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WB/LW1/00021
13th July 2001

LAND AT UPTON ROCKS, WIDNES
FOR
REDROW HOMES (LANCS) LTD

APPLIC... NO. 01/RCA28/FUL
RECEIVED 17 JUL 2001
REGISTERED 12 JUL 2001
LOGGED

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3	-	Letter to Knowsley BC, ref. Roundabout onto Cronton Road – 19th May 2000.
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10	-	Email from Knowsley 28th November 2000 ref. Approval to Plan 6.
11	-	SCP letter to Knowsley with capacity and other checks dated 29th November 2000.
12	-	Knowsley letter dated 23rd April 2001 confirming acceptance of submitted data.

Drawing - Plan 6

APPENDIX 1

LAND AT UPTON ROCKS, WIDNES

Summary

Singleton Clamp & Partners Ltd were instructed by Redrow Homes (Lancs) Ltd to initially investigate the anticipated impact of the opening of the Upton Rocks Link Road upto Cronton Road upon the existing signalised crossroads known as Cronton Crossroads.

This was addressed in our report dated 31st March 2000.

Knowsley MBC had a small number of queries regarding the report which they also wished to cover the detail of the proposed roundabout junction between the link road and Cronton Road.

The initial assessments of the roundabout were held up due to queries regarding the preliminary layout of the roundabout and after much debate and delay a revised layout was agreed on 28th November 2000.

Subsequently, the capacity of the roundabout was reassessed for the highway authority, on 23rd April 2001, Knowsley MBC eventually wrote to confirm approval of the geometry of the layout illustrated on Plan 6 and all the outstanding issues from the submitted TIA.

The enclosed appendices illustrate the chronological sequence of events.

APPENDIX 2

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WB/KD/00021
31 March 2000

LAND AT UPTON ROCKS, CRONTON.

ASSESSMENT OF CRONTON CROSSROADS.

Singleton Clamp & Partners Limited
Registered Office: 1 Bickenhall Mansions, Bickenhall Street, London, W1H 3LF
Registered in England No. 3728935

1.0 INTRODUCTION

1.1 Singleton Clamp and Partners Limited are instructed by Redrow Homes (Lancashire) Limited to investigate and prepare an assessment of the traffic signal controlled junction off Cronton Road (A5080), Smithy Lane and Chapel Lane, knows as the Cronton Crossroads. The junction currently operates with 2 stages with an early cut off on the A5080 westbound arm when flows warrant.

1.2 Substantial residential development is identified on land at Upton Rocks located to the south of Cronton Crossroads as illustrated on SCP1. Around half of the proposed development has been completed.

1.3 All of the proposed development is located within Halton. It is also proposed to provide an extension to the existing Distributor Road northwards to meet Cronton Road (A5080) at a 3 arm roundabout (illustrated at SCP2). This roundabout is located within Knowsley.

1.4 The Distributor Road will link Cronton Road to Prescott Road and would act as a relief road to Chapel Lane and Cronton Crossroads.

1.5 The development at Upton Rocks has been thoroughly examined at the Halton Local Plan and has been the subject of a number of reports regarding the anticipated traffic impact of the proposals and the need for the Distributor Road.

1.6 The highway network surrounding the Upton Rocks development has in recent years been subject to major changes which has helped to re-distribute traffic flow away from Cronton Road (A5080). The schemes that have been implemented in recent years are illustrated at SCP3.

1.7 This report considers the anticipated impact of remnant development of 1051 houses upon Cronton Crossroads. It should be noted that our clients totals only 310 houses out of 1051. It should further be noted that 741 houses could be completed without the distributor road extension. Without the distributor road the available flows on Chapel Lane and at Cronton Crossroads would be anticipated to increase to the detriment of the operation of the traffic signals.

1.8 In order to consider the potential impact upon Cronton Crossroads we have undertaken peak hour traffic counts in 2000 and obtained from Halton, details of the number of dwellings completed at the development at the time of the count.

2.0 EXISTING TRAFFIC DATA

2.1 Traffic surveys have been carried out at Cronton Crossroads in 1994 and 2000. The data is illustrated at Appendices 1 and 2 respectively. The table below summarises the total 2-way flows.

ARM	AM PEAK		PM PEAK	
	1994	2000	1994	2000
Cronton Road (West)	843	716	445	635
Smithy Lane	419	412	287	282
Cronton Road (East)	740	1079	788	1105
Chapel Road	944	889	906	873

2.2 It can be seen that between 1994 and 2000 there has been a decrease in flow on Cronton Road, west of the crossroads and an increase in flow east of the crossroads. Flows on Smithy Lane have remained constant and there has been a decrease in flow on Chapel Road.

2.3 In terms of total in flow into the crossroads there has been a small increase in flow between 1994 and 2000 of 5%.

	AM PEAK			PM PEAK		
Total in flow into Crossroads	1994	2000	%inc	1994	2000	%inc
	1473	1548	+5%	1378	1448	+5%

2.4 Some of the major turning movements have also changed between 1994 and 2000 as detailed below:

MOVEMENT	AM PEAK	PM PEAK
Left turn out from Chapel Lane	-102vph	-133vph
Right turn into Chapel Lane	-130vph	-82vph
Left turn into Chapel Lane	+57vph	+123vph
Right turn out from Chapel Lane	+189vph	+84vph
Cronton Lane (East to West)	+61vph	+79vph

2.5 During the 2000 counts around half of the Upton Rocks development was complete.

2.6 SCP1 illustrates the location of the plots of land at Upton Rocks. The schedule below illustrates the current status of each plot.

SITE	SIZE ha	TOTAL DWELLINGS	STATUS	REMAINING CAPACITY 3/2000
A & B	8.01	178	Complete	---
C	3.72	75	Not Released	75
D	3.5	74	Not Released	74
E	0.85	18	Complete	---
F	4.41	97	Complete	---
G	2.06	78	Complete	---
H	11.2	448	Not Released	448
I	3.5	119	Complete	---
J & K	4.98	102	Complete	---
L	3.6	144	Not Released	144
M	2.43	58	Complete	---
N	3.6	72	Complete	---
O	7.8	144	Complete	---
P	5.6	168	Complete	
Q	12.13	310	Development Approved But Not Standard	310
TOTAL		2085		1051

2.7 The above table illustrates that the development is around 50% complete at present hence traffic data recorded in February include traffic generated from around half of the Upton Rocks development.

3.0 IMPACT OF COMPLETION OF DISTRIBUTOR ROAD

3.1 The completion of the distributor road will provide an alternative route between Cronton Road and Prescott Road and enable vehicles to bypass the signal controlled junction at Cronton Crossroads.

3.2 Indeed examination of Appendix 2 reveals significant turing movements between Cronton Road (East) and Chapel Lane which would clearly benefit from the completion of the distributor road.

3.3 It is anticipated that virtually all of the above movements would be removed from Cronton Crossroads. However, in order to undertake a robust analysis it has been assumed that 20% of the existing movements would remain. This will take account of people who live on Chapel Lane and other general local traffic.

3.4 The impact of the above is illustrated at Appendix 3 and suggests a reduction in total inflow at Cronton Crossroads of 414vph (am peak) and 457vph (pm peak).

4.0 ADDITIONAL GENERATED TRAFFIC

4.1 The potential traffic generation of the overall scheme was assessed previously using a peak hour trip rate of 0.7 total two way movement per dwelling. For consistency this report also assumes the above trip rate.

4.2 The overall development of 2085 houses would therefore be anticipated to generate 1460vph at peak times.

4.3 Currently around 1034 units are complete which are anticipated to generate 724vph at peak times, hence completion of the development would be anticipated to add 736vph at peak times to the network.

4.4 The assignment of the site generated traffic was based upon the following:-

25% traffic North
25% traffic South
25% traffic East
25% traffic West

4.5 The additional traffic generated from the remnant development would be anticipated to use the same peak hour assignments i.e.

184vph to/from North
184vph to/from South
184vph to/from East
184vph to/from West

4.6 For the sake of simplicity the above figures have been rounded up to 200vph (total two way).

4.7 In respect of this report the important movements relate to those that could pass through Cronton Crossroads from the development, i.e. movements to/from the north and movements to/from the west.

4.8 Upon inspection of the local highway network (SCP3) vehicles generated by the new development would have 2 main route choices for northbound movements i.e. Cronton Road west to junction 6 of the M62 or Cronton Road east to junction 7 of the M62.

4.9 Movements to/from the west would have 3 route choices, i.e. Cronton Road, (A5080), Hough Green Road (B5178) and the A561.

4.10 Appendix 4 illustrates the anticipated assignment of the additional traffic that would be passed onto the local highway netowork due to the completion of the Upton Rocks development with the distributor road installed.

4.11 It is our experience that during the morning peak hour 80% of the traffic generated from residential development would be outbound and during the evening peak hour 70% of the traffic generated would be inbound. These directional splits have been applied to the two way flows illustrated at Appendix 4 in order to produce the anticipated additional turning movements at key junctions due to development of the remnant site (Appendix 5).

4.12 The anticipated peak hour design flows at Cronton Crossroads associated with the full development of Upton Rocks together with the completion of the distributor road are illustrated at Appendix 6.

4.13 The two way movements on the links in 2000 both without and with the development are summarised below:-

ARM	2000 AM		2000 PM	
	No Dev*1	With Dev*2	No Dev*1	With Dev*2
Cronton Road (West)	716	966	635	885
Smithy Lane	412	412	282	282
Cronton Road (East)	1079	865	1105	848
Chapel Road	889	525	873	467

*1 No development - existing flows/no distributor road
*2 With development - whole development/with distributor at Cronton Crossroads.

4.14 In terms of total inflow into the junction at Cronton Crossroads the flows would be :-

	2000 AM			2000 PM		
	No Dev.	With Dev.	% Change	No Dev.	With Dev.	% Change
TOTAL INFLOW	1548	1384	-10%	1448	1241	-14%

4.15 It can be seen that the installation of the distributor road would have a beneficial impact upon Cronton Crossroads even with the traffic associated with the development of 2085 houses at Upton Rocks taken into account.

4.16 We have undertaken assessments of the peak hour capacity of the Cronton Crossroads using OSCADY 4 using the following scenarios in both peak hours:-

- 2000 - No additional development/no distribution road.
- 2000 - with all additional development and distributor road.

4.17 As it is anticipated that traffic flow at Cronton Corssroads would reduce once the distributor road is open even with all the development built it is not proposed to undertake a further assessment of the capacity of the Crossroads.

4.18 The capacity assessments are summrised below with full printouts attached at Appendices 7, 8, 9 and 10.

ARM	MOVEMT		2000 AM		2000 PM	
			No Dev.	With Dev.	No Dev.	With Dev.
Cronton Road (West)	ALL	RFC	0.577	0.541	0.710	0.703
		Q	3.4	2.9	4.5	3.8
Smithy Lane	ALL	RFC	0.462	0.639	0.303	0.456
		Q	3.1	3.4	2.1	1.7
Cronton Road (East)	ALL	RFC	1.016	0.828	0.899	0.550
		Q	22.2	7.5	10.1	3.1
Chapel Road	ALL	RFC	1.077	0.807	0.942	0.675
		Q	33.4	5.8	11.2	2.9
CYCLE TIME			70	58	70	46Sec
% RESERVE CAPACITY			5.7%	31%	21%	50%

4.19 It can be seen that the introduction of the extension to the distributor road upto Cronton Road will lead to an improvement in conditions at Cronton Crossroads.

4.20 Indeed it should be remembered that a further 741 houses could be completed at Upton Rocks without the distributor road ever being extended to Cronton Road. Should this scenario occur traffic flows such as the right turn into Cronton Road east from Chapel Lane and the reverse movement at the crossroads would be anticipated to increase and significantly reduce capacity of the crossroads as well as significantly increasing traffic flow on Cronton Road (east).

5.0 CONCLUSIONS

5.1 Development of the committed land at Upton Rocks without the completion of the distributor road will lead to increased flows on Chapel Lane and at Cronton Crossroads.

5.2 The completion of the distributor road with the proposed development of our clients land will lead to a reduction in flow on Chapel Lane and at Cronton Crossroads in comparison to existing flows in 2000.

5.3 The peak hour capacity assessment of the Cronton Crossroads reveals that with the development proposal and the distributor road in place there would be an improvement in terms of capacity at the junction and therefore a reduction in queues and delays.

W Booker
Singleton Clamp & Partners Limited
30 March 2000

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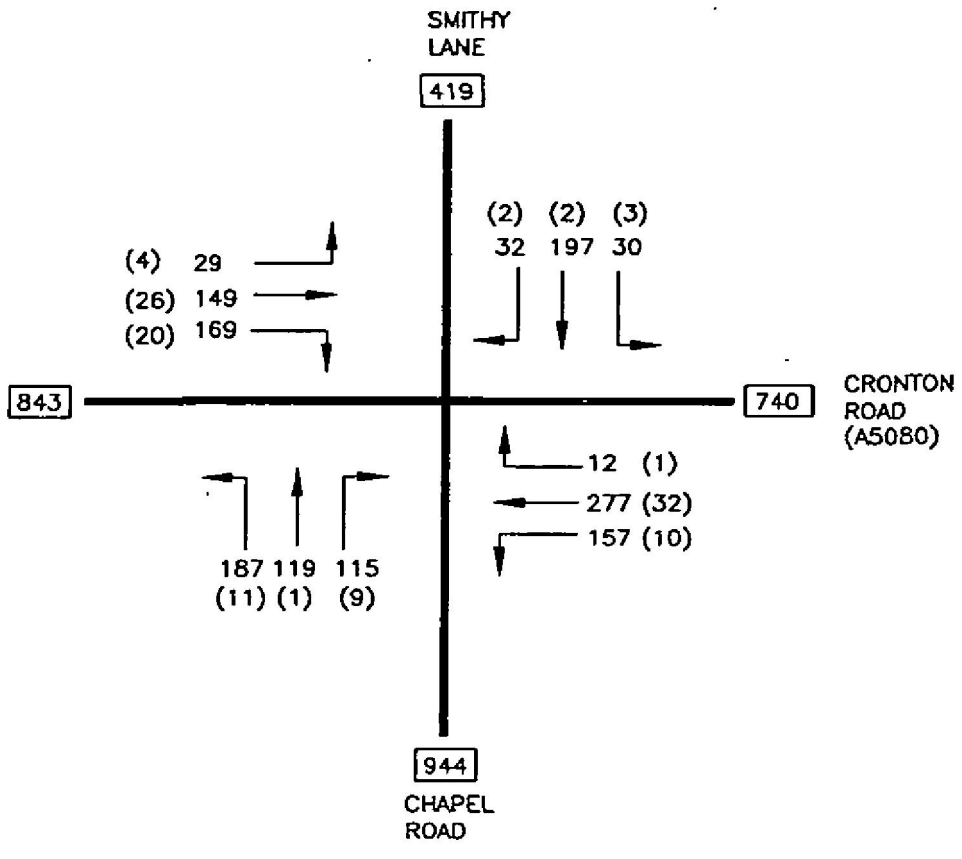
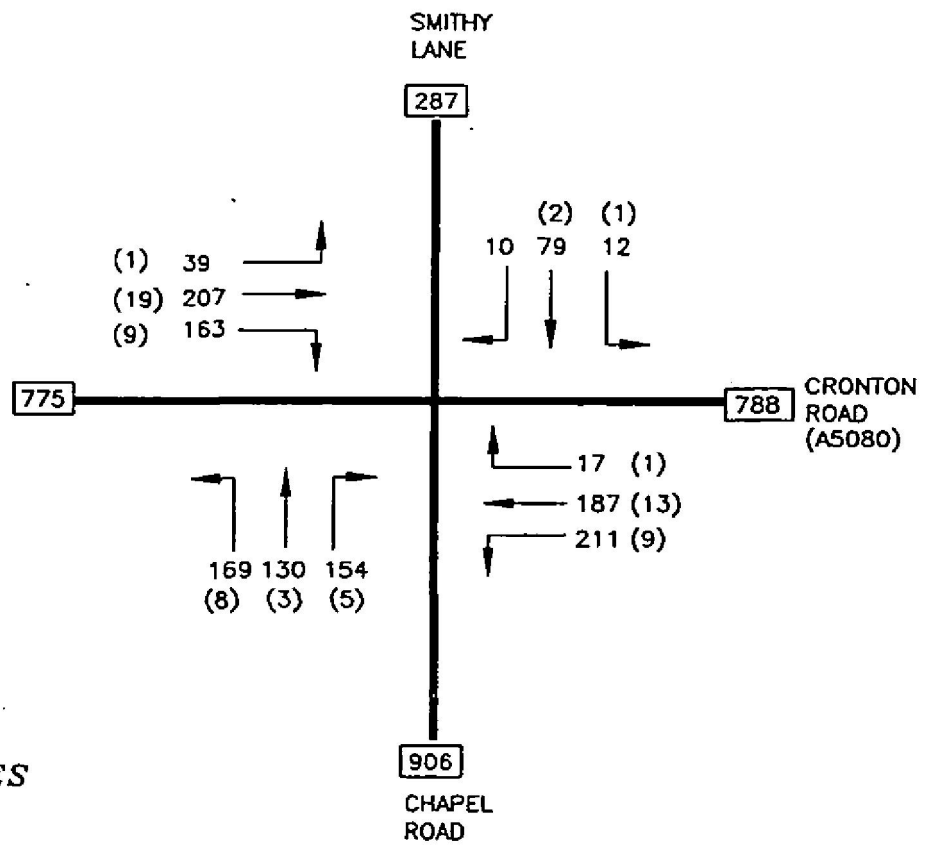
APPENDIX 1

EXISTING TRAFFIC DATA
19th JANUARY 1994

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(16.30 – 17.30)



KEY

( ) HGV'S & BUSES

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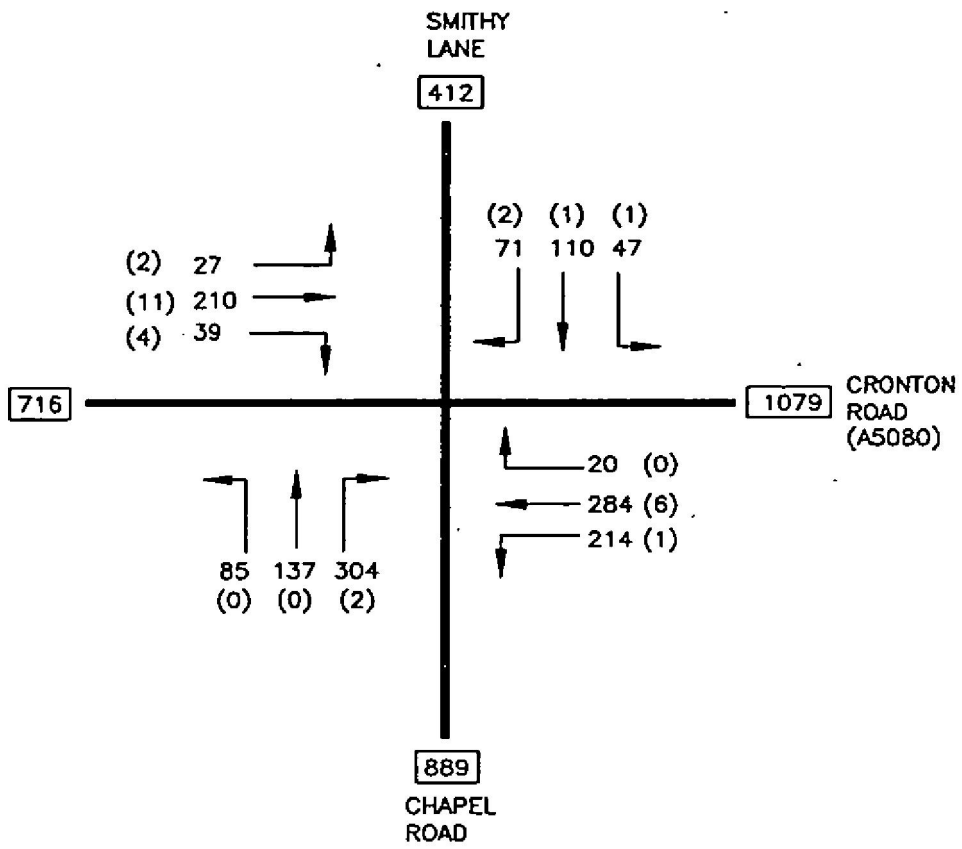
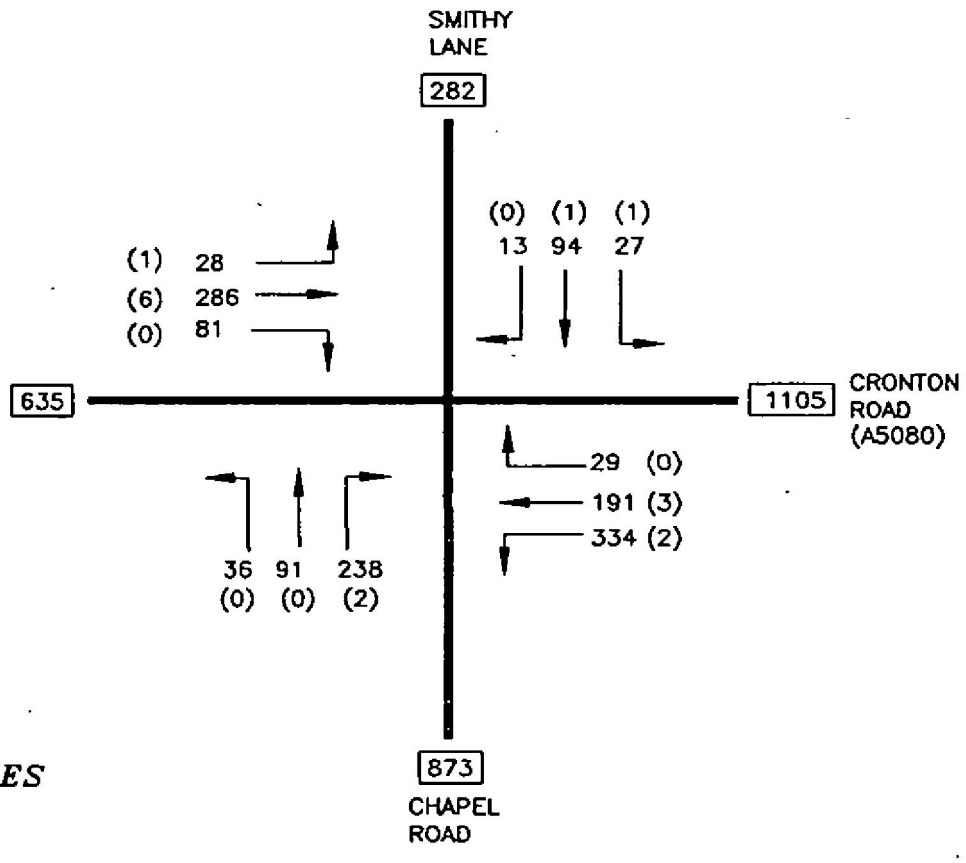
APPENDIX 2

EXISTING TRAFFIC DATA
17th FEBRUARY 2000

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



KEY

( ) HGV'S & BUSES

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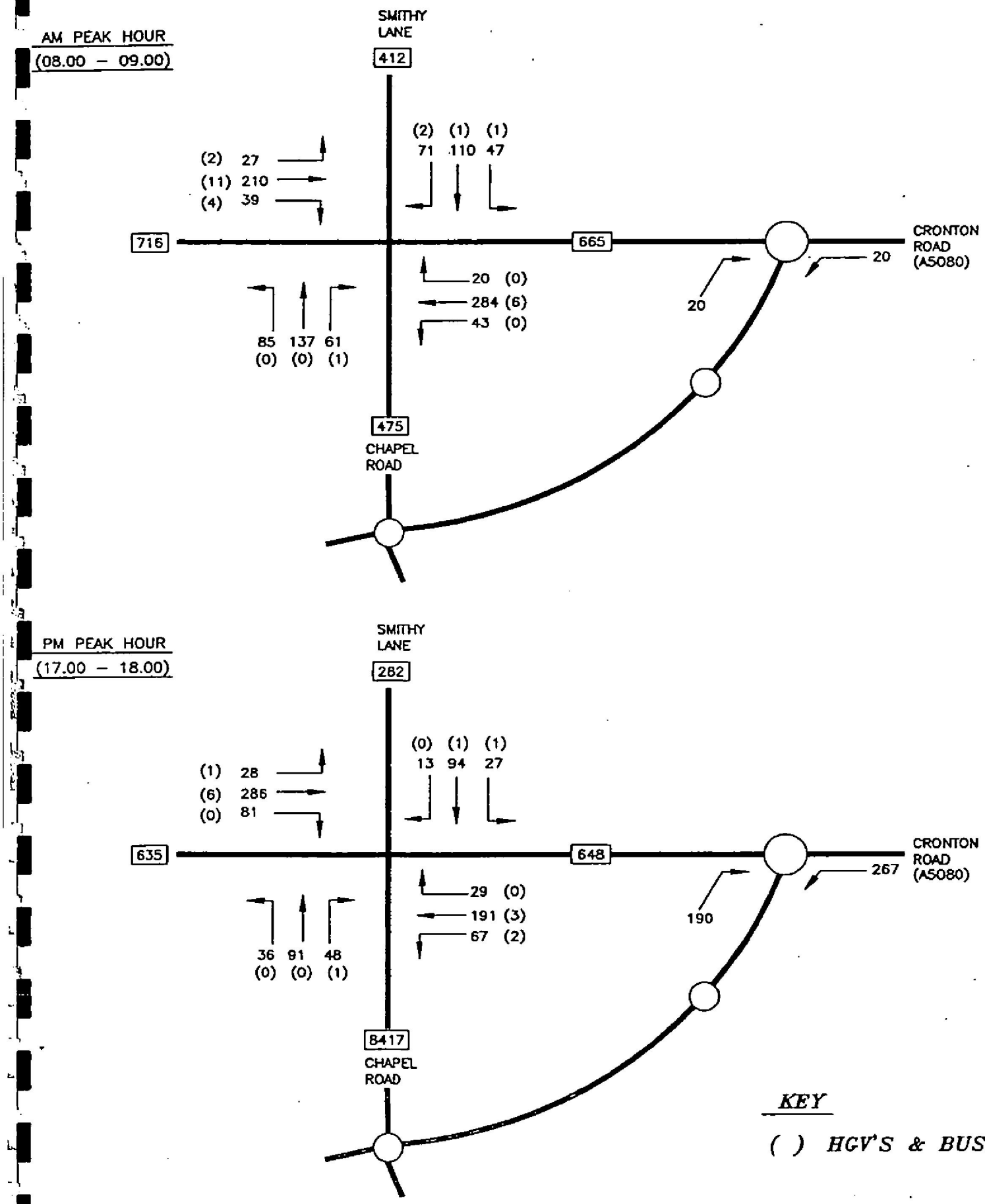
APPENDIX 3

IMPACT OF COMPLETION FROM DISTRIBUTOR ROAD WITHOUT DEVELOPMENT



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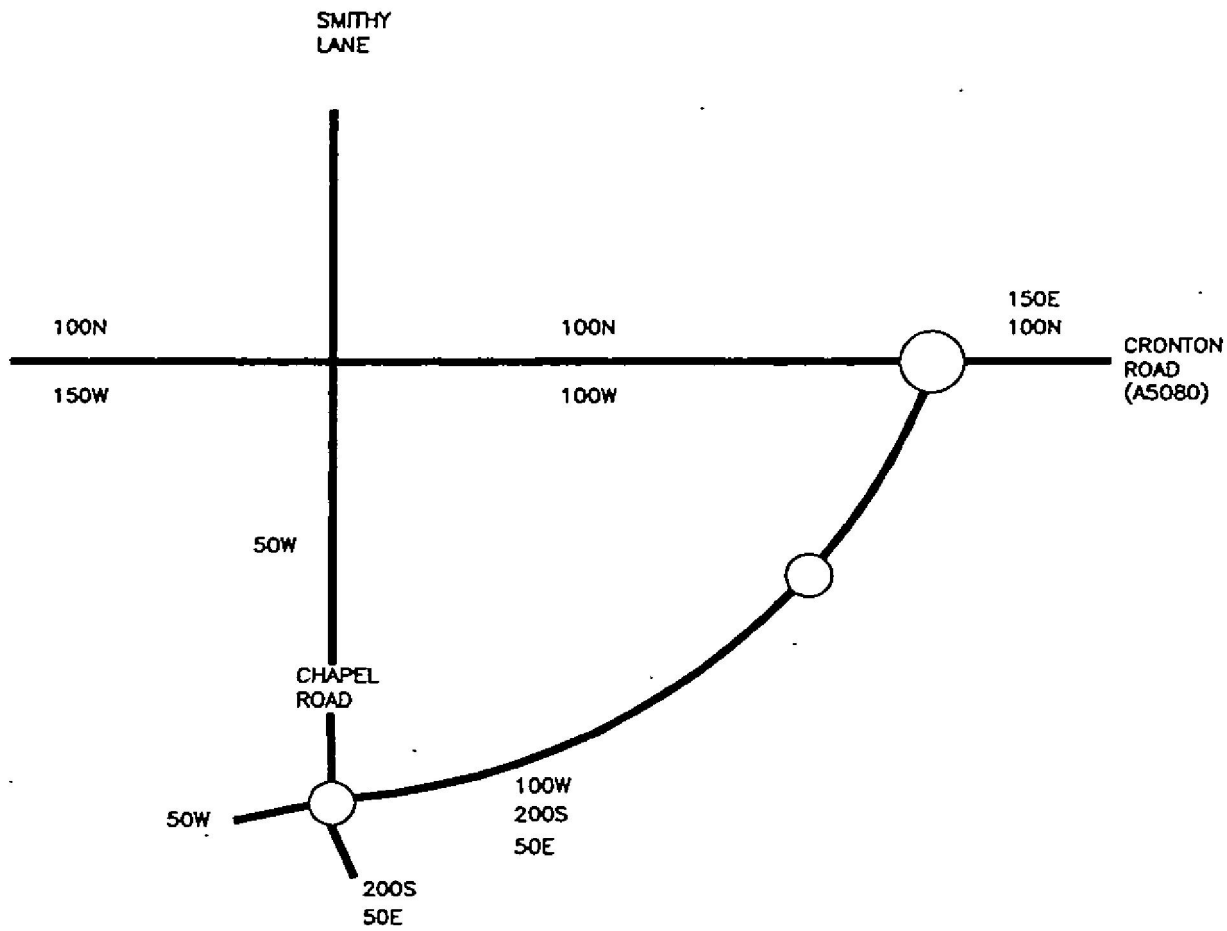
APPENDIX 4

ANTICIPATED ASSIGNMENT OF TRAFFIC GENERATED FROM REMNANT SITE (TWO WAY)



LEGEND

N – MOVEMENT TO/FROM NORTH
E – MOVEMENT TO/FROM EAST
W – MOVEMENT TO/FROM WEST
S – MOVEMENT TO/FROM SOUTH

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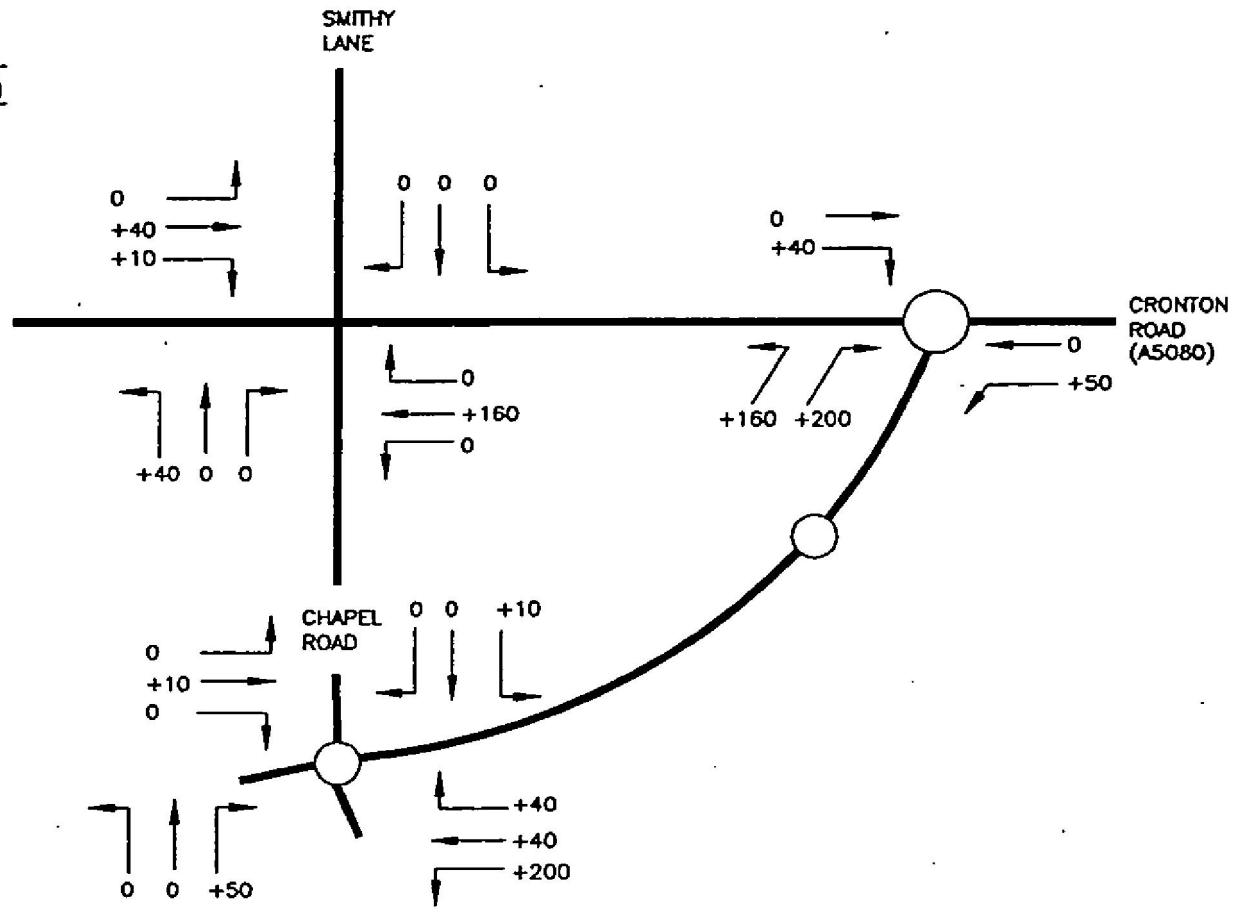
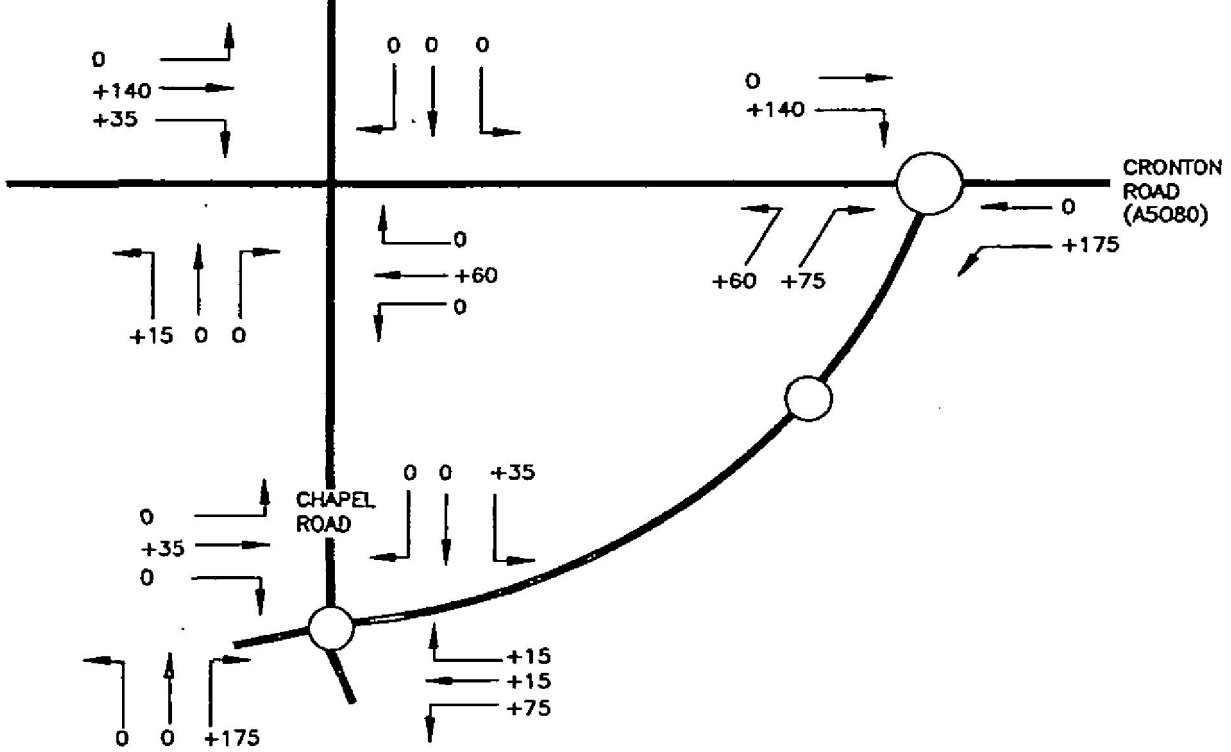
APPENDIX 5

ANTICIPATED TURNING MOVEMENTS ASSOCIATED WITH REMNANT SITE

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



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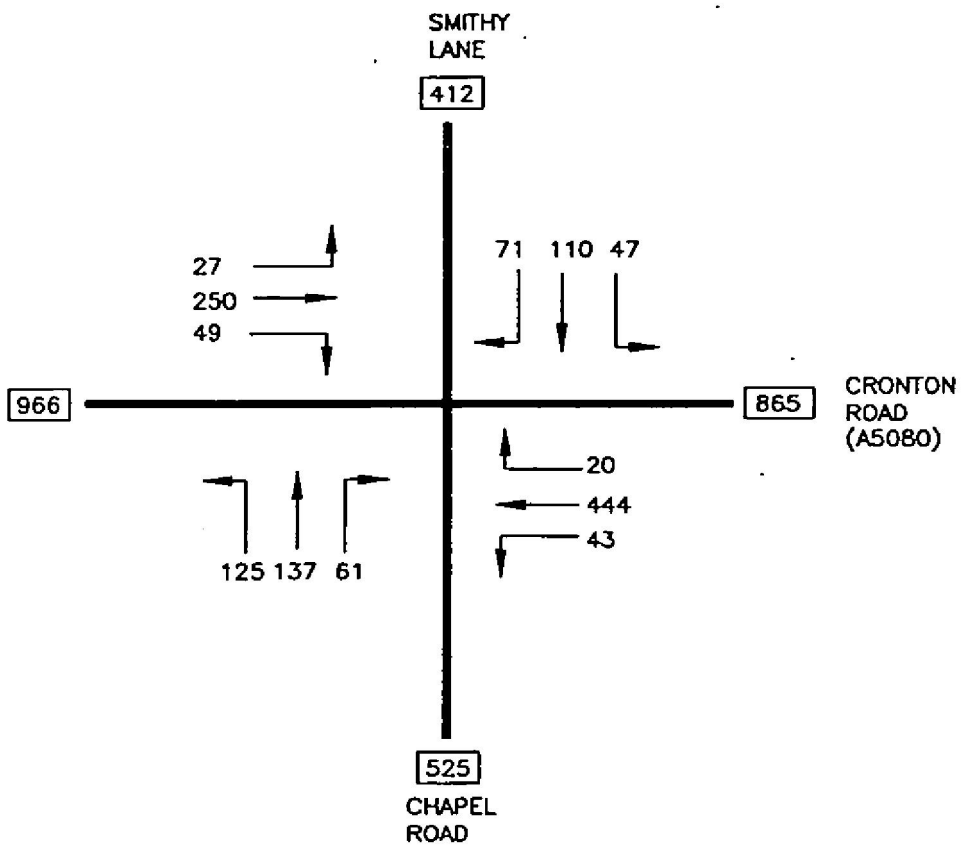
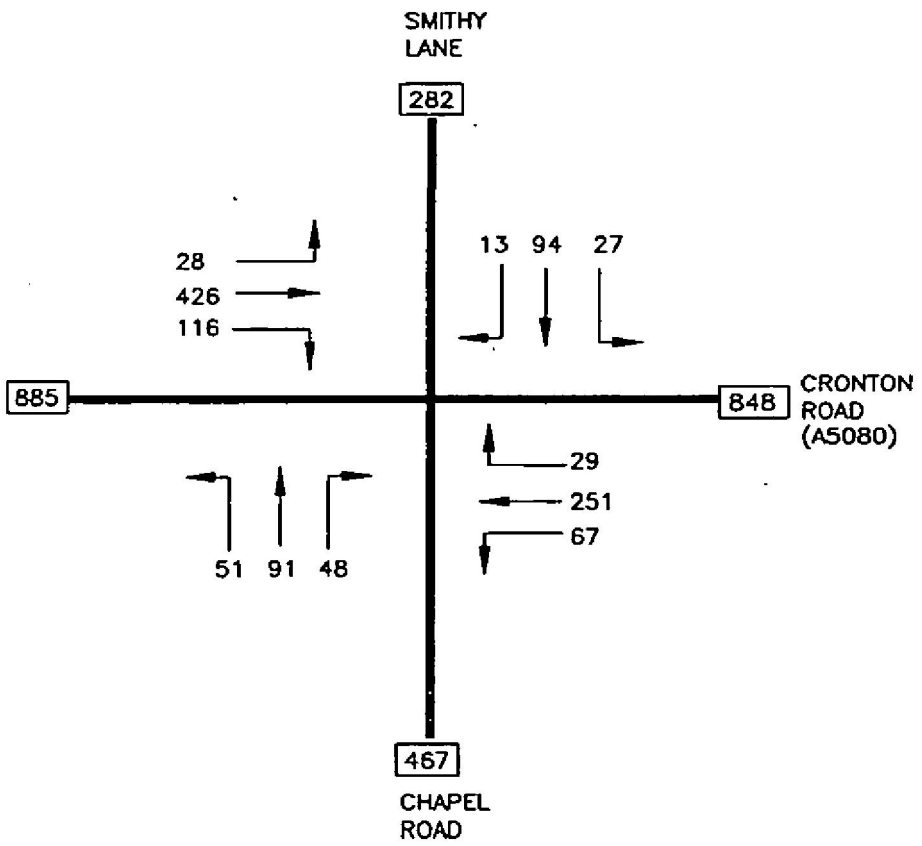
APPENDIX 6

DESIGN FLOWS AT CRONTON CROSSROADS (WITH DISTRIBUTOR ROAD)

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(16.30 – 17.30)



TRANSPORT RESEARCH LABORATORY

APPENDIX 7

(c) COPYRIGHT Transport Research Laboratory, 1998,1999
OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
TRL LTD
TEL: CROWTHORNE (01344) 770018, FAX: 770864

THE USER OF THIS COMPUTER PROGRAM FOR THE SOLUTION OF AN ENGINEERING PROBLEM IS IN NO WAY RELIEVED OF HIS RESPONSIBILITY FOR THE CORRECTNESS OF THE SOLUTION

Run with file:- "C:\pm\00021 upton rocks\cronton cross roads 2000 am existing.voi" at 14:33:54 on Thursday, 30 March 2000

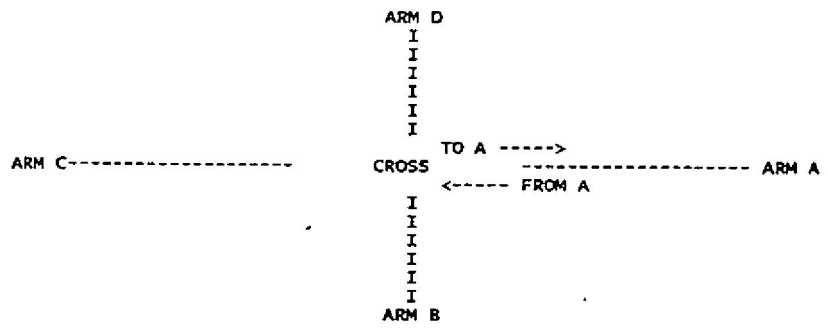
RUN TITLE
Cronton Cross Roads 2000 AM Peak Existing Flows

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Cronton Lane West
ARM B IS Smithy Lane
ARM C IS Cronton Lane East
ARM D IS Chapel Lane

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 07.45 TO 09.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	27.0	210.0	39.0
ARM B	71.0	0.0	47.0	110.0
ARM C	284.0	20.0	0.0	214.0
ARM D	85.0	137.0	304.0	0.0

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS: CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
07.45-09.15	A	0.939	0.000	0.061	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.980	0.000	0.020	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	08.00	08.30	09.00	3.45	5.18	3.45
	B	08.00	08.30	09.00	2.85	4.27	2.85
	C	08.00	08.30	09.00	6.47	9.71	6.47
	D	08.00	08.30	09.00	6.57	9.86	6.57

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION-	07.45-09.15
MAXIMUM CYCLE TIME-	70.0 SECONDS
OPTIMISED CYCLE TIME-	70.0 SECONDS
OPTIMISED TIMINGS BELOW ARE-	DELAY MINIMIZED (see Note 1)
JUNCTION IS-	WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'):	85.1 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] :	5.7 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	24.3	4.0	26.7
PRECEDING INTERSTAGE	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 70.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (85.1 %) and practical reserve capacity of the junction (5.7 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	24	4	27

These timings were calculated for a fixed or maximum cycle time of 70.0 seconds and give a maximum degree of saturation of 84.7 % and practical reserve capacity of the junction of 6.2 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (07.45-09.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	252.3	272.3	1239.1	47.0	91.7
B	1	L S R	208.4	213.8	1447.5	36.6	145.8
C	1	L S R	473.5	485.8	1565.0	84.4	6.7
D	1	L S R	480.8	487.1	1418.1	85.1	5.7

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
07.45-08.00								
A	1	L S R	3.45	1356.2	20.94	34.8		10.40
B	1	L S R	2.85	1501.7	24.39	28.2		9.84
C	1	L S R	6.47	1570.7	25.52	25.8		9.39
D	1	L S R	6.57	1472.3	24.22	28.2		9.77
08.00-08.15								
A	1	L S R	4.12	1262.1	19.49	34.8		9.68
B	1	L S R	3.40	1449.8	23.55	28.2		9.50
C	1	L S R	7.73	1566.0	25.44	25.8		9.36
D	1	L S R	7.85	1421.2	23.38	28.2		9.43
08.15-08.30								
A	1	L S R	5.05	1140.2	17.61	34.8		8.74
B	1	L S R	4.17	1375.7	22.35	28.2		9.02
C	1	L S R	9.47	1558.4	25.31	25.8		9.32
D	1	L S R	9.62	1345.1	22.13	28.2		8.93
08.30-08.45								
A	1	L S R	5.05	1140.2	17.61	34.8		8.74
B	1	L S R	4.17	1375.7	22.35	28.2		9.02
C	1	L S R	9.47	1558.4	25.31	25.8		9.32
D	1	L S R	9.62	1345.1	22.13	28.2		8.93
08.45-09.00								
A	1	L S R	4.12	1262.1	19.49	34.8		9.68
B	1	L S R	3.40	1449.8	23.55	28.2		9.50
C	1	L S R	7.73	1566.0	25.44	25.8		9.36
D	1	L S R	7.85	1421.2	23.38	28.2		9.43
09.00-09.15								
A	1	L S R	3.45	1356.2	20.94	34.8		10.40
B	1	L S R	2.85	1501.7	24.39	28.2		9.84
C	1	L S R	6.47	1570.7	25.52	25.8		9.39
D	1	L S R	6.57	1472.3	24.22	28.2		9.77

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00									
A	1	L S R	3.45	10.40	0.332	0.7	2.1	10.6	
B	1	L S R	2.85	9.84	0.290	0.7	2.1	11.1	
C	1	L S R	6.47	9.39	0.690	2.9	5.7	43.1	
D	1	L S R	6.57	9.77	0.673	2.7	5.4	39.8	
08.00-08.15									
A	1	L S R	4.12	9.68	0.426	1.0	2.6	14.4	
B	1	L S R	3.40	9.50	0.358	0.9	2.5	14.2	
C	1	L S R	7.73	9.36	0.826	4.7	7.8	69.7	
D	1	L S R	7.85	9.43	0.832	4.6	7.7	68.8	
08.15-08.30									
A	1	L S R	5.05	8.74	0.577	1.5	3.4	22.6	
B	1	L S R	4.17	9.02	0.462	1.3	3.1	19.5	
C	1	L S R	9.47	9.32	1.016	13.7	17.2	169.7	
D	1	L S R	9.62	8.93	1.077	19.1	22.2	207.6	
08.30-08.45									
A	1	L S R	5.05	8.74	0.577	1.5	3.4	22.8	
B	1	L S R	4.17	9.02	0.462	1.3	3.1	19.5	
C	1	L S R	9.47	9.32	1.016	18.7	22.2	264.3	
D	1	L S R	9.62	8.93	1.077	30.3	33.4	388.5	
08.45-09.00									
A	1	L S R	4.12	9.68	0.426	1.0	2.6	14.5	
B	1	L S R	3.40	9.50	0.358	0.9	2.5	14.2	
C	1	L S R	7.73	9.36	0.826	5.9	9.2	162.5	
D	1	L S R	7.85	9.43	0.832	9.7	13.0	312.5	
09.00-09.15									
A	1	L S R	3.45	10.40	0.332	0.7	2.1	10.7	
B	1	L S R	2.85	9.84	0.290	0.7	2.1	11.1	
C	1	L S R	6.47	9.39	0.690	3.0	5.7	46.4	
D	1	L S R	6.57	9.77	0.673	2.9	5.7	50.1	

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	0.7	2.1	*+
08.15	1	1.0	2.6	*++
08.30	1	1.5	3.4	**+
08.45	1	1.5	3.4	**+
09.00	1	1.0	2.6	*++
09.15	1	0.7	2.1	*+

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	0.7	2.1	*+
08.15	1	0.9	2.5	*+
08.30	1	1.3	3.1	*++
08.45	1	1.3	3.1	*++
09.00	1	0.9	2.5	*+
09.15	1	0.7	2.1	*+

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	2.9	5.7	***+++
08.15	1	4.7	7.8	*****+++
08.30	1	13.7	17.2	**********+++
08.45	1	18.7	22.2	**********+++
09.00	1	5.9	9.2	******+++
09.15	1	3.0	5.7	***+++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	2.7	5.4	***++
08.15	1	4.6	7.7	*****+++
08.30	1	19.1	22.2	**********+++
08.45	1	30.3	33.4	**********+++
09.00	1	9.7	13.0	**********+++
09.15	1	2.9	5.7	***+++

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (07.45-09.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	(VEH/H)	* QUEUEING * DELAY * (MIN)	(MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	(MIN/VEH)
A-B	37.0	24.7	9.3	0.25	9.3	0.25
A-C	288.0	192.0	72.7	0.25	72.7	0.25
A-D	53.5	35.7	13.5	0.25	13.5	0.25
B-C	64.4	43.0	18.5	0.29	18.5	0.29
B-D	150.8	100.6	43.2	0.29	43.3	0.29
B-A	97.4	64.9	27.9	0.29	27.9	0.29
C-D	293.4	195.6	312.2	1.06	312.4	1.06
C-A	389.4	259.6	414.3	1.06	414.6	1.06
C-B	27.4	18.3	29.2	1.06	29.2	1.06
D-A	116.6	77.7	172.5	1.48	172.5	1.48
D-B	187.9	125.2	278.0	1.48	278.1	1.48
D-C	416.8	277.9	616.8	1.48	617.1	1.48
ALL	2122.6	1415.1	2008.1	0.95	2009.1	0.95

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

[Printed at 14:34:03 on 03-30-2000]

TRANSPORT RESEARCH LABORATORY

APPENDIX 8

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
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Run with file:- "C:\pm\00021 upton rocks\cronton cross roads 2000 pm existing.voi" at 14:36:15 on Thursday, 30 March 2000

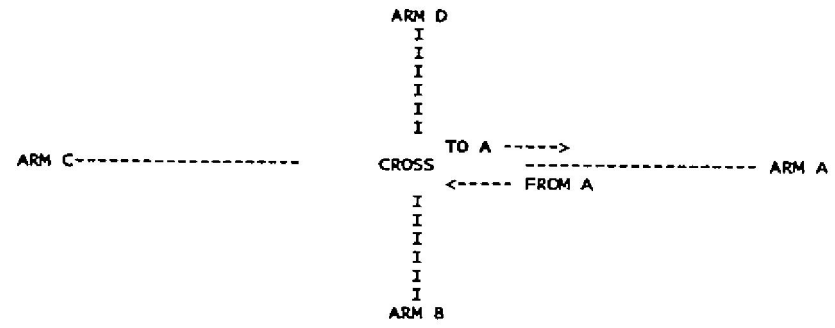
RUN TITLE
Cronton Cross Roads 2000 PM Peak Existing Flows

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Cronton Lane West
ARM B IS Smithy Lane
ARM C IS Cronton Lane East
ARM D IS Chapel Lane

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 16.45 TO 18.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 16.45 TO 18.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)

FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	28.0	286.0	81.0
ARM B	13.0	0.0	27.0	94.0
ARM C	191.0	29.0	0.0	334.0
ARM D	36.0	91.0	238.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS: CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
16.45-18.15	A	0.980	0.000	0.020	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.990	0.000	0.010	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	17.00	17.30	18.00	4.94	7.41	4.94
	B	17.00	17.30	18.00	1.67	2.51	1.67
	C	17.00	17.30	18.00	6.93	10.39	6.93
	D	17.00	17.30	18.00	4.56	6.84	4.56

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION-	16.45-18.15
MAXIMUM CYCLE TIME-	70.0 SECONDS
OPTIMISED CYCLE TIME-	70.0 SECONDS
OPTIMISED TIMINGS BELOW ARE-	DELAY MINIMIZED (see Note 1)
JUNCTION IS-	WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'):	74.4 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] :	21.0 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	30.8	4.0	20.2
PRECEDING INTERSTAGE	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 70.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (74.4 %) and practical reserve capacity of the junction (21.0 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	31	4	20

These timings were calculated for a fixed or maximum cycle time of 70.0 seconds and give a maximum degree of saturation of 74.4 % and practical reserve capacity of the junction of 21.0 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (16.45-18.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	361.1	370.5	1179.1	56.0	60.8
B	1	L S R	122.5	125.7	1618.0	25.0	259.4
C	1	L S R	506.4	513.0	1495.0	74.4	21.0
D	1	L S R	333.7	338.0	1464.5	74.4	21.0

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
16.45-17.00									
	A	1	L S R	4.94	1297.6	21.08	41.3		12.43
	B	1	L S R	1.68	1628.5	26.45	21.7		8.21
	C	1	L S R	6.93	1502.9	24.73	32.3		11.41
	D	1	L S R	4.56	1527.6	25.13	21.7		7.80
17.00-17.15									
	A	1	L S R	5.90	1193.7	19.39	41.3		11.44
	B	1	L S R	2.00	1619.1	26.30	21.7		8.16
	C	1	L S R	8.27	1496.0	24.61	32.3		11.35
	D	1	L S R	5.45	1471.3	24.21	21.7		7.51
17.15-17.30									
	A	1	L S R	7.22	1061.6	17.24	41.3		10.17
	B	1	L S R	2.45	1604.0	26.06	21.7		8.08
	C	1	L S R	10.13	1484.9	24.43	32.3		11.27
	D	1	L S R	6.67	1388.6	22.85	21.7		7.09
17.30-17.45									
	A	1	L S R	7.22	1061.6	17.24	41.3		10.17
	B	1	L S R	2.45	1604.0	26.06	21.7		8.08
	C	1	L S R	10.13	1484.9	24.43	32.3		11.27
	D	1	L S R	6.67	1388.6	22.85	21.7		7.09
17.45-18.00									
	A	1	L S R	5.90	1193.7	19.39	41.3		11.44
	B	1	L S R	2.00	1619.1	26.30	21.7		8.16
	C	1	L S R	8.27	1496.0	24.61	32.3		11.35
	D	1	L S R	5.45	1471.3	24.21	21.7		7.51
18.00-18.15									
	A	1	L S R	4.94	1297.6	21.08	41.3		12.43
	B	1	L S R	1.68	1628.5	26.45	21.7		8.21
	C	1	L S R	6.93	1502.9	24.73	32.3		11.41
	D	1	L S R	4.56	1527.6	25.13	21.7		7.80

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00										
	A	1	L S R	4.94	12.43	0.397	0.8	2.5	11.8	
	B	1	L S R	1.67	8.21	0.204	0.5	1.4	7.9	
	C	1	L S R	6.93	11.41	0.607	2.2	4.9	32.6	
	D	1	L S R	4.56	7.80	0.585	2.0	4.2	30.3	
17.00-17.15										
	A	1	L S R	5.90	11.44	0.516	1.2	3.1	17.4	
	B	1	L S R	2.00	8.16	0.245	0.6	1.7	9.7	
	C	1	L S R	8.27	11.35	0.728	3.2	6.3	48.5	
	D	1	L S R	5.45	7.51	0.726	3.0	5.5	45.4	
17.15-17.30										
	A	1	L S R	7.22	10.17	0.710	2.2	4.5	33.1	
	B	1	L S R	2.45	8.08	0.303	0.8	2.1	12.4	
	C	1	L S R	10.13	11.27	0.899	6.7	10.1	96.6	
	D	1	L S R	6.67	7.09	0.942	7.4	10.1	100.6	
17.30-17.45										
	A	1	L S R	7.22	10.17	0.710	2.2	4.5	33.9	
	B	1	L S R	2.45	8.08	0.303	0.8	2.1	12.4	
	C	1	L S R	10.13	11.27	0.899	7.1	10.5	109.8	
	D	1	L S R	6.67	7.09	0.942	8.5	11.2	130.4	
17.45-18.00										
	A	1	L S R	5.90	11.44	0.516	1.2	3.2	17.6	
	B	1	L S R	2.00	8.16	0.245	0.6	1.7	9.7	
	C	1	L S R	8.27	11.35	0.728	3.3	6.4	53.3	
	D	1	L S R	5.45	7.51	0.726	3.2	5.6	57.3	
18.00-18.15										
	A	1	L S R	4.94	12.43	0.397	0.8	2.5	11.9	
	B	1	L S R	1.67	8.21	0.204	0.5	1.4	7.9	
	C	1	L S R	6.93	11.41	0.607	2.2	4.9	33.3	
	D	1	L S R	4.56	7.80	0.585	2.1	4.2	31.2	

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.8	2.5	*++
17.15	1	1.2	3.1	*++
17.30	1	2.2	4.5	**++
17.45	1	2.2	4.5	**++
18.00	1	1.2	3.2	*++
18.15	1	0.8	2.5	*++

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.5	1.4	*
17.15	1	0.6	1.7	*+
17.30	1	0.8	2.1	*+
17.45	1	0.8	2.1	*+
18.00	1	0.6	1.7	*+
18.15	1	0.5	1.4	*

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	2.2	4.9	**+++
17.15	1	3.2	6.3	***+++
17.30	1	6.7	10.1	*******+++
17.45	1	7.1	10.5	*******++++
18.00	1	3.3	6.4	***+++
18.15	1	2.2	4.9	**+++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	2.0	4.2	**++
17.15	1	3.0	5.5	***++
17.30	1	7.4	10.1	*******+++
17.45	1	8.5	11.2	********+++
18.00	1	3.2	5.6	***+++
18.15	1	2.1	4.2	**++

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (16.45-18.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	(VEH/H)	* QUEUEING * DELAY * (MIN)	(MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	(MIN/VEH)
A-B	38.4	25.6	8.9	0.23	8.9	0.23
A-C	392.2	261.4	91.0	0.23	91.0	0.23
A-D	111.1	74.0	25.8	0.23	25.8	0.23
B-C	37.0	24.7	12.1	0.33	12.1	0.33
B-D	128.9	85.9	42.2	0.33	42.2	0.33
B-A	17.8	11.9	5.8	0.33	5.8	0.33
C-D	458.0	305.3	225.5	0.49	225.6	0.49
C-A	261.9	174.6	128.9	0.49	129.0	0.49
C-B	39.8	26.5	19.6	0.49	19.6	0.49
D-A	49.4	32.9	39.0	0.79	39.0	0.79
D-B	124.8	83.2	98.5	0.79	98.6	0.79
D-C	326.3	217.6	257.7	0.79	257.9	0.79
ALL	1985.5	1323.7	955.1	0.48	955.6	0.48

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

[Printed at 14:36:24 on 03-30-2000]

TRANSPORT RESEARCH LABORATORY

APPENDIX 9

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

FOR SALES AND DISTRIBUTION INFORMATION,
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Run with file:- "C:\pm\00021 upton rocks\cronton cross roads 2000 am design.voi" at 14:37:17 on Thursday, 30 March 2000

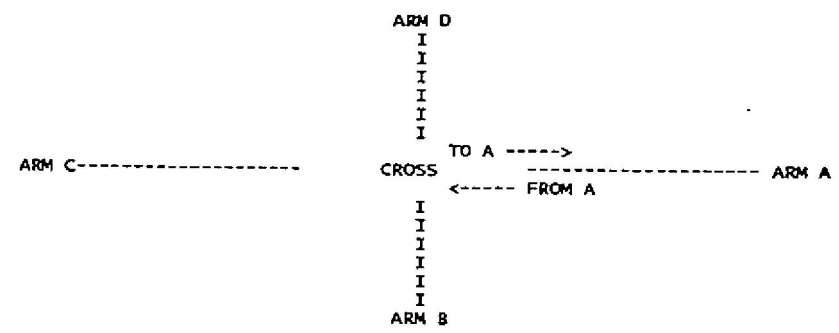
RUN TITLE
Cronpton Cross Roads 2000 AM Peak Design Flows

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Cronton Lane West
ARM B IS Smithy Lane
ARM C IS Cronton Lane East
ARM D IS Chapel Lane

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 07.45 TO 09.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)				
FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	27.0	250.0	49.0
ARM B	71.0	0.0	47.0	110.0
ARM C	444.0	20.0	0.0	43.0
ARM D	125.0	137.0	61.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS					
		CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
07.45-09.15	A	0.939	0.000	0.061	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.980	0.000	0.020	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	08.00	08.30	09.00	4.07	6.11	4.07
	B	08.00	08.30	09.00	2.85	4.27	2.85
	C	08.00	08.30	09.00	6.34	9.51	6.34
	D	08.00	08.30	09.00	4.04	6.06	4.04

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 07.45-09.15
MAXIMUM CYCLE TIME- 70.0 SECONDS
OPTIMISED CYCLE TIME- 58.0 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED (see Note 1)
JUNCTION IS- WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'): 68.7 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] : 31.1 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	22.4	4.0	16.6
PRECEDING INTERSTAGE	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 58.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (68.7 %) and practical reserve capacity of the junction (31.1 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	30	4	21

These timings were calculated for a fixed or maximum cycle time of 70.0 seconds and give a maximum degree of saturation of 63.6 % and practical reserve capacity of the junction of 41.4 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (07.45-09.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	298.0	321.6	1349.7	44.7	101.3
B	1	L S R	208.4	213.8	1357.6	50.5	78.1
C	1	L S R	463.5	475.5	1679.6	68.7	31.1
D	1	L S R	295.3	299.1	1451.7	66.1	36.2

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
07.45-08.00								
A	1	L S R	4.07	1440.2	22.24	32.9		12.62
B	1	L S R	2.85	1429.0	23.21	18.1		7.24
C	1	L S R	6.34	1686.3	27.39	23.9		11.30
D	1	L S R	4.04	1472.2	24.22	18.1		7.55
08.00-08.15								
A	1	L S R	4.87	1362.4	21.04	32.9		11.94
B	1	L S R	3.40	1365.1	22.17	18.1		6.91
C	1	L S R	7.57	1680.6	27.30	23.9		11.26
D	1	L S R	4.82	1454.0	23.92	18.1		7.46
08.15-08.30								
A	1	L S R	5.96	1255.7	19.39	32.9		11.01
B	1	L S R	4.17	1289.1	20.94	18.1		6.53
C	1	L S R	9.27	1671.6	27.15	23.9		11.20
D	1	L S R	5.90	1426.1	23.46	18.1		7.31
08.30-08.45								
A	1	L S R	5.96	1255.7	19.39	32.9		11.01
B	1	L S R	4.17	1289.1	20.94	18.1		6.53
C	1	L S R	9.27	1671.6	27.15	23.9		11.20
D	1	L S R	5.90	1426.1	23.46	18.1		7.31
08.45-09.00								
A	1	L S R	4.87	1362.4	21.04	32.9		11.94
B	1	L S R	3.40	1365.1	22.17	18.1		6.91
C	1	L S R	7.57	1680.6	27.30	23.9		11.26
D	1	L S R	4.82	1454.0	23.92	18.1		7.46
09.00-09.15								
A	1	L S R	4.07	1440.2	22.24	32.9		12.62
B	1	L S R	2.85	1429.0	23.21	18.1		7.24
C	1	L S R	6.34	1686.3	27.39	23.9		11.30
D	1	L S R	4.04	1472.2	24.22	18.1		7.55

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00									
A	1	L S R	4.07	12.62	0.323	0.5	1.8	8.1	
B	1	L S R	2.85	7.24	0.394	0.9	2.0	13.4	
C	1	L S R	6.34	11.30	0.561	1.8	4.0	26.9	
D	1	L S R	4.04	7.55	0.535	1.5	3.0	22.0	
08.00-08.15									
A	1	L S R	4.87	11.94	0.408	0.7	2.2	11.1	
B	1	L S R	3.40	6.91	0.492	1.2	2.5	18.0	
C	1	L S R	7.57	11.26	0.672	2.6	5.1	38.3	
D	1	L S R	4.82	7.46	0.647	2.1	3.9	31.0	
08.15-08.30									
A	1	L S R	5.96	11.01	0.541	1.2	2.9	17.3	
B	1	L S R	4.17	6.53	0.639	1.8	3.4	27.6	
C	1	L S R	9.27	11.20	0.828	4.5	7.4	66.8	
D	1	L S R	5.90	7.31	0.807	3.6	5.7	53.4	
08.30-08.45									
A	1	L S R	5.96	11.01	0.541	1.2	2.9	17.4	
B	1	L S R	4.17	6.53	0.639	1.9	3.4	28.0	
C	1	L S R	9.27	11.20	0.828	4.6	7.5	70.4	
D	1	L S R	5.90	7.31	0.807	3.7	5.8	56.8	
08.45-09.00									
A	1	L S R	4.87	11.94	0.408	0.7	2.2	11.1	
B	1	L S R	3.40	6.91	0.492	1.2	2.6	18.3	
C	1	L S R	7.57	11.26	0.672	2.6	5.1	39.9	
D	1	L S R	4.82	7.46	0.647	2.1	3.9	32.7	
09.00-09.15									
A	1	L S R	4.07	12.62	0.323	0.5	1.8	8.2	
B	1	L S R	2.85	7.24	0.394	0.9	2.1	13.5	
C	1	L S R	6.34	11.30	0.561	1.8	4.0	27.3	
D	1	L S R	4.04	7.55	0.535	1.5	3.1	22.4	

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	0.5	1.8	*+
08.15	1	0.7	2.2	*+
08.30	1	1.2	2.9	*++
08.45	1	1.2	2.9	*++
09.00	1	0.7	2.2	*+
09.15	1	0.5	1.8	*+

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	0.9	2.0	*+
08.15	1	1.2	2.5	*++
08.30	1	1.8	3.4	**+
08.45	1	1.9	3.4	**+
09.00	1	1.2	2.6	*++
09.15	1	0.9	2.1	*+

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.8	4.0	**++
08.15	1	2.6	5.1	***++
08.30	1	4.5	7.4	*****++
08.45	1	4.6	7.5	*****+++
09.00	1	2.6	5.1	***++
09.15	1	1.8	4.0	**++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.5	3.0	*++
08.15	1	2.1	3.9	**++
08.30	1	3.6	5.7	****++
08.45	1	3.7	5.8	****++
09.00	1	2.1	3.9	**++
09.15	1	1.5	3.1	*++

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (07.45-09.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	TOTAL DEMAND (EXCL 2-WHEEL) (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A-B	37.0	24.7	6.1	0.16	6.1	0.16
A-C	342.8	228.5	56.2	0.16	56.2	0.16
A-D	67.2	44.8	11.0	0.16	11.0	0.16
B-C	64.4	43.0	24.5	0.38	24.5	0.38
B-D	150.8	100.6	57.3	0.38	57.3	0.38
B-A	97.4	64.9	37.0	0.38	37.0	0.38
C-D	59.0	39.3	22.9	0.39	22.9	0.39
C-A	608.8	405.9	236.1	0.39	236.2	0.39
C-B	27.4	18.3	10.6	0.39	10.6	0.39
D-A	171.4	114.3	84.5	0.49	84.5	0.49
D-B	187.9	125.2	92.6	0.49	92.6	0.49
D-C	83.6	55.8	41.2	0.49	41.2	0.49
ALL	1897.8	1265.2	679.9	0.36	680.3	0.36

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

[Printed at 14:37:24 on 03-30-2000]

TRANSPORT RESEARCH LABORATORY

APPENDIX 10

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

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Run with file:- "C:\pm\00021 upton rocks\cronton cross roads 2000 pm design.voi" at 14:39:53 on Thursday, 30 March 2000

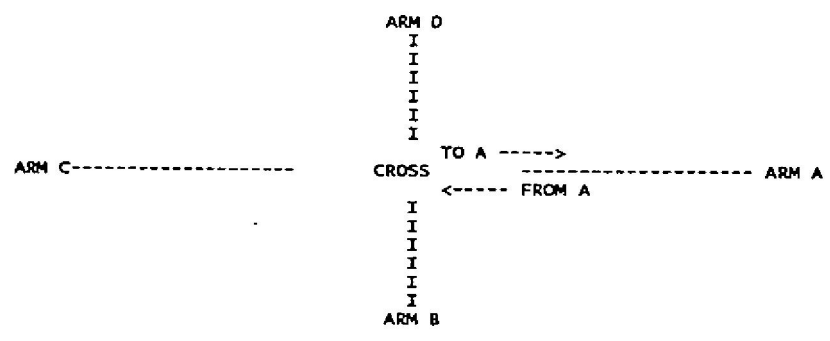
RUN TITLE
Cronton Cross Roads 2000 PM Peak design Flows

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Cronton Lane West
ARM B IS Smithy Lane
ARM C IS Cronton Lane East
ARM D IS Chapel Lane

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 16.45 TO 18.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 16.45 TO 18.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)				
FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	28.0	426.0	116.0
ARM B	13.0	0.0	27.0	94.0
ARM C	251.0	29.0	0.0	67.0
ARM D	51.0	91.0	48.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS					
		CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
16.45-18.15	A	0.980	0.000	0.020	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.990	0.000	0.010	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	17.00	17.30	18.00	7.13	10.69	7.13
	B	17.00	17.30	18.00	1.67	2.51	1.67
	C	17.00	17.30	18.00	4.34	6.51	4.34
	D	17.00	17.30	18.00	2.38	3.56	2.38

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 16.45-18.15
MAXIMUM CYCLE TIME- 70.0 SECONDS
OPTIMISED CYCLE TIME- 45.9 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED (see Note 1)
JUNCTION IS- WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'): 60.0 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] : 49.9 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	18.9	4.0	8.0
PRECEDING INTERSTAGE	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 45.9 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (60.0 %) and practical reserve capacity of the junction (49.9 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	37	4	14

These timings were calculated for a fixed or maximum cycle time of 70.0 seconds and give a maximum degree of saturation of 53.7 % and practical reserve capacity of the junction of 67.5 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (16.45-18.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	521.1	534.6	1489.4	60.0	49.9
B	1	L S R	122.5	125.7	1618.6	37.7	138.8
C	1	L S R	317.2	321.3	1594.9	45.2	99.0
D	1	L S R	173.7	175.9	1541.4	55.4	62.4

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
16.45-17.00									
	A	1	L S R	7.13	1543.4	25.07	29.4		16.08
	B	1	L S R	1.68	1634.4	26.55	9.5		5.47
	C	1	L S R	4.34	1615.4	26.58	20.4		11.84
	D	1	L S R	2.38	1567.3	25.79	9.5		5.31
17.00-17.15									
	A	1	L S R	8.51	1494.5	24.28	29.4		15.57
	B	1	L S R	2.00	1621.5	26.34	9.5		5.43
	C	1	L S R	5.18	1598.2	26.29	20.4		11.71
	D	1	L S R	2.84	1546.9	25.45	9.5		5.24
17.15-17.30									
	A	1	L S R	10.42	1422.0	23.10	29.4		14.82
	B	1	L S R	2.45	1604.2	26.06	9.5		5.37
	C	1	L S R	6.34	1572.6	25.87	20.4		11.52
	D	1	L S R	3.47	1518.3	24.98	9.5		5.15
17.30-17.45									
	A	1	L S R	10.42	1422.0	23.10	29.4		14.82
	B	1	L S R	2.45	1604.2	26.06	9.5		5.37
	C	1	L S R	6.34	1572.6	25.87	20.4		11.52
	D	1	L S R	3.47	1518.3	24.98	9.5		5.15
17.45-18.00									
	A	1	L S R	8.51	1494.5	24.28	29.4		15.57
	B	1	L S R	2.00	1621.5	26.34	9.5		5.43
	C	1	L S R	5.18	1598.2	26.29	20.4		11.71
	D	1	L S R	2.84	1546.9	25.45	9.5		5.24
18.00-18.15									
	A	1	L S R	7.13	1543.4	25.07	29.4		16.08
	B	1	L S R	1.68	1634.4	26.55	9.5		5.47
	C	1	L S R	4.34	1615.4	26.58	20.4		11.84
	D	1	L S R	2.38	1567.3	25.79	9.5		5.31

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00										
	A	1	L S R	7.13	16.08	0.443	0.7	2.2	10.5	
	B	1	L S R	1.67	5.47	0.306	0.5	1.1	7.7	
	C	1	L S R	4.34	11.84	0.366	0.7	2.0	11.0	
	D	1	L S R	2.38	5.31	0.447	0.8	1.7	12.6	
17.00-17.15										
	A	1	L S R	8.51	15.57	0.546	1.0	2.7	15.5	
	B	1	L S R	2.00	5.43	0.369	0.6	1.3	9.7	
	C	1	L S R	5.18	11.71	0.442	1.0	2.4	14.5	
	D	1	L S R	2.84	5.24	0.541	1.1	2.1	17.1	
17.15-17.30										
	A	1	L S R	10.42	14.82	0.703	1.9	3.8	28.5	
	B	1	L S R	2.45	5.37	0.456	0.9	1.7	13.2	
	C	1	L S R	6.34	11.52	0.550	1.4	3.1	20.8	
	D	1	L S R	3.47	5.15	0.675	1.8	2.9	26.4	
17.30-17.45										
	A	1	L S R	10.42	14.82	0.703	1.9	3.8	29.0	
	B	1	L S R	2.45	5.37	0.456	0.9	1.7	13.2	
	C	1	L S R	6.34	11.52	0.550	1.4	3.1	20.9	
	D	1	L S R	3.47	5.15	0.675	1.8	2.9	27.1	
17.45-18.00										
	A	1	L S R	8.51	15.57	0.546	1.0	2.7	15.8	
	B	1	L S R	2.00	5.43	0.369	0.7	1.3	9.8	
	C	1	L S R	5.18	11.71	0.442	1.0	2.4	14.6	
	D	1	L S R	2.84	5.24	0.541	1.2	2.1	17.6	
18.00-18.15										
	A	1	L S R	7.13	16.08	0.443	0.7	2.2	10.5	
	B	1	L S R	1.67	5.47	0.306	0.5	1.1	7.7	
	C	1	L S R	4.34	11.84	0.366	0.7	2.0	11.1	
	D	1	L S R	2.38	5.31	0.447	0.9	1.7	12.8	

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.7	2.2	*+
17.15	1	1.0	2.7	*++
17.30	1	1.9	3.8	**++
17.45	1	1.9	3.8	**++
18.00	1	1.0	2.7	*++
18.15	1	0.7	2.2	*+

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.5	1.1	*
17.15	1	0.6	1.3	*
17.30	1	0.9	1.7	*+
17.45	1	0.9	1.7	*+
18.00	1	0.7	1.3	*
18.15	1	0.5	1.1	*

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.7	2.0	*+
17.15	1	1.0	2.4	*+
17.30	1	1.4	3.1	*++
17.45	1	1.4	3.1	*++
18.00	1	1.0	2.4	*+
18.15	1	0.7	2.0	*+

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.8	1.7	*+
17.15	1	1.1	2.1	*+
17.30	1	1.8	2.9	**+
17.45	1	1.8	2.9	**+
18.00	1	1.2	2.1	*+
18.15	1	0.9	1.7	*+

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (16.45-18.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	(VEH/H)	* QUEUEING * DELAY * (MIN)	(MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	(MIN/VEH)
A-B	38.4	25.6	5.4	0.14	5.4	0.14
A-C	584.1	389.4	82.0	0.14	82.1	0.14
A-D	159.1	106.0	22.3	0.14	22.3	0.14
B-C	37.0	24.7	12.4	0.33	12.4	0.33
B-D	128.9	85.9	43.0	0.33	43.0	0.33
B-A	17.8	11.9	5.9	0.33	6.0	0.33
C-D	91.9	61.2	17.9	0.20	17.9	0.20
C-A	344.2	229.4	67.2	0.20	67.2	0.20
C-B	39.8	26.5	7.8	0.20	7.8	0.20
D-A	69.9	46.6	30.5	0.44	30.6	0.44
D-B	124.8	83.2	54.5	0.44	54.5	0.44
D-C	65.8	43.9	28.7	0.44	28.8	0.44
ALL	1701.7	1134.4	377.7	0.22	377.9	0.22

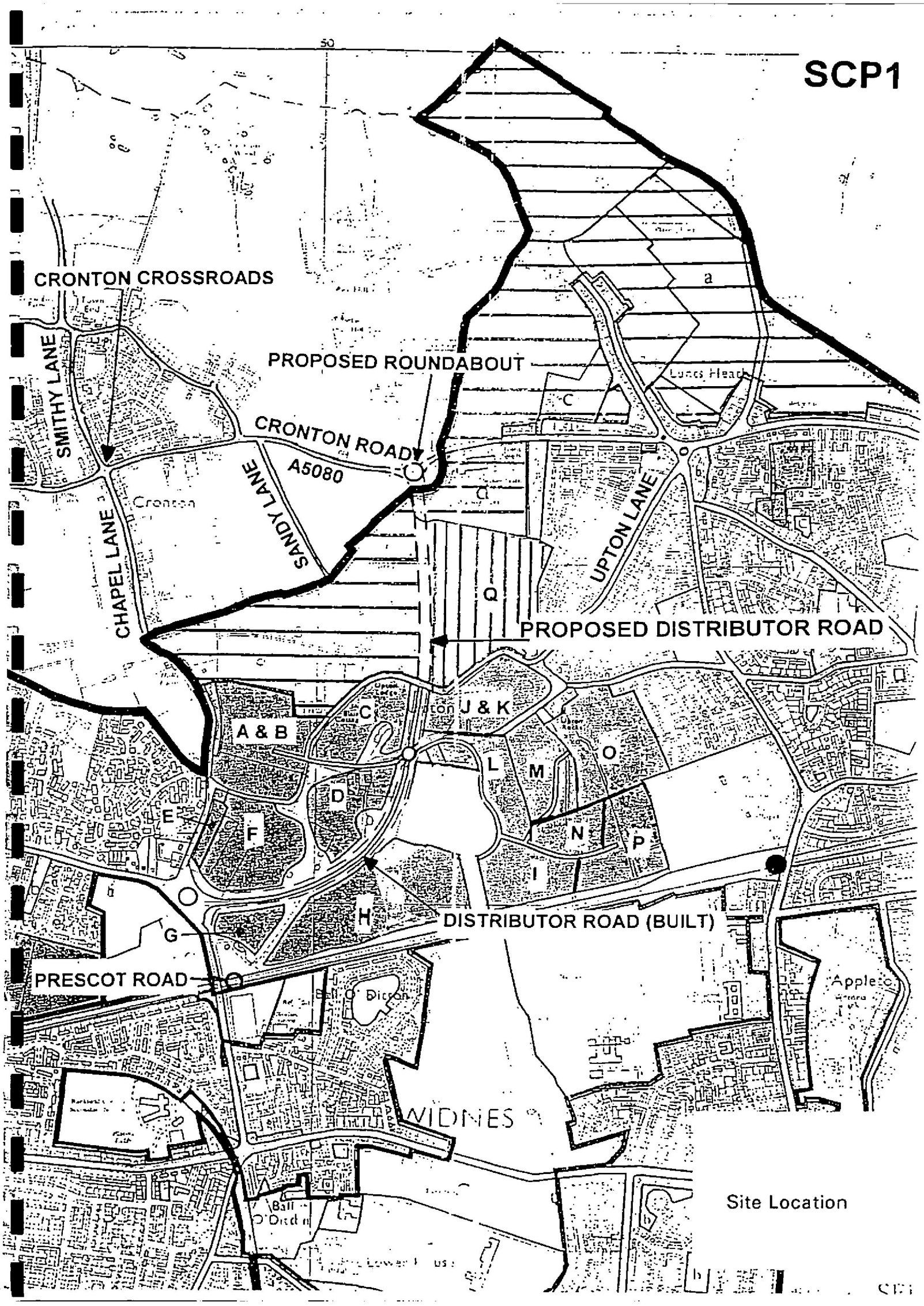
* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

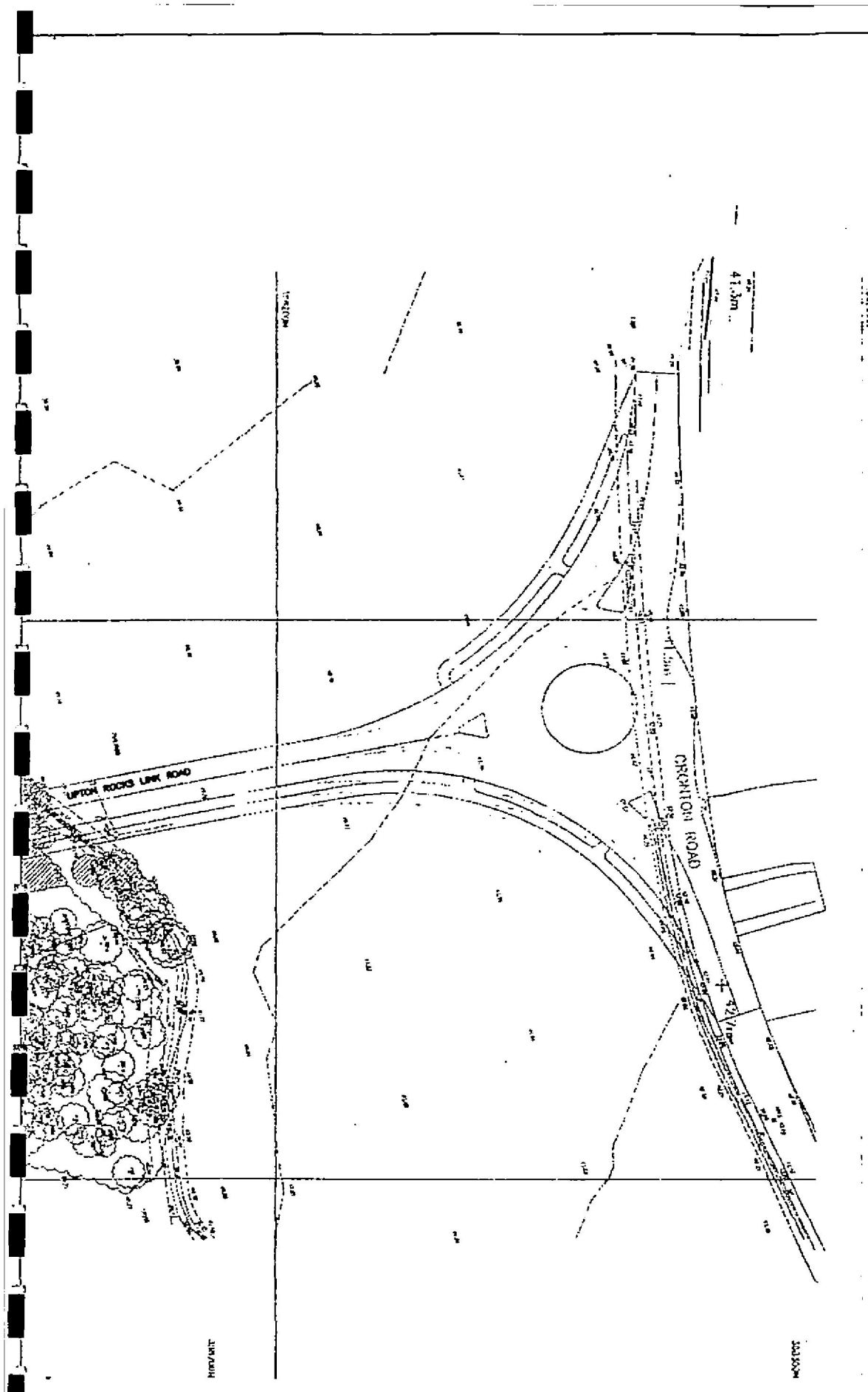
****** OSCADY 4 run completed

[Printed at 14:40:08 on 03-30-2000]

SCP1


CRONTON CROSSROADS
SMITHY LANE
PROPOSED ROUNDABOUT
CRONTON ROAD
A5080
CHAPEL LANE
SANDY LANE
UPTON LANE
PROPOSED DISTRIBUTOR ROAD
DISTRIBUTOR ROAD (BUILT)
PRESCOT ROAD
A & B
J & K
WIDNES
Site Location
a
C
D
E
F
G
H
I
L
M
N
O
P

SCP 2



Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners

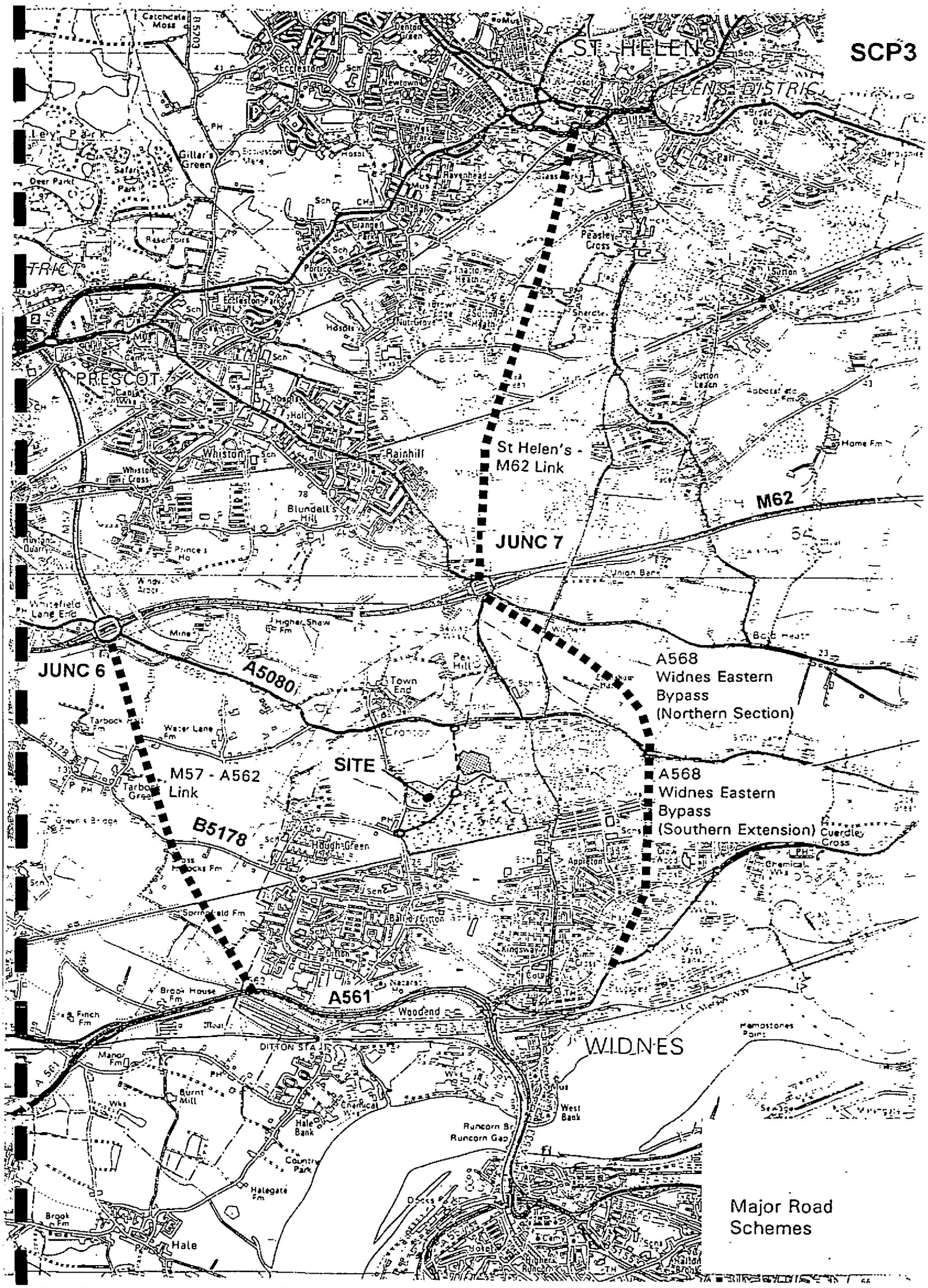
REDROW HOMES

CRONTON ROAD
WIDNES

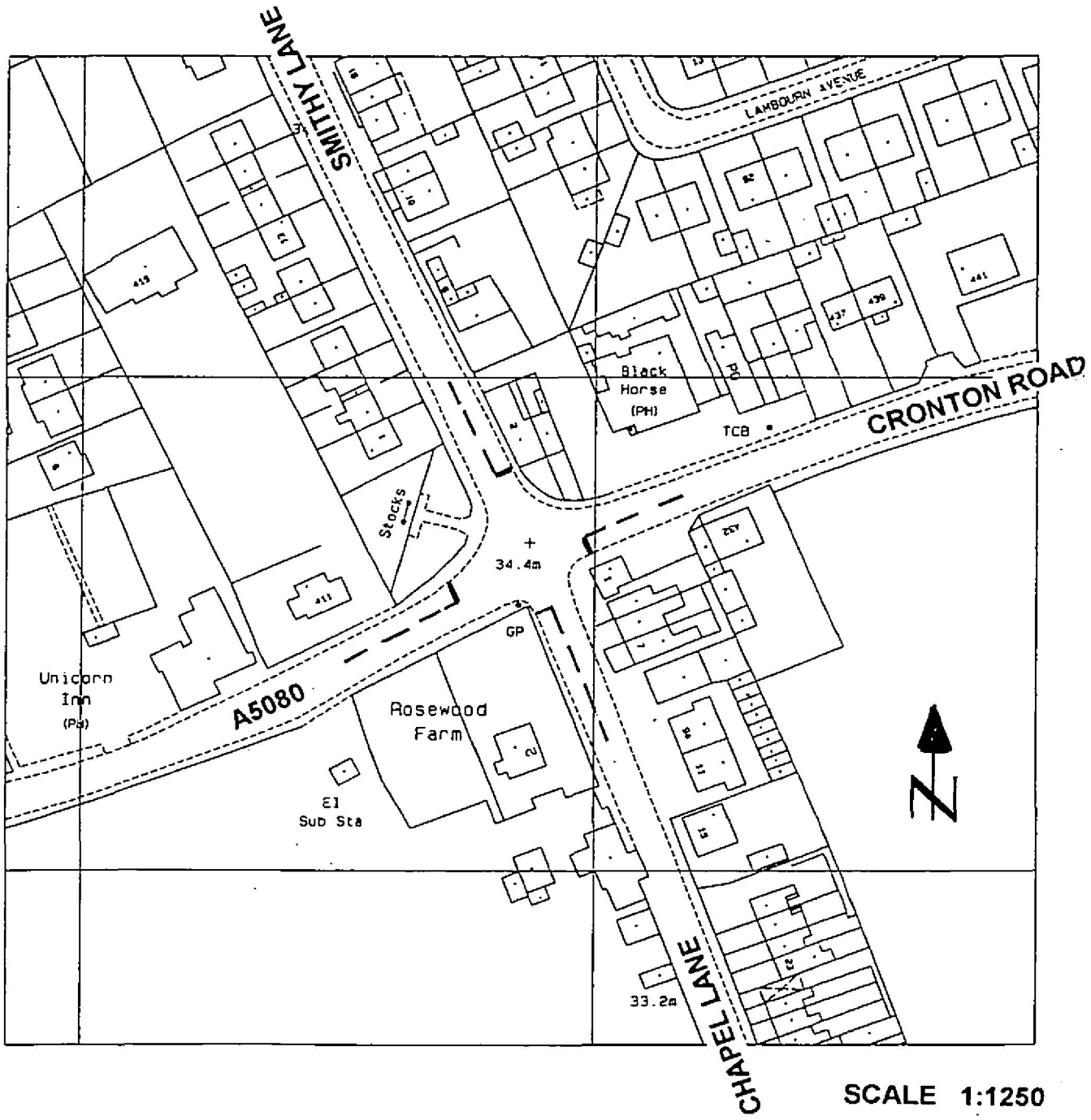
PROPOSED NORTHERN
JUNCTION

SCP/03031/SCP2

JRMcd | March 2000 | 1/1000


SCP3
ST HELENS
ST HELENS DISTRICT
PRESCOT
WIDNES
St Helen's -
M62 Link
JUNC 7
JUNC 6
M62
A5080
A568
Widnes Eastern
Bypass
(Northern Section)
A568
Widnes Eastern
Bypass
(Southern Extension)
M57 - A562
Link
SITE
B5178
A561
Major Road
Schemes

SCP4



SCALE 1:1250

Layout of Cronton Crossroads

APPENDIX 3

File

0151_489_6000

WB/LW/00021
19 May 2000

The Director,
Department of Planning and Development,
Knowsley MBC,
P.O. Box 26,
Yorkon Buildings,
Archway Road,
Huyton,
Knowsley.
L36 9FB

F.A.O. MR D. WHITTLESTON

Dear Sir,

LAND AT UPTON ROCKS – REDROW HOMES (LANCASHIRE) LTD

I write further to my telephone conversation with your Mr Whittleston regarding the above site. As requested, I have undertaken capacity assessment of the proposed roundabout junction of the proposed distributor road with Cronton Road in 2000 and 2015.

Appendix 11 illustrates the anticipated peak hour turning movements at the junction during the AM and PM peak hours in 2000.

In order to undertake a robust analysis of the capacity of the roundabout, further assessments have been undertaken in 2015. Appendix 12 illustrates the anticipated design flows in 2015 assuming traffic growth in line with NRTF High Growth Factors.

The capacity assessments are attached at Appendices 13, 14, 15 and 16 and the results are summarised below:-

Cont..../2

		2000		2015	
		AM	PM	AM	PM
Cronton Road (East)	**RFC**	0.289	0.530	0.386	0.720
	Q	0.4	1.1	0.6	2.5
Distributor Road	**RFC**	0.334	0.276	0.474	0.387
	Q	0.5	0.4	0.9	0.6
Cronton Road (West)	**RFC**	0.306	0.439	0.422	0.611
	Q	0.4	0.8	0.7	1.6

RFC Maximum demand to capacity ratio achieved during period of assessment (normal design maximum of 0.850)
Q Maximum queue in vehicles achieved

It can be seen that the maximum RFC achieved in any arm during the assessment is 0.720 which indicates that the roundabout would operate with spare capacity in 2015.

I trust that the enclosed is sufficient for your purposes and that you are now able to assess the impact of the development proposals upon Cronton Road. Should you have any queries, please do not hesitate to contact me.

Yours faithfully,

W Booker
For SINGLETON CLAMP AND PARTNERS LIMITED

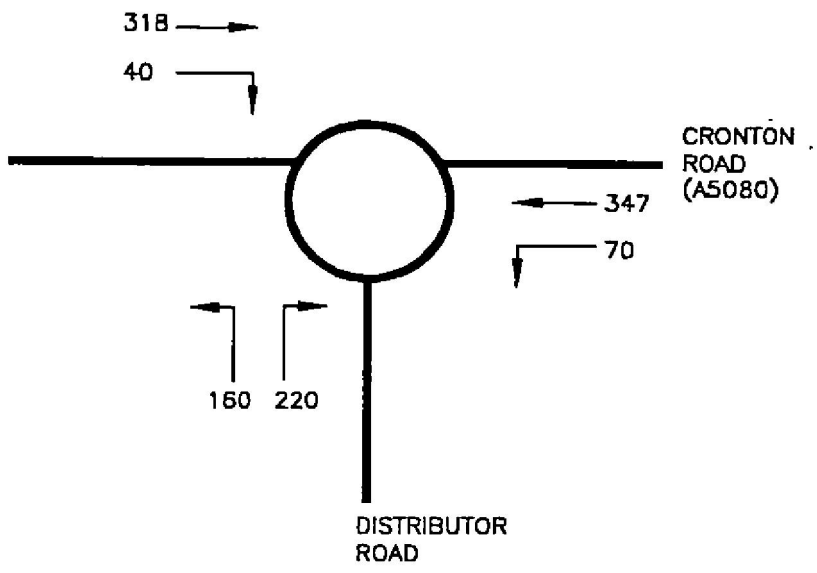
CC: S. Bradshaw

Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester, M2 5WQ Tel: 0161-832-4400

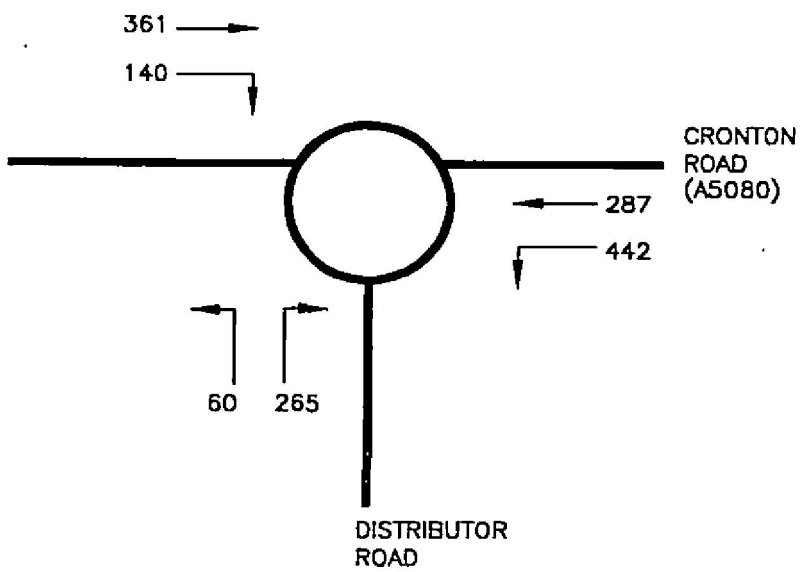
APPENDIX 11

DESIGN FLOWS
YEAR 2000

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



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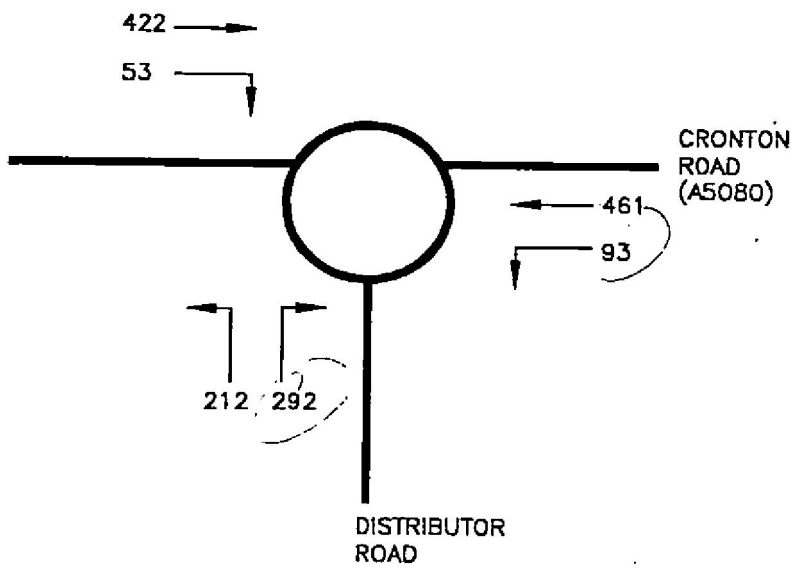
2 Mount Street, Albert Square, Manchester, M2 5WQ Tel: 0161-832-4400

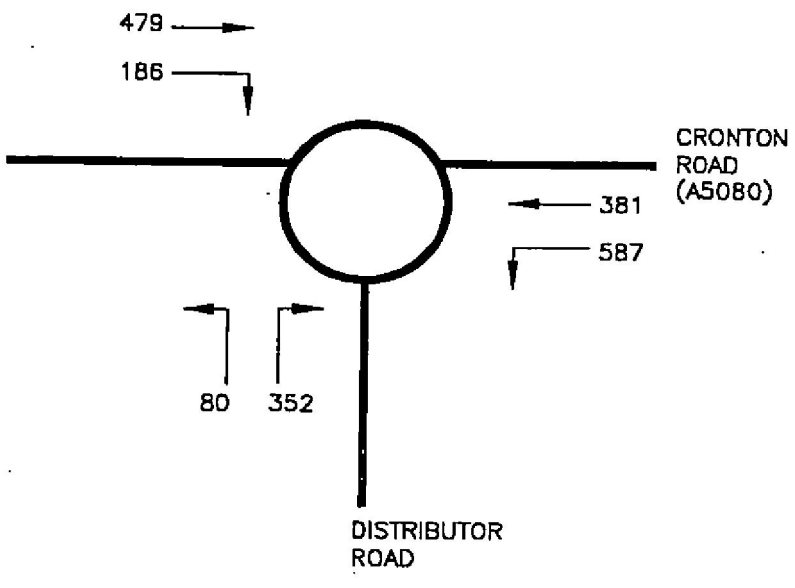
APPENDIX 12

DESIGN FLOWS
YEAR 2015
HIGH GROWTH

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



Appendix 13

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

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EMAIL: SoftwareBureau@trl.co.uk

THE USER OF THIS COMPUTER PROGRAM FOR THE SOLUTION OF AN ENGINEERING PROBLEM IS
IN NO WAY RELIEVED OF HIS RESPONSIBILITY FOR THE CORRECTNESS OF THE SOLUTION

Run with file:- "C:\pm\00\00021 Upton Rocks\cronton rd upton rocks am 2000.vai" at 10:41:52 on Friday, 19 May 2000

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road jn Upton Rocks Link Road AM 2000

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.65	6.00	23.00	40.00	36.00	13.5	0.690	29.613
ARM B	3.65	6.00	11.00	30.00	36.00	11.5	0.665	27.532
ARM C	3.50	6.00	28.00	20.00	36.00	43.5	0.610	26.206

V = approach half-width
E = entry width
L = effective flare length
R = entry radius
D = inscribed circle diameter
PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	5.21	7.82	5.21
ARM B	15.00	45.00	75.00	4.75	7.13	4.75
ARM C	15.00	45.00	75.00	4.47	6.71	4.47

TIME	FROM/TO	ARM A	ARM B	ARM C
07.45 - 09.15				
	ARM A	0.000	0.168	0.832
		0.0	70.0	347.0
		(10.0)	(10.0)	(10.0)
	ARM B	0.579	0.000	0.421
		220.0	0.0	160.0
		(10.0)	(10.0)	(10.0)
	ARM C	0.888	0.112	0.000
		318.0	40.0	0.0
		(10.0)	(10.0)	(10.0)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00								
ARM A	5.21	26.58	0.196		0.0	0.2	3.6	
ARM B	4.75	22.15	0.214		0.0	0.3	4.0	
ARM C	4.47	22.15	0.202		0.0	0.3	3.7	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
ARM A	6.22	26.51	0.235		0.2	0.3	4.5	
ARM B	5.67	21.59	0.263		0.3	0.4	5.2	
ARM C	5.34	21.82	0.245		0.3	0.3	4.8	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
ARM A	7.62	26.42	0.289		0.3	0.4	6.0	
ARM B	6.95	20.82	0.334		0.4	0.5	7.3	
ARM C	6.54	21.38	0.306		0.3	0.4	6.5	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
ARM A	7.62	26.42	0.289		0.4	0.4	6.1	
ARM B	6.95	20.81	0.334		0.5	0.5	7.5	
ARM C	6.54	21.37	0.306		0.4	0.4	6.6	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
ARM A	6.22	26.51	0.235		0.4	0.3	4.7	
ARM B	5.67	21.58	0.263		0.5	0.4	5.5	
ARM C	5.34	21.82	0.245		0.4	0.3	5.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.00-09.15								
ARM A	5.21	26.57	0.196		0.3	0.2	3.7	
ARM B	4.75	22.13	0.215		0.4	0.3	4.2	
ARM C	4.47	22.14	0.202		0.3	0.3	3.9	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.2
08.15	0.3
08.30	0.4
08.45	0.4
09.00	0.3
09.15	0.2

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.3
08.15	0.4
08.30	0.5
08.45	0.5
09.00	0.4
09.15	0.3

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.3
08.15	0.3
08.30	0.4
08.45	0.4
09.00	0.3
09.15	0.3

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	571.8	381.2	28.5	0.05	28.5	0.05
B	521.1	347.4	33.7	0.06	33.7	0.06
C	490.9	327.3	30.4	0.06	30.4	0.06
ALL	1583.7	1055.8	92.6	0.06	92.6	0.06

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 10:42:10 on 19/05/00]

Appendix 14

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

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IN NO WAY RELIEVED OF HIS RESPONSIBILITY FOR THE CORRECTNESS OF THE SOLUTION

Run with file:- "C:\pm\00\00021 Upton Rocks\cronton rd upton rocks pm 2000.vai" at 10:46:58 on Friday, 19 May 2000

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road jn Upton Rocks Link Road PM 2000

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.65	6.00	23.00	40.00	36.00	13.5	0.690	29.613
ARM B	3.65	6.00	11.00	30.00	36.00	11.5	0.665	27.532
ARM C	3.50	6.00	28.00	20.00	36.00	43.5	0.610	26.206

V = approach half-width
E = entry width
L = effective flare length
R = entry radius
D = inscribed circle diameter
PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 16.45 AND ENDS 18.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	9.11	13.67	9.11
ARM B	15.00	45.00	75.00	4.06	6.09	4.06
ARM C	15.00	45.00	75.00	6.26	9.39	6.26

TIME	FROM/TO	ARM A	ARM B	ARM C
16.45 - 18.15		TURNING PROPORTIONS TURNING COUNTS (VEH/HR) (PERCENTAGE OF H.V.S)		
	ARM A	0.000 0.0 (10.0)	0.606 442.0 (10.0)	0.394 287.0 (10.0)
	ARM B	0.815 265.0 (10.0)	0.000 0.0 (10.0)	0.185 60.0 (10.0)
	ARM C	0.721 361.0 (10.0)	0.279 140.0 (10.0)	0.000 0.0 (10.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME		DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00									
	ARM A	9.11	25.72	0.354		0.0	0.5	8.0	
	ARM B	4.06	22.65	0.179		0.0	0.2	3.2	
	ARM C	6.26	21.81	0.287		0.0	0.4	5.9	
17.00-17.15									
	ARM A	10.88	25.48	0.427		0.5	0.7	10.9	
	ARM B	4.85	22.18	0.219		0.2	0.3	4.1	
	ARM C	7.48	21.41	0.349		0.4	0.5	7.8	
17.15-17.30									
	ARM A	13.33	25.16	0.530		0.7	1.1	16.2	
	ARM B	5.94	21.55	0.276		0.3	0.4	5.6	
	ARM C	9.16	20.87	0.439		0.5	0.8	11.3	
17.30-17.45									
	ARM A	13.33	25.15	0.530		1.1	1.1	16.8	
	ARM B	5.94	21.54	0.276		0.4	0.4	5.7	
	ARM C	9.16	20.87	0.439		0.8	0.8	11.6	
17.45-18.00									
	ARM A	10.88	25.47	0.427		1.1	0.8	11.6	
	ARM B	4.85	22.17	0.219		0.4	0.3	4.3	
	ARM C	7.48	21.41	0.349		0.8	0.5	8.3	
18.00-18.15									
	ARM A	9.11	25.71	0.354		0.8	0.6	8.4	
	ARM B	4.06	22.64	0.179		0.3	0.2	3.3	
	ARM C	6.26	21.80	0.287		0.5	0.4	6.2	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.5	*
17.15	0.7	*
17.30	1.1	*
17.45	1.1	*
18.00	0.8	*
18.15	0.6	*

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.2
17.15	0.3
17.30	0.4
17.45	0.4
18.00	0.3
18.15	0.2

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.4	
17.15	0.5	*
17.30	0.8	*
17.45	0.8	*
18.00	0.5	*
18.15	0.4	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A	999.6	666.4	71.8	0.07	71.8	0.07
B	445.6	297.1	26.2	0.06	26.2	0.06
C	687.0	458.0	51.1	0.07	51.2	0.07
ALL	2132.2	1421.5	149.2	0.07	149.2	0.07

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 10:47:07 on 19/05/00]

Appendix 15

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

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Run with file:- "C:\pm\00\00021 Upton Rocks\cronton rd upton rocks am 2015.vai" at 10:54:12 on Friday, 19 May 2000

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road jn Upton Rocks Link Road AM 2015

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.65	6.00	23.00	40.00	36.00	13.5	0.690	29.613
ARM B	3.65	6.00	11.00	30.00	36.00	11.5	0.665	27.532
ARM C	3.50	6.00	28.00	20.00	36.00	43.5	0.610	26.206

V = approach half-width
E = entry width
L = effective flare length
R = entry radius
D = inscribed circle diameter
PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	6.93	10.39	6.93
ARM B	15.00	45.00	75.00	6.30	9.45	6.30
ARM C	15.00	45.00	75.00	5.94	8.91	5.94

TIME	FROM/TO	ARM A	ARM B	ARM C
07.45 - 09.15				
	ARM A	0.000	0.168	0.832
		0.0	93.0	461.0
		(10.0)	(10.0)	(10.0)
	ARM B	0.579	0.000	0.421
		292.0	0.0	212.0
		(10.0)	(10.0)	(10.0)
	ARM C	0.888	0.112	0.000
		422.0	53.0	0.0
		(10.0)	(10.0)	(10.0)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00								
ARM A	6.93	26.47	0.262		0.0	0.4	5.2	
ARM B	6.30	21.21	0.297		0.0	0.4	6.1	
ARM C	5.94	21.61	0.275		0.0	0.4	5.5	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
ARM A	8.27	26.37	0.314		0.4	0.5	6.7	
ARM B	7.52	20.46	0.368		0.4	0.6	8.5	
ARM C	7.09	21.17	0.335		0.4	0.5	7.4	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
ARM A	10.13	26.25	0.386		0.5	0.6	9.2	
ARM B	9.21	19.43	0.474		0.6	0.9	13.0	
ARM C	8.68	20.58	0.422		0.5	0.7	10.6	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
ARM A	10.13	26.25	0.386		0.6	0.6	9.4	
ARM B	9.21	19.43	0.474		0.9	0.9	13.4	
ARM C	8.68	20.57	0.422		0.7	0.7	10.9	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
ARM A	8.27	26.37	0.314		0.6	0.5	7.0	
ARM B	7.52	20.45	0.368		0.9	0.6	9.0	
ARM C	7.09	21.16	0.335		0.7	0.5	7.8	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.00-09.15								
ARM A	6.93	26.46	0.262		0.5	0.4	5.4	
ARM B	6.30	21.19	0.297		0.6	0.4	6.5	
ARM C	5.94	21.59	0.275		0.5	0.4	5.8	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.4	
08.15	0.5	
08.30	0.6	*
08.45	0.6	*
09.00	0.5	
09.15	0.4	

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.4	
08.15	0.6	*
08.30	0.9	*
08.45	0.9	*
09.00	0.6	*
09.15	0.4	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.4	
08.15	0.5	*
08.30	0.7	*
08.45	0.7	*
09.00	0.5	*
09.15	0.4	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	759.7	506.4	42.9	0.06	42.9	0.06
B	691.1	460.7	56.5	0.08	56.5	0.08
C	651.3	434.2	47.9	0.07	47.9	0.07
ALL	2102.1	1401.4	147.4	0.07	147.4	0.07

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 10:54:19 on 19/05/00]

Appendix 16

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

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Run with file:- "C:\pm\00\00021 Upton Rocks\cronton rd upton rocks pm 2015.vai" at 10:50:02 on Friday, 19 May 2000

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road jn Upton Rocks Link Road PM 2015

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.65	6.00	23.00	40.00	36.00	13.5	0.690	29.613
ARM B	3.65	6.00	11.00	30.00	36.00	11.5	0.665	27.532
ARM C	3.50	6.00	28.00	20.00	36.00	43.5	0.610	26.206

V = approach half-width E = entry width L = effective flare length R = entry radius D = inscribed circle diameter PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 16.45 AND ENDS 18.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	12.10	18.15	12.10
ARM B	15.00	45.00	75.00	5.40	8.10	5.40
ARM C	15.00	45.00	75.00	8.31	12.47	8.31

TIME	FROM/TO	ARM A	ARM B	ARM C
16.45 - 18.15		TURNING PROPORTIONS TURNING COUNTS (VEH/HR) (PERCENTAGE OF H.V.S)		
	ARM A	0.000 0.0 (10.0)	0.606 587.0 (10.0)	0.394 381.0 (10.0)
	ARM B	0.815 352.0 (10.0)	0.000 0.0 (10.0)	0.185 80.0 (10.0)
	ARM C	0.720 479.0 (10.0)	0.280 186.0 (10.0)	0.000 0.0 (10.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00								
ARM A	12.10	25.32	0.478		0.0	0.9	13.1	
ARM B	5.40	21.88	0.247		0.0	0.3	4.8	
ARM C	8.31	21.15	0.393		0.0	0.6	9.3	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.00-17.15								
ARM A	14.45	25.01	0.578		0.9	1.3	19.6	
ARM B	6.45	21.26	0.303		0.3	0.4	6.4	
ARM C	9.93	20.62	0.481		0.6	0.9	13.4	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.15-17.30								
ARM A	17.70	24.58	0.720		1.3	2.5	35.1	
ARM B	7.90	20.42	0.387		0.4	0.6	9.2	
ARM C	12.16	19.91	0.611		0.9	1.5	22.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.30-17.45								
ARM A	17.70	24.57	0.720		2.5	2.5	37.7	
ARM B	7.90	20.40	0.387		0.6	0.6	9.4	
ARM C	12.16	19.90	0.611		1.5	1.6	23.2	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.45-18.00								
ARM A	14.45	25.00	0.578		2.5	1.4	21.7	
ARM B	6.45	21.23	0.304		0.6	0.4	6.7	
ARM C	9.93	20.61	0.482		1.6	0.9	14.6	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
18.00-18.15								
ARM A	12.10	25.31	0.478		1.4	0.9	14.3	
ARM B	5.40	21.85	0.247		0.4	0.3	5.0	
ARM C	8.31	21.14	0.393		0.9	0.7	10.1	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.9	*
17.15	1.3	*
17.30	2.5	**
17.45	2.5	***
18.00	1.4	*
18.15	0.9	*

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.3	
17.15	0.4	
17.30	0.6	*
17.45	0.6	*
18.00	0.4	
18.15	0.3	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.6	*
17.15	0.9	*
17.30	1.5	**
17.45	1.6	**
18.00	0.9	*
18.15	0.7	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A	1327.3	884.9	141.5	0.11	141.5	0.11
B	592.4	394.9	41.5	0.07	41.5	0.07
C	911.9	607.9	92.5	0.10	92.5	0.10
ALL	2831.6	1887.7	275.5	0.10	275.5	0.10

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 10:50:53 on 19/05/00]

APPENDIX 4

KNOWSLEY
METROPOLITAN BOROUGH

Date 11/7/00

Number of pages including cover sheet 3

TO: Bill Booker
Singleton Clamp

Phone
Fax Phone 0161 832 5111

FROM: Dave Whittleston
Knowsley MBC
Dept of Planning & Dev.
Transportation & Environmental Strategy Division
Archway Road, Huyton
Merseyside L36 9FB
Phone 0151-443-2229
Fax Phone 0151-480-0267

Landy

REMARKS: ☒ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

Bill

Further to our recent conversation regarding "Upton Rocks", I can confirm that we have looked at your TIA and Roundabout design, and in light of this, it would be much appreciated if you could clarify a couple of points for us :-

1.Pge 5, para 3.3 assumes 20% of existing movements would remain, could this be justified?

2.Pge 6, para 4.4 assumes 25% distribution NSE&W, could this be justified?

3 Pge 2, para 1.1, junction operates 3 stage, not 2 stage i.e., Cronton rd e'bound and w'bound. Cronton rd e'bound right turn indicative green arrow into Chapel la. Smithy la & Chapel la.

4 Pge 8, Incorrect figure in table, should be 874 not 873.

5 Appendix 3, Incorrect figures in am peak diagram. Reduction at traffic signal junction, not consistent with gain at new Roundabout. Same applies to Appendix 11 for Arcady stuff.

6. Oscady runs, Cycle time am peak 100secs, pm peak 68secs, interstage figures incorrect.

7. I have received a memo from our consultants, following their geometry check, and in light of the comments received have attached a copy of the memo, which is probably easiest. The Arcady is a little "Chicken & Egg", untill we are happy with the design, you can't put in the correct values etc. Whilst it is not considered there will be any great capacity problems with the junction, we would like it to be shown.

Cheers.

Dave Whittleston

7 → 6 9 Side. ↓ ↑

M. Mills
0151-443-
-2214

Steve Mobbs

MEMORANDUM

To: DAVE WHITTLESTON

Your Ref:

From: MARGARET MILLS
DPD Des Con

Our Ref: DC/MM

Date: 10th July 2000

Subject: **UPTON ROCKS ROUNDABOUT CHECK**

40mph = 120 m SSD

Dave,

I have completed the geometric checks for the above roundabout and summarise the results below

Geometry

Arm A – CRONTON ROAD, SOUTHBOUND

40

- The entry radius is 100m, but should lie within the range of 10-20m. These results provide inadequate entry deflection. X
- The entry path curvature is 520m, but should not exceed 100m. X
- The visibility to the right should be minimum 40 metres from calculations, it passed on one aspect, but failed on two other right aspects.
- It fails on the Design Minimum Stopping Distance for Pedestrian crossing Visibility, this states a minimum of 50m.

Arm B – LINK ROAD, EASTBOUND

- The entry angle is calculated at 7 degrees, but should lie within 20-60 degrees, best would be 30 degrees. 30
- The entry radius is 97.5m, but should lie within the range of 10-20m. These results provide inadequate entry deflection.
- Taper length of exit is 5.8m. Design manual states that a minimum of 6.0m should be provided to allow for traffic to pass in the event of a vehicle breakdown.
- The visibility to the right should be minimum 38 metres from calculations, it passed on one aspect, but failed on two other right aspects.
- It fails on the Design Minimum Stopping Distance for Pedestrian crossing Visibility, this states a minimum of 50m. X

Arm C – CRONTON ROAD, NORTHBOUND

22½

- The entry radius is 100m, but should lie within the range of 10-20m. These results provide inadequate entry deflection. X
- Taper length of exit is 5.9m. Design manual states that a minimum of 6.0m should be provided to allow for traffic to pass in the event of a vehicle breakdown.
- The visibility to the right should be minimum 50 metres from calculations, it fails on all other right aspects. X

mm
g:\data\smu-cantu\margaret\upton rocks\rdbtmcgm100700.doc

- It fails on the Design Minimum Stopping Distance for Pedestrian crossing Visibility, this states a minimum of 50m.

If you require any further information please do not hesitate to contact me on the above extension.

.....
ENGINEERING TECHNICIAN

nm
g:\data\smteam\margaretlupton rocks\infotmatio100700.doc

APPENDIX 5

KNOWSLEY
METROPOLITAN BOROUGH

Department of Planning and Development
Director: Graham Smith BSc. Dip MS C Eng MICE MIHT

Fax Header Sheet

To	BILL BOOKER		
Company			
Fax Number	0161 832 5111		
From	MARGARET MILLS	Telephone	0151 443 2214
Date	8th August 00		
Number of Pages Including This One	1		

UPTON ROCKS ROUNDABOUT CHECK

Dear Sir,

With reference to the above, I am writing to confirm that on the Entry Radius calculations I stand corrected. My interpretation of the design manual was not as it should have been carried out. I had misread the text and the details showing were the radius measurement should have been calculated. On this point I apologise. I realised this after consultation with my Team Leader.
Your comments were right, Arm A has an Entry Radius off 22.5m, Arm B is 31.50 and Arm C is 40m. Further observation of this indicates that the Entry Radius at each Arm is still larger than recommended by Part 3, TD 16/93, Para. 7.23, were it states that ' a practical good design is about 20m.'
Whilst Arm A is adequate in design, Arm C is twice that design recommendation at 40m.

If you have any further queries or comments to make I would be more than pleased to discuss these with you.

Regards,

Margaret Mills

.....

ENGINEERING TECHNICIAN

Head of Design Consultancy Graham A. Winckles Dip. Arch RIBA
P.O. Box 28, Archway Road, Huyton, Knowsley. L36 9FB
Telephone 0151 443 2205 Facsimile 0151 443 2293

08.08.00 10:55 F-711 T-820 P-001 DESIGN CONSULTANCY 0151443229B

APPENDIX 6

FILE

WB/KD/00021
10 August 2000

The Director
The Department of Planning and Development
Transportation and Environmental Strategy Division
Archway Road
Huyton
L36 9FB

F.A.O Dawn Connick

Dear Sir,

LAND AT UPTON ROCKS, CRONTON

I refer to the fax from David Whittleston dated 11th July 2000 and as requested I have reviewed your comments regarding our submitted TIA and supplementary letter dated 19th May 2000.

Our response is as follows:

Point 1 From Page 5 Para.3.3.

The assumption that 20% of the recorded movement between Chapel Road and Cronton Road (East) and vice versa would remain at the Cronton crossroads upon completion of the Upton Rocks distributor road is based upon the following:

(1) The distributor road will provide an attractive route to avoid the Cronton crossroads as it will be shorter in distance and time for vehicles travelling from the south to the west and vice versa.

(2) Traffic generated from the built part of the Upton Rocks development currently passes through the crossroads and the majority of this flow would be likely to be attracted to the distributor road.

Cont.../2

(3) The 20% figure is, I consider a high estimate which represents a worst case scenario for assessing the crossroads capacity after the completion of the distributor road.

Point 2 Page 6 Para.4.4

This assumed assignment of the site generated flow has been taken from work previously undertaken by my colleague Brian Clamp in respect of objections made to the Halton Local Plan in 1994. As far as I understand these assumptions were not challenged by Halton.

The assumptions take into account the relative attraction of the employment, education and retail land uses. Clearly the central location of the site in relation to the M62 and M56, Liverpool, Preston, St Helens, Widnes and Runcorn adds to the assumption 25% assignment north, south, east and west.

In any event, the rounding up of the generated flow gives a robust assessment of the flows.

Point 3 Page 2 Para.1.1

My observations on site are the existing crossroads usually run with 2 stages however when flows dictate the right turn from Cronton Road west into Chapel Road is given priority using an indicative right turn arrow.

Point 4 Page 8

I agree that the flow on Chapel Road in 20:00pm (no development) should be 874vph rather than 873vph (total two-way). The change above will increase the percentage reduction in flow due to the introduction of the distributor road.

Point 5 Appendix 3 and Appendix 11.

I acknowledge that an error has occurred on Appendix 3 during the AM peak only and enclose a revised Appendix 3 (Rev A). This error was carried through to Appendices 11 and 12, which are now amended to Appendix 11 (Rev A) and Appendix 12 (Rev A). The capacity assessment of the proposed roundabout will be undertaken once the design has been agreed with your colleague Margaret Mills. Although, it envisaged that the capacity of the roundabout will not be an issue.

Cont.../3

Point 6 Oscady Assessment of Cronton Crossroads

The junction was assessed in the TIA assuming 3 stage operation in 2000. The PM cycle time was observed at around 70 seconds.

The assessment produced in the TIA was designed to provide a comparison of the impact of the introduction of the distributor road plus Upton Rocks development flow against the existing flow recorded in February 2000.

As there is an anticipated reduction in flow in 2000 with the distributor road plus Upton Rocks development (outlined in Para.4.14 of the TIA) it is clear that the junction will operate in a better manner than existing in 2000 or in 2015 without the need to reassess the crossroads.

However, for completeness I enclose revised OSCADY4 assessments using your authority's interstage values at Appendices 7A, 8A, 9A and 10A. The data is summarised below:

Arm	Movement		2000 AM		2000 PM	
			No Dev	With Dev	No Dev	With Dev
Cronton Road (West)	ALL	RFC	0.646	0.569	0.823	0.743
		Q	5.2	5.0	5.9	5.9
Smith Lane	ALL	RFC	0.470	0.675	0.350	0.484
		Q	4.4	5.5	2.1	2.5
Cronton Road (East)	ALL	RFC	1.041	0.775	1.059	0.540
		Q	29.5	10.1	31.2	4.2
Chapel Road	ALL	RFC	1.104	0.788	1.098	0.732
		Q	4.5	8.2	28.3	4.3
CYCLE TIME			100	100	68	68
% RESERVE CAPACITY			3.3%	40.1%	2.7%	41.5%

It can be seen that the introduction of the extension to the distributor road up to Cronton Road will lead to a significant improvement in conditions at Cronton Crossroads in both AM and PM peak hours. Indeed it would appear that the cycle time at the crossroads could be reduced upon opening of the distributor road.

Point 7 The Design of the Roundabout

As requested by your colleague David Whittleston I will liaise directly with Margaret Mills regarding the design of the roundabout.

Cont.../4

I trust the enclosed is clear but should you have any further queries please contact me at your earliest convenience.

Yours sincerely,

W Booker
For SINGLETON CLAMP AND PARTNERS LIMITED.

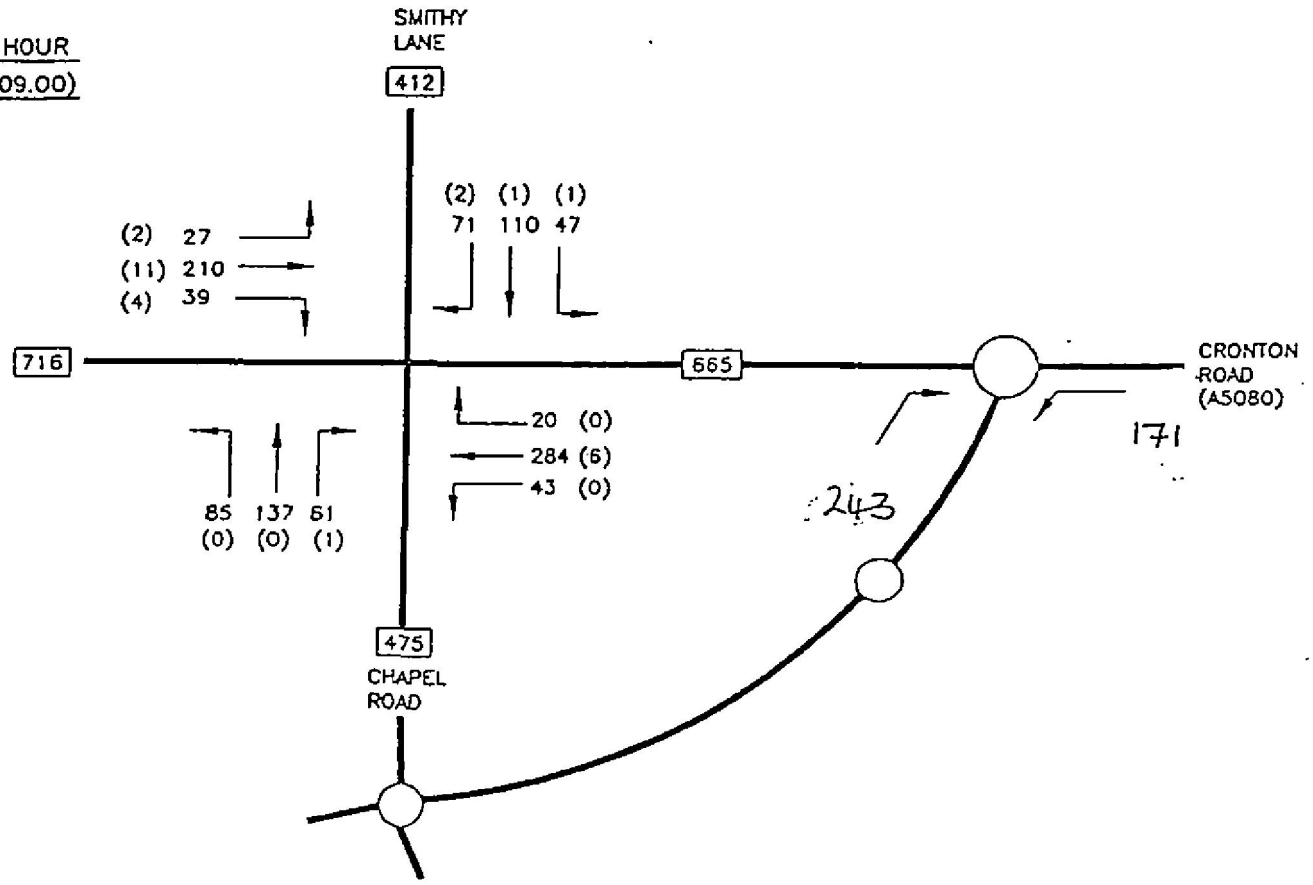
cc S Bradshaw

ngleton Clamp
& PARTNERS
ting Engineers and Transportation Planners
t Street, Albert Square, Manchester, M2 5WQ Tel: 0161-832-4400

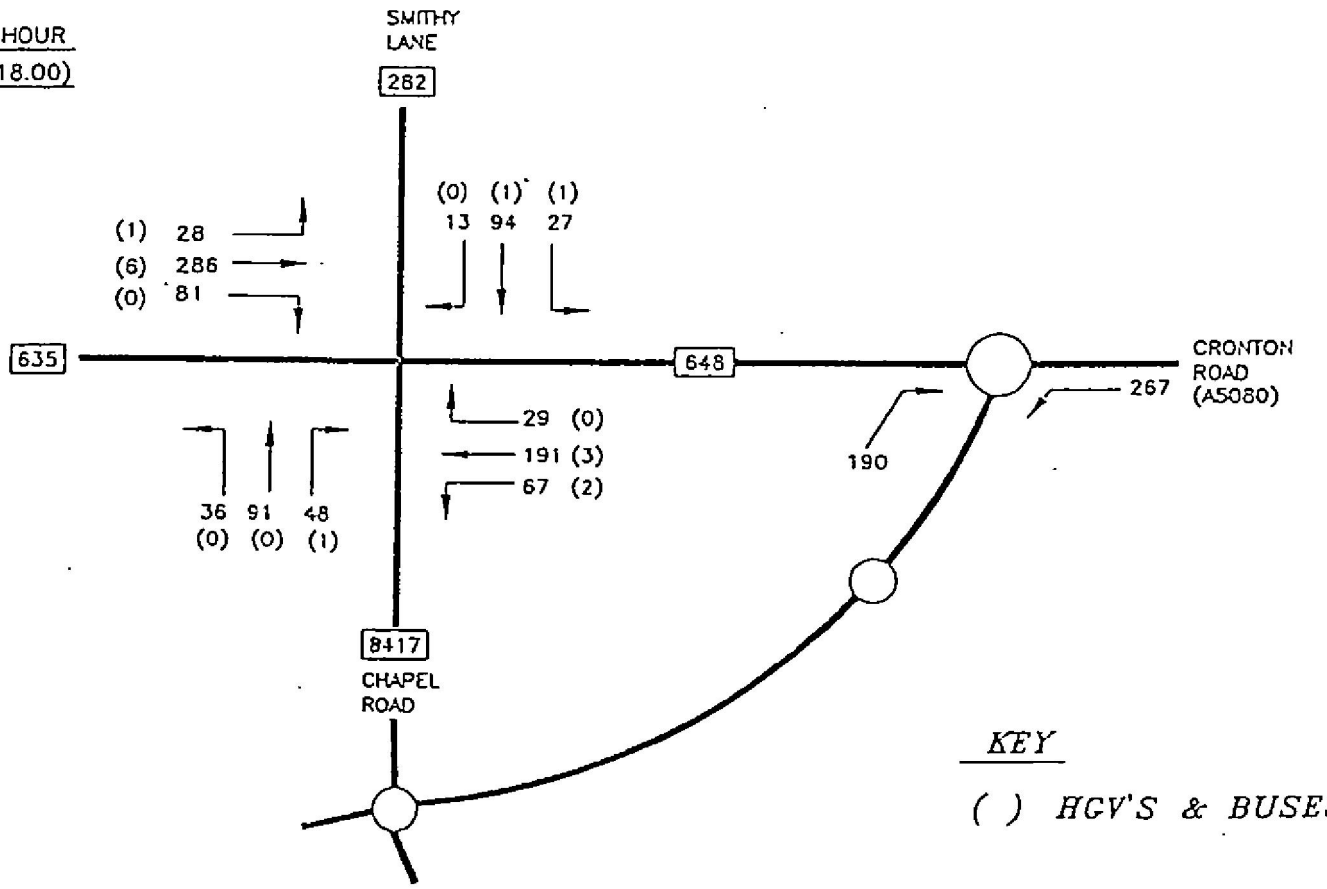
APPENDIX 3
Rev A

IMPACT OF COMPLETION FROM DISTRIBUTOR ROAD WITHOUT DEVELOPMENT

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



KEY

( ) HGV'S & BUSES

APPENDIX 7A

TRANSPORT RESEARCH LABORATORY

(c) COPYRIGHT Transport Research Laboratory, 1998,1999
OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
TRL LTD
TEL: CROWTHORNE (01344) 770018, FAX: 770864

THE USER OF THIS COMPUTER PROGRAM FOR THE SOLUTION OF AN ENGINEERING PROBLEM IS IN NO WAY RELIEVED OF HIS RESPONSIBILITY FOR THE CORRECTNESS OF THE SOLUTION

Run with file:- "C:\paul's stuff\99\99289 ravensoak\oscady's\CRON20AMREV1.voi" at 23:03:13 on Wednesday, 9 August 2000

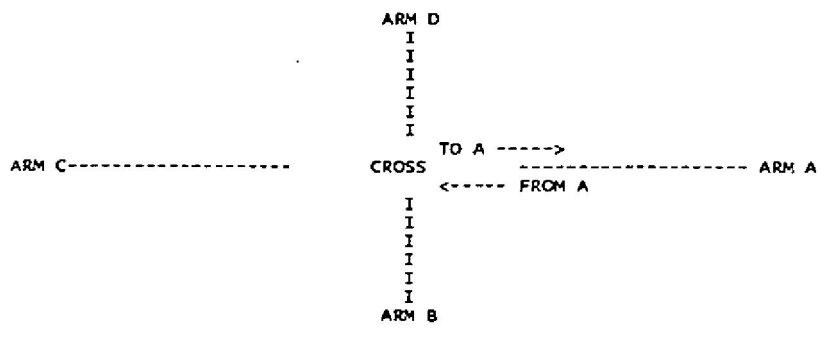
RUN TITLE
****
CRONTON XRDS 2000 AM EXISTING

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS
****

INPUT DATA



ARM A IS CRONTON RD WEST
ARM B IS SMITHY LANE
ARM C IS CRONTON RD EAST
ARM D IS CHAPEL LA

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** OOTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 07.45 TO 09.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)

FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	27.0	210.0	39.0
ARM B	71.0	0.0	47.0	110.0
ARM C	284.0	20.0	0.0	214.0
ARM D	85.0	137.0	304.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS: CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
07.45-09.15	A	0.939	0.000	0.061	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.980	0.000	0.020	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	08.00	08.30	09.00	3.45	5.18	3.45
	B	08.00	08.30	09.00	2.85	4.27	2.85
	C	08.00	08.30	09.00	6.47	9.71	6.47
	D	08.00	08.30	09.00	6.57	9.86	6.57

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 07.45-09.15
FIXED CYCLE TIME- 100.0 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED (see Note 1)
JUNCTION IS- WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'): 87.2 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] : 3.3 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		.
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	34.6	4.0	39.4
PRECEDING INTERSTAGE	7.0	6.0	9.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 100.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (87.2 %) and practical reserve capacity of the junction (3.3 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	34	4	40

These timings were calculated for a fixed or maximum cycle time of 100.0 seconds and give a maximum degree of saturation of 86.7 % and practical reserve capacity of the junction of 3.8 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (07.45-09.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	252.3	272.3	1217.0	51.9	73.4
B	1	L S R	208.4	213.8	1407.0	37.2	142.2
C	1	L S R	473.5	485.8	1559.7	86.3	4.3
D	1	L S R	480.8	487.1	1366.7	87.2	3.3

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME / ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
07.45-08.00								
A	1	L S R	3.45	1328.0	20.51	46.1		9.45
B	1	L S R	2.85	1472.1	23.91	40.9		9.78
C	1	L S R	6.47	1566.4	25.44	36.1		9.19
D	1	L S R	6.57	1429.0	23.51	40.9		9.61
08.00-08.15								
A	1	L S R	4.12	1227.1	18.95	46.1		8.74
B	1	L S R	3.40	1415.6	23.00	40.9		9.40
C	1	L S R	7.73	1560.4	25.35	36.1		9.15
D	1	L S R	7.85	1374.9	22.62	40.9		9.25
08.15-08.30								
A	1	L S R	5.05	1097.3	16.94	46.1		7.81
B	1	L S R	4.17	1334.1	21.67	40.9		8.86
C	1	L S R	9.47	1550.9	25.19	36.1		9.10
D	1	L S R	9.62	1294.2	21.29	40.9		8.71
08.30-08.45								
A	1	L S R	5.05	1097.3	16.94	46.1		7.81
B	1	L S R	4.17	1334.1	21.67	40.9		8.86
C	1	L S R	9.47	1550.9	25.19	36.1		9.10
D	1	L S R	9.62	1294.2	21.29	40.9		8.71
08.45-09.00								
A	1	L S R	4.12	1227.1	18.95	46.1		8.74
B	1	L S R	3.40	1415.6	23.00	40.9		9.40
C	1	L S R	7.73	1560.4	25.35	36.1		9.15
D	1	L S R	7.85	1374.9	22.62	40.9		9.25
09.00-09.15								
A	1	L S R	3.45	1328.0	20.51	46.1		9.45
B	1	L S R	2.85	1472.1	23.91	40.9		9.78
C	1	L S R	6.47	1566.4	25.44	36.1		9.19
D	1	L S R	6.57	1429.0	23.51	40.9		9.61

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME / ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00									
A	1	L S R	3.45	9.45	0.365	1.1	3.2	16.9	
B	1	L S R	2.85	9.78	0.291	1.0	2.9	15.2	
C	1	L S R	6.47	9.19	0.705	3.9	7.9	58.3	
D	1	L S R	6.57	9.61	0.684	3.5	7.3	52.3	
08.00-08.15									
A	1	L S R	4.12	8.74	0.472	1.5	3.9	22.9	
B	1	L S R	3.40	9.40	0.362	1.3	3.5	19.3	
C	1	L S R	7.73	9.15	0.845	6.2	10.6	91.7	
D	1	L S R	7.85	9.25	0.849	6.0	10.2	88.1	

I 08.15-08.30									I
I	A	1	L S R	5.05	7.81	0.646	2.4	5.2	36.2 I
I	B	1	L S R	4.17	8.86	0.470	1.8	4.4	26.3 I
I	C	1	L S R	9.47	9.10	1.041	17.4	22.2	210.0 I
I	D	1	L S R	9.62	8.71	1.104	23.1	27.3	247.4 I
I 08.30-08.45									I
I	A	1	L S R	5.05	7.81	0.646	2.4	5.2	36.7 I
I	B	1	L S R	4.17	8.86	0.470	1.8	4.4	26.3 I
I	C	1	L S R	9.47	9.10	1.041	24.6	29.5	335.4 I
I	D	1	L S R	9.62	8.71	1.104	37.2	41.5	468.9 I
I 08.45-09.00									I
I	A	1	L S R	4.12	8.74	0.472	1.5	4.0	23.1 I
I	B	1	L S R	3.40	9.40	0.362	1.3	3.5	19.3 I
I	C	1	L S R	7.73	9.15	0.845	8.5	13.3	253.0 I
I	D	1	L S R	7.85	9.25	0.849	18.9	23.5	429.7 I
I 09.00-09.15									I
I	A	1	L S R	3.45	9.45	0.365	1.1	3.2	17.0 I
I	B	1	L S R	2.85	9.78	0.291	1.0	2.9	15.2 I
I	C	1	L S R	6.47	9.19	0.705	4.0	8.0	63.6 I
I	D	1	L S R	6.57	9.61	0.684	4.2	8.3	90.6 I

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.1	3.2	*++
08.15	1	1.5	3.9	**++
08.30	1	2.4	5.2	**+++
08.45	1	2.4	5.2	**+++
09.00	1	1.5	4.0	**++
09.15	1	1.1	3.2	*++

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.0	2.9	*++
08.15	1	1.3	3.5	*++
08.30	1	1.8	4.4	**++
08.45	1	1.8	4.4	**++
09.00	1	1.3	3.5	*++
09.15	1	1.0	2.9	*++

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	3.9	7.9	****++++
08.15	1	6.2	10.6	******+++++
08.30	1	17.4	22.2	******************+++++
08.45	1	24.6	29.5	**************************++++
09.00	1	8.5	13.3	*********++++
09.15	1	4.0	8.0	****++++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	3.5	7.3	****+++
08.15	1	6.0	10.2	******++++
08.30	1	23.1	27.3	**********++++
08.45	1	37.2	41.5	**********+++++
09.00	1	18.9	23.5	**********+++++
09.15	1	4.2	8.3	****++++ .

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (07.45-09.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	TOTAL DEMAND (EXCL 2-WHEEL) (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A-B	37.0	24.7	14.9	0.40	14.9	0.40
A-C	288.0	192.0	116.2	0.40	116.2	0.40
A-D	53.5	35.7	21.6	0.40	21.6	0.40
B-C	64.4	43.0	25.1	0.39	25.1	0.39
B-D	150.8	100.6	58.6	0.39	58.7	0.39
B-A	97.4	64.9	37.9	0.39	37.9	0.39
C-D	293.4	195.6	418.1	1.42	418.4	1.43
C-A	389.4	259.6	554.8	1.42	555.3	1.43
C-B	27.4	18.3	39.1	1.42	39.1	1.43
D-A	116.6	77.7	222.5	1.91	222.7	1.91
D-B	187.9	125.2	358.6	1.91	358.9	1.91
D-C	416.8	277.9	795.8	1.91	796.3	1.91
ALL	2122.6	1415.1	2663.2	1.25	2665.1	1.26

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

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[Printed at 23:03:29 on 09/08/00]

APPENDIX 8A

TRANSPORT RESEARCH LABORATORY

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

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Run with file:- "C:\paul's stuff\99\99289 ravensoak\oscady's\CRON20pmrev1.voi" at 23:11:47 on Wednesday, 9 August 2000

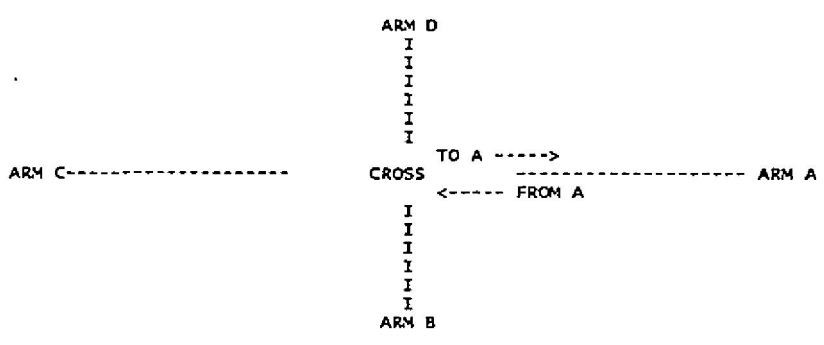
RUN TITLE
CRONTON XRDS 2000 pm existing

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS CRONTON RD WEST
ARM B IS SMITHY LANE
ARM C IS CRONTON RD EAST
ARM D IS CHAPEL LA

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 16.45 TO 18.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 16.45 TO 18.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)

FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	28.0	286.0	81.0
ARM B	13.0	0.0	27.0	94.0
ARM C	191.0	29.0	0.0	334.0
ARM D	36.0	91.0	238.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS: CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
16.45-18.15	A	0.980	0.000	0.020	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.990	0.000	0.010	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	17.00	17.30	18.00	4.94	7.41	4.94
	B	17.00	17.30	18.00	1.67	2.51	1.67
	C	17.00	17.30	18.00	6.93	10.39	6.93
	D	17.00	17.30	18.00	4.56	6.84	4.56

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 16.45-18.15
FIXED CYCLE TIME- 68.0 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED WITHIN CAPACITY (see Note 1)
JUNCTION IS- 87.6 PERCENT
MAXIMUM DEGREE OF SATURATION (X'): 2.7 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] :

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM		STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM	A	1	1	
	B			1
	C	1		
	D			1
MINIMUM GREEN TIME (SECS)		7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)		25.2	4.0	16.8
PRECEDING INTERSTAGE		7.0	6.0	9.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 68.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (87.6 %) and practical reserve capacity of the junction (2.7 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	25	4	17

These timings were calculated for a fixed or maximum cycle time of 68.0 seconds and give a maximum degree of saturation of 87.1 % and practical reserve capacity of the junction of 3.4 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (16.45-18.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	361.1	370.5	1114.9	67.1	34.1
B	1	L S R	122.5	125.7	1614.2	28.9	211.5
C	1	L S R	506.4	513.0	1493.0	87.6	2.7
D	1	L S R	333.7	338.0	1454.0	86.3	4.3

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
16.45-17.00									
	A	1	L S R	4.94	1236.0	20.08	36.7		10.83
	B	1	L S R	1.68	1626.8	26.43	18.3		7.12
	C	1	L S R	6.93	1501.8	24.71	26.7		9.69
	D	1	L S R	4.56	1526.3	25.11	18.3		6.77
17.00-17.15									
	A	1	L S R	5.90	1129.5	18.35	36.7		9.90
	B	1	L S R	2.00	1615.6	26.24	18.3		7.07
	C	1	L S R	8.27	1494.1	24.58	26.7		9.64
	D	1	L S R	5.45	1461.7	24.05	18.3		6.48
17.15-17.30									
	A	1	L S R	7.22	1001.8	16.27	36.7		8.78
	B	1	L S R	2.45	1598.0	25.96	18.3		7.00
	C	1	L S R	10.13	1482.0	24.38	26.7		9.56
	D	1	L S R	6.67	1370.5	22.55	18.3		6.08
17.30-17.45									
	A	1	L S R	7.22	1001.8	16.27	36.7		8.78
	B	1	L S R	2.45	1598.0	25.96	18.3		7.00
	C	1	L S R	10.13	1482.0	24.38	26.7		9.56
	D	1	L S R	6.67	1370.5	22.55	18.3		6.08
17.45-18.00									
	A	1	L S R	5.90	1129.5	18.35	36.7		9.90
	B	1	L S R	2.00	1615.6	26.24	18.3		7.07
	C	1	L S R	8.27	1494.1	24.58	26.7		9.64
	D	1	L S R	5.45	1461.7	24.05	18.3		6.48
18.00-18.15									
	A	1	L S R	4.94	1236.0	20.08	36.7		10.83
	B	1	L S R	1.68	1626.8	26.43	18.3		7.12
	C	1	L S R	6.93	1501.8	24.71	26.7		9.69
	D	1	L S R	4.56	1526.3	25.11	18.3		6.77

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00										
	A	1	L S R	4.94	10.83	0.456	1.0	2.8	15.2	
	B	1	L S R	1.67	7.12	0.235	0.6	1.4	8.8	
	C	1	L S R	6.93	9.69	0.715	3.0	5.8	45.0	
	D	1	L S R	4.56	6.77	0.674	2.5	4.6	36.8	
17.00-17.15										
	A	1	L S R	5.90	9.90	0.596	1.6	3.6	23.4	
	B	1	L S R	2.00	7.07	0.283	0.7	1.7	10.8	
	C	1	L S R	8.27	9.64	0.858	5.3	8.3	77.6	
	D	1	L S R	5.45	6.48	0.841	4.3	6.7	63.8	

I 17.15-17.30									I
I	A	1	L S R	7.22	8.78	0.823	3.6	5.8	52.5 I
I	B	1	L S R	2.45	7.00	0.350	0.9	2.1	14.0 I
I	C	1	L S R	10.13	9.56	1.059	18.2	21.5	207.6 I
I	D	1	L S R	6.67	6.08	1.098	16.2	18.7	177.2 I
I 17.30-17.45									I
I	A	1	L S R	7.22	8.78	0.823	3.7	5.9	57.0 I
I	B	1	L S R	2.45	7.00	0.350	0.9	2.1	14.0 I
I	C	1	L S R	10.13	9.56	1.059	27.9	31.2	366.0 I
I	D	1	L S R	6.67	6.08	1.098	25.8	28.3	330.1 I
I 17.45-18.00									I
I	A	1	L S R	5.90	9.90	0.596	1.6	3.6	24.6 I
I	B	1	L S R	2.00	7.07	0.283	0.7	1.7	10.8 I
I	C	1	L S R	8.27	9.64	0.858	10.7	14.0	300.4 I
I	D	1	L S R	5.45	6.48	0.841	12.9	15.5	297.4 I
I 18.00-18.15									I
I	A	1	L S R	4.94	10.83	0.456	1.0	2.8	15.3 I
I	B	1	L S R	1.67	7.12	0.235	0.6	1.4	8.8 I
I	C	1	L S R	6.93	9.69	0.715	3.3	6.2	60.1 I
I	D	1	L S R	4.56	6.77	0.674	2.9	5.2	65.8 I

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	1.0	2.8	*++
17.15	1	1.6	3.6	**++
17.30	1	3.6	5.8	****++
17.45	1	3.7	5.9	****++
18.00	1	1.6	3.6	**++
18.15	1	1.0	2.8	*++

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.6	1.4	*
17.15	1	0.7	1.7	*+
17.30	1	0.9	2.1	*+
17.45	1	0.9	2.1	*+
18.00	1	0.7	1.7	*+
18.15	1	0.6	1.4	*

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	3.0	5.8	***+++
17.15	1	5.3	8.3	*****+++
17.30	1	18.2	21.5	******************++++
17.45	1	27.9	31.2	****************************+++
18.00	1	10.7	14.0	**********+++
18.15	1	3.3	6.2	***+++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	2.5	4.6	**+++
17.15	1	4.3	6.7	****+++
17.30	1	16.2	18.7	**********+++
17.45	1	25.8	28.3	**********++
18.00	1	12.9	15.5	**********+++
18.15	1	2.9	5.2	***++

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (16.45-18.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	TOTAL DEMAND (EXCL 2-WHEEL) (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A-B	38.4	25.6	13.3	0.35	13.3	0.35
A-C	392.2	261.4	136.1	0.35	136.1	0.35
A-D	111.1	74.0	38.5	0.35	38.6	0.35
B-C	37.0	24.7	13.5	0.37	13.5	0.37
B-D	128.9	85.9	47.1	0.37	47.1	0.37
B-A	17.8	11.9	6.5	0.37	6.5	0.37
C-D	458.0	305.3	637.0	1.39	637.4	1.39
C-A	261.9	174.6	364.3	1.39	364.5	1.39
C-B	39.8	26.5	55.3	1.39	55.3	1.39
D-A	49.4	32.9	95.8	1.94	95.8	1.94
D-B	124.8	83.2	242.1	1.94	242.3	1.94
D-C	326.3	217.6	633.2	1.94	633.6	1.94
ALL	1985.5	1323.7	2282.8	1.15	2284.1	1.15

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

end of file

[Printed at 23:11:58 on 09/08/00]

APPENDIX

TRANSPORT RESEARCH LABORATORY

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

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Run with file:- "C:\paul's stuff\99\99289 ravensoak\oscady's\CRON20AMREV1withdev.voi" at 23:06:14 on Wednesday, 9 August 2(

RUN TITLE
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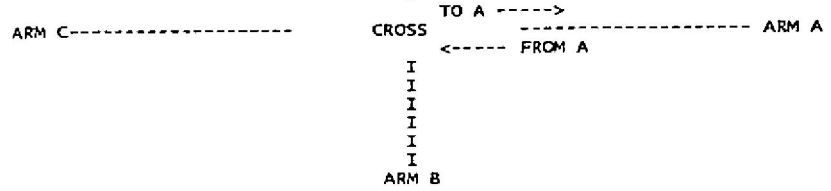
**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS CRONTON RD WEST
ARM B IS SMITHY LANE
ARM C IS CRONTON RD EAST
ARM D IS CHAPEL LA

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 07.45 TO 09.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)				
FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	27.0	250.0	49.0
ARM B	71.0	0.0	47.0	110.0
ARM C	444.0	20.0	0.0	43.0
ARM D	125.0	137.0	61.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS					
		CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
07.45-09.15	A	0.939	0.000	0.061	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.980	0.000	0.020	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	08.00	08.30	09.00	4.07	6.11	4.07
	B	08.00	08.30	09.00	2.85	4.27	2.85
	C	08.00	08.30	09.00	6.34	9.51	6.34
	D	08.00	08.30	09.00	4.04	6.06	4.04

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 07.45-09.15
FIXED CYCLE TIME- 100.0 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED (see Note 1)
JUNCTION IS- WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'): 64.2 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] : 40.1 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	42.8	4.0	31.2
PRECEDING INTERSTAGE	7.0	6.0	9.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 100.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (64.2 %) and practical reserve capacity of the junction (40.1 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	43	4	31

These timings were calculated for a fixed or maximum cycle time of 100.0 seconds and give a maximum degree of saturation of 64.2 % and practical reserve capacity of the junction of 40.1 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (07.45-09.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	298.0	321.6	1347.2	46.5	93.4
B	1	L S R	208.4	213.8	1257.6	52.0	73.1
C	1	L S R	463.5	475.5	1671.5	64.2	40.1
D	1	L S R	295.3	299.1	1423.9	64.2	40.1

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME	ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
07.45-08.00									
	A	1	L S R	4.07	1440.8	22.25	54.3		12.08
	B	1	L S R	2.85	1346.5	21.87	32.7		7.15
	C	1	L S R	6.34	1679.8	27.29	44.3		12.09
	D	1	L S R	4.04	1447.1	23.81	32.7		7.79
08.00-08.15									
	A	1	L S R	4.87	1360.5	21.01	54.3		11.41
	B	1	L S R	3.40	1264.8	20.55	32.7		6.72
	C	1	L S R	7.57	1672.7	27.17	44.3		12.04
	D	1	L S R	4.82	1425.9	23.46	32.7		7.67
08.15-08.30									
	A	1	L S R	5.96	1248.2	19.27	54.3		10.47
	B	1	L S R	4.17	1162.5	18.88	32.7		6.18
	C	1	L S R	9.27	1661.1	26.98	44.3		11.95
	D	1	L S R	5.90	1392.9	22.92	32.7		7.50
08.30-08.45									
	A	1	L S R	5.96	1248.2	19.27	54.3		10.47
	B	1	L S R	4.17	1162.5	18.88	32.7		6.18
	C	1	L S R	9.27	1661.1	26.98	44.3		11.95
	D	1	L S R	5.90	1392.9	22.92	32.7		7.50
08.45-09.00									
	A	1	L S R	4.87	1360.5	21.01	54.3		11.41
	B	1	L S R	3.40	1264.8	20.55	32.7		6.72
	C	1	L S R	7.57	1672.7	27.17	44.3		12.04
	D	1	L S R	4.82	1425.9	23.46	32.7		7.67
09.00-09.15									
	A	1	L S R	4.07	1440.8	22.25	54.3		12.08
	B	1	L S R	2.85	1346.5	21.87	32.7		7.15
	C	1	L S R	6.34	1679.8	27.29	44.3		12.09
	D	1	L S R	4.04	1447.1	23.81	32.7		7.79

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 07.45 AND 09.15

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00										
	A	1	L S R	4.07	12.08	0.337	1.0	3.2	14.6	
	B	1	L S R	2.85	7.15	0.398	1.4	3.4	20.9	
	C	1	L S R	6.34	12.09	0.524	2.5	6.2	37.1	
	D	1	L S R	4.04	7.79	0.518	2.2	4.9	32.4	
08.00-08.15										
	A	1	L S R	4.87	11.41	0.427	1.3	3.9	19.4	
	B	1	L S R	3.40	6.72	0.506	1.8	4.1	27.7	
	C	1	L S R	7.57	12.04	0.629	3.3	7.7	50.1	
	D	1	L S R	4.82	7.67	0.628	2.9	6.0	43.6	

I 08.15-08.30									I
I	A	1	L S R	5.96	10.47	0.569	1.9	5.0	29.2 I
I	B	1	L S R	4.17	6.18	0.675	2.8	5.5	42.1 I
I	C	1	L S R	9.27	11.95	0.775	5.2	10.1	77.3 I
I	D	1	L S R	5.90	7.50	0.788	4.6	8.2	68.4 I
I 08.30-08.45									I
I	A	1	L S R	5.96	10.47	0.569	2.0	5.0	29.3 I
I	B	1	L S R	4.17	6.18	0.675	2.8	5.5	42.8 I
I	C	1	L S R	9.27	11.95	0.775	5.2	10.2	78.7 I
I	D	1	L S R	5.90	7.50	0.788	4.7	8.3	70.9 I
I 08.45-09.00									I
I	A	1	L S R	4.87	11.41	0.427	1.3	3.9	19.4 I
I	B	1	L S R	3.40	6.72	0.506	1.9	4.1	28.0 I
I	C	1	L S R	7.57	12.04	0.629	3.4	7.7	50.8 I
I	D	1	L S R	4.82	7.67	0.628	2.9	6.1	44.9 I
I 09.00-09.15									I
I	A	1	L S R	4.07	12.08	0.337	1.0	3.2	14.6 I
I	B	1	L S R	2.85	7.15	0.398	1.4	3.4	21.0 I
I	C	1	L S R	6.34	12.09	0.524	2.5	6.2	37.3 I
I	D	1	L S R	4.04	7.79	0.518	2.2	4.9	32.7 I

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.0	3.2	*++
08.15	1	1.3	3.9	*+++
08.30	1	1.9	5.0	**+++
08.45	1	2.0	5.0	**+++
09.00	1	1.3	3.9	*+++
09.15	1	1.0	3.2	*++

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	1.4	3.4	*++
08.15	1	1.8	4.1	**++
08.30	1	2.8	5.5	***++
08.45	1	2.8	5.5	***++
09.00	1	1.9	4.1	**++
09.15	1	1.4	3.4	*++

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	2.5	6.2	**++++
08.15	1	3.3	7.7	***+++++
08.30	1	5.2	10.1	*****+++++
08.45	1	5.2	10.2	*****+++++
09.00	1	3.4	7.7	***+++++
09.15	1	2.5	6.2	**++++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
08.00	1	2.2	4.9	**+++
08.15	1	2.9	6.0	***+++
08.30	1	4.6	8.2	*****+++
08.45	1	4.7	8.3	*****+++
09.00	1	2.9	6.1	***+++
09.15	1	2.2	4.9	**+++

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (07.45-09.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	TOTAL DEMAND (EXCL 2-WHEEL) (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A-B	37.0	24.7	10.5	0.28	10.5	0.28
A-C	342.8	228.5	97.0	0.28	97.0	0.28
A-D	67.2	44.8	19.0	0.28	19.0	0.28
B-C	64.4	43.0	37.6	0.58	37.7	0.58
B-D	150.8	100.6	88.1	0.58	88.1	0.58
B-A	97.4	64.9	56.8	0.58	56.9	0.58
C-D	59.0	39.3	28.1	0.48	28.1	0.48
C-A	608.8	405.9	290.2	0.48	290.4	0.48
C-B	27.4	18.3	13.1	0.48	13.1	0.48
D-A	171.4	114.3	113.4	0.66	113.5	0.66
D-B	187.9	125.2	124.2	0.66	124.4	0.66
D-C	83.6	55.8	55.3	0.66	55.4	0.66
ALL	1897.8	1265.2	933.3	0.49	934.0	0.49

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

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[Printed at 23:06:44 on 09/08/00]

APPENDIX 1C

TRANSPORT RESEARCH LABORATORY

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OPTIMISED SIGNAL CAPACITY AND DELAY

Visual OSCADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (MAR 1999)

FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
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Run with file:- "C:\paul's stuff\99\99289 ravensoak\oscady's\CRON20pmrev1withdev.voi" at 23:14:00 on Wednesday, 9 August 20

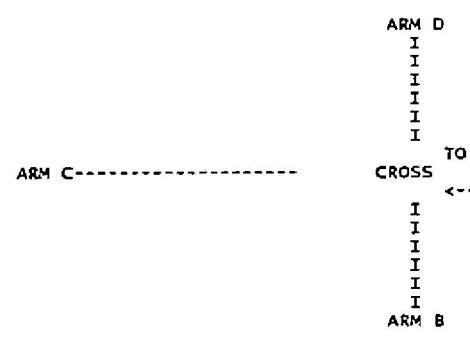
RUN TITLE
CRONTON XRDS 2000 pm with dev

**** ERROR AND WARNING MESSAGES ****

No errors or warnings in the data.

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS CRONTON RD WEST
ARM B IS SMITHY LANE
ARM C IS CRONTON RD EAST
ARM D IS CHAPEL LA

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		1	1	1	1
PERMITTED MOVEMENTS	LANE 1	LSR	LSR	LSR	LSR
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		N/A	N/A	N/A	N/A
LANE WIDTHS	LANE 1	3.50 M	3.00 M	3.50 M	3.00 M
LEFT TURN RADII	LANE 1	16.0 M	14.5 M	6.5 M	5.0 M
RIGHT TURN RADII	LANE 1	10.5 M	12.0 M	12.0 M	11.0 M
OPPOSING TRAFFIC MOVEMENTS FROM OPPOSITE ARM		STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT	STRAIGHT LEFT
STORAGE BEYOND STOPLINE	LANE 1	2.0 VEHS	2.0 VEHS	2.0 VEHS	2.0 VEHS

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 16.45 TO 18.15
PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 16.45 TO 18.15

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)

FROM/TO	ARM A	ARM B	ARM C	ARM D
ARM A	0.0	28.0	426.0	116.0
ARM B	13.0	0.0	27.0	94.0
ARM C	251.0	29.0	0.0	67.0
ARM D	51.0	91.0	48.0	0.0

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS: CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
16.45-18.15	A	0.980	0.000	0.020	0.000	0.000	0.000
	B	0.980	0.000	0.020	0.000	0.000	0.000
	C	0.990	0.000	0.010	0.000	0.000	0.000
	D	0.990	0.000	0.010	0.000	0.000	0.000

DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	17.00	17.30	18.00	7.13	10.69	7.13
	B	17.00	17.30	18.00	1.67	2.51	1.67
	C	17.00	17.30	18.00	4.34	6.51	4.34
	D	17.00	17.30	18.00	2.38	3.56	2.38

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION- 16.45-18.15
FIXED CYCLE TIME- 68.0 SECONDS
OPTIMISED TIMINGS BELOW ARE- DELAY MINIMIZED (see Note 1)
JUNCTION IS- WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'): 63.6 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] : 41.5 PERCENT

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3
LANES ON GREEN: ARM A	1	1	
B			1
C	1		
D			1
MINIMUM GREEN TIME (SECS)	7.0	4.0	7.0
OPTIMISED GREEN TIME (SECS)	30.0	4.0	12.0
PRECEDING INTERSTAGE	7.0	6.0	9.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 68.0 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (63.6 %) and practical reserve capacity of the junction (41.5 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3
GREEN:	31	4	11

These timings were calculated for a fixed or maximum cycle time of 68.0 seconds and give a maximum degree of saturation of 62.3 % and practical reserve capacity of the junction of 44.4 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (16.45-18.15) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L S R	521.1	534.6	1486.4	63.6	41.5
B	1	L S R	122.5	125.7	1588.0	39.7	126.4
C	1	L S R	317.2	321.3	1573.1	44.2	103.8
D	1	L S R	173.7	175.9	1483.0	59.6	51.0

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN-TIME TRUE (SECS)	EFFECTIVE GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
16.45-17.00								
A	1	L S R	7.13	1540.7	25.03	41.5		15.26
B	1	L S R	1.68	1609.1	26.14	13.5		5.20
C	1	L S R	4.34	1597.3	26.28	31.5		12.16
D	1	L S R	2.38	1515.4	24.93	13.5		4.96
17.00-17.15								
A	1	L S R	8.51	1490.4	24.21	41.5		14.76
B	1	L S R	2.00	1591.2	25.85	13.5		5.15
C	1	L S R	5.18	1575.3	25.92	31.5		11.99
D	1	L S R	2.84	1487.4	24.47	13.5		4.87
17.15-17.30								
A	1	L S R	10.42	1415.1	22.99	41.5		14.02
B	1	L S R	2.45	1566.4	25.45	13.5		5.07
C	1	L S R	6.34	1542.2	25.37	31.5		11.74
D	1	L S R	3.47	1447.8	23.82	13.5		4.74
17.30-17.45								
A	1	L S R	10.42	1415.1	22.99	41.5		14.02
B	1	L S R	2.45	1566.4	25.45	13.5		5.07
C	1	L S R	6.34	1542.2	25.37	31.5		11.74
D	1	L S R	3.47	1447.8	23.82	13.5		4.74
17.45-18.00								
A	1	L S R	8.51	1490.4	24.21	41.5		14.76
B	1	L S R	2.00	1591.2	25.85	13.5		5.15
C	1	L S R	5.18	1575.3	25.92	31.5		11.99
D	1	L S R	2.84	1487.4	24.47	13.5		4.87
18.00-18.15								
A	1	L S R	7.13	1540.7	25.03	41.5		15.26
B	1	L S R	1.68	1609.1	26.14	13.5		5.20
C	1	L S R	4.34	1597.3	26.28	31.5		12.16
D	1	L S R	2.38	1515.4	24.93	13.5		4.96

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 16.45 AND 18.15

TIME ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00									
A	1	L S R	7.13	15.26	0.467	1.1	3.4	16.5	
B	1	L S R	1.67	5.20	0.322	0.7	1.6	11.1	
C	1	L S R	4.34	12.16	0.357	1.0	2.8	14.5	
D	1	L S R	2.38	4.96	0.478	1.2	2.4	18.1	
17.00-17.15									
A	1	L S R	8.51	14.76	0.576	1.6	4.2	24.0	
B	1	L S R	2.00	5.15	0.389	0.9	2.0	14.0	
C	1	L S R	5.18	11.99	0.432	1.3	3.3	18.8	
D	1	L S R	2.84	4.87	0.582	1.6	3.0	24.5	

I 17.15-17.30										I
I	A	1	L S R	10.42	14.02	0.743	2.9	5.9	43.2	I
I	B	1	L S R	2.45	5.07	0.484	1.3	2.5	18.8	I
I	C	1	L S R	6.34	11.74	0.540	1.8	4.2	26.4	I
I	D	1	L S R	3.47	4.74	0.732	2.6	4.2	38.3	I
I 17.30-17.45										I
I	A	1	L S R	10.42	14.02	0.743	2.9	5.9	44.0	I
I	B	1	L S R	2.45	5.07	0.484	1.3	2.5	18.8	I
I	C	1	L S R	6.34	11.74	0.540	1.8	4.2	26.5	I
I	D	1	L S R	3.47	4.74	0.732	2.6	4.3	39.9	I
I 17.45-18.00										I
I	A	1	L S R	8.51	14.76	0.576	1.6	4.2	24.3	I
I	B	1	L S R	2.00	5.15	0.389	0.9	2.0	14.1	I
I	C	1	L S R	5.18	11.99	0.432	1.3	3.4	18.9	I
I	D	1	L S R	2.84	4.87	0.582	1.7	3.1	25.5	I
I 18.00-18.15										I
I	A	1	L S R	7.13	15.26	0.467	1.1	3.4	16.6	I
I	B	1	L S R	1.67	5.20	0.322	0.7	1.6	11.1	I
I	C	1	L S R	4.34	12.16	0.357	1.0	2.8	14.5	I
I	D	1	L S R	2.38	4.96	0.478	1.2	2.4	18.4	I

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	1.1	3.4	*++
17.15	1	1.6	4.2	**++
17.30	1	2.9	5.9	***+++
17.45	1	2.9	5.9	***+++
18.00	1	1.6	4.2	**++
18.15	1	1.1	3.4	*++

QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	0.7	1.6	*+
17.15	1	0.9	2.0	*+
17.30	1	1.3	2.5	*+
17.45	1	1.3	2.5	*+
18.00	1	0.9	2.0	*+
18.15	1	0.7	1.6	*+

QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	1.0	2.8	*++
17.15	1	1.3	3.3	*++
17.30	1	1.8	4.2	**++
17.45	1	1.8	4.2	**++
18.00	1	1.3	3.4	*++
18.15	1	1.0	2.8	*++

QUEUES FOR ARM D

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE MEAN (PHASE AVERAGED) *	MAXIMUM (AT END OF RED) +	
17.00	1	1.2	2.4	*+
17.15	1	1.6	3.0	**+
17.30	1	2.6	4.2	***+
17.45	1	2.6	4.3	***+
18.00	1	1.7	3.1	**+
18.15	1	1.2	2.4	*+

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (16.45-18.15)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	(VEH/H)	* QUEUEING * DELAY * (MIN)	(MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	(MIN/VEH)
A-B	38.4	25.6	8.3	0.22	8.3	0.22
A-C	584.1	389.4	126.0	0.22	126.1	0.22
A-D	159.1	106.0	34.3	0.22	34.3	0.22
B-C	37.0	24.7	17.7	0.48	17.7	0.48
B-D	128.9	85.9	61.7	0.48	61.8	0.48
B-A	17.8	11.9	8.5	0.48	8.5	0.48
C-D	91.9	61.2	23.1	0.25	23.1	0.25
C-A	344.2	229.4	86.5	0.25	86.6	0.25
C-B	39.8	26.5	10.0	0.25	10.0	0.25
D-A	69.9	46.6	44.2	0.63	44.3	0.63
D-B	124.8	83.2	78.9	0.63	79.0	0.63
D-C	65.8	43.9	41.6	0.63	41.7	0.63
ALL	1701.7	1134.4	541.1	0.32	541.4	0.32

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
* THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
* A LARGE QUEUE AT THE END OF THE TIME PERIOD.

****** OSCADY 4 run completed

end of file

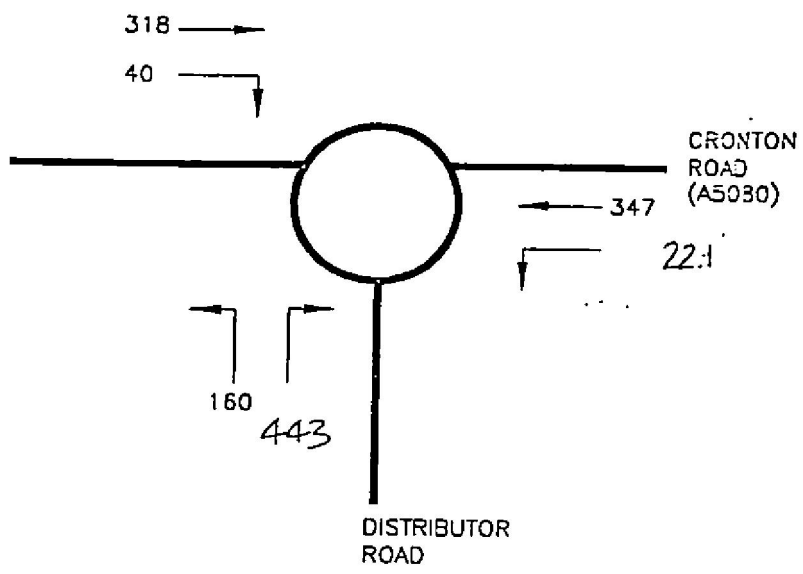
[Printed at 23:14:09 on 09/08/00]

Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester, M2 5WQ Tel: 0161-832-4400

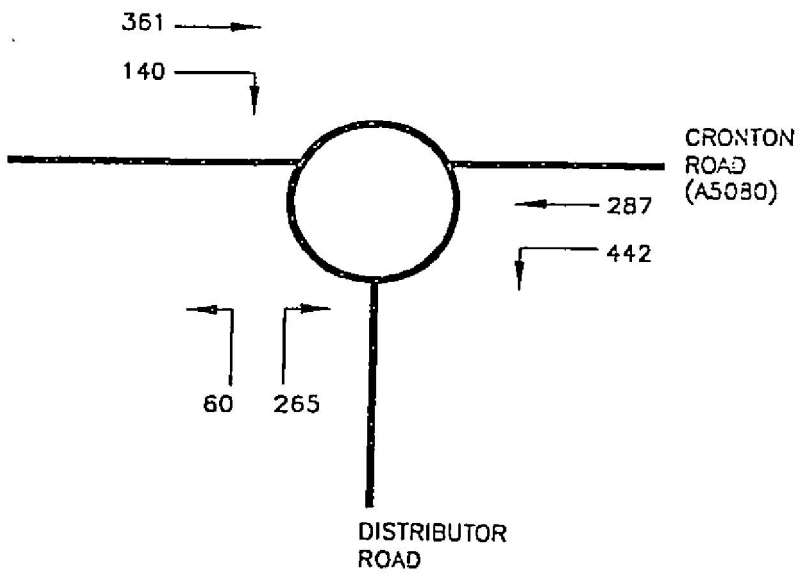
DESIGN FLOWS
YEAR 2000

APPENDIX 1
Rev A

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)

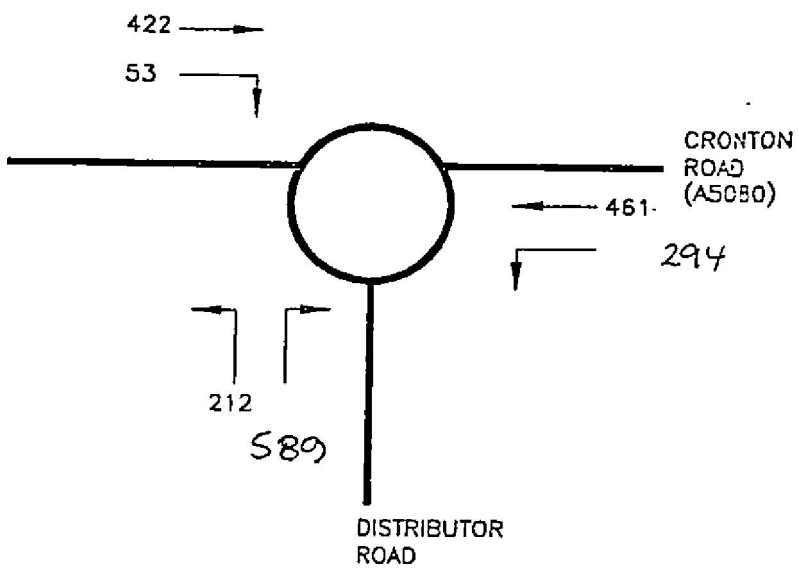


Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester, M2 5WQ. Tel 0161-832-4400

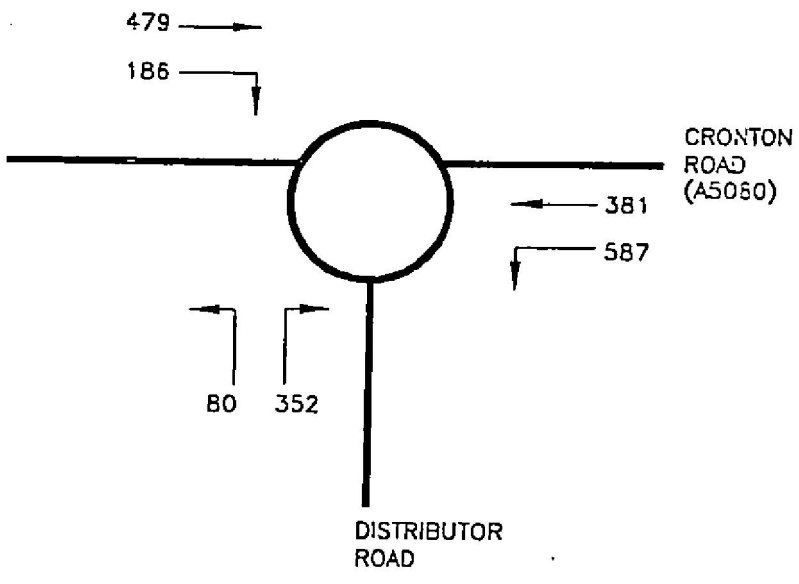
DESIGN FLOWS
YEAR 2015
HIGH GROWTH

APPENDIX 1
Rev A

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)



APPENDIX 7

00021

Singleton Clamp
& PARTNERS LIMITED
Consulting Engineers and Transportation Planners

Facsimile Transmission

Date: 18-8-00

From: Bill Booker

To: Margaret Mills

Company: Knowsley MBC - Design Consultancy

Fax No: 0151 443 2298.

No. of pages: 6
(including this sheet)

Subject: UPTON ROCKS - CROXTETH RD RBT

Message:

Margaret,

I write further to your fax dated 8/8/00 and as requested I have reviewed the original proposal in light of your revised comments. Plan 1 illustrates the current proposals.

At Plan 2 I illustrate the various visibility requirements for a roundabout and I believe the scheme is in accordance with the design guide. I have omitted Stopping sight distances from the plan. These should be 120m and can readily be achieved.

At Plan 3 I illustrate the potential realignment to the roundabout to overcome the only relevant issue of deflection angle. The scheme is slightly larger than the original proposal and Plan 4 illustrates a comparison of the two schemes.

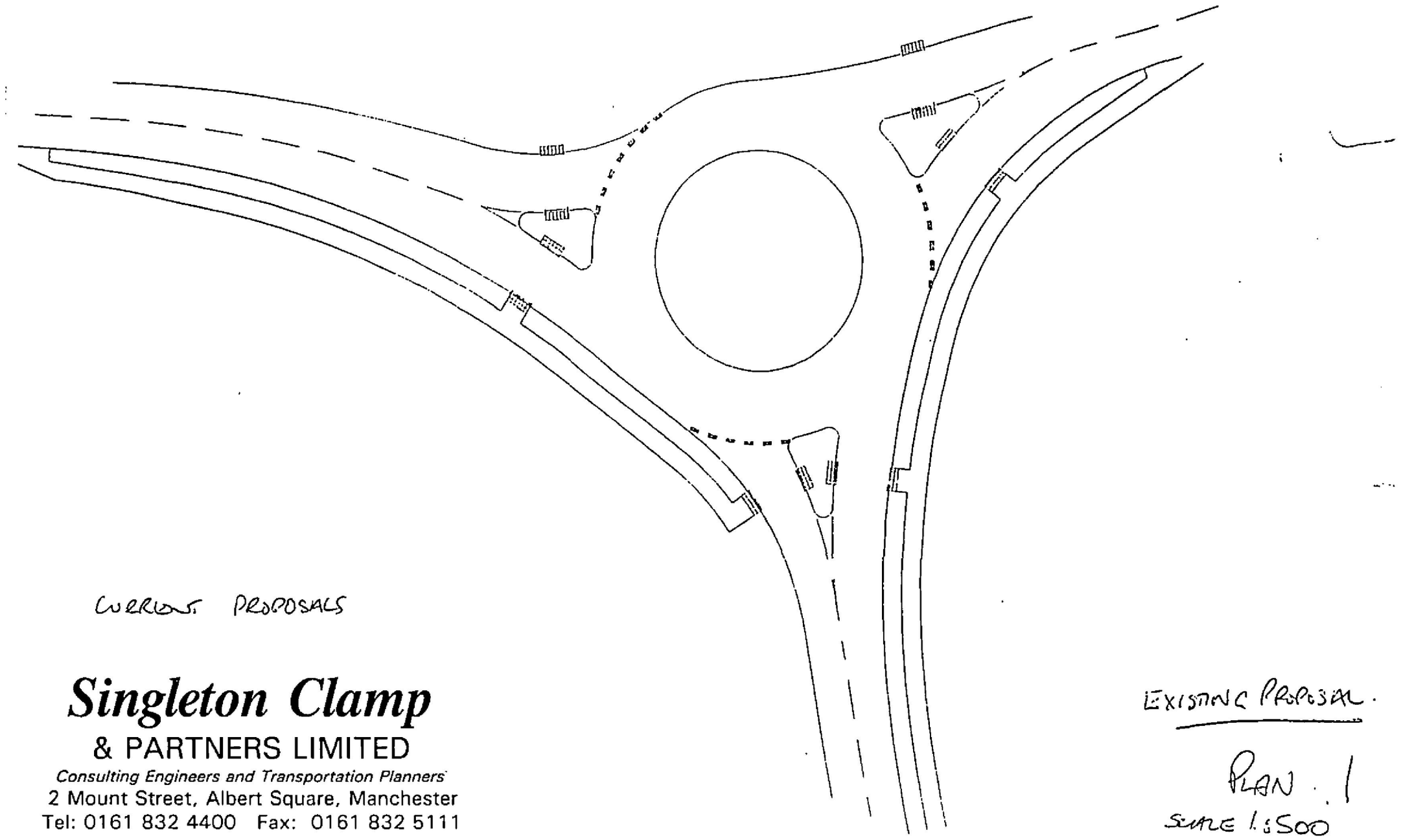
2 Mount Street, Albert Square, Manchester, M2 5WQ. Tel: 0161 832 4400 Fax: 0161 832 5111
e-mail: consult@singletonclamp.co.uk

Plan 3 has been prepared on a without prejudice basis to demonstrate the parameters for a revised roundabout

I would welcome your comments as soon as possible

Regards

[redacted] SCP LTD



CURRENT PROPOSALS

Singleton Clamp
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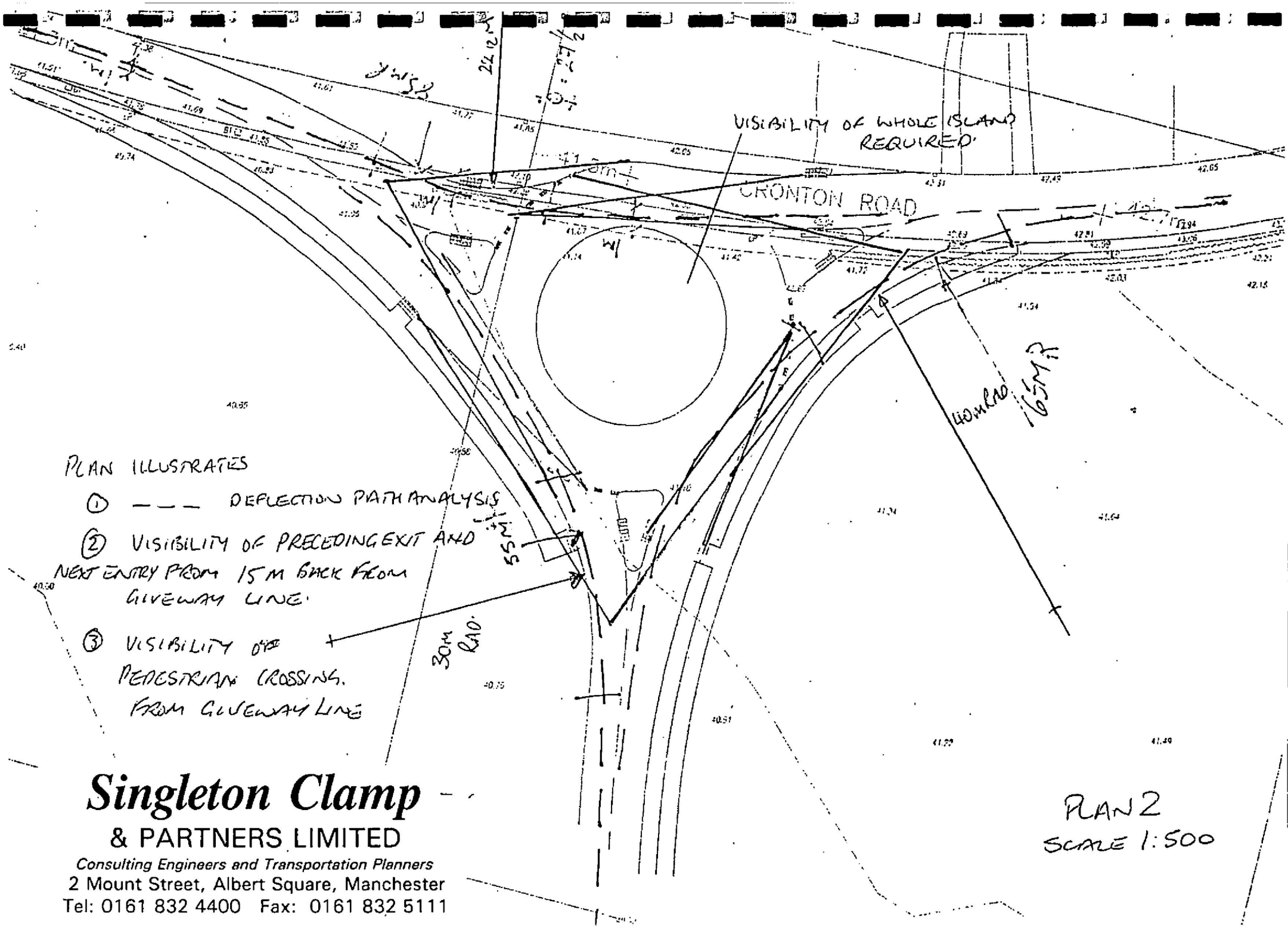
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester
Tel: 0161 832 4400 Fax: 0161 832 5111

EXISTING PROPOSAL.

PLAN. 1
SCALE 1:500



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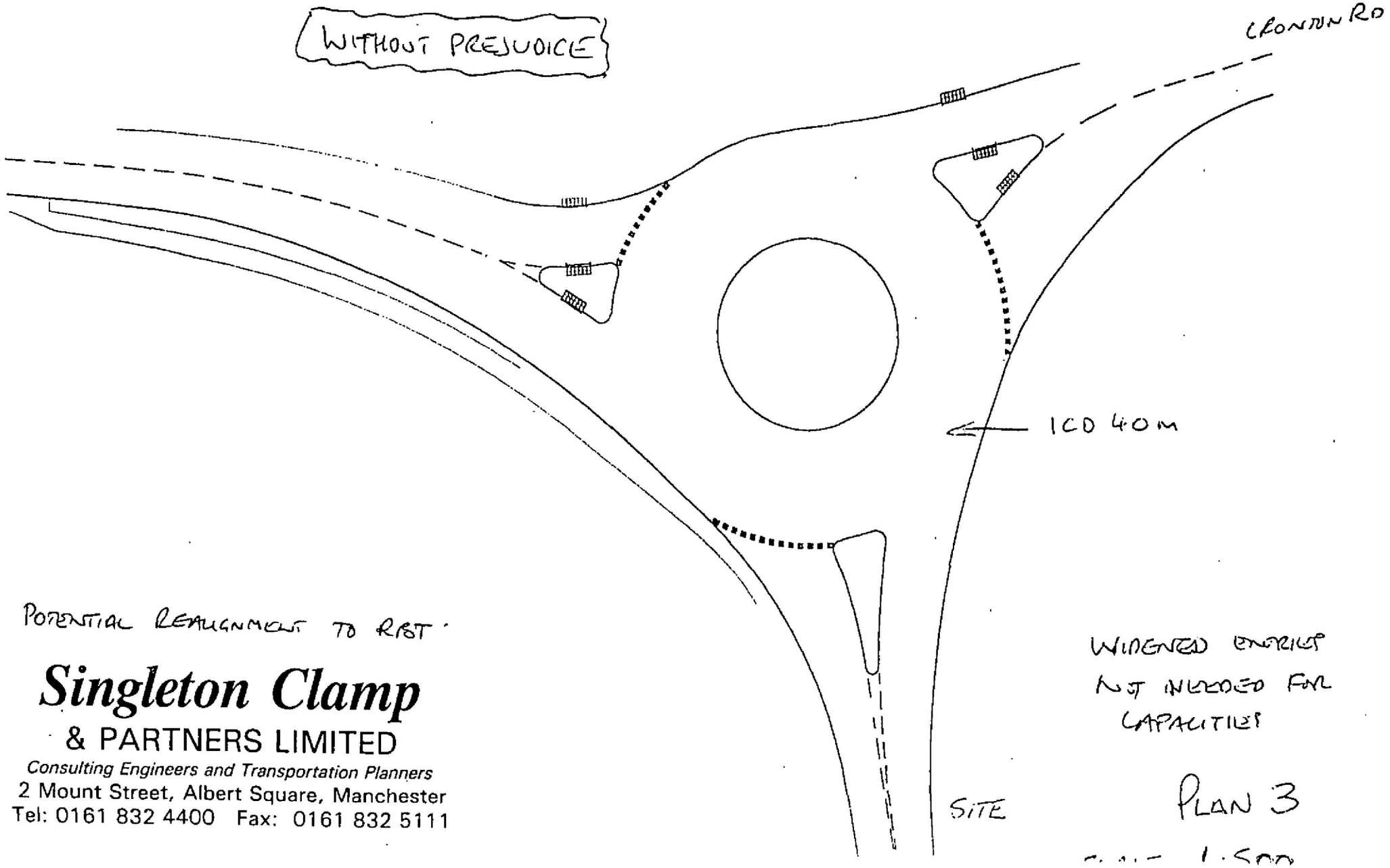
PLAN 2
SCALE 1:500

WITHOUT PREJUDICE



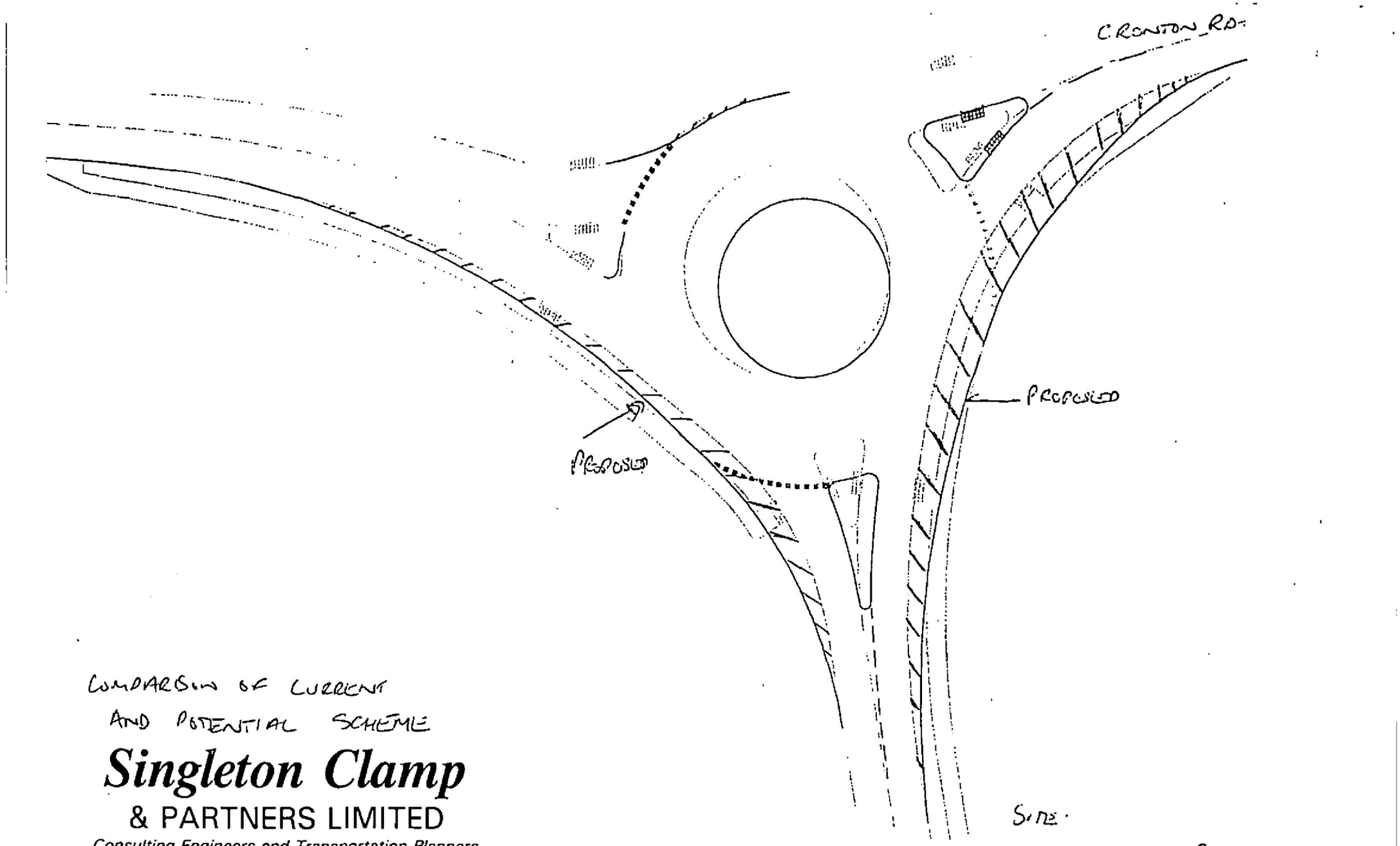
POTENTIAL REALIGNMENT TO R/BT.

WIDENED ENTRIES NOT NEEDED FOR CAPACITIES

PLAN 3

SCALE 1:500

Singleton Clamp
& PARTNERS LIMITED
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester
Tel: 0161 832 4400 Fax: 0161 832 5111



COMPARISON OF CURRENT AND POTENTIAL SCHEME

Singleton Clamp
& PARTNERS LIMITED
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester
Tel: 0161 832 4400 Fax: 0161 832 5111

PLAN 4
SCALE 1:500

APPENDIX 8

KNOWSLEY
APPRAISAL.

MEMORANDUM

To: DAVE WHITTLESTON *Your Ref:*

From: MARGARET MILLS
DPD Des Con

Our Ref: DC/MM

Date: 10th November 2000

Subject: **UPTON ROCKS ROUNDABOUT CHECK**

Dave,

I have completed the geometric checks for the above roundabout and summarise the results below

Geometry

Arm A – CRONTON ROAD, SOUTHBOUND

- The entry radius is 24m, but should lie within the range of 10-20m. These results provide inadequate entry deflection.
- The entry path curvature is 134m, but should not exceed 100m.
- Design Minimum Stopping Distance for Pedestrian crossing Visibility, this cannot be checked as some of the crossing details do not appear on the drawing.
- The entry angle is 78.75 degrees, this exceeds the maximum 60 degrees so therefore fails on this aspect.

Arm B – LINK ROAD, EASTBOUND

- The entry angle is calculated at 81.50 degrees, but should lie within 20-60 degrees, best would be 30 degrees.
- The entry radius is 47m, but should lie within the range of 10-20m. These results provide inadequate entry deflection.
- Taper length of exit is 5.77m. Design manual states that a minimum of 6.0m should be provided to allow for traffic to pass in the event of a vehicle breakdown.
- Design Minimum Stopping Distance for Pedestrian crossing Visibility, this cannot be checked as some of the crossing details do not appear on the drawing.

Arm C – CRONTON ROAD, NORTHBOUND

- The entry radius is 35.40m, but should lie within the range of 10-20m. These results provide inadequate entry deflection.
- Taper length of exit is 5.45m. Design manual states that a minimum of 6.0m should be provided to allow for traffic to pass in the event of a vehicle breakdown.
- The entry angle is calculated at 75.75 degrees, this exceeds the maximum 60 degrees so therefore fails on this aspect.
- Design Minimum Stopping Distance for Pedestrian crossing Visibility, this cannot be checked as some of the crossing details do not appear on the drawing.

JRB
c:\windows\temp\rdbtmemo101100.doc

If you require any further information please do not hesitate to contact me on the above extension.

.....
ENGINEERING TECHNICIAN

JRB
c:\windows\temp\rdbtmemo101100.doc

APPENDIX 9

WB/LW1/00021
15 November 2000

The Director
Knowsley Borough Council
Archway Road
Huyton
Merseyside
L36 9FB

FAO: Mr D Whittlestone

Dear Sir

CRONTON ROAD ROUNDABOUT, UPTON ROCKS

I write further to your Email dated 10/11/00 which contained the technical appraisal carried out by your consultancy. I have spoken with our client and would like to register our concern regarding the length of time taken to respond to our designs.

Our scheme was issued on 18th August 2000 with a subsequent Email of the layout sent on 27th September 2000. Your appraisal was not received until 10th November 2000. Your appraisal is, in our opinion, factually incorrect and misleading.

I enclose our technical appraisal of the roundabout which demonstrates that aside from a minor issue relating to exit widths the roundabout fully complies with the design guidance given in TD16/93.

As you will be aware the planning application for the roundabout was submitted a considerable time ago.

I consider that a meeting would be the best way to progress this scheme and I will contact you.

Your urgent attention to the enclosed would be appreciated.

Yours faithfully,

W Booker
For SINGLETON CLAMP AND PARTNERS LIMITED

CC: S Bradshaw
Redrow Homes

Proposed Roundabout Upton Rocks Link Road SCP Comments Upon Technical Check By Knowlsey MBC

General

TD16/93 is a document produced by the Highways Agency and relates directly to Trunk Road design. The use of the document by highway authorities, such as Knowlsey, is commended by the Highways Agency.

Geometry

Entry Radius

The assertion that the entry radius should lie within the range 10m – 20m is incorrect. With respect to the geometry of this roundabout, TD 16/93 states:

1. minimum entry radius should be no less than 6m
2. where designed to cater for HGV's, entry radii should not be less than 10m
3. good practical design is about 20m
4. it is generally not possible to provide entry deflection for approaches with entry radii of 100m or more

Entry radii for all approaches, are no less than 22m and no greater than 52m. Clearly these radii are well within the parameters outlined above and specified in TD16/93.

Entry Angle

In terms of entry angle the figures stated by Knowsley are incorrect, Plan 4 illustrates the correct entry angles. Again with respect to the geometry of this roundabout TD 16/93 states:

1. the angle should if possible lie within the range between 20 and 60 degrees
2. for this roundabout, since the distance between the offsides of the entries and exits on all approaches is in excess of 30m, the entry angle should be measured as prescribed in Figure 7/5 of TD16/93 Ref para 7.6.

Based on the above, Plan 4 shows entry angles for all approaches, are within 20 to 60 degrees.

Entry Path Curvature

TD 16/93 states entry path curvature should not exceed 100m, Plan 4 illustrates that the entry path curvature of the Cronton Road (arm A) approach is approximately 40m, well below 100m.

Pedestrian Crossings

The crossing points illustrated on the plan, are not intended to be formal Pedestrian Crossings, but are merely advisory crossing places with dropped kerbs and as such the standards referred to do not apply. In any event the stated criteria are met, see plan 4.

Exit Widths

These will be amended as requested, with minimal impact upon the development.

APPENDIX 10

Paul Miller

From: Moorhouse, Steve DPD <steve.moorhouse.dpd@knowsley.gov.uk>
To: 'Singleton Clamp' <consult@singletonclamp.co.uk>
Cc: Wilkinson, Terry DPD <terry.wilkinson.dpd@knowsley.gov.uk>; Whittleston, Dave DPD <dave.whittleston.dpd@knowsley.gov.uk>
Sent: 28 November 2000 13:30
Subject: RE: Upton Rocks

Thank you for the revised drawing of the roundabout. (Plan 6)

I confirm that all our initial concerns have been resolved and the roundabout is approved with regard to the geometry.

Regards

Steve Moorhouse

-----Original Message-----
From: Singleton Clamp [SMTP:consult@singletonclamp.co.uk]
Sent: 23 November 2000 12:04
To: steve.moorhouse.dpd
Subject: Upton Rocks

Please find attached Plan 6, whic as discussed addresses your concerns with Plan 4. << File: PLAN6.dwg >>
This e-mail and any attachments are confidential and may also be privileged. If you are not the intended recipient you should not copy or use any part of it or disclose its contents to any person. If you have received it in error please notify the sender immediately.

This e-mail and any attachments are believed to be virus free but it is the recipient's responsibility to ensure that they are.

Written approval roundabout and on letter head.

28/11/00

APPENDIX 11

FILE

PMD/00021
29 November 2000

The Director
Knowsley Borough Council
The Department of Planning & Development
Transportation & Environmental Strategy Division
Archway Road
Huyton
L36 9FB

For the attention of Jill Nixon

Dear Sir,

LAND AT UPTON ROCKS, CRONTON.

Further to our recent correspondence with Steve Moorhouse, in which he confirms that the in terms of geometry, the design of the proposed roundabout on Cronton Road at its junction with the proposed distributor road is satisfactory. We have now tested the roundabout for capacity, analyses have been undertaken for both the AM and PM peak periods for a design year of 2015.

The traffic flows used for the analysis, are those previously agreed in our letter dated 10th August 2000 and relate to a design year of 2015 based on NRTF high growth. Flow diagrams for the morning and evening peak periods, are attached as Appendix 12 REV A (as referred to in our 10th August 2000 letter)

Plan 6 illustrates the geometry's measured and used for the ARCADY5 analysis.

The results are presented in Table 1 below, the full ARCADY5 outputs are attached as Appendix A.

Cont/d.....2

2015	AM Peak		PM Peak	
	RFC	Q	RFC	Q
Cronton Rd East	0.556	1.2	0.760	3.1
Distributor Rd	0.729	2.6	0.375	0.6
Cronton Rd West	0.463	0.9	0.565	1.3

Table 1

As can be seen from Table 1, ARCADY5 predicts that even in 2015 and assuming high growth. The proposed roundabout will operate well within capacity, RFC values on all arms during both peak periods being well below the practical capacity of 0.85. Queues are also minimal.

Should you have any queries regarding the above please do not hesitate to contact me. Your earliest attention In respect of this matter would be greatly appreciated.

Yours sincerely,

P. McDowell
For SINGLETON CLAMP & PARTNERS LIMITED

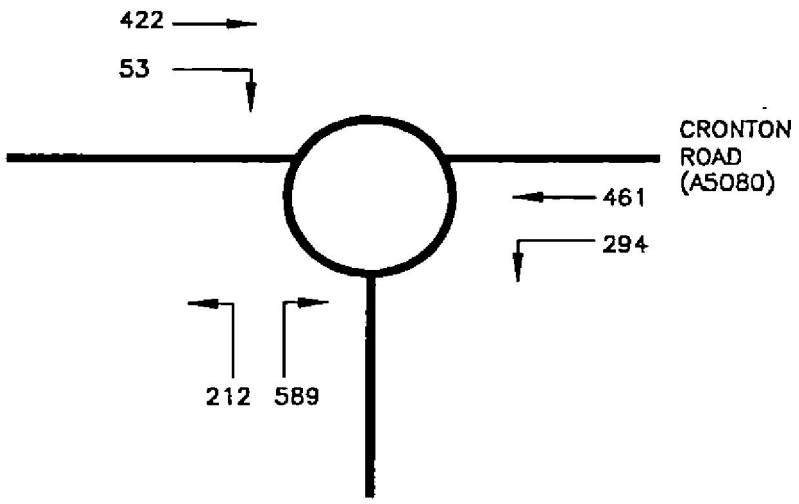
Cc - Stanley Bradshaw Redrow Homes (Lancashire) Ltd
Dave Whittlestone Knowsley Borough Council

Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners
2 Mount Street, Albert Square, Manchester, M2 5WQ Tel: 0161-832-4400

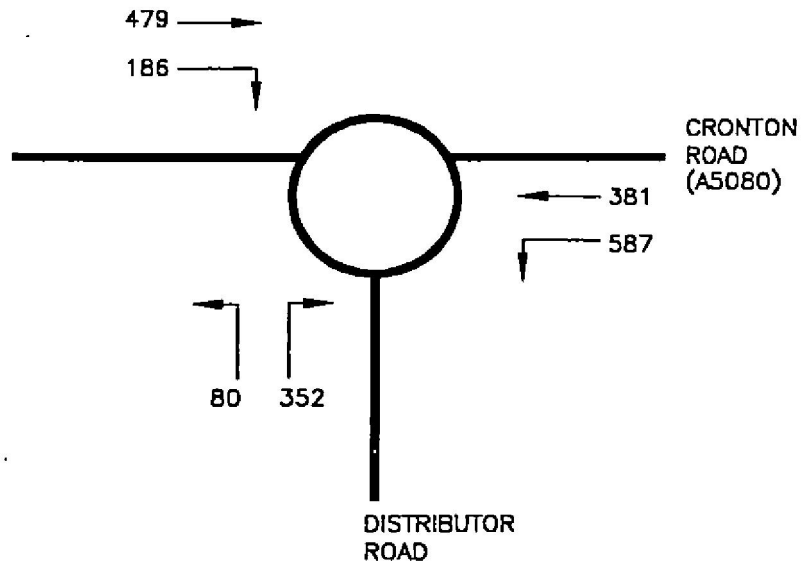
APPENDIX 12 REV A

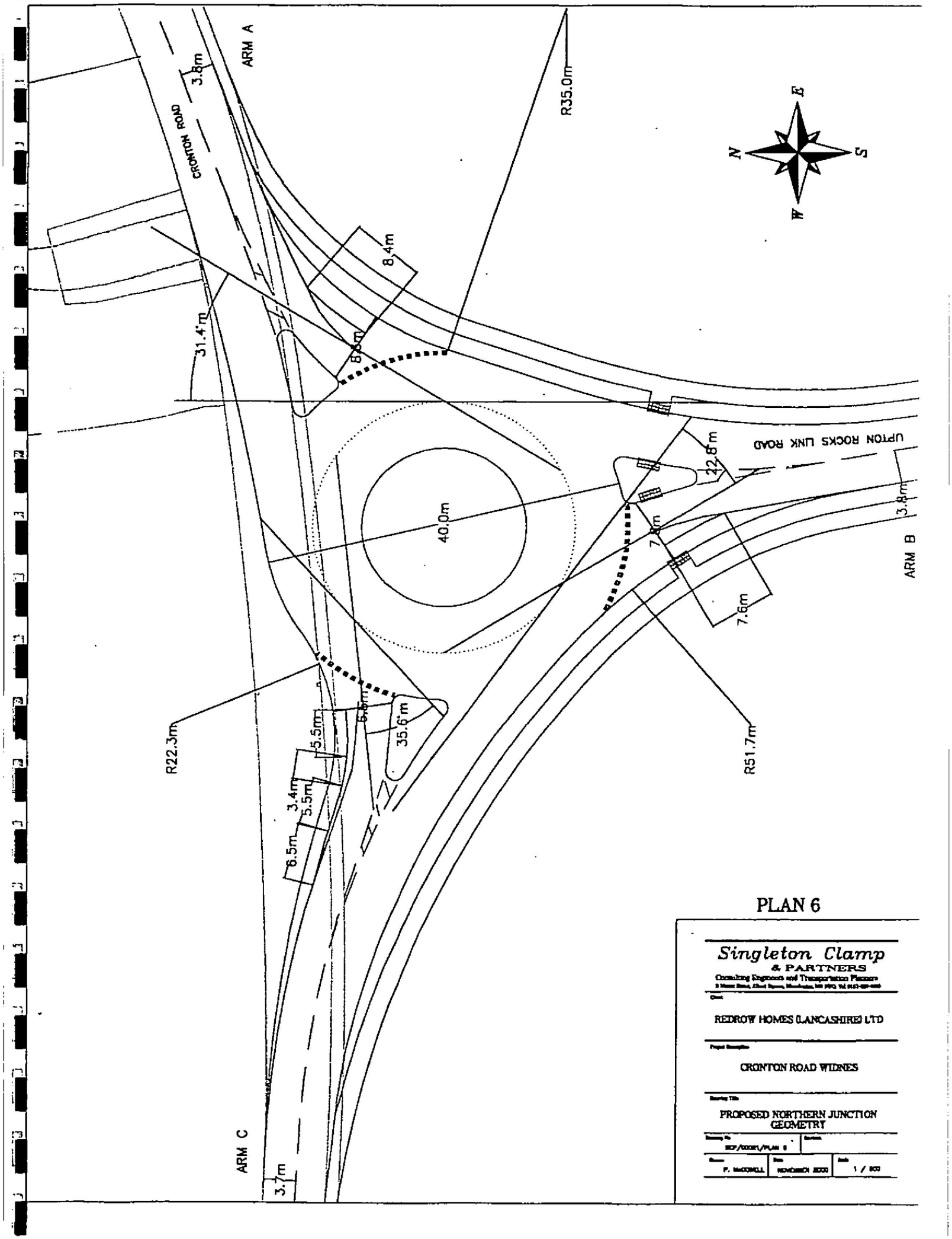
DESIGN FLOWS
YEAR 2015
HIGH GROWTH

AM PEAK HOUR
(08.00 – 09.00)



PM PEAK HOUR
(17.00 – 18.00)





PLAN 6

Singleton Clamp
& PARTNERS
Consulting Engineers and Transportation Planners

REDROW HOMES (LANCASHIRE) LTD

CRONTON ROAD WIDNES

PROPOSED NORTHERN JUNCTION GEOMETRY

SCP/XXXX/PLAN 6		
P. McCONELL	NOVEMBER 2000	1 / 500

Appendix A

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

ADAPTED FROM ARCADY/3 WHICH IS CROWN COPYRIGHT
BY PERMISSION OF THE CONTROLLER OF HMSO

FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
TRL SOFTWARE BUREAU
TEL: CROWTHORNE (01344) 770758, FAX: 770864
EMAIL: SoftwareBureau@trl.co.uk

THE USER OF THIS COMPUTER PROGRAM FOR THE SOLUTION OF AN ENGINEERING PROBLEM IS
IN NO WAY RELIEVED OF HIS RESPONSIBILITY FOR THE CORRECTNESS OF THE SOLUTION

Run with file:- "C:\Paul's Stuff\00\00021 Upton Rocks\Plan 6 cronton rd upton rocks am 2015.vai" at 14:28:35 on Wednesday, 29

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road/Distributor Road AM Peak 2015 High Growth

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.80	8.30	8.40	35.00	40.00	31.4	0.643	28.006
ARM B	3.80	7.80	7.60	51.70	40.00	22.8	0.657	28.184
ARM C	3.70	6.50	20.90	22.30	40.00	35.6	0.636	28.171

V = approach half-width L = effective flare length D = inscribed circle diameter
E = entry width R = entry radius PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	9.44	14.16	9.44
ARM B	15.00	45.00	75.00	10.01	15.02	10.01
ARM C	15.00	45.00	75.00	5.94	8.91	5.94

TIME	FROM/TO	ARM A	ARM B	ARM C
07.45 - 09.15				
	ARM A	0.000	0.389	0.611
		0.0	294.0	461.0
		(10.0)	(10.0)	(10.0)
	ARM B	0.735	0.000	0.265
		589.0	0.0	212.0
		(10.0)	(10.0)	(10.0)
	ARM C	0.888	0.112	0.000
		422.0	53.0	0.0
		(10.0)	(10.0)	(10.0)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00								
ARM A	9.44	25.04	0.377		0.0	0.6	8.8	
ARM B	10.01	21.85	0.458		0.0	0.8	12.1	
ARM C	5.94	20.96	0.283		0.0	0.4	5.7	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
ARM A	11.27	24.95	0.452		0.6	0.8	12.0	
ARM B	11.96	21.11	0.566		0.8	1.3	18.6	
ARM C	7.09	20.04	0.354		0.4	0.5	8.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
ARM A	13.80	24.84	0.556		0.8	1.2	17.9	
ARM B	14.64	20.10	0.729		1.3	2.6	35.8	
ARM C	8.68	18.81	0.462		0.5	0.8	12.3	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
ARM A	13.80	24.84	0.556		1.2	1.2	18.6	
ARM B	14.64	20.09	0.729		2.6	2.6	39.1	
ARM C	8.68	18.77	0.463		0.8	0.9	12.8	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
ARM A	11.27	24.95	0.452		1.2	0.8	12.8	
ARM B	11.96	21.09	0.567		2.6	1.3	20.9	
ARM C	7.09	19.98	0.355		0.9	0.6	8.5	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.00-09.15								
ARM A	9.44	25.03	0.377		0.8	0.6	9.3	
ARM B	10.01	21.83	0.459		1.3	0.9	13.2	
ARM C	5.94	20.92	0.284		0.6	0.4	6.1	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.6	*
08.15	0.8	*
08.30	1.2	*
08.45	1.2	*
09.00	0.8	*
09.15	0.6	*

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.8	*
08.15	1.3	*
08.30	2.6	***
08.45	2.6	***
09.00	1.3	*
09.15	0.9	*

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.4	
08.15	0.5	*
08.30	0.8	*
08.45	0.9	*
09.00	0.6	*
09.15	0.4	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A	1035.3	690.2	79.4	0.08	79.4	0.08
B	1098.3	732.2	139.8	0.13	139.8	0.13
C	651.3	434.2	53.5	0.08	53.5	0.08
ALL	2784.9	1856.6	272.6	0.10	272.7	0.10

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 14:28:56 on 29/11/00]

TRANSPORT RESEARCH LABORATORY

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CAPACITIES, QUEUES AND DELAYS AT ROUNDABOUTS

ARCADY 5.0 ANALYSIS PROGRAM
RELEASE 1.0 (APR 2000)

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Run with file:- "C:\Paul's Stuff\00\00021 Upton Rocks\Plan 6 cronton rd upton rocks pm 2015.vai" at 14:30:34 on Wednesday, 29 ·

ROUNDABOUT CAPACITY AND DELAY

RUN TITLE

Cronton Road/Distributor Road PM Peak 2015 High Growth

INPUT DATA

ARM A - Cronton Road East
ARM B - Distributor Road
ARM C - Cronton Road West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.80	8.30	8.40	35.00	40.00	31.4	0.643	28.006
ARM B	3.80	7.80	7.60	51.70	40.00	22.8	0.657	28.184
ARM C	3.70	6.50	20.90	22.30	40.00	35.6	0.636	28.171

V = approach half-width
E = entry width
L = effective flare length
R = entry radius
D = inscribed circle diameter
PHI = entry angle

TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 16.45 AND ENDS 18.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	12.10	18.15	12.10
ARM B	15.00	45.00	75.00	5.40	8.10	5.40
ARM C	15.00	45.00	75.00	8.31	12.47	8.31

TIME	FROM/TO	ARM A	ARM B	ARM C
16.45 - 18.15				
	ARM A	0.000	0.606	0.394
		0.0	587.0	381.0
		(10.0)	(10.0)	(10.0)
	ARM B	0.815	0.000	0.185
		352.0	0.0	80.0
		(10.0)	(10.0)	(10.0)
	ARM C	0.720	0.280	0.000
		479.0	186.0	0.0
		(10.0)	(10.0)	(10.0)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
16.45-17.00								
ARM A	12.10	23.97	0.505		0.0	1.0	14.6	
ARM B	5.40	22.51	0.240		0.0	0.3	4.6	
ARM C	8.31	22.82	0.364		0.0	0.6	8.3	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.00-17.15								
ARM A	14.45	23.68	0.610		1.0	1.5	22.2	
ARM B	6.45	21.90	0.294		0.3	0.4	6.1	
ARM C	9.93	22.27	0.446		0.6	0.8	11.7	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.15-17.30								
ARM A	17.70	23.28	0.760		1.5	3.0	42.0	
ARM B	7.90	21.07	0.375		0.4	0.6	8.7	
ARM C	12.16	21.53	0.565		0.8	1.3	18.5	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.30-17.45								
ARM A	17.70	23.27	0.760		3.0	3.1	46.0	
ARM B	7.90	21.05	0.375		0.6	0.6	8.9	
ARM C	12.16	21.52	0.565		1.3	1.3	19.3	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.45-18.00								
ARM A	14.45	23.67	0.610		3.1	1.6	25.1	
ARM B	6.45	21.86	0.295		0.6	0.4	6.4	
ARM C	9.93	22.26	0.446		1.3	0.8	12.5	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
18.00-18.15								
ARM A	12.10	23.96	0.505		1.6	1.0	16.0	
ARM B	5.40	22.48	0.240		0.4	0.3	4.8	
ARM C	8.31	22.81	0.364		0.8	0.6	8.9	

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	1.0	*
17.15	1.5	**
17.30	3.0	***
17.45	3.1	***
18.00	1.6	**
18.15	1.0	*

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.3	
17.15	0.4	
17.30	0.6	*
17.45	0.6	*
18.00	0.4	
18.15	0.3	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.6	*
17.15	0.8	*
17.30	1.3	*
17.45	1.3	*
18.00	0.8	*
18.15	0.6	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	1327.3	884.9	165.9	0.12	165.9	0.12
B	592.4	394.9	39.7	0.07	39.7	0.07
C	911.9	607.9	79.1	0.09	79.1	0.09
ALL	2831.6	1887.7	284.6	0.10	284.6	0.10

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

****** ARCADY 5 run completed.

end of file

[Printed at 14:30:46 on 29/11/00]

APPENDIX 12

KNOWSLEY
METROPOLITAN BOROUGH

Department of Planning and Development

Deputy Chief Executive & Director of Planning and Development
Graham Smith B Sc Dip MS C Eng MICE MIHT

Singleton Clamp & Partners
Consulting Engineers
2 Mount Street
Albert Square
Manchester
M2 5WQ

Our Ref: TES/TM/DW

23 April 2001

For the attention of Mr Paul McDowell

Dear Sirs

LAND AT UPTON ROCKS, CRONTON

Further to the recent telephone conversations with Dave Whittleston, and to Steve Moorhouse's fax to you dated 28 November 2000, I can confirm that Plan 6 has been approved in terms of geometry, and also, the outstanding TIA work has satisfactorily been resolved.

If you require any further information or assistance please do not hesitate to contact Dave Whittleston on 0151 443 2229.

Yours faithfully

RECEIVED
25 APR 2001

IAN CHATTEN
Principal Traffic Engineer

ab
(upton-rocks.doc)

INVESTOR IN PEOPLE

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DRAWING