

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	40	300	0	0	Traffic
	C	(untitled)	35	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	13, 60, 100, 119, 1	121	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	121	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	121	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	121	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	121	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	121	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	121	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	121	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	121	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	121	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	6	13	7	1	7
	2	✓	2	B	18	60	42	1	40
	3	✓	3	C	65	100	35	1	35
	4	✓	4	D	105	119	14	1	7
	5	✓	5	E	124	1	7	1	7

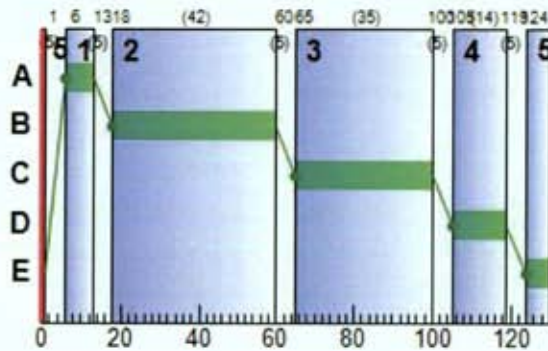
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	6	13	7
	B	1	✓	18	60	42
	C	1	✓	65	100	35
	D	1	✓	105	119	14
	E	1	✓	124	1	7

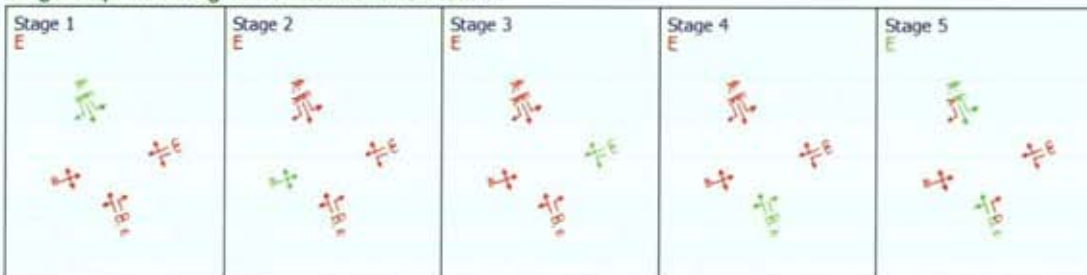
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	65	100	35
A	2	1	1	C	65	100	35
B	1	1	1	D	105	119	14
B	2	1	1	D	105	119	14
C	1	1	1	B	18	60	42
D	1	1	1	A	6	13	7
D	2	1	1	A	6	13	7
D	3	1	1	A	6	13	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	21	323	106	1800	35	37.09	2.94	28.12	15.51	1.01	16.52
		2	87	4	432	1800	35	66.00	17.31	398.23	112.47	5.91	118.38
	Ax	1	0	Unrestricted	639	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	87	4	276	1800	21	80.80	11.71	449.06	87.97	4.11	92.08
		2	78	16	161	1800	14	83.40	6.87	263.20	52.96	2.34	55.30
	Bx	1	0	Unrestricted	467	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-6	664	2094	42	81.19	30.54	702.34	212.65	10.30	222.95
	Cx	1	0	Unrestricted	330	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	65	38	144	1800	14	65.88	5.34	44.29	37.42	1.89	39.31
		2	28	227	61	1800	14	51.34	1.97	16.95	12.35	0.71	13.06
		3	12	667	13	1800	7	59.87	0.45	3.74	3.07	0.15	3.22
	Dx	1	0	Unrestricted	421	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	12	643	218	1800	130	0.14	0.01	0.10	0.12	0.00	0.12
	10	1	30	201	538	1800	130	0.43	0.06	1.08	0.90	0.00	0.90
11	1	24	271	437	1800	130	0.32	0.04	0.60	0.55	0.00	0.55	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	106	106	0		1800	498	21		323	0.00	35
		2	432	432	0		1800	498	87		4	0.00	35
	Ax	1	639	639	0		Unrestricted	Unrestricted	0		Unrestricted	0.67	130
	B	1	276	276	0		1800	318	87		4	0.00	21
		2	161	161	0		1800	208	78		16	0.00	14
	Bx	1	467	467	0		Unrestricted	Unrestricted	0		Unrestricted	0.76	130
	C	1	664	664	0		2094	693	96	✓	-6	0.00	42
	Cx	1	330	330	0		Unrestricted	Unrestricted	0		Unrestricted	0.85	130
	D	1	144	144	0		1800	222	65		38	0.00	14
		2	61	61	0		1800	222	28		227	0.00	14
		3	13	13	0		1800	111	12		667	0.00	7
	Dx	1	421	421	0		Unrestricted	Unrestricted	0		Unrestricted	0.77	130
	9	1	218	218	0		1800	1800	12		643	0.00	130
	10	1	538	538	0		1800	1800	30		201	0.00	130
11	1	437	437	0		1800	1800	24		271	0.00	130	

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.22	37.09	1.06	0.03	15.51	75.99	79.76	0.79	1.01
		2	3.00	66.00	5.37	2.55	112.47	109.17	403.69	67.91	5.91
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	80.80	3.76	2.44	87.97	118.82	264.38	63.55	4.11
		2	1.80	83.40	2.50	1.23	52.96	115.96	154.35	32.35	2.34
	Bx	1	15.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	81.19	7.86	7.11	212.65	123.73	638.55	183.04	10.30
	Cx	1	17.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	65.88	2.05	0.58	37.42	104.64	134.94	15.75	1.89
		2	8.01	51.34	0.82	0.05	12.35	92.96	53.85	2.85	0.71
		3	8.27	59.87	0.21	0.01	3.07	94.59	12.08	0.21	0.15
	Dx	1	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.14	0.00	0.01	0.12	0.00	0.00	0.00	0.00
	10	1	4.05	0.43	0.00	0.06	0.90	0.00	0.00	0.00	0.00
11	1	4.47	0.32	0.00	0.04	0.55	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking	
08:00-09:00	A	1	0.00	2.94	10.47	28.12	0.00	0.00	0.00	0.00	0.00	0.00		
		2	0.00	17.31	4.35	398.23	5.44	0.00	0.00	0.00	0.00	0.00		
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	31.00	0.00	31.00		
	B	1	0.00	11.71	2.61	449.06	4.27	0.00	0.00	0.00	0.00	0.00		
		2	0.00	6.87	2.61	263.20	1.58	0.00	0.00	0.00	0.00	0.00		
	Bx	1	0.00	0.00	22.73	0.00	0.00	0.00	0.00	23.00	0.00	23.00		
	C	1	0.00	30.54	4.35	702.34	14.30	0.00	0.00	0.00	0.00	0.00		
	Cx	1	0.00	0.00	25.09	0.00	0.00	0.00	0.00	48.00	0.00	48.00		
	D	1	0.00	5.34	12.07	44.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	1.97	11.61	16.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	0.45	11.98	3.74	0.00	0.00	0.00	0.00	7.00	0.00	7.00	
	Dx	1	0.00	0.00	27.11	0.00	0.00	0.00	0.00	11.00	0.00	11.00		
	9	1	0.00	0.01	8.52	0.10	0.00	0.00	0.00	0.00	0.00	0.00		
	10	1	0.00	0.06	5.87	1.08	0.00	0.00	0.00	0.00	109.00	109.00		
11	1	0.00	0.04	6.47	0.60	0.00	0.00	0.00	0.00	124.00	124.00			

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	6.38	1.30	4.89	44.31
		2	10.80	8.28	1.30	69.00
	Ax	1	90.92	3.03	30.00	17.07
	B	1	4.14	6.33	0.65	82.60
		2	2.42	3.81	0.63	85.20
	Bx	1	61.03	2.03	30.00	15.68
	C	1	16.60	15.53	1.07	84.19
	Cx	1	47.60	1.59	30.00	17.31
	D	1	9.99	2.97	3.37	74.21
		2	4.07	1.01	4.05	59.34
		3	0.90	0.25	3.64	68.14
	Dx	1	65.62	2.19	30.00	18.70
	9	1	10.68	0.36	29.31	6.02
	10	1	18.16	0.67	27.15	4.48
11	1	16.27	0.58	27.99	4.79	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	2.94	0.03	2.60	1.00	0.00	16.52
		2	0.00	0.00	✓	17.43	2.67	13.95	1.00	0.00	118.38
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	11.88	4.15	10.50	1.00	0.00	92.08
		2	0.00	0.00	✓	6.92	1.28	6.42	1.00	0.00	55.30
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	31.81	8.38	24.43	1.00	0.00	222.95
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	5.35	1.31	4.99	1.00	0.00	39.31
		2	0.00	0.00	✓	1.97	0.05	1.92	1.00	0.00	13.06
		3	0.00	0.00	✓	0.45	0.01	0.45	1.00	0.00	3.22
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.01			1.00	0.00	0.12
	10	1	0.00	0.00	✓	0.06			1.00	0.00	0.90
11	1	0.00	0.00	✓	0.04			1.00	0.00	0.55	

**Network Results**
**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
2	06/09/2022 14:50:27	06/09/2022 14:50:27	1.00	08:00	130	562.41	37.74	95.87	C/1	1	7	C/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	95	-6	4907	1092	27.69	535.97	26.43	562.41

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	4907	4907	0		95	✓	-6	1092

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	6.94	27.69	23.62	14.12	535.97	42.96	1741.61	366.46	26.43

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	702.34	0.00	120.00	233.00	353.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	365.58	49.93	7.32

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	562.41

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	102.9	101.3	99.9
	2	91.5	0.0	97.3	81.0
	3	90.8	92.2	0.0	64.5
	4	104.7	106.1	107.1	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journeydist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	30	102.89	180.87	0.00	0.00	0.00	30	102.89	180.87
2	1	3	334	101.26	167.28	0.00	0.00	0.00	334	101.26	167.28
3	1	4	300	99.87	155.68	0.00	0.00	0.00	300	99.87	155.68
12	4	1	105	104.70	196.47	0.00	0.00	0.00	105	104.70	196.47
13	3	1	212	90.79	203.00	0.00	0.00	0.00	212	90.79	203.00
14	2	3	144	97.30	260.68	0.00	0.00	0.00	144	97.30	260.68
17	3	4	106	64.47	224.63	0.00	0.00	0.00	106	64.47	224.63
19	4	2	171	106.10	208.10	0.00	0.00	0.00	171	106.10	208.10
20	3	2	220	92.19	214.63	0.00	0.00	0.00	220	92.19	214.63
21	2	4	61	81.04	246.42	0.00	0.00	0.00	61	81.04	246.42
22	2	1	13	91.47	262.16	0.00	0.00	0.00	13	91.47	262.16
23	4	3	161	107.06	194.51	0.00	0.00	0.00	161	107.06	194.51

**Final Prediction Table**

Traffic Stream Results

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU			Q
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	
A	1	(untitled)	1	1	C		106	1800	35	0.00	21	323	44.31	37.09	75.99	
	2	(untitled)	1	1	C		432 <	1800	35	0.00	87	4	69.00	66.00	109.17	
Ax	1	(untitled)					639	Unrestricted	130	31.00	0	Unrestricted	17.07	0.00	0.00	
B	1	(untitled)	1	1	D	E	276 <	1800	21	0.00	87	4	82.60	80.80	118.82	
	2	(untitled)	1	1	D		161 <	1800	14	0.00	78	16	85.20	83.40	115.96	
Bx	1	(untitled)					467	Unrestricted	130	23.00	0	Unrestricted	15.68	0.00	0.00	
C	1	(untitled)	1	1	B		664 <	2094	42	0.00	96	-6	84.19	81.19	123.73	
Cx	1	(untitled)					330	Unrestricted	130	48.00	0	Unrestricted	17.31	0.00	0.00	
D	1	(untitled)	1	1	A	E	144	1800	14	0.00	65	38	74.21	65.88	104.64	
	2	(untitled)	1	1	A	E	61	1800	14	0.00	28	227	59.34	51.34	92.96	
	3	(untitled)	1	1	A		13	1800	7	7.00	12	667	68.14	59.87	94.59	
Dx	1	(untitled)					421	Unrestricted	130	11.00	0	Unrestricted	18.70	0.00	0.00	
9	1		1				218	1800	130	0.00	12	643	6.02	0.14	0.00	
10	1		1				538	1800	130	109.00	30	201	4.48	0.43	0.00	
11	1		1				437	1800	130	124.00	24	271	4.79	0.32	0.00	

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
<b>Normal traffic</b>	365.58	49.93	7.32	23.62	14.12	535.97	26.43	0.00	562.41
<b>Bus</b>									
<b>Tram</b>									
<b>Pedestrians</b>									
<b>TOTAL</b>	365.58	49.93	7.32	23.62	14.12	535.97	26.43	0.00	562.41

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A3 - Do Nothing 2040 D3 - Do Nothing 2040,

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (E per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
3	06/09/2022 14:50:30	06/09/2022 14:50:31	1.41	08:00	130	689.25	46.41	96.10	A/2	3	20	A/2	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Do Nothing 2040			✓	D3		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Do Nothing 2040					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1



**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	60.19	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			25.00	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.68						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2103	✓		Normal	
Cx	1	(untitled)		✓	144.24						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.87						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	43	25.85		2103
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	122	122
	2	479	479
Ax	1	715	715
B	1	311	311
	2	186	186
Bx	1	440	440
C	1	645	645
Cx	1	363	363
D	1	164	164
	2	70	70
	3	15	15
Dx	1	474	474
9	1	249	249
10	1	601	601
11	1	497	497

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.22	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	3.00	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	96.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.68	30.00	✓	Nearside	23.66
Cx	1	1	B/1	Cx/1	17.31	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.70	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.68	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.31	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.70	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.68	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.31	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.70	30.00	✓	Offside	74.00

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

## Signal Timings

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	121

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	40	300	0	0	Traffic
	C	(untitled)	35	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	1	100
	2	B	1	1	100
	3	C	1	1	100
	4	D	1	1	100
	5	E	1	1	100

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	13, 59, 99, 119, 1	121	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	121	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	121	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	121	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	121	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	121	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	121	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	121	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	121	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	121	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	6	13	7	1	7
	2	✓	2	B	18	59	41	1	40
	3	✓	3	C	64	99	35	1	35
	4	✓	4	D	104	119	15	1	7
	5	✓	5	E	124	1	7	1	7

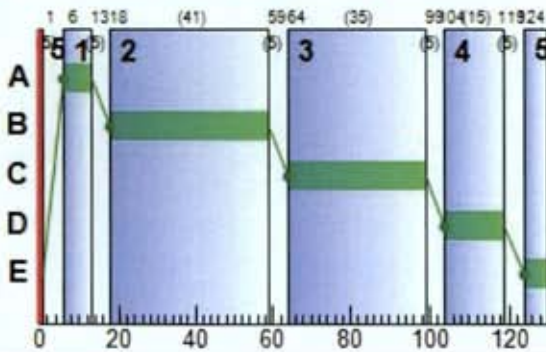
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	6	13	7
	B	1	✓	18	59	41
	C	1	✓	64	99	35
	D	1	✓	104	119	15
	E	1	✓	124	1	7

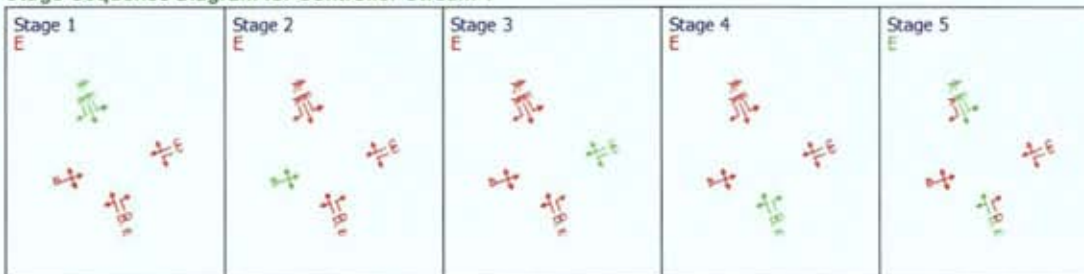
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	64	99	35
A	2	1	1	C	64	99	35
B	1	1	1	D	104	119	15
B	2	1	1	D	104	119	15
C	1	1	1	B	18	59	41
D	1	1	1	A	6	13	7
D	2	1	1	A	6	13	7
D	3	1	1	A	6	13	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	24	268	122	1800	35	37.63	3.43	32.75	18.11	1.18	19.29
		2	96	-6	479	1800	35	96.24	23.67	544.51	181.83	7.91	189.74
	Ax	1	0	Unrestricted	715	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	94	-4	311	1800	22	101.72	15.58	597.17	124.78	5.21	129.99
		2	84	7	186	1800	15	92.60	8.47	324.52	67.94	2.87	70.80
	Bx	1	0	Unrestricted	440	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	95	-5	645	2103	41	77.94	28.84	663.38	198.30	9.78	208.08
	Cx	1	0	Unrestricted	363	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	74	22	164	1800	14	74.15	6.46	53.54	47.96	2.29	50.25
		2	32	185	70	1800	14	52.26	2.29	19.73	14.43	0.83	15.26
		3	14	565	15	1800	7	60.28	0.52	4.37	3.57	0.18	3.75
	Dx	1	0	Unrestricted	474	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	14	551	249	1800	130	0.16	0.01	0.13	0.16	0.00	0.16
	10	1	33	170	601	1800	130	0.50	0.08	1.42	1.19	0.00	1.19
11	1	28	226	497	1800	130	0.38	0.05	0.81	0.75	0.00	0.75	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	122	122	0		1800	498	24		268	0.00	35
		2	479	479	0		1800	498	96	✓	-6	0.00	35
	Ax	1	715	715	0		Unrestricted	Unrestricted	0		Unrestricted	0.65	130
	B	1	311	311	0		1800	332	94	✓	-4	0.00	22
		2	186	186	0		1800	222	84		7	0.00	15
	Bx	1	440	440	0		Unrestricted	Unrestricted	0		Unrestricted	0.72	130
	C	1	645	645	0		2103	679	95	✓	-5	0.00	41
	Cx	1	363	363	0		Unrestricted	Unrestricted	0		Unrestricted	0.81	130
	D	1	164	164	0		1800	222	74		22	0.00	14
		2	70	70	0		1800	222	32		185	0.00	14
		3	15	15	0		1800	111	14		565	0.00	7
	Dx	1	474	474	0		Unrestricted	Unrestricted	0		Unrestricted	0.73	130
	9	1	249	249	0		1800	1800	14		551	0.00	130
	10	1	601	601	0		1800	1800	33		170	0.00	130
11	1	497	497	0		1800	1800	28		226	0.00	130	

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.22	37.63	1.24	0.04	18.11	76.91	92.74	1.09	1.18
		2	3.00	96.24	6.16	6.64	181.83	131.64	463.18	167.38	7.91
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	101.72	4.27	4.52	124.78	133.48	301.73	113.39	5.21
		2	1.80	92.60	2.88	1.90	67.94	122.89	179.41	49.16	2.87
	Bx	1	15.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	77.94	7.70	6.27	198.30	120.88	617.27	162.40	9.78
	Cx	1	17.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	74.15	2.38	1.00	47.96	111.28	156.07	26.43	2.29
		2	8.01	52.26	0.94	0.07	14.43	94.72	62.34	3.96	0.83
		3	8.27	60.28	0.24	0.01	3.57	95.50	14.03	0.29	0.18
	Dx	1	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.16	0.00	0.01	0.16	0.00	0.00	0.00	0.00
	10	1	4.05	0.50	0.00	0.08	1.19	0.00	0.00	0.00	0.00
11	1	4.47	0.38	0.00	0.05	0.75	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking
08:00-09:00	A	1	0.00	3.43	10.47	32.75	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	23.67	4.35	544.51	10.75	0.00	0.00	0.00	0.00	0.00	0.00
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	31.00	0.00	31.00	
	B	1	0.00	15.58	2.61	597.17	7.40	0.00	0.00	0.00	0.00	0.00	0.00
		2	0.00	8.47	2.61	324.52	2.58	0.00	0.00	0.00	0.00	0.00	0.00
	Bx	1	0.00	0.00	22.73	0.00	0.00	0.00	0.00	22.00	0.00	22.00	
	C	1	0.00	28.84	4.35	663.38	12.95	0.00	0.00	0.00	0.00	0.00	0.00
	Cx	1	0.00	0.00	25.09	0.00	0.00	0.00	0.00	46.00	0.00	46.00	
	D	1	0.00	6.46	12.07	53.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2	0.00	2.29	11.61	19.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		3	0.00	0.52	11.98	4.37	0.00	0.00	0.00	0.00	7.00	0.00	7.00
	Dx	1	0.00	0.00	27.11	0.00	0.00	0.00	0.00	6.00	0.00	6.00	
	9	1	0.00	0.01	8.52	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0.00	0.08	5.87	1.42	0.00	0.00	0.00	0.00	130.00	130.00	
11	1	0.00	0.05	6.47	0.81	0.00	0.00	0.00	0.00	130.00	130.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	7.34	1.52	4.83	44.85
		2	11.98	13.20	0.91	99.24
	Ax	1	101.73	3.39	30.00	17.07
	B	1	4.67	8.94	0.52	103.52
		2	2.79	4.88	0.57	94.40
	Bx	1	57.50	1.92	30.00	15.68
	C	1	16.13	14.50	1.11	80.94
	Cx	1	52.36	1.75	30.00	17.31
	D	1	11.38	3.76	3.03	82.47
		2	4.67	1.17	3.99	60.26
		3	1.03	0.29	3.62	68.54
	Dx	1	73.88	2.46	30.00	18.70
	9	1	12.20	0.42	29.20	6.04
	10	1	20.29	0.76	26.70	4.55
11	1	18.50	0.67	27.64	4.85	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	3.43	0.04	3.23	1.00	0.00	19.29
		2	0.00	0.00	✓	25.11	8.08	20.58	1.00	0.00	189.74
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	16.35	7.48	14.10	1.00	0.00	129.99
		2	0.00	0.00	✓	8.59	2.03	7.92	1.00	0.00	70.80
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	29.77	7.19	22.96	1.00	0.00	208.08
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	6.49	2.40	6.03	1.00	0.00	50.25
		2	0.00	0.00	✓	2.29	0.07	2.21	1.00	0.00	15.26
		3	0.00	0.00	✓	0.52	0.01	0.52	1.00	0.00	3.75
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	g	1	0.00	0.00	✓	0.01			1.00	0.00	0.16
	10	1	0.00	0.00	✓	0.08			1.00	0.00	1.19
11	1	0.00	0.00	✓	0.05			1.00	0.00	0.75	

**Network Results**

**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
3	06/09/2022 14:50:30	06/09/2022 14:50:31	1.41	08:00	130	689.25	46.41	96.10	A/2	3	20	A/2	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	96	-6	5331	1093	31.34	659.02	30.23	689.25

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	5331	5331	0		96	✓	-6	1093

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	8.92	31.34	25.81	20.60	659.02	45.22	1886.77	524.11	30.23

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	663.38	0.00	112.00	260.00	372.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	396.45	59.62	6.65



**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	689.25

**Point to Point Journey Time**
**Average Journey Time (s) for Local Matrix: 1**

		To			
		1	2	3	4
From	1	0.0	99.6	98.0	96.6
	2	91.9	0.0	105.6	82.0
	3	121.1	122.5	0.0	65.1
	4	125.7	127.1	116.3	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	32	99.65	180.87	0.00	0.00	0.00	32	99.65	180.87
2	1	3	365	98.02	167.28	0.00	0.00	0.00	365	98.02	167.28
3	1	4	248	96.63	155.68	0.00	0.00	0.00	248	96.63	155.68
12	4	1	114	125.68	196.47	0.00	0.00	0.00	114	125.68	196.47
13	3	1	234	121.10	203.00	0.00	0.00	0.00	234	121.10	203.00
14	2	3	164	105.59	260.68	0.00	0.00	0.00	164	105.59	260.68
17	3	4	122	65.09	224.63	0.00	0.00	0.00	122	65.09	224.63
19	4	2	197	127.07	208.10	0.00	0.00	0.00	197	127.07	208.10
20	3	2	245	122.49	214.63	0.00	0.00	0.00	245	122.49	214.63
21	2	4	70	81.99	246.42	0.00	0.00	0.00	70	81.99	246.42
22	2	1	15	91.90	262.16	0.00	0.00	0.00	15	91.90	262.16
23	4	3	186	116.32	194.51	0.00	0.00	0.00	186	116.32	194.51

**Final Prediction Table**
**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		122	1800	35	0.00	24	268	44.85	37.63	76.91
	2	(untitled)	1	1	C		479 <	1800	35	0.00	96	-6	99.24	96.24	131.64
Ax	1	(untitled)					715	Unrestricted	130	31.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	311 <	1800	22	0.00	94	-4	103.52	101.72	133.48
	2	(untitled)	1	1	D		186 <	1800	15	0.00	84	7	94.40	92.60	122.89
Bx	1	(untitled)					440	Unrestricted	130	22.00	0	Unrestricted	15.68	0.00	0.00
C	1	(untitled)	1	1	B		645 <	2103	41	0.00	95	-5	80.94	77.94	120.88
Cx	1	(untitled)					363	Unrestricted	130	46.00	0	Unrestricted	17.31	0.00	0.00
D	1	(untitled)	1	1	A	E	164	1800	14	0.00	74	22	82.47	74.15	111.28
	2	(untitled)	1	1	A	E	70	1800	14	0.00	32	185	60.26	52.26	94.72
	3	(untitled)	1	1	A		15	1800	7	7.00	14	565	68.54	60.28	95.50
Dx	1	(untitled)					474	Unrestricted	130	6.00	0	Unrestricted	18.70	0.00	0.00
9	1		1				249	1800	130	0.00	14	551	6.04	0.16	0.00
10	1		1				601	1800	130	130.00	33	170	4.55	0.50	0.00
11	1		1				497	1800	130	130.00	28	226	4.85	0.38	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	396.45	59.62	6.65	25.81	20.60	659.02	30.23	0.00	689.25
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	<b>396.45</b>	<b>59.62</b>	<b>6.65</b>	<b>25.81</b>	<b>20.60</b>	<b>659.02</b>	<b>30.23</b>	<b>0.00</b>	<b>689.25</b>

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A4 - Scenario 2040 - Operational Phase (AM) D4 - Scenario 2040 - Operational Phase (AM),

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
4	06/09/2022 14:50:28	06/09/2022 14:50:28	0.90	08:00	130	812.34	54.87	99.31	A/2	3	20	A/2	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Scenario 2040 - Operational Phase (AM)			✓	D4		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2040 - Operational Phase (AM)					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	60.19	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			25.00	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.68						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2101	✓		Normal	
Cx	1	(untitled)		✓	144.24						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.87						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	44	25.85		2101
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	122	122
	2	495	495
Ax	1	725	725
B	1	311	311
	2	186	186
Bx	1	457	457
C	1	670	670
Cx	1	371	371
D	1	166	166
	2	70	70
	3	15	15
Dx	1	482	482
9	1	251	251
10	1	617	617
11	1	497	497

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

	Traffic	Source traffic	Destination traffic	Cycle time for	Cycle speed for	Auto turnlan	Traffic type	Turning	
A	1	1	10/1	A/1	7.22	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	3.00	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.68	30.00	✓	Nearside	23.66
Cx	1	1	B/1	Cx/1	17.31	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.70	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.68	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.31	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.70	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.68	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.31	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.70	30.00	✓	Offside	74.00

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	121

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	40	300	0	0	Traffic
	C	(untitled)	35	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	13, 60, 100, 119, 1	121	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	121	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	121	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	121	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	121	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	121	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	121	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	121	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	121	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	121	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	6	13	7	1	7
	2	✓	2	B	18	60	42	1	40
	3	✓	3	C	65	100	35	1	35
	4	✓	4	D	105	119	14	1	7
	5	✓	5	E	124	1	7	1	7

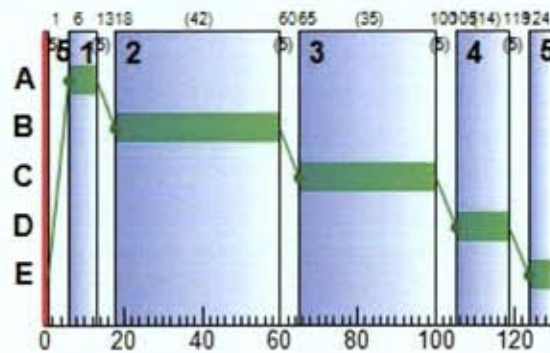
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	6	13	7
	B	1	✓	18	60	42
	C	1	✓	65	100	35
	D	1	✓	105	119	14
	E	1	✓	124	1	7

**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	65	100	35
A	2	1	1	C	65	100	35
B	1	1	1	D	105	119	14
B	2	1	1	D	105	119	14
C	1	1	1	B	18	60	42
D	1	1	1	A	6	13	7
D	2	1	1	A	6	13	7
D	3	1	1	A	6	13	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00



## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	24	268	122	1800	35	37.63	3.43	32.75	18.11	1.18	19.29
		2	99	-9	495	1800	35	118.26	27.55	633.72	230.91	9.06	239.97
	Ax	1	0	Unrestricted	725	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	98	-8	311	1800	21	127.89	17.82	683.26	156.89	5.83	162.71
		2	90	0	186	1800	14	112.00	9.47	362.97	82.17	3.16	85.34
	Bx	1	0	Unrestricted	457	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-7	670	2101	42	83.90	31.29	719.78	221.72	10.55	232.27
	Cx	1	0	Unrestricted	371	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	75	20	166	1800	14	75.21	6.59	54.56	49.25	2.33	51.58
		2	32	185	70	1800	14	52.26	2.29	19.73	14.43	0.83	15.26
		3	14	565	15	1800	7	60.28	0.52	4.37	3.57	0.18	3.75
	Dx	1	0	Unrestricted	482	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	14	545	251	1800	130	0.16	0.01	0.13	0.16	0.00	0.16
	10	1	34	163	617	1800	130	0.52	0.09	1.52	1.27	0.00	1.27
11	1	28	226	497	1800	130	0.38	0.05	0.81	0.75	0.00	0.75	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s per cycle)	
08:00-09:00	A	1	122	122	0		1800	498	24		268	0.00	35	
		2	495	495	0		1800	498	99	✓	-9	0.00	35	
	Ax	1	725	725	0		Unrestricted	Unrestricted	0		Unrestricted	0.64	130	
	B	1	311	311	0		1800	318	98	✓	-8	0.00	21	
		2	186	186	0		1800	208	90		0	0.00	14	
	Bx	1	457	457	0		Unrestricted	Unrestricted	0		Unrestricted	0.71	130	
	C	1	670	670	0		2101	695	96	✓	-7	0.00	42	
	Cx	1	371	371	0		Unrestricted	Unrestricted	0		Unrestricted	0.81	130	
	D	1	166	166	0		1800	222	75			20	0.00	14
		2	70	70	0		1800	222	32			185	0.00	14
		3	15	15	0		1800	111	14			565	0.00	7
	Dx	1	482	482	0		Unrestricted	Unrestricted	0		Unrestricted	0.73	130	
	9	1	251	251	0		1800	1800	14			545	0.00	130
	10	1	617	617	0		1800	1800	34			163	0.00	130
11	1	497	497	0		1800	1800	28			226	0.00	130	

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.22	37.63	1.24	0.04	18.11	76.91	92.74	1.09	1.18
		2	3.00	118.26	6.45	9.82	230.91	145.99	484.96	237.70	9.06
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	127.89	4.37	6.68	156.89	149.49	304.89	160.01	5.83
		2	1.80	112.00	2.93	2.86	82.17	135.64	181.06	71.24	3.16
	Bx	1	15.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	83.90	7.96	7.66	221.72	125.64	645.61	196.16	10.55
	Cx	1	17.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	75.21	2.42	1.05	49.25	112.01	158.04	27.88	2.33
		2	8.01	52.26	0.94	0.07	14.43	94.72	62.34	3.96	0.83
		3	8.27	60.28	0.24	0.01	3.57	95.50	14.03	0.29	0.18
	Dx	1	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.16	0.00	0.01	0.16	0.00	0.00	0.00	0.00
	10	1	4.05	0.52	0.00	0.09	1.27	0.00	0.00	0.00	0.00
11	1	4.47	0.38	0.00	0.05	0.75	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking
08:00-09:00	A	1	0.00	3.43	10.47	32.75	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	27.55	4.35	633.72	14.34	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	30.00	0.00	30.00	
	B	1	0.00	17.82	2.61	683.26	9.64	0.00	0.00	0.00	0.00	0.00	
		2	0.00	9.47	2.61	362.97	3.53	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.73	0.00	0.00	0.00	0.00	21.00	0.00	21.00	
	C	1	0.00	31.29	4.35	719.78	14.95	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.09	0.00	0.00	0.00	0.00	47.00	0.00	47.00	
	D	1	0.00	6.59	12.07	54.56	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	2.29	11.61	19.73	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	0.52	11.98	4.37	0.00	0.00	0.00	7.00	0.00	7.00	
	Dx	1	0.00	0.00	27.11	0.00	0.00	0.00	0.00	4.00	0.00	4.00	
	9	1	0.00	0.01	8.52	0.13	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.09	5.87	1.52	0.00	0.00	0.00	0.00	130.00	130.00	
11	1	0.00	0.05	6.47	0.81	0.00	0.00	0.00	0.00	130.00	130.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	7.34	1.52	4.83	44.85
		2	12.38	16.67	0.74	121.26
	Ax	1	103.15	3.44	30.00	17.07
	B	1	4.67	11.20	0.42	129.69
		2	2.79	5.88	0.47	113.80
	Bx	1	59.72	1.99	30.00	15.68
	C	1	16.75	16.17	1.04	86.90
	Cx	1	53.51	1.78	30.00	17.31
	D	1	11.52	3.85	2.99	83.54
		2	4.67	1.17	3.99	60.26
		3	1.03	0.29	3.62	68.54
	Dx	1	75.13	2.50	30.00	18.70
	9	1	12.30	0.42	29.20	6.04
	10	1	20.83	0.78	26.58	4.57
11	1	18.50	0.67	27.64	4.85	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	3.43	0.04	3.23	1.00	0.00	19.29
		2	0.00	0.00	✓	31.35	13.61	26.54	1.00	0.00	239.97
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
		1	0.00	0.00	✓	19.96	11.50	17.71	1.00	0.00	162.71
	B	2	0.00	0.00	✓	9.84	3.23	9.17	1.00	0.00	85.34
		1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	32.84	9.20	25.39	1.00	0.00	232.27
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	6.62	2.53	6.16	1.00	0.00	51.58
		2	0.00	0.00	✓	2.29	0.07	2.21	1.00	0.00	15.26
		3	0.00	0.00	✓	0.52	0.01	0.52	1.00	0.00	3.75
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.01			1.00	0.00	0.16
10	1	0.00	0.00	✓	0.09			1.00	0.00	1.27	
11	1	0.00	0.00	✓	0.05			1.00	0.00	0.75	

**Network Results**
**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
4	06/09/2022 14:50:28	06/09/2022 14:50:28	0.90	08:00	130	812.34	54.87	99.31	A/2	3	20	A/2	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	99	-9	5435	1092	36.35	779.21	33.13	812.34

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	5435	5435	0		99	✓	-9	1092

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	8.93	36.35	26.54	28.34	779.21	48.61	1943.68	698.34	33.13

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	719.78	0.00	109.00	260.00	369.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	404.30	68.35	5.92

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	812.34

**Point to Point Journey Time**

**Average Journey Time (s) for Local Matrix: 1**

		To			
		1	2	3	4
From	1	0.0	105.6	104.0	102.6
	2	91.9	0.0	106.7	82.0
	3	143.1	144.5	0.0	65.1
	4	151.8	153.2	135.7	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journeydist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	32	105.60	180.87	0.00	0.00	0.00	32	105.60	180.87
2	1	3	373	103.97	167.28	0.00	0.00	0.00	373	103.97	167.28
3	1	4	265	102.58	155.68	0.00	0.00	0.00	265	102.58	155.68
12	4	1	114	151.85	196.47	0.00	0.00	0.00	114	151.85	196.47
13	3	1	242	143.15	203.00	0.00	0.00	0.00	242	143.15	203.00
14	2	3	166	106.66	260.68	0.00	0.00	0.00	166	106.66	260.68
17	3	4	122	65.11	224.63	0.00	0.00	0.00	122	65.11	224.63
19	4	2	197	153.24	208.10	0.00	0.00	0.00	197	153.24	208.10
20	3	2	253	144.54	214.63	0.00	0.00	0.00	253	144.54	214.63
21	2	4	70	81.99	246.42	0.00	0.00	0.00	70	81.99	246.42
22	2	1	15	91.90	262.16	0.00	0.00	0.00	15	91.90	262.16
23	4	3	186	135.72	194.51	0.00	0.00	0.00	186	135.72	194.51

**Final Prediction Table**

**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		122	1800	35	0.00	24	268	44.85	37.63	76.91
	2	(untitled)	1	1	C		495 <	1800	35	0.00	99	-9	121.26	118.26	145.99
Ax	1	(untitled)					725	Unrestricted	130	30.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	311 <	1800	21	0.00	98	-8	129.69	127.89	149.49
	2	(untitled)	1	1	D		186 <	1800	14	0.00	90	0	113.80	112.00	135.64
Bx	1	(untitled)					457	Unrestricted	130	21.00	0	Unrestricted	15.68	0.00	0.00
C	1	(untitled)	1	1	B		670 <	2101	42	0.00	96	-7	86.90	83.90	125.64
Cx	1	(untitled)					371	Unrestricted	130	47.00	0	Unrestricted	17.31	0.00	0.00
D	1	(untitled)	1	1	A	E	166	1800	14	0.00	75	20	83.54	75.21	112.01
	2	(untitled)	1	1	A	E	70	1800	14	0.00	32	185	60.26	52.26	94.72
	3	(untitled)	1	1	A		15	1800	7	7.00	14	565	68.54	60.28	95.50
Dx	1	(untitled)					482	Unrestricted	130	4.00	0	Unrestricted	18.70	0.00	0.00
9	1		1				251	1800	130	0.00	14	545	6.04	0.16	0.00
10	1		1				617	1800	130	130.00	34	163	4.57	0.52	0.00
11	1		1				497	1800	130	130.00	28	226	4.85	0.38	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
<b>Normal traffic</b>	404.30	68.35	5.92	26.54	28.34	779.21	33.13	0.00	812.34
<b>Bus</b>									
<b>Tram</b>									
<b>Pedestrians</b>									
<b>TOTAL</b>	404.30	68.35	5.92	26.54	28.34	779.21	33.13	0.00	812.34

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A5 - Scenario 2040 - Masterplan (AM) D5 - Scenario 2040 - Masterplan (AM),

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
5	06/09/2022 14:50:29	06/09/2022 14:50:29	0.98	08:00	130	4305.13	298.46	149.42	C/1	4	27	C/1	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Scenario 2040 - Masterplan (AM)			✓	D5		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2040 - Masterplan (AM)					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	60.19	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			25.00	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.68						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2084	✓		Normal	
Cx	1	(untitled)		✓	144.24						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.87						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	59	25.85		2084
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	122	122
	2	677	677
Ax	1	770	770
B	1	311	311
	2	186	186
Bx	1	763	763
C	1	1030	1030
Cx	1	553	553
D	1	166	166
	2	70	70
	3	15	15
Dx	1	491	491
9	1	251	251
10	1	799	799
11	1	497	497

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

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**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.22	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	3.00	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.68	30.00	✓	Nearside	23.66
Cx	1	1	B/1	Cx/1	17.31	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.70	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.68	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.31	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.70	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.68	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.31	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.70	30.00	✓	Offside	74.00

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	121

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	40	300	0	0	Traffic
	C	(untitled)	35	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	13, 60, 101, 119, 1	121	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	121	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	121	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	121	
	5	(untitled)	Single	1, 2, 5, 3, 4	26, 50, 75, 114, 11	121	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	121	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	121	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	121	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	121	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	121	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	6	13	7	1	7
	2	✓	2	B	18	60	42	1	40
	3	✓	3	C	65	101	36	1	35
	4	✓	4	D	106	119	13	1	7
	5	✓	5	E	124	1	7	1	7

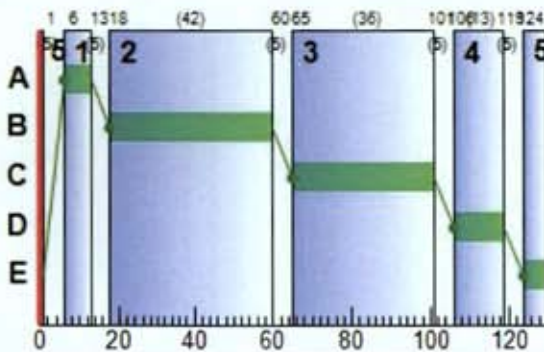
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	6	13	7
	B	1	✓	18	60	42
	C	1	✓	65	101	36
	D	1	✓	106	119	13
	E	1	✓	124	1	7

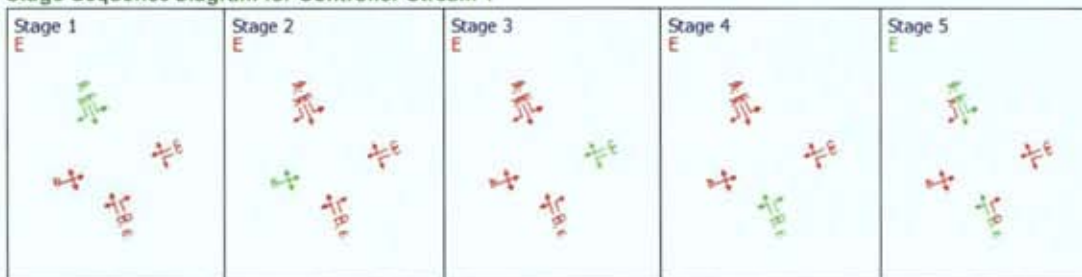
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	65	101	36
A	2	1	1	C	65	101	36
B	1	1	1	D	106	119	13
B	2	1	1	D	106	119	13
C	1	1	1	B	18	60	42
D	1	1	1	A	6	13	7
D	2	1	1	A	6	13	7
D	3	1	1	A	6	13	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
06:00-09:00	A	1	24	278	122	1800	36	36.79	3.39	32.40	17.70	1.16	18.87
		2	132	-32	677	1800	36	481.10	102.21	2350.90	1264.71	20.35	1305.06
	Ax	1	0	Unrestricted	632	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	102	-12	311	1800	20	167.08	21.00	804.81	204.96	6.62	211.58
		2	96	-6	186	1800	13	148.28	11.34	434.83	108.79	3.66	112.45
	Bx	1	0	Unrestricted	574	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	149	-40	1030	2084	42	627.96	196.04	4508.90	2551.28	31.89	2583.17
	Cx	1	0	Unrestricted	448	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	75	20	166	1800	14	75.21	6.59	54.56	49.25	2.33	51.58
		2	32	185	70	1800	14	52.26	2.29	19.73	14.43	0.83	15.26
		3	14	565	15	1800	7	60.28	0.52	4.37	3.57	0.18	3.75
	Dx	1	0	Unrestricted	412	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	14	545	251	1800	130	0.16	0.01	0.13	0.16	0.00	0.16
	10	1	44	103	799	1800	130	0.80	0.18	3.01	2.51	0.00	2.51
11	1	28	226	497	1800	130	0.38	0.05	0.81	0.75	0.00	0.75	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s per cycle)
08:00-09:00	A	1	122	122	0		1800	512	24		278	0.00	36
		2	677	512	0		1800	512	132	✓	-32	0.00	36
	Ax	1	632	632	138	✓	Unrestricted	Unrestricted	0		Unrestricted	0.64	130
	B	1	311	305	0		1800	305	102	✓	-12	0.00	20
		2	186	186	0		1800	194	96	✓	-6	0.00	13
	Bx	1	574	574	189	✓	Unrestricted	Unrestricted	0		Unrestricted	0.76	130
	C	1	1030	689	0		2084	689	149	✓	-40	0.00	42
	Cx	1	448	448	105	✓	Unrestricted	Unrestricted	0		Unrestricted	0.83	130
	D	1	166	166	0		1800	222	75		20	0.00	14
		2	70	70	0		1800	222	32		185	0.00	14
		3	15	15	0		1800	111	14		565	0.00	7
	Dx	1	412	412	79	✓	Unrestricted	Unrestricted	0		Unrestricted	0.71	130
	9	1	251	251	0		1800	1800	14		545	0.00	130
	10	1	799	799	0		1800	1800	44		103	0.00	130
11	1	497	497	0		1800	1800	28		226	0.00	130	

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.22	36.79	1.21	0.04	17.70	76.09	91.80	1.03	1.16
		2	3.00	481.10	6.62	83.86	1284.71	316.73	512.31	1110.34	20.35
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	167.08	4.35	10.08	204.96	173.40	303.30	224.90	6.62
		2	1.80	148.28	2.98	4.68	108.79	157.01	182.63	109.40	3.66
	Bx	1	15.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	627.96	8.33	171.34	2551.28	368.98	689.32	1854.14	31.89
	Cx	1	17.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	75.21	2.42	1.05	49.25	112.01	158.04	27.88	2.33
		2	8.01	52.26	0.94	0.07	14.43	94.72	62.34	3.96	0.83
		3	8.27	60.28	0.24	0.01	3.57	95.50	14.03	0.29	0.18
	Dx	1	18.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.16	0.00	0.01	0.16	0.00	0.00	0.00	0.00
	10	1	4.05	0.80	0.00	0.18	2.51	0.00	0.00	0.00	0.00
11	1	4.47	0.38	0.00	0.05	0.75	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking	
08:00-09:00	A	1	0.00	3.39	10.47	32.40	0.00	0.00	0.00	0.00	0.00	0.00		
		2	0.00	102.21	4.35	2350.90	88.69	0.00	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	32.00	0.00	32.00		
	B	1	0.00	21.00	2.61	804.81	12.93	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	11.34	2.61	434.83	5.40	0.00	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.73	0.00	0.00	0.00	0.00	20.00	0.00	20.00		
	C	1	0.00	196.04	4.35	4508.90	179.34	0.00	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.09	0.00	0.00	0.00	0.00	46.00	0.00	46.00		
	D	1	0.00	6.59	12.07	54.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	2.29	11.61	19.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	0.52	11.98	4.37	0.00	0.00	0.00	0.00	7.00	0.00	7.00	
	Dx	1	0.00	0.00	27.11	0.00	0.00	0.00	0.00	3.00	0.00	3.00		
	9	1	0.00	0.01	8.52	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.18	5.87	3.01	0.00	0.00	0.00	0.00	130.00	130.00		
11	1	0.00	0.05	6.47	0.81	0.00	0.00	0.00	0.00	130.00	130.00			

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	7.34	1.49	4.92	44.01
		2	16.93	91.04	0.19	484.10
	Ax	1	89.88	3.00	30.00	17.07
	B	1	4.67	14.59	0.32	168.88
		2	2.79	7.75	0.36	150.08
	Bx	1	75.03	2.50	30.00	15.68
	C	1	25.75	180.53	0.14	630.96
	Cx	1	64.55	2.15	30.00	17.31
	D	1	11.52	3.85	2.99	83.54
		2	4.67	1.17	3.99	60.26
		3	1.03	0.29	3.62	68.54
	Dx	1	64.19	2.14	30.00	18.70
	9	1	12.30	0.42	29.20	6.04
	10	1	26.98	1.08	25.07	4.85
11	1	18.50	0.67	27.64	4.85	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	3.39	0.04	3.19	1.00	0.00	18.87
		2	0.00	0.00	✓	184.58	166.22	179.46	1.00	0.00	1305.06
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	26.49	18.56	24.38	1.00	0.00	211.58
		2	0.00	0.00	✓	12.69	6.02	12.02	1.00	0.00	112.45
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	366.38	341.68	358.34	1.00	0.00	2583.17
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	6.62	2.53	6.16	1.00	0.00	51.58
		2	0.00	0.00	✓	2.29	0.07	2.21	1.00	0.00	15.26
		3	0.00	0.00	✓	0.52	0.01	0.52	1.00	0.00	3.75
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.01			1.00	0.00	0.16
	10	1	0.00	0.00	✓	0.18			1.00	0.00	2.51
11	1	0.00	0.00	✓	0.05			1.00	0.00	0.75	

**Network Results**

**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
5	06/09/2022 14:50:29	06/09/2022 14:50:29	0.98	08:00	130	4305.13	296.46	149.42	C/1	4	27	C/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	149	-40	6189	1092	173.60	4238.10	67.03	4305.13

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	6189	5677	512	✓	149	✓	-40	1092

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	8.26	173.60	27.09	271.37	4238.10	115.29	2013.77	3331.95	67.03

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	4508.90	0.00	108.00	260.00	368.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	426.13	312.66	1.36

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	4305.13

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

From	To			
	1	2	3	4
1	0.0	649.7	648.0	646.6
2	91.9	0.0	106.7	82.0
3	506.3	507.6	0.0	64.5
4	191.0	192.4	172.0	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	41	649.67	180.87	0.00	0.00	0.00	41	649.67	180.87
2	1	3	418	648.04	167.28	0.00	0.00	0.00	418	648.04	167.28
3	1	4	571	646.65	155.68	0.00	0.00	0.00	571	646.65	155.68
12	4	1	114	191.03	196.47	0.00	0.00	0.00	114	191.03	196.47
13	3	1	424	506.25	203.00	0.00	0.00	0.00	424	506.25	203.00
14	2	3	166	106.66	260.68	0.00	0.00	0.00	166	106.66	260.68
17	3	4	122	64.54	224.63	0.00	0.00	0.00	122	64.54	224.63
19	4	2	197	192.43	208.10	0.00	0.00	0.00	197	192.43	208.10
20	3	2	253	507.65	214.63	0.00	0.00	0.00	253	507.65	214.63
21	2	4	70	81.99	246.42	0.00	0.00	0.00	70	81.99	246.42
22	2	1	15	91.90	262.16	0.00	0.00	0.00	15	91.90	262.16
23	4	3	186	172.00	194.51	0.00	0.00	0.00	186	172.00	194.51

**Final Prediction Table**

**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		122	1800	36	0.00	24	278	44.01	36.79	76.09
	2	(untitled)	1	1	C		677 <	1800	36	0.00	132	-32	484.10	481.10	316.73
Ax	1	(untitled)					632	Unrestricted	130	32.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	311 <	1800	20	0.00	102	-12	168.88	167.08	173.40
	2	(untitled)	1	1	D		186 <	1800	13	0.00	96	-6	150.08	148.28	157.01
Bx	1	(untitled)					574	Unrestricted	130	20.00	0	Unrestricted	15.68	0.00	0.00
C	1	(untitled)	1	1	B		1030 <	2084	42	0.00	149	-40	830.96	627.96	368.98
Cx	1	(untitled)					448	Unrestricted	130	46.00	0	Unrestricted	17.31	0.00	0.00
D	1	(untitled)	1	1	A	E	166	1800	14	0.00	75	20	83.54	75.21	112.01
	2	(untitled)	1	1	A	E	70	1800	14	0.00	32	185	60.26	52.26	94.72
	3	(untitled)	1	1	A		15	1800	7	7.00	14	565	68.54	60.28	95.50
Dx	1	(untitled)					412	Unrestricted	130	3.00	0	Unrestricted	18.70	0.00	0.00
9	1		1				251	1800	130	0.00	14	545	6.04	0.16	0.00
10	1		1				799	1800	130	130.00	44	103	4.85	0.80	0.00
11	1		1				497	1800	130	130.00	28	226	4.85	0.38	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	426.13	312.66	1.36	27.09	271.37	4238.10	67.03	0.00	4305.13
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	426.13	312.66	1.36	27.09	271.37	4238.10	67.03	0.00	4305.13

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX





## TRANSYT 16

Version: 16.0.1.8473  
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**Results are NOT up to date. You should run the file and then refresh this report.**

**Filename:** Kilshane Cross Junction\_Rev2 - AM.t16

**Path:** M:\Projects\21\21-099 - Kilshane Lands\Design\Civil\Traffic\Junction Modelling - EIAR\Kilshane Cross Junction

**Report generation date:** 06/09/2022 14:48:20

- »A1 - Do Nothing 2022 : D1 - Do Nothing 2022, :
- »A2 - Scenario 2024 - Construction Phase (AM) : D2 - Scenario 2024 - Construction Phase (AM), :
- »A3 - Do Nothing 2040 : D3 - Do Nothing 2040, :
- »A4 - Scenario 2040 - Operational Phase (AM) : D4 - Scenario 2040 - Operational Phase (AM), :
- »A5 - Scenario 2040 - Masterplan (AM) : D5 - Scenario 2040 - Masterplan (AM), :

Summary of network performance

	Set ID	PI (£ per hr)	Total delay (Veh-hr/hr)	Highest DOS	Number oversaturated
<b>Do Nothing 2022 - Do Nothing 2022</b>					
Network	A1 D1	542.74	36.42	92% (TS B/1)	2 (13%)

	Set ID	PI (£ per hr)	Total delay (Veh-hr/hr)	Highest DOS	Number oversaturated
<b>Scenario 2024 - Construction Phase (AM) - Scenario 2024 - Construction Phase (AM)</b>					
Network	A2 D2	886.35	60.02	106% (TS C/1)	2 (13%)

	Set ID	PI (£ per hr)	Total delay (Veh-hr/hr)	Highest DOS	Number oversaturated
<b>Do Nothing 2040 - Do Nothing 2040</b>					
Network	A3 D3	577.27	38.62	94% (TS C/1)	2 (13%)

	Set ID	PI (£ per hr)	Total delay (Veh-hr/hr)	Highest DOS	Number oversaturated
<b>Scenario 2040 - Operational Phase (AM) - Scenario 2040 - Operational Phase (AM)</b>					
Network	A4 D4	616.97	41.33	96% (TS C/1)	2 (13%)

	Set ID	PI (£ per hr)	Total delay (Veh-hr/hr)	Highest DOS	Number oversaturated
<b>Scenario 2040 - Masterplan (AM) - Scenario 2040 - Masterplan (AM)</b>					
Network	A5 D5	2086.80	143.30	124% (TS A/2)	3 (20%)

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\byrne
Description	

**Model and Results**

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

**Units**

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	Veh	Veh	perHour	s	-Hour	perHour

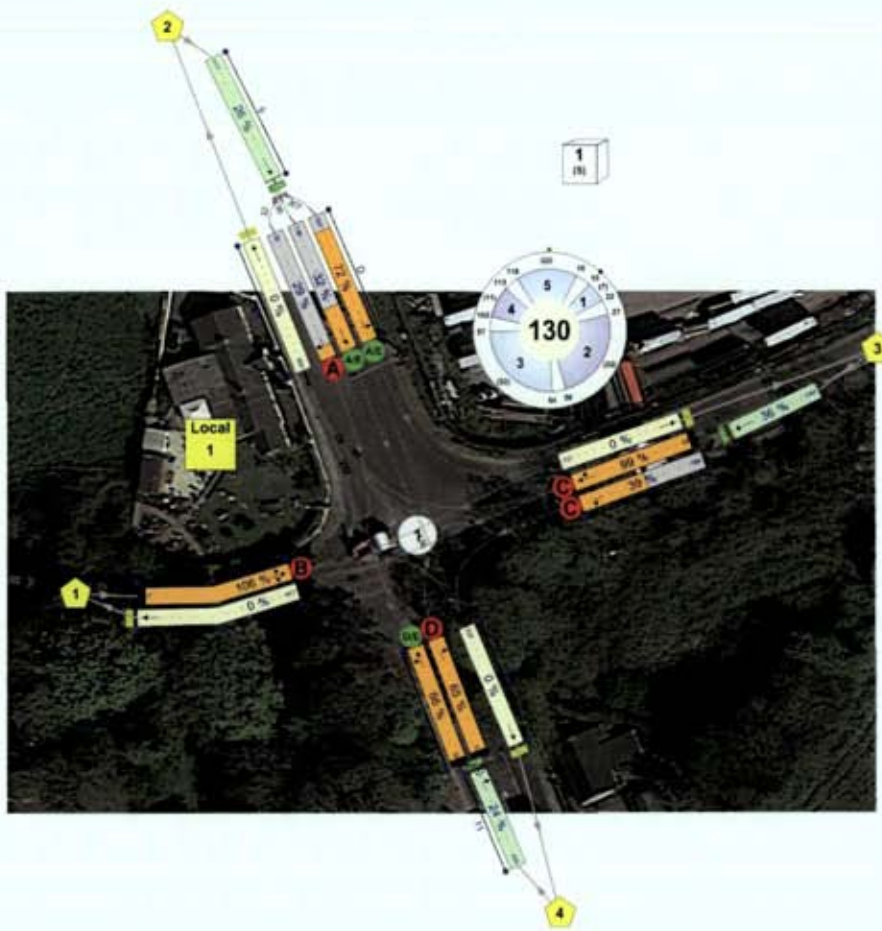
**Sorting**

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

**Simulation options**

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	3.00	999	200	-1	3	60	✓			0	0	0.00

## Network Diagrams



(unfilled)  
Diagram produced using TRANSYT 16.0.1.8473

# A1 - Do Nothing 2022 D1 - Do Nothing 2022,

## Summary

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Traffic Stream Signals	Arm D - Traffic Stream 1 - Signals (1, A/E)	Traffic Stream 1 controlling phase E never runs in the current stage sequence.
Warning	Traffic Stream Signals	Arm D - Traffic Stream 2 - Signals (1, A/E)	Traffic Stream 2 controlling phase E never runs in the current stage sequence.
Warning	Traffic Stream Signals	Arm B - Traffic Stream 1 - Signals (1, D/E)	Traffic Stream 1 controlling phase E never runs in the current stage sequence.
Info	Traffic Stream Signals	Arm D - Traffic Stream 1 - Signals (1, A/E)	Traffic Stream 1 controlling phase E never runs in stage sequence 1,2,3,4,5,6.
Info	Traffic Stream Signals	Arm D - Traffic Stream 2 - Signals (1, A/E)	Traffic Stream 2 controlling phase E never runs in stage sequence 1,2,3,4,5,6.
Info	Traffic Stream Signals	Arm B - Traffic Stream 1 - Signals (1, D/E)	Traffic Stream 1 controlling phase E never runs in stage sequence 1,2,3,4,5,6.

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
1	06/09/2022 14:48:00	06/09/2022 14:48:01	1.70	08:00	130	542.74	36.42	92.28	B/1	2	13	B/1	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Do Nothing 2022			✓	D1		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Do Nothing 2022					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2105	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	41	25.85		2105
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	187	187
	2	452	452
Ax	1	608	608
B	1	345	345
	2	114	114
Bx	1	440	440
C	1	323	323
Cx	1	628	628
D	1	303	303
	2	139	139
	3	30	30
Dx	1	217	217
9	1	472	472
10	1	639	639
11	1	459	459

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

## Signal Timings

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	64

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	



**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4	38, 66, 106, 7	64	
	2	(untitled)	Single	1, 2, 4, 3	21, 49, 70, 90	64	
	3	(untitled)	Single	1, 3, 2, 4	20, 50, 80, 0	64	
	4	(untitled)	Single	1, 3, 4, 2	21, 52, 73, 93	64	
	5	(untitled)	Single	1, 4, 2, 3	20, 40, 60, 90	64	
	6	(untitled)	Single	1, 4, 3, 2	21, 42, 63, 93	64	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To			
		1	2	3	4
From	1				
	2				
	3				
	4				

**Interstage Matrix for Controller Stream 1**

		To			
		1	2	3	4
From	1	0	5	5	5
	2	5	0	5	5
	3	5	5	0	5
	4	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	12	38	26	1	7
	2	✓	2	B	43	66	23	1	23
	3	✓	3	C	71	106	35	1	7
	4	✓	4	D	111	7	26	1	7

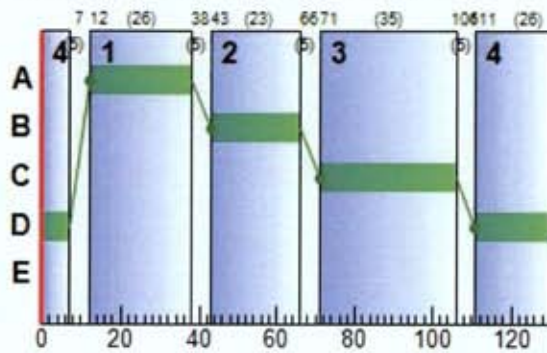
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	12	38	26
	B	1	✓	43	66	23
	C	1	✓	71	106	35
	D	1	✓	111	7	26

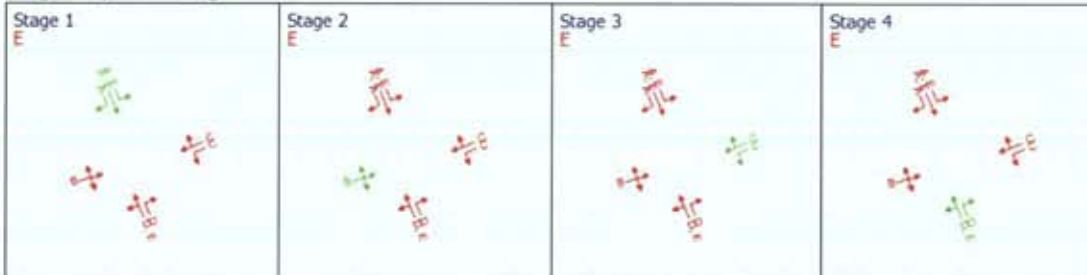
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	71	106	35
A	2	1	1	C	71	106	35
B	1	1	1	D	111	7	26
B	2	1	1	D	111	7	26
C	1	1	1	B	43	66	23
D	1	1	1	A	12	38	26
D	2	1	1	A	12	38	26
D	3	1	1	A	12	38	26

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	38	140	187	1800	35	40.09	5.51	52.92	29.57	1.89	31.46
		2	91	-1	452	1800	35	74.72	19.38	190.54	133.23	6.59	139.81
	Ax	1	0	Unrestricted	608	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	92	-2	345	1800	26	93.23	16.27	623.57	126.87	5.49	132.35
		2	30	195	114	1800	26	45.67	3.52	134.87	20.54	1.21	21.75
	Bx	1	0	Unrestricted	440	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	63	8	323	2105	23	72.11	13.10	301.41	91.87	4.47	96.35
	Cx	1	0	Unrestricted	628	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	81	11	303	1800	26	68.34	11.97	99.22	81.67	4.10	85.77
		2	37	142	139	1800	26	47.07	4.40	37.87	25.81	1.51	27.32
		3	8	1022	30	1800	26	41.96	0.87	7.26	4.97	0.30	5.26
	Dx	1	0	Unrestricted	217	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	26	243	472	1800	130	0.36	0.05	0.55	0.66	0.00	0.66
	10	1	36	154	639	1800	130	0.55	0.10	1.66	1.39	0.00	1.39
11	1	26	253	459	1800	130	0.34	0.04	0.67	0.62	0.00	0.62	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	187	187	0		1800	498	38		140	0.00	35
		2	452	452	0		1800	498	91	✓	-1	0.00	35
	Ax	1	608	608	0		Unrestricted	Unrestricted	0		Unrestricted	0.82	130
	B	1	345	345	0		1800	374	92	✓	-2	0.00	26
		2	114	114	0		1800	374	30		195	0.00	26
	Bx	1	440	440	0		Unrestricted	Unrestricted	0		Unrestricted	0.80	130
	C	1	323	323	0		2105	389	63		8	0.00	23
	Cx	1	628	628	0		Unrestricted	Unrestricted	0		Unrestricted	0.81	130
	D	1	303	303	0		1800	374	81		11	0.00	26
		2	139	139	0		1800	374	37		142	0.00	26
		3	30	30	0		1800	374	8		1022	0.00	26
	Dx	1	217	217	0		Unrestricted	Unrestricted	0		Unrestricted	0.73	130
	9	1	472	472	0		1800	1800	26		243	0.00	130
	10	1	639	639	0		1800	1800	36		154	0.00	130
11	1	459	459	0		1800	1800	26		253	0.00	130	

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	40.09	1.97	0.11	29.57	80.74	147.89	3.10	1.89
		2	7.02	74.72	5.70	3.68	133.23	116.23	428.88	96.47	6.59
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	93.23	4.84	4.10	126.87	126.82	332.94	104.60	5.49
		2	1.80	45.67	1.38	0.07	20.54	84.55	94.55	1.84	1.21
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	72.11	4.58	1.89	91.87	110.46	306.53	50.26	4.47
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	68.34	4.13	1.62	81.67	107.91	283.67	43.29	4.10
		2	8.01	47.07	1.71	0.11	25.81	86.64	117.41	3.02	1.51
		3	8.27	41.96	0.35	0.00	4.97	79.41	23.73	0.10	0.30
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.36	0.00	0.05	0.66	0.00	0.00	0.00	0.00
	10	1	4.05	0.55	0.00	0.10	1.39	0.00	0.00	0.00	0.00
11	1	4.47	0.34	0.00	0.04	0.62	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking
08:00-09:00	A	1	0.00	5.51	10.42	52.92	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	19.38	10.17	190.54	2.63	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	32.00	0.00	32.00	
	B	1	0.00	16.27	2.61	623.57	7.48	0.00	0.00	0.00	0.00	0.00	
		2	0.00	3.52	2.61	134.87	0.10	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	30.00	0.00	30.00	
	C	1	0.00	13.10	4.35	301.41	3.32	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	40.00	0.00	40.00	
	D	1	0.00	11.97	12.07	99.22	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.40	11.61	37.87	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	0.87	11.98	7.26	0.00	0.00	0.00	25.00	0.00	25.00	
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	34.00	0.00	34.00	
	9	1	0.00	0.05	8.52	0.55	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.10	5.87	1.66	0.00	0.00	0.00	0.00	74.00	74.00	
11	1	0.00	0.04	6.47	0.67	0.00	0.00	0.00	0.00	130.00	130.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	11.21	2.46	4.56	47.28
		2	26.43	10.26	2.58	81.74
	Ax	1	86.50	2.88	30.00	17.07
	B	1	5.18	9.11	0.57	95.03
		2	1.71	1.50	1.14	47.47
	Bx	1	57.54	1.92	30.00	15.69
	C	1	8.08	6.74	1.20	75.11
	Cx	1	90.64	3.02	30.00	17.32
	D	1	21.03	6.45	3.26	76.66
		2	9.28	2.13	4.36	55.08
		3	2.07	0.42	4.94	50.23
	Dx	1	33.84	1.13	30.00	18.72
	9	1	23.13	0.82	28.29	6.24
	10	1	21.57	0.82	26.41	4.60
11	1	17.09	0.61	27.87	4.81	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	5.51	0.11	5.00	1.00	0.00	31.46
		2	0.00	0.00	✓	19.69	3.99	15.79	1.00	0.00	139.81
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	16.80	4.63	14.50	1.00	0.00	132.35
		2	0.00	0.00	✓	3.52	0.07	3.33	1.00	0.00	21.75
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	13.18	1.96	11.47	1.00	0.00	96.35
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	12.03	1.67	10.34	1.00	0.00	85.77
		2	0.00	0.00	✓	4.40	0.11	4.09	1.00	0.00	27.32
		3	0.00	0.00	✓	0.87	0.00	0.86	1.00	0.00	5.26
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.05			1.00	0.00	0.66
	10	1	0.00	0.00	✓	0.10			1.00	0.00	1.39
11	1	0.00	0.00	✓	0.04			1.00	0.00	0.62	

**Network Results**

**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
1	06/09/2022 14:48:00	06/09/2022 14:48:01	1.70	08:00	130	542.74	36.42	92.28	B/1	2	13	B/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	92	-2	5356	1133	24.48	517.18	25.56	542.74

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	5356	5356	0		92	✓	-2	1133

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	9.30	24.48	24.65	11.77	517.18	38.06	1735.57	302.67	25.56

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	623.57	0.00	161.00	204.00	365.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	415.29	50.26	8.26

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	542.74

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	93.8	92.2	90.8
	2	73.8	0.0	100.0	77.0
	3	103.7	105.1	0.0	67.6
	4	117.2	118.6	69.4	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	18	93.83	180.96	0.00	0.00	0.00	18	93.83	180.96
2	1	3	191	92.18	167.28	0.00	0.00	0.00	191	92.18	167.28
3	1	4	114	90.80	155.77	0.00	0.00	0.00	114	90.80	155.77
12	4	1	236	117.16	196.56	0.00	0.00	0.00	236	117.16	196.56
13	3	1	362	103.66	236.58	0.00	0.00	0.00	362	103.66	236.58
14	2	3	303	99.97	260.68	0.00	0.00	0.00	303	99.97	260.68
17	3	4	187	67.57	224.46	0.00	0.00	0.00	187	67.57	224.46
19	4	2	109	118.55	208.19	0.00	0.00	0.00	109	118.55	208.19
20	3	2	90	105.06	248.21	0.00	0.00	0.00	90	105.06	248.21
21	2	4	139	77.00	246.52	0.00	0.00	0.00	139	77.00	246.52
22	2	1	30	73.78	262.25	0.00	0.00	0.00	30	73.78	262.25
23	4	3	114	69.35	194.51	0.00	0.00	0.00	114	69.35	194.51

**Final Prediction Table**
**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU			Q
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	
A	1	(untitled)	1	1	C		187	1800	35	0.00	38	140	47.28	40.09	80.74	
	2	(untitled)	1	1	C		452 <	1800	35	0.00	91	-1	81.74	74.72	116.23	
Ax	1	(untitled)					608	Unrestricted	130	32.00	0	Unrestricted	17.07	0.00	0.00	
B	1	(untitled)	1	1	D	E	345 <	1800	26	0.00	92	-2	95.03	93.23	126.82	
	2	(untitled)	1	1	D		114 <	1800	26	0.00	30	195	47.47	45.67	84.55	
Bx	1	(untitled)					440	Unrestricted	130	30.00	0	Unrestricted	15.69	0.00	0.00	
C	1	(untitled)	1	1	B		323 <	2105	23	0.00	83	8	75.11	72.11	110.46	
Cx	1	(untitled)					628	Unrestricted	130	40.00	0	Unrestricted	17.32	0.00	0.00	
D	1	(untitled)	1	1	A	E	303	1800	26	0.00	81	11	76.66	68.34	107.91	
	2	(untitled)	1	1	A	E	139	1800	26	0.00	37	142	55.08	47.07	86.64	
	3	(untitled)	1	1	A		30	1800	26	25.00	8	1022	50.23	41.96	79.41	
Dx	1	(untitled)					217	Unrestricted	130	34.00	0	Unrestricted	18.72	0.00	0.00	
9	1		1				472	1800	130	0.00	26	243	6.24	0.36	0.00	
10	1		1				639	1800	130	74.00	36	154	4.60	0.55	0.00	
11	1		1				459	1800	130	130.00	26	253	4.81	0.34	0.00	

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	415.29	50.26	8.26	24.65	11.77	517.18	25.56	0.00	542.74
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	415.29	50.26	8.26	24.65	11.77	517.18	25.56	0.00	542.74

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A2 - Scenario 2024 - Construction Phase (AM) D2 - Scenario 2024 - Construction Phase (AM),

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (E per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
2	06/09/2022 14:48:01	06/09/2022 14:48:03	2.38	08:00	130	886.35	60.02	106.21	C/1	2	13	C/1	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Scenario 2024 - Construction Phase (AM)			✓	D2		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2024 - Construction Phase (AM)					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1



**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2103	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	43	25.85		2103
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	184	184
	2	465	465
Ax	1	737	737
B	1	322	322
	2	108	108
Bx	1	537	537
C	1	567	567
Cx	1	497	497
D	1	307	307
	2	136	136
	3	32	32
Dx	1	350	350
9	1	475	475
10	1	649	649
11	1	430	430

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	76

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	22, 59, 97, 113, 10	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	15	22	7	1	7
	2	✓	2	B	27	59	32	1	23
	3	✓	3	C	64	97	33	1	7
	4	✓	4	D	102	113	11	1	7
	5	✓	5	E	118	10	22	1	7

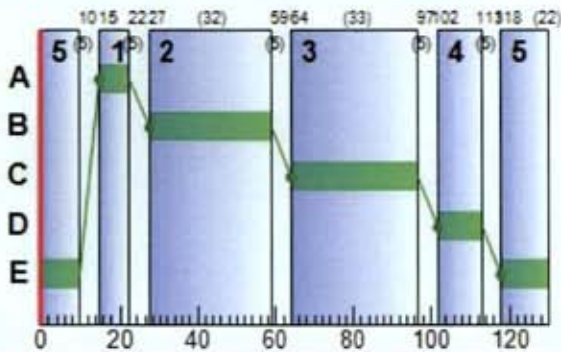
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	15	22	7
	B	1	✓	27	59	32
	C	1	✓	64	97	33
	D	1	✓	102	113	11
	E	1	✓	118	10	22

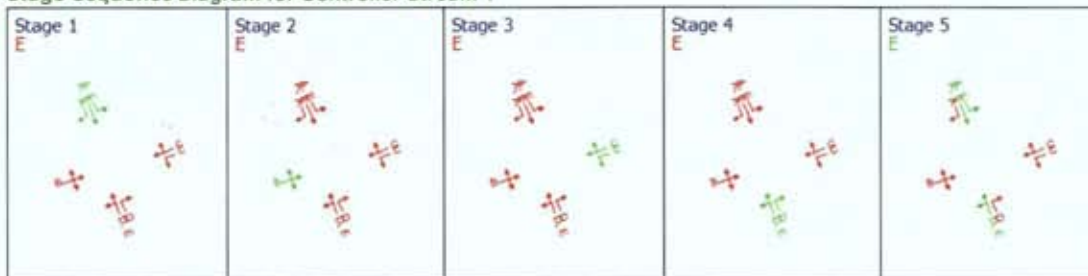
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	64	97	33
A	2	1	1	C	64	97	33
B	1	1	1	D	102	113	11
B	2	1	1	D	102	113	11
C	1	1	1	B	27	59	32
D	1	1	1	A	15	22	7
D	2	1	1	A	15	22	7
D	3	1	1	A	15	22	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	39	130	184	1800	33	41.93	5.54	53.19	30.43	1.90	32.33
		2	99	-9	465	1800	33	117.17	25.62	251.94	214.91	8.44	223.35
	Ax	1	0	Unrestricted	718	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	66	35	322	1800	33	47.45	10.93	419.12	60.27	3.75	64.02
		2	65	38	108	1800	11	76.29	4.33	165.95	32.50	1.48	33.96
	Bx	1	0	Unrestricted	524	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	106	-15	567	2103	32	187.31	41.44	953.08	418.91	12.67	431.58
	Cx	1	0	Unrestricted	497	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	72	26	307	1800	29	52.20	10.60	87.81	63.21	4.01	67.21
		2	32	184	136	1800	29	39.57	3.93	33.83	21.23	1.41	22.64
		3	29	212	32	1800	7	64.86	1.16	9.68	8.19	0.40	8.59
	Dx	1	0	Unrestricted	348	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	26	241	475	1800	130	0.36	0.05	0.55	0.67	0.00	0.67
	10	1	36	150	649	1800	130	0.56	0.10	1.73	1.44	0.00	1.44
11	1	24	277	430	1800	130	0.31	0.04	0.58	0.53	0.00	0.53	

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	184	184	0		1800	471	39		130	0.00	33
		2	465	465	0		1800	471	99	✓	-9	0.00	33
	Ax	1	718	718	19	✓	Unrestricted	Unrestricted	0		Unrestricted	0.67	130
	B	1	322	322	0		1800	485	66		35	0.00	33
		2	108	108	0		1800	166	65		38	0.00	11
	Bx	1	524	524	13	✓	Unrestricted	Unrestricted	0		Unrestricted	0.68	130
	C	1	567	534	0		2103	534	106	✓	-15	0.00	32
	Cx	1	497	497	0		Unrestricted	Unrestricted	0		Unrestricted	0.86	130
	D	1	307	307	0		1800	429	72		26	0.00	29
		2	136	136	0		1800	429	32		184	0.00	29
		3	32	32	0		1800	111	29		212	0.00	7
	Dx	1	348	348	2	✓	Unrestricted	Unrestricted	0		Unrestricted	0.70	130
	9	1	475	475	0		1800	1800	26		241	0.00	130
	10	1	649	649	0		1800	1800	36		150	0.00	130
11	1	430	430	0		1800	1800	24		277	0.00	130	

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**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	41.93	2.02	0.12	30.43	82.50	148.35	3.44	1.90
		2	7.02	117.17	6.17	8.96	214.91	144.74	455.26	217.80	8.44
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	47.45	3.60	0.65	60.27	92.90	281.47	17.68	3.75
		2	1.80	76.29	1.71	0.58	32.50	109.55	102.86	15.46	1.48
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	187.31	7.19	22.31	418.91	189.21	533.78	476.32	12.67
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	52.20	3.58	0.88	63.21	104.05	272.83	46.62	4.01
		2	8.01	39.57	1.42	0.07	21.23	82.78	108.56	4.03	1.41
		3	8.27	64.86	0.52	0.06	8.19	99.45	30.23	1.59	0.40
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.36	0.00	0.05	0.67	0.00	0.00	0.00	0.00
	10	1	4.05	0.56	0.00	0.10	1.44	0.00	0.00	0.00	0.00
11	1	4.47	0.31	0.00	0.04	0.53	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking	
08:00-09:00	A	1	0.00	5.54	10.42	53.19	0.00	0.00	0.00	0.00	0.00	0.00		
		2	0.00	25.62	10.17	251.94	7.17	0.00	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	27.00	0.00	27.00		
	B	1	0.00	10.93	2.61	419.12	3.01	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.33	2.61	165.95	0.39	0.00	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	15.00	0.00	15.00		
	C	1	0.00	41.44	4.35	953.08	27.53	0.00	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	35.00	0.00	35.00		
	D	1	0.00	10.60	12.07	87.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	3.93	11.61	33.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	1.16	11.98	9.68	0.00	0.00	0.00	5.00	0.00	5.00		
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	11.00	0.00	11.00		
	9	1	0.00	0.05	8.52	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.10	5.87	1.73	0.00	0.00	0.00	0.00	120.00	120.00		
11	1	0.00	0.04	6.47	0.58	0.00	0.00	0.00	0.00	94.00	94.00			

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	11.03	2.51	4.39	49.12
		2	27.19	16.04	1.70	124.19
	Ax	1	102.18	3.41	30.00	17.07
	B	1	4.83	4.41	1.10	49.25
		2	1.62	2.34	0.69	78.09
	Bx	1	68.57	2.29	30.00	15.69
	C	1	14.18	29.97	0.47	190.31
	Cx	1	71.73	2.39	30.00	17.32
	D	1	21.30	5.16	4.13	60.52
		2	9.08	1.80	5.05	47.58
		3	2.20	0.65	3.39	73.13
	Dx	1	54.33	1.81	30.00	18.72
	9	1	23.28	0.82	28.28	6.24
	10	1	21.91	0.83	26.34	4.61
11	1	16.01	0.57	28.03	4.78	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	5.54	0.13	5.03	1.00	0.00	32.33
		2	0.00	0.00	✓	28.82	12.15	24.55	1.00	0.00	223.35
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	10.94	3.87	8.79	1.00	0.00	64.02
		2	0.00	0.00	✓	4.34	0.59	4.13	1.00	0.00	33.98
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	58.85	39.72	54.10	1.00	0.00	431.58
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	10.61	0.89	8.99	1.00	0.00	67.21
		2	0.00	0.00	✓	3.93	0.07	3.66	1.00	0.00	22.64
		3	0.00	0.00	✓	1.16	0.06	1.14	1.00	0.00	8.59
Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00	
9	1	0.00	0.00	✓	0.05			1.00	0.00	0.67	
10	1	0.00	0.00	✓	0.10			1.00	0.00	1.44	
11	1	0.00	0.00	✓	0.04			1.00	0.00	0.53	

**Network Results**

**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
2	06/09/2022 14:48:01	06/09/2022 14:48:03	2.38	08:00	130	886.35	60.02	106.21	C/1	2	13	C/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	106	-15	5763	1117	37.49	852.29	34.06	886.35

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	5763	5730	33	✓	106	✓	-15	1117

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	9.36	37.49	26.21	33.81	852.29	48.22	1933.33	782.94	34.06

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	953.08	0.00	93.00	214.00	307.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	449.44	75.00	5.99



**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	886.35

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

From	To			
	1	2	3	4
1	0.0	209.0	207.4	206.0
2	96.7	0.0	83.8	69.5
3	146.1	147.5	0.0	69.4
4	71.4	72.7	99.9	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	28	209.02	180.96	0.00	0.00	0.00	28	209.02	180.96
2	1	3	322	207.38	167.28	0.00	0.00	0.00	322	207.38	167.28
3	1	4	217	206.00	155.77	0.00	0.00	0.00	217	206.00	155.77
12	4	1	90	71.35	196.56	0.00	0.00	0.00	90	71.35	196.56
13	3	1	375	146.12	236.58	0.00	0.00	0.00	375	146.12	236.58
14	2	3	307	83.84	260.68	0.00	0.00	0.00	307	83.84	260.68
17	3	4	184	69.43	224.46	0.00	0.00	0.00	184	69.43	224.46
19	4	2	232	72.75	208.19	0.00	0.00	0.00	232	72.75	208.19
20	3	2	90	147.52	248.21	0.00	0.00	0.00	90	147.52	248.21
21	2	4	136	69.51	246.52	0.00	0.00	0.00	136	69.51	246.52
22	2	1	32	96.69	262.25	0.00	0.00	0.00	32	96.69	262.25
23	4	3	108	99.95	194.51	0.00	0.00	0.00	108	99.95	194.51

**Final Prediction Table**

**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		184	1800	33	0.00	39	130	49.12	41.93	82.50
	2	(untitled)	1	1	C		465 <	1800	33	0.00	99	-9	124.19	117.17	144.74
Ax	1	(untitled)					718	Unrestricted	130	27.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	322 <	1800	33	0.00	66	35	49.25	47.45	92.90
	2	(untitled)	1	1	D		108 <	1800	11	0.00	65	38	78.09	78.29	109.55
Bx	1	(untitled)					524	Unrestricted	130	15.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		567 <	2103	32	0.00	106	-15	190.31	187.31	189.21
Cx	1	(untitled)					497	Unrestricted	130	35.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	307	1800	29	0.00	72	26	60.52	52.20	104.05
	2	(untitled)	1	1	A	E	136	1800	29	0.00	32	184	47.58	39.57	82.78
	3	(untitled)	1	1	A		32	1800	7	5.00	29	212	73.13	64.86	99.45
Dx	1	(untitled)					348	Unrestricted	130	11.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				475	1800	130	0.00	26	241	6.24	0.36	0.00
10	1		1				649	1800	130	120.00	36	150	4.61	0.56	0.00
11	1		1				430	1800	130	94.00	24	277	4.78	0.31	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	449.44	75.00	5.99	26.21	33.81	852.29	34.06	0.00	886.35
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	449.44	75.00	5.99	26.21	33.81	852.29	34.06	0.00	886.35

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A3 - Do Nothing 2040 D3 - Do Nothing 2040,

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
3	06/09/2022 14:48:08	06/09/2022 14:48:10	2.43	08:00	130	577.27	38.62	94.18	C/1	2	13	C/1	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Do Nothing 2040			✓	D3		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Do Nothing 2040					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2105	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	41	25.85		2105
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	213	213
	2	513	513
Ax	1	689	689
B	1	392	392
	2	129	129
Bx	1	499	499
C	1	366	366
Cx	1	713	713
D	1	344	344
	2	157	157
	3	34	34
Dx	1	247	247
9	1	535	535
10	1	726	726
11	1	521	521

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	76

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	20, 48, 93, 110, 8	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	13	20	7	1	7
	2	✓	2	B	25	48	23	1	23
	3	✓	3	C	53	93	40	1	7
	4	✓	4	D	98	110	12	1	7
	5	✓	5	E	115	8	23	1	7

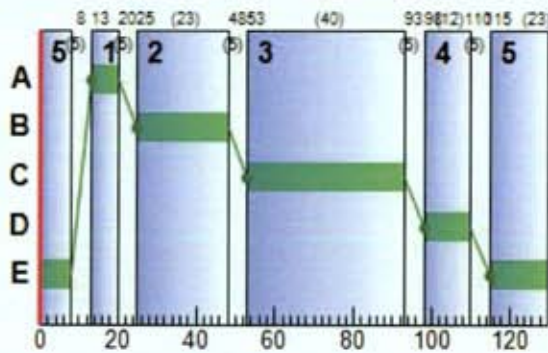
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	13	20	7
	B	1	✓	25	48	23
	C	1	✓	53	93	40
	D	1	✓	98	110	12
	E	1	✓	115	8	23

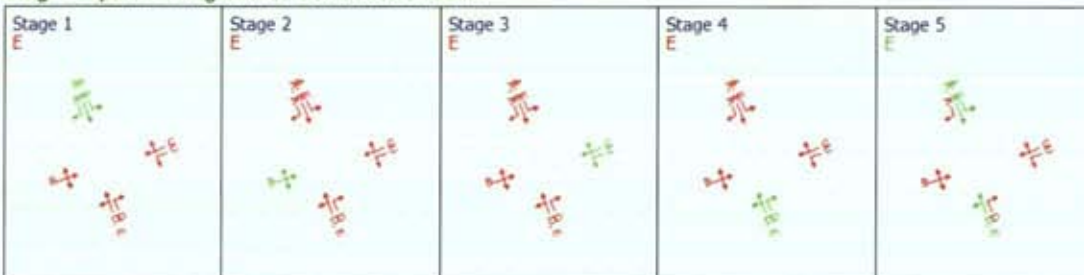
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	53	93	40
A	2	1	1	C	53	93	40
B	1	1	1	D	98	110	12
B	2	1	1	D	98	110	12
C	1	1	1	B	25	48	23
D	1	1	1	A	13	20	7
D	2	1	1	A	13	20	7
D	3	1	1	A	13	20	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00



## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	38	140	213	1800	40	36.45	6.03	57.86	30.63	2.07	32.70
		2	90	0	513	1800	40	68.12	21.31	209.48	137.85	7.25	145.10
	Ax	1	0	Unrestricted	689	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	77	18	392	1800	35	51.78	14.06	538.81	80.06	4.82	84.88
		2	72	26	129	1800	12	80.55	5.37	205.81	40.98	1.83	42.81
	Bx	1	0	Unrestricted	499	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	94	-4	366	2105	23	101.49	18.01	414.30	146.52	6.04	152.56
	Cx	1	0	Unrestricted	713	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	78	16	344	1800	30	55.63	12.38	102.56	75.49	4.74	80.23
		2	35	154	157	1800	30	39.53	4.55	39.17	24.48	1.64	26.12
		3	31	193	34	1800	7	65.52	1.24	10.33	8.79	0.43	9.21
	Dx	1	0	Unrestricted	247	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	30	203	535	1800	130	0.42	0.06	0.74	0.89	0.00	0.89
	10	1	40	123	726	1800	130	0.68	0.14	2.32	1.93	0.00	1.93
	11	1	29	211	521	1800	130	0.41	0.06	0.91	0.84	0.00	0.84

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s per cycle)
08:00-09:00	A	1	213	213	0		1800	568	38		140	0.00	40
		2	513	513	0		1800	568	90	✓	0	0.00	40
	Ax	1	689	689	0		Unrestricted	Unrestricted	0		Unrestricted	0.75	130
	B	1	392	392	0		1800	512	77		18	0.00	35
		2	129	129	0		1800	180	72		26	0.00	12
	Bx	1	499	499	0		Unrestricted	Unrestricted	0		Unrestricted	0.71	130
	C	1	366	366	0		2105	389	94	✓	-4	0.00	23
	Cx	1	713	713	0		Unrestricted	Unrestricted	0		Unrestricted	0.63	130
	D	1	344	344	0		1800	443	78		16	0.00	30
		2	157	157	0		1800	443	35		154	0.00	30
		3	34	34	0		1800	111	31		193	0.00	7
	Dx	1	247	247	0		Unrestricted	Unrestricted	0		Unrestricted	0.54	130
	9	1	535	535	0		1800	1800	30		203	0.00	130
	10	1	726	726	0		1800	1800	40		123	0.00	130
	11	1	521	521	0		1800	1800	29		211	0.00	130

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	36.45	2.04	0.11	30.63	77.46	161.88	3.10	2.07
		2	7.02	68.12	6.07	3.64	137.85	112.71	482.30	95.89	7.25
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	51.78	4.43	1.21	80.06	98.06	351.66	32.72	4.82
		2	1.80	80.55	2.03	0.85	40.98	112.94	123.09	22.60	1.83
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	101.49	5.32	5.00	146.52	131.70	355.89	126.15	6.04
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	55.63	4.02	1.29	75.49	109.93	310.09	68.05	4.74
		2	8.01	39.53	1.63	0.10	24.48	83.21	125.32	5.32	1.64
		3	8.27	65.52	0.55	0.07	8.79	99.88	32.12	1.84	0.43
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	g	1	5.88	0.42	0.00	0.06	0.89	0.00	0.00	0.00	0.00
	10	1	4.05	0.68	0.00	0.14	1.93	0.00	0.00	0.00	0.00
11	1	4.47	0.41	0.00	0.06	0.84	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking
08:00-09:00	A	1	0.00	6.03	10.42	57.86	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	21.31	10.17	209.48	3.39	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	35.00	0.00	35.00	
	B	1	0.00	14.06	2.61	538.81	4.67	0.00	0.00	0.00	0.00	0.00	
		2	0.00	5.37	2.61	205.81	0.83	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	C	1	0.00	18.01	4.35	414.30	7.11	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	24.00	0.00	24.00	
	D	1	0.00	12.38	12.07	102.56	0.01	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.55	11.61	39.17	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	1.24	11.98	10.33	0.00	0.00	0.00	0.00	5.00	0.00	5.00
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	g	1	0.00	0.06	8.52	0.74	0.00	0.00	0.00	0.00	4.00	4.00	
	10	1	0.00	0.14	5.87	2.32	0.00	0.00	0.00	0.00	79.00	79.00	
11	1	0.00	0.06	6.47	0.91	0.00	0.00	0.00	0.00	106.00	106.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	12.76	2.58	4.94	43.65
		2	30.00	10.71	2.80	75.14
	Ax	1	98.03	3.27	30.00	17.07
	B	1	5.88	5.83	1.01	53.58
		2	1.94	2.95	0.66	82.35
	Bx	1	65.26	2.18	30.00	15.69
	C	1	9.15	10.62	0.86	104.49
	Cx	1	102.91	3.43	30.00	17.32
	D	1	23.87	6.11	3.91	63.96
		2	10.48	2.07	5.05	47.54
		3	2.34	0.70	3.36	73.79
	Dx	1	38.52	1.28	30.00	18.72
	g	1	26.22	0.94	27.99	6.30
	10	1	24.51	0.95	25.71	4.73
11	1	19.40	0.71	27.49	4.87	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	6.03	0.11	5.38	1.00	0.00	32.70
		2	0.00	0.00	✓	21.57	3.90	16.58	1.00	0.00	145.10
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
		1	0.00	0.00	✓	14.08	5.83	10.92	1.00	0.00	84.88
	B	2	0.00	0.00	✓	5.39	0.88	5.07	1.00	0.00	42.81
		1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	18.87	5.86	16.64	1.00	0.00	152.56
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	12.40	1.32	10.30	1.00	0.00	80.23
		2	0.00	0.00	✓	4.55	0.10	4.20	1.00	0.00	26.12
		3	0.00	0.00	✓	1.24	0.07	1.22	1.00	0.00	9.21
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.06			1.00	0.00	0.89
10	1	0.00	0.00	✓	0.14			1.00	0.00	1.93	
11	1	0.00	0.00	✓	0.06			1.00	0.00	0.84	

**Network Results**
**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
3	06/09/2022 14:48:08	06/09/2022 14:48:10	2.43	08:00	130	577.27	38.62	94.18	C/1	2	13	C/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	94	-4	6078	1127	22.88	548.46	28.81	577.27

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	6078	6078	0		94	✓	-4	1127

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	9.30	22.88	26.10	12.52	548.46	37.81	1942.35	355.67	28.81

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	538.81	0.00	94.00	189.00	283.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	471.27	54.33	8.67

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	577.27

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	123.2	121.6	120.2
	2	97.4	0.0	87.3	69.5
	3	97.2	98.6	0.0	64.1
	4	75.8	77.2	104.3	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	21	123.21	180.96	0.00	0.00	0.00	21	123.21	180.96
2	1	3	216	121.56	167.28	0.00	0.00	0.00	216	121.56	167.28
3	1	4	129	120.18	155.77	0.00	0.00	0.00	129	120.18	155.77
12	4	1	268	75.77	196.56	0.00	0.00	0.00	268	75.77	196.56
13	3	1	411	97.19	236.58	0.00	0.00	0.00	411	97.19	236.58
14	2	3	344	87.34	260.68	0.00	0.00	0.00	344	87.34	260.68
17	3	4	213	64.06	224.46	0.00	0.00	0.00	213	64.06	224.46
19	4	2	124	77.17	208.19	0.00	0.00	0.00	124	77.17	208.19
20	3	2	102	98.58	248.21	0.00	0.00	0.00	102	98.58	248.21
21	2	4	157	69.54	246.52	0.00	0.00	0.00	157	69.54	246.52
22	2	1	34	97.41	262.25	0.00	0.00	0.00	34	97.41	262.25
23	4	3	129	104.29	194.51	0.00	0.00	0.00	129	104.29	194.51

**Final Prediction Table**

**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		213	1800	40	0.00	38	140	43.65	36.45	77.46
	2	(untitled)	1	1	C		513 <	1800	40	0.00	90	0	75.14	68.12	112.71
Ax	1	(untitled)					689	Unrestricted	130	35.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	392 <	1800	35	0.00	77	18	53.58	51.78	98.06
	2	(untitled)	1	1	D		129 <	1800	12	0.00	72	26	82.35	80.55	112.94
Bx	1	(untitled)					499	Unrestricted	130	15.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		366 <	2105	23	0.00	94	-4	104.49	101.49	131.70
Cx	1	(untitled)					713	Unrestricted	130	24.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	344 <	1800	30	0.00	78	16	63.96	55.63	109.93
	2	(untitled)	1	1	A	E	157	1800	30	0.00	35	154	47.54	39.53	83.21
	3	(untitled)	1	1	A		34	1800	7	5.00	31	193	73.79	65.52	99.88
Dx	1	(untitled)					247	Unrestricted	130	15.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				535	1800	130	4.00	30	203	6.30	0.42	0.00
10	1		1				726	1800	130	79.00	40	123	4.73	0.68	0.00
11	1		1				521	1800	130	106.00	29	211	4.87	0.41	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	471.27	54.33	8.67	26.10	12.52	548.46	28.81	0.00	577.27
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	471.27	54.33	8.67	26.10	12.52	548.46	28.81	0.00	577.27

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX

# A4 - Scenario 2040 - Operational Phase (AM) D4 - Scenario 2040 - Operational Phase (AM),

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
4	06/09/2022 14:48:03	06/09/2022 14:48:05	2.87	08:00	130	616.97	41.33	95.72	C/1	2	13	C/1	10/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Scenario 2040 - Operational Phase (AM)			✓	D4		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2040 - Operational Phase (AM)					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2105	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	41	25.85		2105
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	213	213
	2	522	522
Ax	1	702	702
B	1	410	410
	2	129	129
Bx	1	500	500
C	1	372	372
Cx	1	740	740
D	1	352	352
	2	157	157
	3	35	35
Dx	1	248	248
9	1	544	544
10	1	735	735
11	1	539	539

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00



**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (mph)	Auto turning radius	Traffic turn angle	Turning radius (ft)
A	1	1	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	76

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	1	100
	2	B	1	1	100
	3	C	1	1	100
	4	D	1	1	100
	5	E	1	1	100

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	20, 48, 93, 110, 8	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	13	20	7	1	7
	2	✓	2	B	25	48	23	1	23
	3	✓	3	C	53	93	40	1	7
	4	✓	4	D	98	110	12	1	7
	5	✓	5	E	115	8	23	1	7

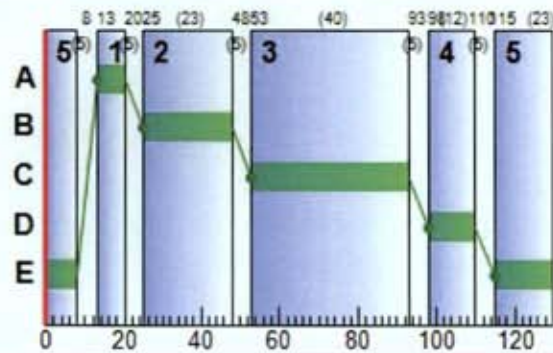
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	13	20	7
	B	1	✓	25	48	23
	C	1	✓	53	93	40
	D	1	✓	98	110	12
	E	1	✓	115	8	23

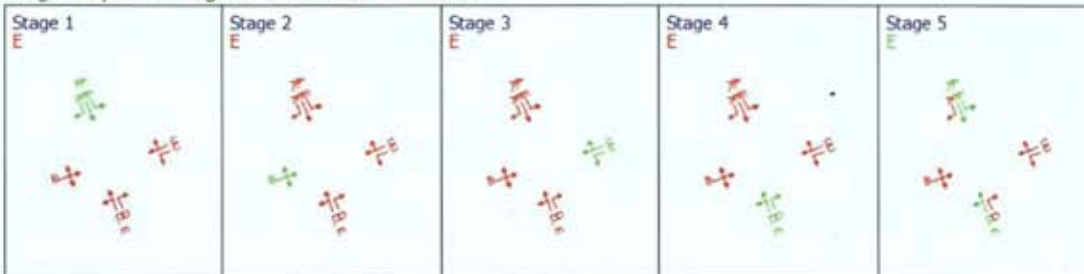
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	53	93	40
A	2	1	1	C	53	93	40
B	1	1	1	D	98	110	12
B	2	1	1	D	98	110	12
C	1	1	1	B	25	48	23
D	1	1	1	A	13	20	7
D	2	1	1	A	13	20	7
D	3	1	1	A	13	20	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	38	140	213	1800	40	36.45	6.03	57.86	30.63	2.07	32.70
		2	92	-2	522	1800	40	72.43	22.40	220.29	149.13	7.60	156.73
	Ax	1	0	Unrestricted	702	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	80	12	410	1800	35	54.79	15.20	582.68	88.61	5.20	93.81
		2	72	26	129	1800	12	80.55	5.37	205.81	40.98	1.83	42.81
	Bx	1	0	Unrestricted	500	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-6	372	2105	23	109.43	19.11	439.52	160.56	6.38	166.94
	Cx	1	0	Unrestricted	740	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	79	13	352	1800	30	57.29	12.81	106.10	79.54	4.95	84.49
		2	35	154	157	1800	30	39.53	4.55	39.17	24.48	1.64	26.12
		3	32	185	35	1800	7	65.86	1.28	10.66	9.09	0.44	9.53
	Dx	1	0	Unrestricted	248	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	30	198	544	1800	130	0.43	0.07	0.77	0.93	0.00	0.93
	10	1	41	120	735	1800	130	0.69	0.14	2.40	2.00	0.00	2.00
	11	1	30	201	539	1800	130	0.43	0.06	0.99	0.91	0.00	0.91

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	213	213	0		1800	568	38		140	0.00	40
		2	522	522	0		1800	568	92	✓	-2	0.00	40
	Ax	1	702	702	0		Unrestricted	Unrestricted	0		Unrestricted	0.74	130
	B	1	410	410	0		1800	512	80		12	0.00	35
		2	129	129	0		1800	180	72		26	0.00	12
	Bx	1	500	500	0		Unrestricted	Unrestricted	0		Unrestricted	0.70	130
	C	1	372	372	0		2105	389	96	✓	-6	0.00	23
	Cx	1	740	740	0		Unrestricted	Unrestricted	0		Unrestricted	0.61	130
	D	1	352	352	0		1800	443	79		13	0.00	30
		2	157	157	0		1800	443	35		154	0.00	30
		3	35	35	0		1800	111	32		185	0.00	7
	Dx	1	248	248	0		Unrestricted	Unrestricted	0		Unrestricted	0.52	130
	9	1	544	544	0		1800	1800	30		198	0.00	130
	10	1	735	735	0		1800	1800	41		120	0.00	130
	11	1	539	539	0		1800	1800	30		201	0.00	130

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	36.45	2.04	0.11	30.63	77.46	161.88	3.10	2.07
		2	7.02	72.43	6.22	4.28	149.13	116.13	494.18	112.04	7.60
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	54.79	4.71	1.53	88.61	101.14	373.28	41.39	5.20
		2	1.80	80.55	2.03	0.85	40.98	112.94	123.09	22.60	1.83
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	109.43	5.42	5.88	160.56	136.76	362.44	146.31	6.38
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	57.29	4.14	1.46	79.54	112.21	318.44	76.53	4.95
		2	8.01	39.53	1.63	0.10	24.48	83.21	125.32	5.32	1.64
		3	8.27	65.86	0.57	0.07	9.09	100.11	33.07	1.97	0.44
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.43	0.00	0.07	0.93	0.00	0.00	0.00	0.00
	10	1	4.05	0.69	0.00	0.14	2.00	0.00	0.00	0.00	0.00
11	1	4.47	0.43	0.00	0.06	0.91	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)	Estimated blocking
08:00-09:00	A	1	0.00	6.03	10.42	57.86	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	22.40	10.17	220.29	4.02	0.00	0.00	0.00	0.00	0.00	0.00
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	35.00	0.00	35.00	
	B	1	0.00	15.20	2.61	582.68	5.40	0.00	0.00	0.00	0.00	0.00	0.00
		2	0.00	5.37	2.61	205.81	0.83	0.00	0.00	0.00	0.00	0.00	0.00
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	C	1	0.00	19.11	4.35	439.52	8.10	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	24.00	0.00	24.00	
	D	1	0.00	12.81	12.07	106.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00
		2	0.00	4.55	11.61	39.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		3	0.00	1.28	11.98	10.66	0.00	0.00	0.00	5.00	0.00	5.00	
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	9	1	0.00	0.07	8.52	0.77	0.00	0.00	0.00	0.00	8.00	8.00	
	10	1	0.00	0.14	5.87	2.40	0.00	0.00	0.00	0.00	85.00	85.00	
11	1	0.00	0.06	6.47	0.99	0.00	0.00	0.00	0.00	111.00	111.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	12.76	2.58	4.94	43.65
		2	30.53	11.52	2.65	79.44
	Ax	1	99.88	3.33	30.00	17.07
	B	1	6.15	6.45	0.95	56.59
		2	1.94	2.95	0.66	82.35
	Bx	1	65.39	2.18	30.00	15.69
	C	1	9.30	11.62	0.80	112.43
	Cx	1	106.81	3.56	30.00	17.32
	D	1	24.43	6.42	3.81	65.61
		2	10.48	2.07	5.05	47.54
		3	2.41	0.72	3.35	74.13
	Dx	1	38.68	1.29	30.00	18.72
	9	1	26.66	0.95	27.94	6.31
	10	1	24.81	0.97	25.64	4.74
11	1	20.07	0.73	27.38	4.89	

**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	6.03	0.11	5.38	1.00	0.00	32.70
		2	0.00	0.00	✓	22.80	4.68	17.58	1.00	0.00	156.73
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	15.23	6.68	11.70	1.00	0.00	93.81
		2	0.00	0.00	✓	5.39	0.88	5.07	1.00	0.00	42.81
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	20.42	7.19	18.15	1.00	0.00	166.94
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	12.84	1.50	10.69	1.00	0.00	84.49
		2	0.00	0.00	✓	4.55	0.10	4.20	1.00	0.00	26.12
		3	0.00	0.00	✓	1.28	0.07	1.26	1.00	0.00	9.53
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.07			1.00	0.00	0.93
	10	1	0.00	0.00	✓	0.14			1.00	0.00	2.00
11	1	0.00	0.00	✓	0.06			1.00	0.00	0.91	

**Network Results**
**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
4	06/09/2022 14:48:03	06/09/2022 14:48:05	2.87	08:00	130	616.97	41.33	95.72	C/1	2	13	C/1	10/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	96	-6	6198	1127	24.00	586.86	30.10	616.97

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s per cycle)
08:00-09:00	6198	6198	0		96	✓	-6	1127

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	9.30	24.00	26.76	14.56	586.86	38.74	1991.70	409.26	30.10

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle)	Wasted time blocking back (s per cycle)	Wasted time total (s per cycle)
08:00-09:00	582.68	0.00	94.00	204.00	298.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	480.29	57.34	8.38

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	616.97

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

From	To			
	1	2	3	4
1	0.0	131.1	129.5	128.1
2	97.8	0.0	89.0	69.5
3	101.5	102.9	0.0	64.1
4	78.8	80.2	104.3	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journey dist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	21	131.14	180.96	0.00	0.00	0.00	21	131.14	180.96
2	1	3	221	129.50	167.28	0.00	0.00	0.00	221	129.50	167.28
3	1	4	130	128.12	155.77	0.00	0.00	0.00	130	128.12	155.77
12	4	1	286	78.81	196.56	0.00	0.00	0.00	286	78.81	196.56
13	3	1	419	101.51	236.58	0.00	0.00	0.00	419	101.51	236.58
14	2	3	352	89.00	260.68	0.00	0.00	0.00	352	89.00	260.68
17	3	4	213	64.08	224.46	0.00	0.00	0.00	213	64.08	224.46
19	4	2	124	80.20	208.19	0.00	0.00	0.00	124	80.20	208.19
20	3	2	103	102.90	248.21	0.00	0.00	0.00	103	102.90	248.21
21	2	4	157	69.55	246.52	0.00	0.00	0.00	157	69.55	246.52
22	2	1	35	97.76	262.25	0.00	0.00	0.00	35	97.76	262.25
23	4	3	129	104.31	194.51	0.00	0.00	0.00	129	104.31	194.51

**Final Prediction Table**

Traffic Stream Results

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Wasted time total (s per cycle)	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		213	1800	40	0.00	38	140	43.65	36.45	77.46
	2	(untitled)	1	1	C		522 <	1800	40	0.00	92	-2	79.44	72.43	116.13
Ax	1	(untitled)					702	Unrestricted	130	35.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	410 <	1800	35	0.00	80	12	56.59	54.79	101.14
	2	(untitled)	1	1	D		129 <	1800	12	0.00	72	26	82.35	80.55	112.94
Bx	1	(untitled)					500	Unrestricted	130	15.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		372 <	2105	23	0.00	96	-6	112.43	109.43	136.78
Cx	1	(untitled)					740	Unrestricted	130	24.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	352 <	1800	30	0.00	79	13	65.61	57.29	112.21
	2	(untitled)	1	1	A	E	157	1800	30	0.00	35	154	47.54	39.53	83.21
	3	(untitled)	1	1	A		35	1800	7	5.00	32	185	74.13	65.86	100.11
Dx	1	(untitled)					248	Unrestricted	130	15.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				544	1800	130	8.00	30	198	6.31	0.43	0.00
10	1		1				735	1800	130	85.00	41	120	4.74	0.69	0.00
11	1		1				539	1800	130	111.00	30	201	4.89	0.43	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	480.29	57.34	8.38	26.76	14.56	586.86	30.10	0.00	616.97
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	480.29	57.34	8.38	26.76	14.56	586.86	30.10	0.00	616.97

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX



# A5 - Scenario 2040 - Masterplan (AM) D5 - Scenario 2040 - Masterplan (AM),

## Summary

### Data Errors and Warnings

No errors or warnings

### Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
5	06/09/2022 14:48:06	06/09/2022 14:48:07	1.89	08:00	130	2066.80	143.30	124.09	A/2	3	20	A/2	11/1

### Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Scenario 2040 - Masterplan (AM)			✓	D5		✓	

### Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2040 - Masterplan (AM)					08:00		✓

## Arms and Traffic Streams

### Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			1

**Traffic Streams**

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2105	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

**Lanes**

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	41	25.85		2105
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	1	(untitled)											1800

**Modelling**

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

**Modelling - Advanced**

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	130

**Normal traffic - Modelling**

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

**Normal traffic - Advanced**

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

**Flows**

Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	213	213
	2	567	567
Ax	1	702	702
B	1	716	716
	2	129	129
Bx	1	500	500
C	1	372	372
Cx	1	1100	1100
D	1	352	352
	2	157	157
	3	44	44
Dx	1	248	248
9	1	553	553
10	1	780	780
11	1	845	845

**Signals**

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

**Entry Sources**

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	30.00

**Sources**

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

**Give Way Data**

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

**Signal Timings**

Network Default: 130s cycle time; 130 steps

**Controller Stream 1**

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	130	76

**Controller Stream 1 - Properties**

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

**Controller Stream 1 - Optimisation**

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

**Phases**

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	300	0	0	Unknown

**Library Stages**

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	1	0	0

**Stage Sequences**

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5	23, 51, 88, 107, 11	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	26, 50, 75, 114, 11	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

**Intergreen Matrix for Controller Stream 1**

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

**Banned Stage transitions for Controller Stream 1**

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

**Interstage Matrix for Controller Stream 1**

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	5	5	5	5	5	0

**Resultant Stages**

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	A	16	23	7	1	7
	2	✓	2	B	28	51	23	1	23
	3	✓	3	C	56	88	32	1	7
	4	✓	4	D	93	107	14	1	7
	5	✓	5	E	112	11	29	1	7

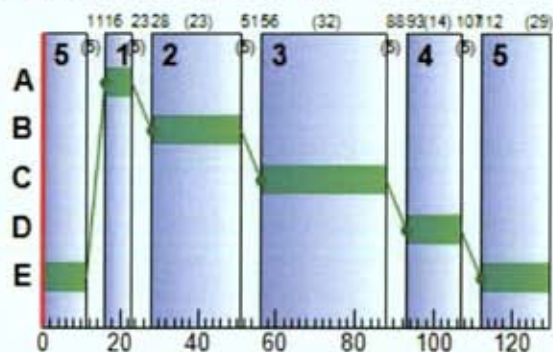
**Resultant Phase Green Periods**

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	16	23	7
	B	1	✓	28	51	23
	C	1	✓	56	88	32
	D	1	✓	93	107	14
	E	1	✓	112	11	29

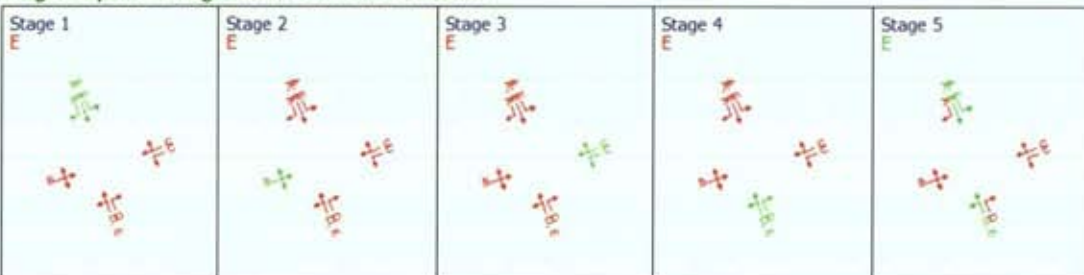
**Traffic Stream Green Times**

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	56	88	32
A	2	1	1	C	56	88	32
B	1	1	1	D	93	107	14
B	2	1	1	D	93	107	14
C	1	1	1	B	28	51	23
D	1	1	1	A	16	23	7
D	2	1	1	A	16	23	7
D	3	1	1	A	16	23	7

**Phase Timings Diagram for Controller Stream 1**



**Stage Sequence Diagram for Controller Stream 1**



**Resultant penalties**

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

## Traffic Stream Results

### Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s per cycle)	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	47	93	213	1800	32	44.47	6.71	64.40	37.36	2.29	39.65
		2	124	-27	567	1800	32	401.04	73.38	721.51	896.92	16.41	913.34
	Ax	1	0	Unrestricted	702	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	115	-22	716	1800	43	284.93	71.87	2755.04	804.70	18.88	823.58
		2	62	45	129	1800	14	68.61	4.90	187.93	34.91	1.68	36.60
	Bx	1	0	Unrestricted	500	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-6	372	2105	23	109.43	19.11	439.52	160.56	6.38	166.94
	Cx	1	0	Unrestricted	933	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	67	35	352	1800	36	43.92	11.32	93.83	60.98	4.20	65.17
		2	30	202	157	1800	36	34.17	4.25	36.62	21.16	1.52	22.68
		3	40	127	44	1800	7	69.23	1.66	13.82	12.02	0.57	12.58
	Dx	1	0	Unrestricted	212	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	31	193	553	1800	130	0.44	0.07	0.80	0.97	0.00	0.97
	10	1	43	108	780	1800	130	0.76	0.17	2.82	2.35	0.00	2.35
	11	1	47	92	845	1800	130	0.88	0.21	3.20	2.94	0.00	2.94

### Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s per cycle)
08:00-09:00	A	1	213	213	0		1800	457	47		93	0.00	32
		2	567	457	0		1800	457	124	✓	-27	0.00	32
	Ax	1	702	702	0		Unrestricted	Unrestricted	0		Unrestricted	0.70	130
	B	1	716	623	0		1800	623	115	✓	-22	0.00	43
		2	129	129	0		1800	208	62		45	0.00	14
	Bx	1	500	500	0		Unrestricted	Unrestricted	0		Unrestricted	0.72	130
	C	1	372	372	0		2105	389	96	✓	-6	0.00	23
	Cx	1	933	933	167	✓	Unrestricted	Unrestricted	0		Unrestricted	0.52	130
	D	1	352	352	0		1800	526	67		35	0.00	36
		2	157	157	0		1800	526	30		202	0.00	36
		3	44	44	0		1800	111	40		127	0.00	7
	Dx	1	212	212	36	✓	Unrestricted	Unrestricted	0		Unrestricted	0.42	130
	9	1	553	553	0		1800	1800	31		193	0.00	130
	10	1	780	780	0		1800	1800	43		108	0.00	130
	11	1	845	845	0		1800	1800	47		92	0.00	130

**Traffic Stream Results: Stops and delays**

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	44.47	2.43	0.20	37.36	85.60	176.76	5.57	2.29
		2	7.02	401.04	6.16	57.01	896.92	286.50	456.92	852.15	16.41
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	284.93	7.13	49.54	804.70	241.66	623.08	882.65	18.88
		2	1.80	68.61	1.96	0.50	34.91	104.06	120.88	13.35	1.68
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	109.43	5.42	5.88	160.56	136.76	362.44	146.31	6.38
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	43.92	3.63	0.67	60.98	95.11	298.85	35.93	4.20
		2	8.01	34.17	1.43	0.06	21.16	77.35	117.95	3.49	1.52
		3	8.27	69.23	0.72	0.13	12.02	102.99	41.82	3.50	0.57
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.44	0.00	0.07	0.97	0.00	0.00	0.00	0.00
	10	1	4.05	0.76	0.00	0.17	2.35	0.00	0.00	0.00	0.00
11	1	4.47	0.88	0.00	0.21	2.94	0.00	0.00	0.00	0.00	

**Traffic Stream Results: Queues and blocking**

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s per cycle))	Wasted time blocking back (s per cycle))	Wasted time total (s per cycle))	Estimated blocking
08:00-09:00	A	1	0.00	6.71	10.42	64.40	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	73.38	10.17	721.51	55.02	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	27.00	0.00	27.00	
	B	1	0.00	71.87	2.61	2755.04	58.10	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.90	2.61	187.93	0.57	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	17.00	0.00	17.00	
	C	1	0.00	19.11	4.35	439.52	8.10	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	21.00	0.00	21.00	
	D	1	0.00	11.32	12.07	93.83	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.25	11.61	36.62	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	1.66	11.98	13.82	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	0.00	12.00	0.00	12.00
	9	1	0.00	0.07	8.52	0.80	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.17	5.87	2.82	0.00	0.00	0.00	0.00	130.00	130.00	
11	1	0.00	0.21	6.47	3.20	0.00	0.00	0.00	0.00	130.00	130.00		

**Traffic Stream Results: Journey times**

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	12.76	3.06	4.18	51.66
		2	33.16	64.27	0.52	408.06
	Ax	1	99.88	3.33	30.00	17.07
	B	1	10.74	57.03	0.19	286.73
		2	1.94	2.52	0.77	70.41
	Bx	1	65.39	2.18	30.00	15.69
	C	1	9.30	11.62	0.80	112.43
	Cx	1	134.68	4.49	30.00	17.32
	D	1	24.43	5.11	4.78	52.24
		2	10.48	1.84	5.70	42.18
		3	3.03	0.95	3.20	77.50
	Dx	1	33.05	1.10	30.00	18.72
	9	1	27.10	0.97	27.90	6.32
	10	1	26.33	1.04	25.24	4.82
11	1	31.46	1.26	25.05	5.35	



**Traffic Stream Results: Advanced**

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	6.71	0.20	5.94	1.00	0.00	39.65
		2	0.00	0.00	✓	128.47	112.10	124.41	1.00	0.00	913.34
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	118.46	105.25	110.15	1.00	0.00	823.58
		2	0.00	0.00	✓	4.91	0.50	4.62	1.00	0.00	36.60
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	20.42	7.19	18.15	1.00	0.00	166.94
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	11.33	0.67	9.28	1.00	0.00	65.17
		2	0.00	0.00	✓	4.25	0.06	3.90	1.00	0.00	22.68
		3	0.00	0.00	✓	1.66	0.13	1.62	1.00	0.00	12.58
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.07			1.00	0.00	0.97
	10	1	0.00	0.00	✓	0.17			1.00	0.00	2.35
11	1	0.00	0.00	✓	0.21			1.00	0.00	2.94	

**Network Results**

**Run Summary**

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignal PRC
5	06/09/2022 14:48:06	06/09/2022 14:48:07	1.89	08:00	130	2086.80	143.30	124.09	A/2	3	20	A/2	11/1

**Network Results: Vehicle summary**

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	124	-27	7075	1133	72.92	2034.87	51.93	2086.80

**Network Results: Flows and signals**

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	7075	6872	203	✓	124	✓	-27	1133

**Network Results: Stops and delays**

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	8.68	72.92	28.87	114.43	2034.87	66.17	2198.70	1942.94	51.93

**Network Results: Queues and blocking**

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s (per cycle))	Wasted time blocking back (s (per cycle))	Wasted time total (s (per cycle))
08:00-09:00	2755.04	0.00	81.00	260.00	341.00

**Network Results: Journey times**

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	523.72	160.76	3.26

**Network Results: Advanced**

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	2086.80

**Point to Point Journey Time**

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	131.1	129.5	128.1
	2	101.1	0.0	75.6	64.2
	3	430.2	431.6	0.0	72.2
	4	309.4	310.8	92.8	0.0

**Path Journey Time**

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journeydist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	21	131.14	180.96	0.00	0.00	0.00	21	131.14	180.96
2	1	3	221	129.50	167.28	0.00	0.00	0.00	221	129.50	167.28
3	1	4	130	128.12	155.77	0.00	0.00	0.00	130	128.12	155.77
12	4	1	592	309.40	196.56	0.00	0.00	0.00	592	309.40	196.56
13	3	1	464	430.19	236.58	0.00	0.00	0.00	464	430.19	236.58
14	2	3	352	75.64	260.68	0.00	0.00	0.00	352	75.64	260.68
17	3	4	213	72.17	224.46	0.00	0.00	0.00	213	72.17	224.46
19	4	2	124	310.79	208.19	0.00	0.00	0.00	124	310.79	208.19
20	3	2	103	431.59	248.21	0.00	0.00	0.00	103	431.59	248.21
21	2	4	157	64.19	246.52	0.00	0.00	0.00	157	64.19	246.52
22	2	1	44	101.14	262.25	0.00	0.00	0.00	44	101.14	262.25
23	4	3	129	92.84	194.51	0.00	0.00	0.00	129	92.84	194.51

**Final Prediction Table**

**Traffic Stream Results**

Arm	Traffic Stream	Name	Traffic node	SIGNALS			FLOWS		PERFORMANCE				PER PCU		
				Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)
A	1	(untitled)	1	1	C		213	1800	32	0.00	47	93	51.66	44.47	85.60
	2	(untitled)	1	1	C		567 <	1800	32	0.00	124	-27	408.06	401.04	286.50
Ax	1	(untitled)					702	Unrestricted	130	27.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	716 <	1800	43	0.00	115	-22	286.73	284.93	241.66
	2	(untitled)	1	1	D		129 <	1800	14	0.00	62	45	70.41	68.61	104.06
Bx	1	(untitled)					500	Unrestricted	130	17.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		372 <	2105	23	0.00	96	-6	112.43	109.43	136.76
Cx	1	(untitled)					933	Unrestricted	130	21.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	352	1800	36	0.00	67	35	52.24	43.92	95.11
	2	(untitled)	1	1	A	E	157	1800	36	0.00	30	202	42.18	34.17	77.35
	3	(untitled)	1	1	A		44	1800	7	4.00	40	127	77.50	69.23	102.99
Dx	1	(untitled)					212	Unrestricted	130	12.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				553	1800	130	0.00	31	193	6.32	0.44	0.00
10	1		1				780	1800	130	130.00	43	108	4.82	0.76	0.00
11	1		1				845	1800	130	130.00	47	92	5.35	0.88	0.00

**Network Results**

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
<b>Normal traffic</b>	523.72	160.76	3.26	28.87	114.43	2034.87	51.93	0.00	2086.80
Bus									
Tram									
Pedestrians									
<b>TOTAL</b>	523.72	160.76	3.26	28.87	114.43	2034.87	51.93	0.00	2086.80

- < = adjusted flow warning (upstream links/traffic streams are over-saturated)
- \* = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%
- ^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%
- + = average link/traffic stream excess queue is greater than 0
- P.I. = PERFORMANCE INDEX



**RESOURCE WASTE  
MANAGEMENT PLAN FOR  
A PROPOSED POWER  
GENERATOR STATION,  
KILSHANE AND  
PIPERSTOWN, KILSHANE  
ROAD, DUBLIN 11**

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## APPENDIX 14

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Report Prepared For

**Kilshane Energy Ltd.**

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Our Reference

CB/227501.0096WMR01

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Date of Issue

8 September 2022

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**Document History**

Document Reference		Original Issue Date	
CB/227501.0096WMR01		6 September 2022	
Revision Level	Revision Date	Description	Sections Affected

**Record of Approval**

Details	Written by	Approved by
Signature		
Name	Chonaill Bradley	Elaine Neary
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Date	8 September 2022	8 September 2022

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## 1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Resource Waste Management Plan (RWMP) on behalf of Kilshane Energy Ltd. The proposed development comprises the construction of a gas turbine power generator station with an output of up to 293 Megawatts, the application of which includes a turbine, an associated exhaust stack, two air cooled condenser units, administration and control building, workshop, stores, fuel gas area, electrical module for fuel gas area, step-up transformer, black start diesel generator, transfer compound, three reserve fuel storage tanks and recessed bund area, miscellaneous plant, and equipment.

The Environmental Protection Agency (EPA) of Ireland issued '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects*' in 2021. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006. The RWMP would be the replacement document for the Construction & Demolition Waste Management Plan. Further detail can be found in section 2.

This plan will provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with the current legal and industry standards including the *Waste Management Act 1996* as amended and associated Regulations <sup>1</sup>, *Environmental Protection Agency Act 1992* as amended <sup>2</sup>, *Litter Pollution Act 1997* as amended <sup>3</sup> and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* <sup>4</sup>. In particular, this plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This RWMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the Proposed Development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and will be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible

## 2.0 RESOURCE & WASTE MANAGEMENT IN IRELAND

### 2.1 National Level

The Irish Government issued a policy statement in September 1998, *Changing Our Ways* <sup>5</sup>, which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e. 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled '*Recycling of Construction and Demolition Waste*' <sup>6</sup> concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, '*A Waste Action*

*Plan for a Circular Economy*<sup>7</sup> (WAPCE), replaces the previous national waste management plan, *"A Resource Opportunity"* (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021)<sup>8</sup> to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Environmental Protection Agency (EPA) of Ireland issued '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects*' in November 2021<sup>9</sup>. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006<sup>10</sup>. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for Resource Waste Manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies i.e. waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m<sup>2</sup>.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m<sup>2</sup>; and
- Demolition projects generating in total less than 100m<sup>3</sup> in volume of C&D waste.



A development which exceeds one or more of these thresholds is classed as a Tier-2 project. This development is a Tier 2 development as it exceeds the below thresholds.

- Demolition projects generating in total less than 100m<sup>3</sup> in volume of C&D waste.

Other guidelines followed in the preparation of this report include '*Construction and Demolition Waste Management – a handbook for Contractors and Site Managers*'<sup>11</sup>, published by FÁS and the Construction Industry Federation in 2002 and the previous guidelines, '*Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects*' (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

## 2.2 Regional Level

The proposed development is located in the Local Authority area of Fingal County Council (FCC).

The *Eastern-Midlands Region Waste Management Plan 2015 – 2021* is the regional waste management plan for the FCC area published in May 2015. Currently the EMR and other regional waste management plans are under review and the Regional Waste Management Planning Offices expect to publish the final plan in early 2022.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of "70% preparing for reuse, recycling and other recovery of construction and demolition waste" (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012*.

The *Fingal Development Plan 2017 – 2023*<sup>11</sup> came into effect on March 2017 and sets out a number of objectives for the Fingal region in line with the objectives of the regional waste management plan.

### Objectives:

- Objective **WM03** Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015 -2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of that Plan.
- Objective **WM07** Promote the increased re-use of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015 -2021 (or any subsequent plan).
- Objective **WM18** Ensure that construction and demolition Waste Management Plans meet the relevant recycling / recovery targets for such waste in accordance with the national legislation and regional waste management policy.
- Objective **DMS36** Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor

*window, unless adequate screened alcoves or other such mitigation measures are provided.*

- *Objective **DMS37** Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*

With regard to C&D waste specifically, the Development Plan requires that a 70% target for the re-use, recycling and recovery of man-made C&D waste in Ireland by 2020 is required in compliance with the EC (Waste Directive) Regulations 2011.

The Draft *Fingal Development Plan 2023– 2029*<sup>13</sup> (2022) and sets out a number of policies and objectives for the Fingal region in line with the objectives of the regional waste management plan, including the following:

- *Objective **DMSO31**: Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened or other such mitigation measures are provided.*
- *Objective **DMSO32**: Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*
- ***Objective IUO34 – Waste Management in New Developments - Require the provision of appropriate, well designed, accessible space to support the storage, separation and collection of as many waste and recycling streams as possible in all new commercial and residential developments within the County.***
- ***Objective DMSO235 – Provision of Public Bring Banks - Ensure the provision of public bring banks in all large retail developments, unless there are existing facilities within a 1 km radius. Bring bank facilities will generally be required at appropriate locations in the following development types:***
  - *In conjunction with significant new commercial developments, or extensions to existing developments.*
  - *In conjunction with new waste infrastructure facilities, proposals should include bring facilities for the acceptance of non-hazardous and hazardous wastes from members of the public and small businesses.*
  - *In conjunction with medium and large scale residential and mixed-use developments providing in excess of 10 residential units, proposals should provide recycling and bring bank facilities to serve residents and in some appropriate locations, the wider community.*
  - *In conjunction with all large retail developments provide space for reverse vending machines to promote the circular economy.*
- ***Objective DMSO236 – Communal Refuse Storage Provision - In the case of communal refuse storage provision, the collection point for refuse should be accessible both to the external collector and to the resident and be secured against illegal dumping by non-residents. In the case of individual houses, the applicant shall clearly show within a planning application the proposed location and design of bin storage to serve each dwelling, and having regard to the number of individual bins required to serve each dwelling at the time of the application and any possible future requirements for refuse storage/collection. The following criteria will be considered in the assessment of the design and siting of waste facilities and bring facilities:***
  - *The location and design of any refuse storage or recycling facility should ensure that it is easily accessible both for residents and/or public and for bin collection, be insect and vermin proofed, will not present an odour problem, and will not significantly detract from the residential amenities of adjacent property or future occupants.*
  - *Provision for the storage and collection of waste materials shall be in accordance with the guidelines for waste storage facilities in the relevant*

*Regional Waste Management Plan and the design considerations contained in Section 4.8 and 4.9 of the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities, DHLGH (2020).*

- *Refuse storage for houses should be externally located, concealed / covered and adequate to cater for the size and number of bins normally allocated to a household. For terraced houses, the most appropriate area for bins to be stored is to the front of the house, which should be located in well-designed enclosures that do not detract from visual amenity.*
- *All applications shall clearly identify the waste storage and collection points and detail the anticipated waste collection schedule having regard to the impact on road users both within the development and the surrounding area.*
- *Access to private waste storage in residential schemes should be restricted to residents only.*
- **Objective DMSO237 – Segregation and Collection of Waste - Ensure all new large-scale residential and mixed-use developments include appropriate facilities for source segregation and collection of waste.**

### 2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended <sup>14</sup>.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2001* and subsequent Irish legislation, is the principle of "Duty of Care". This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of "Polluter Pays" whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the developer ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste or IE licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

### 3.0 DESIGN APPROACH

The client and the design team have integrated the '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects*' guidelines into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

### 4.0 DESCRIPTION OF THE PROJECT

#### 4.1 Location, Size and Scale of the Development

The proposed development comprises the construction of a gas turbine power generator station with an output of up to 293 Megawatts, the application of which includes a turbine, an associated exhaust stack, two air cooled condenser units, administration and control building, workshop, stores, fuel gas area, electrical module for fuel gas area, step-up transformer, black start diesel generator, transfer compound, three reserve fuel storage tanks and recessed bund area, miscellaneous plant, and equipment.

The proposed development will also include 26 no. staff car parking spaces, site and landscaping works, and all associated ancillary site development infrastructure such as foul and surface water drainage works and internal roads, footpaths, access routes, and all associated engineering and construction site works necessary to facilitate the development. Additionally, the proposal includes the realignment of a section of the Kilshane road and construction of a new roundabout junction (bounding the site to the east).



Figure 3.1 Proposed site location



Figure 3.2 Proposed site layout

#### 4.2 Details of the Non-Hazardous Wastes to be produced

There will be waste materials generated from the demolition of the existing residential and farm buildings, along with hardstanding areas on site, as well as from the further

excavation of the building foundations. The volume of waste generated from demolition will be more difficult to segregate than waste generated from the construction phase, as many of the building materials will be bonded together or integrated i.e. plasterboard on timber ceiling joists, steel embedded in concrete, etc.

There will be waste materials generated from the excavation of soil and stones to facilitate site clearance, construction of new building foundations and installation of services. The volume of material to be excavated has been estimated by the project design team at c. 64,500m<sup>3</sup>. It is anticipated that all of this material will be reused onsite for infilling and landscaping works where possible.

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of metal, concrete, plastic, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The appointed Contractor will be contractually required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction and demolition workers e.g. organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided onsite during the construction and demolition phases. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

#### **4.3 Potential Hazardous Wastes to be produced**

##### **4.3.1 Contaminated Soil**

The site investigations carried out by Site Investigations Ltd. in 2021. In total, 11 no. soil samples were collected throughout the trial pitting exercise at the data centre site and analysed for a range of parameters to examine the soil quality and to investigate any present and/or past contamination occurred across the site.

Of the 11 no. samples taken, 8 no. samples were analysed and compared against Waste Acceptance Criteria (WAC) set out by the adopted EU Council Decision 2003/33/EC which established criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). There was no fill material noted during trial pit excavations with all samples being recorded as original clay subsoil.

The WAC analysis identifies that the representative sample is suitable for classification as Category A – Inert. Based on the laboratory results and parametric concentrations obtained from the site investigation, material from the sample locations would be acceptable at inert waste facilities (Category A). It should be noted that waste facilities develop facility specific criteria also and this should be considered should any soil/material to be removed from site in the future.

In the unlikely event that any potentially contaminated material is encountered during construction, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled '*Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous*'<sup>16</sup> using the *HazWasteOnline* application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the waste acceptance criteria in accordance with *EC Council Decision 2003/33/EC*.

No asbestos was found during the SI. In the unlikely event that Asbestos Containing Materials (ACMs) are found within the excavated material, the removal will only be

carried out by a suitably permitted waste contractor, in accordance with *S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010*. All asbestos will be taken to a suitably licensed or permitted facility.

In the event that hazardous soil, or historically deposited waste is encountered during the construction phase, the contractor will notify FCC and provide a Hazardous / Contaminated Soil Management Plan, to include estimated tonnages, description of location, any relevant mitigation, destination for disposal / treatment, in addition to information on the authorised waste collector(s).

#### **4.3.2 Fuel/Oils**

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

#### **4.3.3 Invasive Plant Species**

A site walkover was undertaken by the project ecologist Karen Shevlin. This included a site walkover survey of the entire site, and around part of the outside perimeter to search for any invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011.

No Japanese Knotweed or any third schedule invasive species were detected. If any are detected during the construction phase of the development, then an invasive species management plan will be produced and submitted to FCC.

#### **4.3.4 Asbestos**

Prior to the demolition of the existing structures demolition asbestos surveys will be undertaken by an appropriately qualified expert.

Removal of asbestos or ACMs will be carried out by a suitably qualified contractor and ACMs will only be removed from site by a suitably permitted / licenced waste contractor, in accordance with *S.I. No. 589 of 2010 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010*. All material will be taken to a suitably licensed or permitted facility.

#### **4.3.5 Other known Hazardous Substances**

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or light bulbs and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

### **5.0 ROLES AND RESPONSIBILITIES**

The *Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects* promotes that a RM will be appointed. The RM may be performed by number of different individuals over the life-cycle of the Project, however it is intended to be a reliable person chosen from within the

Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction and demolition methodology that is designed to facilitate maximum reuse and/or recycling of waste.

### 5.1 Role of the Client

The Client and the body establishing the aims and the performance targets for the project.

- The Client has commissioned the preparation and submission of a preliminary RWMP as part of the design and planning submission;
- The Client is to commission the preparation and submission of an updated RWMP as part of the construction and demolition tendering process;
- The Client will ensure that the RWMP is agreed on and submitted to the local authority prior to commencement of works on site;
- The Client is to request the end-of-project RWMP from the Contractor.

### 5.2 Role of the Client Advisory Team

The Client Advisory Team or Design Team is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project;
- Appointing a Resource Manager (RM) to track and document the design process, inform the Design Team and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This will also include data on waste types (e.g. waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team;
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor;
- Working with the Contractor as required to meet the performance targets for the project.

### 5.3 Future Role of the Contractor

The construction Contractors have not yet been decided upon for this RWMP. However, once select they will have major roles to fulfil. They will be responsible for:

- Preparing, implementing and reviewing the RWMP during the construction phase (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines;
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP;
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site;
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable;
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a 'waste' must only be transported to an authorised waste facility;



- End-of-waste and by-product notifications addressed with the EPA where required;
- Clarification of any other statutory waste management obligations, which could include on-site processing;
- Full records of all resources (both wastes and other resources) will be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

## 6.0 KEY MATERIALS & QUANTITIES

### 6.1 Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information will be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered where possible. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or Volume (m<sup>3</sup>) of waste generated per construction value;
- Weight (tonnes) or Volume (m<sup>3</sup>) of waste generated per construction floor area (m<sup>2</sup>);
- Fraction of resource reused on site;
- Fraction of resource notified as by-product;
- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.

### 6.2 Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction activities at a typical site are shown in Table 6.1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

**Table 6.1** Typical waste types generated and LoW codes (\*individual waste types may contain hazardous substances)

Waste Material	LoW/EWC Code
Concrete, bricks, tiles, ceramics	17 01 01-03 & 07
Wood, glass and plastic	17 02 01-03
Bituminous mixtures, coal tar and tarred products	17 03 01*, 02 & 03*
Metals (including their alloys) and cable	17 04 01-11
Soil and stones	17 05 03* & 04
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Green waste	20 02 01
Electrical and electronic components	20 01 35 & 36
Batteries and accumulators	20 01 33 & 34
Liquid fuels	13 07 01-10
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19, 27-30

Waste Material	LoW/EWC Code
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

## 7.0 WASTE MANAGEMENT

### 7.1 Demolition Waste Generation

The demolition stage will involve the demolition of the existing residential and farm buildings, along with hardstanding areas on site, as well as from the further excavation of the building foundations. The demolition areas are identified in the planning drawings provided with this application. The anticipated demolition waste and rates of reuse, recycling / recovery and disposal are shown in **Error! Reference source not found.**, below.

Waste Type	Tonnes	Reuse		Recycle / Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Glass	11.3	0	0.0	85	9.6	15	1.7
Concrete, Bricks, Tiles, Ceramics	64.3	30	19.3	65	41.8	5	3.2
Plasterboard	4.8	30	1.4	60	2.9	10	0.5
Asphalts	1.3	0	0.0	50	0.6	50	0.6
Metals	18.9	5	0.9	80	15.1	15	2.8
Slate	10.1	0	0.0	85	8.6	15	1.5
Timber	15.1	10	1.5	60	9.1	30	4.5
Asbestos	0.3	0	0.0	0	0.0	100	0.3
<b>Total</b>	<b>126.0</b>		<b>23.2</b>		<b>87.7</b>		<b>15.2</b>

**Table 7.1** Estimated off-site reuse, recycle and disposal rates for demolition waste

### 7.2 Construction Waste Generation

Table 7.2 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA *National Waste Reports*, the *GMIT*<sup>16</sup> and other research reports.

Waste Types	%
Mixed C&D	33
Timber	28
Plasterboard	10
Metals	8
Concrete	6
Other	15
<b>Total</b>	<b>100</b>

**Table 7.2** Waste materials generated on a typical Irish construction site

Table 7.3 shows the predicted construction waste generation for the proposed development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average large-scale development waste generation rate per m<sup>2</sup>, using the waste breakdown rates shown in Table 7.2.

Waste Type	Tonnes	Reuse/Recycle		Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	22.0	10	2.2	80	17.6	10	2.2
Timber	18.7	40	7.5	55	10.3	5	0.9
Plasterboard	6.7	30	2.0	60	4.0	10	0.7
Metals	5.3	5	0.3	90	4.8	5	0.3
Concrete	4.0	30	1.2	65	2.6	5	0.2
Other	10.0	20	2.0	60	6.0	20	2.0
<b>Total</b>	<b>66.7</b>		<b>15.2</b>		<b>45.3</b>		<b>6.3</b>

**Table 7.3** Estimated off-site reuse, recycle and disposal rates for construction waste

In addition to the information in Table 7.3, the quantity of excavated material that will be generated has been estimated to be c. 64,500 m<sup>3</sup>. Any suitable excavated material will be temporarily stockpiled for reuse as fill or landscaping, where possible. No material is expected to be removed site with it being envisaged that all will be reused as fill and in landscaping. If for some reason material is deemed to be unsuitable for reuse onsite the material will be removed off site for appropriate reuse, recovery and/or disposal.

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

### 7.3 Proposed Resource and Waste Management Options

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source where feasible. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the FCC Region that provide this service.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arising's requiring disposal off-site will be reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

Written records will be maintained by the contractor(s) detailing the waste arising throughout the C&D phases, the classification of each waste type, waste collection permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required.

The management of the main waste streams is outlined as follows:

#### Soil, Stone, Gravel and Clay

The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling /

recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase. However, all the soils and stones excavated to facilitate construction of the temporary contractor's compound will be reused onsite for to create a temporary berm along the northern perimeter of the contractor's compound and for landscaping purposes. Once the contractor's compound is no longer required, the material in the berm will be used to re-instate the ground in this area.

When material is removed off-site it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Regulation 15 (By-products) (Previously Article 27 and referred to as Article 27 in this report) of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020, which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material should not be removed from site until approval from the EPA has been received. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Regulation 15 (Article 27).

If the material is deemed to be a waste, then removal and reuse / recovery / disposal of the material will be carried out in accordance with the *Waste Management Act 1996* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the unlikely event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

#### Bedrock

While it is not envisaged that bedrock will be encountered, if bedrock is encountered, it is anticipated that it will not be crushed on site. Any excavated rock is expected to be removed off- site for appropriate reuse, recovery and / or disposal.

#### Silt & Sludge

Silt and petrochemical interception will be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

#### Concrete Blocks, Bricks, Tiles & Ceramics

The majority of concrete generated as part of the construction works are expected to be clean, inert material and will be recycled, where possible.

#### Hard Plastic

As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

#### Timber

Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.

#### Metal

Metals will be segregated where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

#### Waste Electrical and Electronic Equipment (WEEE)

Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

#### Other Recyclables

Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

#### Non-Recyclable Waste

C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 10.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

#### Other Hazardous Wastes

On-site storage of any hazardous wastes produced (i.e. contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

### **7.4 Tracking and Documentation Procedures for Off-Site Waste**

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project RM (see Section 9.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 - 2011*, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project waste manager (see Section 10.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project waste manager (see Section 10.0). If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from DCC (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site

along with details of the final destination (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

## 8.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

The total cost of C&D waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

### 8.1 Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones etc. which cannot be reused on site may be used as access roads or capping material for landfill sites etc. This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

### 8.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

### 8.3 Disposal

Landfill charges are currently at around €130 - €150 per tonne which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

## 9.0 TRAINING PROVISIONS

A member of the demolition and construction teams will be appointed as the RM to ensure commitment, operational efficiency and accountability in relation to waste management during the C&D phases of the development.

## 9.1 Resource Waste Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site.

The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the Waste Manager to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this RWMP.

## 9.2 Site Crew Training

Training of site crew in relation to waste is the responsibility of the Waste Manager and, as such, a waste training program will be organised. A basic awareness course will be held for all site crew to outline the RWMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Area (WSA). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

## 10.0 TRACKING AND TRACING / RECORD KEEPING

Records will be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arisings on Site.

A waste tracking log will be used to track each waste movement from the site. On exit from the site, the waste collection vehicle driver will stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or Waste Transfer Form (WTF) for hazardous waste) for the waste load collected. At this time, the security personnel will complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by, e.g. Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC / LoW

The waste vehicle will be checked by security personal or the RM to ensure it has the waste collection permit no. displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the FCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically checked by the RM. Subcontractors who have engaged their own waste contractors, will provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

## 11.0 OUTLINE WASTE AUDIT PROCEDURE

### 11.1 Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the proposed Project. Contact details for the nominated RM will be provided to the FCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

### 11.2 Review of Records and Identification of Corrective Actions

A review of all waste management costs and the records for the waste generated and transported off-site should be undertaken mid-way through the construction phase of the proposed Project.

If waste movements are not accounted for, the reasons for this will be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery / reuse / recycling targets for the site. Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Upon completion of the C&D phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling / reuse / recovery figures for the development.

## 12.0 CONSULTATION WITH RELEVANT BODIES

### 12.1 Local Authority

Once the construction contractor has been appointed and they have appointed waste contractors, and prior to removal of any C&D waste materials off-site, details of the proposed destination of each waste stream will be provided to the FCC Waste Regulation Unit.

FCC will also be consulted, as required, throughout the excavation and construction phases in order to ensure that all available waste reduction, reuse and recycling

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opportunities are identified and utilised and that compliant waste management practices are carried out.

## 12.2 Recycling / Salvage Companies

The appointed waste contractor for the main waste streams managed by the construction and demolition contractors will be audited in order to ensure that relevant and up-to-date waste collection permits and facility registrations / permits / licences are held. In addition, information will be obtained regarding the feasibility of recycling each material, the costs of recycling / reclamation, the means by which the wastes will be collected and transported off-site, and the recycling / reclamation process each material will undergo off-site.

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### 13.0 REFERENCES

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13. FCC, Draft Fingal Development Plan 2023-2029 (2022)
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