heritage SItes exist within the report buffer?

Map Id	Heritage Id	Name	Description	Status	Status Date	Location Type	Block Key	District	Division	Dist	Dir
429	419	Latham grinding Grooves		Provisional Registration	27/09/2106	Restricted	55661370001	BELCONNEN	LATHAM	962m	North East
429	419	Latham grinding Grooves		Provisional Registration	27/09/2106	Restricted	55661430004	BELCONNEN	LATHAM	964m	North East

Heritage Data Source: ACT Government

Natural Hazards - Bushfire & Flood

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

▭ Site Boundary
▭ Report Buffer
▭ Property Boundaries
🟨 Bushfire Prone Area
▨ Bushfire Abatement Zone
▨ Flood 1% AEP

Access Management

▬ Construction
▬ Maintenance
▬ Upgrade
▬ Vegetation Management

Fuel Management

🟦 Chemical
🟫 Cultural Burn
🟧 Ecological Burn
🟨 Grazing
🟪 Physical Removal
🟥 Prescribed Burn
■ Prescribed Burn (RFS)
🟩 Slashing

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Natural Hazards

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Bushfire Prone Areas

What Bushfire Prone Areas exist within the report buffer?

Feature Id	Description	Distance	Direction
1	Bushfire Prone Areas ACT	0m	Onsite

Bushfire Prone Area Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Abatement Zones

What Bushfire Abatement Zones exist within the report buffer?

Feature Id	Feature	Distance	Direction
N/A	No records within buffer		

Bushfire Abatement Zone Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Operational Plan - Access Management

What Bushfire Operational Plan - Access Management exist within the report buffer?

Map Id	Treatment	Distance	Direction
N/A	No records within buffer		

Bushfire Operational Plan Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Operational Plan - Fuel Management

What Bushfire Operational Plan - Fuel Management exist within the report buffer?

Unique Id	Treatment	Hectares	Distance	Direction
FS449	Slashing	4.02	66m	West
FS458	Slashing	43.79	103m	North East
FS425	Slashing	19.17	108m	East
FS463	Slashing	91.90	161m	North West
FB132	Prescribed Burn (PCS)	6.82	221m	North
FS446	Slashing	14.52	986m	South

Bushfire Operational Plan Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Flood (1 Percent Annual Exceedance Probability)

What Flood zone (1% AEP) exists within the report buffer?

Feature Id	Description	Distance	Direction
N/A	No records within buffer		

Flood Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Vegetation Communities

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Legend

- Site Boundary
- Report Buffer
- Property Boundaries
- Alpine Complex
- Dry Sclerophyll Forests
- Freshwater Wetlands
- Forested Wetlands
- u52 Ribbon Gum
- u53 Mountain Gum
- u239 Alpine Ash
- Grassy Woodlands
- Grasslands
- APN, APE, ARB, EPN
- DNF, DNS, DNW
- EXF, EXS, EXW
- PLE Plantation exotic
- PWR Power easement
- EXG Exotic grassland
- NG Native grassland
- URB Urban and developed areas
- UOS Urban Open Space
- Sand
- Rock
- Water

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System: GDA 1994 MGA Zone 55

Date: 25 February 2021

Ecological Constraints

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Vegetation Communities

What Vegetation Communities exist within the report buffer?

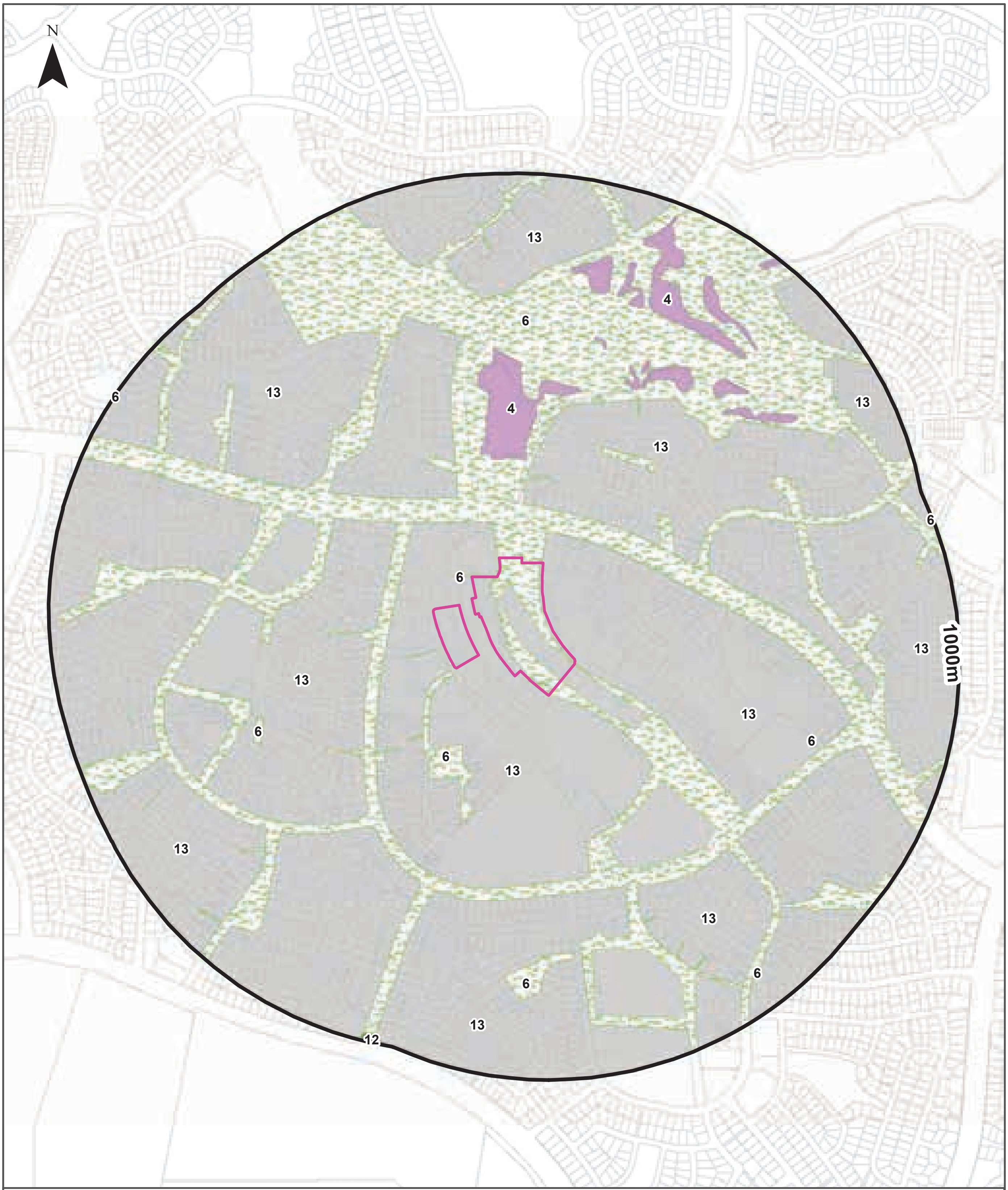
UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
UOS	Urban Open Space_UOS			10.77	20.36	0m	Onsite
URB	Urban and developed areas_URB			8.40	15.73	0m	Onsite
UOS	Urban Open Space_UOS			9.38	36.49	16m	South West
UOS	Urban Open Space_UOS			9.70	26.71	133m	North East
UOS	Urban Open Space_UOS			9.39	38.69	153m	West
UOS	Urban Open Space_UOS			9.88	55.97	246m	North West
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	6.35	10.39	246m	North
UOS	Urban Open Space_UOS			6.52	22.33	257m	South West
EXG	Exotic grassland_EXG			7.75	2.89	258m	North
UOS	Urban Open Space_UOS			11.54	49.89	299m	North East
UOS	Urban Open Space_UOS			9.08	29.22	304m	West
UOS	Urban Open Space_UOS			8.84	43.98	315m	North East
UOS	Urban Open Space_UOS			10.36	36.45	319m	South West
UOS	Urban Open Space_UOS			9.13	28.28	406m	North West
Water	Water			8.25	10.76	468m	East
UOS	Urban Open Space_UOS			8.46	28.81	473m	North East
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	12.29	18.33	503m	North East
UOS	Urban Open Space_UOS			11.05	26.27	508m	South West
EXG	Exotic grassland_EXG			4.40	13.69	512m	North East
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	6.40	21.18	515m	North East
EXG	Exotic grassland_EXG			8.04	32.71	518m	North East
UOS	Urban Open Space_UOS			9.48	29.41	524m	West
UOS	Urban Open Space_UOS			9.53	26.20	536m	South
UOS	Urban Open Space_UOS			10.99	53.72	547m	West
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	4.35	5.78	555m	North East
EXG	Exotic grassland_EXG			6.55	10.33	568m	North East
NG	Native grassland_NG			5.51	4.46	574m	North
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	8.38	34.99	605m	North East

UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
UOS	Urban Open Space_UOS			6.74	40.87	619m	North East
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	6.42	15.18	621m	North East
UOS	Urban Open Space_UOS			10.19	29.62	621m	North
UOS	Urban Open Space_UOS			9.91	42.85	625m	South West
UOS	Urban Open Space_UOS			8.52	32.63	626m	East
UOS	Urban Open Space_UOS			8.75	23.96	652m	North West
UOS	Urban Open Space_UOS			9.99	37.12	672m	South
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	8.65	14.41	705m	North
EXG	Exotic grassland_EXG			7.91	12.16	705m	North
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	7.57	22.54	707m	North East
NG	Native grassland_NG			7.66	7.17	714m	North
EXG	Exotic grassland_EXG			7.16	38.52	743m	North East
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	8.24	25.86	775m	North East
UOS	Urban Open Space_UOS			9.50	38.55	783m	West
UOS	Urban Open Space_UOS			9.22	57.83	813m	South East
NG	Native grassland_NG			5.97	5.09	816m	North
UOS	Urban Open Space_UOS			7.65	20.94	883m	North
UOS	Urban Open Space_UOS			11.12	43.79	917m	East
UOS	Urban Open Space_UOS			9.53	50.28	924m	North West
NTG	Natural Temperate Grassland_NTG	GRASSLANDS	Temperate Montane Grasslands	9.75	4.87	948m	North East
UOS	Urban Open Space_UOS			9.28	47.04	990m	North West

Vegetation Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Vegetation Subformation

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- ▢ Site Boundary
- ▢ Report Buffer
- ▢ Property Boundary
- ■ Dry Forest
- ■ Dry heath shrubland complex
- ■ Former Pine Plantation Post 2003
- ■ Grassland
- ■ Lakes / Water
- ▨ Modified grassland / Urban vegetation complex
- ■ Montane Woodland
- ■ Plantation / Arboretum
- ■ Riparian Woodland
- ■ Subalpine Woodland
- ■ Upland Montane Forest
- ■ Urban
- ■ Wet Forest
- ▨ Wetlands
- ■ Woodland

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Ecological Constraints

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Vegetation Subformation

What Vegetation Subformations exist within the report buffer?

Object Id	Subformation	Distance	Direction
13	Urban	0m	Onsite
6	Modified grassland / Urban vegetation complex	0m	Onsite
4	Grassland	253m	South
12	Woodland	976m	South

Vegetation Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Threatened Woodland

What ACT Listed Threatened Woodland exists within the report buffer?

Feature Id	Community	EPBCStatus	ACT Status	Distance	Direction
N/A	No records within buffer				

Threatened Woodland Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Tree Register

What Trees on the ACT register exists within the report buffer?

Feature Id	Genus	Species	Tree Ref	Tree Height	Status	Date Edit	Distance	Direction
N/A	No records within buffer							

Tree Register Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Important Wetlands

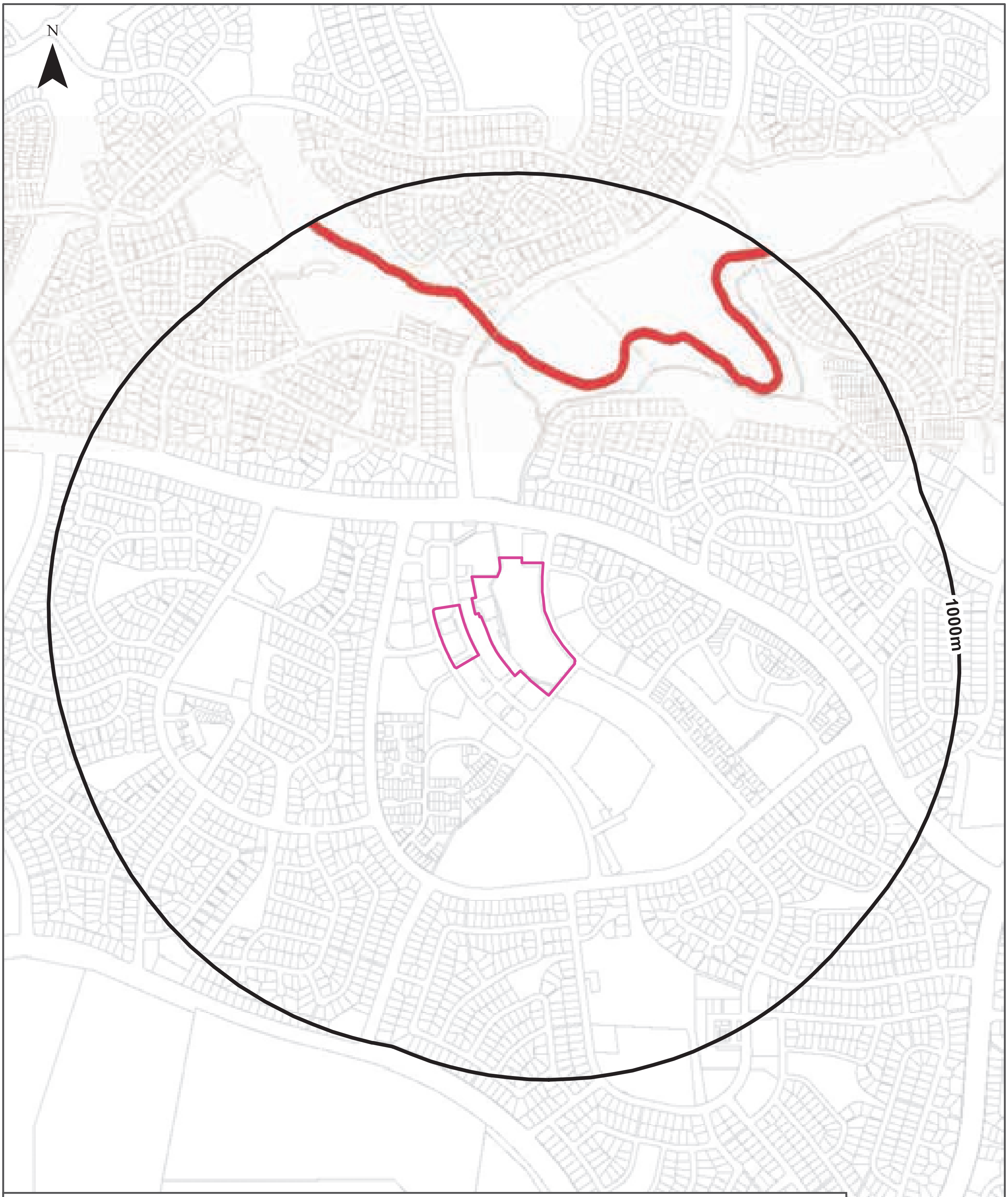
What Wetlands exist within the report buffer?

Feature Id	Name	Distance	Direction
N/A	No records within buffer		

Important Wetlands Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615



Legend

- ☐ Site Boundary
- ☐ Report Buffer
- ☐ Property Boundaries
- 🟥 High potential GDE - from national assessment
- ▨ High potential GDE - from regional studies
- 🟧 Moderate potential GDE - from national assessment
- ▨ Moderate potential GDE - from regional studies
- 🟦 Low potential GDE - from national assessment
- ▨ Low potential GDE - from regional studies
- ▨ Known GDE - from regional studies
- 🟪 Unclassified potential GDE - from national assessment
- ▨ Unclassified potential GDE - from regional studies

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System:
GDA 1994 MGA Zone 55

Date: 25 February 2021

Ecological Constraints

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

Groundwater Dependent Ecosystems Atlas

GDEs within the dataset buffer:

Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Aquatic		High potential GDE - from national assessment	10	Upland plains with separating strike-aligned hills, closed lake basins.	River		456m	East
Aquatic		High potential GDE - from national assessment	7	Upland plains with separating strike-aligned hills, closed lake basins.	River		561m	North

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

Ecological Constraints

Kippax Place, Hardwick Crescent, Flack Street & Moyes Crescent, Holt, ACT 2615

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status
Fauna	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered, Protected		Vulnerable
Fauna	Amphibia	Litoria castanea	Yellow-spotted Tree Frog	Critically Endangered Species, Protected		Endangered
Fauna	Aves	Chthonicola sagittata	Speckled Warbler	Vulnerable, Protected		
Fauna	Aves	Circus assimilis	Spotted Harrier	Vulnerable, Protected		
Fauna	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable, Protected		
Fauna	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable, Protected		
Fauna	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable, Protected		
Fauna	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable, Protected, Category 3 Sensitive Species	Category 3	
Fauna	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable, Protected		
Fauna	Aves	Stagonopleura guttata	Diamond Firetail	Vulnerable, Protected		
Fauna	Aves	Falco subniger	Black Falcon	Vulnerable, Protected		
Fauna	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered Species, Protected		Critically Endangered
Fauna	Aves	Epthianura albifrons	White-fronted Chat	Vulnerable, Protected		
Fauna	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable, Protected		
Fauna	Aves	Pachycephala olivacea	Olive Whistler	Vulnerable, Protected		
Fauna	Aves	Pedionomus torquatus	Plains-wanderer	Endangered, Protected		Critically Endangered
Fauna	Aves	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Vulnerable, Protected		
Fauna	Aves	Petroica boodang	Scarlet Robin	Vulnerable, Protected		
Fauna	Aves	Petroica phoenicea	Flame Robin	Vulnerable, Protected		
Fauna	Aves	Petroica rodinogaster	Pink Robin	Vulnerable, Protected		
Fauna	Aves	Lathamus discolor	Swift Parrot	Endangered, Protected, Category 3 Sensitive Species	Category 3	Critically Endangered
Fauna	Aves	Polytelis swainsonii	Superb Parrot	Vulnerable, Protected, Category 3 Sensitive Species	Category 3	Vulnerable
Fauna	Insecta	Synemon plana	Golden Sun Moth	Endangered		Critically Endangered
Fauna	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable, Protected		Endangered
Fauna	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable, Protected		
Fauna	Mammalia	Phascolarctos cinereus	Koala	Vulnerable, Protected		Vulnerable
Fauna	Reptilia	Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable, Protected		Vulnerable
Fauna	Reptilia	Delma impar	Striped Legless Lizard	Vulnerable, Protected		Vulnerable

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status
Flora	Flora	Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered		Endangered
Flora	Flora	Lepidium pseudopapillosum	Formbe Peppercress	Endangered		Vulnerable
Flora	Flora	Swainsona recta	Small Purple-pea	Endangered		Endangered
Flora	Flora	Prasophyllum petilum	Tarengo Leek Orchid	Endangered, Protected, Category 2 Sensitive Species	Category 2	Endangered

Data does not include NSW category 1 sensitive species.
NSW BioNet: © State of NSW and Office of Environment and Heritage

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Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site
Network of features	Georeferenced to a network of features

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Appendix E

Borelogs

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BOREHOLE LOG S1

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 7/4/2021
TOTAL DEPTH 5.7 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683834.7004 N: 6100555.607
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S1 0.0-0.1		░	SC-SM	Gravelly, clayey, sandy, SILT, brown, moist-dry.	Fill.
0	S1 0.5-0.6	0.5	░			
			░	SC-SM	Gravelly, clayey, SILT, brown, moist-dry.	
0	S1 1.0-1.1	1	░			
			▨	CL	CLAY, brown, dry.	
		1.5	▨			
0	SI 2.0-2.1	2	▨			
		2.5	▨			
0	S1 3.0-3.1	3	▨			
		3.5	▨	CL	CLAY, mottled grey-brown, dry.	
0	S1 4.0-4.1	4	▨			
		4.5	▨			
			░	MLS	Weathered rock, yellow-pale brown, dry.	Bedrock.
0.1	S1 5.0-5.1	5	░			
		5.5	░			
0	S1 5.6-5.7		░			

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BOREHOLE LOG S2

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 13/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683835.5104 N: 6100574.641
COORD SYS MGA / GDA 95
SURFACE ELEVATION 564 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S2 0.0-0.1		▨	SC-SM	Gravelly, silty, CLAY, brown, dry.	
		0.1				
		0.2				
		0.3				
		0.4				
0	S2 0.5-0.6	0.5				
		0.6				
		0.7				
		0.8	▨	SC-SM	Gravelly, silty, CLAY, grey-brown, moist.	
		0.9				
0	S2 1.0-1.1	1				
		1.1				
		1.2				
		1.3				
		1.4	▨	CL	Gravelly, silty, CLAY, orange-brown, moist.	Natural?
		1.5				
		1.6	▨	SC	Sandy, CLAY, grey-orange-brown	
		1.7				
		1.8				
		1.9				
0	S2 2.0-2.1	2				
		2.1				
		2.2				
		2.3				
		2.4				

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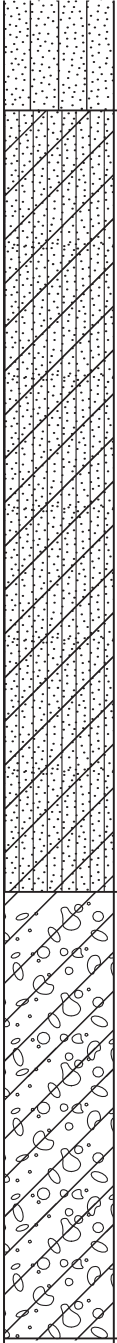
produced by ESlog.ESdat.net on 03 May 2021

BOREHOLE LOG S3

PROJECT NUMBER P21030	**DRILLING DATE** 13/4/2021	**COORDINATES** E: 683917.7197 N: 6100569.579
PROJECT NAME Detailed Site Investigation	**TOTAL DEPTH** 1.8 m	**COORD SYS** MGA / GDA 95
CLIENT JPS Engineering Consultants	**SAMPLE METHOD** Drill Rig	**SURFACE ELEVATION** 564 m above AHD
ADDRESS Section 51, Holt	**DIAMETER** 150 mm	
	CONTRACTOR Douglas Partners	

COMMENTS	**LOGGED BY** KL **CHECKED BY**

PID	**Sample Number**	**Depth (m)**	**Graphic Log**	**USCS**	**Material Description** **Surface:**	**Additional Observations**
0	S3 0.0-0.1	0.1		SM	Sandy, SILT, brown.	Fill - trace brick/concrete.
		0.2		SC-SM	Gravelly, silty, sandy, CLAY, brown.	
		0.3				
		0.4				
0	S3 0.5-0.6	0.5				
		0.6				
		0.7				
		0.8				
		0.9				
0	S3 1.0-1.1	1				
		1.1				
		1.2		GC	Gravelly, sandy, CLAY, orange-brown.	
		1.3				
		1.4				
		1.5				
		1.6				
		1.7				
		1.8				
		1.9				

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BOREHOLE LOG S4

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 13/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683959.9299 N: 6100567.655
COORD SYS MGA / GDA 95
SURFACE ELEVATION 563 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S4 0.0-0.1		░	SM	Sandy, SILT, brown, dry.	
		0.1				
		0.2				
		0.3				
		0.4				
0	S4 0.5-0.6	0.5	▨	CL	Silty, CLAY, red-brown, moist.	
		0.6				
		0.7	▨	GC	Gravelly, silty, CLAY, red-brown.	
		0.8				
		0.9	░	MLS	Gravelly, SAND, red-grey.	Weathered rock?
0	S4 1.0-1.1	1				
		1.1				
		1.2				
		1.3				
		1.4				
		1.5				
		1.6				
		1.7				
		1.8				
		1.9				
0	S4 2.0-2.1	2				
		2.1				
		2.2				
		2.3				
		2.4				

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BOREHOLE LOG S5

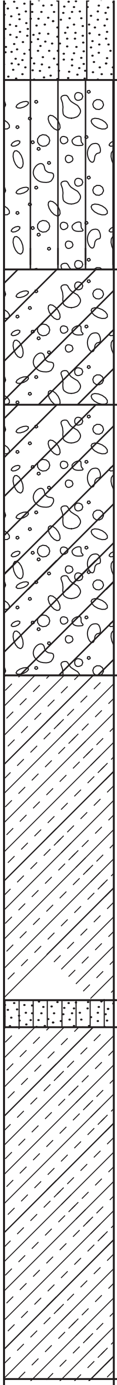
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 13/4/2021
TOTAL DEPTH 5.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683934.3235 N: 6100563.099
COORD SYS MGA / GDA 95
SURFACE ELEVATION 563 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY



PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0.7	S5 0.0-0.1	0.2		SM	Sandy, SILT, brown, moist.	Possible fill.
		0.4		GM	Gravelly. clayey, sandy, SILT, brown, moist.	
0.1	S5 0.5-0.6	0.6 0.8				
0	S5 1.0-1.1	1 1.2 1.4		GC	Gravelly, silty, sandy, CLAY, brown-orange brown, moist.	
		1.6 1.8		GC	Silty, gravelly, CLAY, grey-orange-brown, moist.	
0	S5 2.0-2.1	2 2.2 2.4				
		2.6 2.8		OH	Silty, gravelly, CLAY, grey, moist-wet.	
0	S5 3.0-3.1	3 3.2 3.4 3.6				
				MLS	Gravelly, rock, grey-pink.	Possibly alluvial.
		3.8		OH	Gravelly, sandy, CLAY, grey, moist-wet.	
	S5 4.0-4.1	4 4.2 4.4 4.6 4.8				
	S5 5.0-5.1	5				Wet.
		5.2 5.4				

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BOREHOLE LOG S6

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 8/4/2021
TOTAL DEPTH 5.5 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683939.5882 N: 6100484.534
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S6 0.0-0.1			SM	Sandy, SILT, brown, moist.	Possible fill.
				SC	Sandy, CLAY, orange-brown, moist.	
0	S6 0.5-0.6	0.5				
0.1	S6 1.0-1.1	1				
		1.5				
				SC	Sandy, CLAY, brown-grey, moist-wet.	
0	S6 2.0-2.1	2				
		2.5		OH	Sandy, CLAY, grey, wet.	
0.1	S6 3.0-3.1	3				
		3.5				
0.1	S6 4.0-4.1	4				
				SC	Sandy, CLAY, mottled grey-orange-brown, wet.	
		4.5				water.
0.1	S6 5.0-5.1	5		SC	Sandy, CLAY, brown, moist.	Possibly weathered rock.
		5.5				

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BOREHOLE LOG S7

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 7/4/2021
TOTAL DEPTH 5.3 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683977.2506 N: 6100414.474
COORD SYS MGA / GDA 95
SURFACE ELEVATION 566 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S7 0.0-0.1			SM	Sandy, SILT, brown, moist.	
		0.2		CL	CLAY, orange-brown, moist.	
		0.4				
0	S7 0.5-0.6	0.6				
		0.8		SC	Silty, gravelly, CLAY, brown, moist.	
0.1	S7 1.0-1.1	1				
		1.2				
		1.4		SC	Silty, gravelly, CLAY, grey-brown, moist.	
		1.6				
		1.8				
0.1	S7 2.0-2.1	2				
		2.2				
		2.4				
		2.6				
		2.8				
0	S7 3.0-3.1	3				water.
		3.2				
		3.4				
		3.6				
		3.8				
0	S7 4.0-4.1	4				
		4.2				
		4.4				
		4.6				
		4.8		CL	Silty, CLAY, light brown-grey, moist-wet.	
0	S7 5.0-5.1	5				
		5.2		SC	Weathered ROCK, light brown, wet.	
		5.4				

BOREHOLE LOG S8

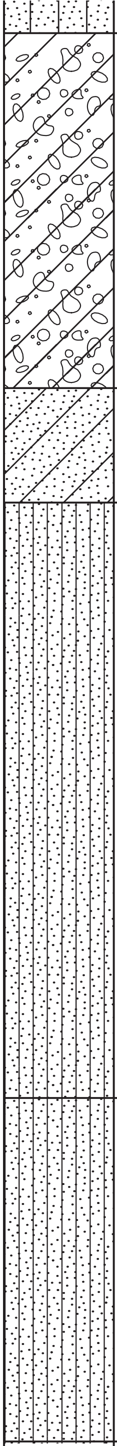
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 8/4/2021
TOTAL DEPTH 6.3 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683949.915 N: 6100361.625
COORD SYS MGA / GDA 95
SURFACE ELEVATION 569 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY



PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S8 0.0-0.1			SM	Sandy, SILT, brown, moist.	
				GC	Gravelly, sandy, CLAY, orange-brown, moist.	
0	S8 0.5-0.6	0.5				
0	S8 1.0-1.1	1				
		1.5				
				SC	Sandy, CLAY, pale brown-orange, moist.	
0	S8 2.0-2.1	2				
				MLS	Weathered ROCK, brown, dry.	
		2.5				
0	S8 3.0-3.1	3				
		3.5				
0	S8 4.0-4.1	4				
		4.5				
				MLS	Clayey, weathered ROCK, brown, moist.	
0	S8 5.0-5.1	5				water.
		5.5				
0	S8 6.0-6.1	6				

BOREHOLE LOG S9

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 7/4/2021
TOTAL DEPTH 3.9 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683911.6451 N: 6100454.567
COORD SYS MGA / GDA 95
SURFACE ELEVATION 566 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S9 0.0-0.1			SM	Sandy, SILT, brown, dry-moist.	
		0.2		GC	Gravelly, silty, sandy, CLAY, brown, moist.	
		0.4				
0	S9 0.5-0.6	0.6				
		0.8				
0	S9 1.0-1.1	1				
		1.2				
		1.4				
		1.6				
		1.8				
0	S9 2.0-2.1	2				
		2.2		SC	Sandy, CLAY, orange-brown, moist.	
		2.4				
		2.6				
		2.8				
0	S9 3.0-3.1	3				
		3.2				
		3.4		MLS	Weathered ROCK, pale brown, dry.	
		3.6				
	S9 3.8-3.9	3.8				Refusal @ 3.9m.

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BOREHOLE LOG S10

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683917.2054 N: 6100373.471
COORD SYS MGA / GDA 95
SURFACE ELEVATION 570 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0.1	S10 0.0-0.1	0.1 0.2 0.3	▨	SM	Gravelly, Sandy, SILT, brown-grey, dry, hard-soft.	Road base
0	S10 0.5-0.6	0.4 0.5 0.6	▨	GC	Gravelly, sandy, CLAY, brown-yellow, dry, plastic.	Trace of weathered volcanics.
0 0	S10 1.0-1.1 S10 2.0-2.1	0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1	▨	SC-SM	Sandy, silty, CLAY, brown-orange-pale brown, dry, slight plasticity.	Natural. Trace of weathered volcanics.
		2.2 2.3 2.4				

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BOREHOLE LOG S11

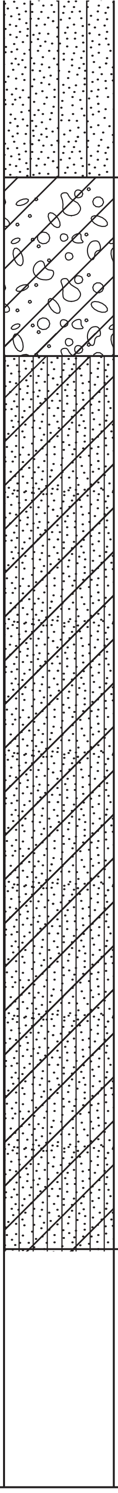
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 0.6 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683875.0883 N: 6100442.519
COORD SYS MGA / GDA 95
SURFACE ELEVATION 568 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0.1	S11 0.0-0.1	0.1 0.2		SM	Gravelly, Sandy, SILT, brown-pale brown, dry, soft-hard.	Road base.
		0.3 0.4		GC	Gravelly, sandy, CLAY, brown-yellow, dry, plastic.	Trace of weathered volcanics.
0.1	S11 0.5-0.6	0.5				
		0.6 0.7 0.8 0.9		SC-SM	Sandy, silty, CLAY, brown-orange, dry, slight plasticity.	Trace of weathered volcanics. Natural.
0.1	S11 1.0-1.1	1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9				
0	S11 2.0-2.1	2			Sandy, silty, CLAY, brown-pale brown, dry, slight plasticity.	
		2.1 2.2 2.3 2.4				

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BOREHOLE LOG S12

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 0.6 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683993.8104 N: 6100522.878
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
	S12 0.0-0.1			SM	Gravelly, Sandy, SILT, brown-pale brown, dry, soft-hard.	Road base.
0		0.05				
		0.1				
		0.15				
		0.2				
		0.25				
		0.3		GC	Gravelly, sandy, CLAY, orange-brown, dry, plastic.	Natural.
		0.35				
		0.4				
		0.45				
	S12 0.5-0.6	0.5				
0		0.55				
		0.6				Refusal @ 0.6
		0.65				
		0.7				
		0.75				
		0.8				
		0.85				
		0.9				
		0.95				

Disclaimer This bore log is intended for environmental not geotechnical purposes.

BOREHOLE LOG S13

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 0.6 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683989.338 N: 6100574.921
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
	S13 0.0-0.1			SM	Gravelly, SAND, red-brown, moist.	Road base.
0		0.05				
		0.1				
		0.15				
		0.2				
		0.25				
		0.3		GC	Gravelly, sandy, CLAY, orange-brown, moist.	Natural.
		0.35				
		0.4				
		0.45				
	S13 0.5-0.6	0.5				
0		0.55				Refusal @ 0.6 m
		0.6				
		0.65				
		0.7				
		0.75				
		0.8				
		0.85				
		0.9				
		0.95				

Disclaimer This bore log is intended for environmental not geotechnical purposes.

BOREHOLE LOG S14

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 0.6 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683991.9808 N: 6100615.782
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
	S14 0.0-0.1		▨	GM	Gravelly, SAND, brown-red, moist, hard	Road base.
0		0.05				
		0.1				
		0.15				
		0.2				
		0.25				
		0.3	▨	GC	Gravelly, clayey, SAND, brown-orange, dry-moist, hard, slight plasticity.	Natural.
		0.35				
		0.4				
		0.45				
	S14 0.5-0.6	0.5				
0		0.55				Refusal @ 0.6 m
		0.6				
		0.65				
		0.7				
		0.75				
		0.8				
		0.85				
		0.9				
		0.95				

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BOREHOLE LOG S15

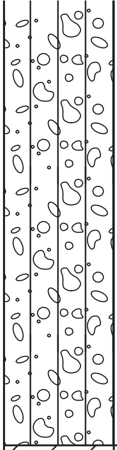
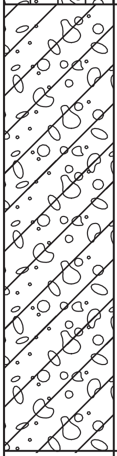
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 0.7 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684004.3816 N: 6100480.594
COORD SYS MGA / GDA 95
SURFACE ELEVATION 565 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S15 0.0-0.1	0.05 0.1 0.15 0.2 0.25		GM	Gravelly, silty, SAND, brown-red, moist, hard	Road base.
0	S15 0.5-0.6	0.3 0.35 0.4 0.45 0.5 0.55		GC	Gravelly, sandy, CLAY, brown-orange, dry-moist, hard, plastic.	Trace of fresh volcanics. Refusal @ 0.7 m
		0.6 0.65 0.7 0.75 0.8 0.85 0.9 0.95				

BOREHOLE LOG S16

PROJECT NUMBER P21030	**DRILLING DATE** 20/4/2021	**COORDINATES** E: 684023.8976 N: 6100439.122
PROJECT NAME Detailed Site Investigation	**TOTAL DEPTH** 1.1 m	**COORD SYS** MGA / GDA 95
CLIENT JPS Engineering Consultants	**SAMPLE METHOD** Drill Rig	**SURFACE ELEVATION** 565 m above AHD
ADDRESS Section 51, Holt	**DIAMETER** 150 mm	
	CONTRACTOR Douglas Partners	

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S16 0.0-0.1	0.1	▨	GM	Gravelly, silty, SAND, brown-red, moist, hard	Road base.
		0.2 0.3 0.4	▨	GC	Gravelly, sandy, CLAY, brown-pale brown, moist, plastic.	Reworked fill.
0	S16 0.5-0.6	0.5				
		0.6 0.7 0.8 0.9	▨	SC	Sandy, CLAY, brown-pale brown, moist, plastic.	Natural. Trace of rounded and angular volcanics.
0	S16 1.0-1.1	1				Refusal @ 1.1 m
		1.1 1.2 1.3 1.4				

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BOREHOLE LOG S17

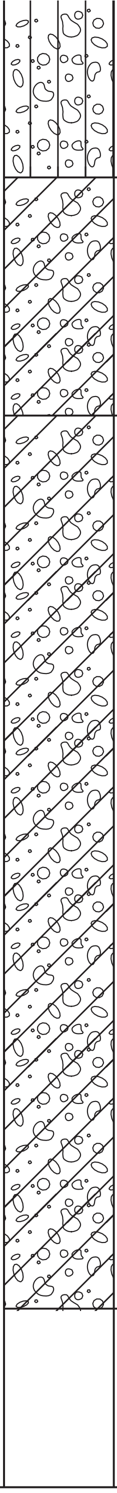
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 20/4/2021
TOTAL DEPTH 2.2 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684051.9518 N: 6100401.31
COORD SYS MGA / GDA 95
SURFACE ELEVATION 567 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S17 0.0-0.1	0.1 0.2 0.3		GM	Gravelly, silty, SAND, brown-red, moist, hard	Road base.
0	S17 0.5-0.6	0.4 0.5 0.6 0.7		GC	Gravelly, sandy, CLAY, brown-pale brown, moist, plastic.	Trace of weathered volcanics. Possibly reworked fill.
0 0	S17 1.0-1.1 S17 2.0-2.1	0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2		GC	Gravelly, sandy, CLAY, brown-grey-green, moist, plastic.	Possible former creek - organic material deposit. Refusal @ 2.2 m
		2.3 2.4				

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BOREHOLE LOG S18

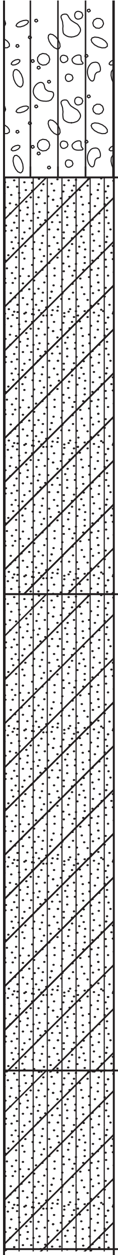
PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 21/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 683890.2748 N: 6100405.464
COORD SYS MGA / GDA 95
SURFACE ELEVATION 569 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S18 0.0-0.1	0.1 0.2		GM	Gravelly, silty, SAND, brown-grey, moist, soft-hard	Road base.
		0.3 0.4		SC-SM	Sandy, clayey, SILT, brown-yellow, dry, soft.	Natural. Trace of weathered volcanics.
0	S18 0.5-0.6	0.5 0.6 0.7 0.8 0.9				
0	S18 1.0-1.1	1 1.1 1.2 1.3 1.4 1.5 1.6 1.7		SC-SM	Sandy, clayey, SILT, brown-orange, dry,-moist,	Trace of rounded 1cm pebbles. .
		1.8 1.9		SC-SM	Sandy, silty, CLAY, brown-yellow, dry-moist, soft, plastic.	
0	S18 2.0-2.1	2				
		2.1 2.2 2.3 2.4				

BOREHOLE LOG S19

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 21/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684002.9663 N: 6100303.107
COORD SYS MGA / GDA 95
SURFACE ELEVATION 569 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S19 0.0-0.1	0.1	▨	SM	Sandy, SILT, dark brown, moist, soft.	Topsoil. Roots and trace of glass.
		0.2 0.3 0.4	▨	SC-SM	Sandy, clayey, SILT, brown, dry-moist, soft.	Roots and trace angular volcanics (fill).
0	S19 0.5-0.6	0.5 0.6	▨			
		0.7 0.8 0.9	▨	SC-SM	Sandy, clayey, SILT, pale brown, dry, soft.	
0	S19 1.0-1.1	1 1.1 1.2	▨			
		1.3 1.4 1.5 1.6 1.7 1.8 1.9	▨	SC-SM	Sandy, silty, CLAY, brown-orange, dry, soft, plastic.	Natural. Trace of weathered volcanics.
0	S19 2.0-2.1	2 2.1	▨			
		2.2 2.3 2.4				

produced by ESlog.ESdat.net on 03 May 2021

BOREHOLE LOG S20

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 21/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684002.1454 N: 6100327.312
COORD SYS MGA / GDA 95
SURFACE ELEVATION 568 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S20 0.0-0.1	0.0	▨	SC-SM	Sandy, silty, CLAY, brown, dry-moist, hard.	Trace weathered rock.
0	S20 0.5-0.6	0.5				
		0.7	▨	SC-SM	Sandy, silty, CLAY, brown-pale brown, dry-moist, soft.	
0	S20 1.0-1.1	1				
		1.1	▨	SC-SM	Sandy, silty, CLAY, brown, moist, soft, plastic.	
		1.5	▨	SC-SM	Sandy, silty, CLAY, brown-orange, moist, soft, plastic.	Natural.
0	S20 2.0-2.1	2				
		2.1				

Disclaimer This bore log is intended for environmental not geotechnical purposes.

BOREHOLE LOG S21

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 21/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684002.1454 N: 6100327.312
COORD SYS MGA / GDA 95
SURFACE ELEVATION 568 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S21 0.0-0.1	0.1	⁙	SM	Sandy, SILT, dark brown, dry, soft.	Topsoil.
0	S21 0.5-0.6	0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9	▨	SC-SM	Sandy, silty, CLAY, brown-orange, moist, soft, plastic.	Reworked fill.
0	S21 1.0-1.1	1 1.1 1.2	▨	SC-SM	Sandy, silty, CLAY, brown-yellow, moist, soft, plastic.	
0	S21 2.0-2.1	1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1	▨	SC-SM	Sandy, silty, CLAY, pale brown-yellow, moist, soft, plastic.	Natural.
		2.2 2.3 2.4				

Disclaimer This bore log is intended for environmental not geotechnical purposes.

lanterra consulting

BOREHOLE LOG S22

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE 21/4/2021
TOTAL DEPTH 2.1 m
SAMPLE METHOD Drill Rig
DIAMETER 150 mm
CONTRACTOR Douglas Partners

COORDINATES E: 684041.6411: N: 6100370.13
COORD SYS MGA / GDA 95
SURFACE ELEVATION 566 m above AHD

COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number	Depth (m)	Graphic Log	USCS	Material Description Surface:	Additional Observations
0	S22 0.0-0.1			SM	Sandy, SILT, dark brown, dry, soft.	Topsoil.
		0.1				
		0.2		OH	CLAY, dark grey, moist, plastic.	Fill? Old creek deposit.
		0.3				
		0.4				
0	S22 0.5-0.6	0.5				
		0.6				
		0.7				
		0.8				
		0.9				
0	S22 1.0-1.1	1				
		1.1				
		1.2		OH	Silty, CLAY, grey-pale brown, moist, soft, plastic.	
		1.3				
		1.4				
		1.5				
		1.6				
		1.7				
		1.8				
		1.9				
0	S22 2.0-2.1	2				
		2.1				
		2.2				
		2.3				
		2.4				

Disclaimer This bore log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 May 2021

BOREHOLE LOG GW51

PROJECT NUMBER P21030
PROJECT NAME Detailed Site Investigation
CLIENT JPS Engineering Consultants
ADDRESS Section 51, Holt

DRILLING DATE
TOTAL DEPTH 12.6 m
SAMPLE METHOD Auger/Reverse air
DIAMETER 150 mm
CONTRACTOR Terra Test

COORDINATES E: 683860.813 N: 6100446.771
COORD SYS MGA / GDA 95
SURFACE ELEVATION 569 m above AHD

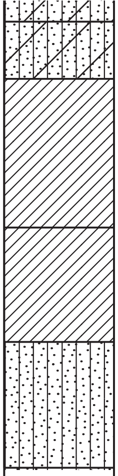
COMMENTS

LOGGED BY KL
CHECKED BY

PID	Sample Number
0.1	GW51 0.0-0.1
0	GW51 0.5-0.6
0	GW51 1.0-1.1
0	GW51 2.0-2.1
0.2	GW51 3.0-3.1
0	GW51 4.0-4.1

Depth (m): 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, 11, 11.5, 12, 12.5

Graphic Log



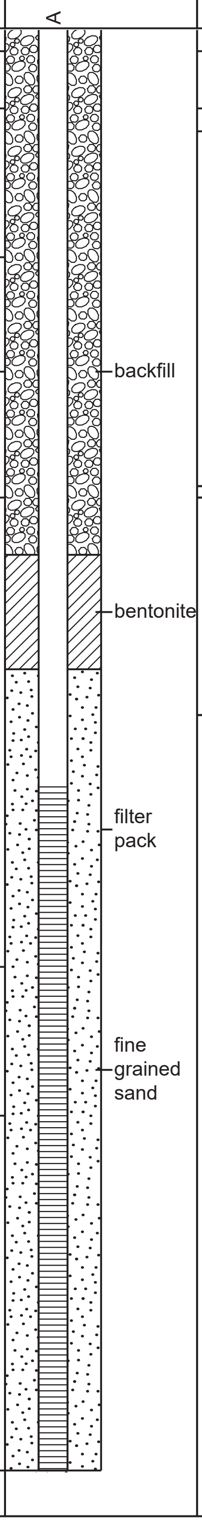
USCS

Material Description

Surface:

- Gravelly, silty, SAND, brown-grey, dry, hard.
- Gravelly, sandy, CLAY, dark brown-brown, dry-moist, plastic.
- Sandy, silty, CLAY, dark brown-brown, dry-moist, plastic.
- Sandy, silty, CLAY, brown, dry-moist, plastic.
- Sandy, silty, CLAY, brown-yellow, dry, plastic.
- Sandy, silty, CLAY, brown-yellow, dry, plastic.
- Weathered volcanic rock. Crystals in air-hammer powder, yellow grey in colour
- Moist powder. Less weathered volcanic rock @ 10.5m.

Well Diagram



Additional Observations

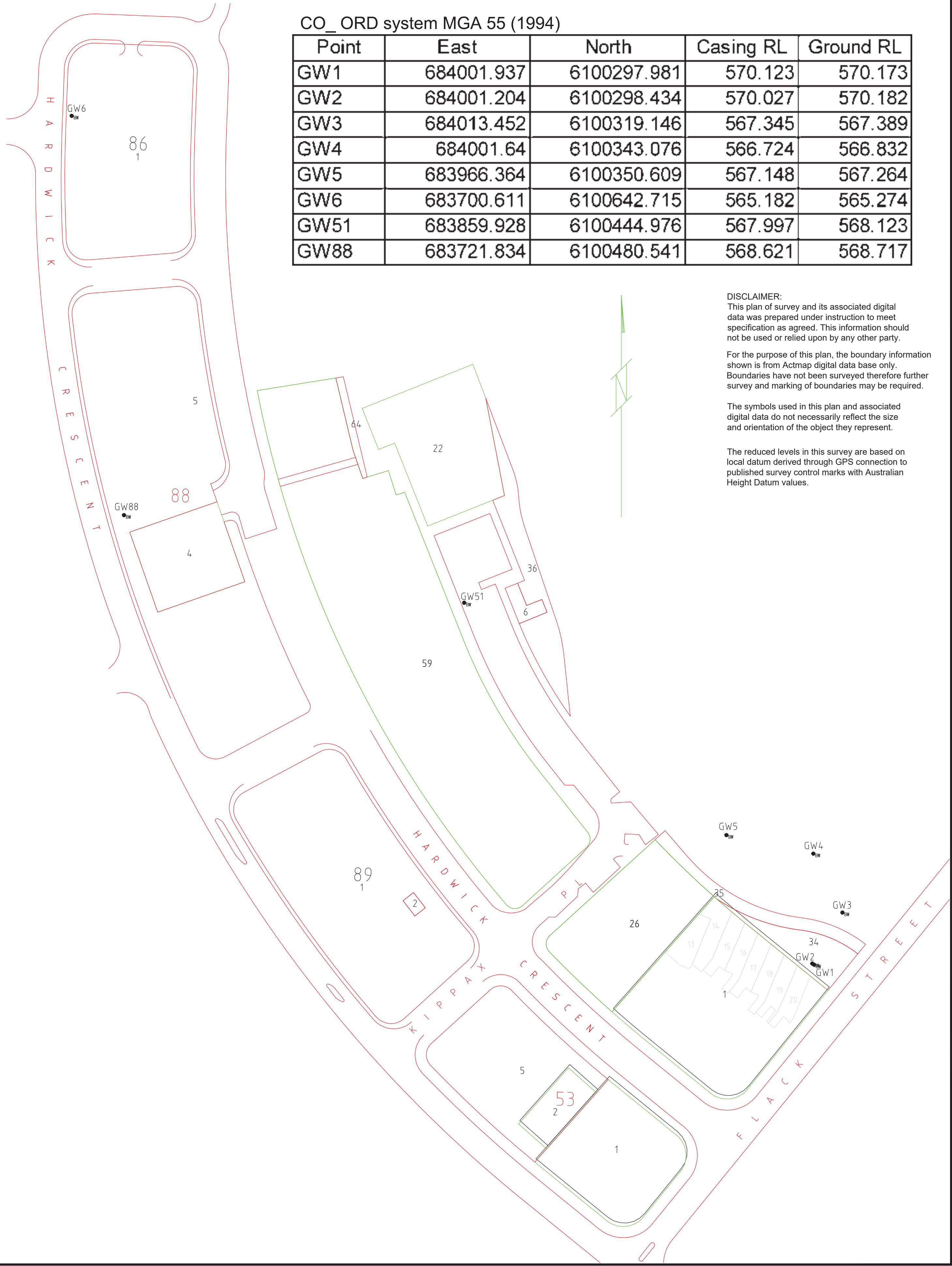
- Bitumen/road base.
- Fill?
- Trace of reworked gravel.
- Air-hammer from 4.0 m.
- Static water level @ 6 m.

Appendix F

Groundwater Well Survey

CO_ ORD system MGA 55 (1994)

Point	East	North	Casing RL	Ground RL
GW1	684001.937	6100297.981	570.123	570.173
GW2	684001.204	6100298.434	570.027	570.182
GW3	684013.452	6100319.146	567.345	567.389
GW4	684001.64	6100343.076	566.724	566.832
GW5	683966.364	6100350.609	567.148	567.264
GW6	683700.611	6100642.715	565.182	565.274
GW51	683859.928	6100444.976	567.997	568.123
GW88	683721.834	6100480.541	568.621	568.717



DISCLAIMER:
This plan of survey and its associated digital data was prepared under instruction to meet specification as agreed. This information should not be used or relied upon by any other party.

For the purpose of this plan, the boundary information shown is from Actmap digital data base only. Boundaries have not been surveyed therefore further survey and marking of boundaries may be required.

The symbols used in this plan and associated digital data do not necessarily reflect the size and orientation of the object they represent.

The reduced levels in this survey are based on local datum derived through GPS connection to published survey control marks with Australian Height Datum values.

CLIENT

LANTERRA

J	SURVEY GROUND WATER WELLS	05.04.21	
REVISION		DATE	ZONE

Contour Interval
Datum A.H.D

BM BM 2700
RL 576.991

Scale NOT TO SCALE

Surveyed	N. Wilson	27.04.2021
Drawn	S. Pointon	04.05.2021
Checked	B. Skeers	04.05.2021
Approved	B. RICHARDSON	

Surveyor, Registered under the Surveyors Act 2007.

CANBERRA
11-13 Lawry Place,
Macquarie, ACT. 2614
Phone 02 6202 7600

MONITORING WELLS
CALTEX KIPPAX
BLOCK 1, SECTION 53
DIVISION OF HOLT
ACT

Project No. 17267.03 **Rev K**

Sheet No. 1 of 1 17267_001

A2

Appendix G

Photographs

lanterra consulting

SITE PHOTOGRAPHS

Client Name	**Site Location**	**Project No.**
JPS Engineering Consultants	Section 51, Holt, ACT2615	P21030

Photo No.	**Date**
1.	07/04/2021

Description

Sampling location of drainage sample D2

Photo No.	**Date**
2.	13/04/2021

Description

Soil profile at a depth of 0.5 – 0.6 m bgl (fill) at sampling location S3

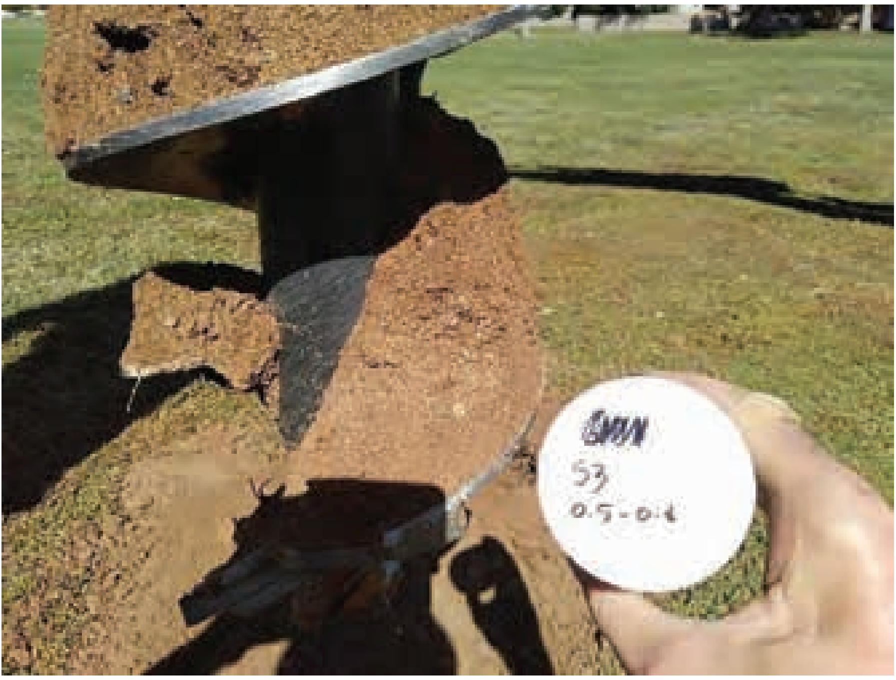


Photo No.	**Date**
3.	08/04/2021

Description

Borehole S6 showing the grey clay observed across the site.

Photo No.	**Date**
4.	07/04/2021

Description

Photograph of material recovered at 4.0 m bgl at borehole S1

Photo No.	Date
5.	20/04/2021

Description

Drilling and sampling of borehole S15 in Moyes Crescent. Natural material is observed in front of the photograph while the road base is observed around the hole on the ground.

Photo No.	Date
6.	15/04/2021

Description

Drilling, installation and soil sampling of groundwater monitoring well GW51.

Photo No.	Date	
7.	21/04/2021	
Description Soil profile at 2.0 m bgl in borehole S10 in Kippax Place. Natural material is observed.		

Photo No.	Date	
8.	21/04/2021	
Description Soil profile at borehole location S22 in the southeast portion of the site. A grey clay is observed in the auger.		

Appendix H

EIL Calculations

Inputs
Select contaminant from list below
As
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Arsenic generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	40
Urban residential and open public spaces	50	100
Commercial and industrial	80	160

Inputs
Select contaminant from list below
Cr_III
Below needed to calculate fresh and aged ACLs
Enter % clay (values from 0 to 100%)
24
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Cr III soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	140	180
Urban residential and open public spaces	290	540
Commercial and industrial	430	890

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
9.35
Enter soil pH (calcium chloride method) (values from 1 to 14)
6.85
Enter organic carbon content (%OC) (values from 0 to 50%)
1
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs

Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	65	80
Urban residential and open public spaces	120	200
Commercial and industrial	160	280

Inputs
Select contaminant from list below
DDT
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	DDT generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	3	3
Urban residential and open public spaces	180	180
Commercial and industrial	640	640

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
9.35
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	30
Urban residential and open public spaces	70	150
Commercial and industrial	120	250

Inputs
Select contaminant from list below
Pb
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Lead generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	110	470
Urban residential and open public spaces	270	1100
Commercial and industrial	440	1800

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
9.35
Enter soil pH (calcium chloride method) (values from 1 to 14)
6.85
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	70	160
Urban residential and open public spaces	180	460
Commercial and industrial	270	670

Inputs
Select contaminant from list below
Naphthalene
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Naphthalene generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	10
Urban residential and open public spaces	170	170
Commercial and industrial	370	370

Appendix K

Correspondence with ACT EPA

Gmail

John Samoty <john.samoty@gmail.com>

FW: Comment on Site Assessment Report

1 message

[redacted] Tue, May 18, 2021 at 7:32 AM

To: Chris Gunton <Chris.Gunton@lanterra.com.au>, John Samoty <john.samoty@gmail.com>, '[redacted]'
[redacted]

OFFICIAL

For discussion please – Nyah will set up a time.

From: [redacted]
Sent: Tuesday, 18 May 2021 7:30 AM
To: [redacted]
Subject: Comment on Site Assessment Report

OFFICIAL

Dear [redacted],

The Office of the Environment Protection Authority has reviewed the report titled “ Detailed Site Investigation Section 51 Kippax Group Centre, Holt ACT 2615” dated 12 May 2021 by Lanterra Consulting Pty Ltd and provides the following comments:

- Due the potential for vapour intrusion from the impacts from the identified contaminants of concern, the proposed and permitted sensitive uses at the site, including residential and childcare, and the likely use of basements within the study area full delineation of impacts must be undertaken in accordance with Environment Protection Authority (EPA) endorsed guidelines;
- Consistent with the requirements of the *Contaminated Sites Environment Protection Policy* and the approach the EPA has taken at other sites with impacts from volatile hydrocarbons and volatile chlorinated hydrocarbons all assessment and remediation works, along with any proposed interim and future management of the site, must be independently audited by an Environment Protection Authority approved environmental auditor;
- The environmental audit must be undertaken in accordance with the requirements of the *Contaminated Sites Environment Protection Policy* and submitted to the EPA for review and endorsement prior to the site being used for other purposes.

Regards

[redacted]

[redacted]

Phone: [redacted]

Office of the Environment Protection Authority

Access Canberra | ACT Government

480 Northbourne Avenue, Dickson ACT 2602

GPO Box 158 Canberra ACT 2601 | http://www.act.gov.au/accesscbr

Appendix L

Douglas Partners, Geotechnical Site Investigation

Douglas Partners
Geotechnics | Environment | Groundwater

Factual Report on
Preliminary Geotechnical Investigation

Proposed Redevelopment
Part Section 51, Holt

Prepared for
Environment Planning and Sustainable Development
Directorate

Project 201883.00
May 2021

Integrated Practical Solutions

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	201883.00	Document No.	R.001.Rev0
Document title	Report on Preliminary Geotechnical Investigation Proposed Redevelopment		
Site address	Part Section 51, Holt		
Report prepared for	Environment Planning and Sustainable Development Directorate		
File name	201883.00.R.001.Rev0.Preliminary Geotechnical Investigation-Part Section 51 Holt a.docx		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Draft A	Sasi Sasiharan	Michael Jones	3 May 2021
Revision 0	Sasi Sasiharan	Michael Jones	12 May 2021

Distribution of copies

Status	Electronic	Paper	Issued to
Draft A	1	0	Graham Mundy, Environment Planning and Sustainable Development Directorate
Revision 0	1	0	Graham Mundy, Environment Planning and Sustainable Development Directorate

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		12 May 2021
Reviewer		12 May 2021

bsi. ISO 9001 Quality Management
FS 604853

Douglas Partners Pty Ltd
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Phone (02) 6260 2788

Table of Contents

Report on Preliminary Geotechnical Investigation
Proposed Redevelopment
Part Section 51, Holt

1. Introduction

This report presents the factual results of a preliminary geotechnical investigation undertaken for future proposed redevelopment at Part Section 51, Holt. The investigation was commissioned in an email dated 2 March 2021 by John Samoty on behalf of Environment Planning and Sustainable Development Directorate and was undertaken in accordance with Douglas Partners' proposal dated 18 February 2021.

It is understood that the site will be developed as part of a future undetermined mixed-use development. It is likely that it would comprise of at least two levels above ground with up to two basement levels. A road extension is also being considered along the northern end of the proposed development area.

The investigation described within was undertaken to assess the site conditions as part of a package of information that will be included to assist in the sale process. The successful block developer must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

The investigation included the drilling of nine (9) boreholes and laboratory testing of selected samples. Three shallow bores (300 mm diameter) were carried out along the potential road extension alignment to obtain pavement design parameters. Six deeper bores (110 mm diameter) were placed evenly across the site and carried out to obtain subsurface information for the future mixed-use development with two likely basement levels.

The details of fieldwork are presented in this factual report, which include:

- A description of the site geology and the subsurface conditions encountered including any groundwater encountered, depth/relative density/moisture condition of natural soil and any fill encountered, and the type and degree of weathering and estimated strength of any rock encountered within the drilled depth;
- A plan showing the investigation locations; and
- Logs of the boreholes including location coordinates and approximate reduced levels.

This report must be read in conjunction with the notes “About this Report” which are included in Appendix A.

2. Site Description

The site is designated as part of Block 47 Section 51, Holt by the ACT Government and covers as approximate 3.5 hectare area. It is bounded to the west/southwest by Kippax Fair Shopping Centre, to the south by Zara Gardens, to the southeast by Flack Street, to the east/southeast by Moyes Crescent and to the north by Kippax Tennis Club.

The site is currently used as a playing field and was grass vegetated with trees up to ~20 m tall along the boundaries. The site is located in a lower lying area and is relatively flat, with a battered slope up to approximately 3.5 m high at the southern end of the western boundary. A drainage swale runs approximately south east to north west along the eastern boundary of the site. Figure 1 below shows the playing fields looking north from near Bore 7.

The northwest corner of the site is within the northern section of Block 66, Section 51. This part of the site slopes from the south west to north east, with two footpaths, minor battered slopes and a number of trees up to 20 m tall. A small skateboard halfpipe is located directly east of Block 66, just within Block 47.

Figure 1: View of proposed redevelopment area looking north from Bore 7.

3. Regional Geology

Reference to BMR (1992) indicates that the site is underlain by rock units of the Deakin Volcanics of late Silurian age, which typically comprise rhyodacitic ignimbrite with minor volcaniclastic and argillaceous sedimentary rocks, tuffaceous and quartz sandstone, and minor shale.

The field testing has confirmed the presence of rhyodacite ignimbrite and tuffaceous sandstone underlying the site.

4. Field Work

4.1 Field Work Methods

Field work for the investigation was undertaken in the period between 5 April 2021 and 13 April 2021 and included the drilling of nine bores (Bores 1 – 9). Bores 1 and 5 – 9 were drilled using a EVH2100 trailer mounted drill rig fitted with 110 mm diameter continuous flight augers with Bores 5, 6 and 8 continued into weathered rock using NMLC coring equipment. Bores 1, 7 and 9 were drilled to refusal depths of 3.9 – 5.7 m; whereas Bores 5, 6 and 8 were cored drilled to depths of 7.0 – 7.85 m. Standard penetration tests (SPT; AS1289 6.3.1:1997) were carried out at nominally 1.5 m test intervals in all bores to provide information on the strength of the overburden soils and samples for logging purposes. The SPT procedure is given in the notes attached and the penetration N values are shown on the borehole logs.

Bores 2 – 4 were drilled using a Kubota KX03304 mini excavator fitted with a 300 mm diameter auger to depths 1.8 – 2.0 m. Dynamic cone penetrometer tests (AS 1289 6.3.2:1997) were also undertaken from the surface adjacent to each test location to provide an indication of the in situ strength profile of the site soils.

The bores were logged onsite by a geotechnical engineer. Disturbed and bulk samples were collected to assist in strata identification and for laboratory testing.

Location coordinates for each test location in respect to ACT Stromlo Grid and levels in respect of the Australian height Datum (AHD) were obtained using a Hemisphere GPS Eclipse II R320 generally with an accuracy of ±0.05 m. The approximate test locations are shown on Drawing 1 in Appendix B.

4.2 Field Work Results

Details of the subsurface conditions encountered are presented in the borehole logs included in Appendix C. The logs must be read in conjunction with the attached notes that define classification methods and terms used to describe the soils and rocks. The bores encountered variable subsurface conditions generally associated with undulating topography and changes in geological conditions across the site.

The general principal succession of strata is broadly summarised as follows:

- TOPSOIL FILL: generally low plasticity sandy Silt, with rootlets, trace gravel, moist to dry, variably firm to very stiff in all bores to depths of 0.2 m – 0.3 m.
- FILL: generally low to medium and medium to high plasticity, silty Clay, sandy Clay and Clay, with a various mixture of silt, sand and gravel, moist to wet, variably very stiff to hard, underlying topsoil fill in all bores to depths of 0.45 – 2.7 m. Bore 3 was terminated in fill due to refusal on cobbles/boulders.
- SILTY CLAY & CLAY: generally low to medium and medium to high plasticity, silty Clay and Clay, with a various mixture of silt, sand and gravel, moist to dry, variably soft to hard encountered below Fill in all bores except Bore 3 to depths of 0.7 – 5.1 m.
- SANDY GRAVEL & SILTY CLAYEY SAND: encountered only in Bore 5 between depths of 3.6 m and 4.0 m sandwiched between clay layers, moist to dry, medium dense.
- EXTREMELY WEATHERED ROCK: breakdown to be medium to high plasticity, very stiff to hard sandy Clay in Bore 2 to the termination depth of 2 m and fine to coarse grained, dense to very dense clayey Sand overlying bedrock in Bores 4 and 8.
- RHYODACITIC IGNIMBRITE/TUFFACEOUS SANDSTONE: variably low to medium/high strength, extremely to slightly weathered in Bores 1, 4, 7 and 9 below depths of 1.5 m – 3.3 m to the slow progress/refusal depths of 2.0 m – 5.7 m and in Bores 5, 6 and 8 below depths of 2.2 m – 4.9 m to the termination depths of 7.0 m – 7.85 m. Rock cores obtained indicated that bedrock is highly fractured (fracture spacing generally varies between 10 mm and 50 mm in Bore 5) to fractured (fracture spacing generally varies between 30 mm and 100 mm in Bores 6 and between 50 mm and 200 mm in Bore 8).

Table 1 presents a summary of the subsurface conditions encountered in each borehole.

Table 1: Summary of Subsurface Conditions

Material	Depth to underside of each layer (m)								
	Bore No.								
	1	2	3	4	5	6	7	8	9
TOPSOIL FILL	0.2	0.3	0.25	0.2	0.2	0.2	0.2	0.2	0.2
FILL	1.2	0.9	1.8 (LOI)	0.45	2.7	1.7	1.6	1.7	1.4
SILTY CLAY & CLAY	4.4	1.8	-	0.7	3.6 and 5.1	4.9	5.1	2.0	3.3
SANDY GRAVEL & SILTY CLAYEY SAND	-	-	-	-	4.0	-	-	-	-
EXTREMELY WEATHERED ROCK	-	2.0 (LOI)	-	1.5	-	-	-	2.2	-
RHYODACITIC IGNIMBRITE/ TUFFACEOUS SANDSTONE	5.7	-	-	2.0 (LOI)	7.0 (LOI)	7.75 (LOI)	5.3 (LOI)	7.85 (LOI)	3.9 (LOI)

*LOI – Limit of Investigation

Groundwater seepage was observed in Bores 5 – 7 at the depths 3.0 m – 4.8 m which generally correlates with the lower portions of the site. It is noted that the boreholes were immediately backfilled following drilling/coring for safety reasons which precluded longer term monitoring of groundwater level. Groundwater conditions rarely remain constant and can change seasonally due to variations in rainfall, temperature and soil permeability. For these reasons, it is noted that the moisture condition of the site soils may vary considerably from the time of the investigation compared to at the time of construction. It must be noted that due to the topography and fractured weathered rock, groundwater seepages must be expected following periods of rainfall.

5. Laboratory Testing

Laboratory testing was performed on selected samples, and comprised the following:

- One Atterberg limits and linear shrinkage test;
- One California bearing ratio (CBR) tests; and
- Two field moisture content tests.

The results of the laboratory testing are provided in detail in the test report sheets in Appendix D and summarised in Table 2 and Table 3 below.

Table 2: Results of Plasticity Tests

Bore No.	Depth (m)	W_F (%)	W_L (%)	W_P (%)	PI (%)	LS (%)	Field Description
7	3.5 – 3.95	30.2	73	20	53	18	Silty Clay

Where W_F = Moisture content W_L = Liquid limit W_P = plastic limit
PI = Plasticity Index LS = Linear shrinkage

Table 3: Summary of Compaction & CBR Testing

Bore No.	Depth (m)	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	Swell (%)	Field Description
2	0.5 – 0.7	11.7	12.5	1.93	13	0.5	Fill/Clay

Where: FMC = Field moisture content MDD = Maximum dry density (standard)
OMC = Optimum moisture content CBR = California bearing ratio

6. Comments

The successful block developer must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

The site must be subject to a development specific geotechnical investigation to enable specific advice on the geotechnically most suitable earthworks methodology, excavation conditions and support and footings for the site conditions. DP can undertake this assessment.

Some variability in subsurface conditions must be anticipated.

Moisture condition of site soils and/or the presence of groundwater may vary considerably from time of investigation compared to at the time of construction.

7. Limitations

Douglas Partners (DP) has prepared this report for this project at Part Section 51, Holt in accordance with DP's proposal dated 18 February 2021 and acceptance received from John Samoty on behalf of Environment Planning and Sustainable Development Directorate dated 02 March 2021. The work was carried out under ACT government general terms and conditions for purchase orders (good and services), Version 5.1 – April 2016. This report is provided for the exclusive use of Environment Planning and Sustainable Development Directorate for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawing 1 – Test Location Plan

Locality Plan

LEGEND

⊕ Borehole Location

NOTE: Base drawing from ACTmapi, dated January 2020

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Environment Planning and Sustainable Development Directorate		TITLE: **Test Location Plan**	PROJECT No: 201883.00
OFFICE: Canberra	DRAWN BY: ADFH	**Proposed Redevelopment**	DRAWING No: 1
SCALE: 1:1500 @ A3	DATE: 12.04.2021	**Part Section 51, Holt**	REVISION: 0

Appendix C

Explanatory Notes
Borehole Logs & Core Photos

Sampling Methods

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Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Descriptions

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

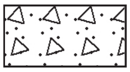
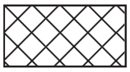
fg	fragmented
bnd	band
qtz	quartz

May 2017

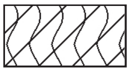
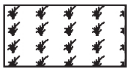
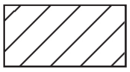
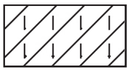
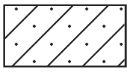
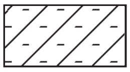
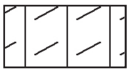
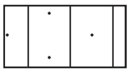
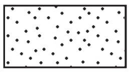
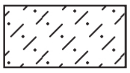
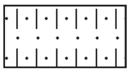
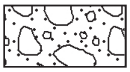
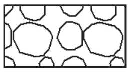
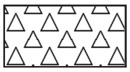
Symbols & Abbreviations

Graphic Symbols for Soil and Rock

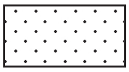
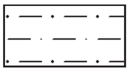
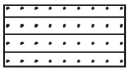
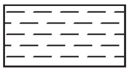
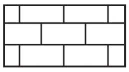
General

■	Asphalt
	Road base
	Concrete
	Filling

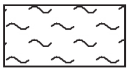
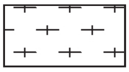
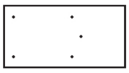
Soils

	Topsoil
	Peat
	Clay
	Silty clay
	Sandy clay
	Gravelly clay
	Shaly clay
	Silt
	Clayey silt
	Sandy silt
	Sand
	Clayey sand
	Silty sand
	Gravel
	Sandy gravel
	Cobbles, boulders
	Talus

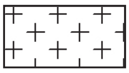
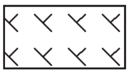
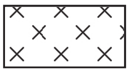
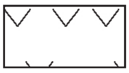
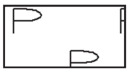
Sedimentary Rocks

	Boulder conglomerate
	Conglomerate
	Conglomeratic sandstone
	Sandstone
	Siltstone
	Laminite
	Mudstone, claystone, shale
■	Coal
	Limestone

Metamorphic Rocks

	Slate, phyllite, schist
	Gneiss
	Quartzite

Igneous Rocks

	Granite
	Dolerite, basalt, andesite
	Dacite, epidote
	Tuff, breccia
	Porphyry

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 565.1 AHD
EASTING: 200858.8
NORTHING: 610525.2
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 201883.00
DATE: 7-4-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Results & Comments	Water	Well Construction Details
565		TOPSOIL FILL/Sandy SILT (ML): low plasticity, dark brown, fine to coarse grained sand, with rootlets, trace organics and fine gravel to 10mm in size, moist to dry, w<PL, stiff, poorly compacted, FILL							
	0.2	FILL/Sandy SILT (ML): low plasticity, brown, fine to medium grained sand, trace gravel to 25mm in size, dry to moist, w<PL, hard, FILL		S	0.5 0.95		7,17,26 N = 43		
564	0.7 1	FILL/Sandy CLAY (CI): medium plasticity, brown, mottled orange-grey, fine to coarse grained sand, trace gravel to 20mm in size and silt, dry to moist, w<PL, hard, FILL							1
	1.2	Silty CLAY (CL/CI): low to medium plasticity, brown, trace gravel to 5mm in size, moist to dry, w<PL, very stiff, residual		A	1.5				
563	2	-from 1.7m, pale brown, with fine to coarse grained sand, hard		S	2.0 2.41		9,19,32/110 refusal		2
				A	2.5				
562	2.7 3	CLAY (CI/CH): medium to high plasticity, grey-brown, with silt, trace gravel to 15mm in size, dry to moist, w<PL, hard, residual							3
561	4	-from 3.2m, with fine to coarse grained sand		S	3.5 3.95		5,16,27 N = 43		4
	4.4	RHYODACITIC IGNIMBRITE: fine to coarse grained, grey-brown, dry to moist, very low to low strength, highly weathered, highly fractured -from 4.7m, low strength		A	4.8				
	5.0								

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT:	Environment Planning and Sustainable Development Directorate	**SURFACE LEVEL:** 565.1 AHD	**BORE No:** 1
PROJECT:	Proposed Redevelopment	**EASTING:** 200858.8	**PROJECT No:** 201883.00
LOCATION:	Part Section 51, Holt	**NORTHING:** 610525.2	**DATE:** 7-4-2021
		DIP/AZIMUTH: 90°/--	**SHEET** 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
560		RHYODACITIC IGNIMBRITE: fine to coarse grained, grey-brown, dry to moist, low strength, highly weathered, highly fractured							
		-from 5.5m, low to medium strength, highly to moderately weathered, highly fractured to fractured		A	5.5				
	5.7	Bore discontinued at 5.7m -refusal							
	6								6
559									
	7								7
558									
	8								8
557									
	9								9
556									

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

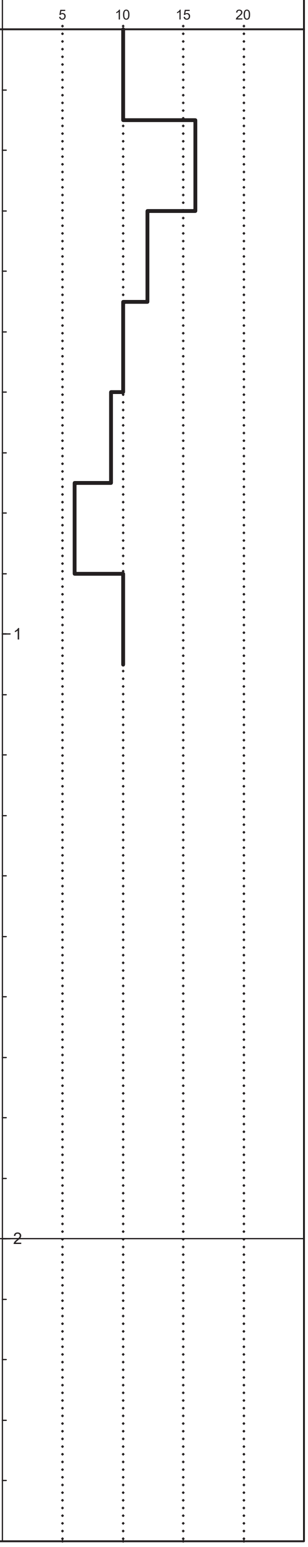
CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 563.6 AHD
EASTING: 200867.1
NORTHING: 610565.7
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 201883.00
DATE: 13-4-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL FILL/Sandy SILT (ML): low plasticity, pale brown, fine to medium grained sand, with rootlets, moist to dry, w<PL, very stiff, FILL -from 0.15m, hard						
563	0.3	FILL/CLAY (CI/CH): medium to high plasticity, brown, with silt, trace fine to coarse grained sand and gravel to 15mm in size, moist to dry, w<PL, very stiff, FILL		B	0.5 0.7			
	0.9 1	Silty CLAY (CL): low plasticity, pale grey, trace fine to medium grained sand, moist to dry, w<PL, very stiff, alluvium		A	1.0			
562	1.4	CLAY (CI/CH): medium to high plasticity, yellow, grey-brown, trace silt and fine to coarse grained sand, moist to dry, w<PL, very stiff, residual		A	1.5			
	1.8	Sandy CLAY (CI/CH): medium to high plasticity, brown, fine to coarse grained sand, trace gravel to 10mm in size, moist to dry, w<PL, very stiff to hard, extremely weathered rhyodacitic ignimbrite		A	1.95			
	2 2.0	Bore discontinued at 2.0m -limit of investigation						

Dynamic Penetrometer Test (blows per 150mm)



RIG: Kubota KX033-4 mini-excavator **DRILLER:** Terrain Projects **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

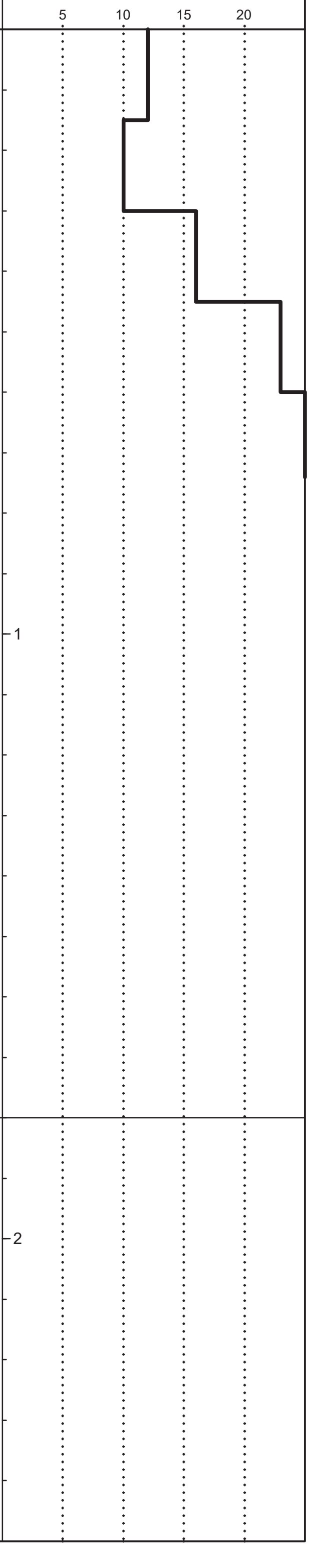
CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 563.2 AHD
EASTING: 200932.9
NORTHING: 610560.6
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 201883.00
DATE: 13-4-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
563		TOPSOIL FILL/Sandy SILT (ML): low plasticity, brown, fine to medium grained sand, with rootlets, moist to dry, w<PL, hard, FILL -from 0.15m, very stiff	▨					
	0.25	FILL/CLAY (CL/CI): low to medium plasticity, pale brown, trace silt, fine to coarse grained sand, gravel to 20mm in size and concrete/brick cobbles to 100mm in size, dry to moist, w<PL, hard, FILL	▨	B	0.6 0.8			
562	1.1	FILL/CLAY (CI/CH): medium to high plasticity, brown, mottled grey, with silt, trace fine to coarse grained sand and gravel to 20mm in size, moist to dry, w<PL, very stiff to hard, FILL	▨	A	1.2			
561	1.8	Bore discontinued at 1.8m -refusal on cobble/boulder						

Dynamic Penetrometer Test (blows per 150mm)



RIG: Kubota KX033-4 mini-excavator **DRILLER:** Terrain Projects **LOGGED:** ADFH **CASING:**
TYPE OF BORING: 300mm diameter auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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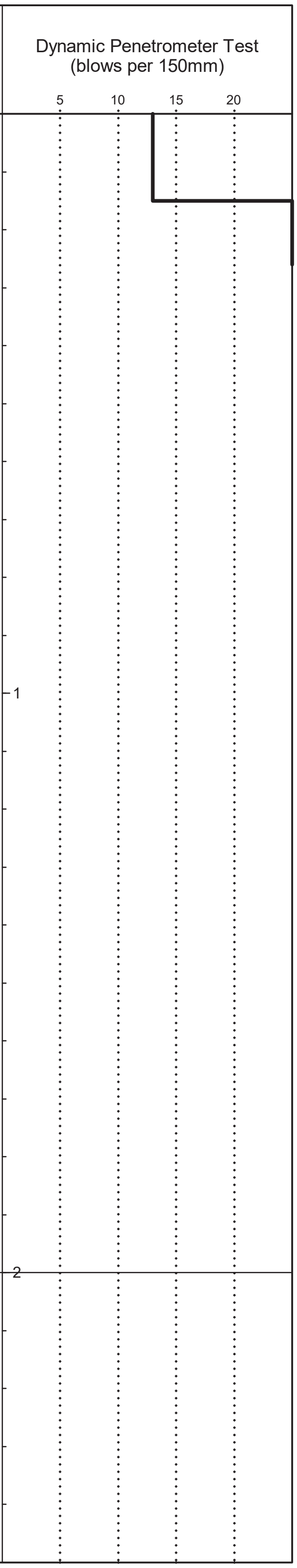
BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 563.0 AHD
EASTING: 200983.7
NORTHING: 610552
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 201883.00
DATE: 13-4-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth	Sample	Results & Comments	Water
563		TOPSOIL FILL/Sandy SILT (ML): low plasticity, pale brown, fine to medium grained sand, with rootlets, dry to moist, w<PL, hard, FILL						
	0.2	FILL/Sandy SILT (ML): low plasticity, pale brown, fine to coarse grained sand, with gravel to 50mm in size, dry to moist, w<PL, very stiff to hard, FILL						
	0.45	Silty CLAY (CI): medium plasticity, red-brown, moist to dry, w<PL, very stiff, residual						
562	0.7 1	Clayey SAND (SC): fine to coarse grained, red, grey-brown, low plasticity clay, with highly weathered rhyodacitic ignimbrite gravel to 15mm in size, moist to dry, dense, (extremely weathered rhyodacitic ignimbrite)/residual		A	0.8			
	1.5	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale purple-grey, dry to moist, extremely low to very low strength, extremely to highly weathered, highly fractured		A A	1.55 1.8			
561	2 2.0	Bore discontinued at 2.0m -limit of investigation						


Dynamic Penetrometer Test (blows per 150mm)

RIG: Kubota KX033-4 mini-excavator **DRILLER:** Terrain Projects **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 563.4 AHD
EASTING: 200949
NORTHING: 610552.2
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 201883.00
DATE: 7 - 8/4/2021
SHEET 1 OF 2

Discontinuities: B - Bedding J - Joint S - Shear F - Fault

RL	Depth (m)	Description of Strata	Water	Sampling Type	Test Results & Comments
	0.2	TOPSOIL FILL/Sandy SILT (ML): low plasticity, brown, fine to medium grained sand, with rootlets, moist to dry, inferred firm to stiff, poorly compacted, FILL			
563	0.8	FILL/CLAY (CI/CH): medium to high plasticity, dark brown, trace silt, fine to coarse grained sand and gravel to 15mm in size, moist, w>PL, stiff, FILL -from 0.4m, with gravel to 15mm in size		A S	 5,6,8 N = 14
1	1.05	FILL/Sandy CLAY (CL): low plasticity, dark brown, fine to coarse grained sand, with gravel to 10mm in size, moist to dry, w~PL, stiff-very stiff, FILL			
562	1.6	FILL/CLAY (CI/CH): medium to high plasticity, dark brown, trace silt, fine to coarse grained sand and gravel to 15mm in size, moist, w>PL, stiff, FILL			
2 561	2.7	FILL/CLAY (CI): medium plasticity, dark grey-brown, with silt and fine to coarse grained sand, moist to wet, w>PL, firm to stiff, FILL		A S	 2,3,5 N = 8
3 560	3.6	CLAY (CI): medium plasticity, dark blue-grey, with silt, trace fine to coarse grained sand, moist to wet, w>PL, firm to stiff, alluvium -from 3.3m, trace sub-rounded gravel to 20mm in size, stiff		A	
	3.7	Sandy GRAVEL (GP): poorly graded gravel to 20mm in size, purple, fine to coarse grained sand, moist to dry, medium dense, alluvium/possible colluvium		S	6,8,6 N = 14
4	4.0	Silty Clayey SAND (SC): fine to coarse grained sand, dark blue-grey, low plasticity fines, moist, medium dense, alluvium/possible colluvium		A	
559		CLAY (CI): medium plasticity, dark blue-grey, with silt, trace fine to coarse grained sand and sub-rounded gravel to 15mm in size, moist to wet, w>PL, firm to stiff, residual	▷		

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:** HQ from 5.25m

TYPE OF BORING: 110mm diameter solid flight auger to 5.25m, then NMLC coring to 7.0m

WATER OBSERVATIONS: Groundwater observed at 4.8m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

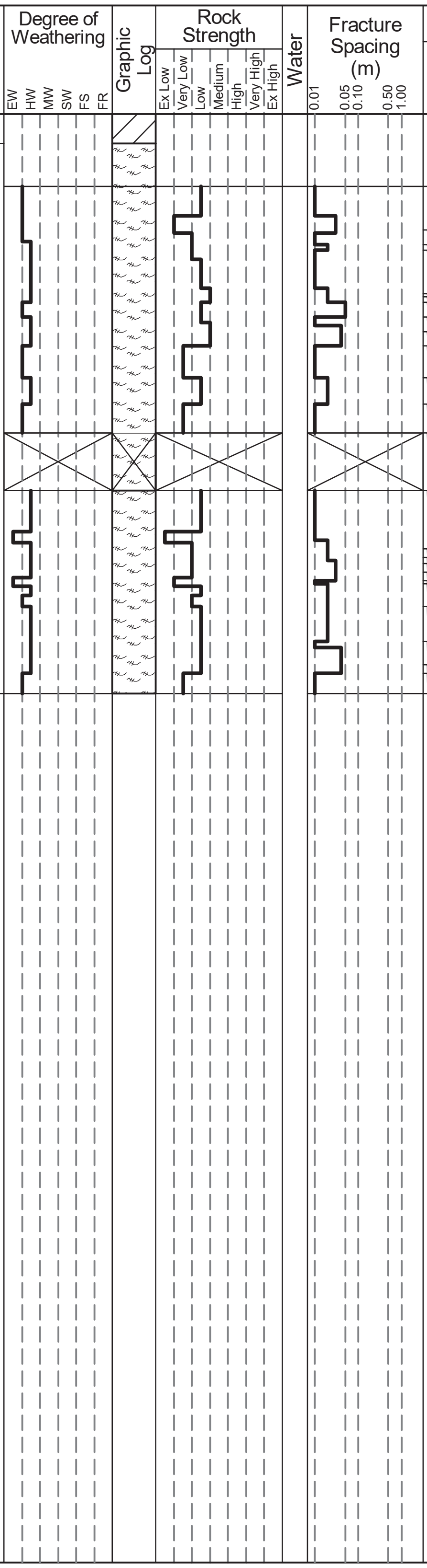
BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 563.4 AHD
EASTING: 200949
NORTHING: 610552.2
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 201883.00
DATE: 7 - 8/4/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing Type	Core Rec. %	RQD %	Test Results & Comments
	5.1	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale orange, grey-brown, dry to moist, very low to low strength, highly weathered, highly fractured -from 5.25m, grey-brown, low strength, high weathered, highly fractured		S			24,40/100 refusal bouncing
558			5.25m: fg 100mm 5.35m: - 5.40m: J, 15°, sm, pl, cly inf, 30mm spacing 5.4m: fg 30mm 5.45m: fg 120mm 5.47m: J, 50°, pl, sm, cly inf 5.62m: J, 75°, pl, sm, he 5.63m: J, 5°, pl, sm, he 5.65m: J, 5°, cu, ro, cly inf 5.7m: fg 20mm 5.75m: J, 2°, pl, sm, fe stn 5.8m: J, 2°, pl, sm, fe stn 5.80m: fg 100mm 5.91m: -6.0: J, 20°, pl, ro, he, 15-20mm spacing 6m: J, 4°, pl, ro 6.00m: fg 100m 6.1m: CORE LOSS: 200mm 6.3m: fg 170mm 6.5m: J, 5°, pl, ro, cly inf, 20mm 6.53m: J, 30°, pl ,ro 6.55m: J, 30°, pl, ro 6.58m: J, 50°, pl, ro, he 6.61m: -6.62m; he 6.62m: -6.82m: J, 20-30°, pl, ro, he, 20-40mm spacing 6.7m: -6.76m: J, 55°, pl, sm, 30mm spacing 6.82m: fg 20mm 6.9m: J, 65°, cu, ro, he 6.93m: fg 70mm	C	100	0	
				C	100	0	PL(D) = 0.42 Failed along pre-exisiting joint
	6						
557	6.3			C	77	0	
	7 7.0	Bore discontinued at 7.0m -limit of investigation					
556							
	8						
555							
	9						
554							



RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:** HQ from 5.25m
TYPE OF BORING: 110mm diameter solid flight auger to 5.25m, then NMLC coring to 7.0m
WATER OBSERVATIONS: Groundwater observed at 4.8m
REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 564.9 AHD
EASTING: 200962.6
NORTHING: 610458.4
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 201883.00
DATE: 5-4-2021
SHEET 1 OF 3

Discontinuities: B - Bedding J - Joint S - Shear F - Fault

RL	Depth (m)	Description of Strata	Water	Sampling & In Situ Testing: Type	Test Results & Comments
	0.2	TOPSOIL FILL/Sandy SILT (ML): low plasticity, brown, fine to medium grained sand, with rootlets, moist to dry, w<PL, inferred firm to stiff, poorly compacted, FILL			
		FILL/CLAY (CI/CH): medium to high plasticity, brown, mottled pale brown, trace silt, fine to coarse grained sand and gravel to 10mm in size, wet, w>PL, firm, FILL		S	3,3,4 N = 7
564	1			A	
	1.7	Silty CLAY (CI/CH): medium to high plasticity, blue-grey, with fine to coarse grained sand, trace sub-rounded gravel, to 10mm in size, wet, w>>PL, soft, alluvium			
563	2			S	0,0,2 N = 2
		-from 2.8m, dark grey		A	
562	3				
	3.1	CLAY (CI/CH): medium to high plasticity, dark grey, with silt, moist, w~PL, stiff, alluvium		S	3,4,7 N = 11 bouncing
561	4				
	4.2	CLAY (CI/CH): medium to high plasticity, pale brown, mottled grey, with silt, trace fine to coarse grained sand, moist to dry, w~PL, very stiff, residual	▷	A	
560	4.9				

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**
TYPE OF BORING: 110mm diameter solid flight auger to 5.5m, then NMLC coring to 7.75m
WATER OBSERVATIONS: Groundwater observed at 4.5m
REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

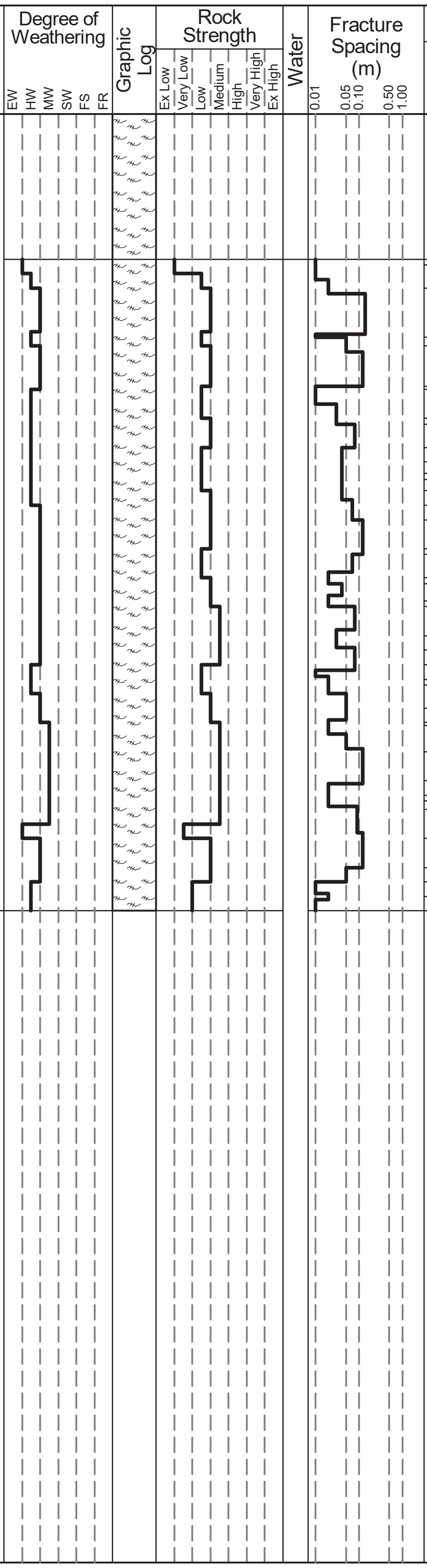
Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 564.9 AHD
EASTING: 200962.6
NORTHING: 610458.4
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 201883.00
DATE: 5-4-2021
SHEET 2 OF 3



RL	Depth (m)	Description of Strata	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, low strength, highly weathered, highly fractured *(continued)*		S			25/40 refusal
559 558	6 7	-from 5.5m, brown-grey, brown, dry to moist, low to medium strength, highly to moderately weathered, fragmented to highly fractured	5.5m: fg 5.52m: J, 5°, pl, sm 5.6m: J, 40°, pl, sm, he 5.75m: J, 25°, pl, fe stn 5.77m: J, 65°, pl, ro, fe stn 5.8m: J, 30°, cu, ro, fe stn 5.94m: J, 15°, ir, ro, fe stn 5.95m: fg, 50mm 6.05m: J, 80°, pl, sm, fe stn 6.07m: J, 15°, ir, ro, stn 6.15m: J, 45°, pl, ro, fe stn 6.2m: J, 80°, un, ro, fe stn 6.24m: J, 45°, pl, ro, 6.26m: J, 50°, pl, ro, fe stn 6.3m: J, 50°, pl, ro 6.35m: J, 20°, un, cu, ro, fe stn 6.4m: J, 5°, pl, ro, fe stn 6.5m: -6.55m, J, 5°-10°, pl, sm, fe stn, 10mm spacing 6.52m: J, 65°, pl, sm, fe stn 6.6m: J, 10°, pl, ro, fe stn 6.62m: J, 10°, pl, sm, fe stn 6.68m: J, 30°, un, ro, fe stn 6.7m: J, 25°, un, ro, fe stn 6.8m: J, 30°, pl, ro, fe stn 6.85m: J, 90°, cu, sm, fe stn 6.9m: fg 6.95m: J, 20°, cu, ro, fe stn 6.97m: J, 70°, pl, ro, fe stn 7.05m: J, 88°, pl, sm, fe stn 7.1m: J, 25°, un, ro, cly inf 7.11m: J, 50°, pl, sm, fe stn, cly inf 7.2m: J, 25°, un, sm, cly inf 7.3m: J, 35°, pl, ro, cly inf 7.35m: J, 60°, pl, sm, fe stn 7.37m: J, 5°, pl, ro, fe stn 7.4m: J, 75°, st, ro, fe stn 7.5m: J, 20°, un, ro, cly inf, he 7.6m: J, 20°, cu, he	C C	100 100	28	PL(D) = 0.1 Failed along pre-exisiting joint PL(D) = 0.15 Failed along pre-exisiting joint PL(D) = 0.36
557 556 555	7.75 8 9	Bore discontinued at 7.75m -limit of investigation					

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger to 5.5m, then NMLC coring to 7.75m

WATER OBSERVATIONS: Groundwater observed at 4.5m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 564.9 AHD
EASTING: 200962.6
NORTHING: 610458.4
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 201883.00
DATE: 5-4-2021
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low, Very Low, Low, Medium, High, Very High, Ex High	Water	Fracture Spacing (m) 0.01 0.05 0.10 0.50 1.00	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
								7.65m: -7.69m, fg 7.7m: 7.75m, fg 7.75m: J, 60°, pl, ro, cly inf				
554	11											
553	12											
552	13											
551	14											
550												

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger to 5.5m, then NMLC coring to 7.75m

WATER OBSERVATIONS: Groundwater observed at 4.5m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 565.7 AHD
EASTING: 201002.7
NORTHING: 610392.3
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 201883.00
DATE: 7-4-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		TOPSOIL FILL/Sandy SILT (ML): low plasticity, brown, fine to medium grained sand, with rootlets, moist to dry, inferred firm to stiff, w<PL, pooly graded, FILL							
	0.2	FILL/CLAY (CI/CH): medium to high plasticity, brown, mottled yellow, trace silt, fine to coarse grained sand and gravel to 10mm in size, moist to dry, w<PL, very stiff, FILL		A	0.3				
				S	0.5		4,15,16 N = 31		
565									
	0.9	FILL/Sandy GRAVEL (GP): gravel to 40mm in size, brown-grey, fine to coarse grained sand, moist to dry, dense, FILL			0.95				
	1								1
	1.1	FILL/CLAY (CI): medium plasticity, dark grey-brown, mottled pale brown, with silt, trace fine to coarse grained sand, and gravel to 10mm in size, moist, w>PL, stiff, FILL		A	1.4				
	1.6	Silty CLAY (CI/CH): medium to high plasticity, dark blue-grey, moist, w>PL, stiff, alluvium							
564				A	1.8				
	2			S	2.0		2,5,4 N = 9		2
					2.45				
563									
	3			A	3.0			▷	3
				A	3.3				
				S	3.5		2,4,5 N = 9		
562									
					3.95				
	4								4
561	4.7	CLAY (CI): medium plasticity, pale yellow-grey brown, with fine to coarse grained sand, trace silt, moist to wet, w>PL, stiff, residual							

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger

WATER OBSERVATIONS: Groundwater observed at 3.0m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 565.7 AHD
EASTING: 201002.7
NORTHING: 610392.3
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 201883.00
DATE: 7-4-2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	5.1			S	5.0 5.18		19,25/30 refusal		
		TUFFACEOUS SANDSTONE: fine to coarse grained, grey-brown, dry to moist, low to medium strength, highly to moderately weathered, highly fractured to fractured							
	5.3	Bore discontinued at 5.3m -refusal							
560									
	6								6
559									
	7								7
558									
	8								8
557									
	9								9
556									

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger

WATER OBSERVATIONS: Groundwater observed at 3.0m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

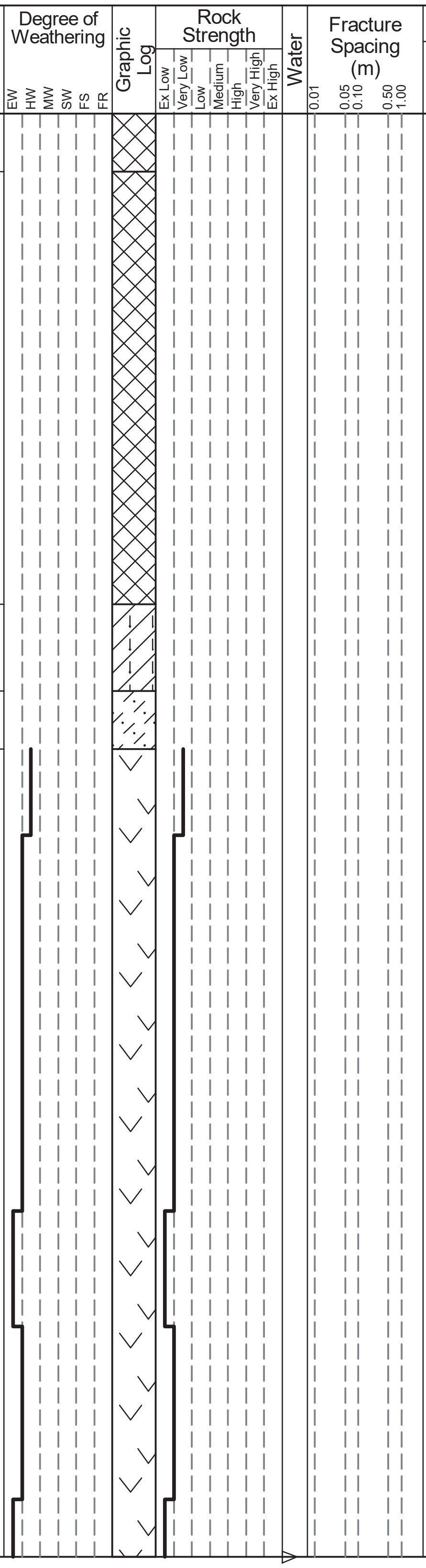
Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 568.2 AHD
EASTING: 200972.5
NORTHING: 610345.4
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 201883.00
DATE: 8 - 9/4/2021
SHEET 1 OF 2



Discontinuities: B - Bedding, J - Joint, S - Shear, F - Fault

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		TOPSOIL FILL/Sandy SILT (ML): low plasticity, pale brown, fine to medium grained sand with rootlets, moist to dry, w<PL, firm to stiff, poorly compacted, FILL				
568	0.2	FILL/CLAY (CI/CH): medium to high plasticity, pale brown, brown, with silt, trace fine to coarse grained sand, wet, w>PL, firm, FILL	S			2,3,3 N = 6
567	1		A			
	1.7	Silty CLAY (CI/CH): medium to high plasticity, pale brown-yellow, trace fine to medium grained sand, dry to moist, w<PL, hard, residual				
	2 2.0	Clayey SAND (SC): fine to medium grained sand, pale brown, low plasticity, dry to moist, very dense, residual / extremely weathered sandstone	S			9,30/90 refusal
566	2.2	TUFFACEOUS SANDSTONE: fine to coarse grained, pale brown, dry to moist, very low strength, highly weathered, highly fractured -from 2.5m, extremely low to very low strength, extremely to highly weathered, with extremely low strength, extremely weathered seams, which drilled as sandy clay (CI), brown, mottled grey, moist to wet, w>PL, stiff	A			
565	3		S			16,25/50 refusal
564	4		A			
	5.0					

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger to 6.3m, then NMLC coring to 7.85m

WATER OBSERVATIONS: Groundwater observed at 5.0m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

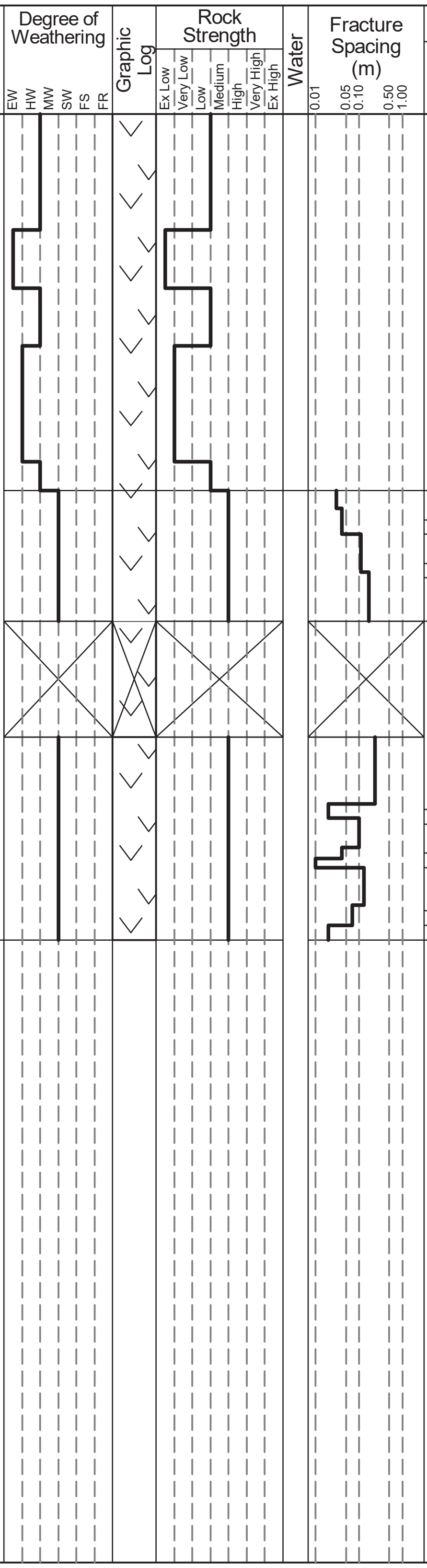
Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 568.2 AHD
EASTING: 200972.5
NORTHING: 610345.4
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 201883.00
DATE: 8 - 9/4/2021
SHEET 2 OF 2



RL	Depth (m)	Description of Strata	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
563		TUFFACEOUS SANDSTONE: fine to coarse grained, pale brown, dry to moist, extremely low to very low strength, extremely to highly weathered, with low to medium strength, highly to moderately weathered seams between a thickness of 100mm - 400mm at depths of 5.0m, 5.6m and 6.2m.		S			30/90 refusal
562	6			A			
		- from 6.3m, brown, mottled grey, moist, medium to high strength, moderately to slightly weathered, fractured	6.35m: J, 45°, sub-pl, sm, stn, fg 6.4m: J, sv, ro, stn 6.45m: J, sh, ro, stn 6.55m: J, ir, ro, stn 6.6m: J, sh, ro, stn 6.75m: J, sh, cly inf, stn CORE LOSS: 400mm				PL(D) = 0.31 Failed along pre-exisiting joint
561	7 7.15		7.15m: J, sh, cly inf, stn	C	74	48	PL(D) = 0.09 Failed along pre-exisiting joint PL(D) = 0.24 Failed along pre-exisiting joint
			7.35m: J, ir, ro, stn 7.4m: J, 80°, sub- pl, ro, stn 7.45m: J, 10°, sub-pl, ro, stn, cly inf 7.55m: J, ir, ro, clt inf 7.6m: J, Cs 20mm 7.75m: J, ir, ro, stn 7.8m: J, 20°, sub-pl, ro, stn 7.8m-7.85m, fg, Cz				PL(D) = 0.15 Failed along pre-exisiting joint
560	7.85 8	Bore discontinued at 7.85m -limit of investigation					
559	9						

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**

TYPE OF BORING: 110mm diameter solid flight auger to 6.3m, then NMLC coring to 7.85m

WATER OBSERVATIONS: Groundwater observed at 5.0m

REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Environment Planning and Sustainable Development Directorate
PROJECT: Proposed Redevelopment
LOCATION: Part Section 51, Holt

SURFACE LEVEL: 565.8 AHD
EASTING: 200929.2
NORTHING: 610424.9
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 201883.00
DATE: 7-4-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Sampling & In Situ Testing: Depth	Sampling & In Situ Testing: Sample	Sampling & In Situ Testing: Results & Comments	Water	Well Construction Details
		TOPSOIL FILL/Sandy SILT (ML): low plasticity, pale brown, fine to medium grained sand with rootlets, moist to dry, w<PL, firm to stiff, poorly graded, FILL	▩						
565	0.2	FILL/Sandy CLAY (CI/CH): medium to high plasticity, brown, mottled orange, fine to coarse grained sand, trace silt and gravel to 10mm in size, moist to dry, w<PL, very stiff, FILL	▩	S	0.5 0.95		5,8,9 N = 17		
	1 1.0	FILL/Silty CLAY (CI): medium plasticity, pale brown, trace fine to coarse grained sand, moist to dry, w<PL, very stiff, FILL	▩	A	1.2				1
564	1.4	CLAY (CL): low plasticity, brown, with silt, trace fine to coarse grained sand, moist to dry, w<PL, very stiff, alluvium	▨	A S	1.8 2.0		8,12,15 N = 27		2
563	2.3	CLAY (CI): medium plasticity, yellow-brown, with fine to coarse grained sand, trace silt and gravel to 15mm in size, moist to dry, w<PL, very stiff, residual	▨	A	2.45 2.9				3
562	3.3	TUFFACEOUS SANDSTONE: fine to coarse grained, pale brown, dry to moist, very low to low strength, highly weathered, highly fractured -from 3.6m, low strength -from 3.8m, low to medium strength	░	S A	3.5 3.76 3.8		12,40/110 refusal		
561	4 3.9	Bore discontinued at 3.9m -refusal							4

RIG: EVH2100 trailer mounted rig **DRILLER:** Sea to Summit **LOGGED:** ADFH **CASING:**
TYPE OF BORING: 110mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location coordinates are in ACT Stromlo grid Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BH 5: 5.25 m to 7.0 m

BH 6: 5.5 m to 7.75 m

BH 8: 6.3 m to 7.85 m

Douglas Partners Geotechnics / Environment / Groundwater	**Core Photos : BH 5 , 6 and 8**	Project No:	201883.00
	Proposed Redevelopment **Part Section 51, Holt**	Plate No:	1 of 1
	Client: Environment Planning and Sustainable Development Directorate	Date:	7 April 2021

Appendix D

Results of Laboratory Testing

Material Test Report

Douglas Partners Pty Ltd
Goulburn Laboratory
54 Sinclair Street Goulburn NSW 2580
Phone: 02 4822 8395
Email: brachlan.harris@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **201883.00-1**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Location data supplied by client.*
Date Issued: 29/04/2021
Client: Environment Planning and Sustainable Development Directorate
Level 2, South Building, Dickson ACT 2602
Contact: Graham Mundy
Project Number: 201883.00
Project Name: Proposed Redevelopment
Project Location: Part Section 51, Holt
Work Request: 5814
Sample Number: GU-5814A
Date Sampled: 07/04/2021
Dates Tested: 15/04/2021 - 19/04/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **Bore 7 , Depth: 3.5 - 3.95**
Material: Silty Clay

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	73		
Plastic Limit (%)	20		
Plasticity Index (%)	**53**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	18.0		
Cracking Crumbling Curling	Cracking		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	30.2

Material Test Report

Douglas Partners Pty Ltd
Goulburn Laboratory
54 Sinclair Street Goulburn NSW 2580
Phone: 02 4822 8395
Email: brachlan.harris@douglaspartners.com.au

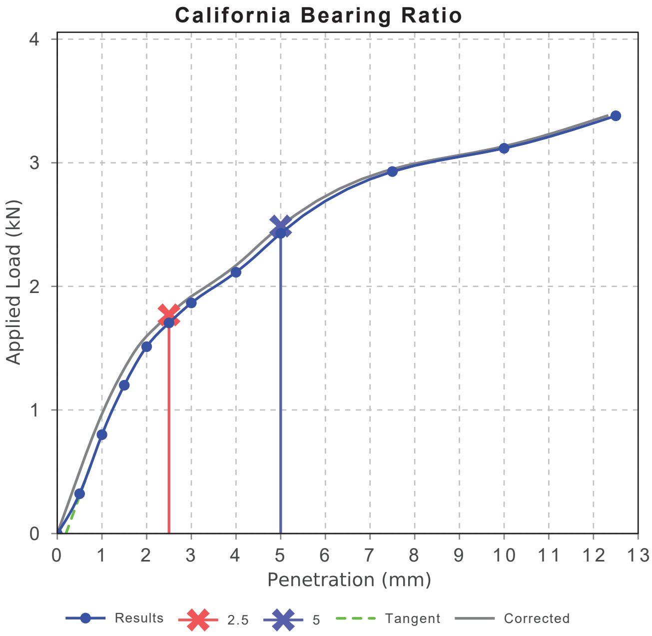
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **201883.00-1**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Location data supplied by client.*
Date Issued: 29/04/2021
Client: Environment Planning and Sustainable Development Directorate
Level 2, South Building, Dickson ACT 2602
Contact: Graham Mundy
Project Number: 201883.00
Project Name: Proposed Redevelopment
Project Location: Part Section 51, Holt
Work Request: 5814
Sample Number: GU-5814B
Date Sampled: 07/04/2021
Dates Tested: 15/04/2021 - 23/04/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **Bore 2 , Depth: 0.5 - 0.7**
Material: Fill/Clay

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**13**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.93		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	98.0		
Laboratory Moisture Ratio (%)	101.5		
Dry Density after Soaking (t/m^3)	1.88		
Field Moisture Content (%)	11.7		
Moisture Content at Placement (%)	12.8		
Moisture Content Top 30mm (%)	15.4		
Moisture Content Rest of Sample (%)	14.3		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	44.4		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.8		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	11.8



Appendix M

dsb Landscape Architects,
Vegetation Assessment Report

Company	JPS Engineering Consultants	**Date**	13 April 2021
Attention	John Samoty	**This Page +**	24
From	dsb Landscape Architects	**Project No.**	4138
Project	Territory Plan Variation Section 51 HOLT (Kippax Shops)		
Subject	Vegetation Assessment Report		

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1. OVERVIEW

Introduction

The aim of this report is to provide detailed information on the location and status of trees within the site referred to as Section 51 Holt. The information will aid in the development of the site by identifying and assessing trees that are Protected and covered by the Tree Protection Act 2005. This report has been prepared in accordance with the mandatory requirements of the ACTs Tree Protection (Guidelines for Tree Management Plans) Determination 2010.

2. MANAGEMENT STATUS INVENTORY

The following represents details recorded for the trees on the site. The information recorded is intended for use in the assessment and management of trees at the nominated location. Refer to Vegetation Assessment drawing 4138-G101 to 4138-G103.

1. Number

Reference number. Each tree/group of trees is numbered to link Plan and Report information and allow for easy identification in the field.

2. Botanical Name/Species

The botanical Name/Species is provided for each tree in the table below:

3. Management Status

E Excellent –A tree or group of trees that:

- has natural of cultural heritage importance; or
- has high and aesthetic value and will contribute significantly to the surrounding landscape; or
- is of outstanding form and condition and is an excellent example of the species; or
- has significant scientific value, including ecological importance.

H High - A tree that:

- is of good form, structure and health;
- is without significant defect; and
- presents a low hazard/safety risk.

M Medium - A tree that:

- is of reasonable form, structure and health; and
- presents a medium to low hazard/safety risk.

P Poor - A tree that;

- is of poor form, structure or health is in decline; or
- presents a high or very high hazard/safety risk.

4. Height

Approximate in metres

5. **Trunk Circumference**

   1 metre above ground level, approximate in millimetres.

6. **Number of Trunks**

   Number of trunks larger than 150mm diameter measured at 1.0 metre above ground level

7. **Canopy Diameter**

   Shown in metres and is the maximum canopy width of the tree. The tree canopy radius, plus 2 metres defines the Tree Protection Zone. Tree Protection ACT 2005 regulates activities within the Tree Protection Zone that have the potential to harm the tree (Prohibited Ground works). Prohibited Ground works includes any ground work under the canopy of the tree that is likely to harm the tree including building, trenching, changing soil levels, compacting or contaminating the soil

8. **Health**

   Assessment based on crown and trunk appearance.

E – Excellent	F - Fair
G – Good	P – Poor

9. **Expected Longevity**

   S - Short (less than 10 years)

   M - Medium (10 - 25 years)

   L - Long (greater than 25 years)

10. **Tree Surgery**

    Recommended short term management action that would be appropriate in the event of changed conditions. Such action may include:

LP	Remove dead wood and light prune to improve form if necessary.
HP	General tree surgery and pruning to remove dead and/or diseased wood, to shape, balance or reduce the crown, to eliminate low growing limbs or other inferior or damaged growth, for management of top heavy or lopsided canopy or corrective work following physical damage or vandalism.
FP	Formative pruning.

    All pruning to be in accordance with AS 4373 – ‘Pruning of Amenity Trees’.

11. **Regulated Tree / Tree Damaging Activity (TDA) Approval:**

Under the Tree Protection Act 2005, all trees on leased Territory land are ‘Protected’ trees until specific Tree Management Precincts are established. Trees that meet any of the following criteria are ‘Regulated’ trees:

a) a height of 12 metres or more, or

b) a trunk circumference of 1.5 metres (approximately 0.5 metres in diameter) or more at 1 metre above ground level, or

c) two or more trunks and the total circumference of all the trunks, 1 metre above ground level, is 1.5 metres or more, or

d) a minimum crown width of 12 metres or more.

Trees meeting any of these criteria are indicated.

Y – Regulated tree - meets at least one of the criteria.

N – Does not meet any of the criteria for a ‘Regulated’ tree.

The approval of the Conservator is required to remove a Regulated tree.

The approval of the Conservator is required to undertake ground works within the Tree Protection Zone. Approval is sought by the submission of an Application to Undertake a Tree Damaging Activity. Contact the Environment ACT Helpline on 6207 9777 for an application form for Approval to Undertake a Tree Damaging Activity. Forms are also available from the Environment ACT Internet site.

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
75	Eucalyptus bicostata	M	18.00	1.89	Multi	10.00	G	L	LP	Y	
76	Styphnolobium japonica	M	12.00	1.26	1	12.00	G	L	LP	Y	Typical dead wood in crown. Growing in large raised planter box.
78	Eucalyptus mannifera	M	14.00	1.89	1	12.00	G	L	LP	Y	
79	Koelreuteria paniculata	P	8.00	0.63	Multi	6.00	G	L	LP	N	
80	Celtis australis	P	8.00	0.63	1	5.00	G	L	LP	N	Weed Species
81	Eucalyptus mannifera	M	15.00	1.57	1	9.00	G	L	LP	Y	
82	Casuarina cunninghamiana	H	18.00	1.89	1	12.00	G	L	LP	Y	
83	Eucalyptus mannifera	P	17.00	1.57	1	8.00	F	L	LP	Y	Decay and bracket fungi in acute V crotch
84	Casuarina cunninghamiana	P	14.00	0.94	1	8.00	F	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
85	Casuarina cunninghamiana	M	16.00	1.57	1	12.00	G	L	LP	Y	
86	Eucalyptus mannifera	M	15.00	1.89	1	10.00	G	L	LP	Y	
87	Eucalyptus bicostata	M	15.00	2.20	Multi	10.00	G	L	LP	Y	
88	Eucalyptus mannifera	M	16.00	1.57	1	8.00	G	L	LP	Y	
89	Eucalyptus mannifera	P	10.00	0.94	1	8.00	F	L	LP	N	
90	Casuarina cunninghamiana	H	15.00	1.89	1	12.00	G	L	LP	Y	
91	Eucalyptus mannifera	M	18.00	2.20	1	15.00	G	L	LP	Y	
92	Eucalyptus mannifera	M	18.00	1.57	1	12.00	G	L	LP	Y	
93	Ulmus chinensis	H	8.00	0.94	1	6.00	G	L	LP	N	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
94	Eucalyptus mannifera	M	10.00	0.94	1	5.00	F	L	LP	N	
95	Casuarina cunninghamiana	H	20.00	2.20	1	12.00	G	L	LP	Y	
96	Casuarina cunninghamiana	M	15.00	1.89	1	12.00	G	L	LP	Y	
97	Casuarina cunninghamiana	M	16.00	1.57	1	12.00	G	L	LP	Y	
98	Ulmus chinensis	H	12.00	1.26	1	10.00	G	L	LP	Y	
99	Casuarina cunninghamiana	H	20.00	1.57	1	10.00	G	L	LP	Y	
100	Casuarina cunninghamiana	H	20.00	1.89	1	10.00	G	L	LP	Y	
101	Eucalyptus mannifera	P	18.00	2.51	1	10.00	F	S	LP	Y	Decay and active bracket fungi in acute V crotch at 2m.
102	Eucalyptus mannifera	M	12.00	0.94	1	6.00	G	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
103	Dead		10.00	1.26	1	8.00					
104	Eucalyptus mannifera	P	15.00	2.20	1	12.00	P	L	LP	Y	Advanced decay in lower trunk
105	Eucalyptus mannifera	M	14.00	1.57	Multi	12.00	G	L	LP	Y	
106	Fraxinus Raywoodii	P	10.00	1.26	1	8.00	F	M	LP	N	
107	Acacia baileyana	P	6.00	0.63	1	6.00	P	S	~	N	
108	Casuarina cunninghamiana	M	9.00	1.57	1	10.00	F	L	LP	Y	
109	Styphnolobium japonica	P	8.00	0.94	1	7.00	F	L	LP	N	Typical dead wood in crown
110	Eucalyptus mannifera	M	18.00	2.20	1	16.00	G	L	LP	Y	
111	Styphnolobium japonica	M	11.00	1.57	1	12.00	G	L	LP	Y	Typical dead wood in crown

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
112	Eucalyptus mannifera	M	20.00	1.26	1	8.00	G	L	LP	Y	
113	Eucalyptus mannifera	M	20.00	1.26	1	10.00	G	L	LP	Y	
114	Eucalyptus nicholii	M	20.00	3.77	1	14.00	F	M	LP	Y	
115	Eucalyptus nicholii	M	14.00	1.26	1	6.00	G	L	LP	Y	
116	Eucalyptus nicholii	M	16.00	2.20	Multi	12.00	G	L	LP	Y	
117	Eucalyptus nicholii	M	15.00	1.89	1	10.00	F	M	LP	Y	
118	Eucalyptus mannifera	P	20.00	2.83	1	14.00	F	L	LP	Y	
119	Eucalyptus sp	M	10.00	2.51	1	7.00	G	L	LP	Y	
120	Styphnolobium japonica	M	10.00	1.57	1	10.00	F	L	LP	Y	Typical dead wood in crown

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
121	Styphnolobium japonica	H	12.00	1.89	1	14.00	G	L	LP	Y	Typical dead wood in crown
122	Dead		7.00	1.26	1	6.00					
123	Eucalyptus sp	M	15.00	1.57	1	12.00	G	L	LP	Y	
124	Styphnolobium japonica	M	10.00	1.57	1	10.00	G	L	LP	Y	Typical dead wood in crown
125	Acacia dealbata	P	6.00	0.63	Multi	6.00	F	S	~	N	
126	Acacia dealbata	P	10.00	1.26	Multi	10.00	F	S	~	N	
127	Styphnolobium japonica	M	10.00	1.26	1	10.00	G	L	LP	N	Typical dead wood in crown
128	Callistemon sp	P	9.00	1.26	Multi	8.00	P	M	~	N	Shrub
129	Prunus sp	M	4.00	0.94	1	4.00	G	L	~	N	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
130	Hakea eriantha	M	5.00	0.94	Multi	5.00	G	M	~	N	Shrub
131	Styphnolobium japonica	P	10.00	1.26	1	8.00	P	M	LP	N	Typical dead wood in crown
132	Populus alba	P	12.00	1.57	1	12.00	G	L	LP	N	45degree trunk lean from ground level. Weed Species
133	Styphnolobium japonica	M	9.00	1.26	1	8.00	G	L	LP	N	Typical dead wood in crown
134	Populus alba	P	10.00	1.26	1	12.00	G	L	LP	N	45degree trunk lean from ground level. Weed Species
135	Populus alba	P	10.00	0.94	1	12.00	G	L	LP	N	45degree trunk lean from ground level. Weed Species
136	Populus alba	P	10.00	1.26	1	15.00	G	L	LP	N	60degree trunk lean from ground level. Weed Species
137	Styphnolobium japonica	P	10.00	1.57	1	10.00	P	L	LP	Y	Typical dead wood in crown. Extensive decay in trunk
138	Populus alba	P	15.00	1.26	1	12.00	G	L	LP	N	Weed Species

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
139	Populus alba	M	12.00	1.89	1	12.00	G	L	LP	N	Weed Species
140	Eucalyptus mannifera	H	20.00	3.14	Multi	15.00	G	L	LP	Y	
141	Populus alba	M	10.00	1.26	1	8.00	G	L	LP	N	Weed Species
142	Eucalyptus mannifera	P	14.00	1.26	1	8.00	P	M	LP	Y	Extensive decay in trunk
143	Populus alba	M	9.00	1.26	1	10.00	G	L	LP	N	Weed Species
144	Dead		10.00	0.63	1	4.00					
145	Eucalyptus mannifera	H	15.00	1.89	1	12.00	G	L	LP	Y	
146	Populus alba	P	10.00	1.57	1	10.00	G	L	LP	N	Weed Species
147	Populus alba	P	10.00	1.26	1	10.00	G	L	LP	N	Weed Species

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
148	Eucalyptus nicholii	P	10.00	1.89	1	12.00	P	M	LP	Y	
149	Eucalyptus mannifera	M	15.00	2.83	Multi	16.00	F	L	LP	Y	
150	Eucalyptus mannifera	P	6.00	0.94	1	6.00	F	L	LP	N	
151	Populus alba	P	10.00	1.26	1	10.00	G	L	LP	N	Weed Species
152	Eucalyptus nicholii	P	8.00	2.20	Multi	10.00	F	L	LP	Y	
153	Styphnolobium japonica	M	10.00	1.26	1	10.00	G	L	LP	N	Typical dead wood in crown
154	Populus alba	P	12.00	1.89	1	12.00	G	L	LP	N	Weed Species
155	Populus alba	P	10.00	1.57	1	10.00	G	L	LP	N	Weed Species
156	Eucalyptus mannifera	H	20.00	2.51	1	15.00	G	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
157	Eucalyptus mannifera	P	15.00	1.57	1	10.00	F	L	LP	Y	
158	Eucalyptus mannifera	P	8.00	1.26	Multi	6.00	F	L	LP	N	
159	Populus alba	P	10.00	1.26	1	10.00	G	L	LP	N	Weed Species
160	Populus alba	M	10.00	1.26	1	10.00	G	L	LP	N	Weed Species
161	Eucalyptus mannifera	H	18.00	1.89	1	14.00	G	L	LP	Y	
162	Eucalyptus nicholii	P	20.00	2.51	Multi	18.00	G	L	LP	Y	
163	Eucalyptus nicholii	P	10.00	1.57	1	10.00	P	M	~	Y	
164	Populus alba	P	10.00	0.94	1	7.00	F	M	LP	N	Weed Species
165	Eucalyptus mannifera	P	20.00	3.14	Multi	15.00	F	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
166	Eucalyptus nicholii	P	20.00	2.20	1	14.00	P	L	LP	Y	
167	Populus alba	M	10.00	1.26	1	10.00	G	L	LP	N	Weed Species
168	Eucalyptus mannifera	M	16.00	1.57	1	12.00	G	L	LP	Y	
169	Eucalyptus nicholii	P	20.00	2.51	1	14.00	G	L	LP	Y	
170	Populus alba	M	10.00	1.26	1	6.00	G	L	LP	N	Weed Species
171	Populus alba	M	10.00	1.26	1	8.00	F	L	LP	N	Weed Species
172	Populus alba	M	12.00	1.57	1	12.00	G	L	LP	N	Weed Species
173	Eucalyptus nicholii	P	12.00	1.57	Multi	10.00	F	M	LP	Y	
174	Populus alba	M	10.00	1.57	1	10.00	G	L	LP	Y	Large exposed girdling root at ground level. Weed Species

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
175	Populus alba	M	14.00	1.89	1	16.00	G	L	LP	N	Weed Species
176	Eucalyptus sideroxylon	M	17.00	2.20	1	16.00	G	L	LP	Y	
177	Eucalyptus sideroxylon	M	18.00	1.89	1	16.00	G	L	LP	Y	
178	Eucalyptus mannifera	M	5.00	0.63	1	4.00	F	M	LP	N	
179	Eucalyptus mannifera	M	16.00	2.51	1	14.00	G	L	LP	Y	
180	Eucalyptus mannifera	M	12.00	1.57	1	12.00	G	L	LP	Y	
181	Eucalyptus mannifera	M	16.00	0.94	1	8.00	G	L	LP	Y	
182	Eucalyptus sideroxylon	M	20.00	1.89	1	12.00	G	L	LP	Y	
183	Eucalyptus sideroxylon	M	18.00	1.89	1	15.00	G	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
184	Eucalyptus mannifera	M	16.00	2.83	1	12.00	G	L	LP	Y	Acute V crotch at 1m
185	Eucalyptus mannifera	M	17.00	1.57	1	10.00	F	L	LP	Y	
186	Eucalyptus mannifera	P	18.00	1.57	1	12.00	F	L	LP	Y	Acute V crotch at 3m
187	Eucalyptus polyanthemos	M	9.00	1.26	Multi	8.00	G	L	LP	N	
188	Eucalyptus polyanthemos	P	5.00	0.63	1	5.00	F	L	LP	N	
189	Eucalyptus polyanthemos	P	8.00	0.94	Multi	6.00	F	L	LP	N	
190	Eucalyptus mannifera	P	15.00	1.57	Multi	10.00	G	L	LP	Y	
191	Eucalyptus mannifera	P	5.00	0.63	1	4.00	F	M	~	N	
192	Eucalyptus nicholii	M	15.00	1.57	1	10.00	G	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
193	Eucalyptus mannifera	M	18.00	2.20	1	18.00	G	L	LP	Y	
194	Eucalyptus polyanthemos	M	15.00	1.26	1	8.00	G	L	LP	Y	
195	Eucalyptus mannifera	M	13.00	0.94	1	7.00	G	L	LP	Y	
196	Eucalyptus sideroxylon	M	18.00	1.89	1	15.00	G	L	LP	Y	
197	Eucalyptus polyanthemos	M	12.00	0.94	1	7.00	G	L	LP	Y	
198	Eucalyptus mannifera	M	14.00	0.94	1	6.00	G	L	LP	Y	
199	Eucalyptus polyanthemos	P	15.00	1.57	Multi	10.00	G	L	LP	Y	
200	Eucalyptus mannifera	M	15.00	0.94	1	6.00	G	L	LP	Y	
201	Eucalyptus polyanthemos	M	6.00	0.63	1	4.00	G	L	LP	N	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
202	Eucalyptus polyanthemos	M	11.00	0.94	1	7.00	G	L	LP	N	
203	Eucalyptus mannifera	M	14.00	0.94	1	6.00	G	L	LP	Y	
204	Eucalyptus mannifera	M	12.00	0.94	1	5.00	G	L	LP	Y	
205	Eucalyptus mannifera	M	12.00	1.26	1	8.00	G	L	LP	Y	
206	Eucalyptus polyanthemos	P	6.00	0.63	1	4.00	F	L	LP	N	
207	Dead		7.00	0.94	1	4.00					
208	Eucalyptus mannifera	M	11.00	0.94	Multi	5.00	G	L	LP	N	
209	Eucalyptus mannifera	P	17.00	2.51	Multi	16.00	P	L	LP	Y	
210	Eucalyptus mannifera	M	14.00	1.26	1	8.00	G	L	LP	Y	

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Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
211	Eucalyptus polyanthemos	M	8.00	1.26	Multi	8.00	G	L	LP	Y	
212	Eucalyptus mannifera	P	8.00	0.94	1	5.00	P	M	~	N	
213	Eucalyptus polyanthemos	M	8.00	0.63	1	5.00	G	L	LP	N	
214	Eucalyptus polyanthemos	H	10.00	0.94	1	6.00	G	L	LP	N	
215	Eucalyptus mannifera	P	5.00	0.63	1	5.00	P	M	LP	N	
216	Eucalyptus mannifera	M	10.00	0.94	1	7.00	F	L	LP	N	
217	Eucalyptus mannifera	M	11.00	0.94	1	6.00	G	L	LP	N	
218	Dead		12.00	0.94	1	6.00					
219	Eucalyptus mannifera	P	8.00	0.63	1	4.00	P	M	~	N	

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
220	Eucalyptus mannifera	M	8.00	1.26	1	6.00	G	L	LP	N	
221	Dead		10.00	0.94	1	5.00					
222	Eucalyptus polyanthemos	M	10.00	1.26	Multi	6.00	G	L	LP	N	
223	Eucalyptus sideroxylon	H	18.00	1.89	1	14.00	G	L	LP	Y	
224	Eucalyptus mannifera	P	8.00	0.94	Multi	4.00	P	M	~	N	
225	Dead		10.00	0.94	1	4.00					
226	Eucalyptus polyanthemos	P	7.00	0.94	1	5.00	F	L	LP	N	
227	Eucalyptus polyanthemos	M	12.00	1.26	Multi	6.00	G	L	LP	Y	
228	Casuarina cunninghamiana	M	7.00	0.94	1	6.00	G	L	LP	N	

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
229	Eucalyptus viminalis	P	10.00	1.89	Multi	12.00	P	M	LP	Y	
230	Casuarina cunninghamiana	M	12.00	0.94	1	4.00	G	L	LP	Y	
231	Dead		15.00	1.26	1	10.00					
232	Eucalyptus mannifera	M	16.00	1.26	1	7.00	G	L	LP	Y	
233	Eucalyptus mannifera	M	12.00	1.89	Multi	8.00	G	L	LP	Y	
234	Dead		12.00	1.57	1	10.00					
235	Dead		10.00	1.57	1	10.00					
236	Eucalyptus viminalis	M	15.00	1.89	1	15.00	G	L	LP	Y	
237	Eucalyptus viminalis	M	17.00	1.89	Multi	14.00	G	L	LP	Y	

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
238	Melaleuca armillaris	P	4.00	0.63	1	4.00	P	S	~	N	Shrub
239	Eucalyptus viminalis	M	16.00	0.94	1	7.00	G	L	LP	Y	
240	Eucalyptus mannifera	M	11.00	1.26	1	8.00	G	L	LP	N	
241	Eucalyptus viminalis	M	14.00	1.57	1	10.00	G	L	LP	Y	
242	Eucalyptus nicholii	H	16.00	1.89	1	14.00	G	L	LP	Y	
243	Eucalyptus mannifera	P	11.00	1.26	1	7.00	F	M	LP	N	
244	Eucalyptus mannifera	M	16.00	1.57	1	12.00	G	L	LP	Y	
245	Eucalyptus mannifera	H	12.00	1.26	1	12.00	G	L	LP	Y	Street tree
246	Eucalyptus mannifera	P	4.00	0.63	1	4.00	P	M	~	N	Deformed

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
247	Eucalyptus mannifera	M	20.00	2.51	Multi	16.00	G	L	LP	Y	
248	Eucalyptus mannifera	M	11.00	1.57	1	10.00	G	L	LP	N	
249	Eucalyptus mannifera	H	14.00	1.89	1	12.00	G	L	LP	Y	
250	Eucalyptus mannifera	P	5.00	0.63	1	4.00	F	L	LP	N	
251	Eucalyptus mannifera	H	9.00	0.94	1	5.00	G	L	LP	N	
252	Eucalyptus mannifera	P	12.00	0.31	Multi	12.00	P	L	~	Y	Regrowth from stump
253	Eucalyptus mannifera	P	17.00	1.26	Multi	14.00	P	L	LP	Y	
254	Eucalyptus mannifera	M	15.00	1.57	1	10.00	G	L	LP	Y	Street tree
255	Eucalyptus mannifera	M	8.00	1.26	1	6.00	G	L	LP	N	Street tree

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
256	Eucalyptus mannifera	M	14.00	2.51	Multi	12.00	G	L	LP	Y	Street tree
257	Eucalyptus mannifera	M	12.00	0.94	1	7.00	G	L	LP	Y	Street tree
258	Casuarina cunninghamiana	M	15.00	0.94	1	10.00	G	L	LP	Y	
259	Casuarina cunninghamiana	M	13.00	0.63	1	7.00	G	L	LP	Y	
260	Populus alba	M	13.00	1.26	1	10.00	G	L	LP	N	Weed Species
261	Casuarina cunninghamiana	M	11.00	0.63	1	7.00	G	L	LP	N	
262	Casuarina cunninghamiana	M	15.00	0.63	Multi	7.00	G	L	LP	Y	
263	Populus alba	P	10.00	0.94	1	7.00	G	L	LP	N	Weed Species
264	Casuarina cunninghamiana	M	16.00	0.94	1	7.00	G	L	LP	Y	

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
265	Casuarina cunninghamiana	M	15.00	0.63	1	6.00	G	L	LP	Y	
266	Casuarina cunninghamiana	M	17.00	1.26	1	11.00	G	L	LP	Y	
267	Casuarina cunninghamiana	M	17.00	1.26	1	12.00	G	L	LP	Y	
268	Eucalyptus mannifera	M	12.00	2.20	1	12.00	F	L	LP	Y	
269	Eucalyptus mannifera	P	18.00	2.51	Multi	12.00	F	L	LP	Y	
270	Populus alba	M	15.00	2.51	1	12.00	G	L	LP	N	Weed Species
271	Populus alba	M	13.00	1.26	1	7.00	G	L	LP	N	Weed Species
272	Eucalyptus mannifera	P	8.00	1.57	1	10.00	G	L	LP	Y	At 1.2m trunk leans at 45degrees
273	Eucalyptus mannifera	P	16.00	4.09	Multi	15.00	G	L	LP	Y	

VEGETATION ASSESSMENT
TERRITORY PLAN VARIATION
SECTION 51 HOLT - KIPPAX SHOPS

Tree No.	Species	M'ment Status	Height (m)	Trunk Circ (mm)	Number of Trunks	Canopy Dia (m)	Health	Expected Longevity	Tree Surgery	Regulated Tree	Notes
274	Populus alba	M	12.00	0.94	1	5.00	G	L	LP	N	Weed Species
275	Populus alba	P	15.00	1.89	1	10.00	G	L	LP	N	Weed Species
276	Populus alba	M	11.00	1.26	1	8.00	G	L	LP	N	Weed Species
277	Populus alba	P	12.00	1.89	1	10.00	G	L	LP	N	60degree trunk lean from ground level.Decay in trunk. Weed Species

3. NOTES / DISCLAIMER

LIMITATIONS ON THE USE OF THIS REPORT
This report is to be utilised in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

UNLESS STATED OTHERWISE
Information contained in this report covers only those trees that were examined and reflect the condition of those trees at the time of inspection on 2 AND 3 April 2021
The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future. The findings of this report may not necessarily agree with reports prepared by others, including the Government Conservator of Trees.

4. QUALIFICATIONS

This Vegetation Assessment Report has been prepared by

Paul Scholtens
FAIH, Registered Horticulturist No 77
Member, Arboriculture Australia

6. *QUALITY ASSURANCE*

Contact information:

DSB Partners Pty Ltd
Trading as dsb Landscape Architects
ABN 94 052 528 293

Directors: Adam Barker, David Pearce and Michael Reeves

Deakin Chambers
14 Hannah Place
Deakin ACT 2600

Phone: (02) 6285 1955

Email: dsb@dsbla.com.au

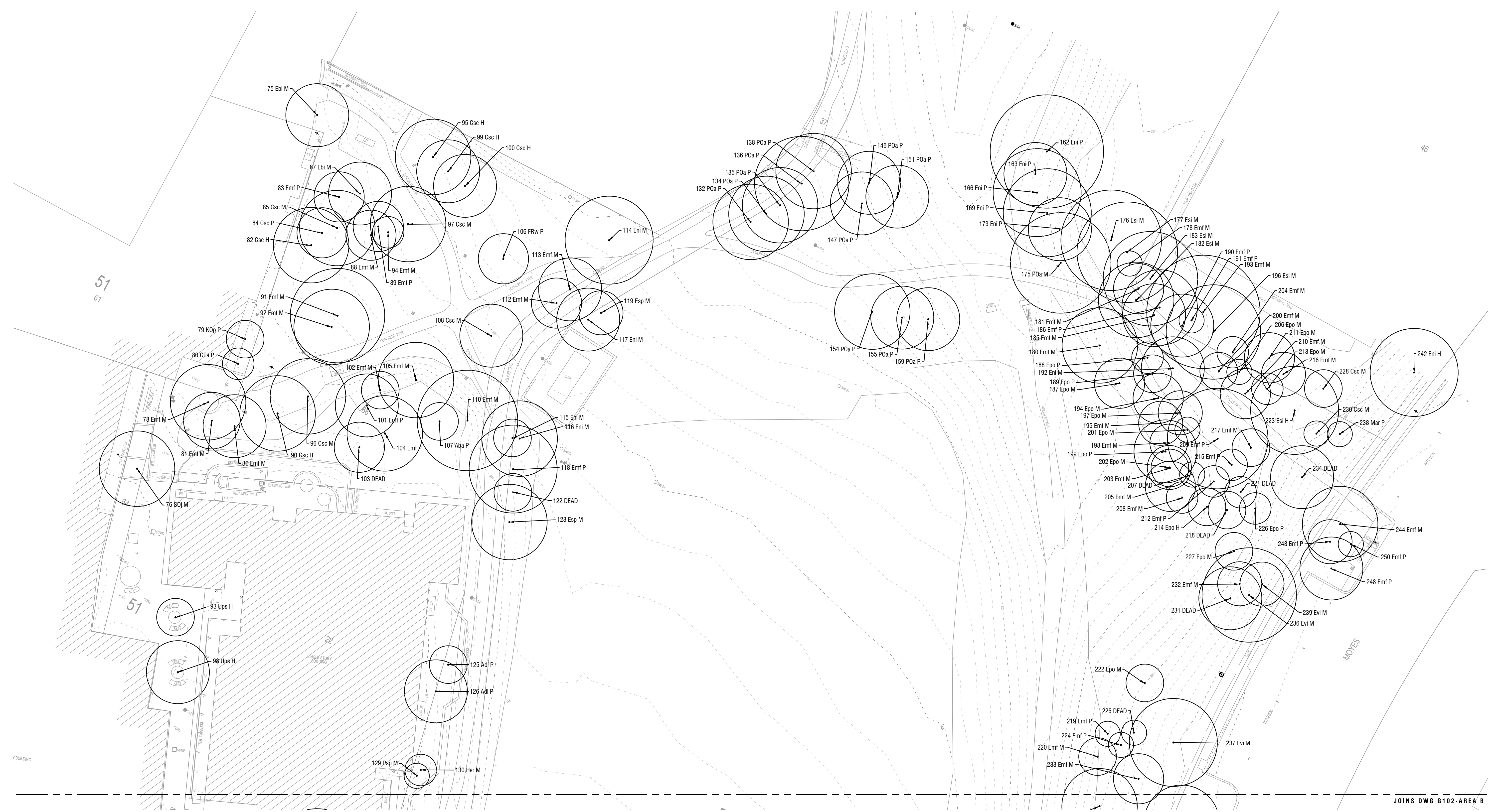
Web: www.dsbla.com.au

Quality assurance information

Report title:	Vegetation Assessment Section 51 Holt Kippax Shops
Job number:	4138
Date:	13 April 2021
Prepared by:	Michael Reeves
Reviewed by:	David Pearce

Issue history

Issue Number	Issue Date	Details	Authorised by
1	13 April 2021	Territory Plan Variation S51 Holt Vegetation Assessment Report	Dp



LEGEND & NOTES

SITE BOUNDARY
Refer Project Survey Drawing

256 EMf M

EXISTING TREE LOCATION
Tree Number, Species Code & Tree Management Status

KEY TO SPECIES

Ups	Ulmus chinensis	Csc	Casuarina cunninghamiana	Epo	Eucalyptus polyanthemos
Eni	Eucalyptus nicholii	Ebi	Eucalyptus bicostata	Mar	Melaleuca armillaris
CTa	Celtis australis	Aba	Acacia baileyana	Evi	Eucalyptus viminalis
Emf	Eucalyptus mannifera	Esp	Eucalyptus sp.	Csp	Callistemon sp.
SOj	Styphnolobium japonica	Adl	Acacia dealbata		
KOp	Koelreuteria paniculata	Her	Hakea eriantha		
Psp	Prunus sp.	Esi	Eucalyptus sideroxylon		

MANAGEMENT STATUS

E EXCELLENT -A TREE OR GROUP OF TREES THAT:
- HAS NATURAL OF CULTURAL HERITAGE IMPORTANCE; OR
- HAS HIGH AND AESTHETIC VALUE AND WILL CONTRIBUTE SIGNIFICANTLY TO THE SURROUNDING LANDSCAPE; OR
- IS OF OUTSTANDING FORM AND CONDITION AND IS AN EXCELLENT EXAMPLE OF THE SPECIES; OR
- HAS SIGNIFICANT SCIENTIFIC VALUE, INCLUDING ECOLOGICAL IMPORTANCE.

H HIGH - A TREE THAT:
- IS OF GOOD FORM, STRUCTURE AND HEALTH;
- IS WITHOUT SIGNIFICANT DEFECT; AND
- PRESENTS A LOW HAZARD/SAFETY RISK.

M MEDIUM - A TREE THAT:
- IS OF REASONABLE FORM, STRUCTURE AND HEALTH; AND
- PRESENTS A MEDIUM TO LOW HAZARD/SAFETY RISK.

P POOR - A TREE THAT;
- IS OF POOR FORM, STRUCTURE OR HEALTH IS IN DECLINE; OR
- PRESENTS A HIGH OR VERY HIGH HAZARD/SAFETY RISK.

TO BE READ IN CONJUNCTION WITH VEGETATION ASSESSMENT REPORT PREPARED BY
dsb Landscape Architects
DATED 13/04/2021

This vegetation assessment has been completed in accordance with the
Tree Protection Act 2005 Part 4 S31 (Guidelines for Tree Management Plans)

NO.	DESIGN	DRAWN	CHECKED	VER'D	DATE	AMENDMENT / ISSUE
A	-	MR	MR	✓	13/04/2021	ISSUE TO CLIENT

NOTES

DRAWINGS TO BE READ IN CONJUNCTION WITH THE INFORMATION CONTAINED IN THE ACCOMPANYING VEGETATION ASSESSMENT REPORT.

TREE LOCATIONS BASED ON SURVEY SUPPLIED BY THE CLIENT.

DO NOT SCALE FROM DRAWING.

0 5 10m
1:300 @ A1 1:600 @ A3

dsb
Landscape Architects

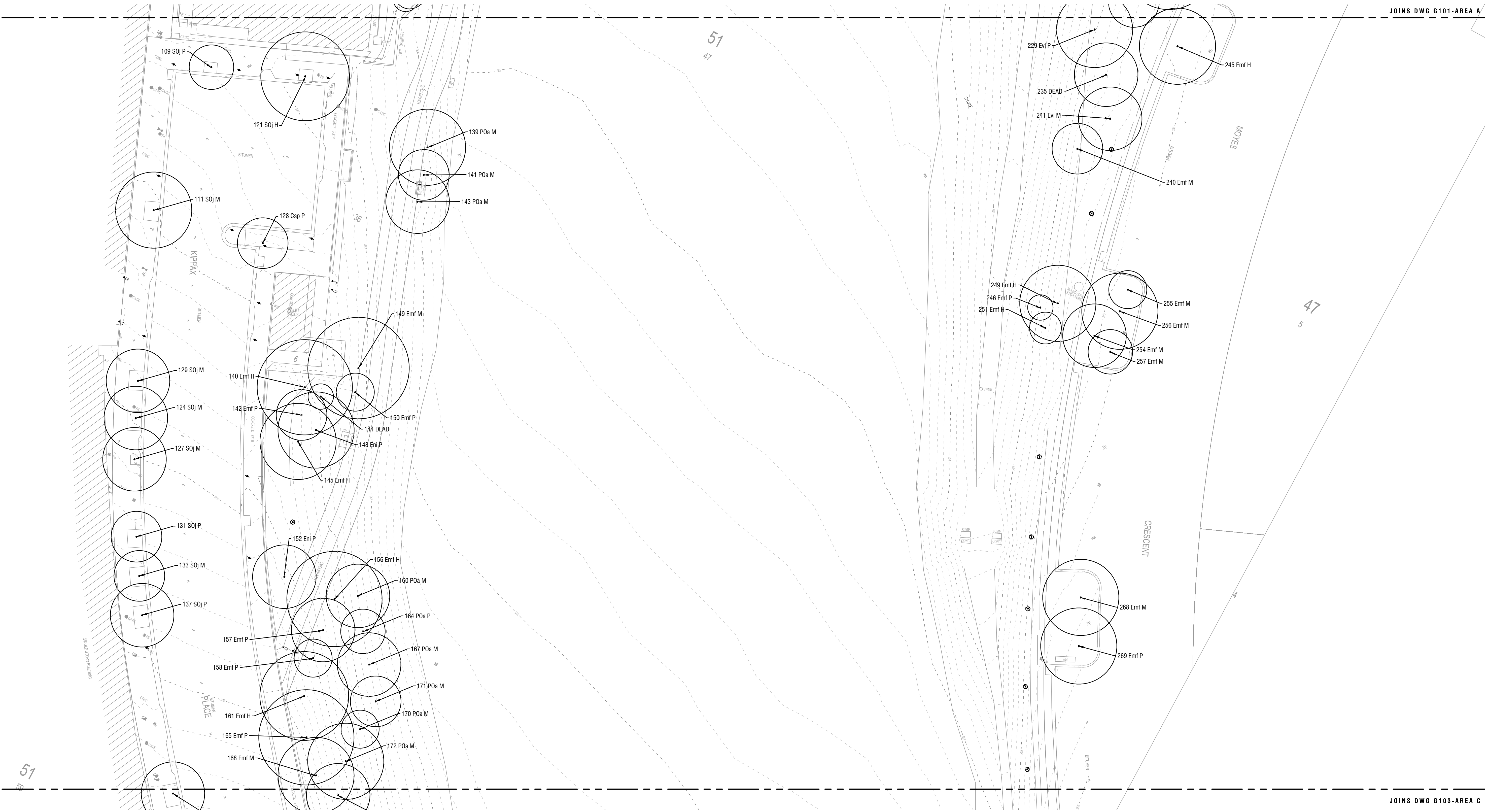
Project
TERRITORY PLAN VARIATION
SECTION 51 KIPPAX

Client
JPS ENGINEERING CONSULTANTS

Drawing Title
VEGETATION ASSESSMENT
AREA A

Scale
Plot Date:
Drg. No.
4138-G101 A

Sheet No.
1/3



LEGEND & NOTES

SITE BOUNDARY
Refer Project Survey Drawing

256 EMf M

EXISTING TREE LOCATION
Tree Number, Species Code & Tree Management Status

KEY TO SPECIES

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CTa	Celtis australis	Aba	Acacia baileyana	Evi	Eucalyptus viminalis
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SOj	Styphnolobium japonica	Adl	Acacia dealbata		
KOp	Koelreuteria paniculata	Her	Hakea eriantha		
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- PRESENTS A LOW HAZARD/SAFETY RISK.

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- IS OF REASONABLE FORM, STRUCTURE AND HEALTH; AND
- PRESENTS A MEDIUM TO LOW HAZARD/SAFETY RISK.

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TO BE READ IN CONJUNCTION WITH VEGETATION ASSESSMENT REPORT PREPARED BY
dsb Landscape Architects
DATED 13/04/2021

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Tree Protection Act 2005 Part 4 S31 (Guidelines for Tree Management Plans)

NO.	DESIGN	DRAWN	CHECKED	VER'D	DATE	AMENDMENT / ISSUE
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0 5 10m
1:300 @ A1 1:600 @ A3

dsb
Landscape
Architects

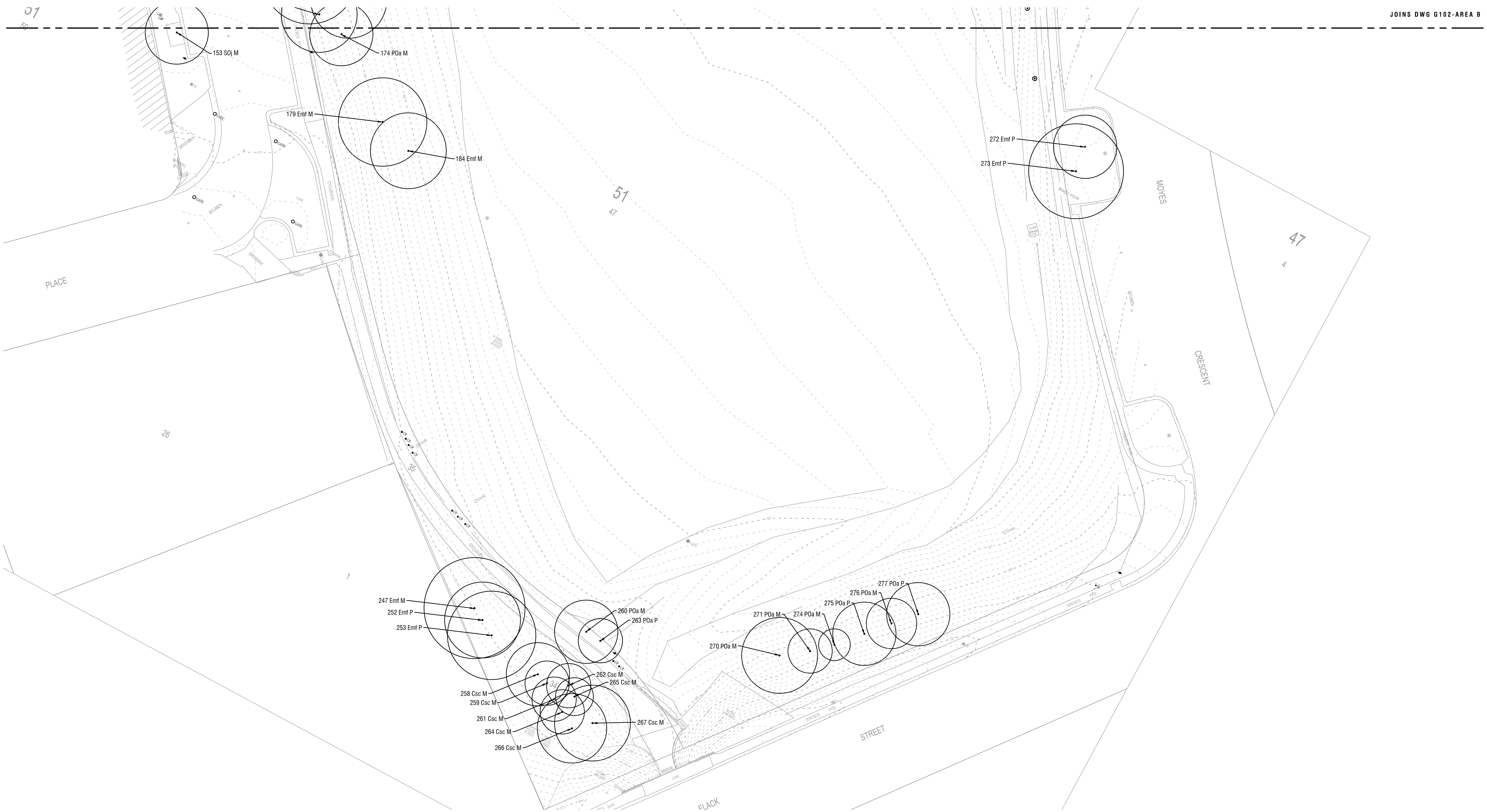
Project
TERRITORY PLAN VARIATION
SECTION 51 KIPPAX

Client
JPS ENGINEERING CONSULTANTS

Drawing Title
VEGETATION ASSESSMENT
AREA B

Scale
Plot Date:
Drg. No.
4138-G102 A

Sheet No.
2/3



LEGEND & NOTES

SITE BOUNDARY
Refer Project Survey Drawing

256 EMf M
EXISTING TREE LOCATION
Tree Number, Species Code & Tree Management Status

KEY TO SPECIES

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dsb Landscape Architects
DATED 13/04/2021

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Tree Protection Act 2005 Part 4 S31 (Guidelines for Tree Management Plans)

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A	-	MR	MR		13/04/2021	ISSUE TO CLIENT

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TREE LOCATIONS BASED ON SURVEY SUPPLIED BY THE CLIENT.

DO NOT SCALE FROM DRAWING.

0 5 10m
1:300 @ A1 1:600 @ A3

dsb
Landscape
Architects

Project
TERRITORY PLAN VARIATION
SECTION 51 KIPPAX

Client
JPS ENGINEERING CONSULTANTS

Drawing Title
VEGETATION ASSESSMENT
AREA C

Scale
Plot Date:
Drg. No.
4138-G103 A
Sheet No.
3/3

Appendix N

Correspondence with ACT Tree Protection Unit

John Samoty <john.samoty@gmail.com>

FW: Section 51, Holt.

1 message

[redacted]> Fri, May 7, 2021 at 7:47 AM
To: John Samoty <john.samoty@gmail.com>
Cc: "[redacted]>

OFFICIAL

Morning John

Please see below email from the Tree Protection Unit.

Can this please be saved as part of the SIR.

Email from Parks and Conservation to follow shortly.

Cheers

[redacted]

From: [redacted]>
Sent: Thursday, 6 May 2021 4:08 PM
To: [redacted]>
Cc: [redacted]>
Subject: FW: Section 51, Holt.

OFFICIAL

Good afternoon [redacted],

The Tree Protection Unit (TPU) has been asked to comment on the tree assessments for Section 51, Holt. A Vegetation Assessment Report was submitted by DSB Landscape Architects, prepared by Paul Scholtens and Dated, 13 April 2021.

Chris Fleming and Geoffrey Lewis-Hughes attended the site on the 5 May 2021, to perform a tree assessment on behalf of the Tree Protection Unit.

Comments on Tree Assessment:

The following trees were assessed as a high quality group of regulated trees that should be retained and protected.

Tree No’s 247, 252, 253, 258, 259, 261, 262, 264-267.

The following regulated trees were assessed as being in fair to good health, these trees do not meet criteria for removal under the provisions of Tree Protection (Approval Criteria) Determination 2006 (No 2).

Tree Nos. 75, 76, 78, 81, 82, 83, 84 , 85, 86, 87, 88, 90, 91, 92, 95 - 102, 104, 105, 108, 110 – 121, 123, 124, 137, 140, 142 145, 148, 149, 152, 156, 157, 161 – 163, 166, 168, 169, 173, 176, 177, 180 – 183, 185, 186, 190, 192 – 200, 203 -205, 209 -211, 223, 227, 229, 230, 232, 233, 236, 237, 239, 241, 242, 244, 249, 269, 272, 273.

These regulated trees would meet criteria for approval under the *Tree Protection Act 2005*, due to the presence of fungal diseases.

Tree Nos. 165, 179, 184

The following trees are not of a regulated size and therefore not covered by the provisions of the *Tree Protection Act 2005*.

Tree Nos. 17, 89, 93, 94, 106, 109, 125 -131, 133, 150, 153, 158, 178, 187 - 189, 191, 201, 202, 206, 208, 212 -217, 219, 220, 222, 224, 226, 228, 238, 240, 243, 246, 250, 251, 261.

The following trees are dead, and therefore not covered by the provisions of the *Tree Protection Act 2005*.

Tree Nos. 103, 122, 144, 207, 218, 221, 225, 231, 234, 235.

The following trees are a declared pest species under the provisions of Pest Plants and Animals (Pest Plants) Declaration 2020 , therefore not covered by the provisions of the *Tree Protection Act 2005.*

Tree Nos. 80, 107, 132, 134, 135, 136, 138, 139, 141, 143, 146, 147, 151, 159, 160, 164, 167, 170, 171, 172, 174, 175, 260, 270, 271, 274, 275, 276, 277.

The following trees are located on unleased land which is not covered by the provisions of the *Tree Protection Act 2005,* but is covered by other legislation.

Tree Nos. 245, 254, 255, 256, 257.

I provide this advice as a delegate of the Conservator of Flora and Fauna.

Geoffrey Lewis-Hughes. Position Number 08065.

Regards

[redacted] | A/g Tree Protection Officer | **Urban Treescapes**

Phone: [redacted]-mail: [redacted]

City Presentation | Transport Canberra and City Services Directorate - TCCS | ACT Government

Level 4, DOB, 480 Northbourne Ave | GPO Box 158 Canberra ACT 2601 | www.gov.au

Please let me know if you require any further information.

Regards

[redacted] | A/g Assistant Director - Tree Protection **| Urban Treescapes**

Phone: [redacted]

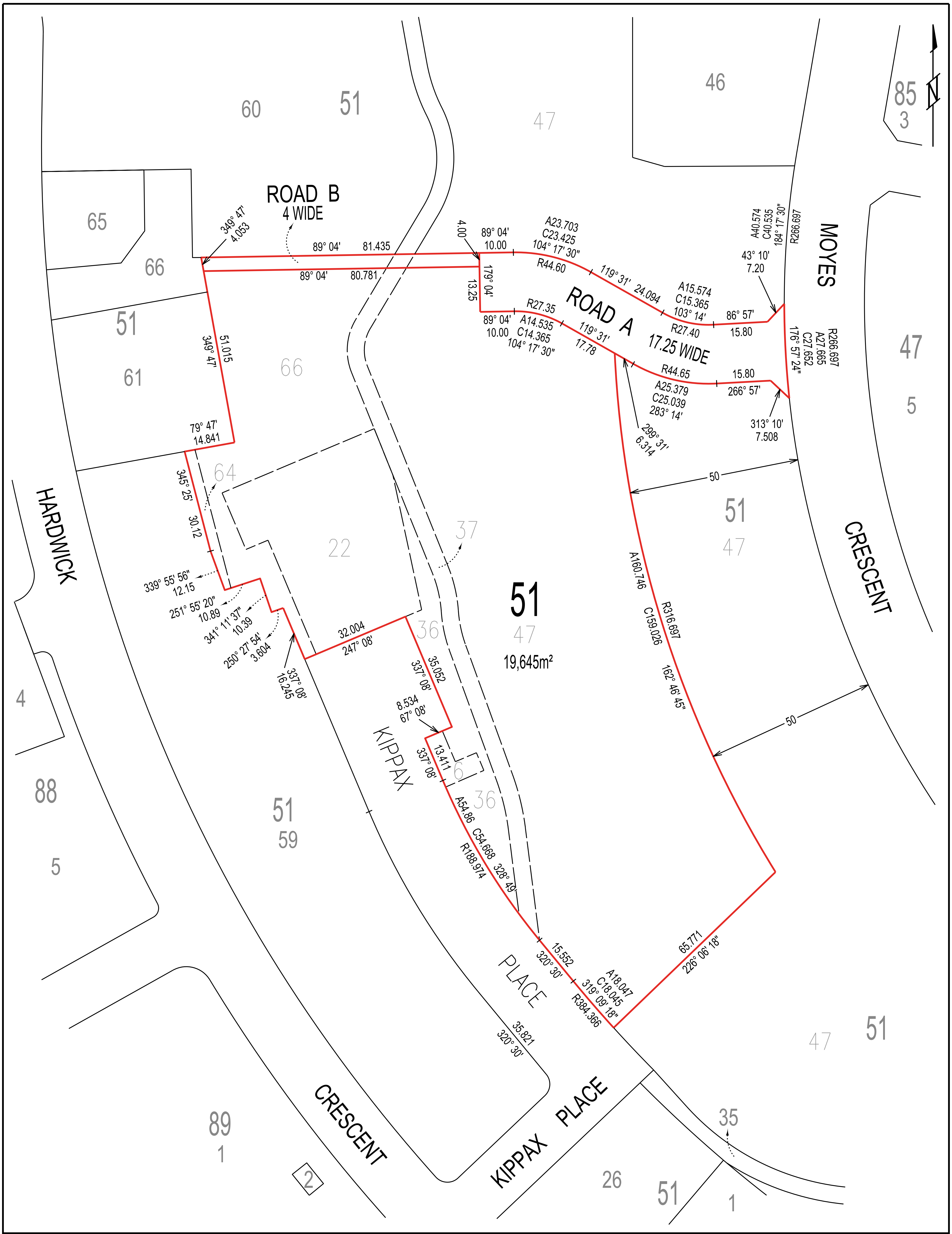
City Presentation | Transport Canberra and City Services Directorate - TCCS | ACT Government

480 Northbourne Ave | GPO Box 158 Canberra ACT 2601 | www.act.gov.au

Appendix O

Anthony Quinn Surveys,

Subdivision Plan



Anthony Quinn Surveys Pty Ltd
Land & Engineering Surveyors
TEL: 62550824 EMAIL: tonyq@bigpond.com

SUBDIVISION PLAN
BLOCKS 6, 22, 36, 64 AND
PART BLOCKS 37, 47 & 66 SECTION 51
HOLT

SCALE 1:1000 at A3	DATE OF SURVEY 5 MAY 2021
REF No. 2782	

Anthony Quinn

ANTHONY QUINN REGISTERED SURVEYOR

Appendix P

Correspondence with TCCS

(Road A and Road B)

Gmail

John Samoty <john.samoty@gmail.com>

RE: Kippax Group Centre Expansion - Access Road Proposal

1 message

[redacted]u> Thu, Apr 29, 2021 at 11:29 AM
To: John Samoty <john.samoty@gmail.com>
Cc: "[redacted]ei"
<TCCS.DACOORD@act.gov.au>

OFFICIAL

Hi John,

Thank you very much for prompt response.

Understood. In this case, TCCS can provide support in principle for the 17.25m width Road A corridor (ie. 7.0m road carriageway, 6.25m verge in the south and 4.0m in the north).

Please let me know if any further assistance required.

Regards,

[redacted]

From: John Samoty <john.samoty@gmail.com>
Sent: Thursday, 29 April 2021 11:20 AM
To: [redacted]u>
Cc: [redacted]>
Subject: Re: Kippax Group Centre Expansion - Access Road Proposal

CAUTION: This email originated from outside of the ACT Government. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi [redacted]

Thank you for your email response. I've attempted to call you several times as well this morning, but it's going straight to voicemail.

I haven't undertaken the masterplanning for Section 51, as I'm only undertaking a due diligence assessment on the site, so I don't have information regarding services that will be required on Road A (and there are no existing services on that alignment). Because of this, I'm unable to draw a typical cross section. I would also be hesitant in locking EPSDD into a design that may change in the future, once masterplanning is done. I'm assuming that if we go the wider 6.25m verge width, all services should comfortably fit within this cross section.

But regardless of this, you have provided the answer we needed below. Dimensions with the qualification that as long as the proposed underground services fit. I believe that's all we need for now to establish a block boundary.

Kind regards,

John Samoty, MIEAust, CPEng, NER, RPEQ, APEC Engineer, IntPE(Aus)
Senior Civil Engineer

JPS Engineering Consultants

M 0417 434 996
E John.Samoty@gmail.com

On Thu, Apr 29, 2021 at 11:08 AM [redacted] wrote:

> OFFICIAL
>
> Hello John,
>
> I tried to call you a couple of times this morning, with no luck.
>
> Just wondering if you can provide us a typical cross section including all existing and proposed underground services for Road A. We believe the clarification for Road A should be determined as Access Street B, which requires 7.0m road carriageway, 6.25m verge in the south and 4.0m in the north provided all existing and proposed underground services can be accommodated without any issues.
>
> We are in the final stage assessing this one, and trying our best to get it back to you once received.
>
> Please give me a call if you wish to have a chat.
>
> Thanks in advance.
>
> Regards,
>
> **[redacted] | Assistant Director | BEng (MIEAust), DipPM**
>
> **Phone: [redacted] | Email: [redacted]**
>
> **Development Planning | Development Coordination Branch | Transport Canberra and City Services Directorate | ACT Government**
>
> **Level 2, 480 Northbourne Avenue, Dickson, ACT 2602| GPO Box 158, Canberra, ACT 2601 |**
> **www.tccs.act.gov.au**

From: [redacted]
Sent: Wednesday, 28 April 2021 3:47 PM
To: [redacted]; TCCS_PlaceCoord <TCCS.PlaceCoord@act.gov.au>
Subject: FW: Kippax Group Centre Expansion - Access Road Proposal

OFFICIAL

[redacted]

Please see below email from John Samoty following from a meeting we had with TCCS on Friday 16/04 in regards the proposed Road A.

As discussed the TPV has already been completed and we are in the stage of completing due diligence studies to commence a sales process in May.

Road A was part of the TPV. I'll forward you the details on that too.

The road and verge dimensions are critical in understanding what the sellable site boundary is, so we can better provide details to a future purchased.

The successful purchaser will also have to undertake their own traffic and parking assessment as part of a Development Application.

Happy for you to speak directly with John

Cheers

[redacted]

Also a map which may assist with Section 51 Holt showing the indicative boundary for the future commercial and residential development. Noting Road A is not providing access to residential at this stage.

From: John Samoty <john.samoty@gmail.com>
Sent: [redacted]
To: TCCS_PlaceCoord <TCCS.PlaceCoord@act.gov.au>
Cc: [redacted]>
Subject: Kippax Group Centre Expansion - Access Road Proposal

CAUTION: This email originated from outside of the ACT Government. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Good morning,

Based on 30 medium density dwellings within the Kippax Group Centre expansion area in Section 51 Holt, the traffic volume is assumed as approximately 210vpd. The intention is to truncate Road A to just service the 20m of residential, to create an undesirable route for accessing the commercial/shopping area. Therefore, the road cross section that is proposed for Road A proposed is as follows:

Southern verge width - 5.5m in line with Table 2A of the EDC for an Access Street A.
Carriageway width - 7.0m in line with an Access Street B, to allow for staggered on street parking (only one side of the road in any stretch).
Northern verge width - 4.0m wide to allow for a 2.5m wide shared path and 1.5m clearance from the kerbline to TCCS Standards. Please note that an additional 2.0m is not provided as this is like an edge road that is fronting open space to the north.

The intention is also to have Road A intersecting with Moyes Crescent 40m from the opposite Postle Cct, in line with the 40m stagger stipulated in the EDC.

If you have any questions regarding this, please don't hesitate to contact me directly. Your earliest consideration of this would be greatly appreciated as this project is under significant public and ACT Government pressure.

Kind regards,

John Samoty, MIEAust, CPEng, NER, RPEQ, APEC Engineer, IntPE(Aus)
Senior Civil Engineer

JPS Engineering Consultants

M 0417 434 996
E John.Samoty@gmail.com

Appendix Q

AECOM, Traffic and Transport Study

Kippax Centre Traffic and Transport Study

Environment, Planning and Sustainable Development Directorate

19-May-2021

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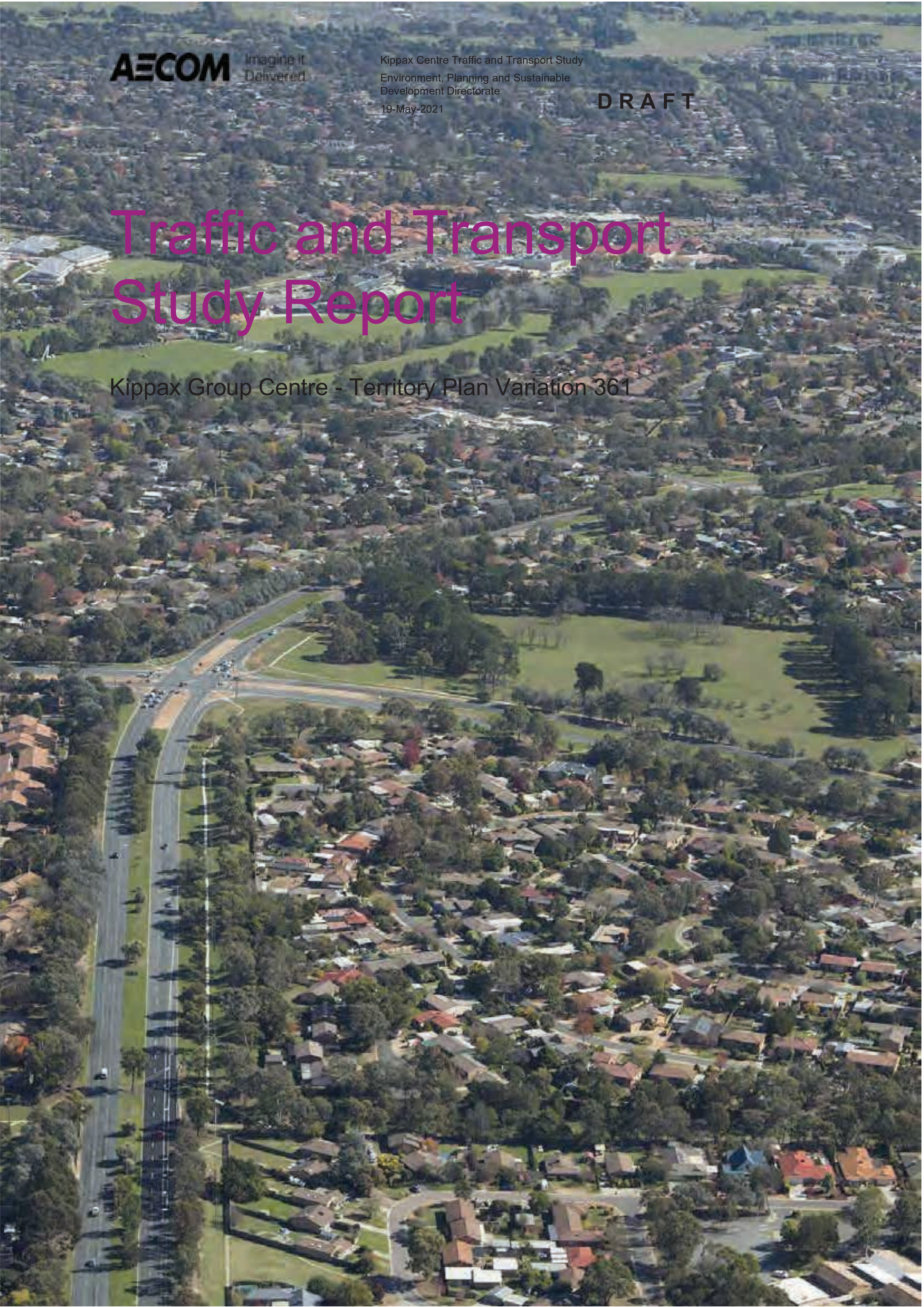
Traffic and Transport Study Report

Kippax Group Centre - Territory Plan Variation 361



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Traffic and Transport Study Report

Kippax Group Centre - Territory Plan Variation 361

Client: Environment, Planning and Sustainable Development Directorate

ABN: 31432729493

Prepared by

AECOM Australia Pty Ltd
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ABN 20 093 846 925

19-May-2021

Job No.: 60657526

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

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Quality Information

Document	Traffic and Transport Study Report
Ref	60657526
Date	19-May-2021
Prepared by	Padmanaban Subramanian
Reviewed by	John Bennett

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	14-May-2021	Initial Draft	John Bennett Principal Transport Planner	
1	19-May-2021	Final Draft to address comments	John Bennett Principal Transport Planner	

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Table of Contents

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1.0 Introduction

1.1 Background

AECOM has been commissioned by the Environment, Planning and Sustainable Development Directorate (EPSDD) to undertake a revised Traffic and Transport Study for the Kippax Group Centre, henceforth referred to as the Kippax Centre. AECOM produced a traffic study for the Kippax Centre in 2016-2017, which included a detailed review of the Kippax Group Centre Draft Master Plan to facilitate growth and guide the future development of the Centre.

In 2020, a Territory Plan Variation (TPV) was approved which allows for further development at the Kippax Centre. The objective of this report is to account for the revised yields and parking requirements and to assess the potential impacts to the traffic network as a result of the proposed land use and road network changes.

1.2 Kippax Group Centre - Territory Plan Variation (TPV) No. 361

The TPV sets out to implement the recommendations of the Kippax Group Masterplan, which has been prepared to focus development within the centre for the next 10 to 20 years. It establishes what is important in the existing Centre and how these attributes can be enhanced through future development of the Centre.

The TPV rezones the following blocks and sections within the existing/proposed Kippax Masterplan:

- Block 5 of Section 53
- Block 4 & Part B5 of Section 88
- Part Blocks 37, 47 & 66 of Section 51
- Blocks 6, 22, 36, 64 Section 51, and
- Part of Kippax Place Road Reserve.

The previous Territory Plan for the Kippax Centre is presented in Figure 1. The areas subject to rezoning are highlighted in this figure.

The existing Kippax Centre has been operating since the 1970s and AECOM's involvement with the Kippax Group Centre extends across 20 years. AECOM (legacy Maunsell) produced studies for upgrade of the Kippax Centre in the late 1990's that resulted in the development of the current bus station, the relocation and expansion of the library and paving upgrades to the centre. The Kippax Masterplan has been progressively refined during recent years.

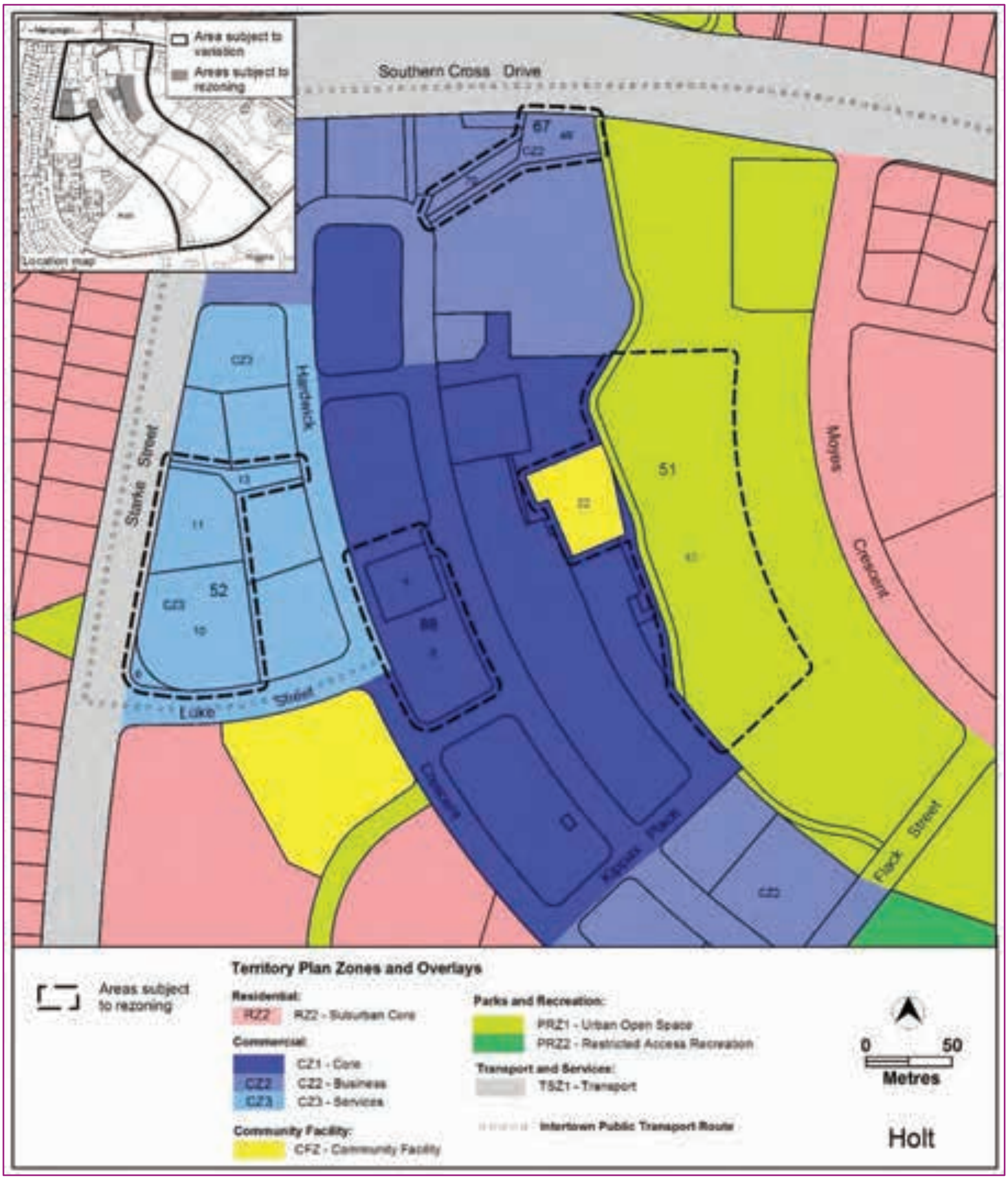
The revised Territory Plan is shown in Figure 2. The following land uses are proposed for the expansion:

- Retail/ commercial facilities
- Community Hub and
- Residential dwellings (including apartments and terrace housings).

The major changes are as follows:

- The existing Kippax Fair block on the Section 51 is further expanded to accommodate a range of commercial development including speciality retail, food and beverage outlets. Apartments are proposed on top of the retail spaces. The Hardwick Crescent frontage is redesigned in a 'Strip Mall' type arrangement to be developed as a pedestrian friendly environment. Terrace housing is proposed to the east of the Kippax Fair, which will utilize the parts of the open areas adjacent to it.
- The existing Holt Library and the Children's play area on Section 88 will be redesigned to accommodate a new community hub, which envisions a co-located library and community facility.

- The Car park adjacent to the Petrol Station on Section 53 is proposed with commercial facilities on the ground floor and four storeys of residential apartments on top of the commercial land uses.



Source: Planning and Development (Plan Variation No 361) Approval 2020

Figure 1 Kippax Original Territory Plan

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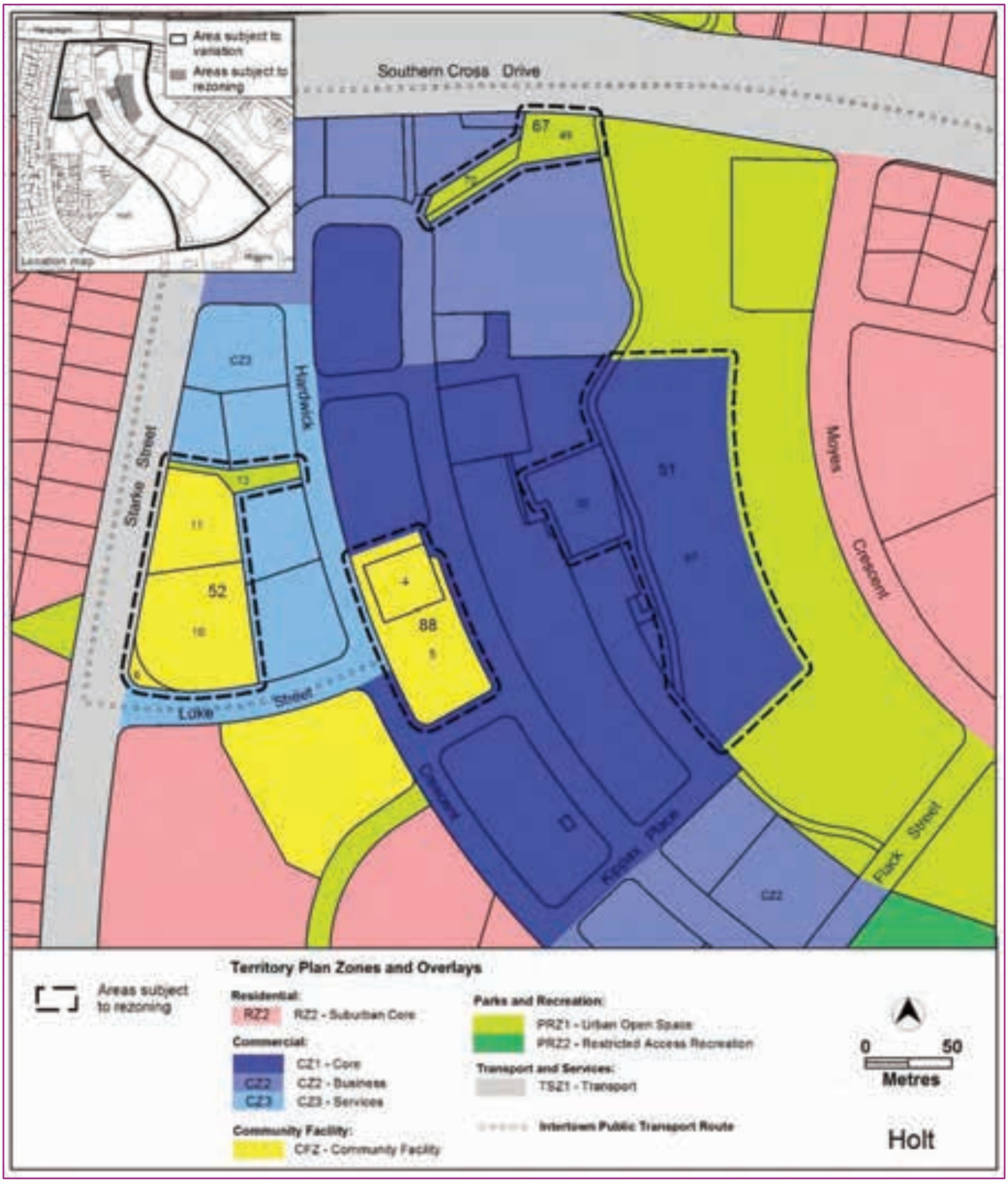

Source: Planning and Development (Plan Variation No 361) Approval 2020

Figure 2 **Kippax Revised Territory Plan due to Variation 361**

To enhance the pedestrian connectivity and circulation, The TPV also proposes two new road connections, namely ‘Road A’ and ‘Road B’ between Hardwick Crescent and Moyes Crescent as shown in Figure 3. At this stage, it is assumed that Road A will provide access to the Terrace Houses and Road B is treated as a shared pedestrian and cyclist route. Road A will not provide a vehicular access to the retail land uses but will provide a convenient access to pedestrians and cyclists from Moyes Crescent.

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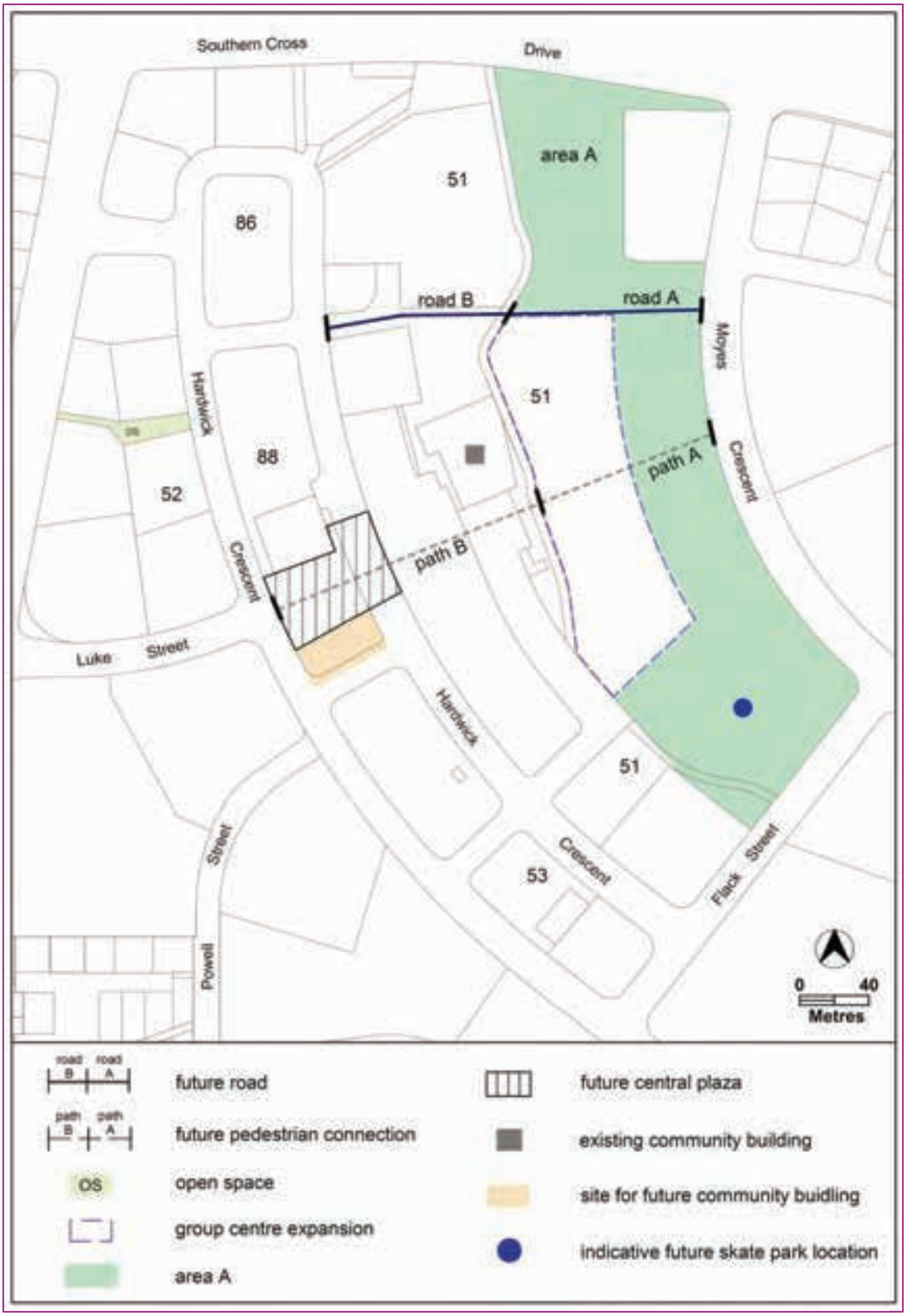

Source: Planning and Development (Plan Variation No 361) Approval 2020

Figure 3 Kippax Centre Future Roads and Pedestrian Paths

1.3 Purpose of Report

The objective of this report is to examine the potential impact of the proposed development on parking requirements, access arrangements and on the surrounding transport facilities of the Centre in relation to the changed land uses highlighted in Section 1.2. The assessment scope includes:

- Review of background reports and previous relevant works.
- Determination of the existing traffic and transport characteristics of the immediate study area.
- Determination of the future trip generation and the parking requirements of the modified land uses.
- Calculation of trip distribution and assignment profiles associated with future traffic in the vicinity of the site.
- Development of a linked SIDRA model for key intersections to determine the potential traffic impact of the development in the base year 2021, opening year 2025 and Horizon Year 2035 in the AM and PM peaks.
- Review of the proposed parking and vehicular access arrangements.
- Review of the proposed future active travel provision.
- A high-level review of existing service and emergency vehicle access.
- High-level commentary on the proposed new road links.

1.4 Study Area

The Centre is located on the northwest of Canberra City, approximately 12km from the Civic Centre and 4.7km to the Belconnen Town Centre. The study area for the Centre is shown in Figure 4. The study area is bounded by Southern Cross Drive to the north, Starke Street to the west, Moyes Crescent to the east and Flack Street to the south.

The existing study area has the following key characteristics:

- A mixed-use precinct offering a range of commercial, retail, residential, community and recreational facilities. The existing commercial/retail establishments include Aldi and Woolworth's supermarkets and a range of smaller retail shops in Kippax Fair.
- The community facilities include Holt Library, NurtureOne Holt Childcare centre, medical facilities, and a YMCA Early Learning Centre.
- The Centre is currently the main public transport hub for the area.
- Two community clubs to the north of the study area, the Magpies Sports Club and to the south, the Raiders Belconnen Sports Club and a variety of restaurants to the west of the study area.

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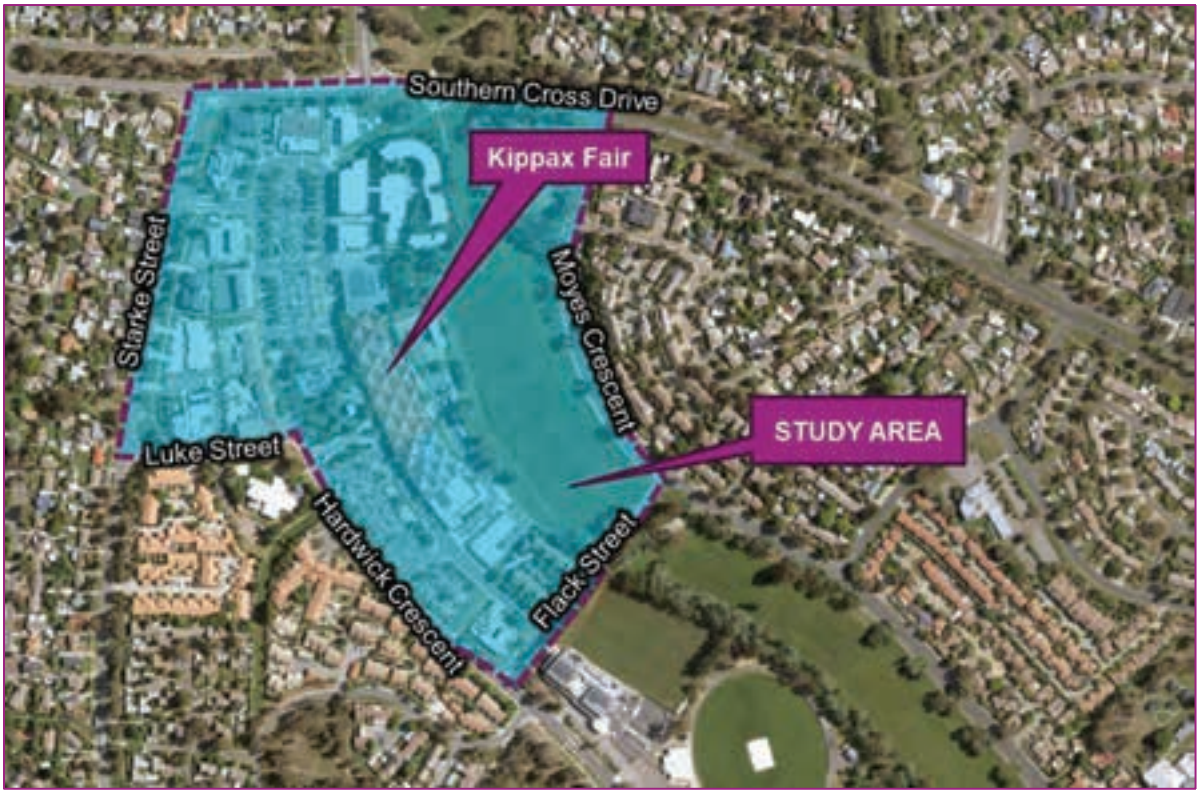

Source: ACTMapi

Figure 4 Study Area

2.0 Review of Background Documents

This chapter presents an overview of the available background documents related to the project. These reports serve as a basis for various assumptions adopted for this study.

2.1 Kippax Centre Traffic and Transport Study (AECOM, June 2016)

The previous study conducted by AECOM in 2016 provided a detailed analysis of the transportation and movement aspects of the draft Kippax Master Plan. It investigated the expected growth of the Centre, the roads and traffic within and around the Centre, the future public transport facilities, the future active travel arrangements, service and emergency vehicle access and the future parking requirements of the Centre.

The previous AECOM study referred to the below reports, which served as an input for the assessment assumptions:

- Kippax Site Analysis – Traffic and Transport (AECOM, January 2015)
- West Belconnen Technical Traffic Report (AECOM, February 2014)
- Southern Cross Drive and Starke Street (West) Signalisation Impacts (AECOM, September 2014)
- Belconnen Town Centre and West Belconnen to City Improved Cycling Connections – Feasibility Study (SMEC, December 2015)
- Kippax Fair Bus Station Planning (MRCagney, October 2014) and
- West Belconnen Community and Stakeholder Consultation – Phase 1 Summary Report (Elton, September 2014).

The 2016 study identified existing parking areas and current utilisation rates within the core area and the periphery of the development. It determined the future parking demand using a temporal parking profile and provided advice with regards to the future parking provisions for the study area.

A Commuter microsimulation traffic model was developed to investigate the future demands, traffic flows and operational impacts on the surrounding roads. The results of the microsimulation modelling estimated that there will not be significant impacts on access roads to the Kippax Centre, including Starke Street, Luke Street and Flack Street, as a result of the proposed link road (which is Road A, in the TPV).

Various options were developed and tested for the future bus interchange within the development along with the potential locations identified for a future bus layover facility.

A preferred scheme was recommended to improve the public transport facilities, improve transport access and encourage active travel within the development. The key infrastructure works recommended as part of the preferred scheme included:

- Development of a bus interchange to the north of the Kippax Library parallel to Hardwick Crescent and creation of a pedestrian zone along the northern frontage of Kippax Fair and ALDI.
- Construction of an underground public car park adjacent to the proposed bus interchange / beneath the proposed pedestrian zone.
- Construction of structured car park located to the north east of Kippax Fair.
- Construction of a link road from Moyes Crescent to the structured car park and the existing Kippax Place and Hardwick Crescent.
- Development of a pedestrian access link between the proposed bus interchange and the assumed location of a possible future light rail station.

2.2 Kippax Group Centre – Master Plan (ACT Government, March 2019)

The Kippax Group Centre Master Plan was released by the ACT Government in March 2019 in response to actions outlined in the 2012 ACT Planning Strategy. The main objectives of the masterplan were to investigate the opportunities for urban intensification for the centre and to encourage active travel within and surrounding areas.

The masterplan identified the following:

- That there is adequate market demand for the retail area expansion.
- The public transport hub within the Kippax Centre provides good accessibility.
- The proposed residential and mixed-use developments may increase the vibrancy of the Kippax centre.
- Adequate car parking is provided within the development.
- Safety and convenience for the pedestrians and cyclists needs to be improved.

The master plan made key recommendations to enhance the Centre's role as a major public transport hub; supported the retail and mixed-use development expansion; and supported enhancements to the public spaces to create a more vibrant community space which encourages active travel. The spatial framework recommended by the Kippax Group Centre Masterplan is shown in Figure 5

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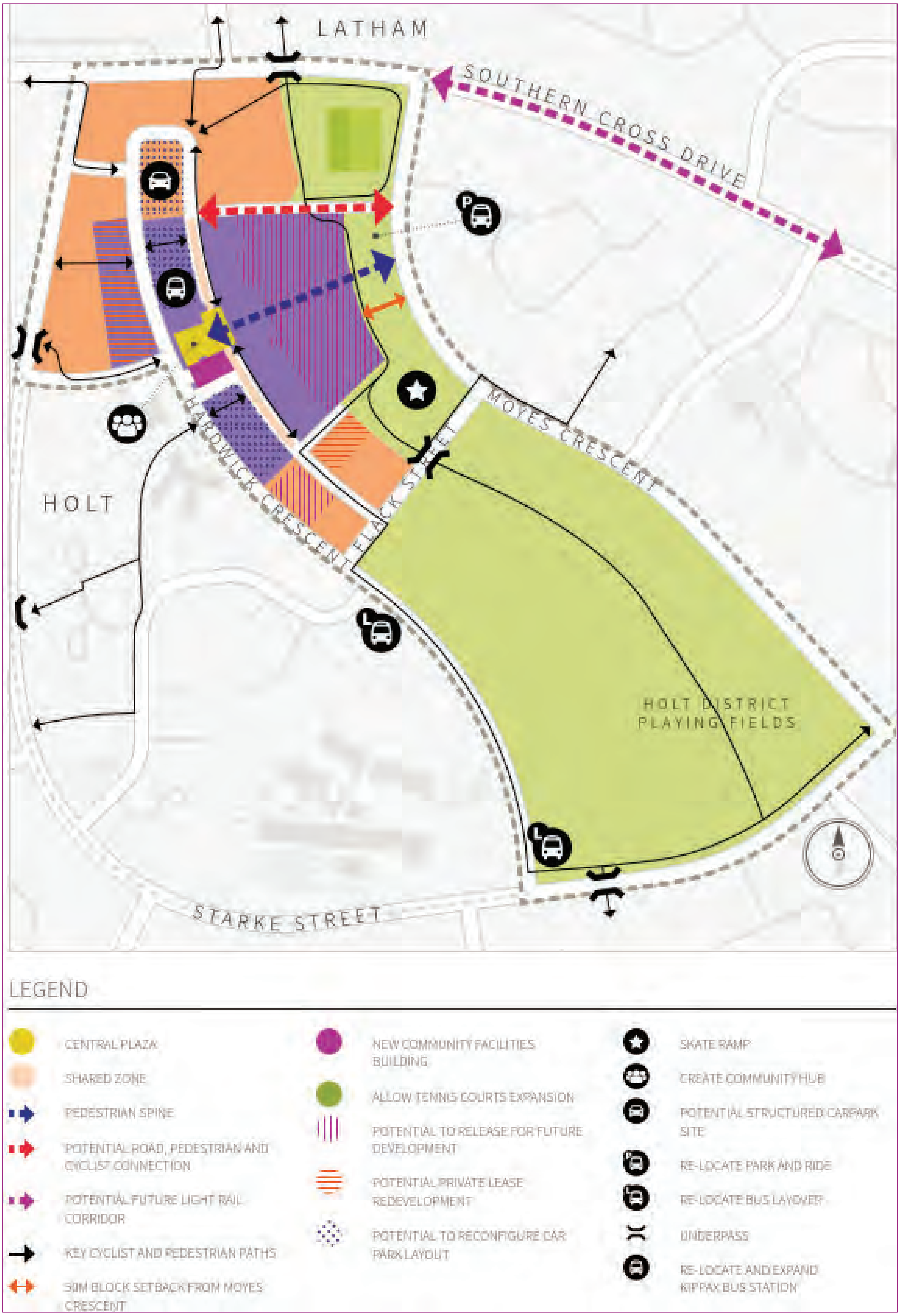

Source: Kippax Master Plan 2019

Figure 5 Kippax Group Centre Masterplan - Spatial Framework

2.3 JPS Engineering Report (September 2020)

This discussion paper outlines the changes to the Kippax Group Centre Territory Plan and gives an overview of proposals for Section 51 and 88; provides an overview of the site context; and discusses two options for the indicative planning scenario:

- **Option A – Consolidated Block**: This option considers that Section 51 will be developed by the Kippax Fair owners, which envisions the redevelopment of Kippax Fair Shopping Centre along with the newly proposed retail, food and beverage outlets and supermarkets at the ground floor and residential developments above these facilities. A 'Green Spine' is proposed to the east with the plaza space and library facilities to the west. This option was used as a basis for this traffic assessment report.
- **Option B – New Development**: This option considers the TPV land uses as a separate entity to the existing Kippax Fair. It considers a 'shop top housing' with retail land uses on the ground floor and residential apartments above, facing Kippax place.

In addition to the above land uses on Section 51 and Section 88, AECOM was advised that additional land uses will be developed on Section 53, which consists 2,100 m^2 GFA of commercial facilities and 36 apartment dwellings, included as per part of the TPV.

2.4 Belconnen Better Intersections Project: Belconnen Way / Springvale Drive & Southern Cross Drive / Starke Street, Intersection Capacity Analysis (Quantum Traffic, June 2020)

This report presents the detailed designs for the construction of two new signalised intersections. The traffic flows and the information presented in the Site 2 (Southern Cross Drive / Starke Street Intersection) of this report has been used extensively for the current study to serve as a basis for the base year and future year traffic flows.

The analysis estimated that the existing intersections at the Starke Street and the Florey Drive with the Southern Cross Drive will operate with a poor level of service in the future years mainly due to the close spacing between the two intersections and lack of lane capacity along Southern Cross Drive. Potential improvement works recommended in the report was considered for this assessment.

2.5 Kippax Group Centre Feasibility Study & Concept Plan (Harris Hobbs, April 2021)

This concept design focusses on the public realm upgrades to enhance the amenity and infrastructure of public spaces, particularly on Hardwick Crescent. This report also reviewed the proposed masterplan specifically in terms of car parking, bus interchange and bus routes, transport connections and their integration with the overall masterplan. The main outcome of the report is a staging plan for six areas and associated implementation strategies along with the proposed improvements to the masterplan that could be delivered sequentially over time.

3.0 Existing Conditions

The site is located in the Holt region of the ACT and the existing Kippax Fair and the surrounding commercial and community facilities are included in Sections 51, 52, 53, 86, 88 and 89. The Kippax Fair Shopping Centre and the car parking area is included in the Commercial CZ1 Core Zone, with Commercial CZ2 Business Zones to the north and south. The Commercial CZ3 Services Zone is located to the west.

The adjoining community facilities are covered by the Community Facility Zone (CFZ), while the surrounding urban open space and playing fields are controlled by the Parks and Recreation Zone Development Code. The latest Territory Plan is shown in Figure 2.

The site is bounded by Southern Cross Drive (arterial road) on the north, Moyes Crescent (minor collector) on the east, Flack Street (local road) on the south and the Starke Street (major collector) on the west. The existing road hierarchy surrounding the development is shown in Figure 6.

Source: ACTMapi and https://activeinfrastructure.net.au/

Figure 6 Kippax Group Centre Existing Conditions

Hardwick Crescent and Luke Street are the main access roads for the development from the external network. Hardwick Crescent is the frontage road serving all the parking areas and the land uses within

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the development. There is a range of facilities within the site which caters to various user groups. For the purposes of this study, the areas are designated as ‘Core’ and ‘Periphery’ for better understanding. The various blocks of the Kippax Centre are shown in Figure 7.

Source: AECOM 2016 Study

Figure 7 Kippax Centre Existing Site Areas

There are several car parking areas provided within the Core, Periphery and the adjacent streets which are utilized by the Kippax Centre users. The car parking provisions surrounding the site are shown in Figure 8

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Source: AECOM 2016 Study

Figure 8 Existing Parking Provision

AECOM conducted a site visit on 14 April 2021 to observe the traffic conditions of the surrounding roads and to identify any safety risks.

It was observed during the site visit that the intersection at Southern Cross Drive and Starke Street is currently being upgraded into a signalized intersection from the priority-controlled layout. The right turn from Starke Street to Southern Cross Drive was closed due to the construction works. There is a local access street on the northern side, which provides access to the residential uses. Figure 9 shows the construction activities at intersection observed during the site visit.

Figure 9 Southern Cross Drive/ Starke Street Intersection – Site Photos

The intersection at Southern Cross Drive and Florey Drive is a signalized T-intersection, with Southern Cross Drive running in the east west direction. This intersection is closely spaced to the Starke Street

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intersection with an approach distance of 135m. The existing layout of this intersection is shown in Figure 10

Source: ACTMapi

Figure 10 Southern Cross Drive / Florey Drive Intersection – Site Photo

The Southern Cross Drive / Moyes Crescent intersection is an unsignalized priority-controlled T-intersection. Minimal traffic was observed at this intersection during the site visit. The site layout is shown in Figure 11

Appendix A provides additional pictures taken during the site visit, along with commentary.

It was observed during the site visit that the pedestrian walkways are provided along the surrounding roads and the parking areas are clearly marked. In addition to the bus interchange hub located within the development, a bus stop is located on Moyes Crescent.

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Figure 11 Southern Cross Drive / Moyes Cr Intersection – Site Photo

4.0 Proposed Development

This section of the report provides details of the existing precinct land uses, proposed development adjacent to Kippax Fair and the proposed TPV development.

4.1 Existing Land Uses within Kippax Centre

The Table 1 presents existing land uses and their yields considered in AECOM 2016 study except Nurtureone Childcare Centre (500m^2) which is included in the below table under '**Community/ Health**' land use within the '**Magpies and McDonalds**' Block.

It was observed that the Nurture one Child Care Centre is currently operational, which was considered as a future year land use in the previous AECOM study. Hence this land use was considered as existing in this assessment.

Table 1 Kippax Centre – Existing Land use and Yields

Land Use	Retail	Office	Food/ entertainment	Community/ Health	Other	Total	Dwellings
PRECINCT - CORE							
Kippax Fair	6,945	516	110	296	0	7,867	0
Commercial on Kippax Place	725	90	0	0	0	815	0
Retail Hardwick Cres W	1,377	0	1,014	146	0	2,537	0
Library	0	0	0	208	0	208	0
Carpark adjacent Petrol Station	0	0	0	0	0	0	0
Carpark opposite Woolworths	0	0	0	0	0	0	0
Central Plaza	0	0	0	0	0	0	0
Carpark opposite Aldi	0	0	0	0	0	0	0
Health Services	0	0	0	1,815	0	1,815	0
Aldi	1,700	0	0	0	0	1,700	0
Kippax Place	0	0	0	0	0	0	0
PRECINCT - PERIPHERY							
Units cnr Flack/Hardwick	0	0	0	0	0	0	10
Starke Street community cluster	260	0	0	1,954	0	2,214	0
Petrol Station Flack St	380	0	0	0	0	380	0
Carpark opposite Magpies	0	0	0	0	0	0	0
Magpies and McDonalds	560	0	1,140	500	450	2,150	50
Church	0	0	0	800	0	800	0
Leagues Club	0	0	4,314	0	0	4,314	0
Parkview Apartments	195	0	120	180	0	495	50

Source: AECOM Traffic Study 2016

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4.2 Future Land Uses of Kippax Centre

The future Kippax Centre land uses and their yields, as presented in the 2016 AECOM study, are presented in Table 2. It can be observed that in the previous study no further land uses were proposed for the Kippax Fair block. Whereas for the library block, a community facility of 2000m^2 GFA was proposed in the previous study.

AECOM has reviewed the land uses contained within the current version of the CSTM for the zone representing the Kippax Centre. The change in land uses in the zone between 2021 and 2041 broadly align with the yields shown in Table 2.

Table 2 Kippax Centre –Future Year Land use and Yields

Retail	Office	Food/ entertainment	Community / Health	Other	Total	Dwellings	Retail
Kippax Fair	0	0	0	0	0	0	0
Commercial on Kippax Place	0	0	0	0	0	0	34
Retail Hardwick Cres W	0	0	0	0	0	0	80
Library	0	0	0	2,000	0	2,000	0
Carpark adjacent Petrol Station	500	0	0	0	0	500	113
Carpark opposite Woolworths	2,000	500	500	0	0	3,000	137
Central Plaza	0	0	0	0	0	0	0
Carpark opposite Aldi	1,500	0	500	0	0	2,000	0
Health Services	3,000	0	500	0	0	3,500	124
Aldi	0	0	0	0	0	0	0
Kippax Place	250	0	250	0	0	500	0
Units cnr Flack/Hardwick	0	0	0	0	0	0	0
Starke Street community cluster	0	0	0	0	0	0	10
Petrol Station Flack St	0	0	0	0	0	0	0
Carpark opposite Magpies	0	0	0	0	0	0	0
Magpies and McDonalds	0	0	0	0	0	0	0
Church	0	0	0	0	0	0	0
Leagues Club	0	0	0	0	0	0	0
Parkview Apartments	0	0	0	0	0	0	0

Source: AECOM Traffic Study 2016

4.3 TPV 361 Proposed Yields

The TPV 361 proposes additional land uses for Sections 51, Section 53 and Section 88. It was observed that the TPV changes highlighted for Section 52 were already considered in the previous study and hence it is deemed no further changes are necessary for these blocks.

The land uses recommended in Option A in the JPS Engineering Report was considered for Section 51 and 88 for this study. AECOM was advised by JPS Engineering Consultants on the yields for Section 53. The TPV yields are shown in Table 3.

Table 3 TPV Land Use Yields

Block	Site	Site Area	Yield	Units
Section 51	Street Retail	2,300	1,840	GFA
	Ground Floor Retail	7,000	5,600	GFA
	Supermarkets	8,100	6,480	GFA
	Food & Beverage	1,400	1,120	GFA
	Tower Residential	19,750 (GFA 14,800)	164	dwellings
	Terrace Housing	-	30	dwellings
Section 88	Community Hub Building	1,500	1,200	GFA
Section 53	Commercial	-	2,100	GFA
	Apartments	-	36	dwellings

Source: JPS Engineering Consultants

The indicative layout showing the expansion of Kippax Fair within Section 51 as per the JPS Engineering Report is shown in Figure 12

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Source: DFP Planning Pty Ltd, 2020

Figure 12 TPV Indicative Layout

The consolidated newly proposed TPV land uses yields are shown in Table 4. It was observed that in the AECOM 2016 study, the library block was proposed with 2,000m^2 GFA of Community facilities whereas in the TPV, the proposed Community Facilities were reduced to 1200m^2 GFA. The Commercial, Food & Beverage, Apartments and Terrace Housing for Section 51 and Section 53 are newly proposed land uses

Table 4 TPV – Proposed Land uses of Kippax Centre

Land Use	Retail/ Commercial	Restaurant + Entertainment	Community+ Health	Total	Dwellings
Kippax Fair (Section 51)	13,920	1,120	-	15,040	164
Library (Section 88)	-	-	1,200	1,200	
Terrace Housing (Section 51)	-	-	-	-	30
Commercial (Section 53)	2,100	-	-	-	-
Apartments (Section 53)	-	-	-	-	36

4.4 TPV access arrangements

In addition to the above land use changes, another notable change in the TPV is provision of Road A and Road B as highlighted in Figure 3. These new roads provide a safe and convenient access for pedestrians and cyclists.

The AECOM 2016 study proposed Road A as major access road for the future land uses. However, it is understood that Road A will only serve the Terrace Housing land use (approximately 150 vpd) located to the east of Kippax Fair with some traffic calming treatments to achieve slower speeds.

Road A will not provide access to the retail and commercial uses. Road B will be a shared pedestrian and cyclist path.

Road A is considered as a 'Access Street B' as per 'Table 2A - Street network requirements – all estates except in industrial zones' of the Estate Development Code with traffic volumes ranging from 301- 1000 vehicles per day. It connects to Moyes Crescent with a new proposed intersection with a 40m offset from the existing Postle Circuit intersection, resulting in a staggered intersection arrangement. This arrangement will result in the removal of some existing on-street parking spaces along Moyes Crescent and may require relocation of the existing bus stop when implemented. The indicative arrangement of Road A and Road B is shown in Figure 13.

Road A will not provide a vehicular access to the commercial land uses. Only the residential users will have access to this road.

Figure 13 Road A and Road B – Indicative Plan

It is expected that about 7 - 8 on-street parking spaces will need to be removed along the Moyes Crescent due to the introduction of Road A and the new intersection. The displaced parking spaces may be compensated along the Road A during the detailed stage.

4.5 TPV Parking Requirements

The car parking provision requirements for various types of developments are detailed in the Environmental, Planning and Sustainable Development Directorate (EPSDD), Parking and Vehicular

Access General Code (PVAGC). The proposed parking rates for the TPV land uses are presented in **Table 5**. The total statutory parking requirement for the TPV land uses are 1,367 spaces.

Table 5 TPV Land Use Car Parking Requirements

Site	Yield code	Yield	Units	Provision rate	Parking requirement
Street Retail (Section 51)	Shop	1,840	m^2	0.05	92
Ground Floor Retail (Section 51)	Shop	5,600	m^2	0.05	280
Supermarkets (Section 51)	Shop	6,480	m^2	0.05	324
Food & Beverage (Section 51)	Restaurant	1,120	m^2	0.10	112
Community Hub Building (Section 88)	COM_ACT_ CEN	1,200	m^2	0.03	36
Tower Residential (Section 51)	2BR	164	dwellings	1.50	246
Terrace Housing (Section 51)	3BR	30	dwellings	2.00	60
Commercial (Section 53)	Shop	2,100	m^2	0.05	105
Apartments (Section 53)	2BR	36	dwellings	1.50	54
Visitors - Apartments	Visitor	200	dwellings	0.25	50
Visitors - Terrace Housing	Visitor	30	dwellings	0.25	8

Source: Yields Source - JPS Engineering Report

Accessible Parking Provision

Accessible parking needs to be provided in accordance with the ACT Parking and Vehicular Access General Code. The code requires that a minimum of 3% of the required number of spaces be provided for people with disabilities. This amounts to 32 accessible parking spaces to be provided within the TPV land uses.

Motorcycle Parking Provision

There is a requirement to provide motorcycle parking at a rate of 3 spaces per 100 public car parking spaces in addition to the car parks. This results in 28 motorcycle spaces for the TPV land uses.

Future Parking Demand

The 2016 AECOM study assessed the existing parking demand using parking temporal profiles at the Kippax Centre and found out that the parking requirements are generally met for the core and periphery developments.

The 2016 AECOM study estimated about 1,023 car parking spaces for the non-residential land uses and 747 parking spaces for the residential land uses. It is assumed that the residential parking supply will be provided within the residential development site boundaries. Furthermore, the 2016 AECOM study also identified about 386 replacement parking spaces for the existing car park which will be replaced by the structured car park. Overall, it was estimated in the previous 2016 AECOM study that 2,156 additional car parking spaces would be required for the future land uses proposed in the core areas. The 2016 AECOM study proposed structured car parks to accommodate the parking demand for the future land uses.

In addition to above parking demand, the TPV land uses will require more parking spaces. The overall future car parking requirements for the core areas including the TPV land uses are shown in Table 6.

Table 6 Kippax Centre – Future Car Parking Requirements

Scope	Land Use	Future Car Parking Requirement (spaces)
2016 AECOM Study	Non-residential use	1,023
	Residential use	747
	Replacement Parking	386
TPV Land uses	Non-residential use	979
	Residential use	418
Total		**3,553**

Source: 2016 AECOM Study and **Table 5**

The TPV approval plan states that the existing car parking spaces is retained within the site and the nominated parking areas to cater for the existing and the future parking demand in the TPV approval is shown in Figure 14. The potential structured car park is proposed in Section 86 or 88 which would mainly serve the future land uses identified in the 2016 AECOM study.

Additionally, the JPS Engineering Report proposes a new basement parking area of about 38,325 m^2 for the TPV land uses within Section 51, which would accommodate 1,222 parking spaces and the remaining parking spaces (145 spaces) will have to be shared/accommodated in the nominated parking areas identified in Figure 14.

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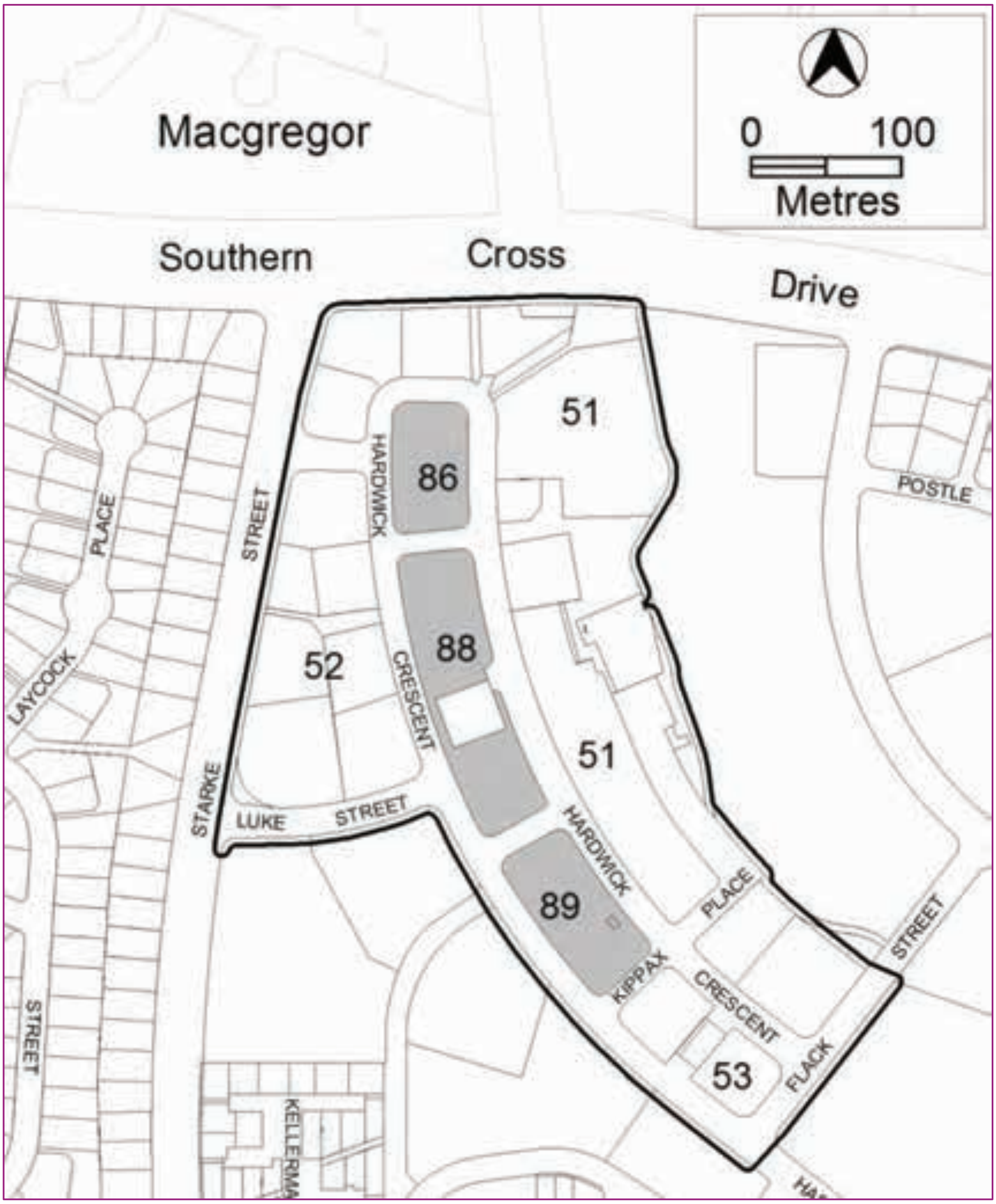

Figure 14 TPV Nominated Parking Areas

5.0 Traffic impact assessment

This section of the report outlines the assessment of the potential impacts of the TPV traffic on the adjacent road network.

5.1 TPV Traffic Generation

The traffic generation for the TPV land uses were determined based on rates from the NSW RTA Guide to Traffic Generating Developments. The following trip rates were adopted:

- **Tower Residential (Apartments)**: A trip rate of 4 vehicles per dwelling in a peak hour was applied to the residential apartments per the RTA Guide to Traffic Generating Developments applicable for Medium Density Residential Buildings.
- **Terrace Housing**: Since the exact mix of the 2 Bedroom and 3 or more bedroom apartments are unknown for the Terrace Housing, a trip rate of 5 vehicles per dwelling in a peak hour was applied as per the RTA Guide to Traffic Generating Developments applicable for Medium Density Residential Buildings.
- **Library Block**: A trip rate of 3 vehicles per 100m^2 GFA in a peak hour was applied to the Community Hub Building as per the RTA Guide to Traffic Generating Developments applicable for Gymnasiums. The land use code was adopted based on the previous study assumptions.
- **Food & Beverage**: A trip rate of 5 vehicles per 100m^2 GFA in a peak hour was applied to food and beverage areas as per the RTA Guide to Traffic Generating Developments (Restaurants).
- **Retail and Commercial Facilities**: A trip rate of 1.78 vehicles per 100m^2 GFA and 3.71 vehicles per 100m^2 GFA was applied to the AM and PM Peaks, respectively as per the Appendix F3 of the 2013 RTA Guide to Traffic Generating Developments. The average trip rates of a typical Thursday of the surveyed sites were used to calculate the proposed trip rate.

Table 7 outlines the estimated trips for the AM and PM peaks for the TPV land uses.

Table 7 TPV Trip Generation Calculations

Land Use	YIELD	UNITS	AM Peak hr Trip Rate	PM Peak hr Trip Rate	AM Peak hr Trips	PM Peak hr Trips
Street Retail (Section 51)	1840	m^2	0.0178	0.0371	33	68
Ground Floor Retail (Section 51)	5600	m^2	0.0178	0.0371	100	208
Supermarkets (Section 51)	6480	m^2	0.0178	0.0371	115	240
Food & Beverage (Section 51)	1120	m^2	0.05	0.05	56	56
Community Hub Building (Section 88)	1200	m^2	0.03	0.03	36	36
Tower Residential (Section 51)	164	dwellings	0.40	0.40	66	66
Terrace Housing (Section 51)	30	dwellings	0.50	0.50	15	15
Commercial (Section 53)	2100	m^2	0.0178	0.0371	37	78
Apartments (Section 53)	36	dwellings	0.40	0.40	14	14

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5.2 TPV Traffic Distribution

The distribution of TPV trips on the surrounding road network was based on travel patterns shown in the CSTM. This is discussed in detail in Section 5.4. The assumed inbound/outbound splits for the TPV trips in the AM and PM peak hours is summarised in Table 8.

Table 8 TPV Land Uses Trip Distribution

Land Use	AM Peak		PM Peak	
	IN%	OUT%	IN%	OUT%
Street Retail (Section 51)	50%	50%	50%	50%
Ground Floor Retail (Section 51)	50%	50%	50%	50%
Supermarkets (Section 51)	50%	50%	50%	50%
Food & Beverage (Section 51)	50%	50%	70%	30%
Community Hub Building (Section 88)	50%	50%	50%	50%
Tower Residential (Section 51)	20%	80%	80%	20%
Terrace Housing (Section 51)	20%	80%	80%	20%
Commercial (Section 53)	50%	50%	50%	50%
Apartments (Section 53)	20%	80%	80%	20%

5.3 Analysis Approach

Sidra Intersection modelling was undertaken to estimate the operation of key intersections adjacent to the centre. Sidra is a micro-analytic lane-based analysis tool. Sidra Intersection 8.0 was used for this study.

The intersections which were analysed as part of the base year and future year analysis (which were agreed with TCCS) are shown in Figure 15 and listed below:

- Site1: Southern Cross Drive / Starke Street Intersection
- Site2: Southern Cross Drive / Florey Drive Intersection
- Site3: Southern Cross Drive / Moyes Crescent Intersection.

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Figure 15 Sidra Analysis Intersections

A linked Sidra intersection model was developed for the above intersections. Table 9 of the RTA Guide to Traffic Generating Developments provides a guide in relation to LOS and acceptable operation levels SIDRA analysis.

Average delay, Level of Service (LOS), 95th Percentile Queue Length and Degree of Saturation (DoS) were considered as the key metrics to assess the intersection performance. The SIDRA models have been set to measure LOS by the Delay RTA NSW method.

Table 9 Sidra Level of Service Parameters

Level of Service	Average Delay / Vehicle (sec/veh)	Traffic Signals and Roundabouts
A	Less than 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	Demand exceeds capacity

TCCS has identified the following performance thresholds in their Sidra Guidelines:

- Degree of Saturation – Less than or equal to 0.9
- Desired LOS – Los E or better.

Signal phases and sequences, minimum green, maximum green, Interphase timings were coded based on TCCS standards and the available SCATS data. The Network and the Routes Function of the Sidra was used to determine the optimum phases splits and the offsets between the sites. The routes were optimised along Southern Cross Dr eastbound direction in the AM Peak and the westbound direction in the PM Peak.

This report has tested future scenarios for the assumed TPV opening year of 2025 and a horizon year of 2035 in the weekday AM and PM peak hours. In the Belconnen Better Intersections study, it was identified that the existing network layout along Southern Cross Drive between Starke Street and Florey Drive would operate at LOS F in the long term.

The analysis in this report has tested the existing network layout in 2025 and 2035 to confirm the Belconnen Better Intersections findings that the road network will operate with demand exceeding the capacity with the background traffic, without the TPV development. Future scenarios with the upgrades (mitigations) recommended in the Belconnen Better Intersections study have also been tested, with and without TPV development traffic. An overview of the proposed mitigations is given in Section 5.8.

The following scenarios were tested in Sidra for this study:

- **Base Year 2021**
- **Opening Year 2025**
    - Base Case Existing Network Layout
    - Base Case with Mitigations
    - Base Case with Mitigations Plus TPV Development
- **Horizon Year 2035**
    - Base Case Existing Network Layout
    - Base Case with Mitigations
    - Base Case with Mitigations Plus TPV Development.

5.4 Base Year (2021) Traffic Flows and Analysis

Due to the ongoing construction for the upgradation of Southern Cross Drive / Starke Street intersection, traffic surveys were not conducted for this study. Hence, AECOM used the 2020 traffic survey flows calibrated to Pre-Covid levels for Southern Cross Drive / Starke Street intersection presented in ‘Belconnen Better Intersections Report.

AECOM has also obtained the 2021 SCATS data for April month for the Southern Cross Drive / Florey Drive intersection from TCCS. TCCS has advised AECOM that there is an overall increase in traffic levels within ACT in 2021 when compared to 2020. The Florey Drive SCATS data was calibrated to pre-Covid SCATS data based on 13 November 2019 when there were no pandemic related restrictions were in place.

It was proposed to use the 2021 SCATS data to benchmark the 2020 flows from the Belconnen Better Intersections report for the base year analysis.

However, the pre-Covid calibrated SCATS data for the Florey Drive intersection was found to be lower than the 2020 calibrated traffic survey data of the Belconnen Better Intersections report. Hence, it was decided to use the flows of 2020 ‘Belconnen Better Intersections’ Report for the 2021 base year analysis as the more conservative set of volumes.

Furthermore, it was also observed that the 2020 flows used for the Sidra analysis for the Starke Street intersection and the Florey Drive intersection in the Belconnen Better Intersections report was not balanced, which indicate missing flows (about 200 vph) between these two intersections. AECOM has balanced the flows for Florey Drive based on the Starke Street intersection to accurately represent the base year flows.

Moreover, the Southern Cross Drive / Moyes Crescent intersection was not in the scope of the Belconnen Better Intersections report. Hence, to estimate the flows for this intersection, AECOM has used traffic counts from the previous AECOM 2016 Study and balanced them against the Florey Drive intersection 2020 traffic flows. The resulting flows for the study intersections for the 2021 AM and PM peaks are presented in Table 10.

Table 10 Base Year 2021 Flows

Uplifted AM Peak Hour Volumes - 2021												
Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Southern Cross / Starke St				419	287		191		216		426	289
Southern Cross / Florey Dr	516		332		374	147				138	504	
Southern Cross / Moyes Cr				0	447		74		0		1,017	3

Uplifted PM Peak Hour Volumes - 2021												
Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Southern Cross / Starke St				322	385		321		309		306	181
Southern Cross / Florey Dr	181		171		536	365				265	350	
Southern Cross / Moyes Cr				0	783		118		0		494	37

The Sidra analysis files were developed with recommended TCCS parameters and tested with the volumes presented in Table 10 for the base year 2021 analysis.

As the Starke St intersection is currently being upgraded, this intersection was considered as a signalized intersection in the base year analysis. The Sidra layout is shown in Figure 16.

Figure 16 Base Year Sidra Layout

A summary of the Base Year analysis outputs are presented in Table 11 to Table 13 for the study intersections.

Table 11 Southern Cross Drive / Starke Street – Sidra Base Year Results Summary

Movement		DOS [v/c]	Average Delay [s]	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.16	7s	10m	A
	Right	1.61	591s	318m	F
East	Left	0.78	21s	133m	B
	Through	0.78	16s	133m	B
West	Through	0.64	7s	68m	A
	Right	0.86	48s	94m	D
Overall		**1.61**	**88s**	**318m**	**F**
PM Peak					
South	Left	0.30	9s	26m	A
	Right	1.28	306s	315m	F
East	Left	0.80	25s	156m	B
	Through	0.80	19s	156m	B
West	Through	0.37	7s	40m	A
	Right	0.81	48s	57m	D
Overall		**1.28**	**68s**	**315m**	**E**

Table 12 Southern Cross Drive / Florey Drive – Sidra Base Year Results Summary

Movement		DOS [v/c]	Average Delay [s]	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.46	16s	74m	B
	Right	0.94	62s	54m	E
North	Left	1.09	143s	573m	F
	Right	1.09	143s	573m	F
West	Left	1.03	71s	220m	F
	Through	1.03	66s	220m	E
Overall		**1.09**	**90s**	**573m**	**F**
PM Peak					
East	Through	0.51	7s	76m	A
	Right	0.96	55s	103m	D
North	Left	1.08	136s	218m	F
	Right	1.08	136s	218m	F
West	Left	0.90	47s	183m	D
	Through	0.90	41s	183m	C
Overall		**1.08**	**53s**	**218m**	**D**

Table 13 Southern Cross Drive / Moyes Crescent – Sidra Base Year Results Summary

Movement		DOS [v/c]	Average Delay [s]	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.10	8s	3m	LOS A
	Right	0.10	11s	3m	LOS A
East	Left	0.00	6s	0m	LOS A
	Through	0.24	0s	0m	LOS A
West	Through	0.24	0s	0m	LOS A
	Right	0.00	8s	0m	LOS A
Overall		**0.24**	**1s**	**3m**	**NA**
PM Peak					
South	Left	0.27	13s	7m	LOS A
	Right	0.27	24s	7m	LOS B
East	Left	0.00	6s	0m	LOS A
	Through	0.42	0s	0m	LOS A
West	Through	0.12	0s	0m	LOS A
	Right	0.07	12s	2m	LOS A
Overall		**0.42**	**2s**	**7m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

The results indicate that the Starke Street intersection and the Florey Drive Intersection are expected to operate with poor level of service in both AM and PM peaks under the current scenarios. It is evident from the analysis that due to the close spacing between these intersections, the south-approach right turn movement from Starke St and the west-approach left turn movement/ north-approach right turn movement at Florey Drive are operating with LOS F with DoS higher than 1.0. This is higher than the TCCS recommended threshold, indicating that this intersection is experiencing demand which exceeds its capacity.

The Moyes Crescent intersection is operating with a good level of service.

These results are in contrast with the ‘Belconnen Better Intersections’ Report, where these two intersections were found to be operating with an acceptable level of service. However, AECOM considers that the following were not considered in the ‘Belconnen Better Intersections’ Report:

- **Unbalanced Flows**: The analysis presented in the ‘Belconnen Better Intersections’ Report did not account for flow balancing between these two closely spaced intersections which resulted in missing flows midblock. In this study, AECOM has balanced the flows and hence the demand flows are higher when compared to ‘Belconnen Better Intersections’ Report.
- **Approach Distances**: The ‘Belconnen Better Intersections’ Report only considered the Starke St and Florey Dr intersections with an approach distance of 135m whereas this study includes the Moyes Crescent intersection too, which is also closely a spaced intersection with an approach distance of 255m compared to the default 500m approach distance.
- **Lane Capacities**: It was also observed that the lane capacities calculated by Sidra in the Belconnen Better Intersections report are consistently higher than the lane capacities calculated in AECOM analysis. However, AECOM is unable to verify the changes to the standard parameters and saturation flow rates used in Belconnen Better Intersections. The parameters used in the AECOM analysis follows the TCCS recommended parameters and settings.

These factors contribute to the poor operation of these intersections from the base year onwards, with the existing network layout. These intersections may currently be operating with a more acceptable level of service compared to the analysis, which is calibrated to the pre-Covid traffic levels, whereas the current traffic volumes on site may not have returned to pre-Covid levels yet.

5.5 Opening Year 2025 and Horizon Year 2035 Traffic Flows

To determine the traffic flows for the Opening Year and the Horizon Year, AECOM has used the 2041 traffic flows presented in the Appendix G of the ‘Belconnen Better Intersections’ Report, which provides estimated traffic flows for Starke Street intersection and Florey Drive intersection. These flows reflect the 2020 surveyed counts, plus growth from the CSTM. The traffic flows for the Moyes Crescent intersection were balanced with the 2041 flows for the Florey Drive intersection.

The 2041 volumes were interpolated to 2025 and 2035 flows based on a projected annual growth of 1%, which was observed in the CSTM population data for the Kippax Zone.

Similar to the Base Year traffic flows, AECOM has balanced the traffic flows at Florey Drive intersection and the Moyes Crescent intersection based on the Starke Street intersection flows. The resulting flows were considered for the 2025 and 2035 flows Base Case (without TPV trips) scenarios.

The distribution of TPV development trips on the road network was calculated as follows:

1. The 2041 CSTM model land uses in the Kippax Centre zone was compared against the future proposed land uses outlined in the 2016 AECOM report. The increase in land uses in the CSTM is broadly similar to the future yields outlined in the 2016 AECOM study, so it was assumed that the TPV yields are not reflected in the CSTM.
2. The trip distribution of this zone was extracted using Select Link Analysis of the relevant CSTM zone for the AM and PM peaks. The outputs are presented in Figure 17 and Figure 18. It was observed that the majority of Kippax Centre traffic was travelling south and only about 15% and 30% of the development traffic was utilizing the study intersections on the north side during AM and PM peaks, respectively. The traffic distribution to the north in the AM was considered low and hence the PM peak distribution was adopted for the AM peak.
3. The additional peak hour traffic generated by the TPV land uses were proportionated based on the CSTM traffic distribution and added to the respective intersection flows of 2025 and 2035 scenarios.
4. The 2016 AECOM Study highlighted that if the Road A (proposed link to Moyes Cr) is connected to the commercial facilities, it would result in an increased peak hour volume along this road which would be utilized to access the Centre which could result in vehicles rat-running and safety issues. However, in the TPV, the Road A will only serve the residential land uses and there will be no direct connections to the commercial facilities. Hence the Road A will not experience as much traffic as highlighted in the 2016 AECOM study and it is expected there will not be any rat running as a result
5. As the Road A only serves to the Section 51 residential land use (Terrace House). The peak hour trips calculated for this development were distributed with an assumption of 70% Left turn and 30% Right Turn at the intersection of this road with Moyes Crescent.
6. The peak hour flows calculated above for the Base Case and Base Case Plus TPV Development scenarios are provided in Appendix B to Appendix D.

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Figure 17 CSTM Kippax Zone Traffic Distribution – AM Peak

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Figure 18 CSTM Kippax Zone Traffic Distribution – PM Peak

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5.6 Opening Year 2025 - Base Case Existing Network Layout

The Base Case Existing Network Layout scenario consists of the Opening Year 2025 traffic flows without the TPV traffic, tested against the existing network layouts. The summary of the Base Case Existing Network Layout (2025) outputs are presented in Table 14 to Table 16 for the study intersections.

Table 14 Southern Cross Drive / Starke Street – Base Case Existing Network Layout (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.20	7s	13m	A
	Right	1.62	607s	426m	F
East	Left	0.69	20s	110m	B
	Through	0.69	14s	110m	A
West	Through	0.59	8s	69m	A
	Right	0.88	55s	103m	D
Overall		**1.62**	**110s**	**426m**	**F**
PM Peak					
South	Left	0.31	10s	34m	A
	Right	1.09	150s	226m	F
East	Left	1.06	100s	220m	F
	Through	1.06	95s	220m	F
West	Through	0.67	17s	73m	B
	Right	1.43	429s	235m	F
Overall		**1.43**	**110s**	**235m**	**F**

Table 15 Southern Cross Drive / Florey Drive – Base Case Existing Network Layout (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.39	16s	73m	B
	Right	1.31	333s	198m	F
North	Left	1.27	294s	1008m	F
	Right	1.27	294s	1008m	F
West	Left	0.90	56s	211m	D
	Through	0.90	50s	211m	D
Overall		**1.31**	**180s**	**1007m**	**F**
PM Peak					
East	Through	0.93	47s	237m	D
	Right	1.86	801s	367m	F
North	Left	1.03	100s	223m	F
	Right	1.03	100s	223m	F
West	Left	0.94	50s	220m	D
	Through	0.94	44s	220m	D
Overall		**1.86**	**233s**	**367m**	**F**

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Table 16 Southern Cross Drive / Moyes Crescent – Base Case Existing Network Layout (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.03	9s	1m	A
	Right	0.03	16s	1m	B
East	Left	0.00	6s	0m	A
	Through	0.28	0s	0m	A
West	Through	0.20	0s	0m	A
	Right	0.29	9s	8m	A
Overall		**0.29**	**1s**	**8m**	**NA**
PM Peak					
South	Left	1.13	155s	148m	F
	Right	1.13	169s	148m	F
East	Left	0.00	6s	0m	A
	Through	0.45	0s	344m	A
West	Through	0.16	0s	0m	A
	Right	0.04	13s	1m	A
Overall		**1.13**	**20s**	**344m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

The results indicate that the issues identified in the base year are amplified with the additional projected background traffic. With the increased traffic flows and with the single lane approach and exit lanes along Starke St and Florey Dr, it is evident that the existing road infrastructure may be unable to accommodate the 2025 demands.

5.7 Horizon Year 2035 - Base Case Existing Network Layout

The Base Case Existing Network Layout for the Horizon Year consists of the 2035 traffic flows without the TPV development traffic tested against the existing network layouts. The summary of the Base Case Existing Network Layout (2035) analysis outputs are presented in Table 17 to Table 19 for the study intersections.

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Table 17 Southern Cross Drive / Starke Street – Base Case Existing Network Layout (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.22	7s	16m	A
	Right	1.81	778s	542m	F
East	Left	0.74	22s	137m	B
	Through	0.74	16s	137m	B
West	Through	0.70	10s	98m	A
	Right	0.90	63s	131m	E
Overall		**1.81**	**141s**	**542m**	**F**
PM Peak					
South	Left	0.34	10s	39m	A
	Right	1.20	242s	330m	F
East	Left	1.11	147s	220m	F
	Through	1.11	141s	220m	F
West	Through	0.74	21s	92m	B
	Right	1.58	559s	301m	F
Overall		**1.58**	**158s**	**330m**	**F**

Table 18 Southern Cross Drive / Florey Drive – Base Case Existing Network Layout (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.43	16s	87m	B
	Right	1.42	426s	260m	F
North	Left	1.51	510s	1532m	F
	Right	1.51	510s	1532m	F
West	Left	0.89	55s	220m	D
	Through	0.89	49s	220m	D
Overall		**1.51**	**289s**	**1532m**	**F**
PM Peak					
East	Through	0.99	77s	322m	F
	Right	1.95	878s	367m	F
North	Left	1.08	133s	294m	F
	Right	1.08	133s	294m	F
West	Left	1.04	88s	220m	F
	Through	1.04	82s	220m	F
Overall		**1.95**	**275s**	**367m**	**F**

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Table 19 Southern Cross Drive / Moyes Crescent – Base Case Existing Network Layout (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.04	9s	1m	A
	Right	0.04	17s	1m	B
East	Left	0.00	6s	0m	A
	Through	0.38	0s	0m	A
West	Through	0.21	0s	0m	A
	Right	0.32	10s	9m	A
Overall		**0.38**	**2s**	**9m**	**NA**
PM Peak					
South	Left	1.53	505s	410m	F
	Right	1.53	518s	410m	F
East	Left	0.00	6s	0m	A
	Through	0.50	0s	424m	A
West	Through	0.16	0s	0m	A
	Right	0.05	15s	1m	B
Overall		**1.53**	**68s**	**424m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

It can be observed that even without the TPV land uses the surrounding road infrastructure performs poorly with significant congestion and delays.

5.8 Opening Year 2025 - Base Case with Mitigations

As the study intersections are expected to fail with the existing network layout, AECOM has considered the potential improvement works highlighted in the Section 3.5.5 of the 'Belconnen Better Intersections' Report. It is unknown whether the mitigations are committed for future years. However, AECOM considers that these measures are likely to be required in the future to accommodate projected growth in background traffic, even without the proposed TPV traffic.

The mitigations proposed in the Belconnen Better Intersections report are as follows,

Southern Cross Drive / Starke Street

- **East Approach**: Approach lanes increased to two (2) lanes from the existing single shared lane to one dedicated lane for the through movement and a shared through and left turn lane. The exit lanes are increased to two (2) lanes from the single lane exit.
- **West Approach**: The through movement is widened to two (2) lanes from the existing single lane. The pocket lane for the right is retained. The exit lanes are increased to two (2) lanes from the single lane exit.

Southern Cross Drive / Florey Drive

- **North Approach**: The approach lane capacity is widened from the existing shared left and right single lane to two (2) lanes with a dedicated right turn lane and short lane shared for the left and right turn, thus increasing the capacity for the right turn movements. The existing continuous left turn arrangement needs to be modified to a yield control.
- **East Approach**: The through movement capacity for the east approach is widened to two (2) dedicated lanes from the existing single lane.

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- **West Approach**: The incoming lanes are increased to two (2) lanes with a dedicated lane for through movement and a shared lane for through and left turn movement. This arrangement will ease the congestion caused by the closed spacing of the Starke Street intersection and the Florey Drive intersection. The exit lanes are increased to two (2) lanes from the single lane exit.

Southern Cross Drive / Moyes Crescent

The mitigations for this intersection are proposed by AECOM, as the Moyes Crescent intersection is not in the scope of Belconnen Better Intersections report. However, the mitigations are based on the entry and exit lanes of the mitigated layouts to the Florey Drive intersection proposed by Belconnen Better Intersections report.

- **East Approach**: Approach lanes increased to two (2) full lanes from the existing single for through movement and a short lane for the left turn movement. In the revised arrangement, one lane is dedicated for through movement and another lane is shared between through and left turn movement.
- **South Approach:** The existing shared left and right turn lane is proposed into a dedicated right turn lane and short lane for the left turn movement.
- **West Approach**: The exit lanes of the west approach is widened to two (2) lanes from the existing single lane exit.

The potential improvements to the study intersections are shown in Figure 19.

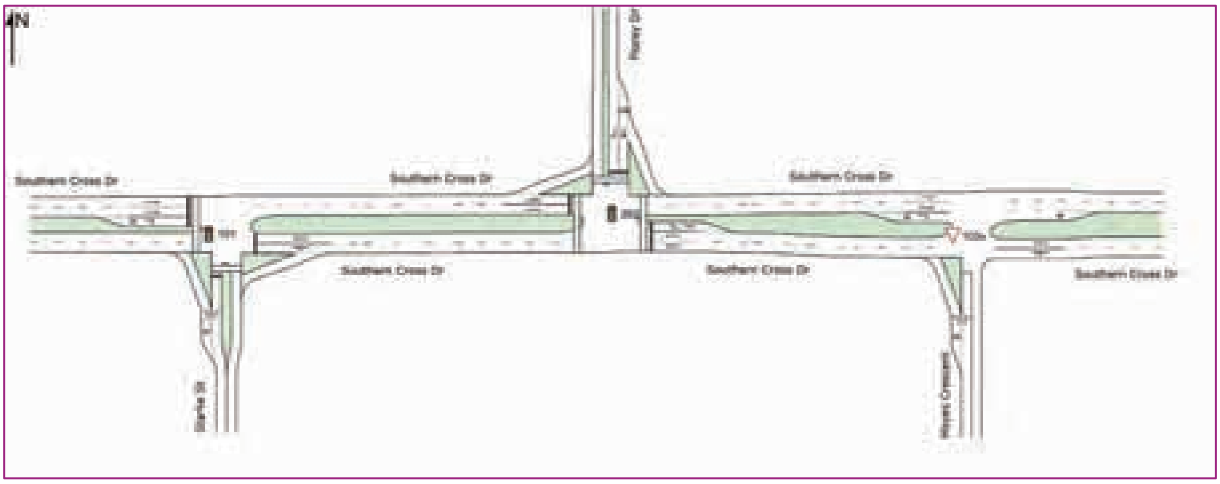

Figure 19 Study Intersections - Mitigation Layout

The summary of the Base Case with Mitigations for the Opening Year 2025 analysis outputs are presented in Table 20 to Table 22 for the study intersections

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Table 20 Southern Cross Drive / Starke Street – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.20	8s	19m	A
	Right	0.56	39s	86m	C
East	Left	0.53	15s	60m	B
	Through	0.53	35s	83m	C
West	Through	0.18	10s	32m	A
	Right	0.54	38s	84m	C
Overall		**0.56**	**23s**	**86m**	**B**
PM Peak					
South	Left	0.28	9s	32m	A
	Right	0.62	34s	95m	C
East	Left	0.59	21s	79m	B
	Through	0.59	29s	102m	C
West	Through	0.16	12s	29m	A
	Right	0.60	47s	65m	D
Overall		**0.62**	**24s**	**102m**	**B**

Table 21 Southern Cross Drive / Florey Drive – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.17	11s	30m	A
	Right	0.54	46s	60m	D
North	Left	0.56	13s	102m	A
	Right	0.56	36s	102m	C
West	Left	0.55	36s	84m	C
	Through	0.55	30s	103m	C
Overall		**0.56**	**25s**	**103m**	**B**
PM Peak					
East	Through	0.20	4s	29m	A
	Right	0.63	29s	138m	C
North	Left	0.57	37s	80m	C
	Right	0.57	48s	80m	D
West	Left	0.59	29s	76m	C
	Through	0.59	39s	96m	C
Overall		**0.63**	**27s**	**138m**	**B**

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Table 22 Southern Cross Drive / Moyes Crescent – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.02	7s	0m	A
	Right	0.02	66s	0m	E
East	Left	0.14	6s	0m	A
	Through	0.14	0s	0m	A
West	Through	0.25	0s	0m	A
	Right	0.33	9s	10m	A
Overall		**0.33**	**2s**	**10m**	**NA**
PM Peak					
South	Left	0.27	8s	8m	A
	Right	0.01	42s	0m	C
East	Left	0.23	6s	0m	A
	Through	0.23	0s	0m	A
West	Through	0.16	0s	0m	A
	Right	0.03	11s	1m	A
Overall		**0.27**	**1s**	**8m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

The results indicate that all the intersections are estimated to operate with an acceptable LOS.

5.9 Horizon Year 2035 - Base Case with Mitigations

The upgraded Base Case with Mitigations layout was tested with 2035 flows without the TPV development traffic and the results are presented in the following tables. It is estimated that the mitigated layouts are capable to cater the Horizon Year traffic without any adverse impacts.

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Table 23 Southern Cross Drive / Starke Street – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.21	8s	22m	A
	Right	0.59	37s	92m	C
East	Left	0.60	16s	69m	B
	Through	0.60	35s	92m	C
West	Through	0.21	11s	39m	A
	Right	0.64	41s	98m	C
Overall		**0.64**	**23s**	**98m**	**B**
PM Peak					
South	Left	0.32	9s	40m	A
	Right	0.71	34s	106m	C
East	Left	0.68	21s	88m	B
	Through	0.68	31s	114m	C
West	Through	0.18	14s	34m	A
	Right	0.70	50s	75m	D
Overall		**0.71**	**25s**	**114m**	**B**

Table 24 Southern Cross Drive / Florey Drive – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.19	11s	34m	A
	Right	0.60	47s	68m	D
North	Left	0.62	15s	113m	B
	Right	0.62	37s	113m	C
West	Left	0.61	35s	94m	C
	Through	0.61	31s	115m	C
Overall		**0.62**	**25s**	**115m**	**B**
PM Peak					
East	Through	0.22	4s	33m	A
	Right	0.70	30s	159m	C
North	Left	0.64	38s	88m	C
	Right	0.64	49s	88m	D
West	Left	0.65	33s	99m	C
	Through	0.65	41s	108m	C
Overall		**0.70**	**28s**	**159m**	**B**

Table 25 Southern Cross Drive / Moyes Crescent – Base Case with Mitigations (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.02	7s	0m	A
	Right	0.03	92s	1m	F
East	Left	0.16	6s	0m	A
	Through	0.16	0s	0m	A
West	Through	0.27	0s	0m	A
	Right	0.39	10s	13m	A
Overall		**0.39**	**2s**	**13m**	**NA**
PM Peak					
South	Left	0.31	9s	10m	A
	Right	0.02	55s	0m	D
East	Left	0.25	6s	0m	A
	Through	0.25	0s	0m	A
West	Through	0.18	0s	0m	A
	Right	0.04	13s	1m	A
Overall		**0.31**	**1s**	**10m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

5.10 Opening Year 2025 – Base Case with Mitigations Plus TPV Development

The previous sections analysed the mitigation layouts without the TPV Development traffic and highlighted that the mitigated layout will perform with good level of service. In this scenario, the Base Case with Mitigations Plus TPV Development traffic was tested for the Opening Year (2025) and the results are presented in Table 26 to Table 28.

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Table 26 Southern Cross Drive / Starke Street – Base Case with Mitigations Plus TPV Development (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.24	8s	24m	A
	Right	0.61	39s	91m	C
East	Left	0.57	15s	63m	B
	Through	0.57	36s	84m	C
West	Through	0.18	10s	33m	A
	Right	0.59	38s	98m	C
Overall		**0.61**	**23s**	**98m**	**B**
PM Peak					
South	Left	0.34	9s	44m	A
	Right	0.73	36s	107m	C
East	Left	0.71	22s	86m	B
	Through	0.71	34s	108m	C
West	Through	0.16	13s	29m	A
	Right	0.71	46s	96m	D
Overall		**0.73**	**26s**	**108m**	**B**

Table 27 Southern Cross Drive / Florey Drive – Base Case with Mitigations Plus TPV Development (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.17	11s	30m	A
	Right	0.56	46s	64m	D
North	Left	0.58	14s	103m	A
	Right	0.58	36s	103m	C
West	Left	0.57	36s	86m	C
	Through	0.57	30s	106m	C
Overall		**0.58**	**25s**	**106m**	**B**
PM Peak					
East	Through	0.21	5s	32m	A
	Right	0.65	30s	141m	C
North	Left	0.59	37s	82m	C
	Right	0.59	46s	82m	D
West	Left	0.62	30s	87m	C
	Through	0.62	40s	98m	C
Overall		**0.65**	**28s**	**141m**	**B**

D R A F T

Table 28 Southern Cross Drive / Moyes Crescent – Base Case with Mitigations Plus TPV Development (2025) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.02	7s	1m	A
	Right	0.02	65s	0m	E
East	Left	0.14	6s	0m	A
	Through	0.14	0s	0m	A
West	Through	0.25	0s	0m	A
	Right	0.33	9s	10m	A
Overall		**0.33**	**2s**	**10m**	**NA**
PM Peak					
South	Left	0.27	8s	8m	A
	Right	0.01	42s	0m	C
East	Left	0.23	6s	0m	A
	Through	0.23	0s	0m	A
West	Through	0.16	0s	0m	A
	Right	0.05	11s	1m	A
Overall		**0.27**	**1s**	**8m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

The results indicate that the intersections will perform with an acceptable level of service even with the additional traffic generated by the TPV development.

5.11 Horizon Year 2035 –With Development and with Mitigation Layout

The mitigation layout was tested with 2035 Horizon Year flows along with the TPV development traffic. The results indicate that the intersections will still be able to perform with good LOS provided if the mitigations are implemented.

Table 29 Southern Cross Drive / Starke Street – Base Case with Mitigations Plus TPV Development (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.26	8s	4m	A
	Right	0.68	36s	14m	C
East	Left	0.65	16s	67m	B
	Through	0.65	36s	90m	C
West	Through	0.22	12s	40m	A
	Right	0.69	41s	113m	C
Overall		**0.69**	24s	**113m**	**B**
PM Peak					
South	Left	0.38	10s	53m	A
	Right	0.83	41s	130m	C
East	Left	0.79	24s	101m	B
	Through	0.79	37s	127m	C
West	Through	0.19	14s	34m	A
	Right	0.83	54s	115m	D
Overall		**0.83**	**29s**	**130m**	**C**

Table 30 Southern Cross Drive / Florey Drive – Base Case with Mitigations Plus TPV Development (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
East	Through	0.19	12s	35m	A
	Right	0.74	31s	44m	C
North	Left	0.61	13s	125m	A
	Right	0.61	36s	125m	C
West	Left	0.75	31s	111m	C
	Through	0.75	33s	130m	C
Overall		**0.75**	**24s**	**130m**	**B**
PM Peak					
East	Through	0.23	5s	36m	A
	Right	0.72	31s	162m	C
North	Left	0.64	39s	92m	C
	Right	0.64	48s	92m	D
West	Left	0.69	36s	109m	C
	Through	0.69	43s	110m	D
Overall		**0.72**	**29s**	**162m**	**C**

Table 31 Southern Cross Drive / Moyes Crescent – Base Case with Mitigations Plus TPV Development (2035) Results Summary

Movement		DOS	Average Delay	95th Percentile Queue Length	LOS
AM Peak					
South	Left	0.03	7s	1m	A
	Right	0.03	90s	1m	F
East	Left	0.16	6s	0m	A
	Through	0.16	0s	0m	A
West	Through	0.27	0s	0m	A
	Right	0.39	10s	13m	A
Overall		**0.39**	**2s**	**13m**	**NA**
PM Peak					
South	Left	0.31	9s	10m	A
	Right	0.02	56s	0m	D
East	Left	0.25	6s	0m	A
	Through	0.25	0s	0m	A
West	Through	0.18	0s	0m	A
	Right	0.06	13s	1m	A
Overall		**0.31**	**1s**	**10m**	**NA**

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. Sidra does not calculate the overall LOS for priority intersections. Only the individual movements are assessed.

6.0 Public Transport

6.1 Existing Bus Routes

AECOM been advised that bus interchange will remain at the current location compared to the various options developed in the 2016 AECOM Study. Figure 20 shows the existing bus stops and layover locations. The available kerb length on the current bus stop is 45m and the layover opposite the library is also approximately 45m, which would accommodate two buses in independent operation.

Two bus layovers (approximately 20m length) are located on Hardwick Crescent south-east of the main entrance. A secondary entrance to Kippax Fair is located to the north of the bus stops. The stops are all located within 200m of the Kippax Fair access points.

Figure 20 Kippax Group Centre – Existing Bus Stops and Layovers

Figure 21 shows the location of the study area in relation to the existing public transport routes. It can be seen that five bus routes are currently servicing Kippax Centre.

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Figure 21 **Existing Weekday Public Transport Network**

Table 32 outlines the existing bus routes and their peak and off-peak frequencies. The peak frequency of bus services for the Centre is 23 buses per hour, or approximately 1 bus service every 3 mins. Based on site observations and current local knowledge of the area this is considered a suitable frequency of bus services for the Centre.

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Table 32 Existing Weekday Bus Services – Kippax Group Centre

Route No	Route Description	AM Peak Hour Departure Frequency (8:00-9:00 am)	PM Peak Hour Arrival Frequency (3:45-4:45)
40	Fraser, Charnwood, Macgregor, Holt, Kippax, Latham, Florey, Belconnen Bus Stations	2	4
44	Kippax, Holt, Macgregor, Higgins, Belconnen Bus Stations	2	4
45	Kippax, Holt, Higgins, Hawker, Weetangera, Belconnen Bus Stations	3	3
903	Kippax to Strathnairn Loop via Kingsford Smith School and Macgregor Primary	4	5
R2	Rapid Service: Fraser, Dunlop, Macgregor, Kippax, Holt, Belconnen Bus Stations, Bruce, City Interchange, Parkes, Kingston, Fyshwick	5	7
TOTAL		**16**	**23**

6.2 Future Bus Routes and Facilities

The 2016 AECOM study analysed the existing public transport services and additional public transport services needed for the future expansion of the Kippax Centre. It was estimated that an additional 12 peak hour bus movements through the centre will be required to serve the West Belconnen area. It was also recommended that the existing bus station is relocated to directly north of the Kippax Library.

Various options were presented in the 2016 AECOM study and it is estimated that a total of 3 to 4 platforms (including the existing platforms) may be required depending on the individual option configuration. It was also identified that an additional 3 bus layovers are required along with the future potential locations of these layovers along the southern end of the Hardwick Crescent and the Moyes Crescent after the Flack Street.

It is noted that the TPV land uses will require additional bus services due to the increased public transport demand, which would need further investigation in subsequent stages of design. The Bus manoeuvrability and operation of the platforms will need to be confirmed through swept path analysis during the detailed design of the bus interchange. The following ACT Standard Drawings should be used for the design of the bus stops, layovers, and pavement markings.

- Drawing No. DS09-06 from TCCS standard drawings – 09 Traffic Control Devices – Part 1
- Drawing No. DS13-03-01 and DS13-03-02 from TCCS standard drawings – 13 Pedestrian and Cycle Facilities

Additionally, the future bus routes within the vicinity of the site was extracted from the CSTM 2041 model. It was observed that the CSTM only included additional school bus routes in addition to the existing bus routes. The route layer extracted from CSTM is shown in Figure 22 and the routes are listed below.

- Route 1052
- Route 1053
- Route 1058
- Route 1059
- Route 1227

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Source: Map Layer – ESRI Community Maps, Bus Routes – 2041 CSTM

Figure 22 Future Bus Routes Extract from 2041 CSTM

6.3 Future Light Rail Connectivity

The future Canberra Light Rail is proposed to be extended to Kippax along Southern Cross Drive. Figure 23 presents the indicative future expansion plans for the Canberra Light Rail. Kippax Centre would be serviced by the Stage 3 expansion works. The light rail would likely help to significantly increase the mode share of public transport travel to and from the Kippax Centre.

Source: Transport Canberra and City Services website

Figure 23 **ACT Light Rail Masterplan**

The 2016 AECOM study considered that the future light rail service will terminate at the Kippax Centre. However, the Figure 23 shows that the service might extend beyond this area. As the exact location of the stops are unknown, it is assumed that there is a potential stop near the intersection of Southern Cross Drive / Moyes Crescent, which is within a 400m radius. The optimal pedestrian route to this potential stop from the Kippax Centre is through Road B and then Road A to access the potential light rail stop. Alternatively, a shuttle service is recommended between the potential stop to the Kippax Centre Bus Stop through Moyes Crescent via Flack Street.

7.0 Active Transport Provision

7.1 Pedestrian Facilities

The existing Kippax Centre has been provided with pedestrian and cyclist paths throughout the site. It was observed that there are some issues in terms of pedestrian connectivity within the centre. The key pedestrian connectivity concerns are in relation to the current pedestrian barrier of Kippax Fair and the poor connectivity between Kippax Fair and the businesses in the western portion of the core of the Centre. The poor connectivity in this area is due to the Hardwick Crescent central parking facilities reducing the pedestrian permeability of the area and increasing the walking distance between local businesses.

The existing bicycle and pedestrian networks adjacent to the Centre are shown in Figure 24. It identifies the nearby shared paths and on-road cycle lane provisions in the area. The shared use paths provide an adequate level of pedestrian connectivity within the local network. On-road cycle lanes are provided on Southern Cross Drive west of the Florey Drive intersection. A Bike and Ride cage is located on Hardwick Crescent within the Centre.

Extension to the existing on-road cycle provisions should occur in the future arrangement. This includes on-road cycling on Starke Street and extension to the on-road cycling on Southern Cross Drive. Pedestrian refuges should also be considered on Starke Street to assist with walkability and improve at-grade crossings rather than reliance on underpass links.

The shared path proposed in the TPV between Hardwick Crescent and Moyes Crescent through Road A and Road B will improve the pedestrian and cyclist connectivity on the east side of the Kippax Centre.

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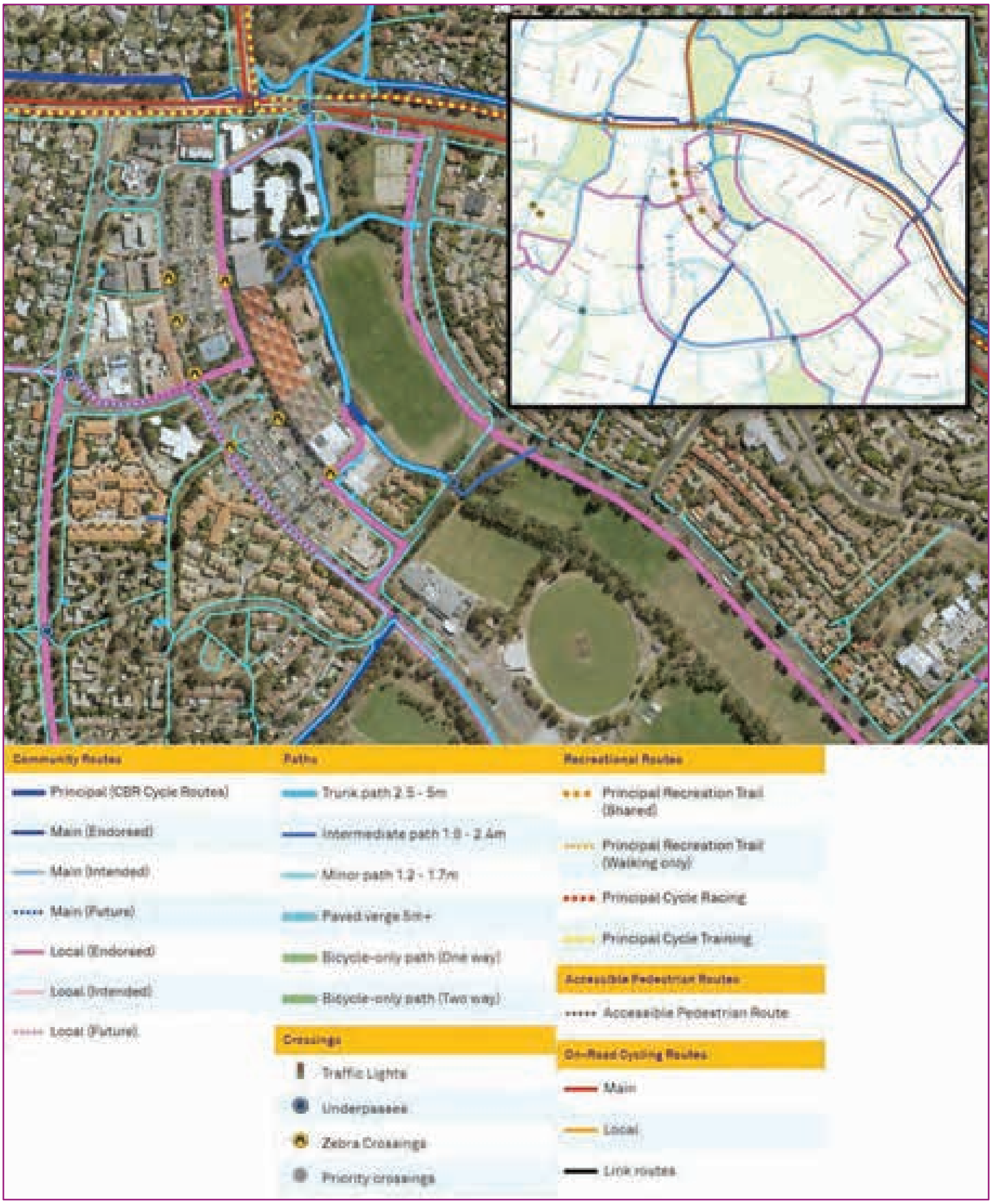

Source: https://activeinfrastructure.net.au/

Figure 24 Kippax Centre - Walking and Cycling Map

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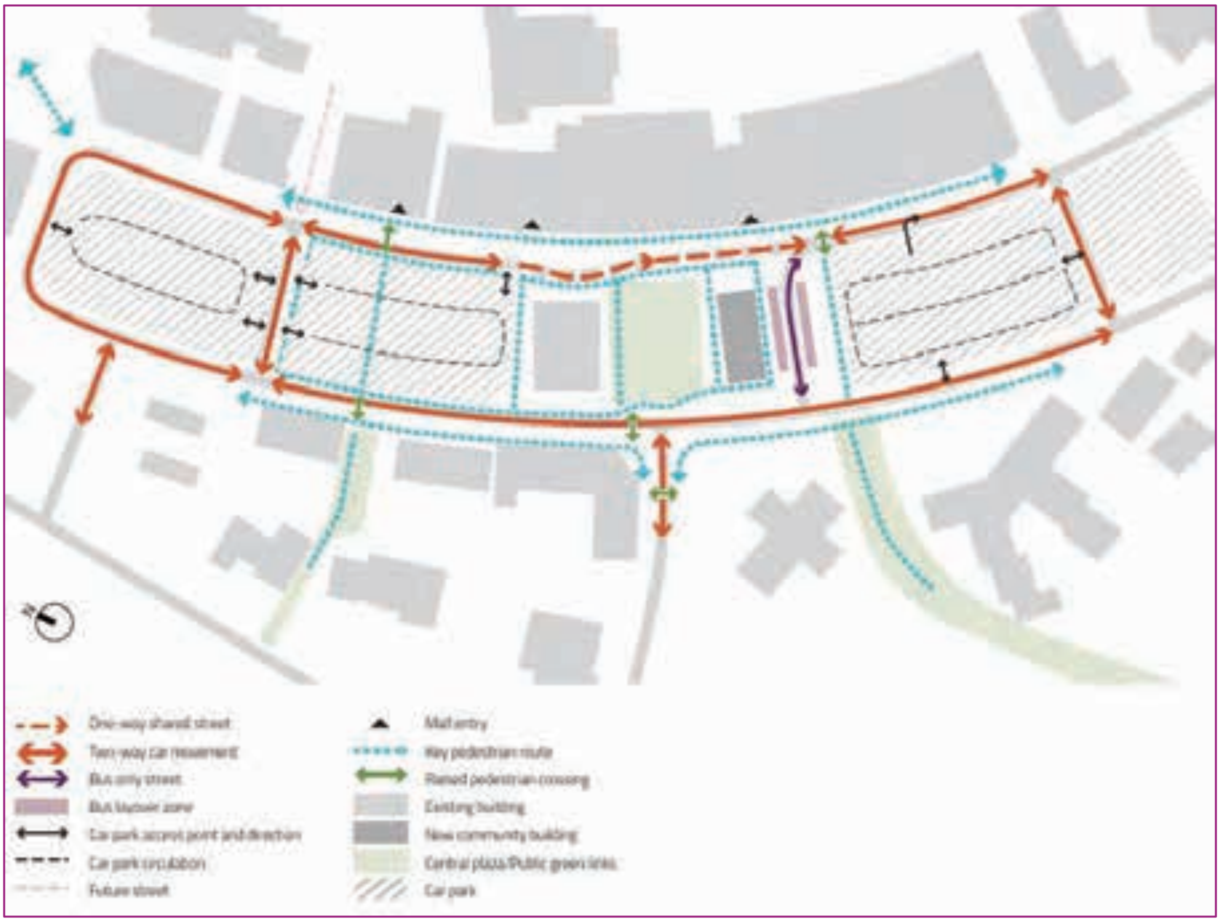
8.0 Circulation and Service/ Emergency Vehicle Access

8.1 Vehicular Circulation

AECOM has undertaken a high-level review of the circulation improvements to the Kippax Fair presented in the 'Kippax Group Centre Feasibility Study & Concept Plan' prepared by Harris Hobbs. The indicative circulation layout recommended in Harris Hobbs Study is presented in Figure 25. AECOM concurs with the circulation arrangements proposed in the Harris Hobbs study including the recommendations to modify the internal circulation of the southern car park from a two aisle to three aisle arrangement. A detailed circulation study is recommended at later stages by the Kippax Fair developer, once the masterplan and the access arrangements are finalized.



Source: Kippax Group Centre Feasibility Study & Concept Plan, Harris Hobbs

Figure 25 Circulation Improvements to Kippax Fair

8.2 Service Vehicles

Service vehicles can access the Centre from Southern Cross Drive via Starke Street to the west or via Moyes Crescent to the east. Heavy vehicles accessing Woolworths loading bay access Kippax Place via Hardwick Crescent in the south. ALDI's loading bay is accessed via Hardwick Crescent in the north of the Centre. Other businesses within the Centre are typically serviced via small rigid vehicles which utilise the loading zones provided within the at-grade car parks.

8.3 Emergency Vehicles

Emergency vehicles accessing the Centre via Southern Cross Drive can connect to the centre via Starke Street to the west and Moyes Crescent to the east. No notable barriers have been observed within the Centre which could restrict the ingress or egress of emergency vehicles from the centre.

Emergency vehicles may access the Centre from the Charnwood and the Belconnen Emergency Service Stations.

The service vehicle and the emergency vehicle access movements are shown in Figure 26. The emergency vehicles and the service vehicles will not use the Road A and Road B to access the site. These vehicles will traverse through Moyes Crescent and Flack Street to enter the Hardwick Crescent or via Florey Drive and Starke Street to access the TPV land uses.

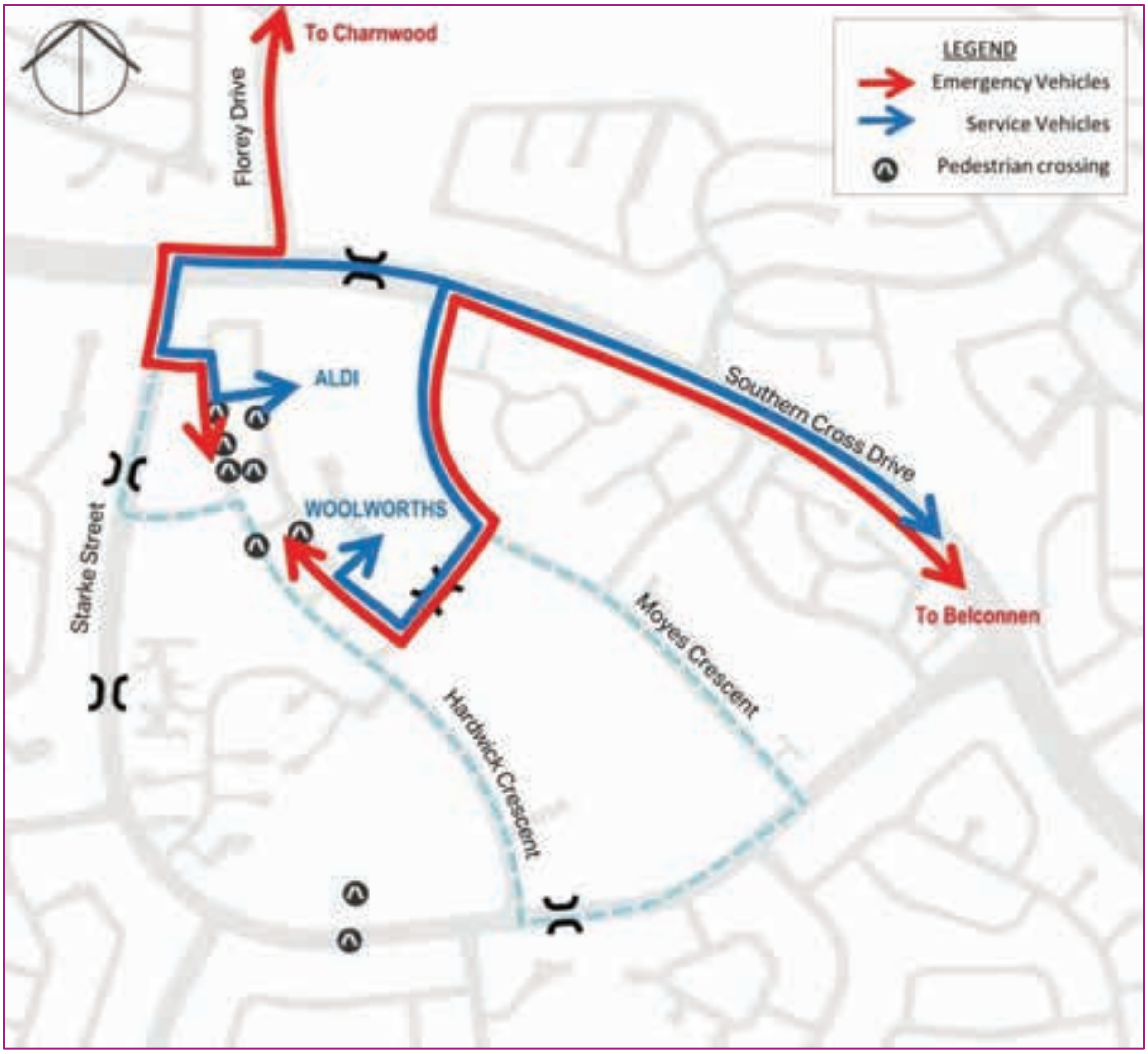


Figure 26 **Emergency and Service Vehicle Access**

9.0 Summary and Conclusion

The Kippax Group Centre is a key retail and amenity hub for the West Belconnen region. AECOM produced a traffic study for the Kippax Centre in 2016, which includes a detailed analysis of the transportation and movement aspects of the draft Kippax Master Plan. Since then, the master plan was approved in 2019 and a Territory Plan Variation (TPV) was approved in 2020.

This study provides a detailed analysis of the revised land uses and the yields of the approved TPV and its potential impacts on the surrounding transport network.

A summary of the key findings of the report are detailed below:

- The background documents provided to AECOM were reviewed to identify the extent of changes due to TPV and extract relevant data/ assumptions for use in the traffic assessment.
- The existing and future land uses were identified, and additional trips and parking requirements of the TPV were estimated and presented. The TPV generates an additional peak hour trips of about 420 and 689 in the AM and PM peak hours, respectively. The total parking requirement for the TPV land uses are 1199 spaces.
- Sidra analysis was conducted for base year 2021, opening year 2025 and horizon year 2035 for 'With TPV land use' and 'Without TPV land use'.
- During the analysis process, several assumptions were made to estimate the correct base year, opening year and the horizon year traffic flows. Future volumes were taken from the Belconnen Better Intersections study report, which considered growth from the CTSM. The estimated traffic flows were then tested using Sidra intersection modelling software for the key study intersections adjacent to the Kippax Centre. The study intersections are as follows,
    - Southern Cross Drive / Starke Street
    - Southern Cross Drive / Florey Drive and
    - Southern Cross Drive / Moyes Crescent
- The SIDRA results estimated that the study intersections existing configurations may operating with a poor level of service due to closely spaced intersections and insufficient road capacity of the current road infrastructure.
- It was estimated that the study intersections will perform poorly future years (2025 and 2035) with the existing and proposed land use facilities adjacent to the TPV site.
- AECOM tested the analysis scenarios with the road improvement measures identified in the Belconnen Better Intersections report. It was found that with these proposed measures, the study intersections were estimated to operate with an acceptable level of service in the future years for 'With' and 'Without' TPV land use scenarios.
- AECOM has also undertaken a high-level review of the public transport connectivity, pedestrian, service vehicles and emergency vehicles. It is recommended to undertake a further detailed analysis of these aspects once the masterplan and the access arrangements are finalised.

Appendix A

Appendix A Site Visit Photos

DRAFT

Appendix A Site Photos

Figure 1 Hardwick Crescent – Entrance to Kippax from Starke Street

D R A F T

Figure 2 View from Hardwick Crescent

Figure 3 Petrol Station Infrastructure at Hardwick Crescent

DRAFT

Figure 4 Construction road signs observed at Hardwick Crescent

DRAFT

Figure 5 Road island - Hardwick Crescent

Figure 6 Hardwick Crescent – View from Starke Street

Figure 7 Construction site observed at Southern Cross Drive and Starke Street

DRAFT

Figure 8 Bus stop observed on Southern Cross Drive

Figure 9 Public announcement of intersection signalisation observed on Southern Cross Drive

Figure 10 Pedestrian link to Kippax Precinct observed at Southern Cross Drive

Figure 11 Underpass between Southern Cross Drive / Florey Drive and Southern Cross Drive / Moyes Crescent

Figure 12 Accessibility Parking observed at Moyes Crescent

DRAFT

Figure 13 On Street parking observed at Moyes Crescent

DRAFT

Figure 14 On-street parking next to Kippax playing fields on Moyes Crescent

Figure 15 Kippax Playing Fields (Section 51) observed from Moyes Crescent

DRAFT

Figure 16 Underpass observed on Flack Street

Figure 17 Petrol station observed on Flack Street

Figure 18 40 Speed limit and bus stop observed on Hardwick Crescent

Figure 19 Parking lot observed off Kippax Precinct

Figure 20 Bus stop bay observed on Kippax Precinct

Figure 21 On-street parking observed on Kippax Precinct

Figure 22 Pedestrian Crossing Observed at Kippax Precinct

DRAFT

Figure 23 On-street parking observed at Kippax Precinct

DRAFT

Figure 24 Pedestrian crossing observed on Hardwick Crescent

Figure 25 Kippax Fair

Figure 26 Pedestrian crossing observed at Kippax Precinct

DRAFT

Figure 27 Parking bays observed at Kippax Precinct

Appendix B

Sidra Outputs - Base Year 2021

Base Year 2021 - Traffic Flows Estimation

00

2020 Flows

AM Peak

2020 Traffic Flows at Starke St & Florey Dr with Southern Cross Dr (Source: Appendix F from Belconnen Better Intersections Report, Calibrated to PreCovid Levels)

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				419	287		191		216		426	289	**1828**
Southern Cross / Florey Dr	516		233		262	147				125	458		**1741**

PM Peak

2020 Traffic Flows at Starke St & Florey Dr with Southern Cross Dr (Source: Appendix F from Belconnen Better Intersections Report, Calibrated to PreCovid Levels)

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				322	385		321		309		306	181	**1824**
Southern Cross / Florey Dr	181		148		463	365				222	293		**1672**

Peak Periods (Source: Pg3, Belconnen Better Intersections)

Time	From	To
AM Peak	8:15	9:15
PM Peak	16:30	17:30

Reference Intersection: Southern Cross / Starke St

Flow Balancing

	AM Peak	PM Peak
Starke St East Approach Exit	642	615
Florey Dr West Approach Entry	583	515
Starke St East Approach Entry	706	707
Florey Dr West Approach Exit	495	611

Factors

AM Peak	PM Peak
1.101	1.194
1.426	1.157

01

2020 Flows

AM Peak

2020 Traffic Flows at Starke St & Florey Dr with Southern Cross Dr (Source: Appendix F from Belconnen Better Intersections Report, Calibrated to PreCovid Levels)

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St	0	0	0	419	287	0	191	0	216	0	426	289	**1828**
Southern Cross / Florey Dr	516		**332**		**374**	147				**138**	**504**		**2011**

PM Peak

2020 Traffic Flows at Starke St & Florey Dr with Southern Cross Dr (Source: Appendix F from Belconnen Better Intersections Report, Calibrated to PreCovid Levels)

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St	0	0	0	322	385	0	321	0	309	0	306	181	**1824**
Southern Cross / Florey Dr	181		171		536	365				**265**	**350**		**1868**

02

2021 Flows - SCATS Benchmark

Southern Cross Dr / Florey Drive Benchmark from SCATS Data, Source TCCS

2021 Traffic Flows	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak	359		234		336	107				107	349		**1492**
PM Peak	193		193		490	366				165	245		**1652**

2021 SCATS shows lesser traffic than 2020 Belconnen Report Traffic. Hence 2020 Belconnen traffic (without any projection) is considered for 2021 analysis

Pre Covid Calibrated Flows Comparison (2020 vs 2021)

Peak	Percent Differenc
AM Peak	**-35%**
PM Peak	**-13%**

Note: 2021 Flows compared against Belconnen Traffic Study Flows

Base Year 2021 - Traffic Flows Estimation

03

Moyes Cr / Southern Cross Dr

Southern Cross Dr / Moyes Cr, Source: Kippax Site Analysis Report - Traffic and Transport, AECOM 2015

Intersection	**North Approach**			**East Approach**			**South Approach**			**West Approach**				
	Left	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**West App Exit (WB)**	**West App Entry (EB)**
AM Peak (2015)				25	236		39		33		115	26		
	Approach Volumes					**261**			**72**			**141**	**275**	**141**
PM Peak (2015)				80	205		31		28		186	46		
	Approach Volumes					**285**			**59**			**232**	**236**	**232**

Turn Flows Distribution

Intersection	**North Approach**			**East Approach**			**South Approach**			**West Approach**		
	Left	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**
AM Peak (2015)				10%	90%		54%		46%		82%	18%
PM Peak (2015)				28%	72%		53%		47%		80%	20%

Traffic Uplift Factors

Florey Dr. App Volumes	**Belconnen Report**		**Annual Growth Factor**	
	AM Peak	**PM Peak**	**AM Peak**	**PM Peak**
East Approach Entry Flows	521	901	**1.89**	**3.82**
East Approach Exit Flows	1020	531	**7.23**	**2.29**
Note: Based on incoming flows from App F				**381%**

No. of Yrs 5

CSTM Flows		**Change Factor**	
AM Peak	**PM Peak**	**AM Peak**	**PM Peak**
112	629	**0.43**	**2.21**
727	201	**5.16**	**0.87**

As CSTM is predicting lower flows than 2015 counts, CSTM is not considered as benchmark

Moyes Cr (Factored Flows)	**AM Peak**	**PM Peak**
West Approach Exit Flows	521	901
West Approach Entry Flows	1020	531

CSTM 2021 - Turn Flows Distribution

Intersection	**North Approach**			**East Approach**			**South Approach**			**West Approach**			
	Left	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	
AM Peak (2015)				0	112		6		0		725	2	**845**
PM Peak (2015)				0	629		33		0		187	14	**863**
AM Peak (2015)				0%	100%		100%		0%		100%	0%	
PM Peak (2015)				0%	100%		100%		0%		93%	7%	

No. of Yrs 5

Southern Cross / Moyes Cr	**North Approach**			**East Approach**			**South Approach**			**West Approach**			
	Left	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	
Uplifted AM Peak Flows (2020)				0	447		74		0		1017	3	**1541**
Uplifted PM Peak Flows (2020)				0	783		118		0		494	37	**1432**

04

Flows

Uplifted AM Peak Hour Volumes - 2021

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				419	287		191		216		426	289
Southern Cross / Florey Dr	516		332		374	147				138	504	
Southern Cross / Moyes Cr				0	447		74		0		1017	3

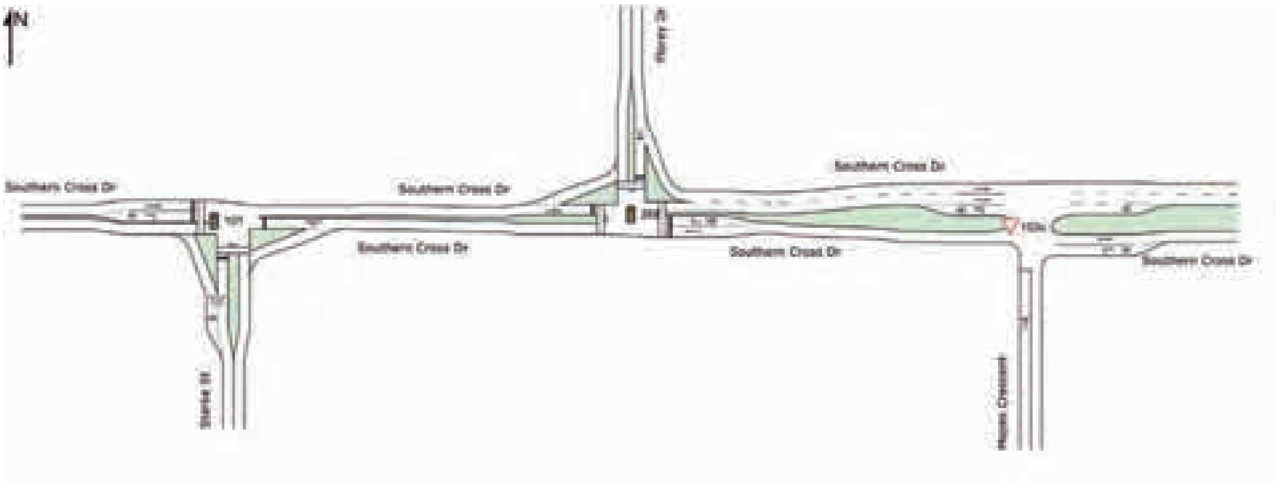
Uplifted PM Peak Hour Volumes - 2021

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				322	385		321		309		306	181
Southern Cross / Florey Dr	181		171		536	365				265	350	
Southern Cross / Moyes Cr				0	783		118		0		494	37

NETWORK LAYOUT

Network: N101 [Kippax - 2021 - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
🚦 101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2021
🚦 262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2021
▽ 103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2021

Organisation: AECOM AUSTRALIA PTY LTD | Created: Friday, 14 May 2021 9:50:21 AM
Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\01-Kippax-Base Year 2021.sip8

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Starke St														
1	L2	191	5.0	191	5.0	0.164	7.2	LOS A	1.4	10.1	0.29	0.63	0.29	52.8
3	R2	216	5.0	216	5.0	1.606	590.5	LOS F	43.6	318.4	1.00	2.47	5.55	2.9
Approach		407	5.0	407	5.0	1.606	316.8	LOS F	43.6	318.4	0.67	1.60	3.08	7.3
East: Southern Cross Dr														
4	L2	419	5.0	402	5.0	0.782	21.3	LOS B	18.2	133.0	0.78	0.84	1.00	39.7
5	T1	287	5.0	275	5.0	0.782	15.7	LOS B	18.2	133.0	0.78	0.84	1.00	40.4
Approach		706	5.0	678[N1]	5.0	0.782	19.0	LOS B	18.2	133.0	0.78	0.84	1.00	40.0
West: Southern Cross Dr														
11	T1	426	5.0	426	5.0	0.644	7.2	LOS A	9.3	67.6	0.59	0.53	0.59	48.6
12	R2	289	5.0	289	5.0	0.860	48.4	LOS D	12.9	94.3	1.00	0.97	1.34	32.7
Approach		715	5.0	715	5.0	0.860	23.9	LOS B	12.9	94.3	0.76	0.71	0.89	38.1
All Vehicles		1828	5.0	1800[N1]	5.1	1.606	88.3	LOS F	43.6	318.4	0.75	0.96	1.43	19.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		105	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Starke St															
Lane 1	191	5.0	191	5.0	1168	0.164	100	7.2	LOS A	1.4	10.1	Short	50	0.0	NA
Lane 2	216	5.0	216	5.0	134	1.606	100	590.5	LOS F	43.6	318.4	Full	500	-50.0[N3]	0.0
Approach	407	5.0	407	5.0		1.606		316.8	LOS F	43.6	318.4				
East: Southern Cross Dr															
Lane 1	706	5.0	678	5.0	866	0.782	100	19.0	LOS B	18.2	133.0	Full	135	0.0	3.6
Approach	706	5.0	678[N1]	5.0		0.782		19.0	LOS B	18.2	133.0				
West: Southern Cross Dr															
Lane 1	426	5.0	426	5.0	661	0.644	100	7.2	LOS A	9.3	67.6	Full	500	-50.0[N3]	0.0
Lane 2	289	5.0	289	5.0	336	0.860	100	48.4	LOS D	12.9	94.3	Short	65	0.0	NA
Approach	715	5.0	715	5.0		0.860		23.9	LOS B	12.9	94.3				
Intersection	1828	5.0	1800[N1]	5.1		1.606		88.3	LOS F	43.6	318.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

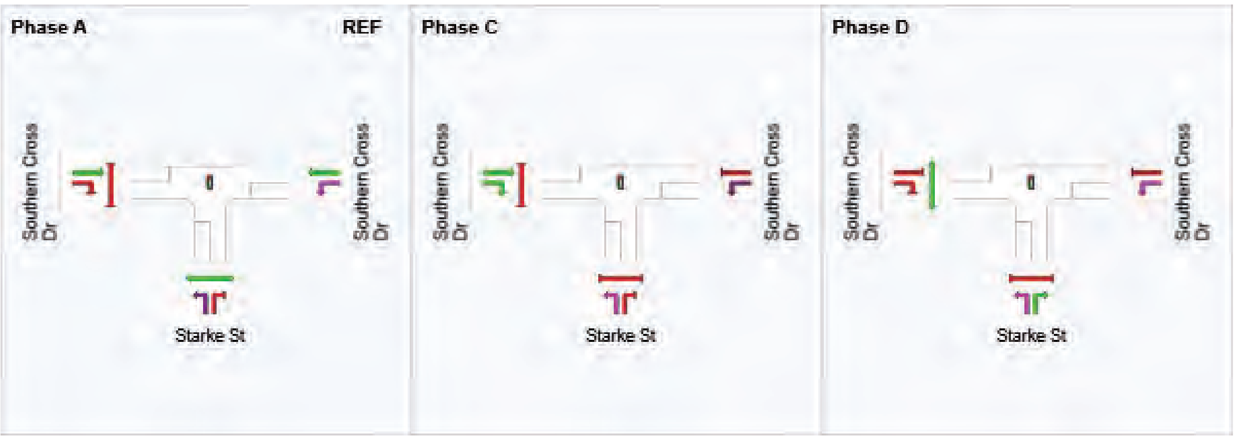
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	41	62
Green Time (sec)	35	15	12
Phase Time (sec)	41	21	18
Phase Split	51%	26%	23%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\01-Kippax-Base Year 2021.sip8

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Southern Cross Dr														
5	T1	374	5.0	374	5.0	0.457	16.4	LOS B	10.1	74.0	0.74	0.64	0.74	27.7
6	R2	147	5.0	147	5.0	0.937	62.1	LOS E	7.4	53.7	1.00	1.09	1.78	24.5
Approach		521	5.0	521	5.0	0.937	29.3	LOS C	10.1	74.0	0.81	0.77	1.03	25.8
North: Florey Dr														
7	L2	516	5.0	516	5.0	1.093	143.3	LOS F	78.5	573.2	1.00	1.54	2.39	10.7
9	R2	332	5.0	332	5.0	1.093	143.2	LOS F	78.5	573.2	1.00	1.54	2.39	10.7
Approach		848	5.0	848	5.0	1.093	143.3	LOS F	78.5	573.2	1.00	1.54	2.39	10.7
West: Southern Cross Dr														
10	L2	138	5.0	125	5.0	1.034	71.4	LOS F	30.2	220.3	1.00	1.19	1.92	16.7
11	T1	504	5.0	455	5.0	1.034	65.7	LOS E	30.2	220.3	1.00	1.19	1.92	4.9
Approach		642	5.0	579[N1]	5.0	1.034	67.0	LOS E	30.2	220.3	1.00	1.19	1.92	8.0
All Vehicles		2011	5.0	1948[N1]	5.2	1.093	90.1	LOS F	78.5	573.2	0.95	1.23	1.89	11.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Southern Cross Dr															
Lane 1	374	5.0	374	5.0	819	0.457	100	16.4	LOS B	10.1	74.0	Full	225	-3.6[N3]	0.0
Lane 2	147	5.0	147	5.0	157	0.937	100	62.1	LOS E	7.4	53.7	Short	125	0.0	NA
Approach	521	5.0	521	5.0		0.937		29.3	LOS C	10.1	74.0				
North: Florey Dr															
Lane 1	848	5.0	848	5.0	776	1.093	100	143.3	LOS F	78.5	573.2	Full	500	-1.5[N3]	17.4
Approach	848	5.0	848	5.0		1.093		143.3	LOS F	78.5	573.2				
West: Southern Cross Dr															
Lane 1	642	5.0	579	5.0	561	1.034	100	67.0	LOS E	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	642	5.0	579[N1]	5.0		1.034		67.0	LOS E	30.2	220.3				
Intersection	2011	5.0	1948[N1]	5.2		1.093		90.1	LOS F	78.5	573.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

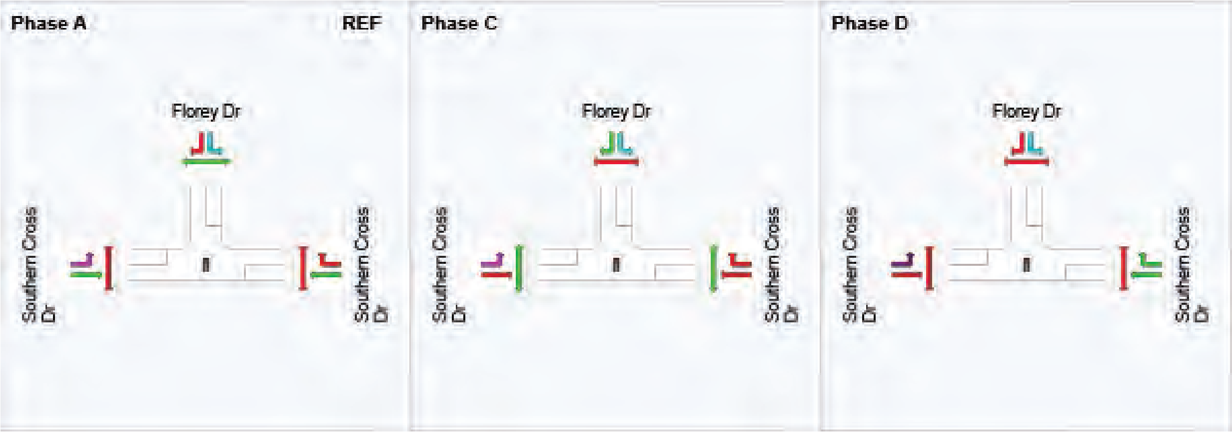
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	10	39	77
Green Time (sec)	23	32	7
Phase Time (sec)	29	38	13
Phase Split	36%	48%	16%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

→	Normal Movement	→	Permitted/Opposed
→	Slip/Bypass-Lane Movement	→	Opposed Slip/Bypass-Lane
⊣	Stopped Movement	⊣	Turn On Red
→	Other Movement Class (MC) Running	⇨	Undetected Movement
→	Mixed Running & Stopped MCs	→	Continuous Movement
⊣	Other Movement Class (MC) Stopped	●	Phase Transition Applied

Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\01-Kippax-Base Year 2021.sip8

MOVEMENT SUMMARY

▽ Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	74	5.0	74	5.0	0.096	8.1	LOS A	0.3	2.5	0.47	0.71	0.47	47.6
3	R2	1	5.0	1	5.0	0.096	11.0	LOS A	0.3	2.5	0.47	0.71	0.47	51.3
Approach		75	5.0	75	5.0	0.096	8.1	LOS A	0.3	2.5	0.47	0.71	0.47	47.7
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	447	5.0	447	5.0	0.237	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		448	5.0	448	5.0	0.237	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	1017	5.0	909	5.0	0.241	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	3	5.0	3	5.0	0.003	7.7	LOS A	0.0	0.1	0.40	0.60	0.40	48.7
Approach		1020	5.0	912[N1]	5.0	0.241	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.9
All Vehicles		1543	5.0	1435[N1]	5.4	0.241	0.5	NA	0.3	2.5	0.03	0.04	0.03	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2021]

Network: N101 [Kippax - 2021 - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Moyes Crescent															
Lane 1	75	5.0	75	5.0	784	0.096	100	8.1	LOS A	0.3	2.5	Full	500	0.0	0.0
Approach	75	5.0	75	5.0		0.096		8.1	LOS A	0.3	2.5				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	447	5.0	447	5.0	1889	0.237	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	448	5.0	448	5.0		0.237		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	509	5.0	455	5.0	1889	0.241	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	509	5.0	455	5.0	1889	0.241	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	3	5.0	3	5.0	840	0.003	100	7.7	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	1020	5.0	912[N1]	5.0		0.241		0.0	NA	0.0	0.1				
Intersection	1543	5.0	1435[N1]	5.4		0.241		0.5	NA	0.3	2.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[N1] Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Starke St														
1	L2	321	5.0	321	5.0	0.302	8.5	LOS A	3.5	25.6	0.39	0.67	0.39	51.8
3	R2	309	5.0	309	5.0	1.283	306.3	LOS F	43.1	314.6	1.00	1.88	3.88	5.3
Approach		630	5.0	630	5.0	1.283	154.6	LOS F	43.1	314.6	0.69	1.27	2.10	13.5
East: Southern Cross Dr														
4	L2	322	5.0	317	5.0	0.801	24.5	LOS B	21.4	156.0	0.84	0.86	1.04	38.1
5	T1	385	5.0	379	5.0	0.801	18.8	LOS B	21.4	156.0	0.84	0.86	1.04	38.8
Approach		707	5.0	695[N1]	5.0	0.801	21.4	LOS B	21.4	156.0	0.84	0.86	1.04	38.5
West: Southern Cross Dr														
11	T1	306	5.0	306	5.0	0.371	7.0	LOS A	5.5	40.4	0.49	0.43	0.49	48.9
12	R2	181	5.0	181	5.0	0.807	48.3	LOS D	7.8	56.9	1.00	0.92	1.30	32.8
Approach		487	5.0	487	5.0	0.807	22.4	LOS B	7.8	56.9	0.68	0.62	0.79	38.6
All Vehicles		1824	5.0	1812[N1]	5.0	1.283	68.0	LOS E	43.1	314.6	0.74	0.94	1.34	22.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		
P1	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		105	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Starke St															
Lane 1	321	5.0	321	5.0	1063	0.302	100	8.5	LOS A	3.5	25.6	Short	50	0.0	NA
Lane 2	309	5.0	309	5.0	241	1.283	100	306.3	LOS F	43.1	314.6	Full	500	-32.8[N3]	0.0
Approach	630	5.0	630	5.0		1.283		154.6	LOS F	43.1	314.6				
East: Southern Cross Dr															
Lane 1	707	5.0	695	5.0	867	0.801	100	21.4	LOS B	21.4	156.0	Full	135	0.0	18.1
Approach	707	5.0	695[N1]	5.0		0.801		21.4	LOS B	21.4	156.0				
West: Southern Cross Dr															
Lane 1	306	5.0	306	5.0	825	0.371	100	7.0	LOS A	5.5	40.4	Full	500	-32.8[N3]	0.0
Lane 2	181	5.0	181	5.0	224	0.807	100	48.3	LOS D	7.8	56.9	Short	65	0.0	NA
Approach	487	5.0	487	5.0		0.807		22.4	LOS B	7.8	56.9				
Intersection	1824	5.0	1812[N1]	5.0		1.283		68.0	LOS E	43.1	314.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

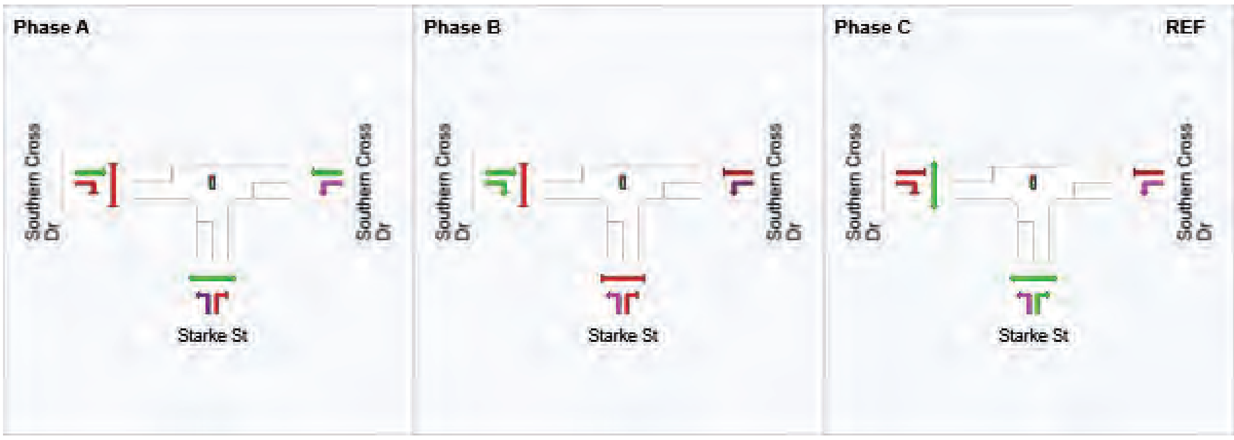
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase C
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	**A**	**B**	**C**
Phase Change Time (sec)	22	64	0
Green Time (sec)	36	10	16
Phase Time (sec)	42	16	22
Phase Split	53%	20%	28%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\01-Kippax-Base Year 2021.sip8

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Southern Cross Dr														
5	T1	536	5.0	536	5.0	0.513	6.9	LOS A	10.4	75.8	0.54	0.48	0.54	40.2
6	R2	365	5.0	365	5.0	0.958	54.5	LOS D	14.1	103.3	1.00	1.15	1.79	26.3
Approach		901	5.0	901	5.0	0.958	26.2	LOS B	14.1	103.3	0.72	0.75	1.04	29.6
North: Florey Dr														
7	L2	181	5.0	181	5.0	1.078	136.4	LOS F	29.9	218.2	1.00	1.50	2.46	11.0
9	R2	171	5.0	171	5.0	1.078	136.2	LOS F	29.9	218.2	1.00	1.50	2.46	11.0
Approach		352	5.0	352	5.0	1.078	136.3	LOS F	29.9	218.2	1.00	1.50	2.46	11.0
West: Southern Cross Dr														
10	L2	265	5.0	238	5.0	0.903	46.6	LOS D	25.1	183.2	1.00	1.14	1.58	28.1
11	T1	350	5.0	314	5.0	0.903	40.9	LOS C	25.1	183.2	1.00	1.14	1.58	10.4
Approach		615	5.0	552[N1]	5.0	0.903	43.3	LOS D	25.1	183.2	1.00	1.14	1.58	20.1
All Vehicles		1868	5.0	1805[N1]	5.2	1.078	52.9	LOS D	29.9	218.2	0.86	1.02	1.48	19.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Southern Cross Dr															
Lane 1	536	5.0	536	5.0	1044	0.513	100	6.9	LOS A	10.4	75.8	Full	225	-18.1[N3]	0.0
Lane 2	365	5.0	365	5.0	381	0.958	100	54.5	LOS D	14.1	103.3	Short	125	0.0	NA
Approach	901	5.0	901	5.0		0.958		26.2	LOS B	14.1	103.3				
North: Florey Dr															
Lane 1	352	5.0	352	5.0	326	1.078	100	136.3	LOS F	29.9	218.2	Full	500	-9.7[N3]	0.0
Approach	352	5.0	352	5.0		1.078		136.3	LOS F	29.9	218.2				
West: Southern Cross Dr															
Lane 1	615	5.0	552	5.0	611	0.903	100	43.3	LOS D	25.1	183.2	Full	135	0.0	32.8
Approach	615	5.0	552[N1]	5.0		0.903		43.3	LOS D	25.1	183.2				
Intersection	1868	5.0	1805[N1]	5.2		1.078		52.9	LOS D	29.9	218.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Phase Sequence: Fixed Time PM Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

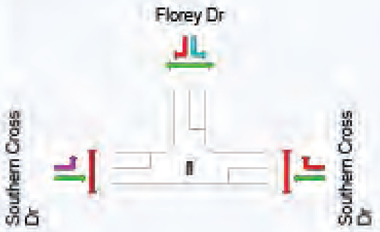
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	28	59	72	12
Green Time (sec)	25	7	14	10
Phase Time (sec)	31	13	20	16
Phase Split	39%	16%	25%	20%

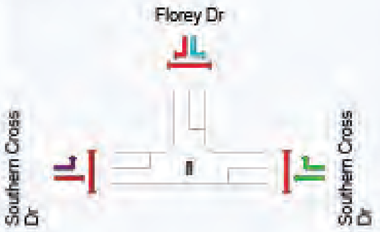
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

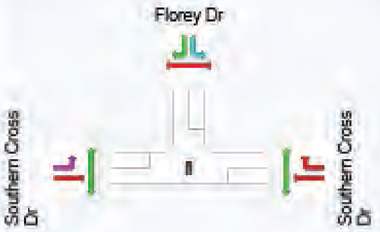
Phase A



Phase B



Phase C REF



Phase D

REF: Reference Phase
VAR: Variable Phase

➡	Normal Movement	➡	Permitted/Opposed
➡	Slip/Bypass-Lane Movement	➡	Opposed Slip/Bypass-Lane
⇥	Stopped Movement	⇥	Turn On Red
➡	Other Movement Class (MC) Running	⇨	Undetected Movement
➡	Mixed Running & Stopped MCs	➡	Continuous Movement
⇥	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov	Turn	Demand Flows		Arrival Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
ID		Total	HV	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Cycles	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	118	5.0	118	5.0	0.267	13.1	LOS A	1.0	7.2	0.72	0.91	0.82	42.1
3	R2	1	5.0	1	5.0	0.267	23.5	LOS B	1.0	7.2	0.72	0.91	0.82	47.9
Approach		119	5.0	119	5.0	0.267	13.2	LOS A	1.0	7.2	0.72	0.91	0.82	42.2
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	783	5.0	783	5.0	0.415	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		784	5.0	784	5.0	0.415	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	494	5.0	448	5.0	0.119	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	37	5.0	34	5.0	0.070	11.7	LOS A	0.2	1.5	0.67	0.87	0.67	45.3
Approach		531	5.0	481[N1]	5.0	0.119	0.8	NA	0.2	1.5	0.05	0.06	0.05	58.7
All Vehicles		1434	5.0	1384[N1]	5.2	0.415	1.5	NA	1.0	7.2	0.08	0.10	0.09	57.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2021]

Network: N101 [Kippax - 2021 - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Moyes Crescent															
Lane 1	119	5.0	119	5.0	446	0.267	100	13.2	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	119	5.0	119	5.0		0.267		13.2	LOS A	1.0	7.2				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	783	5.0	783	5.0	1889	0.415	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	784	5.0	784	5.0		0.415		0.1	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	249	5.0	225	5.0	1889	0.119	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	245	5.0	222	5.0	1865	0.119	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	37	5.0	34	5.0	480	0.070	100	11.7	LOS A	0.2	1.5	Short	60	0.0	NA
Approach	531	5.0	481[N1]	5.0		0.119		0.8	NA	0.2	1.5				
Intersection	1434	5.0	1384[N1]	5.2		0.415		1.5	NA	1.0	7.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Appendix C

Sidra Outputs – Base Case – No Development – 2025 & 2035

2041 Traffic Flows (Used as a basis for estimating 2025 and 2035 flows)

Source Flows

2041 AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				474	325		288		327		482	327	From Belconnen Better Intersections Report
Southern Cross / Florey Dr	751		338		381	215				182	698		From Belconnen Better Intersections Report
Southern Cross / Moyes Cr				0	384		11		0		1498	423	From CSTM - Client provided

2041 PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				402	481		400		386		382	225	From Belconnen Better Intersections Report
Southern Cross / Florey Dr	291		238		743	586				357	469		From Belconnen Better Intersections Report
Southern Cross / Moyes Cr				0	1443		370		0		612	17	From CSTM - Client provided

Flow Balancing

Reference Intersection: Southern Cross / Starke St

	AM Peak	PM Peak
Starke St East Approach Exit	809	768
Florey Dr West Approach Entry	880	826
Starke St East Approach Entry	799	883
Florey Dr West Approach Exit	719	981

Factors

AM Peak	PM Peak
0.919	0.93
1.111	0.9

CSTM Landuse Parameters **(Source: Client Provided data)** **No. of Years** **20**

Zone	DISTRICT	SUBURB	CSTM ZONE ID	POPULATION		EMPLOYMENT		RETAILS SPACE(GFA)	
				2021	2041	2021	2041	2021	2041
Kippax Fair (Core & Periphery)	Belconnen	Holt	31502	290	342	780	1057	22967	33202
CSTM Projected Growth Rate (2021-2041)		Exponential Growth per annum			**1%**		**2%**		**2%**

Belconnen Better Intersections (Counts vs CSTM)		AM Peak	PM Peak	Overall Avg
Southern Cross / Starke St		0.6%	1.1%	**0.9%**
Southern Cross / Florey Dr		1.8%	2.3%	**2.1%**

2041 Traffic Flows (Used as a basis for estimating 2025 and 2035 flows)

Balanced Flows

2041 AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				474	325		288		327		482	327	From Belconnen Better Intersections Report
Southern Cross / Florey Dr	751		**376**		**423**	215				**167**	**641**		From Belconnen Better Intersections Report
Southern Cross / Moyes Cr				0	384		11		0		1498	423	From CSTM - Client provided

2041 PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Southern Cross / Starke St				402	481		400		386		382	225	From Belconnen Better Intersections Report
Southern Cross / Florey Dr	291		**214**		**669**	586				**332**	**436**		From Belconnen Better Intersections Report
Southern Cross / Moyes Cr				0	1443		370		0		612	17	From CSTM - Client provided

Florey Dr	**AM Peak**	**PM Peak**
East Approach Exit Flows	1392	727
East Approach Entry Flows	638	1255

Moyes Cr (Factored Flows)

AM Peak	**PM Peak**
1392	727
638	1255

Moyes Cr	**AM Peak**	**PM Peak**
West Approach Entry Flows	1921	629
West Approach Exit Flows	395	1813

Moyes Cr (Factoring)	**AM Peak**	**PM Peak**
West Approach Entry Flows	0.7246	1.1558
West Approach Exit Flows	1.6152	0.6922

Southern Cross / Moyes Cr	**North Approach**			**East Approach**			**South Approach**			**West Approach**		
	Left	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**	**Left**	**Through**	**Right**
Factored AM Peak Flows (2041)				0	620		18		0		1085	307
Factored PM Peak Flows (2041)				0	999		256		0		707	20

2041 Traffic Flows (Used as a basis for estimating 2025 and 2035 flows)

Intersection Flows without TPV Traffic for 2041

Flows for No-Development Scenario

2041 AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				474	325		288		327		482	327
Southern Cross / Florey Dr	751		376		423	215				167	641	
Southern Cross / Moyes Cr				0	620		18		0		1085	307

2041 PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				402	481		400		386		382	225
Southern Cross / Florey Dr	291		214		669	586				332	436	
Southern Cross / Moyes Cr				0	999		256		0		707	20

Opening Year 2025 Traffic Flows (Interpolated using 2041 flows)

Exponential Growth per annum	**1%**
Yrs (2025-2041)	16
Growth Calc for 2025 - 2041	**1.17257864**

Intersection Flows without TPV Traffic

Flows for No-Development Scenario

2025 AM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				404	277		246		279		411	279
Southern Cross / Florey Dr	640		321		361	183				142	547	
Southern Cross / Moyes Cr				0	529		15		0		925	262

2025 PM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				343	410		341		329		326	192
Southern Cross / Florey Dr	248		183		571	500				283	372	
Southern Cross / Moyes Cr				0	852		218		0		603	17

Horizon Year 2035 Traffic Flows (Interpolated using 2041 flows)

Exponential Growth per annum	1%
Yrs (2035-2041)	6
Growth Calc for 2035 - 2041	1.06152015

Intersection Flows without TPV Traffic

Flows for No-Development Scenario

2035 AM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				447	306		271		308		454	308
Southern Cross / Florey Dr	707		354		398	203				157	604	
Southern Cross / Moyes Cr				0	584		17		0		1022	289

2035 PM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				379	453		377		364		360	212
Southern Cross / Florey Dr	274		202		630	552				313	411	
Southern Cross / Moyes Cr				0	941		241		0		666	19

NETWORK LAYOUT

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)

SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
🚦 101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2025-No DVLP
🚦 262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2025-No DVLP
▽ 103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2025-No DVLP

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MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Arrival Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
		Total	HV	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Cycles	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Starke St														
1	L2	246	5.0	246	5.0	0.201	6.9	LOS A	1.7	12.6	0.25	0.62	0.25	53.0
3	R2	279	5.0	279	5.0	1.620	606.7	LOS F	58.4	426.4	1.00	2.32	5.09	2.8
Approach		525	5.0	525	5.0	1.620	325.7	LOS F	58.4	426.4	0.65	1.52	2.82	7.1
East: Southern Cross Dr														
4	L2	404	5.0	359	5.0	0.694	19.6	LOS B	15.1	109.9	0.69	0.76	0.85	40.9
5	T1	277	5.0	246	5.0	0.694	13.9	LOS A	15.1	109.9	0.69	0.76	0.85	41.7
Approach		681	5.0	605[N1]	5.0	0.694	17.2	LOS B	15.1	109.9	0.69	0.76	0.85	41.2
West: Southern Cross Dr														
11	T1	411	5.0	411	5.0	0.585	7.9	LOS A	9.5	69.3	0.56	0.51	0.56	47.7
12	R2	279	5.0	279	5.0	0.875	55.0	LOS D	14.1	103.3	1.00	0.98	1.36	30.9
Approach		690	5.0	690	5.0	0.875	27.0	LOS B	14.1	103.3	0.74	0.70	0.88	36.4
All Vehicles		1896	5.0	1820[N1]	5.2	1.620	109.9	LOS F	58.4	426.4	0.70	0.96	1.43	16.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		105	39.3	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Starke St															
Lane 1	246	5.0	246	5.0	1226	0.201	100	6.9	LOS A	1.7	12.6	Short	50	0.0	NA
Lane 2	279	5.0	279	5.0	172	1.620	100	606.7	LOS F	58.4	426.4	Full	500	-46.0[N3]	0.0
Approach	525	5.0	525	5.0		1.620		325.7	LOS F	58.4	426.4				
East: Southern Cross Dr															
Lane 1	681	5.0	605	5.0	872	0.694	100	17.2	LOS B	15.1	109.9	Full	135	0.0	0.0
Approach	681	5.0	605[N1]	5.0		0.694		17.2	LOS B	15.1	109.9				
West: Southern Cross Dr															
Lane 1	411	5.0	411	5.0	703	0.585	100	7.9	LOS A	9.5	69.3	Full	500	-46.0[N3]	0.0
Lane 2	279	5.0	279	5.0	319	0.875	100	55.0	LOS D	14.1	103.3	Short	65	0.0	NA
Approach	690	5.0	690	5.0		0.875		27.0	LOS B	14.1	103.3				
Intersection	1896	5.0	1820[N1]	5.2		1.620		109.9	LOS F	58.4	426.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

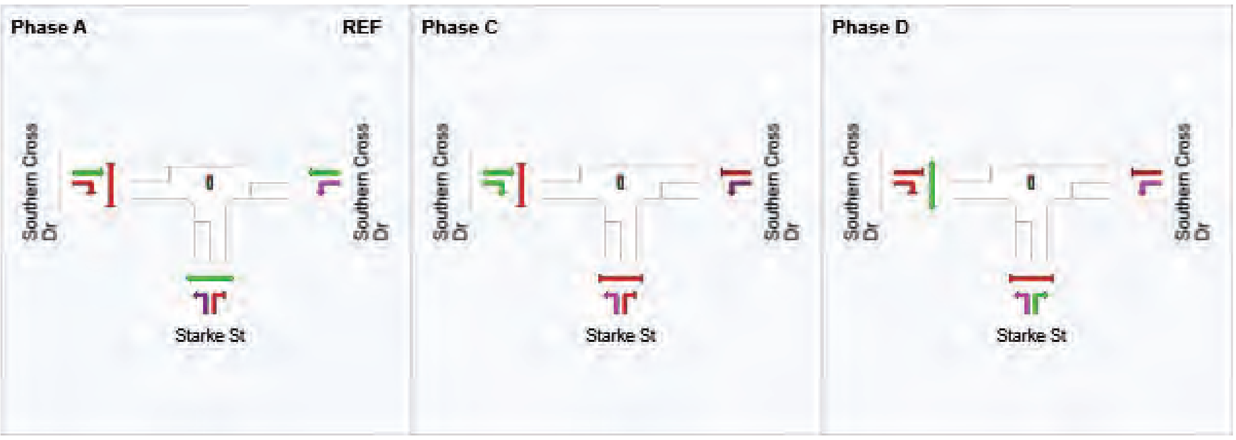
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	**A**	**C**	**D**
Phase Change Time (sec)	0	46	68
Green Time (sec)	40	16	16
Phase Time (sec)	46	22	22
Phase Split	51%	24%	24%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
🟥🟩	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Southern Cross Dr														
5	T1	361	5.0	361	5.0	0.391	15.6	LOS B	10.0	72.7	0.68	0.59	0.68	28.5
6	R2	183	5.0	183	5.0	1.312	332.5	LOS F	27.2	198.3	1.00	1.87	3.77	6.8
Approach		544	5.0	544	5.0	1.312	122.2	LOS F	27.2	198.3	0.78	1.02	1.71	9.6
North: Florey Dr														
7	L2	640	5.0	640	5.0	1.269	293.9	LOS F	138.0	1007.7	1.00	2.00	3.36	5.7
9	R2	321	5.0	321	5.0	1.269	293.7	LOS F	138.0	1007.7	1.00	2.00	3.36	5.7
Approach		961	5.0	961	5.0	1.269	293.8	LOS F	138.0	1007.7	1.00	2.00	3.36	5.7
West: Southern Cross Dr														
10	L2	142	5.0	123	5.0	0.901	55.6	LOS D	28.9	211.1	1.00	1.11	1.75	25.6
11	T1	547	5.0	474	5.0	0.901	50.0	LOS D	28.9	211.1	1.00	1.11	1.75	8.9
Approach		689	5.0	598 N1	5.0	0.901	51.1	LOS D	28.9	211.1	1.00	1.11	1.75	13.6
All Vehicles		2194	5.0	2103 N1	5.2	1.312	180.4	LOS F	138.0	1007.7	0.94	1.49	2.48	7.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		158	39.3	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Southern Cross Dr															
Lane 1	361	5.0	361	5.0	923	0.391	100	15.6	LOS B	10.0	72.7	Full	225	0.0	0.0
Lane 2	183	5.0	183	5.0	139	1.312	100	332.5	LOS F	27.2	198.3	Short	125	0.0	NA
Approach	544	5.0	544	5.0		1.312		122.2	LOS F	27.2	198.3				
North: Florey Dr															
Lane 1	961	5.0	961	5.0	757	1.269	100	293.8	LOS F	138.0	1007.7	Full	500	0.0	70.1
Approach	961	5.0	961	5.0		1.269		293.8	LOS F	138.0	1007.7				
West: Southern Cross Dr															
Lane 1	689	5.0	598	5.0	664	0.901	100	51.1	LOS D	28.9	211.1	Full	135	0.0	46.0
Approach	689	5.0	598[N1]	5.0		0.901		51.1	LOS D	28.9	211.1				
Intersection	2194	5.0	2103[N1]	5.2		1.312		180.4	LOS F	138.0	1007.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 90 seconds (Network Optimum Cycle Time - Minimum Delay)

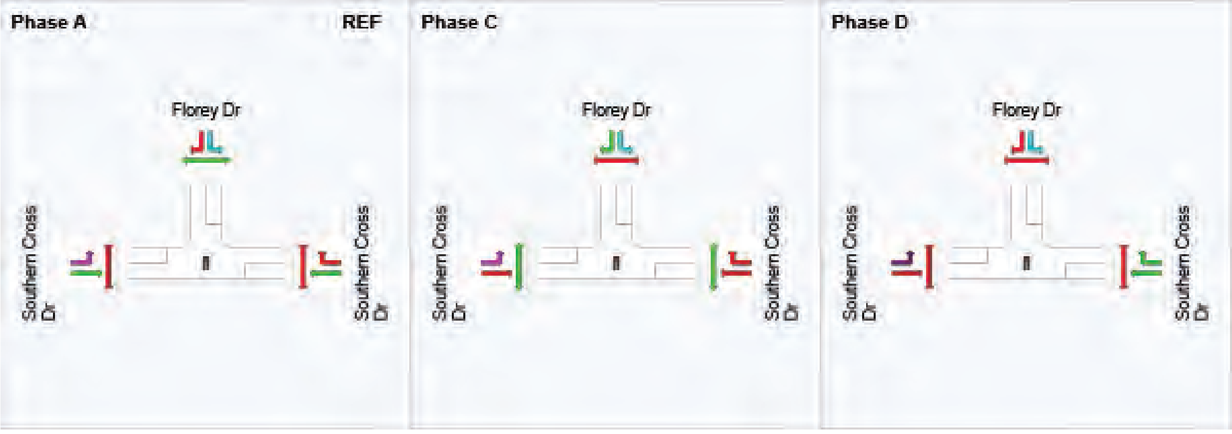
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	11	48	88
Green Time (sec)	31	34	7
Phase Time (sec)	37	40	13
Phase Split	41%	44%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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MOVEMENT SUMMARY

▽ Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Moyes Crescent														
1	L2	15	5.0	15	5.0	0.025	8.5	LOS A	0.1	0.6	0.51	0.69	0.51	46.6
3	R2	1	5.0	1	5.0	0.025	15.5	LOS B	0.1	0.6	0.51	0.69	0.51	50.7
Approach		16	5.0	16	5.0	0.025	8.9	LOS A	0.1	0.6	0.51	0.69	0.51	47.0
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	529	5.0	529	5.0	0.280	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		530	5.0	530	5.0	0.280	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	925	5.0	751	5.0	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	262	5.0	213	5.0	0.285	9.3	LOS A	1.1	7.8	0.55	0.84	0.60	47.2
Approach		1187	5.0	964 N1	5.0	0.285	2.1	NA	1.1	7.8	0.12	0.18	0.13	56.6
All Vehicles		1733	5.0	1510 N1	5.7	0.285	1.4	NA	1.1	7.8	0.08	0.13	0.09	57.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Moyes Crescent															
Lane 1	16	5.0	16	5.0	650	0.025	100	8.9	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	16	5.0	16	5.0		0.025		8.9	LOS A	0.1	0.6				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	529	5.0	529	5.0	1889	0.280	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	530	5.0	530	5.0		0.280		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	466	5.0	379	5.0	1889	0.201	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	459	5.0	373	5.0	1857	0.201	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	262	5.0	213	5.0	746	0.285	100	9.3	LOS A	1.1	7.8	Short	60	0.0	NA
Approach	1187	5.0	964[N1]	5.0		0.285		2.1	NA	1.1	7.8				
Intersection	1733	5.0	1510[N1]	5.7		0.285		1.4	NA	1.1	7.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[N1] Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Starke St														
1	L2	341	5.0	341	5.0	0.309	9.9	LOS A	4.6	33.6	0.46	0.69	0.46	50.8
3	R2	329	5.0	329	5.0	1.087	150.4	LOS F	30.9	225.5	1.00	1.45	2.59	10.0
Approach		670	5.0	670	5.0	1.087	78.9	LOS F	30.9	225.5	0.72	1.06	1.51	21.9
East: Southern Cross Dr														
4	L2	343	5.0	339	5.0	1.055	100.2	LOS F	30.2	220.3	1.00	1.49	2.03	16.1
5	T1	410	5.0	405	5.0	1.055	94.6	LOS F	30.2	220.3	1.00	1.49	2.03	16.2
Approach		753	5.0	745[N1]	5.0	1.055	97.1	LOS F	30.2	220.3	1.00	1.49	2.03	16.2
West: Southern Cross Dr														
11	T1	326	5.0	326	5.0	0.674	16.9	LOS B	10.0	73.1	0.80	0.72	0.82	38.7
12	R2	192	5.0	192	5.0	1.428	428.6	LOS F	32.2	235.2	1.00	2.19	4.71	7.2
Approach		518	5.0	518	5.0	1.428	169.5	LOS F	32.2	235.2	0.87	1.27	2.26	11.6
All Vehicles		1941	5.0	1933[N1]	5.0	1.428	110.2	LOS F	32.2	235.2	0.87	1.28	1.91	16.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		
P1	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		105	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Starke St															
Lane 1	341	5.0	341	5.0	1103	0.309	100	9.9	LOS A	4.6	33.6	Short	50	0.0	NA
Lane 2	329	5.0	329	5.0	303	1.087	100	150.4	LOS F	30.9	225.5	Full	500	-50.0[N3]	0.0
Approach	670	5.0	670	5.0		1.087		78.9	LOS F	30.9	225.5				
East: Southern Cross Dr															
Lane 1	753	5.0	745	5.0	706	1.055	100	97.1	LOS F	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	753	5.0	745[N1]	5.0		1.055		97.1	LOS F	30.2	220.3				
West: Southern Cross Dr															
Lane 1	326	5.0	326	5.0	484	0.674	100	16.9	LOS B	10.0	73.1	Full	500	-50.0[N3]	0.0
Lane 2	192	5.0	192	5.0	134	1.428	100	428.6	LOS F	32.2	235.2	Short	65	0.0	NA
Approach	518	5.0	518	5.0		1.428		169.5	LOS F	32.2	235.2				
Intersection	1941	5.0	1933[N1]	5.0		1.428		110.2	LOS F	32.2	235.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

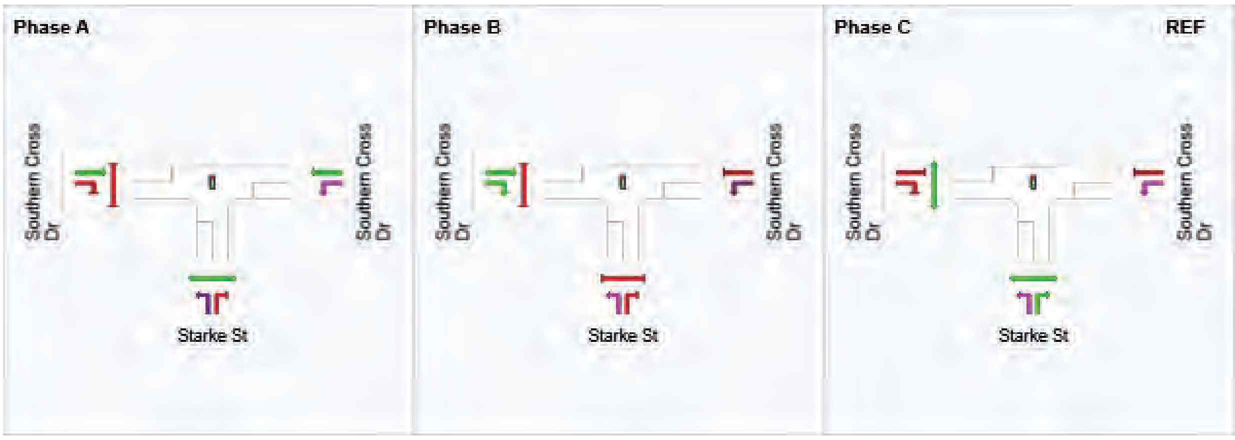
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase C
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	33	68	0
Green Time (sec)	29	6	27
Phase Time (sec)	35	12	33
Phase Split	44%	15%	41%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
🟥	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Southern Cross Dr														
5	T1	571	5.0	571	5.0	0.930	46.9	LOS D	32.5	237.2	0.96	1.22	1.44	13.9
6	R2	500	5.0	500	5.0	1.859	800.9	LOS F	50.3	367.2	1.00	2.85	6.38	3.0
Approach		1071	5.0	1071	5.0	1.859	398.9	LOS F	50.3	367.2	0.98	1.98	3.74	3.8
North: Florey Dr														
7	L2	248	5.0	248	5.0	1.027	99.6	LOS F	30.6	223.2	1.00	1.33	2.05	14.3
9	R2	183	5.0	183	5.0	1.027	99.5	LOS F	30.6	223.2	1.00	1.33	2.05	14.3
Approach		431	5.0	431	5.0	1.027	99.5	LOS F	30.6	223.2	1.00	1.33	2.05	14.3
West: Southern Cross Dr														
10	L2	283	5.0	277	5.0	0.942	49.6	LOS D	30.2	220.3	1.00	1.16	1.57	27.1
11	T1	372	5.0	364	5.0	0.942	44.0	LOS D	30.2	220.3	1.00	1.16	1.57	9.8
Approach		655	5.0	641[N1]	5.0	0.942	46.4	LOS D	30.2	220.3	1.00	1.16	1.57	19.2
All Vehicles		2157	5.0	2143[N1]	5.0	1.859	233.3	LOS F	50.3	367.2	0.99	1.61	2.75	6.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: Southern Cross Dr															
Lane 1	571	5.0	571	5.0	614	0.930	100	46.9	LOS D	32.5	237.2	Full	225	-50.0[N3]	50.0[8]
Lane 2	500	5.0	500	5.0	269	1.859	100	800.9	LOS F	50.3[N4]	367.2[N4]	Short	125	0.0	NA
Approach	1071	5.0	1071	5.0		1.859		398.9	LOS F	50.3	367.2				
North: Florey Dr															
Lane 1	431	5.0	431	5.0	420	1.027	100	99.5	LOS F	30.6	223.2	Full	500	0.0	0.0
Approach	431	5.0	431	5.0		1.027		99.5	LOS F	30.6	223.2				
West: Southern Cross Dr															
Lane 1	655	5.0	641	5.0	680	0.942	100	46.4	LOS D	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	655	5.0	641[N1]	5.0		0.942		46.4	LOS D	30.2	220.3				
Intersection	2157	5.0	2143[N1]	5.0		1.859		233.3	LOS F	50.3	367.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

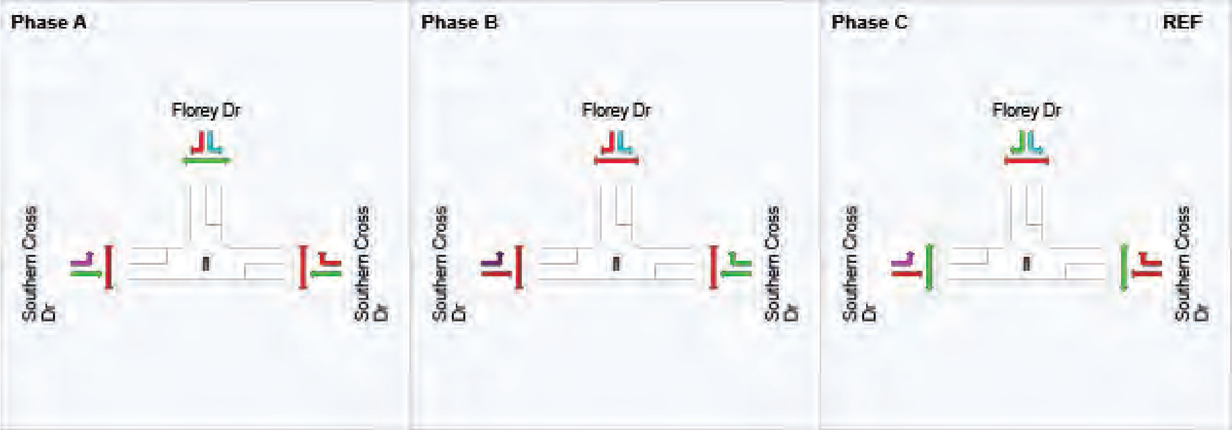
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time PM Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

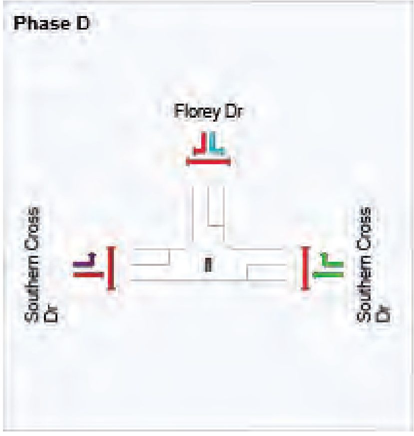
Phase Timing Summary

Phase	**A**	**B**	**C**	**D**
Phase Change Time (sec)	32	66	78	20
Green Time (sec)	28	6	16	6
Phase Time (sec)	34	12	22	12
Phase Split	43%	15%	28%	15%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence





REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\02-Kippax-Opening Year 2025 - (Base Case) No Development.sip8

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV	Total	HV				Vehicles	Distance				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	218	5.0	218	5.0	1.129	154.8	LOS F	20.3	148.1	1.00	3.53	10.25	9.9
3	R2	1	5.0	1	5.0	1.129	169.4	LOS F	20.3	148.1	1.00	3.53	10.25	16.7
Approach		219	5.0	219	5.0	1.129	154.9	LOS F	20.3	148.1	1.00	3.53	10.25	10.0
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	852	5.0	852	5.0	0.451	0.1	LOS A	47.1	344.0	0.00	0.00	0.00	59.9
Approach		853	5.0	853	5.0	0.451	0.1	NA	47.1	344.0	0.00	0.00	0.00	59.8
West: Southern Cross Dr														
11	T1	603	5.0	587	5.0	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	17	5.0	17	5.0	0.040	12.8	LOS A	0.1	0.8	0.71	0.89	0.71	44.5
Approach		620	5.0	604[N1]	5.0	0.155	0.4	NA	0.1	0.8	0.02	0.02	0.02	59.4
All Vehicles		1692	5.0	1676[N1]	5.0	1.129	20.4	NA	47.1	344.0	0.14	0.47	1.35	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2025-No DVLP]

Network: N101 [Kippax - 2025-No DVLP - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Moyes Crescent															
Lane 1	219	5.0	219	5.0	194	1.129	100	154.9	LOS F	20.3	148.1	Full	500	-49.9[N3]	0.0
Approach	219	5.0	219	5.0		1.129		154.9	LOS F	20.3	148.1				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	852	5.0	852	5.0	1889	0.451	100	0.1	LOS A	47.1[N5]	344.0[N5]	Full	500	0.0	0.0
Approach	853	5.0	853	5.0		0.451		0.1	NA	47.1	344.0				
West: Southern Cross Dr															
Lane 1	302	5.0	294	5.0	1889	0.155	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	302	5.0	294	5.0	1889	0.155	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	17	5.0	17	5.0	416	0.040	100	12.8	LOS A	0.1	0.8	Short	60	0.0	NA
Approach	620	5.0	604[N1]	5.0		0.155		0.4	NA	0.1	0.8				
Intersection	1692	5.0	1676[N1]	5.0		1.129		20.4	NA	47.1	344.0				

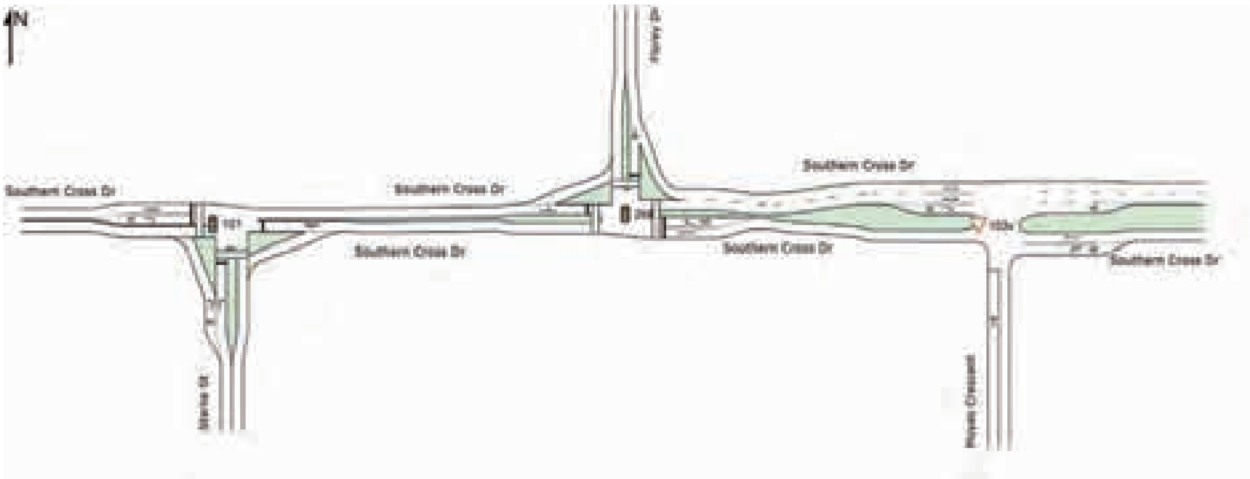
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).

NETWORK LAYOUT

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK

Site ID	CCG ID	Site Name
101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2035-No DVLP
262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2035-No DVLP
▽103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2035-No DVLP

Organisation: AECOM AUSTRALIA PTY LTD | Created: Friday, 14 May 2021 10:53:21 AM
Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\03-Kippax-Future Year 2035 - (Base Case) No Development.sip8

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Starke St														
1	L2	271	5.0	271	5.0	0.220	7.2	LOS A	2.3	16.4	0.26	0.63	0.26	52.8
3	R2	308	5.0	308	5.0	1.808	778.0	LOS F	74.2	541.5	1.00	2.38	5.24	2.2
Approach		579	5.0	579	5.0	1.808	417.2	LOS F	74.2	541.5	0.65	1.56	2.91	5.7
East: Southern Cross Dr														
4	L2	447	5.0	376	5.0	0.738	21.9	LOS B	18.7	136.6	0.73	0.79	0.90	39.3
5	T1	306	5.0	257	5.0	0.738	16.3	LOS B	18.7	136.6	0.73	0.79	0.90	40.0
Approach		753	5.0	633[N1]	5.0	0.738	19.6	LOS B	18.7	136.6	0.73	0.79	0.90	39.6
West: Southern Cross Dr														
11	T1	454	5.0	454	5.0	0.697	10.1	LOS A	13.4	97.5	0.65	0.59	0.65	45.2
12	R2	308	5.0	308	5.0	0.904	62.9	LOS E	17.9	130.9	1.00	1.00	1.39	29.0
Approach		762	5.0	762	5.0	0.904	31.4	LOS C	17.9	130.9	0.79	0.75	0.95	34.2
All Vehicles		2094	5.0	1974[N1]	5.3	1.808	140.8	LOS F	74.2	541.5	0.73	1.00	1.51	13.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		105	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Starke St															
Lane 1	271	5.0	271	5.0	1234	0.220	100	7.2	LOS A	2.3	16.4	Short	50	0.0	NA
Lane 2	308	5.0	308	5.0	170	1.808	100	778.0	LOS F	74.2	541.5	Full	500	-50.0[N3]	12.2
Approach	579	5.0	579	5.0		1.808		417.2	LOS F	74.2	541.5				
East: Southern Cross Dr															
Lane 1	753	5.0	633	5.0	858	0.738	100	19.6	LOS B	18.7	136.6	Full	135	0.0	6.0
Approach	753	5.0	633[N1]	5.0		0.738		19.6	LOS B	18.7	136.6				
West: Southern Cross Dr															
Lane 1	454	5.0	454	5.0	652	0.697	100	10.1	LOS A	13.4	97.5	Full	500	-50.0[N3]	0.0
Lane 2	308	5.0	308	5.0	341	0.904	100	62.9	LOS E	17.9	130.9	Short	65	0.0	NA
Approach	762	5.0	762	5.0		0.904		31.4	LOS C	17.9	130.9				
Intersection	2094	5.0	1974[N1]	5.3		1.808		140.8	LOS F	74.2	541.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

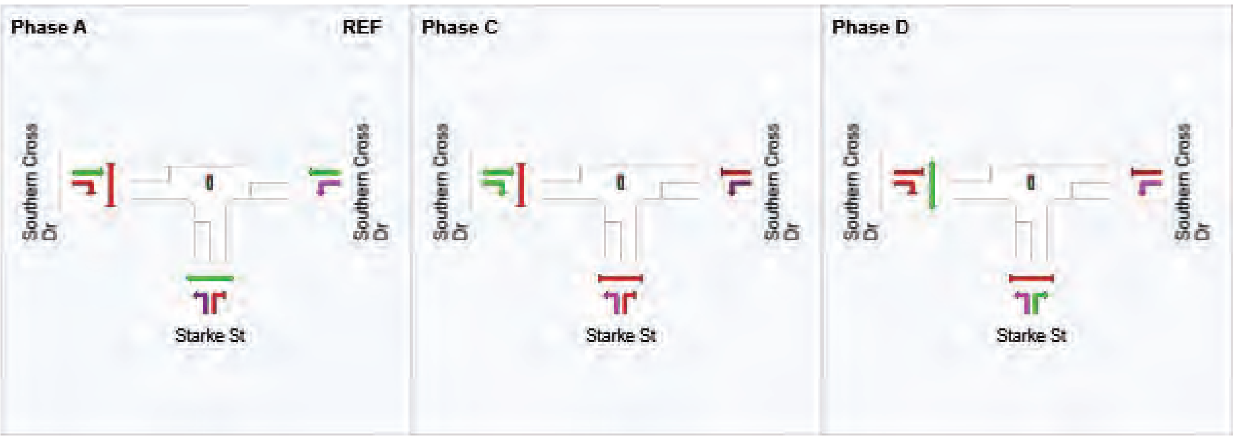
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects not included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	50	75
Green Time (sec)	44	19	19
Phase Time (sec)	50	25	25
Phase Split	50%	25%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Southern Cross Dr														
5	T1	398	5.0	398	5.0	0.431	15.9	LOS B	11.9	87.0	0.66	0.58	0.66	28.2
6	R2	203	5.0	203	5.0	1.415	425.9	LOS F	35.7	260.3	1.00	1.95	3.94	5.4
Approach		601	5.0	601	5.0	1.415	154.4	LOS F	35.7	260.3	0.78	1.04	1.77	7.9
North: Florey Dr														
7	L2	707	5.0	707	5.0	1.511	510.0	LOS F	209.9	1532.2	1.00	2.40	4.20	3.4
9	R2	354	5.0	354	5.0	1.511	509.9	LOS F	209.9	1532.2	1.00	2.40	4.20	3.4
Approach		1061	5.0	1061	5.0	1.511	510.0	LOS F	209.9	1532.2	1.00	2.40	4.20	3.4
West: Southern Cross Dr														
10	L2	157	5.0	134	5.0	0.889	54.9	LOS D	30.2	220.3	0.98	1.06	1.65	25.8
11	T1	604	5.0	514	5.0	0.889	49.3	LOS D	30.2	220.3	0.98	1.06	1.65	9.0
Approach		761	5.0	648[N1]	5.0	0.889	50.4	LOS D	30.2	220.3	0.98	1.06	1.65	13.7
All Vehicles		2423	5.0	2310[N1]	5.2	1.511	288.6	LOS F	209.9	1532.2	0.94	1.67	2.85	4.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[N1] Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		158	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: Southern Cross Dr															
Lane 1	398	5.0	398	5.0	923	0.431	100	15.9	LOS B	11.9	87.0	Full	225	-6.0[N3]	18.2[8]
Lane 2	203	5.0	203	5.0	143	1.415	100	425.9	LOS F	35.7	260.3	Short	125	0.0	NA
Approach	601	5.0	601	5.0		1.415		154.4	LOS F	35.7	260.3				
North: Florey Dr															
Lane 1	1061	5.0	1061	5.0	702	1.511	100	510.0	LOS F	209.9	1532.2	Full	500	-2.1[N3]	100.0
Approach	1061	5.0	1061	5.0		1.511		510.0	LOS F	209.9	1532.2				
West: Southern Cross Dr															
Lane 1	761	5.0	648	5.0	728	0.889	100	50.4	LOS D	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	761	5.0	648[N1]	5.0		0.889		50.4	LOS D	30.2	220.3				
Intersection	2423	5.0	2310[N1]	5.2		1.511		288.6	LOS F	209.9	1532.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

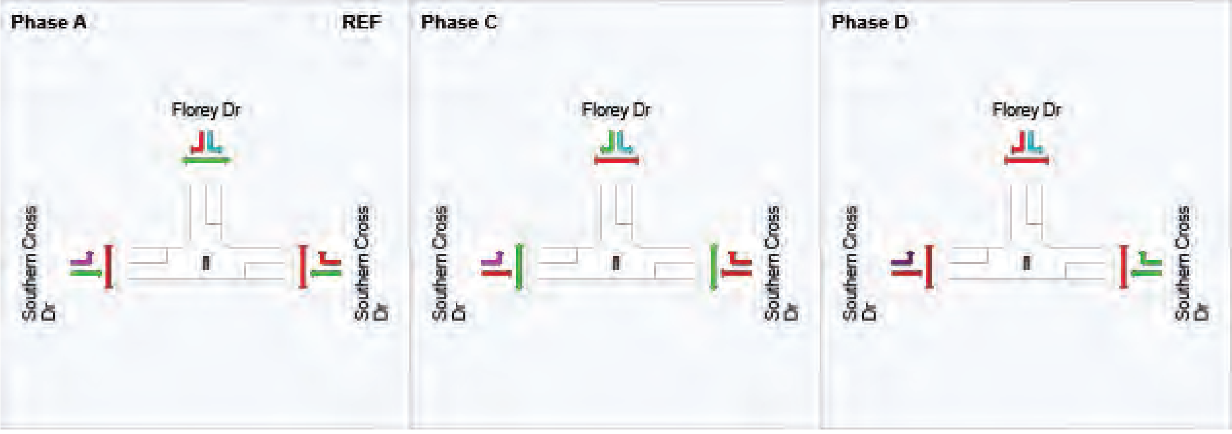
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	11	55	97
Green Time (sec)	38	36	8
Phase Time (sec)	44	42	14
Phase Split	44%	42%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
🟥	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\03-Kippax-Future Year 2035 - (Base Case) No Development.sip8

MOVEMENT SUMMARY

▽ Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	17	5.0	17	5.0	0.036	9.0	LOS A	0.1	0.7	0.54	0.73	0.54	46.0
3	R2	1	5.0	1	5.0	0.036	17.4	LOS B	0.1	0.7	0.54	0.73	0.54	50.3
Approach		18	5.0	18	5.0	0.036	9.5	LOS A	0.1	0.7	0.54	0.73	0.54	46.4
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	584	5.0	584	5.0	0.378	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		585	5.0	585	5.0	0.378	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	1022	5.0	768	5.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	289	5.0	217	5.0	0.317	10.2	LOS A	1.2	8.9	0.61	0.87	0.69	46.5
Approach		1311	5.0	986 N1	5.0	0.317	2.2	NA	1.2	8.9	0.13	0.19	0.15	56.4
All Vehicles		1914	5.0	1589 N1	6.0	0.378	1.5	NA	1.2	8.9	0.09	0.13	0.10	57.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Moyes Crescent															
Lane 1	18	5.0	18	5.0	497	0.036	100	9.5	LOS A	0.1	0.7	Full	500	-17.4[N3]	0.0
Approach	18	5.0	18	5.0		0.036		9.5	LOS A	0.1	0.7				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	584	5.0	584	5.0	1545	0.378	100	0.1	LOS A	0.0	0.0	Full	500	-18.2[N3]	0.0
Approach	585	5.0	585	5.0		0.378		0.1	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	516	5.0	388	5.0	1889	0.205	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	506	5.0	381	5.0	1853	0.205	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	289	5.0	217	5.0	684	0.317	100	10.2	LOS A	1.2	8.9	Short	60	0.0	NA
Approach	1311	5.0	986[N1]	5.0		0.317		2.2	NA	1.2	8.9				
Intersection	1914	5.0	1589[N1]	6.0		0.378		1.5	NA	1.2	8.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Starke St														
1	L2	377	5.0	377	5.0	0.343	10.0	LOS A	5.3	38.5	0.47	0.70	0.47	50.7
3	R2	364	5.0	364	5.0	1.203	242.3	LOS F	45.2	329.9	1.00	1.73	3.37	6.6
Approach		741	5.0	741	5.0	1.203	124.1	LOS F	45.2	329.9	0.73	1.20	1.90	16.0
East: Southern Cross Dr														
4	L2	379	5.0	358	5.0	1.114	146.8	LOS F	30.2	220.3	1.00	1.74	2.47	12.1
5	T1	453	5.0	428	5.0	1.114	141.1	LOS F	30.2	220.3	1.00	1.74	2.47	12.2
Approach		832	5.0	786[N1]	5.0	1.114	143.7	LOS F	30.2	220.3	1.00	1.74	2.47	12.1
West: Southern Cross Dr														
11	T1	360	5.0	360	5.0	0.744	20.6	LOS B	12.5	91.5	0.85	0.82	0.94	35.9
12	R2	212	5.0	212	5.0	1.576	559.2	LOS F	41.2	300.8	1.00	2.44	5.39	5.7
Approach		572	5.0	572	5.0	1.576	220.3	LOS F	41.2	300.8	0.90	1.42	2.59	9.4
All Vehicles		2145	5.0	2099[N1]	5.1	1.576	157.6	LOS F	45.2	329.9	0.88	1.47	2.30	12.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		105	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Starke St															
Lane 1	377	5.0	377	5.0	1099	0.343	100	10.0	LOS A	5.3	38.5	Short	50	0.0	NA
Lane 2	364	5.0	364	5.0	303	1.203	100	242.3	LOS F	45.2	329.9	Full	500	-50.0[N3]	0.0
Approach	741	5.0	741	5.0		1.203		124.1	LOS F	45.2	329.9				
East: Southern Cross Dr															
Lane 1	832	5.0	786	5.0	706	1.114	100	143.7	LOS F	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	832	5.0	786[N1]	5.0		1.114		143.7	LOS F	30.2	220.3				
West: Southern Cross Dr															
Lane 1	360	5.0	360	5.0	484	0.744	100	20.6	LOS B	12.5	91.5	Full	500	-50.0[N3]	0.0
Lane 2	212	5.0	212	5.0	134	1.576	100	559.2	LOS F	41.2	300.8	Short	65	0.0	NA
Approach	572	5.0	572	5.0		1.576		220.3	LOS F	41.2	300.8				
Intersection	2145	5.0	2099[N1]	5.1		1.576		157.6	LOS F	45.2	329.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

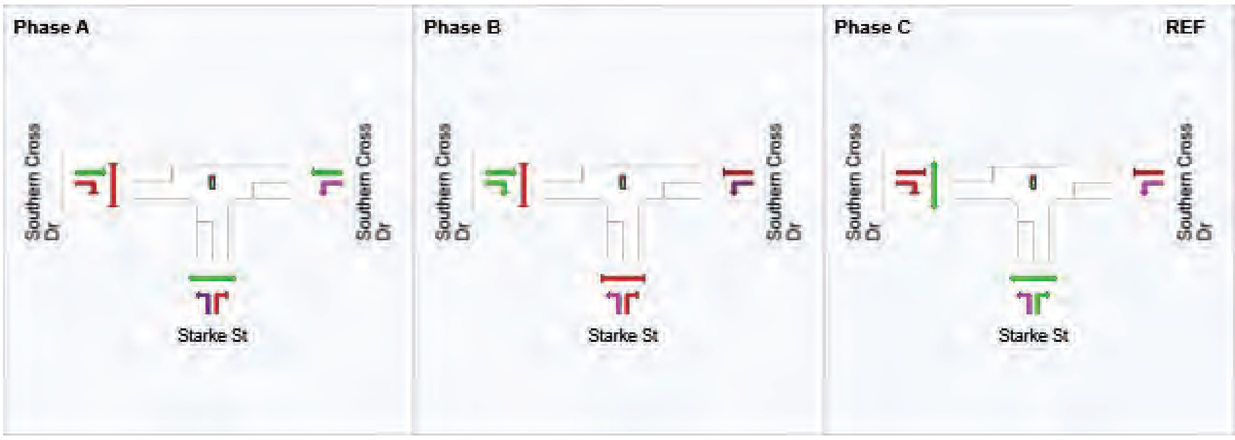
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase C
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	33	68	0
Green Time (sec)	29	6	27
Phase Time (sec)	35	12	33
Phase Split	44%	15%	41%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

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Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\03-Kippax-Future Year 2035 - (Base Case) No Development.sip8

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Southern Cross Dr														
5	T1	630	5.0	597	5.0	0.992	76.9	LOS F	44.0	321.5	1.00	1.48	1.80	9.3
6	R2	552	5.0	523	5.0	1.945	878.0	LOS F	50.3	367.2	1.00	2.95	6.63	2.8
Approach		1182	5.0	1120[N1]	5.0	1.945	451.0	LOS F	50.3	367.2	1.00	2.17	4.05	3.4
North: Florey Dr														
7	L2	274	5.0	274	5.0	1.077	133.3	LOS F	40.2	293.6	1.00	1.49	2.38	11.3
9	R2	202	5.0	202	5.0	1.077	133.2	LOS F	40.2	293.6	1.00	1.49	2.38	11.3
Approach		476	5.0	476	5.0	1.077	133.3	LOS F	40.2	293.6	1.00	1.49	2.38	11.3
West: Southern Cross Dr														
10	L2	313	5.0	295	5.0	1.038	88.0	LOS F	30.2	220.3	1.00	1.39	1.92	17.0
11	T1	411	5.0	387	5.0	1.038	82.4	LOS F	30.2	220.3	1.00	1.39	1.92	5.1
Approach		724	5.0	682[N1]	5.0	1.038	84.8	LOS F	30.2	220.3	1.00	1.39	1.92	11.0
All Vehicles		2382	5.0	2279[N1]	5.2	1.945	275.0	LOS F	50.3	367.2	1.00	1.79	3.07	5.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[N1] Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Southern Cross Dr															
Lane 1	630	5.0	597	5.0	602	0.992	100	76.9	LOS F	44.0	321.5	Full	225	-50.0[N3]	50.0[8]
Lane 2	552	5.0	523	5.0	269	1.945	100	878.0	LOS F	50.3[N4]	367.2[N4]	Short	125	0.0	NA
Approach	1182	5.0	1120[N1]	5.0		1.945		451.0	LOS F	50.3	367.2				
North: Florey Dr															
Lane 1	476	5.0	476	5.0	442	1.077	100	133.3	LOS F	40.2	293.6	Full	500	0.0	0.0
Approach	476	5.0	476	5.0		1.077		133.3	LOS F	40.2	293.6				
West: Southern Cross Dr															
Lane 1	724	5.0	682	5.0	657	1.038	100	84.8	LOS F	30.2[N4]	220.3[N4]	Full	135	0.0	50.0
Approach	724	5.0	682[N1]	5.0		1.038		84.8	LOS F	30.2	220.3				
Intersection	2382	5.0	2279[N1]	5.2		1.945		275.0	LOS F	50.3	367.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 80 seconds (Network Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Fixed Time PM Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

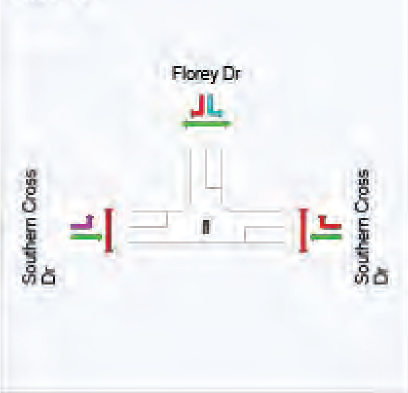
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	34	67	79	22
Green Time (sec)	27	6	17	6
Phase Time (sec)	33	12	23	12
Phase Split	41%	15%	29%	15%

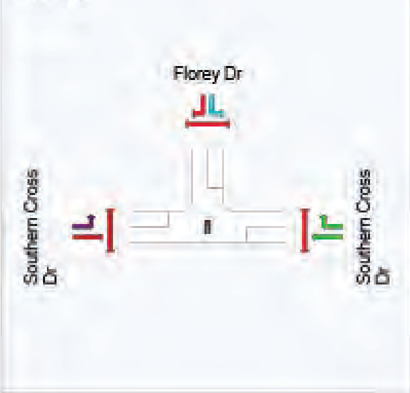
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

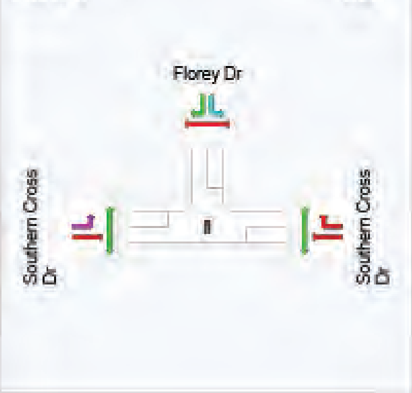
Phase A

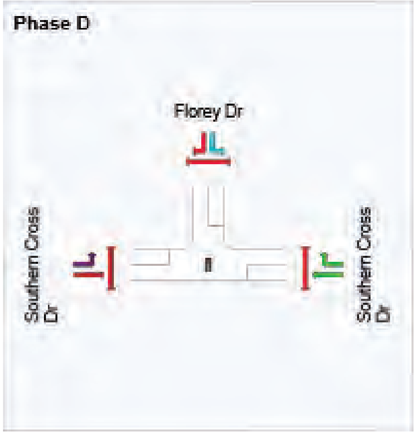


Phase B



Phase C **REF**





REF: Reference Phase
VAR: Variable Phase

➡	Normal Movement	➡	Permitted/Opposed
➡	Slip/Bypass-Lane Movement	➡	Opposed Slip/Bypass-Lane
⊣	Stopped Movement	⊣	Turn On Red
➡	Other Movement Class (MC) Running	⇨	Undetected Movement
➡	Mixed Running & Stopped MCs	➡	Continuous Movement
⊣	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	241	5.0	241	5.0	1.534	504.8	LOS F	56.2	410.0	1.00	6.56	22.23	3.4
3	R2	1	5.0	1	5.0	1.534	518.3	LOS F	56.2	410.0	1.00	6.56	22.23	6.4
Approach		242	5.0	242	5.0	1.534	504.9	LOS F	56.2	410.0	1.00	6.56	22.23	3.4
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
5	T1	941	5.0	941	5.0	0.498	0.1	LOS A	58.1	424.4	0.00	0.00	0.00	59.8
Approach		942	5.0	942	5.0	0.498	0.1	NA	58.1	424.4	0.00	0.00	0.00	59.8
West: Southern Cross Dr														
11	T1	666	5.0	608	5.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	19	5.0	17	5.0	0.051	14.9	LOS B	0.1	1.0	0.77	0.91	0.77	42.9
Approach		685	5.0	626[N1]	5.0	0.162	0.4	NA	0.1	1.0	0.02	0.03	0.02	59.3
All Vehicles		1869	5.0	1810[N1]	5.2	1.534	67.7	NA	58.1	424.4	0.14	0.89	2.98	20.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - PM Peak - 2035-No DVLP]

Network: N101 [Kippax - 2035-No DVLP - PM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Moyes Crescent															
Lane 1	242	5.0	242	5.0	158	1.534	100	504.9	LOS F	56.2	410.0	Full	500	-49.9[N3]	0.0
Approach	242	5.0	242	5.0		1.534		504.9	LOS F	56.2	410.0				
East: Southern Cross Dr															
Lane 1	1	5.0	1	5.0	1793	0.001	100	5.6	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	941	5.0	941	5.0	1889	0.498	100	0.1	LOS A	58.1[N5]	424.4[N5]	Full	500	0.0	0.0
Approach	942	5.0	942	5.0		0.498		0.1	NA	58.1	424.4				
West: Southern Cross Dr															
Lane 1	336	5.0	307	5.0	1889	0.162	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	330	5.0	302	5.0	1858	0.162	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	19	5.0	17	5.0	339	0.051	100	14.9	LOS B	0.1	1.0	Short	60	0.0	NA
Approach	685	5.0	626[N1]	5.0		0.162		0.4	NA	0.1	1.0				
Intersection	1869	5.0	1810[N1]	5.2		1.534		67.7	NA	58.1	424.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).

Appendix D

Sidra Outputs – Base Case and With Development – 2025 & 2035

TPV Land Uses Traffic Flow Distribution

Kippax Traffic Flows - 2041 CSTM

Time	IN	OUT
AM Peak	183	76
PM Peak	104	248

Legend

- 🟩 Kippax Origin Traffic
- 🟦 Kippax Destination Traffic

Kippax Traffic on Study Intersections (AM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St							10		3			
Southern Cross / Florey Dr												

Kippax Traffic on Study Intersections (PM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				8			64		21			23
Southern Cross / Florey Dr			8							21		

Used the same trip distributions of PM for the AM Peak, as the AM distribution was found to be very low on the north side

Kippax Traffic Distribution at Study Intersections (AM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St	0	0	0	8%	0	0	26%	0	8%	0	0	22%
Southern Cross / Florey Dr	0	0	8%	0	0	0	0	0	0	8%	0	0

Kippax Traffic Distribution at Study Intersections (PM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				8%			26%		8%			22%
Southern Cross / Florey Dr			8%							8%		

Additional Kippax Traffic at Study Intersections (AM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				14			59		19			40
Southern Cross / Florey Dr			14			8				19		
Southern Cross / Moyes Cr*							8					

*The Terrace Housing origin & destination traffic is assumed to utilize the South approach left turns

Additional Kippax Traffic at Study Intersections (PM Peak - 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				30			83		27			87
Southern Cross / Florey Dr	8		30							27		
Southern Cross / Moyes Cr*												8

*The Terrace Housing origin & destination traffic is assumed to utilize the South approach left turns

Additional Traffic from TPV land uses (Opening Year 2025)

Flows for With Development Scenario

AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				14	0		59		19		0	40
Southern Cross / Florey Dr	0		14		0	8				19	0	
Southern Cross / Moyes Cr				0	0		8		0		0	0

PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				30	0		83		27		0	87
Southern Cross / Florey Dr	8		30		0	0				27	0	
Southern Cross / Moyes Cr				0	0		0		0		0	8

Opening Year 2025 Traffic Flows (Interpolated using 2041 flows)

Exponential Growth per annum	**1%**
Yrs (2025-2041)	16
Growth Calc for 2025 - 2041	**1.17257864**

Intersection Flows without TPV Traffic

Flows for No-Development Scenario

2025 AM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				404	277		246		279		411	279
Southern Cross / Florey Dr	640		321		361	183				142	547	
Southern Cross / Moyes Cr				0	529		15		0		925	262

2025 PM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				343	410		341		329		326	192
Southern Cross / Florey Dr	248		183		571	500				283	372	
Southern Cross / Moyes Cr				0	852		218		0		603	17

Intersection Flows With TPV Traffic

Flows for With Development Scenario

2025 AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				418	277		305		298		411	319
Southern Cross / Florey Dr	640		335		361	192				161	547	
Southern Cross / Moyes Cr				0	529		24		0		925	262

2025 PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				373	410		424		356		326	279
Southern Cross / Florey Dr	257		213		571	500				310	372	
Southern Cross / Moyes Cr				0	852		218		0		603	25

Horizon Year 2035 Traffic Flows (Interpolated using 2041 flows)

Exponential Growth per annum	**1%**
Yrs (2035-2041)	6
Growth Calc for 2035 - 2041	**1.06152015**

Intersection Flows without TPV Traffic

Flows for No-Development Scenario

2035 AM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				447	306		271		308		454	308
Southern Cross / Florey Dr	707		354		398	203				157	604	
Southern Cross / Moyes Cr				0	584		17		0		1022	289

2035 PM Peak hour flows (Interpolated from 2041)

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				379	453		377		364		360	212
Southern Cross / Florey Dr	274		202		630	552				313	411	
Southern Cross / Moyes Cr				0	941		241		0		666	19

Intersection Flows With TPV Traffic

Flows for With Development Scenario

2035 AM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				461	306		330		327		454	348
Southern Cross / Florey Dr	707		368		398	211				176	604	
Southern Cross / Moyes Cr				0	584		25		0		1022	289

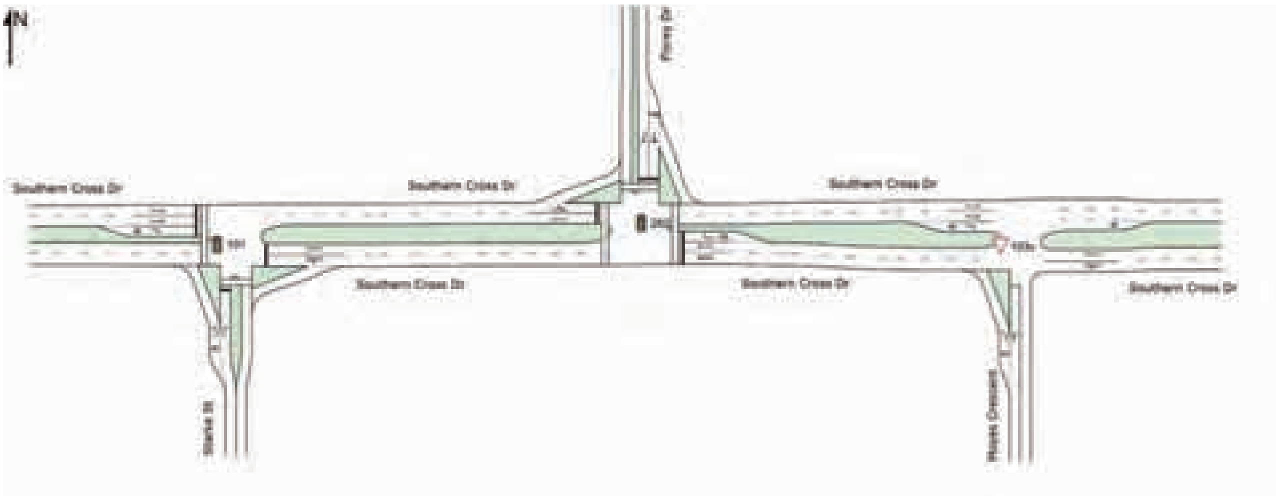
2035 PM Peak hour flows

Intersection	North Approach			East Approach			South Approach			West Approach		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Southern Cross / Starke St				409	453		460		391		360	299
Southern Cross / Florey Dr	283		232		630	552				340	411	
Southern Cross / Moyes Cr				0	941		241		0		666	27

NETWORK LAYOUT

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2025 - No DVLP (Base Case) Mitigation
262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2025 - No DVLP (Base Case) Mitigation
▽103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2025 - No DVLP (Base Case) Mitigation

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Starke St														
1	L2	246	5.0	246	5.0	0.195	7.9	LOS A	2.5	18.6	0.30	0.64	0.30	52.3
3	R2	279	5.0	279	5.0	0.556	39.0	LOS C	11.7	85.7	0.91	0.82	0.91	26.5
Approach		525	5.0	525	5.0	0.556	24.4	LOS B	11.7	85.7	0.62	0.74	0.62	38.6
East: Southern Cross Dr														
4	L2	404	5.0	404	5.0	0.525	14.6	LOS B	8.2	60.1	0.70	0.76	0.70	43.3
5	T1	277	5.0	277	5.0	0.525	34.5	LOS C	11.4	82.9	0.95	0.82	0.95	31.6
Approach		681	5.0	681	5.0	0.525	22.7	LOS B	11.4	82.9	0.80	0.79	0.80	37.6
West: Southern Cross Dr														
11	T1	411	5.0	411	5.0	0.181	9.5	LOS A	4.4	32.3	0.48	0.40	0.48	45.9
12	R2	279	5.0	279	5.0	0.537	38.1	LOS C	11.6	84.4	0.89	0.82	0.89	36.2
Approach		690	5.0	690	5.0	0.537	21.0	LOS B	11.6	84.4	0.65	0.57	0.65	39.8
All Vehicles		1896	5.0	1896	5.0	0.556	22.6	LOS B	11.7	85.7	0.70	0.69	0.70	38.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		105	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Starke St															
Lane 1	246	5.0	246	5.0	1265	0.195	100	7.9	LOS A	2.5	18.6	Short	50	0.0	NA
Lane 2	279	5.0	279	5.0	502	0.556	100	39.0	LOS C	11.7	85.7	Full	500	0.0	0.0
Approach	525	5.0	525	5.0		0.556		24.4	LOS B	11.7	85.7				
East: Southern Cross Dr															
Lane 1	433	5.0	433	5.0	824	0.525	100	14.2	LOS A	8.2	60.1	Full	135	0.0	0.0
Lane 2	248	5.0	248	5.0	472	0.525	100	37.5	LOS C	11.4	82.9	Full	135	0.0	0.0
Approach	681	5.0	681	5.0		0.525		22.7	LOS B	11.4	82.9				
West: Southern Cross Dr															
Lane 1	206	5.0	206	5.0	1133	0.181	100	9.5	LOS A	4.4	32.3	Full	500	0.0	0.0
Lane 2	206	5.0	206	5.0	1133	0.181	100	9.5	LOS A	4.4	32.3	Full	500	0.0	0.0
Lane 3	279	5.0	279	5.0	520	0.537	100	38.1	LOS C	11.6	84.4	Short	65	0.0	NA
Approach	690	5.0	690	5.0		0.537		21.0	LOS B	11.6	84.4				
Intersection	1896	5.0	1896	5.0		0.556		22.6	LOS B	11.7	85.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

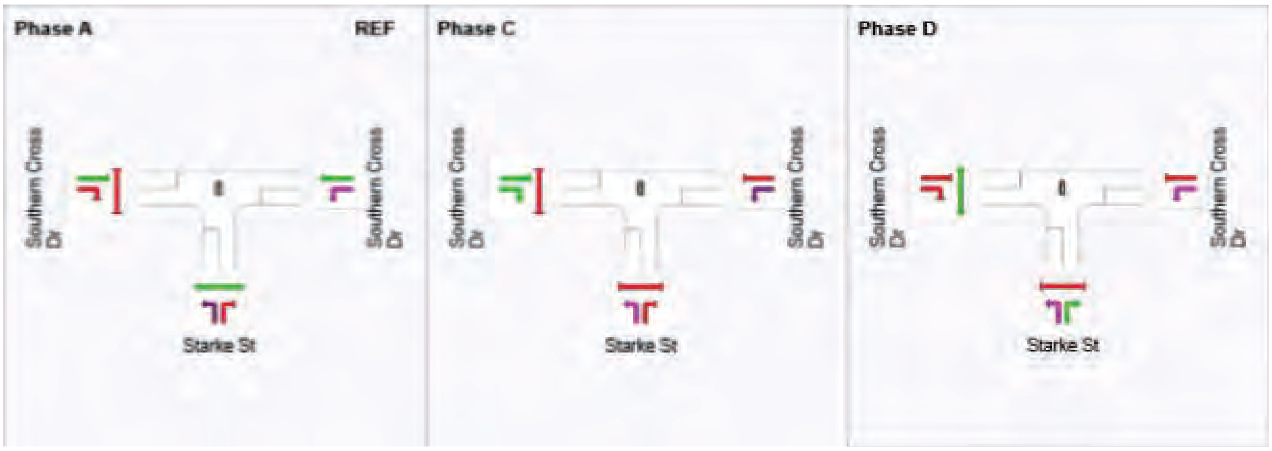
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	31	66
Green Time (sec)	25	29	28
Phase Time (sec)	31	35	34
Phase Split	31%	35%	34%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	☐	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Southern Cross Dr														
5	T1	361	5.0	361	5.0	0.168	10.8	LOS A	4.1	30.0	0.50	0.42	0.50	34.2
6	R2	183	5.0	183	5.0	0.537	45.9	LOS D	8.3	60.3	0.95	0.81	0.95	28.9
Approach		544	5.0	544	5.0	0.537	22.6	LOS B	8.3	60.3	0.66	0.55	0.66	30.7
North: Florey Dr														
7	L2	640	5.0	640	5.0	0.560	12.9	LOS A	13.9	101.6	0.57	0.78	0.65	42.6
9	R2	321	5.0	321	5.0	0.560	36.1	LOS C	13.9	101.6	0.88	0.82	0.88	27.6
Approach		961	5.0	961	5.0	0.560	20.7	LOS B	13.9	101.6	0.68	0.80	0.73	36.1
West: Southern Cross Dr														
10	L2	142	5.0	142	5.0	0.554	36.0	LOS C	11.5	83.8	0.77	0.80	1.22	32.3
11	T1	547	5.0	547	5.0	0.554	30.4	LOS C	14.1	102.6	0.86	0.79	1.03	13.4
Approach		689	5.0	689	5.0	0.554	31.5	LOS C	14.1	102.6	0.84	0.79	1.07	19.4
All Vehicles		2194	5.0	2194	5.0	0.560	24.6	LOS B	14.1	102.6	0.72	0.74	0.82	29.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		158	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: Southern Cross Dr															
Lane 1	181	5.0	181	5.0	1077	0.168	100	10.8	LOS A	4.1	30.0	Full	225	0.0	0.0
Lane 2	181	5.0	181	5.0	1077	0.168	100	10.8	LOS A	4.1	30.0	Full	225	0.0	0.0
Lane 3	183	5.0	183	5.0	341	0.537	100	45.9	LOS D	8.3	60.3	Short	125	0.0	NA
Approach	544	5.0	544	5.0		0.537		22.6	LOS B	8.3	60.3				
North: Florey Dr															
Lane 1	649	5.0	649	5.0	1159	0.560	100	12.9	LOS A	13.9	101.6	Short	100	0.0	NA
Lane 2	312	5.0	312	5.0	556	0.560	100	36.8	LOS C	12.8	93.5	Full	500	0.0	0.0
Approach	961	5.0	961	5.0		0.560		20.7	LOS B	13.9	101.6				
West: Southern Cross Dr															
Lane 1	354	5.0	354	5.0	639	0.554	100	32.6	LOS C	11.5	83.8	Full	135	0.0	0.0
Lane 2	335	5.0	335	5.0	604	0.554	100	30.4	LOS C	14.1	102.6	Full	135	0.0	0.0
Approach	689	5.0	689	5.0		0.554		31.5	LOS C	14.1	102.6				
Intersection	2194	5.0	2194	5.0		0.560		24.6	LOS B	14.1	102.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\Rev 1\04-Kippax-Opening Year 2025 - (Base Case) Mitigations - No Development.sip8

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

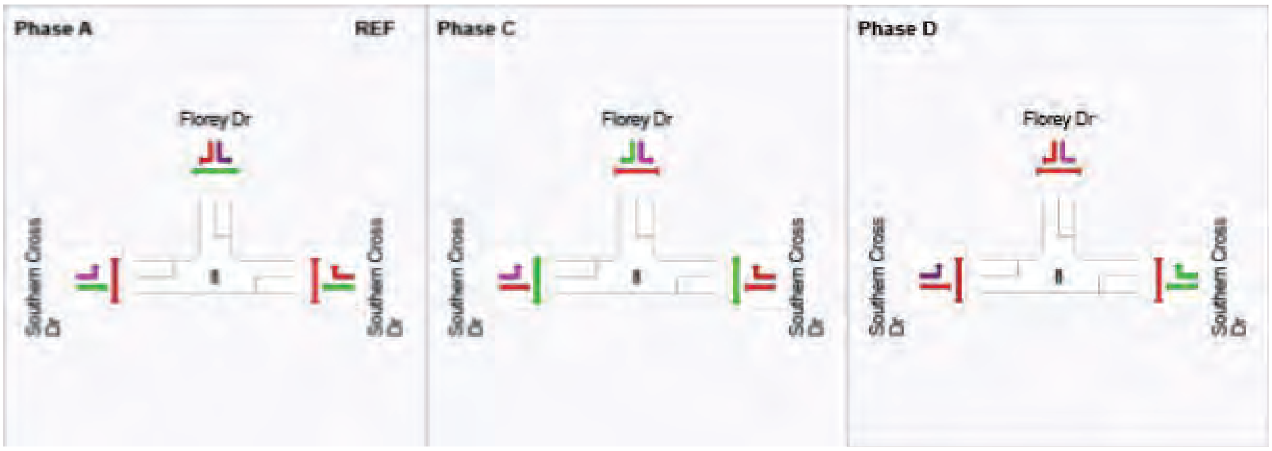
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	11	49	86
Green Time (sec)	32	31	19
Phase Time (sec)	38	37	25
Phase Split	38%	37%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Moyes Crescent														
1	L2	15	5.0	15	5.0	0.015	6.8	LOS A	0.1	0.4	0.34	0.56	0.34	48.9
3	R2	1	5.0	1	5.0	0.018	65.7	LOS E	0.1	0.4	0.94	0.98	0.94	28.3
Approach		16	5.0	16	5.0	0.018	10.5	LOS A	0.1	0.4	0.38	0.58	0.38	45.1
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.140	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
5	T1	529	5.0	529	5.0	0.140	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		530	5.0	530	5.0	0.140	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	925	5.0	925	5.0	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	262	5.0	262	5.0	0.333	9.4	LOS A	1.4	10.4	0.54	0.82	0.62	47.8
Approach		1187	5.0	1187	5.0	0.333	2.1	NA	1.4	10.4	0.12	0.18	0.14	56.8
All Vehicles		1733	5.0	1733	5.0	0.333	1.5	NA	1.4	10.4	0.09	0.13	0.10	57.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025 - No DVLP (Base Case) Mitigation]

Network: N101 [Kippax - 2025-Base Case No DVLP Mitigations - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Moyes Crescent															
Lane 1	15	5.0	15	5.0	991	0.015	100	6.8	LOS A	0.1	0.4	Short	60	0.0	NA
Lane 2	1	5.0	1	5.0	54	0.018	100	65.7	LOS E	0.1	0.4	Full	500	0.0	0.0
Approach	16	5.0	16	5.0		0.018		10.5	LOS A	0.1	0.4				
East: Southern Cross Dr															
Lane 1	274	0.0	274	0.0	1949	0.140	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	256	10.3	256	10.3	1827	0.140	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	530	5.0	530	5.0		0.140		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	466	5.0	466	5.0	1889	0.247	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	459	5.0	459	5.0	1860	0.247	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	262	5.0	262	5.0	788	0.333	100	9.4	LOS A	1.4	10.4	Short	60	0.0	NA
Approach	1187	5.0	1187	5.0		0.333		2.1	NA	1.4	10.4				
Intersection	1733	5.0	1733	5.0		0.333		1.5	NA	1.4	10.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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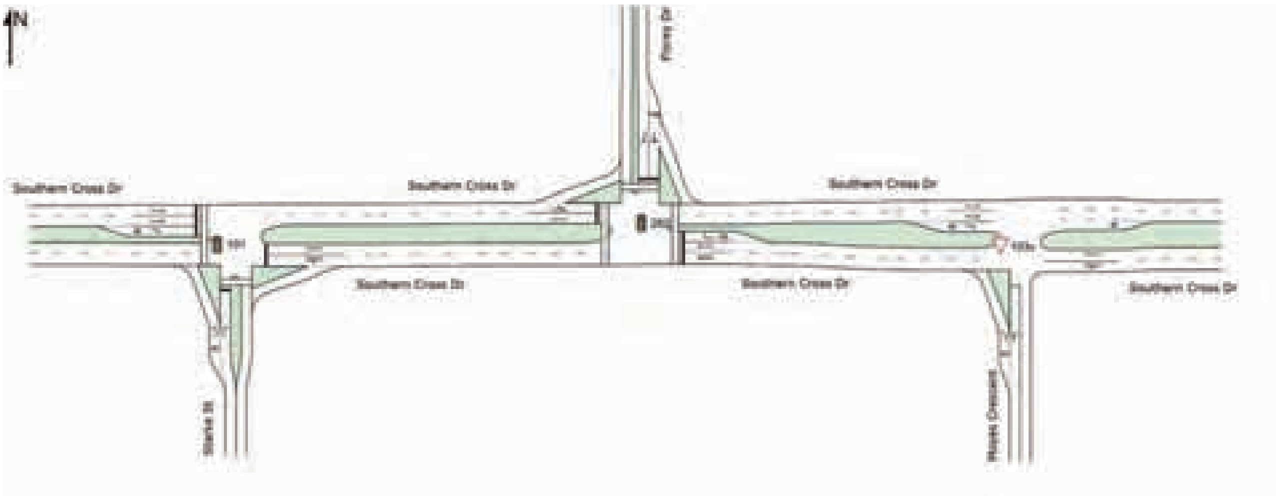
Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\Rev 1\04-Kippax-Opening Year 2025 - (Base Case) Mitigations - No Development.sip8

NETWORK LAYOUT

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
🚦101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation No DVLP (Base case)
🚦262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation No DVLP (Base case)
▽103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation No DVLP (Base case)

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Starke St														
1	L2	271	5.0	271	5.0	0.214	8.2	LOS A	3.0	22.0	0.32	0.65	0.32	52.1
3	R2	308	5.0	308	5.0	0.589	36.8	LOS C	12.6	92.2	0.89	0.82	0.89	27.4
Approach		579	5.0	579	5.0	0.589	23.4	LOS B	12.6	92.2	0.62	0.74	0.62	39.2
East: Southern Cross Dr														
4	L2	447	5.0	447	5.0	0.601	15.6	LOS B	9.5	69.3	0.76	0.79	0.76	42.5
5	T1	306	5.0	306	5.0	0.601	35.1	LOS C	12.6	91.9	0.96	0.83	0.96	31.3
Approach		753	5.0	753	5.0	0.601	23.5	LOS B	12.6	91.9	0.84	0.81	0.84	37.1
West: Southern Cross Dr														
11	T1	454	5.0	454	5.0	0.211	11.1	LOS A	5.3	38.9	0.52	0.44	0.52	44.1
12	R2	308	5.0	308	5.0	0.636	40.7	LOS C	13.4	98.1	0.94	0.84	0.94	35.3
Approach		762	5.0	762	5.0	0.636	23.1	LOS B	13.4	98.1	0.69	0.60	0.69	38.6
All Vehicles		2094	5.0	2094	5.0	0.636	23.3	LOS B	13.4	98.1	0.73	0.71	0.73	38.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		105	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Starke St															
Lane 1	271	5.0	271	5.0	1265	0.214	100	8.2	LOS A	3.0	22.0	Short	50	0.0	NA
Lane 2	308	5.0	308	5.0	523[1]	0.589	100	36.8	LOS C	12.6	92.2	Full	500	0.0	0.0
Approach	579	5.0	579	5.0		0.589		23.4	LOS B	12.6	92.2				
East: Southern Cross Dr															
Lane 1	481	5.0	481	5.0	799	0.601	100	15.2	LOS B	9.5	69.3	Full	135	0.0	0.0
Lane 2	272	5.0	272	5.0	453	0.601	100	38.2	LOS C	12.6	91.9	Full	135	0.0	0.0
Approach	753	5.0	753	5.0		0.601		23.5	LOS B	12.6	91.9				
West: Southern Cross Dr															
Lane 1	227	5.0	227	5.0	1077	0.211	100	11.1	LOS A	5.3	38.9	Full	500	0.0	0.0
Lane 2	227	5.0	227	5.0	1077	0.211	100	11.1	LOS A	5.3	38.9	Full	500	0.0	0.0
Lane 3	308	5.0	308	5.0	484	0.636	100	40.7	LOS C	13.4	98.1	Short	65	0.0	NA
Approach	762	5.0	762	5.0		0.636		23.1	LOS B	13.4	98.1				
Intersection	2094	5.0	2094	5.0		0.636		23.3	LOS B	13.4	98.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

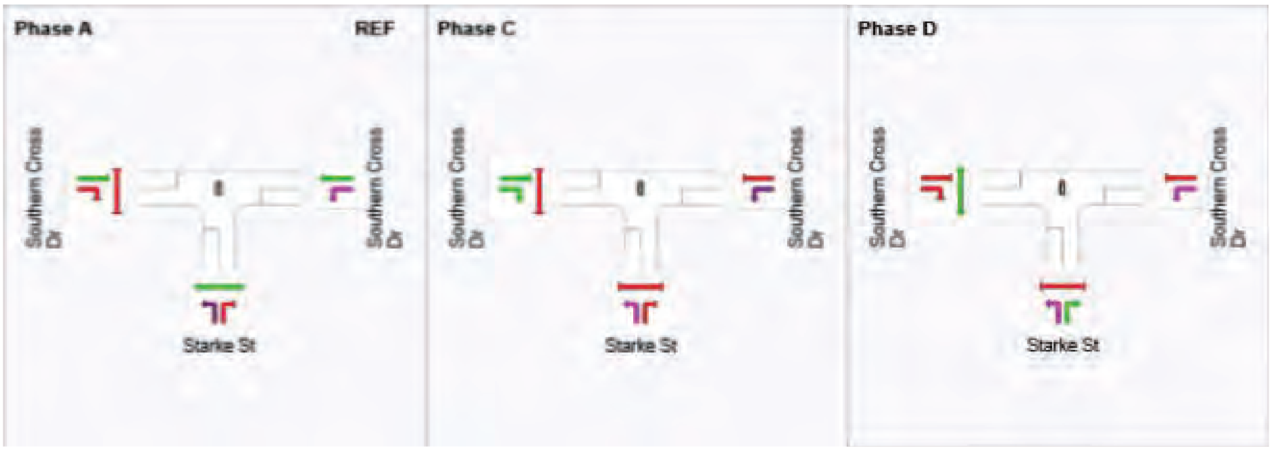
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	30	63
Green Time (sec)	24	27	31
Phase Time (sec)	30	33	37
Phase Split	30%	33%	37%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	● Phase Transition Applied

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Southern Cross Dr														
5	T1	398	5.0	398	5.0	0.185	10.9	LOS A	4.6	33.5	0.51	0.43	0.51	34.0
6	R2	203	5.0	203	5.0	0.596	46.5	LOS D	9.3	67.8	0.97	0.82	0.97	28.7
Approach		601	5.0	601	5.0	0.596	22.9	LOS B	9.3	67.8	0.66	0.56	0.66	30.6
North: Florey Dr														
7	L2	707	5.0	707	5.0	0.620	15.1	LOS B	15.5	113.4	0.64	0.85	0.78	40.5
9	R2	354	5.0	354	5.0	0.620	37.0	LOS C	15.5	113.4	0.90	0.84	0.91	27.3
Approach		1061	5.0	1061	5.0	0.620	22.4	LOS B	15.5	113.4	0.73	0.84	0.83	34.9
West: Southern Cross Dr														
10	L2	157	5.0	157	5.0	0.612	35.4	LOS C	12.9	94.1	0.77	0.81	1.24	32.5
11	T1	604	5.0	604	5.0	0.612	30.6	LOS C	15.7	114.5	0.86	0.80	1.05	13.3
Approach		761	5.0	761	5.0	0.612	31.6	LOS C	15.7	114.5	0.85	0.80	1.09	19.4
All Vehicles		2423	5.0	2423	5.0	0.620	25.4	LOS B	15.7	114.5	0.75	0.76	0.87	29.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		158	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Southern Cross Dr															
Lane 1	199	5.0	199	5.0	1077	0.185	100	10.9	LOS A	4.6	33.5	Full	225	0.0	0.0
Lane 2	199	5.0	199	5.0	1077	0.185	100	10.9	LOS A	4.6	33.5	Full	225	0.0	0.0
Lane 3	203	5.0	203	5.0	341	0.596	100	46.5	LOS D	9.3	67.8	Short	125	0.0	NA
Approach	601	5.0	601	5.0		0.596		22.9	LOS B	9.3	67.8				
North: Florey Dr															
Lane 1	716	5.0	716	5.0	1155	0.620	100	15.1	LOS B	15.5	113.4	Short	100	0.0	NA
Lane 2	345	5.0	345	5.0	556	0.620	100	37.6	LOS C	14.5	105.8	Full	500	0.0	0.0
Approach	1061	5.0	1061	5.0		0.620		22.4	LOS B	15.5	113.4				
West: Southern Cross Dr															
Lane 1	391	5.0	391	5.0	639	0.612	100	32.0	LOS C	12.9	94.1	Full	135	0.0	0.0
Lane 2	370	5.0	370	5.0	604	0.612	100	31.1	LOS C	15.7	114.5	Full	135	0.0	0.0
Approach	761	5.0	761	5.0		0.612		31.6	LOS C	15.7	114.5				
Intersection	2423	5.0	2423	5.0		0.620		25.4	LOS B	15.7	114.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

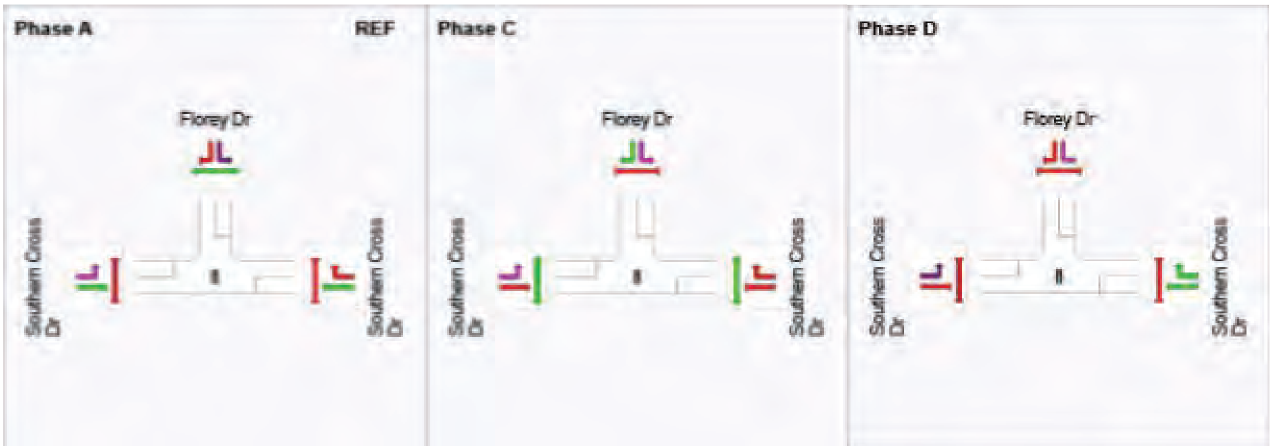
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	11	49	86
Green Time (sec)	32	31	19
Phase Time (sec)	38	37	25
Phase Split	38%	37%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩 Normal Movement	🟩 Permitted/Opposed
🟪 Slip/Bypass-Lane Movement	🟪 Opposed Slip/Bypass-Lane
🟥 Stopped Movement	🟥 Turn On Red
🟩 Other Movement Class (MC) Running	☐ Undetected Movement
🟥 Mixed Running & Stopped MCs	🟦 Continuous Movement
⬜ Other Movement Class (MC) Stopped	● Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	Demand Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Moyes Crescent														
1	L2	17	5.0	17	5.0	0.018	6.9	LOS A	0.1	0.4	0.36	0.57	0.36	48.7
3	R2	1	5.0	1	5.0	0.027	92.0	LOS F	0.1	0.5	0.96	0.98	0.96	23.5
Approach		18	5.0	18	5.0	0.027	11.7	LOS A	0.1	0.5	0.39	0.59	0.39	43.9
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.155	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
5	T1	584	5.0	584	5.0	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		585	5.0	585	5.0	0.155	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	1022	5.0	1022	5.0	0.272	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	289	5.0	289	5.0	0.393	10.4	LOS A	1.8	13.3	0.60	0.88	0.75	47.0
Approach		1311	5.0	1311	5.0	0.393	2.3	NA	1.8	13.3	0.13	0.19	0.17	56.5
All Vehicles		1914	5.0	1914	5.0	0.393	1.7	NA	1.8	13.3	0.09	0.14	0.12	57.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation No DVLP (Base case)]

Network: N101 [Kippax - 2035-Mitigation No DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Moyes Crescent															
Lane 1	17	5.0	17	5.0	960	0.018	100	6.9	LOS A	0.1	0.4	Short	60	0.0	NA
Lane 2	1	5.0	1	5.0	37	0.027	100	92.0	LOS F	0.1	0.5	Full	500	0.0	0.0
Approach	18	5.0	18	5.0		0.027		11.7	LOS A	0.1	0.5				
East: Southern Cross Dr															
Lane 1	302	0.0	302	0.0	1949	0.155	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	283	10.3	283	10.3	1827	0.155	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	585	5.0	585	5.0		0.155		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	513	5.0	513	5.0	1889	0.272	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	509	5.0	509	5.0	1872	0.272	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	289	5.0	289	5.0	735	0.393	100	10.4	LOS A	1.8	13.3	Short	60	0.0	NA
Approach	1311	5.0	1311	5.0		0.393		2.3	NA	1.8	13.3				
Intersection	1914	5.0	1914	5.0		0.393		1.7	NA	1.8	13.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

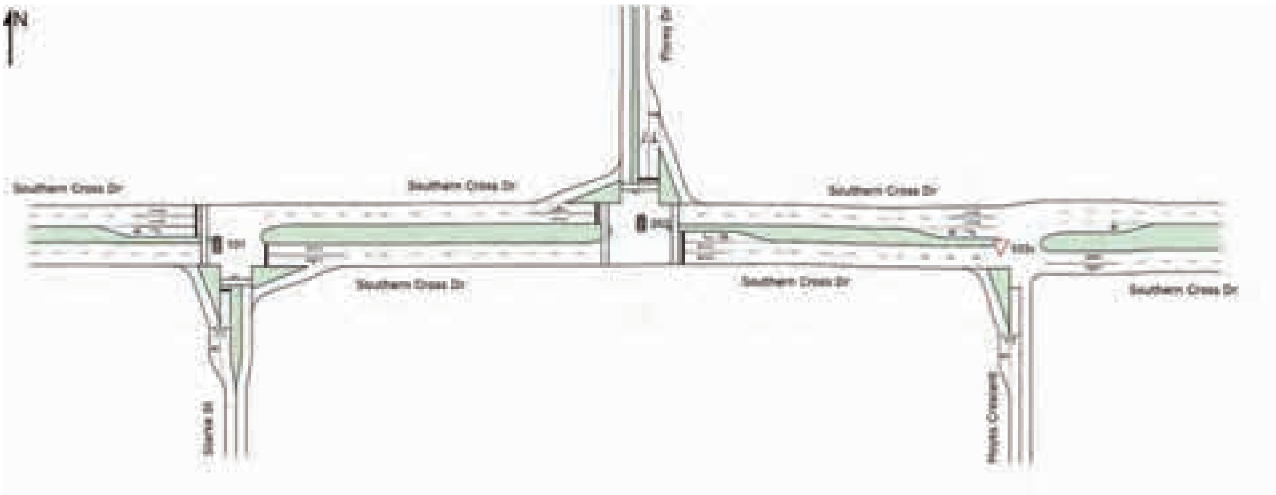
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

NETWORK LAYOUT

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
🚦101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2025- Mitigation With DVLP
🚦262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2025- Mitigation With DVLP
▽103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2025- Mitigation With DVLP

SIDRA INTERSECTION 8.0 | Copyright © 2000-2019 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: AECOM AUSTRALIA PTY LTD | Created: Wednesday, 19 May 2021 3:02:27 PM
Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\Rev 1\06-Kippax-Opening Year 2025 - WITH DVLP - Mitigations.sip8

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Starke St														
1	L2	305	5.0	305	5.0	0.238	8.0	LOS A	3.3	24.1	0.31	0.65	0.31	52.2
3	R2	298	5.0	298	5.0	0.610	38.5	LOS C	12.5	91.4	0.91	0.83	0.91	26.7
Approach		603	5.0	603	5.0	0.610	23.1	LOS B	12.5	91.4	0.61	0.74	0.61	39.7
East: Southern Cross Dr														
4	L2	418	5.0	418	5.0	0.567	15.4	LOS B	8.7	63.3	0.74	0.78	0.74	42.6
5	T1	277	5.0	277	5.0	0.567	35.8	LOS C	11.5	83.6	0.97	0.83	0.97	31.0
Approach		695	5.0	695	5.0	0.567	23.6	LOS B	11.5	83.6	0.83	0.80	0.83	37.1
West: Southern Cross Dr														
11	T1	411	5.0	411	5.0	0.184	10.0	LOS A	4.5	33.1	0.49	0.41	0.49	45.3
12	R2	319	5.0	319	5.0	0.593	38.0	LOS C	13.4	97.7	0.91	0.83	0.91	36.2
Approach		730	5.0	730	5.0	0.593	22.2	LOS B	13.4	97.7	0.67	0.60	0.67	39.4
All Vehicles		2028	5.0	2028	5.0	0.610	22.9	LOS B	13.4	97.7	0.71	0.71	0.71	38.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		105	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Starke St															
Lane 1	305	5.0	305	5.0	1279	0.238	100	8.0	LOS A	3.3	24.1	Short	50	0.0	NA
Lane 2	298	5.0	298	5.0	489[1]	0.610	100	38.5	LOS C	12.5	91.4	Full	500	0.0	0.0
Approach	603	5.0	603	5.0		0.610		23.1	LOS B	12.5	91.4				
East: Southern Cross Dr															
Lane 1	449	5.0	449	5.0	791	0.567	100	15.1	LOS B	8.7	63.3	Full	135	0.0	0.0
Lane 2	246	5.0	246	5.0	434	0.567	100	39.0	LOS C	11.5	83.6	Full	135	0.0	0.0
Approach	695	5.0	695	5.0		0.567		23.6	LOS B	11.5	83.6				
West: Southern Cross Dr															
Lane 1	206	5.0	206	5.0	1114	0.184	100	10.0	LOS A	4.5	33.1	Full	500	0.0	0.0
Lane 2	206	5.0	206	5.0	1114	0.184	100	10.0	LOS A	4.5	33.1	Full	500	0.0	0.0
Lane 3	319	5.0	319	5.0	538	0.593	100	38.0	LOS C	13.4	97.7	Short	65	0.0	NA
Approach	730	5.0	730	5.0		0.593		22.2	LOS B	13.4	97.7				
Intersection	2028	5.0	2028	5.0		0.610		22.9	LOS B	13.4	97.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

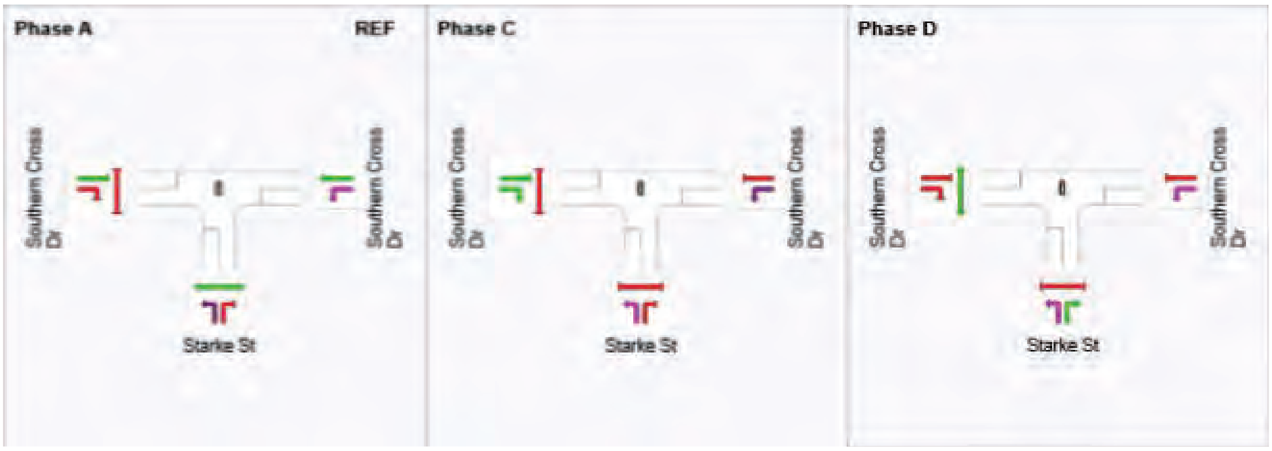
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	29	65
Green Time (sec)	23	30	29
Phase Time (sec)	29	36	35
Phase Split	29%	36%	35%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
🟥	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total		Arrival Flows Total		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV	Total	HV				Vehicles	Distance				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Southern Cross Dr														
5	T1	361	5.0	361	5.0	0.168	10.8	LOS A	4.1	30.0	0.50	0.42	0.50	34.2
6	R2	192	5.0	192	5.0	0.564	46.2	LOS D	8.7	63.6	0.96	0.81	0.96	28.8
Approach		553	5.0	553	5.0	0.564	23.1	LOS B	8.7	63.6	0.66	0.56	0.66	30.6
North: Florey Dr														
7	L2	640	5.0	640	5.0	0.575	14.2	LOS A	14.1	103.2	0.61	0.81	0.72	41.4
9	R2	335	5.0	335	5.0	0.575	36.0	LOS C	14.1	103.2	0.88	0.83	0.89	27.7
Approach		975	5.0	975	5.0	0.575	21.7	LOS B	14.1	103.2	0.70	0.82	0.78	35.4
West: Southern Cross Dr														
10	L2	161	5.0	161	5.0	0.566	35.7	LOS C	11.8	85.9	0.77	0.82	1.23	32.3
11	T1	547	5.0	547	5.0	0.566	30.4	LOS C	14.5	105.6	0.86	0.80	1.03	13.4
Approach		708	5.0	708	5.0	0.566	31.6	LOS C	14.5	105.6	0.84	0.80	1.08	20.0
All Vehicles		2236	5.0	2236	5.0	0.575	25.2	LOS B	14.5	105.6	0.74	0.75	0.84	29.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		158	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

🚦 Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Southern Cross Dr															
Lane 1	181	5.0	181	5.0	1077	0.168	100	10.8	LOS A	4.1	30.0	Full	225	0.0	0.0
Lane 2	181	5.0	181	5.0	1077	0.168	100	10.8	LOS A	4.1	30.0	Full	225	0.0	0.0
Lane 3	192	5.0	192	5.0	341	0.564	100	46.2	LOS D	8.7	63.6	Short	125	0.0	NA
Approach	553	5.0	553	5.0		0.564		23.1	LOS B	8.7	63.6				
North: Florey Dr															
Lane 1	655	5.0	655	5.0	1138	0.575	100	14.2	LOS A	14.1	103.2	Short	100	0.0	NA
Lane 2	320	5.0	320	5.0	556	0.575	100	37.0	LOS C	13.2	96.5	Full	500	0.0	0.0
Approach	975	5.0	975	5.0		0.575		21.7	LOS B	14.1	103.2				
West: Southern Cross Dr															
Lane 1	366	5.0	366	5.0	646	0.566	100	32.6	LOS C	11.8	85.9	Full	135	0.0	0.0
Lane 2	342	5.0	342	5.0	604	0.566	100	30.6	LOS C	14.5	105.6	Full	135	0.0	0.0
Approach	708	5.0	708	5.0		0.566		31.6	LOS C	14.5	105.6				
Intersection	2236	5.0	2236	5.0		0.575		25.2	LOS B	14.5	105.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

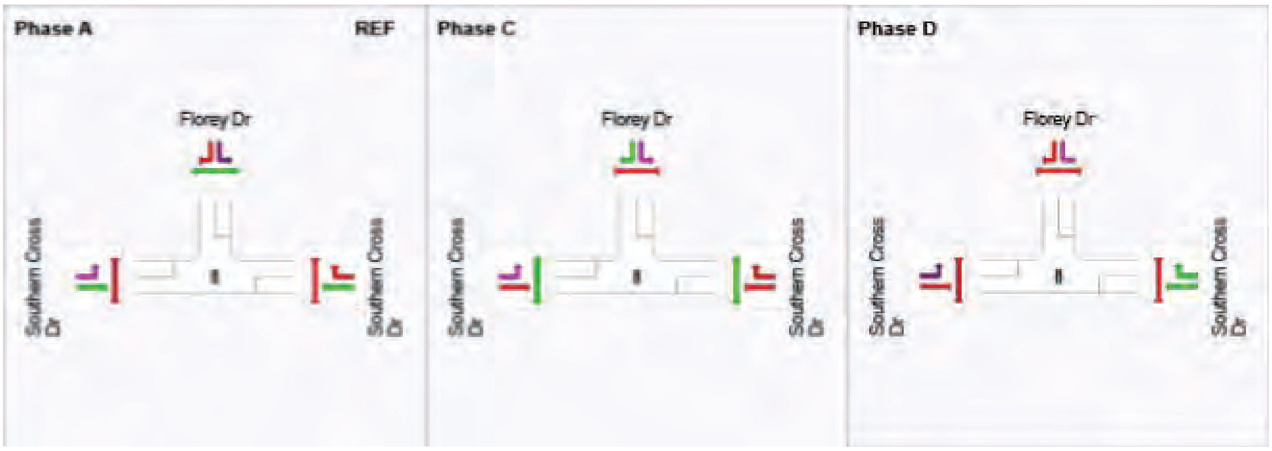
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time AM Phasing
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	**A**	**C**	**D**
Phase Change Time (sec)	11	49	86
Green Time (sec)	32	31	19
Phase Time (sec)	38	37	25
Phase Split	38%	37%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
🟥🟩	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Moyes Crescent														
1	L2	24	5.0	24	5.0	0.024	6.8	LOS A	0.1	0.6	0.34	0.57	0.34	48.8
3	R2	1	5.0	1	5.0	0.018	64.5	LOS E	0.0	0.4	0.94	0.98	0.94	28.6
Approach		25	5.0	25	5.0	0.024	9.1	LOS A	0.1	0.6	0.36	0.58	0.36	46.4
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.140	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
5	T1	529	5.0	529	5.0	0.140	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		530	5.0	530	5.0	0.140	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	925	5.0	925	5.0	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	262	5.0	262	5.0	0.333	9.4	LOS A	1.4	10.3	0.54	0.82	0.62	47.8
Approach		1187	5.0	1187	5.0	0.333	2.1	NA	1.4	10.3	0.12	0.18	0.14	56.8
All Vehicles		1742	5.0	1742	5.0	0.333	1.6	NA	1.4	10.3	0.09	0.13	0.10	57.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2025- Mitigation With DVLP]

Network: N101 [Kippax - 2025-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

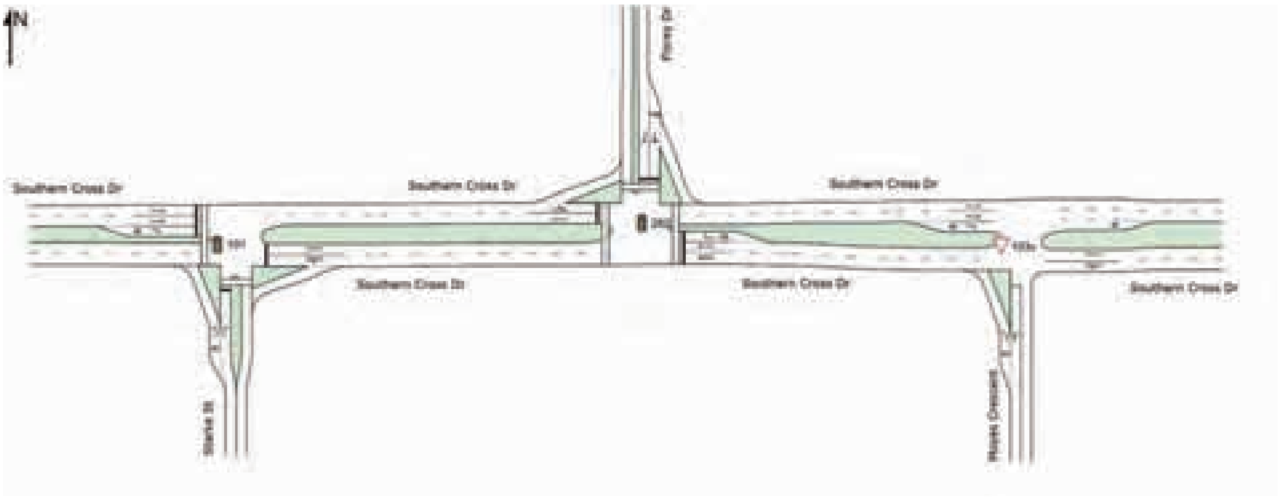
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Moyes Crescent															
Lane 1	24	5.0	24	5.0	991	0.024	100	6.8	LOS A	0.1	0.6	Short	60	0.0	NA
Lane 2	1	5.0	1	5.0	55	0.018	100	64.5	LOS E	0.0	0.4	Full	500	0.0	0.0
Approach	25	5.0	25	5.0		0.024		9.1	LOS A	0.1	0.6				
East: Southern Cross Dr															
Lane 1	274	0.0	274	0.0	1949	0.140	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	256	10.3	256	10.3	1827	0.140	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	530	5.0	530	5.0		0.140		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	466	5.0	466	5.0	1889	0.247	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	459	5.0	459	5.0	1860	0.247	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	262	5.0	262	5.0	788	0.333	100	9.4	LOS A	1.4	10.3	Short	60	0.0	NA
Approach	1187	5.0	1187	5.0		0.333		2.1	NA	1.4	10.3				
Intersection	1742	5.0	1742	5.0		0.333		1.6	NA	1.4	10.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

NETWORK LAYOUT

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

Southern Cross Drive Corridor
Network Category: (None)



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
🚦101	NA	Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation With DVLP
🚦262	NA	Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation With DVLP
▽103v	NA	Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation With DVLP

Organisation: AECOM AUSTRALIA PTY LTD | Created: Wednesday, 19 May 2021 3:05:14 PM
Project: \\AUCBR1FP001\Projects\CBR\60491711\4. Tech work area\4.3 TPV Study\02-Sidra Anaylsis\Rev 1\07-Kippax-Future Year 2035 - WITH DVLP - Mitigations.sip8

MOVEMENT SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: Starke St														
1	L2	330	5.0	330	5.0	0.257	8.3	LOS A	3.8	27.9	0.33	0.65	0.33	52.0
3	R2	327	5.0	327	5.0	0.677	36.4	LOS C	13.5	98.2	0.89	0.83	0.89	27.5
Approach		657	5.0	657	5.0	0.677	22.3	LOS B	13.5	98.2	0.61	0.74	0.61	40.1
East: Southern Cross Dr														
4	L2	461	5.0	461	5.0	0.653	16.4	LOS B	9.1	66.7	0.74	0.79	0.74	41.9
5	T1	306	5.0	306	5.0	0.653	35.8	LOS C	12.3	89.7	0.94	0.81	0.94	31.0
Approach		767	5.0	767	5.0	0.653	24.1	LOS B	12.3	89.7	0.82	0.79	0.82	36.8
West: Southern Cross Dr														
11	T1	454	5.0	454	5.0	0.216	11.7	LOS A	5.5	40.2	0.53	0.45	0.53	43.5
12	R2	348	5.0	348	5.0	0.693	41.0	LOS C	15.5	112.9	0.95	0.85	0.96	35.2
Approach		802	5.0	802	5.0	0.693	24.4	LOS B	15.5	112.9	0.71	0.62	0.72	38.1
All Vehicles		2226	5.0	2226	5.0	0.693	23.7	LOS B	15.5	112.9	0.72	0.72	0.72	38.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		105	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Starke St															
Lane 1	330	5.0	330	5.0	1287	0.257	100	8.3	LOS A	3.8	27.9	Short	50	0.0	NA
Lane 2	327	5.0	327	5.0	483[1]	0.677	100	36.4	LOS C	13.5	98.2	Full	500	-1.6[N3]	0.0
Approach	657	5.0	657	5.0		0.677		22.3	LOS B	13.5	98.2				
East: Southern Cross Dr															
Lane 1	496	5.0	496	5.0	760	0.653	100	16.0	LOS B	9.1	66.7	Full	135	0.0	0.0
Lane 2	271	5.0	271	5.0	415	0.653	100	39.0	LOS C	12.3	89.7	Full	135	0.0	0.0
Approach	767	5.0	767	5.0		0.653		24.1	LOS B	12.3	89.7				
West: Southern Cross Dr															
Lane 1	229	5.0	229	5.0	1058	0.216	100	11.7	LOS A	5.5	40.2	Full	500	0.0	0.0
Lane 2	225	5.0	225	5.0	1041	0.216	100	11.7	LOS A	5.4	39.6	Full	500	-1.6[N3]	0.0
Lane 3	348	5.0	348	5.0	502	0.693	100	41.0	LOS C	15.5	112.9	Short	65	0.0	NA
Approach	802	5.0	802	5.0		0.693		24.4	LOS B	15.5	112.9				
Intersection	2226	5.0	2226	5.0		0.693		23.7	LOS B	15.5	112.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
[N3] Capacity Adjustment due to downstream lane blockage determined by the program.

PHASING SUMMARY

Site: 101 [Site1 - Southern Cross / Starke St - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

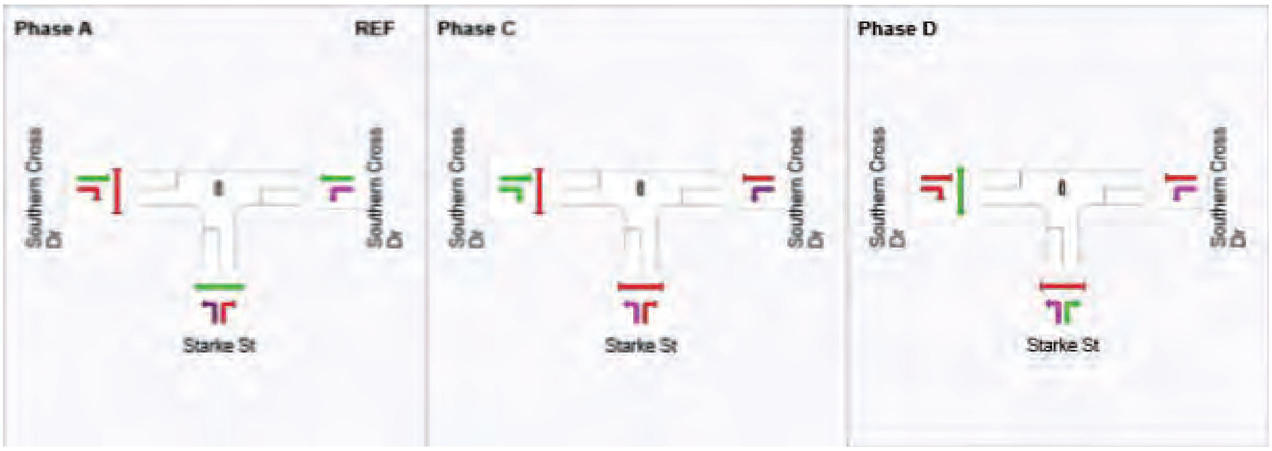
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time Coordinated - AM
Reference Phase: Phase A
Input Phase Sequence: A, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	**A**	**C**	**D**
Phase Change Time (sec)	0	28	62
Green Time (sec)	22	28	32
Phase Time (sec)	28	34	38
Phase Split	28%	34%	38%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip/Bypass-Lane Movement	🟪	Opposed Slip/Bypass-Lane
🟥	Stopped Movement	🟥	Turn On Red
🟩	Other Movement Class (MC) Running	⬜	Undetected Movement
▨	Mixed Running & Stopped MCs	🟦	Continuous Movement
⬜	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Southern Cross Dr														
5	T1	398	5.0	398	5.0	0.192	12.0	LOS A	4.8	35.1	0.53	0.45	0.53	32.6
6	R2	211	5.0	211	5.0	0.735	30.8	LOS C	6.0	43.5	1.00	0.86	1.11	34.5
Approach		609	5.0	609	5.0	0.735	18.5	LOS B	6.0	43.5	0.70	0.59	0.73	33.8
North: Florey Dr														
7	L2	707	5.0	707	5.0	0.612	13.0	LOS A	17.1	125.0	0.62	0.78	0.65	42.4
9	R2	368	5.0	368	5.0	0.612	35.7	LOS C	17.1	125.0	0.89	0.84	0.89	27.8
Approach		1075	5.0	1075	5.0	0.612	20.8	LOS B	17.1	125.0	0.71	0.80	0.73	36.0
West: Southern Cross Dr														
10	L2	176	5.0	176	5.0	0.752	30.5	LOS C	15.2	111.3	0.88	0.83	1.03	34.8
11	T1	604	5.0	604	5.0	0.752	33.0	LOS C	17.8	130.0	0.94	0.86	1.02	12.6
Approach		780	5.0	780	5.0	0.752	32.5	LOS C	17.8	130.0	0.93	0.85	1.02	19.6
All Vehicles		2464	5.0	2464	5.0	0.752	23.9	LOS B	17.8	130.0	0.78	0.77	0.83	30.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		158	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

LANE SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
East: Southern Cross Dr															
Lane 1	199	5.0	199	5.0	1039	0.192	100	12.0	LOS A	4.8	35.1	Full	225	0.0	0.0
Lane 2	199	5.0	199	5.0	1039	0.192	100	12.0	LOS A	4.8	35.1	Full	225	0.0	0.0
Lane 3	211	5.0	211	5.0	287	0.735	100	30.8	LOS C	6.0	43.5	Short	125	0.0	NA
Approach	609	5.0	609	5.0		0.735		18.5	LOS B	6.0	43.5				
North: Florey Dr															
Lane 1	713	5.0	713	5.0	1164	0.612	100	13.0	LOS A	17.1	125.0	Short	100	0.0	NA
Lane 2	362	5.0	362	5.0	592	0.612	100	36.1	LOS C	15.0	109.2	Full	500	0.0	0.0
Approach	1075	5.0	1075	5.0		0.612		20.8	LOS B	17.1	125.0				
West: Southern Cross Dr															
Lane 1	396	5.0	396	5.0	527	0.752	100	27.4	LOS B	15.2	111.3	Full	135	0.0	0.0
Lane 2	384	5.0	384	5.0	510	0.752	100	37.7	LOS C	17.8	130.0	Full	135	0.0	1.6
Approach	780	5.0	780	5.0		0.752		32.5	LOS C	17.8	130.0				
Intersection	2464	5.0	2464	5.0		0.752		23.9	LOS B	17.8	130.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PHASING SUMMARY

Site: 262 [Site2 - Southern Cross / Florey Drive - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Signals - Fixed Time Coordinated   Cycle Time = 100 seconds (Network Optimum Cycle Time - Minimum Delay)

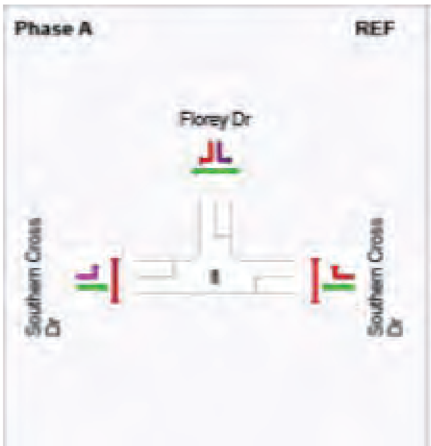
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Fixed Time Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

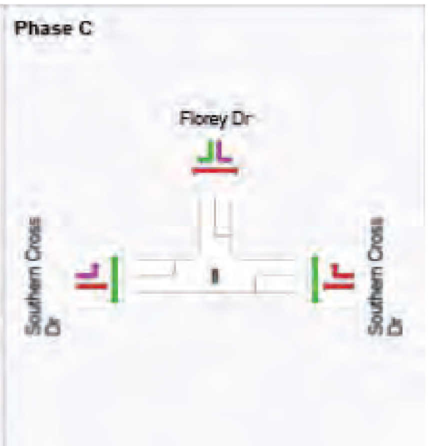
Phase Timing Summary

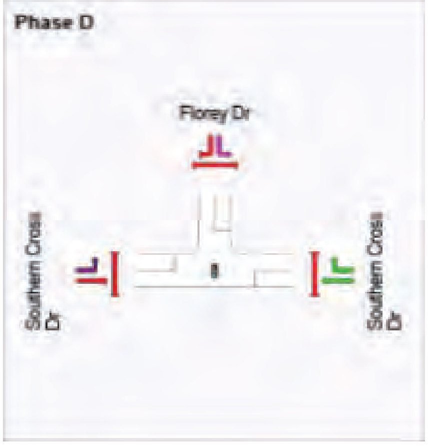
Phase	A	B	C	D
Phase Change Time (sec)	11	44	57	96
Green Time (sec)	27	7	33	9
Phase Time (sec)	33	13	39	15
Phase Split	33%	13%	39%	15%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence







REF: Reference Phase
VAR: Variable Phase

➡	Normal Movement	➡	Permitted/Opposed
➡	Slip/Bypass-Lane Movement	➡	Opposed Slip/Bypass-Lane
⇥	Stopped Movement	⇥	Turn On Red
➡	Other Movement Class (MC) Running	⇨	Undetected Movement
➡	Mixed Running & Stopped MCs	➡	Continuous Movement
⇥	Other Movement Class (MC) Stopped	●	Phase Transition Applied

MOVEMENT SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: Moyes Crescent														
1	L2	25	5.0	25	5.0	0.026	7.0	LOS A	0.1	0.7	0.36	0.58	0.36	48.7
3	R2	1	5.0	1	5.0	0.026	90.0	LOS F	0.1	0.5	0.96	0.98	0.96	23.8
Approach		26	5.0	26	5.0	0.026	10.2	LOS A	0.1	0.7	0.38	0.59	0.38	45.3
East: Southern Cross Dr														
4	L2	1	5.0	1	5.0	0.155	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
5	T1	584	5.0	584	5.0	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		585	5.0	585	5.0	0.155	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Southern Cross Dr														
11	T1	1022	5.0	1022	5.0	0.272	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	289	5.0	289	5.0	0.393	10.4	LOS A	1.8	13.3	0.60	0.88	0.75	47.0
Approach		1311	5.0	1311	5.0	0.393	2.3	NA	1.8	13.3	0.13	0.19	0.17	56.5
All Vehicles		1922	5.0	1922	5.0	0.393	1.7	NA	1.8	13.3	0.10	0.14	0.12	57.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 103v [Site3 - Southern Cross / Moyes Cr - AM Peak - 2035- Mitigation With DVLP]

Network: N101 [Kippax - 2035-Mitigation With DVLP - AM Peak]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						Veh	Dist				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Moyes Crescent															
Lane 1	25	5.0	25	5.0	960	0.026	100	7.0	LOS A	0.1	0.7	Short	60	0.0	NA
Lane 2	1	5.0	1	5.0	38	0.026	100	90.0	LOS F	0.1	0.5	Full	500	0.0	0.0
Approach	26	5.0	26	5.0		0.026		10.2	LOS A	0.1	0.7				
East: Southern Cross Dr															
Lane 1	302	0.0	302	0.0	1949	0.155	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	283	10.3	283	10.3	1827	0.155	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	585	5.0	585	5.0		0.155		0.0	NA	0.0	0.0				
West: Southern Cross Dr															
Lane 1	513	5.0	513	5.0	1889	0.272	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 2	509	5.0	509	5.0	1872	0.272	100	0.0	LOS A	0.0	0.0	Full	225	0.0	0.0
Lane 3	289	5.0	289	5.0	735	0.393	100	10.4	LOS A	1.8	13.3	Short	60	0.0	NA
Approach	1311	5.0	1311	5.0		0.393		2.3	NA	1.8	13.3				
Intersection	1922	5.0	1922	5.0		0.393		1.7	NA	1.8	13.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix R

Robson Environmental, Building Inspection Reports

Hazardous Materials Survey & Management Plan

Re inspection

Kippax Health Centre
20 Kippax Place
Kippax 2615

August 2017

This report includes information from the report dated May 2005

This report MUST NOT be used as a removal specification

Client: ACTPRO Depots,

255 Canberra Ave, Fyshwick, ACT, 2609

Accredited for compliance with ISO/IEC 17020

CERTIFICATE OF APPROVAL FOR ISSUE OF DOCUMENTS

Document No: 309
Title: Reinspection - Hazardous Materials Survey
Kippax Health Centre
20 Kippax Place
Kippax 2615

Revision Status: 1
Date of Issue: 6/11/2020

Client: ACTPRO Depots

Copy No: One

	Assessor	Position	Signature
Surveyed by:	Patrick Cerone - Licensed Asbestos Assessor #AA00031 Colin Chapman - Licensed Asbestos Assessor #NTWS-AA-457114	Hazardous Materials Consultant Manager Hazardous Materials & Laboratory Services	
Approved by:	Joshua Low - Licensed Asbestos Assessor #NTWS-AA-466882	Manager Hazardous Materials & Laboratory Services	
Released by:	John Robson - Licensed Asbestos Assessor #LAA000195	Managing Director	John Robson

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Robson Environmental Pty Ltd	John Robson	2	6/11/2020

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1 PREFACE

This Hazardous Materials Survey and Management Plan (HMSMP) was commissioned by ACTPRO Depots in order to assure the occupants of the site the highest standards of occupational health and safety in relation to hazardous materials. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to the demolition of the premises.

The HMSMP contains sections covering the identification, evaluation and control of hazardous materials including asbestos containing materials (ACM), Lead Paint, Polychlorinated Biphenyls (PCB), Synthetic Mineral Fibre (SMF), Ozone Depleting Substances (ODS) and fuel storage above and underground storage tanks (A/UST).

Robson Environmental Pty Ltd undertook the hazardous material survey on 24 August 2017 and incorporated previous findings from the site hazmat report(s). This report will take precedence over any previously issued hazmat survey for this property. Any changes to the condition/location of previously identified hazardous materials will be expressed within this report. The information contained in this document will assist the PMCW (person with control or management of a workplace) in fulfilling their obligations under the latest editions of the following regulations/Acts:

- *How To Manage and Control Asbestos In The Workplace Code of Practice*
- *How To Safely Remove Asbestos Code of Practice*
- *Dangerous Substances (General) Regulation 2004*
- *Dangerous Substances Act 2004*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulations 2011*
- *National Code of Practice for the Safe Use of Synthetic Mineral Fibre* [NOHSC:2006(1990)]
- *National Standard for Synthetic Mineral Fibres* [NOHSC:1004(1990)]
- *Guide to Hazardous Paint Management Part 2: Lead paint in residential, public and commercial buildings Standards Australia, AS 4361.2 – 2017*
- *Identification of PCB-Containing Capacitors; An information Booklet for Electricians and Electrical Contractors* ANZECC 1997 and
- *The Australian Refrigeration and Air-conditioning Code of Good Practice* Standards Australia, HB 40.1 – 2001

2 EXECUTIVE SUMMARY

2.1 Purpose

This report presents the findings of a Hazardous Materials survey conducted at the site on 24 August 2017 at the request of the client. The survey was undertaken to assess the extent and condition of hazardous materials and document safe management procedures in accordance with current legislation. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to refurbishment or demolition of the premises or where the risk assessment recommends removal. This report includes information which must be known and acted upon prior to the commencement of any demolition, refurbishment, or hazardous material removal or remediation. It also details responsibilities that the PMCW (person with management or control of a workplace) and occupier must address to ensure safe occupation of the premises.

2.2 Scope

The Hazardous Materials survey was non-destructive and non-intrusive in nature with the extent limited to the following areas:

- Interior and exterior of the building
- Roof, amenities and immediate surrounding land
- A/UST filler points and breather vents

The survey did not include the inspection or assessment of the following areas:

- Subterranean areas (e.g. infill/soil)
- Concealed cavities
- Formwork and subterranean electrical cable ducts and water pipe ducts

2.3 Survey Methodology

The survey involved the visual inspection of accessible, representative, construction materials and the collection and analysis of sampled materials suspected of being potentially hazardous to human health.

Hazardous materials assessed included ACM, SMF, PCBs, lead containing paint, ODS and A/UST.

The site inspection included the sampling of representative materials suspected of being hazardous, was undertaken in accordance with Robson's NATA ISO/IEC 17020 accreditation, ISO9001, ISO14001, AS4801 and current legislation. The particular sampling methodology used for each hazardous materials type is provided below:

Asbestos: The asbestos materials survey was conducted in accordance with the current legislation. It involved a visual inspection of accessible representative construction materials suspected of containing asbestos. Materials were not sampled from all areas due to the uniformity of the materials used throughout the building(s). Samples were analysed in Robson Environmental's National Association of Testing Authorities (NATA) accredited laboratory for the presence of asbestos by polarising light microscopy and dispersion staining.

Note that electrical switchboards and other similar areas were only inspected where they were isolated by a qualified electrician. Live switchboards were not inspected, and accordingly are presumed to be ACM until conclusively proven otherwise.

Lead (Pb) Based Paints: Representative paint samples were collected in accordance with AS4361.2-2017 and analysed for lead content. The sampling criterion provided below is taken from AS4361.2-2017 Section A4 Sampling Strategy clauses (a, b, c);

(a) An adequate number of sample sites should be analysed to properly characterise the paint systems present on site.

(b) For small surfaces such as architraves, windows and doors and cupboards, a **single** sample may suffice.

(c) For large, uniformly painted surface areas such as the exterior facade of high rise buildings, or for interior walls and ceilings of large rooms, and where laboratory testing is employed, **composite** samples should be taken from three separate locations in 10m² sections.

Collected paint samples were analysed for their lead (Pb) content by Envirolab Services Pty Ltd – NATA accreditation number: 2901 using ICP/AES techniques and in-house Method No.4.

Within the same building, wherever a paint coating had a similar surface texture, colour, etc. to a paint coating that had already been sampled because of its suspected lead content, it was presumed that these paint coatings were identical. However, results can only be guaranteed valid for directly tested/sampled paints (especially due to deliberate attempts to match new paint to existing coatings in some applications).

SMF: Synthetic Mineral Fibre (SMF) materials were visually identified and a determination made as to whether they were bonded or un-bonded.

PCBs: The information (make, type, capacitance etc.) recorded for each representative fluorescent light fitting capacitor suspected of containing PCB was cross-referenced against *ANZECC Identification of PCB Containing Capacitors – Information Booklet for Electricians and Electrical Contractors - 1997*.

This identification booklet provides a list of electrical equipment that is known to contain PCBs, and a list of electrical equipment known not to contain PCBs. Where the information recorded from the capacitor case(s) correlated exactly with the information listed in the ANZECC Information Booklet for known PCB-containing capacitors it was determined that PCBs were present in the capacitor under analysis.

Wherever a capacitor could not be identified in either list, this was noted in the PCB register as being a capacitor suspected to contain PCBs.

Note that light fittings were only inspected where they were isolated by a qualified electrician. Live light fittings were not inspected, and accordingly no determination about whether or not they contain PCB is included in this report.

Ozone Depleting Substances: A visual examination was made of refrigerant gas labels affixed to representative air-conditioning and refrigeration units. Information concerning the

ASHRAE/ARI refrigerant designated R number was noted for later cross-reference to relevant air-conditioning and refrigeration industry Codes of Practice and Guidelines. In addition, the condition of the plant was noted and comment made as to possible refrigerant or lubricant leaks.

Where refrigerant gas labels were absent from representative air-conditioning and refrigeration plant, an assessment was made as to the likelihood of the plant using an ozone depleting substance based on its age and condition.

Fuel Storage Facilities: The survey included a visual inspection for above ground storage tanks (AST) and underground storage tank (UST) filler points and breather vents.

2.4 Key Findings

Asbestos

Table 1A: ACM locations and required actions

Kippax Health Centre			
ACM	**Tracker Location No.**	**Locations**	**Action to be taken**
Mastic (Non-Friable)	001	Exterior - expansion joint to wall	Label and maintain Inspect every 5 years
Moulded Sheet (Non-Friable)	001	Exterior - PMG pit	Inform Telstra
Sheet (Non-Friable)	001	Exterior - verge under cloaking	Label and maintain Inspect every 5 years
Pipe lagging (fibrous) (Presumed Friable)	001	Wet areas - to pipes embedded in masonry walls (throughout building)	Further investigation required
Fire door core (Friable)	002	Ground floor Corridor - fire doors	Label and maintain Inspect every 5 years
Sheet (Non-Friable)	002	Ground floor Front Corridor - ceiling to electrical cupboard	Encapsulate Label and maintain Inspect every 5 years
Fire door core (Friable)	003	Ground floor Rear Corridor - fire door	Label and maintain Inspect every 5 years
Sheet (Non-Friable)	003	Ground floor Rear Corridor - ceiling to fire hose cupboards	Encapsulate Label and maintain Inspect every 5 years
Sheet (Non-Friable)	003	Ground floor Rear Corridor - ceiling to electrical cupboard	Encapsulate Label and maintain Inspect every 5 years
Bituminous product (Non-Friable)	005	Ground floor Child Health Clinic - pad to underside of sink	Label and maintain Inspect every 5 years
Mastic (Non-Friable)	005	Ground floor Child Health Clinic - expansion joint to internal wall	Label and maintain Inspect every 5 years
Gaskets (compressed) (Non-Friable)	006	Ground floor Child Health Clinic - to chiller compressor	Label and maintain Inspect every 5 years
Sheet (Non-Friable)	008	Ground floor Ceiling Space - ceilings throughout	Encapsulate Label and maintain Inspect every 5 years

Kippax Health Centre			
ACM	**Tracker Location No.**	**Locations**	**Action to be taken**
Sheet (Non-Friable)	008	Ground floor Ceiling Space - packers to AC vents	Encapsulate Label and maintain Inspect every 5 years
Pipe (Non-Friable)	011	Ground floor MDF Room - pipe conduit	Maintain Inspect every 5 years

Refer to Section 2.4 - Table 1B for presumed ACM and Section 3.2 for exclusions

Table 1B: Presumed ACM, concealed locations and required actions

Type	ACM	Locations	Action to be taken
The materials listed below while not identified on site, should be presumed to be present until a destructive survey confirms otherwise			
Presumed ACM	Insulation/pipe lagging	Inaccessible ducts, risers and ceiling and wall space cavities	Destructive survey under controlled conditions prior to any refurbishment which is likely to disturb possible ACM in these areas. Until these areas are surveyed they should be presumed to contain asbestos. No access to unauthorised personnel should be given
	Asbestos millboard lining	Interior of air conditioning ductwork adjacent to heater elements	
	Asbestos insulation and gaskets/joints	Within mechanical equipment concealed by outer metal cladding, structure or housing	
	Asbestos vinyl floor tiles, covering, cushioning underlay and adhesive	Found beneath carpets and vinyl flooring	
	Asbestos sheeting	Backing material to ceramic tiles (roofs, floors and walls) and packers to building construction joints, such as gable end verge undercloaking	
	Asbestos cement sheet formwork and electrical cable duct / water pipe	Subterranean areas	

Prior to any planned demolition, refurbishment or maintenance, its effect upon any in situ asbestos must be established by reference to this document including amendments.

Lead Paint

It should be assumed that all similar paints throughout the building contain comparable percentages of lead.

Lead Free Paint (>0.1%) - Kippax Health Centre		
Location	**Paint Colour**	**Required action**
No Lead Paint Found		

Lead Free Paint (<0.1%) - Kippax Health Centre		
Location	**Paint Colour**	**Required action**
Exterior - to guttering and eaves	Brown	No action required
Exterior - railings to rear of building	White	No action required

Synthetic Mineral Fibre (SMF)

It should be presumed that SMF materials may be present to inaccessible areas.

Kippax Health Centre		
Material	**Location & Material**	**Required action**
Soundproofing behind metal cladding	Ground floor Redundant Plant Room	Manage during demolition or refurbishment
Foil backed insulation to underside of roof	Ground floor Ceiling Space	Manage during demolition or refurbishment
Foil backed insulation to ducting	Throughout building	Manage during demolition or refurbishment

Polychlorinated Biphenyls (PCB)

Make - Type	Location	Total	Required action
No PCBs located			

* Note that light fittings were only inspected where they were isolated by a qualified electrician. Live light fittings were not inspected, and accordingly no determination about whether or not they contain PCB is included in this report.

Ozone Depleting Substances (ODS)

R Number	Location	Total	Required action
No ozone depleting substances located			

Non – Ozone Depleting Substances

Kippax Health Centre			
R Number	**Location**	**Total**	**Required action**
R-410A	Exterior, Daikin Inverter	6 no	No action required

Above Ground Storage Tanks (AST) & Underground Storage Tanks (UST)

A/UST	Location	Total	Required action
No storage tanks located			

2.5 Key Recommendations

Asbestos

- The non-friable asbestos cement sheet ceilings to the fire hose and electrical cupboards were found to be in fair condition and may remain in situ providing they are not disturbed. It is required that the unpainted sheets be encapsulated with paint or PVA to prevent fibre release. Any works which may disturb the ACM must be undertaken by a licensed Asbestos Removalist.

- The non-friable asbestos cement sheet ceilings throughout the ceiling space were found to be in fair condition and may remain in situ providing they are not disturbed. It is required that the unpainted sheets be encapsulated with paint or PVA to prevent fibre release. Any works which may disturb the ACM must be undertaken by a licensed Asbestos Removalist.

- The communications pit the exterior of the building contains asbestos sheet internal lining and is in poor condition. Telstra, as owners of the pit should be contacted to arrange remediation or removal as part of their refurbishment program. Access to the pit or pits must be restricted until remediation has been completed.

- The non-friable asbestos bitumen pad to the underside of the sink in the Child Health Clinic was found to be in good condition and may remain in situ providing it is not disturbed.

- The verge under cloaking was found to be encapsulated beneath metal cladding and may remain in situ provided it is maintained and left undisturbed. Any works which may disturb the ACM must be undertaken by a licensed Asbestos Removalist.

- Mastic expansion joints to the exterior masonry walls and the interior masonry wall within the Child Health Clinic contain asbestos in good condition. They pose negligible risk to occupants of the premises during normal day-to-day use but should be removed by a licensed Asbestos Removalist prior to any works that may disturb them. Due to the variable composition of mastics manufactured prior to 1990, replacement of these materials during repairs may result in differing results taken from similar locations. Therefore, it is recommended that all mastic throughout the premises be presumed to be ACM. These materials may remain in situ unless they will be disturbed.

- The fire doors in the front and rear corridors contains asbestos cores. The fire doors may remain in situ provided they are maintained and not disturbed. Door furniture must not be removed as this will expose the asbestos cores. Automatic closure fittings must be maintained to ensure they do not damage the top of the doors. Scraping of the bottom of the doors on the floor may also expose the core. Alternatively, the fire doors may be removed by a licensed Asbestos Removalist and replaced with non-ACM fire doors.

- The gasket to the chiller compressor contains asbestos in good condition. Any similar gaskets are to be presumed as ACM. Gaskets should be removed by a licensed Asbestos Removalist during routine or as-required maintenance or prior to decommissioning plant.
- Given the age of the premises and its masonry construction to the wet areas, it should be presumed that all hot water pipes embedded in masonry walls are lagged with friable ACM. Taps and other plumbing fittings should not be removed and areas of wall that may contain hot water pipes should not be disturbed. Construction plans should be consulted to determine the layout of the hot water pipes. Prior to works which may disturb walls or plumbing fittings, the water and should be isolated and a licensed Asbestos Assessor engaged to conduct an intrusive investigation to determine the composition and extent of any pipe lagging.
- Sheet packers located between the air conditioning vents and the ceilings within the ceiling space contain asbestos. The accessible ACM is required to be sealed with paint. The packers are required to be removed prior to any works which may disturb them.
- ACM must not be drilled, cut, sanded, damaged, or abraded and a good paint finish maintained.
- Asbestos work on non-friable ACM may be undertaken by a licensed Class A or B Asbestos Removalist. Any works on, or in the vicinity of friable ACM must only be undertaken by a licensed Class A Asbestos Removalist.
- Any ACM identified in this report that is to remain in situ should be inspected by a licensed Asbestos Assessor at the intervals stated in Section 4.5 Table 3A Asbestos Register.
- As access could not be gained to all areas of the building, it should be presumed that any similar materials located within these areas could contain asbestos until proven otherwise. Strict controls should be put in place to brief all contractors.
- ACM should be labelled with approved asbestos warning labels or signs. Due to the stigma associated with asbestos and to avoid malicious damage to ACM, labelling can be kept to discrete areas. Where labelling cannot be undertaken, the PMCW must adopt strict administrative controls to ensure ACM is not subject to accidental damage.

Asbestos Removal

Removal of ACM must be undertaken by a licensed Asbestos Removalist in accordance with current legislation. The removal/remediation of friable ACM must be undertaken by a licensed Class A Asbestos Removalist. Removal or remediation of non friable asbestos may be undertaken by either an A or B Class Asbestos Removalist.

Prior to the commencement of any removal or remediation works associated with any amount of friable or non friable asbestos a building certifier must be engaged and building approval granted. An application must be submitted to WorkSafe ACT and ComCare (where applicable) at least 5 days prior to removal works commencing. An asbestos removal contractor must supply an Asbestos Removal Control Plan (ARCP) and a Safe Work Method Statement (SWMS). An independent licensed Asbestos Assessor should be engaged to ensure that the ARCP addresses all safety issues relating to the planned asbestos works.

Air monitoring is mandatory during the removal or remediation of friable asbestos and should be considered during the removal or remediation of non friable asbestos. Air sampling is to be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd* Edition and test certificates should be NATA endorsed.

An independent Asbestos Assessor must also be employed to undertake a Clearance Inspection of both friable and non friable asbestos removal or remediation works. A satisfactory clearance certificate for the remediated areas must ensure that no visible asbestos or presumed asbestos remains. Additionally no asbestos fibres should be detected by laboratory analysis if any validation samples are taken. All surfaces within the remediated area must be free of general dust and debris.

Lead Paint

- No lead was identified in any internal or external painted surface. It should be assumed that all similar paint applications throughout the building would contain similar percentages of lead.
- Refer to Appendix D for further general information on lead paint.

SMF

- SMF soundproofing was found to the underside of metal cladding to the walls of the redundant Plant Room.
- Foil backed insulation was located to the underside of the roof and to the ductwork throughout the ceiling space.
- If these materials are to be disturbed during refurbishment appropriate PPE should be worn. SMF materials being removed should be done so using effective dust control procedures.
- Refer to Appendix D for further general information on SMF.

PCBs

- The fluorescent lights were not accessible as they were electrically live. All capacitors should be presumed to contain PCB. The capacitors within the light fittings should be checked for PCBs following electrical isolation.
- Refer to Appendix D for further general information on PCB.

ODS

- No ODS located.
- Refer to Appendix D for further general information on ODS.

A/UST

- No A/UST located.
- Refer to Appendix D for further general information on A/UST.

Legislation and Guidelines (UST): Section 3.2 of AS4976 (2008) *The Removal and Disposal of Underground Petroleum Storage Tanks*, states that the out-of-service period for a A/UST should not exceed that laid down in any applicable regulation and should not normally be greater than twelve (12) months. Also, Section 6 (Decommissioning) of the ACT EPA (2009) *Environmental Guidelines for Service Station Sites and Hydrocarbon Storage* indicates that all decommissioned tanks must be removed unless there are specific operational or structural reasons as to why they must remain. These reasons must be outlined or substantiated by an experienced and competent person.

Demolition and Refurbishment

Robson Environmental Pty Ltd recommends that prior to any demolition our office be contacted. Our licensed Asbestos Assessors can attend the site to observe the demolition process, advise as necessary and in the event of previously inaccessible hazardous materials being located, assist with assessing the extent, type and removal or abatement of materials as required.

Robson Environmental Pty Ltd provides a range of occupational hygiene services in relation to the safe remediation or abatement of hazardous materials as well as contaminated land advice in relation to hydrocarbon contamination.

To assist with the tendering process Robson Environmental could be engaged to attend the walkthrough to show the extent of ACM and to respond to questions of clarification.

3 INTRODUCTION

The following Hazardous Materials Survey and Management Plan (HMSMP) has been designed to address the safe control of hazardous materials. It covers current requirements for hazardous material management as at 24/08/2017 only and must therefore be updated to comply with any future changes to legislative requirements. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to any renovation or demolition of the premises.

This HMSMP includes the following:

- a register of all identified hazardous materials
- extent, form, condition and risks associated with nominated hazardous materials
- labelling requirements for identified hazardous materials
- a timetable for managing risks including priorities for removal or control of ACM and for reviewing risk assessments
- responsibilities of all persons involved in hazardous materials management
- procedures to address incidents or spillage involving ACM
- safe work and removal methods
- guidelines on reviewing and updating the HMSMP and hazardous materials register

3.1 Requirements for the HMSMP

This HMSMP must be held on site for ready access. All personnel undertaking any repair or maintenance work must be provided with a copy of the HMSMP before commencement of work.

Maintenance, trade and other personnel must be instructed not to remove or damage identified hazardous materials if hazardous material is identified in the area where work will be undertaken it must be removed or remediated before work begins.

Removal of hazardous material must be undertaken by suitably qualified persons in accordance with relevant Regulations and Codes of Practice.

3.2 Exclusions

The HMSMP commissioned by the client was to be non-destructive and non-intrusive in nature. This type of commission limits or restricts access to the building structure, some surfaces and materials.

The survey undertaken was limited to those areas available for access at the time of building inspection. Only the areas accessible to the surveyors at the time of the building inspection are included in this HMSMP.

Unless specifically noted, the survey did not cover exterior ground surfaces and sub-surfaces (e.g. infill/soil) or materials other than normal building fabric such as materials in laboratories or special purpose facilities.

At the time of survey no access was gained to materials and / or void areas located behind, above, or attached to any sampled or assumed hazardous materials.

The HMSMP does not include the areas, locations and equipment items to which the surveyors could not gain access at the time of inspection.

Some other areas which *may* conceal asbestos include:

Material	**Location**
Asbestos millboard lining	Air conditioning duct work adjacent to heater elements
Asbestos insulation and gaskets/joints	Within mechanical equipment concealed by outer metal cladding
Asbestos insulation	Walls and cavities (e.g. as lagging to hot water pipes set into and sealed within masonry walls)
Vinyl floor tiles and floor covering	Beneath carpets
Sheeting	Backing material to ceramic tiles and as packers to building construction joints
Asbestos cement sheet formwork and electrical cable/water pipe duct	Sub-ground floor slab

No absolute determination can be made regarding the possibility of concealed or inaccessible hazardous materials or items in the areas, locations and equipment listed in the table above until access is gained to allow for inspection.

Materials and equipment in any non-accessed area should therefore be assumed to contain ACM, SMF, lead paint, PCB, ODS and A/UST (the nominated hazardous materials) and be treated appropriately until assessment and sample analysis confirm otherwise.

Samples were not taken where the act of sampling would endanger the surveyor or affect the structural integrity of the item concerned.

This HMSMP, although extensive, is not intended for and must not be used as a specification or method statement for any future hazardous material removal project. In this instance detailed plans, quantities etc. would be required.

Before any refurbishment or hazardous material removal projects, the contractor(s) carrying out the work must fully acquaint themselves with the extent of the hazardous materials, particularly in those areas which may need full or partial demolition in order to determine the exact extent and location of such materials.

Care should be taken when demolishing or excavating to determine the existence or otherwise of hazardous materials. For example subsurface pipes and drains, revealed through excavation may be constructed of asbestos cement. Wherever a material is uncovered or revealed and it is suspected to be hazardous, it should be assumed to be hazardous and treated appropriately until such time as assessment and sample analysis of the material confirms otherwise.

Until this confirmation occurs the building work must cease in the immediate vicinity of the suspect material and a suitably qualified person must issue a clearance certificate or report before the building work can recommence in the affected area.

To ensure contextual integrity, this HMSMP must always be read in its entirety and should never be referred to in part only.

3.3 Limitations

This report is based on the information obtained by Robson Environmental Pty Ltd at the time of inspection. Robson Environmental Pty Ltd will not update this report; nor take into account any event(s) occurring after the time that its assessment was conducted.

As both the range and use of manufactured products containing hazardous materials was extremely widespread, Robson Environmental Pty Ltd cannot accept responsibility for any consequential loss or damage that results from non-recognition of a material that may later be established to contain hazardous material. For example, certain textured wall and ceiling finishes may contain small traces of asbestos fibre. In situ, textured finishes are often composed of assorted batches of product, or may have been repaired/patched at various times. It is therefore always a possibility that the samples collected may not always be representative of the entire material.

While Robson Environmental Pty Ltd has taken all care and attention to ensure that this report includes the most accurate information available, it has been unable to examine any inaccessible materials or materials hidden from view.

Under normal construction practices some materials are “built in” or “randomly applied”. These materials are therefore not readily accessible and can only be exposed through demolition or damage to the structure or finishes. Access to a material may also be prevented or restricted by “in service” or operational equipment, or where to obtain access contravenes a relevant statutory requirement or code of practice. (e.g. electrical switchboards) Consequently, while all reasonable care and attention was taken in compiling this report no guarantee to its completeness can be given.

Robson Environmental Pty Ltd has taken all care to ensure that this report includes the most accurate information available, where it uses test results prepared by other persons it relies on the accuracy of the test results in preparing this report. In providing this report Robson Environmental Pty Ltd does not warrant the accuracy of such third party test results.

4 ASBESTOS SURVEY RESULTS

4.1 Survey Details

The survey of the site included all accessible areas of the building(s) except where stated otherwise. For further asbestos management information, refer to Appendix D.

4.2 Survey Methodology

The re-inspection of hazardous materials previously identified on site involved a visual inspection and condition assessment of known hazardous items. It also involved sampling and analysis of any suspect asbestos materials not identified on the previous report. These samples were analysed in Robson Environmental's National Association of Testing Authorities (NATA) laboratory using polarising light microscopy (PLM) and dispersion staining. Samples from the previous surveys were analysed by Robsons and/or other NATA accredited laboratories as shown in Appendix A. Samples were a representative selection of materials suspected of containing asbestos. Samples were not taken from all areas due to the uniformity of the materials used throughout the building. Laboratory analysis certificates are presented in Appendix A.

4.3 Sample Analysis

Table 2: Mineralogical Analysis of Samples for Asbestos using PLM

Kippax Health Centre				
Sample reference	**Tracker Location No.**	**Sample location**	**Sample type**	**Composition**
2540-19-1	002	Ground floor Corridor - fire doors	Fire door core	Chrysotile, Amosite Asbestos Detected
2540-19-10	006	Ground floor Child Health Clinic - to chiller compressor	Gaskets (compressed)	Chrysotile Asbestos Detected
2540-19-2	003	Ground floor Rear Corridor - ceiling to fire hose cupboards	Sheet	Chrysotile Asbestos Detected
2540-19-3	002	Ground floor Front Corridor - passageway flooring	Vinyl floor tile	No Asbestos Detected
2540-19-4	003	Ground floor Rear Corridor - fire door	Fire door core	Chrysotile, Amosite Asbestos Detected
2540-19-5	007	Ground floor Redundant plant room - to pipe flange joint	Gaskets (compressed)	No Asbestos Detected
2540-19-6	008	Ground floor Ceiling Space - debris	Sheet	Removed

Kippax Health Centre				
Sample reference	**Tracker Location No.**	**Sample location**	**Sample type**	**Composition**
2540-19-7	001	Exterior - PMG pit	Moulded Sheet	Chrysotile; Amosite; Asbestos Detected
2540-19-8	001	Exterior - vertical wall panel	Sheet	No Asbestos Detected
2540-19-9	008	Ground floor Ceiling Space - ceilings throughout	Sheet	Chrysotile Asbestos Detected
3617-84-A1	005	Ground floor Child Health Clinic - expansion joint to internal wall	Mastic	Chrysotile Asbestos Detected
3617-84-A10	001	Exterior - expansion joint to wall	Mastic	Chrysotile: Asbestos Detected
3617-84-A2	001	Interior - pad to underside of sink (throughout building)	Bituminous product	No Asbestos Detected
3617-84-A4	004	Storeroom - beige flooring (throughout building)	Vinyl floor tile	No Asbestos Detected
3617-84-A5	001	Exterior - debris to ground	Sheet	No Asbestos Detected
3617-84-A6	009	Ground floor Dental Care - flooring to Storeroom	Vinyl floor covering	No Asbestos Detected
3617-84-A7	001	Exterior - expansion joint to concrete walkway	Mastic	No Asbestos Detected
3617-84-A8	001	Exterior - verge under cloaking	Sheet	Chrysotile; Amosite; Asbestos Detected
3617-84-A9	010	Ground floor Bin Store - spandrel panels above windows	Sheet	No Asbestos Detected
I0602	007	Ground floor Redundant plant room - to wall	Pipe lagging debris	No Asbestos Detected
M0508	001	Exterior - to windows	Caulking	No Asbestos Detected
M0509	011	Ground floor MDF Room - pipe conduit	Pipe	Chrysotile; Amosite; Asbestos Detected

Kippax Health Centre				
Sample reference	**Tracker Location No.**	**Sample location**	**Sample type**	**Composition**
M0510	011	Ground floor MDF Room - cream floor tiles	Vinyl floor tile	No Asbestos Detected
M0511	008	Ground floor Ceiling Space - packers to AC vents	Sheet	Chrysotile; Amosite; Asbestos Detected
M0512	005	Ground floor Child Health Clinic - pad to underside of sink	Bituminous product	Chrysotile Asbestos Detected

NATA accredited laboratory:

Robson Environmental Pty Ltd
Accreditation number: 3181

Chrysotile = white asbestos

Amosite = grey or brown asbestos

Crocidolite = blue asbestos

It should be noted that the above samples were a representative selection of materials suspected of containing asbestos.

On-site inspections and an examination of the Asbestos Register within this report should be undertaken prior to the commencement of any asbestos removal programme.

4.4 Risk Assessment

The purpose of the risk assessment is to enable informed decisions to be made concerning the control of ACM.

The risk assessment should take account of the identification information in the Asbestos Register, including:

- type of ACM (non-friable or friable)
- condition and location of ACM
- whether the ACM is likely to be disturbed due to its condition and location
- the likelihood of exposure

Types of ACM

Non-friable ACM	Non-friable ACM is any material that contains asbestos bound into a stable matrix. It may consist of cement or various resins/binders and cannot be reduced to a dust by hand pressure. As such it does not present an exposure hazard unless cut, abraded, sanded or otherwise disturbed. Therefore, the exposure risk from non-friable ACM is negligible during normal building occupation. *Note: If non-friable ACM is damaged or otherwise deteriorated, the risk assessment may be reviewed to reflect a higher potential for exposure to asbestos fibres. A licensed Asbestos Assessor should perform the risk assessment.*
Friable ACM	Friable ACM can be crumbled or reduced to a dust by hand pressure when dry and can represent a significant exposure hazard. Examples of friable asbestos are hot water pipe lagging, severely damaged asbestos cement sheet, limpet spray to structural beams and electrical duct heater millboard.

ACM CONDITION RATING

1	**Severe**	Deteriorated surface in extremely poor condition
2	**Poor**	Deteriorated material
3	**Normal**	Stable asbestos with little damage
4	**Good**	Well sealed stable surfaces in accessible locations

ACM RISK RATING

A	**Very High**	Exposure to airborne asbestos as a consequence of extremely minor disturbance
B	**High**	Exposure to airborne asbestos likely as a consequence of significant disturbance
C	**Medium**	Exposure to airborne asbestos unlikely during normal building use
D	**Low**	No exposure to airborne asbestos during normal building use

4.5 Asbestos Register

The Asbestos Register details the type, location, risk assessment and action required for all identified ACM. The Register should be accessed to inform all decisions made concerning control of ACM. Action taken to control ACM must be recorded in this Register in order to comply with current legislation.

Table 3A: Asbestos Register

Kippax Health Centre								
Sample No.	**Tracker Location No.**	**Material Description & Location**	**Condition Rating**	**Risk Rating**	**Approx Quantity**	**Recommended Management Action**	**Action Undertaken**	**Assessor/ Date assessed**
2540-19-1	002	Ground floor Corridor - Fire door core - fire doors (Friable)	3	C	2 no	Label and maintain Inspect every 5 years		
2540-19-10	006	Ground floor Child Health Clinic - Gaskets (compressed) - to chiller compressor (Non-Friable)	4	D	1 no	Label and maintain Inspect annually		
RA 2540-19-2	002	Ground floor Front Corridor - Sheet - ceiling to electrical cupboard (Non-Friable)	3	D	1 m²	Encapsulate Label and maintain Inspect every 5 years		
RA 2540-19-2	003	Ground floor Rear Corridor - Sheet - ceiling to electrical cupboard (Non-Friable)	3	D	1 m²	Encapsulate Label and maintain Inspect every 5 years		
2540-19-2	003	Ground floor Rear Corridor - Sheet - ceiling to fire hose cupboards (Non-Friable)	3	D	2 m²	Encapsulate Label and maintain Inspect every 5 years		

Kippax Health Centre								
Sample No.	**Tracker Location No.**	**Material Description & Location**	**Condition Rating**	**Risk Rating**	**Approx Quantity**	**Recommended Management Action**	**Action Undertaken**	**Assessor/ Date assessed**
2540-19-4	003	Ground floor Rear Corridor - Fire door core - fire door (Friable)	3	C	2 no	Label and maintain Inspect every 5 years		
2540-19-7	001	Exterior - Moulded Sheet - PMG pit (Non-Friable)	2	C	1 no	Inform Telstra		
2540-19-9	008	Ground floor Ceiling Space - Sheet - ceilings throughout (Non-Friable)	3	D	>100 m²	Encapsulate Label and maintain Inspect every 5 years		
3617-84-A1	005	Ground floor Child Health Clinic - Mastic - expansion joint to internal wall (Non-Friable)	4	D	4 lin m	Label and maintain Inspect annually		
3617-84-A10	001	Exterior - Mastic - expansion joint to wall (Non-Friable)	4	D	>10 m	Label and maintain Inspect every 5 years		
3617-84-A8	001	Exterior - Sheet - verge under cloaking (Non-Friable)	4	D	>10 m	Label and maintain Inspect every 5 years		
M0509	011	Ground floor MDF Room - Pipe - pipe conduit (Non-Friable)	3	C	2 no	Maintain Inspect every 5 years		
M0511	008	Ground floor Ceiling Space - Sheet - packers to AC vents (Non-Friable)	3	C	-	Encapsulate Label and maintain Inspect every 5 years		

Kippax Health Centre								
Sample No.	**Tracker Location No.**	**Material Description & Location**	**Condition Rating**	**Risk Rating**	**Approx Quantity**	**Recommended Management Action**	**Action Undertaken**	**Assessor/ Date assessed**
M0512	005	Ground floor Child Health Clinic - Bituminous product - pad to underside of sink (Non-Friable)	4	D	1 m²	Label and maintain Inspect every 5 years		
VA1	001	Wet areas - Pipe lagging (fibrous) - to pipes embedded in masonry walls (throughout building) (Presumed Friable)	4	C	-	Further investigation required		

Refer to Section 2.4 Table 1B for presumed ACM and Section 3.2 for exclusions

Table 3B: Register of sampled materials which have been confirmed as non ACM

Kippax Health Centre			
Sample number	**Type**	**Tracker Location No.**	**Locations**
2540-19-3	Vinyl floor tile	002	Ground floor Front Corridor - passageway flooring
2540-19-5	Gaskets (compressed)	007	Ground floor Redundant plant room - to pipe flange joint
2540-19-8	Sheet	001	Exterior - vertical wall panel
3617-84-A2	Bituminous product	001	Interior - pad to underside of sink (throughout building)
3617-84-A4	Vinyl floor tile	004	Store Room - beige flooring (throughout building)
3617-84-A5	Sheet	001	Exterior - debris to ground
3617-84-A6	Vinyl floor covering	009	Ground floor Dental Care - flooring to Store Room
3617-84-A7	Mastic	001	Exterior - expansion joint to concrete walkway
3617-84-A9	Sheet	010	Ground floor Bin Store - spandrel panels above windows
I0602	Pipe lagging debris	007	Ground floor Redundant plant room - to wall
M0508	Caulking	001	Exterior - to windows
M0510	Vinyl floor tile	011	Ground floor MDF Room - cream floor tiles

5 LEAD PAINT SURVEY RESULTS

5.1 Introduction

Lead paint is defined by the Australian Standard (AS 4361.2 – 2017 Guide to hazardous paint management Part 2: Lead paint in residential, public and commercial buildings) as a paint or component coat of a paint system containing lead or lead compounds, in which the lead content (calculated as lead metal) is in excess of 0.1% by weight of the dry film as determined by laboratory testing.

Analytical values of ≤ 0.1% Pb allow the sample to be categorised as being lead free paint.

5.2 Results

Representative paint samples were collected in accordance with AS4361.2-2017 and analysed for lead content. The sampling criterion provided below is taken from AS4361.2-2017 Section A4 Sampling Strategy clauses (a, b, c);

(a) An adequate number of sample sites should be analysed to properly characterise the paint systems present on site.

(b) For small surfaces such as architraves, windows and doors and cupboards, a **single** sample may suffice.

(c) For large, uniformly painted surface areas such as the exterior facade of high rise buildings, or for interior walls and ceilings of large rooms, and where laboratory testing is employed, **composite** samples should be taken from three separate locations in 10m² sections.

Collected paint samples were analysed for their lead (Pb) content by Envirolab Services Pty Ltd – NATA accreditation number: 2901 using ICP/AES techniques and in-house Method No.4.
Within the same building, wherever a paint coating had a similar surface texture, colour, etc. to a paint coating that had already been sampled because of its suspected lead content, it was presumed that these paint coatings were identical. However, results can only be guaranteed valid for directly tested/sampled paints (especially due to deliberate attempts to match new paint to existing coatings in some applications).

Table 4: Lead Composition in Paint by Inductively-Coupled Plasma Spectroscopy

Kippax Health Centre				
Sample No.	**Item No.**	**Sample location**	**Colour**	**Lead in Paint %**
3617-84-P1	PB2328	Exterior - to guttering and eaves	Brown	0.05
3617-84-P2	PB2329	Exterior - railings to rear of building	White	0.07

Notes:

Lead Paint	(> 0.1% Pb)
Lead-free Paint	(≤ 0.1% Pb)

5.3 Discussion and Conclusion

The analytical result(s) of paint sampling revealed that no lead was identified in any internal or external painted surface during the hazardous materials survey.

It should be assumed that all similar paint(s) throughout the premises contains comparable percentages of lead.

6 Synthetic Mineral Fibre (SMF) Survey Results

6.1 Introduction

SMF is a generic term used to collectively describe a number of amorphous (non-crystalline) fibrous materials including glass fibre, mineral wool (Rockwool and Slagwool) and ceramic fibre. Generally referred to as SMF, these materials are also known as 'Man-Made Mineral Fibres' (MMMF).

SMF products are used extensively in commercial and residential buildings for thermal and acoustic insulation, and as a reinforcing agent in cement, plaster and plastic materials. In some specialised instances, SMF materials have also been used as alternatives to asbestos, especially where high temperature insulation properties are required.

There are two basic forms of SMF insulation **bonded** and **unbonded.**

The **bonded form** is where adhesives, binding agents, facing/cladding, cement or other sealants have been applied to the SMF before delivery and the SMF product has a specific shape (e.g. a binding or sealing agents hold the SMF in a batt or blanket form). Some bonded SMF materials may also be clad in various coverings on one or more sides (e.g. a silver foil backing).

The **unbonded form** has no adhesives, binding agents, facing/cladding or sealants applied, and the SMF is a loose material (e.g. wet spray and loose fill).

6.2 Results

Table 5: Visual Assessment of Samples

Kippax Health Centre			
Item No.	**Location**	**Sample Type**	**Form**
SMF468	Ground floor Redundant Plant Room	soundproofing behind metal cladding	Bonded
SMF2027	Ground floor Ceiling Space	foil backed insulation to underside of roof	Bonded
SMF2028	Throughout	foil backed insulation to ducting	Bonded

6.3 Conclusion

It should be presumed that SMF materials may be present to inaccessible areas including the ceiling space of areas which are inaccessible. If building work is likely to significantly disturb the insulation, the SMF materials should be removed using effective dust control procedures.

Refer to Appendix D for safe SMF handling.

7 POLYCHLORINATED BIPHENYLS (PCB) SURVEY RESULTS

7.1 Introduction

PCB is the common name for polychlorinated biphenyls. PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow then black resins, depending on the chlorine content of the PCB.

PCBs are chemically stable synthetic compounds that do not degrade appreciably over time or with exposure to high temperatures. The major use of PCBs was as an insulating fluid inside transformers and capacitors. Capacitors containing PCBs were installed in various types of equipment including domestic appliances, motors and fluorescent light fittings during the 1950s, 60s and 70s.

These applications generally do not present an immediate risk to human health or the environment as the equipment is sealed and contains relatively small amounts of PCB. The equipment can continue to be used safely provided that the capacitors do not leak.

The Australian and New Zealand Environment and Conservation Council (ANZECC) in its *PCB Management Plan* of *2003* stipulate cessation dates for the generation of PCB scheduled waste, the use of articles containing PCB scheduled waste, and the disposal of PCB scheduled waste*.

> * PCB scheduled waste means any PCB material that has no further use that contains PCBs at levels at, or in excess of 50mg/kg and is of a quantity of 50g or more.

Small equipment items and capacitors found in households and commercial buildings that contain scheduled PCBs (i.e. at or in excess of 50mg/kg) are to be disposed of as scheduled PCB waste. Where the aggregate weight of the items or capacitors exceeds 10kg, they must be notified to the relevant Commonwealth, State or Territory Government agency prior to their disposal.

7.2 Results

Table 6: PCB and non PCB Containing Capacitors Identified on fluorescent light fittings

Item No.	Location	Make - Type	Capacitance (μF)
No PCB capacitors located			

Item No.	Location	Make - Type	Capacitance (μF)
No Non-PCB capacitors were located			

* Note that light fittings were only inspected where they were isolated by a qualified electrician. Live light fittings were not inspected, and accordingly no determination about whether or not they contain PCB is included in this report.

For further PCB management information refer to Appendix D.

8 OZONE DEPLETING SUBSTANCES SURVEY RESULTS

The site was surveyed for the presence of air conditioning and refrigeration units that contain ozone depleting substances.

ODS are used for heat transfer in refrigeration and air conditioning systems, absorbing or releasing heat according to vapour pressure. Release of these substances to the atmosphere has the ability to cause long term atmospheric pollution that can lead to ozone depletion, global warming, petrochemical smog and acid rain.

The ozone depletion potential (ODP) of a fluorocarbon refrigerant gas, its global warming potential (GWP) and estimated atmospheric life (EAL) all contribute to its potential to deplete the stratospheric ozone layer and enhance the greenhouse effect leading to global warming.

Chlorofluorocarbons (CFCs) contain chlorine and possess a large ODP, high GWP and long EAL. They are generally found in refrigeration and air-conditioning systems e.g. centrifugal chillers.

Hydrochlorofluorocarbons (HCFCs) are less saturated with chlorine than are CFCs and the hydrogen within these compounds give the HCFCs a much shorter EAL and lower ODP. They are generally found in refrigeration systems that are used for food display, cold stores and self contained, split, multi-split and central plant chillers used for building air-conditioning.

Hydrofluorocarbons (HFCs) are a class of replacement gases for CFCs. They do not contain chlorine or bromine and therefore do not deplete the ozone layer. While all HFCs have an ODP of zero, some do have a high GWP (e.g. R-404A, R-407B, R-125 etc).

Halons are synthetic chemical compounds that contain one or two carbon atoms, bromine and other halogens. They have a long atmospheric lifetime and cause very aggressive ozone depletion when breaking down in the stratosphere. Halons were introduced into Australia as fire-extinguishing agents in the early 1970s and quickly replaced many previously accepted fire-fighting products because of their superior fire-extinguishing characteristics and ease of use.

Halon 1211 was commonly used in portable fire extinguishers, while fixed fire protection systems, such as those that protect computer rooms and ship engine rooms, commonly contained Halon 1301.

Halon 1301 has an ODP that is 10 times greater that of CFCs, while Halon 1211 has an ODP 3 times greater than that of CFCs.

8.1 Results

Table 7: Chemical properties of ODS located during survey

ODS Item No.	Location	R Number	Chemical name	ODP	GWP	EAL
No ozone depleting substances located						

Chemical properties of non ODS located during survey

Kippax Health Centre						
Non ODS	**Location**	**R Number**	**Chemical name**	**ODP**	**GWP**	**EAL**
ODS278	Exterior - Daikin Inverter	R-410A	HFC-32 (50%), HFC-125 (50%)	0	1370	36

For further refrigerant management information refer to Appendix D.

9 FUEL STORAGE FACILITIES

Prior to the introduction of natural gas in the ACT in the 1980s commercial premises generally utilised heating systems where boilers were fuelled by diesel or heating oils which were stored in A/USTs.

9.1 Results

A/UST Type	Item No.	Location	Recommendations
No storage tanks located			

10 ASBESTOS MANAGEMENT

10.1 Management of ACM

General requirements

- ACM identified as representing an exposure risk (see Table 3A Asbestos Register) should be removed or otherwise controlled.
- Any ACM that is not scheduled for immediate removal should be labelled with appropriate warnings and maintained in good condition.
- The location of ACM must be entered into the Asbestos Register.
- Maintenance and other personnel must be made aware of the location of ACM.
- The Asbestos Register must be freely available.
- Unless they have valid ACT Asbestos Removal licence, maintenance workers, trades or occupants shall not remove or knowingly damage identified ACM.
- Before any planned demolition, refurbishment or maintenance, its effect upon any in situ asbestos must be established by reference to this document, including amendments.

10.2 Management of Contractors

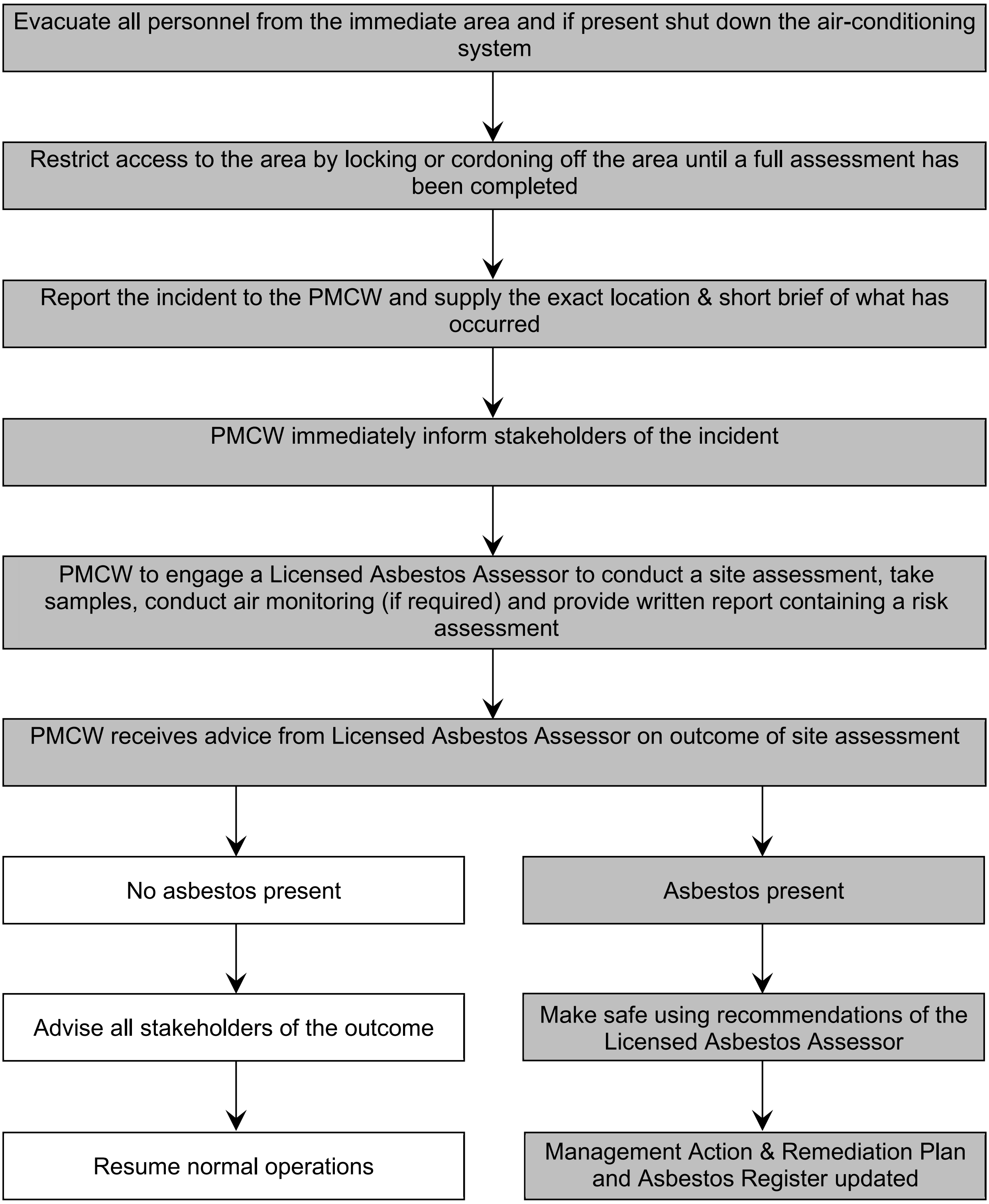
Before any contractor is engaged to carry out work on a site, the Asbestos Register, site plan and photographs should be checked to ensure the work will not interfere with, or disturb asbestos containing materials (ACM).

The chart below should be used by the PMCW to induct contractors onto sites:

Contractor arrives on site	Check Safe Work Method Statement (SWMS) and Trade Licenses (including Asbestos Awareness training) of all personnel involved in the work
Induct contractor	Conduct contractor's induction for the personnel involved in the work and ensure they are aware of any special requirements for ACM, security, no smoking, etc.
Check the Asbestos Register	The Asbestos Register and plan should be readily accessible (i.e. front office/reception) and in colour. Check the Asbestos Register with the contractor for ACM in the proposed work area.
Is asbestos present in the work area?	
No	**Yes**
Contractor may proceed with work	
Will the asbestos be disturbed?	
No	**Yes**
Contractor may proceed with work	**No work to be conducted – contact the PMCW immediately informing them of the problem.**

10.3 Asbestos Emergency Procedures

The following course of action should be taken **immediately** if ACM or suspected ACM is disturbed, or is accidentally damaged.



Evacuate all personnel from the immediate area and if present shut down the air-conditioning system

Restrict access to the area by locking or cordoning off the area until a full assessment has been completed

Report the incident to the PMCW and supply the exact location & short brief of what has occurred

PMCW immediately inform stakeholders of the incident

PMCW to engage a Licensed Asbestos Assessor to conduct a site assessment, take samples, conduct air monitoring (if required) and provide written report containing a risk assessment

PMCW receives advice from Licensed Asbestos Assessor on outcome of site assessment

No asbestos present

Advise all stakeholders of the outcome

Resume normal operations

Asbestos present

Make safe using recommendations of the Licensed Asbestos Assessor

Management Action & Remediation Plan and Asbestos Register updated

10.4 PMCW Decision Record

Option 1: Defer action

Item no.	ACM and Location	Reason	Authorisation	Date

Option 2: Encapsulate or seal

Item no.	ACM and Location	Reason	Authorisation	Date

Option 3: Removal

Item no.	ACM and Location	Reason	Authorisation	Date

10.5 Timetable for Action

The timetable for action should be administered to ensure the PMCW has a clear plan for all works which may affect ACM in the workplace. This includes maintenance work, scheduled removal work and risk assessment reviews, which may impact ACM.

Table 8: Timetable for action

ACM removal/ work	Date of scheduled works	Details	Authorisation	Date
Asbestos review/audit	**Date of scheduled review**	**Details**	**Authorisation**	**Date**

11 RESPONSIBILITIES

11.1 Asbestos - Provision of Information

The PMCW must:

- ensure the ACM register and all relevant information pertaining to asbestos in the workplace is freely available upon request
- provide occupants with up-to-date information relating to the condition and relative risk of ACM in the workplace
- provide information on the control measures in place to contain ACM-related risk and
- provide information to staff and contractors on measures to be taken to ensure that they are not exposed to asbestos in the workplace, either through accident or negligence

PMCW Action Record

Record all communication activities undertaken to inform staff/occupants of ACM in the workplace.

Action	Authorisation	Date

11.2 Updating the Risk Assessment

The register of ACM, including any risk assessments, should be reviewed every 12 months or earlier where:

- a risk assessment indicates the need for reassessment; or
- any ACM has been disturbed or moved

A visual inspection of identified ACM should be undertaken as part of any review.

Each review should critically assess all asbestos management procedures and their effectiveness in:

- preventing exposure to asbestos fibres
- controlling access to asbestos
- highlighting the need for action to maintain or remove ACM
- maintaining the accuracy of the ASMP

Details of any mitigating actions must be recorded in the Asbestos Register (refer Table 3A).

11.3 Key Personnel

This section outlines the responsibilities of all persons involved in the safe management of ACM.

1. PMCW

Name:	
Contact details:	
Responsibilities:	*e.g. provision of information*

2. Occupational Health and Safety Representative

Name:	
Contact details:	
Responsibilities:	*e.g. keeping occupants informed of any changes to the status of ACM in the workplace*

3. Facilities Management (if applicable)

Name:	
Contact details:	
Responsibilities:	*e.g. arrange removal and repair works as required; maintaining the HMSMP*

4. Other

Name:	
Contact details:	
Responsibilities:	

12 ASBESTOS REMOVAL WORKS

12.1 PMCW Responsibilities

Where it has been determined that ACM is to be removed, the PMCW must ensure that a risk assessment is performed before the removal work commences and that the removalist takes this risk assessment into account. The risk assessment must include the possibility of uncovering previously concealed ACM, and that concealed ACM is subsequently identified by a licensed Asbestos Assessor.

The PMCW should provide a detailed scope of works prepared by a licensed Asbestos Assessor for the removalist, including potential hazards, details on areas, which contain asbestos and arrangements for clearance inspections and airborne fibre monitoring.

12.2 Removalist Responsibilities

Before the commencement of removal work, the licensed removal contractor must:

- Provide a site-specific Asbestos Removal Control Plan(ARCP)
- Ensure the removal is adequately supervised and carried out in a safe manner
- Ensure that the equipment used in the project is appropriate for the task
- Ensure all persons carrying out the removal are competent and trained for the type of work being carried out
- Demonstrate that they have a health surveillance program in accordance with the requirements of Code Of Practice: How To Safely Remove Asbestos

12.3 Licensing Requirements

All Asbestos Removalists in the ACT are licensed by WorkSafe ACT

As a minimum the holder of an ACT Asbestos Removal Licence is required to demonstrate practical experience in the industry for at least three years and possess a full and complete understanding of the requirements of:

- *How to Manage and Control Asbestos in the Workplace Code of Practice*
- *How to Safely Remove Asbestos Code of Practice*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulations 2011*

Environment and Planning Directorate (EPD) specify requirements for authorising certifiers and WorkSafe ACT and ACT NOWaste for the removal and transport of ACM.

12.4 Approval to Begin Asbestos Removal Works

- All removal methods and procedures are required to be undertaken in accordance with current legislation.
- The PMCW in conjunction with a licensed Asbestos Assessor where required, will inform the asbestos removalist of the 'Scope of Works'.
- The licensed Asbestos Assessor will be required to provide a clearance certificate on satisfactory completion of the works.

12.5 Emergency Work in Areas Containing Asbestos

- If emergency access is required contact the PMCW.
- If the PMCW determines that asbestos is likely to be disturbed, all works must be undertaken in accordance with current legislation - that is, a licensed Asbestos Removalist must be contracted to undertake any asbestos removal works.
- A licensed Asbestos Assessor will be required to provide a clearance certificate on satisfactory completion of the works.

12.6 Monitoring Arrangements

Control air monitoring should be performed when indicated by a Risk Assessment to ensure the control measures are effective.

All air monitoring must be performed by a licensed Asbestos Assessor accredited to perform air sampling for asbestos. Sampling should be performed in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres* [NOHSC: 3003 (2005)].

It is the Asbestos Removalist's responsibility to ensure that the maximum fibre levels throughout asbestos removal and associated works does not equal or exceed the minimum practical detection limit of 0.01 fibres per millilitre of air (F/ml). If the airborne fibre levels are observed at or exceeding those specified below, the licensed Asbestos Assessor will instruct the contractor to take the appropriate control /action as per current legislation.

Table 9: Control levels and required actions

Control Level (airborne asbestos fibres/ml)	Control/Action
< 0.01	Continue with control measures
≥ 0.01	Review control measures
≥ 0.02	Stop removal work and find the cause

12.7 Clearance Inspections

Following removal work, a licensed Asbestos Assessor must undertake a clearance inspection before re-occupation of an asbestos work area.

All barriers and warning signs should remain in place until the area has been cleared.

12.8 ACM removal/maintenance record

The Asbestos Register, Section 4.5, Table 3A is to be completed by the PMCW after receiving appropriate clearance certification from a licensed Asbestos Assessor.

The 'Work Performed' and 'Asbestos Control Measure' Tables are required to be completed by the PMCW.

1. Work Performed

Company name	Contact details	Date of work + job no.	Scope of work

2. Asbestos Control Measures

Work performed	Air monitoring/ decontamination	Clearance certificate issued	Other

3. Additional Information

----

13 FURTHER INFORMATION

13.1 Useful Contacts

Additional information on asbestos can be obtained from the following organisations and agencies.

Environment and Planning Directorate (EPD)

Dame Pattie Menzies House
16 Challis Street
Dickson ACT 2602
Phone: 02 6207 1923
Internet: www.environment.act.gov.au

ACT Government

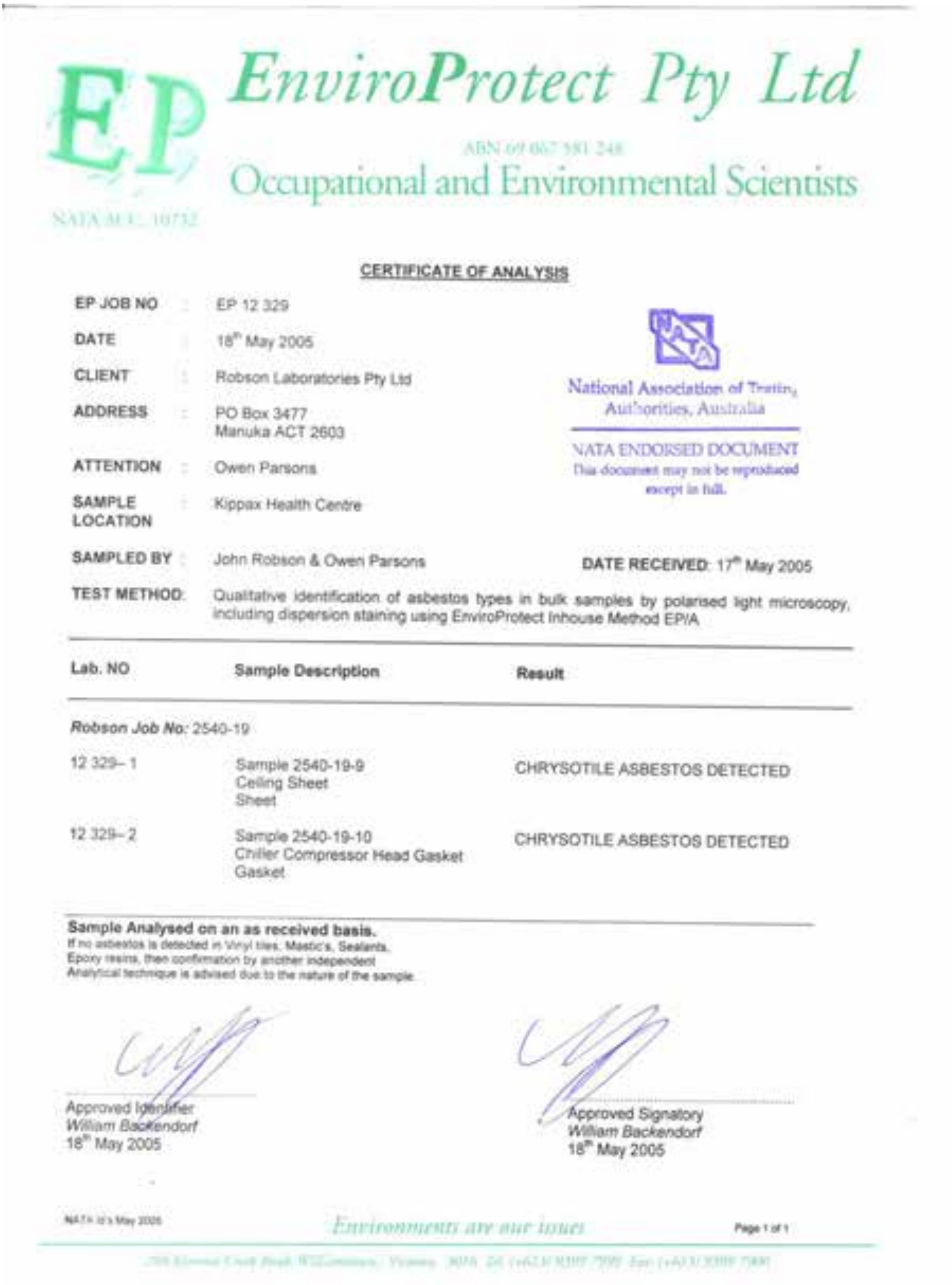
Phone: 13 22 81
Internet: www.asbestos.act.gov.au

WorkSafe ACT

255 Canberra Avenue
Fyshwick ACT 2609
Phone: 02 6205 0200
Email: worksafe@act.gov.au
Internet: www.WorkSafe.act.gov.au

14 APPENDICES

14.1 APPENDIX A – Laboratory Reports



EnviroProtect Pty Ltd

ABN 69 067 581 248

Occupational and Environmental Scientists

NATA ACC. 10732

CERTIFICATE OF ANALYSIS

EP JOB NO : EP 12 329

DATE : 18th May 2005

CLIENT : Robson Laboratories Pty Ltd

ADDRESS : PO Box 3477
Manuka ACT 2603

ATTENTION : Owen Parsons

SAMPLE LOCATION : Kippax Health Centre

SAMPLED BY : John Robson & Owen Parsons

DATE RECEIVED: 17th May 2005

TEST METHOD: Qualitative identification of asbestos types in bulk samples by polarised light microscopy, including dispersion staining using EnviroProtect Inhouse Method EP/A

National Association of Testing Authorities, Australia

NATA ENDORSED DOCUMENT
This document may not be reproduced except in full.

Lab. NO	**Sample Description**	**Result**
Robson Job No: 2540-19		
12 329– 1	Sample 2540-19-9 Ceiling Sheet Sheet	CHRYSOTILE ASBESTOS DETECTED
12 329– 2	Sample 2540-19-10 Chiller Compressor Head Gasket Gasket	CHRYSOTILE ASBESTOS DETECTED

Sample Analysed on an as received basis.
If no asbestos is detected in Vinyl tiles, Mastic's, Sealants, Epoxy resins, then confirmation by another independent Analytical technique is advised due to the nature of the sample.

Approved Identifier
William Backendorf
18th May 2005

Approved Signatory
William Backendorf
18th May 2005

NATA Id's May 2005

Environments are our issues

Page 1 of 1

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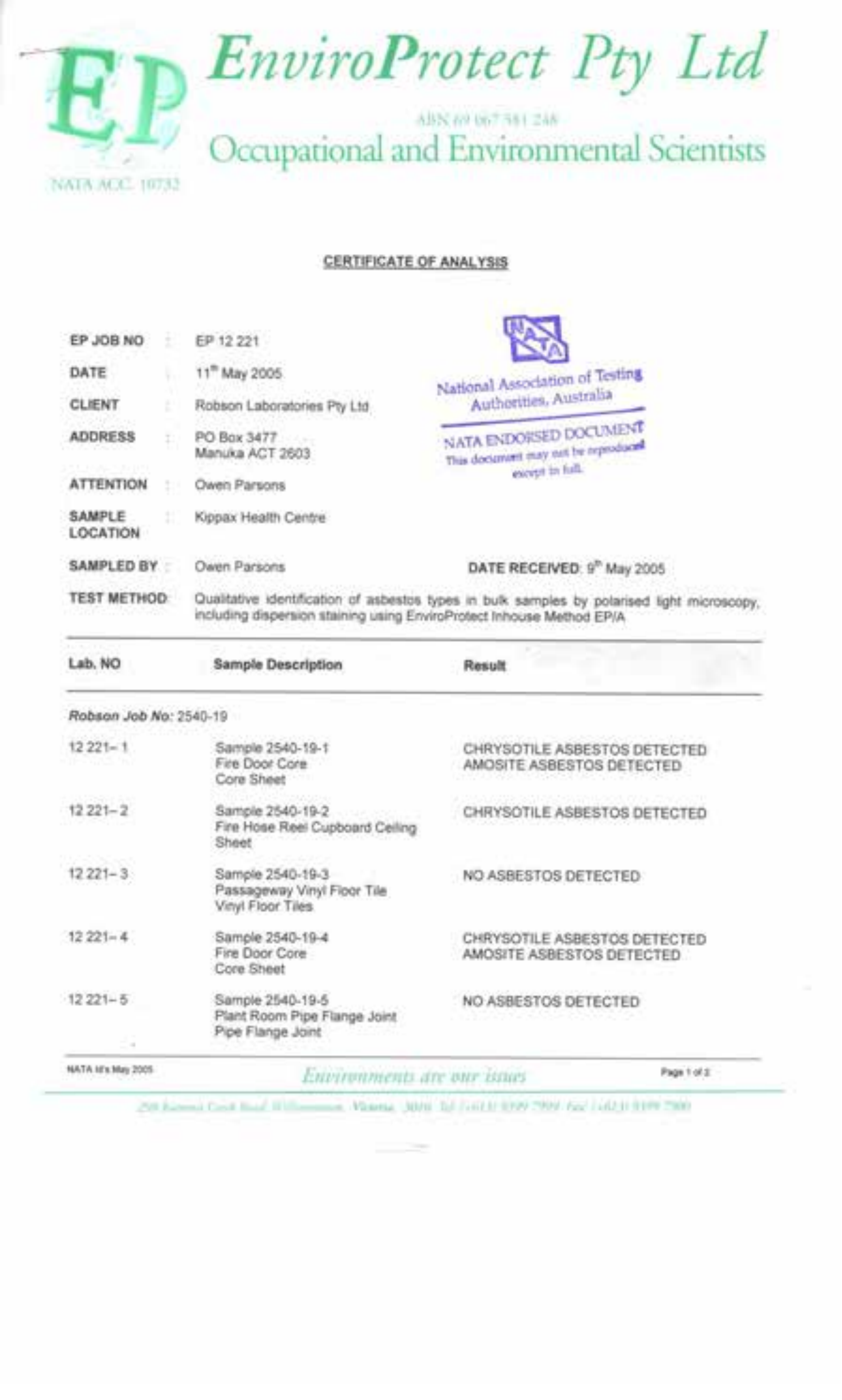

EnviroProtect Pty Ltd

ABN 69 067 581 248

Occupational and Environmental Scientists

NATA ACC. 10732

CERTIFICATE OF ANALYSIS

National Association of Testing Authorities, Australia

NATA ENDORSED DOCUMENT

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EP JOB NO : EP 12 221

DATE : 11th May 2005

CLIENT : Robson Laboratories Pty Ltd

ADDRESS : PO Box 3477
Manuka ACT 2603

ATTENTION : Owen Parsons

SAMPLE LOCATION : Kippax Health Centre

SAMPLED BY : Owen Parsons

DATE RECEIVED: 9th May 2005

TEST METHOD: Qualitative identification of asbestos types in bulk samples by polarised light microscopy, including dispersion staining using EnviroProtect Inhouse Method EP/A

Lab. NO	Sample Description	Result
Robson Job No: 2540-19		
12 221– 1	Sample 2540-19-1 Fire Door Core Core Sheet	CHRYSOTILE ASBESTOS DETECTED AMOSITE ASBESTOS DETECTED
12 221– 2	Sample 2540-19-2 Fire Hose Reel Cupboard Ceiling Sheet	CHRYSOTILE ASBESTOS DETECTED
12 221– 3	Sample 2540-19-3 Passageway Vinyl Floor Tile Vinyl Floor Tiles	NO ASBESTOS DETECTED
12 221– 4	Sample 2540-19-4 Fire Door Core Core Sheet	CHRYSOTILE ASBESTOS DETECTED AMOSITE ASBESTOS DETECTED
12 221– 5	Sample 2540-19-5 Plant Room Pipe Flange Joint Pipe Flange Joint	NO ASBESTOS DETECTED

NATA Id's May 2005 *Environments are our issues* Page 1 of 2

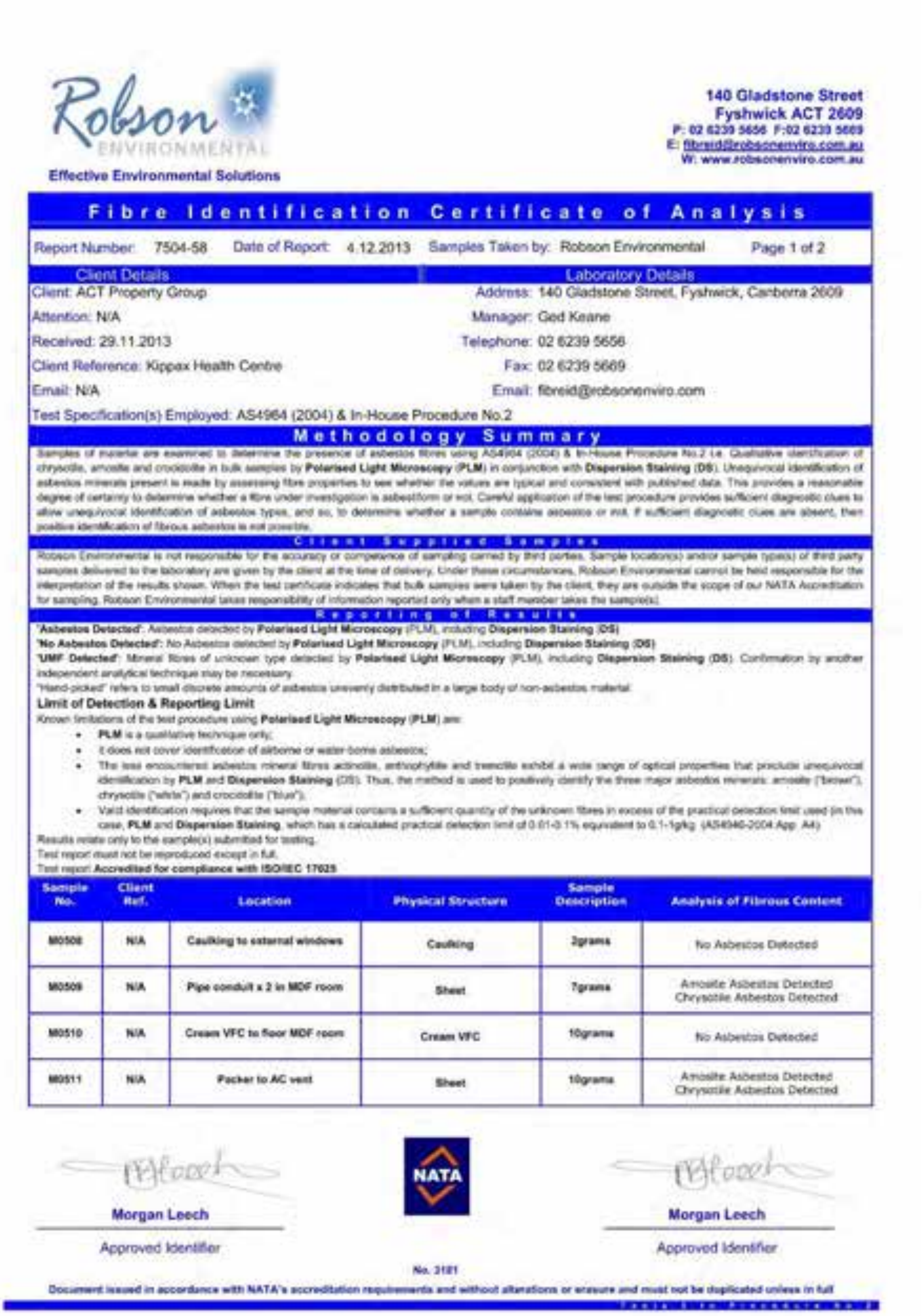
258 Kororoit Creek Road, Williamstown, Victoria, 3016 Tel (+613) 9399 7999 Fax (+613) 9399 7900

Lab. NO	Sample Description	Result
12 221– 6	Sample 2540-19-6 Debris In Ceiling Space Sheet	CHRYSOTILE ASBESTOS DETECTED
12 221– 7	Sample 2540-19-7 PMG Box Moulded Sheet	CHRYSOTILE ASBESTOS DETECTED AMOSITE ASBESTOS DETECTED
12 221– 8	Sample 2540-19-8 External Vertical Wall Panel Sheet	NO ASBESTOS DETECTED

Sample Analysed on an as received basis.
If no asbestos is detected in Vinyl tiles, Mastic's, Sealants,
Epoxy resins, then confirmation by another independent
Analytical technique is advised due to the nature of the sample.

Approved Identifier
William Backendorf
11th May 2005

Approved Signatory
William Backendorf
11th May 2005



Robson ENVIRONMENTAL
Effective Environmental Solutions

140 Gladstone Street
Fyshwick ACT 2609
P: 02 6239 5656 F:02 6239 5669
E: fibreid@robsonenviro.com.au
W: www.robsonenviro.com.au

Fibre Identification Certificate of Analysis

Report Number: 7504-58 Date of Report: 4.12.2013 Samples Taken by: Robson Environmental Page 1 of 2

Client Details	Laboratory Details
Client: ACT Property Group	Address: 140 Gladstone Street, Fyshwick, Canberra 2609
Attention: N/A	Manager: Ged Keane
Received: 29.11.2013	Telephone: 02 6239 5656
Client Reference: Kippax Health Centre	Fax: 02 6239 5669
Email: N/A	Email: fibreid@robsonenviro.com

Test Specification(s) Employed: AS4964 (2004) & In-House Procedure No.2

Methodology Summary

Samples of material are examined to determine the presence of asbestos fibres using AS4964 (2004) & In-House Procedure No.2 i.e. Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by **Polarised Light Microscopy (PLM)** in conjunction with **Dispersion Staining (DS)**. Unequivocal identification of asbestos minerals present is made by assessing fibre properties to see whether the values are typical and consistent with published data. This provides a reasonable degree of certainty to determine whether a fibre under investigation is asbestiform or not. Careful application of the test procedure provides sufficient diagnostic clues to allow unequivocal identification of asbestos types, and so, to determine whether a sample contains asbestos or not. If sufficient diagnostic clues are absent, then positive identification of fibrous asbestos is not possible.

Client Supplied Samples

Robson Environmental is not responsible for the accuracy or competence of sampling carried by third parties. Sample location(s) and/or sample type(s) of third party samples delivered to the laboratory are given by the client at the time of delivery. Under these circumstances, Robson Environmental cannot be held responsible for the interpretation of the results shown. When the test certificate indicates that bulk samples were taken by the client, they are outside the scope of our NATA Accreditation for sampling. Robson Environmental takes responsibility of information reported only when a staff member takes the sample(s).

Reporting of Results

'Asbestos Detected': Asbestos detected by **Polarised Light Microscopy** (PLM), including **Dispersion Staining (DS)**
'No Asbestos Detected': No Asbestos detected by **Polarised Light Microscopy** (PLM), including **Dispersion Staining (DS)**
'UMF Detected': Mineral fibres of unknown type detected by **Polarised Light Microscopy** (PLM), including **Dispersion Staining (DS)**. Confirmation by another independent analytical technique may be necessary.
"Hand-picked" refers to small discrete amounts of asbestos unevenly distributed in a large body of non-asbestos material.

Limit of Detection & Reporting Limit

Known limitations of the test procedure using **Polarised Light Microscopy (PLM)** are:

- **PLM** is a qualitative technique only;
- It does not cover identification of airborne or water-borne asbestos;
- The less encountered asbestos mineral fibres actinolite, anthophyllite and tremolite exhibit a wide range of optical properties that preclude unequivocal identification by **PLM** and **Dispersion Staining** (DS). Thus, the method is used to positively identify the three major asbestos minerals: amosite ("brown"), chrysotile ("white") and crocidolite ("blue").
- Valid identification requires that the sample material contains a sufficient quantity of the unknown fibres in excess of the practical detection limit used (in this case, **PLM** and **Dispersion Staining**, which has a calculated practical detection limit of 0.01-0.1% equivalent to 0.1-1g/kg (AS4964-2004 App. A4)

Results relate only to the sample(s) submitted for testing.
Test report must not be reproduced except in full.
Test report **Accredited for compliance with ISO/IEC 17025**

Sample No.	Client Ref.	Location	Physical Structure	Sample Description	Analysis of Fibrous Content
M0508	N/A	Caulking to external windows	Caulking	3grams	No Asbestos Detected
M0509	N/A	Pipe conduit x 2 in MDF room	Sheet	7grams	Amosite Asbestos Detected Chrysotile Asbestos Detected
M0510	N/A	Cream VFC to floor MDF room	Cream VFC	10grams	No Asbestos Detected
M0511	N/A	Packer to AC vent	Sheet	10grams	Amosite Asbestos Detected Chrysotile Asbestos Detected

Morgan Leech
Approved Identifier

NATA

Morgan Leech
Approved Identifier

No. 3181

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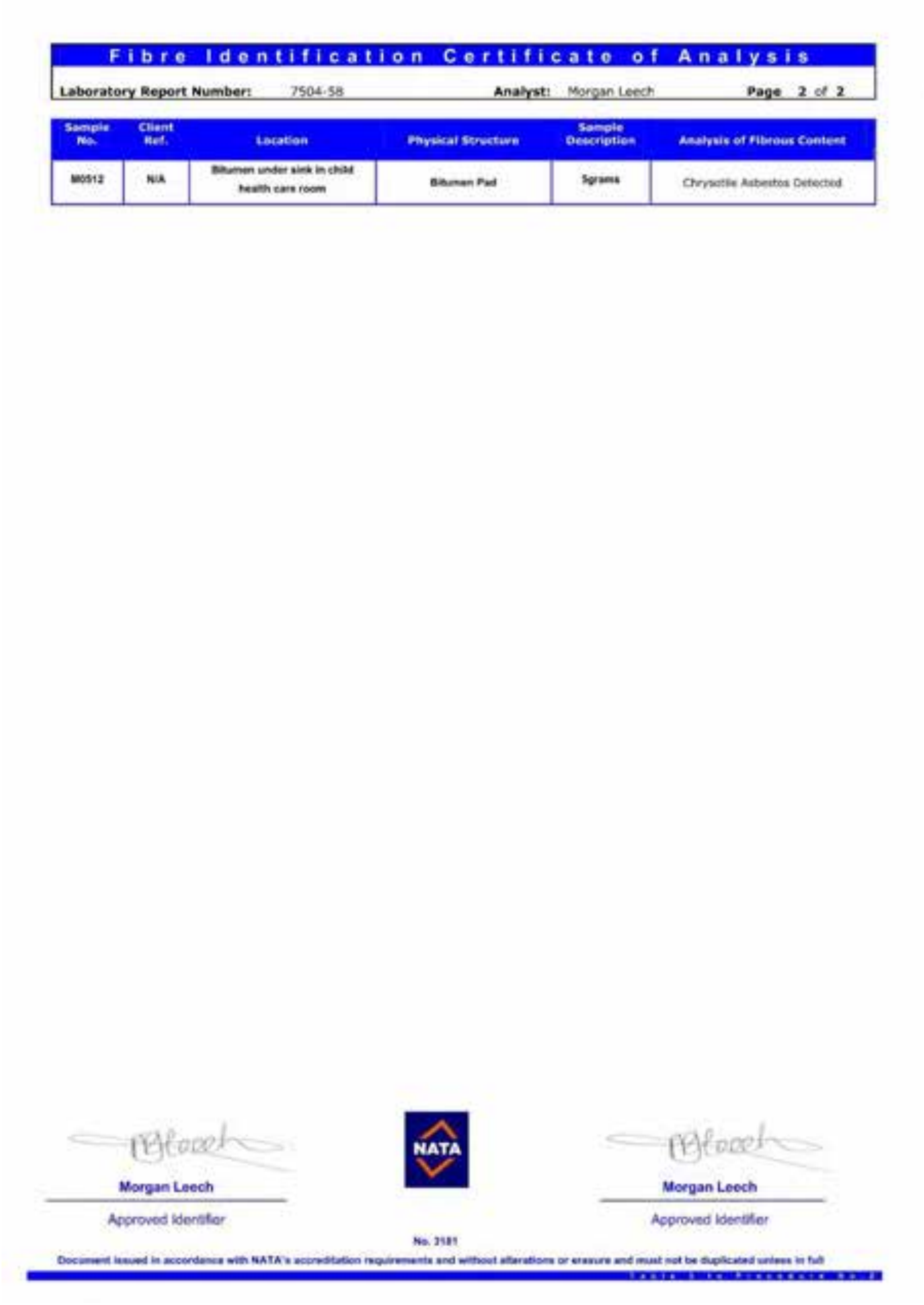
Tests 1 to Procedure No 2



Fibre Identification Certificate of Analysis

Laboratory Report Number: 7504-58 **Analyst:** Morgan Leech **Page** 2 of 2

Sample No.	Client Ref.	Location	Physical Structure	Sample Description	Analysis of Fibrous Content
M0512	N/A	Bitumen under sink in child health care room	Bitumen Pad	5grams	Chrysotile Asbestos Detected

Morgan Leech
Approved Identifier

NATA

Morgan Leech
Approved Identifier

No. 3181

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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
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 46956

Client:
Robson Environmental Pty Ltd
PO Box 112
Fyshwick
ACT 2609

Attention: Ged Keane

Sample log in details:

Your Reference:	**361784, Kippax Health Centre**
No. of samples:	10 Materials
Date samples received:	14/10/10
Date completed instructions received:	14/10/10

Analysis Details:

Please refer to the following pages for results and methodology summary.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Note, even after disintegration it can be difficult to detect the presence of asbestos in some asbestos -containing bulk materials using PLM and dispersion staining. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.

Report Details:

Date results requested by:	21/10/10
Date of Preliminary Report:	Not Issued
Issue Date:	18/10/10

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Asbestos was analysed by Approved Identifier:	Matt Mansfield
Asbestos was authorised by Approved Signatory:	Matt Mansfield

Matt Mansfield
Approved Signatory

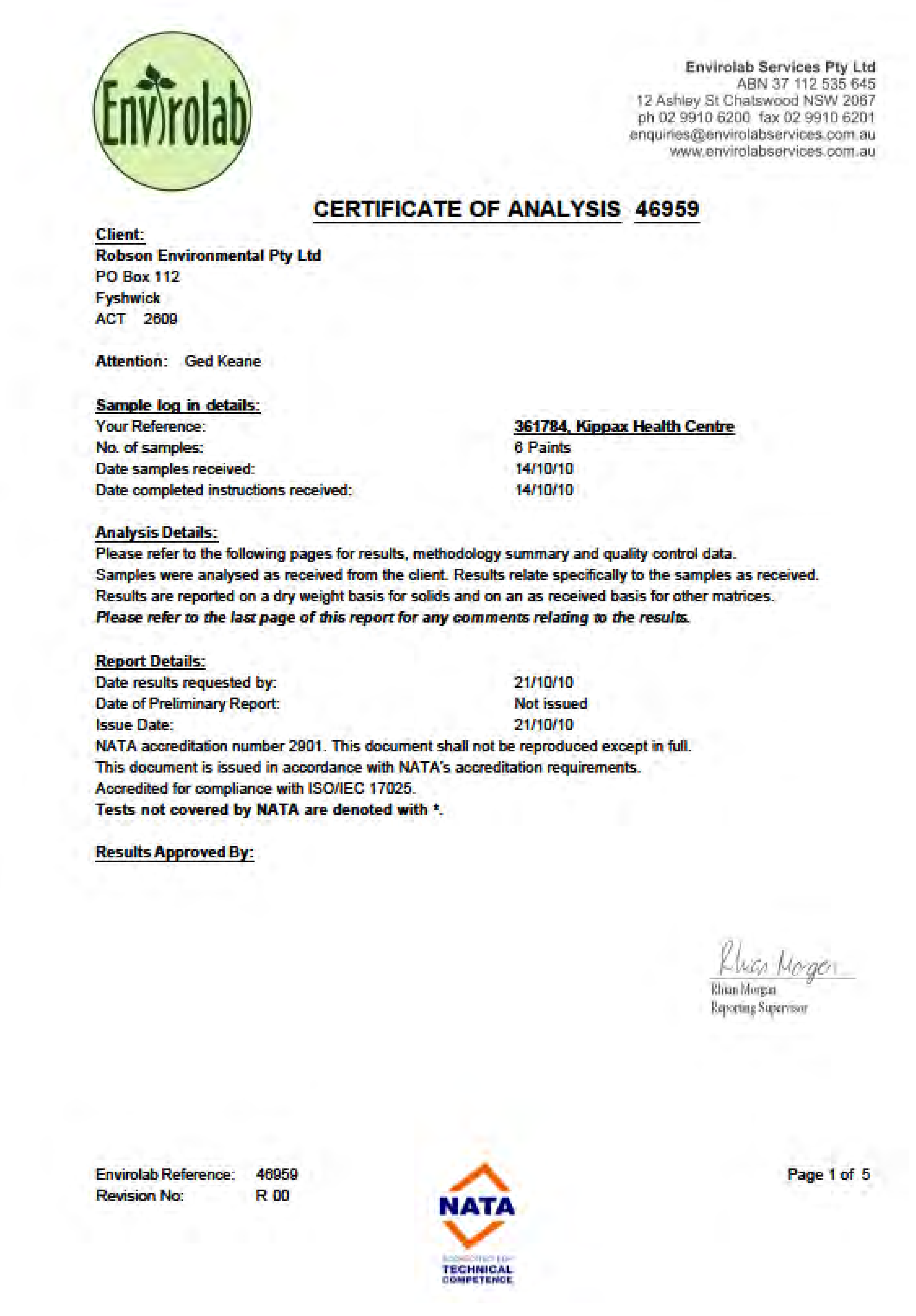
Client Reference: 361784, Kippax Health Centre

Envirolab Ref:	Sample ID:	Date analysed	Sample Description	Asbestos ID in materials
–	–	-	-	-
46956-1	361784-A1	18/10/2010	10x10x2mm Mastic	Chrysotile asbestos detected
46956-2	361784-A2	18/10/2010	25x20x1mm Bituminious board	No asbestos detected
46956-3	361784-A3	18/10/2010	0.13g Tile fragments	No asbestos detected
46956-4	361784-A4	18/10/2010	15x15x2mm Tile fragments	No asbestos detected
46956-5	361784-A5	18/10/2010	50x40x4mm Fibreboard	No asbestos detected
46956-6	361784-A6	18/10/2010	20x15x2mm Vinyl floor tile	No asbestos detected
46956-7	361784-A7	18/10/2010	30x10x3mm Bituminious Mastic	No asbestos detected
46956-8	361784-A8	18/10/2010	10x10x3mm Fibresheet	Chrysotile asbestos detected Amosite asbestos detected
46956-9	361784-A9	18/10/2010	0.3g Sheet fragments	No asbestos detected
46956-10	361784-A10	18/10/2010	7x5x2mm Mastic	Chrysotile asbestos detected

Client Reference: 361784, Kippax Health Centre

Method ID	Methodology Summary
AS4964-2004	Asbestos ID - Qualitative identification of asbestos type fibres in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques.

Envirolab Reference: 46956
Revision No: R 00



Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 46959

Client:
Robson Environmental Pty Ltd
PO Box 112
Fyshwick
ACT 2609

Attention: Ged Keane

Sample log in details:

Your Reference: **361784, Kippax Health Centre**
No. of samples: 6 Paints
Date samples received: 14/10/10
Date completed instructions received: 14/10/10

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: 21/10/10
Date of Preliminary Report: Not issued
Issue Date: 21/10/10
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This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Rhian Morgan
Rhian Morgan
Reporting Supervisor

Client Reference: 361784, Kippax Health Centre

Lead in Paint						
Our Reference:	UNITS	46959-1	46959-2	46959-3	46959-4	46959-5
Your Reference	------------	361784-P1a	361784-P1b	361784-P1c	361784-P2a	361784-P2b
Type of sample	------------	Paint	Paint	Paint	Paint	Paint
Lead in paint	%w/w	<0.05	<0.05	<0.05	0.068	<0.05

Lead in Paint		
Our Reference:	UNITS	46959-6
Your Reference	------------	361784-P2c
Type of sample	------------	Paint
Lead in paint	%w/w	<0.05

Method ID	Methodology Summary
Metals.4	Digestion of Paint chips for Lead determination by ICP-AES.

QUALITY CONTROL Lead in Paint	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD
Lead in paint	% w/w	0.05	Metals.4	<0.05	46959-6	<0.05 || 0.058

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job
Asbestos counting was analysed by Approved Counter:	@ERROR
Asbestos counting was authorised by Approved Signatory:	@ERROR

INS: Insufficient sample for this test
NA: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

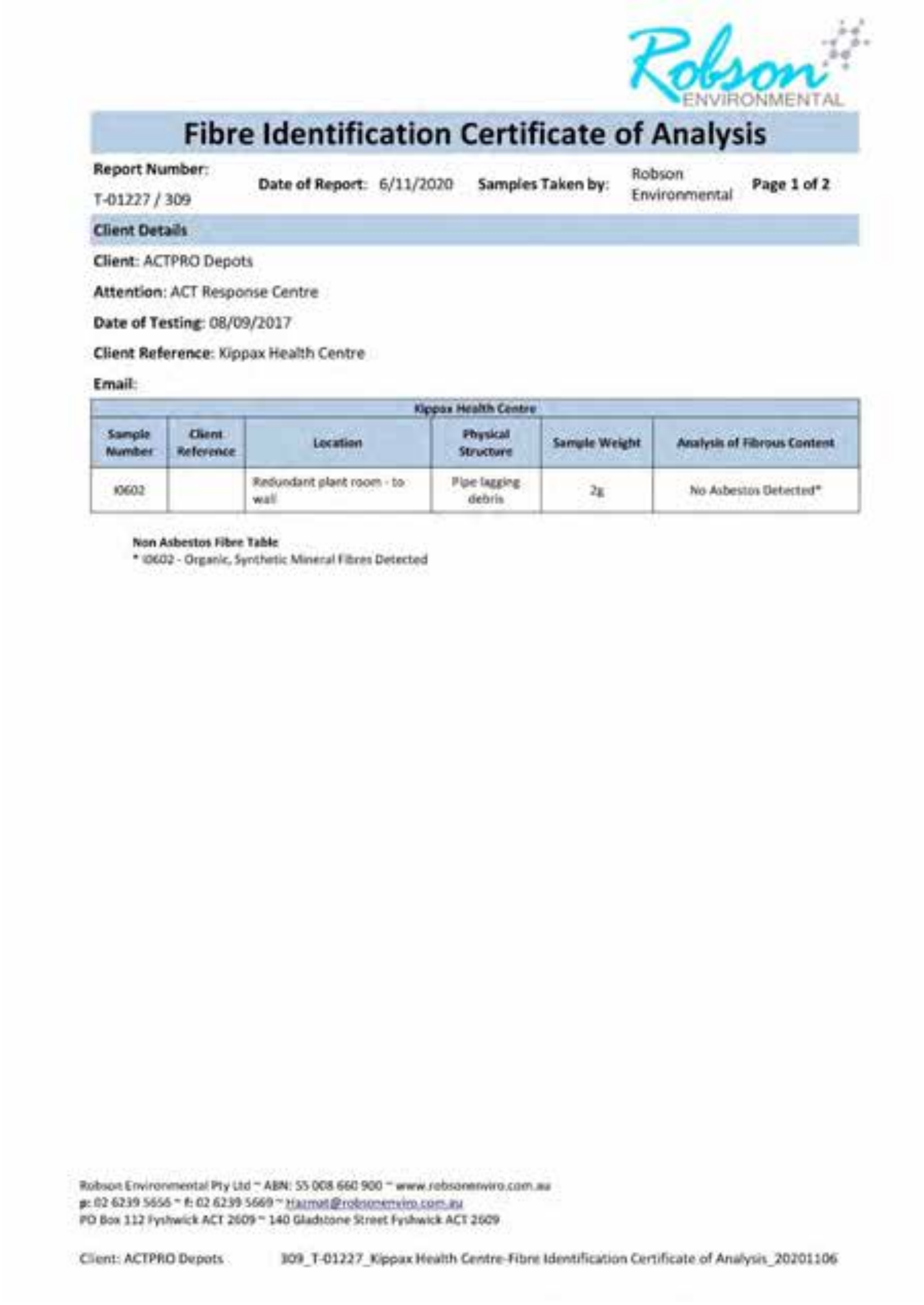
Quality Control Definitions

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.

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 batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.



Robson ENVIRONMENTAL

Fibre Identification Certificate of Analysis

Report Number: T-01227 / 309 **Date of Report:** 6/11/2020 **Samples Taken by:** Robson Environmental **Page 1 of 2**

Client Details

Client: ACTPRO Depots

Attention: ACT Response Centre

Date of Testing: 08/09/2017

Client Reference: Kippax Health Centre

Email:

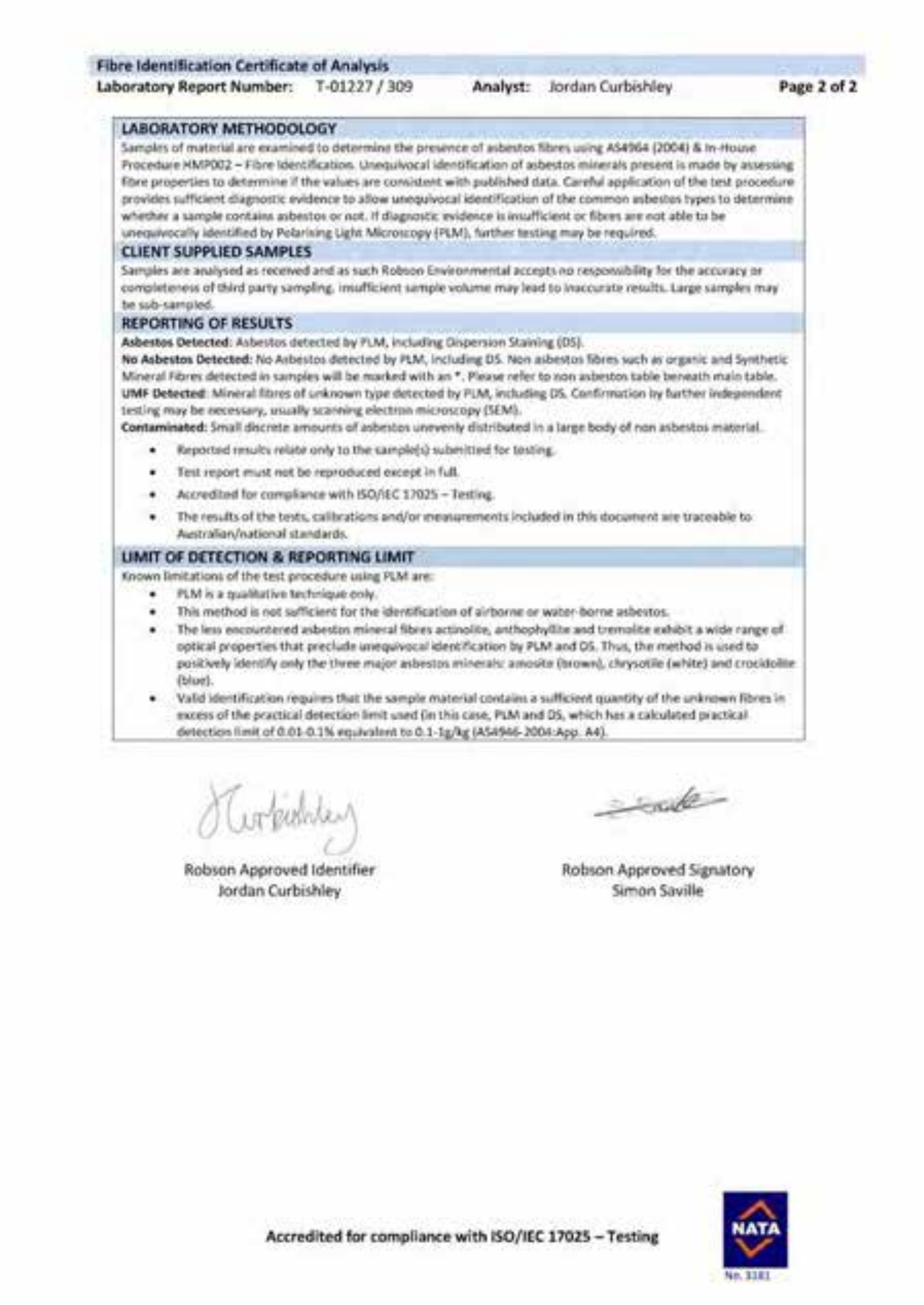
Kippax Health Centre					
Sample Number	**Client Reference**	**Location**	**Physical Structure**	**Sample Weight**	**Analysis of Fibrous Content**
I0602		Redundant plant room - to wall	Pipe lagging debris	2g	No Asbestos Detected*

Non Asbestos Fibre Table

* I0602 - Organic, Synthetic Mineral Fibres Detected

Robson Environmental Pty Ltd ~ ABN: 55 008 660 900 ~ www.robsonenviro.com.au
p: 02 6239 5656 ~ f: 02 6239 5669 ~ Hazmat@robsonenviro.com.au
PO Box 112 Fyshwick ACT 2609 ~ 140 Gladstone Street Fyshwick ACT 2609

Client: ACTPRO Depots 309_T-01227_Kippax Health Centre-Fibre Identification Certificate of Analysis_20201106



Fibre Identification Certificate of Analysis

Laboratory Report Number: T-01227 / 309 **Analyst:** Jordan Curbishley **Page 2 of 2**

LABORATORY METHODOLOGY

Samples of material are examined to determine the presence of asbestos fibres using AS4964 (2004) & In-House Procedure HMP002 – Fibre Identification. Unequivocal identification of asbestos minerals present is made by assessing fibre properties to determine if the values are consistent with published data. Careful application of the test procedure provides sufficient diagnostic evidence to allow unequivocal identification of the common asbestos types to determine whether a sample contains asbestos or not. If diagnostic evidence is insufficient or fibres are not able to be unequivocally identified by Polarising Light Microscopy (PLM), further testing may be required.

CLIENT SUPPLIED SAMPLES

Samples are analysed as received and as such Robson Environmental accepts no responsibility for the accuracy or completeness of third party sampling, insufficient sample volume may lead to inaccurate results. Large samples may be sub-sampled.

REPORTING OF RESULTS

Asbestos Detected: Asbestos detected by PLM, including Dispersion Staining (DS).

No Asbestos Detected: No Asbestos detected by PLM, including DS. Non asbestos fibres such as organic and Synthetic Mineral Fibres detected in samples will be marked with an *. Please refer to non asbestos table beneath main table.

UMF Detected: Mineral fibres of unknown type detected by PLM, including DS. Confirmation by further independent testing may be necessary, usually scanning electron microscopy (SEM).

Contaminated: Small discrete amounts of asbestos unevenly distributed in a large body of non asbestos material.

- Reported results relate only to the sample(s) submitted for testing.
- Test report must not be reproduced except in full.
- Accredited for compliance with ISO/IEC 17025 – Testing.
- The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

LIMIT OF DETECTION & REPORTING LIMIT

Known limitations of the test procedure using PLM are:

- PLM is a qualitative technique only.
- This method is not sufficient for the identification of airborne or water-borne asbestos.
- The less encountered asbestos mineral fibres actinolite, anthophyllite and tremolite exhibit a wide range of optical properties that preclude unequivocal identification by PLM and DS. Thus, the method is used to positively identify only the three major asbestos minerals: amosite (brown), chrysotile (white) and crocidolite (blue).
- Valid identification requires that the sample material contains a sufficient quantity of the unknown fibres in excess of the practical detection limit used (in this case, PLM and DS, which has a calculated practical detection limit of 0.01-0.1% equivalent to 0.1-1g/kg (AS4946-2004:App. A4).

J Curbishley

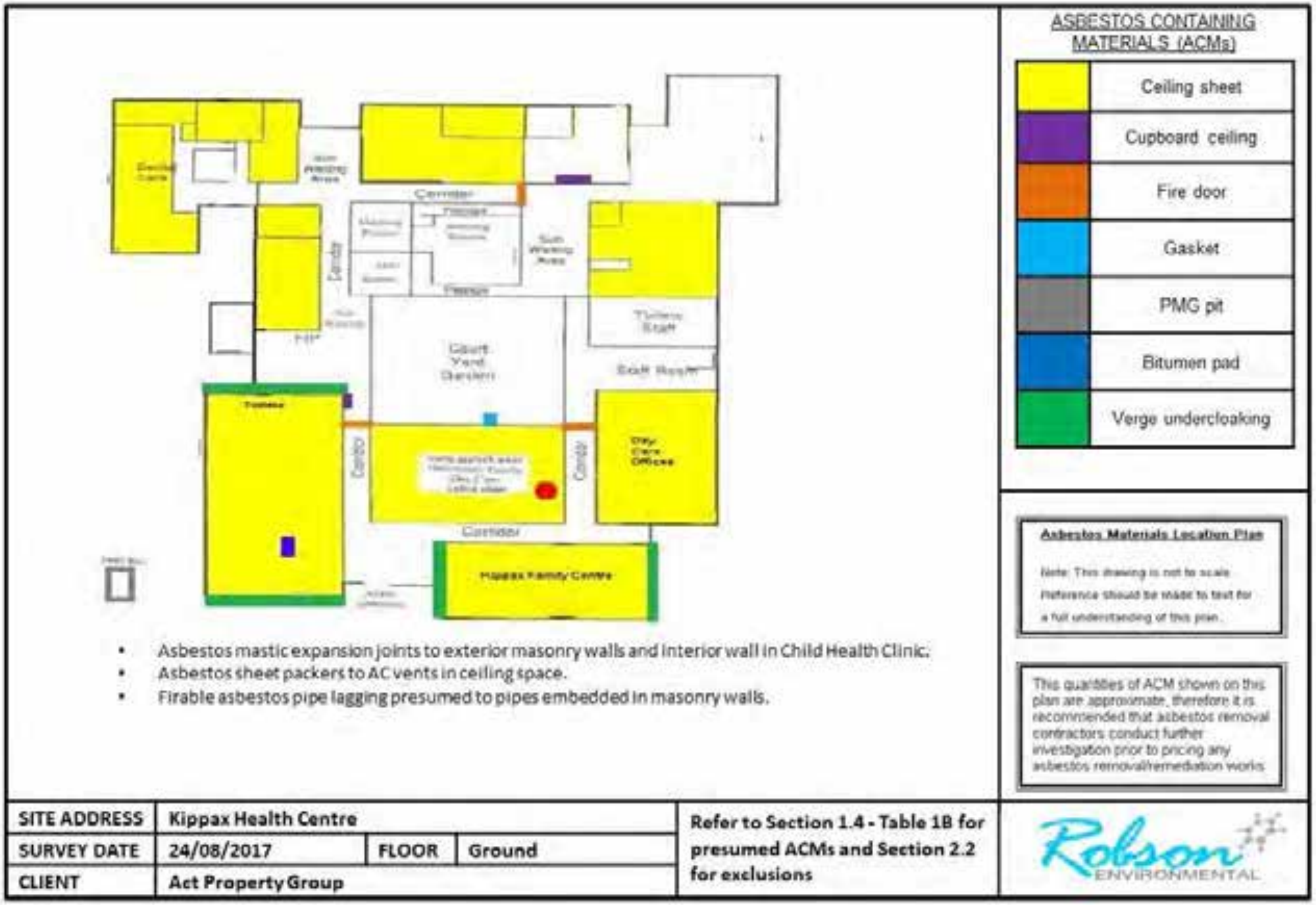
Robson Approved Identifier
Jordan Curbishley

Robson Approved Signatory
Simon Saville

Accredited for compliance with ISO/IEC 17025 – Testing

NATA
No. 3181

14.2 APPENDIX B – Plans



- Asbestos mastic expansion joints to exterior masonry walls and interior wall in Child Health Clinic.
- Asbestos sheet packers to AC vents in ceiling space.
- Firable asbestos pipe lagging presumed to pipes embedded in masonry walls.

ASBESTOS CONTAINING MATERIALS (ACMs)

🟨	Ceiling sheet
🟪	Cupboard ceiling
🟧	Fire door
🟦	Gasket
⬛	PMG pit
🟦	Bitumen pad
🟩	Verge undercloaking

Asbestos Materials Location Plan

Note: This drawing is not to scale. Reference should be made to text for a full understanding of this plan.

This quantities of ACM shown on this plan are approximate, therefore it is recommended that asbestos removal contractors conduct further investigation prior to pricing any asbestos removal/remediation works.

SITE ADDRESS	**Kippax Health Centre**		
SURVEY DATE	**24/08/2017**	**FLOOR**	**Ground**
CLIENT	**Act Property Group**		

Refer to Section 1.4 - Table 1B for presumed ACMs and Section 2.2 for exclusions

14.3 APPENDIX C – HAZMAT Item locations & representative photographs

ASBESTOS - Kippax Health Centre				
SAMPLE NO.	**TRACKER LOCATION NO.**	**LOCATIONS**	**MATERIAL DESCRIPTION**	**PHOTOGRAPH**
2540-19-1	002	Ground floor Corridor - fire doors	Fire door core (Friable)	
2540-19-10	006	Ground floor Child Health Clinic - to chiller compressor	Gaskets (compressed) (Non-Friable)	
RA 2540-19-2	002	Ground floor Front Corridor - ceiling to electrical cupboard	Sheet (Non-Friable)	

ASBESTOS - Kippax Health Centre				
SAMPLE NO.	**TRACKER LOCATION NO.**	**LOCATIONS**	**MATERIAL DESCRIPTION**	**PHOTOGRAPH**
RA 2540-19-2	003	Ground floor Rear Corridor - ceiling to electrical cupboard	No Access to Sheet (Non-Friable)	
2540-19-2	003	Ground floor Rear Corridor - ceiling to fire hose cupboards	Sheet (Non-Friable)	
2540-19-4	003	Ground floor Rear Corridor - fire door	Fire door core (Friable)	
2540-19-7	001	Exterior - PMG pit	Moulded Sheet (Non-Friable)	

ASBESTOS - Kippax Health Centre				
SAMPLE NO.	**TRACKER LOCATION NO.**	**LOCATIONS**	**MATERIAL DESCRIPTION**	**PHOTOGRAPH**
2540-19-9	008	Ground floor Ceiling Space - ceilings throughout	Sheet (Non-Friable)	
3617-84-A1	005	Ground floor Child Health Clinic - expansion joint to internal wall	Mastic (Non-Friable)	
3617-84-A10	001	Exterior - expansion joint to wall	Mastic (Non-Friable)	
3617-84-A8	001	Exterior - verge under cloaking	Sheet (Non-Friable)	

ASBESTOS - Kippax Health Centre				
SAMPLE NO.	**TRACKER LOCATION NO.**	**LOCATIONS**	**MATERIAL DESCRIPTION**	**PHOTOGRAPH**
M0509	011	Ground floor MDF Room - pipe conduit	Pipe (Non-Friable)	
M0511	008	Ground floor Ceiling Space - packers to AC vents	Sheet (Non-Friable)	
M0512	005	Ground floor Child Health Clinic - pad to underside of sink	Bituminous product (Non-Friable)	
VA1	001	Wet areas - to pipes embedded in masonry walls (throughout building)	Pipe lagging (fibrous) (Presumed Friable)	

SMF - Kippax Health Centre			
ITEM NO.	**LOCATION**	**MATERIAL TYPE**	**PHOTOGRAPH**
SMF468	Ground floor Redundant Plant Room	soundproofing behind metal cladding	
SMF2027	Ground floor Ceiling Space	foil backed insulation to underside of roof	
SMF2028	Throughout	foil backed insulation to ducting	

14.4 APPENDIX D – Hazardous Material Management Information

ASBESTOS

Some 3000 products have been manufactured using asbestos, of which cement sheeting, pipe insulation, textiles, gaskets, vinyl floor tiles and fire door cores are the most commonly encountered. The mineral asbestos (i.e. Crocidolite, Chrysotile and Amosite and other forms) is classified by the National Occupational Health and Safety Commission as a Category 1 carcinogen. If respirable asbestos fibres are inhaled they may cause an inflammatory response, which in turn may lead to asbestosis (scarring of the lung), mesothelioma (cancer of the pleura or peritoneum) or lung cancer.

It is illegal under Commonwealth, State and Territory legislation to manufacture asbestos building materials or to reuse asbestos products.

Asbestos sheeting or ‘fibro’ is bonded into a stable matrix and as such does not present an exposure hazard unless it is cut, abraded, sanded or otherwise disturbed. This material is referred to as non friable ACM. Friable ACM has the potential to release fibre with only minor disturbance.

The health risks associated with asbestos exposure increase with the fibre type, level and frequency of exposure. Crocidolite (blue asbestos) is the most hazardous type. Amosite (brown asbestos) is not as hazardous as crocidolite but is significantly more hazardous than chrysotile (white asbestos). Exposure to all types of asbestos can result in diseases including asbestosis, lung cancer and mesothelioma. Smoking increases the risk of disease 50 fold. The often heard adage ‘ one fibre can kill you” is overly simplistic. Evidence indicates that risk increases with the level, type and frequency of exposure. Some individuals may be predisposed to disease at low and infrequent exposure, while others suffer no ill effect even after prolonged industrial exposure. We do not know what level can be considered safe nor what level may be considered hazardous. Asbestos may also be naturally present in the environment at very low levels. Therefore controls should be implemented to avoid exposure as far as practicable.

Asbestos is only hazardous if it becomes airborne and inhaled. When it is fully encapsulated within the structure it cannot become airborne. Simple engineering controls can ensure it remains encapsulated. These controls are detailed in the Required Actions and Recommendations detailed in this report.

Provided the site has been inspected by a licensed Asbestos Assessor and their recommendations adopted, normal occupation would not be hazardous. It is vital that any maintenance or renovation be in strict accordance with the Assessor’s recommendations.

Any person employed to undertaken any maintenance or refurbishment must be informed of the presence of friable and/or non friable asbestos in the premises. The PMCW must ensure that if planned work may impact on any asbestos materials, the asbestos is removed or remediated by the appropriate class of removalist prior to commencement.

LEAD PAINT

Introduction

Lead in paint (as lead carbonate) is found extensively in homes and commercial and industrial buildings built pre-1970. Although Australian industry has generally phased out lead content in paint, levels of below 1 percent are still permitted and industrial application of high-lead paint to residential/commercial dwellings may still continue.

Lead-based paint may be a health issue if it becomes mobile in the environment or if ingested. For this reason, sealing or safe removal of paint is strongly recommended particularly where it is flaking or exposed to the elements.

Assessment Criteria

Lead paint is defined by the Australian Standard (AS 4361.2 – 2017 Guide to hazardous paint management Part 2: Lead paint in residential, public and commercial buildings) as a paint or component coat of a paint system containing lead or lead compounds, in which the lead content (calculated as lead metal) is in excess of 0.1% by weight of the dry film as determined by laboratory testing.

Lead Paint Management and Recommendations

The following information uses Australian Standard (AS 4361.2 – 2017) as the primary reference. Lead paint and first schedule paints in residential and commercial premises may be managed in one of four ways:

- Leave undisturbed
- Stabilised (i.e. over painting or encapsulation)
- Abated (i.e. removed)
- A combination of the three management options may be required

Should removal be chosen, a high degree of skill, preparation and risk minimisation is required to avoid lead exposure, as dry sanding of lead levels as low as 0.1% can generate high lead dust. Therefore, the Wet Scraping and Wet Sanding methods are amongst the safest methods available.

Strict adherence to the guidelines described in AS 4361.2 – 2017 will best ensure minimisation of risk. During this process personal protective equipment and waste containment equipment is essential and children, pregnant women and persons not directly engaged in the process should not be present. General workers may undertake this process providing they adhere strictly to the guidelines, however, a specialist lead paint removal contractor is recommended for extensive paint removal works.

Where remediation is required it is important to minimise ongoing maintenance costs by ensuring that the works are undertaken by a professional who is able to give a significant time guarantee of the painted surfaces at the completion of the works. The following website lists contactors by postcodes that have been included based on their indicated skills and training in working safely with lead paint. http://www.lead.org.au/paintersall.html. These contractors should however be assessed by current performance prior to engagement.

Responsibilities of Owners and Contractors

According to AS 4361.2 – 2017 owners of residences or commercial buildings that may contain lead should:

- Manage the property in such a manner as to effectively control any health risk to occupants, contractors or others
- Ensure occupants are sufficiently informed about and protected from the hazards associated with lead paint
- If management work is to be undertaken, inform immediate neighbours about the nature of the work

Contractors should:

- Obtain appropriate accreditation to undertake the proposed level of remedial work involving lead paint and have the required level of specialized training
- Undertake the contracted work in such a way as to protect the health and safety of employees, tenants and the general public

SYNTHETIC MINERAL FIBRE

SMF refers to man-made mineral fibrous materials commonly used for their insulating and reinforcing properties. The amorphous (non-crystalline) materials include glass fibre, mineral wool and ceramic fibre products.

Discussion

Although glass fibre is classified as an irritant, levels of airborne fibreglass during routine occupation of the premises would be insignificant. During any large-scale installation or removal of fibreglass insulation, providing SMF fibre suppression measures as defined below are employed, exposure standards for SMF fibre would not normally be exceeded.

The following Risk Assessment is based on the requirements of Worksafe Australia, WorkSafe Australia, Sydney 1990, *Synthetic Mineral Fibres: National Standard and National Code of Practice.*

SMF Risk Assessment

According to Worksafe Australia 1990 (p 9) health risks associated with SMF are "significantly less potent … than white asbestos (Chrysotile) fibres" and that "...the possibility of lung cancer is eliminated at an exposure standard (time weighted average) of 0.5 respirable fibres per millilitre of air for all types of synthetic mineral fibres...." (p V).

To reduce the possibility of skin, eye and upper respiratory tract irritation a maximum exposure standard of 2 milligrams per cubic metre of inspirable dust is recommended. These two standards are designed principally for the manufacture and end user industries in which significant dust clouds would be generated.

The same document also states: "The overall conclusion based on available animal experiments and epidemiology is that provided work is carried out in accordance with (NOHSC 1990), and compliance is maintained with the exposure standards, then there is a negligible health risk associated with exposure to SMF under present-day manufacturing and usage patterns."

PCB

PCB is the common name for Polychlorinated Biphenyls. PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow then black resins, depending on chlorine content of the PCB.

Discussion

The major use of PCBs in the electrical industry has been as an insulating fluid inside transformers and capacitors. These transformers and capacitors have ranged in size from the very large transformers typically used by electrical supply companies, to the small capacitors used in commercial products. Capacitors containing PCBs were installed in various types of equipment including fluorescent light fittings during the 1950s, 60s and 70s.

Risk Assessment

Small quantities of PCBs are usually found in sealed containers known as capacitors. PCB-containing capacitors are unlikely to pose a health risk, unless they become damaged and leak.

PCBs can enter the body in three ways:
- absorption through the skin
- inhalation of PCB vapour
- ingestion by contamination of food or drink

The most commonly observed symptom in people exposed to high levels of PCBs is a condition known as chloracne. This is a severe, persistent acne-like rash due to repeated and prolonged contact of PCBs with skin. This condition has also occurred in people who have accidentally ingested PCBs.

Very high exposure to PCBs may also cause liver damage and damage to the nervous system.

There is the possibility that PCBs may cause cancers.

The likelihood of becoming sick from PCB exposure increases with the length of time and the amount of material that a person might come in contact with.

OZONE DEPLETING SUBSTANCES

Introduction

Ozone depleting substances (ODS) are compounds that contribute to stratospheric ozone depletion. They are widely used in refrigerators, air-conditioners, fire extinguishers, in dry cleaning, as solvents for cleaning, electronic equipment and as agricultural fumigants.

Ozone depleting substances (ODS) include:

- Bromochloromethane (BCM)
- Carbontetrachloride (CCl_4)
- Chlorofluorocarbons (CFCs)
- Halons
- Hydrobromofluorocarbons (HBFCs)
- Hydrochlorofluorocarbons (HCFCs)
- Methylbromide (CH_3Br)
- Methylchloroform (CH_3CCl_3)

ODS are generally very stable in the troposphere and only degrade under intense ultraviolet light in the stratosphere. When they break down they release chlorine or bromine atoms which then deplete the ozone.

Ozone Protection Strategy

The Australian Strategy for Ozone Protection calls for personnel who handle, install, service, commission and decommission and maintain commercial and industrial refrigeration and air-conditioning equipment to be accredited, licensed, registered to work with ozone depleting substances.

Best Management Practices

In Australia a ‘Code of Good Practice’ has been drawn up with the objective of assisting the reduction of emissions into the atmosphere of substances that deplete the ozone layer and contribute to global warming.

The Australian Refrigeration and Air-conditioning Code of Good Practice (HB 40.1 – 2001) recommends best practice for the maintenance, design, servicing, labelling and manufacture of refrigeration and air conditioning systems towards this objective.

Legislation

Under the Federal Government’s *Ozone Protection and Synthetic Gas Management Act 1989* and its *Ozone Protection and Synthetic Gas Legislation Amendment Bill 2003* it is illegal to vent an ODS (Scheduled Substances) to the atmosphere.

General Maintenance

- All refrigeration and air-conditioning plant should be regularly inspected for traces of leaking refrigerant and/or oil, and for signs of leak-indicating dye
- Whenever a system is charged with refrigerant and/or lubricant, the service person must clearly label the system with the refrigerant/lubrication type; name of service organization; and date of service. In addition, the ASHRAE/ARI refrigerant designated R number shall be clearly displayed
- A service person should be aware of the possibility that a refrigeration or air-conditioning system may have been incorrectly charged or incorrectly labelled. The type of refrigerant contained in the system must therefore be first established by checking the temperature/pressure relationship or by using other tests to verify that the labelling is correct

Advice to Equipment Users

- Users are advised that persons who service refrigeration and air-conditioning equipment are required by legislation to observe the Code of Good Practice and not to ‘top-up’ or ‘charge’ systems known to be leaking refrigerant, or to service equipment unless it can be returned into service in a leak-free condition
- If a user does not have trained staff to undertake service or maintenance work, then it is recommended that a routine maintenance agreement for their plant be undertaken with a reputable service organization
- All users should monitor the operation of their installation weekly and call the service person immediately if any abnormal condition is found
- When a refrigeration system contains in excess of 50 kg of refrigerant, that system should be leak tested on a quarterly basis

Leak Testing

- Various methods may be used for leak-testing, e.g. electronic leak detectors, halide lamp and or ultraviolet lamp
- Only a non-controlled refrigerant mixed with a pressurising substance such as dry nitrogen should be used to leak test refrigeration and air-conditioning systems
- Where an air-conditioning or refrigeration system is found to be leaking and needs to be repaired, the vapour and/or liquid must first be recovered from the leaking system
- Where pressurisation testing has determined that an air-conditioning or refrigeration system is not leaking, moisture and non-condensables must be evacuated from the system using dry nitrogen as the moisture absorber and either the deep or triple evacuation methods
- All refrigerants shall be recovered and either recycled, reclaimed or held for disposal in an approved manner
- It is highly recommended that a refrigerant charge monitor or leak detector be installed to alert equipment owners/operators of a refrigerant leak

Recovery, Recycling and Disposal of Refrigerants

- It is highly recommended, and in some cases mandatory, for recovery and/or recycling equipment to be used for the removal and recovery of refrigerant during service
- To avoid the danger of mixing different refrigerant types, the receiving containers shall be identified by the correct colour coding and labelling and shall only be used for the refrigerant type that is being transferred. The recovery containers shall conform to AS 4484-2004, '*Gas Cylinders for Industrial, Scientific and Refrigerant use – labelling and colour coding'*
- As chillers have large internal volume, it is important that all refrigerant vapour be recovered. A chiller at atmospheric pressure can still hold many kilograms of refrigerant vapour after the liquid has been removed
- When recovering refrigerant from a chiller the refrigerant should be recovered until the internal system pressure is reduced to 3 kPa absolute for low-pressure systems (e.g., R-11) and 70 kPa absolute for positive pressure systems (e.g., R-12 and R-22). The internal pressure should then be taken up to atmospheric pressure with dry nitrogen if the chiller is to be opened. This will prevent moisture–laden air entering the system, which could lead to contamination and corrosion

Disposal of Refrigerants

- Unusable or surplus fluorocarbon refrigerant shall not be discharged to the atmosphere, but shall be returned to a supplier
- Empty residual refrigerant in a disposable container shall be recovered and the container disposed of at a recycling centre
- The utmost care must be taken to avoid mixing different types of refrigerants, as separation may be impossible and large quantities of refrigerant may be rendered unusable

Handling and Storage

Losses of refrigerant to the atmosphere can occur during the handling and storage of refrigerant containers. Service persons have a duty of care to avoid such losses.

- There are numerous hazards associated with the storage of refrigerant. These include asphyxiation in confined space due to leakage from refrigerant containers; and fire, which may overheat and explode refrigerant containers or decompose refrigerant into toxic substances

Alternative Refrigerants and Lubricants

- With the introduction of HFC alternative refrigerants, alternative lubricants need to be considered to ensure system reliability. Some of these alternative lubricants tend to exhibit greater hygroscopicity than mineral oils, so care must be taken to ensure they are kept in sealed containers at all times
- Care must be taken to ensure that all components used in the refrigeration/air-conditioning system are compatible with the new refrigerant and lubricant

Recovery of Fluorocarbons Mixed with other Refrigerants

A number of different refrigerants and refrigeration mixtures have been used to replace or to ‘top up’ fluorocarbon based refrigerants in refrigeration and air-conditioning systems.

In many cases the equipment in question may not be labelled to indicate that hydrocarbon or hydrocarbon mixtures have been used and as the operating pressures of these replacement refrigerants are usually similar to those of the original refrigerant, their identification in the field is extremely difficult.

- It is not safe therefore to recover flammable refrigerant (hydrocarbon) using equipment designed only for non-flammable refrigerants such as R-12 and R-134a

- Should it be suspected that refrigeration or air-conditioning system contains an unidentified mixture or, if on asking the owner, examining the labels, and/or detecting instruments indicate that a hydrocarbon/fluorocarbon mixture or any other non-standard mixture of refrigerant may be present; the following procedure should be followed:
  - If a hydrocarbon or flammable mixture that contains hydrocarbon is suspected, use only equipment designed for the recovery of flammable gasses and recover the refrigerant into a specially marked container
  - In the case of refrigerant mixtures, it is not advisable to use recovery equipment as many mixtures have very high condensing pressures, which could result in equipment failure and/or injury to persons operating, or near the equipment
  - The safest method of recovery is to use an evacuated and preferably chilled container to depressurise the system
  - Label the container to show that it contains a mixture or the suspected composition, if known, and deliver it to a supplier for recycling
  - Purge the residual gas from the system with dry nitrogen before proceeding with any repairs

Health Effects

In addition to causing environmental degradation certain ozone depleting substances may present a risk to human health when they are improperly handled or released in to a poorly ventilated area.

Inhalation

The most significant exposure route for humans is through inhalation. Refrigerant gases displace oxygen in the air making breathing difficult.

Overexposure can cause central nervous system depression and oxygen deficiency. Effects of overexposure may include light-headedness, giddiness, shortness-of-breath, headaches, and in extreme cases, irregular heartbeats, cardiac arrest, asphyxiation and death.

Symptoms of overexposure at lower concentrations may include transient eye, nose and throat irritation.

Skin Contact

Contact with rapidly released refrigerant gas may cause frostbite. Symptoms of frostbite may include changes in skin colour to white or greyish yellow.

Other direct dermal contact may result in skin de-fatting, dryness, irritation or contact dermatitis.

Standard work clothes provide adequate protection of the skin but it is recommended that lined butyl gloves and goggles be used whenever handling liquid refrigerants.

Eye Contact

Eye contact with rapidly released refrigerant or air-conditioning gas may cause severe frostbite damage to eyes and eyelids. Eye irritation may occur if exposure occurs at lower concentrations.

FUEL STORAGE FACILITIES

In the ACT the management of fuel storage tanks is regulated by ACT WorkSafe who administers the *Dangerous Substances Act 2004* and the *Dangerous Substances (General) Regulation 2004.*

Heating oil and other petroleum products are classified as a Dangerous Substance under the ACT Dangerous Substances Act 2004.

The Dangerous Substances (General) Regulation 2004 – Division 2.4.2-233 *Decommissioning* (applies to a container used to store a dangerous substance) states the following:

'The container is thoroughly cleaned so that the container is in the condition it would be in if it had never contained the substance';

This would be difficult to achieve therefore it is advantageous to remove the tank.

In the ACT, Environment Protection and Heritage prefers underground fuel storage tanks be removed once they are no longer in use, unless there are extenuating circumstances i.e. their removal undermines permanent infrastructure. This is also emphasized in the Australian Standard *The Removal and Disposal of Underground Petroleum Storage Tanks* (AS 4976-2008).

Further, the ACT Environment Protection Authority (Environment Protection and Heritage) which administers the Environment Protection Act 1997 which contains contaminated land provisions responsible for the development of policy and guidelines to facilitate best practice when it comes to the management of contaminated land.

Environment Protection and Heritage deems all sites known to have had fuel storage facilities as potentially contaminated until investigated and assessed and shown to be free of contamination.

Based on this information and for the long-term management of the sites with fuel storage tanks, Robson Environmental Pty Ltd recommends that the USTs be removed in accordance with the requirements of ACT WorkSafe and Environment Protection and Heritage.

Removal of the UST does require approvals from relevant ACT Government agencies which include:

- ACT Planning and Land Authority (ACTPLA)
- ACT WorkSafe - Dangerous Goods Unit.

15 GLOSSARY

ACM	*See asbestos containing material*
Air monitoring	Air Monitoring means airborne asbestos fibre sampling to assist in assessing exposures and the effectiveness of control measures. Air monitoring includes exposure monitoring, control monitoring and clearance monitoring. *Note: Air monitoring should be undertaken in accordance with the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres [NOHSC:3003 (2005)]*
Airborne asbestos fibres	Any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only respirable asbestos fibres (those less than 3µm wide, more than 5µm long and with a length to width ratio of more than 3 to 1) are counted.
Amosite	Grey or brown asbestos
AR	*See Asbestos Register*
Asbestos Containing Material	Any material, object, product or debris that contains asbestos.
Asbestos Register	Inventory of ACM by type, form, location, risk and required action.
Asbestos Removalist	A competent person who performs asbestos removal work. *Note: an asbestos removal licence is required in all State and Territory jurisdictions.*
Asbestos Survey and Management Plan	Document covering the identification, risk evaluation, control and management of identified asbestos hazards, developed in accordance with current legislation.
Asbestos[2]	The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals, including actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite or any mixture containing one or more of the mineral silicates belonging to the serpentine and amphibole groups.
Asbestos–cement (AC)	Products consisting of sand aggregate and cement reinforced with asbestos fibres (e.g. asbestos cement pipes and flat or corrugated asbestos cement sheets).
ASCC	*See Safe Work Australia Council*
Non-friable asbestos	ACM that is bonded into a stable matrix and cannot be reduced to a dust by hand pressure.
Chrysotile	White asbestos
Clearance inspection	An inspection, carried out by a licensed Asbestos Assessor, to verify that an asbestos work area is safe to be returned to normal use after work involving the disturbance of ACM has taken place. A clearance inspection must include a visual inspection, and may also include clearance monitoring and/or settled dust sampling.

Clearance monitoring	Air monitoring using static or positional samples to measure the level of airborne asbestos fibres in an area following work on ACM. An area is 'cleared' when the level of airborne asbestos fibres is measured as being below 0.01 fibres/mL.
Control monitoring	Air monitoring, using static or positional sampling devices to measure the level of airborne asbestos fibres in an area during work on ACM. Control monitoring is designed to assist in assessing the effectiveness of control measures. Its results are not representative of actual occupational exposures, and should not be used for that purpose.
Crocidolite	Blue asbestos
Exposure monitoring	Air monitoring in the breathing zone to determine a person's likely exposure to a hazardous substance. Exposure monitoring is designed to reliably estimate the person's exposure, so that it may be compared with the National Exposure Standard.
HMSMP	*See hazardous material survey re-inspection and management plan*
In situ[2]	Fixed or installed in its original position, not having been removed.
Inaccessible areas	Areas which are difficult to access, such as wall cavities and the interiors of plant and equipment.
Licensed Asbestos Assessor	Person who is qualified to undertake the identification and assessment of asbestos and provide recommendations on its safe management.
Membrane	A flexible or semi-flexible material, which functions as the waterproofing component in a roofing or waterproofing assembly.
NATA	National Association of Testing Authorities
NOHSC *(now SWA)*	National Occupational Health and Safety Commission (*now known as Safe Work Australia)*
PMCW	Person with management or control of a workplace
Safe Work Australia Council (SWAC)	A council that provides a national forum for State and Territory governments, employers and employees to consult and participate in the development of policies relating to OHS and workers' compensation matters, and promote national consistency in the OHS and workers' compensation regulatory framework.
SWMS	Safe Work Method Statement

16 REFERENCES

- *How To Manage and Control Asbestos In The Workplace Code of Practice*
- *How To Safely Remove Asbestos Code of Practice*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulations 2011*
- *Australian Capital Territory Parliamentary Counsel (2006), Asbestos Legislation Amendment Act 2006 [A2006-16], Canberra, Australia*
- *ANZECC 1997, Identification of PCB-Containing Capacitors; An information Booklet for Electricians and Electrical Contractors*
- *Guide to Hazardous Paint Management Part 2: Lead paint in residential, public and commercial buildings Standards Australia, AS 4361.2 – 2017*
- *Standards Australia, HB 40.1 – 2001 The Australian Refrigeration and Air-conditioning Code of Good Practice*
- *WorkSafe Australia, Sydney 1990, Synthetic Mineral Fibres: National Standard and National Code of Practice*

Pre-Demolition Hazardous Materials Survey

Kippax Playing Fields Toilet & Services Block
Kippax Place
Holt
ACT 2615

December 2020

This report MUST NOT be used as a removal specification

Client: Environment, Planning and Sustainability
Development Directorate

Accredited for compliance with ISO/IEC 17020

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CERTIFICATE OF APPROVAL FOR ISSUE OF DOCUMENTS

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Kippax Place
Holt
ACT 2615

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Robson Environmental Pty Ltd	John Robson	2	21/12/2020

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1 PREFACE

This Pre-Demolition Hazardous Materials Survey (PDHMS) was commissioned by the Environment, Planning and Sustainability Directorate (EPSDD), in order to assure the occupants/users of the site the highest standards of occupational health and safety in relation to hazardous materials. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to the demolition of the premises.

The PDHMS contains sections covering the identification, evaluation and control of hazardous materials including asbestos containing materials (ACM), Polychlorinated Biphenyls (PCB), Synthetic Mineral Fibre (SMF) and Ozone Depleting Substances (ODS).

Robson Environmental Pty Ltd undertook the PDHMS on 7 and 8 December 2020. The information contained in this document will assist the PCBU (person conducting a business or undertaking) in fulfilling their obligations under the latest editions of the following regulations/Acts:

- *How to Manage and Control Asbestos in The Workplace Code of Practice*
- *How to Safely Remove Asbestos Code of Practice*
- *Dangerous Substances (General) Regulation 2004*
- *Dangerous Substances Act 2004*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulations 2011*
- *National Code of Practice for the Safe Use of Synthetic Mineral Fibre* [NOHSC:2006(1990)]
- *National Standard for Synthetic Mineral Fibres* [NOHSC:1004(1990)]
- *Guide to Hazardous Paint Management Part 2: Lead paint in residential, public and commercial buildings Standards Australia, AS 4361.2 – 2017*
- *Identification of PCB-Containing Capacitors; An information Booklet for Electricians and Electrical Contractors* ANZECC 1997 and
- *The Australian Refrigeration and Air-conditioning Code of Good Practice* Standards Australia, HB 40.1 – 2001

2 EXECUTIVE SUMMARY

2.1 Purpose

This report presents the findings of the Intrusive Hazardous Materials Survey conducted at the site on 7 and 8 December 2020 at the request of the client. The intrusive survey was undertaken to assess the extent and condition of hazardous materials and document safe pre-demolition procedures in accordance with current legislation. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to demolition of the premises. This report includes information which must be known and acted upon prior to the commencement of any demolition. It also details responsibilities that the PCBU (person conducting a business or undertaking) and occupier must address prior to demolition.

2.2 Scope

The Hazardous Materials Survey was non-destructive in nature because the toilet section of the property is still currently used. No inspection of subterranean areas was undertaken and as such formwork, stormwater and electrical conduit ACM products may be concealed.

2.3 Survey Methodology

John Robson conducted an inspection of the property on 7 and 8 December 2020. The inspection included the three toilets and the roller door storage area. Although the survey was non-destructive, access was gained to all interior areas. There were no ceiling spaces due to slated timbers lining the roof and chasing of hot water pipes was not required due to the fact that the basins were only supplied with cold water. (i.e., there is not a hot water system within the building).

Hazardous materials assessed included ACM, Lead, SMF, PCBs, and ODS.

The site inspection included the sampling of representative materials suspected of being hazardous, was undertaken in accordance with Robson's NATA ISO/IEC 17020 accreditation, ISO9001, ISO14001, AS4801 and current legislation. The particular sampling methodology used for each hazardous materials type is provided below:

Asbestos: The asbestos materials survey was conducted in accordance with the current legislation. It involved an intrusive inspection of accessible representative construction materials suspected of containing asbestos. Materials were not sampled from all areas due to the uniformity of the materials used throughout the building(s). Samples were analysed in Robson Environmental's National Association of Testing Authorities (NATA) accredited laboratory for the presence of asbestos by polarising light microscopy and dispersion staining.

Note: The exterior live switchboard was not inspected as the cabinet was locked, and accordingly is presumed to be ACM until conclusively proven otherwise.

Lead (Pb) Based Paints: Where required representative paint samples are collected in accordance with AS4361.2-2017 and analysed for lead content.

The sampling criterion is taken from AS4361.2-2017 Section A4 Sampling Strategy clauses (a, b, c).

Collected paint samples are analysed for their lead (Pb) content by a NATA accredited laboratory using ICP/AES.

Within the same building, wherever a paint coating had a similar surface texture, colour, etc. to a paint coating that had already been sampled because of its suspected lead content, it was presumed that these paint coatings were identical. However, results can only be guaranteed valid for directly tested/sampled paints (especially due to deliberate attempts to match new paint to existing coatings in some applications)

SMF: Synthetic Mineral Fibre (SMF) materials were visually identified, and a determination made as to whether they were bonded or un-bonded.

PCBs: The information (make, type, capacitance etc.) recorded for each representative fluorescent light fitting capacitor suspected of containing PCB was cross-referenced against *ANZECC Identification of PCB Containing Capacitors – Information Booklet for Electricians and Electrical Contractors - 1997*.

This identification booklet provides a list of electrical equipment that is known to contain PCBs, and a list of electrical equipment known not to contain PCBs. Where the information recorded from the capacitor case(s) correlated exactly with the information listed in the ANZECC Information Booklet for known PCB-containing capacitors it was determined that PCBs were present in the capacitor under analysis.

Wherever a capacitor could not be identified in either list, this was noted in the PCB register as being a capacitor suspected to contain PCBs.

Note that fluorescent light fittings were only inspected where they were isolated by a qualified electrician. Live fluorescent light fittings were not inspected, and accordingly no determination about whether or not they contain PCB is included in this report. One damaged light fitting in the roller door storage area was inspected as the metal cover plate was partly removed permitting access to internal capacitors if present.

Ozone Depleting Substances: Where present a visual examination was made of refrigerant gas labels affixed to representative air-conditioning and refrigeration units. Information concerning the ASHRAE/ARI refrigerant designated R number was noted for later cross-reference to relevant air-conditioning and refrigeration industry Codes of Practice and Guidelines. In addition, the condition of the plant is noted, and comment made as to possible refrigerant or lubricant leaks. Where refrigerant gas labels are absent from representative air-conditioning and refrigeration plant, an assessment is made as to the likelihood of the plant using an ozone depleting substance based on its age and condition

Sharps: As governments provide community sharps bins for disposal of single syringes in public toilets with a history of syringe litter, the toilets were assessed for the presence of yellow syringe containers.

These disposal facilities are also available for use by people who are required to self-inject regularly to treat a medical condition, particularly when they are away from home or travelling.

2.4 Key Findings

Asbestos

Table 1: ACM locations and required actions

ACM	Locations	Action to be taken
Sheet	Male toilet partitions	Remove prior to demolition
Sheet	Female toilet partitions	Remove prior to demolition
Sheet	Disabled toilet partition	Remove prior to demolition

Lead Paint

Lead Paint (>0.1%)		
Location	Paint Colour	Required action
No samples of paint were collected for testing. Although all painted surfaces were generally in a good condition it is recommended that samples are collected and analysed for lead content prior to demolition.		

SMF

Synthetic Mineral Fibre (SMF)		
Material	Location & Material	Required action
No SMF located		

PCBs

Polychlorinated Biphenyls (PCB)			
Make - Type	Location	Total	Required action
No PCBs located in the accessible fluorescent light fitting in the storage area. However, following isolation, the remaining sealed fluorescent lights must be assessed for PCBs.			

* Note that light fittings were only inspected where they were isolated by a qualified electrician.

One damaged light fitting in the roller door storage area was inspected as the metal cover plate was partly removed permitting access to internal capacitor if present. If metal capacitors are located, it is recommended that Robson Environmental are contacted to identify the unit and assessed for PCBs.

ODS

Ozone Depleting Substances (ODS)			
R Number	Location	Total	Required action
No split systems present and therefore no ozone depleting substances located			

Sharps (Syringes)

Yellow syringe containers were observed in the toilets. These items must be removed by appropriate hygiene personal for approved disposal, prior to asbestos removal and demolition.

2.5 Key Recommendations

Asbestos

- All cubicle and entry partitions in the toilets are compressed asbestos cement sheeting.

Lead

- It is recommended that samples are collected and analysed for lead content prior to demolition, however as the painted surfaces are generally in a good condition, (i.e. not flaking or powdery), the general dust control procedures implemented during demolition would be suitable to address any lead paint present.

SMF

- No SMF materials were identified in the building.
- ***Information only***. Refer to Appendix D for further general information on SMF.

PCBs

- No capacitors containing PCBs were located in the accessible fluorescent light fitting in the storage area. However, following isolation, the remaining sealed fluorescent lights must be assessed for PCBs as they are operational.
- Refer to Appendix D for further general information on PCB.

ODS

- No ODS were identified in the building.
- ***Information only***. Refer to Appendix D for further general information on ODS.

Demolition and Refurbishment

Robson Environmental Pty Ltd recommends that prior to any demolition our office be contacted. Our licensed Asbestos Assessors can attend the site to observe the demolition process, advise as necessary and in the event of previously inaccessible hazardous materials being located, assist with assessing the extent, type and removal or abatement of materials as required.

Robson Environmental Pty Ltd provides a range of occupational hygiene services in relation to the safe remediation or abatement of hazardous materials as well as contaminated land advice in relation to hydrocarbon contamination.

3 INTRODUCTION

The following destructive Pre-Demolition Hazardous Materials Survey (PDHMS) has been designed to address the safe control of hazardous materials. It covers current requirements for hazardous material management as of 8 December 2020 only. The safe removal of hazardous materials must be undertaken by appropriately licensed and skilled personnel prior to any demolition of the premises.

This PDHMS includes the following:

- a register of all identified hazardous materials
- extent, form, condition, and risks associated with nominated hazardous materials; and
- safe work and removal methods

3.1 Exclusions and Limitations

This report should only be used or reproduced in full and for the purpose indicated above. It is not an asbestos management plan or a building inspection report, and it should not be used as such.

The statements and methods within this report are accurate as of 9 December 2020. Robson Environmental is not responsible for updating this report to reflect changes in legislation or policy, and it is the responsibility of the client and/or any person or organisation to whom the client issues this report to ensure that they at all times comply with all relevant legislation and policy. Care should also be taken to ensure that the property and/or the materials contained within have not changed in condition or extent since the inspection.

Whilst intrusive in nature, there are some areas the inspection did not cover. Soil samples were not taken, nor was an inspection of the soil included. No excavation works were undertaken, and there may therefore be ACM or asbestos contaminated items concealed underground, such as asbestos cement formwork and conduit pipes. Where taking a sample or assessing an area was unsafe, illegal, or would in the judgement of the assessor have compromised the structural integrity of the building or otherwise endangered the safety of others or the environment, this activity was not undertaken. Accordingly, ACM or asbestos contaminated items may be concealed in some areas which are not included in this report.

This report is based on the information obtained by Robson Environmental Pty Ltd at the time of inspection. Robson Environmental Pty Ltd will not update this report; nor take into account any event(s) occurring after the time that its assessment was conducted.

Robson Environmental Pty Ltd has taken all care to ensure that this report includes the most accurate information available, where it uses test results prepared by other persons it relies on the accuracy of the test results in preparing this report. In providing this report Robson Environmental Pty Ltd does not warrant the accuracy of such third-party test results.

4 ASBESTOS SURVEY RESULTS

4.1 Survey Details

The survey of the site included all accessible areas of the building(s) except where stated otherwise. For further asbestos management information, refer to Appendix D.

4.2 Survey Methodology

The survey involved a destructive inspection of the premises. Samples were analysed in Robson Environmental's National Association of Testing Authorities (NATA) laboratory using polarising light microscopy (PLM) and dispersion staining. Samples were a representative selection of materials suspected of containing asbestos. Samples were not taken from all areas due to the uniformity of the materials used throughout the building. Laboratory analysis certificates are presented in Appendix A.

4.3 Sample Analysis

Table 2: Mineralogical Analysis of Samples for Asbestos using PLM

Sample reference	Sample location	Sample type	Composition Asbestos type
L2932	Male toilet wall partition adjacent entry	Sheet	Chrysotile Asbestos
L2933	Male toilet cubicle partition	Sheet	Chrysotile Asbestos
L2934	Exterior expansion joint between wall and concrete footpath	Bituminous product	No Asbestos Detected

NATA accredited laboratory:

Robson Environmental Pty Ltd
Accreditation number: 3181

It should be noted that the above samples were a representative selection of materials suspected of containing asbestos.

Types of ACM

Non-friable ACM	Non-friable ACM is any material that contains asbestos bound into a stable matrix. It may consist of cement or various resins/binders and cannot be reduced to a dust by hand pressure. As such it does not present an exposure hazard unless cut, abraded, sanded, or otherwise disturbed. Therefore, the exposure risk from non-friable ACM is negligible during normal building occupation. *Note: If non-friable ACM is damaged or otherwise deteriorated, the risk assessment may be reviewed to reflect a higher potential for exposure to asbestos fibres. A licensed Asbestos Assessor should perform the risk assessment.*
Friable ACM	Friable ACM can be crumbled or reduced to a dust by hand pressure when dry and can represent a significant exposure hazard. Examples of friable asbestos are hot water pipe lagging, severely damaged asbestos cement sheet, limpet spray to structural beams and electrical duct heater millboard.

ACM CONDITION RATING

1	**Severe**	Deteriorated surface in extremely poor condition
2	**Poor**	Deteriorated material
3	**Normal**	Stable asbestos with little damage
4	**Good**	Well sealed stable surfaces in accessible locations

ACM RISK RATING

A	**Very High**	Exposure to airborne asbestos as a consequence of extremely minor disturbance
B	**High**	Exposure to airborne asbestos likely as a consequence of significant disturbance
C	**Medium**	Exposure to airborne asbestos unlikely during normal building use
D	**Low**	No exposure to airborne asbestos during normal building use

4.4 Asbestos Register

The Asbestos Register details the type, location, risk assessment and action required for all identified ACM. The Register should be accessed to inform all decisions made concerning control of ACM. Action taken to control ACM must be recorded in this Register in order to comply with current legislation.

Table 3: Asbestos Register

Asbestos Containing Material (ACM)							
Sample No.	**Material Description & Location**	**Condition Rating**	**Risk Rating**	**Approx. Quantity**	**Recommended Management Action**	**Action Undertaken**	**Assessor/ Date assessed**
L2932	Male toilet wall partition sheeting adjacent entry	Low	Low	1	Remove prior to demolition		
L2933	Male toilet cubicle partition sheeting	Low	Low	1	Remove prior to demolition		
RA - L2932	Female toilet partition	Low	Low	3 large 3 small	Remove prior to demolition		
RA - L2932	Disabled toilet partition sheeting	Low	Low	1	Remove prior to demolition		

RA: Referred Asbestos – material consistent with analysed sheeting

Table 4: Register of sampled materials which have been confirmed as non ACM

Non Asbestos Containing Material (ACM)		
Sample number	**Type**	**Locations**
L2934	Exterior expansion joint between wall and concrete footpath	Bituminous product

5 LEAD PAINT SURVEY RESULTS

5.1 Introduction

Lead paint is defined by the Australian Standard (AS 4361.2 – 2017 Guide to hazardous paint management Part 2: Lead paint in residential, public, and commercial buildings) as a paint or component coat of a paint system containing lead or lead compounds, in which the lead content (calculated as lead metal) is in excess of 0.1% by weight of the dry film as determined by laboratory testing.

Where required representative paint samples are collected in accordance with AS4361.2-2017 and analysed for lead content.

The sampling criterion provided below is taken from AS4361.2-2017 Section A4 Sampling Strategy clauses (a, b, c).

a) An adequate number of sample sites should be analysed to properly characterise the paint systems present on site.

b) For small surfaces such as architraves, windows and doors and cupboards, a **single** sample may suffice.

c) For large, uniformly painted surface areas such as the exterior facade of high-rise buildings, or for interior walls and ceilings of large rooms, and where laboratory testing is employed, **composite** samples should be taken from three separate locations in 10m² sections

Collected paint samples are analysed for their lead (Pb) content by a NATA accredited laboratory using ICP/AES. Please refer to Appendix A for details of any such laboratories and the in-house techniques used in their testing.

Within the same building, wherever a paint coating had a similar surface texture, colour, etc. to a paint coating that had already been sampled because of its suspected lead content, it was presumed that these paint coatings were identical. However, results can only be guaranteed valid for directly tested/sampled paints (especially due to deliberate attempts to match new paint to existing coatings in some applications)

Table 4: Lead Composition in Paint by Inductively-Coupled Plasma Spectroscopy

Lead Paint (>0.1%)		
Location	**Paint Colour**	**Required action**
No paint samples were collected and analysed for lead content. Refer to the discussion and recommendations.		

5.2 Discussion and Recommendation

Although all painted surfaces were generally in a good condition it is recommended that samples are collected and analysed for lead content prior to demolition, however as the painted surfaces are generally in a good condition, (i.e. not flaking or powdery), the general dust control procedures implemented during demolition would be suitable to address any lead paint present.

6 Synthetic Mineral Fibre (SMF) Survey Results

6.1 Introduction

SMF is a generic term used to collectively describe a number of amorphous (non-crystalline) fibrous materials including glass fibre, mineral wool (Rockwool and Slagwool) and ceramic fibre. Generally referred to as SMF, these materials are also known as ‘Man-Made Mineral Fibres’ (MMMF).

SMF products are used extensively in commercial and residential buildings for thermal and acoustic insulation, and as a reinforcing agent in cement, plaster, and plastic materials. In some specialised instances, SMF materials have also been used as alternatives to asbestos, especially where high temperature insulation properties are required.

There are two basic forms of SMF insulation **bonded** and **unbonded.**

The **bonded form** is where adhesives, binding agents, facing/cladding, cement, or other sealants have been applied to the SMF before delivery and the SMF product has a specific shape (e.g., a binding or sealing agents hold the SMF in a batt or blanket form). Some bonded SMF materials may also be clad in various coverings on one or more sides (e.g., a silver foil backing).

The **unbonded form** has no adhesives, binding agents, facing/cladding or sealants applied, and the SMF is a loose material (e.g., wet spray and loose fill).

6.2 Results

Table 5: Visual Assessment of Samples

Synthetic Mineral Fibre (SMF)			
Item No	**Location**	**Sample Type**	**Form**
No SMF material found			

6.3 Conclusion

No SMF materials were identified in the building.

<u>Information only</u>. Refer to Appendix D for further general information on SMF.

7 POLYCHLORINATED BIPHENYLS (PCB) SURVEY RESULTS

7.1 Introduction

PCB is the common name for polychlorinated biphenyls. PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow then black resins, depending on the chlorine content of the PCB.

PCBs are chemically stable synthetic compounds that do not degrade appreciably over time or with exposure to high temperatures. The major use of PCBs was as an insulating fluid inside transformers and capacitors. Capacitors containing PCBs were installed in various types of equipment including domestic appliances, motors, and fluorescent light fittings during the 1950s, 60s and 70s.

These applications generally do not present an immediate risk to human health or the environment as the equipment is sealed and contains relatively small amounts of PCB. The equipment can continue to be used safely provided that the capacitors do not leak.

The Australian and New Zealand Environment and Conservation Council (ANZECC) in its *PCB Management Plan* of *2003* stipulate cessation dates for the generation of PCB scheduled waste, the use of articles containing PCB scheduled waste, and the disposal of PCB scheduled waste*.

> * PCB scheduled waste means any PCB material that has no further use that contains PCBs at levels at, or in excess of 50mg/kg and is of a quantity of 50g or more.

Small equipment items and capacitors found in households and commercial buildings that contain scheduled PCBs (i.e. at or in excess of 50mg/kg) are to be disposed of as scheduled PCB waste. Where the aggregate weight of the items or capacitors exceeds 10kg, they must be notified to the relevant Commonwealth, State or Territory Government agency prior to their disposal.

7.2 Results

Table 6: PCB and non PCB Containing Capacitors Identified on fluorescent light fittings

Polychlorinated Biphenyls (PCB)			
Item No.	**Location**	**Make - Type**	**Capacitance (µF)**
No PCBs were located in the accessible fluorescent light fitting in the storage area. However, following isolation, the remaining sealed fluorescent lights must be assessed for PCBs			

* Note that light fittings were only inspected where they were isolated by a qualified electrician.

One damaged light fitting in the roller door storage area was inspected as the metal cover plate was partly removed permitting access to internal capacitor if present. No capacitor was located within the damaged light fitting.

7.3 Conclusion

Following isolation, the remaining sealed fluorescent lights must be assessed for PCBs as they are operational. If metal capacitors are located, it is recommended that a suitably qualified electrician or Robson Environmental be contacted to identify the unit and assessed for PCBs.

Refer to Appendix D for further general information on PCBs.

8 OZONE DEPLETING SUBSTANCES SURVEY RESULTS

8.1 Introduction

The site was surveyed for the presence of air conditioning and refrigeration units that contain ozone depleting substances.

ODS are used for heat transfer in refrigeration and air conditioning systems, absorbing, or releasing heat according to vapour pressure. Release of these substances to the atmosphere has the ability to cause long term atmospheric pollution that can lead to ozone depletion, global warming, petrochemical smog, and acid rain.

The ozone depletion potential (ODP) of a fluorocarbon refrigerant gas, its global warming potential (GWP) and estimated atmospheric life (EAL) all contribute to its potential to deplete the stratospheric ozone layer and enhance the greenhouse effect leading to global warming.

Chlorofluorocarbons (CFCs) contain chlorine and possess a large ODP, high GWP and long EAL. They are generally found in refrigeration and air-conditioning systems e.g. centrifugal chillers.

Hydrochlorofluorocarbons (HCFCs) are less saturated with chlorine than are CFCs and the hydrogen within these compounds give the HCFCs a much shorter EAL and lower ODP. They are generally found in refrigeration systems that are used for food display, cold stores and self-contained, split, multi-split and central plant chillers used for building air-conditioning.

Hydrofluorocarbons (HFCs) are a class of replacement gases for CFCs. They do not contain chlorine or bromine and therefore do not deplete the ozone layer. While all HFCs have an ODP of zero, some do have a high GWP (e.g., R-404A, R-407B, R-125 etc).

Halons are synthetic chemical compounds that contain one or two carbon atoms, bromine, and other halogens. They have a long atmospheric lifetime and cause very aggressive ozone depletion when breaking down in the stratosphere. Halons were introduced into Australia as fire-extinguishing agents in the early 1970s and quickly replaced many previously accepted fire-fighting products because of their superior fire-extinguishing characteristics and ease of use.

Halon 1211 was commonly used in portable fire extinguishers, while fixed fire protection systems, such as those that protect computer rooms and ship engine rooms, commonly contained Halon 1301.

Halon 1301 has an ODP that is 10 times greater that of CFCs, while Halon 1211 has an ODP 3 times greater than that of CFCs.

8.2 Results

Table 7: Chemical properties of ODS located during survey

Ozone Depleting Substances (ODS)			
R Number	**Location**	**Total**	**Required action**
No split systems present and therefore no ozone depleting substances located			

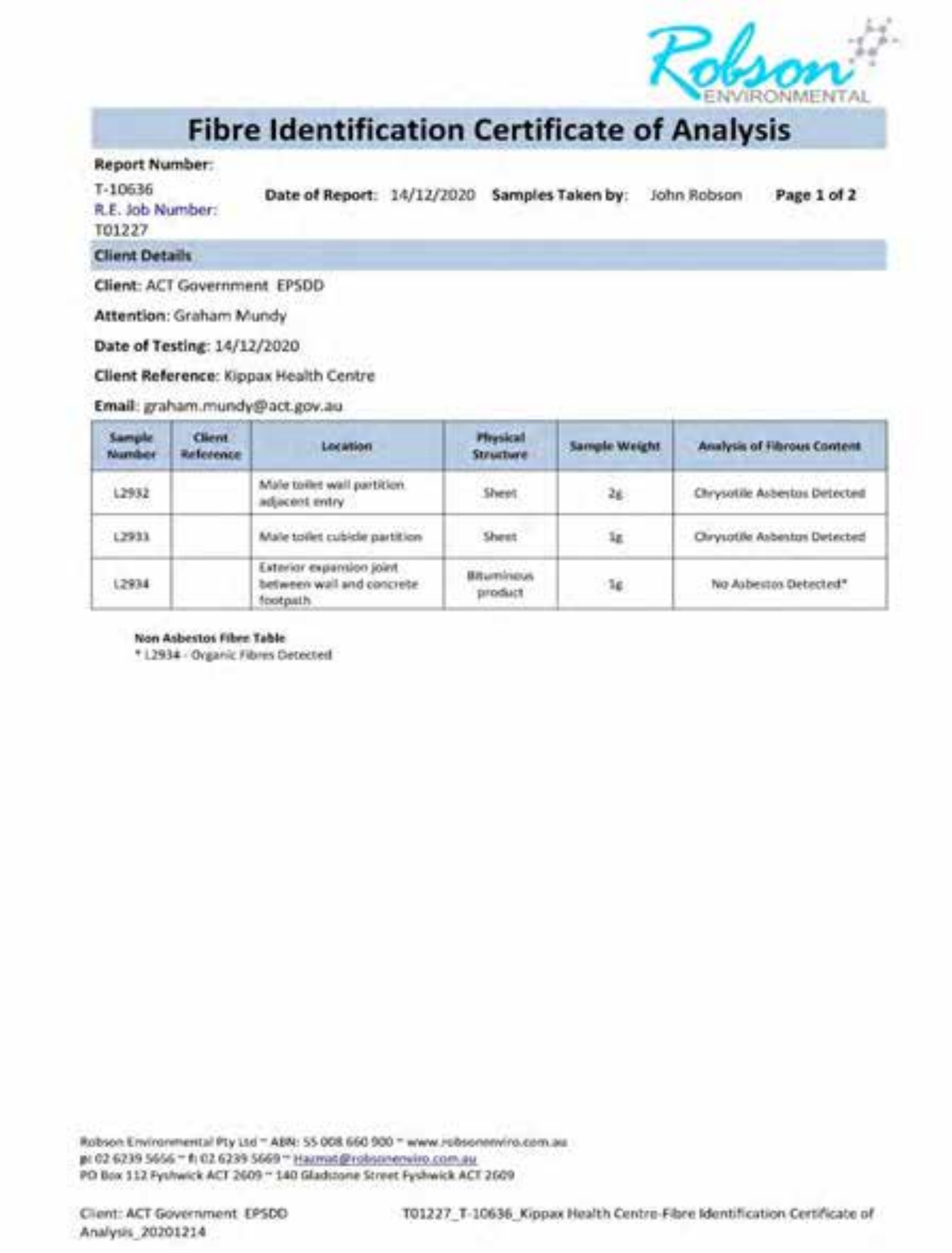
8.3 Conclusion

No ODS were identified in the building.

Information only. Refer to Appendix D for further general information on ODS

9 APPENDICES

9.1 APPENDIX A – Laboratory Reports



Fibre Identification Certificate of Analysis

Report Number:
T-10636
R.E. Job Number:
T01227

Date of Report: 14/12/2020 **Samples Taken by:** John Robson **Page 1 of 2**

Client Details

Client: ACT Government EPSDD

Attention: Graham Mundy

Date of Testing: 14/12/2020

Client Reference: Kippax Health Centre

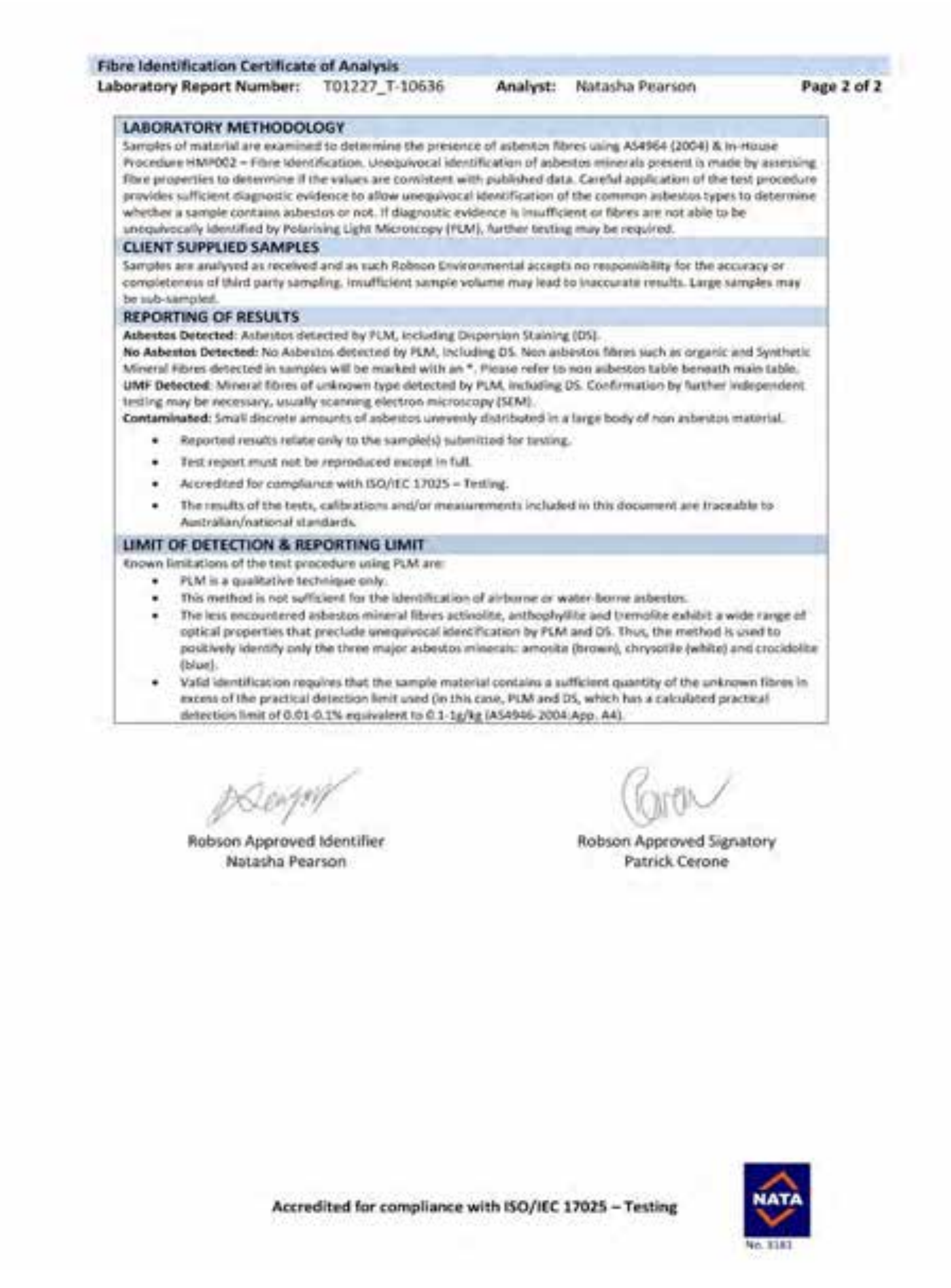
Email: graham.mundy@act.gov.au

Sample Number	Client Reference	Location	Physical Structure	Sample Weight	Analysis of Fibrous Content
L2932		Male toilet wall partition adjacent entry	Sheet	2g	Chrysotile Asbestos Detected
L2933		Male toilet cubicle partition	Sheet	1g	Chrysotile Asbestos Detected
L2934		Exterior expansion joint between wall and concrete footpath	Bituminous product	1g	No Asbestos Detected*

Non Asbestos Fibre Table
* L2934 - Organic Fibres Detected

Robson Environmental Pty Ltd ~ ABN: 55 008 660 900 ~ www.robsonenviro.com.au
p: 02 6239 5656 ~ f: 02 6239 5669 ~ Hazmat@robsonenviro.com.au
PO Box 112 Fyshwick ACT 2609 ~ 140 Gladstone Street Fyshwick ACT 2609

Client: ACT Government EPSDD T01227_T-10636_Kippax Health Centre-Fibre Identification Certificate of Analysis_20201214



Fibre Identification Certificate of Analysis

Laboratory Report Number: T01227_T-10636 **Analyst:** Natasha Pearson **Page 2 of 2**

LABORATORY METHODOLOGY

Samples of material are examined to determine the presence of asbestos fibres using AS4964 (2004) & In-House Procedure HMP002 – Fibre Identification. Unequivocal identification of asbestos minerals present is made by assessing fibre properties to determine if the values are consistent with published data. Careful application of the test procedure provides sufficient diagnostic evidence to allow unequivocal identification of the common asbestos types to determine whether a sample contains asbestos or not. If diagnostic evidence is insufficient or fibres are not able to be unequivocally identified by Polarising Light Microscopy (PLM), further testing may be required.

CLIENT SUPPLIED SAMPLES

Samples are analysed as received and as such Robson Environmental accepts no responsibility for the accuracy or completeness of third party sampling. Insufficient sample volume may lead to inaccurate results. Large samples may be sub-sampled.

REPORTING OF RESULTS

Asbestos Detected: Asbestos detected by PLM, including Dispersion Staining (DS).

No Asbestos Detected: No Asbestos detected by PLM, including DS. Non asbestos fibres such as organic and Synthetic Mineral Fibres detected in samples will be marked with an *. Please refer to non asbestos table beneath main table.

UMF Detected: Mineral fibres of unknown type detected by PLM, including DS. Confirmation by further independent testing may be necessary, usually scanning electron microscopy (SEM).

Contaminated: Small discrete amounts of asbestos unevenly distributed in a large body of non asbestos material.

- Reported results relate only to the sample(s) submitted for testing.
- Test report must not be reproduced except in full.
- Accredited for compliance with ISO/IEC 17025 – Testing.
- The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

LIMIT OF DETECTION & REPORTING LIMIT

Known limitations of the test procedure using PLM are:

- PLM is a qualitative technique only.
- This method is not sufficient for the identification of airborne or water-borne asbestos.
- The less encountered asbestos mineral fibres actinolite, anthophyllite and tremolite exhibit a wide range of optical properties that preclude unequivocal idencification by PLM and DS. Thus, the method is used to positively identify only the three major asbestos minerals: amosite (brown), chrysotile (white) and crocidolite (blue).
- Valid identification requires that the sample material contains a sufficient quantity of the unknown fibres in excess of the practical detection limit used (in this case, PLM and DS, which has a calculated practical detection limit of 0.01-0.1% equivalent to 0.1-1g/kg (AS4946-2004 App. A4).

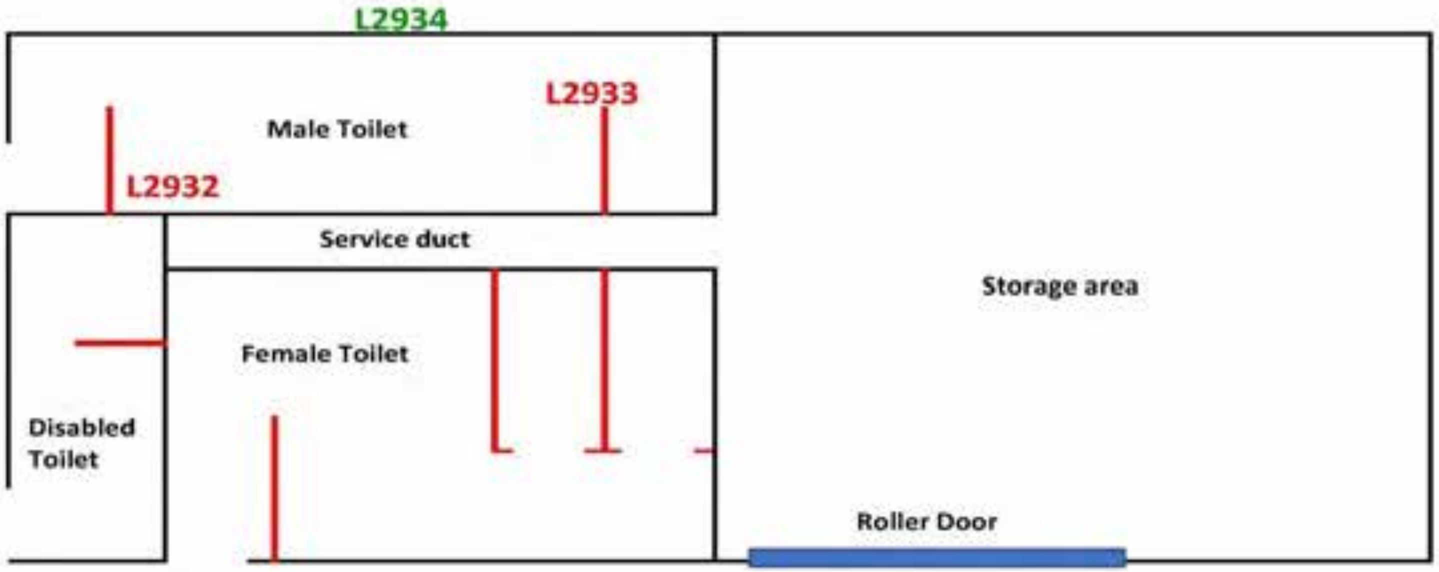
Robson Approved Identifier
Natasha Pearson

Robson Approved Signatory
Patrick Cerone

Accredited for compliance with ISO/IEC 17025 – Testing

NATA
No. 3181

9.2 APPENDIX B – Plans



Kippax Playing Fields Toilet Block - Kippax Place Holt
Surveyed 7 and 8 December 2020

Red Samples: Asbestos partition sheeting
Green Sample: Non-Asbestos bituminous pavement/wall expansion joint

9.3 APPENDIX C – HAZMAT Item locations & representative photographs

SAMPLE NO	LOCATION	MATERIAL DESCRIPTION	PHOTOGRAPH
L2932	Male toilet wall partition sheeting adjacent entry	Sheet	
L2932	Male toilet wall partition sheeting adjacent entry	Sheet	
L2933	Male toilet cubicle partition sheeting	Sheet	

SAMPLE NO	LOCATION	MATERIAL DESCRIPTION	PHOTOGRAPH
L2933	Male toilet cubicle partition sheeting	Sheet	
RA - L2932	Female toilet partition (cubicles)	Sheet	
RA - L2932	Female toilet partition (entry)	Sheet	

SAMPLE NO	LOCATION	MATERIAL DESCRIPTION	PHOTOGRAPH
RA - L2932	Female toilet cubicle	Sheet and sharps container (yellow)	
RA - L2932	Disabled toilet partition sheeting	Sheet	
RA - L2932	Disabled toilet cubicle	Sheet and sharps container (yellow)	

9.4 APPENDIX D – HAZMAT Management Information

ASBESTOS

Some 3000 products have been manufactured using asbestos, of which cement sheeting, pipe insulation, textiles, gaskets, vinyl floor tiles and fire door cores are the most commonly encountered. The mineral asbestos (i.e. Crocidolite, Chrysotile and Amosite and other forms) is classified by the National Occupational Health and Safety Commission as a Category 1 carcinogen. If respirable asbestos fibres are inhaled, they may cause an inflammatory response, which in turn may lead to asbestosis (scarring of the lung), mesothelioma (cancer of the pleura or peritoneum) or lung cancer.

It is illegal under Commonwealth, State and Territory legislation to manufacture asbestos building materials or to reuse asbestos products.

Asbestos sheeting or ‘fibro’ is bonded into a stable matrix and as such does not present an exposure hazard unless it is cut, abraded, sanded, or otherwise disturbed. This material is referred to as non friable ACM. Friable ACM has the potential to release fibre with only minor disturbance.

The health risks associated with asbestos exposure increase with the fibre type, level and frequency of exposure. Crocidolite (blue asbestos) is the most hazardous type. Amosite (brown asbestos) is not as hazardous as crocidolite but is significantly more hazardous than chrysotile (white asbestos). Exposure to all types of asbestos can result in diseases including asbestosis, lung cancer and mesothelioma. Smoking increases the risk of disease 50 fold. The often heard adage ‘ one fibre can kill you” is overly simplistic. Evidence indicates that risk increases with the level, type and frequency of exposure. Some individuals may be predisposed to disease at low and infrequent exposure, while others suffer no ill effect even after prolonged industrial exposure. We do not know what level can be considered safe nor what level may be considered hazardous. Asbestos may also be naturally present in the environment at very low levels. Therefore controls should be implemented to avoid exposure as far as practicable.

Asbestos is only hazardous if it becomes airborne and inhaled. When it is fully encapsulated within the structure it cannot become airborne. Simple engineering controls can ensure it remains encapsulated. These controls are detailed in the Required Actions and Recommendations detailed in this report.

Provided the site has been inspected by a licensed Asbestos Assessor and their recommendations adopted, normal occupation would not be hazardous. It is vital that any maintenance or renovation be in strict accordance with the Assessor’s recommendations.

Any person employed to undertake any maintenance or refurbishment must be informed of the presence of friable and/or non friable asbestos in the premises. The PMCW must ensure that if planned work may impact on any asbestos materials, the asbestos is removed or remediated by the appropriate class of removalist prior to commencement.

LEAD PAINT

Introduction

Lead in paint (as lead carbonate) is found extensively in homes and commercial and industrial buildings built pre-1970. Although Australian industry has generally phased out lead content in paint, levels of below 1 percent are still permitted and industrial application of high-lead paint to residential/commercial dwellings may still continue.

Lead-based paint may be a health issue if it becomes mobile in the environment or if ingested. For this reason, sealing or safe removal of paint is strongly recommended particularly where it is flaking or exposed to the elements.

Assessment Criteria

Lead paint is defined by the Australian Standard (AS 4361.2 – 2017 Guide to hazardous paint management Part 2: Lead paint in residential, public, and commercial buildings) as a paint or component coat of a paint system containing lead or lead compounds, in which the lead content (calculated as lead metal) is in excess of 0.1% by weight of the dry film as determined by laboratory testing.

Lead Paint Management and Recommendations

The following information uses Australian Standard (AS 4361.2 – 2017) as the primary reference. Lead paint and first schedule paints in residential and commercial premises may be managed in one of four ways:

- Leave undisturbed
- Stabilised (i.e. over painting or encapsulation)
- Abated (i.e. removed)
- A combination of the three management options may be required

Should removal be chosen, a high degree of skill, preparation and risk minimisation is required to avoid lead exposure, as dry sanding of lead levels as low as 0.1% can generate high lead dust. Therefore, the Wet Scraping and Wet Sanding methods are amongst the safest methods available.

Strict adherence to the guidelines described in AS 4361.2 – 2017 will best ensure minimisation of risk. During this process personal protective equipment and waste containment equipment is essential and children, pregnant women and persons not directly engaged in the process should not be present. General workers may undertake this process providing they adhere strictly to the guidelines; however, a specialist lead paint removal contractor is recommended for extensive paint removal works.

Where remediation is required it is important to minimise ongoing maintenance costs by ensuring that the works are undertaken by a professional who is able to give a significant time guarantee of the painted surfaces at the completion of the works. The following website lists contactors by postcodes that have been included based on their indicated skills and training in working safely with lead paint. http://www.lead.org.au/paintersall.html. These contractors should however be assessed by current performance prior to engagement.

Responsibilities of Owners and Contractors

According to AS 4361.2 – 2017 owners of residences or commercial buildings that may contain lead should:

- Manage the property in such a manner as to effectively control any health risk to occupants, contractors, or others
- Ensure occupants are sufficiently informed about and protected from the hazards associated with lead paint
- If management work is to be undertaken, inform immediate neighbours about the nature of the work

Contractors should:

- Obtain appropriate accreditation to undertake the proposed level of remedial work involving lead paint and have the required level of specialized training
- Undertake the contracted work in such a way as to protect the health and safety of employees, tenants, and the general public

SYNTHETIC MINERAL FIBRE

SMF refers to man-made mineral fibrous materials commonly used for their insulating and reinforcing properties. The amorphous (non-crystalline) materials include glass fibre, mineral wool, and ceramic fibre products.

Discussion

Although glass fibre is classified as an irritant, levels of airborne fibreglass during routine occupation of the premises would be insignificant. During any large-scale installation or removal of fibreglass insulation, providing SMF fibre suppression measures as defined below are employed, exposure standards for SMF fibre would not normally be exceeded.

The following Risk Assessment is based on the requirements of Worksafe Australia, WorkSafe Australia, Sydney 1990, *Synthetic Mineral Fibres: National Standard and National Code of Practice.*

SMF Risk Assessment

According to Worksafe Australia 1990 (p 9) health risks associated with SMF are "significantly less potent … than white asbestos (Chrysotile) fibres" and that "...the possibility of lung cancer is eliminated at an exposure standard (time weighted average) of 0.5 respirable fibres per millilitre of air for all types of synthetic mineral fibres...." (p V).

To reduce the possibility of skin, eye and upper respiratory tract irritation a maximum exposure standard of 2 milligrams per cubic metre of inspirable dust is recommended. These two standards are designed principally for the manufacture and end user industries in which significant dust clouds would be generated.

The same document also states: "The overall conclusion based on available animal experiments and epidemiology is that provided work is carried out in accordance with (NOHSC 1990), and compliance is maintained with the exposure standards, then there is a negligible health risk associated with exposure to SMF under present-day manufacturing and usage patterns."

PCB

PCB is the common name for Polychlorinated Biphenyls. PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow then black resins, depending on chlorine content of the PCB.

Discussion

The major use of PCBs in the electrical industry has been as an insulating fluid inside transformers and capacitors. These transformers and capacitors have ranged in size from the very large transformers typically used by electrical supply companies, to the small capacitors used in commercial products. Capacitors containing PCBs were installed in various types of equipment including fluorescent light fittings during the 1950s, 60s and 70s.

Risk Assessment

Small quantities of PCBs are usually found in sealed containers known as capacitors. PCB-containing capacitors are unlikely to pose a health risk unless they become damaged and leak.

PCBs can enter the body in three ways:
- absorption through the skin
- inhalation of PCB vapour
- ingestion by contamination of food or drink

The most commonly observed symptom in people exposed to high levels of PCBs is a condition known as chloracne. This is a severe, persistent acne-like rash due to repeated and prolonged contact of PCBs with skin. This condition has also occurred in people who have accidentally ingested PCBs.

Very high exposure to PCBs may also cause liver damage and damage to the nervous system.

There is the possibility that PCBs may cause cancers.

The likelihood of becoming sick from PCB exposure increases with the length of time and the amount of material that a person might come in contact with.

OZONE DEPLETING SUBSTANCES

Introduction

Ozone depleting substances (ODS) are compounds that contribute to stratospheric ozone depletion. They are widely used in refrigerators, air-conditioners, fire extinguishers, in dry cleaning, as solvents for cleaning, electronic equipment and as agricultural fumigants.

Ozone depleting substances (ODS) include:

- Bromochloromethane (BCM)
- Carbontetrachloride (CCl_4)
- Chlorofluorocarbons (CFCs)
- Halons
- Hydrobromofluorocarbons (HBFCs)
- Hydrochlorofluorocarbons (HCFCs)
- Methylbromide (CH_3Br)
- Methylchloroform (CH_3CCl_3)

ODS are generally very stable in the troposphere and only degrade under intense ultraviolet light in the stratosphere. When they break down, they release chlorine or bromine atoms which then deplete the ozone.

Ozone Protection Strategy

The Australian Strategy for Ozone Protection calls for personnel who handle, install, service, commission and decommission and maintain commercial and industrial refrigeration and air-conditioning equipment to be accredited, licensed, registered to work with ozone depleting substances.

Best Management Practices

In Australia, a ‘Code of Good Practice’ has been drawn up with the objective of assisting the reduction of emissions into the atmosphere of substances that deplete the ozone layer and contribute to global warming.

The Australian Refrigeration and Air-conditioning Code of Good Practice (HB 40.1 – 2001) recommends best practice for the maintenance, design, servicing, labelling and manufacture of refrigeration and air conditioning systems towards this objective.

Legislation

Under the Federal Government’s *Ozone Protection and Synthetic Gas Management Act 1989* and its *Ozone Protection and Synthetic Gas Legislation Amendment Bill 2003* it is illegal to vent an ODS (Scheduled Substances) to the atmosphere.

General Maintenance

- All refrigeration and air-conditioning plant should be regularly inspected for traces of leaking refrigerant and/or oil, and for signs of leak-indicating dye
- Whenever a system is charged with refrigerant and/or lubricant, the service person must clearly label the system with the refrigerant/lubrication type; name of service organization; and date of service. In addition, the ASHRAE/ARI refrigerant designated R number shall be clearly displayed
- A service person should be aware of the possibility that a refrigeration or air-conditioning system may have been incorrectly charged or incorrectly labelled. The type of refrigerant contained in the system must therefore be first established by checking the temperature/pressure relationship or by using other tests to verify that the labelling is correct

Advice to Equipment Users

- Users are advised that persons who service refrigeration and air-conditioning equipment are required by legislation to observe the Code of Good Practice and not to ‘top-up’ or ‘charge’ systems known to be leaking refrigerant, or to service equipment unless it can be returned into service in a leak-free condition
- If a user does not have trained staff to undertake service or maintenance work, then it is recommended that a routine maintenance agreement for their plant be undertaken with a reputable service organization
- All users should monitor the operation of their installation weekly and call the service person immediately if any abnormal condition is found
- When a refrigeration system contains in excess of 50 kg of refrigerant, that system should be leak tested on a quarterly basis

Leak Testing

- Various methods may be used for leak-testing, e.g. electronic leak detectors, halide lamp and or ultraviolet lamp
- Only a non-controlled refrigerant mixed with a pressurising substance such as dry nitrogen should be used to leak test refrigeration and air-conditioning systems
- Where an air-conditioning or refrigeration system is found to be leaking and needs to be repaired, the vapour and/or liquid must first be recovered from the leaking system
- Where pressurisation testing has determined that an air-conditioning or refrigeration system is not leaking, moisture and non-condensables must be evacuated from the system using dry nitrogen as the moisture absorber and either the deep or triple evacuation methods
- All refrigerants shall be recovered and either recycled, reclaimed, or held for disposal in an approved manner
- It is highly recommended that a refrigerant charge monitor or leak detector be installed to alert equipment owners/operators of a refrigerant leak

Recovery, Recycling and Disposal of Refrigerants

- It is highly recommended, and in some cases mandatory, for recovery and/or recycling equipment to be used for the removal and recovery of refrigerant during service
- To avoid the danger of mixing different refrigerant types, the receiving containers shall be identified by the correct colour coding and labelling and shall only be used for the refrigerant type that is being transferred. The recovery containers shall conform to AS 4484-2004, '*Gas Cylinders for Industrial, Scientific and Refrigerant use – labelling and colour coding'*
- As chillers have large internal volume, it is important that all refrigerant vapour be recovered. A chiller at atmospheric pressure can still hold many kilograms of refrigerant vapour after the liquid has been removed
- When recovering refrigerant from a chiller the refrigerant should be recovered until the internal system pressure is reduced to 3 kPa absolute for low-pressure systems (e.g., R-11) and 70 kPa absolute for positive pressure systems (e.g., R-12 and R-22). The internal pressure should then be taken up to atmospheric pressure with dry nitrogen if the chiller is to be opened. This will prevent moisture–laden air entering the system, which could lead to contamination and corrosion

Disposal of Refrigerants

- Unusable or surplus fluorocarbon refrigerant shall not be discharged to the atmosphere, but shall be returned to a supplier
- Empty residual refrigerant in a disposable container shall be recovered and the container disposed of at a recycling centre
- The utmost care must be taken to avoid mixing different types of refrigerants, as separation may be impossible and large quantities of refrigerant may be rendered unusable

Handling and Storage

Losses of refrigerant to the atmosphere can occur during the handling and storage of refrigerant containers. Service persons have a duty of care to avoid such losses.

- There are numerous hazards associated with the storage of refrigerant. These include asphyxiation in confined space due to leakage from refrigerant containers; and fire, which may overheat and explode refrigerant containers or decompose refrigerant into toxic substances

Alternative Refrigerants and Lubricants

- With the introduction of HFC alternative refrigerants, alternative lubricants need to be considered to ensure system reliability. Some of these alternative lubricants tend to exhibit greater hygroscopicity than mineral oils, so care must be taken to ensure they are kept in sealed containers at all times
- Care must be taken to ensure that all components used in the refrigeration/air-conditioning system are compatible with the new refrigerant and lubricant

Recovery of Fluorocarbons Mixed with other Refrigerants

A number of different refrigerants and refrigeration mixtures have been used to replace or to 'top up' fluorocarbon-based refrigerants in refrigeration and air-conditioning systems.

In many cases the equipment in question may not be labelled to indicate that hydrocarbon or hydrocarbon mixtures have been used and as the operating pressures of these replacement refrigerants are usually similar to those of the original refrigerant, their identification in the field is extremely difficult.

- It is not safe therefore to recover flammable refrigerant (hydrocarbon) using equipment designed only for non-flammable refrigerants such as R-12 and R-134a

- Should it be suspected that refrigeration or air-conditioning system contains an unidentified mixture or, if on asking the owner, examining the labels, and/or detecting instruments indicate that a hydrocarbon/fluorocarbon mixture or any other non-standard mixture of refrigerant may be present; the following procedure should be followed:
  - If a hydrocarbon or flammable mixture that contains hydrocarbon is suspected, use only equipment designed for the recovery of flammable gasses and recover the refrigerant into a specially marked container
  - In the case of refrigerant mixtures, it is not advisable to use recovery equipment as many mixtures have very high condensing pressures, which could result in equipment failure and/or injury to persons operating, or near the equipment
  - The safest method of recovery is to use an evacuated and preferably chilled container to depressurise the system
  - Label the container to show that it contains a mixture or the suspected composition, if known, and deliver it to a supplier for recycling
  - Purge the residual gas from the system with dry nitrogen before proceeding with any repairs

Health Effects

In addition to causing environmental degradation certain ozone depleting substances may present a risk to human health when they are improperly handled or released in to a poorly ventilated area.

Inhalation

The most significant exposure route for humans is through inhalation. Refrigerant gases displace oxygen in the air making breathing difficult.

Overexposure can cause central nervous system depression and oxygen deficiency. Effects of overexposure may include light-headedness, giddiness, shortness-of-breath, headaches, and in extreme cases, irregular heartbeats, cardiac arrest, asphyxiation, and death.

Symptoms of overexposure at lower concentrations may include transient eye, nose, and throat irritation.

Skin Contact

Contact with rapidly released refrigerant gas may cause frostbite. Symptoms of frostbite may include changes in skin colour to white or greyish yellow.

Other direct dermal contact may result in skin de-fatting, dryness, irritation or contact dermatitis.

Standard work clothes provide adequate protection of the skin, but it is recommended that lined butyl gloves and goggles be used whenever handling liquid refrigerants.

Eye Contact

Eye contact with rapidly released refrigerant or air-conditioning gas may cause severe frostbite damage to eyes and eyelids. Eye irritation may occur if exposure occurs at lower concentrations.

10 GLOSSARY

ACM	*See asbestos containing material*
Air monitoring	Air Monitoring means airborne asbestos fibre sampling to assist in assessing exposures and the effectiveness of control measures. Air monitoring includes exposure monitoring, control monitoring and clearance monitoring. *Note: Air monitoring should be undertaken in accordance with the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres [NOHSC:3003 (2005)]*
Airborne asbestos fibres	Any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only respirable asbestos fibres (those less than 3μm wide, more than 5μm long and with a length to width ratio of more than 3 to 1) are counted.
Amosite	Grey or brown asbestos
AR	*See Asbestos Register*
Asbestos Containing Material	Any material, object, product, or debris that contains asbestos.
Asbestos Register	Inventory of ACM by type, form, location, risk and required action.
Asbestos Removalist	A competent person who performs asbestos removal work. *Note: an asbestos removal licence is required in all State and Territory jurisdictions.*
Asbestos Survey and Management Plan	Document covering the identification, risk evaluation, control, and management of identified asbestos hazards, developed in accordance with current legislation.
Asbestos[2]	The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals, including actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite or any mixture containing one or more of the mineral silicates belonging to the serpentine and amphibole groups.
Asbestos–cement (AC)	Products consisting of sand aggregate and cement reinforced with asbestos fibres (e.g. asbestos cement pipes and flat or corrugated asbestos cement sheets).
ASCC	*See Safe Work Australia Council*
Non-friable asbestos	ACM that is bonded into a stable matrix and cannot be reduced to a dust by hand pressure.
Chrysotile	White asbestos
Clearance inspection	An inspection carried out by a licensed Asbestos Assessor, to verify that an asbestos work area is safe to be returned to normal use after work involving the disturbance of ACM has taken place. A clearance inspection must include a visual inspection and may also include clearance monitoring and/or settled dust sampling.
Clearance monitoring	Air monitoring using static or positional samples to measure the level of airborne asbestos fibres in an area following work on ACM. An

	area is ‘cleared’ when the level of airborne asbestos fibres is measured as being below 0.01 fibres/mL.
Control monitoring	Air monitoring, using static or positional sampling devices to measure the level of airborne asbestos fibres in an area during work on ACM. Control monitoring is designed to assist in assessing the effectiveness of control measures. Its results are not representative of actual occupational exposures and should not be used for that purpose.
Crocidolite	Blue asbestos
Exposure monitoring	Air monitoring in the breathing zone to determine a person’s likely exposure to a hazardous substance. Exposure monitoring is designed to reliably estimate the person’s exposure, so that it may be compared with the National Exposure Standard.
HMSMP	*See hazardous material survey re-inspection and management plan*
In situ[2]	Fixed or installed in its original position, not having been removed.
Inaccessible areas	Areas which are difficult to access, such as wall cavities and the interiors of plant and equipment.
Licensed Asbestos Assessor	Person who is qualified to undertake the identification and assessment of asbestos and provide recommendations on its safe management.
Membrane	A flexible or semi-flexible material, which functions as the waterproofing component in a roofing or waterproofing assembly.
NATA	National Association of Testing Authorities
NOHSC *(now SWA)*	National Occupational Health and Safety Commission (*now known as Safe Work Australia)*
PCBU	Person conducting a business or undertaking
Safe Work Australia Council (SWAC)	A council that provides a national forum for State and Territory governments, employers, and employees to consult and participate in the development of policies relating to OHS and workers' compensation matters and promote national consistency in the OHS and workers' compensation regulatory framework.
SWMS	Safe Work Method Statement

11 REFERENCES

- *How to Manage and Control Asbestos in The Workplace Code of Practice*
- *How to Safely Remove Asbestos Code of Practice*
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulations 2011*
- *Australian Capital Territory Parliamentary Counsel (2006), Asbestos Legislation Amendment Act 2006 [A2006-16], Canberra, Australia*
- *ANZECC 1997, Identification of PCB-Containing Capacitors; An information Booklet for Electricians and Electrical Contractors*
- *National Standard for Synthetic Mineral Fibres* [NOHSC:1004(1990)]
- *Guide to Hazardous Paint Management Part 2: Lead paint in residential, public, and commercial buildings Standards Australia, AS 4361.2 – 2017*
- *Standards Australia, HB 40.1 – 2001 The Australian Refrigeration and Air-conditioning Code of Good Practice*
- *WorkSafe Australia, Sydney 1990, Synthetic Mineral Fibres: National Standard and National Code of Practice*