

Appendix B

SIDRA modelling results



MOVEMENT SUMMARY

 Site: I01 [Mowbray / Hampden (Site Folder: Existing - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Existing signalised intersection

Site Category: Existing Design

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 143 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]		[Total HV]					[Veh. veh	Dist]				
			veh/h	%	veh/h	%	v/c	sec			m				km/h
South: Hampden Road															
1	L2	All MCs	219	1.9	219	1.9	* 0.566	53.7	LOS D	12.0	85.5	0.95	0.91	0.95	14.6
Approach			219	1.9	219	1.9	0.566	53.7	LOS D	12.0	85.5	0.95	0.91	0.95	14.6
East: Mowbray Road															
4	L2	All MCs	84	0.0	84	0.0	0.408	20.9	LOS B	16.6	119.3	0.58	0.56	0.58	28.1
5	T1	All MCs	825	4.1	825	4.1	* 0.408	16.3	LOS B	16.6	120.6	0.58	0.53	0.58	26.6
Approach			909	3.7	909	3.7	0.408	16.8	LOS B	16.6	120.6	0.58	0.54	0.58	26.8
North: Chatswood Dive Site															
7	L2	All MCs	1	0.0	1	0.0	0.010	5.4	LOS A	0.1	0.7	0.84	0.60	0.84	12.6
9	R2	All MCs	1	0.0	1	0.0	* 0.010	84.5	LOS F	0.1	0.7	0.84	0.60	0.84	11.6
Approach			2	0.0	2	0.0	0.010	44.9	LOS D	0.1	0.7	0.84	0.60	0.84	12.1
West: Mowbray Road															
11	T1	All MCs	867	4.7	867	4.7	0.303	4.9	LOS A	8.6	62.7	0.32	0.28	0.32	39.7
12	R2	All MCs	391	1.3	391	1.3	* 0.604	11.2	LOS A	10.5	74.4	0.58	0.75	0.58	31.9
Approach			1258	3.7	1258	3.7	0.604	6.8	LOS A	10.5	74.4	0.40	0.43	0.40	36.6
All Vehicles			2388	3.5	2388	3.5	0.604	15.0	LOS B	16.6	120.6	0.52	0.51	0.52	28.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Hampden Road												
P1	Full	6	6	44.5	LOS E	0.0	0.0	0.92	0.92	198.3	200.0	1.01
East: Mowbray Road												
P2	Full	20	21	65.7	LOS F	0.1	0.1	0.96	0.96	219.5	200.0	0.91
North: Chatswood Dive Site												
P3	Full	10	11	65.7	LOS F	0.0	0.0	0.96	0.96	219.5	200.0	0.91
All Pedestrians		36	38	62.1	LOS F	0.1	0.1	0.95	0.95	216.0	200.0	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.

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Project: C:\Users\AUSM510678\WSP O365\209600 - Chatswood to St Leonards Cycleway - via Artarmon Connection - 4_WIP\2. Traffic Assessments\SIDRA\C2L - Rev B.sip9

MOVEMENT SUMMARY

 Site: I01 [Mowbray / Hampden (Site Folder: Existing - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Existing signalised intersection

Site Category: Existing Design

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 136 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]		[Total HV]					[Veh. veh	Dist] m				km/h
			veh/h	%	veh/h	%	v/c	sec							
South: Hampden Road															
1	L2	All MCs	191	0.6	191	0.6	* 0.371	39.4	LOS C	9.0	63.6	0.86	0.80	0.86	17.9
Approach			191	0.6	191	0.6	0.371	39.4	LOS C	9.0	63.6	0.86	0.80	0.86	17.9
East: Mowbray Road															
4	L2	All MCs	12	0.0	12	0.0	* 0.484	26.4	LOS B	20.3	143.0	0.68	0.61	0.68	25.3
5	T1	All MCs	973	1.4	973	1.4	0.484	21.4	LOS B	20.3	143.2	0.68	0.61	0.68	23.5
Approach			984	1.4	984	1.4	0.484	21.4	LOS B	20.3	143.2	0.68	0.61	0.68	23.5
North: Chatswood Dive Site															
7	L2	All MCs	1	0.0	1	0.0	0.041	5.1	LOS A	0.5	2.3	0.93	0.65	0.93	11.1
9	R2	All MCs	8	0.0	8	0.0	* 0.041	56.5	LOS E	0.5	2.3	0.93	0.65	0.93	9.9
Approach			9	0.0	9	0.0	0.041	50.8	LOS D	0.5	2.3	0.93	0.65	0.93	10.0
West: Mowbray Road															
11	T1	All MCs	859	1.0	859	1.0	0.295	4.8	LOS A	8.2	57.8	0.32	0.28	0.32	39.9
12	R2	All MCs	305	0.7	305	0.7	* 0.440	11.6	LOS A	7.4	51.6	0.55	0.72	0.55	31.4
Approach			1164	0.9	1164	0.9	0.440	6.6	LOS A	8.2	57.8	0.38	0.40	0.38	36.9
All Vehicles			2348	1.1	2348	1.1	0.484	15.6	LOS B	20.3	143.2	0.55	0.52	0.55	27.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Hampden Road												
P1	Full	12	13	41.9	LOS E	0.0	0.0	0.91	0.91	195.7	200.0	1.02
East: Mowbray Road												
P2	Full	26	27	62.2	LOS F	0.1	0.1	0.96	0.96	216.0	200.0	0.93
North: Chatswood Dive Site												
P3	Full	16	17	62.2	LOS F	0.1	0.1	0.96	0.96	216.0	200.0	0.93
All Pedestrians		54	57	57.7	LOS E	0.1	0.1	0.95	0.95	211.5	200.0	0.95

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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MOVEMENT SUMMARY

 Site: I01 [Mowbray / Hampden (Site Folder: Design - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Concept design

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 143 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	[Total HV]	[Total HV]	[Total HV]				[Veh. veh	Dist] m				km/h
			veh/h	%	veh/h	%	v/c	sec							
South: Hampden Road															
1	L2	All MCs	219	1.9	219	1.9	* 0.595	54.8	LOS D	12.1	85.9	0.96	0.93	0.96	14.4
Approach			219	1.9	219	1.9	0.595	54.8	LOS D	12.1	85.9	0.96	0.93	0.96	14.4
East: Mowbray Road															
4	L2	All MCs	84	0.0	84	0.0	0.408	20.9	LOS B	16.6	119.3	0.58	0.56	0.58	28.0
5	T1	All MCs	825	4.1	825	4.1	* 0.408	16.3	LOS B	16.6	120.6	0.58	0.53	0.58	26.6
Approach			909	3.7	909	3.7	0.408	16.8	LOS B	16.6	120.6	0.58	0.54	0.58	26.7
North: Chatswood Dive Site															
7	L2	All MCs	1	0.0	1	0.0	0.010	5.4	LOS A	0.1	0.7	0.84	0.60	0.84	12.6
9	R2	All MCs	1	0.0	1	0.0	* 0.010	84.5	LOS F	0.1	0.7	0.84	0.60	0.84	11.6
Approach			2	0.0	2	0.0	0.010	44.9	LOS D	0.1	0.7	0.84	0.60	0.84	12.1
West: Mowbray Road															
11	T1	All MCs	867	4.7	867	4.7	0.303	4.9	LOS A	8.6	62.7	0.32	0.28	0.32	39.7
12	R2	All MCs	391	1.3	391	1.3	* 0.604	11.2	LOS A	10.5	74.4	0.58	0.75	0.58	31.7
Approach			1258	3.7	1258	3.7	0.604	6.8	LOS A	10.5	74.4	0.40	0.43	0.40	36.5
All Vehicles			2388	3.5	2388	3.5	0.604	15.0	LOS B	16.6	120.6	0.52	0.51	0.52	28.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Hampden Road												
P1	Full	6	6	44.5	LOS E	0.0	0.0	0.92	0.92	198.3	200.0	1.01
East: Mowbray Road												
P2	Full	20	21	65.7	LOS F	0.1	0.1	0.96	0.96	219.5	200.0	0.91
North: Chatswood Dive Site												
P3	Full	10	11	65.7	LOS F	0.0	0.0	0.96	0.96	219.5	200.0	0.91
All Pedestrians		36	38	62.1	LOS F	0.1	0.1	0.95	0.95	216.0	200.0	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.

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MOVEMENT SUMMARY

 Site: I01 [Mowbray / Hampden (Site Folder: Design - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Concept design

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 136 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Queue [Veh. veh	Back Of Queue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Hampden Road															
1	L2	All MCs	191	0.6	191	0.6	*0.390	40.3	LOS C	9.1	63.8	0.87	0.81	0.87	17.6
Approach			191	0.6	191	0.6	0.390	40.3	LOS C	9.1	63.8	0.87	0.81	0.87	17.6
East: Mowbray Road															
4	L2	All MCs	12	0.0	12	0.0	*0.484	26.4	LOS B	20.3	143.0	0.68	0.61	0.68	25.2
5	T1	All MCs	973	1.4	973	1.4	0.484	21.4	LOS B	20.3	143.2	0.68	0.61	0.68	23.4
Approach			984	1.4	984	1.4	0.484	21.4	LOS B	20.3	143.2	0.68	0.61	0.68	23.4
North: Chatswood Dive Site															
7	L2	All MCs	1	0.0	1	0.0	0.041	5.1	LOS A	0.5	2.3	0.93	0.65	0.93	11.1
9	R2	All MCs	8	0.0	8	0.0	*0.041	56.5	LOS E	0.5	2.3	0.93	0.65	0.93	9.9
Approach			9	0.0	9	0.0	0.041	50.8	LOS D	0.5	2.3	0.93	0.65	0.93	10.0
West: Mowbray Road															
11	T1	All MCs	859	1.0	859	1.0	0.295	4.8	LOS A	8.2	57.8	0.32	0.28	0.32	39.9
12	R2	All MCs	305	0.7	305	0.7	*0.440	11.6	LOS A	7.4	51.6	0.55	0.73	0.55	31.3
Approach			1164	0.9	1164	0.9	0.440	6.6	LOS A	8.2	57.8	0.38	0.40	0.38	36.8
All Vehicles			2348	1.1	2348	1.1	0.484	15.7	LOS B	20.3	143.2	0.55	0.52	0.55	27.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Hampden Road												
P1	Full	12	13	41.9	LOS E	0.0	0.0	0.91	0.91	195.7	200.0	1.02
East: Mowbray Road												
P2	Full	26	27	62.2	LOS F	0.1	0.1	0.96	0.96	216.0	200.0	0.93
North: Chatswood Dive Site												
P3	Full	16	17	62.2	LOS F	0.1	0.1	0.96	0.96	216.0	200.0	0.93
All Pedestrians		54	57	57.7	LOS E	0.1	0.1	0.95	0.95	211.5	200.0	0.95

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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MOVEMENT SUMMARY

 **Site: I02 [Brand / Hampden (Site Folder: Existing - AM Peak)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Existing unsignalised intersection
Site Category: Existing Design
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				
			veh/h	%	veh/h	%	v/c	sec							km/h
South: Hampden Road															
1	L2	All MCs	142	2.2	142	2.2	0.165	4.5	LOS A	0.9	6.8	0.28	0.50	0.28	39.2
3	R2	All MCs	485	2.2	485	2.2	0.363	5.8	LOS A	2.8	19.6	0.29	0.54	0.29	31.0
3u	U	All MCs	13	0.0	13	0.0	0.363	7.0	LOS A	2.8	19.6	0.29	0.54	0.29	31.5
Approach			640	2.1	640	2.1	0.363	5.5	LOS A	2.8	19.6	0.29	0.53	0.29	33.3
East: Brand Street															
4	L2	All MCs	364	0.9	364	0.9	0.490	6.0	LOS A	3.7	26.1	0.72	0.63	0.72	31.4
5	T1	All MCs	55	5.8	55	5.8	0.490	5.7	LOS A	3.7	26.1	0.72	0.63	0.72	38.9
6u	U	All MCs	2	0.0	2	0.0	0.490	9.6	LOS A	3.7	26.1	0.72	0.63	0.72	30.6
Approach			421	1.5	421	1.5	0.490	5.9	LOS A	3.7	26.1	0.72	0.63	0.72	32.7
West: Hampden Road															
11	T1	All MCs	97	3.3	97	3.3	0.538	9.6	LOS A	4.4	30.9	0.78	0.79	0.90	35.5
12	R2	All MCs	322	0.3	322	0.3	0.538	12.4	LOS A	4.4	30.9	0.78	0.79	0.90	35.2
12u	U	All MCs	6	16.7	6	16.7	0.538	14.7	LOS B	4.4	30.9	0.78	0.79	0.90	39.2
Approach			425	1.2	425	1.2	0.538	11.8	LOS A	4.4	30.9	0.78	0.79	0.90	35.3
All Vehicles			1486	1.7	1486	1.7	0.538	7.4	LOS A	4.4	30.9	0.55	0.63	0.59	33.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

 **Site: I02 [Brand / Hampden (Site Folder: Existing - PM Peak)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Existing unsignalised intersection
Site Category: Existing Design
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				
			veh/h		veh/h		v/c	sec							km/h
South: Hampden Road															
1	L2	All MCs	133	0.0	133	0.0	0.180	5.1	LOS A	1.0	6.9	0.37	0.53	0.37	38.7
3	R2	All MCs	652	0.2	652	0.2	0.509	6.1	LOS A	4.5	31.4	0.43	0.54	0.43	30.6
3u	U	All MCs	22	0.0	22	0.0	0.509	7.4	LOS A	4.5	31.4	0.43	0.54	0.43	31.1
Approach			806	0.1	806	0.1	0.509	6.0	LOS A	4.5	31.4	0.42	0.54	0.42	32.3
East: Brand Street															
4	L2	All MCs	388	0.8	388	0.8	0.489	5.0	LOS A	3.8	27.0	0.63	0.55	0.63	32.1
5	T1	All MCs	94	0.0	94	0.0	0.489	4.5	LOS A	3.8	27.0	0.63	0.55	0.63	39.7
6u	U	All MCs	1	0.0	1	0.0	0.489	8.6	LOS A	3.8	27.0	0.63	0.55	0.63	31.2
Approach			483	0.7	483	0.7	0.489	4.9	LOS A	3.8	27.0	0.63	0.55	0.63	33.9
West: Hampden Road															
11	T1	All MCs	103	0.0	103	0.0	0.487	10.9	LOS A	3.8	26.3	0.84	0.84	0.97	34.6
12	R2	All MCs	208	2.5	208	2.5	0.487	13.9	LOS A	3.8	26.3	0.84	0.84	0.97	34.3
12u	U	All MCs	7	0.0	7	0.0	0.487	15.2	LOS B	3.8	26.3	0.84	0.84	0.97	38.6
Approach			319	1.7	319	1.7	0.487	13.0	LOS A	3.8	26.3	0.84	0.84	0.97	34.5
All Vehicles			1608	0.6	1608	0.6	0.509	7.1	LOS A	4.5	31.4	0.57	0.60	0.59	33.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

 Site: I02 [Brand / Hampden (Site Folder: Design - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Concept design
Site Category: Proposed Design 1
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				
South: Hampden Road															
1	L2	All MCs	142	2.2	142	2.2	0.166	3.3	LOS A	0.9	6.8	0.28	0.43	0.28	36.5
3	R2	All MCs	485	2.2	485	2.2	0.364	4.1	LOS A	2.8	19.6	0.29	0.47	0.29	28.2
3u	U	All MCs	13	0.0	13	0.0	0.364	5.0	LOS A	2.8	19.6	0.29	0.47	0.29	28.8
Approach			640	2.1	640	2.1	0.364	3.9	LOS A	2.8	19.6	0.29	0.46	0.29	30.4
East: Brand Street															
4	L2	All MCs	364	0.9	364	0.9	0.490	6.0	LOS A	3.7	26.1	0.72	0.63	0.72	28.2
5	T1	All MCs	55	5.8	55	5.8	0.490	5.7	LOS A	3.7	26.1	0.72	0.63	0.72	38.9
6u	U	All MCs	2	0.0	2	0.0	0.490	9.6	LOS A	3.7	26.1	0.72	0.63	0.72	30.6
Approach			421	1.5	421	1.5	0.490	5.9	LOS A	3.7	26.1	0.72	0.63	0.72	29.9
West: Hampden Road															
11	T1	All MCs	97	3.3	97	3.3	0.538	9.6	LOS A	4.4	30.9	0.78	0.79	0.90	35.5
12	R2	All MCs	322	0.3	322	0.3	0.538	12.4	LOS A	4.4	30.9	0.78	0.79	0.90	32.9
12u	U	All MCs	6	16.7	6	16.7	0.538	14.7	LOS B	4.4	30.9	0.78	0.79	0.90	39.2
Approach			425	1.2	425	1.2	0.538	11.8	LOS A	4.4	30.9	0.78	0.79	0.90	33.6
All Vehicles			1486	1.7	1486	1.7	0.538	6.7	LOS A	4.4	30.9	0.55	0.60	0.59	31.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

 Site: I02 [Brand / Hampden (Site Folder: Design - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Concept design
Site Category: Proposed Design 1
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Hampden Road															
1	L2	All MCs	133	0.0	133	0.0	0.180	3.9	LOS A	1.0	6.9	0.37	0.47	0.37	36.0
3	R2	All MCs	652	0.2	652	0.2	0.509	4.4	LOS A	4.5	31.4	0.43	0.49	0.43	27.9
3u	U	All MCs	22	0.0	22	0.0	0.509	5.4	LOS A	4.5	31.4	0.43	0.49	0.43	28.4
Approach			806	0.1	806	0.1	0.509	4.4	LOS A	4.5	31.4	0.42	0.49	0.42	29.5
East: Brand Street															
4	L2	All MCs	388	0.8	388	0.8	0.489	5.0	LOS A	3.8	27.0	0.63	0.55	0.63	28.7
5	T1	All MCs	94	0.0	94	0.0	0.489	4.5	LOS A	3.8	27.0	0.63	0.55	0.63	39.7
6u	U	All MCs	1	0.0	1	0.0	0.489	8.6	LOS A	3.8	27.0	0.63	0.55	0.63	31.2
Approach			483	0.7	483	0.7	0.489	4.9	LOS A	3.8	27.0	0.63	0.55	0.63	31.2
West: Hampden Road															
11	T1	All MCs	103	0.0	103	0.0	0.488	10.9	LOS A	3.8	26.4	0.84	0.84	0.98	34.6
12	R2	All MCs	208	2.5	208	2.5	0.488	14.0	LOS A	3.8	26.4	0.84	0.84	0.98	32.1
12u	U	All MCs	7	0.0	7	0.0	0.488	15.3	LOS B	3.8	26.4	0.84	0.84	0.98	38.6
Approach			319	1.7	319	1.7	0.488	13.0	LOS A	3.8	26.4	0.84	0.84	0.98	33.1
All Vehicles			1608	0.6	1608	0.6	0.509	6.2	LOS A	4.5	31.4	0.57	0.58	0.59	30.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Herbert Street											
P1	Full	8	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04
East: Cleg Street											

P2 Full	52	39.3	LOS D	0.1	0.1	0.94	0.94	193.1	200.0	1.04
North: Herbert Street										
P3 Full	20	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04
West: Cleg Street										
P4 Full	35	39.3	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04
All Pedestrians	115	39.3	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04

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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Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Herbert Street											
P1	Full	5	34.2	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
East: Cleg Street											

P2 Full	53	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06
North: Herbert Street										
P3 Full	7	34.2	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
West: Cleg Street										
P4 Full	22	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
All Pedestrians	87	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06

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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Assessments\SIDRA\C2L - Rev B.sip9

MOVEMENT SUMMARY

 Site: I04 [Herbert / Cleg (Site Folder: Design - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

 Network: N101 [Concept - AM - Keep RT (final) (Network Folder: General)]

Signalised intersection, turning movements remove for heavy vehicles, cycleway on the east

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]	[Total HV]											
			veh/h	%	veh/h	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Herbert Street															
1	L2	All MCs	56	9.4	56	9.4	0.372	13.4	LOS A	6.9	49.3	0.45	0.44	0.45	37.6
2	T1	All MCs	324	1.0	324	1.0	0.372	8.0	LOS A	6.9	49.3	0.45	0.44	0.45	39.2
3	R2	All MCs	44	2.4	44	2.4	0.390	37.4	LOS C	1.6	11.5	0.79	0.70	0.79	21.0
Approach			424	2.2	424	2.2	0.390	11.8	LOS A	6.9	49.3	0.49	0.46	0.49	36.1
East: Cleg Street															
4	L2	All MCs	43	0.0	43	0.0	0.789	63.1	LOS E	5.7	39.3	1.00	0.93	1.28	11.9
5	T1	All MCs	77	2.7	77	2.7	* 0.789	58.9	LOS E	5.7	39.3	1.00	0.93	1.28	20.3
6	R2	All MCs	73	0.0	73	0.0	0.438	58.8	LOS E	3.2	22.3	0.99	0.76	0.99	20.3
Approach			193	1.1	193	1.1	0.789	59.8	LOS E	5.7	39.3	1.00	0.87	1.17	16.7
North: Herbert Street															
7	L2	All MCs	115	2.8	115	2.8	* 0.854	67.8	LOS E	24.3	172.9	0.99	0.99	1.16	22.9
8	T1	All MCs	413	1.5	413	1.5	0.854	36.1	LOS C	24.3	172.9	0.99	1.00	1.16	16.9
9	R2	All MCs	46	0.0	46	0.0	0.096	23.7	LOS B	1.1	7.9	0.59	0.68	0.59	32.2
Approach			574	1.7	574	1.7	0.854	41.4	LOS C	24.3	172.9	0.96	0.97	1.12	18.2
West: Cleg Street															
10	L2	All MCs	68	0.0	68	0.0	* 0.877	54.8	LOS D	14.0	99.4	1.00	1.04	1.33	20.6
11	T1	All MCs	66	4.8	66	4.8	0.877	49.2	LOS D	14.0	99.4	1.00	1.04	1.33	19.8
12	R2	All MCs	144	1.5	144	1.5	0.877	53.8	LOS D	14.0	99.4	1.00	1.04	1.33	13.7
Approach			279	1.9	279	1.9	0.877	52.9	LOS D	14.0	99.4	1.00	1.04	1.33	17.2
All Vehicles			1469	1.8	1469	1.8	0.877	37.5	LOS C	24.3	172.9	0.84	0.82	0.98	21.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Herbert Street											
P1	Full	8	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04

East: Cleg Street											
P2	Full	52	39.3	LOS D	0.1	0.1	0.94	0.94	193.1	200.0	1.04
North: Herbert Street											
P3	Full	20	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04
West: Cleg Street											
P4	Full	35	39.3	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04
All Pedestrians		115	39.3	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04

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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Assessments\SIDRA\IC2L - Rev B.sip9

MOVEMENT SUMMARY

 Site: I04 [Herbert / Cleg (Site Folder: Design - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

 Network: N101 [Concept - PM - Keep RT (final) (Network Folder: General)]

Signalised intersection, turning movements remove for heavy vehicles, cycleway on the east

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 80 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]		[Total HV]					[Veh. veh	Dist]				
			veh/h	%	veh/h	%	v/c	sec			m			km/h	
South: Herbert Street															
1	L2	All MCs	48	0.0	48	0.0	0.335	19.7	LOS B	8.6	59.7	0.72	0.61	0.72	32.6
2	T1	All MCs	279	0.0	279	0.0	0.335	14.5	LOS A	8.6	59.7	0.72	0.61	0.72	34.0
3	R2	All MCs	36	2.9	36	2.9	0.202	32.5	LOS C	0.8	5.6	0.75	0.66	0.75	21.5
Approach			363	0.3	363	0.3	0.335	16.9	LOS B	8.6	59.7	0.72	0.62	0.72	32.1
East: Cleg Street															
4	L2	All MCs	68	0.0	68	0.0	0.714	53.6	LOS D	5.7	40.2	1.00	0.88	1.16	13.7
5	T1	All MCs	71	3.0	71	3.0	* 0.714	49.0	LOS D	5.7	40.2	1.00	0.88	1.16	22.7
6	R2	All MCs	103	0.0	103	0.0	0.444	50.4	LOS D	3.9	27.3	0.97	0.77	0.97	22.3
Approach			242	0.9	242	0.9	0.714	50.9	LOS D	5.7	40.2	0.99	0.84	1.08	18.1
North: Herbert Street															
7	L2	All MCs	55	0.0	55	0.0	* 0.752	61.5	LOS E	15.2	107.4	0.97	0.89	1.05	25.3
8	T1	All MCs	354	1.2	354	1.2	0.752	26.7	LOS B	15.2	107.4	0.97	0.89	1.05	19.2
9	R2	All MCs	53	0.0	53	0.0	0.115	21.1	LOS B	1.3	9.2	0.66	0.70	0.66	31.3
Approach			461	0.9	461	0.9	0.752	30.2	LOS C	15.2	107.4	0.93	0.87	1.00	21.7
West: Cleg Street															
10	L2	All MCs	56	0.0	56	0.0	0.721	44.2	LOS D	7.6	54.2	1.00	0.89	1.13	23.5
11	T1	All MCs	75	1.4	75	1.4	* 0.721	38.6	LOS C	7.6	54.2	1.00	0.89	1.13	22.8
12	R2	All MCs	57	5.6	57	5.6	0.721	43.2	LOS D	7.6	54.2	1.00	0.89	1.13	16.3
Approach			187	2.2	187	2.2	0.721	41.7	LOS C	7.6	54.2	1.00	0.89	1.13	21.4
All Vehicles			1254	0.9	1254	0.9	0.752	32.1	LOS C	15.2	107.4	0.89	0.79	0.95	23.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Herbert Street											
P1	Full	8	34.2	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06

East: Cleg Street											
P2	Full	52	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06
North: Herbert Street											
P3	Full	20	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
West: Cleg Street											
P4	Full	35	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06
All Pedestrians		115	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06

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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Assessments\SIDRA\IC2L - Rev B.sip9

■ ■ Network: N101 [Existing - AM (Network Folder: General)]

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

- * Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped Dist] ped m		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec						sec	m	m/sec
South: Herbert Street											
P1	Full	22	39.2	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04
East: Access Road											

P2 Full	93	39.4	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04
North: Herbert Street										
P3 Full	19	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04
West: Frederick Street										
P4 Full	97	39.4	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04
All Pedestrians	231	39.3	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04

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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Site: I05 [Herbert / Frederick (Site Folder: Existing - PM Peak)]

■ ■ Network: N101 [Existing - PM (Network Folder: General)]

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 80 seconds (Network User-Given Cycle Time)

- * Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Herbert Street											
P1	Full	18	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
East: Access Road											

P2 Full	80	34.3	LOS D	0.2	0.2	0.93	0.93	188.2	200.0	1.06
North: Herbert Street										
P3 Full	21	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
West: Frederick Street										
P4 Full	67	34.3	LOS D	0.1	0.1	0.93	0.93	188.2	200.0	1.06
All Pedestrians	186	34.3	LOS D	0.2	0.2	0.93	0.93	188.2	200.0	1.06

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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Assessments\SIDRA\C2L - Rev B.sip9

MOVEMENT SUMMARY

 Site: I05 [Herbert / Frederick (Site Folder: Design - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

 Network: N101 [Concept - AM - Keep RT (final) (Network Folder: General)]

Signalised intersection, includes turning movements from Cleg Street

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]		[Total HV]					[Veh. veh	Dist]				km/h
			veh/h	%	veh/h	%	v/c	sec			m				
South: Herbert Street															
1	L2	All MCs	288	5.1	288	5.1	0.284	14.2	LOS A	6.5	47.3	0.55	0.68	0.55	26.8
2	T1	All MCs	342	1.5	342	1.5	*0.802	40.3	LOS C	15.6	110.5	1.00	0.97	1.14	12.0
Approach			631	3.2	631	3.2	0.802	28.3	LOS B	15.6	110.5	0.79	0.84	0.87	18.0
SouthEast: Cycleway															
23a	R1	All MCs	3	0.0	3	0.0	0.002	28.3	LOS B	0.1	0.3	0.80	0.49	0.80	13.4
Approach			3	0.0	3	0.0	0.002	28.3	LOS B	0.1	0.3	0.80	0.49	0.80	13.4
East: Access Road															
4	L2	All MCs	3	0.0	3	0.0	0.014	37.8	LOS C	0.1	0.9	0.90	0.57	0.90	5.0
5	T1	All MCs	9	22.2	9	22.2	*0.059	37.5	LOS C	0.5	4.3	0.90	0.63	0.90	10.3
6	R2	All MCs	4	0.0	4	0.0	0.059	37.5	LOS C	0.5	4.3	0.90	0.63	0.90	5.1
Approach			17	12.5	17	12.5	0.059	37.6	LOS C	0.5	4.3	0.90	0.62	0.90	8.2
North: Herbert Street															
7	L2	All MCs	31	6.9	31	6.9	0.781	60.0	LOS E	22.0	155.4	1.00	0.92	1.04	11.3
7a	L1	All MCs	6	0.0	6	0.0	0.003	14.0	LOS A	0.1	0.3	0.47	0.33	0.47	22.7
8	T1	All MCs	448	0.9	448	0.9	0.781	52.8	LOS D	22.0	155.4	1.00	0.92	1.04	11.9
9	R2	All MCs	97	3.3	97	3.3	*0.805	67.6	LOS E	4.7	34.2	1.00	0.94	1.26	14.2
Approach			582	1.6	582	1.6	0.805	55.2	LOS D	22.0	155.4	0.99	0.92	1.07	10.6
West: Frederick Street															
10	L2	All MCs	77	5.5	77	5.5	0.169	36.4	LOS C	3.0	21.6	0.76	0.74	0.76	14.2
11	T1	All MCs	16	6.7	16	6.7	0.169	40.4	LOS C	3.0	21.6	0.76	0.74	0.76	12.4
12	R2	All MCs	402	4.5	402	4.5	*0.771	45.4	LOS D	17.1	124.4	0.97	0.90	1.05	11.8
Approach			495	4.7	495	4.7	0.771	43.8	LOS D	17.1	124.4	0.93	0.87	1.00	10.4
All Vehicles			1727	3.2	1727	3.2	0.805	41.9	LOS C	22.0	155.4	0.90	0.87	0.98	12.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
					[Ped	Dist]					

		ped/h	sec		ped	m			sec	m	m/sec
South: Herbert Street											
P1	Full	22	39.2	LOS D	0.1	0.1	0.93	0.93	193.1	200.0	1.04
SouthEast: Cycleway											
P5	Full	53	39.3	LOS D	0.1	0.1	0.94	0.94	193.1	200.0	1.04
East: Access Road											
P2	Full	93	39.4	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04
North: Herbert Street											
P3	Full	19	39.2	LOS D	0.0	0.0	0.93	0.93	193.1	200.0	1.04
West: Frederick Street											
P4	Full	97	39.4	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04
All Pedestrians		283	39.3	LOS D	0.2	0.2	0.94	0.94	193.2	200.0	1.04

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.

MOVEMENT SUMMARY

 Site: I05 [Herbert / Frederick (Site Folder: Design - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

 Network: N101 [Concept - PM - Keep RT (final) (Network Folder: General)]

Signalised intersection, includes turning movements from Cleg Street

Site Category: Proposed Design 1

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 80 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]		[Total HV]					[Veh. veh	Dist]				km/h
			veh/h	%	veh/h	%	v/c	sec			m				
South: Herbert Street															
1	L2	All MCs	259	2.8	259	2.8	0.276	15.3	LOS B	5.7	40.8	0.60	0.69	0.60	26.1
2	T1	All MCs	279	0.4	279	0.4	* 0.641	31.2	LOS C	10.2	71.4	0.96	0.81	0.97	14.2
Approach			538	1.6	538	1.6	0.641	23.5	LOS B	10.2	71.4	0.79	0.75	0.79	19.9
SouthEast: Cycleway															
23a	R1	All MCs	9	0.0	9	0.0	0.007	25.1	LOS B	0.3	0.7	0.80	0.53	0.80	14.3
Approach			9	0.0	9	0.0	0.007	25.1	LOS B	0.3	0.7	0.80	0.53	0.80	14.3
East: Access Road															
4	L2	All MCs	6	0.0	6	0.0	0.025	32.7	LOS C	0.2	1.5	0.89	0.59	0.89	5.3
5	T1	All MCs	37	2.9	37	2.9	* 0.170	32.9	LOS C	1.7	12.1	0.91	0.68	0.91	10.8
6	R2	All MCs	12	0.0	12	0.0	0.170	32.9	LOS C	1.7	12.1	0.91	0.68	0.91	5.4
Approach			55	1.9	55	1.9	0.170	32.9	LOS C	1.7	12.1	0.91	0.67	0.91	9.3
North: Herbert Street															
7	L2	All MCs	4	0.0	4	0.0	0.549	46.9	LOS D	14.6	103.5	1.00	0.79	1.00	12.5
7a	L1	All MCs	7	0.0	7	0.0	0.003	25.5	LOS B	0.3	0.7	1.00	0.63	1.00	19.0
8	T1	All MCs	371	1.4	371	1.4	0.549	39.8	LOS C	14.6	103.5	1.00	0.79	1.00	14.0
9	R2	All MCs	64	3.3	64	3.3	* 0.474	53.2	LOS D	2.6	19.1	1.00	0.76	1.00	16.0
Approach			446	1.7	446	1.7	0.549	41.5	LOS C	14.6	103.5	1.00	0.78	1.00	12.9
West: Frederick Street															
10	L2	All MCs	63	0.0	63	0.0	0.160	35.2	LOS C	2.2	15.5	0.82	0.73	0.82	13.9
11	T1	All MCs	8	0.0	8	0.0	0.160	39.1	LOS C	2.2	15.5	0.82	0.73	0.82	12.3
12	R2	All MCs	385	1.1	385	1.1	* 0.870	50.3	LOS D	17.2	121.5	1.00	1.03	1.29	10.3
Approach			457	0.9	457	0.9	0.870	48.0	LOS D	17.2	121.5	0.97	0.98	1.22	9.7
All Vehicles			1505	1.4	1505	1.4	0.870	36.6	LOS C	17.2	121.5	0.91	0.83	0.99	13.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance										
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Eff. Stop Rate	Travel Time	Travel Dist.
					[Ped	Dist]				Speed

		ped/h	sec		ped	m			sec	m	m/sec
South: Herbert Street											
P1	Full	22	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
SouthEast: Cycleway											
P5	Full	53	34.3	LOS D	0.1	0.1	0.93	0.93	188.1	200.0	1.06
East: Access Road											
P2	Full	93	34.4	LOS D	0.2	0.2	0.93	0.93	188.2	200.0	1.06
North: Herbert Street											
P3	Full	19	34.3	LOS D	0.0	0.0	0.93	0.93	188.1	200.0	1.06
West: Frederick Street											
P4	Full	97	34.4	LOS D	0.2	0.2	0.93	0.93	188.2	200.0	1.06
All Pedestrians		283	34.3	LOS D	0.2	0.2	0.93	0.93	188.2	200.0	1.06

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.

MOVEMENT SUMMARY

▼ Site: I06 [Herbert / Ella (Site Folder: Existing - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

■ Network: N101 [Existing - AM (Network Folder: General)]

Herbert St / Ella St
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec	[Veh. veh	Dist] m					km/h
South: Herbert Street															
2	T1	All MCs	477	4.2	477	4.2	0.361	2.0	LOS A	1.7	12.0	0.29	0.34	0.31	35.7
3	R2	All MCs	75	4.2	75	4.2	0.361	9.6	LOS A	1.7	12.0	0.29	0.34	0.31	42.3
Approach			552	4.2	552	4.2	0.361	3.1	NA	1.7	12.0	0.29	0.34	0.31	37.5
East: Ella Street															
4	L2	All MCs	105	0.0	105	0.0	0.621	12.6	LOS A	3.6	25.2	0.83	1.16	1.51	35.0
6	R2	All MCs	156	0.0	156	0.0	0.621	22.3	LOS B	3.6	25.2	0.83	1.16	1.51	33.4
Approach			261	0.0	261	0.0	0.621	18.4	LOS B	3.6	25.2	0.83	1.16	1.51	34.2
North: Herbert Street															
7	L2	All MCs	203	2.1	203	2.1	0.451	3.5	LOS A	0.0	0.0	0.00	0.11	0.00	38.6
8	T1	All MCs	655	2.7	655	2.7	0.451	0.1	LOS A	0.0	0.0	0.00	0.11	0.00	39.0
Approach			858	2.6	858	2.6	0.451	0.9	NA	0.0	0.0	0.00	0.11	0.00	38.8
All Vehicles			1671	2.7	1671	2.7	0.621	4.3	NA	3.6	25.2	0.23	0.35	0.34	37.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Assessments\SIDRA\C2L - Rev B.sip9

MOVEMENT SUMMARY

▼ Site: I06 [Herbert / Ella (Site Folder: Existing - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

■ Network: N101 [Existing - PM (Network Folder: General)]

Herbert St / Ella St
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist] m				
South: Herbert Street															
2	T1	All MCs	423	2.0	423	2.0	0.346	2.1	LOS A	1.8	12.5	0.38	0.42	0.39	35.2
3	R2	All MCs	108	0.0	108	0.0	0.346	8.1	LOS A	1.8	12.5	0.38	0.42	0.39	41.6
Approach			532	1.6	532	1.6	0.346	3.3	NA	1.8	12.5	0.38	0.42	0.39	37.5
East: Ella Street															
4	L2	All MCs	66	0.0	66	0.0	0.386	7.9	LOS A	1.8	12.5	0.69	0.93	0.93	37.5
6	R2	All MCs	129	0.0	129	0.0	0.386	14.8	LOS B	1.8	12.5	0.69	0.93	0.93	37.2
Approach			196	0.0	196	0.0	0.386	12.5	LOS A	1.8	12.5	0.69	0.93	0.93	37.3
North: Herbert Street															
7	L2	All MCs	289	0.4	289	0.4	0.402	3.4	LOS A	0.0	0.0	0.00	0.17	0.00	38.2
8	T1	All MCs	481	1.8	481	1.8	0.402	0.1	LOS A	0.0	0.0	0.00	0.17	0.00	38.5
Approach			771	1.2	771	1.2	0.402	1.3	NA	0.0	0.0	0.00	0.17	0.00	38.4
All Vehicles			1498	1.2	1498	1.2	0.402	3.5	NA	1.8	12.5	0.23	0.36	0.26	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: C:\Users\AUSM510678\WSP O365\209600 - Chatswood to St Leonards Cycleway - via Artarmon Connection - 4_WIP\2. Traffic

Assessments\SIDRA\C2L - Rev B.sip9

MOVEMENT SUMMARY

Site: I06v [Herbert / Ella (Site Folder: Design - AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Network: N101 [Concept - AM - Keep RT (final) (Network Folder: General)]

Herbert St / Ella St
Site Category: Existing Design
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist]				
			veh/h		veh/h		v/c	sec			m				km/h
South: Herbert Street															
2	T1	All MCs	477	4.2	477	4.2	0.515	4.2	LOS A	5.0	35.9	0.63	0.49	0.63	33.0
3	R2	All MCs	75	4.2	75	4.2	0.515	7.0	LOS A	5.0	35.9	0.63	0.49	0.63	40.6
Approach			552	4.2	552	4.2	0.515	4.6	LOS A	5.0	35.9	0.63	0.49	0.63	34.9
East: Ella Street															
4	L2	All MCs	105	0.0	105	0.0	0.372	11.7	LOS A	3.9	27.0	0.93	0.64	0.93	37.4
6	R2	All MCs	156	0.0	156	0.0	0.372	14.3	LOS A	3.9	27.0	0.93	0.64	0.93	36.9
Approach			261	0.0	261	0.0	0.372	13.2	LOS A	3.9	27.0	0.93	0.64	0.93	37.2
North: Herbert Street															
7	L2	All MCs	203	2.1	203	2.1	0.653	3.9	LOS A	7.9	56.0	0.35	0.41	0.35	41.9
8	T1	All MCs	655	2.7	655	2.7	0.653	3.5	LOS A	7.9	56.0	0.35	0.41	0.35	35.8
Approach			858	2.6	858	2.6	0.653	3.6	LOS A	7.9	56.0	0.35	0.41	0.35	37.5
All Vehicles			1671	2.7	1671	2.7	0.653	5.4	LOS A	7.9	56.0	0.53	0.48	0.53	36.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: I06v [Herbert / Ella (Site Folder: Design - PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

 Network: N101 [Concept - PM - Keep RT (final) (Network Folder: General)]

Concept design
Site Category: Proposed Design 1
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh. veh	Dist]				
			veh/h		veh/h		v/c	sec		veh	m				km/h
South: Herbert Street															
2	T1	All MCs	423	2.0	423	2.0	0.465	3.7	LOS A	4.2	29.2	0.53	0.46	0.53	33.1
3	R2	All MCs	108	0.0	108	0.0	0.465	6.5	LOS A	4.2	29.2	0.53	0.46	0.53	40.3
Approach			532	1.6	532	1.6	0.465	4.3	LOS A	4.2	29.2	0.53	0.46	0.53	35.7
East: Ella Street															
4	L2	All MCs	66	0.0	66	0.0	0.241	8.2	LOS A	2.0	13.9	0.73	0.63	0.73	38.8
6	R2	All MCs	129	0.0	129	0.0	0.241	10.9	LOS A	2.0	13.9	0.73	0.63	0.73	39.3
Approach			196	0.0	196	0.0	0.241	10.0	LOS A	2.0	13.9	0.73	0.63	0.73	39.1
North: Herbert Street															
7	L2	All MCs	289	0.4	289	0.4	0.619	4.2	LOS A	6.4	45.1	0.37	0.45	0.37	41.9
8	T1	All MCs	481	1.8	481	1.8	0.619	3.8	LOS A	6.4	45.1	0.37	0.45	0.37	35.6
Approach			771	1.2	771	1.2	0.619	3.9	LOS A	6.4	45.1	0.37	0.45	0.37	38.3
All Vehicles			1498	1.2	1498	1.2	0.619	4.9	LOS A	6.4	45.1	0.48	0.48	0.48	37.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data 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.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix C

SIDRA options testing



6 Operational impact

To identify the optimal cycleway design, an options assessment was conducted using SIDRA 9.1. Multiple options were explored for each intersection, leading to the selection of two final options. These options were then evaluated in SIDRA for both the AM and PM peak periods on the day with the highest traffic volumes recorded (Thursday 30th of May 2024). This assessment aims to inform the selection of the preferred option.

6.1 Road network impact

6.1.1 Intersection performance

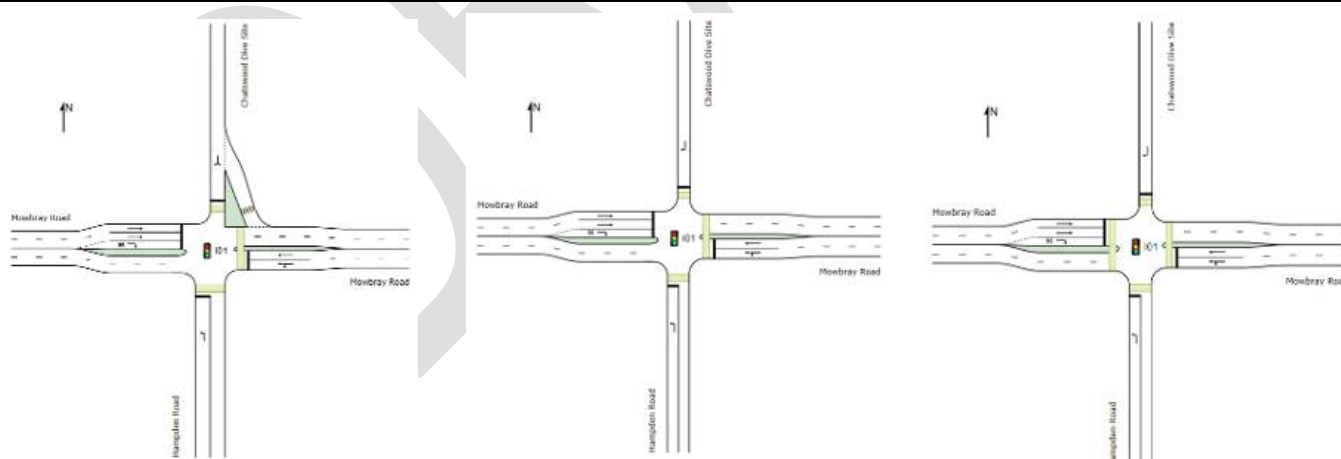
6.1.1.1 Hampden Road and Mowbray Road (I01)

Overview

To address the issues and opportunities outlined for the intersection of Hampden Road and Mowbray Road, two options were explored, which assess updates to the configuration of the northern leg, based on changes proposed for the Sydney Metro dive site access and the addition of a pedestrian / cyclist crossing on the Mowbray Road western leg. As depicted in Section 5.1.1.1, both options include a north-south cycleway on the eastern side of the intersection. The specific changes between the existing conditions, option 1 and option 2 are summarised in Table 6.1 below.

Table 6.1 I01 intersection configuration – existing and options

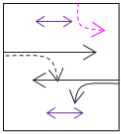
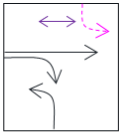
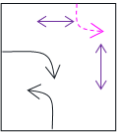
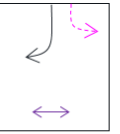
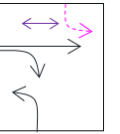
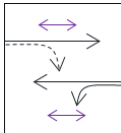
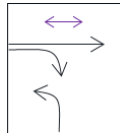
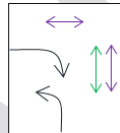
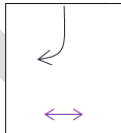
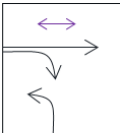
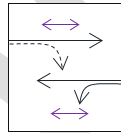
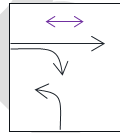
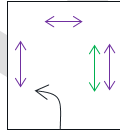
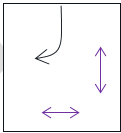
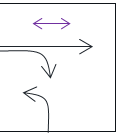
Existing	Option 1	Option 2
Runs as per existing conditions, with the single lane approach and slip lane on the northern leg, signalised pedestrian crossing on the northern, eastern and southern legs.	Removal of the northern slip lane as per the proposed upgrades to the Chatswood Dive Site. All other conditions remain the same.	Removal of the northern slip lane as per the proposed upgrades to the Chatswood Dive Site. Additional pedestrian crossing on the western leg to support additional crossing opportunities for pedestrians and cyclists.



Phasing

Alternative phasing arrangements have been explored for Option 1 and 2, as summarised in Table 6.2. The SCATS 15-minute history files were used to determine the phase times and frequencies for the existing AM and PM peak periods. Since the phasing does not change in Option 1, the existing specified phase times and frequencies have been adopted for this option. Option 2 however has been run with the same cycle time as specified in the existing conditions.

Table 6.2 I01 signal phasing – existing and options

Existing				
Existing conditions support the high demand along Mowbray Road (east-west) in the main phase (Phase A), with alternative phases supporting turning movements for each approach leg. The slip lane on the Sydney Metro dive site (northern leg) is permitted to run in every phase.				
				
A Phase	B Phase	C Phase	D Phase	E Phase
Option 1				
Option 1 phasing remains identical to the existing conditions, as the only change in this option is the removal of the priority-controlled slip lane from the northern leg (Sydney Metro dive site). The phase time allocated to cyclists in this arrangement (Phase C) is 24 seconds (119 second wait time) in the AM peak and 23 seconds (113 second wait time). Note that compared with existing conditions which only runs the pedestrian phase approximately 50% of the time, in this option the phase frequency has been increased to 100% to better support cyclist and pedestrian movements.				
				
A Phase	B Phase	C Phase	D Phase	E Phase
Option 2				
Option 2 includes the removal of the slip lane on the northern leg, as well as an additional pedestrian / cyclist crossing on the Mowbray Road western leg. The phase time allocated to cyclists in this arrangement (Phase C) is				
				
A Phase	B Phase	C Phase	D Phase	E Phase

Performance

The performance of these intersection configurations has been assessed in SIDRA, for the AM and PM peak periods. As discussed in Section 2.3.1, this intersection has been modelled in isolation, however consideration has been given to its proximity to the major intersection of Mowbray Road / Pacific Highway to the west. Detailed outputs from SIDRA 9.1 are provided in Appendix A. A summary of the results is provided in Table 6.3 below.

The results from the existing conditions indicate that I01 is already operating close to capacity in the context of the surrounding network. The longest queues are recorded for the Mowbray Road approaches, where the Mowbray Road eastern 95th percentile queue exceeds the lane length in the PM peak by approximately 6 metres. This indicates approximately one car length worth of queuing into the intersection during PM peak conditions. The lowest performing intersection leg is the northern approach (Sydney Metro dive site), operating at LoS F. This is due to this phase being allocated minimal phase time (15 seconds in both peaks) and frequency, as a result of the low demand at this approach.

The performance of Option 1 is almost identical to the existing conditions in both the AM and PM peak periods, as the intersection configuration and phasing arrangement only minorly changes with the removal of the slip lane and cycling signal running alongside the pedestrians on the east. In Option 2, the addition of the pedestrian phase on the Mowbray

Road western leg will likely have an impact on the adjacent intersections (Pacific Highway / Mowbray Road and Mowbray Road / Elizabeth Street). The 95th percentile queue on the Mowbray Road eastern approach exceeds the existing lane length by approximately 50 metres. Similarly on the western approach, the 95th percentile queue exceeds the existing lane length for the through movements as well as the right turns in both the AM and PM peak periods. To understand the full extent of the impact of this additional pedestrian crossing on the neighbouring intersections, a network model would be needed.

Table 6.3 I01 intersection performance – existing and options

Performance measure	Existing		Option 1		Option 2	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.60	0.48	0.60	0.52	0.64	0.528
Average Delay (seconds)	15.0	15.6	17.2	18.5	26.3	20.4
Overall LoS	B	B	B	B	B	B
Approach with longest queue	Mowbray Road East	Mowbray Road East	Mowbray Road East	Mowbray Road East	Mowbray Road East	Mowbray Road East
95 th percentile queue length (m)	120.6	143.2	141.3	163.3	187.3	157.0

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following conclusions have been made:

- Option 1 is less likely to cause traffic queueing back to Pacific Highway
- Option 2 has better active transport outcomes

It is recommended at this stage Option 1 proceed with the potential to incorporate an additional signalised crossing once further modelling has been undertaken.

6.1.1.2 Hampden Road and Brand Street (I02)

Overview

As discussed in the Issues and Opportunities Section 4, the challenges at the intersection of Hampden Road and Brand Street relate to the limited active travel infrastructure currently present and the complex geometry and topography including poor lines of site and steeper gradients at some approaches. In response to these challenges, two options were analysed for the design of the Hampden Road / Brand Street (I02) intersection: an unsignalised and signalised option. As depicted in Section 5.1.1.1, both options include a north-south cycleway on the western side of the intersection. The intersection layouts for the existing conditions, option 1 and option 2 are summarised in Table 6.4 below.

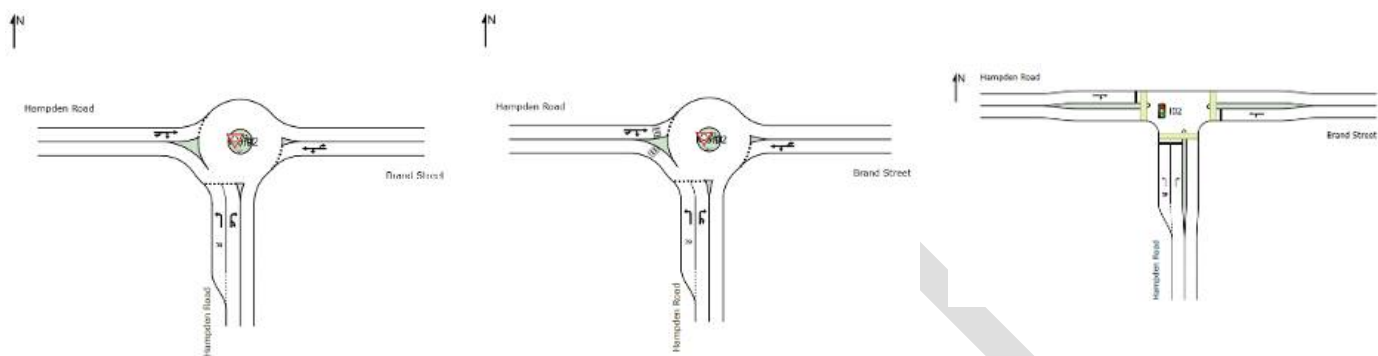
A warrant assessment for the signalisation of this intersection has been undertaken in accordance with the RTA Traffic Signal Design Warrant Assessment (2011) (see Appendix B). The findings from this warrant assessment indicate that I02 does not meet the criteria for signalisation, with regards to traffic demand, continuous traffic, pedestrian safety and crashes. However, a signalised option has been explored given the complex geometry constraints and likely safety implications for pedestrians and cyclists under unsignalised conditions (see Appendix C Design Decision Log).

A pedestrian crossing warrant assessment was also undertaken to determine if a crossing should be provided on Brand Street (eastern leg), noting that under existing conditions, pedestrians are required to cross Brand Street at a refuge 40 metres east of the intersection. The results from this assessment also indicated that this intersection did not warrant an additional pedestrian crossing (see Appendix B). However, it should be noted that TfNSW specifies that an exemption can be granted if council is in support of providing a pedestrian crossing on a local road.

However, an existing driveway adjacent to the intersection on Brand Street renders it challenging to provide a pedestrian crossing on this leg of the intersection and therefore this has not been carried through to the design options.

Table 6.4 I02 intersection configuration – existing and options

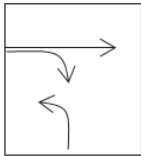
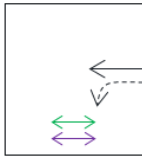
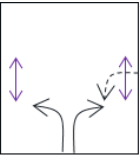
Existing	Option 1	Option 2
Runs as per existing conditions, roundabout with no protected pedestrian crossings.	Addition of a raised zebra crossing on the western leg and south of the intersection on the southern leg.	Signalised intersection with a pedestrian crossing on all approach legs.



Phasing

The proposed phasing for Option 2 is summarised in Table 6.5. For both the AM and PM peak periods, this phasing has been modelled in SIDRA for the Optimum Cycle Time.

Table 6.5 I02 signal phasing – existing and options

Existing	Option 1	Option 2
Priority-controlled intersection configuration.	Priority-controlled intersection configuration.	Option 2 is proposed to include three phases, supporting cyclist movements in Phase B. SIDRA models this arrangement with an optimum cycle time of 60 seconds in the AM peak and 70 seconds in the PM peak.
N/A	N/A	   A Phase B Phase C Phase

Performance

The performance of these intersection configurations has been assessed in SIDRA, for the AM and PM peak periods. As discussed in Section 2.3.1, this intersection has been modelled in isolation, however consideration has been given to neighbouring intersections and the impact of increased queuing on these intersections. Detailed outputs from SIDRA are provided in Appendix A. A summary of the results is provided in Table 6.6 below.

Whilst signalisation of I02 would have safety benefits for pedestrians and cyclists, forcing cars to stop and give way to these active movements, the SIDRA results indicate that intersection performance worsens with signalisation. Particularly in the PM peak, the through movement on Brand Street performs at LoS F, with an average delay of 101.6 seconds. However overall intersection performance is still satisfactory, performing at an overall LoS D. Compared with existing conditions, the 95th percentile queue on the Herbert Street south approach increases by almost 100 metres. In the

PM peak the 95th percentile queue extends beyond the proposed signalised intersection at Broughton Street, resulting in an increase in queued traffic in the Artarmon station precinct.

However, as discussed in the issues and opportunities (Section 4) and throughout this section, the safety implications of maintaining a roundabout with cycleway are extremely high for pedestrians and cyclists. To enhance safety at this intersection, traffic calming measures such as raised crossings would be necessary. Despite these measures, the safety standards would still not match those of a signalised crossing.

Table 6.6 I02 intersection performance – existing and options

Performance measure	Existing		Option 1		Option 2	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.54	0.51	0.54	0.51	0.88	0.95
Average Delay (seconds)	7.4	7.1	7.4	7.1	31.5	50.0
Overall LoS	A	A	A	A	C	D
Approach with longest queue	Hampden Road West	Hampden Road South	Hampden Road West	Hampden Road South	Hampden Road South	Hampden Road South
95 th percentile queue length (m)	30.9	31.4	30.9	31.4	121.1	217.1

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following recommendations have been made:

- Option 1 has better performance outcomes for the local traffic environment
- Option 2 has better safety implications for pedestrians and cyclists

It is recommended at this stage Option 2 proceed, with further work to improve intersection performance going forward.

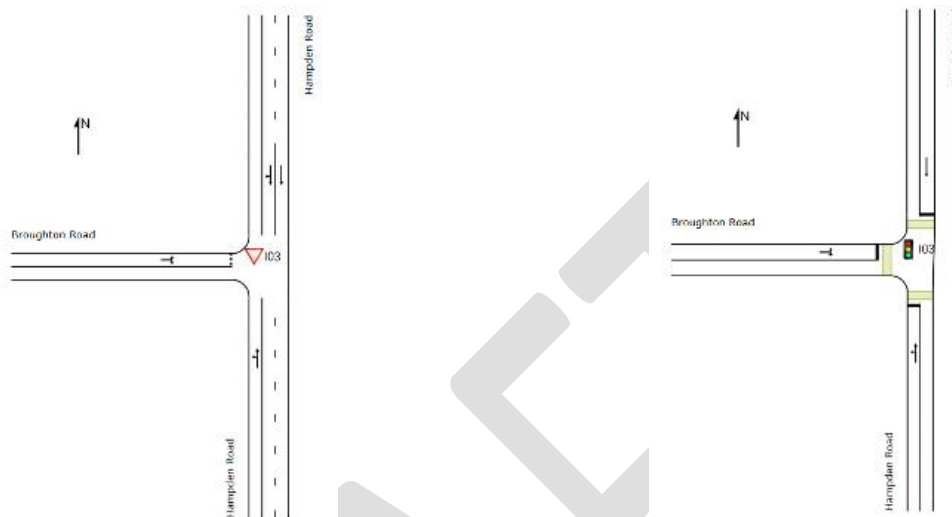
6.1.1.3 Hampden Road and Broughton Road (I03)

Overview

As discussed in the Issues and Opportunities (see Section 4), the key opportunity for the intersection of Hampden Road and Broughton Road is to provide a cycle lantern, allowing for cyclists to travel east-west through the intersection adjacent to pedestrians. This allows cyclists from the west to connect with the shared path on the east of Hampden Road. As such a single option has been explored to incorporate the east-west cycling lanterns into the phasing arrangement for this intersection, which has been approved as part of the Artarmon Local Centre Streetscape Upgrade.

Table 6.7 I03 intersection configuration – existing and options

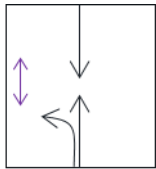
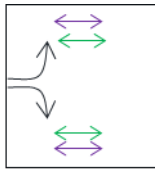
Existing	Option 1
The conditions at the time that the 7-day traffic survey was undertaken, included a priority-controlled intersection with two approach lanes on Hampden Road north and single lane approaches on all other legs.	Option 1 facilitates a cycling lantern, which allows cyclists to run alongside pedestrians crossing Hampden Road.



Phasing

The existing and proposed phasing arrangement for the intersection of Hampden Road and Broughton Road are summarised below in Table 6.8. As identified below, user given phase time were assigned to option 1 to increase the time provided to cyclists to cross Hampden Road and reduce the waiting time. An optimum cycle time of 60 seconds has been adopted, with 40 seconds assigned to phase A and 20 seconds assigned to phase B. This approach has been used to maximised the time allocated to pedestrians and cyclists and whilst this results in a decline in intersection performance, the results are still satisfactory (discussed in the following section).

Table 6.8 I03 signal phasing – existing and options

Existing	Option 1
At the time of the 7-day survey, the existing conditions included a priority-controlled intersection.	The planned phasing arrangement agreed as part of the Artarmon Local Centre Streetscape Upgrade, includes a split-phasing arrangement. This option incorporates the east-west cycling movements alongside the pedestrians in phase B. User given phase times have been used to increase the phase time given to cyclists travelling east-west (total cycle time 60 seconds).
N/A	  A Phase B Phase

Performance

The performance of these intersection configurations has been assessed in SIDRA, for the AM and PM peak periods. As discussed in Section 2.3.1, this intersection has been modelled in isolation, however consideration has been given to neighbouring intersections and the impact of increased queuing on these intersections. Detailed outputs from SIDRA are provided in Appendix A. A summary of the results is provided in Table 6.9 below.

Although the intersection's performance decreases with the signalized option, it will still operate satisfactorily at Level of Service (LoS) A, with an average delay of 10 to 11 seconds. During both the AM and PM peak periods, the 95th percentile queue length does not exceed the length of the approach lane.

Table 6.9 I03 intersection performance – existing and options

Performance measure	Existing		Option 1	
	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.27	0.34	0.60	0.61
Average Delay (seconds)	0.9	1.1	10.4	10.7
Overall LoS	B	B	A	A
Approach with longest queue	Broughton Road	Broughton Road	Hampden Road north	Hampden Road south
95 th percentile queue length (m)	4.7	6.8	93.1	89.4

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following recommendations have been made:

- Incorporating the cycling lantern and maximising the phase time allocated to cyclists and pedestrians will result in longer average delays and 95th percentile queues. However the overall intersection performance is still highly satisfactory.

It is therefore recommended that this cycling lantern is incorporated into the phasing arrangement and the phase time allocated to cyclists and pedestrians is maximised.

6.1.1.4 Herbert Street and Cleg Street (I04)

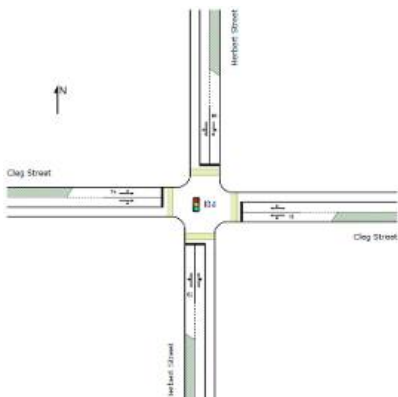
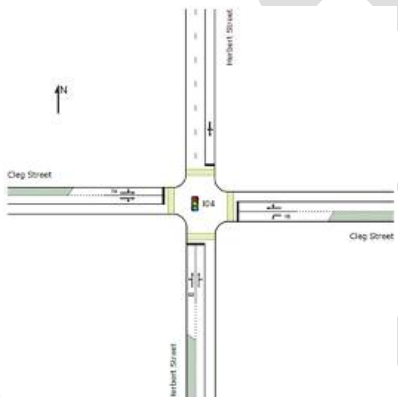
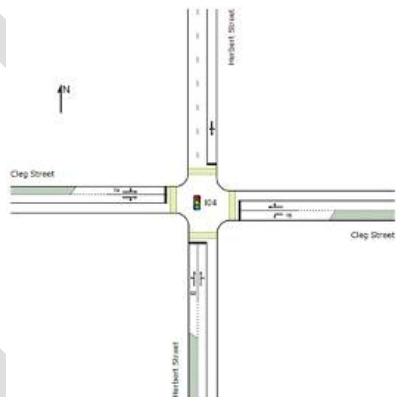
Overview

As outlined in the issues and opportunities (see Section 4), one of the key issues / opportunities outlined for the intersection of Herbert Street and Cleg Street, is the geometry constraints currently requiring the cycleway to start several metres south of the intersection on Herbert Street. A swept path assessment was undertaken and determined that a restriction on 8.8 metre or longer vehicles turning left out of Cleg Street east would be needed to move the cycleway start line further north. The implications of this update are summarised in the Design Decision Log (see Appendix C). From the results of the 7-day surveys, a maximum of 5 heavy vehicles currently turn left out of Cleg Street east during a one-hour period. Banning this left turn would require these heavy vehicles to detour via Reserve Road and Frederick Street to continue heading south towards the Pacific Highway.

The swept path assessment also indicated that under existing conditions, right turns out of Herbert Street cannot run concurrently for HRV's. Since these movements run in the same phase, the existing conditions currently pose a safety risk to these heavy vehicle movements. In addition, the left turn out of Cleg Street west cannot run concurrently with the right turn from Herbert Street north for an HRV, however these movements are in two separate phases and therefore do not currently pose as a risk to safety.

A single option has been explored for this intersection, where the heavy vehicle left turn out of Cleg Street is banned and the Herbert Street north approach is reduced from two lanes to one to allocate road space to the cycleway, as summarised in Table 6.10.

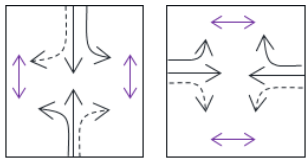
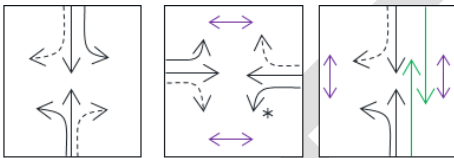
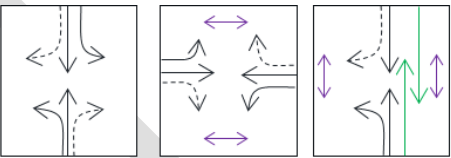
Table 6.10 104 intersection configuration – existing and options

Existing	Option 1	Option 2
Runs as per existing conditions, signalised intersection with no vehicle movements banned.	Heavy vehicles movements turning left out of Cleg Street east are banned and the number of approach lanes on Herbert Street north are reduced from two to one lane. This ban allows for the cycleway to be positioned in-line with the intersection.	The number of approach lanes on Herbert Street north are reduced from two to one lane. Heavy vehicles are still permitted to turn left out of Cleg Street east, requiring the cycleway start line to be set back from the intersection on the southern approach leg.
		

Phasing

The proposed phasing for the Existing conditions and Option 1 is summarised in Table 6.11. The cycle time for the existing conditions (from the SCATS 15-minute history data) has been applied to both options in the AM and PM peaks.

Table 6.11 I04 signal phasing – existing and options

Existing	Option 1	Option 2
Existing conditions include a split phase arrangement, with no vehicle restrictions from turning movements.	An additional phase is introduced to protect cyclists from vehicles turning into / out of Cleg Street east. In addition, heavy vehicles are banned from the left turn out of Cleg Street east. The cycle time prescribed for this option is consistent with the existing cycle times in the AM and PM peaks. The phase time allocated to cyclists in the AM peak is 16 sec (62 sec wait time) and in the PM peak is 14 sec (53 sec wait time).	An additional phase is introduced to protect cyclists from vehicles turning into / out of Cleg Street east. No restrictions on heavy vehicle movements are implemented. The cycle time prescribed for this option is consistent with the existing cycle times in the AM and PM peaks. The phase time allocated to cyclists in the AM peak is 16 sec (62 sec wait time) and in the PM peak is 14 sec (53 sec wait time).
 A Phase B Phase	 A Phase B Phase C Phase	 A Phase B Phase C Phase

*Heavy vehicles banned from the left turn out from Ella Street

Performance

The performance of these intersection configurations has been assessed in SIDRA, for the AM and PM peak periods. As discussed in Section 2.3.1, this intersection has been modelled in isolation, however consideration has been given to neighbouring intersections and the impact of increased queuing on these intersections. Detailed outputs from SIDRA are provided in Appendix A. A summary of the results is provided in Table 6.12 below.

The results indicate overall intersection performance slightly diminishes in Option 1 however the results are still satisfactory, operating at LoS B and A in the AM and PM peaks respectively.

Table 6.12 I04 intersection performance – existing and options

Performance measure	Existing		Option 1		Option 2	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.56	0.36	0.69	0.54	0.69	0.54
Average Delay (seconds)	16.6	13.5	22.4	18.3	22.4	18.3
Overall LoS	B	A	B	B	B	B
Approach with longest queue	Herbert Street north	Herbert Street north	Herbert Street north	Herbert Street north	Herbert Street north	Herbert Street north
95 th percentile queue length (m)	63.5	41.1	110.6	70.7	110.6	70.7

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following recommendations have been made:

- It is recommended that Option 1 (restricting heavy vehicles equal to or longer than 8.8 metres turning left out of Cleg Street east) is adopted, to allow the cycleway on Herbert Street south to be situated at the intersection.

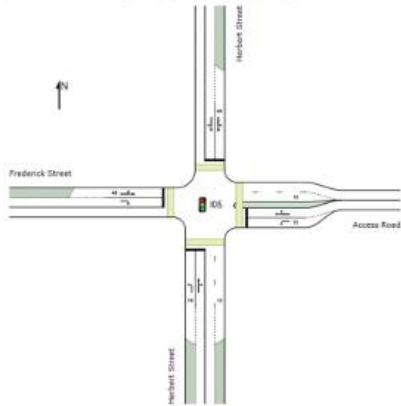
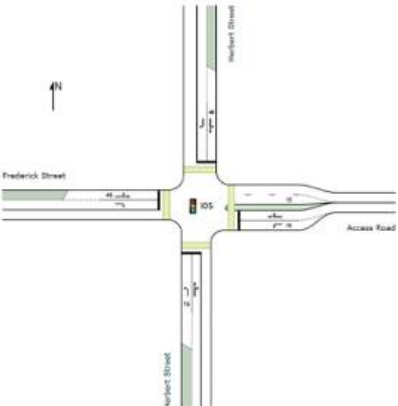
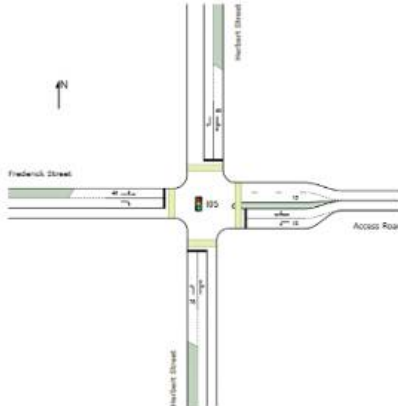
- This will help reinforce cyclist priority along the corridor and minimise the potential for conflicts with heavy vehicles.

6.1.1.5 Herbert Street and Frederick Street (I05)

Overview

As outlined in the issues and opportunities (see Section 4), the constraints at the intersection of Herbert Street and Frederick Street relate to a constrained carriageway and conflicts between heavy vehicle turning movements. As such, two options have been explored (Table 6.13), considering an on-road cycleway with partial encroachment on the footpath, and an option where the cycleway completely encroaches onto the existing footpath. This second option would require property acquisition to maintain a suitable footpath width, however it allows the right turn into Frederick Street (from Herbert Street north) to run concurrently with the left turn out of Frederick Street (from Herbert Street north) to run concurrently with the left turn out of Frederick Street.

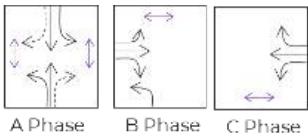
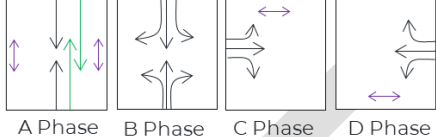
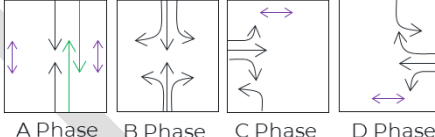
Table 6.13 I05 intersection configuration – existing and options

Existing	Option 1	Option 2
Existing conditions are signalised with two approach lanes in each direction.	The cycleway on the east side of Herbert Street partially encroaches on the footpath through this intersection. Due to geometry constraints the inside approach lane on Herbert Street north is limited to right turns only. Left turns out of Frederick Street cannot run concurrently with right turns into Frederick Street.	The cycleway on the east side of Herbert Street completely encroaches on the footpath through this intersection. Due to geometry constraints the inside approach lane on Herbert Street north is limited to right turns only. This option results in significant lateral shift for through southbound traffic and cyclists (see Appendix C).
		

Phasing

The proposed phasing for the Existing conditions and Option 1 is summarised in Table 6.14. The cycle time for the existing conditions (from the SCATS 15-minute history data) has been applied to both options in the AM and PM peaks.

Table 6.14 I05 signal phasing – existing and options

Existing	Option 1	Option 2
Three phases with filter turns in out of Herbert Street in Phase A.	An additional phase is included at the start, allowing cyclists to run protected from vehicles alongside the through vehicle movements.	An additional phase is included at the start, allowing cyclists to run protected from vehicles alongside the through vehicle movements. The cycle time prescribed for this option is consistent with the existing cycle times in the AM and PM peaks. The phase time allocated to cyclists in the AM peak is 24 sec (60 sec wait time) and in the PM peak is 24 sec (49 sec wait time).
 A Phase B Phase C Phase	 A Phase B Phase C Phase D Phase	 A Phase B Phase C Phase D Phase

Performance

The performance of these intersection configurations has been assessed in SIDRA, for the AM and PM peak periods. As discussed in Section 2.3.1, this intersection has been modelled in isolation, however consideration has been given to neighbouring intersections and the impact of increased queuing on these intersections. Detailed outputs from SIDRA are provided in Appendix A. A summary of the results is provided in Table 6.15 below.

Option 1 performs satisfactorily in the AM peak, however in the PM peak performance on Frederick Street significantly diminishes, resulting in overall intersection DoS exceeding 0.95 and the right turn out of Frederick Street operating at LoS F. Compared with the existing PM peak 95th percentile queue, in Option 1 the 95th percentile queue increases by almost 100 metres.

As depicted in Table 6.14, Option 2 allows for concurrent left turns out of Herbert Street south and north in Phase C and D respectively. This approach minorly improves intersection performance across the two peak periods. In the AM peak the right turn out of Frederick Street continues to perform the worst at LoS F with an average delay of 75.3 seconds. However, in the PM peak the performance for this approach movement improves to LoS D and average delay of 45.2 seconds, which is a more satisfactory result.

Table 6.15 I05 intersection performance – existing and options

Performance measure	Existing		Option 1		Option 2	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.87	0.67	0.92	1.05	0.96	0.87
Average Delay (seconds)	31.1	21.3	38.3	45.8	45.4	30.1
Overall LoS	C	B	C	D	D	C
Approach with longest queue	Herbert Street north	Frederick Street	Frederick Street	Frederick Street	Frederick Street	Frederick Street
95 th percentile queue length (m)	145.3	86.4	149.3	181.9	168.3	112.3

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following recommendations have been made:

- Since the optimal phasing arrangement for this intersection does not require the right turn out of Frederick Street to run simultaneously with the left turn out of Frederick Street, it is recommended that Option 1 is taken forward (partial encroachment onto the footpath).
- Adopting this option reduces the lateral shift required for southbound through traffic and cyclists.

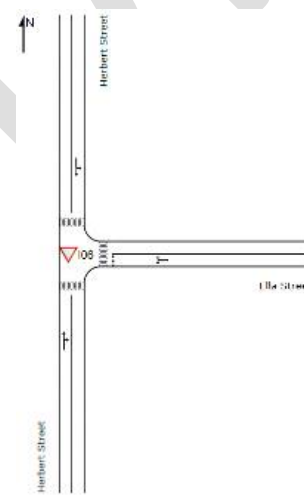
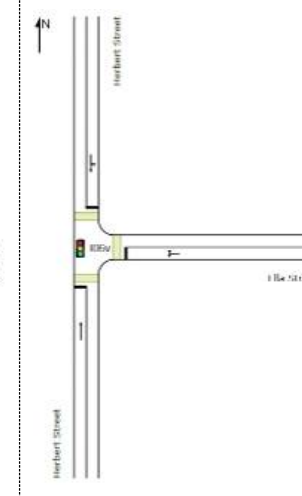
6.1.1.6 Herbert Street and Ella Street (I06)

Overview

As outlined in the issues and opportunities (see Section 4), pedestrian and cyclist safety at the intersection of Herbert Street and Ella Street is currently hindered by poor crossing facilities and vehicles turning out of Ella Street directly onto the on-road bike lane. Feedback from a recent pedestrian fatality on Ella Street (not included in the crash analysis data in Section 3.1.6), emphasises this issue.

A warrant assessment for the signalisation of this intersection has been undertaken in accordance with the RTA Traffic Signal Design Warrant Assessment (2011) (see Appendix B). The findings from this warrant assessment indicate that the intersection of Herbert Street and Ella Street technically does not warrant signalisation, however, comes extremely close in terms of traffic demand and therefore should be considered for signalisation. A warrant assessment for a pedestrian crossing at this intersection was also undertaken (see Appendix B), the results from which indicate that the intersection comes extremely close to requiring a pedestrian crossing. Considering these results and the recent fatality, a series of options involving signalisation and priority-control with raised zebra crossings were explored as part of the design options assessment (see Appendix C). Three final options have been taken forward for further assessment and are summarised in Table 6.16.

Table 6.16 I06 intersection configuration – existing and options

Existing	Option 1	Option 2	Option 3
Existing conditions include a priority-controlled intersection with refuge island provided on Herbert Street south and Ella Street.	Remains a priority-controlled intersection with the inclusion of a raised zebra crossing on all approach legs. Cycleway on the east side of Herbert Street.	Signalised intersection with pedestrian crossings on all legs and all turning movements maintained. Cycleway on the east side of Herbert Street.	Signalised intersection with pedestrian crossings on all legs and the right turn from Herbert Street south banned. Cycleway on the east side of Herbert Street.
			

Phasing

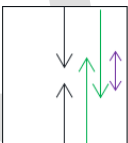
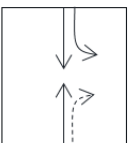
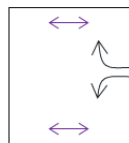
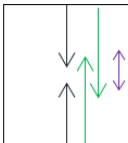
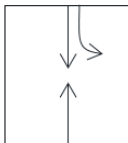
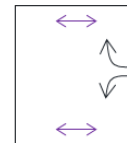
The proposed phasing for the signalised options (Option 2 and Option 3) is summarised in Table 6.17. For both options, optimal phasing time has been used to maximise the performance of each option. Locating the cycleway on the eastern side of Herbert Street poses challenges to the signal phasing arrangement, as vehicles turning into Ella Street will cross the cycleway, causing safety issues for cyclists if running in the same phase. Therefore, the cyclists and turning movements off Herbert Street need to be separated into two phases, which reduces the performance of the intersection and reduces the phase time available to cyclists to travel through the intersection.

Locating the cycleway on the western side of Herbert Street would resolve this issue, improving cyclist safety and maintaining satisfactory performance for both cyclists and general traffic. However, there are several constraints that render a cycleway on the west less feasible, including:

- South of Ella Street the western side of Herbert Street has a higher number of driveways and access roads, including the patient pick-up and drop-off at the Royal North Shore Hospital
- Moving the cycleway to the west of Herbert Street between Artarmon and the Royal North Shore Hospital will increase the number of times the cycleway crosses sides, reducing the efficiency and safety of cyclists.

As outlined in the design decision log (see Appendix C), split phasing was also explored for this intersection, due to the improved safety conditions that can be achieved under this arrangement. However, the results from SIDRA indicated unsatisfactory performance (LoS F), with significant delays and 95th percentile queues for most movements. As a result, the filter-turn option and right-turn ban outlined below were taken forward for further assessment.

Table 6.17 I06 signal phasing – options

Existing conditions	Option 1	Option 2	Option 3
Priority-controlled intersection configuration.	Priority-controlled intersection configuration.	Three phases where cyclists run with pedestrians in Phase A, with turn / filter turn into Ella Street introduced in Phase B. This arrangement effectively separates cyclists from the vehicle turning movements. The phase time allocated to cyclists in the AM peak is 17 sec (83 sec wait time) and in the PM peak is 15 sec (75 sec wait time).	Similar to Option 2 with the exception of right turns out of Herbert Street south and into Ella Street banned. This has performance implications which will be explored in the following section. The phase time allocated to cyclists in the AM peak is 17 sec (73 sec wait time) and in the PM peak is 13 sec (57 sec wait time).
N/A	N/A	   A Phase B Phase C Phase	   A Phase B Phase C Phase

Performance

The performance of the existing conditions and options for the intersection of Herbert Street and Ella Street has been assessed in SIDRA, for the AM and PM peaks. Detailed outputs are provided in Appendix A and a summary is provided in Table 6.18 below. As indicated the results for the existing conditions and option 1 are identical and perform satisfactorily across the AM and PM peaks.

Overall, the results indicate that intersection performance declines under the signalised options. Option 2 experiences the highest average delay and longest 95th percentile queues compared with Option 3. Queuing on Hebert Street north also

extends beyond the adjacent intersection of Herbert Street / Frederick Street, likely resulting in further congestion and delays at this intersection. In the AM peak, the right turn from Herbert Street south performs at LoS F, with a high average delay of 157.7 seconds. This low performance impacts the through movements from Herbert Street south, due to the provision of a single approach lane, resulting in extended queueing south to Lanceley Avenue.

Option 3 explores the removal of the right turn on Herbert Street south, which is a more typical approach for a single lane intersection approach. Overall intersection performance is improved for this option, with average delays almost half of Option 2 and the 95th percentile queue reduced.

One significant limitation of the signalised phasing arrangement for this intersection, is the limited amount of phase time allocated to cyclists. Currently the phase time allocated to cyclists in Option 2 and Option 3, is 17% and 19% of the overall phase time respectively (noting the minor improvement in Option 3). This current arrangement causes delays for cyclists, reducing the overall attractiveness of the cycleway. It is recommended that further interrogation of these phasing arrangements is completed, to help achieve better outcomes for cyclists.

Table 6.18 106 intersection performance – existing and options

Performance measure	Existing		Option 1		Option 2		Option 3	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
DoS	0.75	0.44	0.75	0.44	0.96	0.88	0.84	0.76
Average Delay (seconds)	5.5	3.9	5.5	3.9	41.3	28.2	22.1	15.6
Overall LoS	C	B	C	B	C	B	B	B
Approach with longest queue	Ella Street	Herbert Street south	Ella Street	Herbert Street south	Herbert Street south	Herbert Street south	Herbert Street north	Herbert Street north
95 th percentile queue length (m)	31.0	13.8	31.0	13.8	268.7	181.8	243.6	151.6

Recommendation

As a result of the design progress and SIDRA assessments undertaken, the following recommendations have been made:

- A signalised intersection option will improve safety conditions for cyclists and pedestrians through this intersection and therefore should be taken forward as the preferred option
- Option 3, which involves the removal of the right turn from Herbert Street south onto Ella Street, is the preferred option from a traffic and safety perspective. This option limits the overall decline in intersection performance compared with existing conditions and allocates more phase time to cyclists.

6.2 Road and lane access changes

To be finalised for the 90% design TIA

6.3 Active transport

To be finalised for the 90% design TIA

Appendix D

Warrant assessments



1 Intersection Assessment

A warrant assessment has been undertaken for two key intersections (Hampden Road / Brand Street and Herbert Street / Ella Street) within the Chatswood to St Leonards cycleway corridor. A warrant assessment for signalisation has been undertaken in accordance with the RTA Traffic Signal Design Warrant assessment (2011). In addition, a numerical warrant assessment for providing formalised pedestrian crossings has also been undertaken for key approaches, as per the Supplement to Australian Standard AS1742.10-2009 Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection.

1.1 Hampden Road / Brand Street

1.1.1 Traffic Signal Warrant Assessment

A warrant assessment has been undertaken for the Hampden Road / Brand Street intersection for each of the relevant criteria and is summarised in Table 1.2. Hampden Road has been identified as the major road and Brand Street as the minor road, based on the existing traffic volumes. The Pedestrian Safety – High speed road assessment criteria has been excluded from this assessment, as neither road in the intersection can be defined as a high speed road. The results indicate that this intersection does not warrant signalisation, however comes close in the traffic demand criteria as two out of the three approaches satisfy the demand requirements.

Table 1.1 Hampden Road / Brand Street warrant assessment

Warrant Assessment Criteria		Check			
(a) Traffic Demand					
For each of four one-hour periods of an average day:		(i & ii) As displayed in the table below, the criteria for a major road (>600 veh/hr), is not satisfied for the Hampden Road West approach only. Specifically, traffic flows on this approach fall within 47% - 67% of 600 vehicles per hour.			
(i)	The major road flow exceeds 600 vehicles hour in each direction and				
(ii)	The minor road flow exceeds 200 vehicles hour in one direction	Time period	Major – Hampden Road South (> 600 veh/h)	Major – Hampden Road West (> 600 veh/h)	Minor – Brand Street East (> 200 veh/h)
		8:15 – 9:15 AM	605	402 (67%)	399
		8:30 – 9:30 AM	619	382 (64%)	366
		4:45 – 5:45 PM	759	297 (50%)	457
		5:00 – 6:00 PM	755	283 (47%)	430
(b) Continuous traffic					
For each of four one-hour periods of an average day:		(i & ii) As displayed in the table below, the criteria for a major road (>900 veh/hr), is not satisfied for both Hampden Road approaches, with traffic volumes falling within the 67% - 84% range for Hampden Road South and 31% - 45% for Hampden Road West.			
(i)	The major road flow exceeds 900 vehicles hour in each direction and				
(ii)	The minor road flow exceeds 100 vehicles hour in one direction and	Time period	Major – Hampden Road South (> 900 veh/h)	Major – Hampden Road West (> 900 veh/h)	Minor – Brand Street East (> 100 veh/h)
(iii)	The speed of traffic on the major road or limited sight distance from the minor road causes undue delay or hazard to the minor road vehicles and	8:15 – 9:15 AM	605 (67%)	402 (45%)	399
		8:30 – 9:30 AM	619 (69%)	382 (42%)	366
		4:45 – 5:45 PM	759 (84%)	297 (33%)	457
(iv)	There is no other nearby traffic signal site easily accessible to the minor road vehicles.	5:00 – 6:00 PM	755 (84%)	283 (31%)	430
		(iii) Observations indicate the possibility for some limited sight distance for vehicles on the Brand Street approach, as both Hampden Road approaches curve from the intersection. However results from SIDRA 9.1 intersection modelling during the AM Peak period (testing the intersection in isolation), indicate satisfactory level of service and delay for vehicles on the minor road (Brand Street) approach (LOS A and average delay of 5.6 seconds)			
		(iv) Whilst there are no signalised intersections on the minor road (Brand Street) there is a signal intersection north (approximately 350 metres) on the major road Hampden Road. This likely does not satisfy this criteria.			

Warrant Assessment Criteria		Check
(c) Pedestrian safety		
For each of four one-hour periods of an average day:		(i) Using the same time periods considered for (a) and (b), pedestrian flow crossing the major road (Hampden Road) has been summarised in the table below, with the proportion of 150 persons per hour displayed. As shown, Hampden Road on experiences between 5% - 13% of 150 people per hour during the four one-hour time periods specified and therefore does not satisfy this criteria.
(i) <i>The pedestrian flow crossing the major road exceeds 150 persons per hour and</i>		
(ii) <i>The major road flow exceeds 600 vehicles per hour in each direction or, where there is a central median of at least 1.2m wide, 1000 vehicles per hour in each direction</i>	Time period	Major – Hampden Road (> 150 p/h)
	8:15 – 9:15 AM	10 (7%)
	8:30 – 9:30 AM	8 (5%)
	4:45 – 5:45 PM	20 (13%)
	5:00 – 6:00 PM	14 (9%)
		(ii) As summarised in (a) (i & ii) vehicle demand does not reach 600 veh/h for the Hampden Road west approach and therefore does not satisfy this criteria.
Crashes		
(i) <i>The intersection has been the site of an average of three or more reported tow-away or casualty traffic accidents per year over a three year period, where the traffic accidents could have been prevented by traffic signals and (not the case given no reported crash history on the new road network)</i>	(i) Crash data (2018 – 2022) indicates that only one incident occurred within the vicinity of the intersection at the approach on Brand Street (in 2022), resulting in a serious injury. This does not satisfy the criteria for three or more reported traffic accidents per year over a three-year period.	
	(ii) As depicted in (a) (i) and (b) (i), traffic flows do not consistently meet at least 80% of the appropriate flow warrant across all intersection approaches and therefore does not satisfy this criteria.	
(ii) <i>The traffic flows are at least 80% of the appropriate flow warrants.</i>		

1.1.2 Pedestrian Crossing Warrant Assessment

Another option is to consider providing pedestrian crossings on the Brand Street and Hampden Road south approaches to support safety for walking and cycling if the intersection remains unsignalised. Note that Hampden Road West has not been considered for this assessment as providing a crossing on this approach would not be safe or feasible with the proposed design, within the available carriageway. A normal warrant for pedestrian (zebra) crossings has been undertaken for the two approaches as summarised below.

The findings from the numerical warrant assessments indicate that both intersection approaches do not meet the criteria for providing a pedestrian crossing. However, it is important to note that TfNSW states that the warrant requirements for a specific number of people crossing, do not have to be met on local streets for installing a new zebra crossing. If council is in support of providing a pedestrian crossing on a local road, an exemption can be granted.

Brand Street

A pedestrian (zebra) Crossing is warranted where:

in each of three separate one hour periods in a typical day

a) *The pedestrian flow per hour (P) crossing the road is greater than or equal to 30 AND*

This demand is **not satisfied** on the Brand Street East approach (see Table 1.2), however this is likely due to the lack of a formalised crossing point at this intersection approach. It is likely that pedestrians are currently using the refuge approximately 40 m east of the intersection to cross Brand Street.

b) *The vehicular flow per hour (V) through the site is greater than or equal to 500 AND*

The vehicle flow requirement is **satisfied** for the Brand Street East approach (see Table 1.2), where the combined traffic flow on Brand Street East consistently exceeds 500 veh/h during the three specified time periods.

c) *The product PV is greater than or equal to 60,000*

The product PV is consistently less than 60,000 (see Table 1.2), primarily due to the low number of pedestrian flows through the intersection approach and is therefore **not satisfied**.

Table 1.2 Brand Street flows

Time period	Brand Street East (≥ 30 p/h)	Brand Street East (≥ 500 veh/h)	Brand Street East (≥ 60,000 PV/h)
9:45 – 10:45 AM	2 (7%)	691	1,382 (2%)
10:00 – 11:00 AM	2 (7%)	683	1,366 (2%)
2:15 – 3:15 PM	3 (10%)	873	2,619 (4%)

Hampden Road South

A pedestrian (zebra) Crossing is warranted where:

in each of three separate one hour periods in a typical day

a) *The pedestrian flow per hour (P) crossing the road is greater than or equal to 30 AND*

This demand is **not satisfied** on the Hampden Road South approach (as summarised in Table 1.3), however this is likely due to the lack of a formalised crossing point at this intersection approach.

b) *The vehicular flow per hour (V) through the site is greater than or equal to 500 AND*

The vehicle flow requirement is **satisfied** for the Brand Street East approach (see Table 1.3) where the combined traffic flow on Brand Street East consistently exceeds 500 veh/h during the three specified time periods.

(c) The product PV is greater than or equal to 60,000

The product PV is consistently less than 60,000 (see Table 1.3), primarily due to the low number of pedestrian flows through the intersection approach and is therefore **not satisfied**.

Table 1.3 **Hampden Road south approach flows**

Time period	Hampden Road South (≥ 30 p/h)	Hampden Road South (≥ 500 veh/h)	Hampden Road South ($\geq 60,000$ PV/h)
7:45 – 8:45 AM	6 (20%)	1171	7,026 (12%)
8:00 – 9:00 AM	5 (17%)	1235	6,175 (10%)
3:45 – 4:45 PM	3 (10%)	1116	3,348 (6%)

1.2 Herbert Street / Ella Street

A warrant assessment has been undertaken for the Herbert Street / Ella Street intersection for each of the relevant criteria and is summarised in Table 1.5. Herbert Street has been identified as the major road and Ella Street as the minor road, based on the existing traffic volumes. The Pedestrian Safety – High speed road assessment criteria has been excluded from this assessment, as neither road in the intersection can be defined as a high speed road. The results indicate that this intersection does not technically warrant signalisation, however comes close in the traffic demand criteria as two out of the three approaches, with the non-compliant approach flows falling within 85% - 91% of the desired flow value.

Warrant Assessment Criteria		Check			
(a) Traffic Demand					
For each of four one-hour periods of an average day:		(i & ii) As displayed in the table below, the criteria for a major road (>600 veh/hr), is not technically satisfied for Herbert Street South approach only. However, it should be noted that the traffic flows fall within a close range of the required flows, within 85% - 91% of the required traffic flows.			
(i) The major road flow exceeds 600 vehicles hour in each direction and					
(ii) The minor road flow exceeds 200 vehicles hour in one direction					
		Time period	Major – Herbert Street North (> 600 veh/h)	Major – Herbert Street South (> 600 veh/h)	Minor – Ella Street East (> 200 veh/h)
		8:15 – 9:15 AM	810	523 (87%)	248
		8:30 – 9:30 AM	729	546 (91%)	234
		3:30 – 4:30 PM	642	511 (85%)	222
		3:45 – 4:45 PM	654	515 (86%)	203
(b) Continuous traffic					
For each of four one-hour periods of an average day:		(i & ii) As displayed in the table below, the criteria for a major road (>900 veh/hr), is not satisfied for both Herbert Street approaches, noting that traffic flows on Herbert Street North approach reach within 71% - 90% of 900 veh/hr.			
(i) The major road flow exceeds 900 vehicles hour in each direction and					
(ii) The minor road flow exceeds 100 vehicles hour in one direction and					
(iii) The speed of traffic on the major road or limited sight distance from the minor road causes undue delay or hazard to the minor road vehicles and					
(iv) There is no other nearby traffic signal site easily accessible to the minor road vehicles.					
		Time period	Major – Herbert Street North (> 900 veh/h)	Major – Herbert Street South (> 900 veh/h)	Minor – Ella Street East (> 100 veh/h)
		8:15 – 9:15 AM	810 (90%)	523 (58%)	248
		8:30 – 9:30 AM	729 (81%)	546 (61%)	234
		3:30 – 4:30 PM	642 (71%)	511 (57%)	222
		3:45 – 4:45 PM	654 (73%)	515 (57%)	203
		(iii) Sight distance from the Ella Street approach is satisfactory and results from SIDRA 9.1 intersection modelling during the AM Peak period (testing the intersection in isolation), indicate satisfactory level of service for Ella Street (LOS B) with a higher average delay of 23.3 seconds compared with the Hampden Road / Brand St intersection. The speed limit along Herbert Street is 40 km/h however anecdotal evidence indicates vehicles likely travel faster through the intersection.			
		(iv) There is a traffic signal approximately 169 metres north of the intersection (on Herbert Street) and therefore this criteria is not satisfied .			

Warrant Assessment Criteria		Check										
(c) Pedestrian safety												
For each of four one-hour periods of an average day:		(i) Using the same time periods considered for (a) and (b), pedestrian flow crossing the major road (Herbert Street) has been summarised in the table below, with the proportion of 150 persons per hour displayed. Herbert Street experiences between 35% - 47% of 150 people per hour during the four one-hour time periods specified. This criteria is not satisfied for the intersection.										
(i) The pedestrian flow crossing the major road exceeds 150 persons per hour and	(ii) The major road flow exceeds 600 vehicles per hour in each direction or, where there is a central median of at least 1.2m wide, 1000 vehicles per hour in each direction	<table><tr><th>Time period</th><th>Major – Herbert Street (> 150 p/h)</th></tr><tr><td>8:15 – 9:15 AM</td><td>60 (40%)</td></tr><tr><td>8:30 – 9:30 AM</td><td>52 (35%)</td></tr><tr><td>3:30 – 4:30 PM</td><td>70 (47%)</td></tr><tr><td>3:45 – 4:45 PM</td><td>71 (47%)</td></tr></table>	Time period	Major – Herbert Street (> 150 p/h)	8:15 – 9:15 AM	60 (40%)	8:30 – 9:30 AM	52 (35%)	3:30 – 4:30 PM	70 (47%)	3:45 – 4:45 PM	71 (47%)
Time period	Major – Herbert Street (> 150 p/h)											
8:15 – 9:15 AM	60 (40%)											
8:30 – 9:30 AM	52 (35%)											
3:30 – 4:30 PM	70 (47%)											
3:45 – 4:45 PM	71 (47%)											
		(ii) As summarised in (a) (i & ii) vehicle demand does not reach 600 veh/h for the Herbert Street south approach and therefore does not satisfy this criteria.										
Crashes												
(i) The intersection has been the site of an average of three or more reported tow-away or casualty traffic accidents per year over a three year period, where the traffic accidents could have been prevented by traffic signals and (not the case given no reported crash history on the new road network)	(ii) The traffic flows are at least 80% of the appropriate flow warrants.	(i) Crash data (2018 – 2022) indicates that no incidents occurred within the vicinity of the intersection during this time period. However, it is known that a fatality at the intersection on Ella Street occurred in 2023, potentially indicating underlying safety issues. However, these results do not satisfy the criteria. (ii) As depicted in (a) (i), traffic flows consistently meet at least 80% of the appropriate flow warrant, however for (b) (i) this is not the case. However the results from (a) (i) may be deemed satisfactory for the criteria.										

1.2.2 Pedestrian Crossing Warrant Assessment

As with the Hampden Road / Brand Street intersection, another option is to consider providing a pedestrian crossing on Ella Street to support safety for walking and cycling through the intersection. This is particularly important given the recent fatality on Ella Street, which needs to be addressed through an improvement to pedestrian safety and priority. A normal warrant for pedestrian (zebra) crossings has been undertaken for the Ella Street approach as summarised below.

The findings from the assessment indicate that whilst Ella Street technically does not meet the requirements of the numerical warrant assessment, it is extremely close, with the only non-compliance in the PV measure for two time periods (results falling within 92% - 98% of the desired value). It is important to note that TfNSW states that the warrant requirements for a specific number of people crossing, do not have to be met on local streets for installing a new zebra crossing. If council is in support of providing a pedestrian crossing on a local road, an exemption can be granted.

Ella Street

A pedestrian (zebra) Crossing is warranted where:

on each of three separate one hour periods in a typical day

- a) The pedestrian flow per hour (P) crossing the road is greater than or equal to 30 AND*

The pedestrian flow demand is **satisfied** on Ella Street (see Table 1.6).

- a) The vehicular flow per hour (V) through the site is greater than or equal to 500 AND*

The vehicle flow is **satisfied** through Ella Street (see Table 1.6).

- b) The product PV is greater than or equal to 60,000*

The product (PV) for Ella Street falls just short of satisfaction across all time periods but is consistently between 92% and 98% of the target value of 60,000. While technically **not satisfying** the criteria, the proximity of the results should be considered.

Table 1.5 Ella Street pedestrian flow

Time period	Ella Street (≥ 30 p/h)	Ella Street (≥ 500 veh/h)	Ella Street (≥ 60,000 PV/h)
8:00 – 9:00 AM	110	532	58,520 (98%)
8:15 – 9:15 AM	122	511	62,342
8:30 – 9:30 AM	110	502	55,220 (92%)

Appendix E

Design decision log



Design Decision log

Chatswood to St Leonards Cycleway

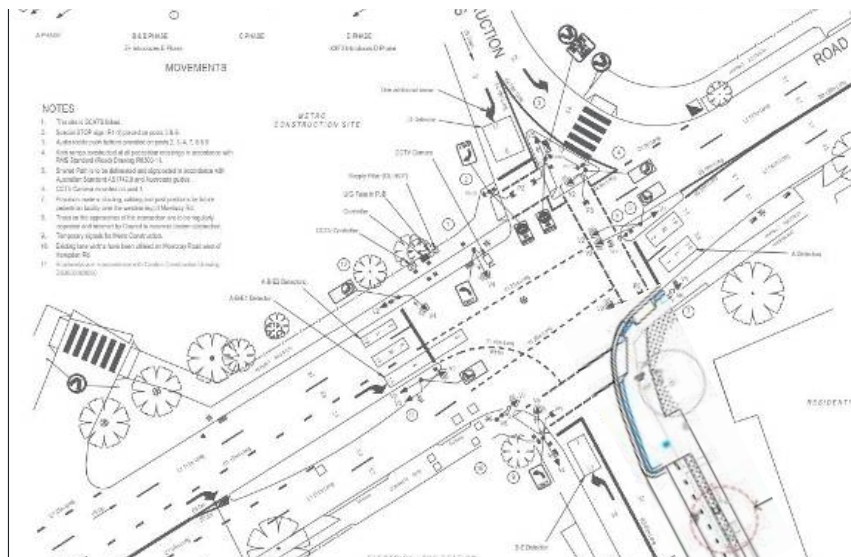


Hampden Road / Mowbray Road

Design decisions



Overview



Design objectives:

- Provide dedicated, parallel cycleway movement with pedestrian crossing.
- Consider Frank Shannon walk & future development – School at Dive Site
- Confirm cycleway on east side is best outcome

Previous design:

- Shared cycleway and pedestrian phasing from Dive site.
- Cyclist entering shared pedestrian footpath on Hampden Rd.

Option 1



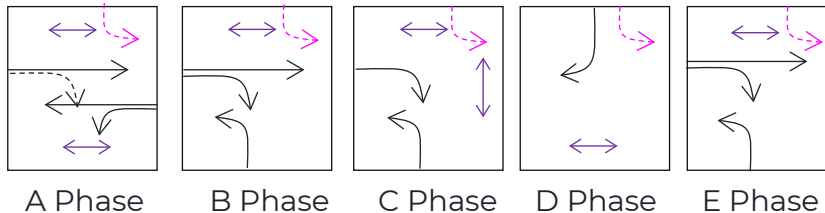
Features:

Cycleway & crossing on eastern side. Remove splitter island & provide kerb return.

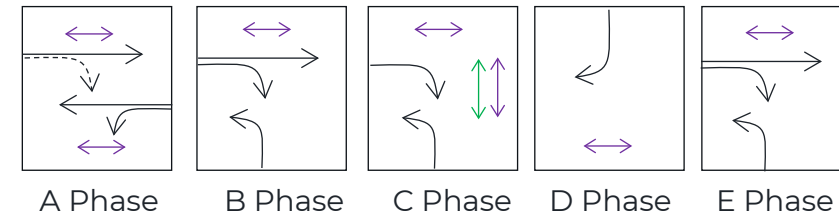
Considerations:

- + Achieves wider crossing & larger storage area compared to base design and Option 1.
- + Provides a more direct & safe connection for cyclists & pedestrians. Large storage area.
- No crossing on the western side
- LT out of north leg can be subjected to delay caused by pedestrian crossing.

Existing signal phasing



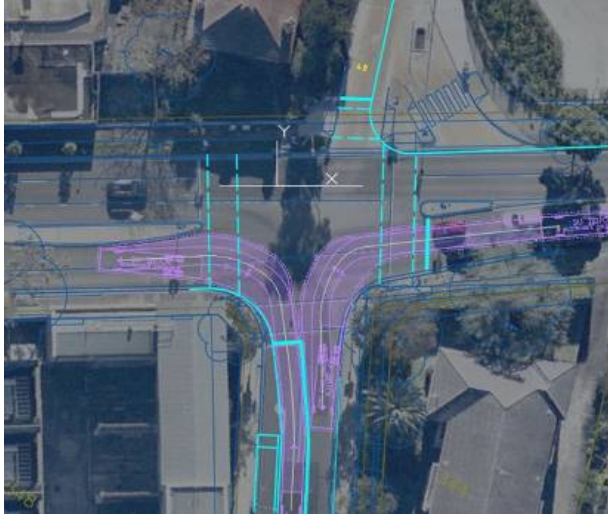
Proposed signal phasing



Design decision: This option was initially progressed, however ultimately dropped with the Rev C Concept Design submission, due to changes to the metro dive site still unconfirmed.

Date:
25/08/25

Option 2



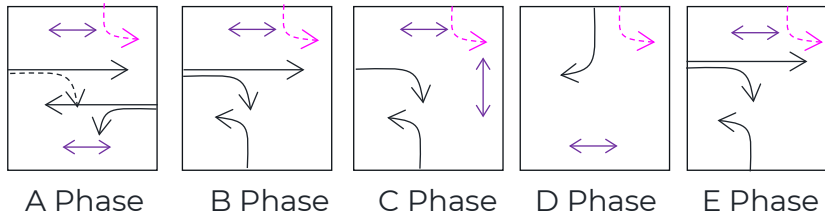
Features:

Cycleway & crossing on western side. Remove splitter island & provide kerb return.

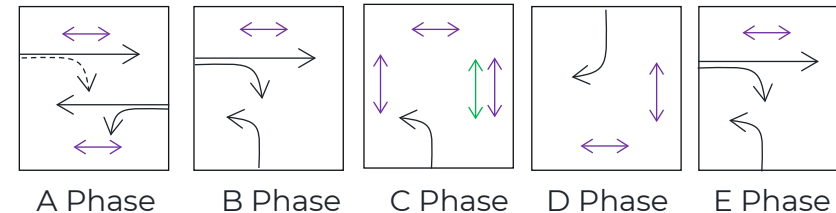
Considerations:

- + Achieves crossing across all approaches of intersection
- Approach lane in southern leg needs to be skewed to accommodate turn paths
- Restricted space at south-west and north-west corner. Potential overcrowding if cycleway is on the western side of Hampden Rd
- Intersection operation is sensitive to coordination with Pacific Hwy/Mowbray Rd. Additional delay caused by the crossing on western side could have adverse impact to queueing on EB Mowbray Rd in peak periods.

Existing signal phasing



Proposed signal phasing



Design decision: This option was assessed and was found to have potential traffic implications for the neighbouring intersection of the Pacific Highway / Mowbray Road. Further development of this design was paused pending agreement to further assess the traffic impacts in more detail.

Date:
23/08/24

Hampden Road / Mowbray Road

Option 3



Features:

Cycleway & crossing on eastern side. Increase size of splitter island.

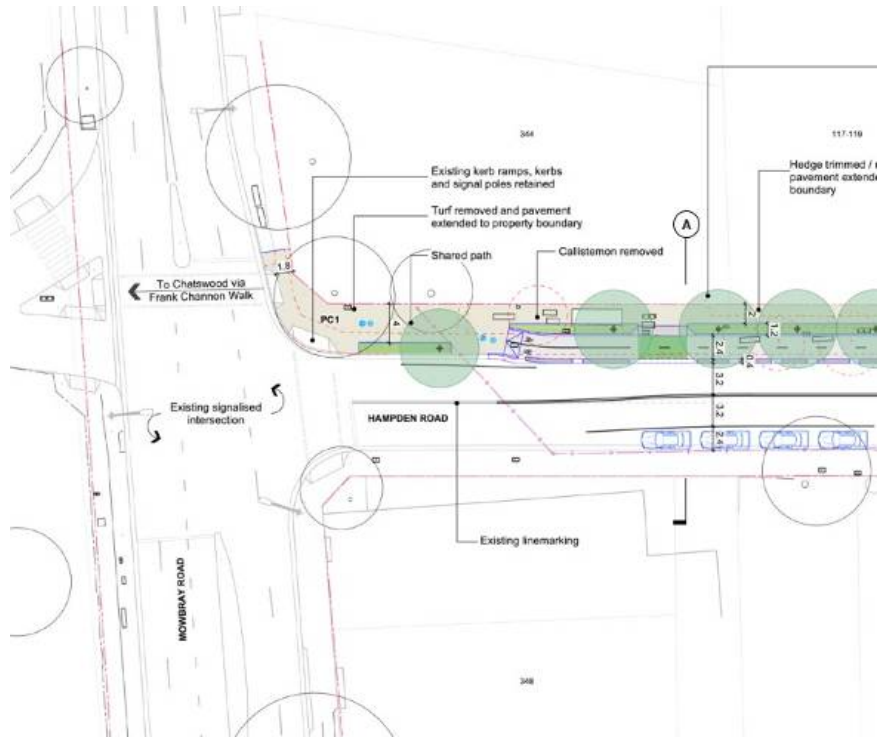
Considerations:

- + Achieves wider crossing & larger storage area compared to base design.
- + LT out of north leg operates independently & not subject to delay caused by pedestrian crossing.
- No crossing on the western side
- Splitter island requires 2-stage crossings for cyclists & pedestrians. Less direct, less safe & can potentially have overcrowding issues if future demand is high.

Design decision: This design was ultimately dropped as the slip lane on the northern approach leg is planned for removal as per current works at the Chatswood Dive Site. Options exploring a kerb build-out have been selected for progression.

Date:
24/07/24

Final Concept design



Features:

Existing intersection configuration retained with slip lane still intact.

Considerations:

- + Turf removal and pavement widening on the southeast kerb to increase pedestrian storage space
- + Consistent with existing conditions and will not impact existing intersection operations which are typically constrained.

Hampden Road / Brand Street

Design decisions

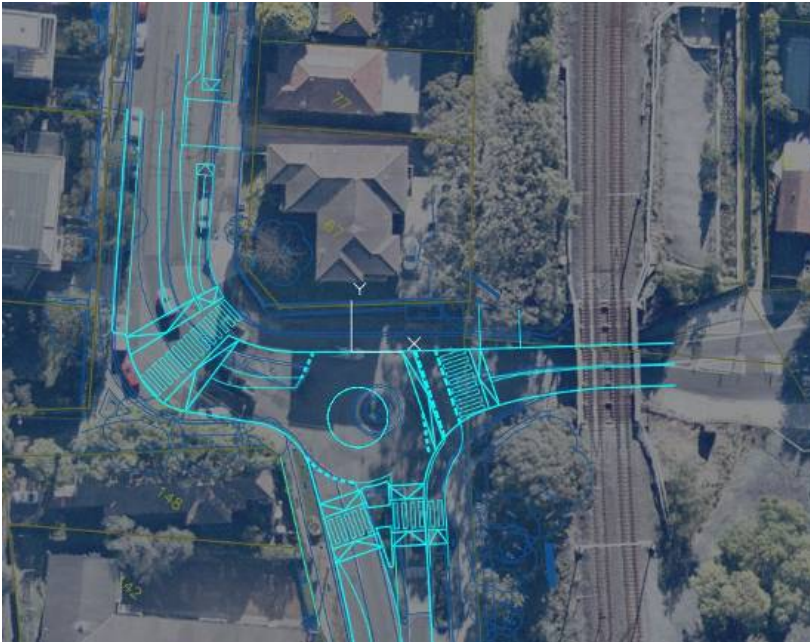


- Remove shared path option for a dedicated on-road cycleway, signalised movement. To achieve a dedicated cycleway in Artarmon Local Centre where feasible.
- Confirmation it meets required warrants

- Shared cycleway and pedestrian path north side of intersection
- Shared cycleway and pedestrian phasing on signalised crossing

Hampden Road / Brand Street

Option 1



Features:

Roundabout configuration retained in this option. Cycleway on the west side and pedestrian crossings on the western and southern approaches.

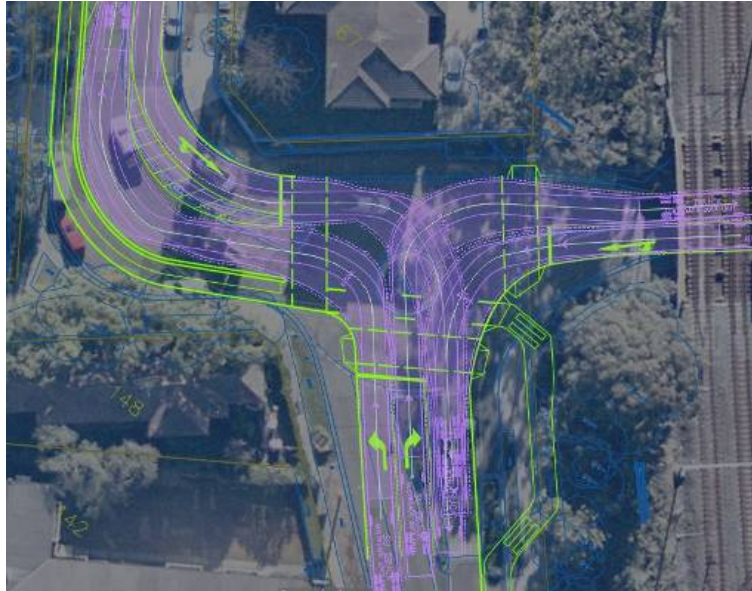
Considerations:

- + Retaining the roundabout minimises the impact of this upgrade on the local traffic environment / character.
- Unsignalised option can lead to greater safety implications for cyclists and pedestrians.
- Traffic calming measures required to improve safety for cyclists and pedestrians.
- Cycleway on the west requires cyclists to switch sides south of Mowbray Road / Hampden Road.

Design decision: This option was progressed to concept design. An update to this option was explored, in which the pedestrian crossing on the southern leg was shifted south of the intersection.

Date:
23/08/24

Option 2



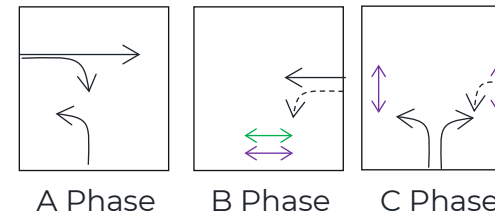
Features:

Signalised option proposed with the cycleway on western side & pedestrian / cyclist crossing on all intersection legs.

Considerations:

- + Design provides tie-in between cycleway on western side of Hampden (north of Brand) & eastern side of Hampden (south of Brand) without compensating on existing pedestrian space.
- + Design achieves wider storage area for pedestrians compared to existing conditions and base design particularly for south-east & south-west kerb returns
- + Achieves pedestrian crossing across all approach
- + Base design proposed phasing generally maintained.
- Pedestrian crossing across cycle path needed to provide clear path for cyclists. However, could cause pedestrian/cyclist conflict.
- Steep road gradient on Hampden, north of the intersection to be resolved
- Cycleway on the west requires cyclists to switch sides south of Mowbray Road / Hampden Road.

Proposed signal phasing



Design decision: This option was explored as part of the Traffic Impact Assessment, however ultimately an unsignalised option was taken forward to the concept design, as it better aligns with the council's objectives.

Date:
06/09/24

Hampden Road / Brand Street

Option 3



Features:

Cycleway & crossing on eastern side.

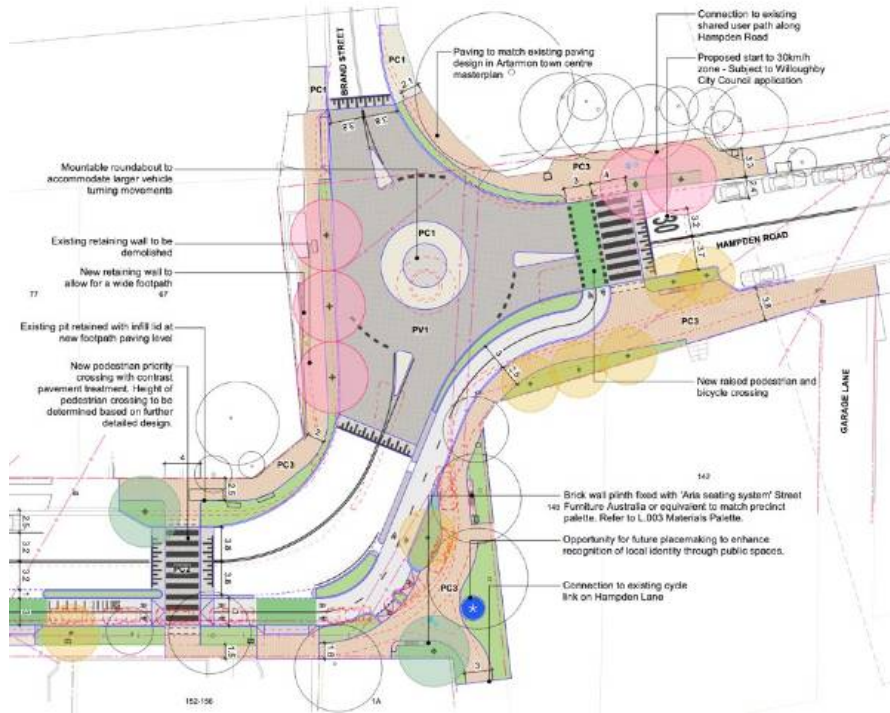
Considerations:

- + Design provides tie-in between cycleway on eastern side without compensating on existing pedestrian space
- + Design achieves wider storage area for pedestrians compared to existing conditions and base design particularly for south-east & south-west kerb returns
- + Achieves pedestrian crossing across all approach
- + Base design proposed phasing generally maintained.
- Steep road gradient on Hampden, north of the intersection to be resolved

Design decision: This option will not be taken forward as it has been determined safest to include the cycleway on the western side of Hampden Road at this intersection specifically.

Date:
24/07/24

Final Concept design



Features:

Roundabout with cycleway on the west, transitioning to the east at the south of the intersection. Wombat crossings on the northern and southern approaches.

Considerations:

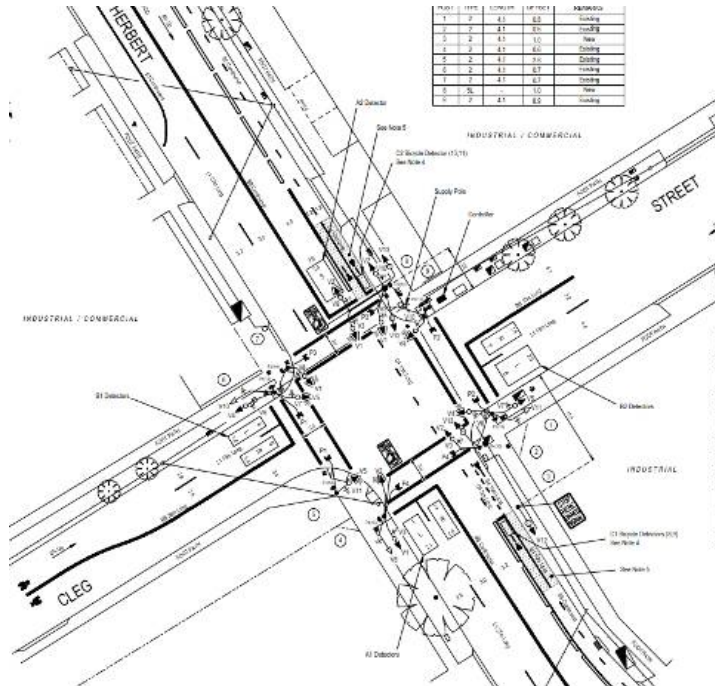
- + Facilitates continuous and separated cycleway through the intersection
- + Maintains existing roundabout configuration
- + Design achieves wider storage area for pedestrians compared to existing conditions
- + Achieves pedestrian crossing on the north and south approaches
- Cycleway transition from east to west to east to minimise the impact of the steep grade and corner on safety

Herbert Street / Cleg Street

Design decisions



Overview



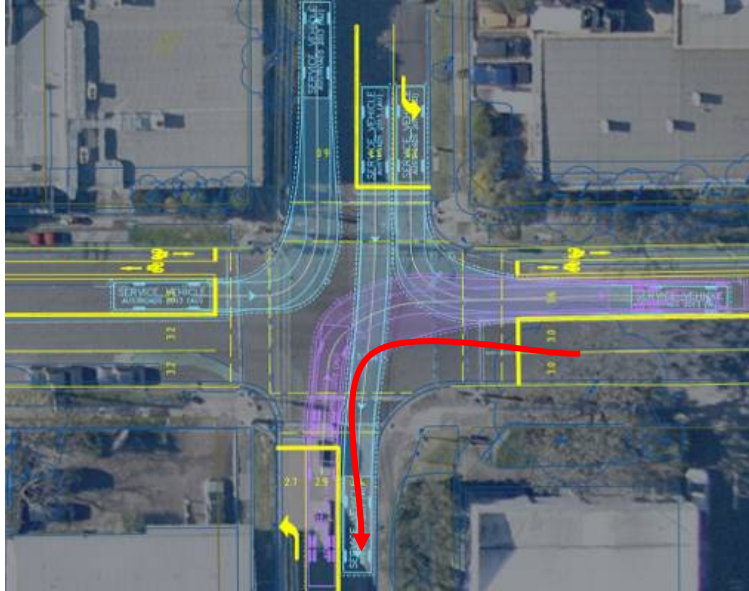
Design objectives:

- Provide wider cycleway lane and medians (to include planting opportunities where possible)
- Provide a separated cycling phase protecting cyclists from vehicle turning movements

Previous design:

- Dedicated on-road cycleway signalised crossing
- Cycleway start line setback (south) from the intersection

Option 1



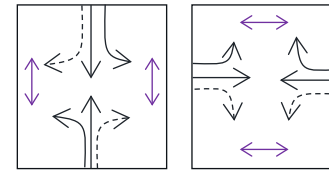
Features:

Cycleway on eastern side and heavy vehicles banned from turning east out of Cleg Street. This change allows the cycleway start line to be moved north, aligning it with the intersection..

Considerations:

- + Design brings the cycleway stop line closer to the intersection compared with the previous design.
- + Provides 3.6m wide pedestrian crossings across all legs.
- Ban on 8.8m long vehicles turning out of Cleg Street (east) onto Herbert Street south, requiring re-routing.

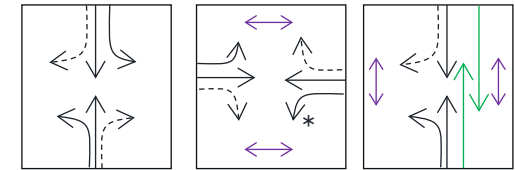
Existing signal phasing



A Phase

B Phase

Proposed signal phasing



A Phase

B Phase

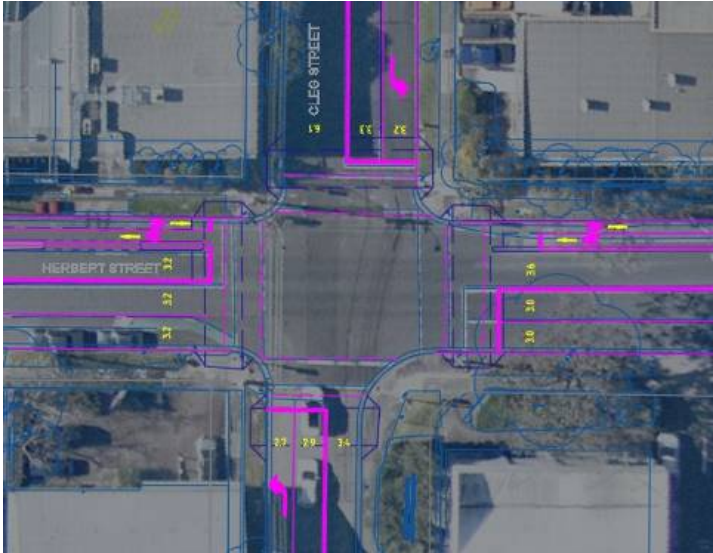
C Phase

*Heavy vehicle movement banned

Design decision: This design was taken forward to concept design, with agreement to ban the heavy vehicle turning movements out of Cleg Street east pending council approval.

Date:
06/09/24

Option 2



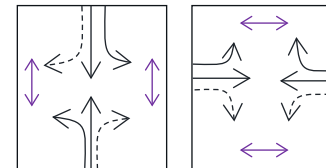
Features:

Cycleway on eastern side.

Considerations:

- + Provides 3.6m wide pedestrian crossings across all legs.
- + No bans on heavy vehicle movements (out of Cleg Street east)
- Cycleway stop line remains south of the intersection.

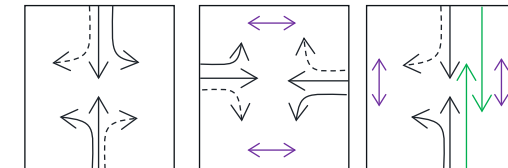
Existing



A Phase

B Phase

Proposed signal phasing



A Phase

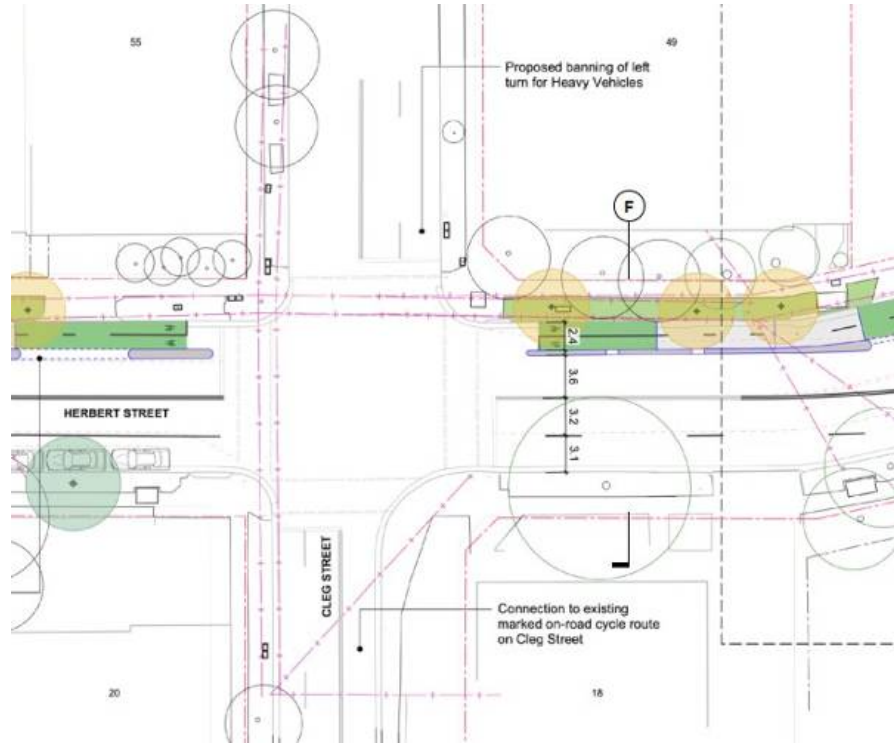
B Phase

C Phase

Design decision: This design was assessed as part of the concept design and remains the option if council does not approve the heavy vehicle turning movement ban out of Cleg Street.

Date:
06/09/24

Final concept design

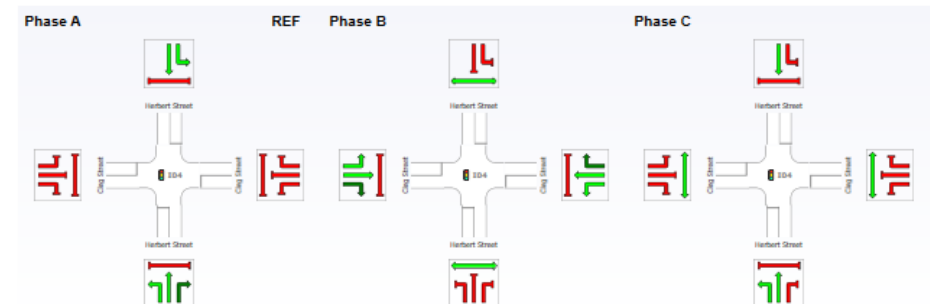


Features:

Two-way cycleway on the eastern side of the road. Herbert Street north approach reduced from two travel lanes to one.

Considerations:

- + Facilitates continuous and separated cycleway through the intersection
- + On-street parking retained on the western kerbside
- Left turn ban (from Cleg Street east) for vehicles over 8.8 metres
- Right turn ban from Herbert Street north into Cleg Street west for general traffic

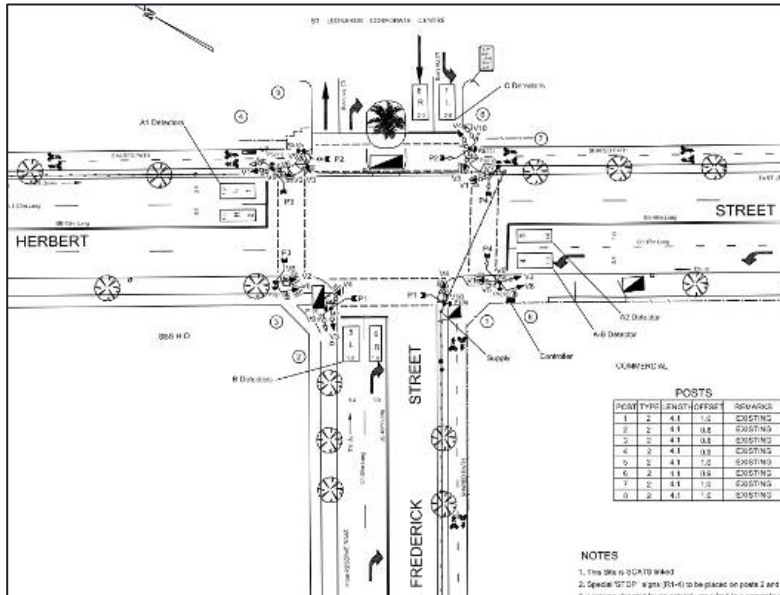


Herbert Street / Frederick Street

Design decisions



Overview



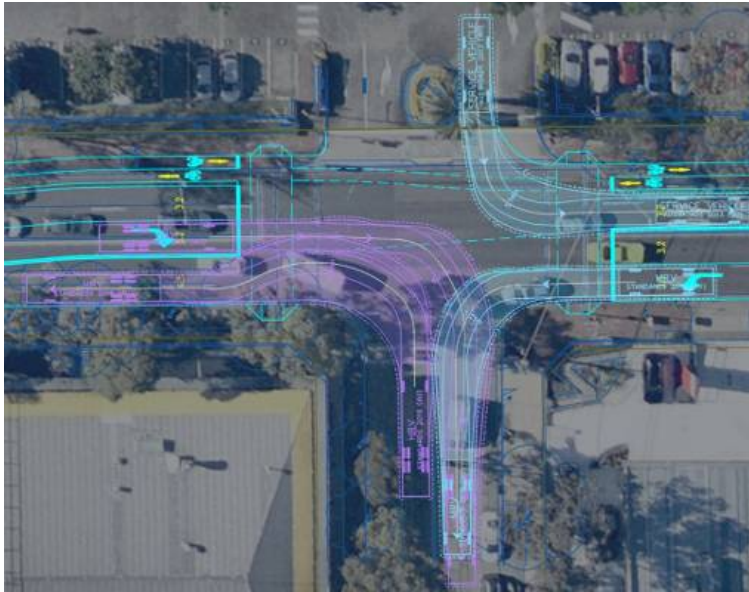
Design objectives:

- Remove shared path option for a dedicated on-road cycleway, signalised movement. To achieve a dedicated cycleway.

Current proposal:

- Shared cycleway and pedestrian path east side at intersection
- Shared cycleway and pedestrian phasing on signalised crossing

Option 1



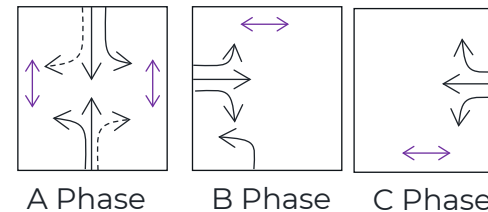
Features:

Cycleway on eastern side.

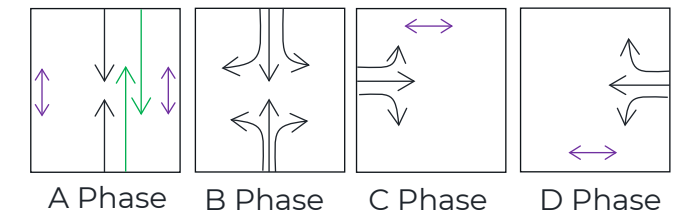
Considerations:

- + Maintains the existing number of approach and exit lanes at all legs.
- + Provides 3.6m wide pedestrian crossings across all legs.
- Cycleway encroaches on the footpath.
- Right turn into Frederick Street cannot run simultaneously with left turns out of Frederick Street.

Existing



Option 1



Design decision: It was decided that the intersection would be reconfigured to included a shared path on the eastern kerbside rather than a separated cycling facility.

Date:
06/09/24

Option 2



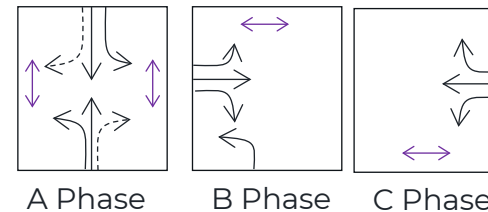
Features:

Cycleway on eastern side.

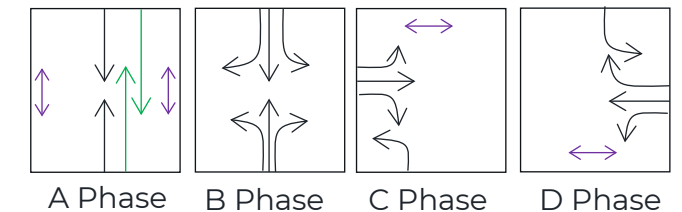
Considerations:

- + Maintains the existing number of approach and exit lanes at all legs.
- + Provides 3.6m wide pedestrian crossings across all legs.
- Property acquisition required to maintain suitable footpath width.
- Significant lateral shift for through southbound traffic increases the risk of incidents.

Existing



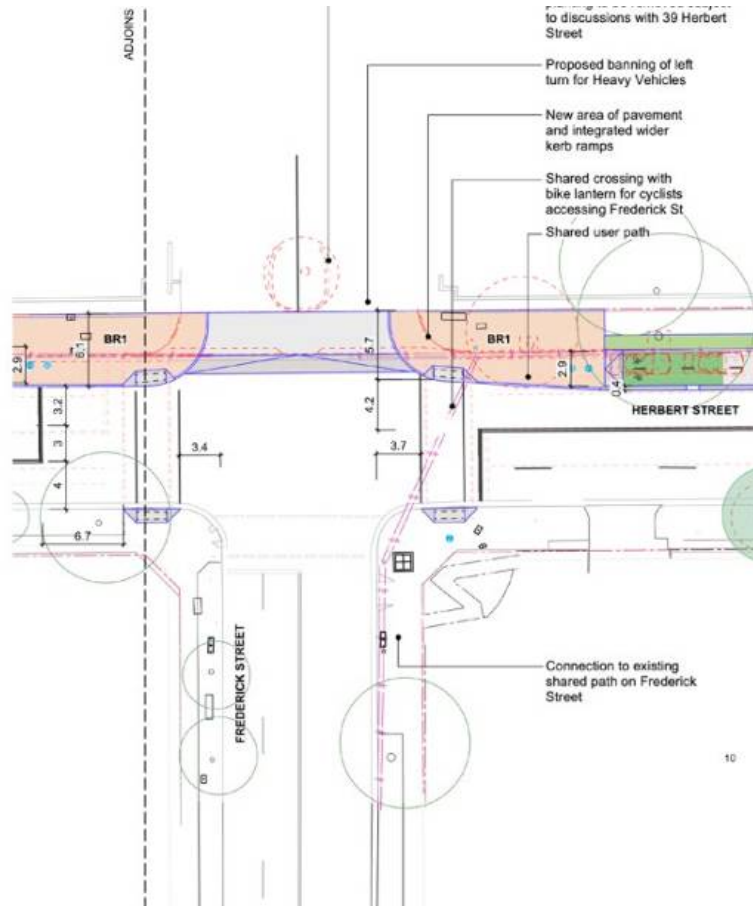
Option 2



Design decision: It was decided that the intersection would be reconfigured to included a shared path on the eastern kerbside rather than a separated cycling facility.

Date:
06/09/24

Final concept design

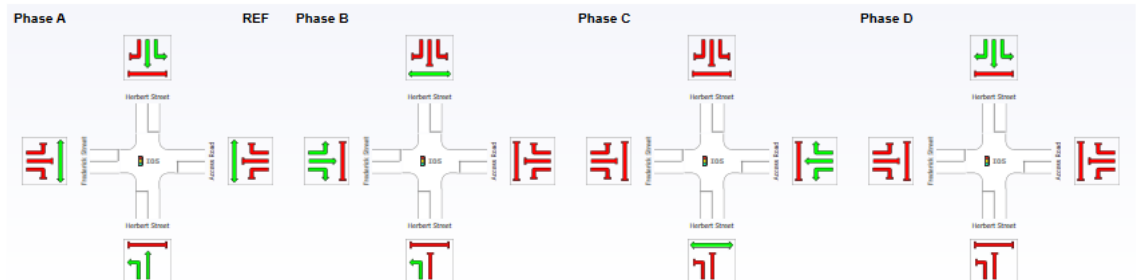


Features:

Two-way cycleway on the eastern side of the road, transitioning to a shared path at the intersection.

Considerations:

- + Cycling facilities provided on the eastern side of the intersection
- Transition to shared path required given the constrained intersection configuration and heavy vehicle needs
- Right turn into Frederick Street for heavy vehicles banned
- Left turn from Frederick Street east into Herbert Street south banned for vehicles over 8.8 m

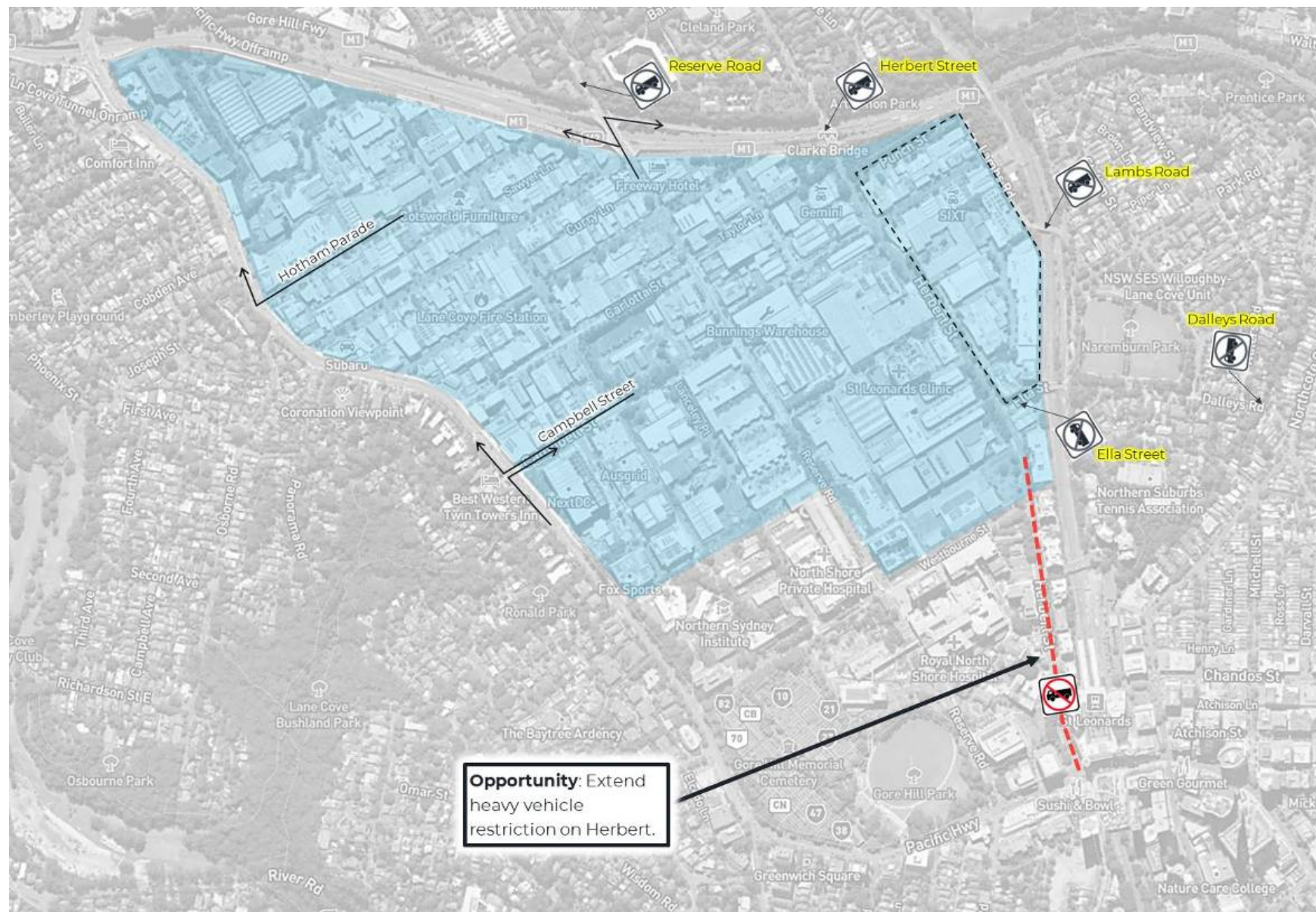


Heavy vehicle access

Herbert Street, Cleg Street & Frederick
Street



Heavy vehicle access



Heavy vehicle access

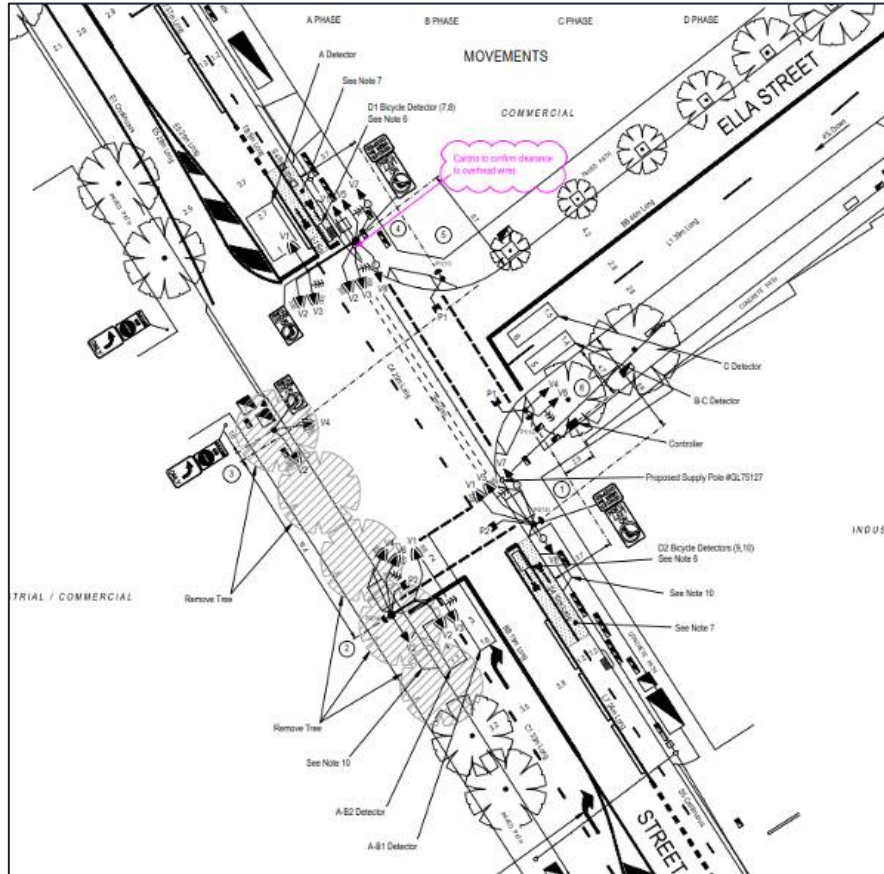


Herbert Street / Ella Street

Design decisions



Overview



Design objectives:

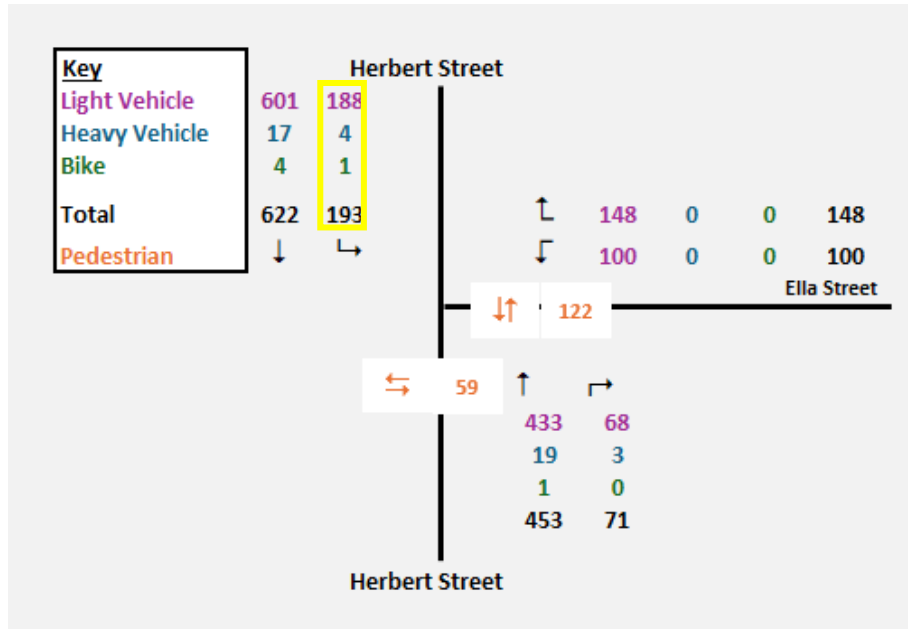
- Investigate warrant requirements for signalised intersection & consider recent fatality at intersection
- Crash analysis of intersection
- Provide alternative to removal of significant existing tree at intersection

Current proposal:

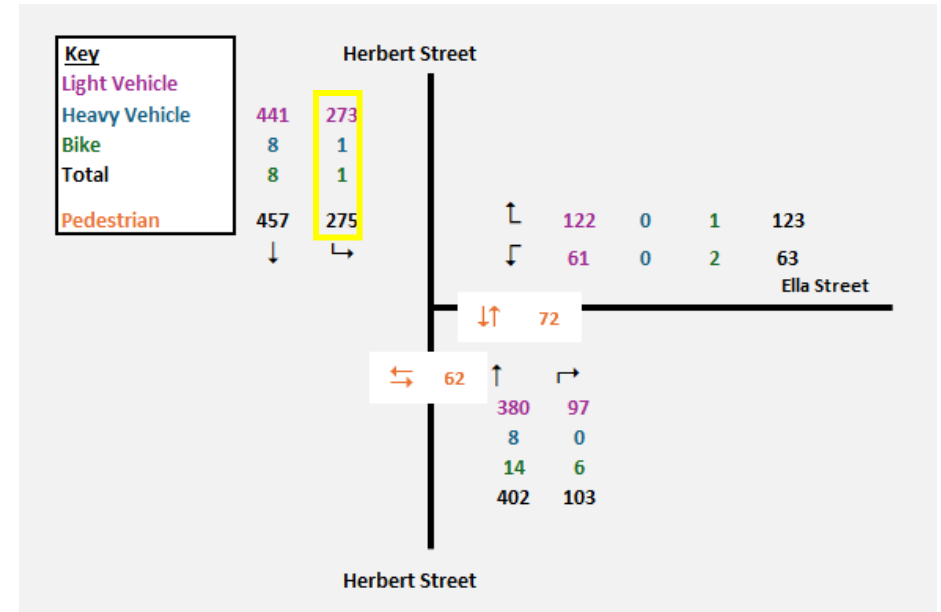
- Dedicated on road cycleway signalised at intersection.
- TfNSW provided feedback that it does not meet the required warrants.

Traffic demand

AM Peak



PM Peak



Heavy demand for left turns from Herbert Street north onto Ella Street.

Warrant Assessment

Traffic demand requirements: 600 vph on major road each direction, 200 on minor road

Time period	Major – Herbert Street North (> 600 veh/h)	Major – Herbert Street South (> 600 veh/h)	Minor – Ella Street East (> 200 veh/h)
8:15 – 9:15 AM	810	523 (87%)	248
8:30 – 9:30 AM	729	546 (91%)	234
3:30 – 4:30 PM	642	511 (85%)	222
3:45 – 4:45 PM	654	515 (86%)	203

Warrant for one of the “major” road is nearly met with demand approx. 90% of warrant.

Pedestrian safety requirements: 150 persons/hr, 600 vph in each direction.

Time period	Major – Herbert Street (> 150 p/h)
8:15 – 9:15 AM	60 (40%)
8:30 – 9:30 AM	52 (35%)
3:30 – 4:30 PM	70 (47%)
3:45 – 4:45 PM	71 (47%)

Continuous traffic requirements: 900 vph on major road each direction, 100 vph on minor road

Time period	Major – Herbert Street North (> 900 veh/h)	Major – Herbert Street South (> 900 veh/h)	Minor – Ella Street East (> 100 veh/h)
8:15 – 9:15 AM	810 (90%)	523 (58%)	248
8:30 – 9:30 AM	729 (81%)	546 (61%)	234
3:30 – 4:30 PM	642 (71%)	511 (57%)	222
3:45 – 4:45 PM	654 (73%)	515 (57%)	203

Crashes:

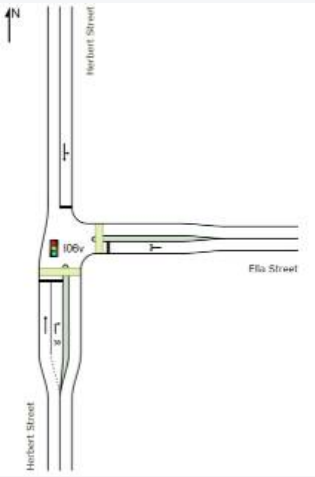
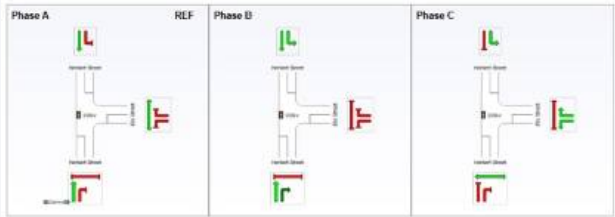
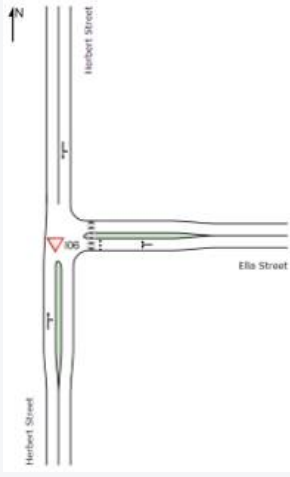
≥3 crashes per year over 3 years

90% traffic demand warrant.

Warrant is not met as there’s been no crashes recorded in latest 5-year period (2018-2022). However, it is known that a fatality occurred in 2023 (not included in latest crash history).

Signalised intersection options explored

A summary of the options explored for signalling the intersection of Herbert Street / Ella Street.

Option 1 – signalised		Option 2 – unsignalised
		
	East	East
Herbert South Config	Dual-lane approach (full through lane and short right turning lane)	Single-lane approach (through and right turns)
+	- Cyclists completely protected from turning movements - Overall acceptable performance (LOS B) – approach performance ranging from LOS A to D (AM peak) - Phasing allows for cyclist signal to be called in each cycle	- Shorter queues and approach performance improved compared with signalised - Overall, LOS C (ranging from LOS A to C on each approach) (AM peak)
-	- Extensive queuing for the Herbert Street north approach (exceeds the approach length by approximately 68 metres) - Overall queuing increases at all approaches under signalised conditions	- Cyclists are not allocated their own phase and therefore are likely to conflict with turning vehicles - Heavy demand for left turns from Herbert North will make this dangerous

Signalised intersection options explored (TS 05462.4)

Warrants for edge lines: dividing line must exist and pavement at least 6.8 m in width

4.7.5 Warrants for edge lines

On a carriageway of more than one lane, edge lines shall not be used unless a dividing line exists and the pavement is at least 6.8 m in width, or unless special circumstances exist, i.e. poor alignment, fog and similar conditions. Where edge lines are used, they shall be placed on both sides of the sealed surface, in accordance with the following:

Linemarkings on bridges: no dividing barrier line to be provided. S1 Separation line to be used.

4.4.3.3 Two-lane bridges

Dividing (barrier) lines shall not normally be marked on two-lane bridges, unless the warrant in Section 4.4.3.1 indicates that a no-overtaking zone is required and the width is 5.5 m or greater between kerbs. When linemarking is not possible regulatory signs would be used.

4.2.2 Warrants for use

4.2.2.1 Volume warrants

Dividing line markings, including barrier type (see Section 4.3), where required, should be used on sealed pavements 5.5 m or more wide if the AADT (see Section 1.6 and Section 2.5.3 for AADT definition and further explanation) is in excess of the following:

- (a) 300 vehicles on rural roads
- (b) 2500 vehicles on urban roads

4.2.2.2 Two-lane two-way roads:

A dividing (separation) line (S1) should be provided on sealed pavements of 5.5 m or more in width, if the road satisfies the volume warrants, outlined in Section 4.2.2.1.

Herbert Street / Ella Street

Banning the right turn

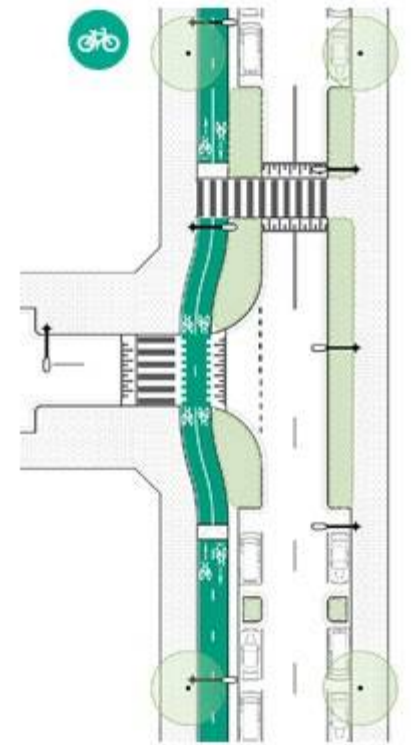
The following traffic demand is experienced for the right turn from Herbert Street South onto Ella Street.

Time	Volume (vehicle)
AM Peak	71
PM Peak	103
Midday Peak	44



Herbert Street / Ella Street

Option 1

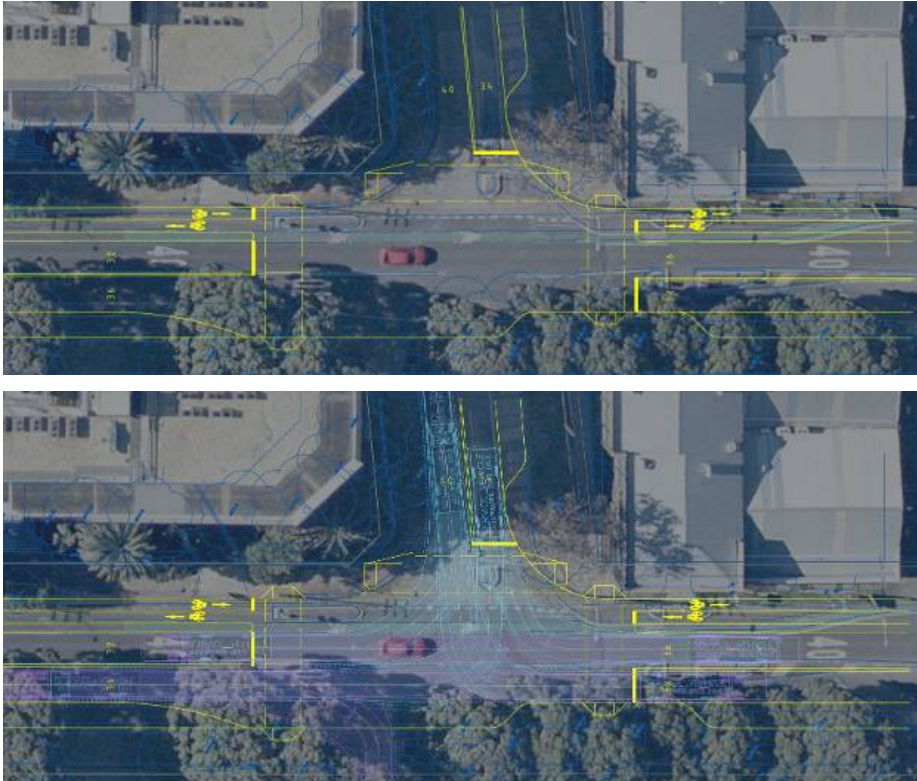


Design decision: This design was discontinued following the decision to adopt a roundabout configuration instead.

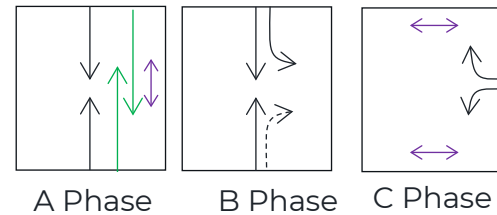
Date:
25/08/25

Herbert Street / Ella Street

Option 2



Option 2

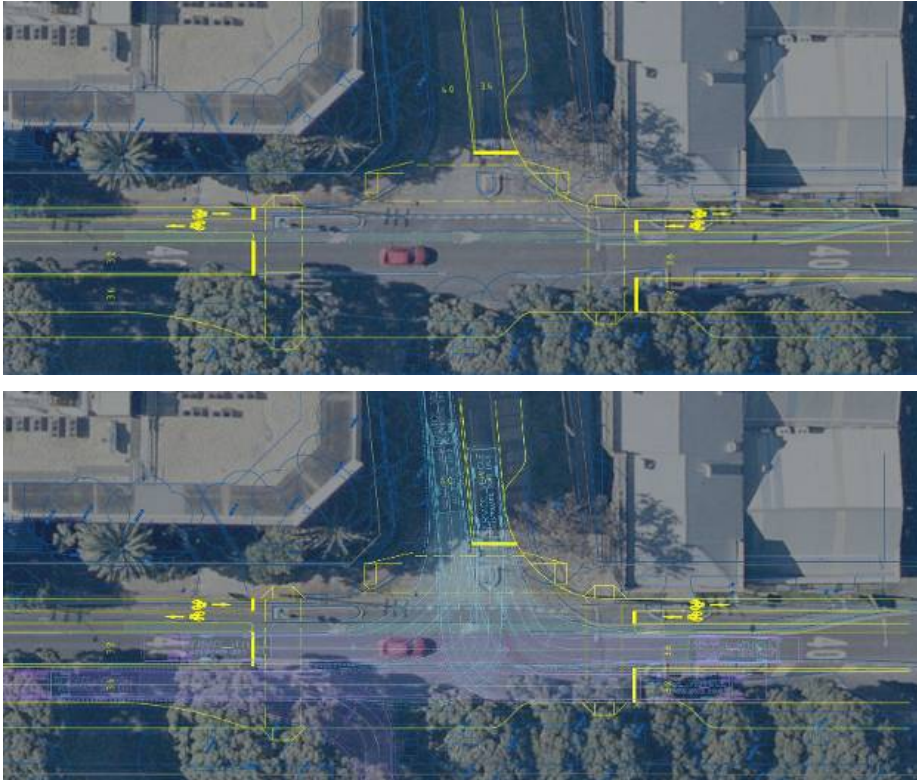


Design decision: This design was discontinued following the decision to adopt a roundabout configuration instead.

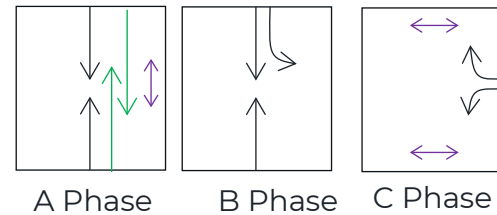
Date:
25/08/25

Herbert Street / Ella Street

Option 3



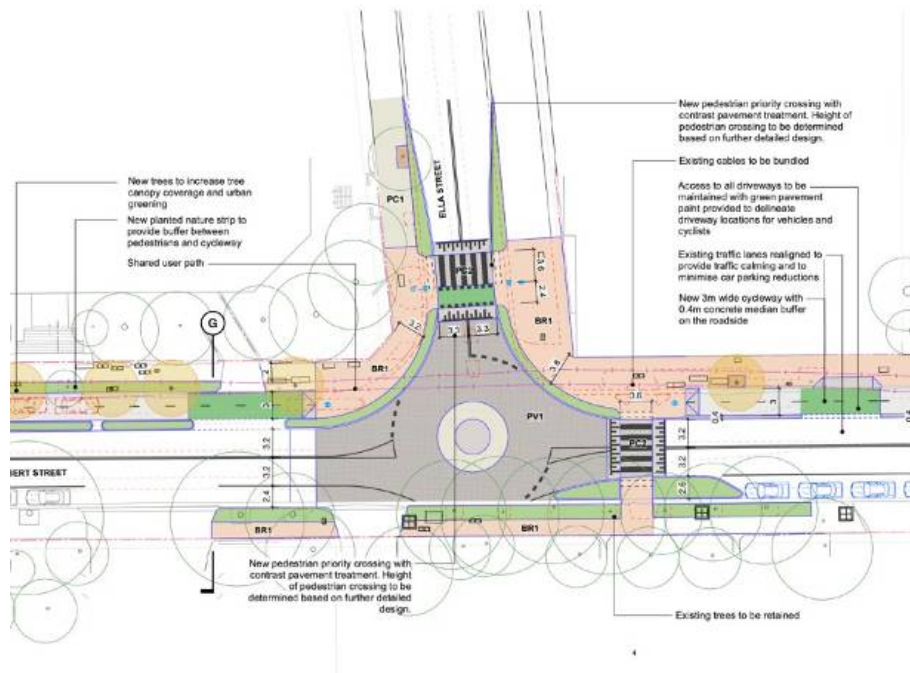
Option 3



Design decision: This design was discontinued following the decision to adopt a roundabout configuration instead.

Date:
25/08/25

Final concept design



Features:

Reconfiguration of Ella Street intersection to a roundabout with wombat crossings on the Ella Street and Herbert Street south approaches.

Considerations:

- + Safer crossing facilities for pedestrians
- + Kerb build-outs increasing storage space for pedestrians
- + Safer operations compared with priority controlled
- Transition to shared path required given the intersection geometry

Appendix F

Issues and opportunities



Issues and Opportunities

Chatswood to St Leonards Cycleway

Mowbray Road/ Hampden Road

Design objectives:

- Provide dedicated, parallel cycleway movement with pedestrian crossing.
- Consider Frank Shannon walk & future development – School at Dive Site
- Confirm cycleway on east side is best outcome

Current proposal:

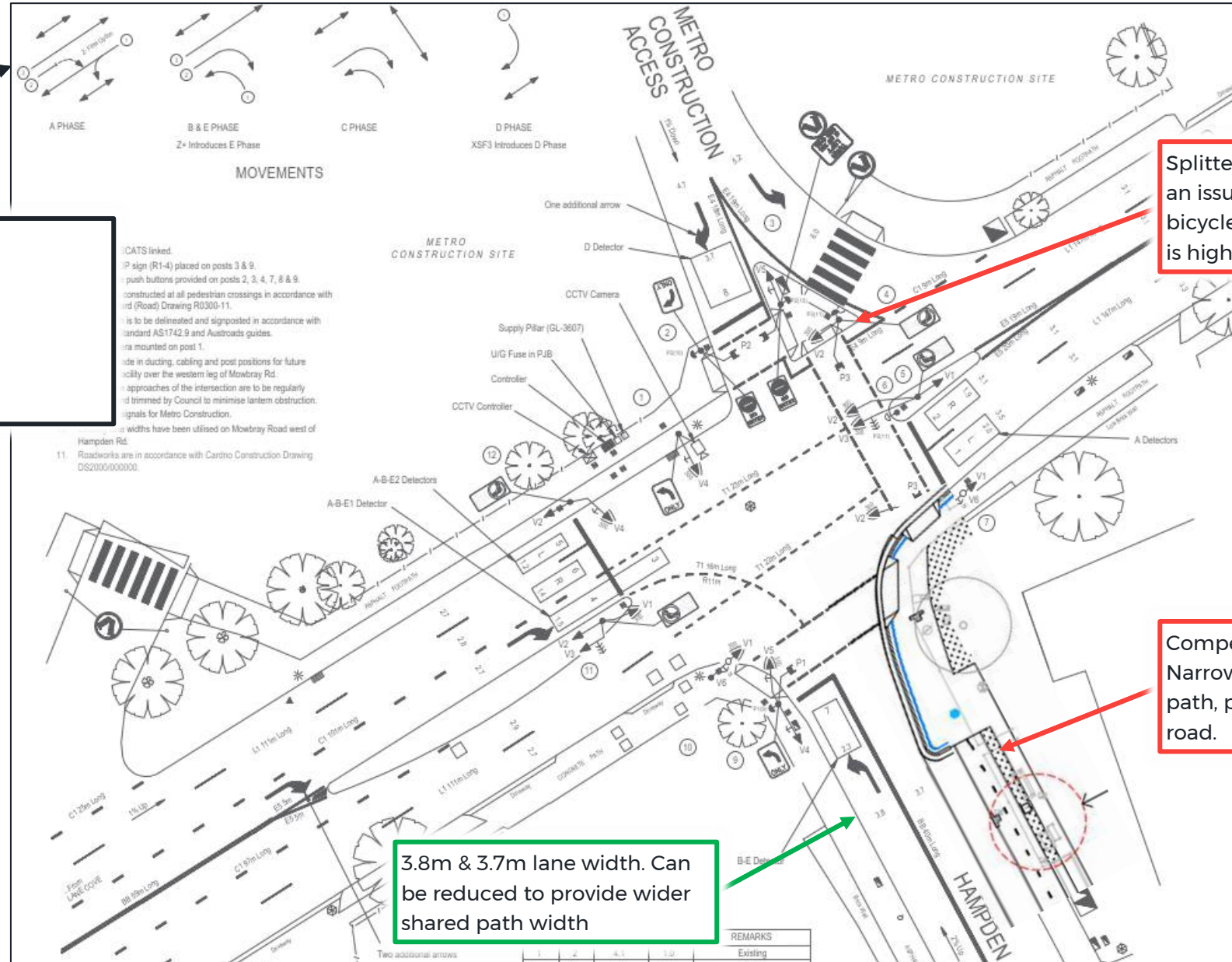
- Shared cycleway and pedestrian phasing from Dive site.
- Cyclist entering shared pedestrian footpath on Hampden Rd.



Note: Current phasing without pedestrian crossing on eastern side allows LT out of Hampden Rd to run concurrently with RT in.

Council confirmed with Sydney Metro:

- Right turn exit only from intersection
- One exit lane RT
- LT slip not maintained



Splitter island – could be an issue if pedestrian & bicycle crossing demand is high.

Competing road space: Narrow footpath, cycle path, parking and 2-way road.

3.8m & 3.7m lane width. Can be reduced to provide wider shared path width



Option 1: Cycleway & crossing on eastern side. Increase size of splitter island.

- Achieves wider crossing & larger storage area compared to base design.
- LT out of north leg operates independently & not subject to delay caused by pedestrian crossing.
- No crossing on the western side
- Splitter island requires 2-stage crossings for cyclists & pedestrians. Less direct, less safe & can potentially have overcrowding issues if future demand is high.



Option 2: Cycleway & crossing on eastern side. Remove splitter island & provide kerb return.

- Achieves wider crossing & larger storage area compared to base design and Option 1.
- Provides a more direct & safe connection for cyclists & pedestrians. Large storage area.
- No crossing on the western side
- LT out of north leg can be subjected to delay caused by pedestrian crossing.

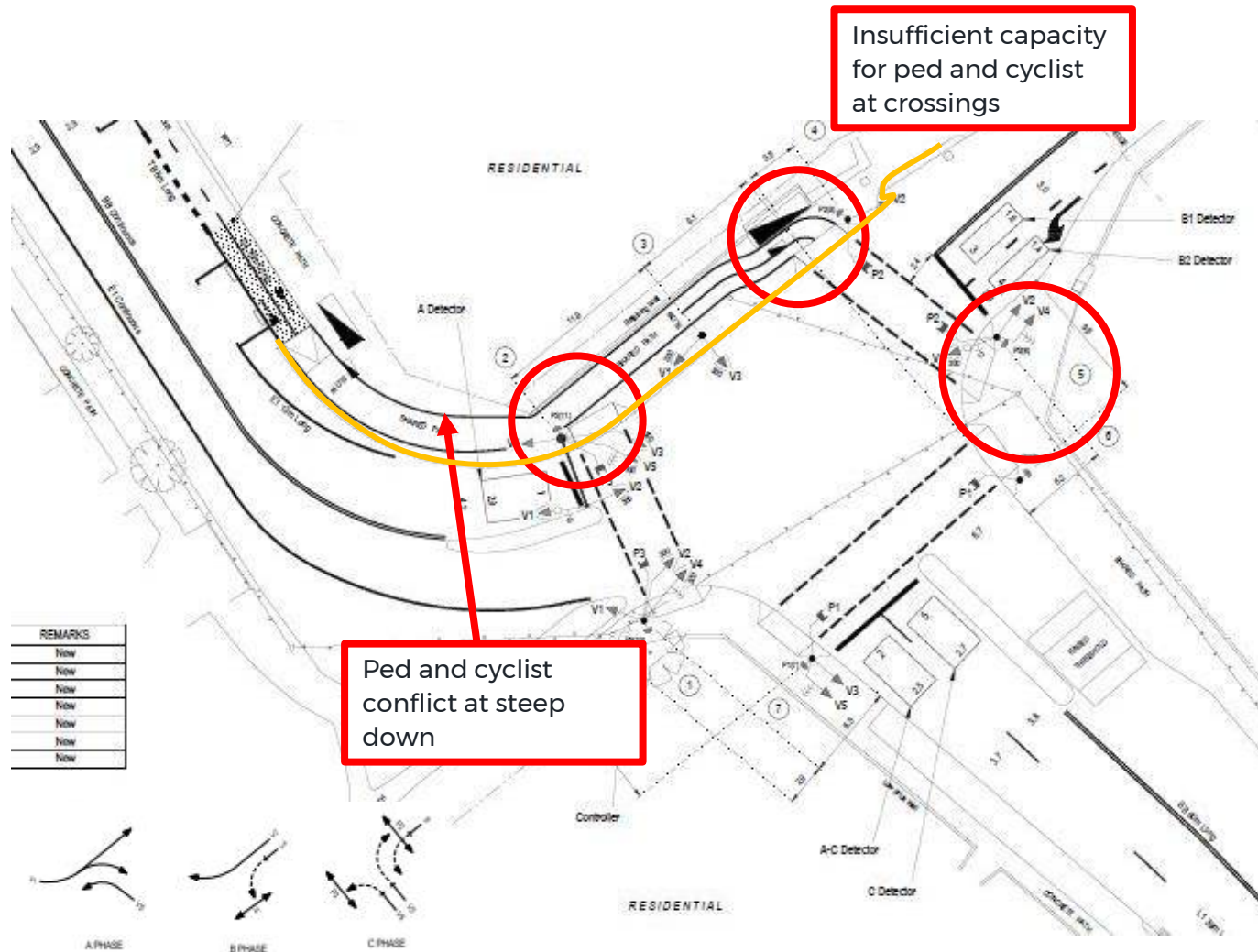
Option 2 is preferred, however needs to be consulted with TfNSW & Sydney Metro to understand future use access arrangements.



Option 3: Cycleway & crossing on western side

- Achieves crossing across all approaches of intersection
- Approach lane in southern leg needs to be skewed to accommodate turn paths
- Restricted space at south-west and north-west corner. Potential overcrowding if cycleway is on the western side of Hampden Rd
- Intersection operation is sensitive to coordination with Pacific Hwy/Mowbray Rd. Additional delay caused by the crossing on western side could have adverse impact to queueing on EB Mowbray Rd in peak periods.

Hampden Rd / Brand St

**Design objectives:**

- Remove shared path option for a dedicated on-road cycleway, signalised movement. To achieve a dedicated cycleway in Artarmon Local Centre where feasible.
- Confirmation it meets required warrants

Current proposal:

- Shared cycleway and pedestrian path north side of intersection
- Shared cycleway and pedestrian phasing on signalised crossing

Traffic Signal Warrant Assessment Hampden/Brand

Traffic demand: 600 vph on major road each direction, 200 on minor road

Time period	Major – Hampden Road South (> 600 veh/h)	Major – Hampden Road West (> 600 veh/h)	Minor – Brand Street East (> 200 veh/h)
8:15 – 9:15 AM	605	402 (67%)	399 (200%)
8:30 – 9:30 AM	619	382 (64%)	366 (183%)
4:45 – 5:45 PM	759	297 (50%)	457 (229%)
5:00 – 6:00 PM	755	283 (47%)	430 (215%)

Approx. equal split between Hampden (west) and Brand (east). Volumes are ~200% of minor warrant, but 60% of major warrant.

Pedestrian safety: 150 persons/hr, 600 vph in each direction.

Time period	Major – Hampden Road (> 150 p/h)
8:15 – 9:15 AM	10 (7%)
8:30 – 9:30 AM	8 (5%)
4:45 – 5:45 PM	20 (13%)
5:00 – 6:00 PM	14 (9%)

Continuous traffic: 900 vph on major road each direction, 100 vph on minor road

Time period	Major – Hampden Road South (> 900 veh/h)	Major – Hampden Road West (> 900 veh/h)	Minor – Brand Street East (> 100 veh/h)
8:15 – 9:15 AM	605 (67%)	402 (45%)	399
8:30 – 9:30 AM	619 (69%)	382 (42%)	366
4:45 – 5:45 PM	759 (84%)	297 (33%)	457
5:00 – 6:00 PM	755 (84%)	283 (31%)	430

Crashes:

≥3 crashes per year over 3 years

80% traffic demand warrant.

Warrant is not met as there's been one reported crash in latest 5-year period (2018-2022).

Pedestrian crossing warrant Hampden/Brand

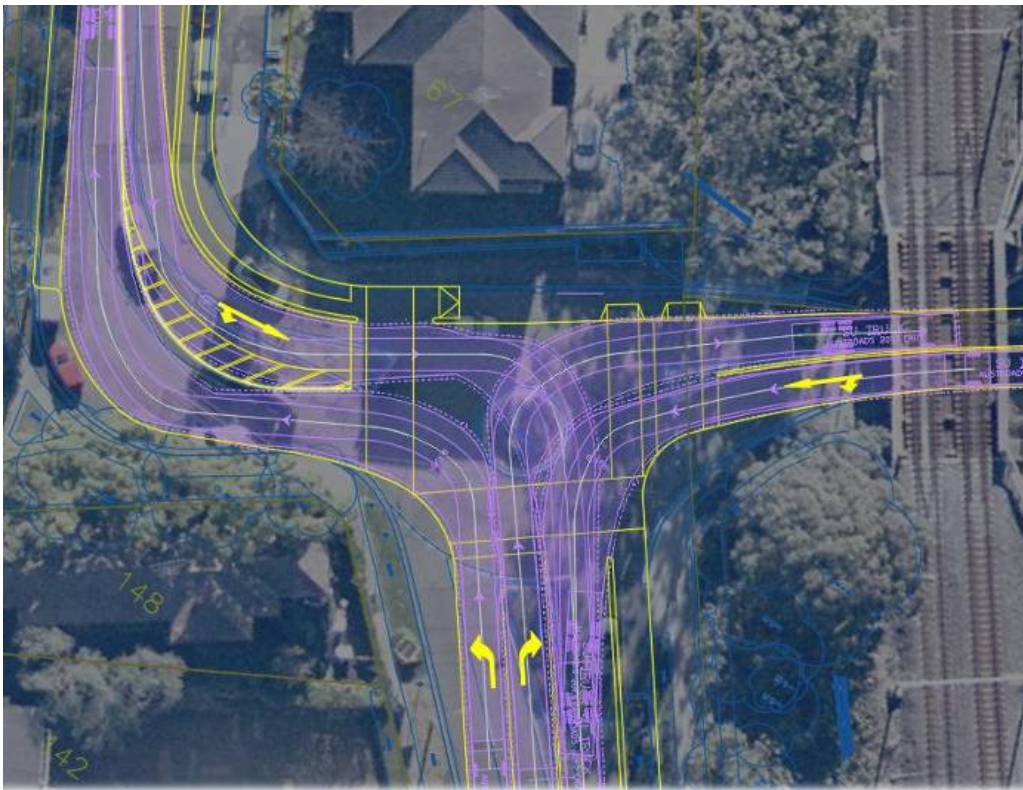
Pedestrian volume: 30

Vehicle volume: 500

V x P: 60,000

Time period	Brand Street East (≥ 30 p/h)	Brand Street East (≥ 500 veh/h)	Brand Street East (≥ 60,000 PV/h)
9:45 – 10:45 AM	2 (7%)	691	1,382 (2%)
10:00 – 11:00 AM	2 (7%)	683	1,366 (2%)
2:15 – 3:15 PM	3 (10%)	873	2,619 (4%)

Time period	Hampden Road South (≥ 30 p/h)	Hampden Road South (≥ 500 veh/h)	Hampden Road South (≥ 60,000 PV/h)
7:45 – 8:45 AM	6 (20%)	1171	7,026 (12%)
8:00 – 9:00 AM	5 (17%)	1235	6,175 (10%)
3:45 – 4:45 PM	3 (10%)	1116	3,348 (6%)

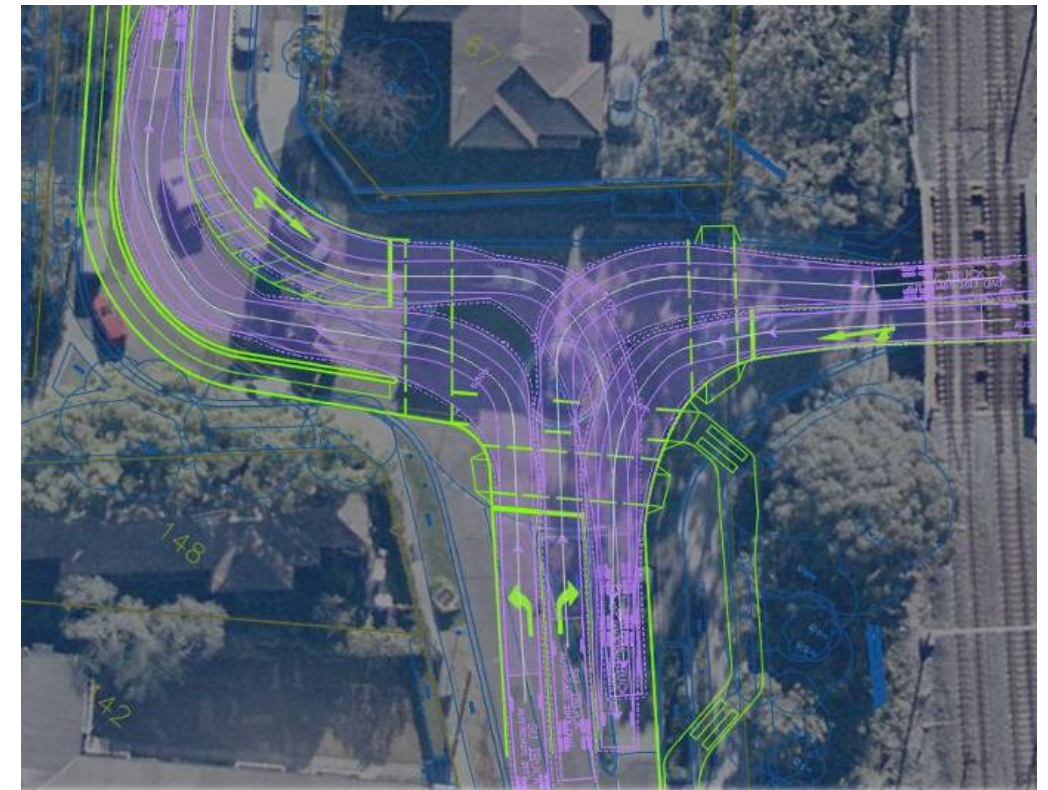


Option 1: Cycleway & crossing on eastern side

- Design provides tie-in between cycleway on eastern side without compensating on existing pedestrian space
- Design achieves wider storage area for pedestrians compared to existing conditions and base design particularly for south-east & south-west kerb returns
- Achieves pedestrian crossing across all approach
- Base design proposed phasing generally maintained.

- Steep road gradient on Hampden, north of the intersection to be resolved

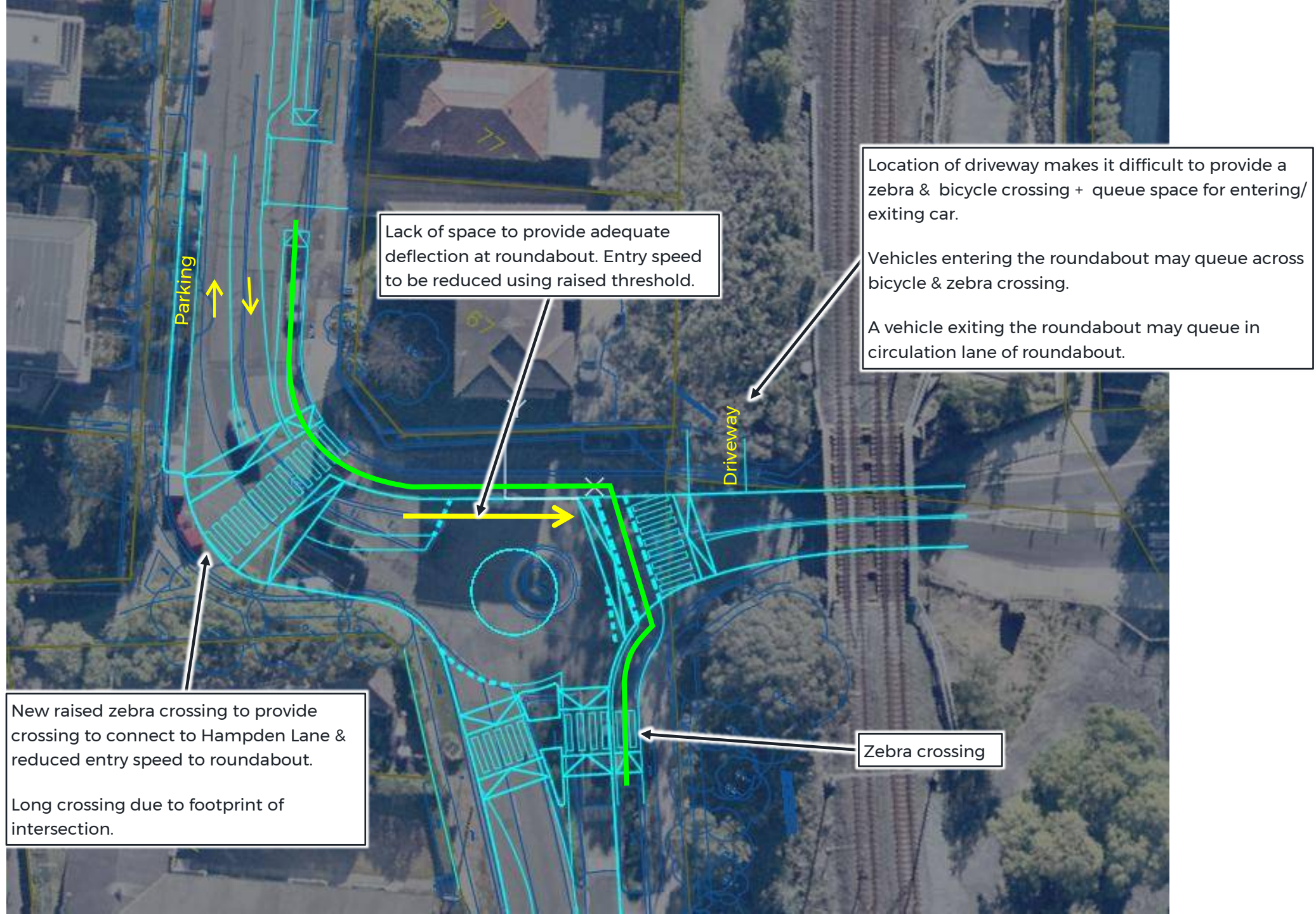
Option 1 is preferred, however subject to agreement for cycleway to be on the eastern side of Hampden



Option 2: Cycleway on western side & crossing on southern side

- Design provides tie-in between cycleway on western side of Hampden (north of Brand) & eastern side of Hampden (south of Brand) without compensating on existing pedestrian space.
- Design achieves wider storage area for pedestrians compared to existing conditions and base design particularly for south-east & south-west kerb returns
- Achieves pedestrian crossing across all approach
- Base design proposed phasing generally maintained.

- Pedestrian crossing across cycle path needed to provide clear path for cyclists. However, could cause pedestrian/cyclist conflict.
- Steep road gradient on Hampden, north of the intersection to be resolved



Design objectives:

- Provide wider cycleway lane and medians (to include planting opportunities where possible)

Current proposal:

- Dedicated on-road cycleway signalised crossing



From Council's RFP

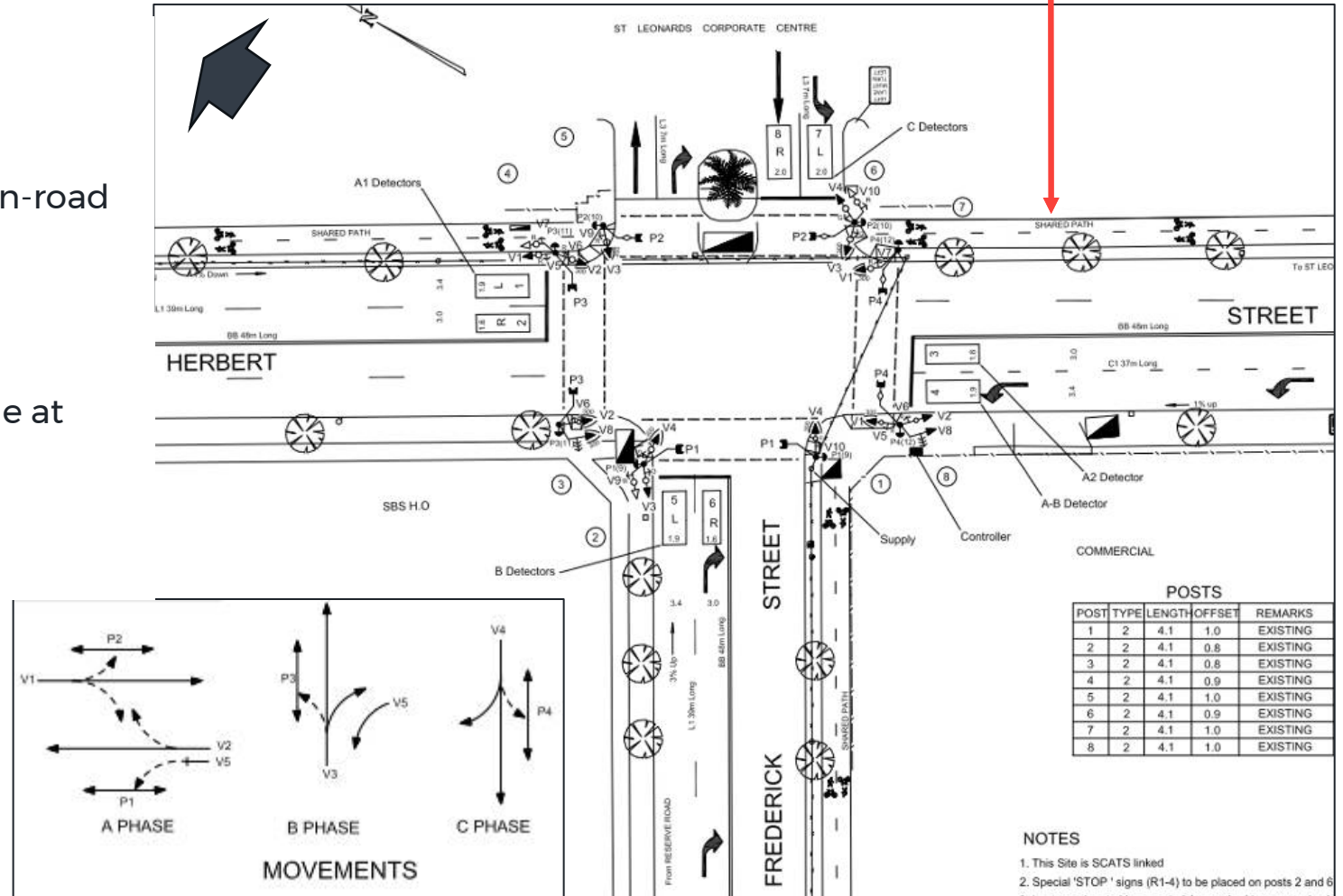
Design objectives:

- Remove shared path option for a dedicated on-road cycleway, signalised movement. To achieve a dedicated cycleway.

Current proposal:

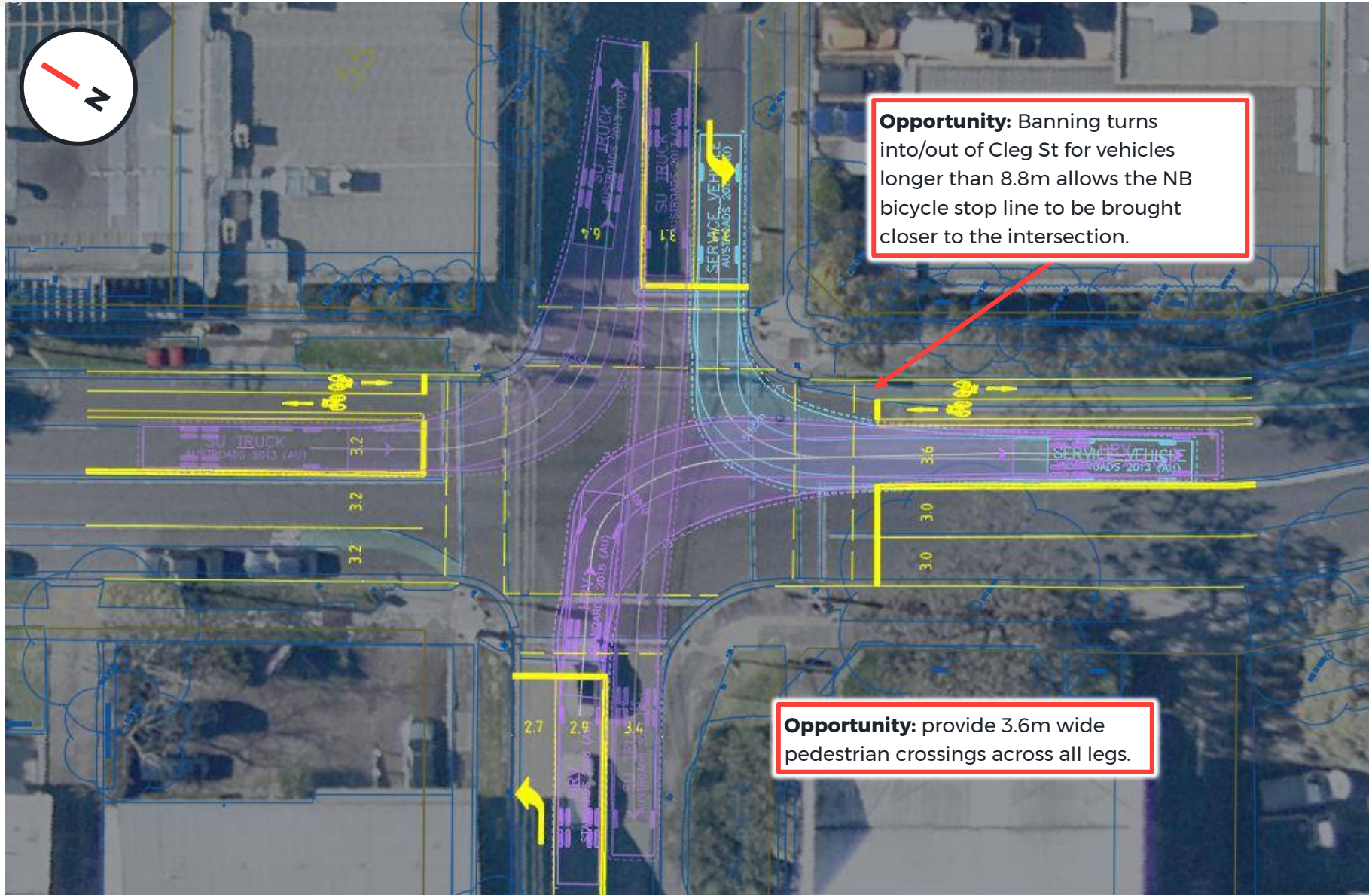
- Shared cycleway and pedestrian path east side at intersection
- Shared cycleway and pedestrian phasing on signalised crossing

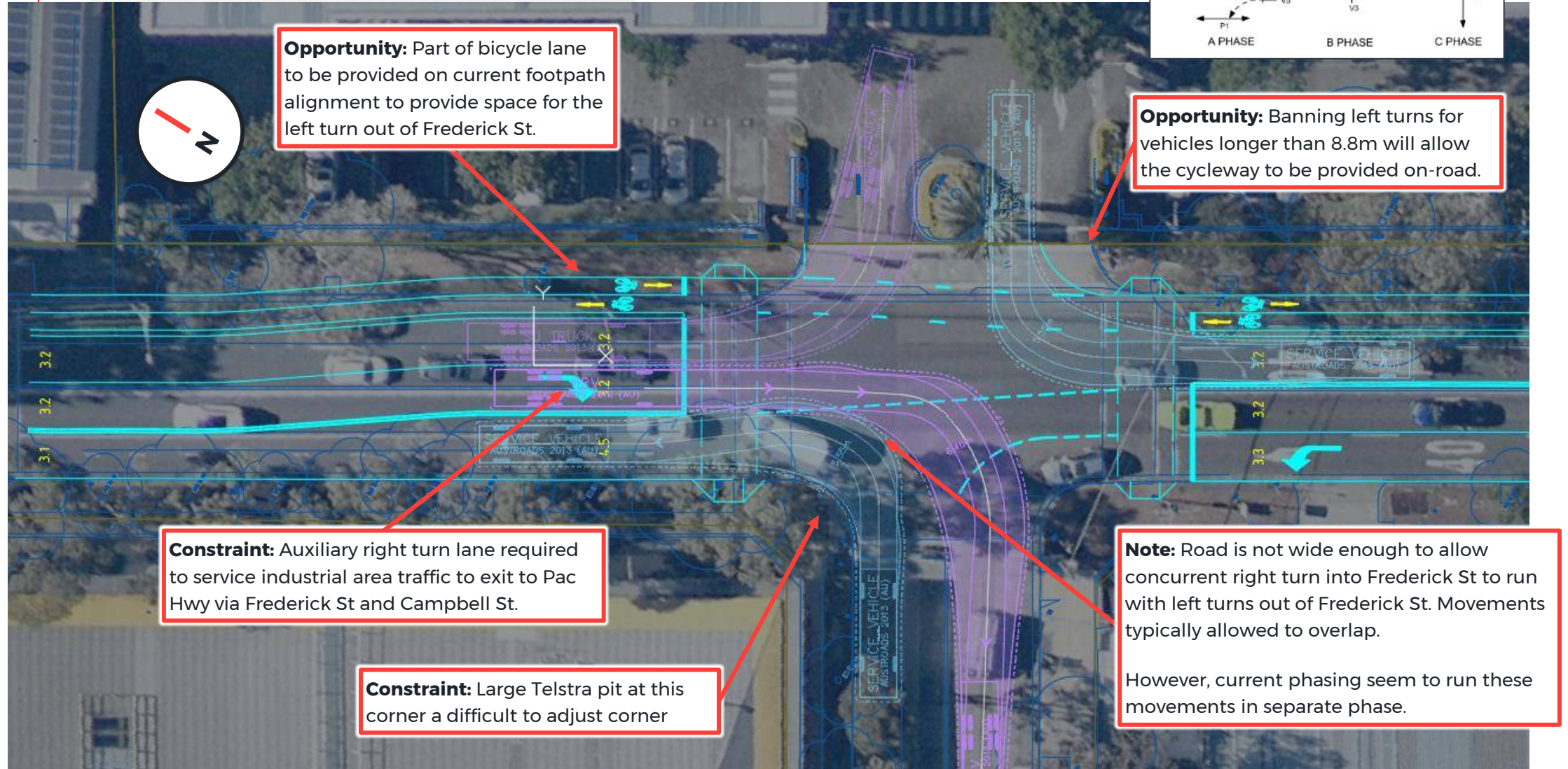
Cycleway is proposed as a shared path at Frederick Street. Increasing conflict with other path users.





Herbert St / Cleg St





Herbert St / Ella St

Design objectives:

- Investigate warrant requirements for signalised intersection & consider recent fatality at intersection
- Crash analysis of intersection
- Provide alternative to removal of significant existing tree at intersection

Current proposal:

- Dedicated on road cycleway signalised at intersection.
- TfNSW provided feedback that it does not meet the required warrants.



Warrant Assessment Hampden/Brand

Traffic demand: 600 vph on major road each direction, 200 on minor road

Time period	Major – Herbert Street North (> 600 veh/h)	Major – Herbert Street South (> 600 veh/h)	Minor – Ella Street East (> 200 veh/h)
8:15 – 9:15 AM	810	523 (87%)	248
8:30 – 9:30 AM	729	546 (91%)	234
3:30 – 4:30 PM	642	511 (85%)	222
3:45 – 4:45 PM	654	515 (86%)	203

Warrant for one of the “major” road is nearly met with demand approx. 90% of warrant.

Pedestrian safety: 150 persons/hr, 600 vph in each direction.

Time period	Major – Herbert Street (> 150 p/h)
8:15 – 9:15 AM	60 (40%)
8:30 – 9:30 AM	52 (35%)
3:30 – 4:30 PM	70 (47%)
3:45 – 4:45 PM	71 (47%)

Continuous traffic: 900 vph on major road each direction, 100 vph on minor road

Time period	Major – Herbert Street North (> 900 veh/h)	Major – Herbert Street South (> 900 veh/h)	Minor – Ella Street East (> 100 veh/h)
8:15 – 9:15 AM	810 (90%)	523 (58%)	248
8:30 – 9:30 AM	729 (81%)	546 (61%)	234
3:30 – 4:30 PM	642 (71%)	511 (57%)	222
3:45 – 4:45 PM	654 (73%)	515 (57%)	203

Crashes:

≥3 crashes per year over 3 years

90% traffic demand warrant.

Warrant is not met as there’s been no crashes recorded in latest 5-year period (2018-2022).

Pedestrian crossing warrant Ella / Herbet

Pedestrian volume: 30

Vehicle volume: 500

V x P: 60,000

Time period	Ella Street (≥ 30 p/h)	Ella Street (≥ 500 veh/h)	Ella Street ($\geq 60,000$ PV/h)
8:00 – 9:00 AM	110	532	58,520 (98%)
8:15 – 9:15 AM	122	511	62,342
8:30 – 9:30 AM	110	502	55,220 (92%)

V x P warrant is very nearly met.
Demand is >92% of warrant

Herbert St / Ella St



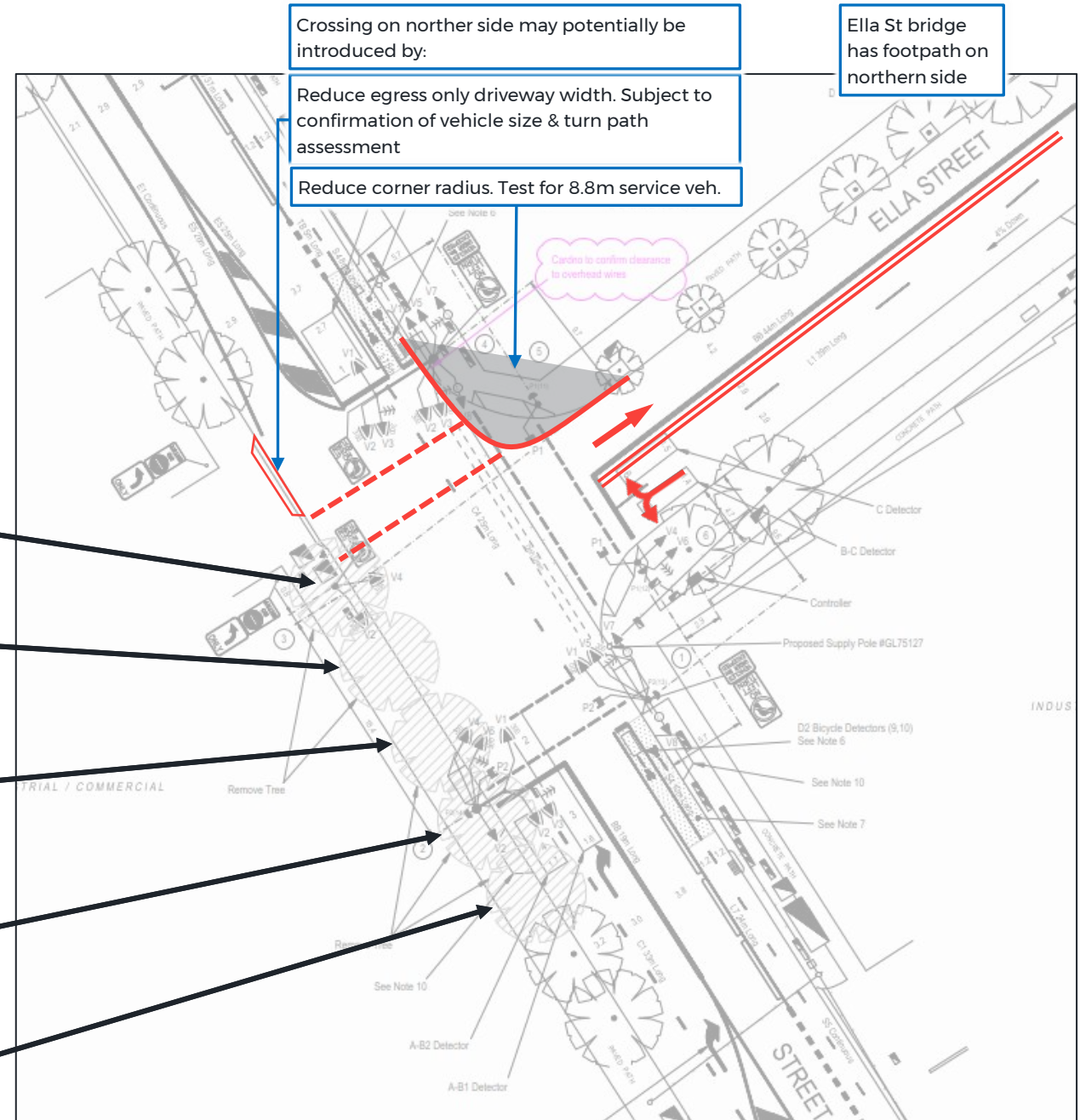
Tree removal required to install Post #3 & footing.

Tree removal can be avoided if branch overhang is trimmed to ensure >5m high clearance

Tree removal required to ensure adequate sight distance to pedestrians & allow provision for kerb ramp.

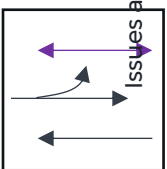
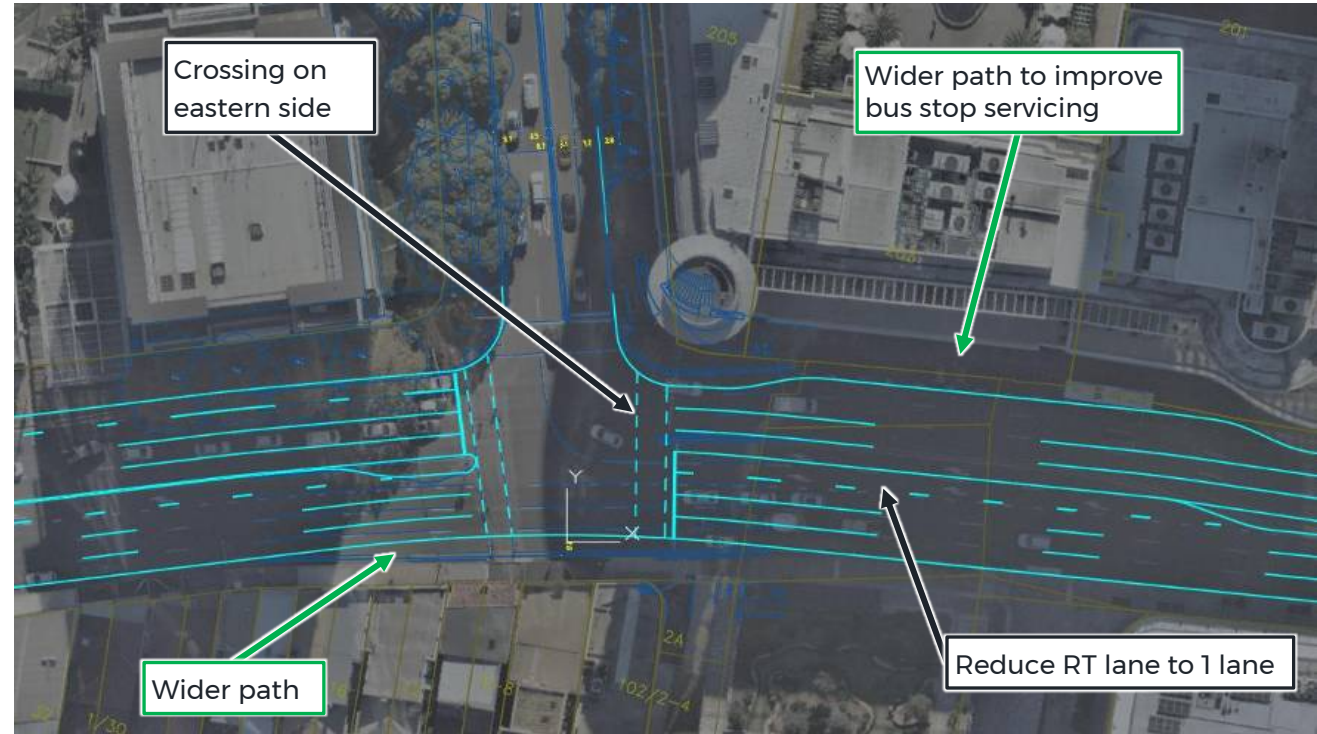
Tree removal required to install signal post.

Drivers to have adequate sight distance to V2 lantern (legal requirement). Tree removal may be avoided if branches can be cleared to ensure 6m high clearance.

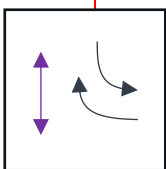


Herbert St/Pacific Hwy

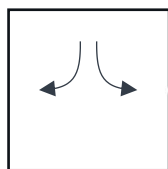
No data collected at this intersection & no TCS plan



A 20

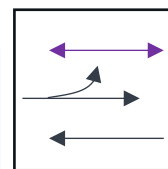


B

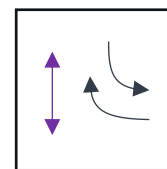


C

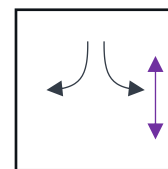
W/O crossing on eastern side, Phase C can run short with smaller RT demand. Thus, more time allocated to Phase A & B to dissipate queue



A



B



C

With crossing on eastern side, Phase C to run at least 25s (6s green + clearance). Thus, potentially impact allocation to other phasing with higher demand.

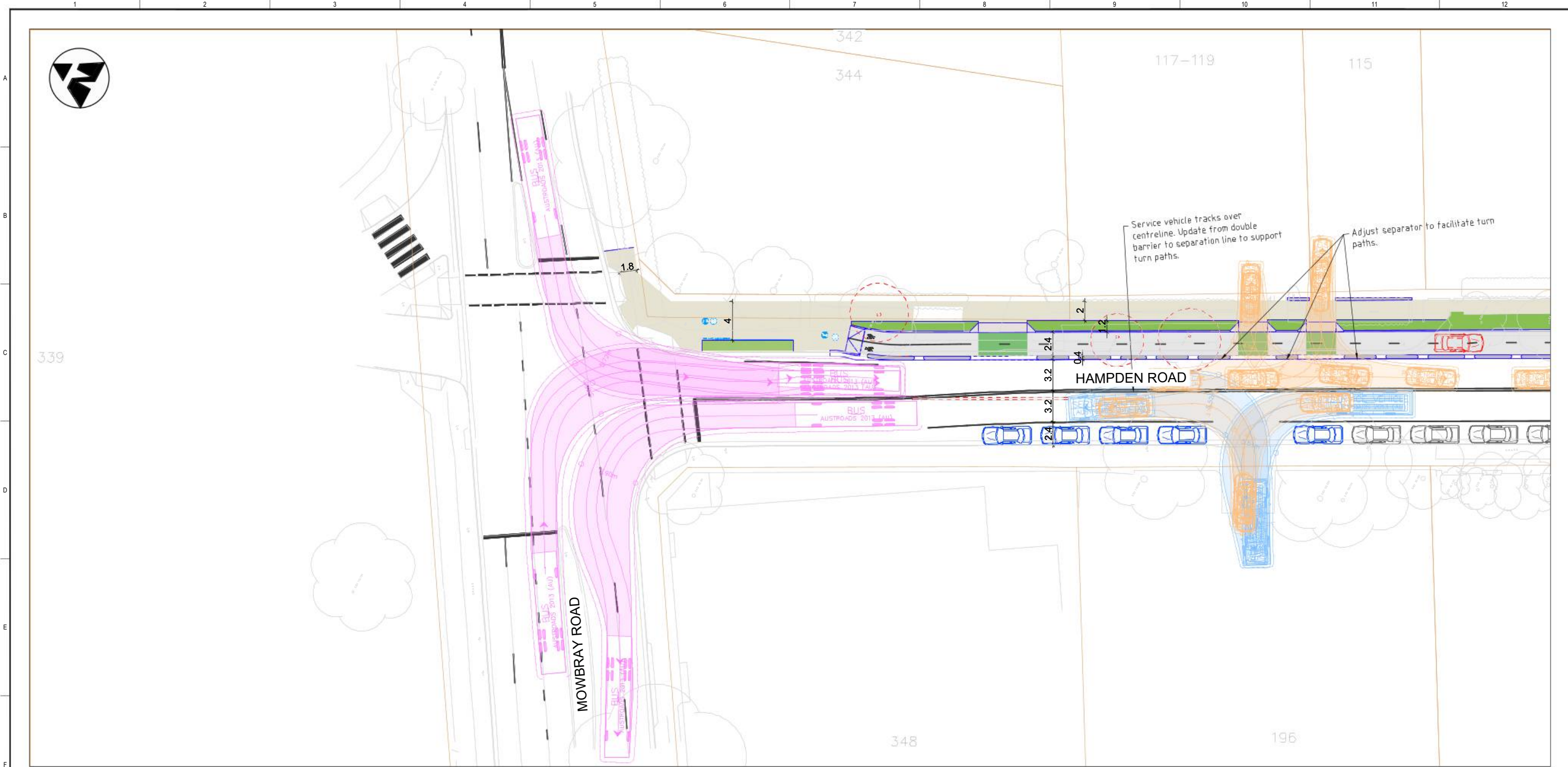
Herbert St / Frederick St – **Option 2:** Spatial impact

Appendix G

Turn path assessment



File name: \CORP PRJMAN\NET\ANZPROJECTS\SAU\2020\XX309600_CHATSWOOD_TO_ST_LEONARDS_CYCLEWAY\TP-DR-0201.DWG, printed on Tuesday, 30 September 2025 2:41:59 PM, by Murlianto, City

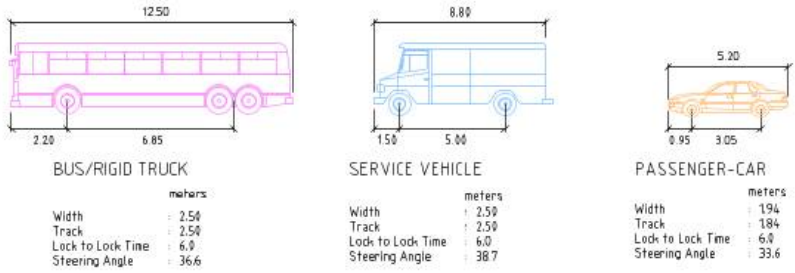


PLAN
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NOTE

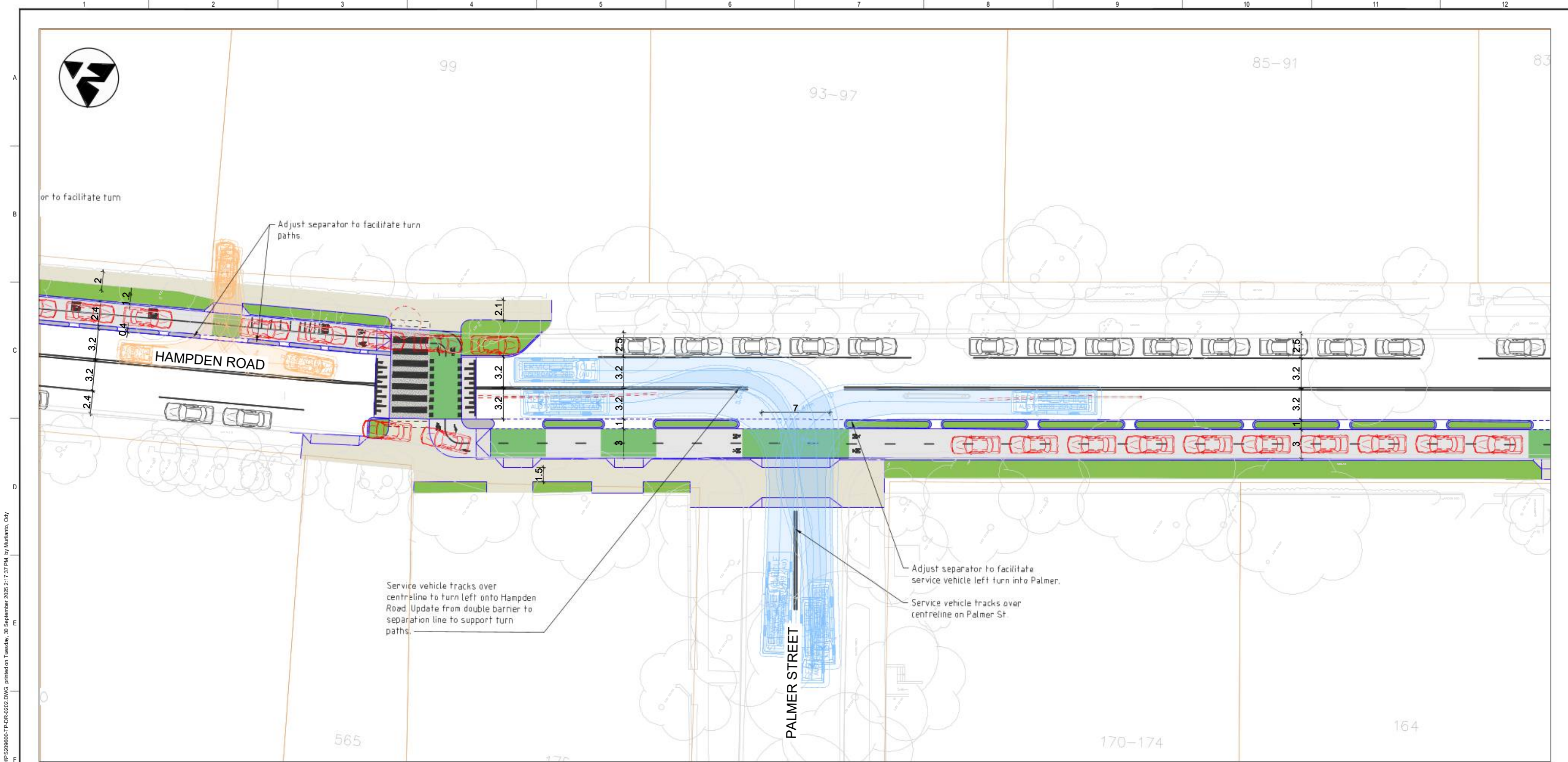
- TURNING PATH ASSESSMENTS HAVE BEEN CONDUCTED AT 5-10 KM/H TRAVEL SPEED
- A CLEARANCE OF 0.5 METRES ARE INDICATIVELY SHOWN ON INDIVIDUAL SWEEP PATHS. WHILE FULL CLEARANCE IS DESIRABLE, IT DOES NOT NEED TO BE PROVIDED FOR LOCAL STREETS IN URBAN AREAS. REFER TO DESIGN VEHICLES AND TURNING PATH TEMPLATES GUIDE (AUSTROADS, 2023)

LEGEND



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O.M.				V.O.									
CHK				APPD									
REV				DATE		BY		DESCRIPTION					
B				30.09.25		H.C.		90% CD - FOR COORDINATION		O.M.		V.O.	
A				07.07.25		H.C.		50% CD - FOR COORDINATION		O.M.		V.O.	

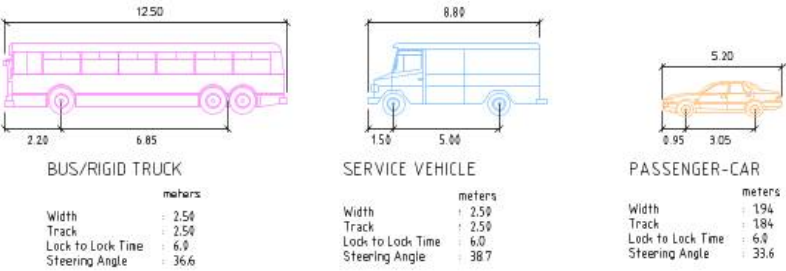
Level 27, 680 George Street, Sydney GPO Box 5394, NSW 2001, Australia Tel: +61 2 9272 5100 Fax: +61 2 9272 5101 wsp.com		CLIENT: WILLOUGHBY CITY COUNCIL 31 Victor Street Chatswood NSW 2067 (02) 9777 1000 email@willoughby.nsw.gov.au		DELIVERY PARTNERS: Woolacotts spackman mossop michaels		PROJECT: WILLOUGHBY CITY COUNCIL CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT TITLE: HAMPDEN ROAD AND HERBERT STREET TURNING PATH ASSESSMENT MOWBRAY ROAD/HAMPDEN ROAD SHEET 01		DRAWING STATUS: 90% CD - FOR COORDINATION DESIGNED: ODY MURLIANTO PROJECT No: PS209600 DRAWN: HAYLEY CAVANAGH DATE: 30.09.25 APPROVED: VINCE OLIVERI DATE: 30.09.25 DRAWING No: PS209600-TP-DR-0201 REV: B	
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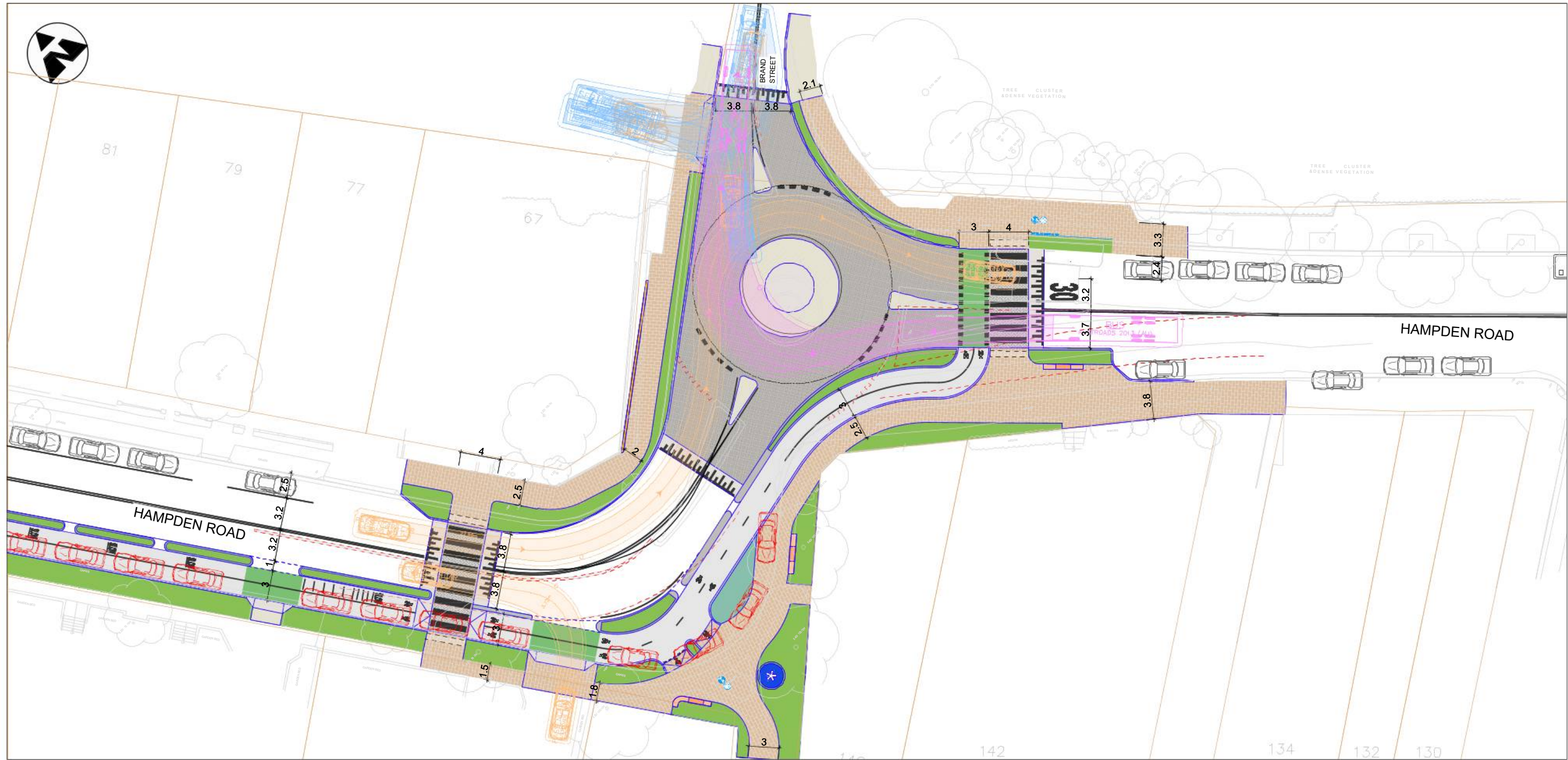
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31 Victor Street				Chatswood NSW 2067		(02) 9777 1000		email@willoughby.nsw.gov.au					
WILLOUGHBY CITY COUNCIL													
DELIVERY PARTNERS:				Woolacotts.		spackman mossop michael's							
PROJECT:				WILLOUGHBY CITY COUNCIL		CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT							
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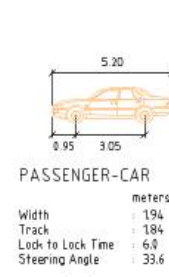
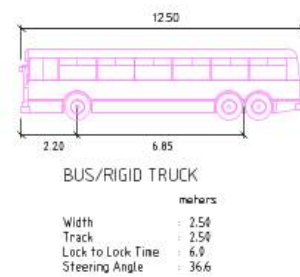


PLAN
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NOTE

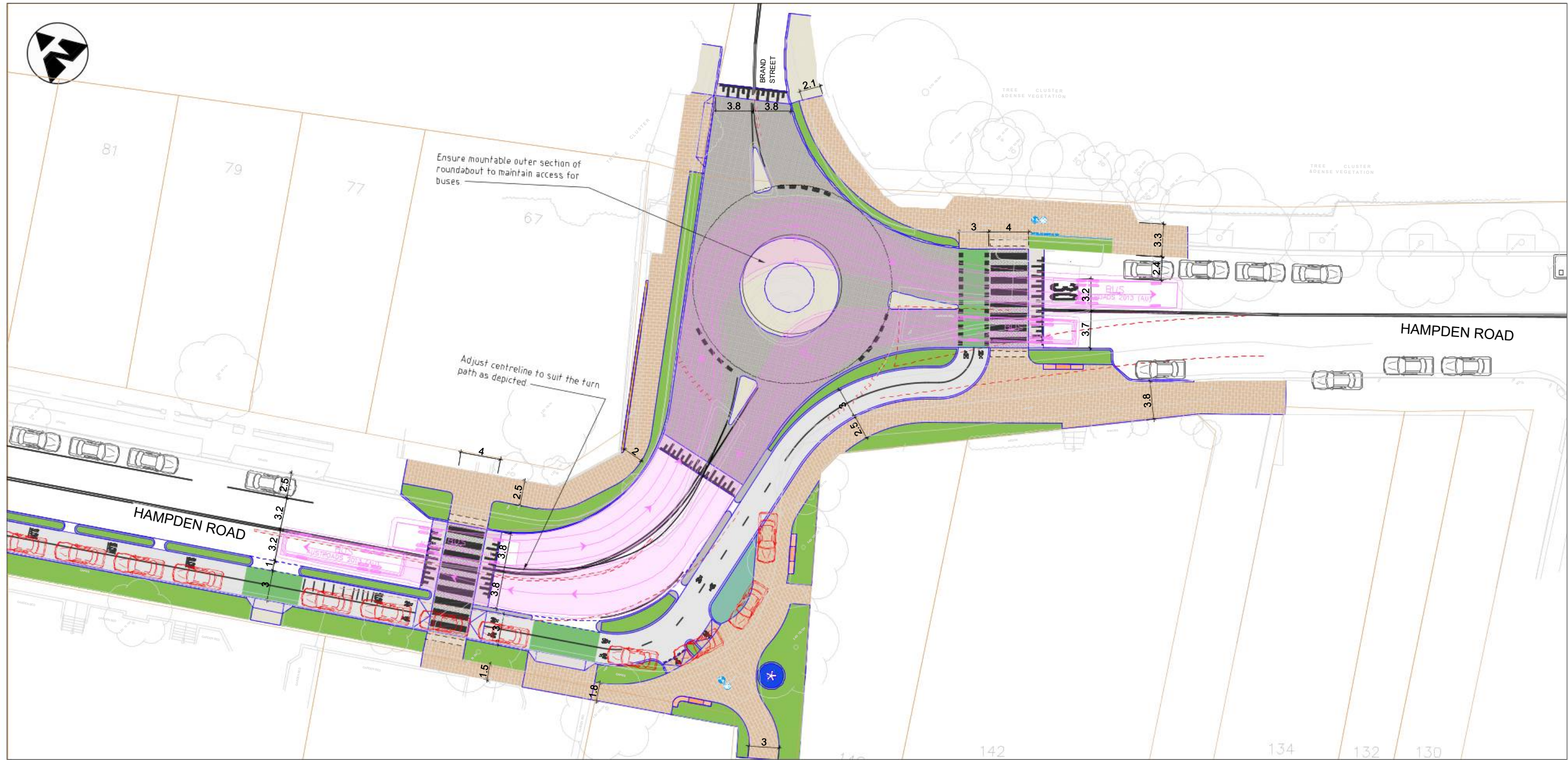
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LEGEND



REFERENCE COORDINATION DRAWINGS				SCALES		A3 ORIGINAL		CLIENT		DELIVERY PARTNERS		PROJECT		DRAWING STATUS	
DESCRIPTION				DRAWING NO.		DO NOT SCALE THIS DRAWING		WILLOUGHBY CITY COUNCIL		Woolacotts		CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT		90% CD - FOR COORDINATION	
SURVEY DATUM				APPROVED		SIGNED:		31 Victor Street		spackman mossop michael		HAMPDEN ROAD AND HERBERT STREET		DESIGNED: ODY MURLIANTO	
HORIZONTAL DATUM:				DATE:		RREQ:		Chatswood NSW 2067		PROJECT No: PS209600		TURNING PATH ASSESSMENT		CHECKED: ODY MURLIANTO	
VERTICAL DATUM:				© WSP Australia Pty Ltd.				(02) 9777 1000		DRAWN: HAYLEY CAVANAGH		BRAND STREET/HAMPDEN ROAD DRIVEWAYS		APPROVED: VINCE OLIVERI	
								email@willoughby.nsw.gov.au		DATE: 30.09.25		SHEET 03		DRAWING No: PS209600-TP-DR-0203-B	
														REV: B	

File name: \CORP\PRJMAN\NET\ANZ\PROJECTS\AU\2009\XX309600_CHATSWOOD_TO_ST_LEONARDS_CYCLEWAY\TURNING PATH\PS209600-TP-DR-0203.DWG, printed on Tuesday, 30 September 2025 2:25:39 PM, by Murlianto, City

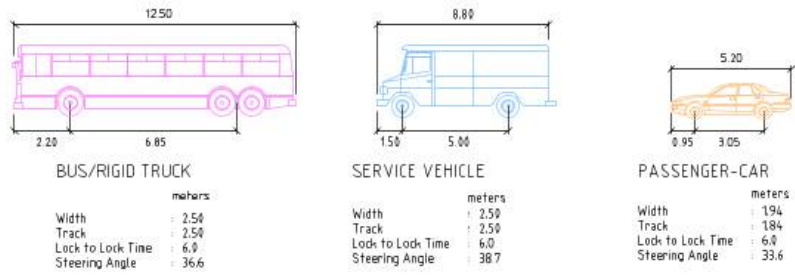


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NOTE

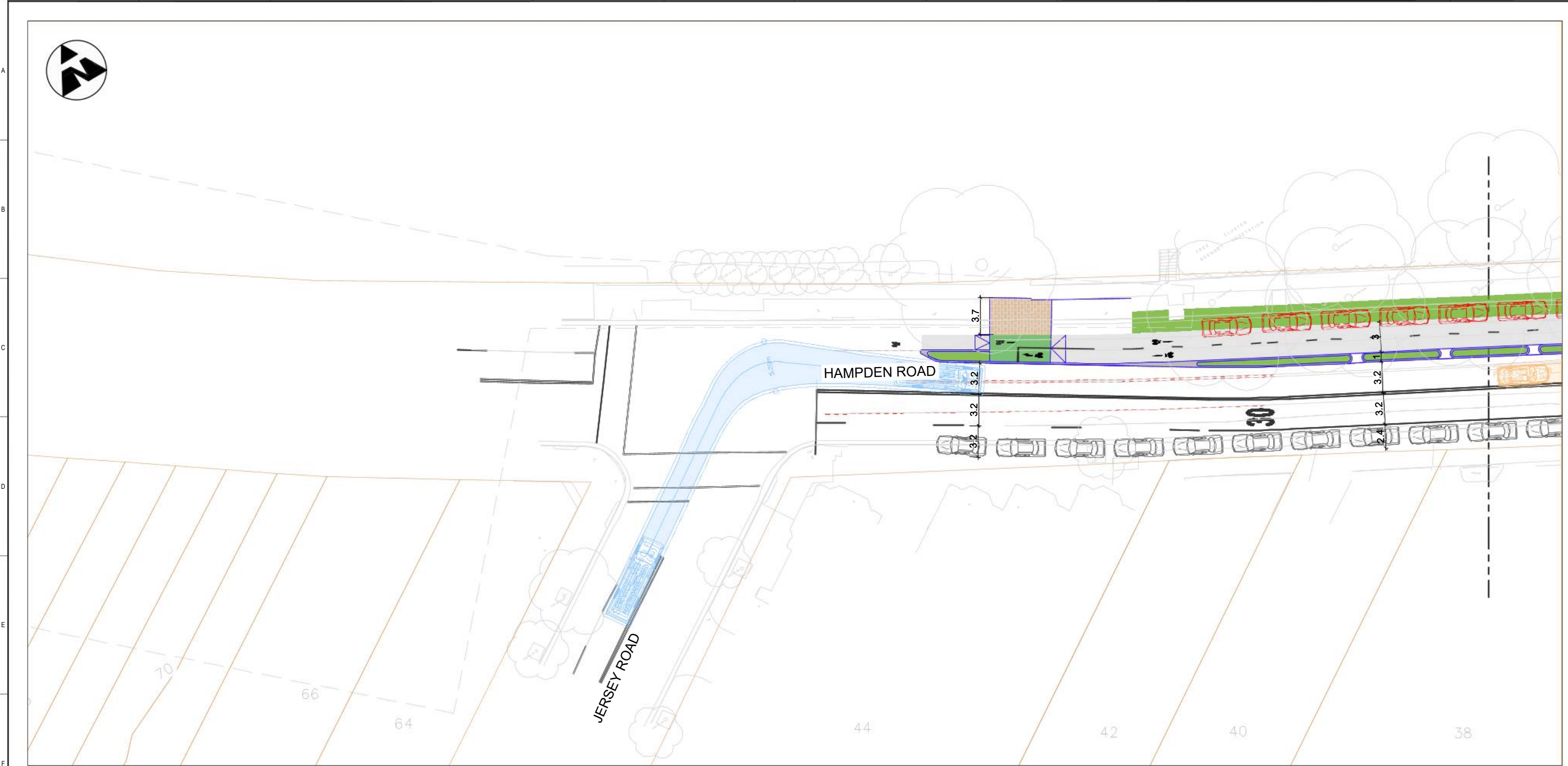
- TURNING PATH ASSESSMENTS HAVE BEEN CONDUCTED AT 5-10 KM/H TRAVEL SPEED
- A CLEARANCE OF 0.5 METRES ARE INDICATIVELY SHOWN ON INDIVIDUAL SWEEP PATHS. WHILE FULL CLEARANCE IS DESIRABLE, IT DOES NOT NEED TO BE PROVIDED FOR LOCAL STREETS IN URBAN AREAS. REFER TO DESIGN VEHICLES AND TURNING PATH TEMPLATES GUIDE (AUSTROADS, 2023)

LEGEND



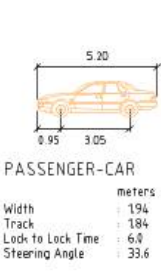
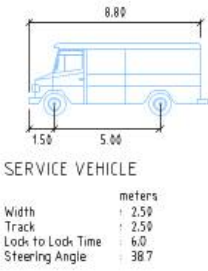
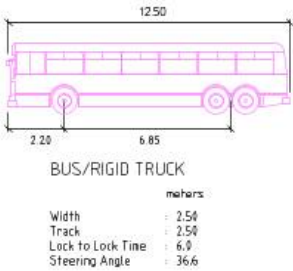
				REFERENCE COORDINATION DRAWINGS				SIGNED				A3 ORIGINAL DO NOT SCALE THIS DRAWING				 Level 27, 680 George Street, Sydney GPO Box 5394, NSW 2001, Australia Tel: +61 2 9272 5100 Fax: +61 2 9272 5101 wsp.com				CLIENT:  DELIVERY PARTNERS:  PROJECT: WILLOUGHBY CITY COUNCIL CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT				DRAWING STATUS: 90% CD - FOR COORDINATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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File name: \CORP\PRJMAN\NET\ANZ\PROJECTS\AU\2020\XX309600_CHATSWOOD_TO_ST_LEONARDS\WIP\CAD\TP\TURNING PATH\PS209600-TP-DR-020.DWG, printed on Tuesday, 30 September 2025 2:41:59 PM, by Murlianto, City

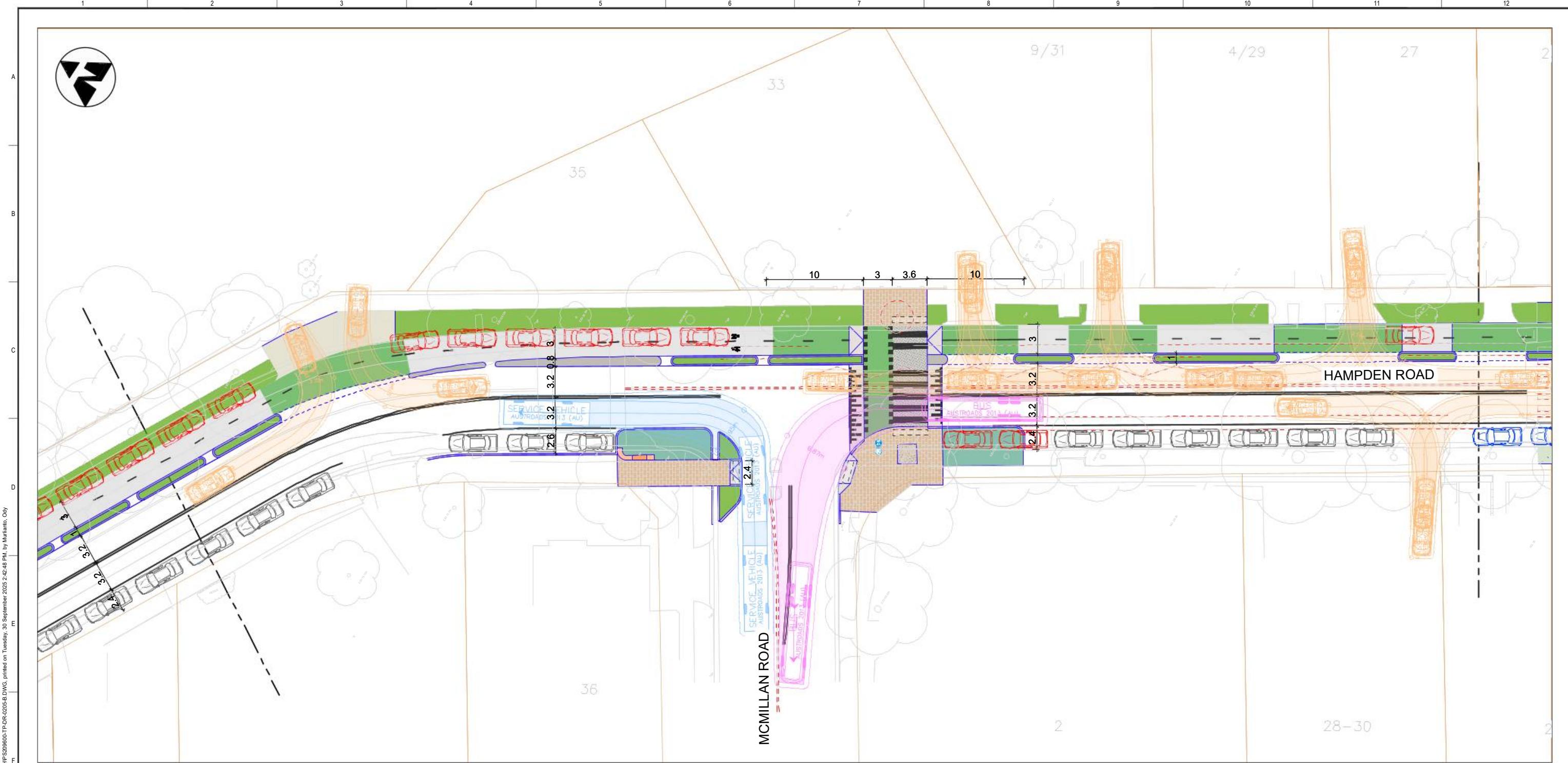


- NOTE**
- TURNING PATH ASSESSMENTS HAVE BEEN CONDUCTED AT 5-10 KM/H TRAVEL SPEED
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LEGEND



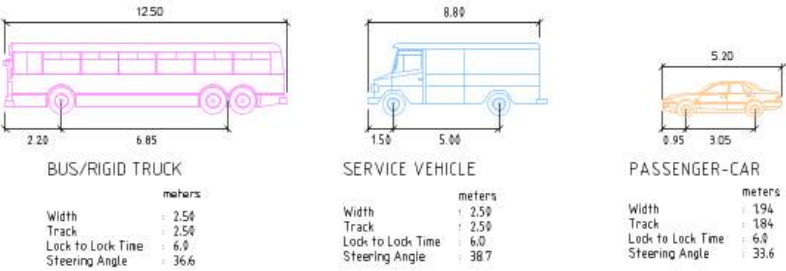
			REFERENCE COORDINATION DRAWINGS				SIGNED		 Level 27, 680 George Street, Sydney GPO Box 5394, NSW 2001, Australia Tel: +61 2 9272 5100 Fax: +61 2 9272 5101 wsp.com		CLIENT:  31 Victor Street Chatswood NSW 2067 (02) 9777 1000 email@willoughby.nsw.gov.au		DELIVERY PARTNERS:  spackman mossop michaels		PROJECT: WILLOUGHBY CITY COUNCIL CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT				DRAWING STATUS: 90% CD - FOR COORDINATION			
			DESCRIPTION		DRAWING NO.		REV								CHK		DESIGNED: ODY MURLIANTO		CHECKED: ODY MURLIANTO		APPROVED: VINCE OLIVERI	
																	PROJECT No: PS209600		DRAWN: HAYLEY CAVANAGH		DATE: 30.09.25	
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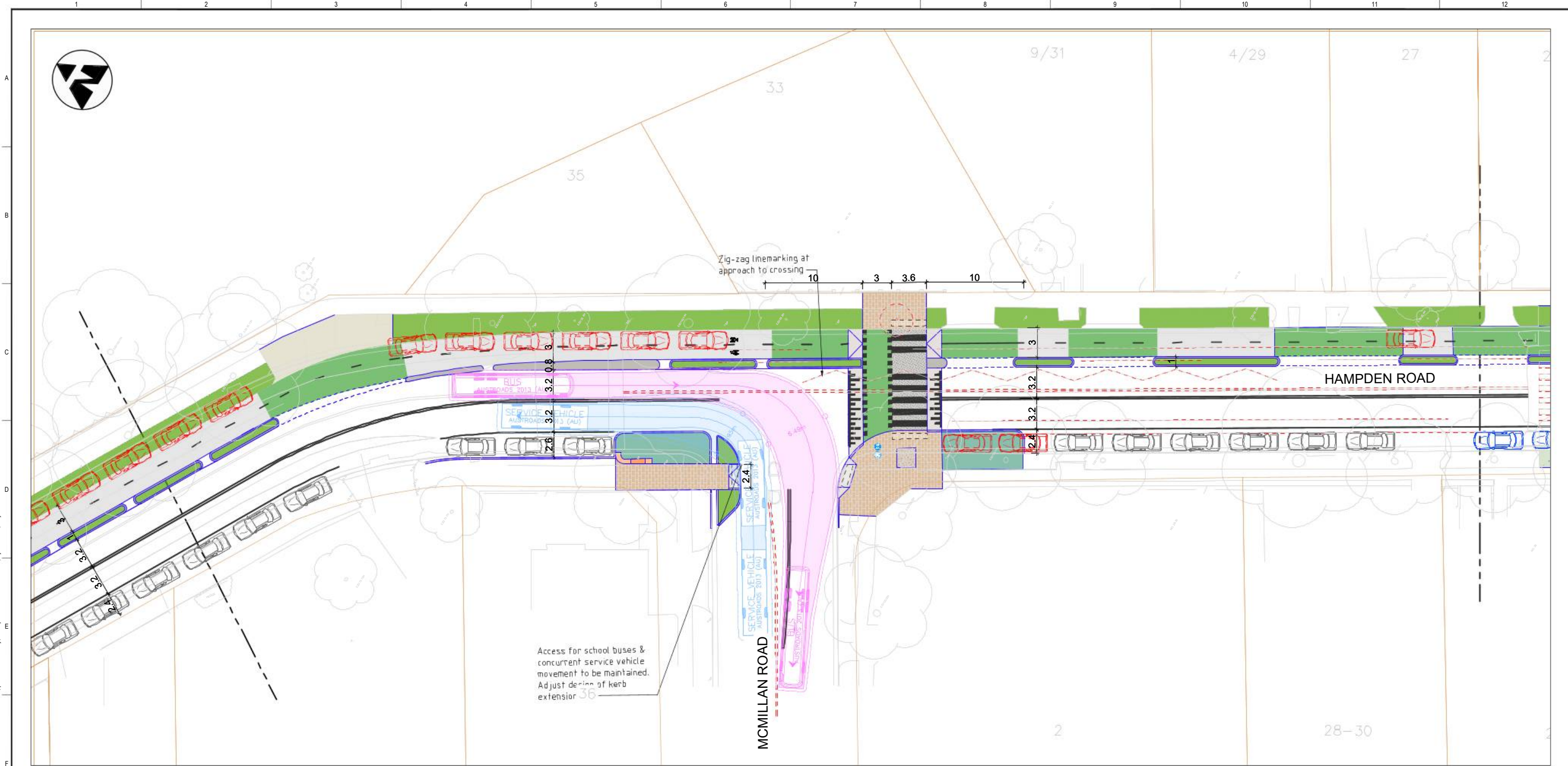
- NOTE**
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LEGEND



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	B A				DESCRIPTION				DRAWING NO.				REV				CHK						DESIGNED: ODY MURLIANTO				CHECKED: ODY MURLIANTO				APPROVED: VINCE OLIVERI																																	
	30.09.25				H.C.				90% CD - FOR COORDINATION				50% CD - FOR COORDINATION				O.M.						V.O.				PROJECT No: PS209600				DRAWN: HAYLEY CAVANAGH				DATE: 30.09.25				REV:																									
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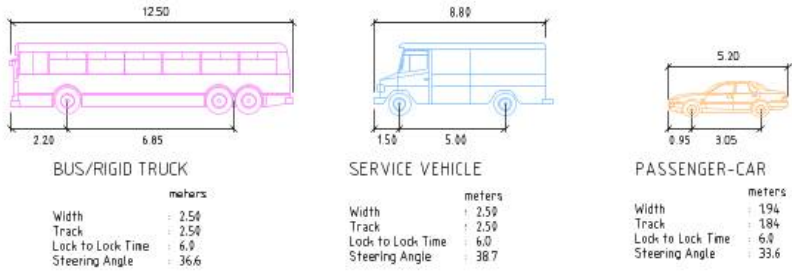
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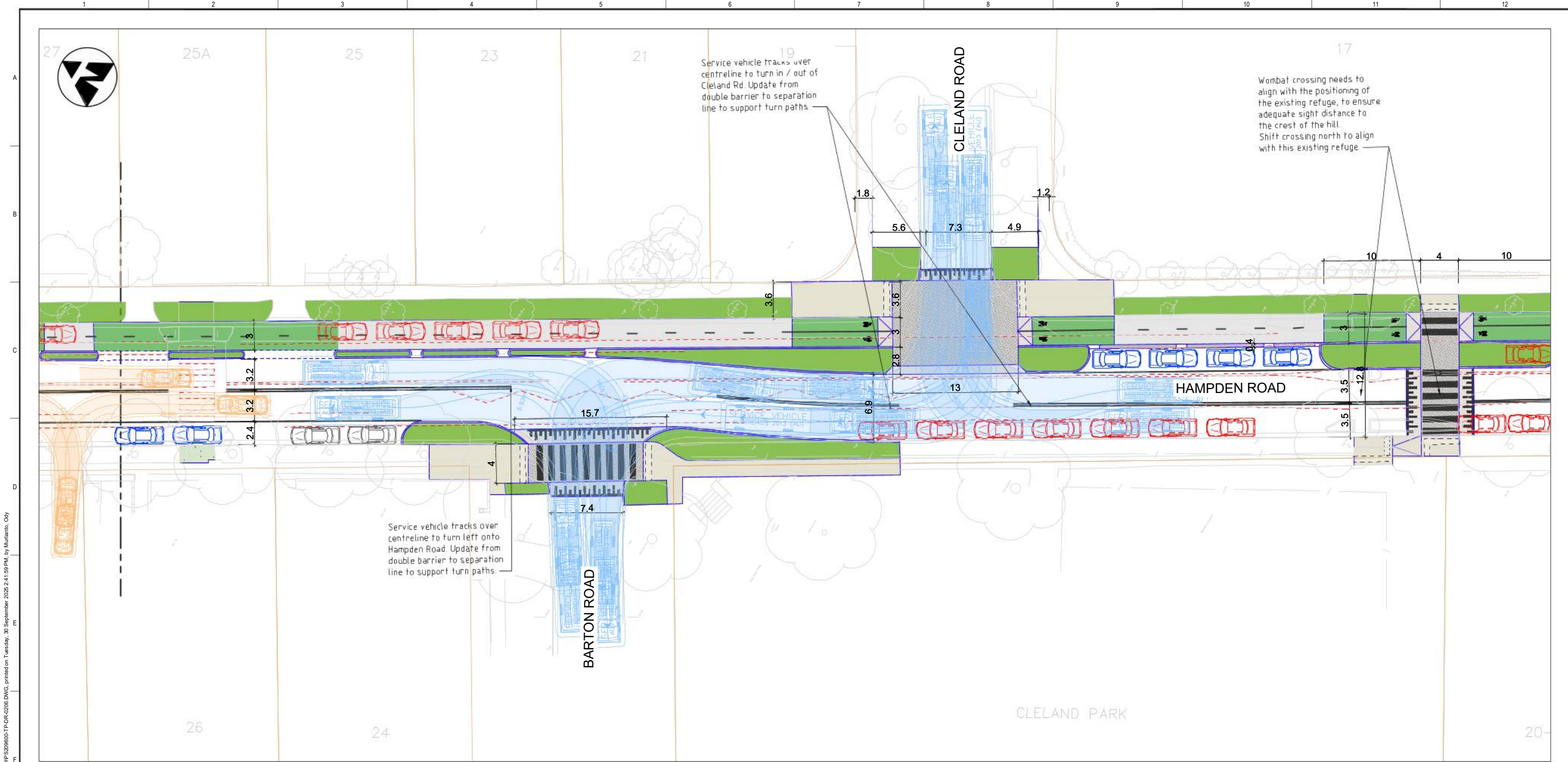
NOTE

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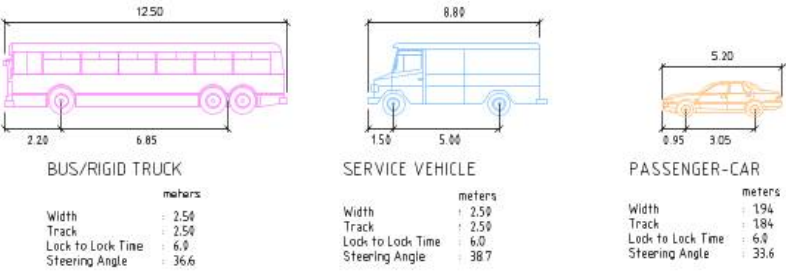
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DESCRIPTION				DRAWING NO.		DO NOT SCALE THIS DRAWING		WILLOUGHBY CITY COUNCIL		Woolacotts.		CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT		90% CD - FOR COORDINATION	
SURVEY DATUM				SIGNED:		APPROVED		31 Victor Street		spackman mossop michael		HAMPDEN ROAD AND HERBERT STREET		DESIGNED: ODY MURLIANTO	
HORIZONTAL DATUM:				DATE:		RREQ:		Chatswood NSW 2067		(02) 9777 1000		TURNING PATH ASSESSMENT		CHECKED: ODY MURLIANTO	
VERTICAL DATUM:				© WSP Australia Pty Ltd.				email@willoughby.nsw.gov.au				MCMILAN ROAD/HAMPDEN ROAD		APPROVED: VINCE OLIVERI	
												SHEET 05		PROJECT No: PS209600	
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														DATE: 30.09.25	
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														REV: B	



PLAN
SCALE 1:400

- NOTE**
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LEGEND



REFERENCE COORDINATION DRAWINGS				SIGNED		APPROVED		DATE		RREQ		DATE		RREQ	
DESCRIPTION	DRAWING NO.	REV	CHK												
SURVEY DATUM															
HORIZONTAL DATUM:		VERTICAL DATUM:													
REV	DATE	BY	DESCRIPTION	CHK	APPD										
B	30.09.25	H.C.	90% CD - FOR COORDINATION	O.M.	V.O.										
A	07.07.25	H.C.	50% CD - FOR COORDINATION	O.M.	V.O.										

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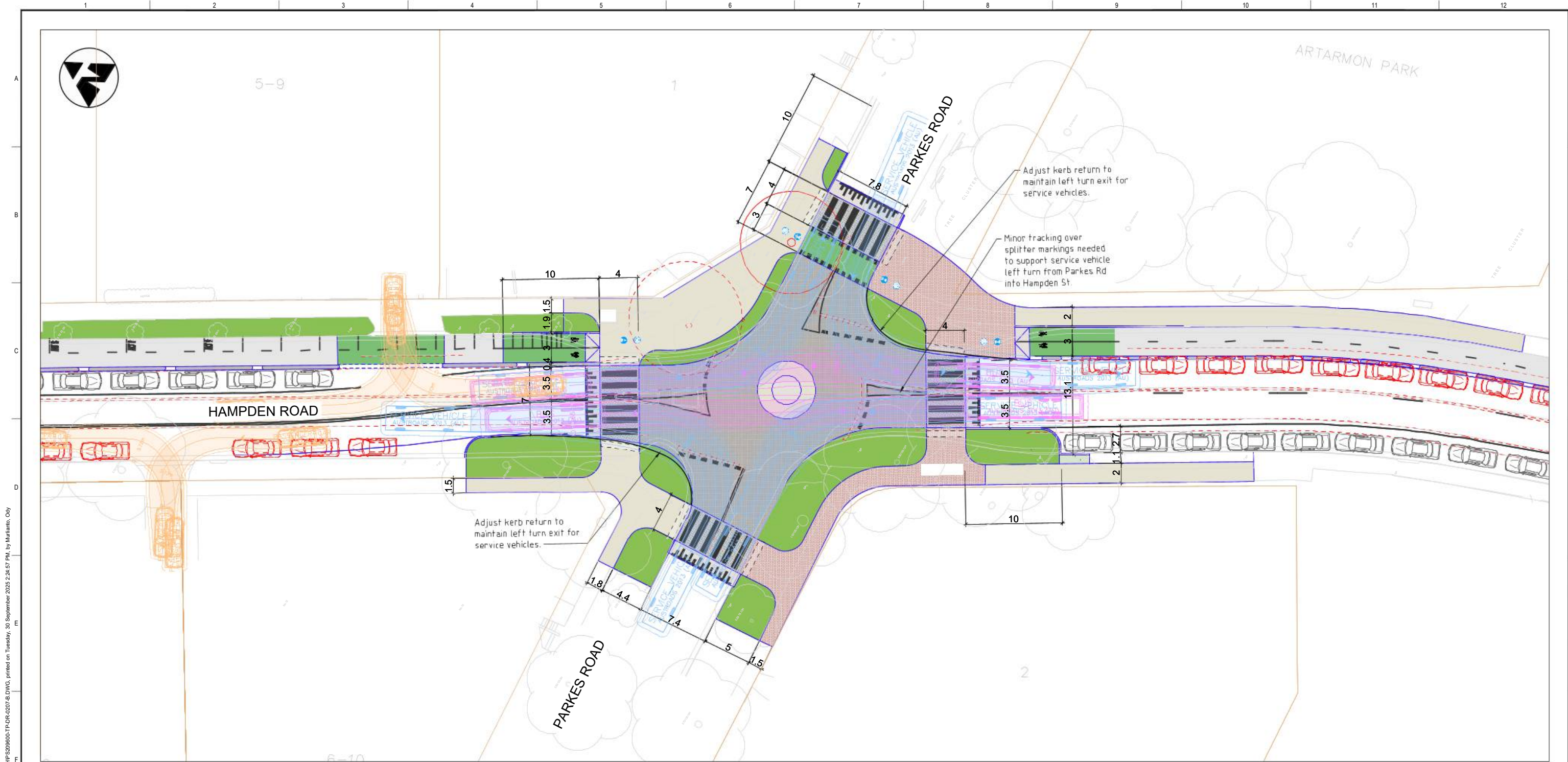
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SIGNED:		APPROVED	
DATE:		RREQ:	
© WSP Australia Pty Ltd.			

wsp		Level 27, 680 George Street, Sydney GPO Box 5394, NSW 2001, Australia Tel: +61 2 9272 5100 Fax: +61 2 9272 5101 wsp.com	
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CLIENT:		DELIVERY PARTNERS:	
WILLOUGHBY CITY COUNCIL		Woolacotts	
31 Victor Street Chatswood NSW 2067 (02) 9777 1000 email@willoughby.nsw.gov.au		spackman mossop michaels	

PROJECT:		WILLOUGHBY CITY COUNCIL	
CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT			
TITLE:		HAMPDEN ROAD AND HERBERT STREET TURNING PATH ASSESSMENT BARTON RD/CLELAND RD/HAMPDEN RD SHEET 06	

DRAWING STATUS:		90% CD - FOR COORDINATION	
DESIGNED:		CHECKED:	
ODY MURLIANTO		ODY MURLIANTO	
PROJECT No:		DRAWN:	
PS209600		HAYLEY CAVANAGH	
DATE:		DATE:	
30.09.25			
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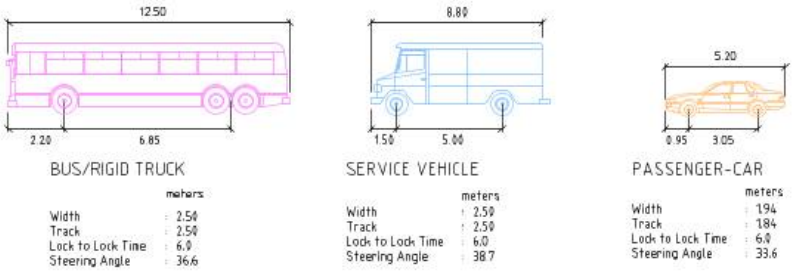


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NOTE

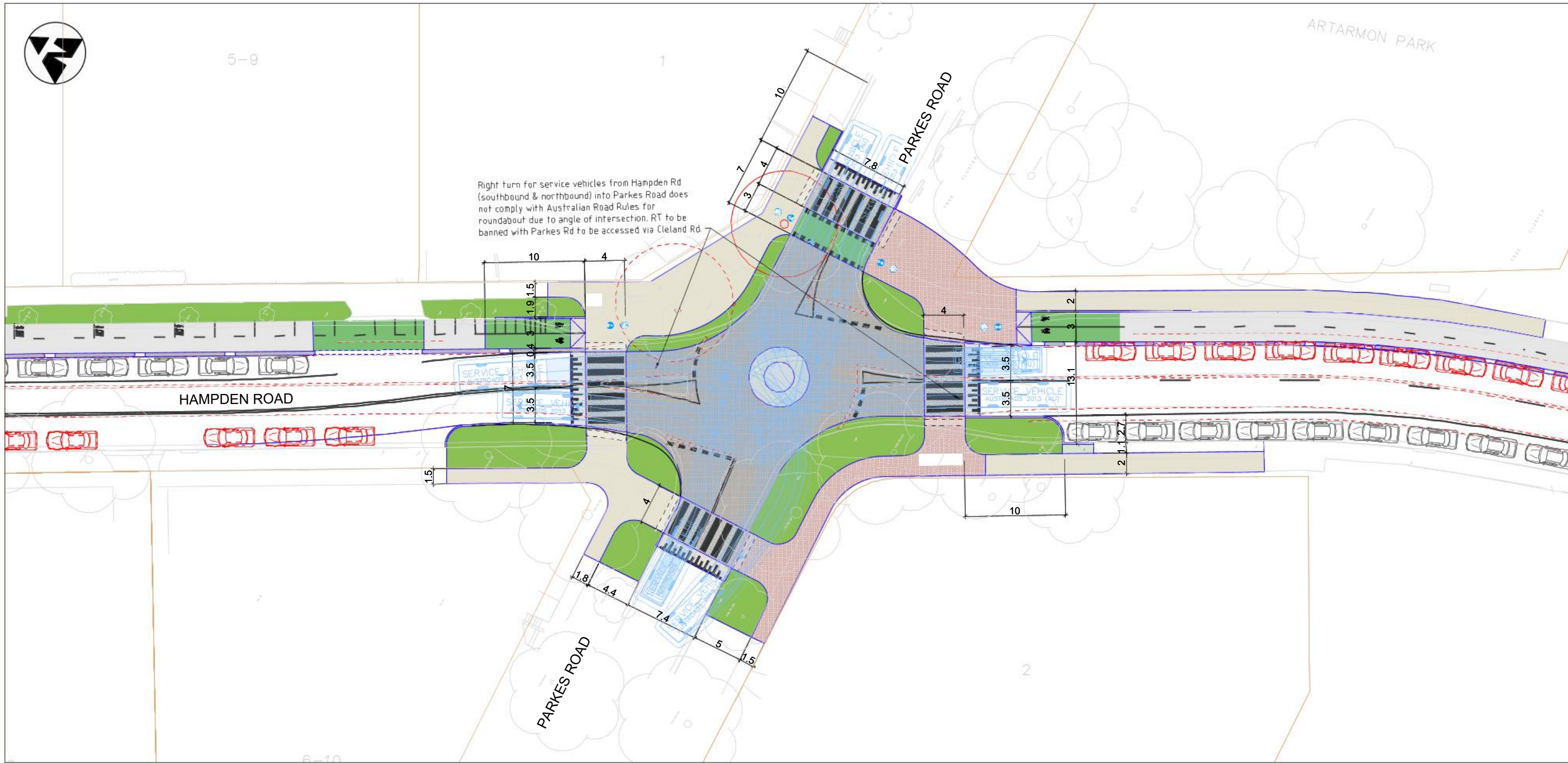
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LEGEND



REFERENCE COORDINATION DRAWINGS				SIGNED		APPROVED		DATE		RREQ		© WSP Australia Pty Ltd.	
DESCRIPTION				DRAWING NO.		REV		CHK		DATE		WSP Australia Pty Ltd.	
SURVEY DATUM				HORIZONTAL DATUM		VERTICAL DATUM		DATE		BY		WSP Australia Pty Ltd.	
O.M.				V.O.		CHK		APPD		DATE		WSP Australia Pty Ltd.	
H.C.				S.C.		CHK		APPD		DATE		WSP Australia Pty Ltd.	
90% CD - FOR COORDINATION				50% CD - FOR COORDINATION		DATE		BY		DATE		WSP Australia Pty Ltd.	
30.09.25				07.07.25		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	
B				A		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	
30.09.25				07.07.25		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	
B				A		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	
30.09.25				07.07.25		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	
B				A		H.C.		S.C.		DATE		WSP Australia Pty Ltd.	

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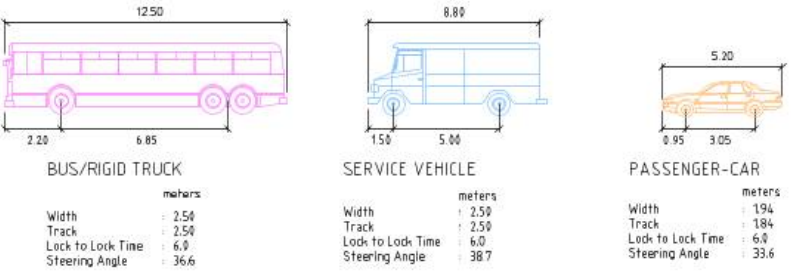


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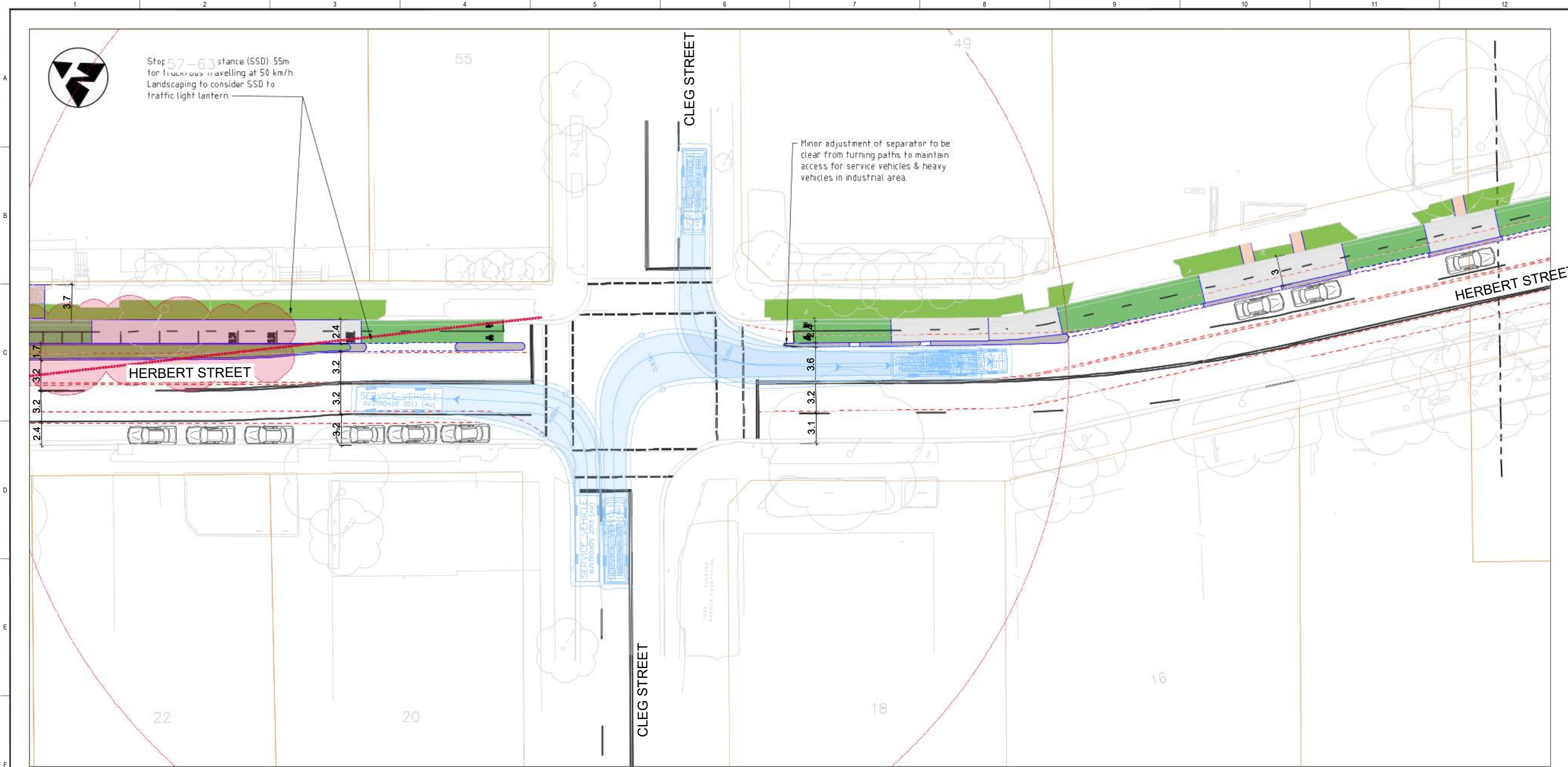
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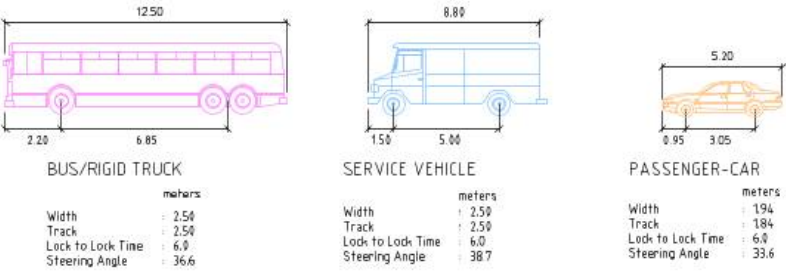
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PLAN
SCALE 1:400

- NOTE**
- TURNING PATH ASSESSMENTS HAVE BEEN CONDUCTED AT 5-10 KM/H TRAVEL SPEED
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REFERENCE COORDINATION DRAWINGS				SIGNED		APPROVED		DATE		RREQ		© WSP Australia Pty Ltd.	
DESCRIPTION				DRAWING NO.		REV		CHK		DATE		RREQ	
SURVEY DATUM				HORIZONTAL DATUM		VERTICAL DATUM		DATE		RREQ		© WSP Australia Pty Ltd.	
O.M.				V.O.		CHK		APPD		DATE		RREQ	
B				A		30.09.25		07.07.25		H.C.		90% CD - FOR COORDINATION	
B				A		30.09.25		07.07.25		H.C.		50% CD - FOR COORDINATION	

Full Size 1:400 ; A3		SCALE (m)	
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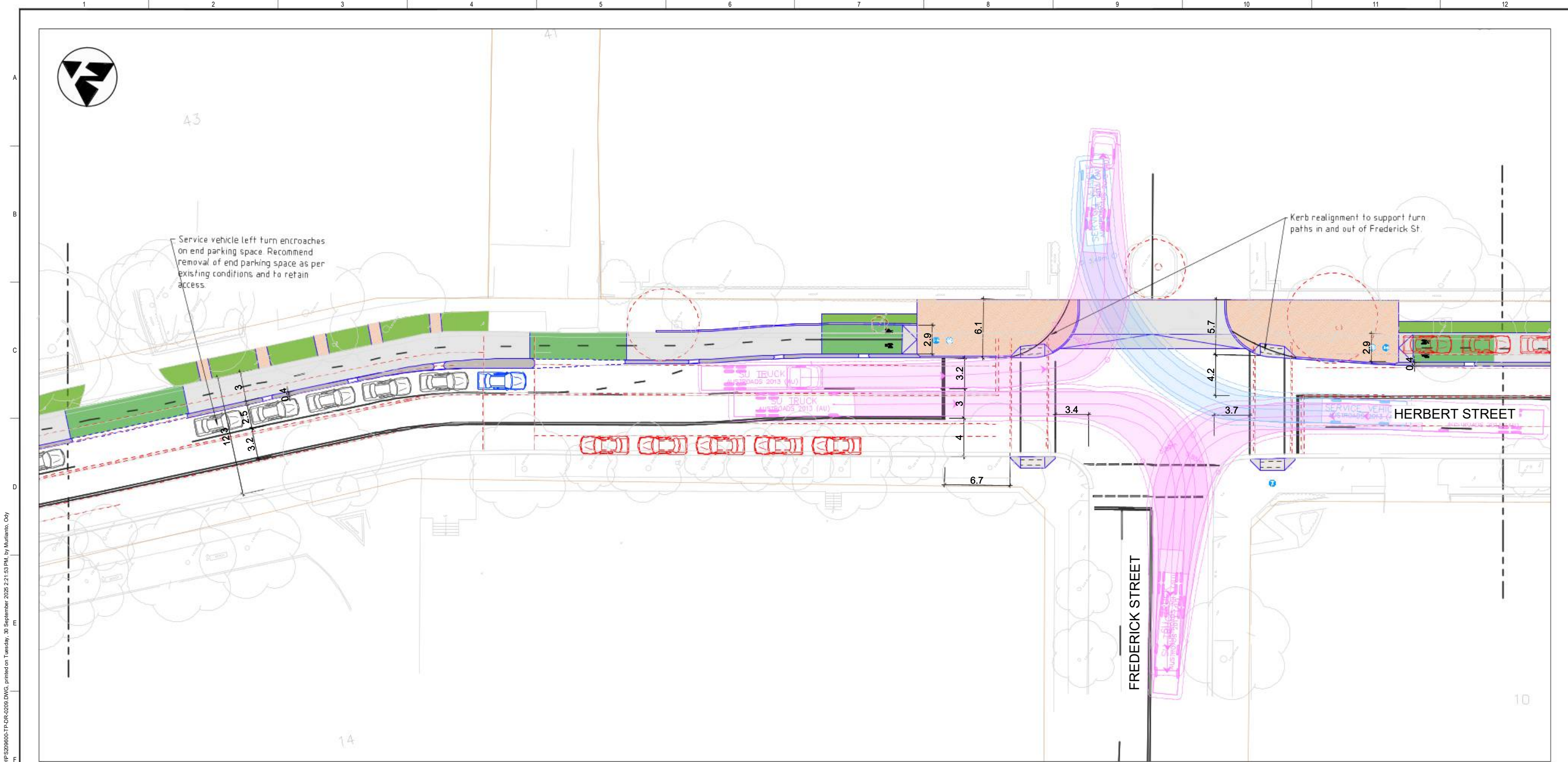
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DATE		RREQ	
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Level 27, 680 George Street, Sydney		GPO Box 5394, NSW 2001, Australia	
Tel: +61 2 9272 5100 Fax: +61 2 9272 5101		wsp.com	

CLIENT:		DELIVERY PARTNERS:	
WILLOUGHBY CITY COUNCIL		Woolacotts	
31 Victor Street		spackman mossop michael	
CHATSWOOD NSW 2067		(02) 9777 1000	
email@willoughby.nsw.gov.au			

PROJECT:		WILLOUGHBY CITY COUNCIL	
CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT		TITLE:	
HAMPDEN ROAD AND HERBERT STREET		TURNING PATH ASSESSMENT	
CLEG STREET/HERBERT STREET		SHEET 08	

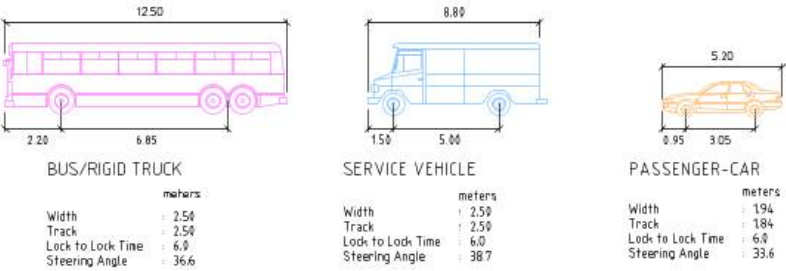
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DESIGNED:		CHECKED:	
ODY MURLIANTO		ODY MURLIANTO	
PROJECT No:		DRAWN:	
PS209600		HAYLEY CAVANAGH	
DATE:		DATE:	
30.09.25		30.09.25	
DRAWING No:		REV:	
PS209600-TP-DR-0208		B	



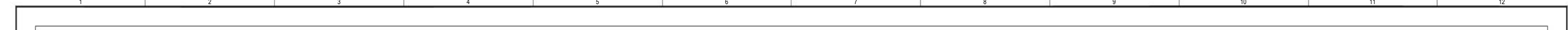
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SCALE 1:400

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LEGEND



REFERENCE COORDINATION DRAWINGS				SCALES		A3 ORIGINAL		CLIENT		DELIVERY PARTNERS		PROJECT		DRAWING STATUS	
DESCRIPTION				DRAWING NO.		DO NOT SCALE THIS DRAWING		WILLOUGHBY CITY COUNCIL		Woolacotts.		CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT		90% CD - FOR COORDINATION	
SURVEY DATUM				HORIZONTAL DATUM		SIGNED:		31 Victor Street		spackman mossop michael		TITLE		DESIGNED: ODY MURLIANTO	
VERTICAL DATUM:				DATE:		RREQ:		Chatswood NSW 2067		(02) 9777 1000		HAMPDEN ROAD AND HERBERT STREET		CHECKED: ODY MURLIANTO	
						© WSP Australia Pty Ltd.		email@willoughby.nsw.gov.au				TURNING PATH ASSESSMENT		APPROVED: VINCE OLIVERI	
												FREDERICK STREET/HERBERT STREET		PROJECT No: PS209600	
												SHEET 09		DRAWN: HAYLEY CAVANAGH	
														DATE: 30.09.25	
														REV: PS209600-TP-DR-0209	
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1. TURNING PATH ASSESSMENTS HAVE BEEN CONDUCTED AT 5-10 KM/H TRAVEL SPEED
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Track	2.50
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Steering Angle	36.6

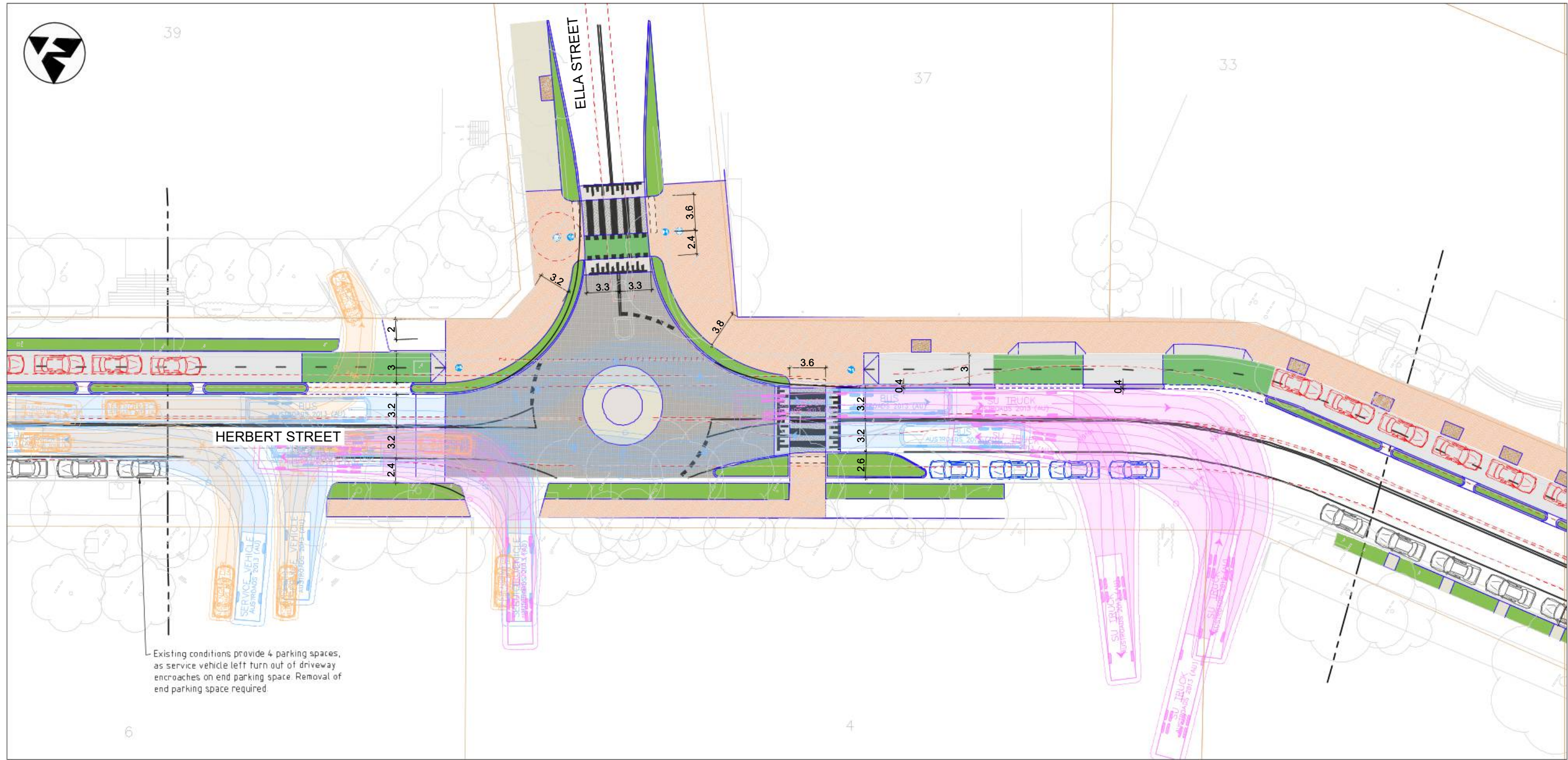
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Track	2.50
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Steering Angle	38.7

	meters
Width	1.94
Track	1.84
Lock to Lock Time	6.0
Steering Angle	33.6

PLAN
SCALE 1:400

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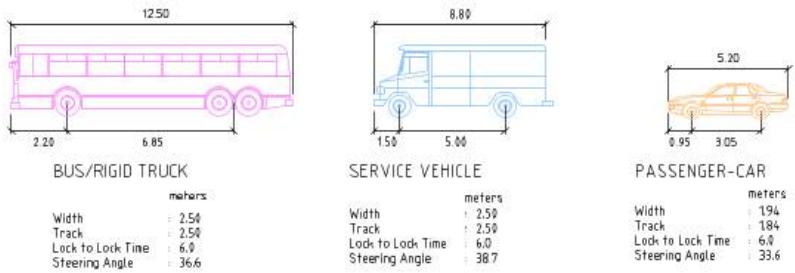


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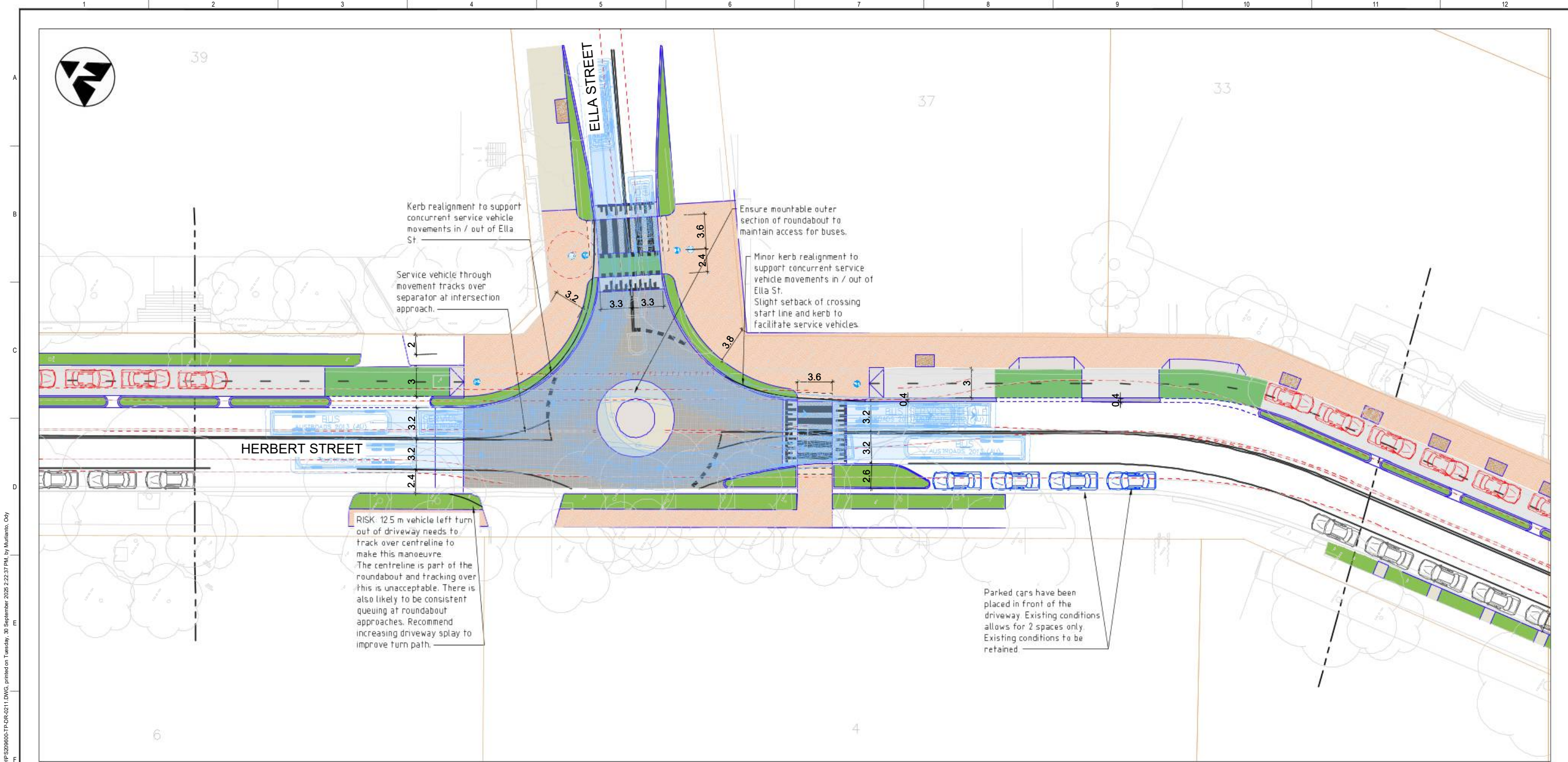
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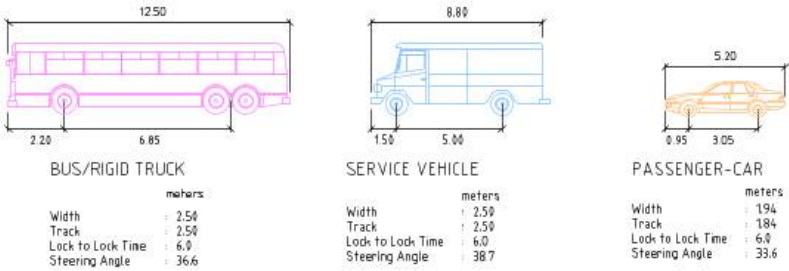
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SURVEY DATUM				HORIZONTAL DATUM		SIGNED:		Level 27, 680 George Street, Sydney		spackman mossop		HAMPDEN ROAD AND HERBERT STREET		DESIGNED: ODY MURLIANTO	
VERTICAL DATUM:				DATE:		RREQ:		GPO Box 5394, NSW 2001, Australia		michaels		TURNING PATH ASSESSMENT		CHECKED: ODY MURLIANTO	
CHK				APPD		© WSP Australia Pty Ltd.		Tel: +61 2 9272 5100 Fax: +61 2 9272 5101		31 Victor Street		ELLA STREET/HERBERT STREET DRIVEWAYS		APPROVED: VINCE OLIVERI	
REV				DATE		DATE		wsp.com		Chatswood NSW 2067		SHEET 11		PROJECT No: PS209600	
BY				DESCRIPTION		DATE		email@willoughby.nsw.gov.au		(02) 9777 1000		DRAWING No: PS209600-TP-DR-0211-B		DRAWN: HAYLEY CAVANAGH	
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1				2		3		4		5		6		REV: B	



NOTE

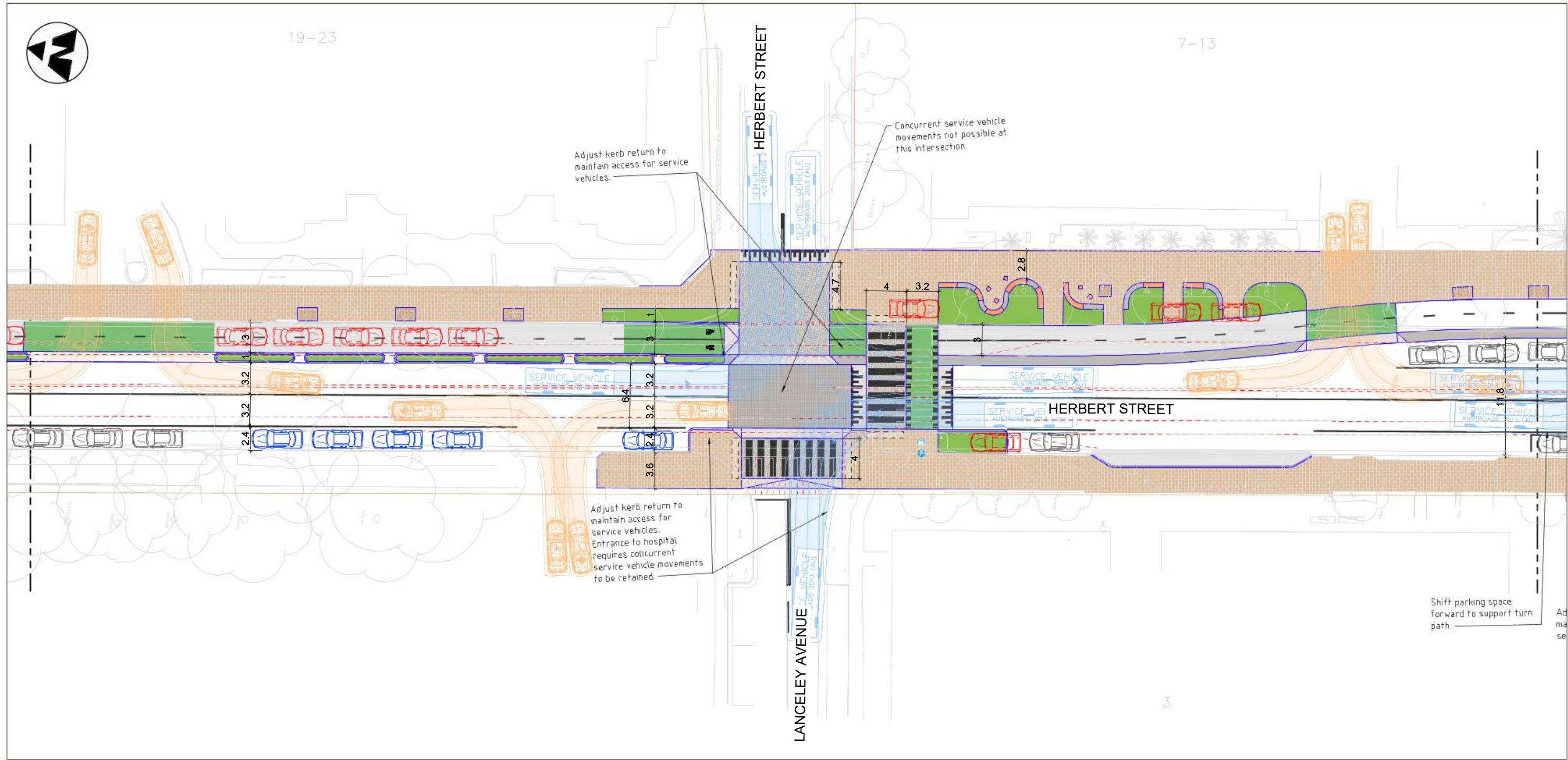
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REFERENCE COORDINATION DRAWINGS				SIGNED		APPROVED		CLIENT		DELIVERY PARTNERS		PROJECT		DRAWING STATUS	
DESCRIPTION	DRAWING NO.	REV	CHK	DATE	RREQ	DATE	RREQ	WILLOUGHBY CITY COUNCIL	Woolacotts	spackman mossop michael	WILLOUGHBY CITY COUNCIL	CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT	DESIGNED: ODY MURLIANTO	CHECKED: ODY MURLIANTO	APPROVED: VINCE OLIVERI
SURVEY DATUM				Full Size 1:400 ; A3 SCALE (m)		Level 27, 680 George Street, Sydney		31 Victor Street		CHATSWOOD NSW 2067		HAMPDEN ROAD AND HERBERT STREET		PS209600-TP-DR-0211	
HORIZONTAL DATUM				© WSP Australia Pty Ltd.		GPO Box 5394, NSW 2001, Australia		Willoughby City Council		Willoughby City Council		ELLAS STREET/HERBERT STREET		B	
REV	DATE	BY	DESCRIPTION	CHK	APPD	Level 27, 680 George Street, Sydney		31 Victor Street		CHATSWOOD NSW 2067		HAMPDEN ROAD AND HERBERT STREET		PS209600-TP-DR-0211	
B	30.09.25	H.C.	90% CD - FOR COORDINATION	O.M.	V.O.	GPO Box 5394, NSW 2001, Australia		Willoughby City Council		Willoughby City Council		ELLAS STREET/HERBERT STREET		PS209600-TP-DR-0211	
A	07.07.25	H.C.	50% CD - FOR COORDINATION	O.M.	V.O.	Tel: +61 2 9272 5100 Fax: +61 2 9272 5101		(02) 9777 1000		email@willoughby.nsw.gov.au		SHEET 11		B	

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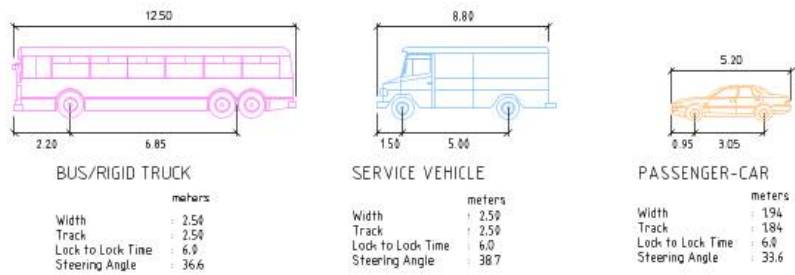


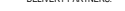
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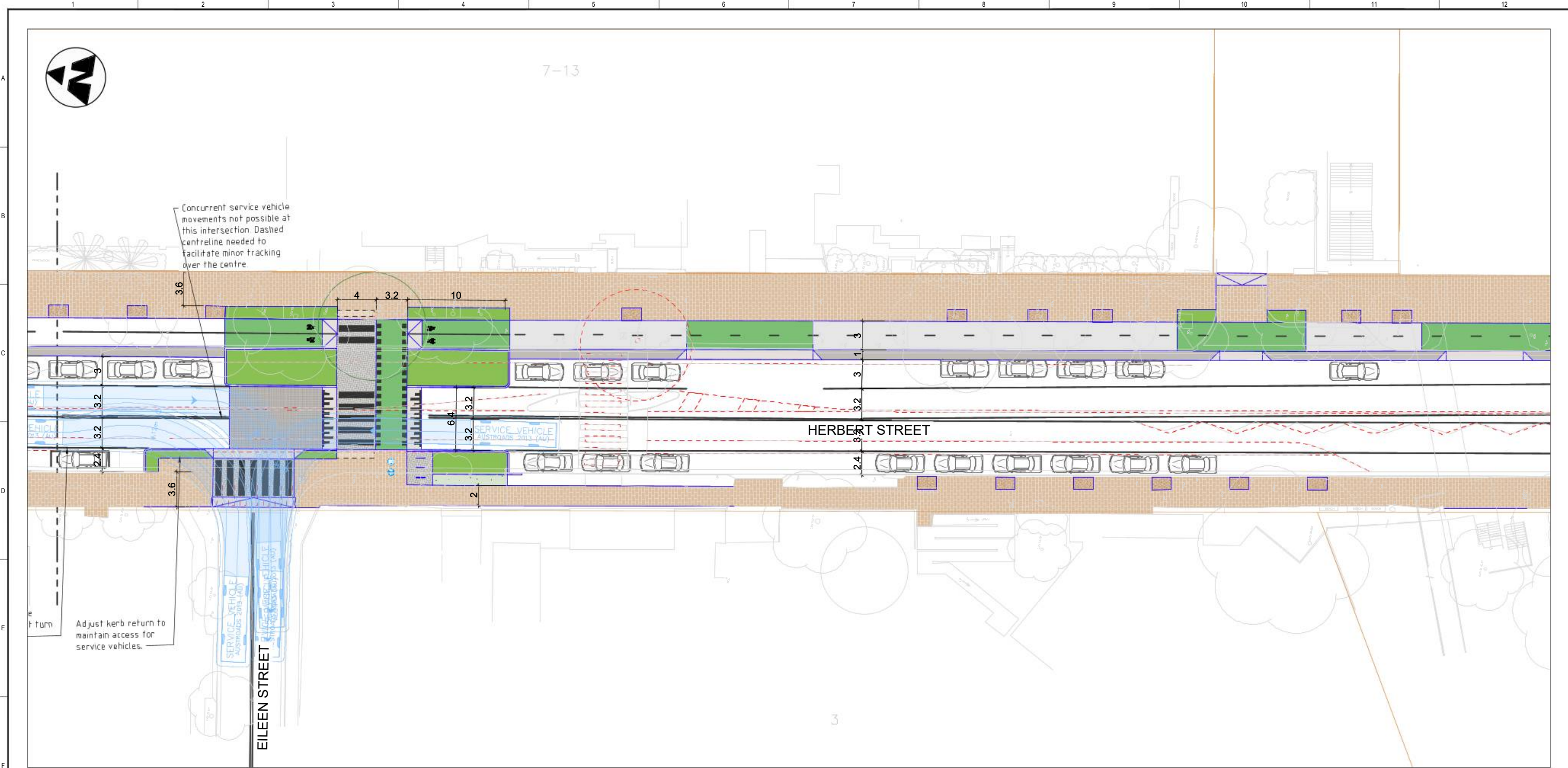
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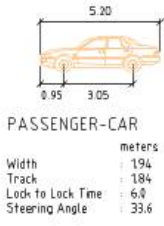
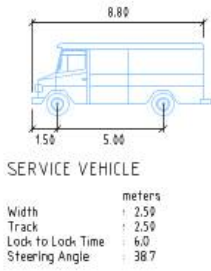
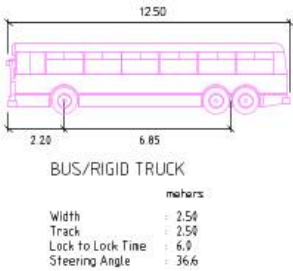
				REFERENCE COORDINATION DRAWINGS				SIGNED				A3 ORIGINAL DO NOT SCALE THIS DRAWING				 Level 27, 680 George Street, Sydney GPO Box 5394, NSW 2001, Australia Tel: +61 2 9272 5100 Fax: +61 2 9272 5101 wsp.com				CLIENT:  31 Victor Street Chatswood NSW 2067 (02) 9777 1000 email@willoughby.nsw.gov.au				DELIVERY PARTNERS:  spackman mossop michaels				PROJECT: WILLOUGHBY CITY COUNCIL CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT				DRAWING STATUS: 90% CD - FOR COORDINATION			
				DESCRIPTION				DRAWING NO.				APPROVED								DESIGNED: ODY MURLANTO				CHECKED: ODY MURLANTO				APPROVED: VINCE OLIVERI							
								REV				CHK								PS209600				DRAWN: HAYLEY CAVANAGH				DATE: 30.09.25							
				SURVEY DATUM																															
				HORIZONTAL DATUM:				VERTICAL DATUM:																											

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			REFERENCE COORDINATION DRAWINGS				SCALES		A3 ORIGINAL DO NOT SCALE THIS DRAWING		CLIENT		DELIVERY PARTNERS		PROJECT:		DRAWING STATUS:							
			DESCRIPTION		DRAWING NO.		REV		CHK						WILLOUGHBY CITY COUNCIL		90% CD - FOR COORDINATION							
															CHATSWOOD TO ST LEONARDS CYCLEWAY PROJECT									
			SURVEY DATUM				Full Size 1:400 ; A3 SCALE (m)		APPROVED		31 Victor Street Chatswood NSW 2067 (02) 9777 1000 email@willoughby.nsw.gov.au		spackman mossop michaels		HAMPDEN ROAD AND HERBERT STREET TURNING PATH ASSESSMENT EILEEN STREET/HERBERT STREET SHEET 14		DESIGNED: ODY MURLIANTO		CHECKED: ODY MURLIANTO		APPROVED: VINCE OLIVERI			
			HORIZONTAL DATUM:		VERTICAL DATUM:				SIGNED:		DATE:		RPEC:				PROJECT No: PS209600		DRAWN: HAYLEY CAVANAGH		DATE: 30.09.25		REV:	
									© WSP Australia Pty Ltd.								PS209600-TP-DR-0214				B			
B	30.09.25	H.C.	90% CD - FOR COORDINATION				O.M.		V.O.															
A	07.07.25	H.C.	50% CD - FOR COORDINATION				O.M.		V.O.															
REV	DATE	BY	DESCRIPTION				CHK	APPD																

Appendix H

Wayfinding guidance plan





WAYFINDING GUIDANCE PLAN

CHATSWOOD TO ST LEONARDS CYCLEWAY
October 2025





Chatswood to St Leonards Cycleway

Rev	Date	Details
A	17/10/2025	90% Concept Design

	Name	Date	Signature
Prepared by	Vaishnavi Ragipani Hayley Cavanagh	17/10/2025	
Reviewed by	Ody Murlianto	17/10/2025	
Approved by	Vince Oliveri	17/10/2025	

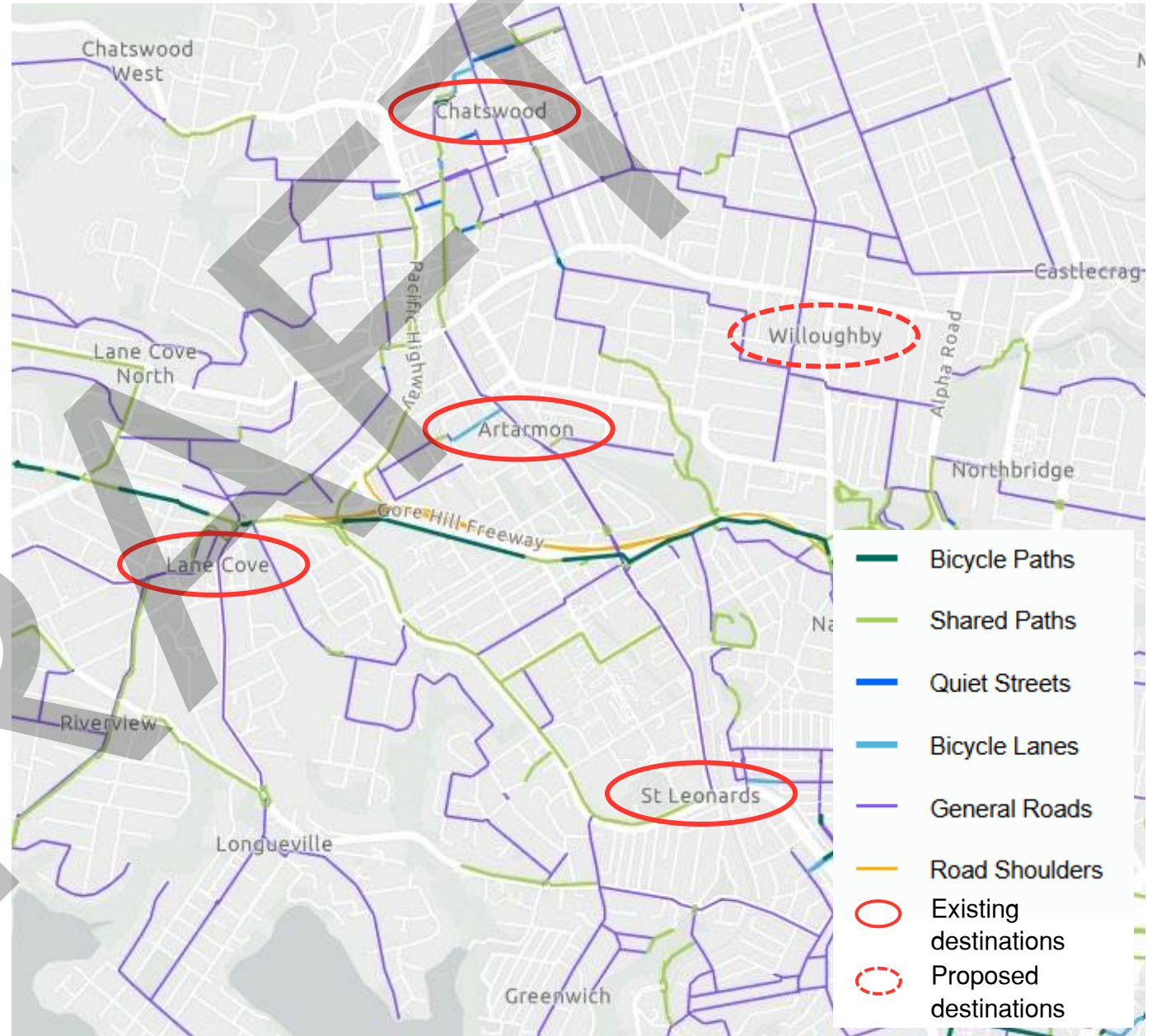
WSP Overview

Wayfinding guidance plays a key role in assisting cyclists with navigation along and across the cycleway, supporting informed decision-making and enhancing the overall user experience.

The proposed wayfinding plan builds upon the existing signage network, identifying new locations where additional or relocated signage is required due to changes introduced by the proposed cycleway – such as signage needing to be moved to the opposite side of the road or added at new junctions and intersections. This plan provides directions to the key destinations identified in the map to the right, which are included in the existing wayfinding guidance along this route.

As part of the Chatswood to St Leonards Cycleway design, we are proposing to include Willoughby as a destination and are seeking feedback from Willoughby City Council (WCC) regarding this inclusion. The proposed future connection of the cycling facility along Burra Road and Edward Street would support this addition. It is also noted that WCC is planning to enhance cycling infrastructure along Edward Street, further reinforcing the relevance of including Willoughby.

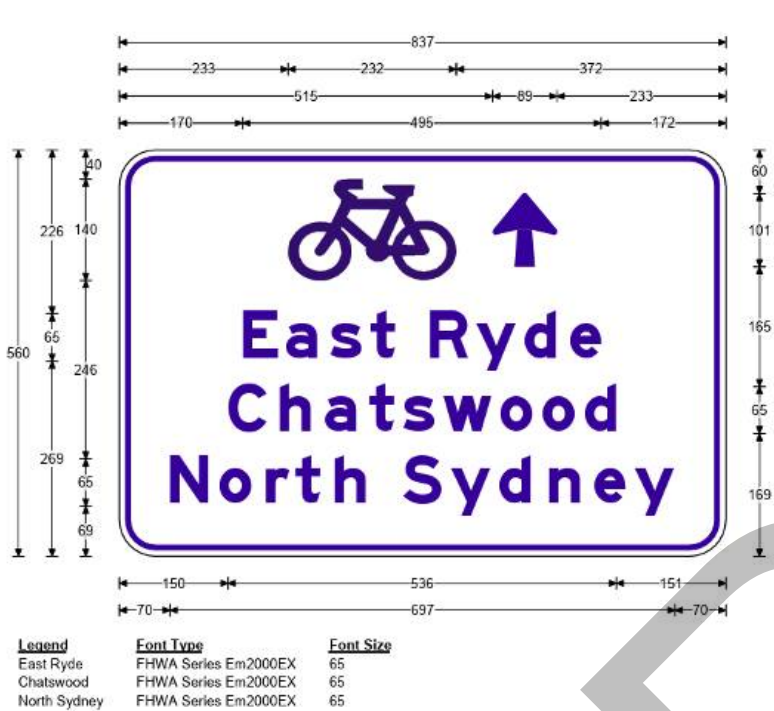
The proposed wayfinding signage plan incorporates the identified key destinations to provide clear and consistent navigational support. Wayfinding signage to be designed in accordance with AS 1742.9, discussed in more detail overleaf.



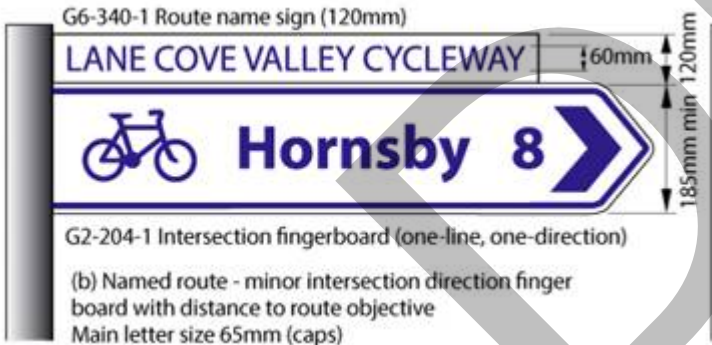
Source: TfNSW Cycleway Finder

WSP Signage Design

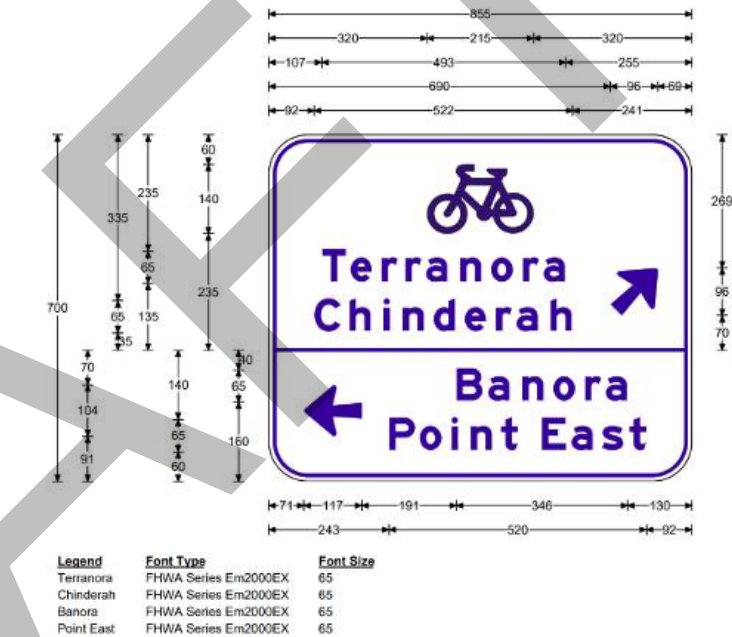
Wayfinding signage to be designed in accordance with AS 1742.9, with sign face designed in accordance with Transport for NSW's (TfNSW) G202/204 series and Austroads AP-R493-15, depicted below. The specifications for these are available [online](#), noting that height and width varies according to the legend content. The wayfinding plan provides signage identifiers to support design.



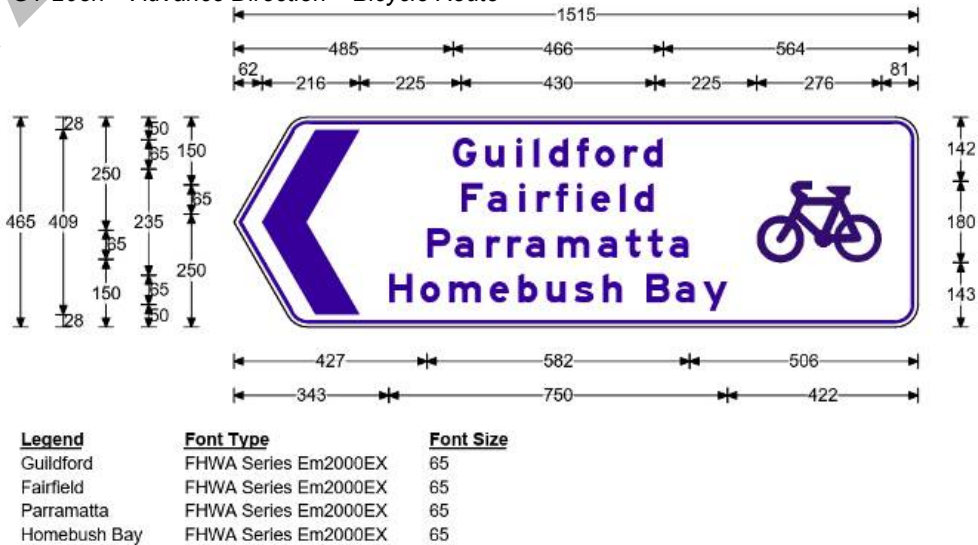
G4-202-3n – Reassurance – Bicycle Route (3 lines) (TfNSW)



G6-340-1 Route Name sign (120mm) (AP-R493-15, Austroads)



G1-205n – Advance Direction – Bicycle Route



G2-204-4n – Intersection Fingerboard – Bicycle Route (4 lines) (TfNSW)

Wayfinding guidance plan

Location:
Mowbray Rd / Hampden Rd (north) to Hampden Rd / Brand St (south).

- Key:**
- Existing wayfinding signage
 - Proposed wayfinding signage
 - Replace existing wayfinding signage
 - Remove existing wayfinding signage

Proposed



Facing south

Sign: G4-202-2n
Description: Reassurance - Bicycle Route (2 lines)

Proposed



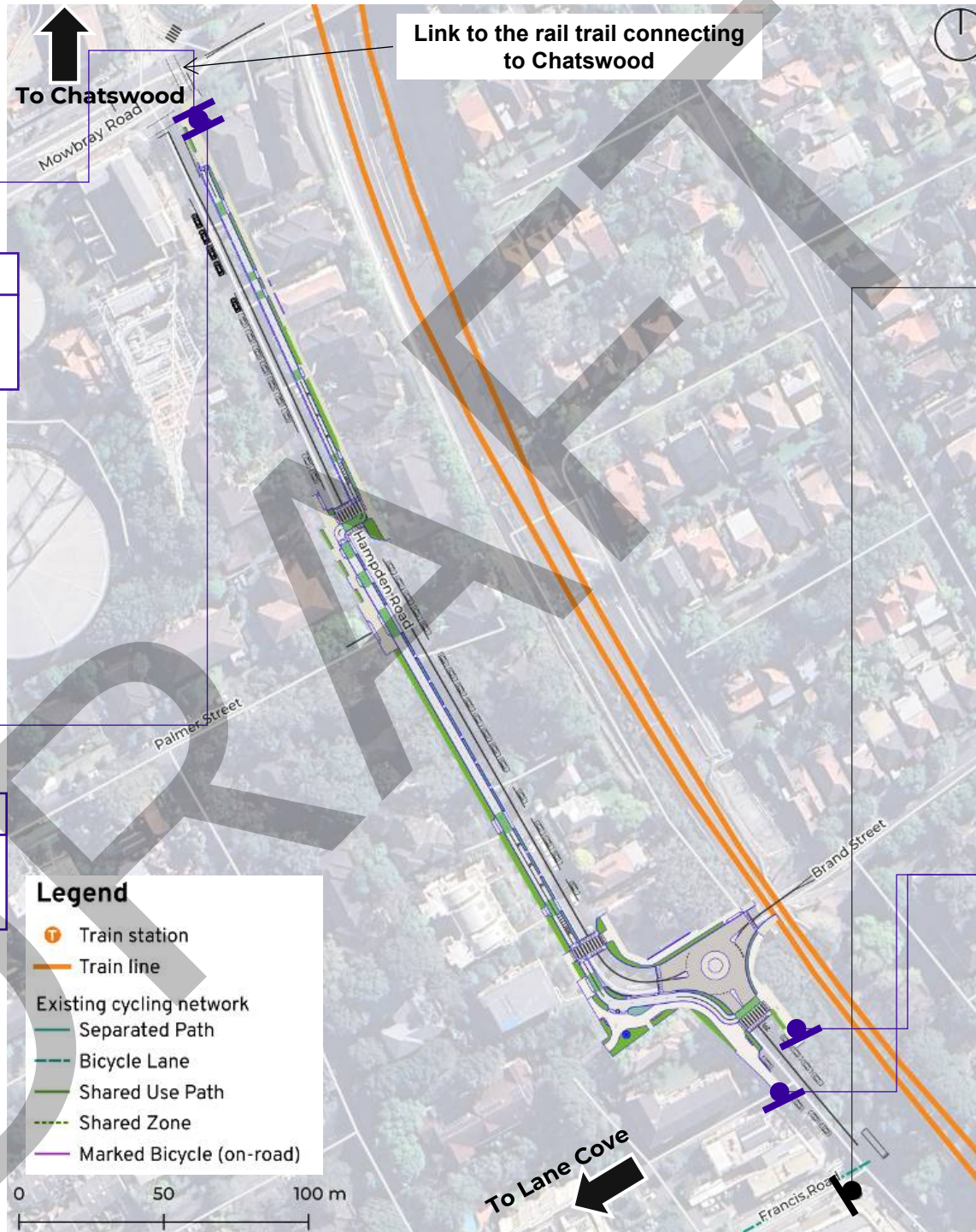
Facing north

Sign: G4-202-1n
Description: Reassurance - Bicycle Route (1 line)

Legend

- Train station
- Train line
- Existing cycling network
 - Separated Path
 - Bicycle Lane
 - Shared Use Path
 - Shared Zone
 - Marked Bicycle (on-road)

0 50 100 m



Link to the rail trail connecting to Chatswood

Existing – retain



Facing west

Sign: G4-202-1n
Description: Reassurance - Bicycle Route (1 line)

Proposed



Facing north

Sign: G4-202-1n
Description: Reassurance - Bicycle Route (1 line)

Wayfinding guidance plan

Location:
Hampden Rd / Brand St (north) to Hampden Rd / McMillan Rd (south).

- Key:**
- Existing wayfinding signage
 - Proposed wayfinding signage
 - Replace existing wayfinding signage
 - Remove existing wayfinding signage

Artarmon Chatswood ↑

Artarmon Reserve →

Facing north-west

Sign: G1-205n
Description: Advance Direction – Bicycle Route

Note: Request feedback on including “Willoughby” below “Artarmon Reserve”.



St Leonards ↑

← **Artarmon Reserve**

Facing south-east

Sign: G1-205n
Description: Advance Direction – Bicycle Route

St Leonards ↑

← **Artarmon Reserve**

Facing south-east

Sign: G1-205n
Description: Advance Direction – Bicycle Route

Note: Replace existing black and white signage with new blue on white or branded signage.

Wayfinding guidance plan

Location:
 Hampden Rd / McMillan Rd (north) to Hampden Rd / Punch St (south).

- Key:**
- Existing wayfinding signage
 - Proposed wayfinding signage
 - Replace existing wayfinding signage
 - Remove existing wayfinding signage

Artarmon
Chatswood

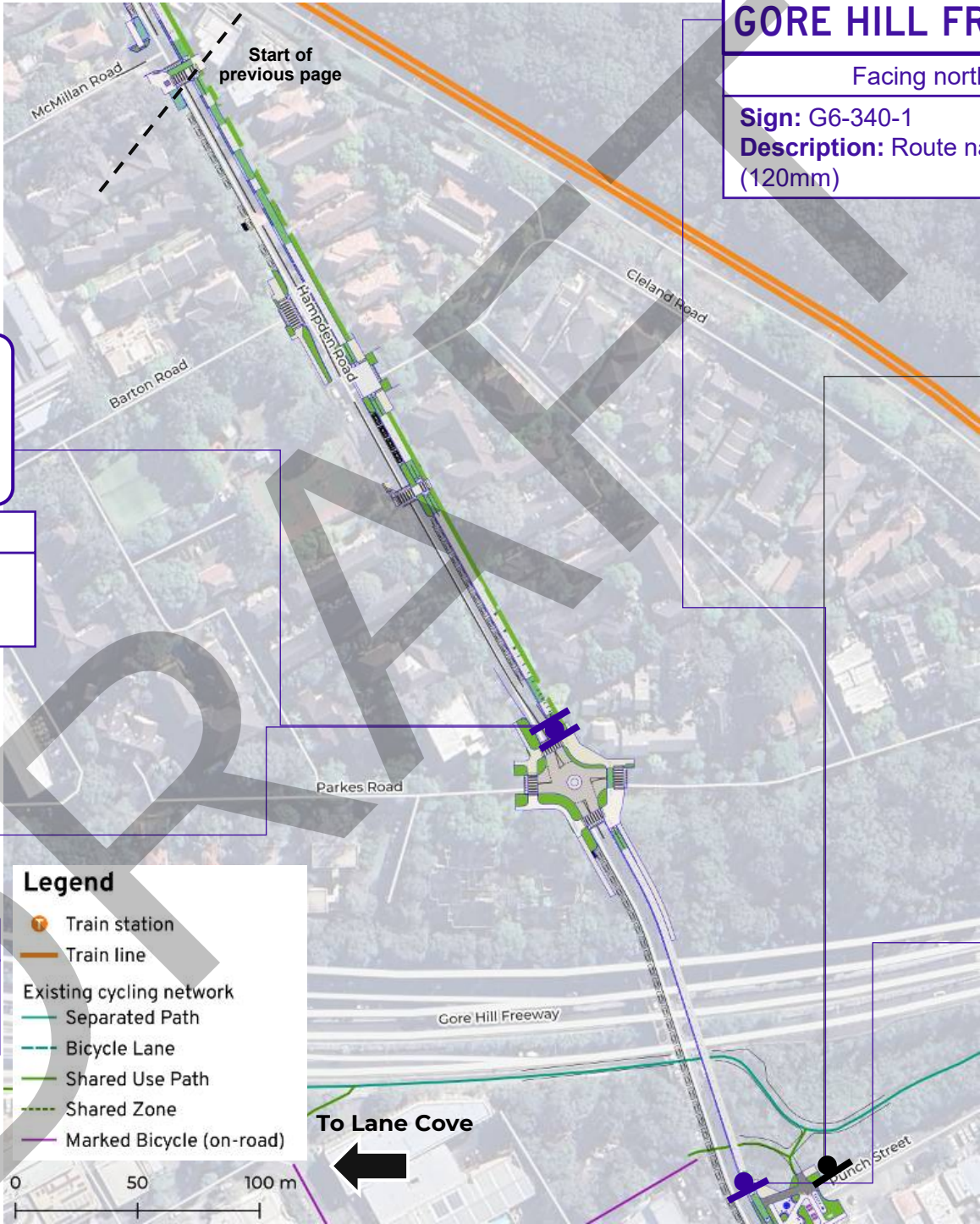
Facing north

Sign: G4-202-2n
Description: Reassurance - Bicycle Route (2 lines)

St Leonards

Facing south

Sign: G4-202-1n
Description: Reassurance - Bicycle Route (1 line)



Proposed

GORE HILL FREEWAY CYCLEWAY

Facing north

Sign: G6-340-1
Description: Route name sign (120mm)

Note: Route name sign to be positioned above existing Reassurance sign.

Existing – retain

Facing north

Similar to
Sign: G4-202-4n
Description: Reassurance - Bicycle Route (4 lines)

Proposed

Artarmon
Chatswood

Facing north

Sign: G4-202-2n
Description: Reassurance - Bicycle Route (2 lines)

Proposed

Lane Cove



Facing north & south / pointing west

Sign: G2-204-1n

Description: Intersection Fingerboard
- Bicycle Route (1 line-left)

Proposed

Artarmon
Chatswood



Facing west / pointing north

Sign: G2-204-2n

Description: Intersection Fingerboard
- Bicycle Route (2 lines-left)

St Leonards

Facing west / pointing south

Sign: G2-204-1n

Description: Intersection Fingerboard
- Bicycle Route (1 line-right)

Proposed

St Leonards



Facing south

Sign: G4-202-1n

Description: Reassurance -
Bicycle Route (1 line)

Note: Replace existing black and white signage with new blue on white or branded signage.

Existing - replace



Facing south
Similar to
Sign: G4-202-1n
Description:
Reassurance - Bicycle
Route (1 line)

Proposed

St Leonards



Facing south

Sign: G4-202-1n

Description: Reassurance -
Bicycle Route (1 line)

Existing - remove



Facing north
Similar to
Sign: G4-202-1n
Description:
Reassurance - Bicycle
Route (1 line)

Existing - remove



Sign: G2-204-2n
Description: Reassurance -
Bicycle Route (2 lines)

Wayfinding guidance plan

Location:

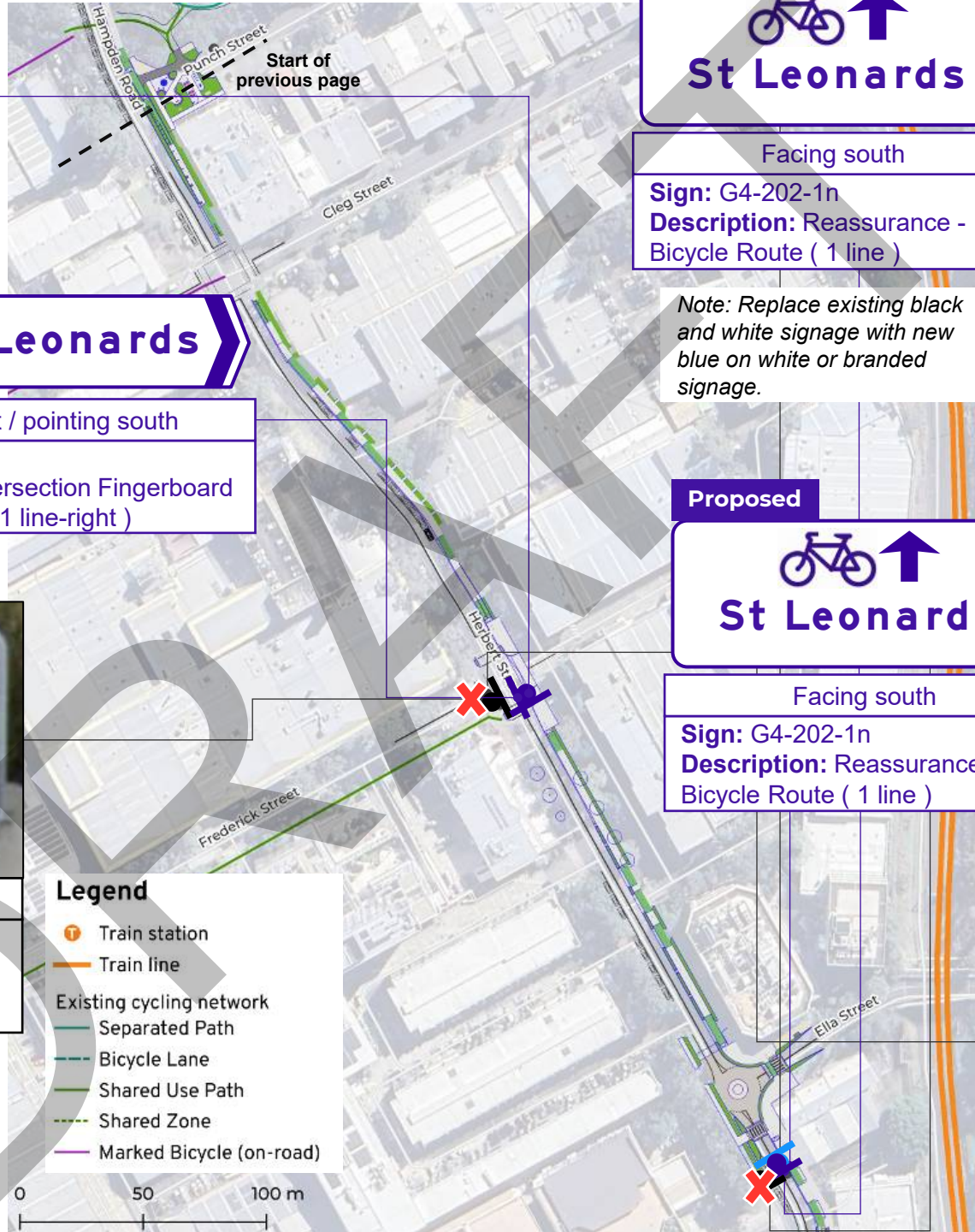
Hampden Rd / Punch St
(north) to Herbert St / Ella
St (south).

Key:

- Existing wayfinding signage
- Proposed wayfinding signage
- Replace existing wayfinding signage
- Remove existing wayfinding signage

Legend

- Train station
- Train line
- Existing cycling network
- Separated Path
- Bicycle Lane
- Shared Use Path
- Shared Zone
- Marked Bicycle (on-road)



Existing - retain



Facing west

Sign: G4-202-1n
Description: Reassurance -
Bicycle Route (1 line)



Note: Confirmation from WCC requested to confirm if it is appropriate to have North Sydney indicated. It is reachable from the eastern side of St Leonards station, however, has no direct and rideable connection from the C2L cycleway.

Proposed

**Artarmon
Chatswood**



Facing west / pointing north

Sign: G2-204-2n

Description: Intersection Fingerboard
- Bicycle Route (2 lines-left)

Lane Cove



Facing south / pointing west

Sign: G2-204-1n

Description: Intersection Fingerboard
- Bicycle Route (1 line-left)

North Sydney



Facing west / pointing south

Sign: G2-204-1n

Description: Intersection Fingerboard
- Bicycle Route (1 line-right)

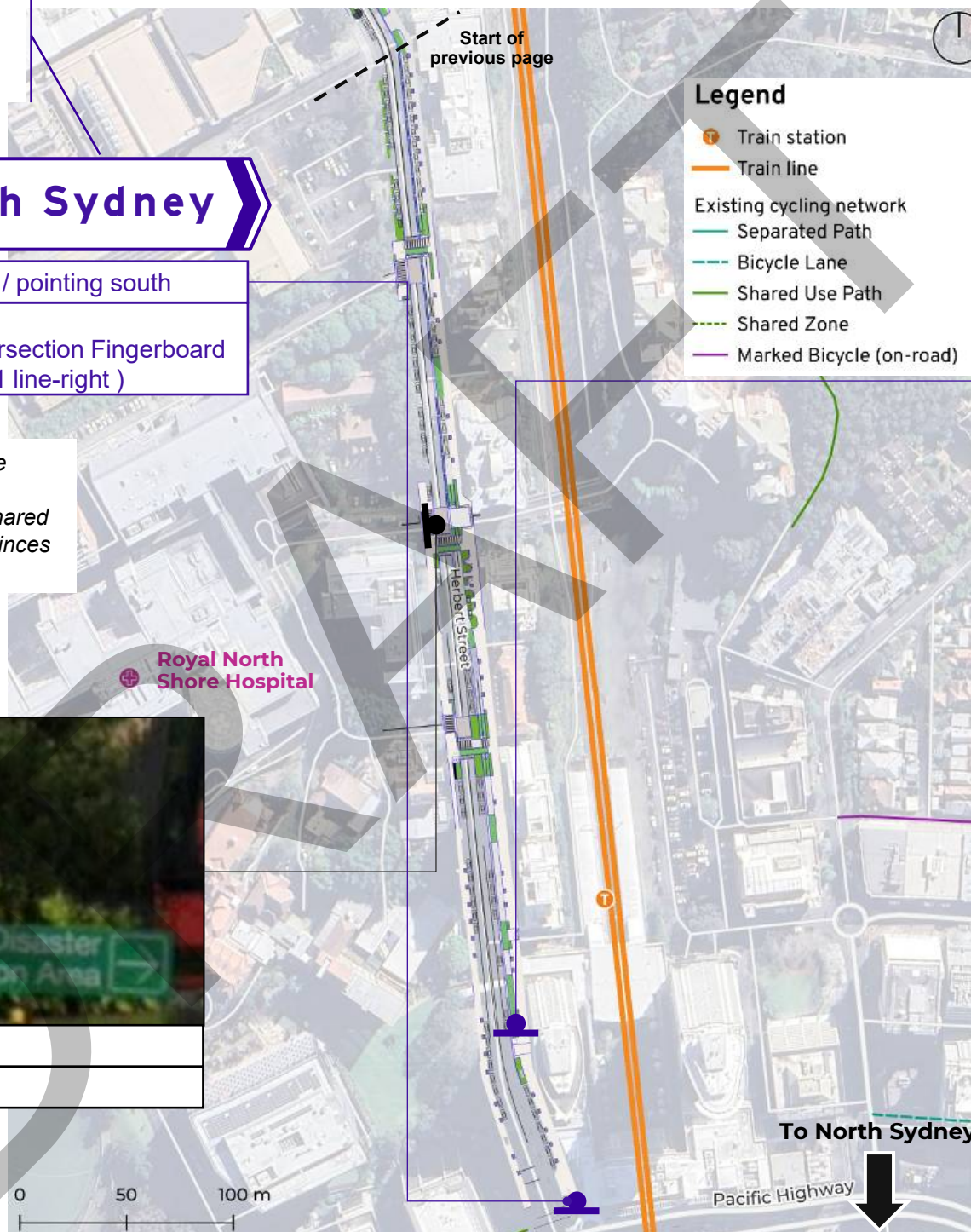
Note: Lane Cove
signage directs
cyclists to the shared
facility on the Princes
Highway.

Existing – retain



Facing west

Hospital signage



Proposed



**Artarmon
Chatswood**

Facing north

Sign: G4-202-2n

Description: Reassurance -
Bicycle Route (2 lines)

Wayfinding guidance plan

Location:

Herbert St / Ella St (south)
to Pacific Highway.

Key:

- Existing wayfinding signage
- Proposed wayfinding signage
- Replace existing wayfinding signage
- Remove existing wayfinding signage