Dublin City
Baile Átha Cliath

Dublin Waste to Energy Project
Baseline Monitoring

Volume 3
Technical Appendices

COWI

January 2005

RPS mcos

DOCUMENT CONTROL SHEET

Client	Dublin City Council					
Project Title	Dublin Waste to Energy Project					
Document Title	Baseline Monitoring – Technical Appendices – Volume 3					
Document No.	MDE0133RP0001A02					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	-	-	-	6

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A02	Issue for Client Approval	RPS MCOS COWI Dublin City Council Dublin Transportation Office			Carnegie House Dun Laoghaire	Jan 2005

Dublin Waste to Energy

Baseline Environmental Study

Site Investigation & Topographical Surveys

PREAMBLE

This baseline report is for information purposes only and was prepared solely based on site surveys, measurements, investigations and other data collected over the period of the survey. The data supplied are warranted to be accurate for the dates and locations shown in the report. The report does not purport to interpolate between recorded data or to be necessarily representative of environmental conditions in locations or circumstances different to those encountered on the recorded dates and locations. Any opinions stated in the reports are not warranted.

Recipients of this document must conduct their own investigations, appraisals and due diligence procedures to satisfy themselves as to the soil, water, air or other environmental conditions required for the safe and timely completion of this project.

Approved

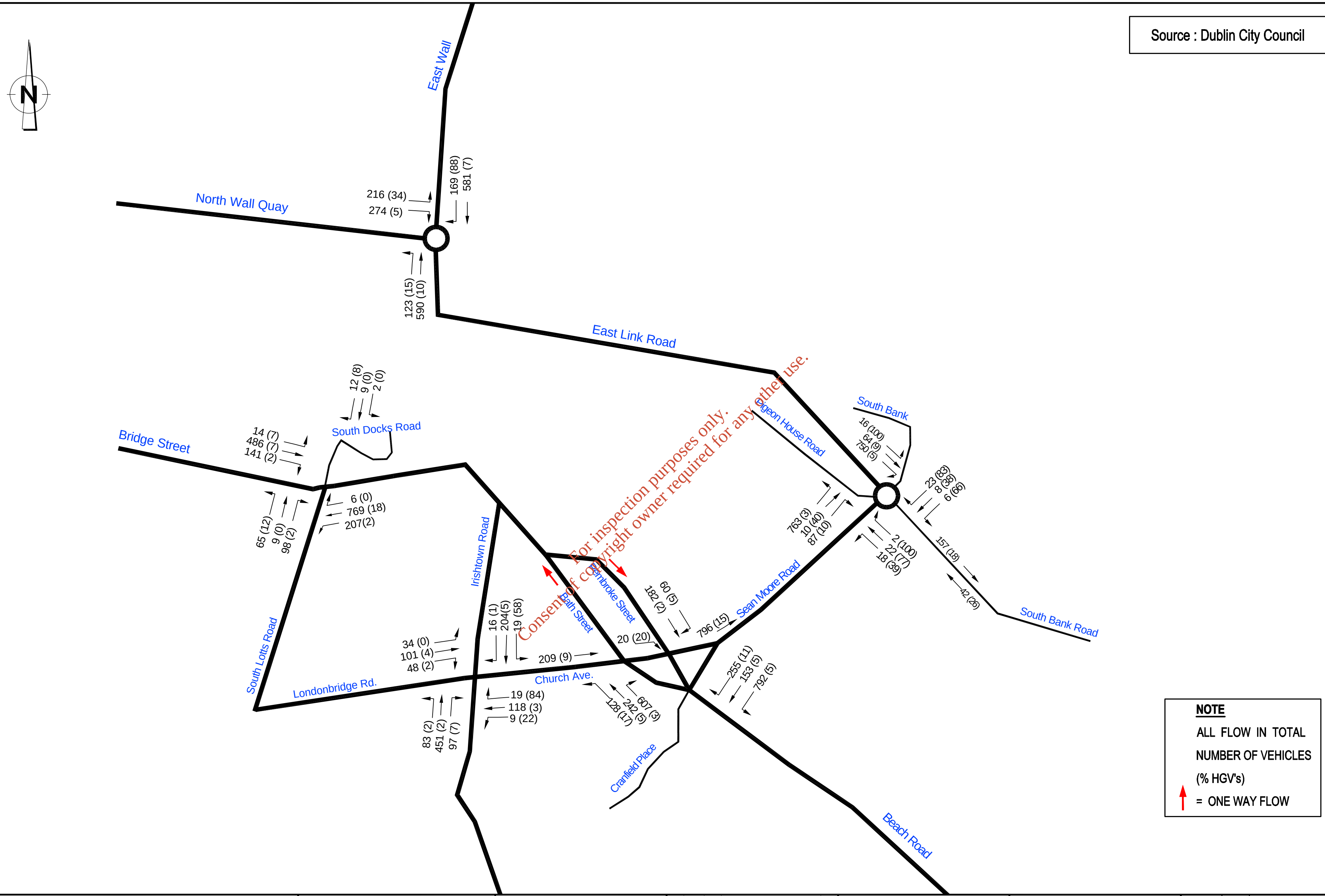
15.7.05

Volume 3 - Technical Appendices

TABLE OF CONTENTS

APPENDIX A

Figures



Source : Dublin City Council

Client:

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Baile Átha Cliath

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Dun Laoghaire,
Co. Dublin
T: +353 1 202 0870
F: +353 1 202 0707
E: rpsmcos@rpsgroup.ie
W: www.rpsmcos.ie

NOTES

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3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	Dn. / App.	Amendment / Issue	App.
A01	Apr.'04	MM / TE	ISSUE FOR APPROVAL	G.K.

Project:

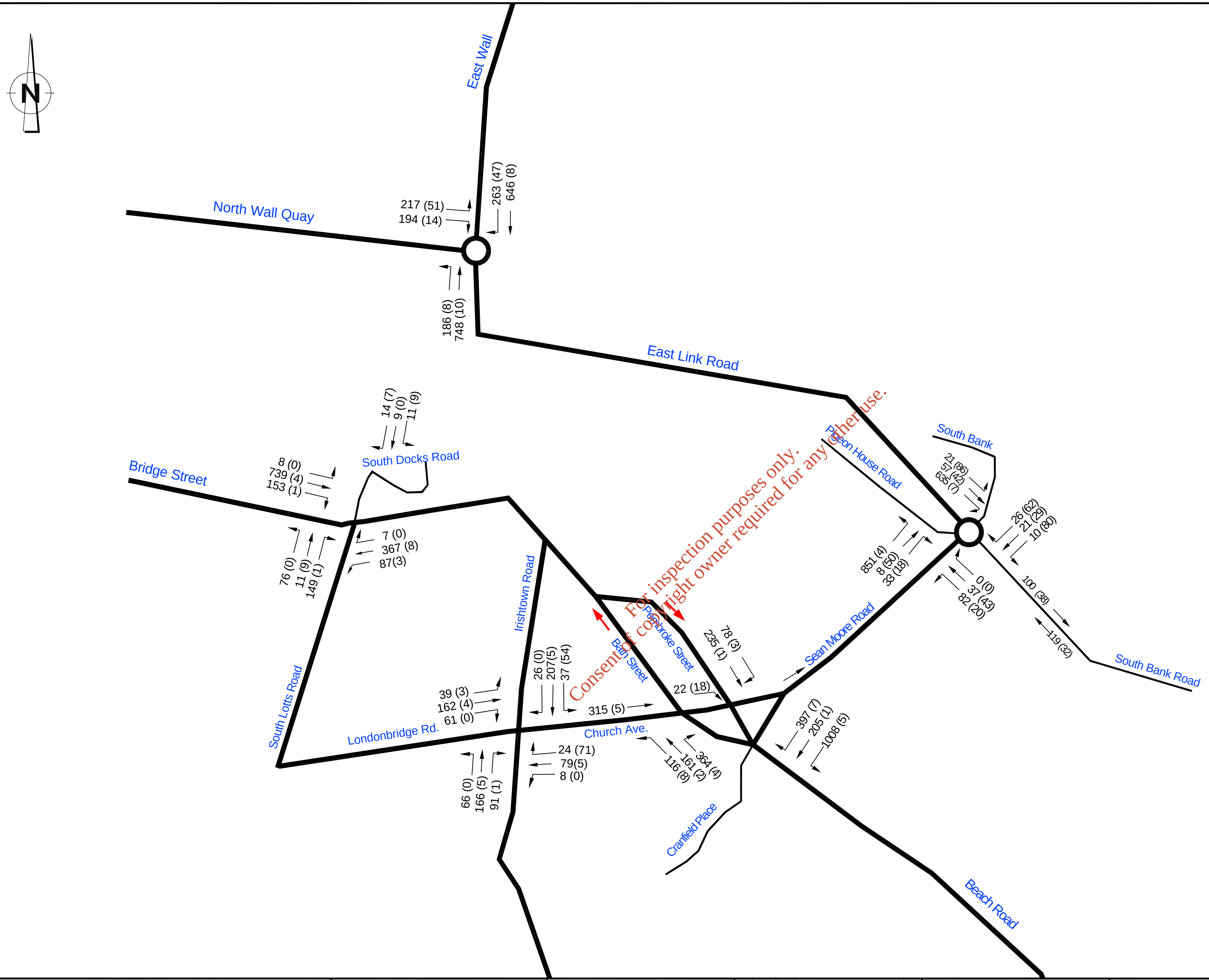
DUBLIN WASTE
TO ENERGY PROJECT

Title:

2003 EXISTING AM PEAK
TRAFFIC FLOWS

Drawn by: M.M.
Checked by: T.E.
Approved by: G.K.
Scale: N.T.S.
Date: Apr.'04
Job No: MDE0133
File No: MDE0133FIG00A1
Drg. No: A.1
Rev: A01

Source : Dublin City Council



NOTE

ALL FLOW IN TOTAL NUMBER OF VEHICLES

(% HGV's)

↑ = ONE WAY FLOW

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A01	Apr.'04	MM / TE	ISSUE FOR APPROVAL	G.K.

Project:

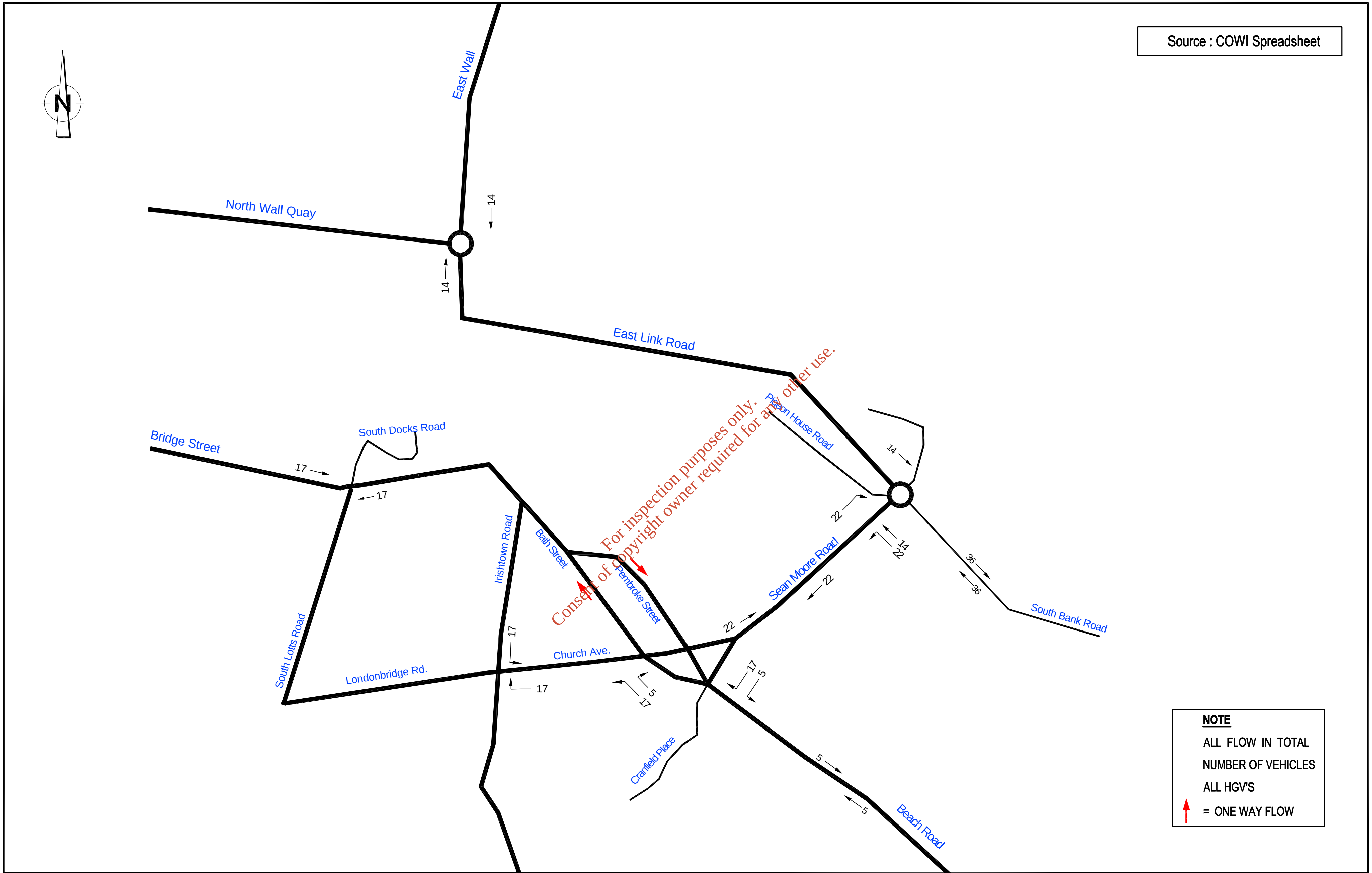
DUBLIN WASTE
TO ENERGY PROJECT

Title:

2003 EXISTING PM PEAK
TRAFFIC FLOWS

Drawn by: M.M.
Checked by: T.E.
Approved by: G.K.
Scale: N.T.S.
Date: Apr.'04
Job No: MDE0133
File No: MDE0133FIG00A2
Drg. No: A.2
Rev: A01

Source : COWI Spreadsheet



NOTE

ALL FLOW IN TOTAL

NUMBER OF VEHICLES

ALL HGV'S

↑ = ONE WAY FLOW

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No.	Date	Drn. App.	Amendment / Issue	App.
A01	Apr.'04	MM. T.E.	ISSUE FOR APPROVAL	G.K.

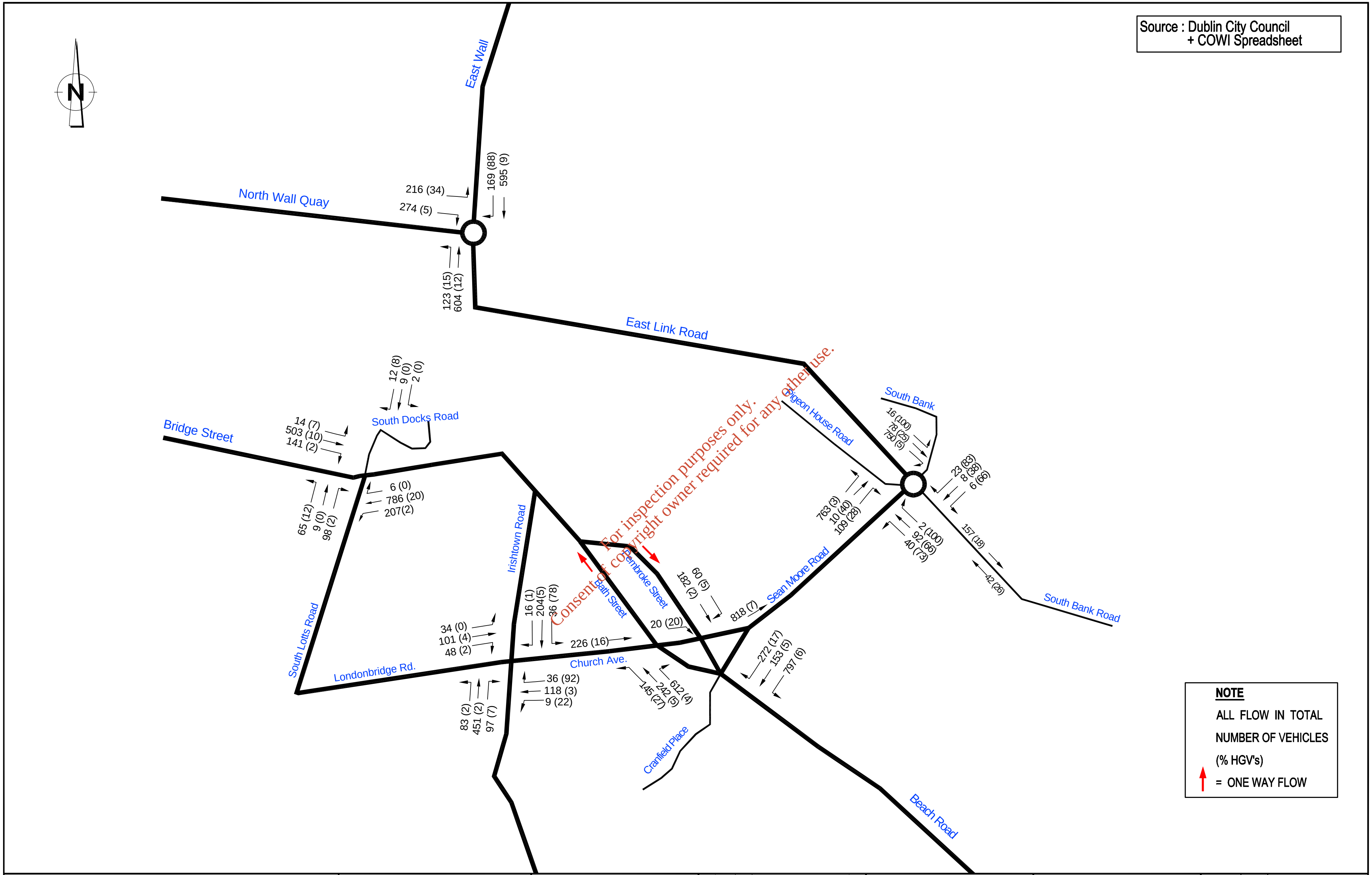
Project:

DUBLIN WASTE
TO ENERGY PROJECT

Title:

PEAK HOUR
"PLANT" TRAFFIC

Drawn by: M.N.
Checked by: T.E.
Approved by: G.K.
Scale: N.T.S.
Date: Apr.'04
Job No: MDE0133
File No: MDE0133FIG00A3
Drg. No: A.3
Rev: A01



Source : Dublin City Council
+ COWI Spreadsheet

NOTE

ALL FLOW IN TOTAL
NUMBER OF VEHICLES
(% HGV's)
↑ = ONE WAY FLOW

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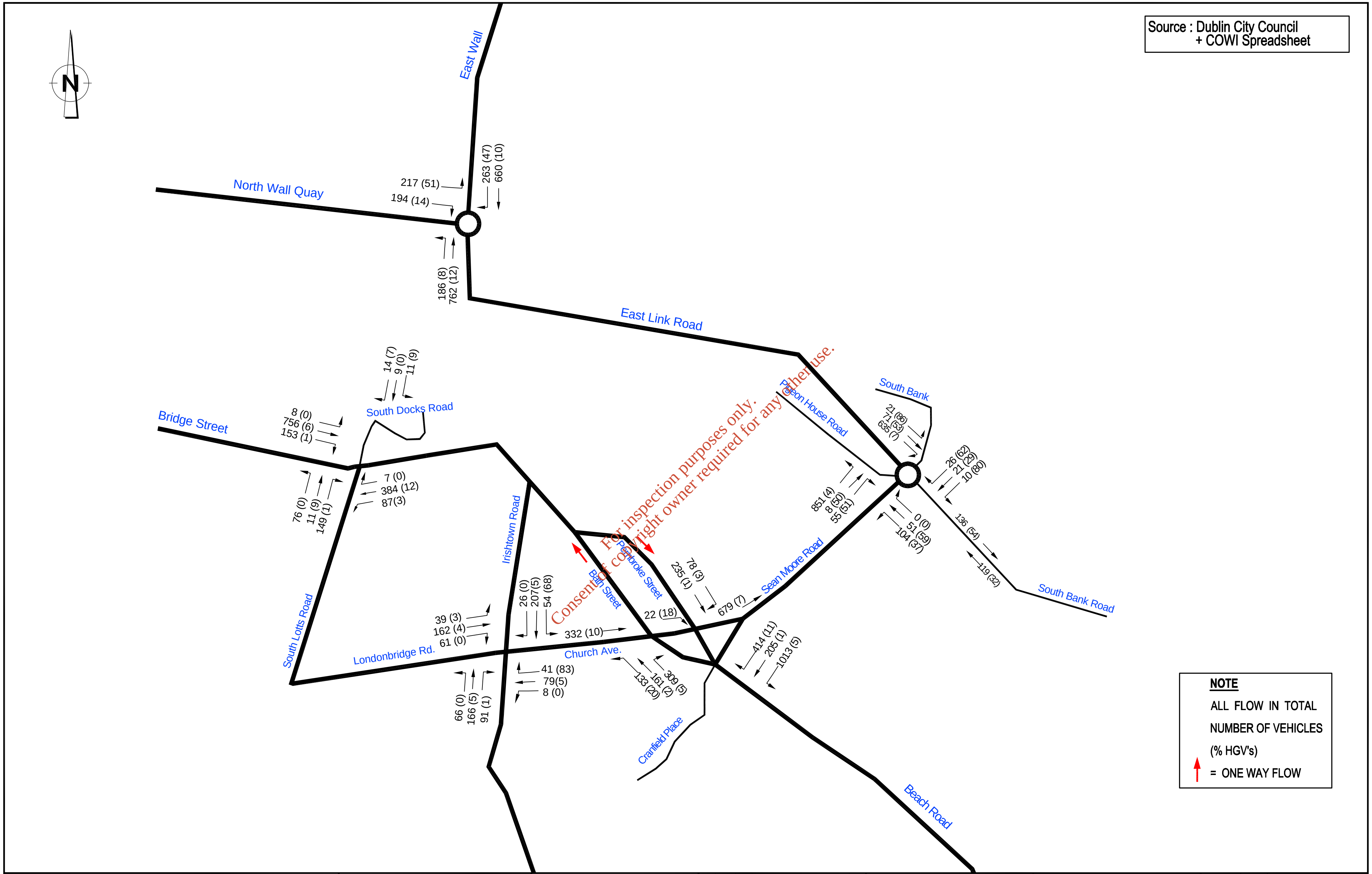
No.	Date	Dr. Ap.	Amendment / Issue	App.
A01	Apr.'04	MM T.E.	ISSUE FOR APPROVAL	G.K.

Project:
DUBLIN WASTE
TO ENERGY PROJECT

Title:
2003 EXISTING AM PEAK
TRAFFIC FLOWS
WITH "PLANT" TRAFFIC

Drawn by: M.M.
Checked by: T.E.
Approved by: G.K.
Scale: N.T.S.
Date: Apr.'04
Job No: MDE0133
File No: MDE0133FIG00A4
Drg. No: A.4
Rev: A01



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A01	Apr.'04	MM TE	ISSUE FOR APPROVAL	G.K.
No.	Date	Drn App.	Amendment / Issue	App.

Project:

DUBLIN WASTE
TO ENERGY PROJECT

Title:

2003 EXISTING PM PEAK
TRAFFIC FLOWS
WITH "PLANT" TRAFFIC

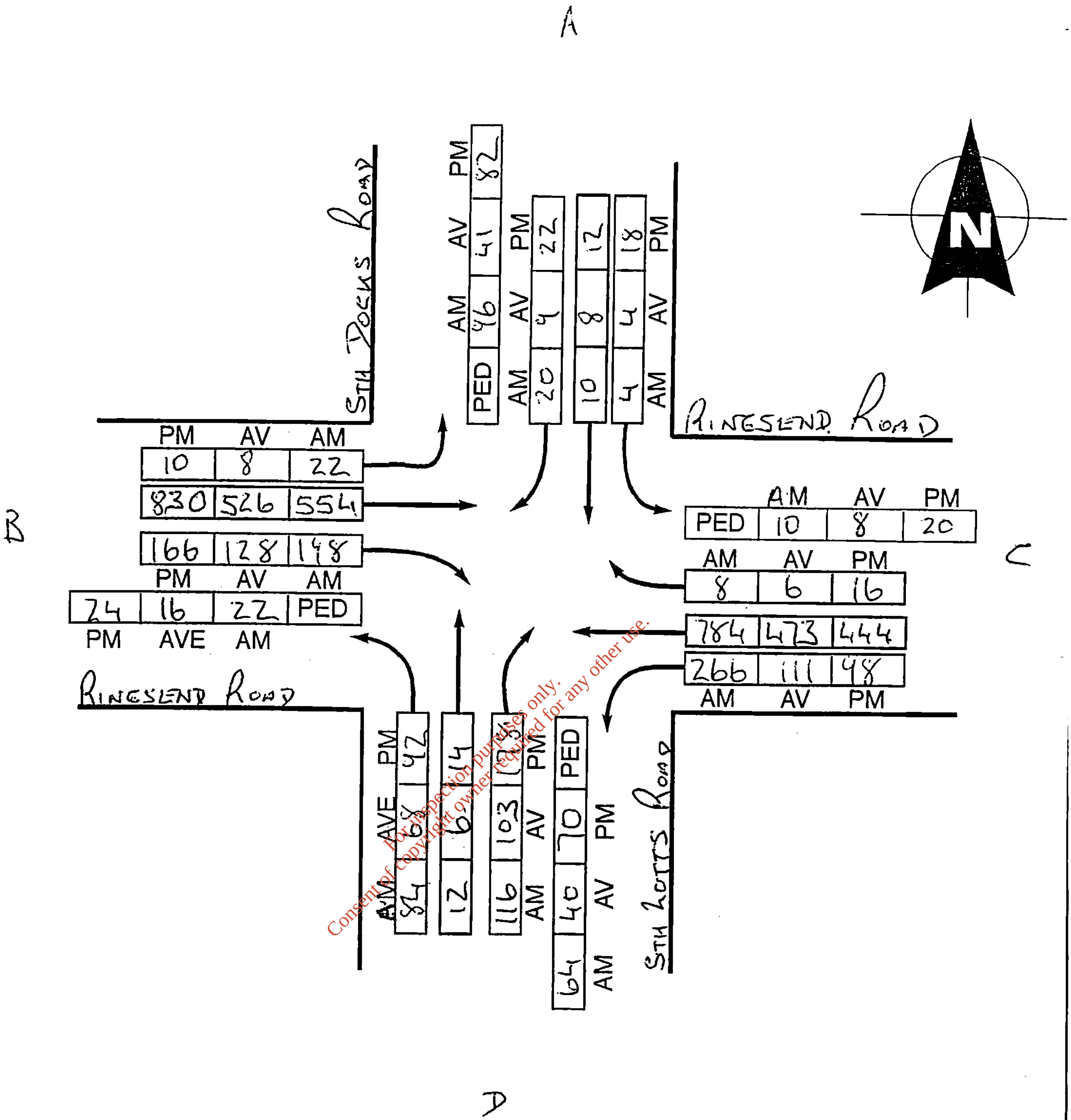
Drawn by: M.M.
Checked by: T.E.
Approved by: G.K.
Scale: N.T.S.
Date: Apr.'04
Job No: MDE0133
File No: MDE0133FIG00A5
Drg. No: A.5
Rev: A01

APPENDIX B

Full Details Of Traffic Counts

1. Dublin City 2003 Traffic Counts
2. Abacus Transportation Surveys 2004 Counts
3. Dublin Transportation Office Model Outputs
    - 2008 & 2023 Actual Flows (HGV & LGV)
      AM Peak, PM Peak, Off-Peak
    - 2008 Demand Flows (HGV & LGV)
      AM Peak, PM Peak, Off-Peak

DUBLIN CITY 2003 TRAFFIC COUNTS



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8

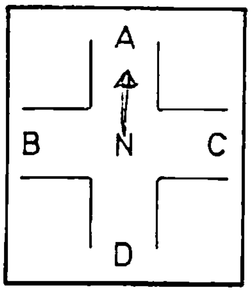
LOCATION

Ringsend Road - Sth Lotts Road

MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)

DATE	DAY	WEATHER
29-5-2003	Thursday	Fair

COUNT No. 2003/87

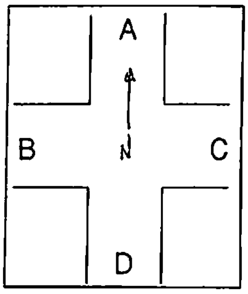


RINGSEND ROAD - STH LOTTS ROAD

DATE 24-5-2003 DAY Thursday WEATHER Fair

Carriageway Widths	A	B	C	D
		10m		

	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	Sth Docks Road				Ringsend Road				Ringsend Road				Sth Lotts Road			
¼ HR.TO	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
	1	2	2	5	1	42	59	152	20	184	1	210	12	2	15	29
	-	3	-	3	2	153	40	195	42	203	1	246	18	1	23	42
	-	2	4	6	7	124	26	157	45	180	1	226	13	4	25	42
9.00	1	2	6	9	4	126	32	162	80	164	2	246	19	2	27	48
	1	2	3	6	2	124	46	177	53	174	2	229	23	2	31	56
	-	2	2	4	3	122	45	170	32	171	2	206	12	-	14	31
	-	1	4	5	1	121	30	152	30	178	-	208	16	1	21	38
10.00	-	3	1	4	2	87	32	121	22	102	1	125	16	-	18	34
	1	3	2	6	2	84	32	118	20	98	2	120	17	-	15	32
	5	2	3	10	3	84	20	112	20	101	-	121	13	1	25	39
	2	-	-	2	2	78	16	96	20	94	-	114	10	3	19	32
11.00	1	1	-	2	2	74	27	103	22	94	-	116	12	-	20	32
	-	1	-	1	1	74	21	96	14	97	-	116	15	2	22	39
	-	2	3	5	3	102	25	130	24	121	1	146	16	-	18	34
	1	3	1	5	2	118	26	146	23	112	-	135	16	1	23	40
12.00	-	2	2	4	3	128	25	156	23	113	-	136	20	4	25	49
	1	1	-	2	1	145	34	180	26	109	1	136	14	-	23	42
	-	1	3	4	2	164	36	202	21	113	-	134	14	-	26	45
	-	4	1	5	1	133	39	173	30	128	4	162	12	3	32	47
13.00	2	2	1	5	3	165	40	208	24	100	-	124	11	2	20	33
	2	3	3	8	3	158	28	189	31	101	1	133	20	4	20	44
	-	2	3	5	2	168	36	206	28	101	2	131	14	1	14	39
	1	2	2	5	1	172	36	209	31	107	-	138	14	1	20	35
14.00	-	2	-	2	4	127	26	157	27	106	1	134	17	1	27	45
	2	1	2	5	5	120	34	159	28	112	5	135	18	2	22	42
	1	1	3	5	1	121	27	149	26	103	3	137	16	1	28	45
	1	1	4	6	4	144	19	167	30	116	6	152	12	1	25	38
15.00	-	3	4	7	2	127	37	166	28	108	3	139	16	4	21	41
	1	3	2	6	1	130	25	156	33	108	2	143	19	-	24	48
	1	3	2	6	3	119	24	141	27	107	5	134	15	3	31	49
	2	1	1	4	1	103	26	130	28	120	3	151	21	2	28	51
16.00	2	2	2	6	-	83	23	106	22	110	3	135	18	1	18	37
	1	-	3	4	1	93	27	121	24	115	2	141	14	4	23	41
	2	1	3	6	-	129	24	153	24	107	1	132	16	2	28	46
	-	3	4	7	1	172	29	202	21	88	-	109	18	1	28	47
17.00	2	1	3	6	-	181	29	210	22	97	-	119	14	1	38	58
	-	2	2	4	4	189	41	234	25	99	2	126	14	5	41	65
	3	4	4	11	1	189	36	226	24	101	3	128	13	2	48	63
	5	2	7	14	-	210	42	252	20	105	-	125	21	2	36	59
18.00	4	1	2	7	3	205	36	244	22	99	2	123	23	3	31	57
	2	3	1	6	2	180	46	228	18	107	6	131	23	2	32	57
18.30	1	1	-	2	2	168	37	207	16	95	1	112	23	1	26	50
TOTAL	50	83	97	230	88	5526	1350	6964	1173	4468	64	6210	716	63	1089	1868
AVERAGE	4	8	9	22	8	526	128	663	111	473	6	591	68	6	103	178



Ringsend Road Sth Lotts Road

DATE 24-5-2003 DAY Thursday WEATHER Fair

PEDESTRIAN COUNTS

1/4 HR. TO	CROSSING ON 'A'			CROSSING ON 'B'			CROSSING ON 'C'			CROSSING ON 'D'		
	Sth Docks Road			Ringsend Road			Ringsend Road			Sth Lotts Road		
	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
		11	11		2	2		-			15	15
		14	14	1	3	4		2	2	4	9	13
		20	20		4	4		3	3		17	17
9.00	6	22	28	2	5	7		2	2	1	14	15
		14	14		3	3		1	1	2	12	14
	2	10	12		2	2		1	1	1	9	10
	1	8	9	1	3	4	1	4	5	2	13	15
10.00	2	6	8		5	5		1	1		8	8
		7	7	1	6	7		2	2		6	6
		8	8		11	11		4	4	-	4	4
	1	7	8	1	8	9		2	2	-	3	3
11.00		3	3		2	2	-	3	3	-	7	7
		6	6		4	4		3	3		5	5
	1	7	8		3	3		-	-		7	7
		5	5		2	2		-	-		9	9
12.00		6	6	1	3	4	1	-	1		8	8
	1	9	10		5	5	3	2	5	1	10	11
		8	8	1	4	5	-	-	-		9	9
	2	9	11		3	3	2	-	2	5	7	12
13.00		8	8	1	7	8		2	2	2	10	12
		13	13	2	8	10		-	-	1	8	9
	2	7	9		5	5		-	-		11	11
		9	9	1	4	5	1	2	3		10	10
14.00	1	8	9		11	11		1	1	-	9	9
	-	8	8		2	2		2	3	-	7	7
	-	11	11		1	1		4	4		4	4
	-	9	9		1	1		3	3		7	7
15.00	-	5	5		1	1		1	1		4	4
		9	9		3	3		3	3	1	7	8
	-	6	6	-	3	3	-	4	4	2	9	11
		6	6		-	-		3	3		8	8
16.00	2	7	9		2	2		1	1	2	11	13
		5	5		3	3		3	3		7	7
		8	8	3	3	6		-	-	1	6	7
		7	7	1	4	5		1	1	-	10	10
17.00	1	8	9	-	3	3	-	2	2	-	8	8
		7	7		3	3	1	5	6		12	12
		10	10		-	-	1	3	4		14	14
	2	13	15		-	-		3	3		10	10
18.00	3	22	25	1	4	5		1	1		16	16
		16	16	1	6	7		2	2		16	16
18.30		13	13		3	3	2	-	2		19	19
TOTAL.	27	405	432	18	155	173	12	75	87	25	395	420
AVERAGE	2	38	41	1	14	16	1	7	8	2	37	40

CORPORATION, TRAFFIC DEPT.   TRAFFIC CENSUS AT JCT. OF Ringsend Road - Sth. Lotts Road

TRAFFIC FROM: Sth. Docks Road   DAY Thursday   DATE 29-5-2003   WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			1			1			2			2			2			2
8.30			-			-			3			3			-			-
8.45			-			-			2			2			4			4
9.00			1			1	1		2			2			4	1^{2}		6
9.15			1			1			2			2			3			3
9.30			-			-			2			2			2.			2
9.45			-			-	1		1			1			2	1^{2}		4
10.00			-			-			1	1^{2}		3			1			1
10.15			1			1			3			3			2			2
10.30			5			5			2			2			1	1^{2}		3
10.45			2			2			-			-			-			-
11.00			1			1			1			1			-			-
11.15			-			-			1			1			-			-
11.30			-			-			2			2			1	1^{2}		3
11.45			1			1			1	1^{2}		3			1			1
12.00			-			-			2			2			2			2
12.15			1			1			1			1			-			-
12.30			-			-			1			1			3.			3
12.45			-			-			2	1^{2}		4	1		1			1
13.00			2			2			2			2	.		1			1
13.15			2			2			3			3		1	1	1^{2}		3
13.30			-			-			2			2			3			3
13.45			1			1			2			2			2			2
14.00			-			-			2			2	2		-			-
14.15			2			2			1			1			2			2
14.30			1			1			1			1			1	1^{2}		3
14.45		1	1			1			1			1		1	2	1^{2}		4
15.00			-			-			3			3			2	1^{2}		4
15.15			1			1			1	1^{2}		3			2			2
15.30			1			1			1	1^{2}		3			-	1^{2}		2
15.45			2			2			1			1			1			1
16.00			2			2			2			2			2			2
16.15			1			1			-			-			1	1^{2}		3
16.30		1	2			2			1			1			3			3
16.45			-			-			3			3			2	1^{2}		4
17.00			2			2		1	1			1			3.			3
17.15			-			-			2			2			2			2
17.30			3			3			4			4			4			4
17.45			5			5	1	1	2			2			5	1^{2}		7
18.00			2	1^{2}		4			1			1			2			2
18.15			2			2			1	1^{2}		3			1			1
18.30			1			1			1			1			-			-
Totals for 10 Hours	-	2^{1}	47	1^{2}		50	3^{1}	2^{1}	69	6^{12}		83	3^{1}	2^{1}	71	12^{24}		97
Averages per Hour		-	4	-		4	-	-	6	-		8	-	-	6	1		9

TURNING LEFT TO: Irish Town.

STRAIGHT AHEAD TO: Sth Lotts Road

TURNING RIGHT TO: Pearse St.

CORPORATION, TRAFFIC DEPT. TRAFFIC CENSUS AT JCT. OF Ringsend Road - Sth Lotts Road

TRAFFIC FROM: Pearse Street DAY Thursday DATE 29-5-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			1			1	3	2	80	3	2	92		2	54	2		59
8.30			2			2	3	5	124	10	3	153			38	1		40
8.45			5	1		7	5	2	108	6	1	124			26			26
9.00			4			4	4	3	110	5	2	126		1	30	1		32
9.15			2			2	3	5	108	8	1	129			44	1		46
9.30			3			3	3	2	104	6	2	127			41	2		45
9.45			1			1	2	3	108	5	1	121	1	1	28	1		30
10.00			2			2	1	3	72	6	1	87	1		30	1		32
10.15			2			2	2	4	68	7	2	84			28	2		32
10.30			1	1		3	1	2	70	4	–	89			20			20
10.45			2			2	2	1	64	5	2	78			14	1		16
11.00			2			2	–	4	58	7	–	74			23	2		27
11.15			1			1	1	2	63	5	–	74			19	1		21
			1	1		3	3	2	76	11	1	102		2	20	1		25
11.45			2			2	4	3	88	12	2	118		1	24	1		26
12.00			1	1		3	2	4	96	14	1	128			21	2		25
12.15			1			1	1	6	122	7	3	145			28	3		34
12.30			2			2	2	5	134	12	2	164		1	32	2		36
12.45			1			1	2	6	118	4	2	133	1	2	34	2		39
13.00			3			3	3	4	134	12	2	165		1	36	2		40
13.15			3			3	5	7	138	6	2	158			28			28
13.30			2			2	4	7	142	9	2	168		1	34	1		36
13.45			1			1	5	6	146	10	1	172	1		32	2		36
14.00			4			4	1	3	106	9	1	127		1	24		1	26
14.15			3	1		5	4	4	97	8	2	120	1	1	30	2		34
14.30			1			1	2	3	106	7	–	121			25		1	27
14.45		2	3			4	1	3	113	14	1	144		2	18			19
15.00			2			2	4	3	104	6	2	127	1		24	4		37
15.15			1			1	2	3	119	5	–	130			25			25
			1	1		3	1	2	106	4	2	119		1	27	1		24
15.45			1			1	1	4	91	3	2	103			26			26
16.00			–			–	1	3	78	2	–	83			23			23
16.15			1			1	3	4	84	2	1	93			27			27
16.30			–			–	7	11	106	6	2	129	1		22	1		24
16.45			1			1	6	8	148	8	1	172		2	24	2		29
17.00	1		–			–	7	6	162	10	2	181			27	1		29
17.15			4			4	5	8	166	8	1	189			37	2		41
17.30			1			1	7	6	174	3	2	189			36			36
17.45			–				6	8	184	7	3	210			42			42
18.00			3			3	5	5	184	6	2	205			36			36
18.15			2			2	5	7	166	3	3	180	2		44	1		46
18.30			2			2	5	6	150	5	2	168	–	1	33	2		37
Totals for 10 Hours	1	2	75	6		88	134	185	4672	295	64	5526	9	20	1239	47	2	1350
Averages per Hour	–	–	7	–		8	12	17	445	28	6	526	–	2	118	4	–	128

TURNING LEFT TO: Sth. Yorks Road

STRAIGHT AHEAD TO: Irishtown

TURNING RIGHT TO: Sth Lotts Road

CORPORATION, TRAFFIC DEPT. TRAFFIC CENSUS AT JCT. OF Ringsend Road · Sth Lotts Road

TRAFFIC FROM: Irishtown. DAY Thursday DATE 24 · 5 · 2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15	2	1	18	1^{2}		20	2	2^{1}	160	12^{24}	2^{4}	189			1			1
8.30	8^{2}	2^{1}	39			42	5^{1}	1	178	10^{20}	2^{4}	203			1			1
8.45	6^{2}		37	3^{6}		45	14^{4}	1	152	10^{20}	2^{4}	180	1	.	1			1
9.00	3^{1}	4^{2}	75	1^{2}		80	11^{3}	3^{1}	146	6^{12}	1^{2}	164			2			2
9.15	2	3^{1}	52			53	10^{3}	3^{1}	153	7^{14}	2^{4}	174		.	2			2
9.30	6^{2}	2^{1}	29			32	6^{2}	4^{2}	155	3^{6}	3^{6}	171			–	1^{2}		2
9.45	3^{1}	2^{1}	24	2^{4}		30	6^{3}	4^{2}	148	8^{16}	.	178	1	.	–			-
10.00	2	3^{1}	21			22	6^{2}	1	88	4^{8}	2^{4}	102			1			1
10.15	1	3^{1}	14			20	3^{1}	2^{1}	84	5^{10}	1^{2}	98			–	1^{2}		2
10.30	1		18	1^{2}		20	2^{1}	5^{2}	80	7^{14}	2^{4}	101			–			-
10.45			20			20	1	4^{2}	78	6^{12}	1^{2}	94			–			-
11.00			22			22	1	3^{1}	81	5^{10}	1^{2}	94			–			-
11.15		1	19			19	1	4^{2}	83	5^{10}	1^{2}	97			–			-
:0	1		20	2^{4}		24	5^{1}	6^{3}	91	11^{22}	2^{4}	121			1			1
11.45	2		19	2^{4}		23	5^{1}	5^{2}	84	9^{18}	1^{2}	112			–			-
12.00	2	1	21	1^{2}		23	4^{1}	1	94	7^{14}	2^{4}	113			–			-
12.15	3^{1}	4^{2}	17	3^{6}		26	6^{2}	3^{1}	86	9^{18}	1^{2}	109			1			1
12.30	1		14	1^{2}		21	5^{1}	4^{2}	92	8^{16}	1^{2}	113			–			-
12.45		3^{1}	27	1^{2}		30	3^{1}	9^{4}	99	10^{20}	2^{4}	128			4			4
13.00	1	1	29			29	4^{1}	6^{3}	76	8^{16}	2^{4}	100			–			-
13.15	2	1	31			31	3^{1}	7^{3}	79	7^{14}	2^{4}	101			1			1
13.30		1	28			28	2	2^{1}	80	8^{16}	2^{4}	101			2			2
13.45	1	2^{1}	30			31	5^{1}	3^{1}	87	7^{14}	2^{4}	107			–			-
14.00		1	27			27	3^{1}	3^{1}	84	7^{14}	3^{6}	106			1			1
14.15		1	28			28	1	4^{2}	86	11^{22}	1^{2}	112			5			5
14.30		2^{1}	25			26	2	3^{1}	82	9^{18}	1^{2}	103			3			3
14.45		1	30			30	1	5^{2}	90	10^{20}	2^{4}	116			4	1^{2}		6
15.00			28			28	2	4^{1}	87	8^{16}	2^{4}	108			3			3
15.15	1	2^{1}	32			33	1	4^{1}	93	6^{12}	1^{2}	108			2			2
0		1	27			27	2	6^{3}	86	7^{14}	2^{4}	107			5			5
15.45			26	1^{2}		28	2	5^{2}	96	8^{16}	3^{6}	120			3			3
16.00		1	22			22	6^{2}	4^{2}	90	7^{14}	1^{2}	110			3			3
16.15			24			24	4^{1}	3^{1}	97	6^{12}	2^{4}	115			2			2
16.30	2	2^{1}	23			24	3^{1}	3^{1}	93	2^{4}	4^{8}	107			1			1
16.45	1		19	1^{2}		21	2	4^{2}	76	4^{8}	1^{2}	88			–			-
17.00			22			22	3^{1}	3^{1}	83	5^{10}	1^{2}	97			–			-
17.15			19	3^{6}		25	2	3^{1}	82	6^{12}	2^{4}	99			2			2
17.30	2	2^{1}	23			24	3^{1}	4^{2}	86	5^{10}	1^{2}	101			3			3
17.45			20			20	3^{1}	5^{2}	84	7^{14}	2^{4}	105			–			-
18.00	1		22			22	3^{1}	3^{1}	87	4^{8}	1^{2}	99			2			2
18.15	1	1	18			18	3^{1}	3^{1}	95	4^{8}	1^{2}	107			4	1^{2}		6
18.30			16			16	4^{1}	5^{2}	82	3^{6}	2^{4}	95			1			1
Totals for 10 Hours	$\overset{18}{55}$	$\overset{24}{48}$	1085	23^{46}	–	1123	$\overset{53}{161}$	$\overset{79}{158}$	4114	$\overset{582}{291}$	70^{140}	4968	2		61	4^{8}		64
Averages per Hour	5	4	103	2	-	111	15	15	391	27	6	473	–		5	–		6

TURNING LEFT TO: Sth Lotts Road

STRAIGHT AHEAD TO: Pearse Street

TURNING RIGHT TO: Sth · Lotts Road

CORPORATION, TRAFFIC DEPT.   TRAFFIC CENSUS AT JCT. OF Ringsend Road Sth Lotts Road

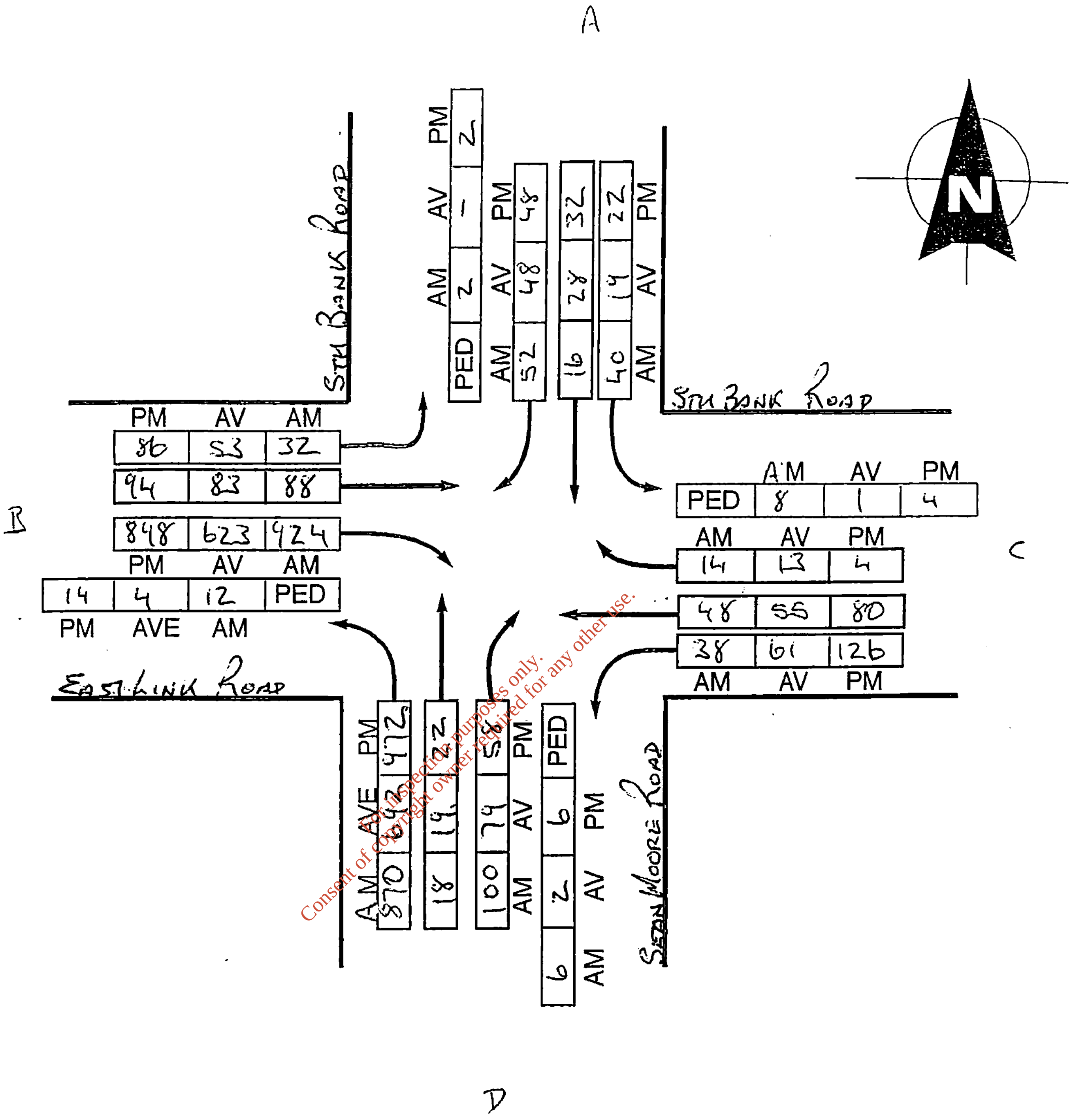
TRAFFIC FROM: Sth Lotts Road DAY Thursday DATE 29-5-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15		2^{1}	11			12	1		2			2	2		15			15
8.30		1	14	2^{4}		18			1			1	5^{1}		20	1^{2}		23
8.45	1		11	1^{2}		13			4			4		3^{1}	24			25
9.00			15	2^{4}		19			2			2	7^{2}	1	25			27
9.15		1	17	3^{6}		23			2			2	3^{1}	3^{1}	27	1^{2}		31
9.30		1	10	1^{2}		12			--			-			19			19
9.45			14	1^{2}		16			1			1	1	2^{1}	20			21
10.00		1	12	2^{4}		16			-			-	2		16	1^{2}		18
10.15		1	13	2^{4}		17			-			-	2	1	15			15
10.30			11	1^{2}		13			1			1	1	2^{1}	20	2^{4}		25
10.45			8	1^{2}		10			1	1^{2}		3	2	3^{1}	18			19
11.00			12			12			-			-	1	1	18	1^{2}		20
11.15			13	1^{2}		15			-	1^{2}		2	1	2^{1}	14	1^{2}		22
11.30			12	2^{4}		16			-			-	1	1	18			18
15			14	1^{2}		16			1			1	1	3^{1}	20	1^{2}		23
12.00			16	2^{4}		20			2	1^{2}		4	1	2^{1}	22	1^{2}		25
12.15		1	13	3^{6}		14			-			-		1	23			23
12.30	1		15	2^{4}		19			-			-		2^{1}	25			26
12.45			12			12			1	1^{2}		3			30	1^{2}		32
13.00			11			11			2			2			20			20
13.15	1		14	3^{6}		20			4			4		1	18	1^{2}		20
13.30			15	2^{4}		19			1			1		2^{1}	16	1^{2}		19
13.45			12	1^{2}		14						1	2	1	18	1^{2}		20
14.00			15		1^{2}	17			1			1	1	2^{1}	22	2^{4}		27
14.15		1	16	1^{2}		18			2			2		3^{1}	14	1^{2}		22
14.30			14	1^{2}		16			1			1	1	2^{1}	23	2^{4}		28
14.45			12			12			1			1		2^{1}	22	1^{3}		25
15.00	1	1	10	3^{4}		16			2	1^{2}		4	1	3^{1}	18	1^{3}		21
15.15		1	15	2^{4}		19			-			-	2	2^{1}	28			29
15.30		1	15			15			1	1^{2}		3	2	1	24	1^{2}		31
5			14	1^{2}		21			-	1^{2}		2	1	2^{1}	25	1^{2}		28
16.00			18			18			1			1	2	2^{1}	17			18
16.15			14			14	2		2	1^{2}		4	1	3^{1}	20	1^{3}		23
16.30		1	16			16			-	1^{2}		2	2	2^{1}	27			28
16.45			18			18			1			1	3^{1}	1	25	1^{2}		28
17.00	1		19			19			1			1	3^{1}	4^{2}	35			38
17.15			19			19			3	1^{2}		5	3^{1}	4^{2}	38			41
17.30	1		13			13			2			2	2	3^{1}	47			48
17.45	1		21			21			2			2	2	2^{1}	33	1^{2}		36
18.00	1	1	23			23			3			3	2	2^{1}	30			31
18.15			23			23			2			2	2	5^{2}	30			32
18.30	1	2^{1}	20	1^{2}		23			1			1	–	1	26	–		26
Totals for 10 Hours	9^{3}	16^{5}	615	42^{54}	1^{2}	716	3^{1}	-	57	10^{20}		63	63^{21}	76^{38}	980	25^{50}		1084
Averages per Hour	–	1	58	4	-	68	–	–	5	1		6	6	7	93	2		103

TURNING LEFT TO: Pearse Street

STRAIGHT AHEAD TO: Sth Docks Road

TURNING RIGHT TO: Irishtown



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

**ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8**

LOCATION

Sean Moore Road. Sth Bank. Road

**MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)**

COUNT No. 2003/141.

DATE	DAY	WEATHER
3-11-2003	Monday	Fair

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Sean Moore Road - Sth Bank Road

TRAFFIC FROM Sean Moore Road DAY Monday DATE 3-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15	2	12^{6}	194	3^{6}	–	206			1			1	3^{1}	2^{1}	17	2^{4}		23
8.30	3^{1}	11^{5}	180	12^{24}	1^{4}	22			1			1		1	21	3^{6}		27
8.45	6^{2}	14^{7}	202	6^{12}	–	223			1	2^{4}		5		2^{1}	16	3^{4}		23
9.00	5^{1}	12^{6}	173	1^{2}	–	182			2			2		1	21	2^{4}		25
9.15	4^{1}	9^{4}	183	4^{8}	1^{2}	178		1	2	2^{4}		6		2^{1}	20	1^{2}		23
9.30	2	7^{3}	150	6^{12}	1^{2}	167			1	1^{2}		3		1	17	4^{8}		25
9.45	2	4^{2}	153	6^{12}	–	167			1	1^{2}		3			21	5^{10}	1^{2}	33
10.00	2	5^{2}	161	7^{14}	–	177			2	2^{4}		6		1	19	5^{10}		29
10.15	2	6^{3}	156	5^{10}	–	164			1	1^{2}		3		1	20	6^{12}		32
10.30	–	3^{1}	150	10^{20}	–	171			4	1^{2}		6			16	4^{8}		24
10.45	–	–	116	9^{18}	–	134			3	1^{2}		5			18	8^{16}		34
11.00	–	1	102	12^{24}	–	126			1	1^{2}		3			12	5^{10}		22
11.15	1	2^{1}	112	10^{20}	–	133			2	1^{2}		4			16	5^{10}		26
0	2	3^{1}	104	11^{22}	–	132			3			3		1	12	6^{12}		24
11.45	1	2^{1}	111	13^{26}	–	138			5	1^{2}		7		2^{1}	10	4^{8}		19
12.00	–	1	107	8^{16}	–	123			2	1^{2}		4		1	9	6^{12}		21
12.15	–	1	100	6^{12}	–	112			3	2^{4}		7			11	5^{10}		21
12.30	1	2^{1}	104	7^{14}	–	119			4	1^{2}		6			12	6^{12}		24
12.45	–	2^{1}	106	9^{18}	–	125			2	4		10			9	4^{8}		17
13.00	1	3^{1}	110	8^{16}	–	127			3	3^{6}		9			11	5^{10}		21
13.15	1	1	118	10^{20}	–	138			1	2^{4}		5			13	6^{12}		25
13.30	–	3^{1}	120	13^{26}	–	147			2	3^{6}		8	1		14	4^{8}		22
13.45.	1	2^{1}	117	11^{22}	–	140			3	2^{4}		7			12	5^{10}		22
14.00	1	3^{1}	126	11^{22}	1^{2}	151			4	3^{6}		10		1	16	4^{8}		24
14.15		2^{1}	104	9^{18}		128			2	4^{8}		10			9	4^{8}		17
14.30		1	132	8^{16}		148			2	1^{2}		4			14	4^{8}		22
14.45	–	5^{2}	165	18^{36}	1^{2}	205			4	1^{2}		6			18	2^{4}		22
15.00		4^{2}	152	17^{34}		188			1	1^{2}		3			14	5^{10}		24
15.15		5^{2}	122	8^{16}	1^{2}	142			–			–			13	4^{8}		21
30		1	144	11^{22}		166			–			–			14	3^{6}		20
15.45		2^{1}	168	7^{14}	1^{2}	185			2	2^{4}		6			9	4^{8}		17
16.00		4^{2}	152	11^{22}		176			1	3^{6}		7	1		8	1^{2}		10
16.15		2^{1}	165	7^{14}		180			2	2^{4}		6	1		9			9
16.30	1	3^{1}	186	6^{12}		199			2	1^{2}		4			6			6
16.45	3^{1}	3^{1}	172	9^{18}		192			–	3^{6}		6			9			9
17.00		2^{1}	223	10^{20}	1^{2}	246			1	2^{4}		5			8			8
17.15	2	6^{3}	186	7^{14}		203			–	1^{2}		2			6			6
17.30	3^{1}	4^{2}	227	6^{12}		242			1	3^{6}		7			8	2^{4}		12
17.45	4^{1}	4^{2}	193	9^{18}	1^{2}	216			1			1			6			6
18.00	3^{1}	5^{2}	215	8^{16}		234			2			2			7	4^{8}		15
18.15	3^{1}	6^{3}	222	6^{12}	1^{2}	240			2	3^{6}		4		1	8	3^{6}		14
1830	2	6^{3}	227	8^{16}		246			1			1			6	2^{4}		10
Totals for 10 Hours	58^{19}	174^{87}	6420	363^{726}	10^{20}	7272	1	1	79	62^{124}		203	6^{2}	17^{8}	535	146^{242}	1^{2}	839
Averages per Hour	5	16	611	54	1	692	–	–	7	6		19	–	1	50	13	–	79

TURNING LEFT TO: East Link

STRAIGHT AHEAD TO Sth Bank Nth

TURNING RIGHT TO Sth Bank East

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Sitan Moore Road. Sth Bank Road

TRAFFIC FROM Sth Bank Road. Eastside DAY Monday DATE 3-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			2	2 ^{4}		6			-	1 ^{2}		2			--			-
8.30			3	5 ^{10}		13			2	4 ^{8}		10			-	1 ^{2}		2
8.45			5	1 ^{2}		7			2	6 ^{12}		14			—			-
9.00		1	—			-			1	4 ^{8}		9			1			1
9.15			3	1 ^{2}		5			—	3 ^{6}		6			—	1 ^{2}		2
9.30	1		1	2 ^{4}		5			1			1			3	1 ^{2}		5
9.45			3			3			1			1			1	2 ^{4}		5
10.00			3	2 ^{4}		7			2	1 ^{2}		4			1	1 ^{2}		3
10.15			2	3 ^{6}		8			1			1			—			-
10.30			3	2 ^{4}		7			2	2 ^{4}		6			—			-
10.45			7	2 ^{4}		11			4	6 ^{12}		16			1	4 ^{8}		9
11.00			5	4 ^{8}		13		1	3	6 ^{12}		15			2	3 ^{6}		8
11.15	1		3	4 ^{8}		11			2	6 ^{12}		14			1	3 ^{6}		7
11.30			2	1 ^{2}		4		1	5	4 ^{8}	1 ^{2}	15			--	1 ^{2}		2
11.45		1	3	3 ^{6}		9			4	3 ^{6}		10			—	3 ^{6}		6
12.00			3	3 ^{6}		9			3	4 ^{8}		11			—	2 ^{4}		4
12.15			4	4 ^{8}		12			2	6 ^{12}		14			1	2 ^{4}		5
12.30			6	4 ^{8}		14			3	2 ^{4}		7			1	2 ^{4}		5
12.45			7	3 ^{6}		13			3	4 ^{4}	1 ^{2}	9			1	3 ^{6}		7
13.00	1		10	4 ^{8}		18			3	3 ^{6}		9			—			-
13.15	1		8	2 ^{4}		12			7	3 ^{6}	1 ^{2}	15			—			—
13.30			7	3 ^{6}		13			6	3 ^{6}		12			—	1 ^{2}		2
13.45			6	4 ^{8}		14			4	4 ^{8}		12			1	2 ^{4}		5
14.00			7	3 ^{6}		13		1	3	4 ^{8}		11			1	3 ^{6}		7
14.15		1	8	4 ^{8}		16			4	5 ^{10}		14			1			1
14.30			13	10 ^{20}		33			7	13 ^{26}		33			1			1
14.45			8	6 ^{12}		20		1	6	8 ^{16}		22			3	2 ^{4}		7
15.00	1	1	5	4 ^{8}		13		1	6	8 ^{16}		22			3	4 ^{8}		11
	2		7	2 ^{4}		11			5	7 ^{14}		14			2	3 ^{6}		8
15.30			8	4 ^{8}		16			5	6 ^{12}		17			1	1 ^{2}		3
15.45			12	7 ^{14}		26			3	6 ^{12}		15			—	3 ^{6}		6
16.00	1	2. ^{1}	16	7 ^{14}		31	1		13	11 ^{22}		35			1	2 ^{4}		5
16.15			18	9 ^{18}		36		2 ^{1}	15	12 ^{24}		40			2	3 ^{6}		8
16.30			17	5 ^{10}		27	1	1	10	7 ^{14}		24			—	1 ^{2}		2
16.45			14	3 ^{6}		20			8	4 ^{8}		16			—			-
17.00			20	6 ^{12}		32			7	6 ^{12}		19			—			—
17.15		1	16	4 ^{8}		24			5	3 ^{6}		11			—			—
17.30			23	3 ^{6}		29	1		3	6 ^{12}		15			—			—
17.45			17	4 ^{8}		25		1	6	3 ^{6}		12			—			—
18.00			10	5 ^{10}		20			7	4 ^{8}		15			—			-
18.15			13	3 ^{6}		19	1		5	2 ^{4}		9			—			-
1830			7	4 ^{8}		15			3	3 ^{6}		9			—			-
Totals for 10 Hours	8 ^{2}	7 ^{3}	335	304 152	—	644	4 ^{1}	9 ^{4}	182	384 142	3 ^{6}	577			29	108 54		137
Averages per Hour	—	—	32	14	—	61	—		17	18	—	55			2	5		13

TURNING LEFT TO: Sitan Moore Road

STRAIGHT AHEAD TO: East Link

TURNING RIGHT TO: Sth Bank Nth

B

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Sean Moore Road – Sth Bank Road

TRAFFIC FROM East Link DAY Monday DATE 3-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			–			-	1	1	15	1^{2}		17	1	6^{3}	154	9^{18}	–	175
8.30			–	6^{12}		12			14	2^{4}		18	–	5^{2}	177	10^{20}		199
8.45		1	–	2^{4}		4	3^{1}	2^{1}	16	4^{8}		26	3^{1}	7^{3}	171	12^{24}		199
9.00			-	5^{10}		10	2	1	14	1^{2}		16	2	6^{3}	142	6^{12}		207
9.15			–	3^{6}		6	1	2^{1}	11	2^{4}		16	1	4^{2}	174	8^{16}		192
9.30			1	4^{8}		9			4	4^{8}		17	–	5^{2}	152	7^{14}	–	168
9.45			2	10^{20}		22		1	8	4^{8}		16	4^{1}	4^{2}	137	12^{24}	1^{2}	166
10.00			–	7^{14}		14			5	2^{4}		9	2	3^{1}	149	9^{18}	-	168
10.15			1	12^{24}		25			7	3^{6}		13	3^{1}	5^{2}	131	11^{22}	-	156
10.30			3	7^{14}		17		1	8	4^{8}		16	–	1	143	14^{28}	-	161
10.45			1	6^{12}		13			5	2^{4}		9	–	3^{1}	138	12^{24}	–	163
11.00		1	2	6^{12}		14			7	3^{6}		13	2	1	133	10^{20}	–	153
.. 15			2	5^{10}		12			8	9^{18}		26	1	3^{1}	129	12^{24}	–	154
..30			1	3^{6}		7		1	10	7^{14}		24	–	3^{1}	115	16^{32}	1^{2}	150
11.45			1	4^{8}		9			1	3^{6}		7	–	2^{1}	121	14^{28}	–	150
12.00		1	7	12^{24}		31			1	4^{8}		9	–	1	95	11^{22}	–	117
12.15			2	6^{12}		14		1	4	7^{14}		18	–	3^{1}	107	11^{22}	1^{2}	132
12.30			1	4^{8}		9			5	15^{30}		35	1	2^{1}	118	10^{20}	–	134
12.45		1	1	5^{10}		11			5	11^{22}		27	–	3^{1}	125	16^{32}	–	158
13.00			4	3^{6}		10	1		3	14^{28}		31	–	4^{2}	117	10^{20}	–	139
13.15			2	4^{8}		10			2	11^{22}		24	1	2^{1}	126	13^{26}	–	153
13.30		1	3	12^{24}		27	1	1	11	12^{24}		35	–	-	99	9^{18}	1^{2}	119
13.45			1	7^{14}		15			8	8^{16}		24	–	2^{1}	111	11^{22}	–	133
14.00			4	5^{10}		14		1	3	11^{22}		25	–	2^{1}	116	13^{26}	–	143
14.15			2	6^{12}		14			9	8^{16}		25	1	5^{2}	123	15^{30}	–	163
14.30			1	5^{10}		11			10	8^{16}		26	–	4^{2}	130	14^{28}	–	166
14.45			–	4^{8}		8			8	11^{22}		30	1	3^{2}	111	13^{26}	–	142
15.00	1	1	1	12^{24}		25			12	8^{16}		28	–	3^{2}	121	6^{12}	.	137
.			–	5^{10}		10			7	7^{14}		21	2	3^{2}	115	9^{18}	–	139
15.30			2	7^{14}		16		1	11	8^{16}		27	–	2^{1}	124	12^{24}	–	152
15.45			–	5^{10}		10		2^{1}	4	10^{20}		25	–	1^{1}	104	7^{14}	–	120
16.00			3	9^{18}		21			8	4^{8}		16	1	1^{1}	125	5^{10}	–	137
16.15			1	8^{16}		17			10	6^{12}		22	–	2^{1}	133	7^{14}	–	151
16.30		1	1	8^{16}		17			6	8^{16}		22	1	2^{1}	118	5^{10}	–	132
16.45			–	12^{24}		24			5	10^{20}		25	–	1	128	13^{26}	–	154
17.00	1		3	8^{16}		19		1	8	6^{12}		20	2	4^{2}	149	11^{22}	–	173
17.15			–	6^{12}		12		1	11	6^{12}		23	3^{1}	6^{3}	116	8^{16}	1^{2}	138
17.30			1	4^{8}		9		2^{1}	7	6^{12}		20	1	2^{1}	143	13^{26}	–	170
17.45			–	5^{10}		10		1	9	8^{16}		25	–	6^{3}	162	9^{18}	–	183
18.00			2	3^{6}		8		1	6	4^{8}		14	3^{1}	8^{4}	172	11^{22}	–	199
18.15			–	4^{8}		8		2^{1}	4	5^{10}		15	4^{1}	4^{2}	143	8^{16}	–	162
1830	1		–	1^{2}		4		1	3	3^{6}		9	3^{1}	5^{2}	128	6^{12}	–	143
Totals for 10 Hours	3^{1}	7^{3}	56	500 250		560	9^{3}	24^{12}	317	540 270		872	43^{14}	138^{64}	5575	876 438	5^{10}	6374
Averages per Hour	–	–	5	23		53		2	30	25		83	4	13	530	41	–	623

TURNING LEFT TO: Sth Bank Road Nth

STRAIGHT AHEAD TO: Sth Bank East

TURNING RIGHT TO: Sean Moore Road

A

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Seton Moore Road - Sth Bank Road

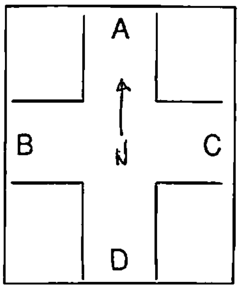
TRAFFIC FROM Sth Bank Road Nth Side DAY Monday DATE 3-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS*	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			-			-			1	2^{4}		5			2	6^{12}		16
8.30			-	2^{4}		4			-	1^{2}		2			2	3^{6}		9
8.45			-			-			1			1			1	8^{16}		17
9.00			2	2^{4}		6			3	1^{2}		5			1	3^{6}		7
9.15			-			-			1	1^{2}		3			-	5^{10}		10
9.30			-	1^{2}		2			1	1^{2}		3			-	6^{12}		12
9.45			1	6^{12}		13			3	1^{2}		5			1	4^{8}		9
10.00			-	3^{6}		6			1			1			1	5^{10}		11
10.15			1	2^{4}		5			1	1^{2}		3			-	4^{8}		8
10.30			-	1^{2}		2			2	2^{4}		6			1	5^{10}		11
10.45			2	2^{4}		6			4	3^{6}		10			1	7^{14}		15
11.00			1	2^{4}		5			3	4^{8}		11			2	6^{12}		14
·5			1	3^{6}		7	1	1	3	4^{8}		11			2	5^{10}		12
11.30			2	1^{2}		4			2	1^{2}		4			-	7^{14}		14
11.45			-	1^{2}		2			1	2^{4}		5			-	8^{16}		16
12.00			2	1^{2}		4		1	2			2		1	1	3^{6}		7
12.15			2	2^{4}		6			1			1			1	6^{12}		13
12.30			-	1^{2}		2			-	3^{6}		6			1	4^{8}		9
12.45			-	1^{2}		2			3	1^{2}		5			2	5^{10}		12
13.00			-	3^{6}		6			2	1^{2}		4			2	6^{12}		14
13.15			-	2^{4}		4			1	3^{6}		7			1	5^{10}		11
13.30			-	2^{4}		4			2	2^{4}		6			1	6^{12}		13
13.45			-	2^{4}		4			3	3^{6}		9			2	4^{8}		10
14.00			-	1^{2}		2			6	2^{4}		10		1	2	5^{10}		12
14.15			3	3^{6}		9			5	7^{14}		19			2	2^{4}		6
14.30			2	3^{6}		8			3	4^{8}		11			3	5^{10}		13
14.45			1	4^{8}		9			2	6^{12}		14			1	6^{12}		13
15.00		1	2	3^{6}		8			5	7^{14}		19			3	10^{20}		22
	1		3	2^{4}		7		1	3	6^{12}		15			2	11^{22}		24
15.30			1	1^{2}		3			4	2^{4}		8			3	8^{16}		19
15.45			1	6^{12}		13			3	5^{10}		13			2	5^{10}		12
16.00			-	3^{6}		6			6	3^{6}		12			6	6^{12}		18
16.15			1	2^{4}		5			3	1^{2}		5			3	5^{10}		13
16.30			-	3^{6}		6			5	1^{2}		7			3	3^{6}		9
16.45			1	2^{4}		5		1	4	2^{4}		8			3	4^{8}		11
17.00			1	-		1			5	1^{2}		7			2	3^{6}		8
17.15			-	3^{6}		6			5	2^{4}		9			2	4^{8}		10
17.30			1	2^{4}		5			3	1^{2}		5		1	2	3^{6}		8
17.45			-	1^{2}		2			4	1^{2}		6			3	5^{10}		13
18.00			1	2^{4}		5			3	2^{4}		7			3	4^{8}		11
18.15			1	2^{4}		5			2	1^{2}		4			2	3^{6}		8
1830			-	1^{2}		2			1	1^{2}		3			2	3^{6}		8
Totals for 10 Hours	1	1	33	84^{168}		201	1	4^{2}	113	92^{184}		299	-	3^{1}	74	216^{432}		507
Averages per Hour	-		3	8		19	-		10	8		28		-	7			48

TURNING LEFT TO: Sth Bank Road East Side

STRAIGHT AHEAD TO: Seton Moore Road

TURNING RIGHT TO: East Link Rd

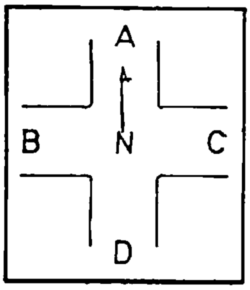


Sean Moore Road - Sth. Bank Road

DATE 3-11-2003 DAY Monday WEATHER Fair

PEDESTRIAN COUNTS

	CROSSING ON 'A'			CROSSING ON 'B'			CROSSING ON 'C'			CROSSING ON 'D'		
	Sth. Bank Road			East Link Road			Sth Bank Road			Sean Moore Road		
1/4 HR. TO	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
		-	-		2	2		-	-		1	1
		-	-		-	-		-	-		-	-
		-	-		3	3		3	3		1	1
9.00		-	-		3	3		1	1		-	-
		-	-		-	-		-	-		2	2
		1	1		1	1		-	-		1	1
		-	-		1	1		-	-		-	-
10.00		-	-		1	1		-	-		2	2
		-			2	2		-	-		1	1
		-			3	3		-	-		1	1
		1	1		1	1		1	1		-	-
11.00		-			-	-		-	-		-	-
		-	-		2	2		-	-		-	-
		-	-		1	1		-	-		1	1
		-	-		-	-		-	-		-	-
12.00		1	1		2	2		-	-		-	-
		-			1	1		-	-		-	-
		1	1	-	1	1		1	1		-	-
		-	-		1	1		-	-		-	-
13.00		-	-		2	2		1	1		-	-
		-	-		-	-		1	1		-	-
		-	-		1	1		-	-		-	-
		-	-		1	1		-	-		-	-
14.00		-	-		-	-		-	-		1	1
		-	-		-	-		-	-		-	-
		-	-		1	1		-	-		2	2
		-	-		-	-		-	-		1	1
15.00		-	-		3	2		-	-		-	-
		-	-		-	-		1	1		-	-
		-	-		1	1		-	-		2	2
		-	-		1	1		-	-		-	-
16.00		-	-		3	3		1	1		-	-
		-	-		-	-		-	-		1	1
		1	1		1	1		-	-		-	-
		-	-		-	-		-	-		-	-
17.00		-	-	-	3	3		-	-		-	-
		-	-		-	-		-	-		-	-
		-	-		4	4		2	2		2	2
		-	-		-	-		-	-		1	1
18.00		-	-		2	2		-	-		-	-
		-	-		2	3		-	-		-	-
18.30		-	-		-	-		-	-		-	-
TOTAL.	-	5	5		49	49		12	13		20	20
AVERAGE					4	4		1	1		2	2

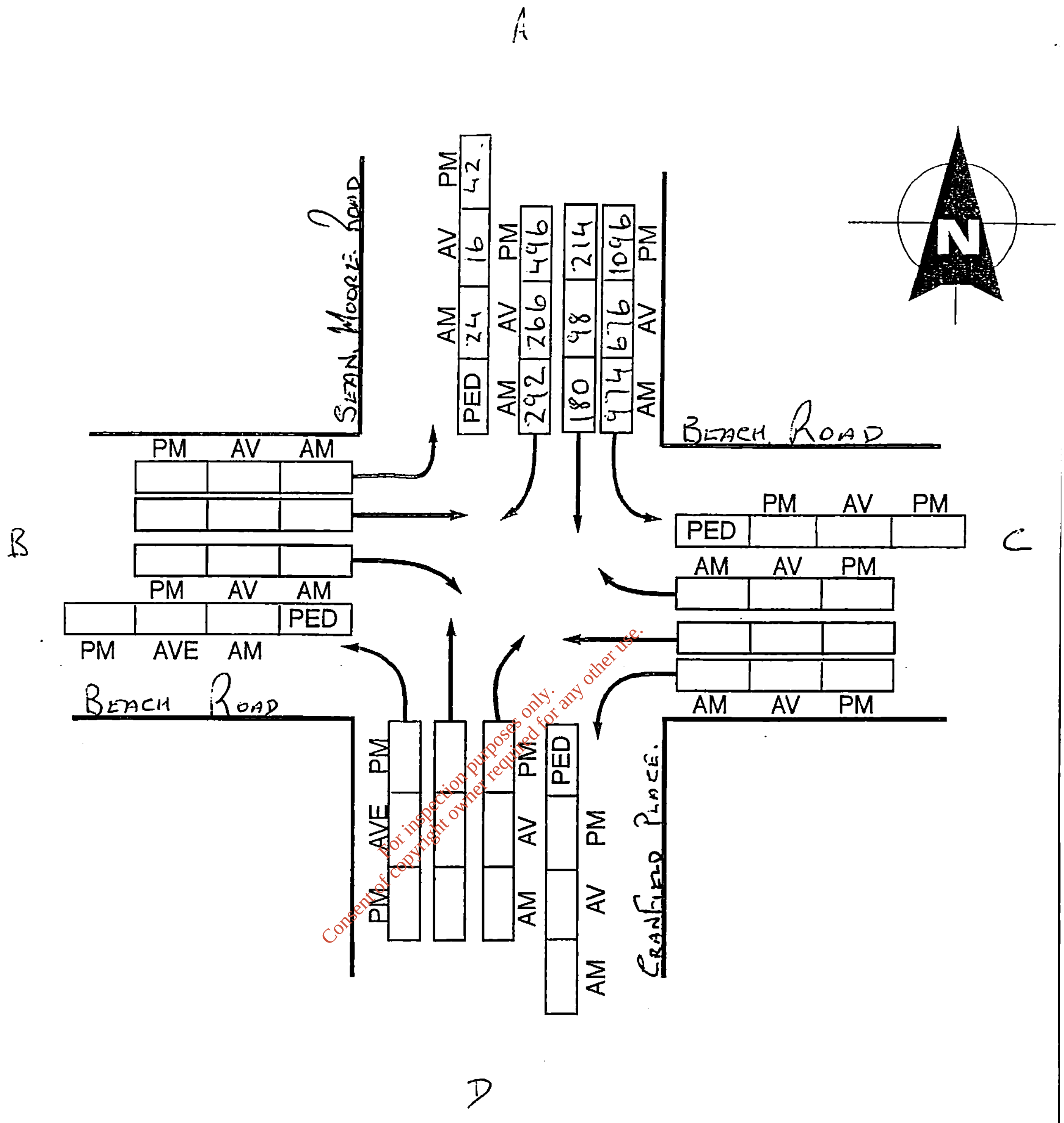


Stan Moore Road - Sth Bank Road

DATE 3-11-2003 DAY Monday WEATHER Fair

Carriageway Widths	A	B	C	D

¼ HR. TO	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	Sth Bank Road				East Link Road				Sth Bank Road				Stan Moore Road			
	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
	-	5	16	21	-	17	175	192	6	2	-	8	206	1	23	230
	4	2	9	15	12	18	194	224	13	10	2	15	212	1	27	240
	-	1	17	18	4	26	199	229	7	14	-	21	223	5	23	251
9.00	6	5	7	18	10	16	207	233	-	9	1	10	182	2	25	209
	-	3	10	13	6	16	192	214	5	6	2	13	198	6	23	227
	2	3	12	17	9	17	168	194	5	1	5	11	167	3	25	195
	13	5	9	27	22	16	166	204	3	1	5	9	167	3	33	203
10.00	6	1	11	18	14	9	168	191	7	4	3	14	177	6	29	212
	5	3	8	16	25	13	156	194	8	1	-	9	169	3	32	204
	2	6	11	19	17	16	161	194	7	6	-	13	171	6	24	201
	6	10	15	31	13	9	163	185	11	16	9	36	134	5	34	173
11.00	5	11	14	30	14	13	153	180	13	15	8	36	126	3	22	151
	7	11	12	30	12	26	154	192	11	14	7	32	133	4	26	163
	4	4	14	22	7	24	150	181	4	15	2	21	132	3	24	159
	2	5	16	23	9	7	150	176	9	10	6	25	138	7	19	164
12.00	4	2	7	13	31	9	117	157	9	11	4	24	123	4	21	148
	6	1	13	20	14	18	132	164	12	14	5	31	112	7	21	140
	2	6	9	17	9	35	139	183	14	7	5	26	119	6	24	149
	2	5	12	19	11	27	158	196	13	4	7	24	125	10	17	152
13.00	6	4	14	24	10	31	139	180	18	9	-	27	127	9	21	157
	4	7	11	22	10	24	153	197	12	15	-	27	138	5	25	168
	4	6	13	23	27	35	119	171	13	12	2	27	147	8	22	177
	4	9	10	23	15	24	133	172	14	12	5	31	140	7	22	169
14.00	2	10	12	24	14	25	143	182	13	11	7	31	151	10	24	185
	9	19	6	34	14	25	163	202	16	14	1	31	128	10	17	145
	8	11	13	32	11	26	166	203	33	33	1	67	148	4	22	174
	9	14	13	36	8	30	142	180	20	22	7	49	205	6	22	233
15.00	8	19	22	49	25	28	137	190	13	22	11	46	188	3	24	215
	7	15	24	46	10	21	139	170	11	19	8	38	142	-	21	163
	3	8	19	30	16	27	152	195	16	17	3	36	166	-	20	186
	13	13	12	38	10	25	120	155	26	15	6	47	185	6	17	208
16.00	6	12	18	36	21	16	137	174	31	35	5	71	176	7	10	193
	5	5	13	23	17	22	151	190	36	40	8	84	180	6	9	195
	6	7	9	22	17	22	132	171	27	24	2	53	199	4	6	209
	5	8	11	24	24	25	154	203	20	16	-	36	192	6	9	207
17.00	1	7	8	16	19	20	173	212	32	19	-	51	246	5	8	259
	6	9	10	25	12	23	138	173	24	11	-	35	203	2	6	211
	5	5	8	18	9	20	170	199	29	15	-	44	242	7	12	261
	2	6	13	21	10	25	183	228	25	12	-	37	216	1	6	223
18.00	5	7	11	23	8	14	199	221	20	15	-	35	234	2	15	251
	5	4	8	17	8	15	162	185	19	9	-	28	240	9	14	263
18.30	2	3	8	13	4	4	143	151	15	9	.	24.	246	1	10	257
TOTAL	201	249	507	1007	560	872	6544	7976	644	577	137	1358	7272	203	834	8314
AVERAGE	19	28	48	95	53	83	623	759.	61	55	13	124.	642	14.	74	741



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8

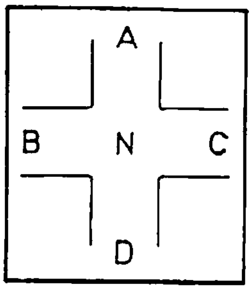
LOCATION

Beach Road – Sean Moore Road

MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)

DATE	DAY	WEATHER
10-11-2003	Monday	Fair

COUNT No. 2003/143

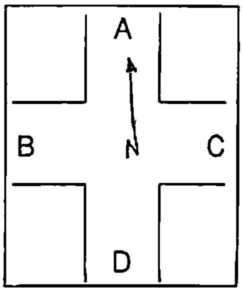


BEACH ROAD- SEAN MOORE ROAD

DATE 10-11-2003 DAY MONDAY WEATHER FAIR

Carriageway Widths	A	B	C	D

	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	SEAN MOORE ROAD				BEACH ROAD				BEACH ROAD				CRANFIELD PLACE			
¼ HR.TO	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
	238	41	62	341												
	249	49	66	364												
	203	42	76	321												
900	195	36	69	300												
	188	34	77	299												
	179	38	55	262												
	169	40	55	264												
10.00	180	44	65	289												
	173	36	59	267												
	135	23	54	212												
	143	9	48	200												
11.00	132	8	51	191												
	141	12	60	213												
	124	5	42	171												
	125	8	48	181												
12.00	123	6	48	177												
	124	12	51	187												
	120	7	56	183												
	125	11	51	187												
13.00	120	11	48	179												
	125	14	52	191												
	125	9	41	175												
	116	7	39	162												
14.00	117	10	53	180												
	110	13	62	185												
	116	18	67	201												
	106	16	75	197												
15.00	129	28	82	239												
	147	18	51	216												
	158	22	59	239												
	184	15	57	256												
1600	164	12	59	235												
	159	11	65	235												
	162	14	61	237												
	171	19	68	258												
17.00	218	36	78	232												
	250	50	86	386												
	275	56	98	429												
	273	51	119	443												
18.00	271	50	125	446												
	250	42	123	415												
18.30	243	41	114	398												
TOTAL	7099	1035	2795	10,929												
AVERAGE	676	98	266	1040												



Beach Road - Sean Moore Road

DATE 10 - 11 - 2003 DAY Monday WEATHER Fair

PEDESTRIAN COUNTS

	CROSSING ON 'A'			CROSSING ON 'B'			CROSSING ON 'C'			CROSSING ON 'D'		
	Sean Moore Road			Beach Road			Beach Road			Cranfield Place		
1/4 HR. TO	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
		6	6									
	1	4	5									
	1	2	3									
9.00	2	4	6									
	1	5	6									
	-	3	3									
		2	2									
10.00		4	4									
	1	1	2									
		4	4									
		2	2									
11.00	-	5	5									
	-	3	3									
		1	1									
		2	2									
12.00		1	1									
	-	-	-									
	-	1	1									
		-	-									
13.00		1	1									
		2	2									
		1	1									
		3	3									
14.00	-	4	4									
	2	5	7									
	3	6	9									
	-	2	2									
15.00		3	3									
		5	5									
		4	4									
	4	7	11									
16.00	1	7	8									
	2	5	7									
		3	3									
		5	5									
17.00		2	2									
	2	7	9									
	4	8	12									
	2	6	8									
18.00	3	5	7									
	-	2	2									
18.30	-	2	2									
TOTAL.	31	142	173									
AVERAGE	3	13	16									

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Beach Road – Sean Moore Road

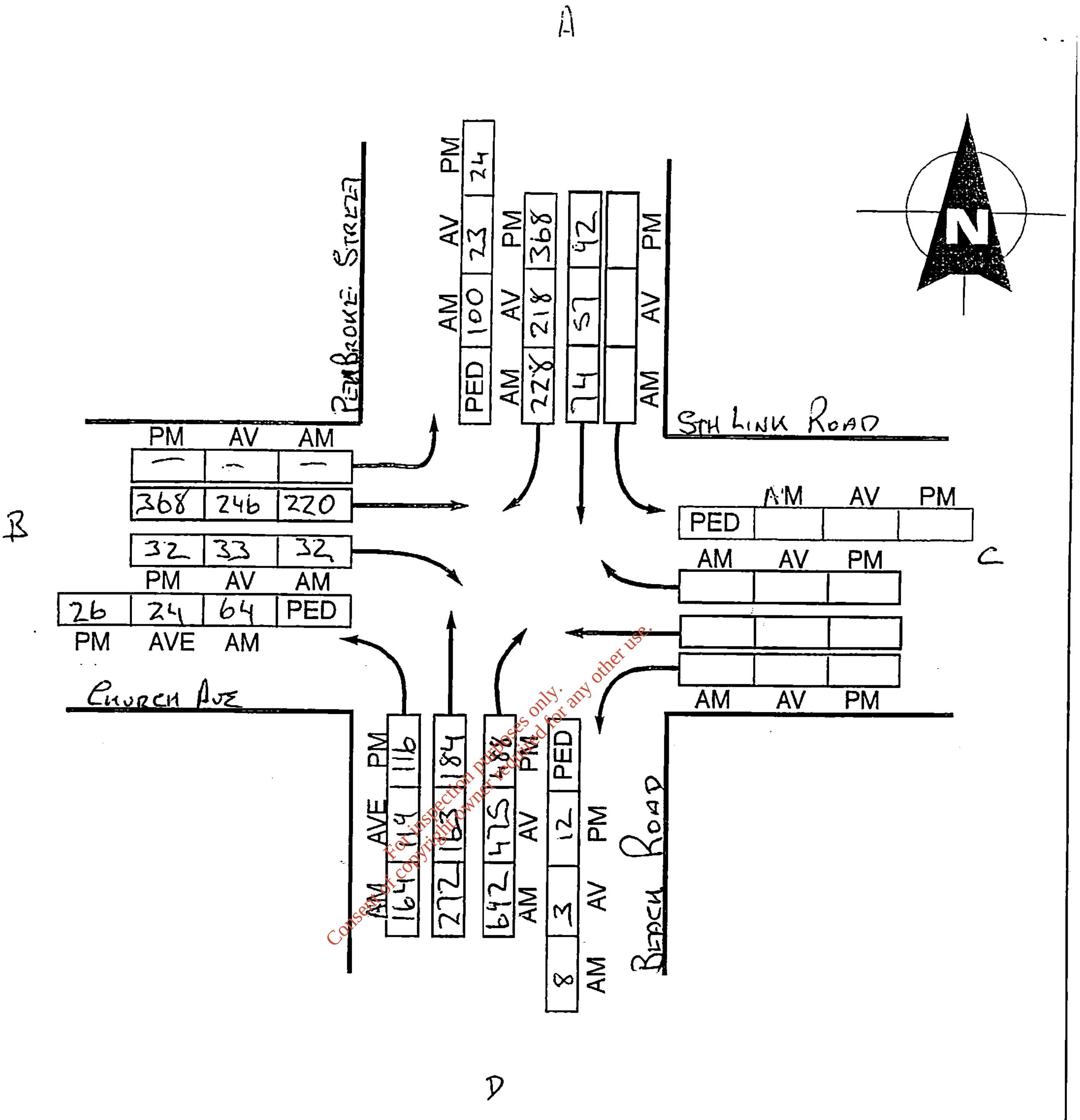
TRAFFIC FROM Sean Moore Road DAY Monday DATE 10 - 11 - 2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15	4^{1}	7^{2}	216	8^{16}	1^{2}	238		1	35	3^{6}		41		5^{2}	44	7^{14}	1^{2}	62
8.30	3^{1}	5^{2}	222	10^{20}	2	249	1	2^{1}	40	4^{8}		49		4^{2}	46	8^{16}	1^{2}	66
8.45	1	2^{1}	184	9^{18}	–	203		1	38	2^{4}		42		4^{2}	58	7^{14}	1^{2}	76
9.00	2	3^{1}	178	8^{16}	–	195	1	1	36			36		2^{1}	60	4^{8}		69
9.15	2	4^{2}	172	7^{14}	–	188		1	32	1^{2}		34		3^{1}	64	5^{10}	1^{2}	77
9.30	3^{1}	4^{2}	160	7^{14}	1^{2}	179		1	36	1^{2}		38	1		45	5^{10}	–	55
9.45	2	3^{1}	156	6^{12}	–	169	1		38	1^{2}		40	2	1	47	4^{8}		55
10.00	4^{1}	5^{2}	161	8^{16}	–	180		1	40	2^{4}		44	1	3^{1}	52	6^{12}		65
10.15	2	4^{2}	157	7^{14}	–	173			36			36		2^{1}	48	5^{10}		59
10.30	–	3^{1}	126	3^{6}	1^{2}	135			21	1^{2}		23	1		44	5^{10}		54
10.45	–	2^{1}	122	10^{20}	–	143		1	9			9		3^{1}	35	6^{12}		48
11.00	–	5^{2}	110	10^{20}	–	132	1	–	8			8	–	2^{1}	36	7^{14}	–	51
11.15	2	6^{3}	114	12^{24}	–	141			10	1^{2}		12		4^{2}	40	8^{16}	1^{2}	60
	1	1	100	11^{22}	1^{2}	124	1		5			5			32	5^{10}		42
11.45	2	3^{1}	106	9^{18}	–	125	1		8			8			36	6^{12}		48
12.00	1	2^{1}	102	10^{20}	–	123			6			6			34	7^{14}		48
12.15	2	3^{1}	107	8^{16}	–	124	1		10	1^{2}		12		2^{1}	38	6^{12}		51
12.30	1	4^{2}	98	10^{20}	–	120		1	7			7	1	3^{1}	41	7^{14}		56
12.45	2	5^{2}	105	9^{18}	–	125	1		11			11		2^{1}	36	6^{12}	1^{2}	51
13.00	1	4^{2}	102	8^{16}	–	120			9	1^{2}		11	1	1	38	5^{10}		48
13.15	–	3^{1}	110	7^{14}	–	125	2	1	12		1^{2}	14		2^{1}	43	4^{8}		52
13.30	–	3^{1}	114	5^{10}	–	125			9			9	1	1	39	1^{2}		41
13.45	–	4^{2}	106	4^{8}	–	116			7			7		1	35	2^{4}		39
14.00	1	3^{1}	88	12^{24}	2^{4}	117			10			10	1	3^{1}	38	7^{14}		53
14.15	2	4^{2}	76	15^{30}	1^{2}	110		1	13			13	1	3^{1}	41	9^{18}	1^{2}	62
14.30	1	3^{1}	81	16^{32}	1^{2}	116			16	1^{2}		18	2	4^{2}	43	11^{22}		67
14.45	–	1	96	5^{10}	–	106		1	16			16	1	2^{1}	46	14^{28}		75
15.00	1	2^{1}	114	7^{14}	–	129			24	2^{4}		28	2	1	48	16^{32}	1^{2}	82
15	1	2^{1}	120	13^{26}	–	147		1	16	1^{2}		18	1		37	7^{14}		51
15.30	2	4^{2}	126	15^{30}	–	158		1	18	2^{4}		22	1	3^{1}	40	8^{16}	1^{2}	59
15.45	3^{1}	3^{1}	152	14^{28}	1^{2}	184			13	1^{2}		15	1	2^{1}	40	7^{14}	1^{2}	57
16.00	–	4^{2}	146	7^{14}	1^{2}	164			10	1^{2}		12	1	2^{1}	44	6^{12}	1^{2}	59
16.15	1	2^{1}	138	10^{20}	–	154			11			11		3^{1}	48	8^{16}		65
16.30	–	3^{1}	143	9^{18}	–	162		1	14			14	1	1	47	7^{14}		61
16.45	2	6^{3}	156	11^{22}	–	171			14			19	3^{1}	4^{2}	53	5^{10}	1^{2}	68
17.00	2	8^{4}	188	12^{24}	1^{2}	218			34	1^{2}		36	4^{1}	3^{1}	66	5^{10}		78
17.15	4^{1}	11^{5}	230	11^{22}	1^{2}	250	1	1	50			50	2	3^{1}	78	4^{8}		86
17.30	3^{1}	8^{4}	238	16^{32}	–	275			56			56	2	4^{2}	82	6^{12}	1^{2}	98
17.45	2	7^{3}	244	12^{24}	1^{2}	273			51			51	1	4^{2}	101	8^{16}		119
18.00	2	5^{2}	241	13^{26}	1^{2}	271			46	2^{4}		50		3^{1}	110	7^{14}		125
18.15	3^{1}	4^{2}	221	13^{26}	–	250	1		42			42	2	3^{1}	106	8^{16}		123
1830	1	3^{1}	218	11^{22}	1^{2}	243			39	1^{2}		41	2	2^{1}	101	6^{12}		114
Totals for 10 Hours	66^{22}	167^{83}	6144	408^{816}	17^{34}	7099	12^{4}	17^{3}	961	30^{60}	1^{2}	1035	36^{12}	95^{47}	2160	275^{550}	13^{26}	2795
Averages per Hour	6	16	585	38	1	676	1	1	91	3	–	98	3	9	205	26	1	266

TURNING LEFT TO: Beach Road

STRAIGHT AHEAD TO: Cranfield Place

TURNING RIGHT TO: Bath Street



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8

LOCATION

Beach Road Church Ave

MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)

DATE	DAY	WEATHER
10-11-2003	Monday	Fair

COUNT No. 2003/142.

DUBLIN CORPORATION, TRAFFIC DEPT. : PEDESTRIAN COUNT

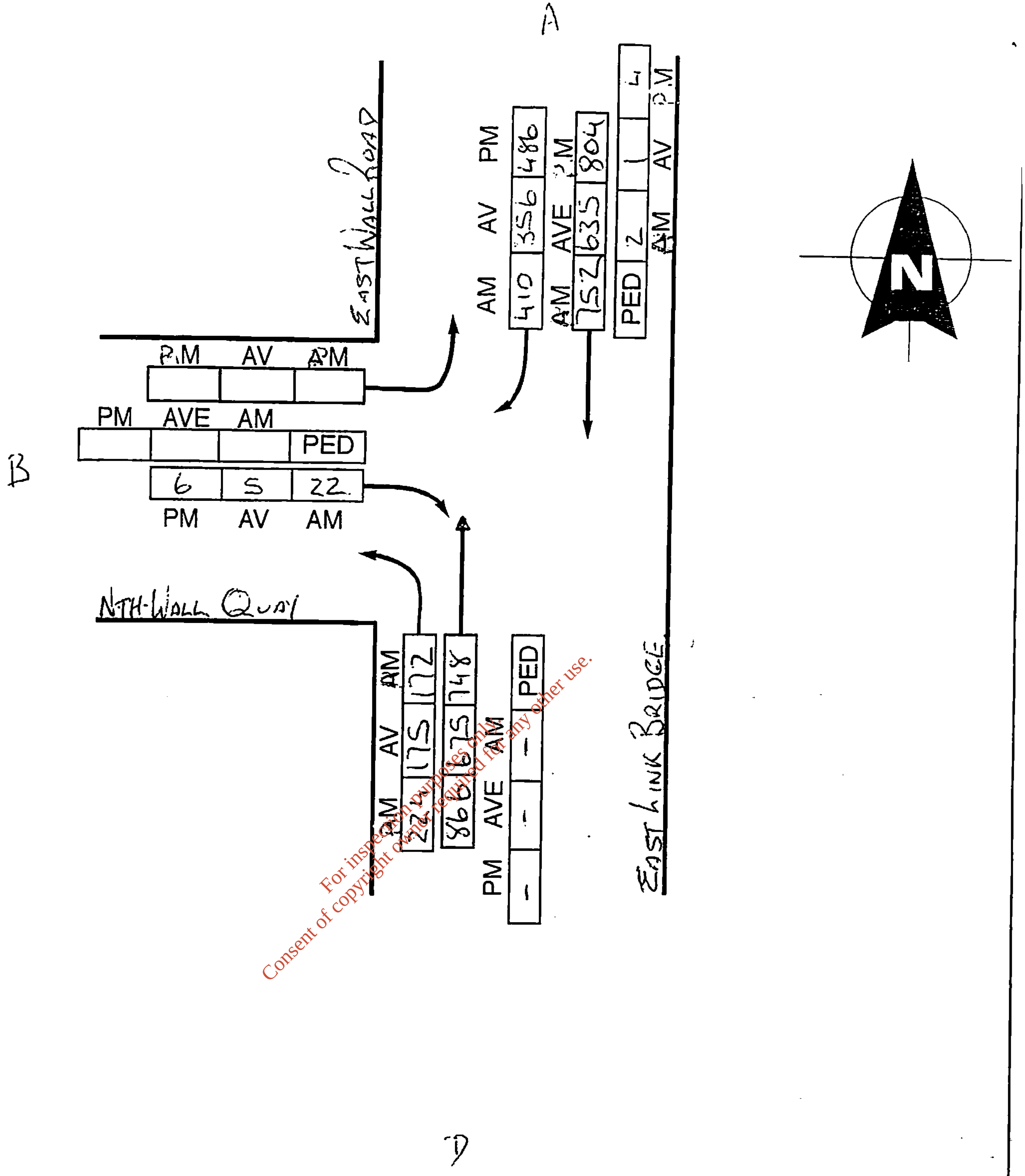
STREET: BATH STREET LOCATION: BEACH ROAD

PEDESTRIANS CROSSING ON: BATH STREET

WIDTH OF ROADWAY:

DATE 10-11-2003 DAY: MONDAY WEATHER: FAIR

QUARTER HOUR ENDING	CHILDREN	ADULTS	TOTAL	QUARTER HOUR ENDING	CHILDREN	ADULTS	TOTAL
8.15	–	1	1	13.30	1	5	6
8.30	10	14	25	13.45	–	1	1
8.45	13	14	27	14.00	–	4	4
9.00	8	10	18	14.15	2	5	7
9.15	–	6	6	14.30	3	3	6
9.30	1	7	8	14.45	7	2	9
9.45	1	6	7	15.00	–	3	3
10.00	–	4	4	15.15	10	3	13
10.15	1	6	7	15.30	8	3	11
10.30	–	4	4	15.45	2	4	6
10.45	3	3	6	16.00	1	4	5
11.00	–	4	4	16.15	6	1	7
11.15	1	5	6	16.30	2	3	5
11.30	1	7	8	16.45	2	4	6
11.45	–	3	3	17.00	1	3	4
12.00	1	1	2	17.15	–	2	2
12.15	–	3	3	17.30	–	1	1
12.30	1	5	6	17.45	1	2	3
12.45	–	2	2	18.00	2	4	6
13.00	3	3	6	18.15	–	2	2
13.15	–	2	2	18.30	1	3	4
REMARKS				TOTAL COUNTS	93	173	266
				AVERAGES PER HOUR	8.	16	25



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8

LOCATION

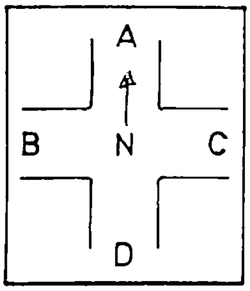
East Wall Road. North Wall Quay
East Link Bridge

MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)

DATE	DAY	WEATHER
23-10-2003	Thursday	Raining

COUNT No.

2003/140



East Wall Road - North Wall Quay

DATE 23-10-2003 DAY Thursday WEATHER Raining

Carriageway Widths	A	B	C	D

	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	East Wall Road				Nth Wall Quay								East Link Bridge			
¼ HR.TO	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
		140	49	239	73		82	155					25	168		193
		178	106	284	74		80	154					48	206		254
		148	78	276	61		75	136					38	154		192
9.00		140	67	207	79		68	147					35	167		202
		134	66	200	76		70	146					26	145		171
		143	83	276	66		76	142					27	158		185
		184	66	250	71		83	154					31	144		175
10.00		206	63	269	77		91	168					22	145		167
		204	55	259	81		82	163					25	142		167
		145	97	242	101		67	168					46	154		200
		134	70	209	96		49	145					44	158		202
11.00		149	75	224	96		48	144					50	170		220
		151	78	229	95		54	149					50	173		223
		152	70	222	87		49	136					50	173		223
		167	81	248	86		53	139					49	155		204
12.00		110	78	188	101		39	140					46	151		197
		137	91	228	85		49	134					28	111		139
		151	93	244	71		54	125					38	133		171
		140	121	261	88		57	145					40	168		206
13.00		141	113	254	97		58	155					41	155		196
		148	100	248	81		62	143					37	163		200
		150	103	253	103		59	162					36	152		188
		137	100	237	98		59	157					32	161		193
14.00		151	89	240	93		55	148					24	155		179
		136	86	222	102		61	163					48	163		211
		140	94	234	108		63	171					53	175		228
		122	106	228	124		59	183					50	174		224
15.00		135	90	225	91		45	136					38	152		190
		136	85	221	90		58	148					53	160		213
		153	85	248	104		49	153					58	166		224
		154	98	252	101		56	157					65	177		242
16.00		167	75	242	76		46	122					67	179		246
		178	82	260	84		50	134					68	190		258
		177	93	270	87		54	141					44	155		199
		182	104	286	76		59	135					45	173		218
17.00		191	116	307	75		61	136					47	201		248
		198	127	325	92		64	156					51	210		261
		204	108	312	79		50	129					58	223		281
		166	74	340	73		52	125					45	194		239
18.00		151	79	230	88		56	144					47	204		256
		163	94	257	70		53	123					60	212		272
18.30		166	97	263	78		48	126					40	191		231
TOTAL		6671	3746	10'417	3680		2518	6198					1845	7093		8938
AVERAGE		635	356	992	350		239	590					175	675		851

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF East Wall Road North Wall Quay

TRAFFIC FROM East Link Bridge DAY Thursday DATE 23-10-2003 WEATHER Raining

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			17	4		25	3	1	125	21		168						
8.30	1		32	8		48	3	2	168	18		206						
8.45	3	2	28	4		38	7	4	124	13		154						
9.00	3	5	26	3		35	4	14	121	18	1	167						
9.15	2	2	19	3		26	8	9	117	11		145						
9.30	3	1	22	2		27	6	5	126	13	1	158						
9.45	2	1	23	4		31	7	5	116	12	·	144						
10.00		1	18	2		22	9	3	123	10	·	145						
10.15	2	1	21	2		25	4	4	111	13	1	142						
10.30			32	7		46	1	3	121	16		154						
10.45		1	34	5		44	2	4	128	14		158						
11.00		1	36	7		50	1	4	116	25	1	170						
1' '5		1	40	5		50	2	3	122	24	1	173						
1...		1	38	6		50	1	2	130	21		173						
11.45			35	7		49	2	3	118	18		155						
12.00			34	6		46	–	4	104	20	–	151						
12.15		1	24	2		28	1	2	92	9		111						
12.30		1	30	4		38	1	3	106	13		133						
12.45		1	28	6		40	–	3	123	22		168						
13.00		1	33	4		41	2	2	118	18	—	155						
13.15		2	28	4		37	3	3	121	20		163						
13.30		1	32	2		36	1	2	115	18		152						
13.45		1	24	4		32	–	4	127	16		161						
14.00			22	1		24	2	3	112	21	—	155						
14.15		4	38	4		48	2	7	126	17	–	163						
14.30		3	42	5		53	3	5	130	20	1	175						
14.45	2	2	37	6		50	3	4	127	22	–	174						
15.00		1	32	3		38	1	2	115	18	—	152						
·		1	29	12		53	2	4	118	20	–	160						
15.30		2	31	13		58	1	6	120	21	1	166						
15.45	1	3	34	15		65	3	4	126	24		177						
16.00		3	38	14		67	2	6	132	21	1	179						
16.15	1	3	41	13		68	3	7	138	23	1	190						
16.30	2	2	39	2		44	1	3	114	22	–	155						
16.45	1	1	35	5		45	3	4	134	18		173						
17.00	1		33	7		47	4	4	154	22		201						
17.15	2	1	43	4		51	6	3	169	19		210						
17.30	1	1	52	3		58	8	3	178	20	1	223						
17.45	3	1	40	2		45	5	5	159	16	–	194						
18.00	2	1	37	5		47	4	4	168	14	–	209						
18.15	3	1	53	3		60	6	3	179	15	–	212						
1830	1		38	1		40	4	3	152	18	·	191						
Totals for 10 Hours	12 36	27 55	1368	438 219		1845	42 127	84 168	5429	1518 259	20 10	7043						
Averages per Hour	3	5	130	20		175	12	16	517	72	1	675						

TURNING LEFT TO: Nth Wall Quay

STRAIGHT AHEAD TO East Wall Road

TURNING RIGHT TO:

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF East Wall Road - North Wall Quay

TRAFFIC FROM Nth Wall Quay DAY Thursday DATE 23-10-2003 WEATHER Raining

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15	2	2 1	34	18 36	1 2	73								4 2	72	4 8		82
8.30	1	-	32	21 42	-	74								4 2	68	5 10		80
8.45	1	-	35	13 26	-	61								5 2	64	2 4		75
9.00	1	1	37	20 40	1 2	79							2	1	58	4 8	1 2	68
9.15	-	1	38	19 38	-	76							1	1	64	3 6		70
9.30	-	1	32	17 34	-	66								3 1	63	6 12		76
9.45	1	2 1	30	20 40	-	71								3 1	66	8 16		83
10.00	—	1	27	25 50	-	77							—	2 1	65	12 24		91
10.15		1	29	26 52		81							1	2 1	63	9 18		82
10.30		1	33	33 66	1 2	101								3 1	42	12 24		67
10.45		2 1	33	30 60	1 2	96							1	1	37	6 12		49
11.00			32	31 62	1 2	96								3 1	37	5 10		48
11.15		1	31	32 64		95							1	2 1	39	7 14		54
		1	29	24 58		87								1	37	6 12		49
11.45			32	27 54		86								2 1	38	7 14		53
12.00		1	27	37 74		101							–	1	25	7 14		39
12.15	1	1	29	28 56		85								1	33	8 16		49
12.30	1		31	22 44	1 2	71								2 1	35	9 18		54
12.45	1	1	30	29 58		88								3 1	36	10 20		57
13.00	1	1	27	34 68	1 2	97								2 1	39	9 18		58
13.15	1		25	33 66		81							1	1	42	10 20		62
13.30			27	36 72	2 4	103								2 1	40	9 18		59
13.45		2 1	24	34 68		98								1	43	8 16		59
14.00			27	33 66		93								1	41	7 14		55
14.15	1	1	32	35 70		102								2 1	44	8 16		61
14.30	2	3 1	31	38 76		108								2 1	46	7 14	1 2	63
14.45		1	42	41 82		124							1	1	43	8 16		59
15.00		2 1	36	27 54		91								1	31	7 14		45
		2 1	33	28 56		90							1	3 1	39	9 18		58
15.30		2 1	37 -	33 66		104								2 1	34	7 14		49
15.45	1	1	41	30 60		101								2 1	39	8 16		56
16.00	1	2 1	27	24 48		76								3 1	35	5 10		46
16.15	2	3 1	24	27 54		84								2 1	37	6 12		50
16.30	1	1	27	29 58	1 2	87								2 1	39	7 14		54
16.45			24	26 52		76								1	43	8 16		59
17.00	2	1	25	25 50		75							1	1	47	7 14		61
17.15	1	2 1	29	31 62		92								1	46	9 18		64
17.30	1	3 1	24	27 54		79							2	1	38	6 12		50
17.45	1	1	23	24 48	1 2	73							1	2 1	41	5 10		52
18.00	2	2 1	29	29 58		88							1	1	42	7 14		56
18.15	1	1	26	27 44		70							—	2 1	38	7 14		53
1630	1	1	30	24 48		78							—	1	36	6 12		48
Totals for 10 Hours	28 4	49 24	1281	1172 2345	11 22	3680							14 4	80 40	1870	300 600	2 4	251
Averages per Hour	2	4	122	111	1	350							1	7	178	28	—	239

TURNING LEFT TO: East Wall Road

STRAIGHT AHEAD TO:

TURNING RIGHT TO East Link Bridge

1

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF East Wall Road - North Wall Quay

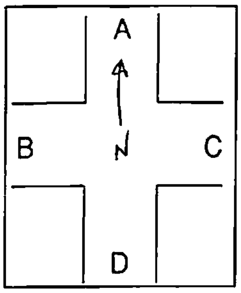
TRAFFIC FROM East Wall Road DAY Thursday DATE 22-10-2003 WEATHER Raining

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15							5 1	4 2	109	14 28		140			7	45 90	1 2	99
8.30							5 1	10 5	146	13 26		178	1		6	50 100		106
8.45							12 4	8 4	172	9 18		198			10	34 68		78
9.00							14 4	9 4	114	9 18		140	1	1	3	32 64		67
9.15							11 3	10 5	110	8 16		134			2	32 64		66
9.30							5 1	6 3	151	19 38		193	2	1	7	38 76		83
9.45							7 2	5 2	156	12 24		184			6	30 60		66
10.00							4 1	6 3	162	15 30		206		1	7	28 56		63
10.15							4 1	5 2	165	18 36		204		1	5	25 50		55
10.30							1	5 3	117	13 26		145	1		13	40 80	2 4	97
10.45							—	3 1	102	18 36		139	1		14	27 54	1 2	70
11.00							—	1	125	12 24		149	1		15	30 60		75
							1	3 1	122	14 28		151	1		12	32 64	1 2	78
11.30							1	3 1	127	12 24		152	1		10	30 60		70
11.45							—	4 2	115	25 50		167			15	33 66		81
12.00							1	3 1	71	19 38		110			22	28 56		78
12.15							1	3 1	96	20 40		137		3 1	16	37 74		91
12.30							—	4 2	111	19 38		151	1		27	33 66		93
12.45							—	6 3	103	17 34		140	1		45	37 74	1 2	121
13.00							—	3 1	110	15 30		141	1		39	36 72	1 2	113
13.15							2	4 2	118	14 28		148			32	34 68		100
13.30							2	2 1	109	20 40		150	1	1	25	38 76	1 2	103
13.45							1	2 1	100	18 36		137			28	36 72		100
14.00							1	3 1	108	21 42		151		1	21	34 68		89
14.15							—	1	106	12 24		136		1	24	31 62		86
14.30							—	1	100	19 38	1 2	140			24	35 70		94
14.45							2	1	86	18 36		122			24	41 82		106
15.00							1	2 1	102	16 32		135			22	34 68		90
15.15							1	2 1	107	14 28		136		1	23	31 62		85
15.30							3 1	6 3	111	19 38		153			19	33 66		85
15.45							4 1	7 3	116	16 32	1 2	154	1	1	22	37 74	1 2	98
16.00							1	4 2	111	27 54	-	167			19	27 54	1 2	75
16.15							1	4 2	148	13 26	1 2	178			30	26 52		82
16.30							5 1	5 2	146	14 28		177		1	27	33 66		93
16.45							4 1	7 3	152	12 24	1 2	182		2 1	31	36 72		104
17.00							1	6 3	156	15 30	1 2	191		2 1	37	39 78		116
17.15							6 2	8 4	160	16 32	-	198	1	1	39	44 88		127
17.30							5 1	7 3	166	17 34	-	204	1		40	34 68		108
17.45							6 2	6 3	139	11 22	-	166		2 1	31	21 42		74
18.00							4 1	7 3	127	10 20	-	151	1		24	25 50		79
18.15							5 1	4 2	134	13 26		163	—	1	32	31 62	—	94
1830							4 1	5 2	131	15 30	1 2	166	—	—	27	35 70	—	97
Totals for 10 Hours							43 131	97 194	5217	1302 651	12 6	6671	5 17	10 21	887	2824 1412	20 10	3746
Averages per Hour							12	18	496	62	—	635	1	2	84	134	1	356

TURNING LEFT TO:

STRAIGHT AHEAD TO: East Link Bridge

TURNING RIGHT TO: Nth Wall Quay



East Wall Road. North Wall Quay.

DATE 22-10-2003 DAY Thursday WEATHER Fair

PEDESTRIAN COUNTS

	CROSSING ON 'A'			CROSSING ON 'B'			CROSSING ON 'C'			CROSSING ON 'D'		
	East Wall Road			Nth-Wall Road						East Link Bridge		
¼ HR. TO	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
		1	1		4	4					-	-
		-	-		2	2					-	
		-	-		4	4					-	
9.00		-	-		6	6						
			-		5	5					-	
			-		2	2					-	
			-		3	3					-	
10.00		-	-		-	-					-	-
		1	1		-	-						
		-			1	1					-	-
		-			1	1						
11.00		2	2		2	2						
		-	-		1	1					-	-
		1	1		-	-						-
		1	1		-	-						-
12.00		1	1		1	1					-	-
		-	-		-	-						
		-	-		3	3						
		-	-		1	1						
13.00		-	-		1	1						
		2	2		-	-						
		-	-		1	1						
		-	-		2	2						
14.00		1	1		1	1						
		-	-		1	1						
		-	-		2	2						
		1	1		2	2						
15.00		2	2		-	-						
		-	-		2	2						
		-	-		1	1						
		-	-		-	-						
16.00		-	-		-	-						
		-	-		1	1						
		1	1		-	-						
		-	-		2	2						
17.00		-	-		1	1						
		-	-		1	1						
		-	-		-	-						
		-	-		2	2						
18.00		-	-		1	1						
		1	1		1	1						
18.30		-	-		-	-						
TOTAL.		15	15		58	58						
AVERAGE		1	1		5	5						

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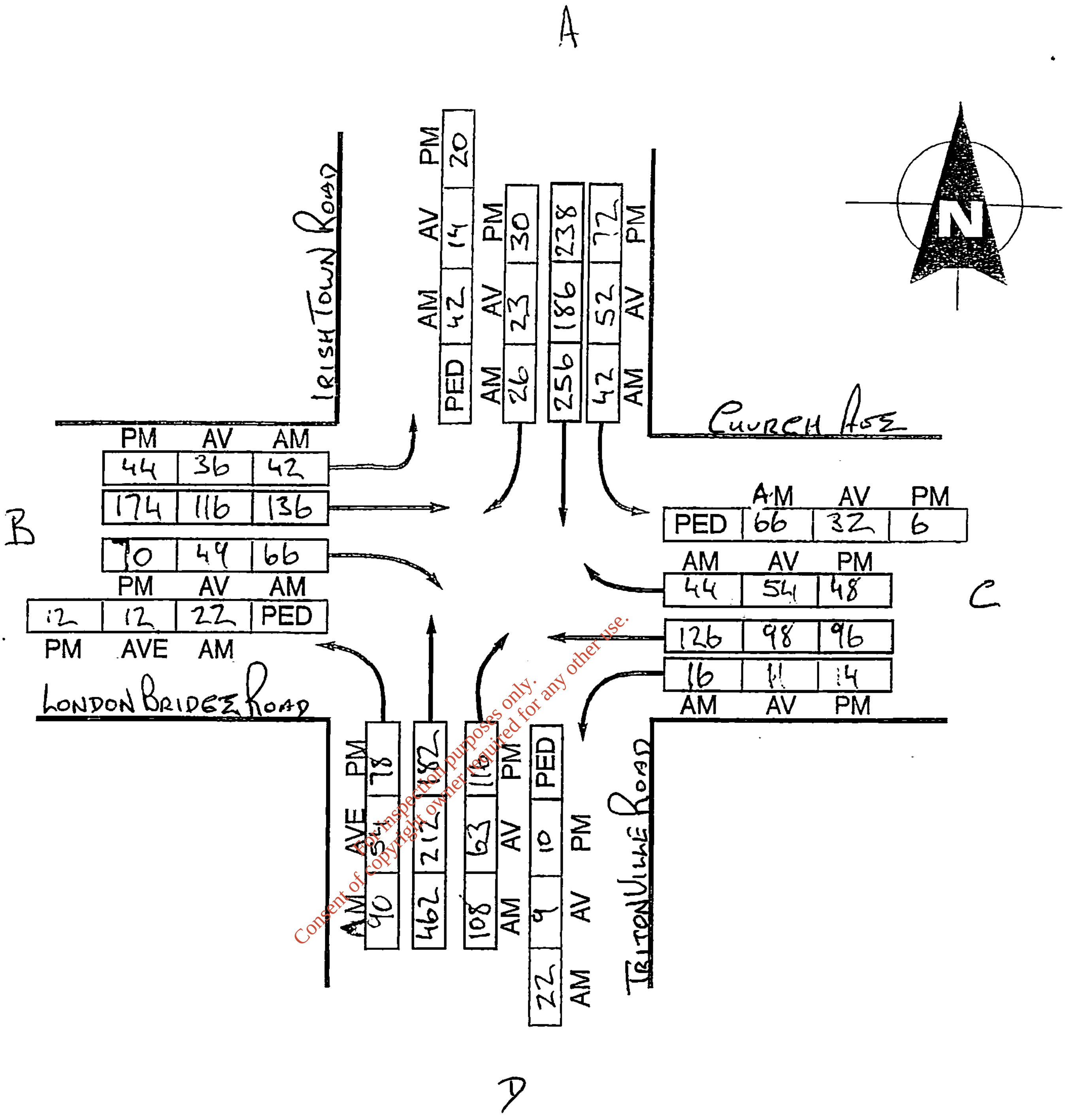


Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

ROADS & TRAFFIC DEPT.
CIVIC OFFICE
FISHAMBLE ST., DUBLIN 8

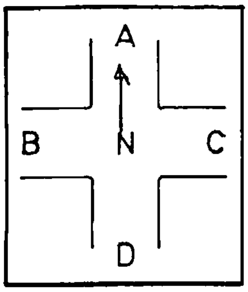
LOCATION

IRISHTOWN ROAD TRITONVILLE ROAD

MICHAEL PHILLIPS B.E., C.Eng.
DUBLIN CITY ENGINEER (ROADS)

COUNT No. 2004/195

DATE	DAY	WEATHER
4-2-2004.	WEDNESDAY	RAINING

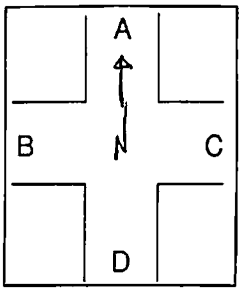


IRISHTOWN ROAD - TRITONVILLE ROAD

DATE 4-2-2004 DAY Wednesday WEATHER Raining

Carriageway Widths	A	B	C	D

	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	IRISHTOWN ROAD				LONDON BRIDGE ROAD				CHURCH AVE				TRITONVILLE ROAD			
¼ HR.TO	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
	4	33	3	40	6	27	7	40	2	31	6	34	23	103	15	141
	5	36	3	44	4	32	9	50	3	32	11	46	22	110	26	158
	4	65	2	71	7	36	11	54	5	29	8	42	20	120	28	168
900	11	63	7	81	6	21	13	40	2	30	8	40	22	111	25	158
	10	53	5	68	12	17	16	45	1	30	8	39	21	119	25	165
	7	36	8	51	9	12	17	38	4	33	14	51	15	77	18	110
	12	28	7	47	7	11	4	22	3	29	12	44	19	57	14	90
10.00	10	27	4	41	8	11	7	26	1	27	10	39	15	56	13	84
	13	30	5	48	7	10	5	22	1	29	12	42	10	51	15	76
	13	31	8	52	5	10	4	19	5	30	7	42	8	50	8	66
	10	32	6	48	8	16	12	36	4	22	3	29	13	40	10	62
11.00	17	42	10	69	6	12	10	28	2	26	12	40	12	43	8	63
	14	35	7	56	5	17	12	34	2	22	11	35	9	38	6	53
	9	30	4	43	6	21	9	36	3	21	20	44	8	44	19	71
	15	34	2	51	7	25	8	40	3	17	20	40	7	43	11	61
12.00	20	34	2	56	6	21	9	36	2	17	18	37	9	47	10	66
	17	42	6	65	7	27	11	45	1	22	16	39	10	39	9	58
	14	37	3	54	10	28	8	46	2	21	21	44	14	43	11	78
	13	35	2	50	12	35	14	61	1	20	22	43	8	35	14	57
13.00	14	47	5	66	8	26	11	45	4	20	22	46	16	42	9	67
	15	64	10	89	9	30	12	51	6	20	18	44	11	39	11	61
	16	55	7	78	11	34	13	58	6	26	17	49	13	38	12	62
	18	47	9	74	10	31	11	52	3	20	22	45	15	45	10	70
14.00	15	50	6	71	11	39	8	58	2	24	14	40	12	35	13	60
	14	50	3	67	12	36	14	62	4	24	20	48	11	43	11	75
	12	53	6	71	8	32	12	52	3	24	20	47	11	53	17	81
	17	53	5	75	10	38	10	58	4	29	17	50	9	62	10	81
15.00	15	59	12	86	14	29	16	59	3	26	14	43	9	44	8	61
	12	59	4	75	8	30	18	56	2	34	14	50	14	37	16	67
	16	47	5	68	10	29	15	54	1	29	19	49	11	41	10	62
	20	53	8	81	13	38	18	69	2	22	12	36	5	45	7	57
1600	14	46	6	66	14	29	17	60	2	25	11	38	8	38	12	58
	13	55	7	75	10	37	15	62	4	21	11	36	6	43	20	69
	14	42	7	63	9	43	13	65	3	25	11	39	12	38	32	82
	5	38	8	51	9	36	20	65	4	23	7	34	21	40	26	87
17.00	9	53	2	64	12	44	15	71	3	19	8	30	18	45	24	87
	11	53	6	70	9	43	15	67	1	23	8	32	17	46	32	95
	15	57	7	79	11	40	16	67	2	21	13	36	15	41	18	74
	16	59	8	83	8	40	16	64	3	23	11	37	14	50	23	92
18.00	15	56	7	78	12	41	14	67	2	18	9	29	15	40	19	74
	20	60	6	86	10	37	14	61	3	21	9	33	14	41	24	79
18.30	16	59	6	81	8	35	13	56	1	20	10	31	10	36	18	64
TOTAL	552	1961	246	2759	384	1224	523	2131	118	1039	575	1732	575	2233	670	3478
AVERAGE	52	186	23	262	36	116	49	202	11	98	54	164	54	212	63	331



Irishtown Road Tritonville. Road

DATE 4 - 2 . 2004 DAY Wednesday WEATHER Raining

PEDESTRIAN COUNTS

	CROSSING ON 'A' P. B. UNIT Irishtown Road			CROSSING ON 'B' London Bridge Road			CROSSING ON 'C' Church Ave			CROSSING ON 'D' Tritonville Road		
1/4 HR. TO	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
	4	5	9		3	3		5	5	2	3	5
	4	8	12	2	4	6	1	5	6	2	4	6
	5	3	8	1	4	5	3	8	11	2	2	4
9.00		6	6		3	3	5	16	21		3	3
	1	4	5	–	1	1	2	10	12	4	2	5
		2	2	–	1	1	–	7	7		1	1
		2	2		3	3		3	3		–	–
10.00	1	3	4		1	1		3	3		1	1
	1	4	5		2	2		2	2		–	–
		2	2		3	2	1	8	9		1	1
		3	3		1	1		8	8		3	3
11.00	–	–	–	–	2	2	3	14	17	–	1	1
		3	3		1	1	2	6	8		3	3
		2	2		1	1		6	6		1	1
		–	–		2	2	1	4	5		1	1
12.00		1	1		2	2		5	5		2	2
		3	3		6	6		3	3		2	2
	–	2	2	–	3	3	1	4	5		–	–
		2	2		5	5		4	4		3	3
13.00		1	1		2	2		4	4		2	2
	1	2	3	1	5	6	3	10	13		2	2
		1	1		3	3		3	3		3	3
		3	3	1	2	3		4	4	2	6	8
14.00		2	2	2	4	6	–	6	6	–	4	4
		3	3	1	6	7	2	6	8		6	6
	2	1	3		7	7	1	7	8		2	2
	3	3	6		3	3	5	8	13		1	1
15.00		1	1		4	4	2	5	7	2	2	4
	2	1	3		1	1	3	6	9.	4	3	7.
	4	2	6.	1	2	3	3	6	9		1	1
	5	4	9	3	2	5	2	6	8		2	3
16.00	2	2	4	2	2	4	1	3	4	1	3	4
	4	2	6		1	1	3	4	7	–	–	–
		4	4		3	3		12	12		3	3
		1	1		3	3		10	10		1	1
17.00	1	3	4	–	2	2	5	12	17	–	2	2
		2	2		4	4		13	13		3	3
		4	4		2	2	2	11	14		1	1
	1	3	4		3	3	3	9	12		1	1
18.00		5	5		3	3	1	8	9		2	2
		4	4	–	2	2		8	8		1	1
18.30		3	3.	–	2	2		9	9.	–	2	2
TOTAL.	41	112	153	14	115	129	55	291	346	19	84	103
AVERAGE	4	10	14.	1	10	12	5	27	32	1	8	9

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Irish Town Road Tritonville Road

TRAFFIC FROM Irish Town DAY Wednesday DATE 4-2-2004 WEATHER Raining

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			2	1		4		2	28	1	1	33			3			3
8.30			1	2		5	1		34		1	36			3			3
8.45			2	1		4	2	1	55	4	1	65			2			2
9.00		1	1	4	1	11	1	3	60		1	63			5	1		7
9.15			4	3		10	3	1	44	2	2	53			5			5
9.30			3	2		7	1	1	32		2	36			8			8
9.45			4	4		12	1	1	26	—	1	28			5	1		7
10.00			4	3		10		1	23	1	1	27			4			4
10.15			3	5		13	1	2	25	1	1	30			5			5
10.30			3	5		12		2	22	3	1	31			8			8
10.45		1	4	3		10		1	26	2	1	32			6			6
11.00			5	6		17	1	3	33	2	2	42			8	1		10
11.15		1	6	4		14	1	1	29	2	1	35		1	7			7
			3	3		9		1	26	1	1	30			4			4
11.45			5	5		15	1		28	1	2	34			2			2
12.00			4	7	1	20	1	1	30		2	34			2			2
12.15			5	6		17		2	37	1	1	42			4	1		6
12.30	1		4	5		14	1	1	31	2	1	37			3.			3
12.45			3	5		13			24	2	1	35			2			2
13.00		1	4	5		14	1		37	4	1	47			5			5
13.15			3	6		15	2	3	55	1	3	64			8	1		10
13.30			6	5		16	3		46	2	2	55			5	1		7
13.45			4	7		18		1	43	1	1	47			5	2		9
14.00			3	6		15	2	1	44	2	1	50			6.			6
14.15			4	5		14		2	43	2	1	50			3			3
14.30			6	3		12			47	2	1	53		1	6			6
14.45	1		9	4		17	1	3	40	6	1	55			5			5
15.00			5	5		15		1	47	4	2	59			8	2		12
			4	4		12	1	2	52	1	2	59			2	1		4
15.30			8	4		16	—	1	39	2	2	47			5.			5
15.45			8	6		20		1	43	2	3	53			6	1		8
16.00			2	6		14	2	4	40	1	1	46			6			6
16.15			5	4		13	1	3	46	2	2	55			7			7
16.30			2	6		14		4	38		1	42			7			7
16.45			1	2		5			34		2	38		1	8			8
17.00			5	2		9	2	4	45	2	1	53		1	2			2
17.15			3	3	1	11	4	2	47	1	1	53			5			5
17.30			5	5		15	5	3	51	1	1	57			6			6
17.45			4	6		16	3	2	49	2	2	59		1	7			7
18.00		1	5	5		15	3	3	50	1	1	56			8			8
18.15			6	7		20	4	2	56		1	60		1	7			7
1830			4	5	1	16	2	1	53	1	2	59			6.			6
Totals for 10 Hours	2	5	172	185	4	552	52	67	1663	65	59	1961		6	219	12		246
Averages per Hour	–	-	16	17	–	52.	5,	6	158	6.	.5,	186	-	-	20	1		23

TURNING LEFT TO: Church Ave

STRAIGHT AHEAD TO Tritonville Road

TURNING RIGHT TO London Bridge Rd

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Irish Town Road — Tritonville Road

TRAFFIC FROM Church Ave DAY Wednesday. DATE 4-2-2004 WEATHER Raining

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			2			2	2		29	1^{2}		31			—	3^{6}		6
8.30			1	1^{2}		3	1	1	32			32			1	5^{10}		11
8.45	1		3	1^{2}		5		1	29			29			—	4^{8}		8
9.00			2			2		1	26	2^{4}		30			—	4^{8}		8
9.15			1			1	1		28	1^{2}		30			2	3^{6}		8
9.30			4			4	1		29	2^{4}		33			2	6^{12}		14
9.45	1		1	1^{2}		3	1		29			29			—	6^{12}		12
10.00	1		1			1		1	27			27			—	5^{10}		10
10.15			1			1	1		29			29			—	6^{12}		12
10.30			5			5			30			30			1	3^{6}		7
10.45			4			4			22			22			1	—	1^{2}	3
11.00			2			2	1		24	1^{2}		26			2	10^{10}		12
11.15			2			2		1	22			22			1	5^{10}		11
[illegible]	1		3			3		1	19	1^{2}		21			—	10^{20}		20
11.45			1	1^{2}		3			15	1^{2}		17			2	9^{18}		20
12.00			2			2		1	17			17			—	9^{18}		18
12.15			1			1		1	22			22			—	8^{16}		16
12.30			2			2	1		19	1^{2}		21			1	10^{20}		21
12.45			1			1	1	1	20			20			2	10^{20}		22
13.00			2	1^{2}		4			18	1^{2}		20			2	10^{20}		22
13.15		1	4	1^{2}		6		1	20			20			2	8^{16}		18
13.30			4	1^{2}		6			20	3^{6}		26			3	7^{14}		17
13.45		1	1	1^{2}		3	1		18	1^{2}		20			2	10^{20}		22
14.00			2			2		2^{1}	23			24			2	6^{12}		14
14.15			4			4	1	1	24			24	1		2	8^{16}	1^{2}	20
14.30			3			3	1	1	24			24	1		2	8^{16}	1^{2}	20
14.45			4			4			27	1^{2}		29			1	7^{14}	1^{2}	17
15.00			1	1^{2}		3			26	—		26			2	6^{12}		14
15 15			2			2			30	2^{4}		34			2	6^{12}		14
1[illegible]			1			1			27	1^{2}		29		—	1	8^{16}	1^{2}	19
15.45			2			2			20	1^{2}		22		1	2	5^{10}		12
16.00			2			2		1	23	1^{2}		25		1	3	7^{8}		11
16.15			4			4			21			21		1	1	4^{8}	1^{2}	11
16.30			3			3		1	23	1^{2}		25			1	5^{10}		11
16.45			4			4			23			23			1	3^{6}		7
17.00		1	3			3	1	2^{1}	14	2^{4}		19			—	4^{8}		8
17.15		1	1			1	1	2^{1}	18	2^{4}		23			2	3^{6}		8
17.30			2			2	1	1	21			21			3	5^{10}		13
17.45			3			3	1		19	2^{4}		23			1	4^{8}	1^{2}	11
18.00			2			2		2^{1}	17			18			1	4^{8}		9
18.15			3			3		1	19	1^{2}		21			3	3^{6}		9
1830			1			1	1		20			20			—	5^{10}		10
Totals for 10 Hours	4^{1}	4^{2}	97	9^{18}		118	18^{6}	25^{12}	963	29^{53}		1039	2	3^{1}	56	504 252	7^{14}	575
Averages per Hour	—	—	9	—		11	1	2	71	2		98	—	—	5	24	—	54

TURNING LEFT TO: Tritonville Road

STRAIGHT AHEAD TO: London Bridge Road

TURNING RIGHT TO: Irish Town.

B

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF IRISHTOWN ROAD – TRITONVILLE ROAD

TRAFFIC FROM LONDONBRIDGE ROAD DAY WEDNESDAY. DATE 4-2-2004 WEATHER RAINING

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15		1	6			6		1	25	1 ^{2}		27			7			7
8.30		1	4			4		2 ^{1}	29	1 ^{2}		32		1	7	1 ^{2}		9
8.45			7			7	1	1	34	1 ^{2}		36			11			11
9.00			6			6	1		19	1 ^{2}		21			13			13
9.15			12			12			15	1 ^{2}		17	2		16			16
9.30		1	9			9	1	1	12			12			15		1 ^{2}	17
9.45		1	7			7			11			11		1	4			4
10.00			8			8			9	1 ^{2}		11	1		7			7
10.15			7			7			8	1 ^{2}		10			5			5
10.30			5			5			6	2 ^{4}		10			4			4
10.45			8			8			14	1 ^{2}		16	1		12			12
11.00			6			6			10	1 ^{2}		12		1	10			10
11.15	1		5			5		1	15	2 ^{4}		17			10	1 ^{2}		12
			6			6			21			21			9			9
11.45			7			7			23	1 ^{2}		25			8			8
12.00			6			6		1	21			21			9			4
12.15			7			7			23	2 ^{4}		27			11			11
12.30			8	1 ^{2}		10			26	1 ^{2}		28			8.			8
12.45			10	1 ^{2}		12		1	35			35		1	14			14
13.00			8			8	2		22	2 ^{4}		26			9	1 ^{2}		11
13.15		1	9			9	1		28	1 ^{2}		30	1	1	12			12
13.30			11			11	1	1	32	1 ^{2}		34			13			13
13.45			10			10	1		29	1 ^{2}		31	1	1	11			11
14.00			9	1 ^{2}		11			33	3 ^{6}		39		1	8			8
14.15			10	1 ^{2}		12		2 ^{1}	35			36		1	14			14
14.30		1	8			8	2		28	2 ^{4}		32	1	1	12			12
14.45			10			10	1		32	3 ^{6}		38			10			10
15.00		1	14			14			25	2 ^{4}		29			16			16
1			8			8			30			30	1		18			18
15.30			10			10			27	1 ^{2}		29			15.			15
15.45			13			13		1	34	2 ^{4}		38		1	18			18
16.00		2 ^{1}	11	1 ^{2}		14	2		29			29	1	1	17			17
16.15	1	1	10			10	1		33	2 ^{4}		37		1	15			15
16.30	1		9			4	2		39	2 ^{4}		43	2		13			13
16.45			9			9	1		36			36			18		1 ^{2}	20
17.00			10	1 ^{2}		12			40	2 ^{4}		44	2.		15			15
17.15			9			9	1	1	41	1 ^{2}		43			15			15
17.30			11			11	1		38	1 ^{2}		40	1		16			16
17.45			8			8	1	1	40	2 ^{4}		40			16			16
18.00			10	1 ^{2}		12		1	37	2 ^{4}		41	1		14			14
18.15			10			10	1		35	1 ^{2}		37			14			14
1830			8			8			33	1. ^{2}		35			13.			13
Totals for 10 Hours	3 ^{1}	10 ^{5}	364	7 ^{14}		384	21 ^{7}	15 ^{7}	1112	49 ^{98}	—	1224	15 ^{5}	13 ^{6}	502	3 ^{6}	2 ^{4}	523
Averages per Hour	—	1	34.	—		36	2'	1	105	4	—	116	1	1	47	—	—	44.

TURNING LEFT TO: IRISHTOWN.

STRAIGHT AHEAD TO: CHURCH AVE

TURNING RIGHT TO: TRITONVILLE ROAD

D

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF IRISH TOWN ROAD TRITON VILLE ROAD

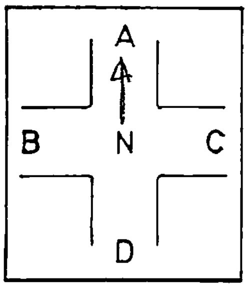
TRAFFIC FROM TRITON VILLE ROAD DAY WEDNESDAY DATE 4-2-2004 WEATHER RAINING

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15			23			23	2		95	3 ^{6}	1 ^{4}	103			13	1 ^{2}		15
8.30	2		20		1 ^{2}	22	1		106	2 ^{4}		110			20	3 ^{6}		26
8.45	1		20			20			118	1 ^{2}	–	120			24	2 ^{4}		28
9.00	1		22			22	3 ^{1}	1	102	1 ^{2}	3 ^{6}	111	1		21	2 ^{4}		25
9.15			19	1 ^{2}		21	2	2 ^{1}	116	1	1 ^{4}	119		1	25			25
9.30			15			15	1	1	71	2 ^{4}	1 ^{2}	77			18			18
9.45	1		17	1 ^{2}		14	1	1	51	1 ^{2}	2 ^{4}	57			12		1 ^{2}	14
10.00			15			15	2	1	48	2 ^{4}	2 ^{4}	56			13			13
10.15			10			10	2		37	4 ^{8}	3 ^{6}	51			13		1 ^{2}	15
10.30			8			8			44	2 ^{4}	1 ^{2}	50			8			8
10.45			12			12		1	34	1 ^{2}	2 ^{4}	40			10			10
11.00			10	1 ^{2}		12	1		39	1 ^{2}	1 ^{2}	43			8			8
11 15	1		7	1 ^{2}		9		1	28	2 ^{4}	3 ^{6}	38			6			6
[illegible]	1		8			8	1	1	38	1 ^{2}	2 ^{4}	44			9	5 ^{10}		19
11.45		/	7			7	1	2 ^{1}	36	1 ^{2}	2 ^{4}	43			7	2 ^{4}		11
12.00			9			9		1	39	2 ^{4}	2 ^{4}	47			8	1 ^{2}		10
12.15			8	1 ^{2}		10	1		35	1 ^{2}	1 ^{2}	39			7	1 ^{2}		9
12.30			12	1 ^{2}		14			33	3 ^{6}	2 ^{4}	43			9	1 ^{2}		11
12.45		1	8			8	2	3 ^{1}	30	1 ^{2}	1 ^{2}	35			8	3 ^{6}		14
13.00	1	1	16			16	1	1	34	3 ^{6}	1 ^{2}	42			7	1 ^{2}		9
13.15			11			11	1	1	35	2 ^{4}	–	34			9	1 ^{2}		11
13.30		1	12			12	1	2 ^{1}	33	2 ^{4}	–	38			8	2 ^{4}		12
13.45			15			15	3	2 ^{1}	37	3 ^{6}	–	45			6	2 ^{4}		10
14.00		1	12			12	2	3 ^{1}	30	1 ^{2}	1 ^{2}	35			9	2 ^{4}		13
14.15			11			11	1	2 ^{1}	38	2 ^{4}		43		1	9	1 ^{2}		11
14.30			11			11	2		47	1 ^{2}	2 ^{4}	53		1	13	2 ^{4}		17
14.45	1		9			9		1	58	1 ^{2}	1 ^{2}	62		1	10			10
15.00			7	1 ^{2}		9	1	1	42	1 ^{2}		44		1	8			8
	2	1	14			14	1		35		1 ^{2}	37			14	1 ^{2}		16
15.30	1	1	9	1 ^{2}		11	1		39	1 ^{2}		41			10			10
15.45		1	5			5		1	43		1 ^{2}	45			7			7
16.00	1	1	6		1 ^{2}	8	1		36		1 ^{2}	38	1		10	1 ^{2}		12
16.15			6			6			41		1 ^{2}	43			16	2 ^{4}		20
16.30			12			12	1	1	38			38			32			32
16.45			21			21	2	1	36	1 ^{2}	1 ^{2}	40			26			26
17.00			18			18	2	1	39	1 ^{2}	2 ^{4}	45			24			24
17.15	1	1	17			17	6 ^{2}	1	42		1 ^{2}	46			30	1 ^{2}		32
17.30	1		15			15	4 ^{1}		36	1 ^{2}	1 ^{2}	41			18			18
17.45	1	1	19			19	2		46		2 ^{4}	50			23			23
18.00		1	15			15	1		34	1 ^{2}	2 ^{4}	40		1	19			19
18.15	2		14			14		2 ^{1}	38		1 ^{2}	41			24			24
1830	1		17	1 ^{2}		10	2	1	30	2 ^{4}	1 ^{2}	36			18			18
Totals for 10 Hours	19 ^{6}	11 ^{5}	542	9 ^{18}	2 ^{4}	575	55 ^{18}	36 ^{18}	1987	55 ^{110}	50 ^{100}	2233	2	6 ^{3}	589	37 ^{74}	2 ^{4}	670
Averages per Hour	1	1	51	–	-	54	5	3	189	5	4	212	–	–	56	3	–	63

TURNING LEFT TO: LONDON BRIDGE ROAD

STRAIGHT AHEAD TO: IRISH TOWN.

TURNING RIGHT TO: CHURCH AVE



Beach Road Church Ave

DATE 10-11-2003 DAY Monday WEATHER Fair

Carriageway Widths	A	B	C	D

	TRAFFIC ON A				TRAFFIC ON B				TRAFFIC ON C				TRAFFIC ON D			
	Pembroke Street				Church Ave				Sth Link Road				Beach Road			
¼ HR.TO	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL	LEFT	STR.	RGT.	TOTAL
		5	28	33		36	8	44					20	43	154	217
		10	39	49		48	7	55					31	53	171	255
		16	51	67		61	4	65					48	74	172	244
9.00		20	63	83		49	7	56					34	62	174	270
		17	36	53		49	6	55					38	71	127	236
		18	44	62		49	10	59					39	43	120	202
		10	35	45		48	5	53					32	44	106	182
10.00		4	41	45		48	8	56					31	30	105	166
		8	44	52		48	7	65					30	28	94	152
		7	32	39		39	8	47					33	36	116	185
		8	37	45		35	11	46					23	35	150	208
11.00		13	36	49		54	10	64					24	31	128	183
		14	32	46		42	9	51					20	34	125	179
		16	58	64		49	7	56					25	45	99	169
		6	38	44		54	6	60					31	30	103	164
12.00		5	45	50		61	10	71					35	28	100	163
		7	34	41		57	8	65					37	23	101	161
		10	54	64		56	10	66					28	27	92	147
		5	59	64		58	7	65					24	32	102	158
13.00		15	45	60		57	9	66					35	42	105	182
		10	53	63		54	14	68					31	52	96	179
		15	64	79		54	10	64					31	43	112	186
		9	59	68		59	7	66					34	44	98	176
14.00		14	56	70		56	12	68					28	41	111	180
		15	66	81		53	15	68					24	38	147	209
		18	58	76		63	14	77					25	41	116	182
		22	65	87		65	15	70					25	34	123	182
15.00		27	67	94		56	8	64					24	42	122	188
		14	67	81		69	5	74					30	30	129	189
		14	68	82		75	8	83					23	30	137	190
		20	73	93		81	5	86					22	43	148	213
16.00		23	75	98		82	9	91					29	36	153	218
		22	72	94		84	11	95					29	32	152	213
		20	45	115		94	5	99					34	44	147	225
		26	89	115		90	4	94					24	48	97	169
17.00		19	74	93		80	10	90					30	37	86	153
		26	67	93		68	4	72					31	36	84	156
		18	66	84		78	8	86					29	43	108	180
		20	61	81		81	9	90					33	42	97	172
18.00		16	56	72		84	5	89					32	45	93	170
		9	39	48		79	7	86					29	41	87	157
18.30		11	45	56		78	5	83					26	38	80	144
TOTAL		605	2294	2899		2592	353	2945					1253	1718	4494	7966
AVERAGE		57	218	276		246	33	280					114	163	475	758

A

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Beach Road - Church Ave

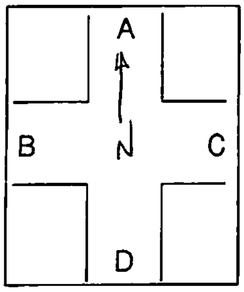
TRAFFIC FROM Pembroke Street DAY Monday DATE 10-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15								1	5			6			28			28
8.30									8	1^{2}		10	1	1	31	1^{2}		34
8.45									14	1^{2}		16	2	3^{1}	48	1^{2}		51
9.00									20			20	6^{2}		57	2^{4}		63
9.15									15	1^{2}		17	2		36			36
9.30									18			18	1	1	42	1^{2}		44
9.45									6	2^{4}		10		1	31	2^{4}		35
10.00									4			4	3^{1}		38	1^{2}		41
10.15								1	8			8	1		40	2^{4}		44
10.30									5	1^{2}		7		1	32			32
10.45									8			8	1		33	2^{4}		37
11.00									9	2^{4}		13			34	1^{2}		36
									8	3^{6}		14		1	30	1^{2}		32
11.30									10	3^{6}		16		1	48	5^{10}		58
11.45									6			6	1		32	3^{6}		38
12.00									3	1^{2}		5		1	43	1^{2}		45
12.15									7			7	1		30	2^{4}		34
12.30									8	1^{2}		10			44	5^{10}		54
12.45									5			5		1	51	4^{8}		59
13.00									13	1^{2}		15		2^{1}	44			45
13.15									10			10		1	49	2^{4}		53
13.30									13	1^{2}		15			62	1^{2}		64
13.45									9			9	1		55	2^{4}		59
14.00									14			14			54	1^{2}		56
14.15									13	1^{2}		15		1	60	3^{6}		66
14.30									18			18	1	1	54	2^{4}		58
14.45								1	22			22			59	3^{6}		65
15.00									25	1^{2}		27	2	2^{1}	68			67
..5								1	10	2^{4}		14			63	2^{4}		67
15.30								1	14			14	1		66	1^{2}		68
15.45									18	1^{2}		20			69	2^{4}		73
16.00									23			23		2^{1}	70	2^{4}		75
16.15									18	2^{4}		22		1	72			72
16.30									20			20	1	2^{1}	90	2^{4}		95
16.45									24	1^{2}		26	2	1	87	1^{2}		89
17.00								1	19			19	1	4^{2}	72			74
17.15									22	2^{4}		26	2	2^{1}	66			67
17.30									18			18		1	54	1^{2}		66
17.45									20			20	1	2^{1}	60			61
18.00									16			16	3^{1}	1	53	1^{2}		56
18.15									9			9	3^{1}		36	1^{2}		39
1830									11			11	5^{1}	1	44			45
Totals for 10 Hours								6^{3}	546	28^{56}		605	42^{14}	35^{17}	2141	61^{122}		2294
Averages per Hour								–	52	2		57	4	3	204	5		218

TURNING LEFT TO:

STRAIGHT AHEAD TO: Sean Moore Road

TURNING RIGHT TO: Beach Road



Beach Road - Church Ave

DATE 10-11-2003 DAY Monday WEATHER Fair

PEDESTRIAN COUNTS

	CROSSING ON 'A'			CROSSING ON 'B'			CROSSING ON 'C'			CROSSING ON 'D'		
	Pembroke Street			Church Ave			Sth Link Road			Beach Road		
1/4 HR. TO	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL	CHILD.	ADULT.	TOTAL
		1	1		2	2				-	-	-
	10	14	24	3	3	6				1	2	3
	12	14	26	8	13	21					-	-
9.00	8	10	18	5	6	11					1	1
		4	4	2	4	6					-	-
	1	7	8		3	3					-	-
	1	6	7		4	4					-	-
10.00		4	4	-	2	2					1	1
	1	6	7		3	3					-	-
		4	4	1	1	2					-	-
	1	3	4		3	3					2	2
11.00		6	6		3	3					-	-
	1	4	5	1	4	5					-	-
		3	3		3	3					1	1
		1	1		2	2					-	-
12.00	-	1	1		4	4					-	-
		3	3		2	2					1	1
	1	3	4		4	4					-	-
		2	2	2	9	11					1	1
13.00	1	3	4		5	5					-	-
		2	2	2	5	7					-	-
		5	5	1	6	7					-	-
		2	2.	4	5	9					1	1
14.00	-	1	1	1	6	7					-	
	2	5	7	2	5	7				1	1	2
	3	3	6	3	8	11				3	2	5
	7	2	9		4	4				-	-	-
15.00	-	1	1	3	12	15					1	1
	7	4	11	4	8	12					-	-
	10	3	13	9	6	15					1	1
	8	3	11	4	5	9.				4	1	5
16.00	2	4	6	-	6	6				1	-	1
	1	4	5	2	8	10					1	1
	6	1	7		3	3					1	1
	2	3	5	2	4	6					-	-
17.00	2	4	6	1	3	4					2	2
	1	3	4	1	4	5				3	1	4
	-	2	2		3	3					-	-
	-	-	-		-	-					1	1
18.00	-	-	-		-	-					1	1
	1	4	5		6	6					-	-
18.30		2	2	2	5	7					-	-
TOTAL.	89	157	246	63	192	255				13	23	36
AVERAGE	8,	14	23	6	18	24				1	2	3

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Beach Road Church Ave,

TRAFFIC FROM Church Ave DAY Monday DATE 10-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15								1	30	3 -		36			6	1 2		8
8.30									40	4 8		48	1		5	1 2		7
8.45								2 1	54	2 4	1 2	61			2	1 2		4
9.00							1	3 1	42	3 6		49	1	1	5	1 2		7
9.15								2 1	38	5 10		49			4	1 2		6
9.30								1	35	7 14		49			6	2 4		10
9.45									40	4 8		48			5			5
10.00							1	1	38	5 10		48			6	1 2		8
10.15								1	36	6 12		48			5	1 2		7
10.30									31	4 8		39		1	4	2 4		8
10.45							1		29	3 6		35			7	2 4		11
11.00									32	11 22		54	1		8		1 2	10
11.15									30	6 12		42		1	5	2 4		9
							1		39	5 10		49			5	1 2		7
11.45									42	6 12		54			4	1 2		6
12.00									45	8 16		61			6	2 4		10
12.15							2		37	9 18	1 2	57		1	6	1 2		8
12.30								1	40	7 14	1 2	56			4	3 6		10
12.45									38	10 20		58		1	7			7
13.00									41	8 16		57			5	1 2	1 2	9
13.15							1	2 1	41	6 12		54	1		10	2 4		14
13.30								1	40	7 14		54			8	1 2		10
13.45								1	43	8 16		59		1	7			7
14.00									48	4 8		56			6	3 6		12
14.15									41	6 12		53		1	11	2 4		15
14.30							2		49	7 14		63			8	3 6		14
14.45									47	9 18		65		1	11	2 4		15
15.00									44	6 12		56			8			8
5								1	53	8 16		64	1		5			5
15.30									61	7 14		75			4	2 4		8
15.45							2	2 1	64	7 14	1 2	81	1		5			5
16.00							1		68	7 14		82			7	1 2		9
16.15								2 1	71	6 12		84	1		9	1 2		11
16.30								1	80	6 12	1 2	94		1	5			5
16.45									86	2 4		90			4			4
17.00									72	4 8		80			8	1 2		10
17.15								1	60	3 6	1 2	68		1	4			4
17.30							2	2 1	69	4 8		78			6	1 2		8
17.45							1	4 2	73	3 6		81			5	2 4		9
18.00							3 1	2 1	78	2 4		84			3	1 2		5
18.15							2	2 1	72	3 6		79		1	7			7
1830							3 1	1	73	2 4		78		1	5			5
Totals for 10 Hours							23 7	34 17	2090	233 466	6 12	2592	7 2	12 4	251	46 92	2 4	353
Averages per Hour							2	3	199	22	–	246	–	1	24	4	–	33

TURNING LEFT TO:

STRAIGHT AHEAD TO: Slan Moore Road

TURNING RIGHT TO: Black Road

D

CORPORATION, TRAFFIC DEPT . TRAFFIC CENSUS AT JCT. OF Beach Road = Church Ave

TRAFFIC FROM Beach Road DAY Monday DATE 10-11-2003 WEATHER Fair

QUARTER HOUR ENDING	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.	CYCLES		CARS	LORRIES	BUSES	P.C.U.
	Pedal	Motor					Pedal	Motor					Pedal	Motor				
8.15	1	1	10	5		20	5	1	36	3		43	4	3	146	3	---	154
8.30		1	23	4		31	8	1	45	3		52	4	5	156	6		171
8.45			36	5	1	48	4	1	65	3		74	3	7	158	5		172
9.00		3	27	3		34	5	2	56	2		62	3	13	153	7		174
9.15		1	20	7	2	38	2	1	65	3		71	1	7	120	2		127
9.30			33	3		39	1		41	1		43	1	4	102	8	---	120
9.45	1		26	3		32		1	42	1		44	-	1	82	12		106
10.00			21	5		31	2	2	27	1		30	1	3	86	9		105
10.15			22	4		30	1	1	26	1		28	-	2	79	7		94
10.30		1	25	4		33	2	1	34	1		36	-	-	100	7	1	116
10.45		1	19	2		23			33	1		35	-	1	122	13	1	150
11.00			18	3		24	1	2	28	1		31	-	2	115	6	-	123
11.15		1	16	2		20	1		30	2		34	1	2	116	4		125
1			17	4		25	1		39	3		45	-	2	94	2		99
11.45			19	6		31	1		26	2		30	-	2	88	7		103
12.00			13	11		35			26	1		28	-	1	88	10		100
12.15		1	21	8		37	2		23			23	1	1	85	8		101
12.30		1	16	5	1	28		1	25	1		27	2	1	62	13	2	92
12.45			14	4	1	24			32			32	-	2	75	13		102
13.00			21	7		35	1	1	40	1		42	1	2	86	9		105
13.15		1	17	7		31	1		46	3		52	-	2	81	7		96
13.30			19	6		31	1	1	39	2		43	-	2	91	10		112
13.45		1	20	7		34	1		42	1		44	-	1	84	7		98
14.00	1		20	4		28		1	37	2		41	-	2	96	7	-	111
14.15		1	16	4		24	1	1	36	1		38	-	-	125	11	-	147
14.30		1	19	3		25	4	3	37	1		41	1	2	93	11	-	116
14.45		1	19	3		25	2	1	32	1		34	1	2	102	9	1	123
15.00		1	16	4		24	1	3	37	2		42	-	1	100	10	1	122
15.15		1	26	2		30	1	1	28	1		30	-	4	103	11	1	124
15	1		19	2		23	2	1	28	1		30	-	-	121	8	-	137
15.45			18	2		22	2	1	39	2		43	-	3	127	9	1	148
16.00		1	21	4		29		1	32	2		36	-	1	143	4	1	153
16.15			25	2		29	1	1	30	1		32	-	2	127	11	1	152
16.30		1	24	4	1	34		1	42	1		44	3	3	129	8	-	147
16.45	1		16	4		24	2	4	44	1		48	1	3	88	4	-	97
17.00	1		24	3		30	2	2	34	1		37	1	4	78	3	-	86
17.15			29	1		31	1		36			36		2	80	4		89
17.30	1		25	2		29	1	1	41	1		43		3	95	5	1	108
17.45		1	27	3		33	2	2	39	1		42	1	2	88	4		97
18.00	1		26	3		32	2	1	41	2		45	1		85	3	1	93
18.15		1	25	2		29	1	2	38	1		41	1		81	3		87
1830			22	2		26	1	1	36	1		38			76	2		80
Totals for 10 Hours	8	22	890	169	6	1253	71	44	1553	60		1718	32	100	4296	307	12	4444
Averages per Hour	-	2	84	16	-	119	6	4	147	5		163	3	9.	404	29	1	425

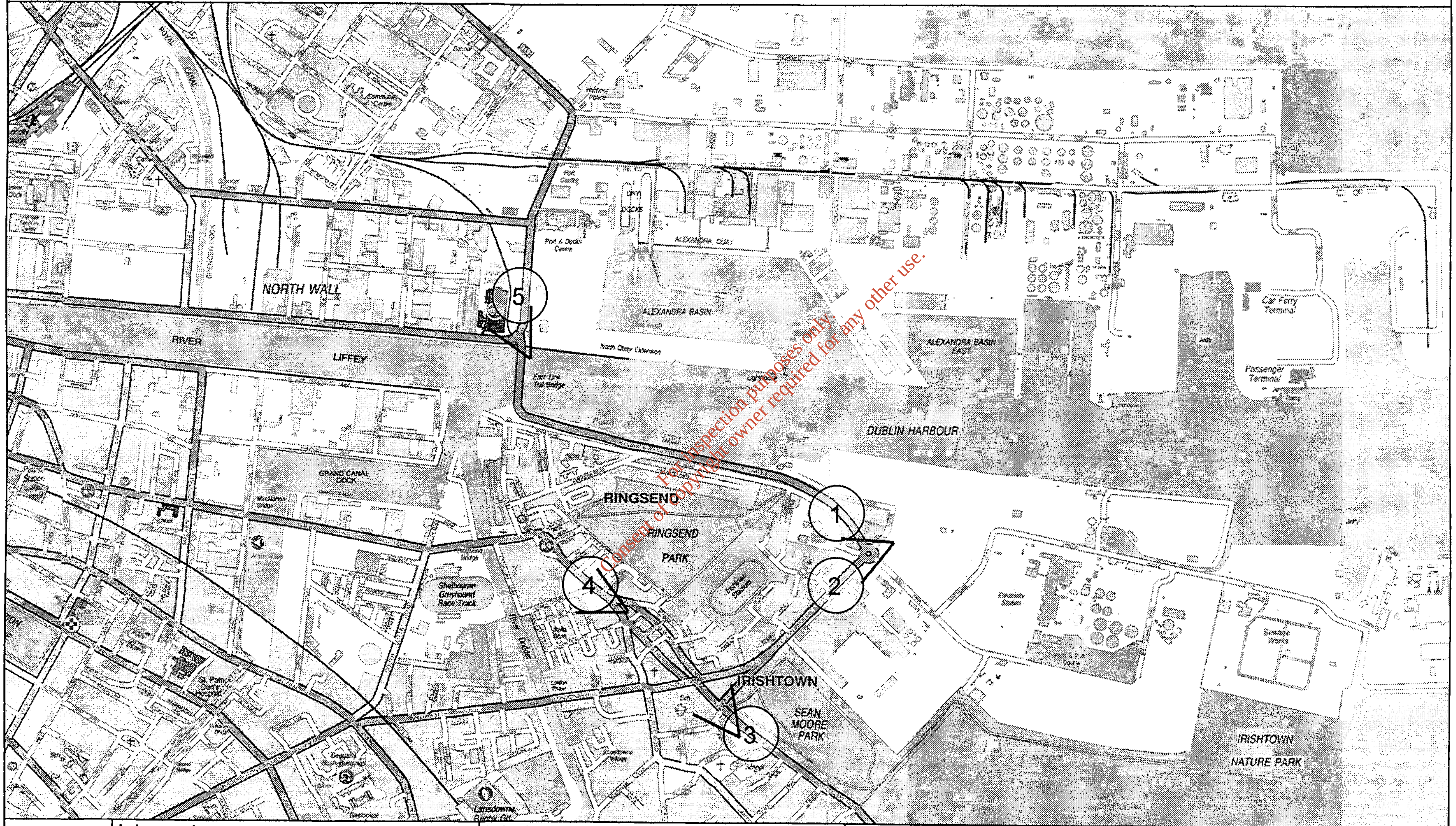
TURNING LEFT TO: Church Ave

STRAIGHT AHEAD TO: Bath Street

TURNING RIGHT TO: Sean Moore Road

ABACUS TRANSPORTATION SURVEYS 2004 COUNTS

Site Locations

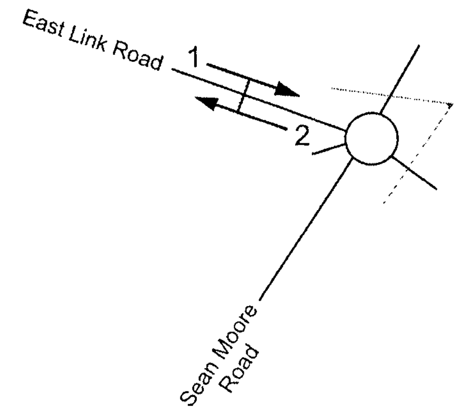


Job number: ATH/04/043	Job date: 11th - 12th March 2004	Drawing No: ATH/04/043-1
Client: MCOS	Job day Thursday - Friday	Author: PDF

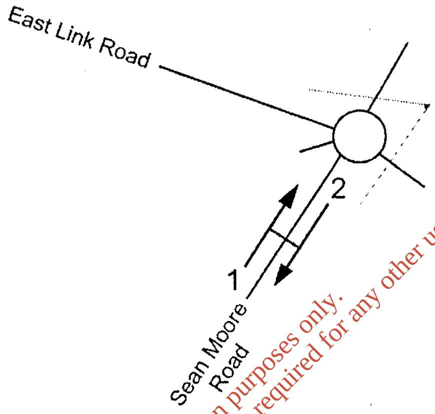
abacus
Transportation Surveys

Movement Numbers & Directions

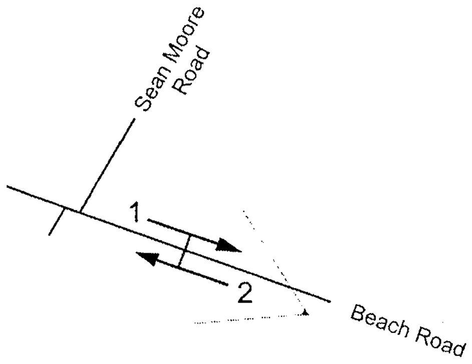
Site 1



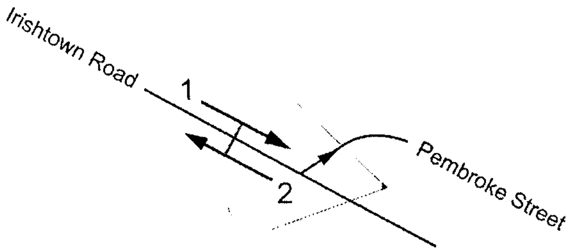
Site 2



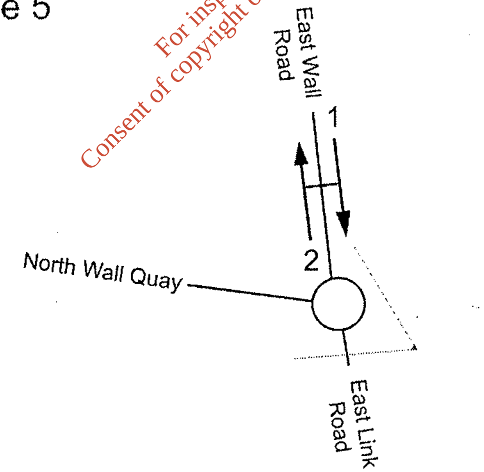
Site 3



Site 4



Site 5



Job number: ATH/04/043	Job date: 11th - 12th March 2004	Drawing No: ATH/04/043-2
Client: MCOS	Job day Thursday - Friday	Author: PDF

abacus Transportation Surveys

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**

MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 01 DATE: 11th/12th March 2004

LOCATION: East Link Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
7:00	109	19	4	10	0	142	105	4	3	8	0	120
7:15	205	24	5	15	0	249	144	17	8	15	0	184
7:30	191	20	5	16	0	232	133	9	6	23	0	171
7:45	226	28	8	19	0	281	140	22	6	13	0	181
H/TOT	731	91	22	60	0	904	522	52	23	59	0	656
8:00	243	27	7	16	0	293	177	8	2	13	0	200
8:15	207	23	4	15	0	249	138	8	8	12	0	166
8:30	222	32	4	15	0	273	174	14	6	8	2	204
8:45	212	20	4	13	1	250	179	15	2	6	0	202
H/TOT	884	102	19	59	1	1065	668	45	18	39	2	772
9:00	188	23	5	15	0	231	153	13	3	13	0	182
9:15	188	20	4	16	3	231	180	20	4	12	0	216
9:30	158	18	9	17	1	203	131	11	6	17	0	165
9:45	147	35	5	16	0	203	136	14	6	15	0	171
H/TOT	681	96	23	64	4	868	600	58	19	57	0	734
10:00	139	26	8	18	1	192	145	16	7	14	0	182
10:15	117	27	6	17	1	168	164	19	13	9	0	205
10:30	140	23	9	21	0	193	189	25	15	21	0	250
10:45	101	18	8	22	0	149	146	25	12	16	0	199
H/TOT	497	94	31	78	2	702	644	85	47	60	0	836
11:00	66	23	7	19	1	116	156	23	11	16	2	208
11:15	95	17	8	17	1	138	126	17	12	10	0	165
11:30	125	13	7	26	1	172	112	20	13	15	0	160
11:45	127	19	4	13	0	163	102	18	6	21	0	147
H/TOT	413	72	26	75	3	589	496	78	42	62	2	680
12:00	103	20	8	18	1	150	110	22	8	15	0	155
12:15	102	18	7	19	1	147	109	20	14	15	1	159
12:30	121	15	5	20	0	161	107	21	9	10	0	147
12:45	146	20	6	23	0	195	109	25	6	9	1	150
H/TOT	472	73	26	80	2	653	435	88	37	49	2	611

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS — **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS — **ATH/04/043**

SITE: 01 DATE: 11th/12th March 2004

LOCATION: East Link Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
13:00	103	17	6	21	0	147	138	23	12	17	0	190
13:15	123	14	4	21	1	163	130	27	16	11	0	184
13:30	110	14	6	20	0	150	133	14	14	18	0	179
13:45	100	11	3	16	0	130	128	27	9	14	0	178
H/TOT	436	56	19	78	1	590	529	91	51	60	0	731
14:00	128	18	7	17	1	171	160	28	18	17	0	223
14:15	102	17	7	16	1	143	122	18	7	15	0	162
14:30	76	15	3	9	2	105	137	34	7	14	0	192
14:45	127	25	7	17	1	177	149	24	22	14	0	209
H/TOT	433	75	24	59	5	596	568	104	54	60	0	786
15:00	111	15	3	17	0	146	127	28	8	14	1	178
15:15	109	14	3	17	0	143	152	20	16	25	1	214
15:30	97	19	4	21	0	141	152	28	11	16	1	208
15:45	153	13	5	16	1	188	176	33	8	19	0	236
H/TOT	470	61	15	71	1	618	607	109	43	74	3	836
16:00	168	14	2	12	2	198	201	41	5	17	0	264
16:15	154	15	3	9	0	181	129	18	7	11	0	165
16:30	184	16	2	12	1	215	235	38	6	8	0	287
16:45	176	19	3	13	2	213	236	34	4	8	1	283
H/TOT	682	64	10	46	5	807	801	131	22	44	1	999
17:00	210	16	3	11	0	240	262	26	4	12	0	304
17:15	215	11	4	7	2	239	225	21	4	9	0	259
17:30	247	13	3	7	1	271	204	20	5	9	0	238
17:45	268	12	3	5	0	288	97	13	2	1	0	113
H/TOT	940	52	13	30	3	1038	788	80	15	31	0	914
18:00	243	9	2	4	0	258	202	15	3	5	0	225
18:15	191	5	1	7	0	204	82	12	1	3	0	98
18:30	236	4	4	4	0	248	276	20	3	6	0	305
18:45	158	7	3	4	0	172	217	8	2	5	0	232
H/TOT	828	25	10	19	0	882	777	55	9	19	0	860

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 01 DATE: 11th/12th March 2004

LOCATION: East Link Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
19:00	165	5	0	2	1	173	222	11	3	2	0	238
19:15	159	4	0	3	1	167	125	5	1	1	0	132
20:15	120	4	0	5	0	129	113	10	2	2	1	128
21:15	113	5	0	0	0	118	122	7	2	1	0	132
H/TOT	557	18	0	10	2	587	582	33	8	6	1	630
20:00	90	6	0	1	0	97	92	6	2	1	0	101
20:15	97	4	0	0	2	103	85	6	1	1	0	93
20:30	90	3	0	1	0	94	74	5	1	2	0	82
20:45	82	2	1	1	0	86	59	4	0	5	0	68
H/TOT	359	15	1	3	2	380	310	21	4	9	0	344
21:00	56	5	0	1	1	63	46	4	0	0	0	50
21:15	56	2	0	2	0	60	52	3	0	0	0	55
21:30	60	3	0	1	0	64	60	1	0	0	0	61
21:45	60	3	0	1	0	64	55	3	0	0	0	58
H/TOT	232	13	0	5	1	251	213	11	0	0	0	224
22:00	47	1	0	1	0	49	68	3	0	1	0	72
22:15	47	2	0	0	1	50	33	0	0	2	1	36
22:30	40	1	0	0	0	41	51	2	2	0	0	55
22:45	30	0	0	1	0	31	33	2	0	0	0	35
H/TOT	164	4	0	2	1	171	185	7	2	3	1	198
23:00	18	0	0	3	0	21	26	1	2	0	0	29
23:15	23	1	0	0	0	24	26	1	0	1	0	28
23:30	20	1	0	1	0	22	22	1	0	0	0	23
23:45	16	0	0	0	0	16	18	0	1	0	0	19
H/TOT	77	2	0	4	0	83	92	3	3	1	0	99
0:00	20	0	0	0	0	20	16	1	0	0	0	17
0:15	12	0	0	0	0	12	19	2	0	0	0	21
0:30	10	1	0	0	0	11	15	0	0	0	0	15
0:45	8	1	0	0	0	9	11	1	0	0	0	12
H/TOT	50	2	0	0	0	52	61	4	0	0	0	65

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 01 DATE: 11th/12th March 2004

LOCATION: East Link Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
1:00	5	0	0	0	0	5	5	0	1	0	0	6
1:15	2	0	0	0	0	2	6	2	0	0	0	8
1:30	1	0	0	0	0	1	3	0	1	1	0	5
1:45	3	1	0	0	0	4	3	0	0	2	0	5
H/TOT	11	1	0	0	0	12	17	2	2	3	0	24
2:00	2	0	0	1	0	3	4	0	0	0	0	4
2:15	2	1	0	0	0	3	3	0	0	0	0	3
2:30	0	0	0	1	0	1	0	0	0	0	0	0
2:45	1	0	0	0	0	1	3	0	0	0	0	3
H/TOT	5	1	0	2	0	8	10	0	0	0	0	10
3:00	1	0	0	0	0	1	2	0	0	0	0	2
3:15	2	0	0	1	0	3	6	0	0	0	0	6
3:30	0	0	1	0	0	1	3	1	0	0	0	4
3:45	2	0	0	0	0	2	3	0	0	0	0	3
H/TOT	5	0	1	1	0	7	14	1	0	0	0	15
4:00	0	0	1	0	0	1	6	0	1	0	0	7
4:15	0	0	0	0	0	0	5	0	0	2	0	7
4:30	4	1	0	1	0	6	5	0	0	0	0	5
4:45	1	0	0	1	0	2	10	0	0	3	0	13
H/TOT	5	1	1	2	0	9	26	0	1	5	0	32
5:00	2	0	2	3	0	7	24	1	0	2	0	27
5:15	4	1	1	0	0	6	35	4	2	0	0	41
5:30	5	1	1	4	0	11	32	2	1	1	0	36
5:45	8	1	2	6	0	17	16	1	3	2	0	22
H/TOT	19	3	6	13	0	41	107	8	6	5	0	126
6:00	13	4	4	11	0	32	27	2	2	1	0	32
6:15	20	5	3	14	0	42	38	2	0	0	0	40
6:30	39	10	2	8	0	59	56	7	0	1	0	64
6:45	76	12	4	18	0	110	81	15	5	5	0	106
H/TOT	148	31	13	51	0	243	202	26	7	7	0	242
P/TOT	9099	952	260	812	33	11156	9254	1092	413	653	12	11424

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 02 DATE: 11th/12th March 2004

LOCATION: Sean Moore Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
7:00	120	10	5	8	0	143	107	21	9	7	0	144
7:15	130	19	9	6	0	164	182	27	12	11	0	232
7:30	177	11	7	5	1	201	199	22	13	7	0	241
7:45	175	25	5	2	0	207	219	34	9	10	1	273
H/TOT	602	65	26	21	1	715	707	104	43	35	1	890
8:00	198	17	7	4	0	226	237	28	13	13	0	291
8:15	164	10	10	2	0	186	209	27	7	9	0	252
8:30	217	22	3	2	1	245	244	40	6	12	0	302
8:45	181	11	5	6	0	203	196	27	10	2	0	235
H/TOT	760	60	25	14	1	860	886	122	36	36	0	1080
9:00	156	15	3	5	0	179	177	23	9	2	0	211
9:15	216	15	4	6	0	241	173	16	4	7	1	201
9:30	111	9	6	11	0	137	156	19	7	8	0	190
9:45	146	19	8	6	0	179	151	27	5	10	0	193
H/TOT	629	58	21	28	0	736	657	85	25	27	1	795
10:00	138	21	9	9	0	177	159	16	5	9	2	191
10:15	182	21	12	9	0	224	122	21	5	11	1	160
10:30	196	25	18	9	0	248	142	14	9	9	0	174
10:45	152	23	17	10	0	202	117	20	6	2	0	145
H/TOT	668	90	56	37	0	851	540	71	25	31	3	670
11:00	186	38	17	11	2	254	71	19	4	9	0	103
11:15	114	20	11	5	0	150	128	19	7	11	0	165
11:30	119	14	13	2	0	148	86	13	4	7	1	111
11:45	109	27	8	15	0	159	143	17	5	10	0	175
H/TOT	528	99	49	33	2	711	428	68	20	37	1	554
12:00	99	18	5	6	0	128	117	21	8	10	1	157
12:15	137	28	17	7	1	190	138	17	6	13	0	174
12:30	116	26	9	6	0	157	114	17	3	5	0	139
12:45	124	24	7	13	2	170	144	18	6	15	1	184
H/TOT	476	96	38	32	3	645	513	73	23	43	2	654

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT | **MARCH 2004**

MANUAL CLASSIFIED JUNCTION COUNT | **ATH/04/043**

SITE: 02

DATE: 11th/12th March 2004

LOCATION: Sean Moore Road

DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
13:00	156	25	14	6	0	201	119	11	4	10	0	144
13:15	157	30	12	9	0	208	131	11	4	7	0	153
13:30	132	16	16	9	0	173	150	22	2	18	0	192
13:45	135	31	12	3	0	181	101	11	5	7	0	124
H/TOT	580	102	54	27	0	763	501	55	15	42	0	613
14:00	151	23	18	8	0	200	124	11	8	9	0	152
14:15	162	25	11	4	0	202	126	17	9	12	0	164
14:30	140	34	7	4	0	185	77	12	5	12	0	106
14:45	155	28	20	2	0	205	130	21	3	3	1	158
H/TOT	608	110	56	18	0	792	457	61	25	36	1	580
15:00	152	22	14	9	1	198	147	22	6	4	0	179
15:15	142	20	11	6	1	180	112	12	3	10	0	137
15:30	147	30	9	7	1	194	120	16	4	3	0	143
15:45	170	27	14	2	0	213	194	8	5	5	0	212
H/TOT	611	99	48	24	3	785	573	58	18	22	0	671
16:00	177	37	6	5	0	225	153	7	1	10	0	171
16:15	90	16	8	2	0	116	162	8	4	6	0	180
16:30	208	27	6	7	0	248	200	20	3	3	0	226
16:45	212	24	5	4	1	246	203	13	6	3	0	225
H/TOT	687	104	25	18	1	835	718	48	14	22	0	802
17:00	209	22	5	6	0	242	228	16	5	5	0	254
17:15	197	19	3	3	1	223	241	12	0	3	2	258
17:30	134	10	3	0	0	147	214	11	0	4	1	230
17:45	77	9	3	2	0	91	235	6	2	2	0	245
H/TOT	617	60	14	11	1	703	918	45	7	14	3	987
18:00	147	13	2	1	0	163	256	10	2	2	0	270
18:15	57	5	1	3	0	66	187	5	1	3	0	196
18:30	239	14	2	3	0	258	232	2	1	1	0	236
18:45	210	10	2	2	0	224	161	3	1	3	0	168
H/TOT	653	42	7	9	0	711	836	20	5	9	0	870

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 02 DATE: 11th/12th March 2004

LOCATION: Sean Moore Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
19:00	206	13	3	2	0	224	187	4	0	0	1	192
19:15	127	6	1	0	0	134	162	3	0	2	1	168
20:15	118	11	1	3	1	134	112	2	0	3	0	117
21:15	125	6	2	0	0	133	116	5	0	0	0	121
H/TOT	576	36	7	5	1	625	577	14	0	5	2	598
20:00	83	8	2	1	0	94	90	5	0	1	0	96
20:15	99	8	1	1	0	109	109	2	0	0	1	112
20:30	81	4	1	2	0	88	97	3	1	1	0	102
20:45	68	3	0	5	0	76	91	4	2	1	0	98
H/TOT	331	23	4	9	0	367	387	14	3	3	1	408
21:00	57	5	0	0	0	62	60	4	1	0	0	65
21:15	53	2	0	0	0	55	60	4	0	1	0	65
21:30	64	0	0	0	0	64	76	1	0	2	0	79
21:45	62	4	0	0	0	66	58	2	0	1	0	61
H/TOT	236	11	0	0	0	247	254	11	1	4	0	270
22:00	66	3	0	1	0	70	53	1	0	0	0	54
22:15	27	4	0	2	0	33	55	3	0	2	1	61
22:30	52	3	1	0	0	56	41	1	0	0	0	42
22:45	35	2	0	0	0	37	30	0	0	1	0	31
H/TOT	180	12	1	3	0	196	179	5	0	3	1	188
23:00	28	1	2	1	0	32	21	1	0	3	0	25
23:15	33	1	0	1	0	35	25	0	0	0	0	25
23:30	24	1	0	0	0	25	25	0	0	0	0	25
23:45	21	0	1	0	0	22	19	0	0	0	0	19
H/TOT	106	3	3	2	0	114	90	1	0	3	0	94
0:00	18	1	0	0	0	19	20	1	0	0	0	21
0:15	20	1	0	0	0	21	10	2	0	1	0	13
0:30	22	0	0	0	0	22	12	0	0	0	0	12
0:45	10	2	0	0	0	12	8	2	0	0	0	10
H/TOT	70	4	0	0	0	74	50	5	0	1	0	56

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 02 DATE: 11th/12th March 2004

LOCATION: Sean Moore Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
1:00	5	0	1	0	0	6	4	0	0	0	0	4
1:15	7	2	0	0	0	9	5	0	0	0	0	5
1:30	2	0	1	1	0	4	3	0	0	0	0	3
1:45	5	0	0	2	0	7	5	0	0	0	0	5
H/TOT	19	2	2	3	0	26	17	0	0	0	0	17
2:00	4	0	0	0	0	4	2	0	0	0	0	2
2:15	3	0	0	0	0	3	1	1	0	0	0	2
2:30	0	0	0	0	0	0	1	1	0	0	0	2
2:45	3	0	0	0	0	3	1	0	0	0	0	1
H/TOT	10	0	0	0	0	10	5	2	0	0	0	7
3:00	2	0	0	0	0	2	1	0	0	0	0	1
3:15	6	0	0	0	0	6	2	0	0	0	0	2
3:30	3	1	0	0	0	4	1	0	0	0	0	1
3:45	3	0	0	0	0	3	1	0	0	0	0	1
H/TOT	14	1	0	0	0	15	5	0	0	0	0	5
4:00	6	0	1	0	0	7	0	0	0	0	0	0
4:15	5	0	0	3	0	8	0	0	0	0	0	0
4:30	5	0	0	1	0	6	4	0	0	1	0	5
4:45	10	0	0	3	0	13	2	0	0	0	0	2
H/TOT	26	0	1	7	0	34	6	0	0	1	0	7
5:00	23	2	0	1	0	26	2	1	1	4	0	8
5:15	34	5	2	0	0	41	4	2	0	0	0	6
5:30	24	2	1	0	0	27	5	3	0	3	0	11
5:45	13	1	5	4	0	23	8	1	0	6	0	15
H/TOT	94	10	8	5	0	117	19	7	1	13	0	40
6:00	30	3	3	4	0	40	14	3	2	11	0	30
6:15	41	2	1	0	0	44	17	4	0	8	0	29
6:30	67	7	3	8	0	85	34	8	1	5	0	48
6:45	101	20	3	11	0	135	69	10	2	2	0	83
H/TOT	239	32	10	23	0	304	134	25	5	26	0	190
P/TOT	9320	1119	455	329	13	11236	9457	894	266	413	16	11046

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 03 DATE: 11th/12th March 2004

LOCATION: Beach Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
7:00	123	19	9	5	0	156	164	13	6	3	0	186
7:15	176	28	7	9	0	220	210	16	4	1	0	231
7:30	208	24	11	5	0	248	184	10	4	4	0	202
7:45	214	31	5	7	0	257	191	17	3	0	0	211
H/TOT	721	102	32	26	0	881	749	56	17	8	0	830
8:00	220	27	10	7	0	264	206	9	1	1	0	217
8:15	198	17	5	5	0	225	174	10	3	1	0	188
8:30	209	25	6	6	0	246	177	16	2	0	1	196
8:45	195	21	7	1	0	224	195	10	2	1	0	208
H/TOT	822	90	28	19	0	959	752	45	8	3	1	809
9:00	143	21	8	2	0	174	197	9	3	1	0	210
9:15	149	17	4	2	0	172	208	12	2	1	0	223
9:30	141	14	10	6	1	172	126	8	3	6	0	143
9:45	131	15	8	1	0	155	157	13	3	2	0	175
H/TOT	564	67	30	11	1	673	688	42	11	10	0	751
10:00	131	28	13	3	1	176	148	8	5	5	0	166
10:15	133	35	7	2	2	179	179	15	16	4	0	214
10:30	109	12	10	3	0	134	161	16	11	8	0	196
10:45	105	16	4	3	0	128	189	20	9	11	0	229
H/TOT	478	91	34	11	3	617	677	59	41	28	0	805
11:00	104	23	13	2	0	142	151	22	9	9	2	193
11:15	96	26	8	3	1	134	135	17	12	4	0	168
11:30	141	13	8	10	1	173	133	18	4	6	0	161
11:45	148	23	9	8	0	188	113	14	7	11	0	145
H/TOT	489	85	38	23	2	637	532	71	32	30	2	667
12:00	103	22	5	7	1	138	100	13	5	2	0	120
12:15	132	21	7	7	0	167	127	25	12	1	1	166
12:30	143	18	7	4	0	172	128	20	6	4	1	159
12:45	157	16	9	7	0	189	122	15	7	5	0	149
H/TOT	535	77	28	25	1	666	477	73	30	12	2	594

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 03 DATE: 11th/12th March 2004

LOCATION: Beach Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
13:00	144	13	6	5	0	168	127	22	10	3	0	162
13:15	160	15	3	9	0	187	140	24	8	7	0	179
13:30	132	21	3	7	0	163	140	14	10	7	0	171
13:45	149	9	10	4	0	172	146	22	11	4	0	183
H/TOT	585	58	22	25	0	690	553	82	39	21	0	695
14:00	142	16	9	2	0	169	140	20	13	4	0	177
14:15	149	19	7	6	0	181	156	24	7	3	0	190
14:30	123	22	7	4	0	156	135	20	9	1	2	167
14:45	179	23	6	3	0	211	122	19	13	2	0	156
H/TOT	593	80	29	15	0	717	553	83	42	10	2	690
15:00	162	32	4	1	0	199	127	19	7	3	1	157
15:15	177	23	5	6	1	212	151	22	8	6	0	187
15:30	147	22	3	1	0	173	161	24	13	4	1	203
15:45	216	24	6	1	0	247	166	31	5	5	0	207
H/TOT	702	101	18	9	1	831	605	96	33	18	2	754
16:00	226	24	8	3	0	261	150	34	3	3	0	190
16:15	187	18	3	1	0	209	87	8	1	2	0	98
16:30	195	22	2	1	0	220	131	23	8	6	1	169
16:45	216	19	6	0	0	241	121	8	2	2	0	133
H/TOT	824	83	19	5	0	931	489	73	14	13	1	590
17:00	223	17	5	2	0	247	183	17	4	1	0	205
17:15	230	10	0	2	2	244	147	7	1	1	0	156
17:30	207	9	2	6	0	224	100	14	4	1	0	119
17:45	253	10	2	2	0	267	90	6	0	1	0	97
H/TOT	913	46	9	12	2	982	520	44	9	4	0	577
18:00	228	5	1	1	0	235	88	11	1	1	0	101
18:15	195	7	1	0	0	203	45	4	1	0	0	50
18:30	276	6	1	1	0	284	148	8	1	2	0	159
18:45	200	6	1	1	0	208	185	13	2	0	0	200
H/TOT	899	24	4	3	0	930	466	36	5	3	0	510

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 03 DATE: 11th/12th March 2004

LOCATION: Beach Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
19:00	219	11	0	0	1	231	184	17	1	2	0	204
19:15	223	4	0	1	1	229	148	10	0	0	2	160
20:15	154	4	0	3	0	161	113	9	0	2	0	124
21:15	172	6	0	0	0	178	130	13	0	0	0	143
H/TOT	768	25	0	4	2	799	575	49	1	4	2	631
20:00	139	7	1	0	0	147	82	2	0	1	0	85
20:15	151	6	0	2	1	160	104	6	2	0	0	112
20:30	125	4	0	1	0	130	67	3	0	0	0	70
20:45	129	5	1	1	0	136	82	2	0	4	0	88
H/TOT	544	22	2	4	1	573	335	13	2	5	0	355
21:00	106	5	0	1	0	112	68	2	0	0	0	70
21:15	106	9	0	2	0	117	74	1	0	0	0	75
21:30	94	5	0	1	0	100	60	4	0	0	0	64
21:45	92	6	0	1	0	99	66	2	0	0	0	68
H/TOT	398	25	0	5	0	428	268	9	0	0	0	277
22:00	93	1	0	0	0	94	78	1	0	1	0	80
22:15	82	2	0	0	1	85	51	0	0	2	0	53
22:30	82	2	1	0	0	85	58	3	0	0	0	61
22:45	61	4	0	1	0	66	35	1	0	0	0	36
H/TOT	318	9	1	1	1	330	222	5	0	3	0	230
23:00	38	2	0	3	0	43	32	2	0	2	0	36
23:15	45	2	0	0	0	47	37	1	0	0	0	38
23:30	36	1	0	0	0	37	29	0	1	0	0	30
23:45	38	0	0	0	0	38	25	1	0	0	0	26
H/TOT	157	5	0	3	0	165	123	4	1	2	0	130
0:00	31	2	0	0	0	33	19	0	0	0	0	19
0:15	27	1	0	1	0	29	32	0	0	0	0	32
0:30	24	1	0	0	0	25	20	3	0	0	0	23
0:45	15	2	0	0	0	17	9	0	0	0	0	9
H/TOT	97	6	0	1	0	104	80	3	0	0	0	83

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 03 DATE: 11th/12th March 2004

LOCATION: Beach Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
1:00	12	0	0	0	0	12	8	1	0	0	0	9
1:15	8	1	0	0	0	9	11	2	0	0	0	13
1:30	3	0	0	0	1	4	3	0	0	1	0	4
1:45	6	1	0	0	0	7	5	1	0	2	0	8
H/TOT	29	2	0	0	1	32	27	4	0	3	0	34
2:00	6	1	0	0	0	7	4	0	0	0	0	4
2:15	11	0	0	0	0	11	4	0	0	0	0	4
2:30	6	1	1	0	0	8	1	0	0	0	0	1
2:45	2	0	0	0	0	2	3	0	0	0	0	3
H/TOT	25	2	1	0	0	28	12	0	0	0	0	12
3:00	5	0	0	0	0	5	2	2	0	0	0	4
3:15	4	0	0	1	0	5	9	0	0	0	0	9
3:30	7	0	1	0	0	8	2	0	0	0	0	2
3:45	3	1	0	0	0	4	5	1	0	0	0	6
H/TOT	19	1	1	1	0	22	18	3	0	0	0	21
4:00	4	0	0	0	0	4	4	0	1	1	0	6
4:15	3	1	0	0	0	4	5	1	0	3	0	9
4:30	6	1	0	0	0	7	5	0	0	0	0	5
4:45	2	1	0	1	0	4	14	1	0	3	0	18
H/TOT	15	3	0	1	0	19	28	2	1	7	0	38
5:00	3	3	1	4	0	11	21	1	0	2	0	24
5:15	4	2	1	0	0	7	38	1	0	2	0	41
5:30	8	2	0	4	0	14	38	3	0	1	0	42
5:45	17	1	0	4	0	22	28	3	0	5	0	36
H/TOT	32	8	2	12	0	54	125	8	0	10	0	143
6:00	26	6	1	8	0	41	35	1	0	2	0	38
6:15	20	6	0	7	0	33	53	4	1	1	0	59
6:30	44	8	4	3	0	59	81	5	1	1	0	88
6:45	87	17	1	4	0	109	124	18	1	6	0	149
H/TOT	177	37	6	22	0	242	293	28	3	10	0	334
P/TOT	10704	1049	304	238	15	12310	9167	888	289	204	12	10560

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 04 DATE: 11th/12th March 2004

LOCATION: Irishtown Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
7:00	55	7	0	10	0	72	102	3	2	0	1	108
7:15	75	14	6	5	3	103	131	0	1	6	1	139
7:30	76	12	2	2	1	93	127	3	2	3	1	136
7:45	91	7	2	6	1	107	142	3	2	4	2	153
H/TOT	297	40	10	23	5	375	502	9	7	13	5	536
8:00	79	15	3	5	1	103	133	7	0	7	2	149
8:15	99	7	4	2	1	113	172	4	2	7	0	185
8:30	97	8	4	1	2	112	135	16	1	5	1	158
8:45	122	12	4	3	2	143	159	12	0	4	2	177
H/TOT	397	42	15	11	6	471	599	39	3	23	5	669
9:00	88	19	3	3	1	114	137	13	1	6	0	157
9:15	68	12	5	6	3	94	123	5	5	5	2	140
9:30	72	15	7	8	2	104	101	15	2	3	0	121
9:45	58	13	6	4	1	82	103	10	0	6	2	121
H/TOT	286	59	21	21	7	394	464	43	8	20	4	539
10:00	80	22	3	5	2	112	83	9	1	5	1	99
10:15	69	20	1	7	2	99	93	11	2	5	1	112
10:30	69	8	3	2	3	85	89	9	2	9	1	110
10:45	83	23	8	3	4	121	110	14	2	7	3	136
H/TOT	301	73	15	17	11	417	375	43	7	26	6	457
11:00	94	20	3	8	0	125	88	17	5	8	0	118
11:15	96	15	4	6	2	123	79	21	2	9	3	114
11:30	76	14	2	7	2	101	83	22	2	4	2	113
11:45	86	14	5	8	1	114	87	7	0	6	0	100
H/TOT	352	63	14	29	5	463	337	67	9	27	5	445
12:00	92	13	0	3	2	110	83	19	4	7	1	114
12:15	91	15	2	11	0	119	85	17	3	6	2	113
12:30	122	20	3	7	1	153	106	13	2	3	1	125
12:45	108	18	3	9	2	140	80	14	3	11	1	109
H/TOT	413	66	8	30	5	522	354	63	12	27	5	461

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 04 DATE: 11th/12th March 2004

LOCATION: Irishtown Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**
13:00	126	15	5	8	2	156	88	7	1	3	2	101
13:15	98	9	2	2	3	114	97	12	4	5	1	119
13:30	114	18	5	6	2	145	94	7	2	7	1	111
13:45	108	10	3	1	2	124	113	8	2	5	2	130
H/TOT	446	52	15	17	9	539	392	34	9	20	6	461
14:00	96	19	3	8	2	128	103	9	0	6	2	120
14:15	115	11	1	4	1	132	101	11	0	2	0	114
14:30	113	23	5	5	1	147	99	10	9	4	3	125
14:45	129	21	9	1	2	162	92	8	1	3	2	106
H/TOT	453	74	18	18	6	569	395	38	10	15	7	465
15:00	119	24	2	5	1	151	80	6	1	1	1	89
15:15	128	14	2	7	2	153	71	10	1	4	1	87
15:30	133	22	2	4	2	163	107	9	3	2	0	121
15:45	127	18	0	5	1	151	121	13	3	0	3	140
H/TOT	507	78	6	21	6	618	379	38	8	7	5	437
16:00	127	19	0	3	2	151	116	9	0	4	2	131
16:15	151	18	1	2	0	172	125	7	1	6	0	139
16:30	126	5	2	2	1	136	121	8	3	1	0	133
16:45	164	13	1	3	2	183	99	7	1	2	1	110
H/TOT	568	55	4	10	5	642	461	31	5	13	3	513
17:00	130	10	3	2	2	147	128	5	1	2	1	137
17:15	145	7	2	3	0	157	127	9	1	1	2	140
17:30	145	5	2	3	1	156	116	7	0	2	1	126
17:45	154	10	2	2	1	169	113	5	0	1	2	121
H/TOT	574	32	9	10	4	629	484	26	2	6	6	524
18:00	172	11	2	1	2	188	134	6	0	1	1	142
18:15	161	9	1	0	0	171	146	11	1	3	2	163
18:30	178	8	2	2	0	190	166	4	1	1	1	173
18:45	158	8	1	2	2	171	154	6	1	0	3	164
H/TOT	669	36	6	5	4	720	600	27	3	5	7	642

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 04 DATE: 11th/12th March 2004

LOCATION: Irishtown Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
19:00	161	14	0	0	0	175	171	4	0	1	1	177
19:15	131	8	0	0	3	142	120	7	0	1	0	128
20:15	146	9	0	1	0	156	107	4	0	0	2	113
21:15	124	10	1	1	1	137	116	2	1	1	2	122
H/TOT	562	41	1	2	4	610	514	17	1	3	5	540
20:00	114	7	1	0	0	122	87	6	1	0	1	95
20:15	129	10	0	0	1	140	94	7	0	0	0	101
20:30	110	9	0	0	2	121	71	1	0	0	1	73
20:45	95	7	0	1	1	104	64	3	1	1	1	70
H/TOT	448	33	1	1	4	487	316	17	2	1	3	339
21:00	88	3	0	0	0	91	57	6	0	0	0	63
21:15	92	6	0	0	1	99	58	0	0	0	1	59
21:30	86	0	0	0	1	87	54	2	0	1	0	57
21:45	79	3	0	0	0	82	52	7	0	0	1	60
H/TOT	345	12	0	0	2	359	221	15	0	1	2	239
22:00	80	0	0	0	1	81	76	1	0	0	2	79
22:15	87	7	0	0	2	96	48	3	0	0	0	51
22:30	70	5	1	0	1	77	39	2	0	0	2	43
22:45	57	5	0	0	1	63	36	3	0	0	1	40
H/TOT	294	17	1	0	5	317	199	9	0	0	5	213
23:00	64	3	0	1	1	69	45	1	0	0	0	46
23:15	42	3	0	0	1	46	43	2	0	0	1	46
23:30	35	1	0	0	1	37	34	1	1	0	1	37
23:45	37	0	0	0	0	37	21	0	0	0	0	21
H/TOT	178	7	0	1	3	189	143	4	1	0	2	150
0:00	28	0	0	0	0	28	24	2	0	0	0	26
0:15	34	2	0	0	0	36	25	1	0	0	0	26
0:30	25	1	0	0	0	26	23	1	0	0	0	24
0:45	16	4	0	0	0	20	21	1	0	0	0	22
H/TOT	103	7	0	0	0	110	93	5	0	0	0	98

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 04 DATE: 11th/12th March 2004

LOCATION: Irishtown Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
1:00	22	1	0	0	0	23	16	1	0	0	0	17
1:15	12	1	0	0	0	13	10	0	0	0	0	10
1:30	7	1	0	0	2	10	17	0	0	0	0	17
1:45	11	1	0	0	0	12	11	2	0	0	0	13
H/TOT	52	4	0	0	2	58	54	3	0	0	0	57
2:00	11	0	0	0	0	11	7	1	0	0	0	8
2:15	11	1	0	0	0	12	10	0	0	0	0	10
2:30	7	0	0	0	0	7	5	0	0	0	0	5
2:45	7	0	0	0	0	7	5	0	0	0	0	5
H/TOT	36	1	0	0	0	37	27	1	0	0	0	28
3:00	10	1	0	0	0	11	8	0	0	0	0	8
3:15	7	0	0	0	0	7	4	0	0	0	0	4
3:30	6	1	0	0	1	8	4	0	0	0	0	4
3:45	5	1	0	0	0	6	5	1	0	0	0	6
H/TOT	28	3	0	0	1	32	21	1	0	0	0	22
4:00	7	1	0	0	0	8	3	0	0	1	0	4
4:15	5	1	0	0	0	6	4	2	0	0	0	6
4:30	3	1	0	1	0	5	3	0	0	1	0	4
4:45	3	1	0	0	0	4	6	1	0	0	0	7
H/TOT	18	4	0	1	0	23	16	3	0	2	0	21
5:00	4	2	0	0	0	6	4	3	0	0	0	7
5:15	5	2	0	0	0	7	9	1	0	0	0	10
5:30	4	0	0	3	0	7	15	1	0	1	0	17
5:45	9	4	0	5	0	18	15	1	1	0	0	17
H/TOT	22	8	0	8	0	38	43	6	1	1	0	51
6:00	23	3	0	4	0	30	12	1	2	0	0	15
6:15	15	4	0	1	0	20	25	2	2	6	0	35
6:30	37	6	3	10	0	56	33	0	1	2	0	36
6:45	58	6	1	8	0	73	55	6	1	0	0	62
H/TOT	133	19	4	23	0	179	125	9	6	8	0	148
P/TOT	7482	826	148	248	94	8798	7114	548	94	218	81	8055

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNTS **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNTS **ATH/04/043**

SITE: 05 DATE: 11th/12th March 2004

LOCATION: East Wall Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
7:00	68	9	7	59	0	143	127	13	13	44	1	198
7:15	104	12	7	70	1	194	152	7	10	39	2	210
7:30	124	11	4	54	0	193	200	29	15	42	2	288
7:45	138	7	5	58	0	208	137	10	10	18	0	175
H/TOT	434	39	23	241	1	738	616	59	48	143	5	871
8:00	169	15	6	52	0	242	173	15	3	23	0	214
8:15	159	10	7	54	1	231	153	9	10	14	0	186
8:30	168	11	9	54	0	242	194	21	8	24	2	249
8:45	124	13	6	46	0	189	144	13	7	13	0	177
H/TOT	620	49	28	206	1	904	664	58	28	74	2	826
9:00	126	22	5	38	0	191	137	17	5	28	0	187
9:15	133	16	6	38	1	194	154	17	5	28	0	204
9:30	122	22	9	38	3	194	146	13	7	34	0	200
9:45	116	29	7	35	0	187	149	21	4	49	1	224
H/TOT	497	89	27	149	4	766	586	68	21	139	1	815
10:00	122	20	10	31	0	183	149	17	9	38	0	213
10:15	142	24	16	38	2	222	143	15	10	44	1	213
10:30	109	20	10	37	1	177	160	22	16	44	2	244
10:45	117	15	4	50	3	189	148	28	11	47	1	235
H/TOT	490	79	40	156	6	771	600	82	46	173	4	905
11:00	59	26	9	42	0	136	130	26	14	39	1	210
11:15	91	14	6	38	0	149	107	17	16	40	0	180
11:30	102	20	6	42	1	171	101	16	12	51	0	180
11:45	103	22	7	57	0	189	115	23	9	51	0	198
H/TOT	355	82	28	179	1	645	453	82	51	181	1	768
12:00	109	25	7	63	3	207	122	19	7	58	0	206
12:15	99	10	3	34	1	147	113	20	22	25	2	182
12:30	105	16	5	54	1	181	114	23	14	41	0	192
12:45	140	24	9	41	1	215	127	26	9	39	1	202
H/TOT	453	75	24	192	6	750	476	88	52	163	3	782

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 05 DATE: 11th/12th March 2004

LOCATION: East Wall Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
13:00	119	23	4	38	2	186	128	26	13	41	1	209
13:15	111	15	13	30	0	169	123	25	16	21	2	187
13:30	113	15	12	32	0	172	145	17	14	54	1	231
13:45	182	29	11	52	1	275	123	15	5	37	0	180
H/TOT	525	82	40	152	3	802	519	83	48	153	4	807
14:00	109	18	16	28	0	171	137	22	17	36	0	212
14:15	102	22	6	37	1	168	122	20	15	31	1	189
14:30	73	16	8	35	1	133	106	29	8	34	0	177
14:45	135	26	4	43	0	208	126	28	12	38	2	206
H/TOT	419	82	34	143	2	680	491	99	52	139	3	784
15:00	106	19	9	38	0	172	138	25	15	52	1	231
15:15	86	18	10	27	0	141	110	25	20	37	1	193
15:30	118	18	7	38	0	181	93	15	12	26	1	147
15:45	144	16	8	32	0	200	142	24	14	43	0	223
H/TOT	454	71	34	135	0	694	483	89	61	158	3	794
16:00	129	10	6	18	2	165	98	14	11	37	0	160
16:15	155	20	9	16	1	201	124	26	3	21	0	174
16:30	138	25	8	23	0	194	159	26	9	27	0	221
16:45	170	9	8	36	0	223	142	21	7	24	2	196
H/TOT	592	64	31	93	3	783	523	87	30	109	2	751
17:00	125	6	7	12	1	151	123	17	7	22	0	169
17:15	162	9	4	13	1	189	50	7	4	16	0	77
17:30	140	9	6	18	0	173	54	6	5	19	1	85
17:45	169	9	5	14	0	197	39	1	4	14	0	58
H/TOT	596	33	22	57	2	710	266	31	20	71	1	389
18:00	157	8	5	11	0	181	42	7	2	13	1	65
18:15	148	5	14	10	0	177	45	5	3	13	0	66
18:30	131	5	2	14	1	153	145	11	7	24	1	188
18:45	145	3	5	22	0	175	78	10	3	26	1	118
H/TOT	581	21	26	57	1	686	310	33	15	76	3	437

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**

MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

SITE: 05 DATE: 11th/12th March 2004

LOCATION: East Wall Road DAY: Thursday/Friday

	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
19:00	132	8	0	24	3	167	181	8	5	20	0	214
19:15	136	0	3	16	3	158	142	8	8	29	2	189
20:15	126	3	7	17	1	154	119	16	1	34	2	172
21:15	123	9	2	25	1	160	111	7	5	21	0	144
H/TOT	517	20	12	82	8	639	553	39	19	104	4	719
20:00	137	11	7	23	1	179	94	11	6	25	3	139
20:15	97	8	1	16	1	123	86	4	2	20	0	112
20:30	101	5	4	8	1	119	82	5	2	9	1	99
20:45	73	3	2	22	0	100	53	3	0	26	0	82
H/TOT	408	27	14	69	3	521	315	23	10	80	4	432
21:00	65	2	3	6	0	76	72	2	0	11	0	85
21:15	52	3	5	11	0	71	54	2	0	15	0	71
21:30	70	1	0	12	0	83	57	2	2	14	0	75
21:45	53	2	0	15	1	71	48	1	0	15	0	64
H/TOT	240	8	8	44	1	301	231	7	2	55	0	295
22:00	59	1	1	7	0	68	74	5	0	6	0	85
22:15	47	2	4	14	1	68	46	0	1	10	0	57
22:30	49	2	1	12	0	64	62	1	2	7	1	73
22:45	40	1	0	8	0	49	34	2	1	6	0	43
H/TOT	195	6	6	41	1	249	216	8	4	29	1	258
23:00	27	1	1	3	1	33	30	5	1	5	1	42
23:15	28	1	1	8	0	38	39	2	2	6	1	50
23:30	25	0	0	3	0	28	21	2	0	4	0	27
23:45	30	1	0	3	0	34	18	1	1	3	1	24
H/TOT	110	3	2	17	1	133	108	10	4	18	3	143
0:00	19	1	0	5	0	25	27	1	0	5	0	33
0:15	14	0	0	5	0	19	20	1	1	4	0	26
0:30	10	1	2	1	0	14	21	0	0	2	0	23
0:45	14	2	0	3	0	19	18	0	0	1	0	19
H/TOT	57	4	2	14	0	77	86	2	1	12	0	101

ABACUS TRANSPORTATION SURVEYS

EAST LINK TRAFFIC COUNT **MARCH 2004**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/04/043**

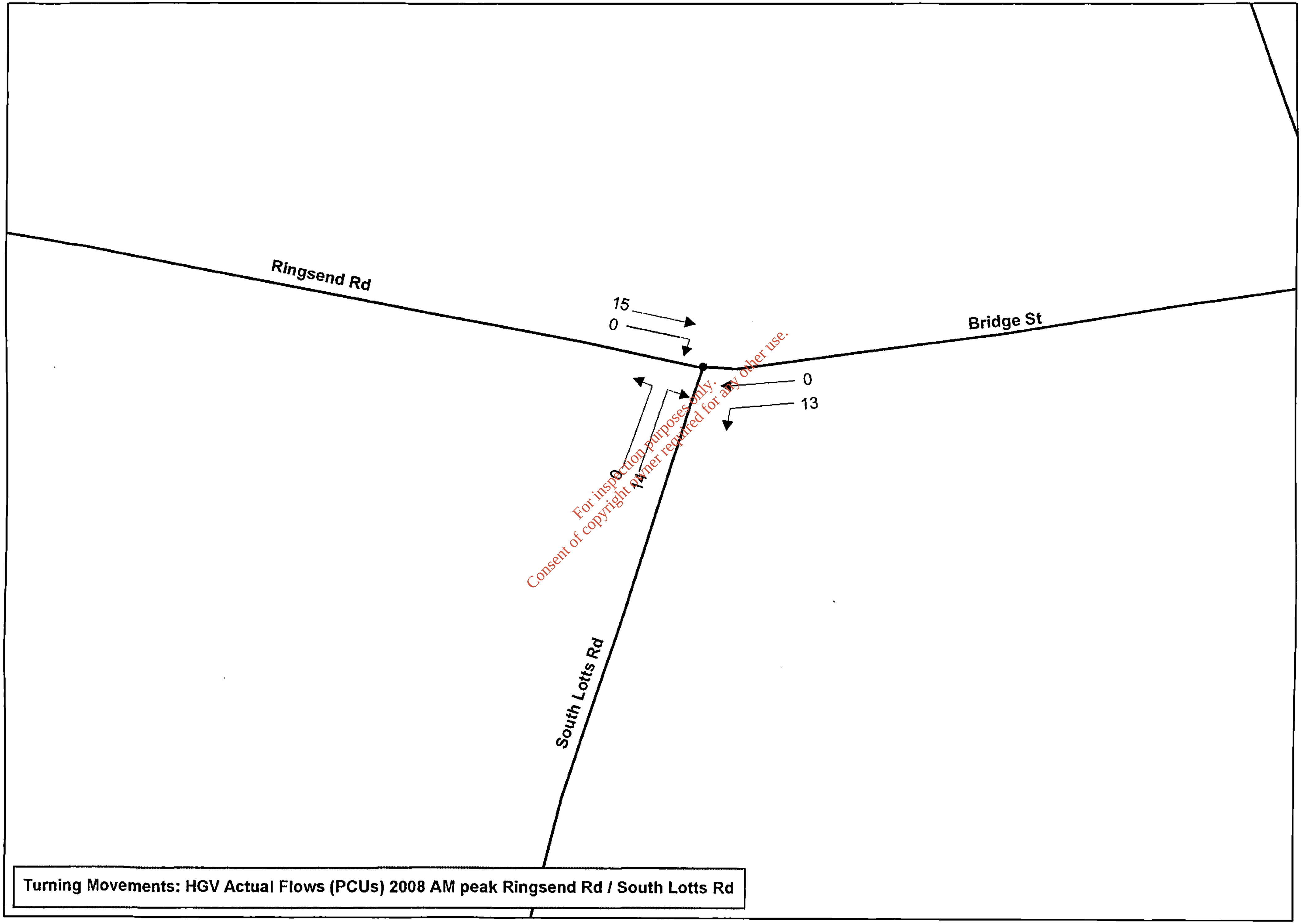
SITE: 05 DATE: 11th/12th March 2004

LOCATION: East Wall Road DAY: Thursday/Friday

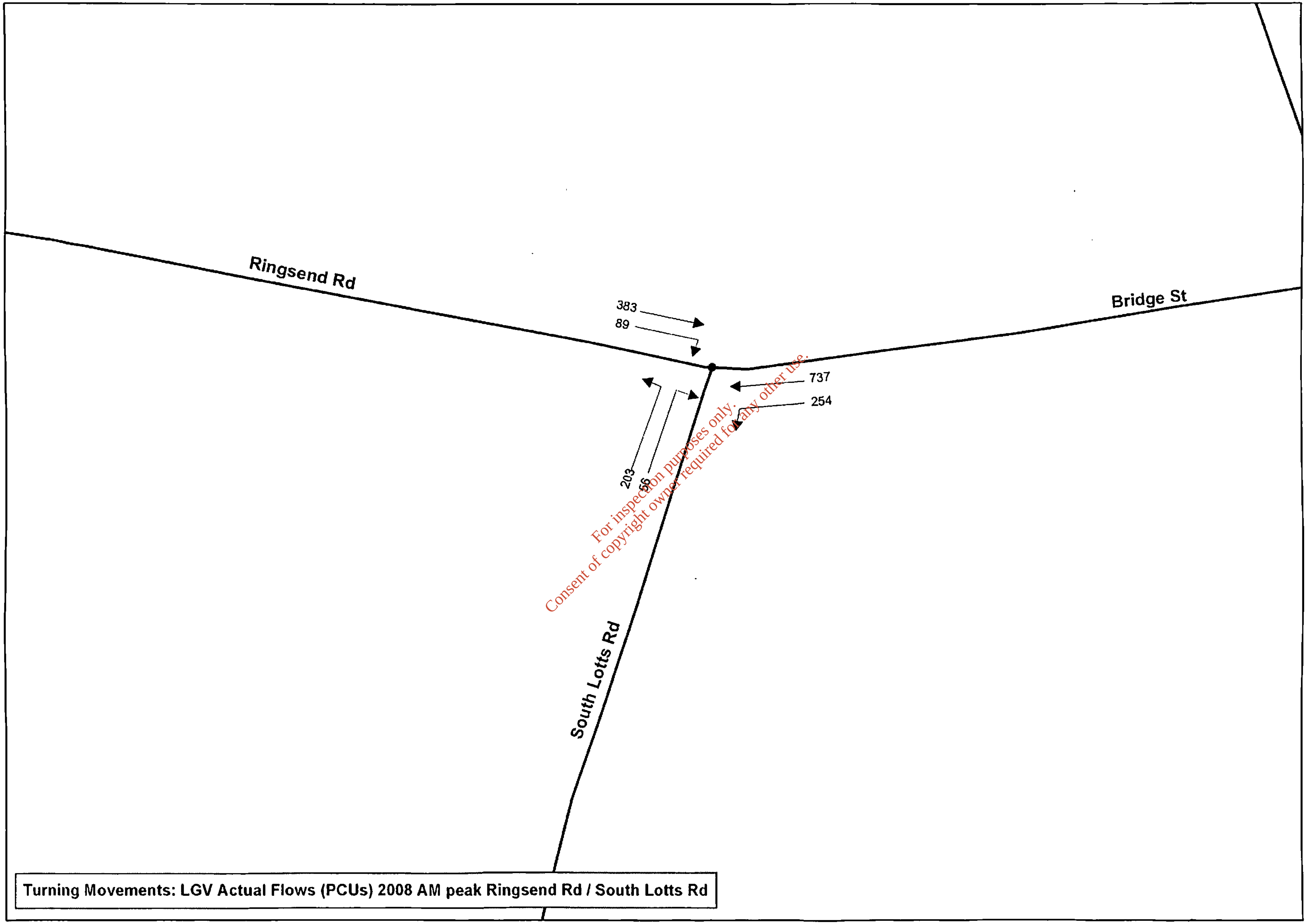
	MOVEMENT 1						MOVEMENT 2					
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	CAR	LGV	OGV1	OGV2	BUS	TOT
1:00	4	1	0	3	0	8	6	0	1	4	0	11
1:15	6	0	0	0	0	6	15	2	0	3	0	20
1:30	6	1	0	3	0	10	7	0	0	4	0	11
1:45	7	1	0	7	0	15	8	2	0	3	0	13
H/TOT	23	3	0	13	0	39	36	4	1	14	0	55
2:00	4	1	0	3	0	8	6	0	0	1	0	7
2:15	6	1	0	2	0	9	7	2	0	1	0	10
2:30	3	0	1	2	0	6	7	2	2	4	0	15
2:45	4	0	1	2	0	7	9	1	0	2	0	12
H/TOT	17	2	2	9	0	30	29	5	2	8	0	44
3:00	7	1	1	1	0	10	6	0	0	3	0	9
3:15	2	0	0	2	0	4	5	0	0	2	0	7
3:30	1	0	1	3	0	5	6	2	0	0	0	8
3:45	2	0	0	5	0	7	4	0	0	4	0	8
H/TOT	12	1	2	11	0	26	21	2	0	9	0	32
4:00	4	0	2	3	0	9	9	0	0	5	0	14
4:15	0	1	1	2	0	4	7	0	1	3	0	11
4:30	4	2	1	2	0	9	8	0	0	4	0	12
4:45	4	0	1	6	0	11	13	2	2	12	0	29
H/TOT	12	3	5	13	0	33	37	2	3	24	0	66
5:00	2	0	4	12	0	18	25	3	1	5	0	34
5:15	3	4	1	7	0	15	53	6	3	8	1	71
5:30	7	2	2	18	0	29	51	2	2	16	0	71
5:45	18	2	7	49	0	76	35	5	3	25	0	68
H/TOT	30	8	14	86	0	138	164	16	9	54	1	244
6:00	14	2	4	55	0	75	46	7	10	28	0	91
6:15	20	5	3	46	0	74	53	5	5	23	0	86
6:30	67	17	7	69	0	160	75	6	8	44	0	133
6:45	48	6	8	93	1	156	96	17	10	42	1	166
H/TOT	149	30	22	263	1	465	270	35	33	137	1	476
P/TOT	7786	881	446	2422	45	11580	8053	1012	560	2123	46	11794

DUBLIN TRANSPORTATION OFFICE MODEL OUTPUTS

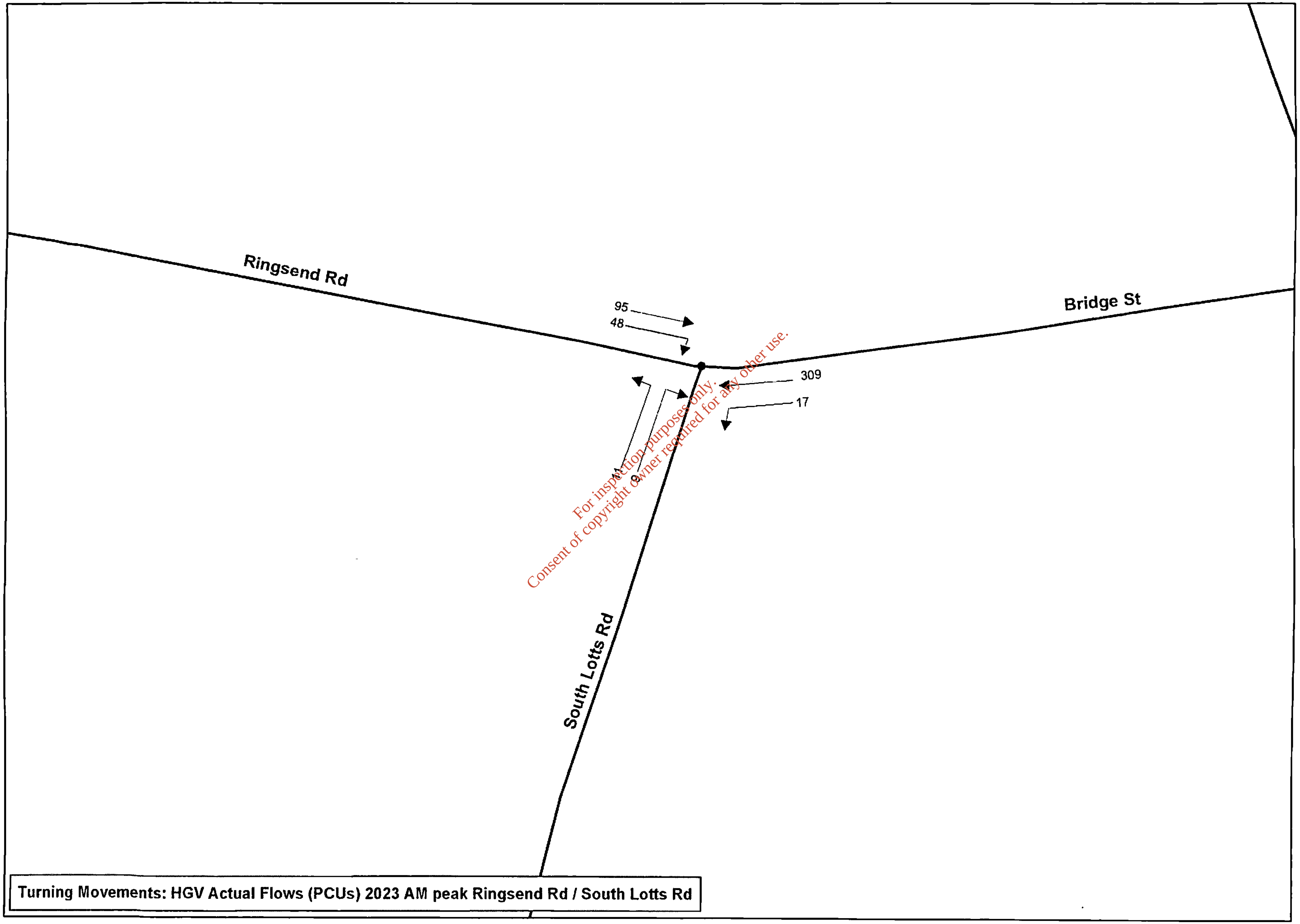
2008 & 2023 ACTUAL FLOWS (HGV & LGV)
AM PEAK, PM PEAK, OFF-PEAK



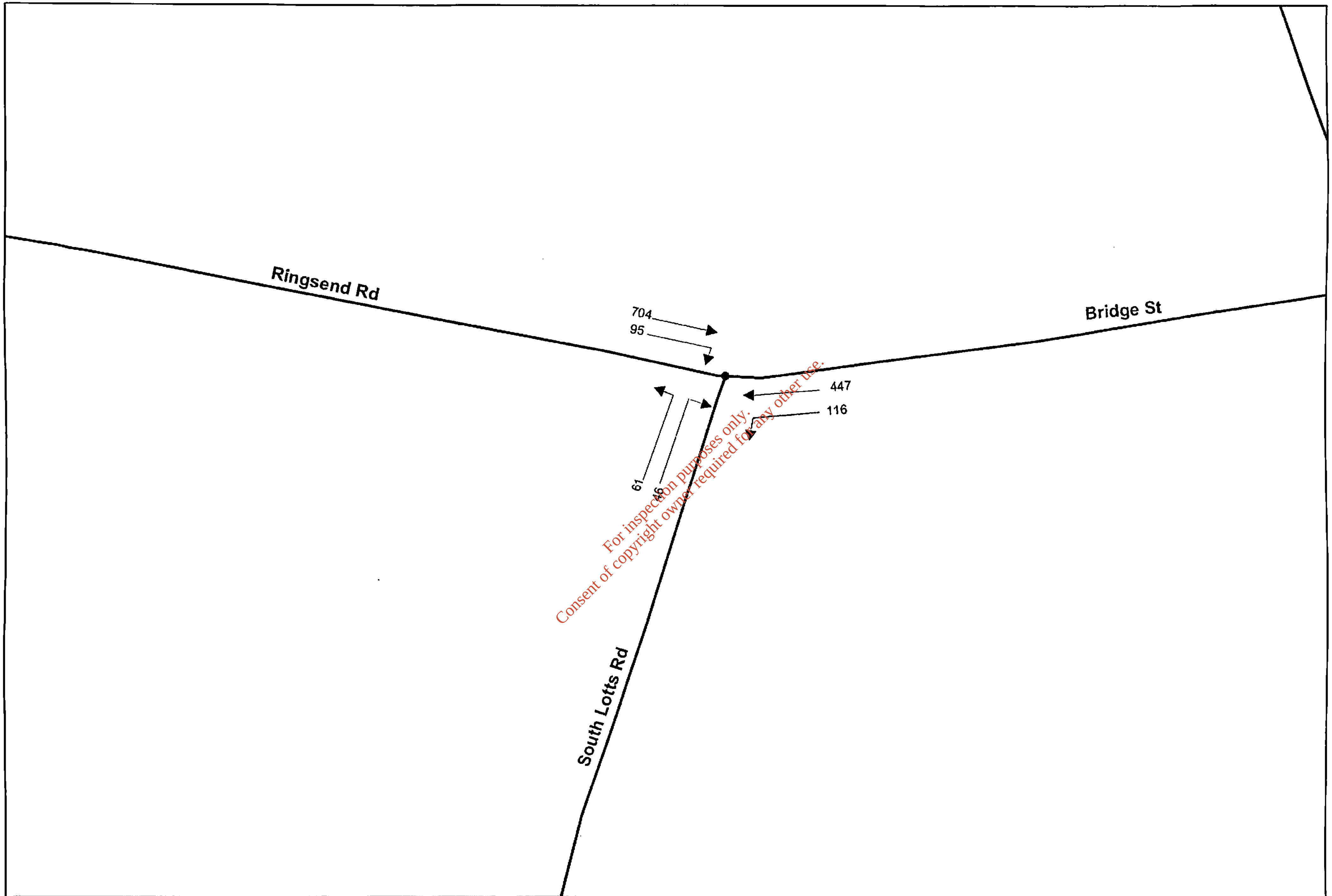
Turning Movements: HGV Actual Flows (PCUs) 2008 AM peak Ringsend Rd / South Lotts Rd



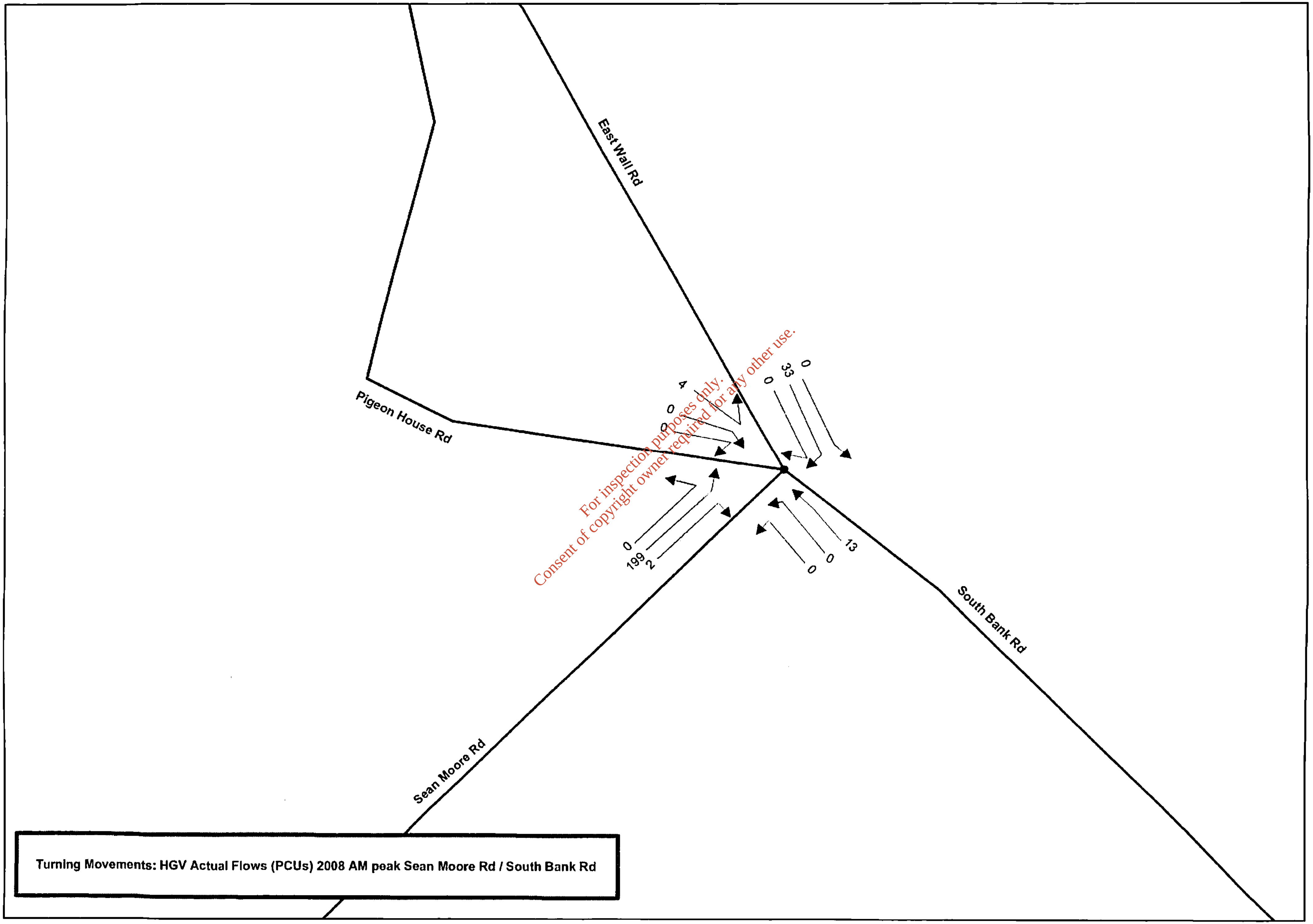
Turning Movements: LGV Actual Flows (PCUs) 2008 AM peak Ringsend Rd / South Lotts Rd



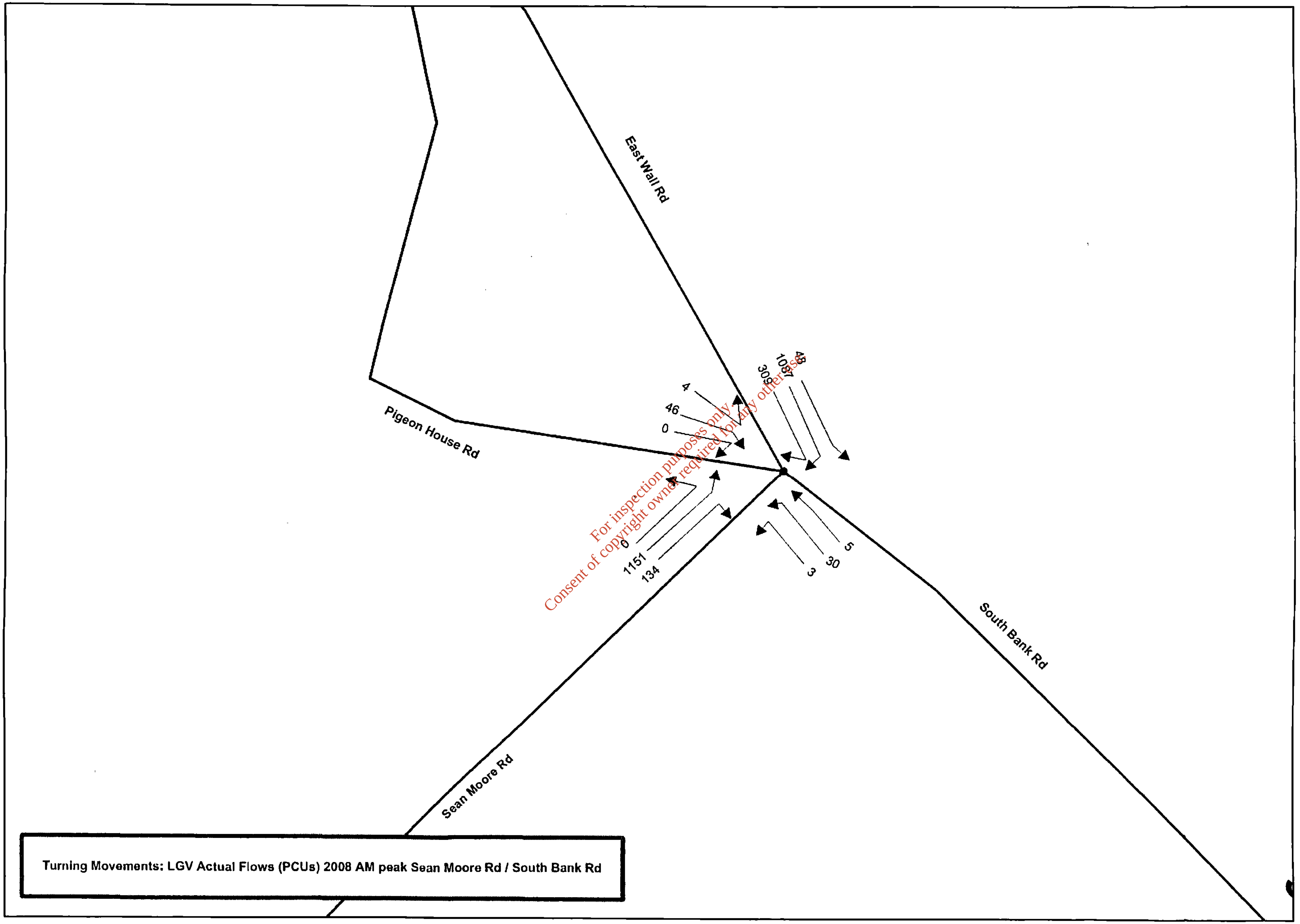
Turning Movements: HGV Actual Flows (PCUs) 2023 AM peak Ringsend Rd / South Lotts Rd



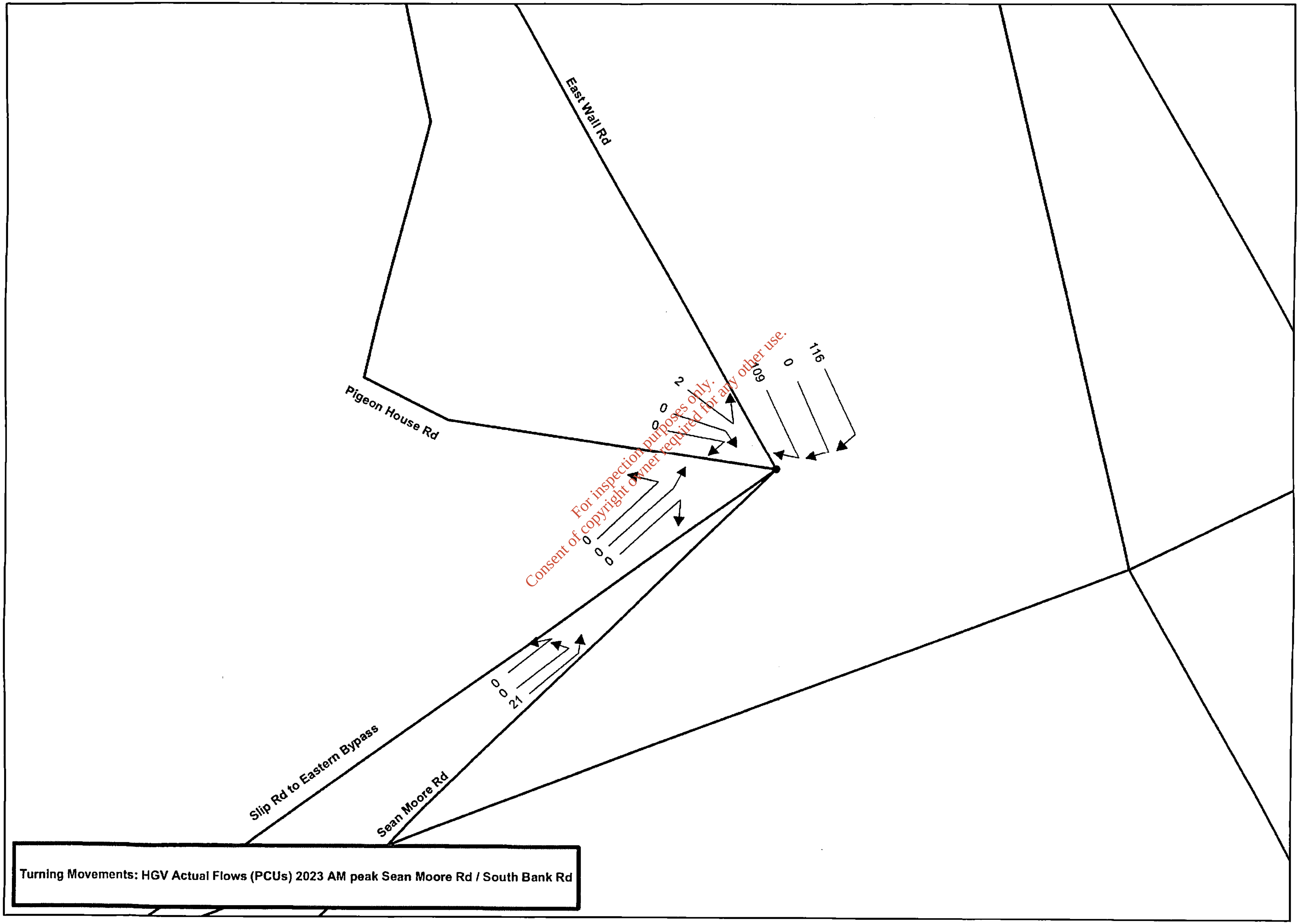
Turning Movements: LGV Actual Flows (PCUs) 2023 AM peak Ringsend Rd / South Lotts Rd



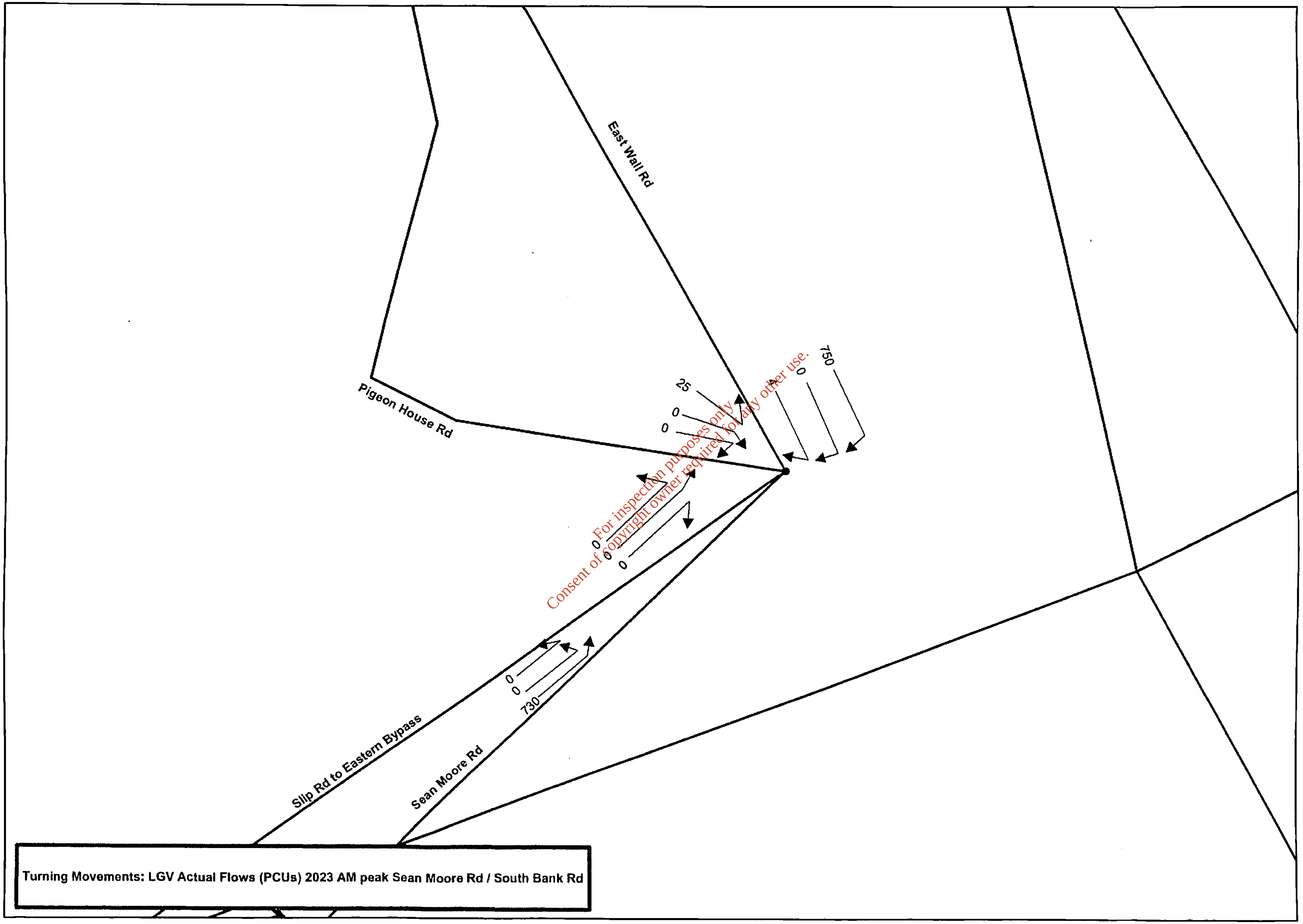
Turning Movements: HGV Actual Flows (PCUs) 2008 AM peak Sean Moore Rd / South Bank Rd



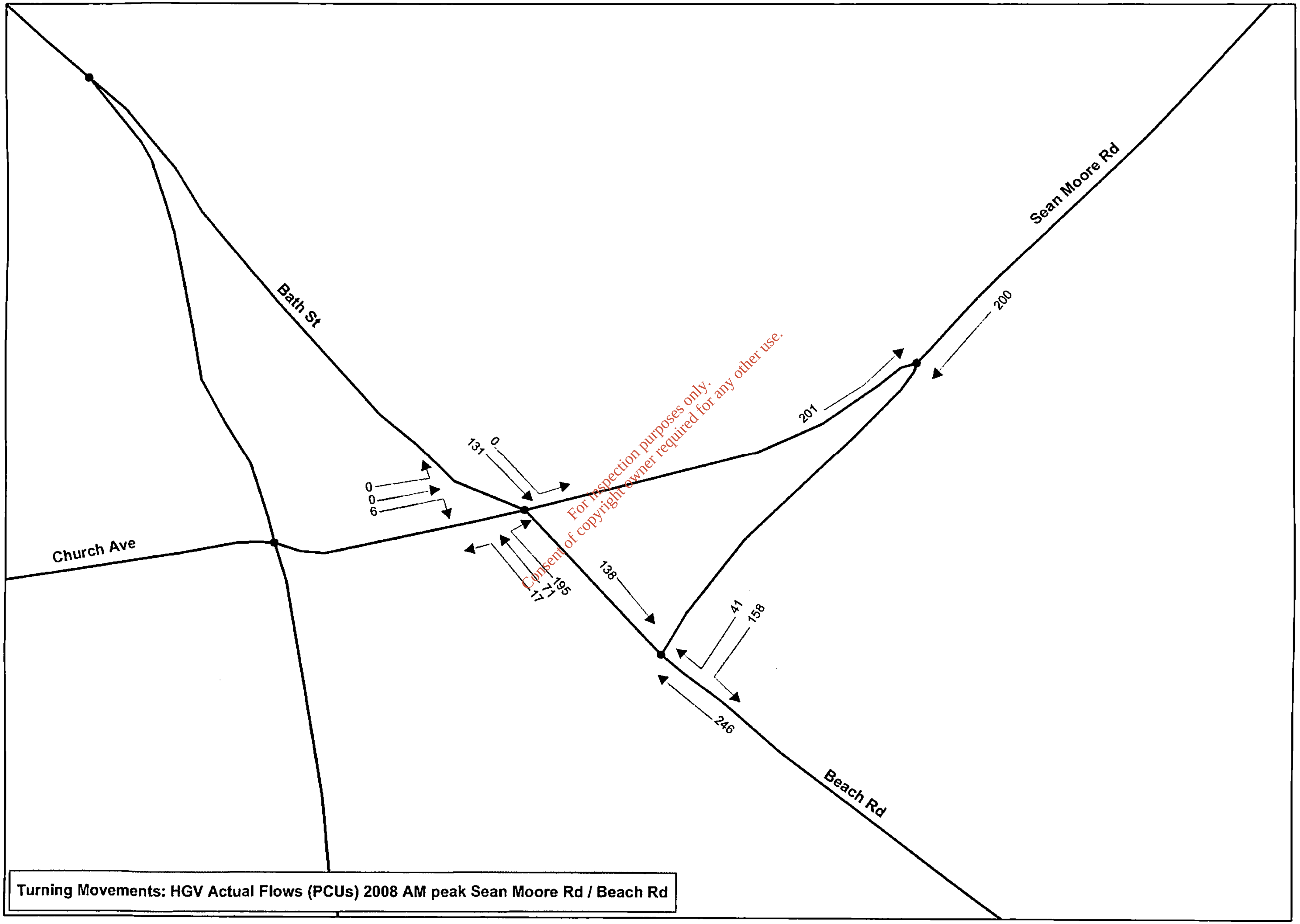
Turning Movements: LGV Actual Flows (PCUs) 2008 AM peak Sean Moore Rd / South Bank Rd



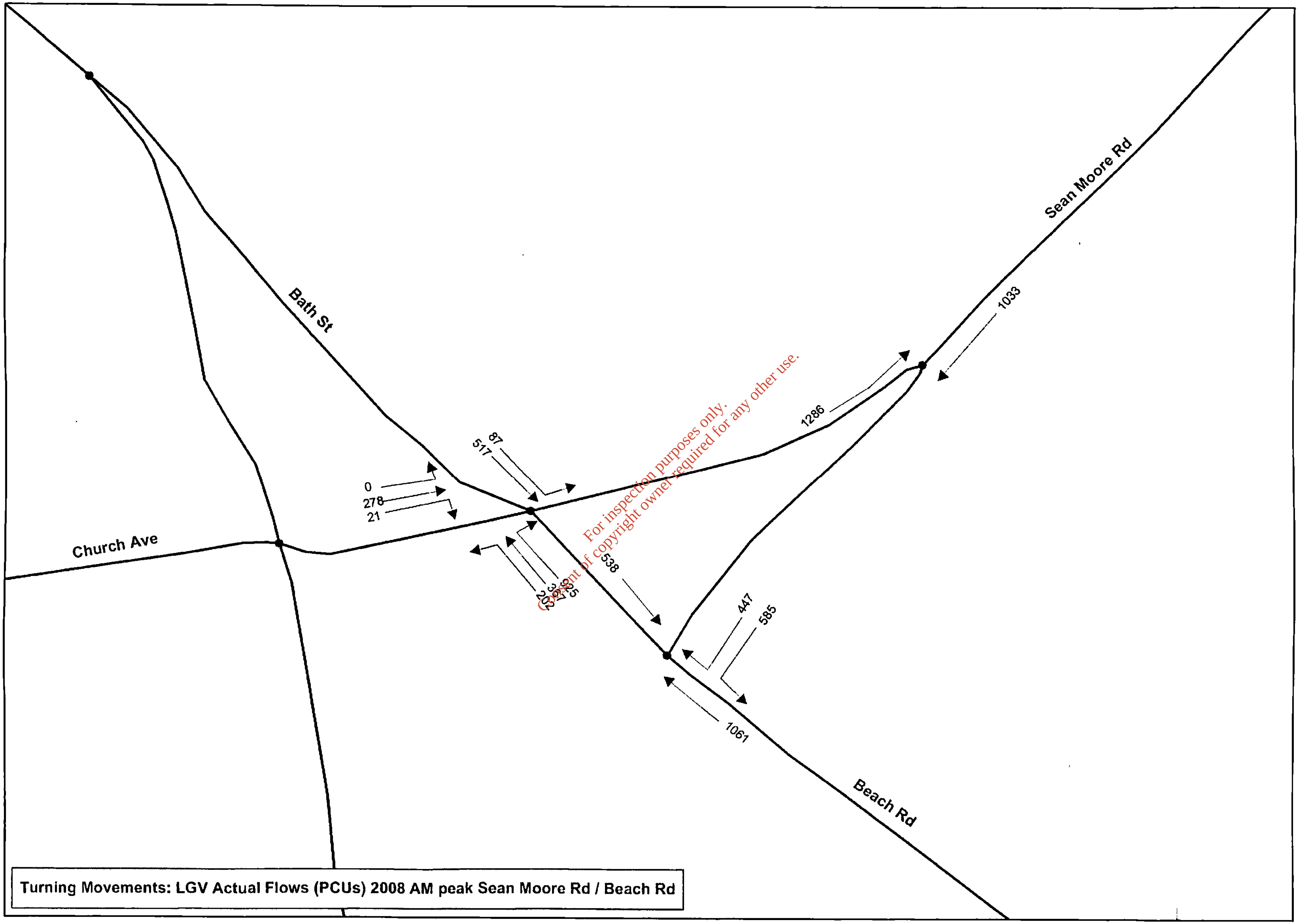
Turning Movements: HGV Actual Flows (PCUs) 2023 AM peak Sean Moore Rd / South Bank Rd



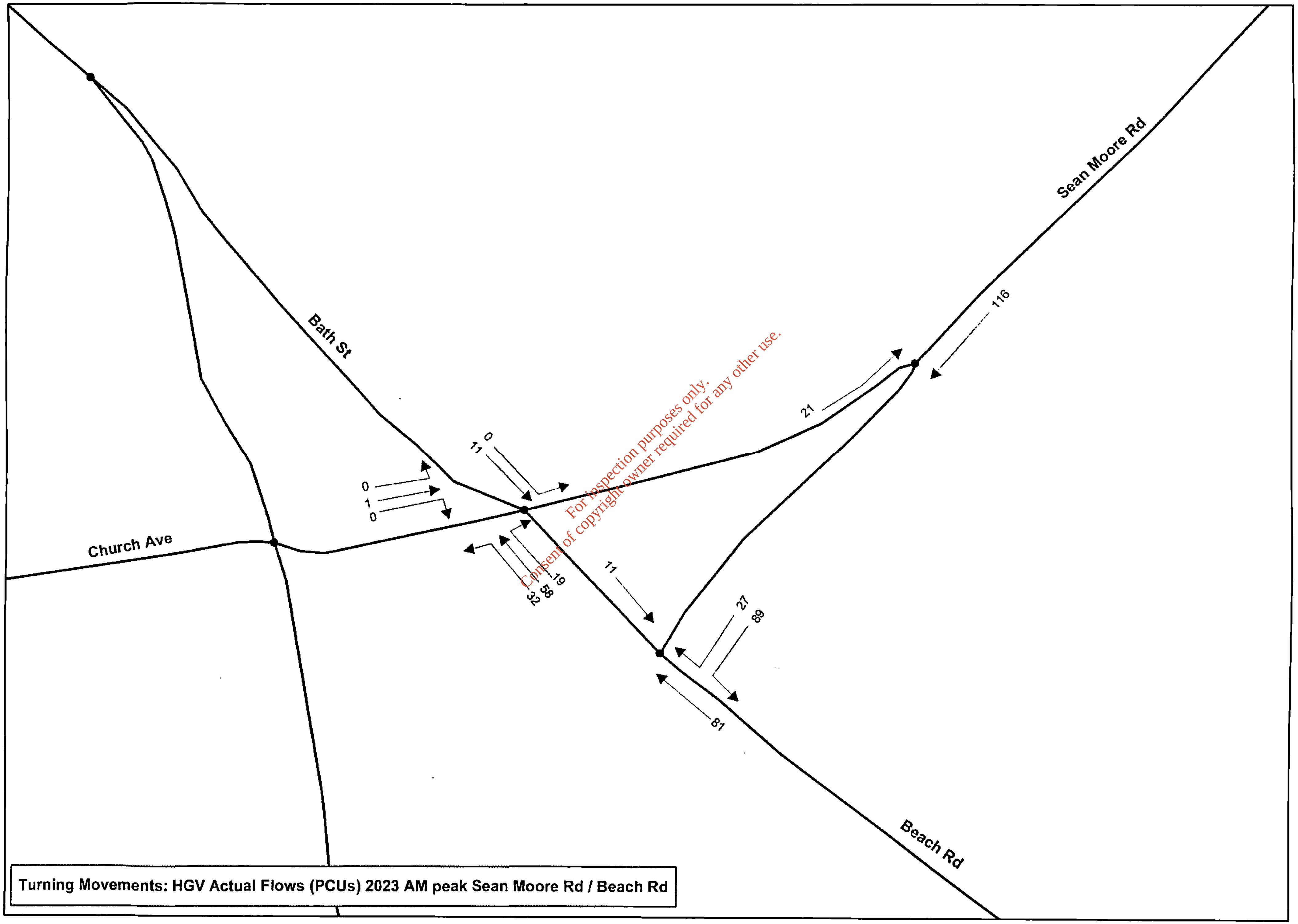
Turning Movements: LGV Actual Flows (PCUs) 2023 AM peak Sean Moore Rd / South Bank Rd



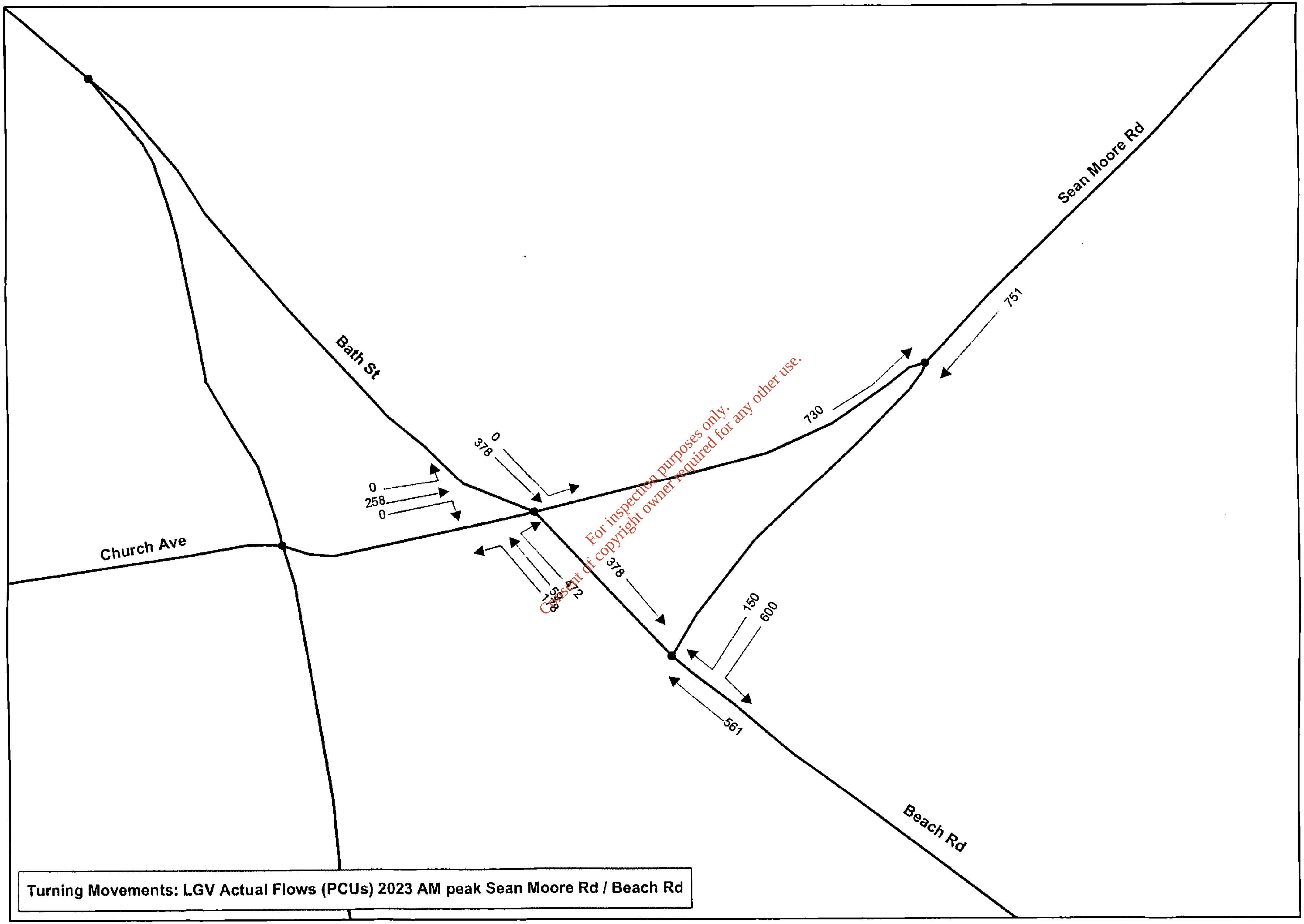
Turning Movements: HGV Actual Flows (PCUs) 2008 AM peak Sean Moore Rd / Beach Rd



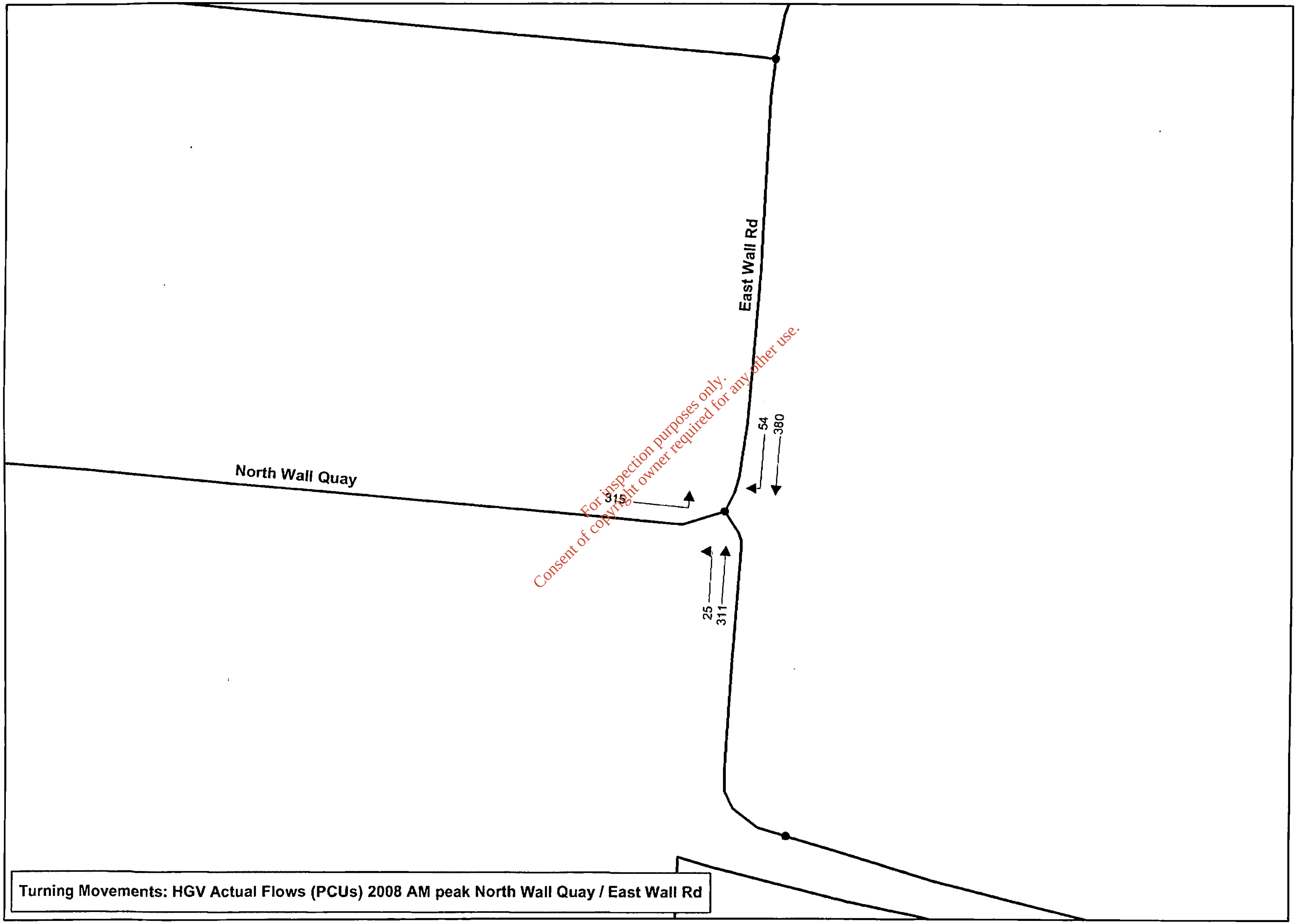
Turning Movements: LGV Actual Flows (PCUs) 2008 AM peak Sean Moore Rd / Beach Rd



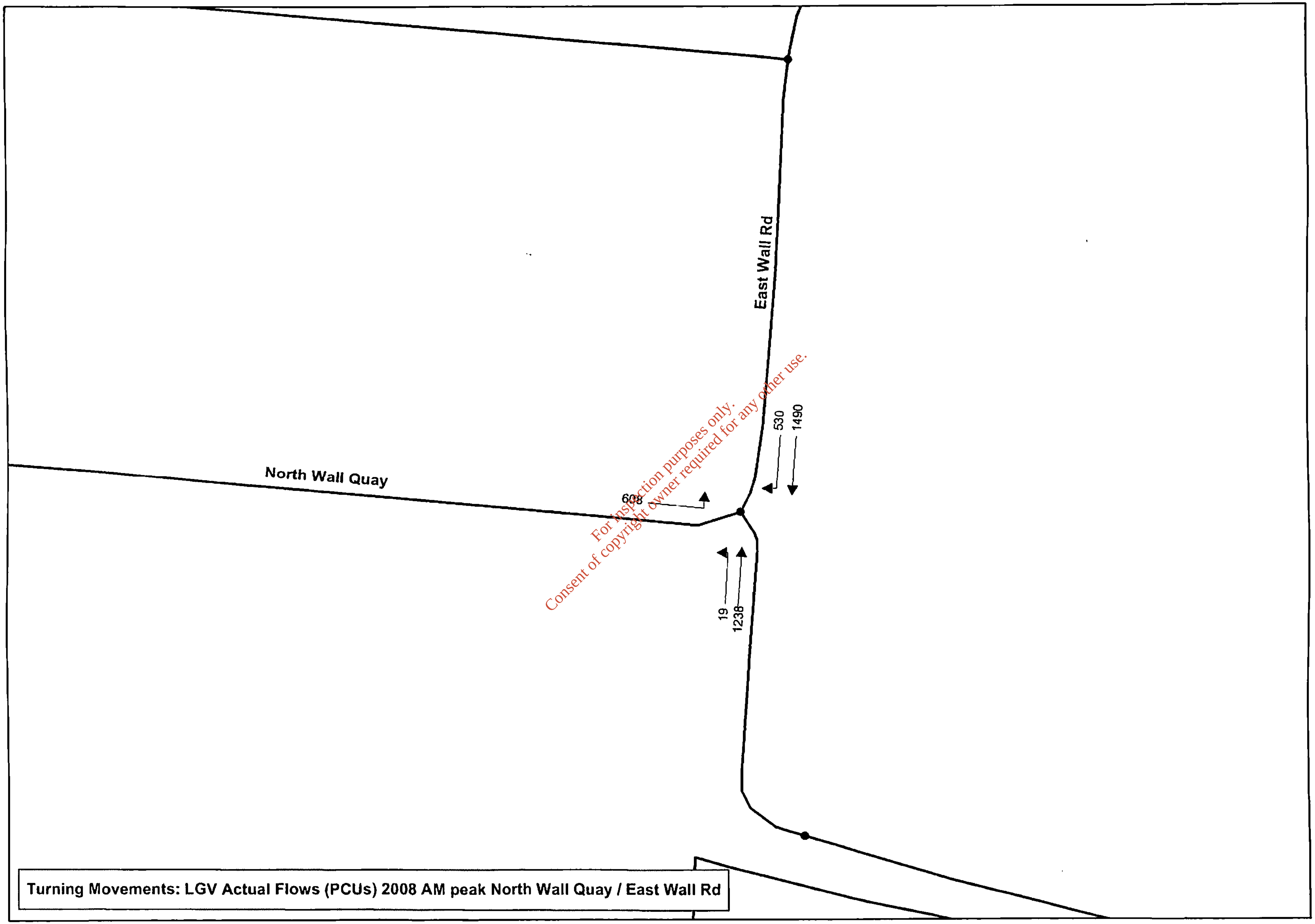
Turning Movements: HGV Actual Flows (PCUs) 2023 AM peak Sean Moore Rd / Beach Rd



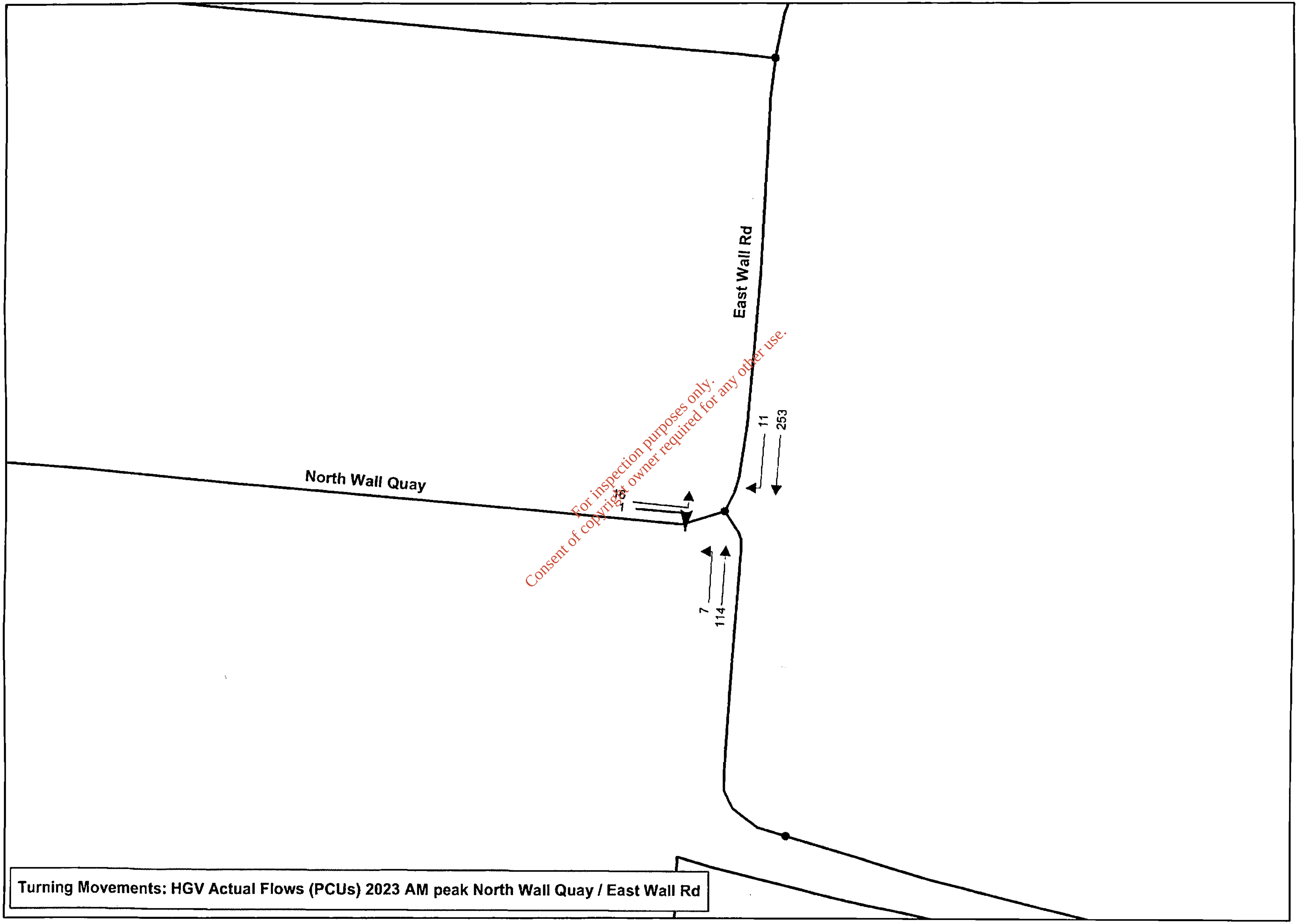
Turning Movements: LGV Actual Flows (PCUs) 2023 AM peak Sean Moore Rd / Beach Rd



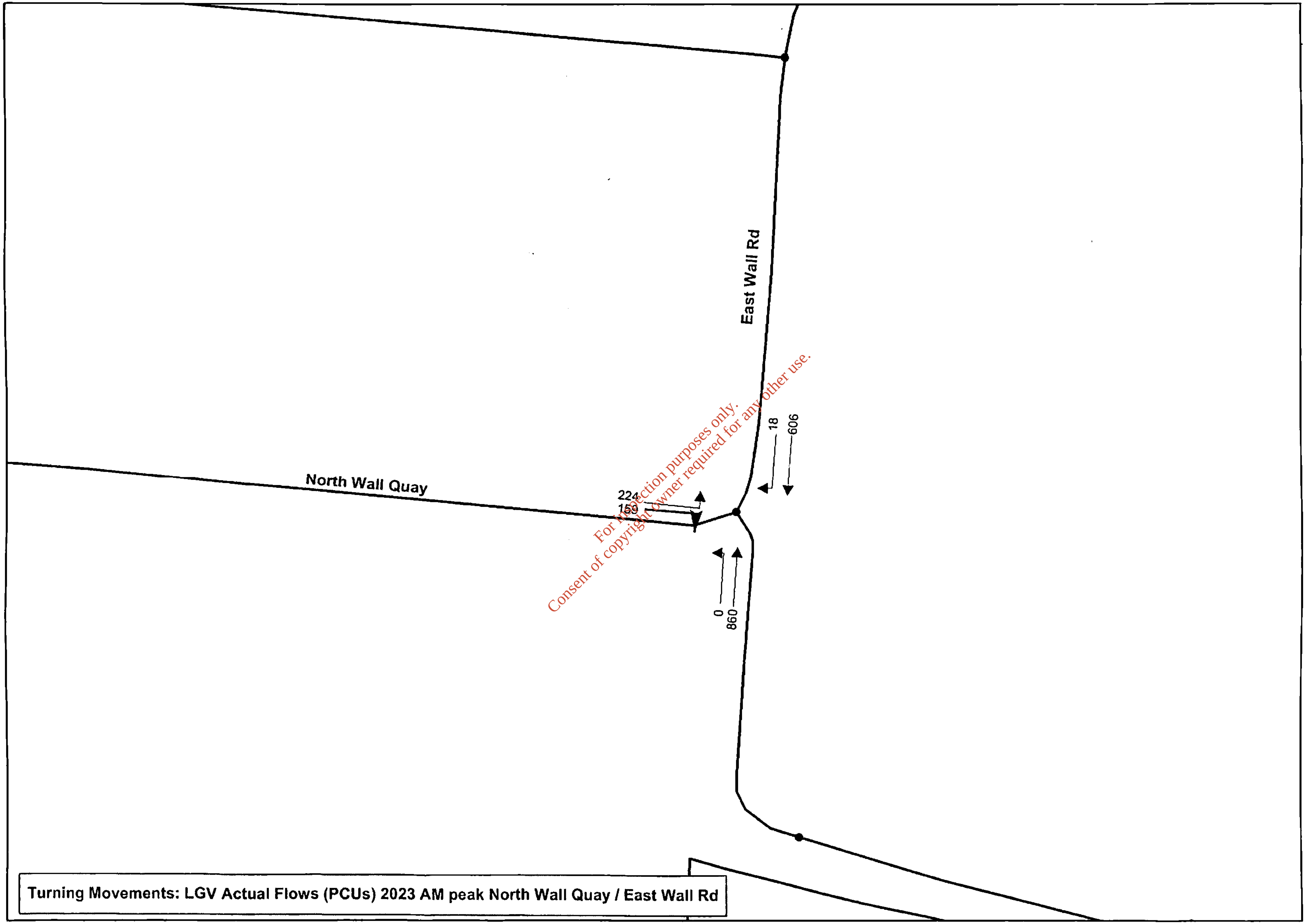
Turning Movements: HGV Actual Flows (PCUs) 2008 AM peak North Wall Quay / East Wall Rd



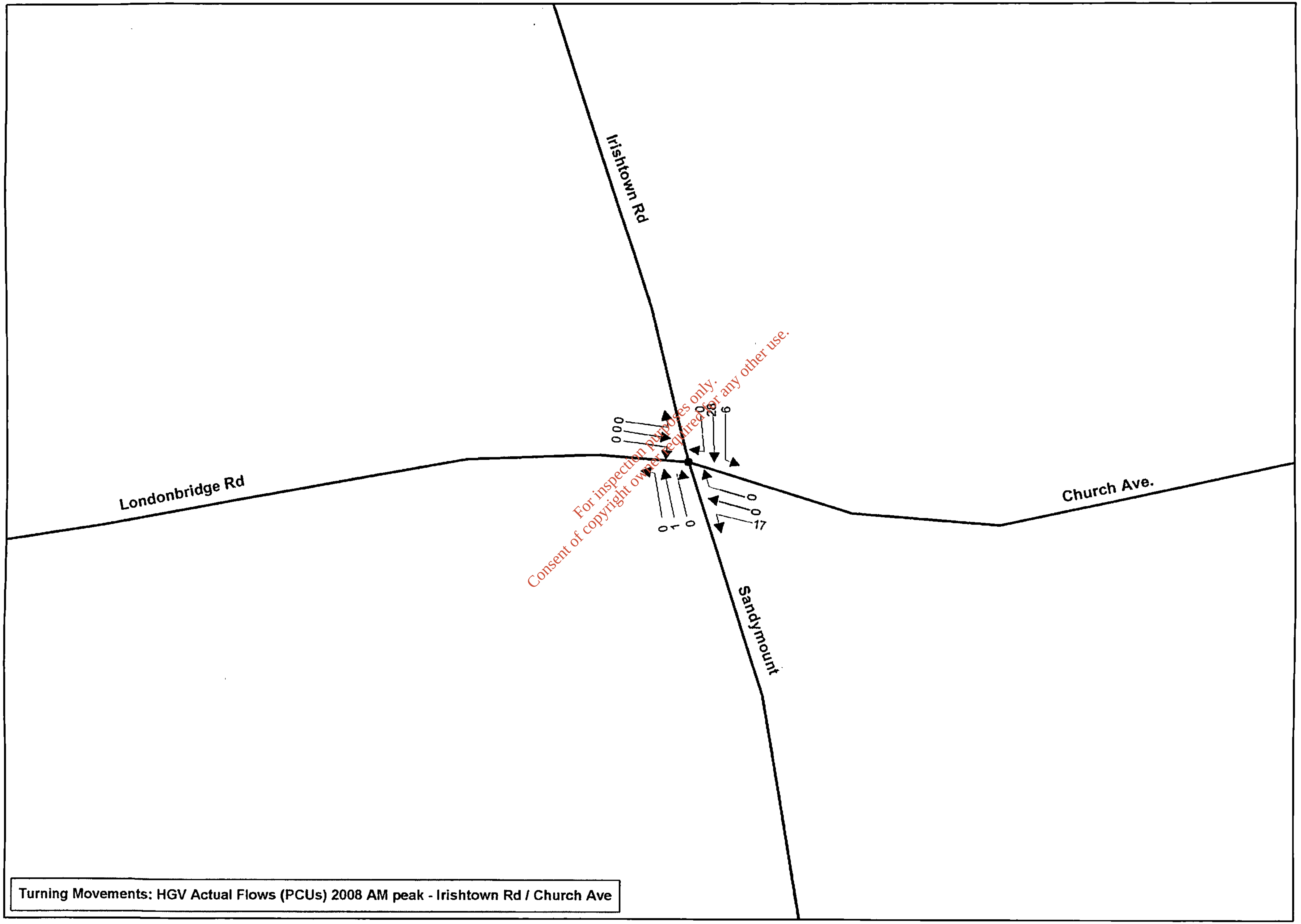
Turning Movements: LGV Actual Flows (PCUs) 2008 AM peak North Wall Quay / East Wall Rd



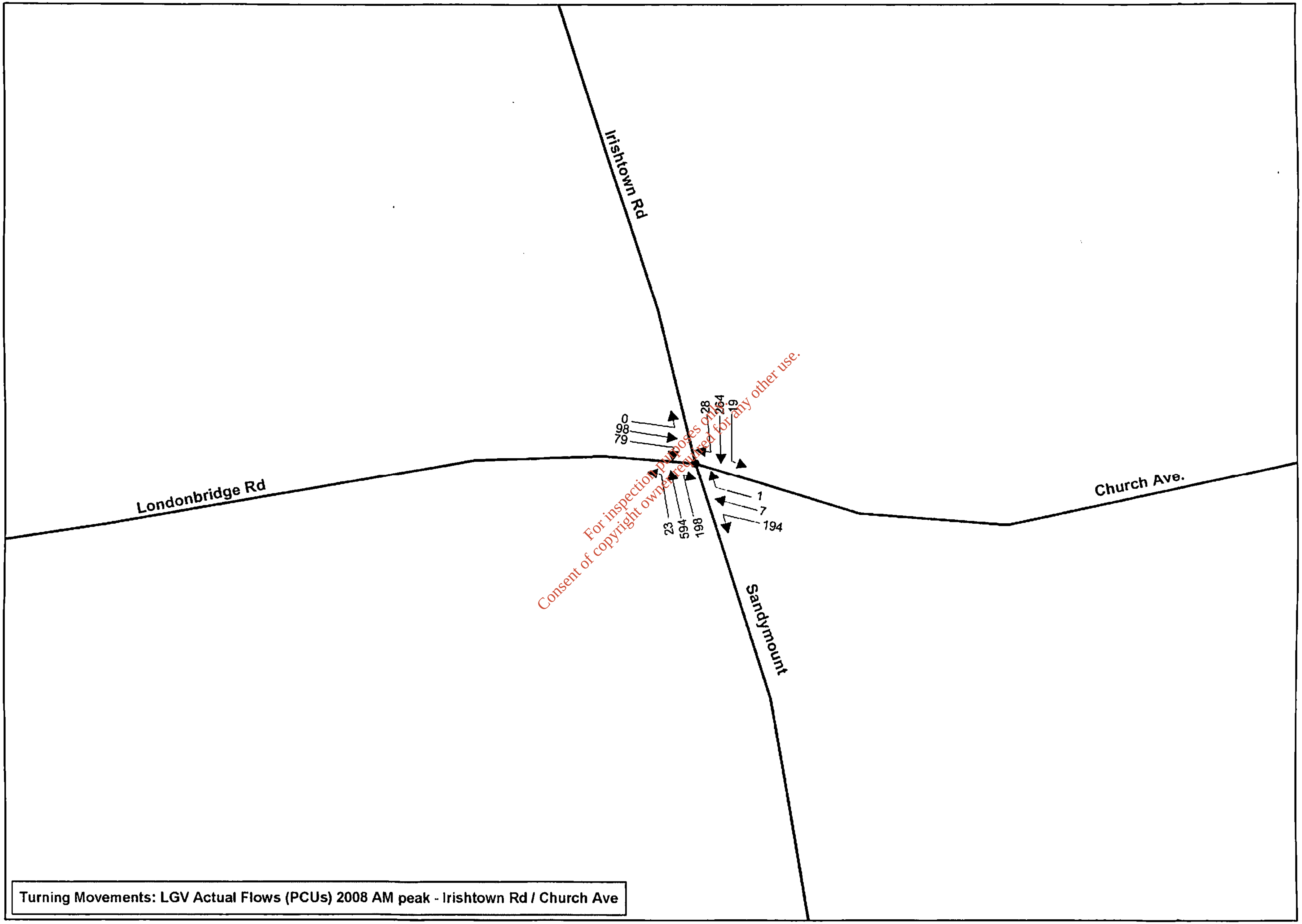
Turning Movements: HGV Actual Flows (PCUs) 2023 AM peak North Wall Quay / East Wall Rd



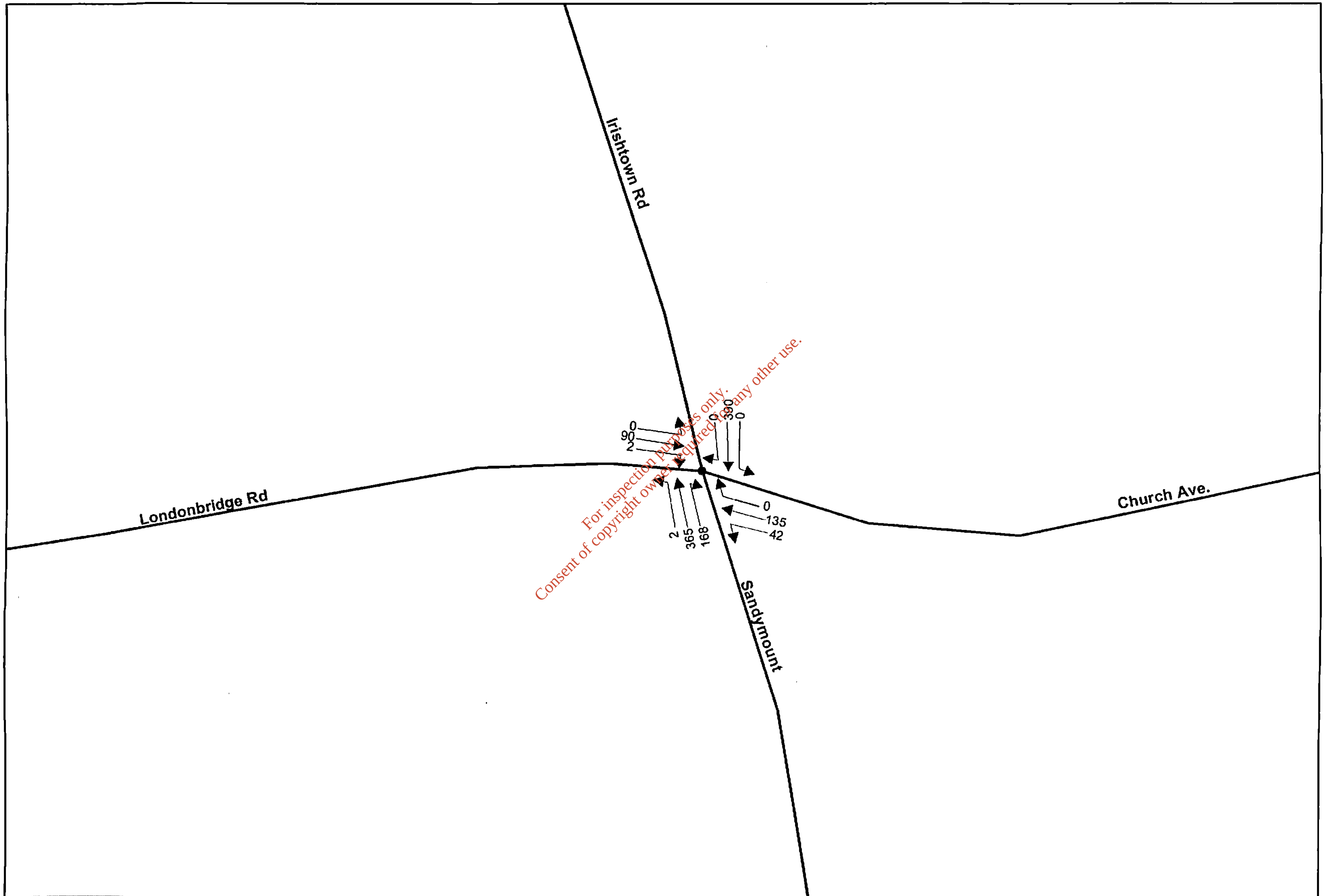
Turning Movements: LGV Actual Flows (PCUs) 2023 AM peak North Wall Quay / East Wall Rd



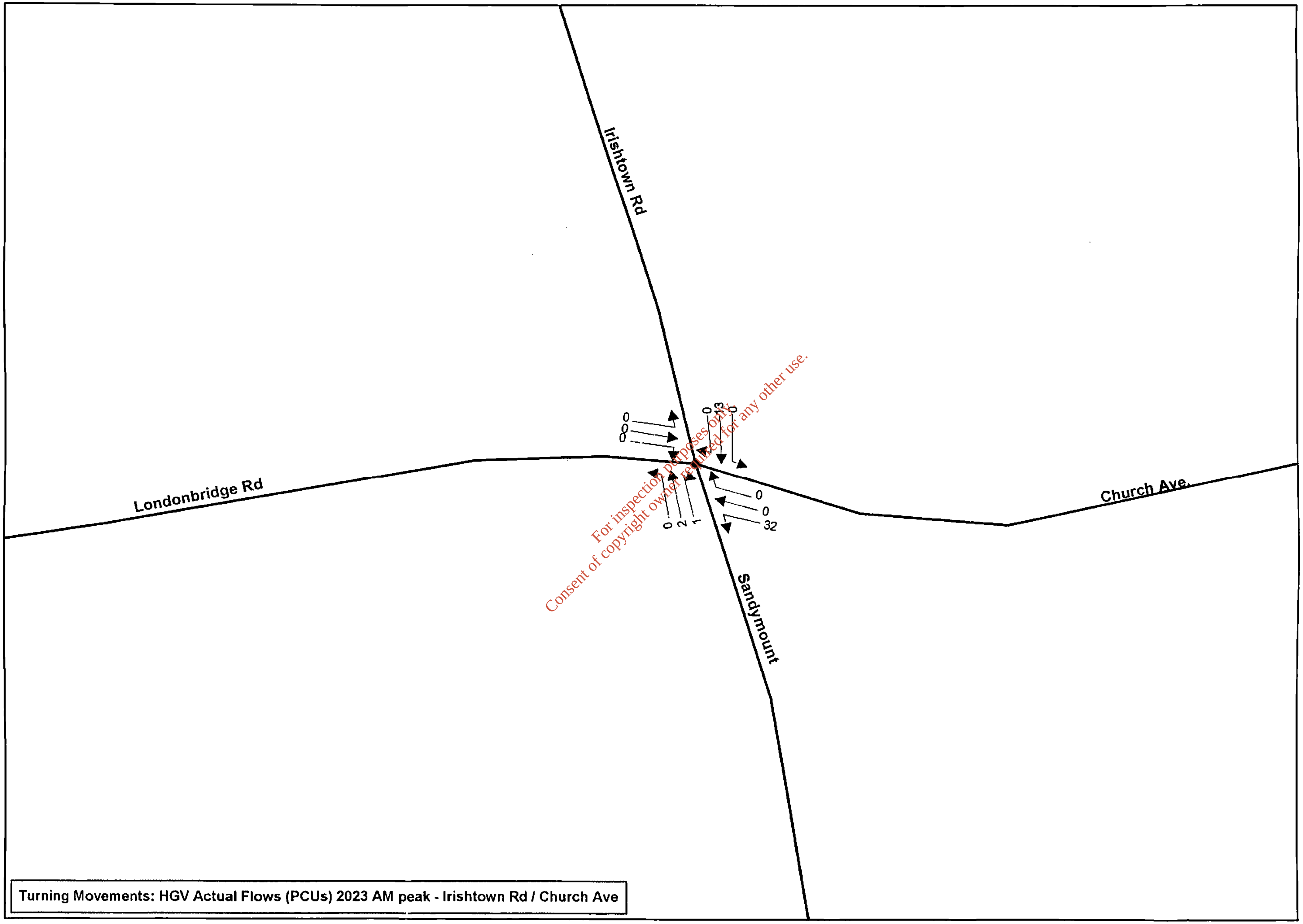
Turning Movements: HGV Actual Flows (PCUs) 2008 AM peak - Irishtown Rd / Church Ave



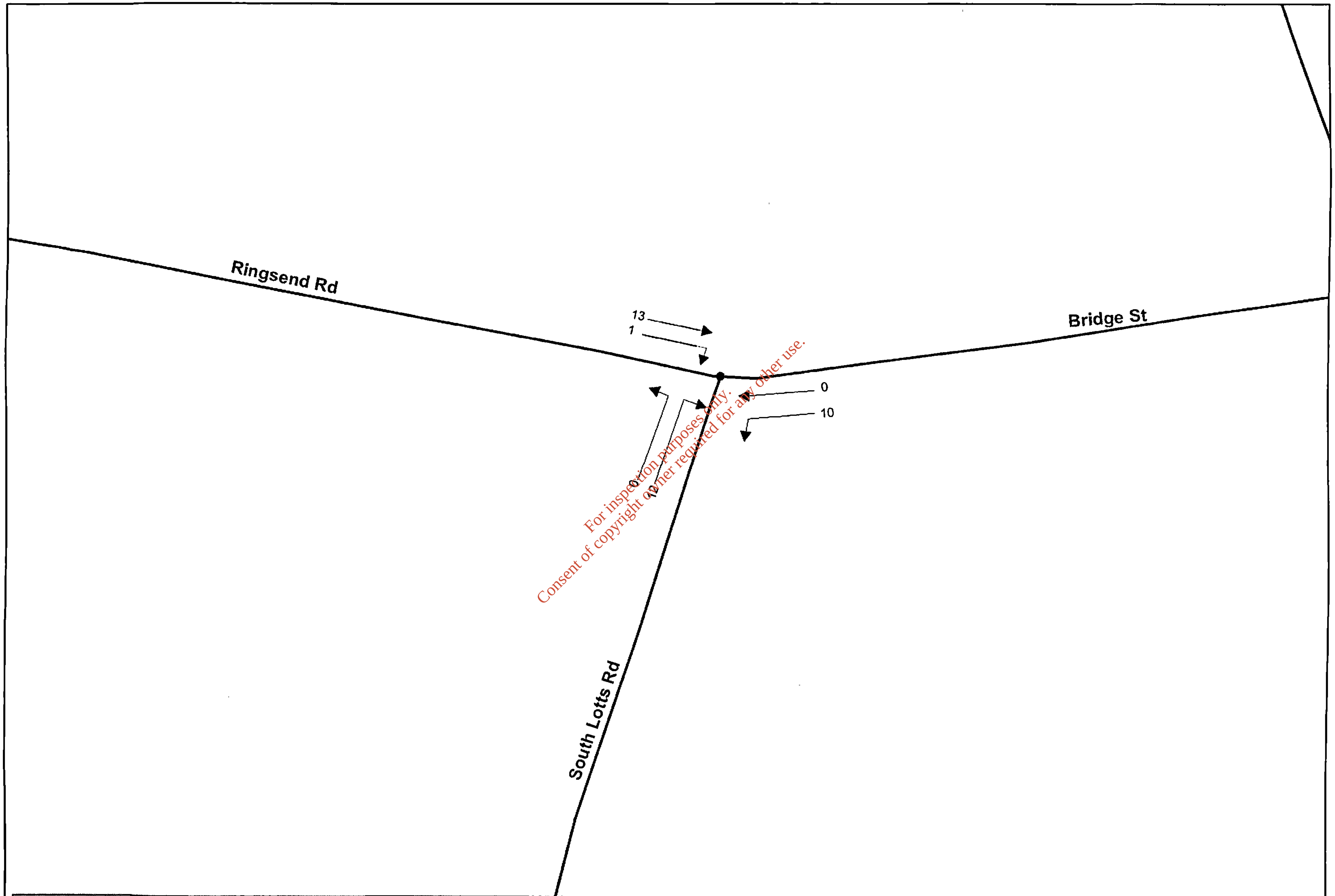
Turning Movements: LGV Actual Flows (PCUs) 2008 AM peak - Irishtown Rd / Church Ave



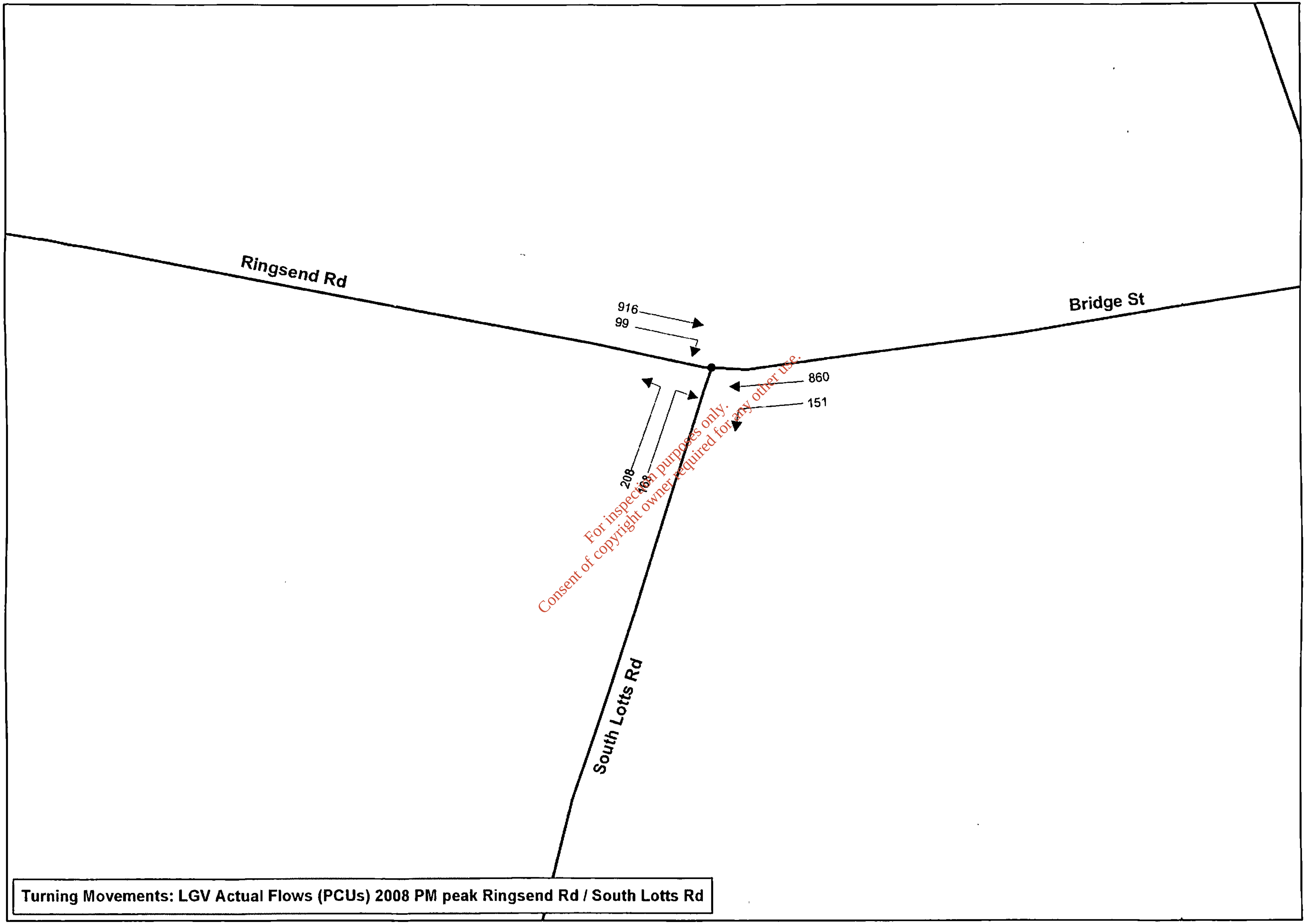
Turning Movements: LGV Actual Flows (PCUs) 2023 AM peak - Irishtown Rd / Church Ave



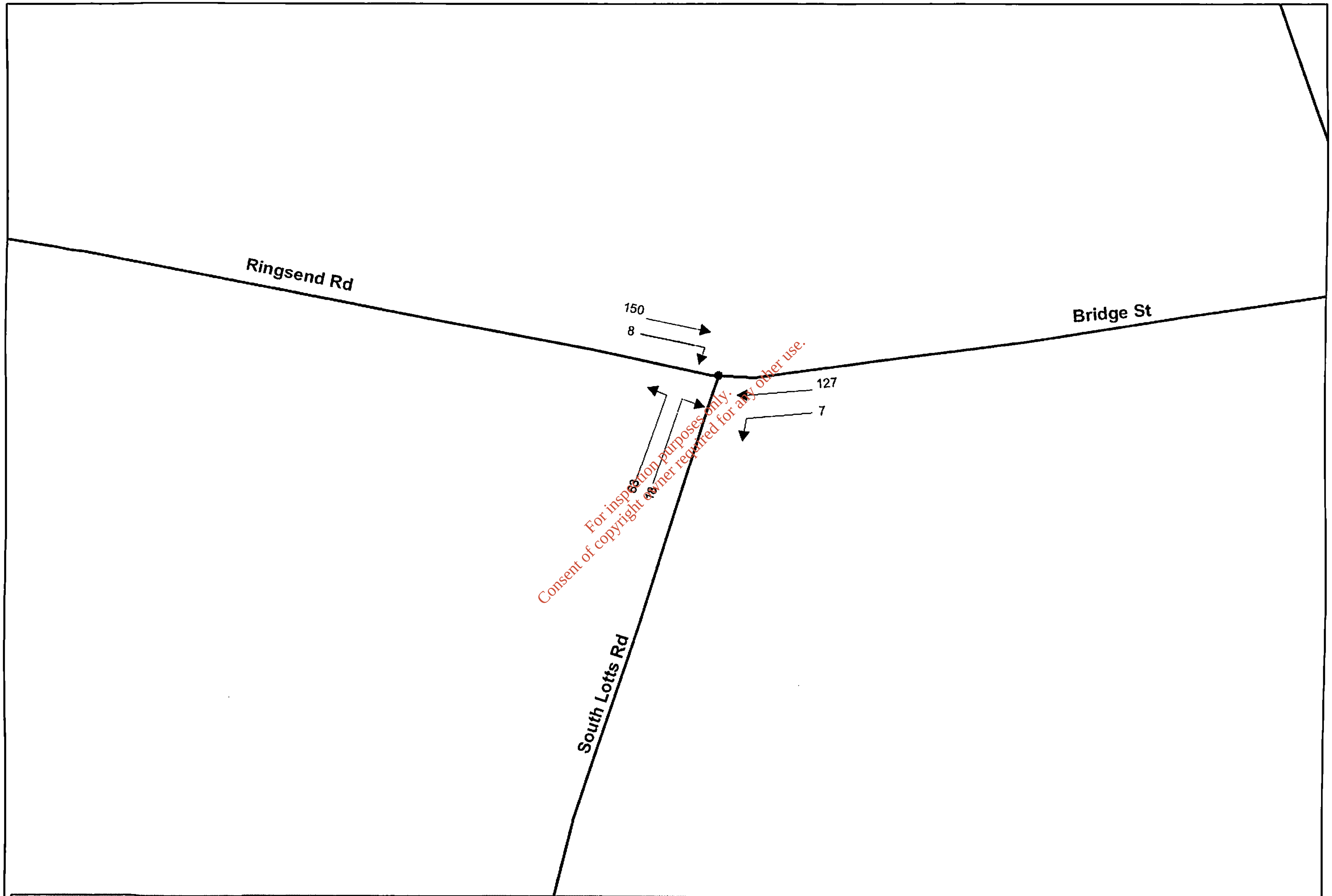
Turning Movements: HGV Actual Flows (PCUs) 2023 AM peak - Irishtown Rd / Church Ave



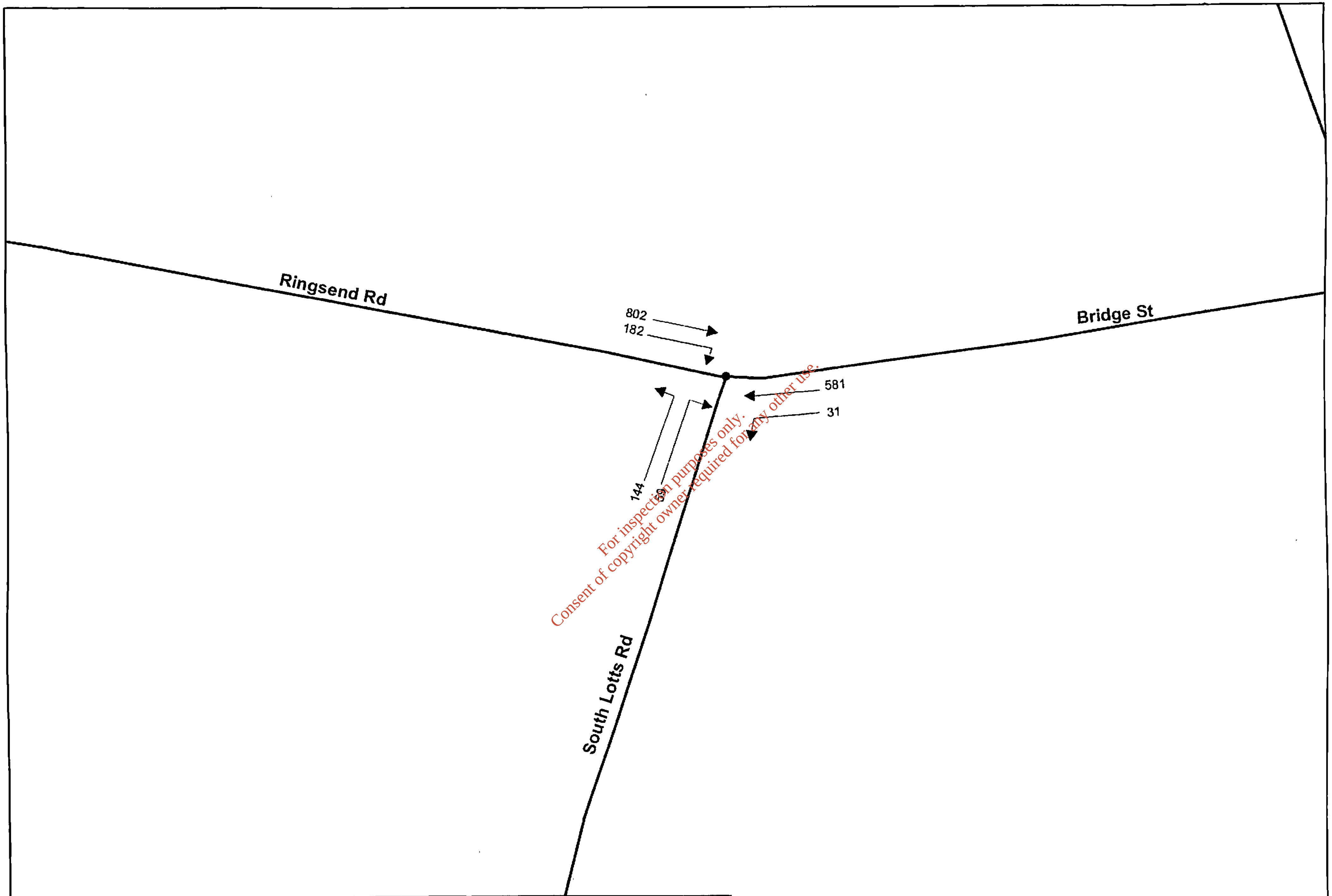
Turning Movements: HGV Actual Flows (PCUs) 2008 PM peak Ringsend Rd / South Lotts Rd



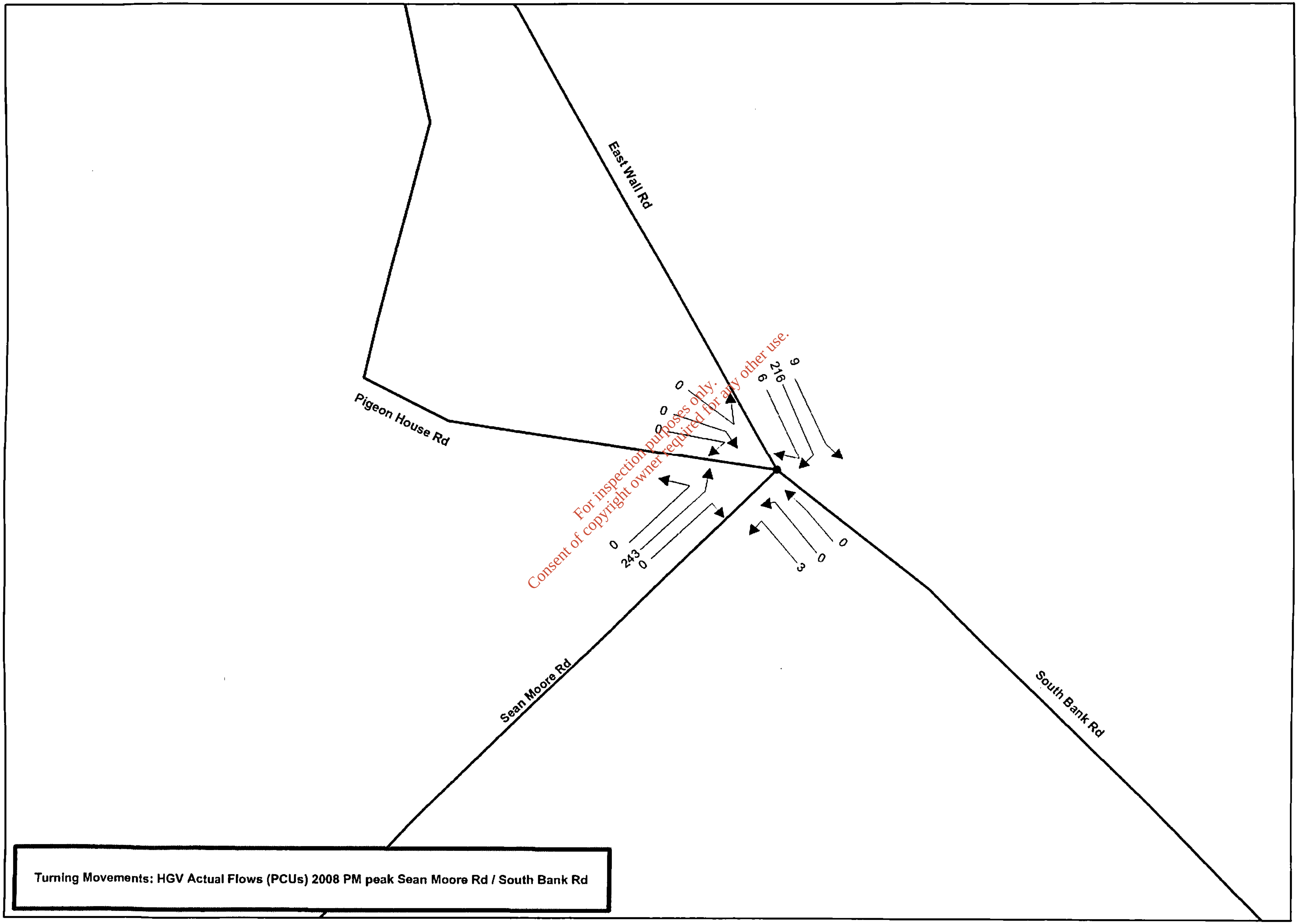
Turning Movements: LGV Actual Flows (PCUs) 2008 PM peak Ringsend Rd / South Lotts Rd



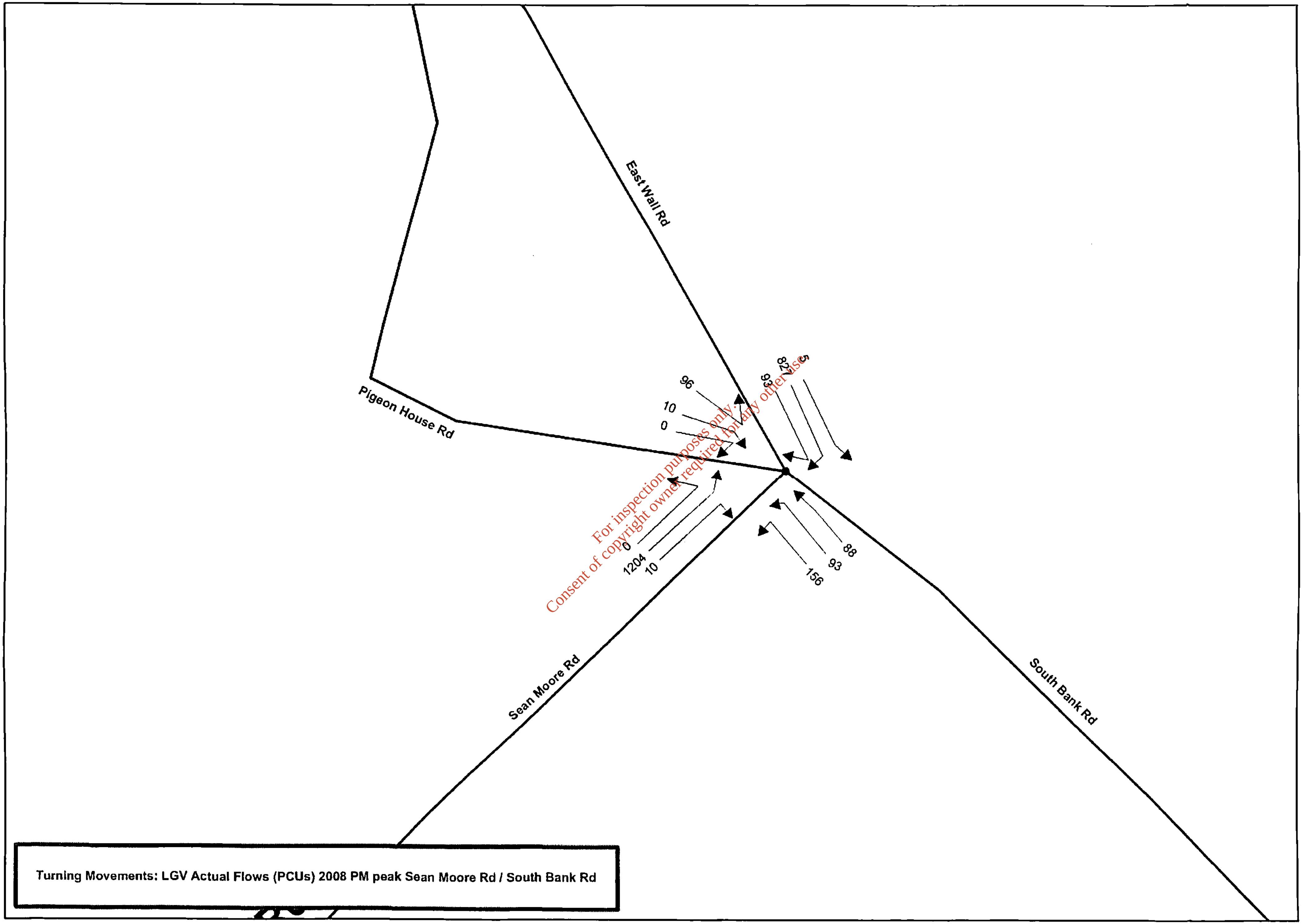
Turning Movements: HGV Actual Flows (PCUs) 2023 PM peak Ringsend Rd / South Lotts Rd



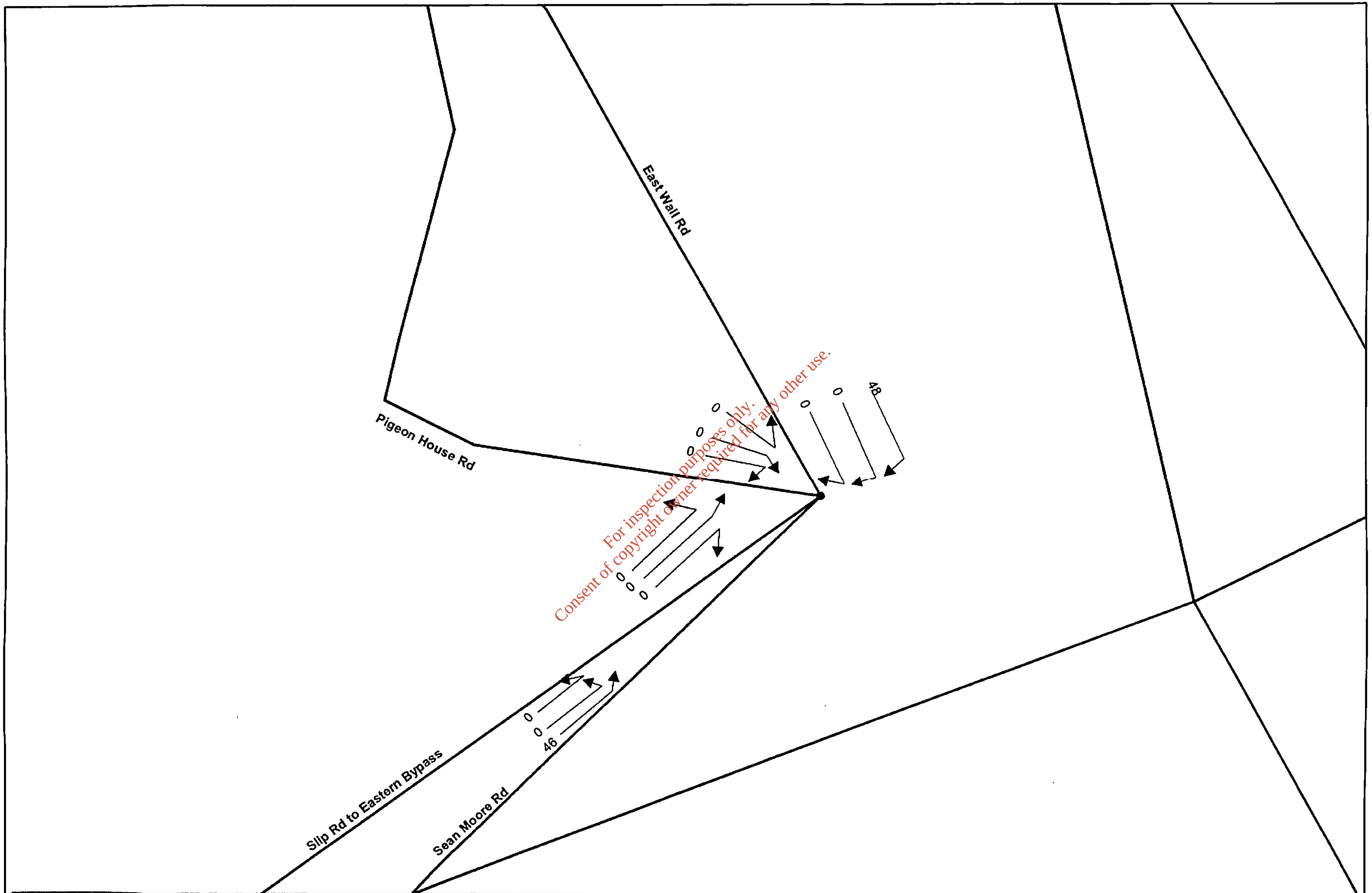
Turning Movements: LGV Actual Flows (PCUs) 2023 PM peak Ringsend Rd / South Lotts Rd



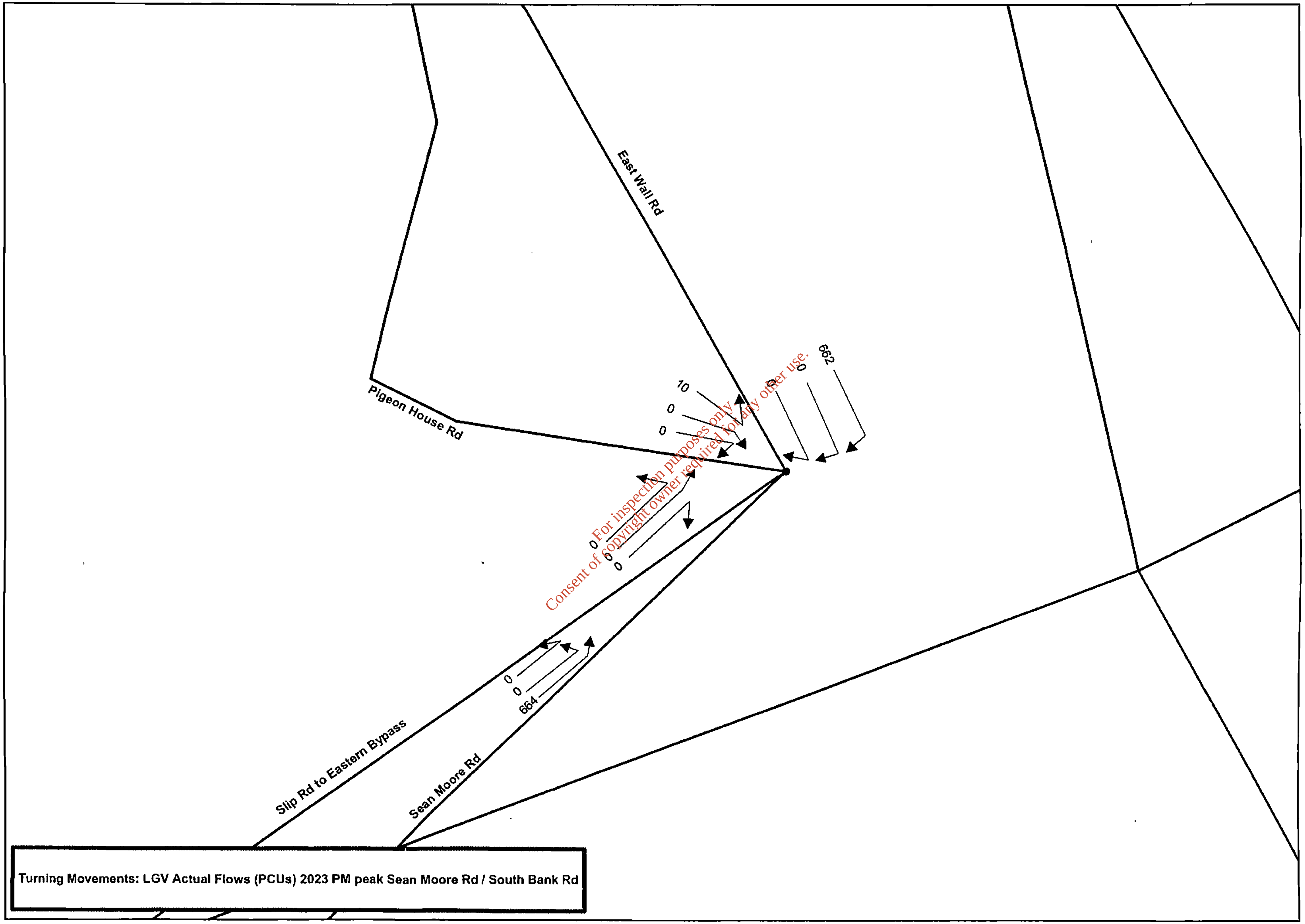
Turning Movements: HGV Actual Flows (PCUs) 2008 PM peak Sean Moore Rd / South Bank Rd



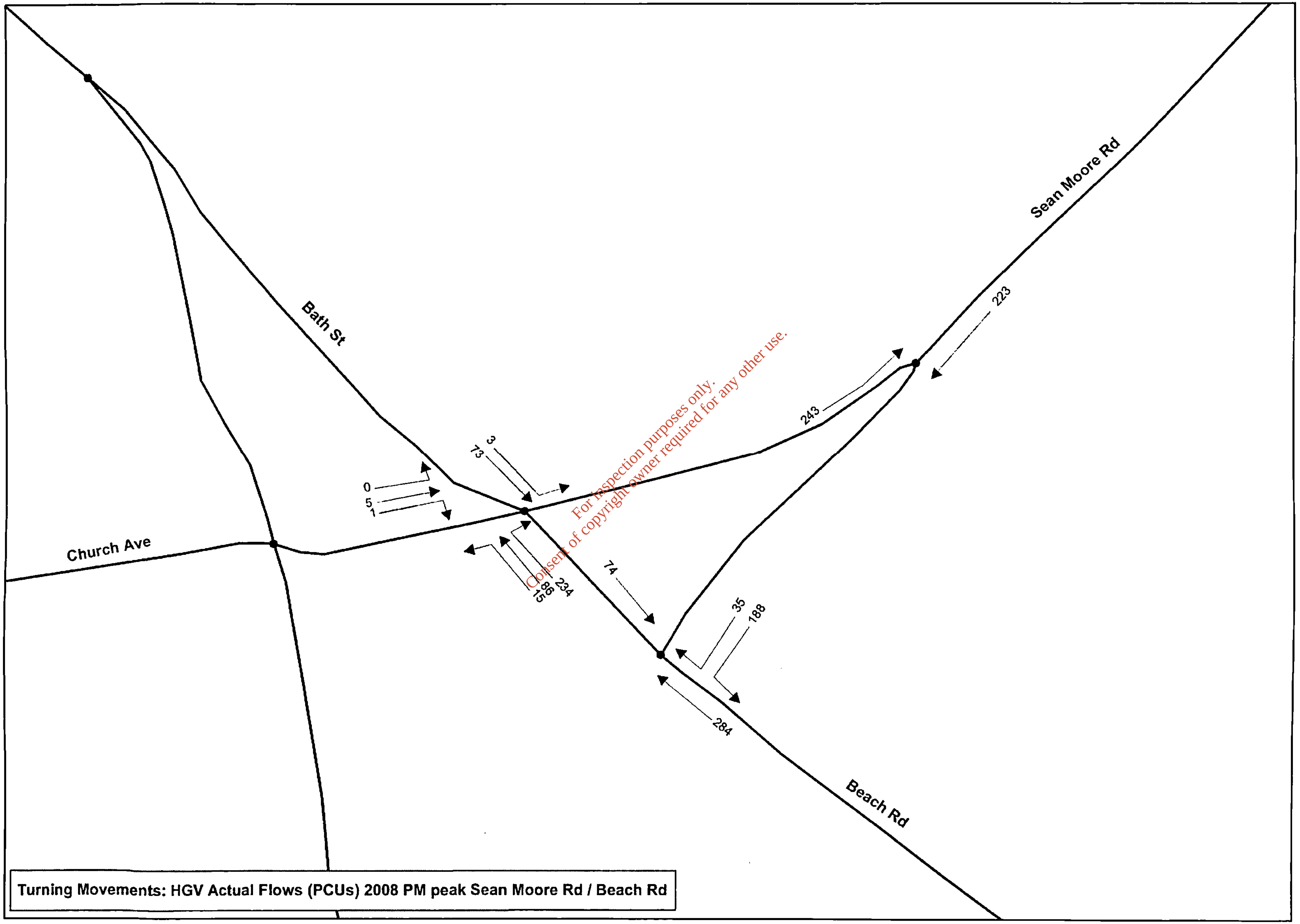
Turning Movements: LGV Actual Flows (PCUs) 2008 PM peak Sean Moore Rd / South Bank Rd



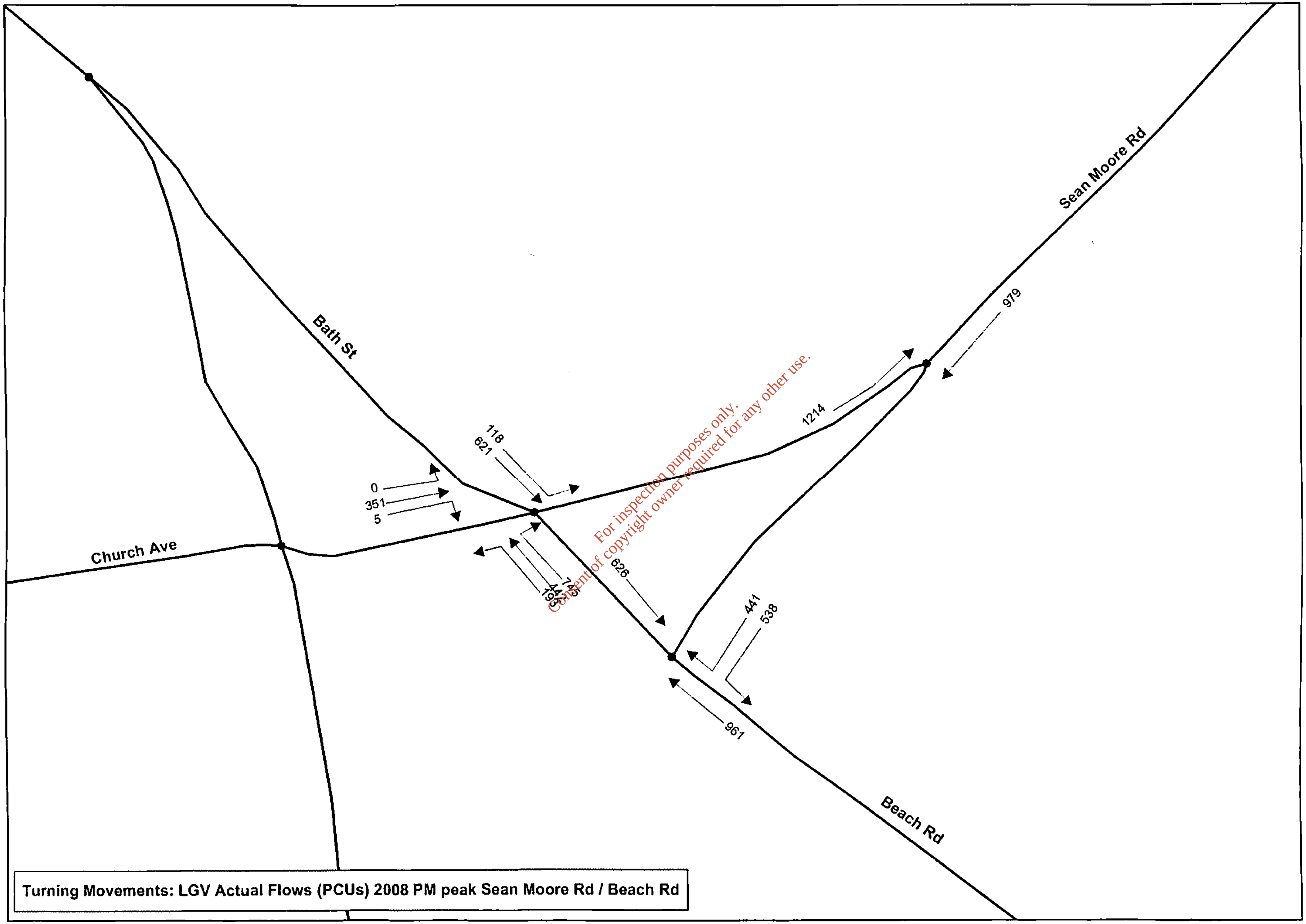
Turning Movements: HGV Actual Flows (PCUs) 2023 PM peak Sean Moore Rd / South Bank Rd



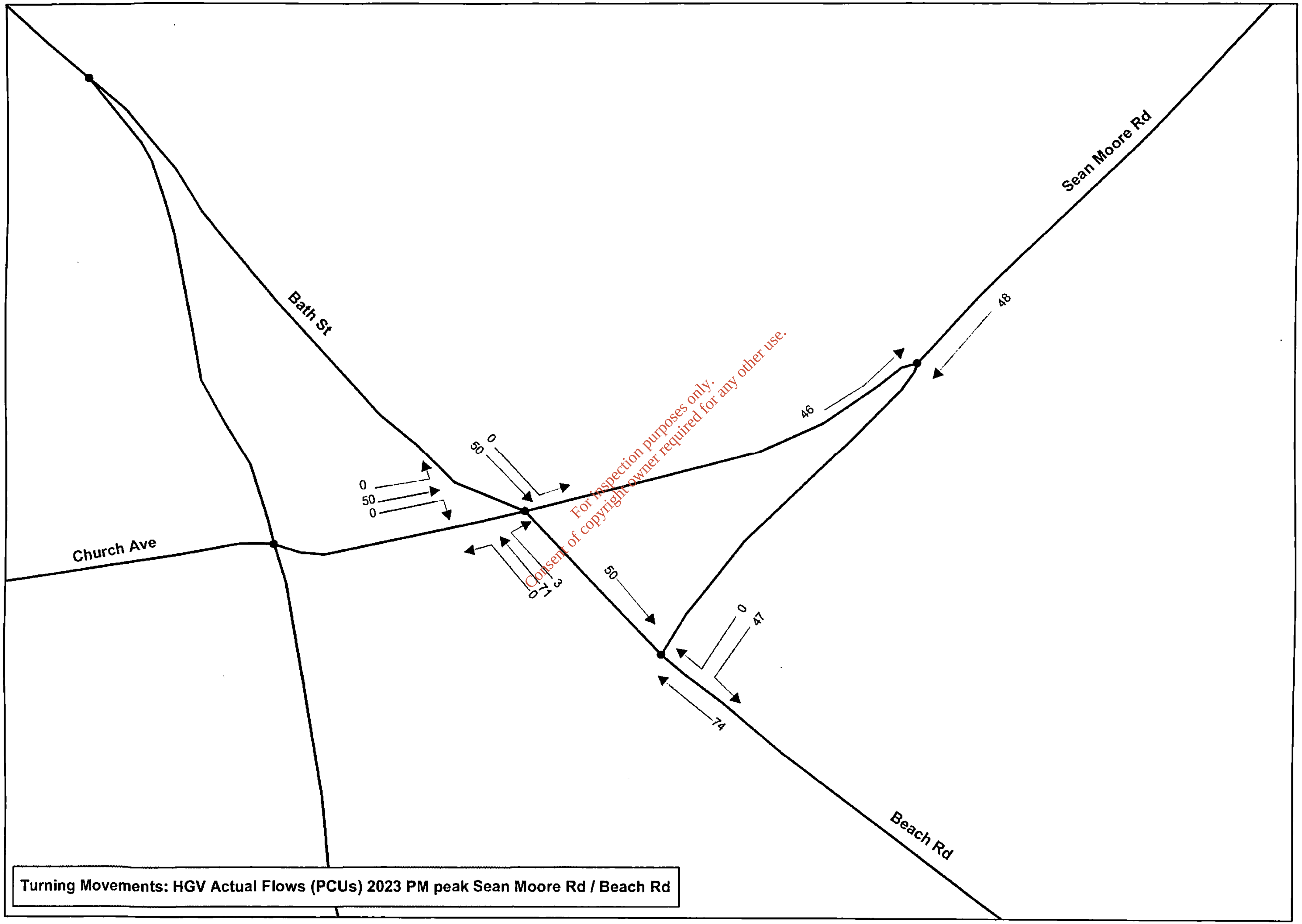
Turning Movements: LGV Actual Flows (PCUs) 2023 PM peak Sean Moore Rd / South Bank Rd



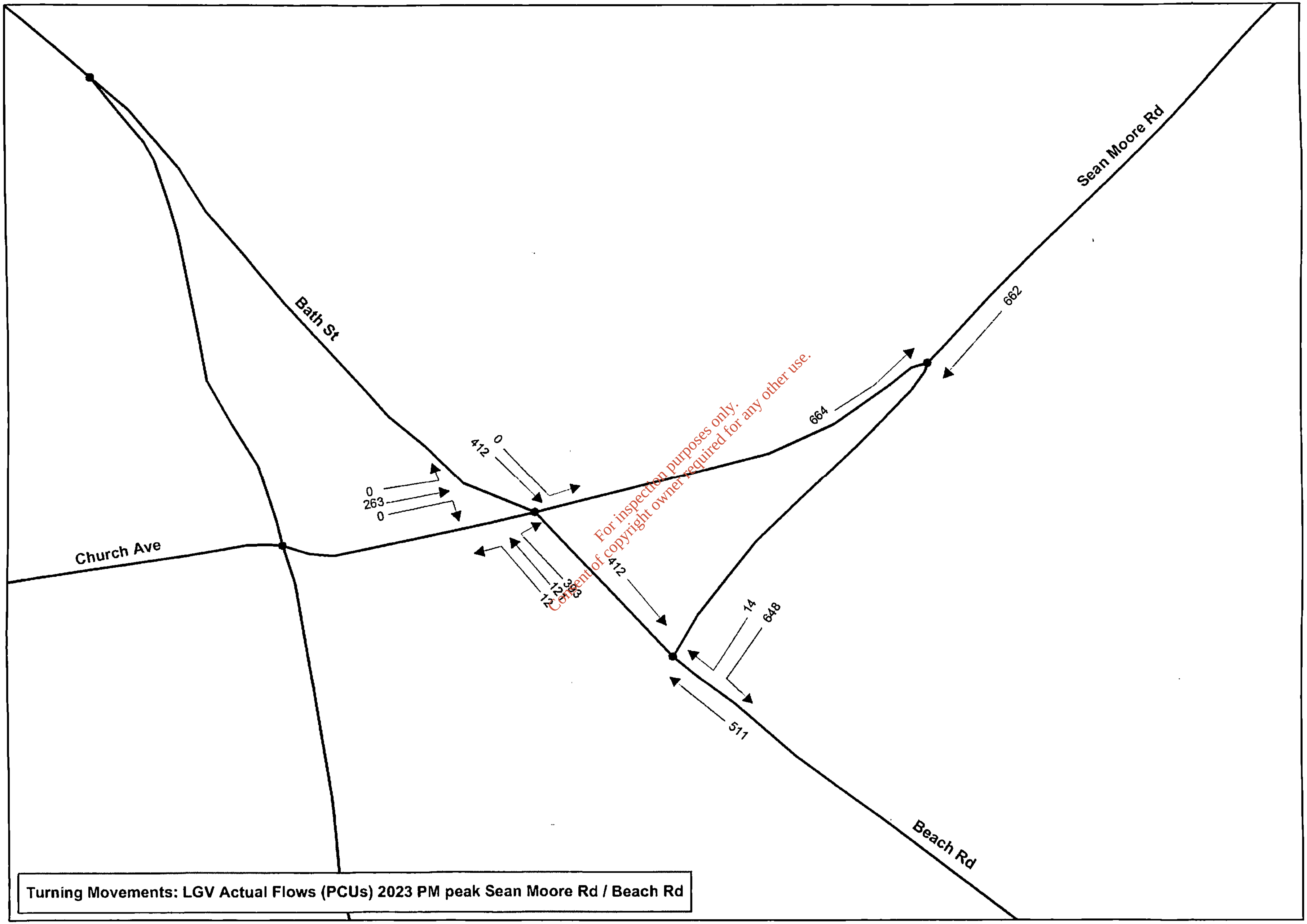
Turning Movements: HGV Actual Flows (PCUs) 2008 PM peak Sean Moore Rd / Beach Rd



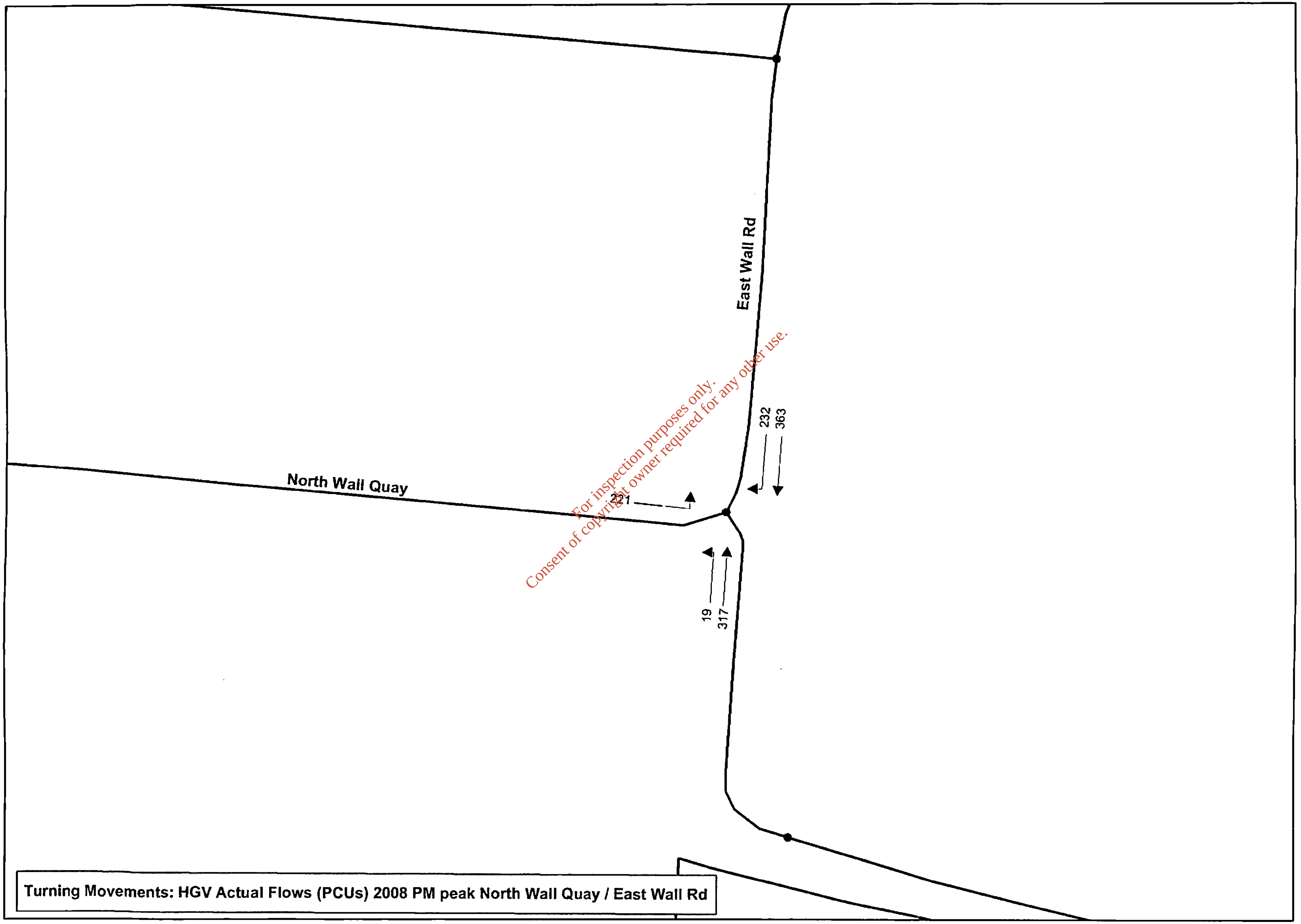
Turning Movements: LGV Actual Flows (PCUs) 2008 PM peak Sean Moore Rd / Beach Rd



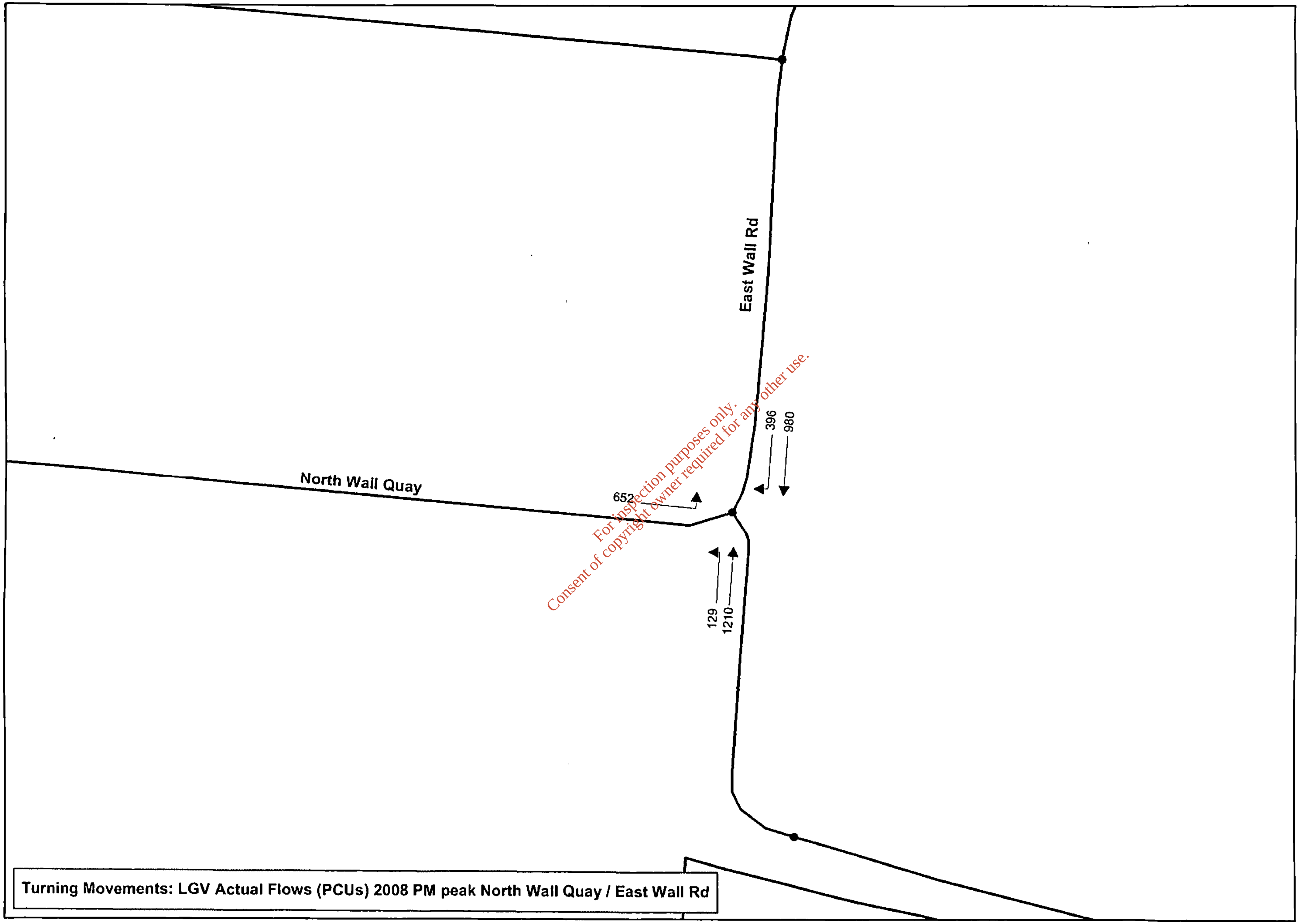
Turning Movements: HGV Actual Flows (PCUs) 2023 PM peak Sean Moore Rd / Beach Rd



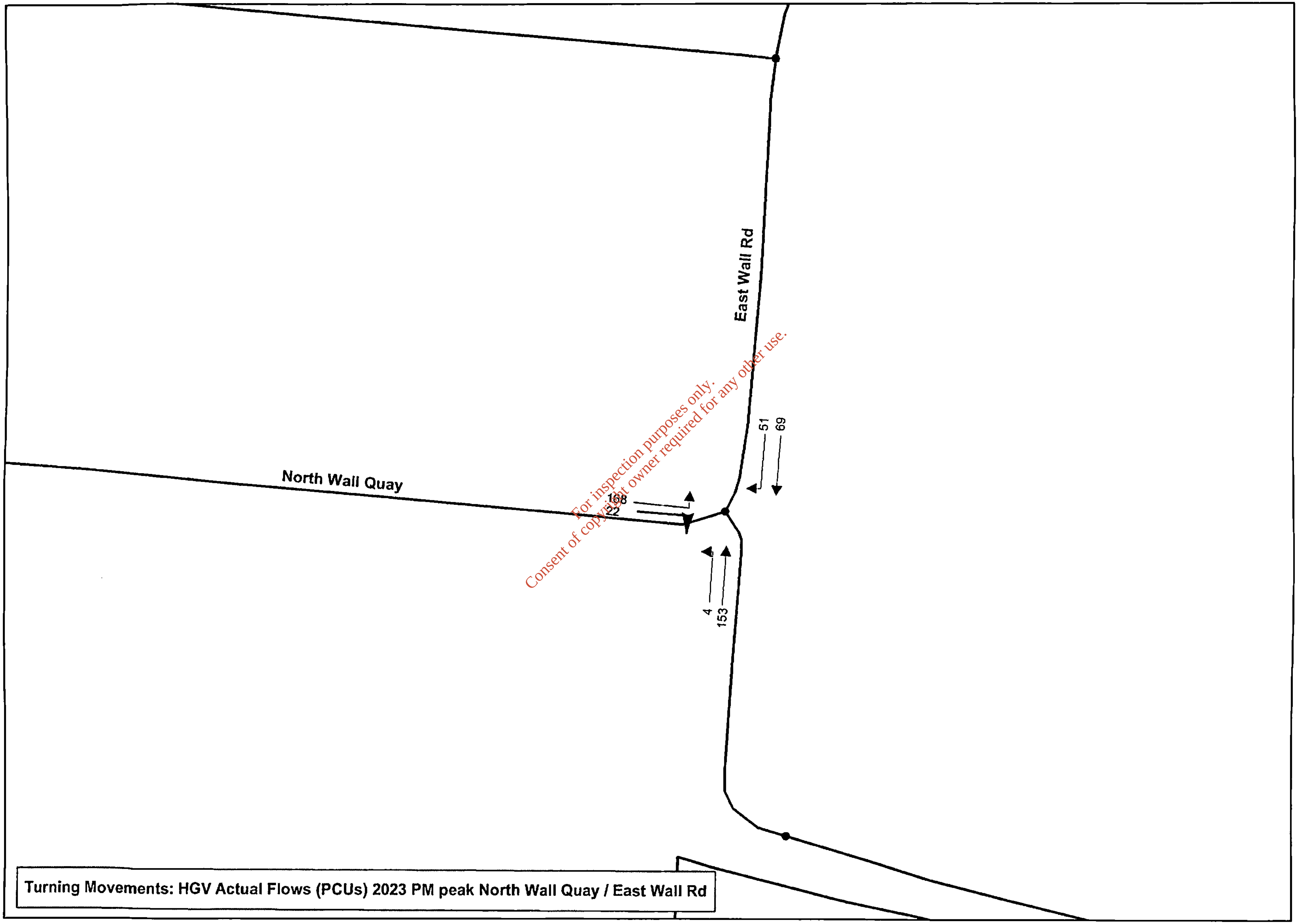
Turning Movements: LGV Actual Flows (PCUs) 2023 PM peak Sean Moore Rd / Beach Rd



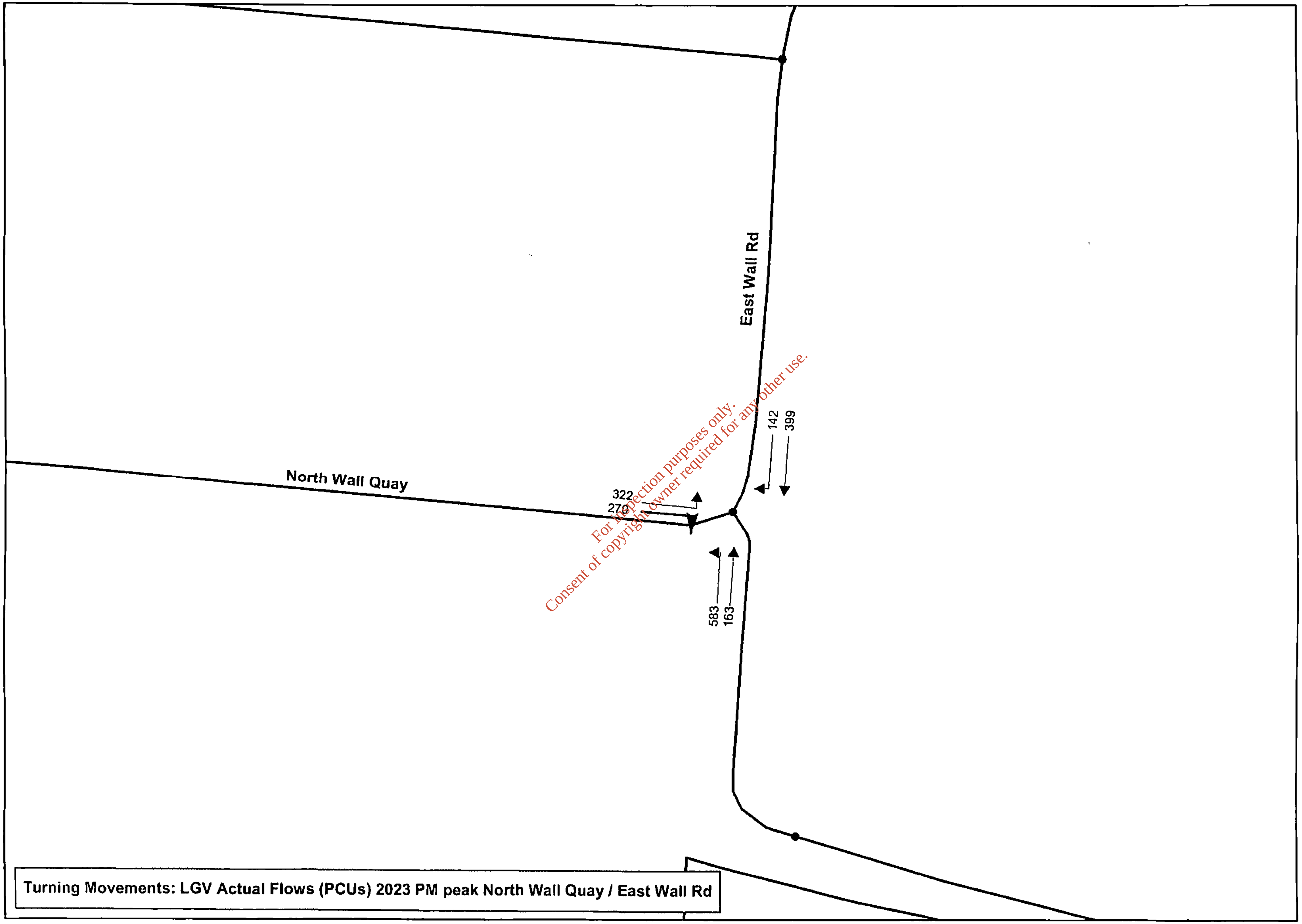
Turning Movements: HGV Actual Flows (PCUs) 2008 PM peak North Wall Quay / East Wall Rd



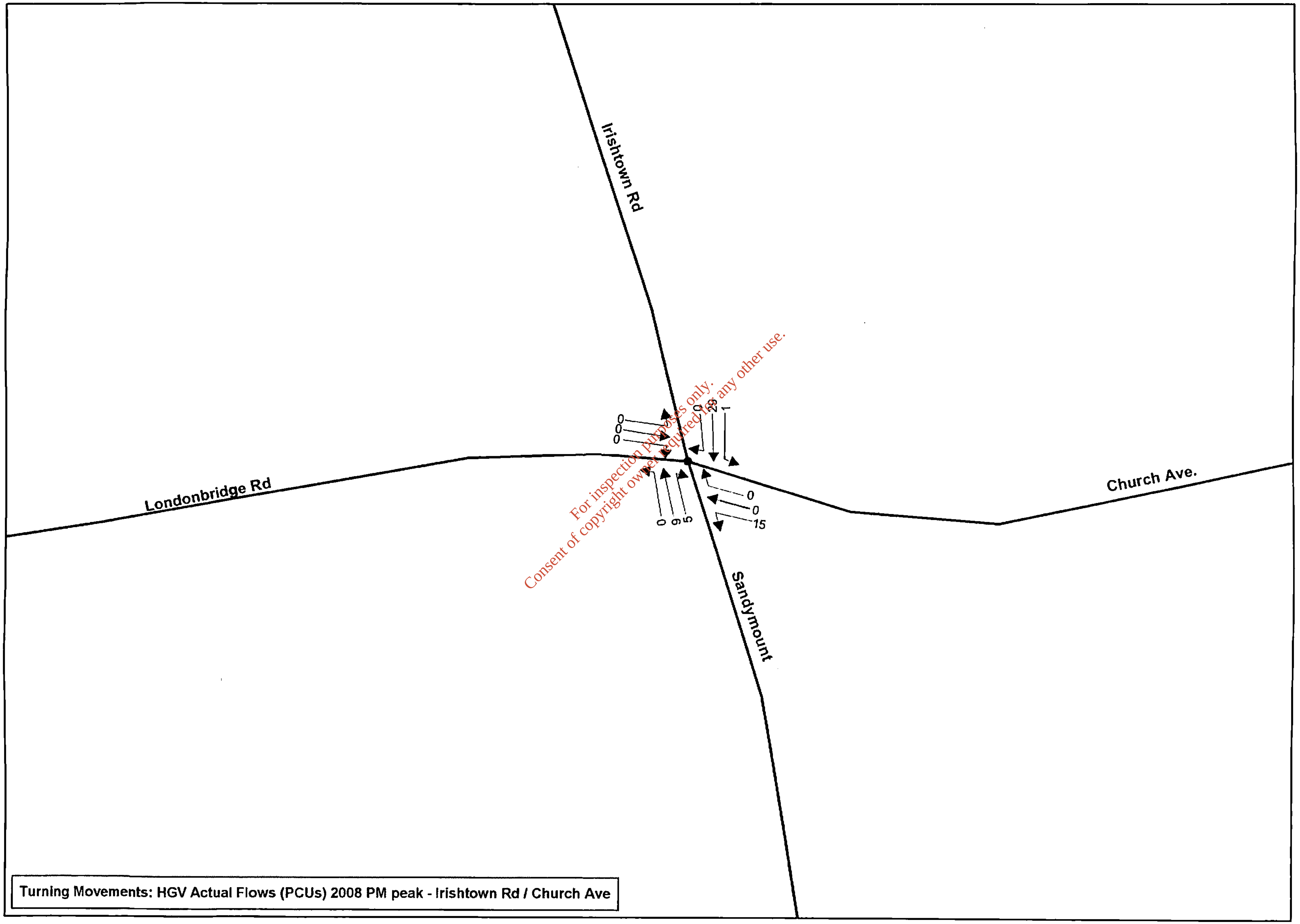
Turning Movements: LGV Actual Flows (PCUs) 2008 PM peak North Wall Quay / East Wall Rd



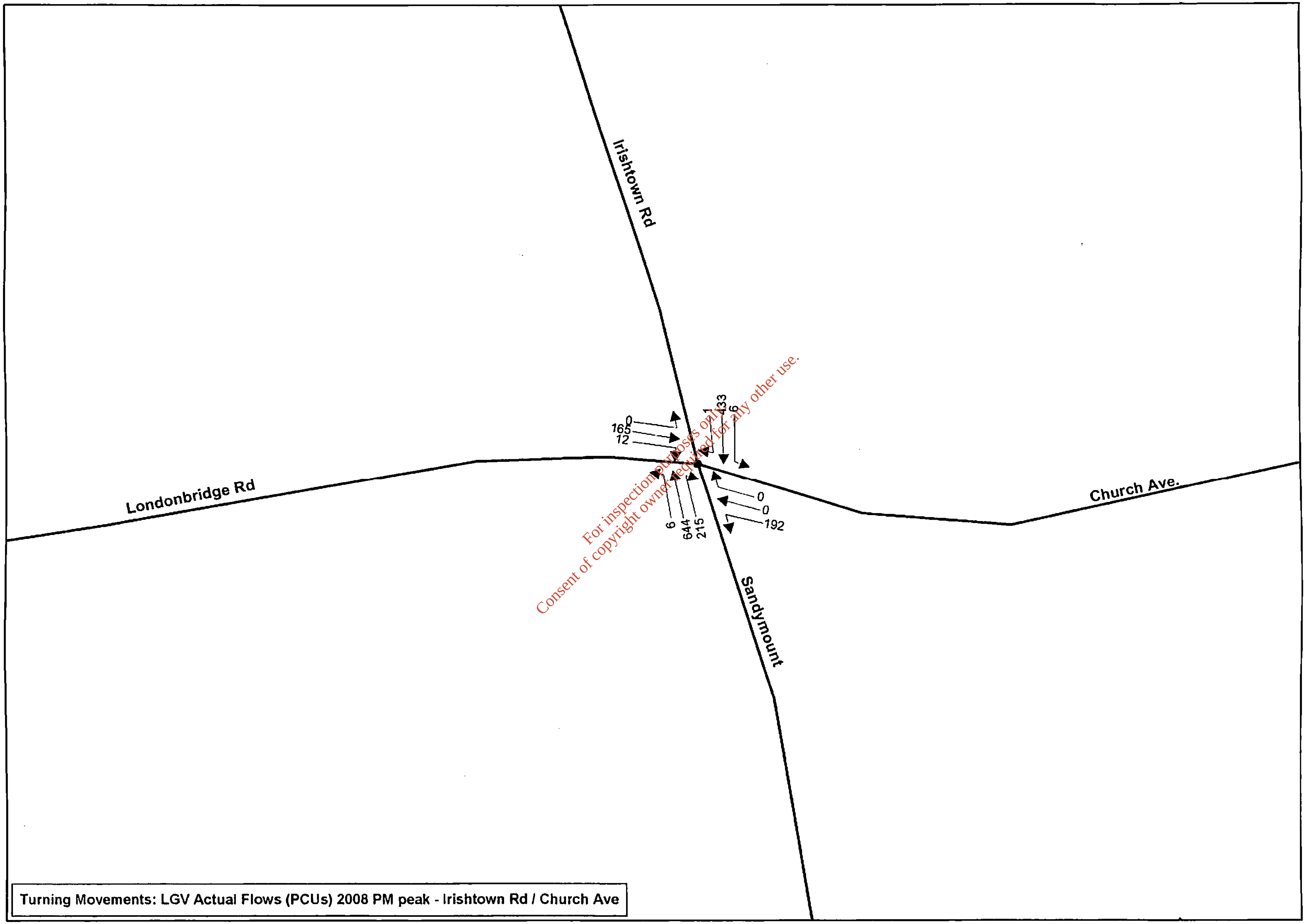
Turning Movements: HGV Actual Flows (PCUs) 2023 PM peak North Wall Quay / East Wall Rd



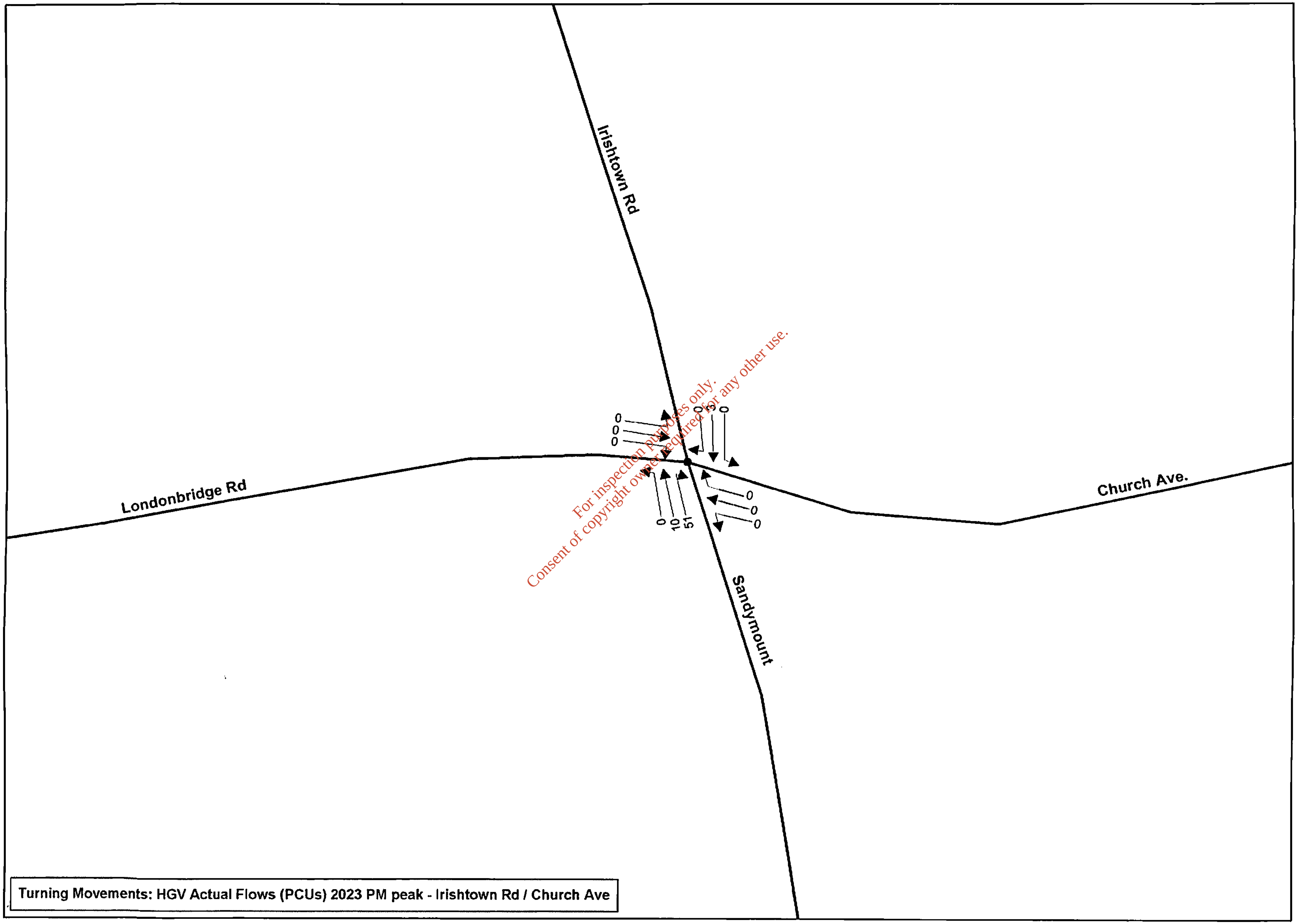
Turning Movements: LGV Actual Flows (PCUs) 2023 PM peak North Wall Quay / East Wall Rd



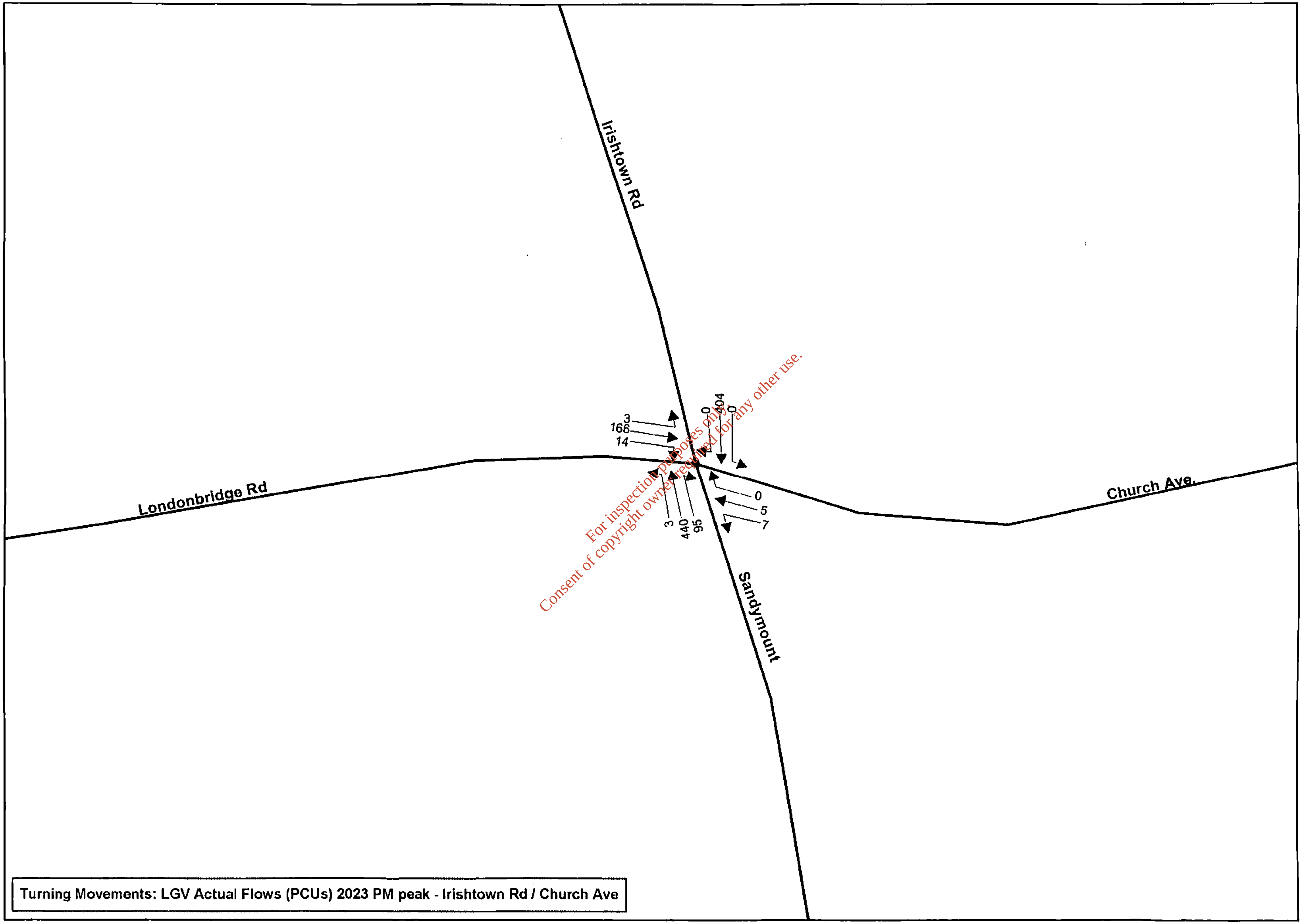
Turning Movements: HGV Actual Flows (PCUs) 2008 PM peak - Irishtown Rd / Church Ave



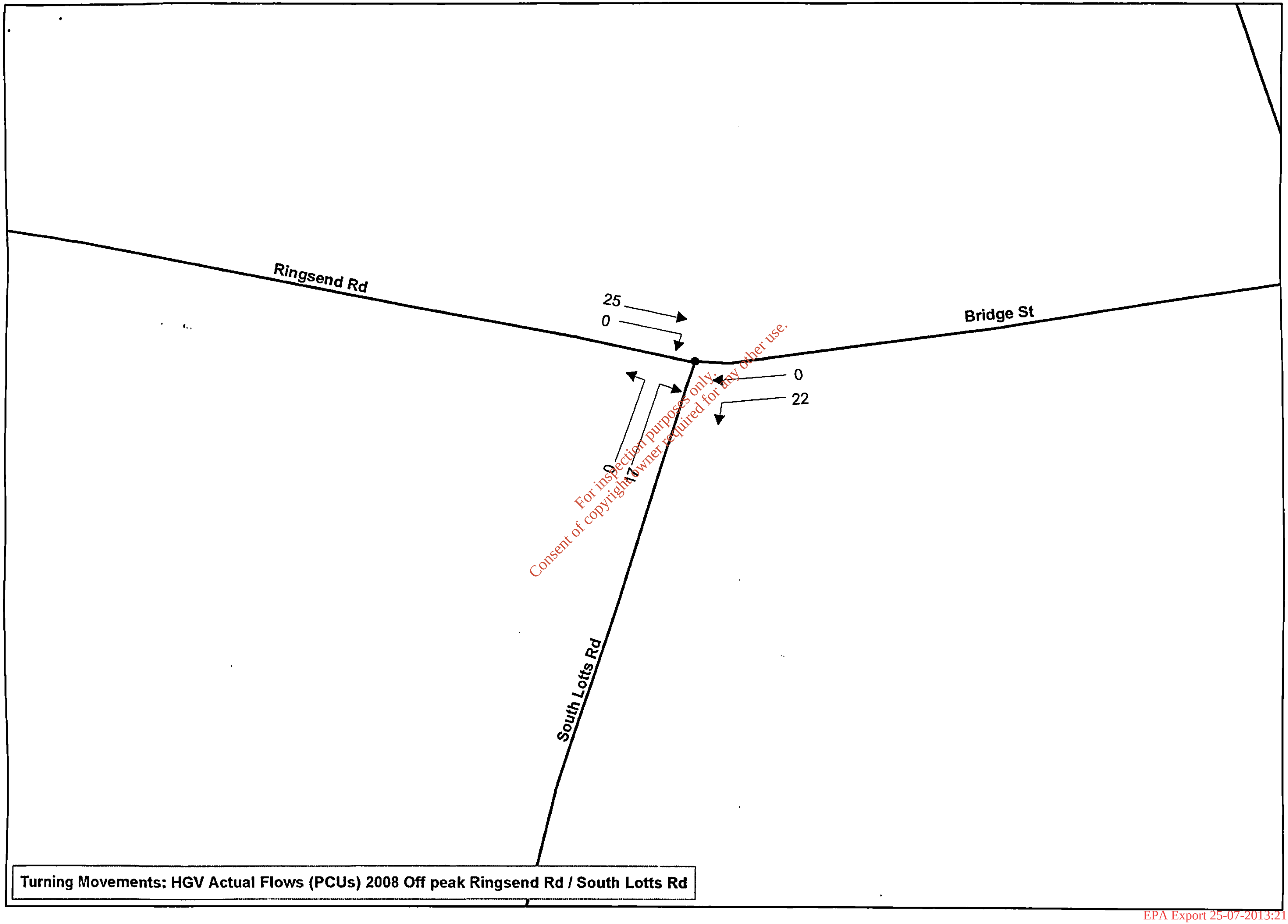
Turning Movements: LGV Actual Flows (PCUs) 2008 PM peak - Irishtown Rd / Church Ave



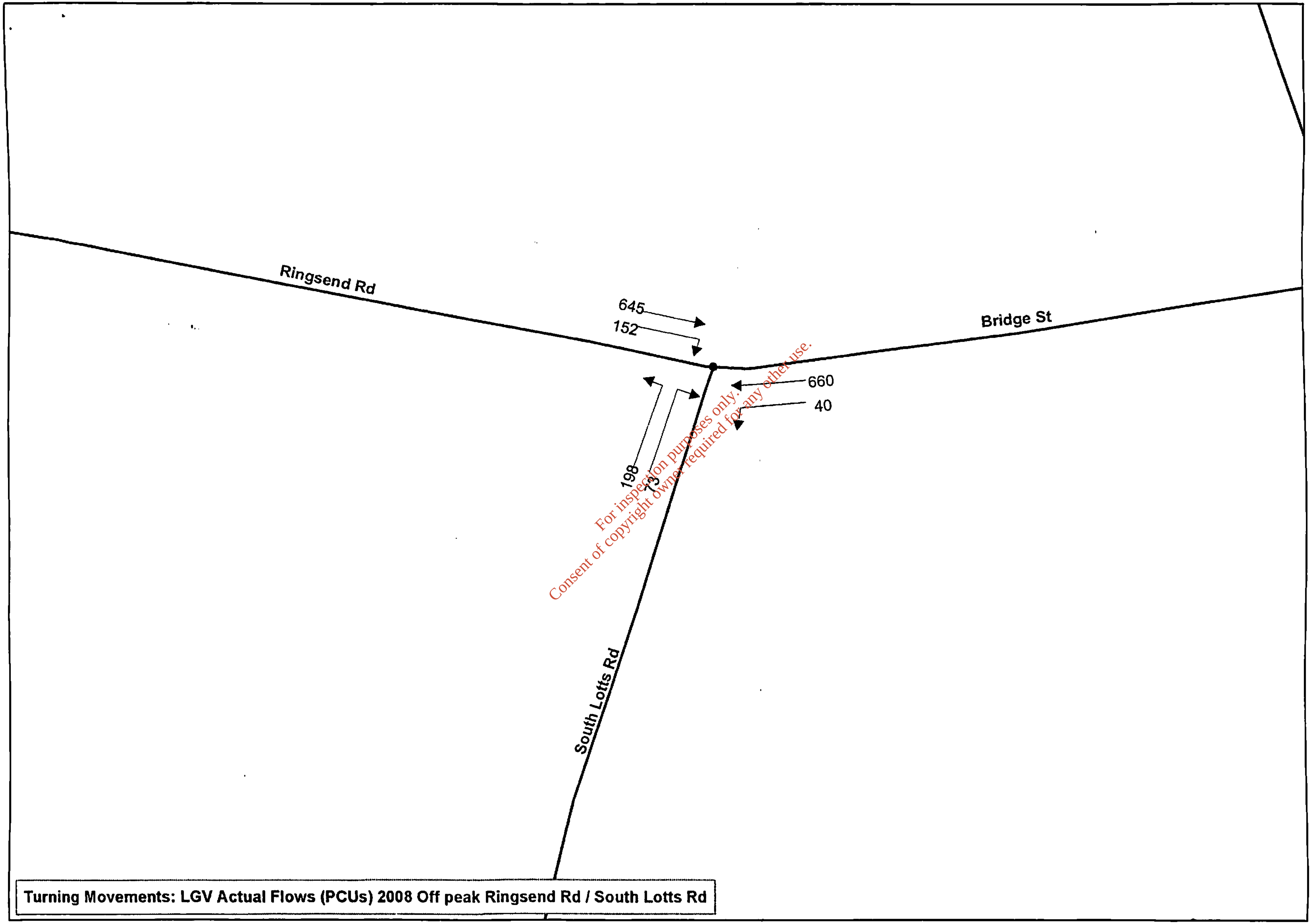
Turning Movements: HGV Actual Flows (PCUs) 2023 PM peak - Irishtown Rd / Church Ave



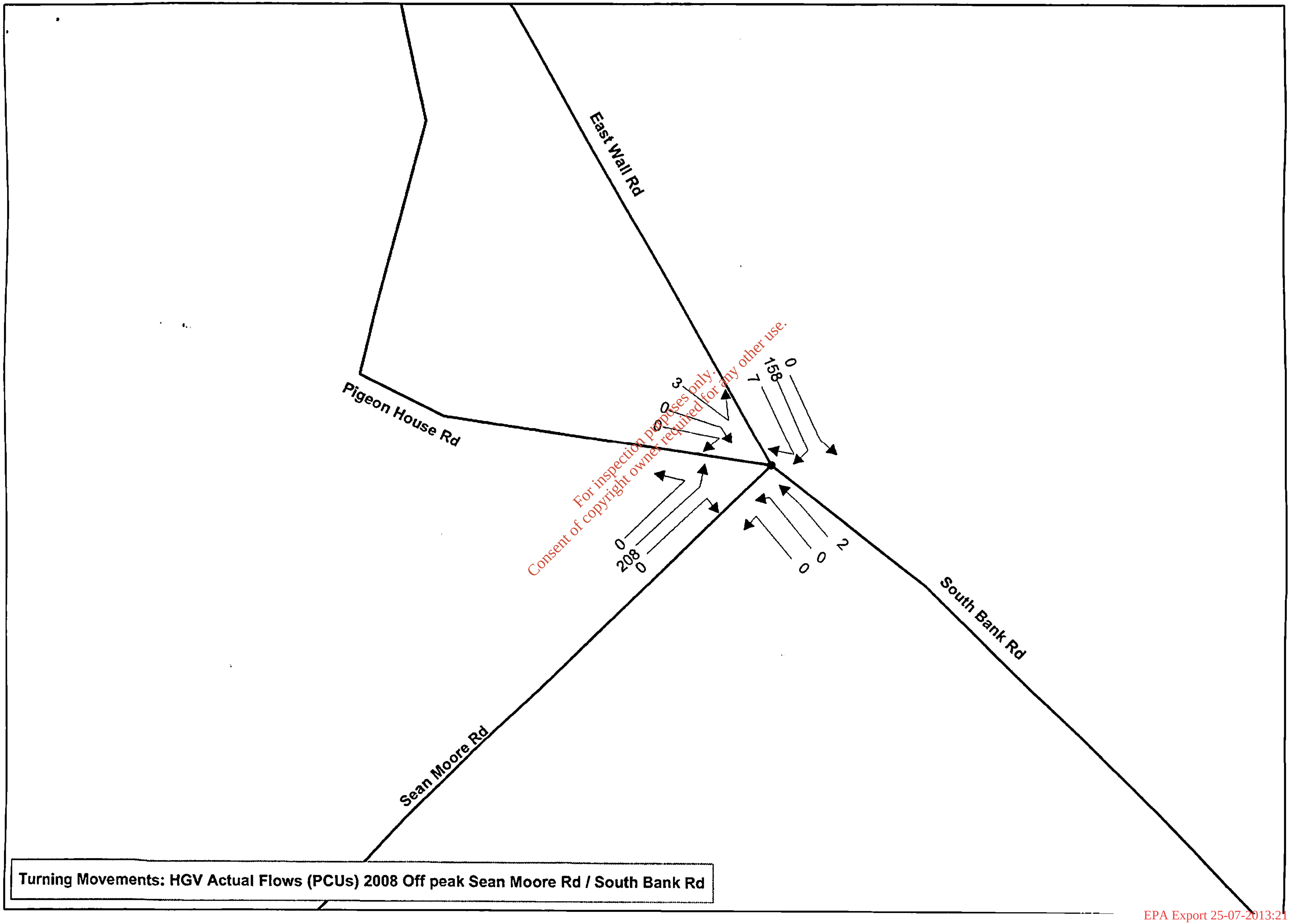
Turning Movements: LGV Actual Flows (PCUs) 2023 PM peak - Irishtown Rd / Church Ave



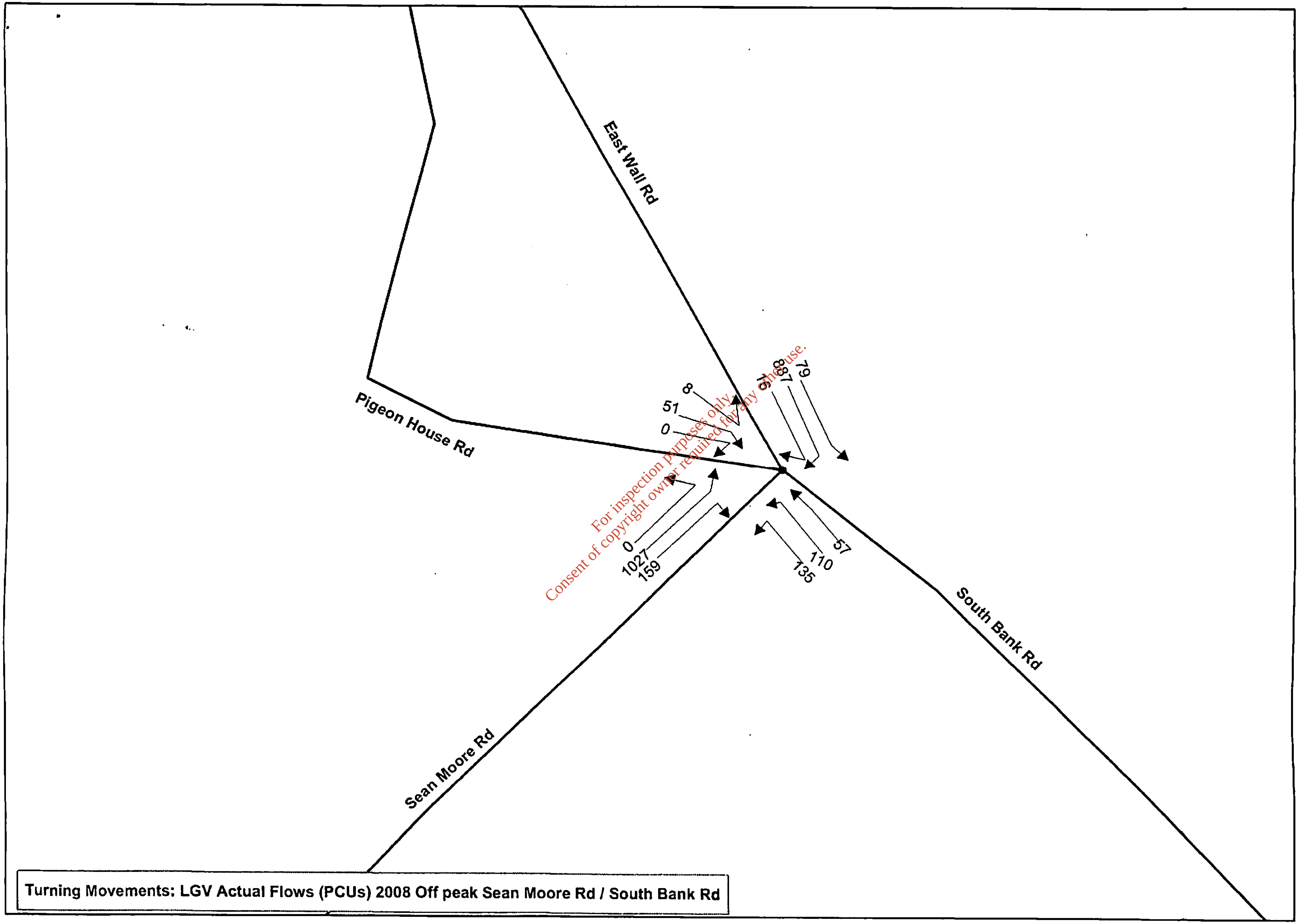
Turning Movements: HGV Actual Flows (PCUs) 2008 Off peak Ringsend Rd / South Lotts Rd



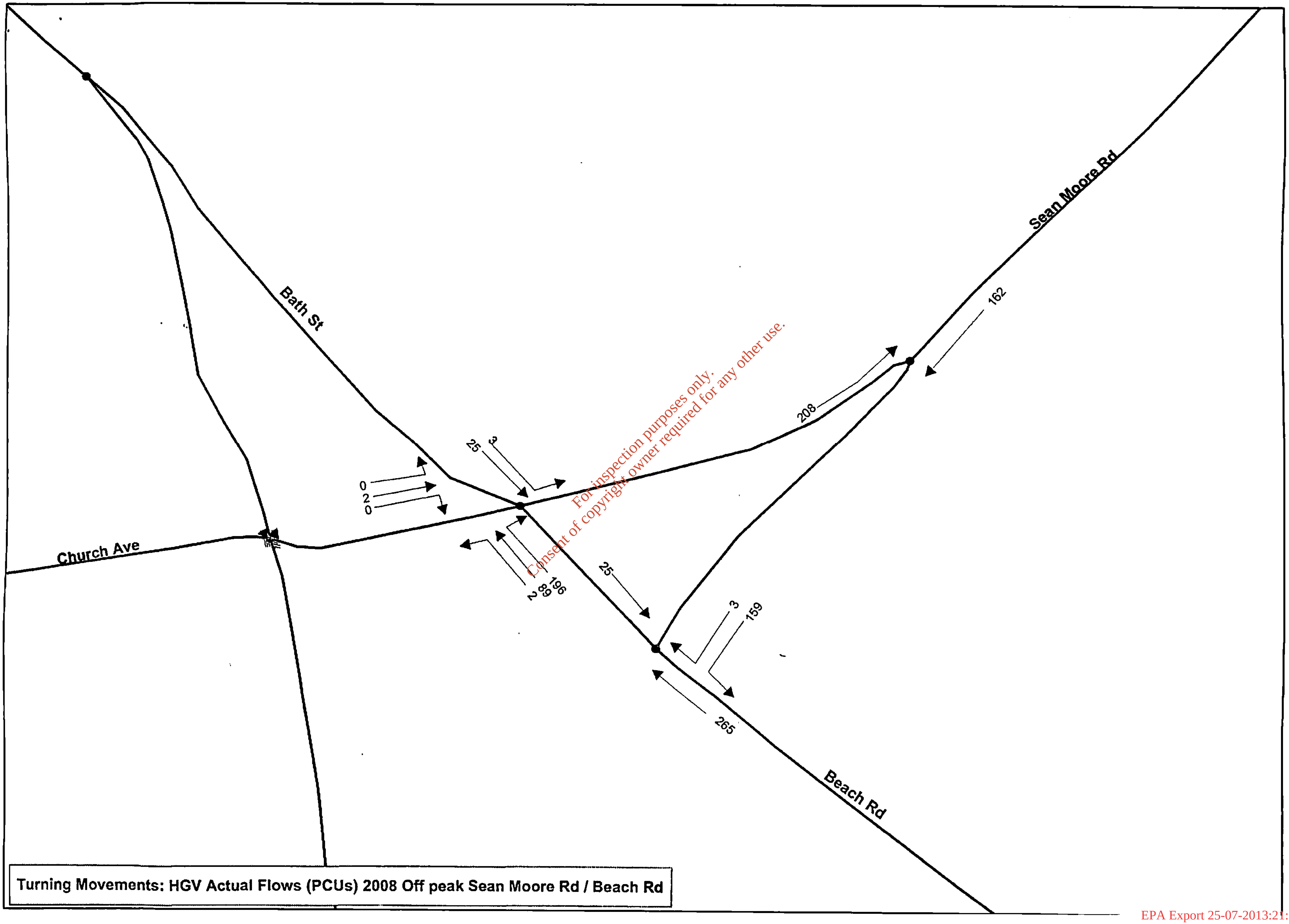
Turning Movements: LGV Actual Flows (PCUs) 2008 Off peak Ringsend Rd / South Lotts Rd



Turning Movements: HGV Actual Flows (PCUs) 2008 Off peak Sean Moore Rd / South Bank Rd



Turning Movements: LGV Actual Flows (PCUs) 2008 Off peak Sean Moore Rd / South Bank Rd



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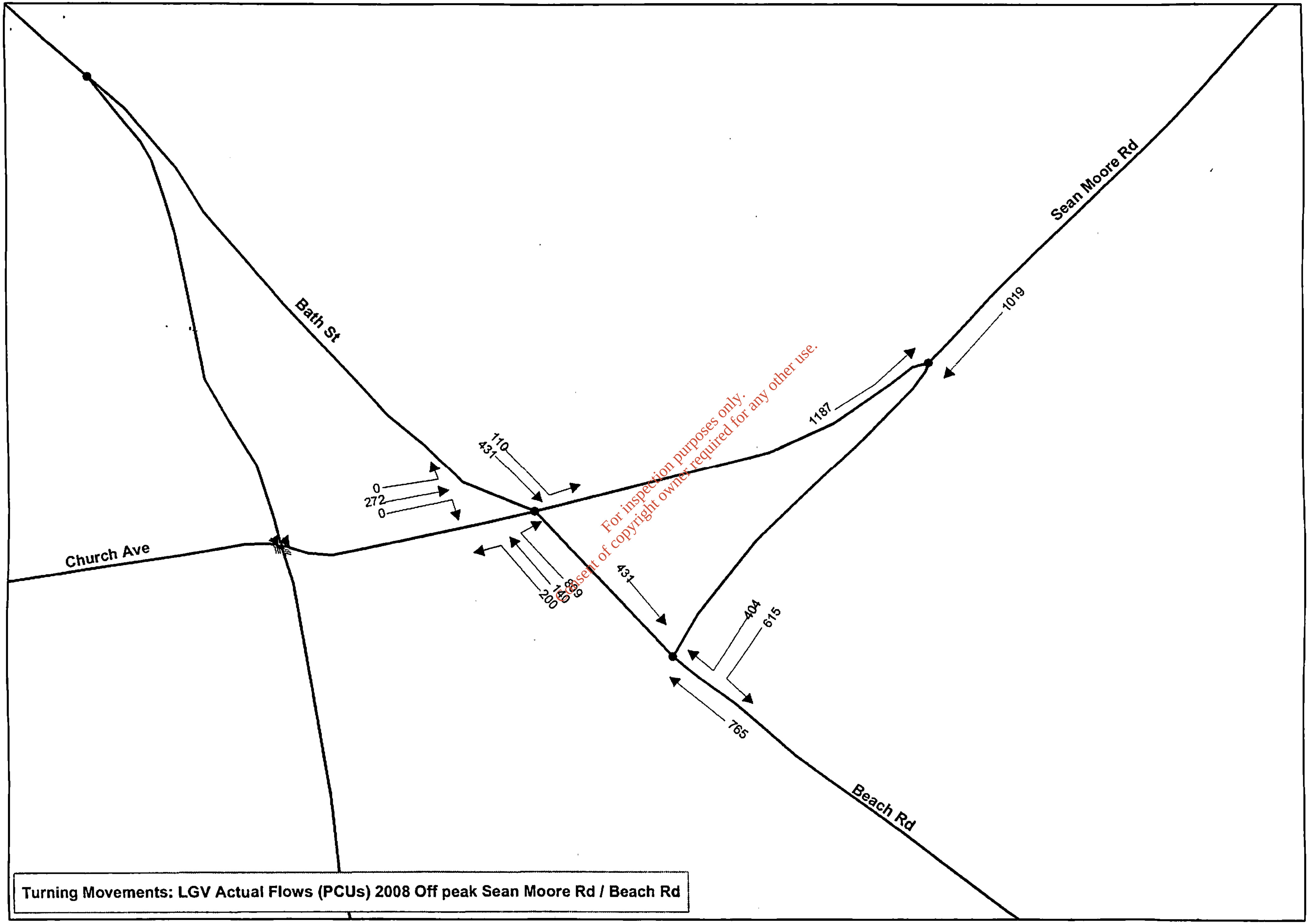

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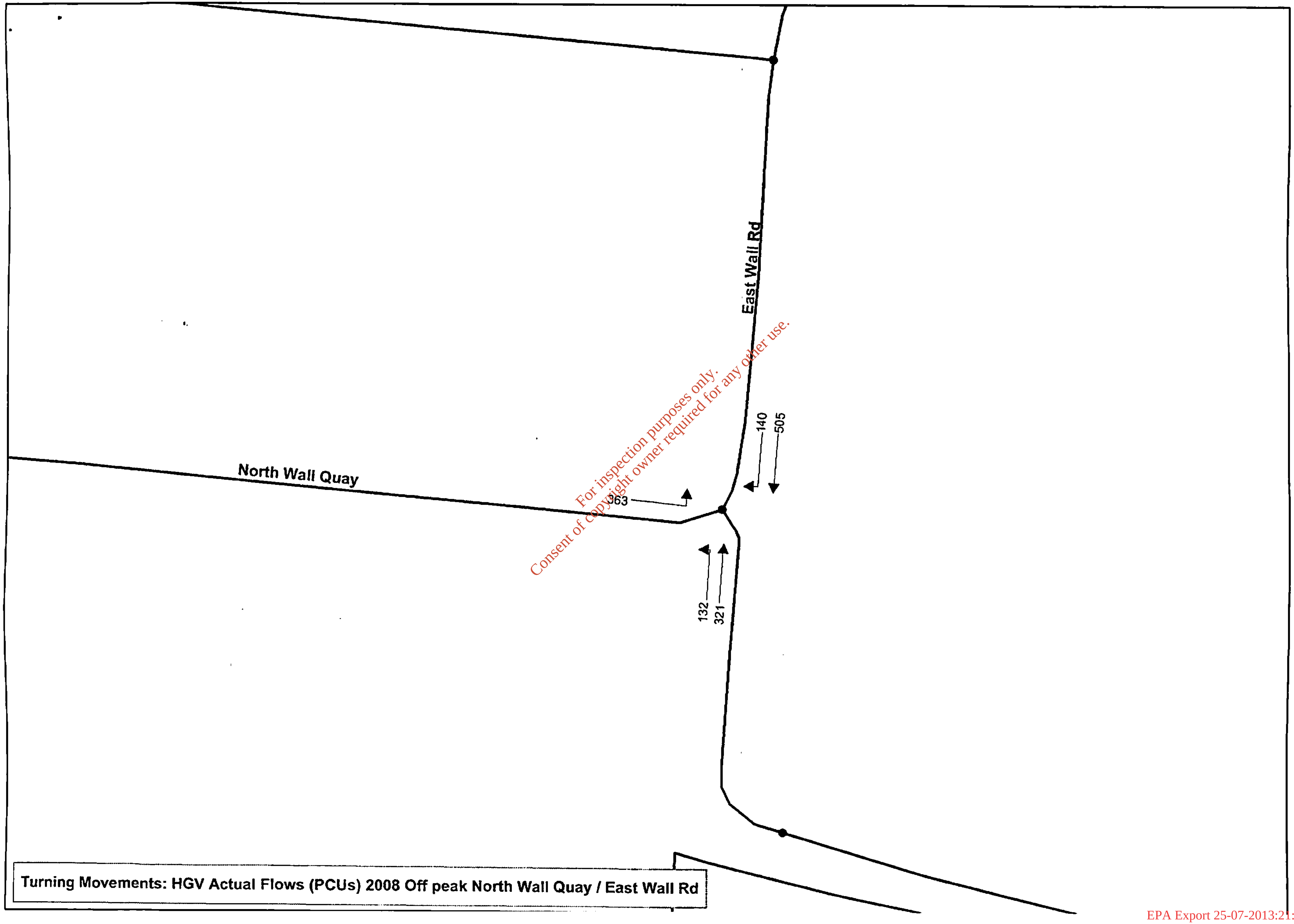

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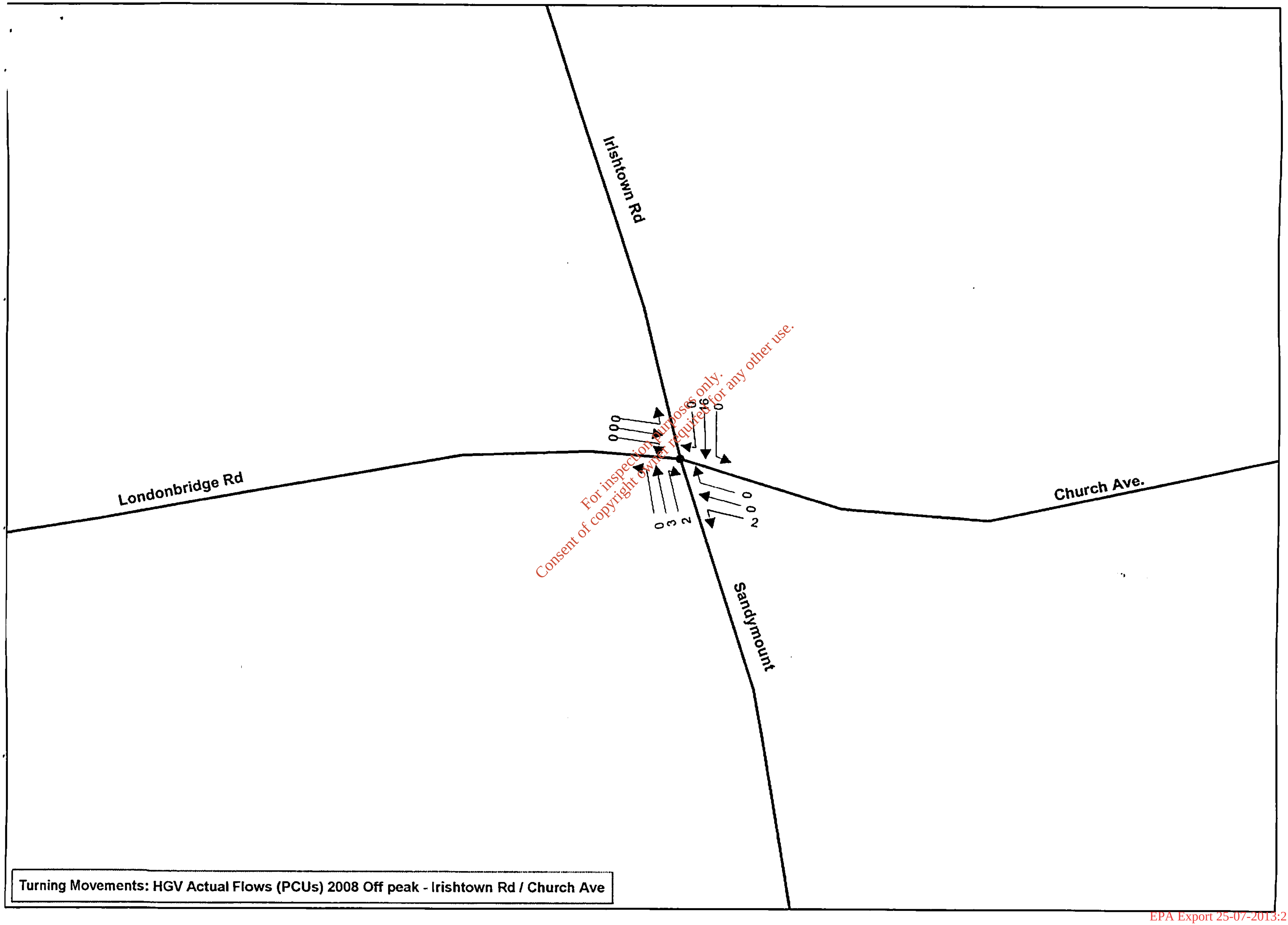
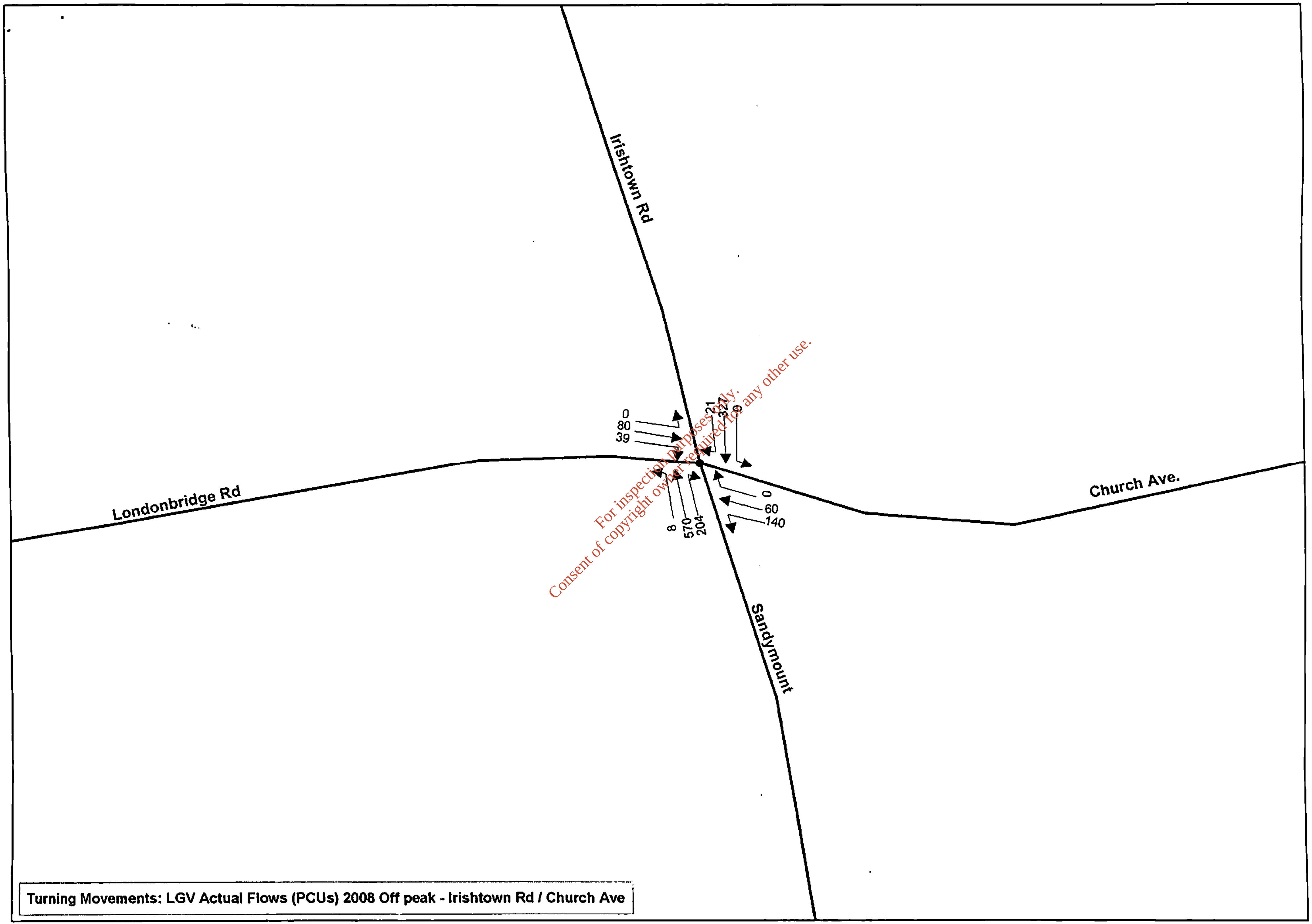
Turning Movements: LGV Actual Flows (PCUs) 2008 Off peak North Wall Quay / East Wall Rd

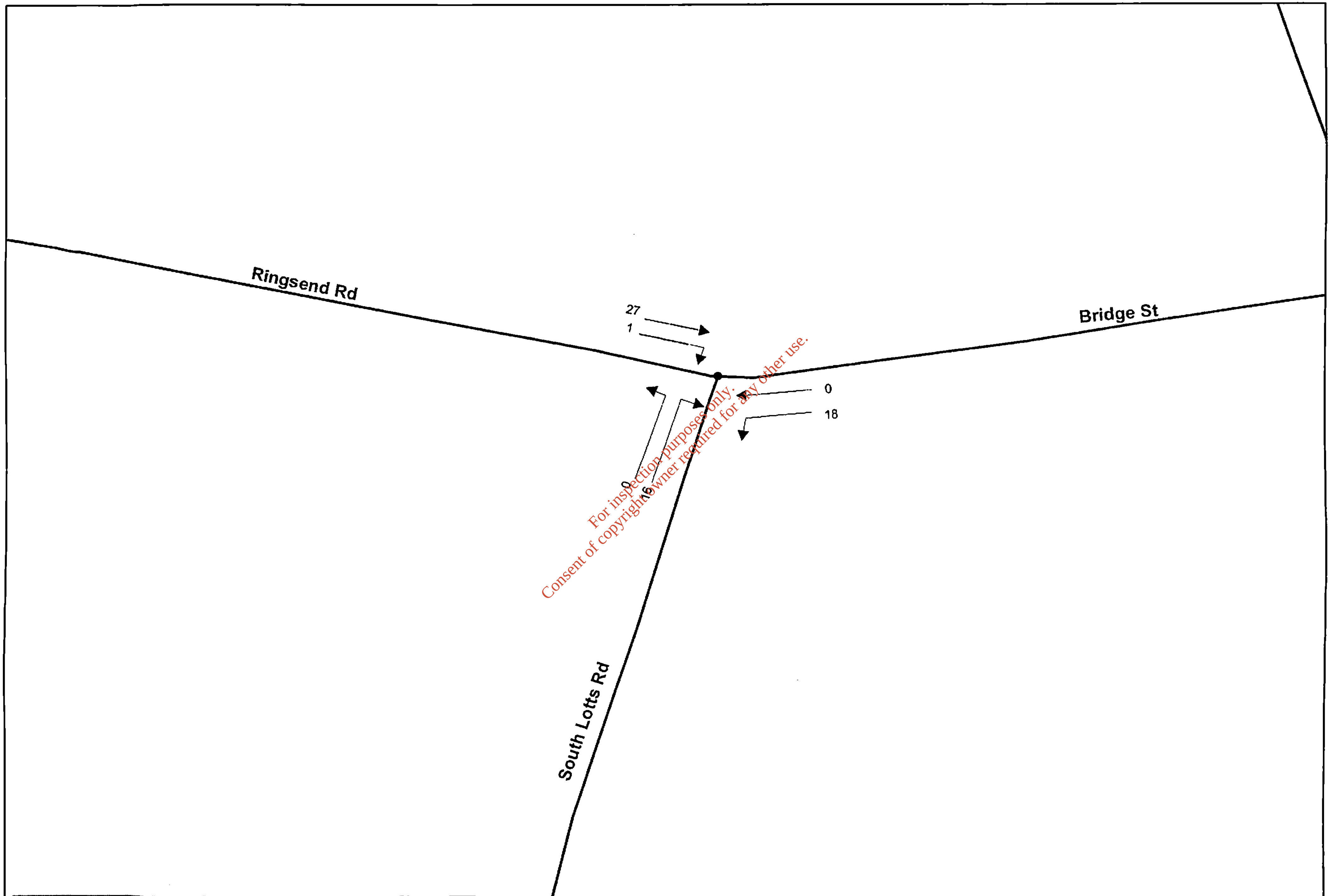


Turning Movements: HGV Actual Flows (PCUs) 2008 Off peak - Irishtown Rd / Church Ave

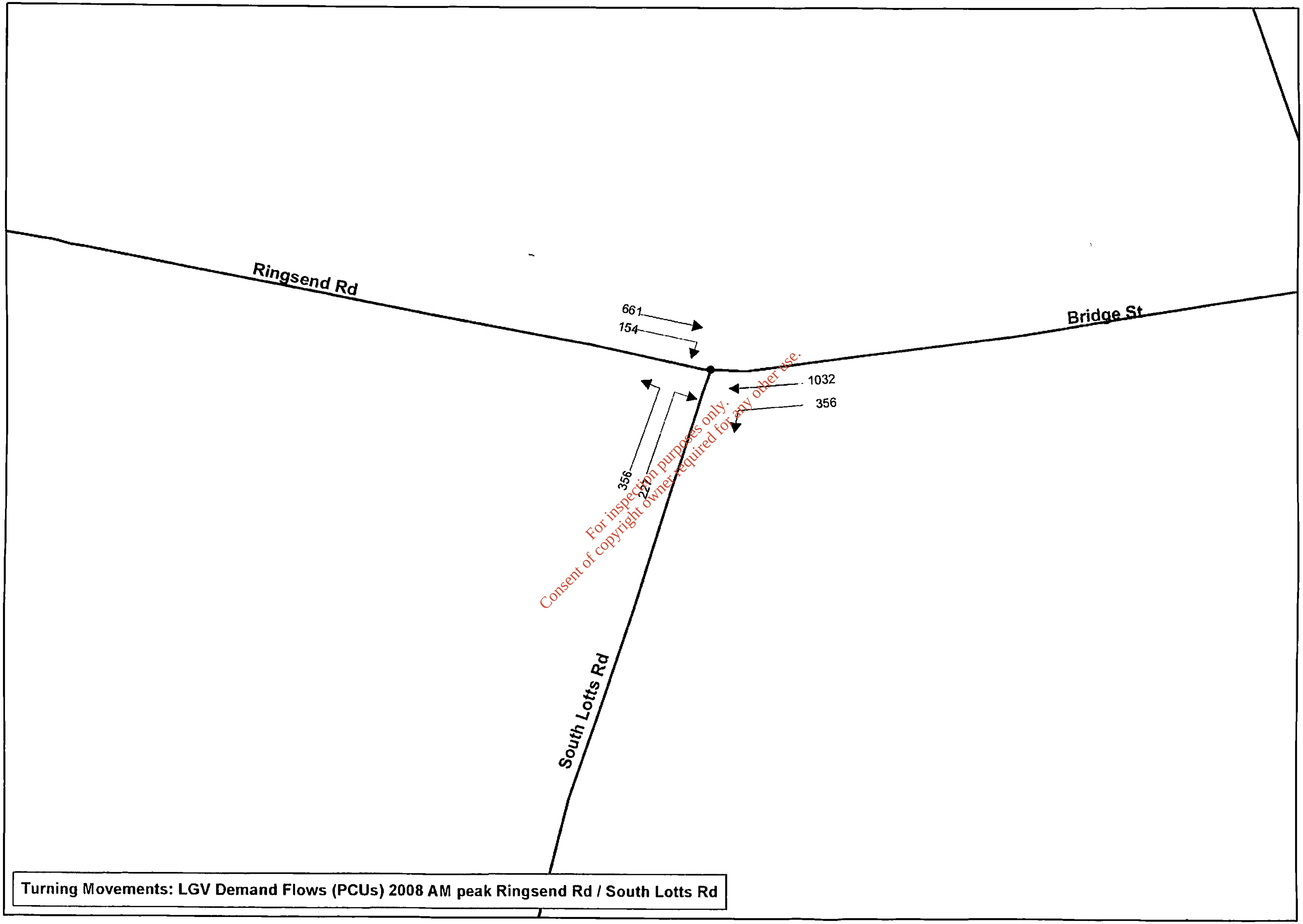


Turning Movements: LGV Actual Flows (PCUs) 2008 Off peak - Irishtown Rd / Church Ave

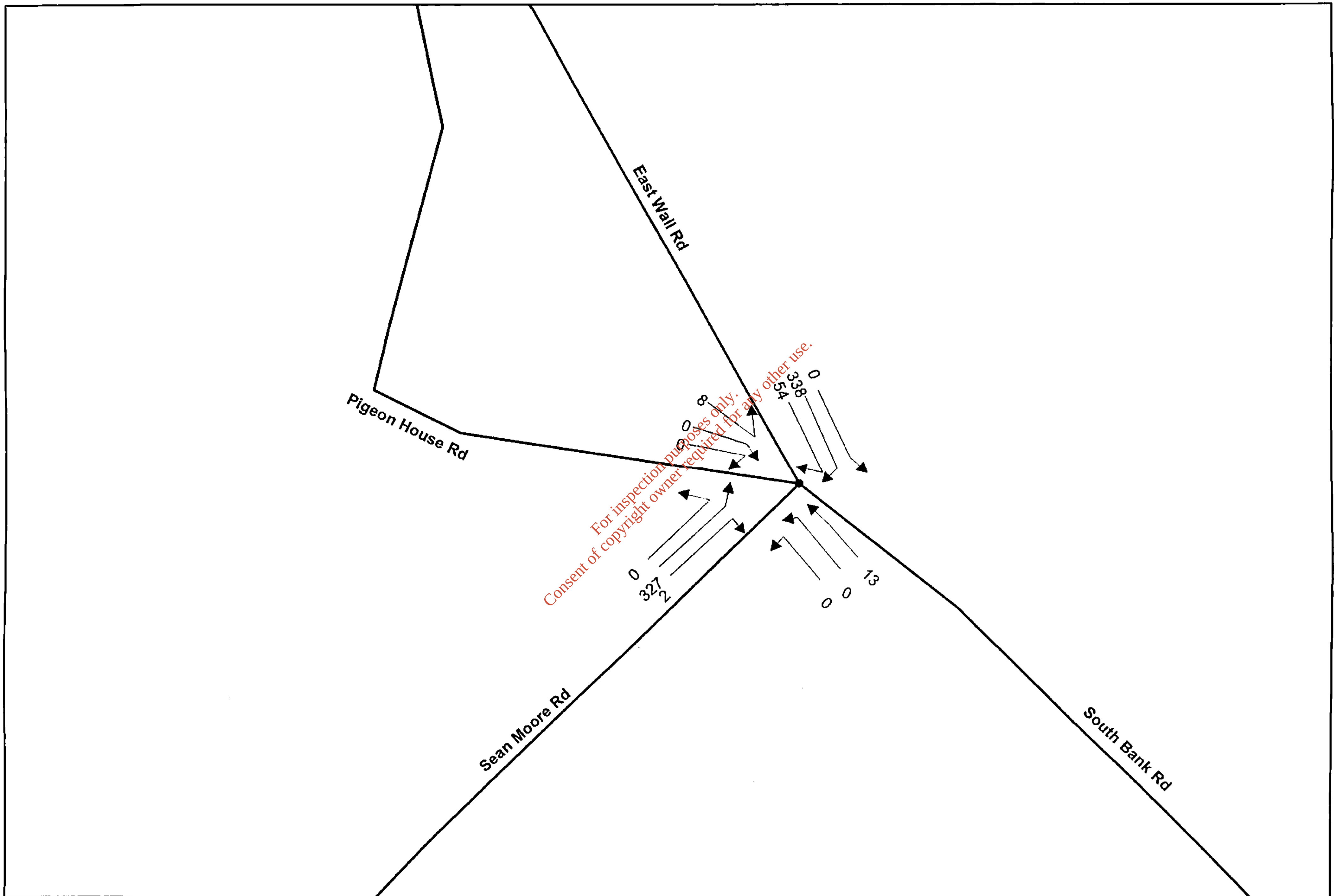
2008 DEMAND FLOWS (HGV & LGV)
AM PEAK, PM PEAK, OFF-PEAK



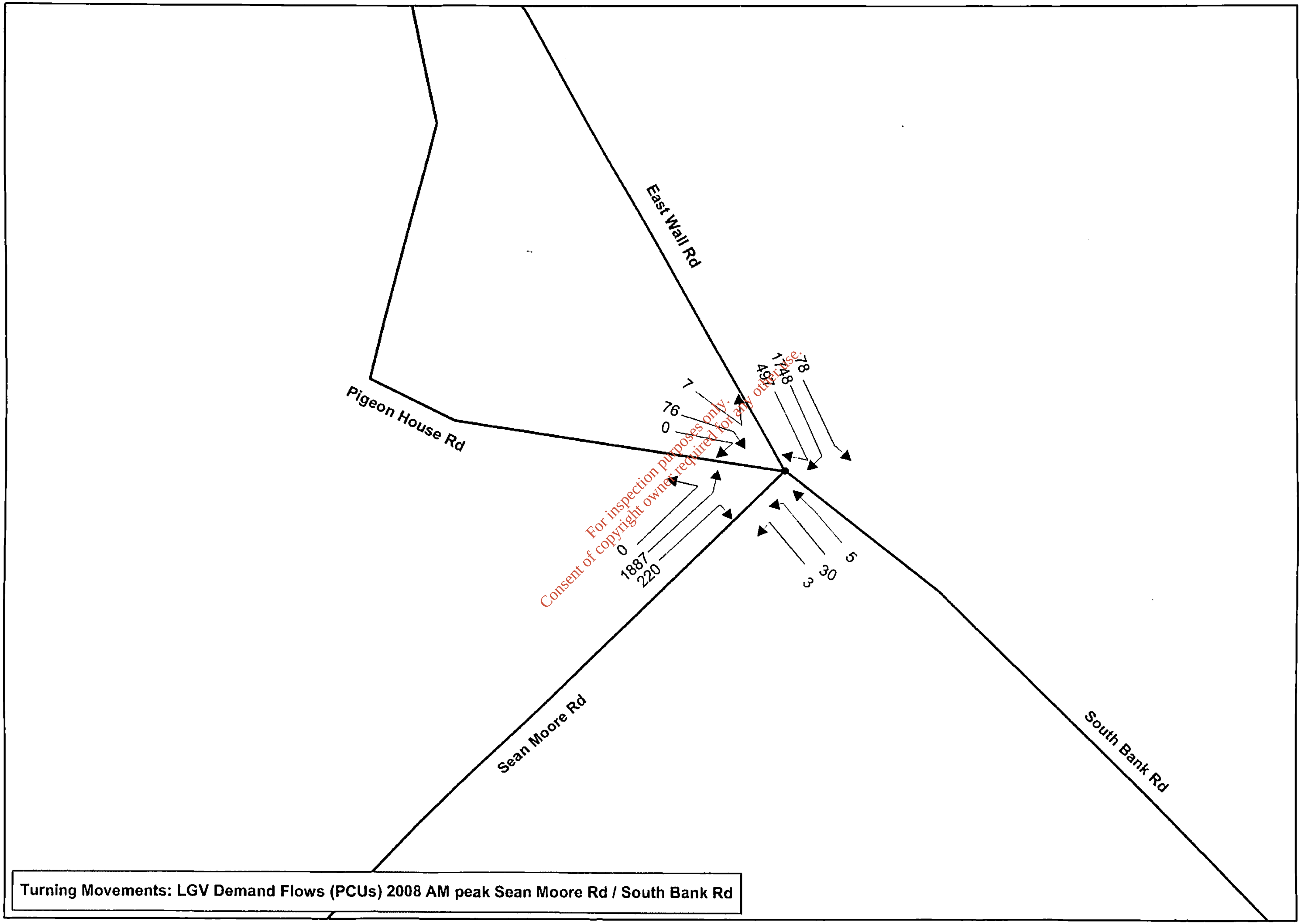
Turning Movements: HGV Demand Flows (PCUs) 2008 AM peak Ringsend Rd / South Lotts Rd



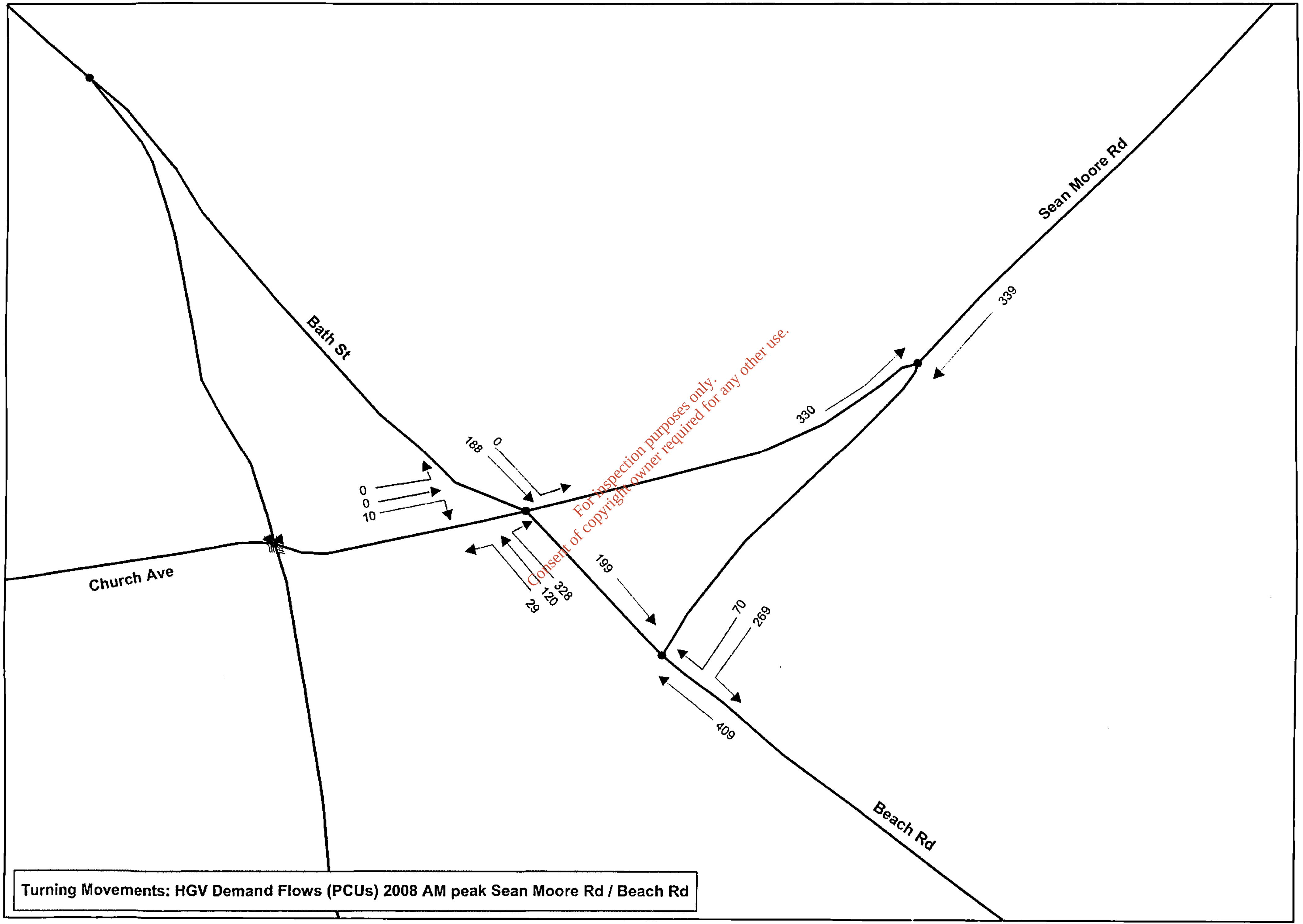
Turning Movements: LGV Demand Flows (PCUs) 2008 AM peak Ringsend Rd / South Lotts Rd



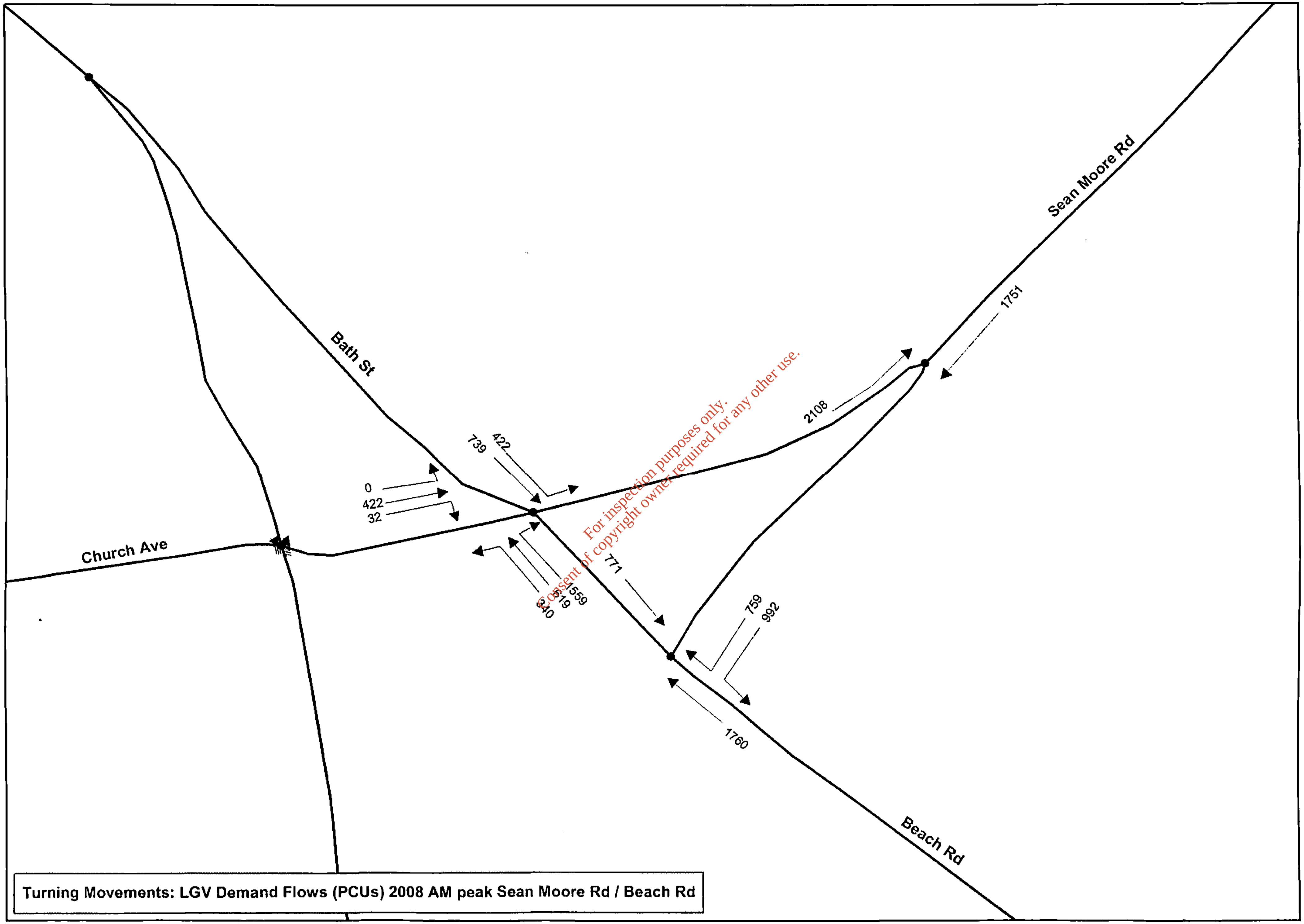
Turning Movements: HGV Demand Flows (PCUs) 2008 AM peak Sean Moore Rd / South Bank Rd



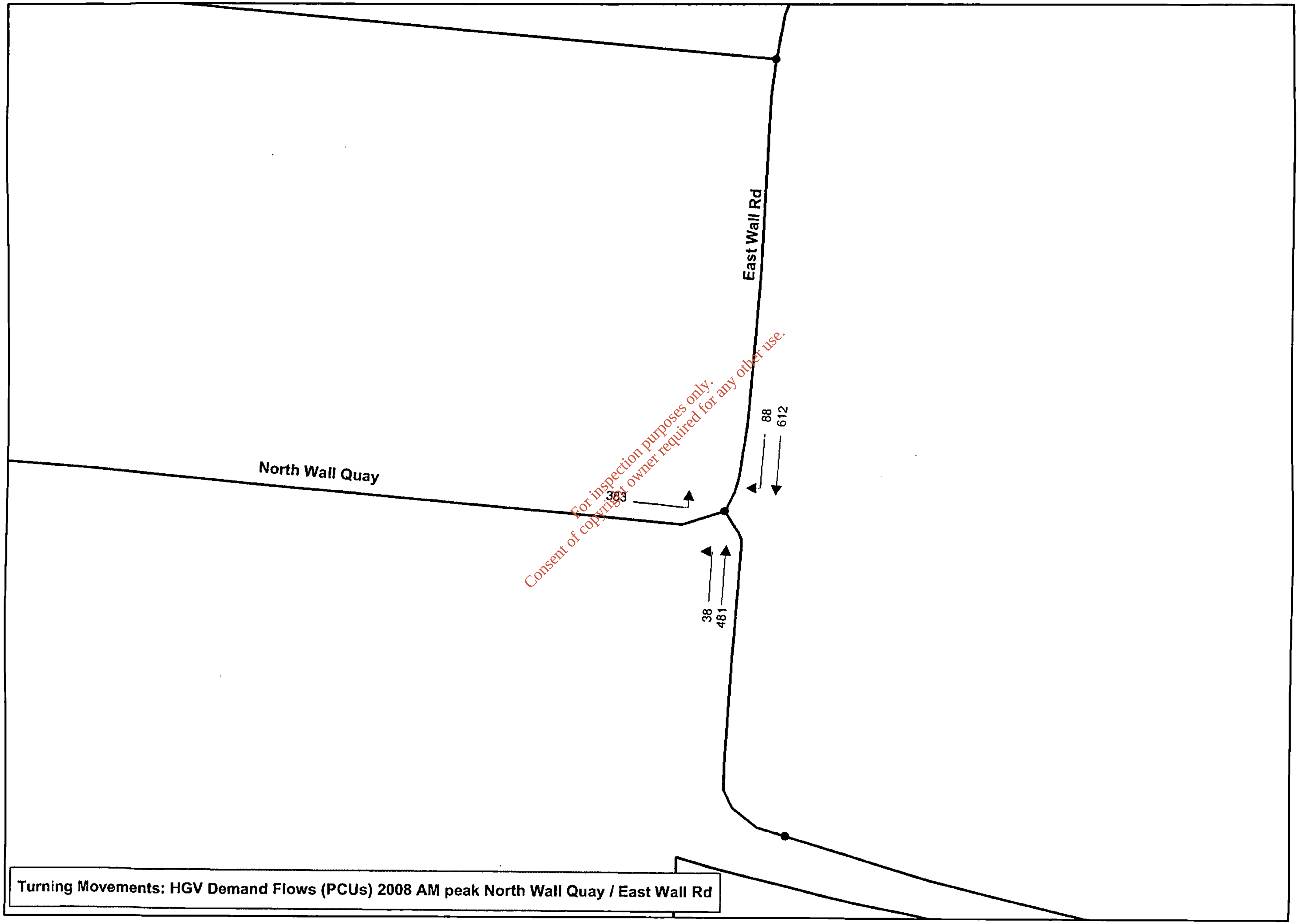
Turning Movements: LGV Demand Flows (PCUs) 2008 AM peak Sean Moore Rd / South Bank Rd



Turning Movements: HGV Demand Flows (PCUs) 2008 AM peak Sean Moore Rd / Beach Rd



Turning Movements: LGV Demand Flows (PCUs) 2008 AM peak Sean Moore Rd / Beach Rd



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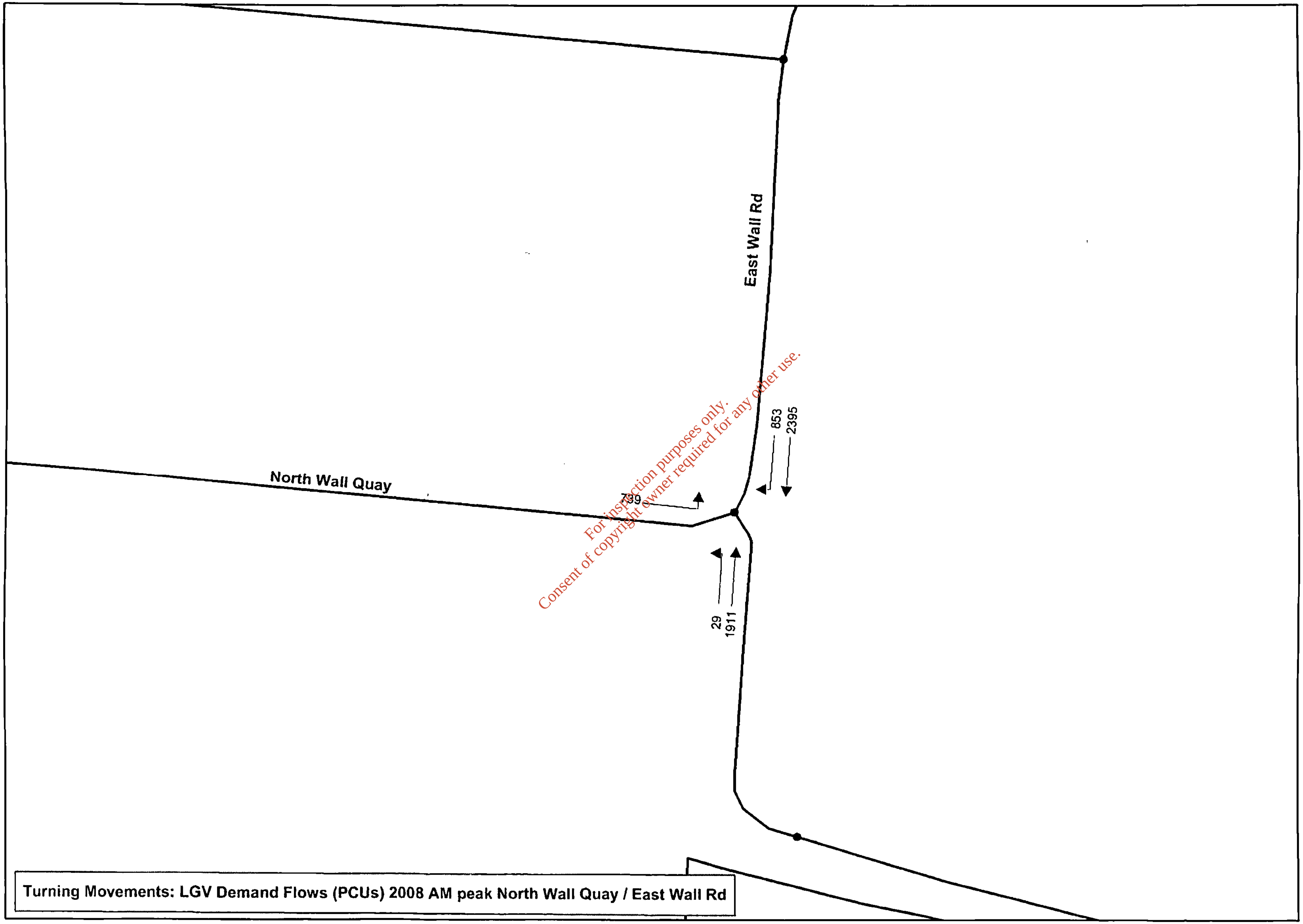

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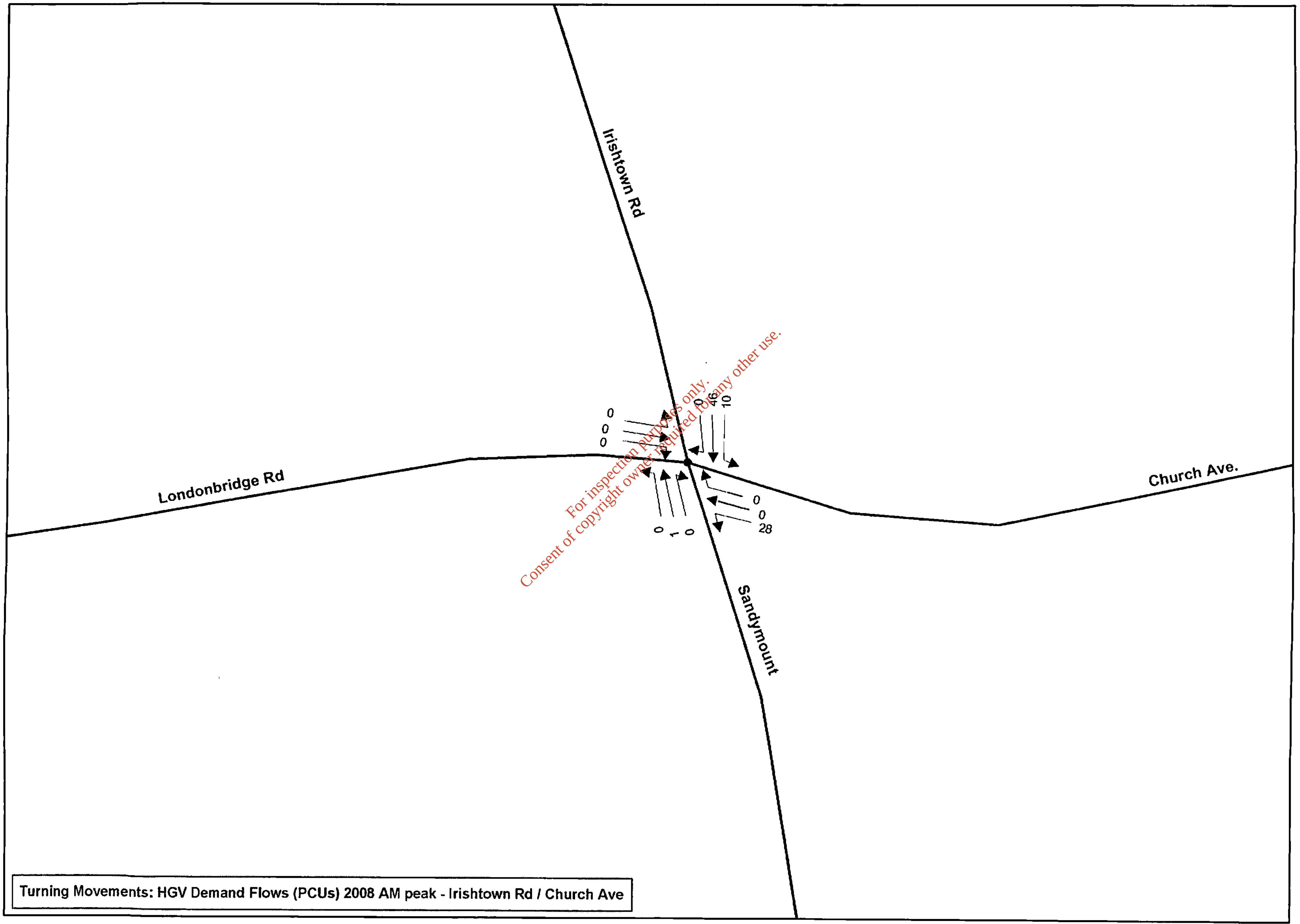
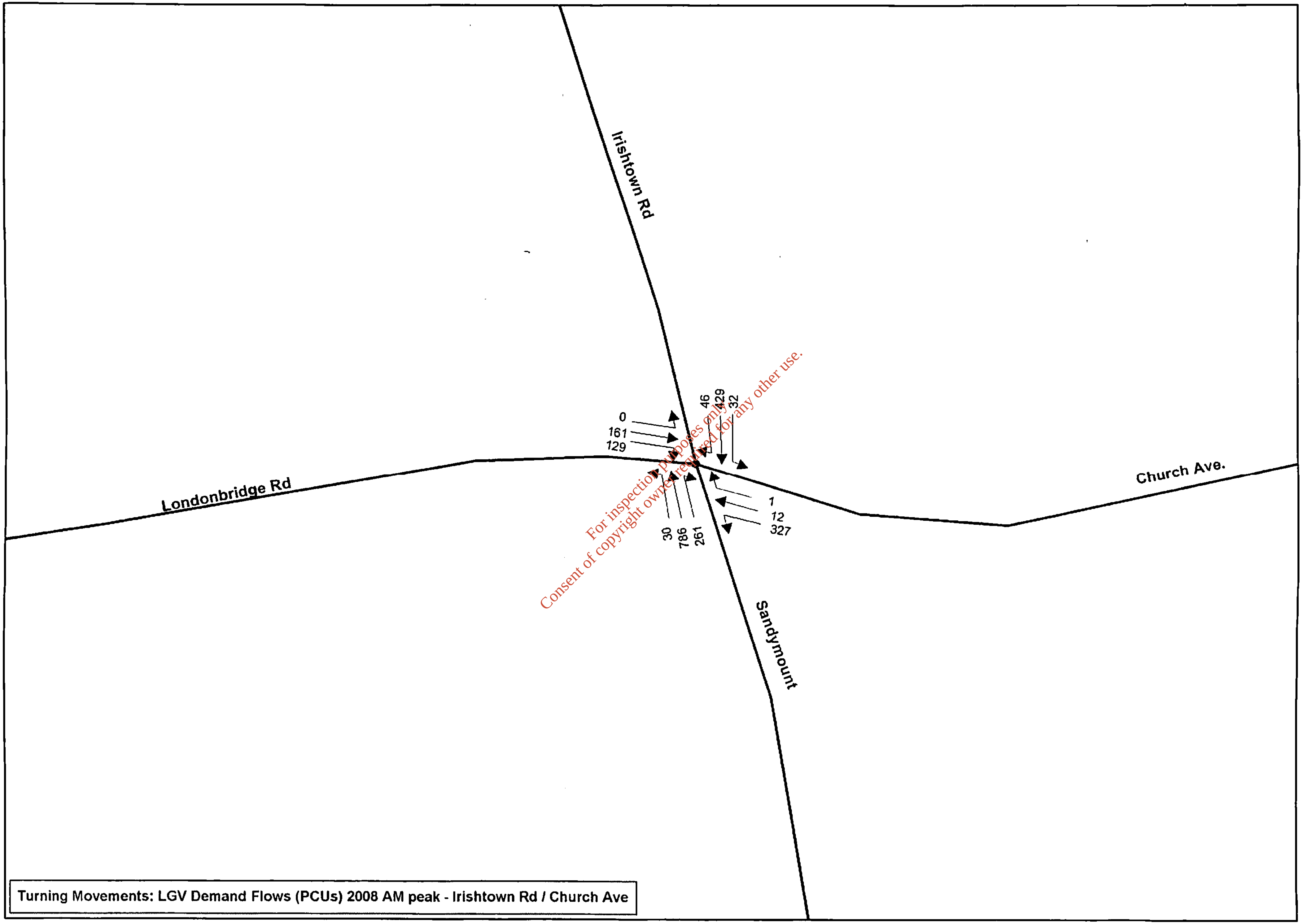


Turning Movements: HGV Demand Flows (PCUs) 2008 AM peak - Irishtown Rd / Church Ave



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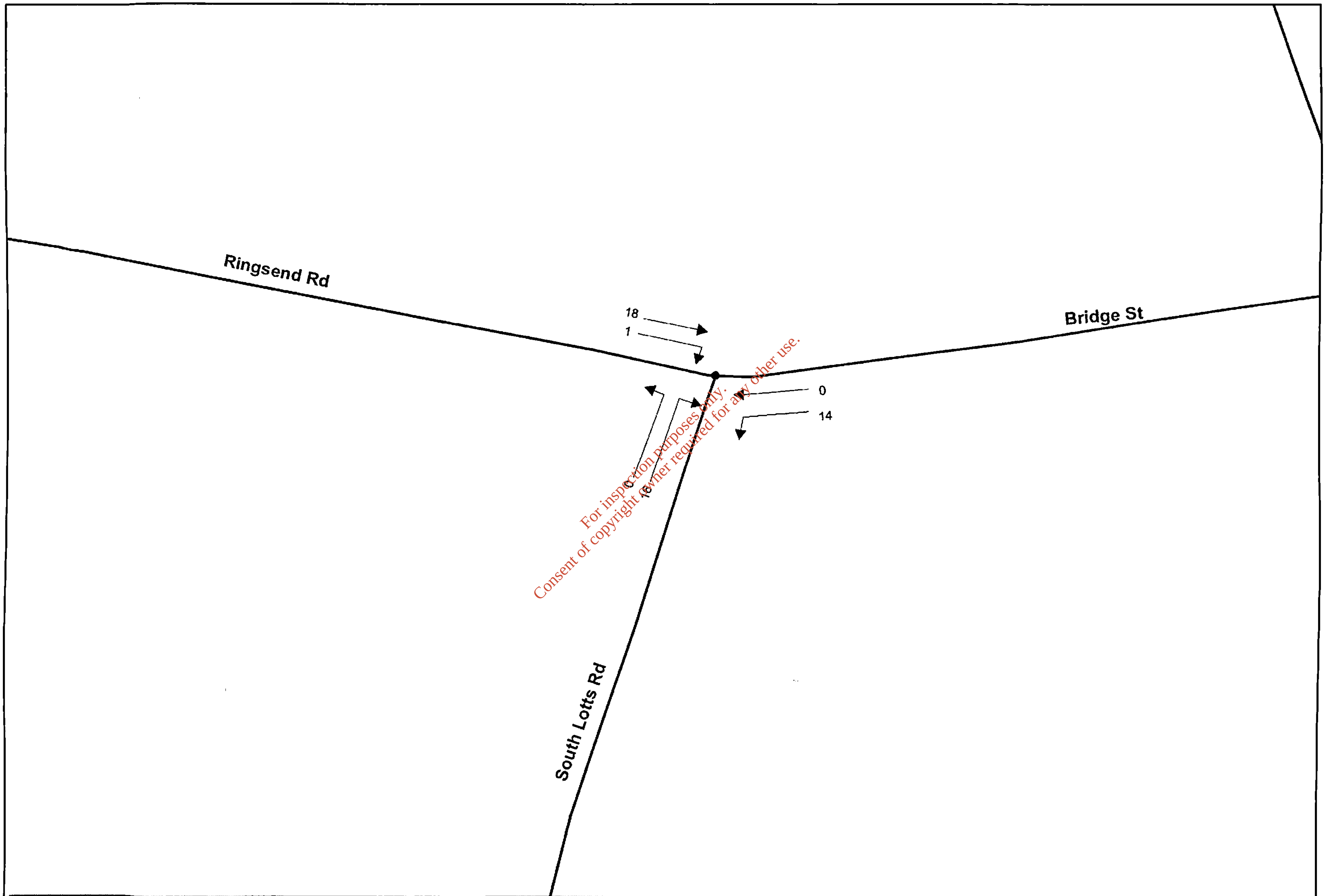
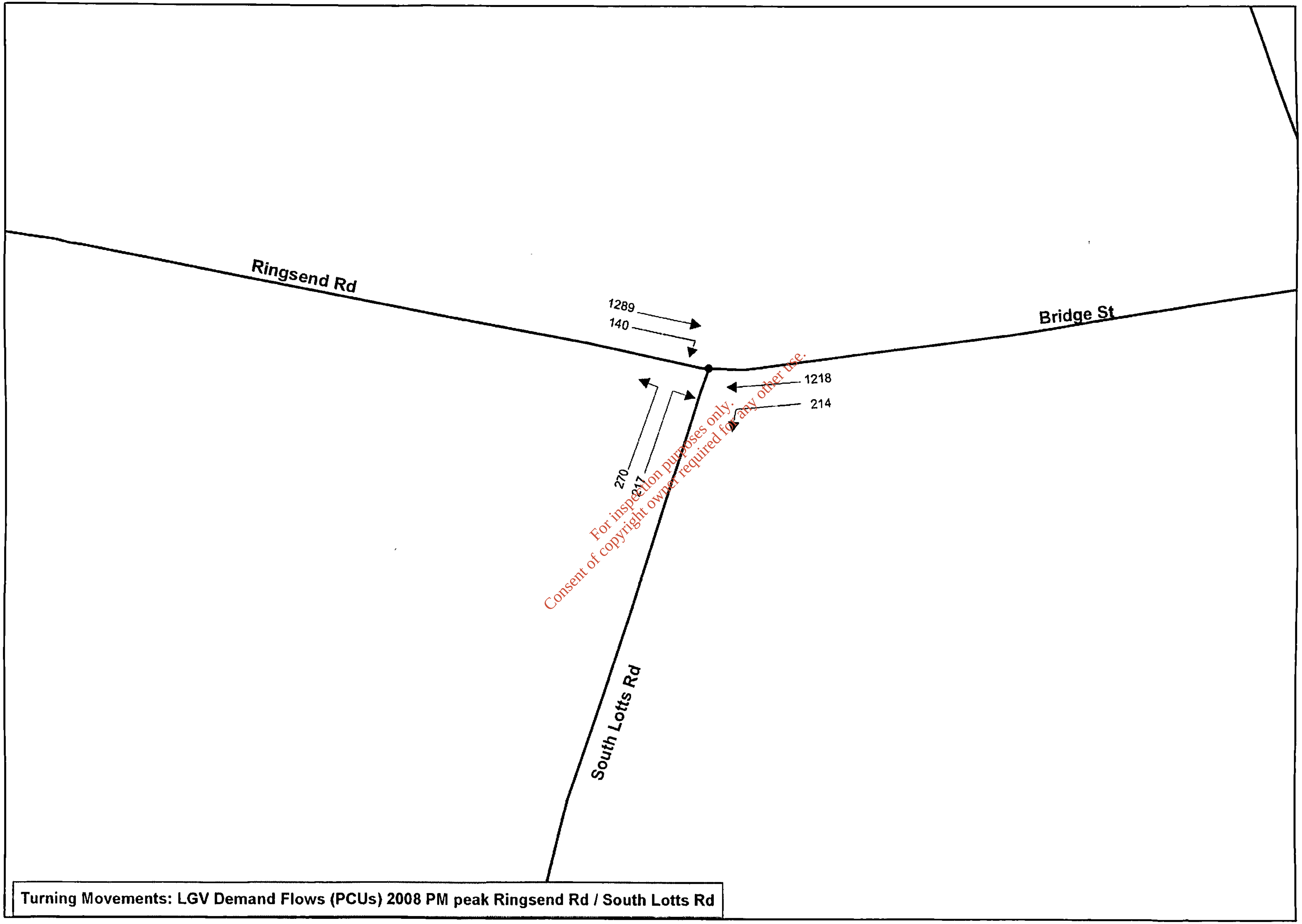


Turning Movements: HGV Demand Flows (PCUs) 2008 PM peak Ringsend Rd / South Lotts Rd



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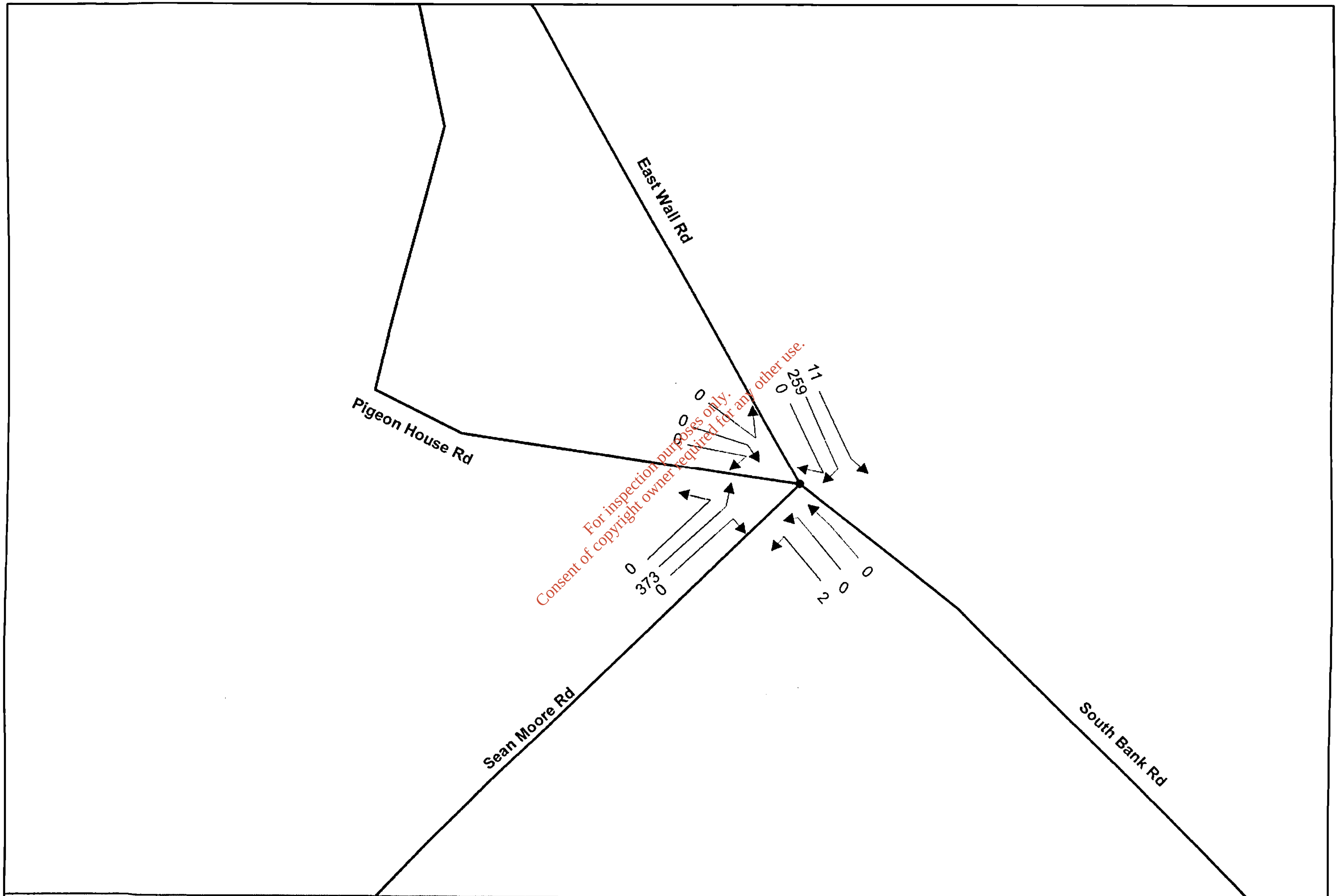
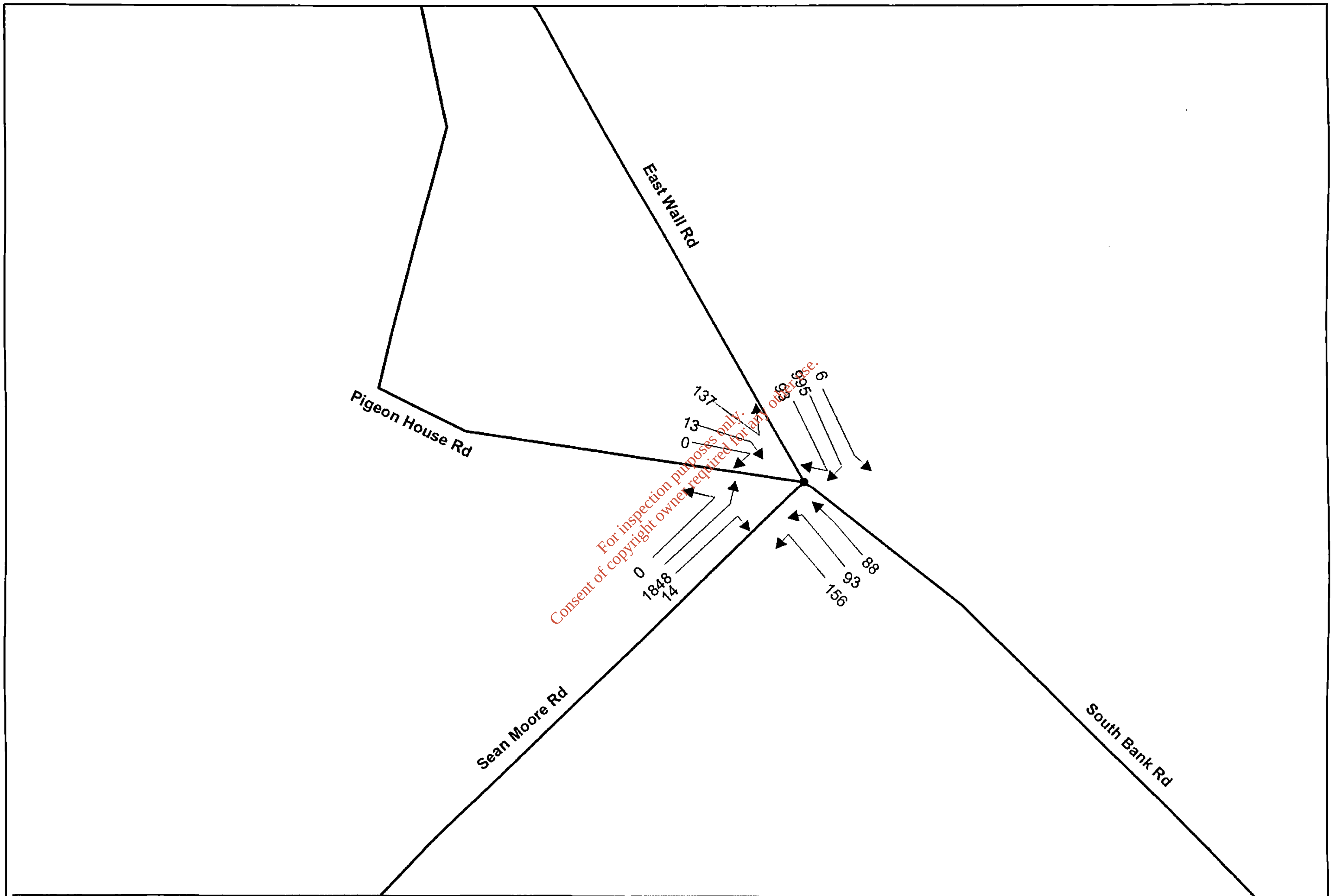
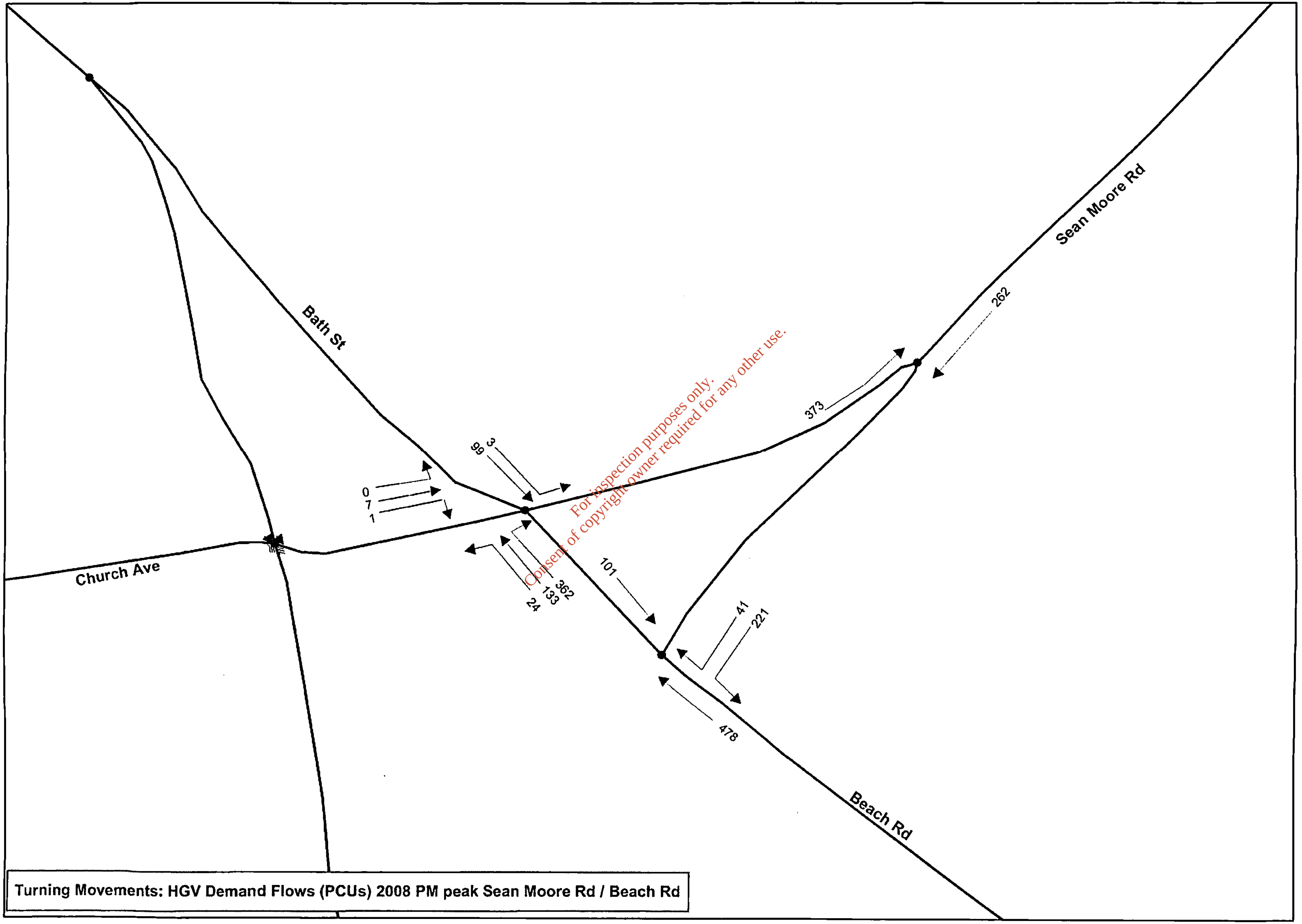


Turning Movements: HGV Demand Flows (PCUs) 2008 PM peak Sean Moore Rd / South Bank Rd



Turning Movements: LGV Demand Flows (PCUs) 2008 PM peak Sean Moore Rd / South Bank Rd



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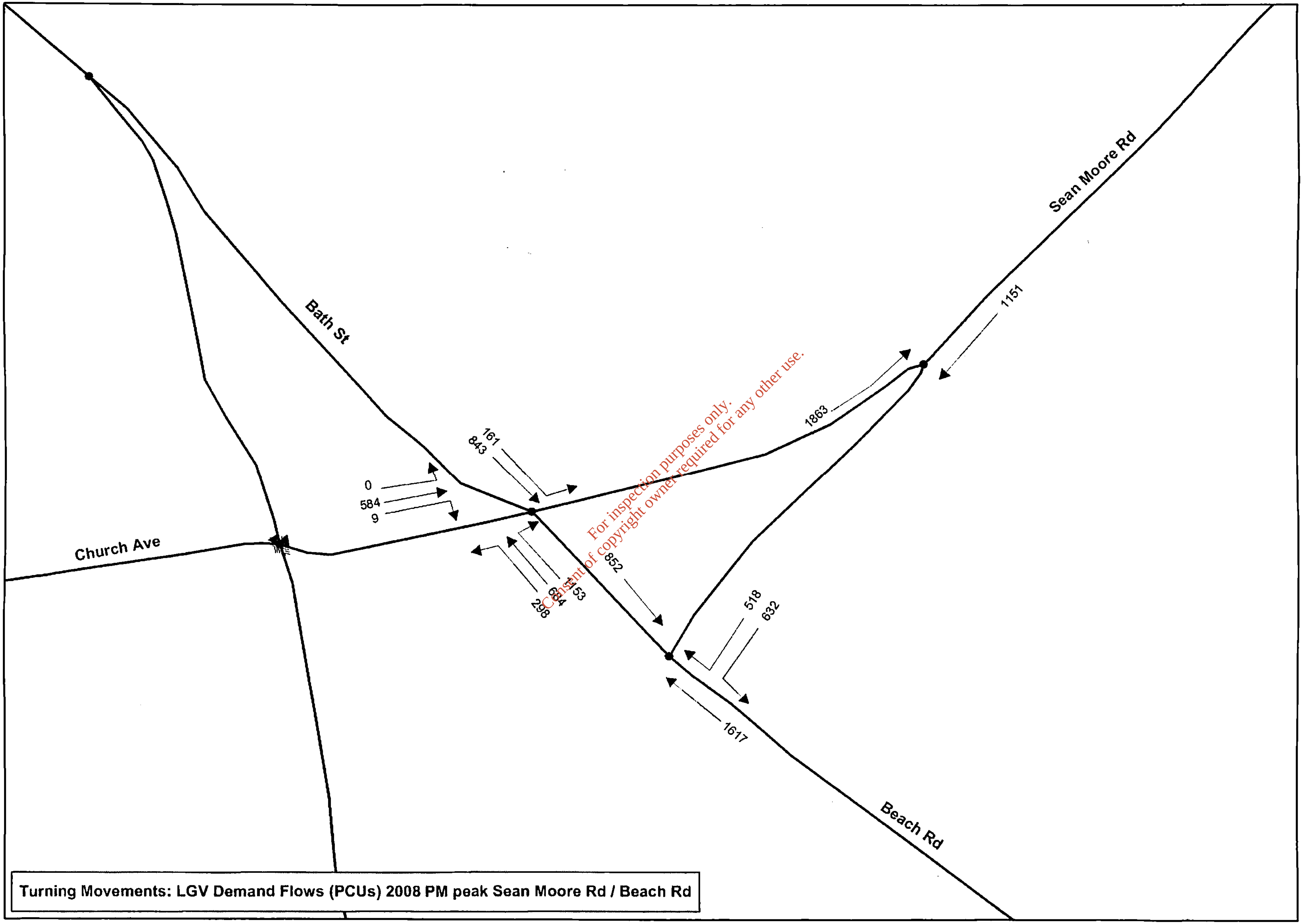
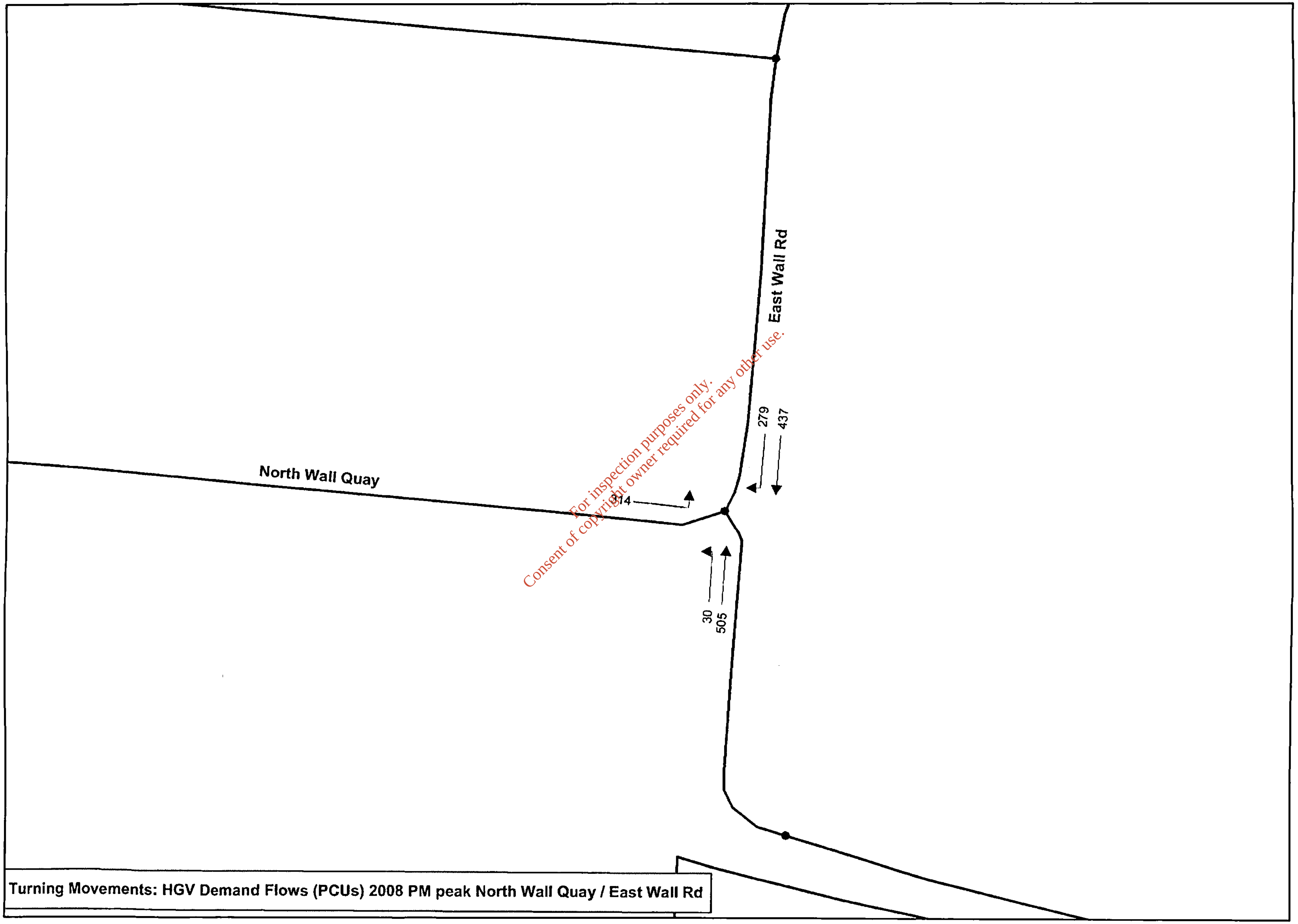
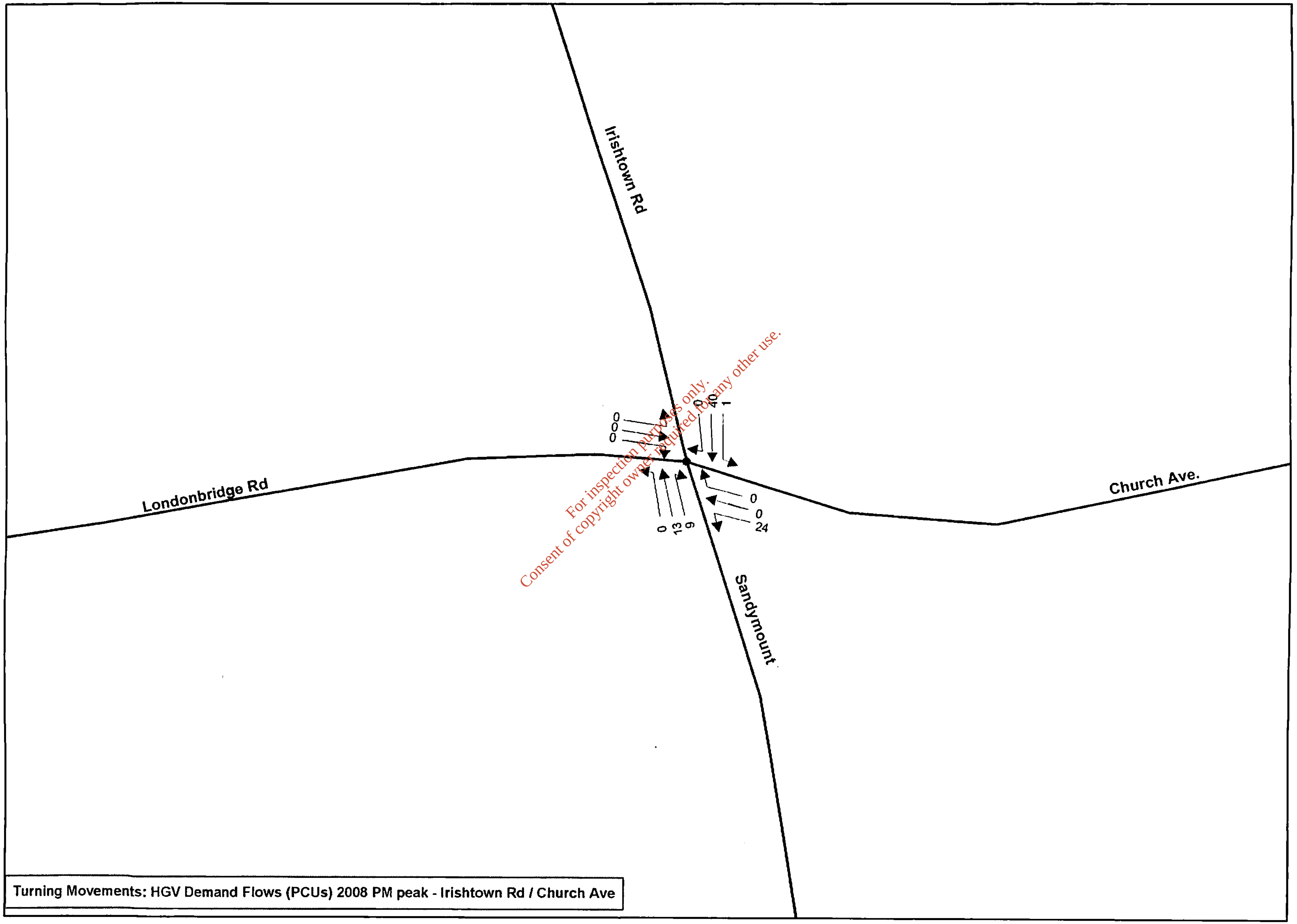


Turning Movements: LGV Demand Flows (PCUs) 2008 PM peak Sean Moore Rd / Beach Rd

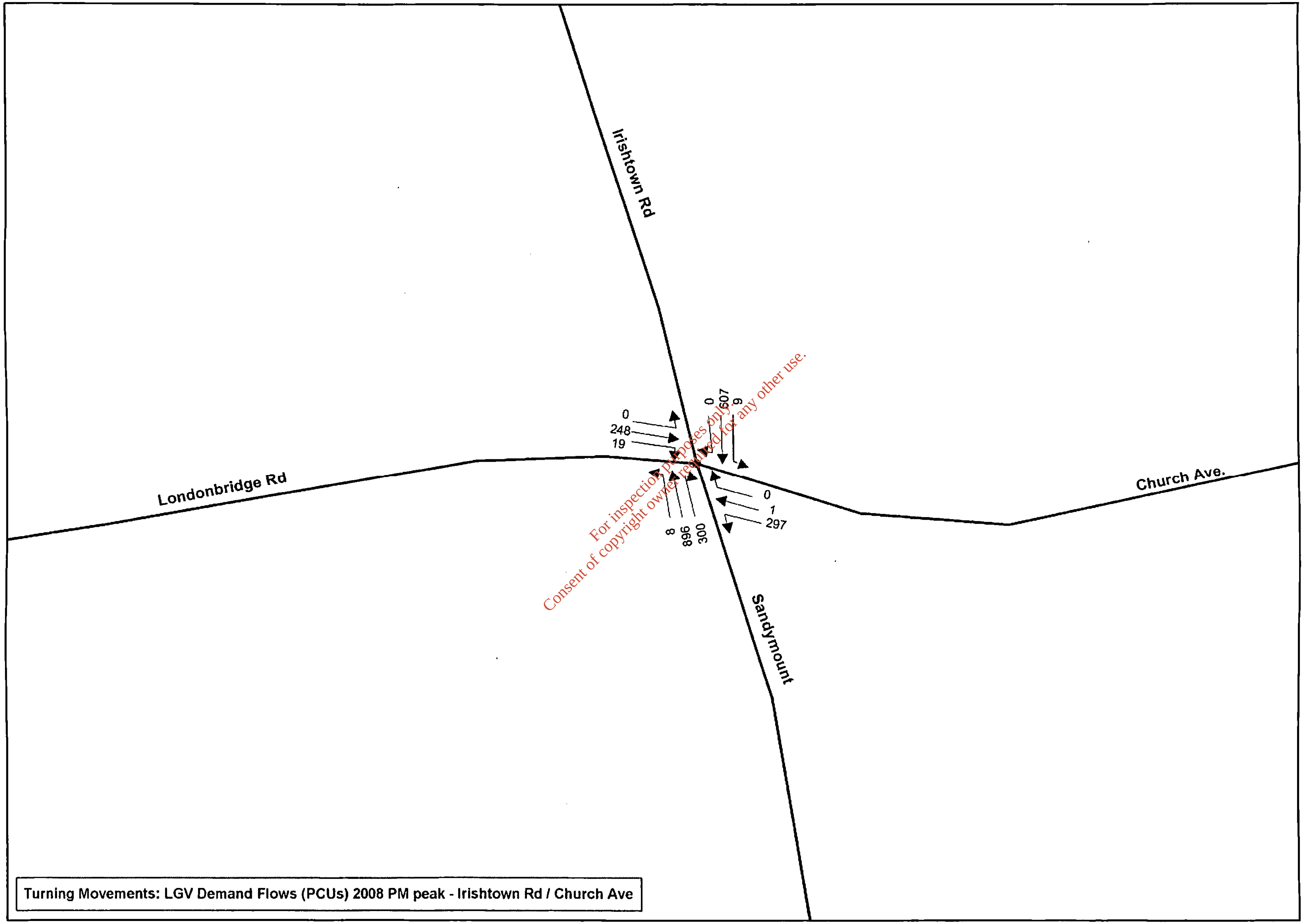


Turning Movements: HGV Demand Flows (PCUs) 2008 PM peak North Wall Quay / East Wall Rd

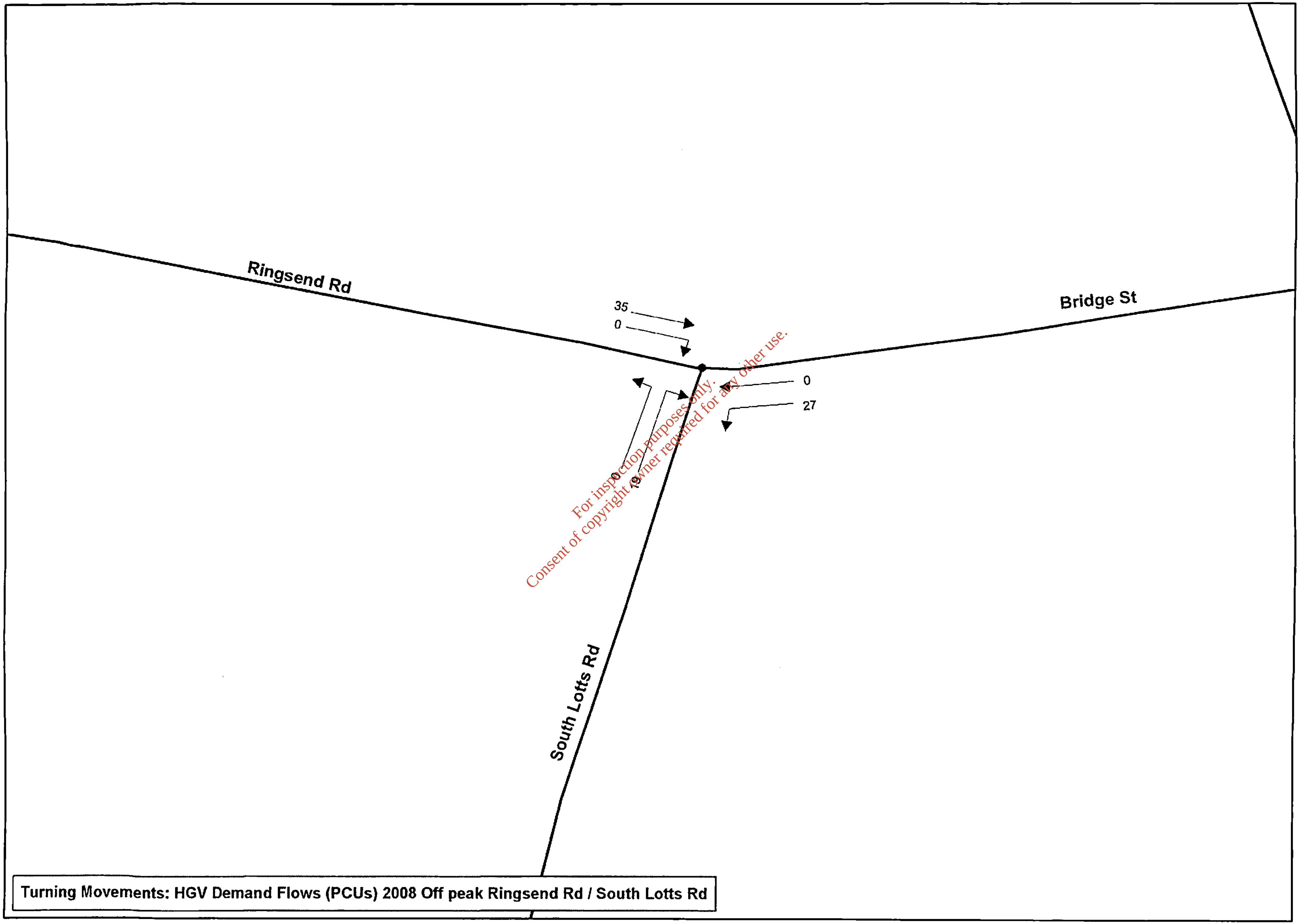
Turning Movements: LGV Demand Flows (PCUs) 2008 PM peak North Wall Quay / East Wall Rd



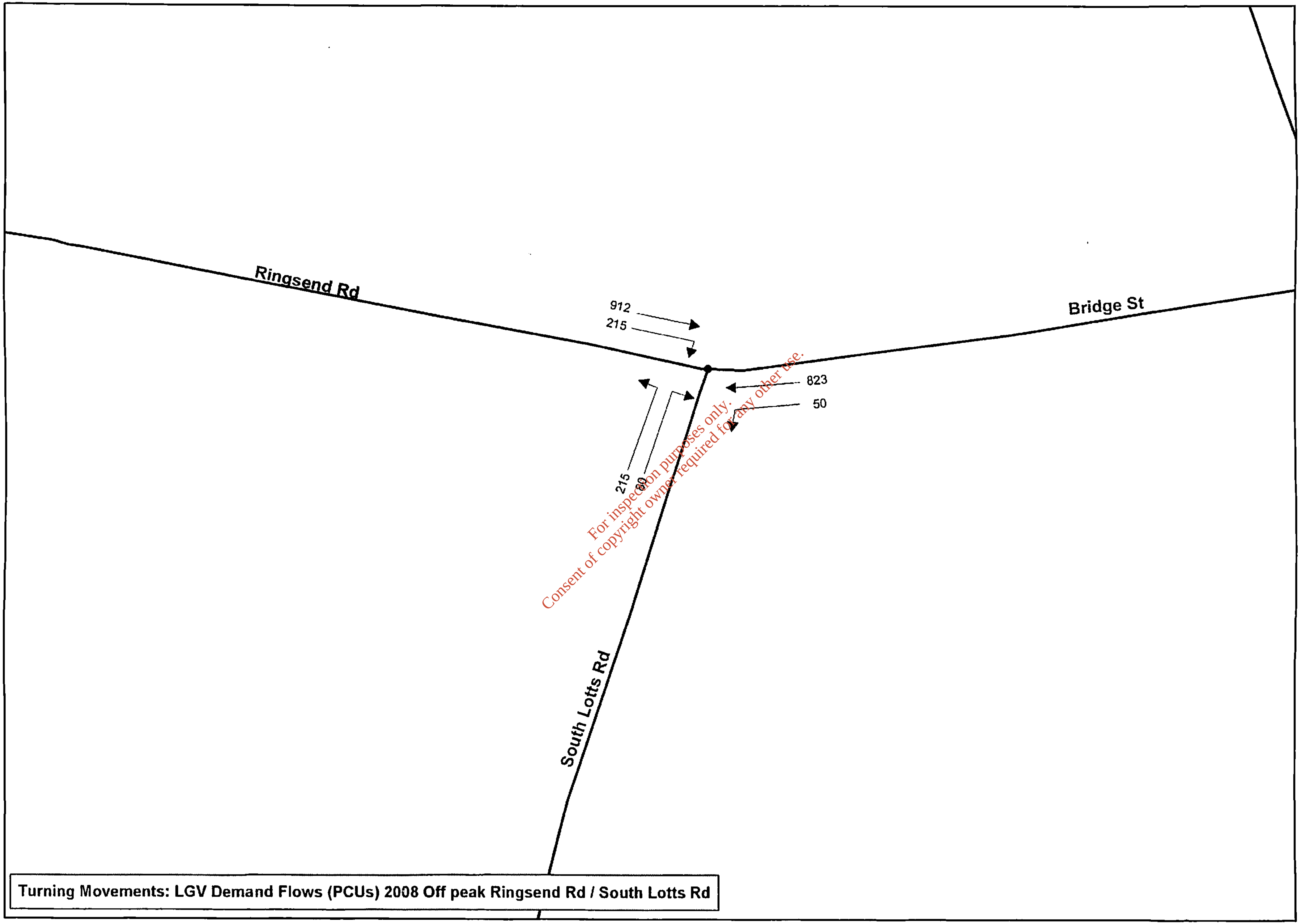
Turning Movements: HGV Demand Flows (PCUs) 2008 PM peak - Irishtown Rd / Church Ave



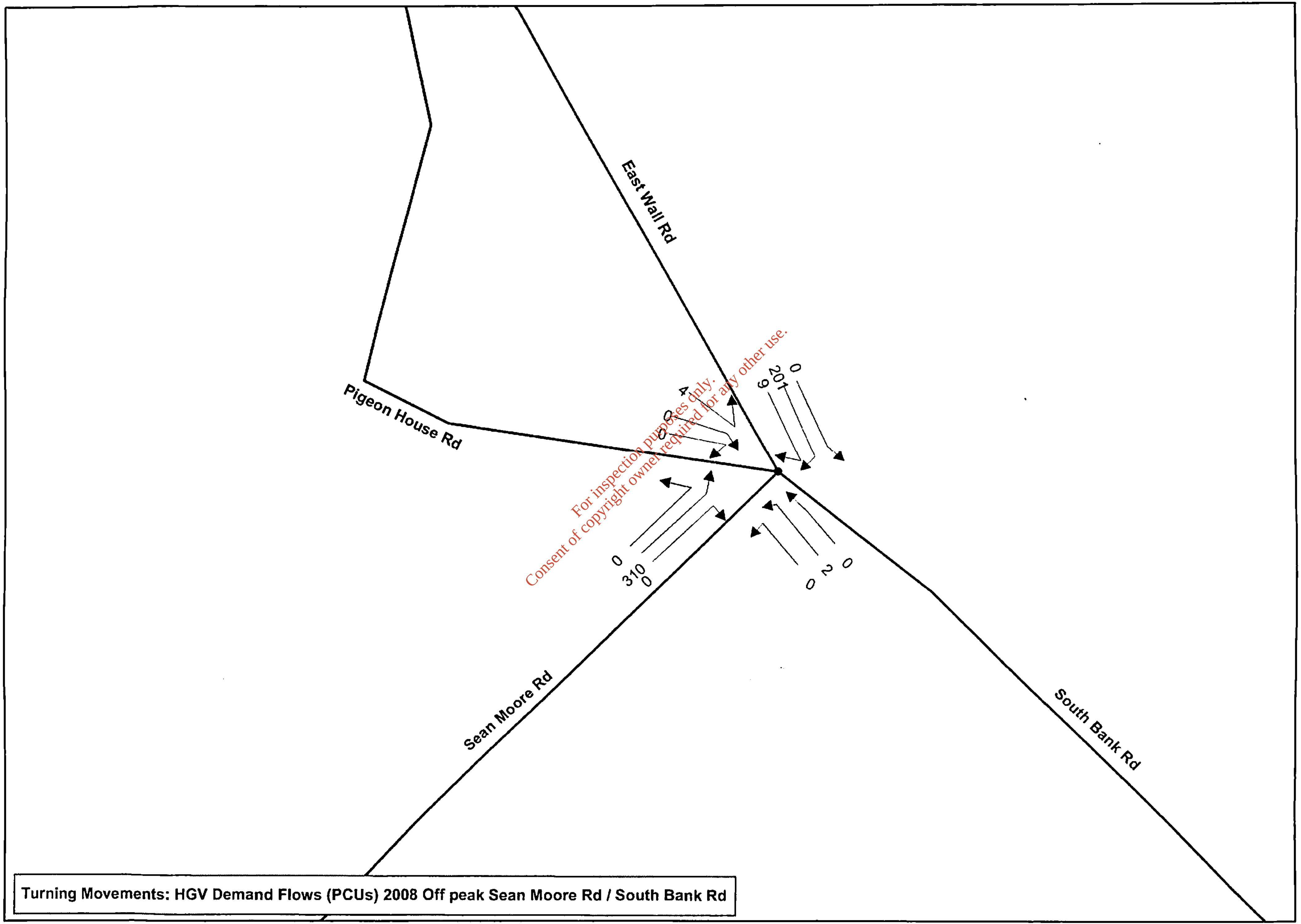
Turning Movements: LGV Demand Flows (PCUs) 2008 PM peak - Irishtown Rd / Church Ave



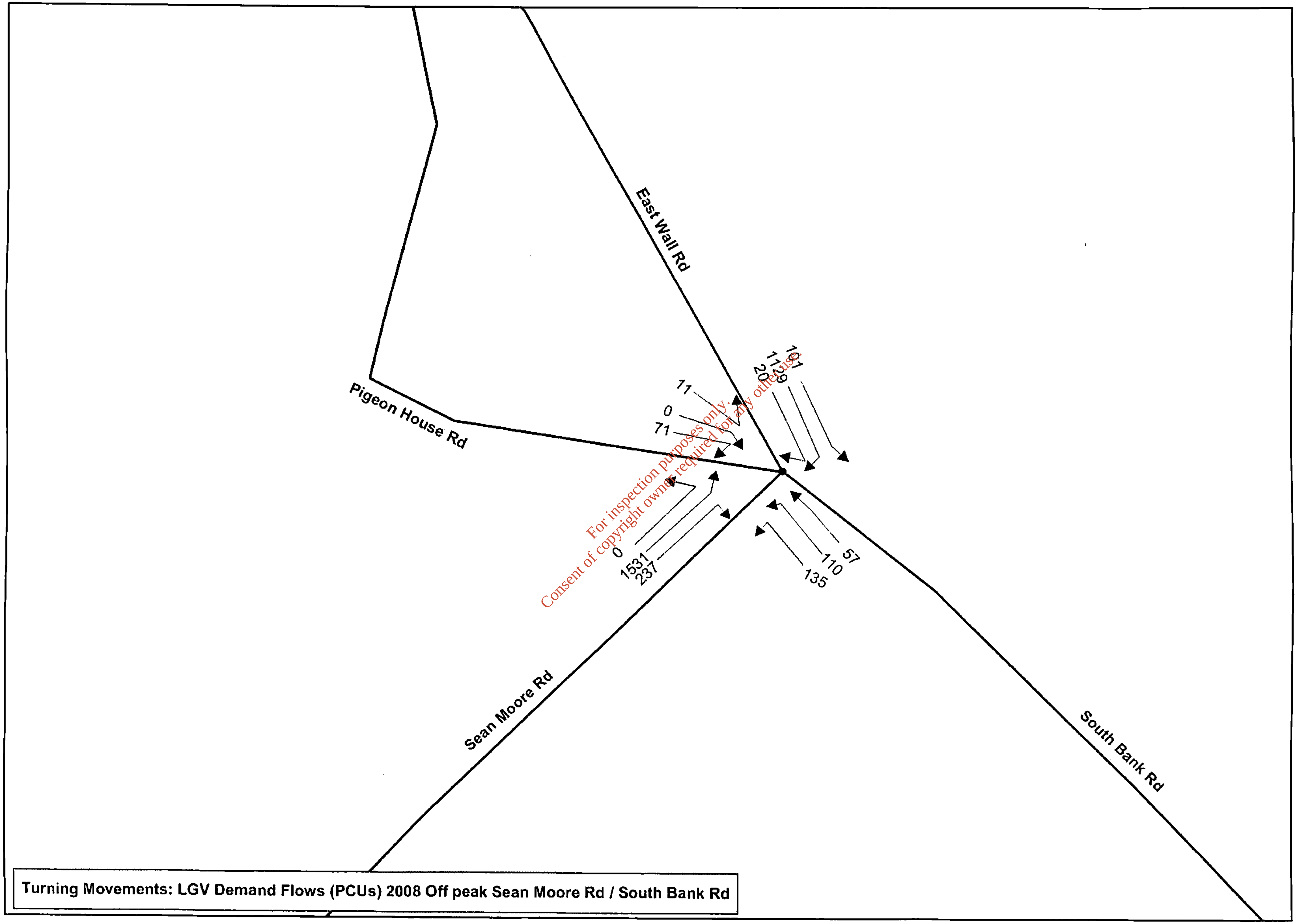
Turning Movements: HGV Demand Flows (PCUs) 2008 Off peak Ringsend Rd / South Lotts Rd



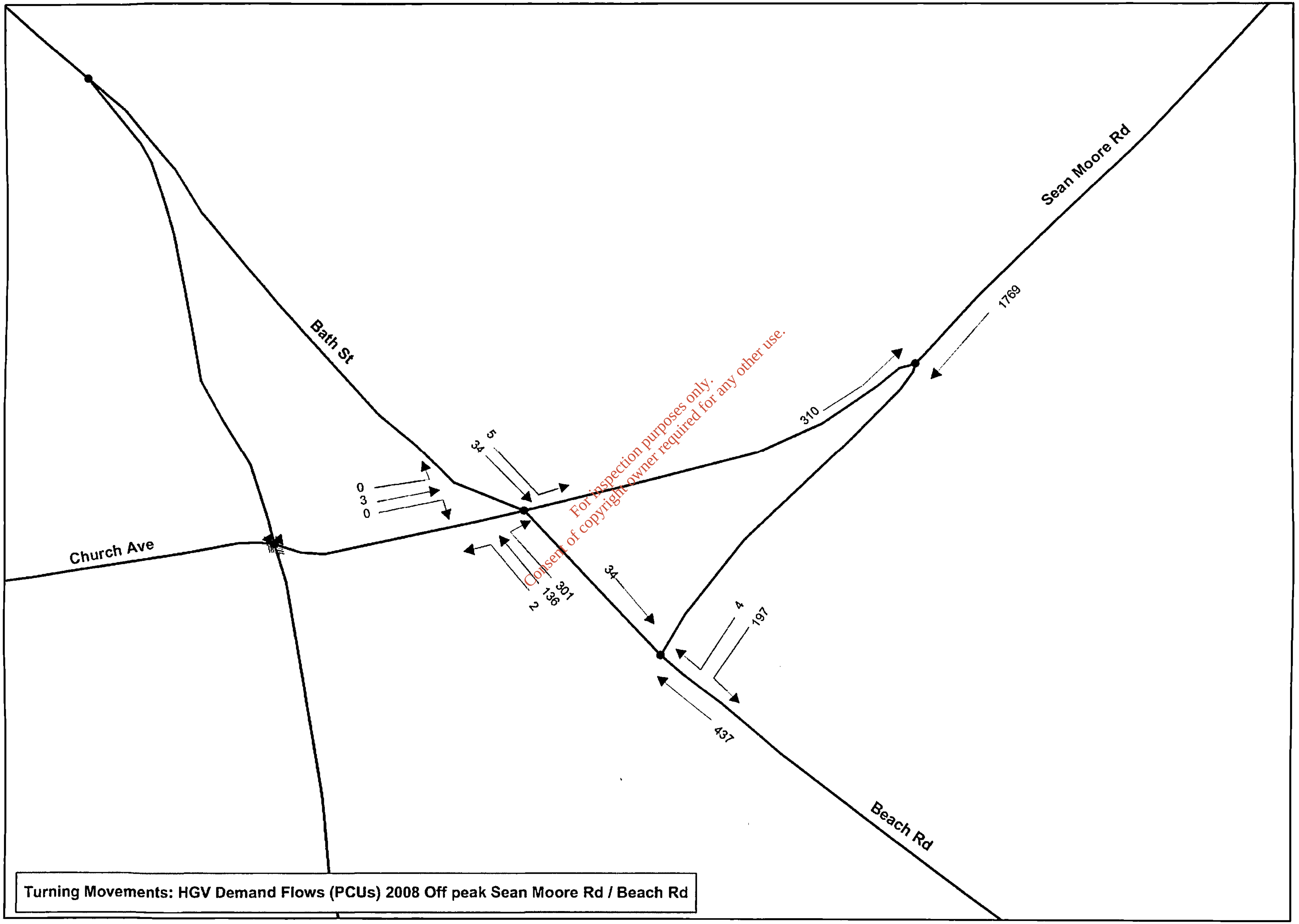
Turning Movements: LGV Demand Flows (PCUs) 2008 Off peak Ringsend Rd / South Lotts Rd



Turning Movements: HGV Demand Flows (PCUs) 2008 Off peak Sean Moore Rd / South Bank Rd



Turning Movements: LGV Demand Flows (PCUs) 2008 Off peak Sean Moore Rd / South Bank Rd



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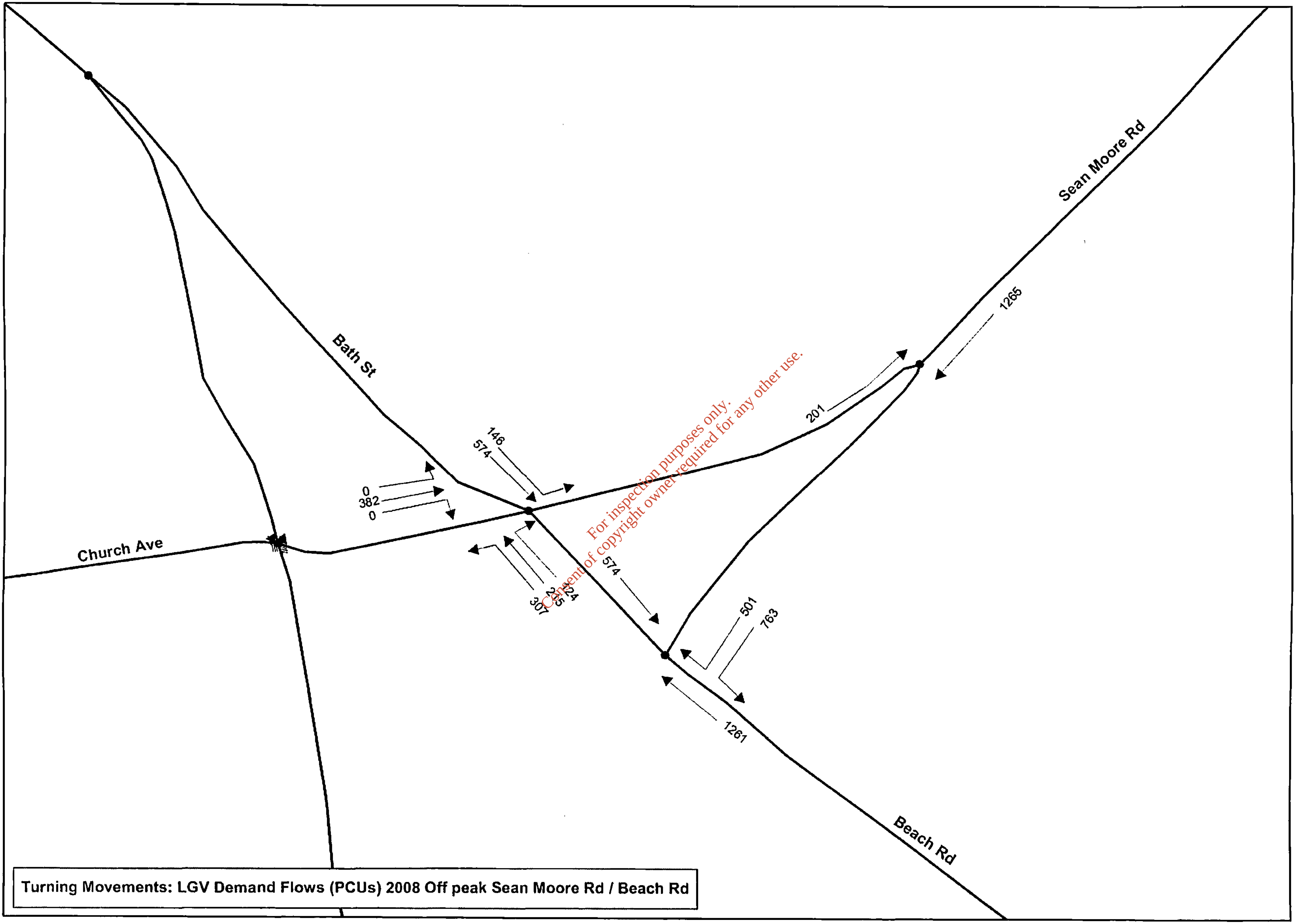
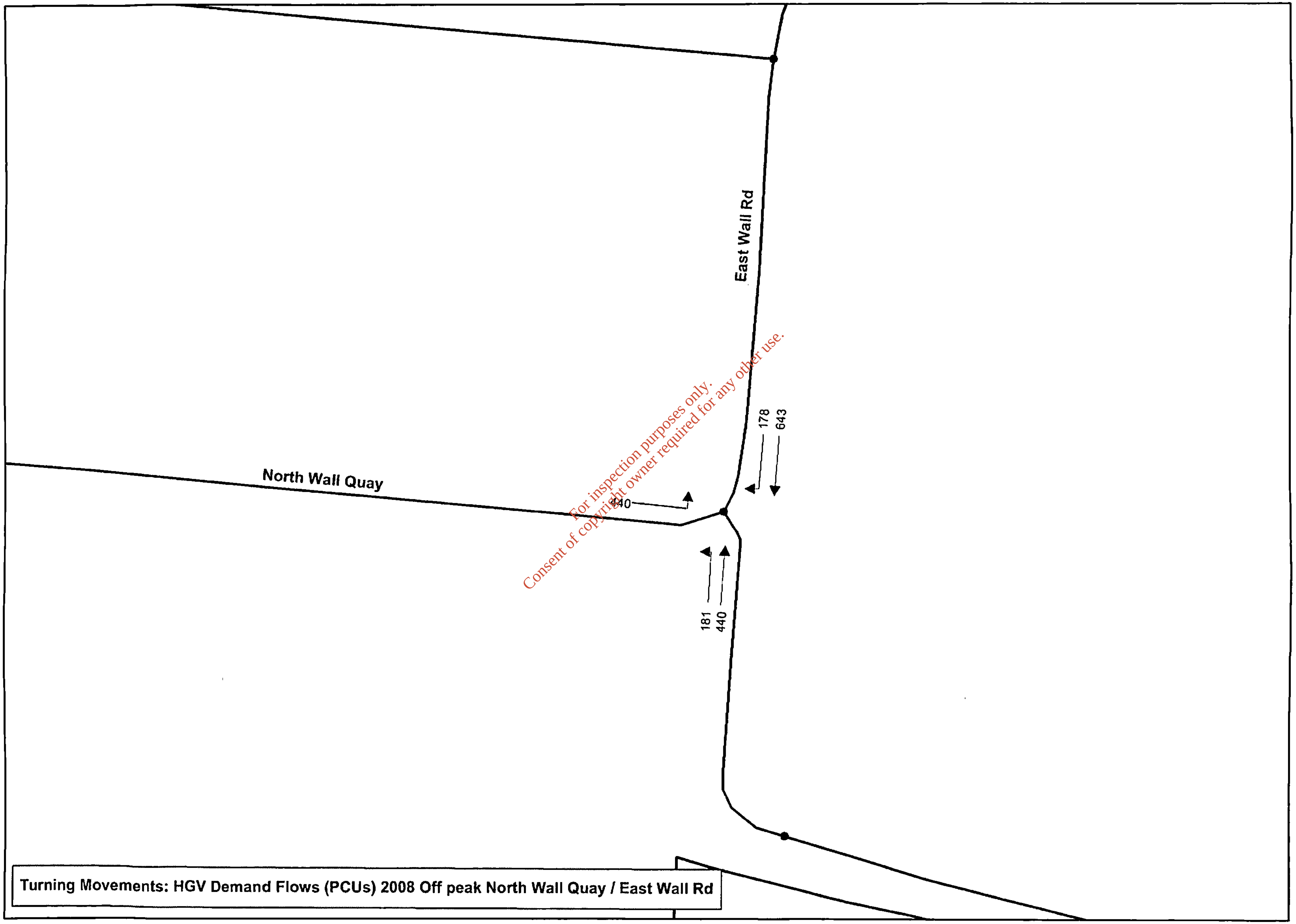
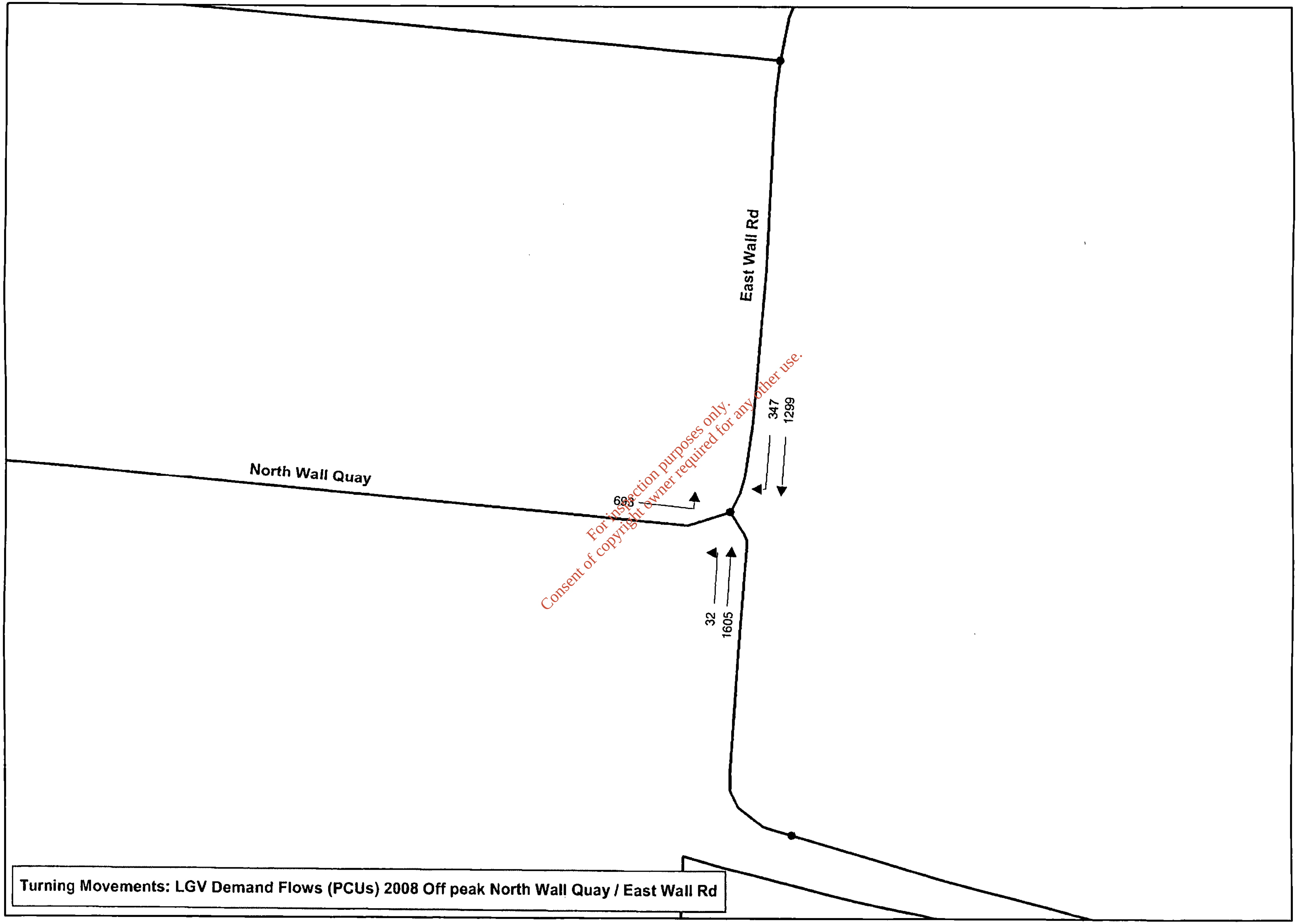


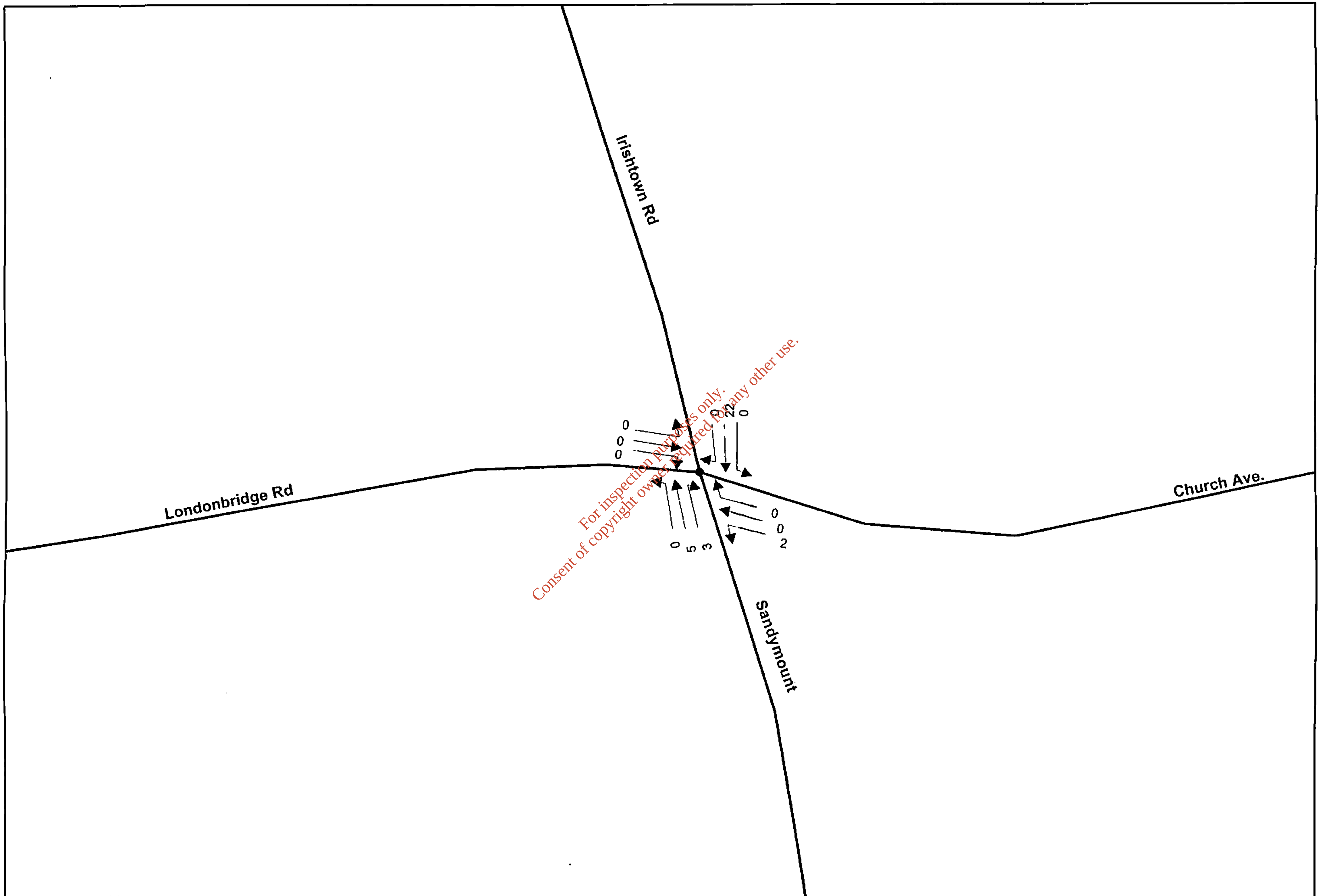
Turning Movements: LGV Demand Flows (PCUs) 2008 Off peak Sean Moore Rd / Beach Rd



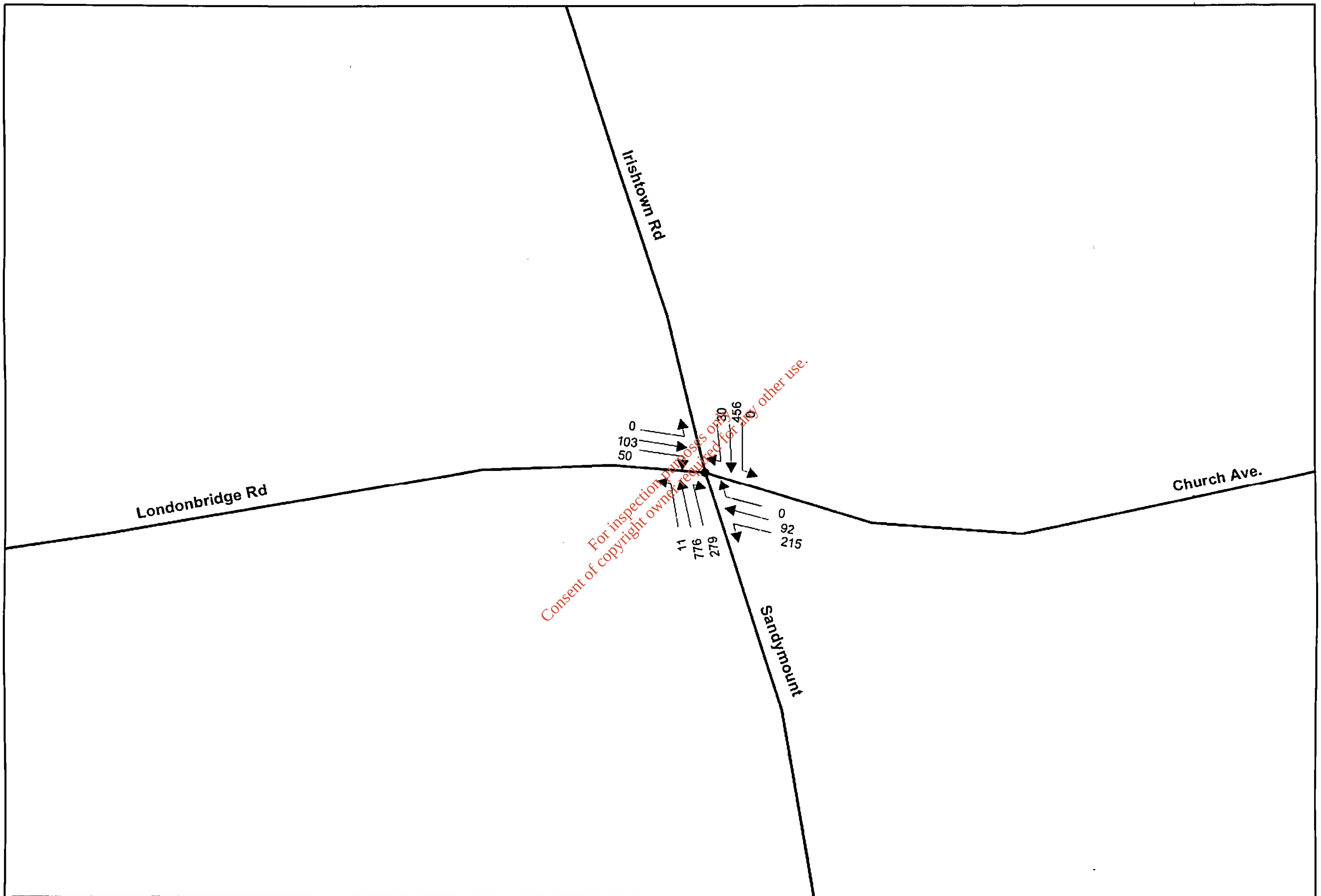
Turning Movements: HGV Demand Flows (PCUs) 2008 Off peak North Wall Quay / East Wall Rd



Turning Movements: LGV Demand Flows (PCUs) 2008 Off peak North Wall Quay / East Wall Rd



Turning Movements: HGV Demand Flows (PCUs) 2008 Off peak - Irishtown Rd / Church Ave



Turning Movements: LGV Demand Flows (PCUs) 2008 Off peak - Irishtown Rd / Church Ave

APPENDIX C

Proposed Traffic Scenarios

Scenario 1

Scenario 1 describes a situation where all collection vehicles drives directly to the "Plant" by the shortest possible route i.e. the baling stations are not taken into consideration. The main results of the calculations are shown in the table below.

Number of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station Tonnes	Waste to W2E Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	36	7	0	430	576	6.800
Commercial	69.000	230	32	5	0	230	512	3.632
Industrial	32.000	107	19	3	0	107	152	924
Litter	9.200	31	4	1	0	31	64	544
Daily transports	239.200	797	91	16	0	797	1.304	11.900
FCC								
Household	42.000	140	10	2	0	140	260	3.588
Commercial	23.000	77	9	1	0	77	234	1.989
Industrial	10.000	33	4	1	0	33	104	858
Litter	3.000	10	5	1	0	10	130	286
Daily transports	78.000	260	28	5	0	260	728	6.721
SDCC								
Household	59.000	197	14	3	0	197	308	4.202
Commercial	32.000	107	12	2	0	107	264	2.442
Industrial	15.000	50	7	1	0	50	154	1.155
Litter	4.200	14	4	1	0	14	88	308
Daily transports	110.200	367	37	7	0	367	814	8.107
DLRCC								
Household	50.000	167	12	2	0	167	264	3.828
Commercial	27.000	90	11	2	0	90	242	2.013
Industrial	12.000	40	6	1	0	40	132	924
Litter	3.600	12	1	0	0	12	22	264
Daily transports	92.600	309	30	5	0	309	660	7.029
Transport Waste	520.000	1.733	**186**	**32**	0	1.733	**3.506**	33.757
Waste Round Trip			**372**	**65**				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**206**	**35**				
Total Round Trips W2E			**412**	**71**				

This scenario will require the highest number of transport to the "Plant", and the shortest total waste transportation. The economic and environmental results are described in section 6.4.8

Scenario 2

Scenario 2 describe a situation where:

- All compacting vehicles from DCC drives directly to the “Plant”
- All skip vehicles drives directly to the “Plant”
- All four-axled vehicles from FCC, SDCC, DLRCC drives directly to the “Plant”
- All other compaction vehicles drives to a baling station for transfer to large vehicles
- Special haulage from baling stations to “Plant”

Number of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	36	7	0	430	576	6.800
Commercial	69.000	230	32	5	0	230	512	3.632
Industrial	32.000	107	19	3	0	107	152	924
Litter	9.200	31	4	1	0	31	64	544
Daily transports	239.200	797	91	16	0	797	1.304	11.900
FCC								
Household	42.000	140	8	1	48	92	352	5.316
Commercial	23.000	77	8	1	24	53	280	2.853
Industrial	10.000	33	3	0	24	9	98	1.098
Litter	3.000	10	1	0	11	-1	130	286
Daily transports	78.000	260	20	3	107	153	860	9.553
SDCC								
Household	59.000	197	12	2	41	156	272	4.448
Commercial	32.000	107	11	2	24	83	250	2.586
Industrial	15.000	50	7	1	0	50	154	1.155
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	30	5	79	288	764	8.497
DLRCC								
Household	50.000	167	11	2	24	143	274	4.356
Commercial	27.000	90	11	2	0	90	242	2.013
Industrial	12.000	40	5	1	24	16	142	1.452
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	28	4	60	249	680	8.085
Transport Waste	520.000	1.733	169	28	246	1.487	**3.608**	38.035
Waste Round Trip			337	56				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**189**	**31**				
Total Round Trips W2E			**377**	**62**				

Using the baling stations for a minor part of the waste reduce the number of peak hour transportations by 9 but increase the required transport distance by 102 km per day compared with scenario 1

Scenario 2A

Scenario 2A describe the same situation as scenario 2, but the special transports from the baling stations to the “Plant” follows the ring-road M50

Numbers of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	36	7	0	430	576	6.800
Commercial	69.000	230	32	5	0	230	512	3.632
Industrial	32.000	107	19	3	0	107	152	924
Litter	9.200	31	4	1	0	31	64	224
Daily transports	239.200	797	91	16	0	797	1.304	11.580
FCC								
Household	42.000	140	8	1	48	92	408	6.660
Commercial	23.000	77	8	1	24	53	308	3.525
Industrial	10.000	33	3	0	24	9	126	1.770
Litter	3.000	10	1	0	11	-1	130	286
Daily transports	78.000	260	20	3	107	153	972	12.241
SDCC								
Household	59.000	197	12	2	41	156	320	5.596
Commercial	32.000	107	11	2	24	83	278	3.258
Industrial	15.000	50	7	1	0	50	154	1.155
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	30	5	79	288	840	10.317
DLRCC								
Household	50.000	167	11	2	24	143	314	5.316
Commercial	27.000	90	11	2	0	90	242	2.013
Industrial	12.000	40	5	1	24	16	182	2.412
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	28	4	60	249	760	10.005
Transport Waste	520.000	1.733	169	28	246	1.487	**3.876**	44.143
Waste Round Trip			337	56				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**189**	**31**				
Total Round Trips W2E			**377**	**62**				

Using the ring-road M50 for transportation of waste from the baling stations the total distance required is increased by 370 km per day compared with scenario 1.

Scenario 3

Scenario 3 describes a situation where:

- All compacting vehicles from DCC drives directly to the “Plant”
- All skip vehicles drives directly to the “Plant”
- All Compacting vehicles from FCC, SDCC, DLRCC drives directly to a baling station
- Special haulage from baling station to “Plant”

Numbers of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	36	7	0	430	576	6.800
Commercial	69.000	230	32	5	0	230	512	3.632
Industrial	32.000	107	19	3	0	107	152	924
Litter	9.200	31	4	1	0	31	64	544
Daily transports	239.200	797	91	16	0	797	1.304	11.900
FCC								
Household	42.000	140	6	1	138	2	510	8.556
Commercial	23.000	77	7	1	54	23	333	3.933
Industrial	10.000	33	3	0	24	9	98	1.098
Litter	3.000	10	1	0	11	-1	130	286
Daily transports	78.000	260	17	2	227	33	1.070	13.873
SDCC								
Household	59.000	197	8	1	191	6	235	5.348
Commercial	32.000	107	10	1	84	23	235	2.946
Industrial	15.000	50	6	1	30	20	147	1.335
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	24	3	319	48	704	9.937
DLRCC								
Household	50.000	167	7	1	174	-7	367	7.656
Commercial	27.000	90	10	1	60	30	279	3.333
Industrial	12.000	40	5	1	24	16	142	1.452
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	22	3	270	39	810	12.705
Transport Waste	520.000	1.733	154	23	816	917	**3.888**	48.415
Waste Round Trip			309	47				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**174**	**26**				
Total Round Trips W2E			**349**	**53**				

Using the baling stations for nearly half of the waste reduce the number of peak hour transportations by 19 but increase the required transport distance by 382 km per day compared with scenario 1

Scenario 3A

Scenario 3A describe the same situation as scenario 3, but the special transports from the baling stations to the “Plant” follows the ring-road M50

Numbers of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	36	7	0	430	576	6.800
Commercial	69.000	230	32	5	0	230	512	3.632
Industrial	32.000	107	19	3	0	107	152	924
Litter	9.200	31	4	1	0	31	64	224
Daily transports	239.200	797	91	16	0	797	1.304	11.580
FCC								
Household	42.000	140	6	1	138	2	671	12.420
Commercial	23.000	77	7	1	54	23	396	5.445
Industrial	10.000	33	3	0	24	9	126	1.770
Litter	3.000	10	1	0	11	-1	130	1.105
Daily transports	78.000	260	17	2	227	33	1.322	20.740
SDCC								
Household	59.000	197	8	1	191	6	458	10.696
Commercial	32.000	107	10	1	84	23	333	5.298
Industrial	15.000	50	6	1	30	20	182	2.175
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	24	3	319	48	1.060	18.477
DLRCC								
Household	50.000	167	7	1	174	-7	657	14.616
Commercial	27.000	90	10	1	60	30	379	5.733
Industrial	12.000	40	5	1	24	16	182	2.412
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	22	3	270	39	1.240	23.025
Transport Waste	520.000	1.733	154	23	816	917	**4.926**	73.822
Waste Round Trip			309	47				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**174**	**26**				
Total Round Trips W2E			**349**	**53**				

Using the ring-road M50 for transportation of waste from the baling stations the total distance required is increased by 1,420 km per day compared with scenario 1.

Scenario 4

Scenario 4 describe a situation where:

- All compacting vehicles from DCC west of M1 and the railway to the south drives to a baling station
- All compacting vehicles from DCC east of M1 and the railway to the south drives directly to the "Plant"
- All skip vehicles drives directly to the "Plant"
- All compacting vehicles from FCC, SDCC, DLRCC drives to a baling station
- Special haulage from the baling station to the "Plant"

Numbers of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	27	8	213	218	770	11.900
Commercial	69.000	230	29	5	69	162	574	5.276
Industrial	32.000	107	18	3	24	83	198	1.788
Litter	9.200	31	3	1	17	14	64	544
Daily transports	239.200	797	76	17	322	475	1.606	19.508
FCC								
Household	42.000	140	6	1	138	2	510	8.556
Commercial	23.000	77	7	1	54	23	333	3.933
Industrial	10.000	33	3	0	24	9	98	1.098
Litter	3.000	10	1	0	11	-1	130	286
Daily transports	78.000	260	17	2	227	33	1.070	13.873
SDCC								
Household	59.000	197	8	1	191	6	235	5.348
Commercial	32.000	107	10	1	84	23	235	2.946
Industrial	15.000	50	6	1	30	20	147	1.335
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	24	3	319	48	704	9.937
DLRCC								
Household	50.000	167	7	1	174	-7	367	7.656
Commercial	27.000	90	10	1	60	30	279	3.333
Industrial	12.000	40	5	1	24	16	142	1.452
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	22	3	270	39	810	12.705
Transport Waste	520.000	1.733	140	20	1.138	595	**4.190**	56.023
Waste Round Trip			279	39				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**160**	**23**				
Total Round Trips W2E			**319**	**45**				

Using the baling stations for nearly half of the waste reduce the number of peak hour transportations by 26 but increase the required transport distance by 684 km per day compared with scenario 1

Scenario 4A

Scenario 4A describe the same situation as scenario 4, but the special transports from the baling stations to the “Plant” follows the ring-road M50

Numbers of transports and distance required

	Waste amount per annum Tonnes	Waste amount per day Tonnes	Vehicles per day to W2E Numbers	Vehicles peak hour Numbers*	Waste to Transfer Station per day Tonnes	Waste to W2E per day Tonnes	Transport KM per day	Transport Tonnes KM per day
DCC								
Household	129.000	430	27	5	213	218	1.018	17.850
Commercial	69.000	230	29	4	69	162	654	7.194
Industrial	32.000	107	18	2	24	83	226	2.460
Litter	9.200	31	3	0	17	14	64	544
Daily transports	239.200	797	76	12	322	475	1.962	28.048
FCC								
Household	42.000	140	6	1	138	2	671	12.420
Commercial	23.000	77	7	1	54	23	396	5.445
Industrial	10.000	33	3	0	24	9	126	1.770
Litter	3.000	10	1	0	11	-1	130	286
Daily transports	78.000	260	17	2	227	33	1.322	19.921
SDCC								
Household	59.000	197	8	1	191	6	458	10.696
Commercial	32.000	107	10	1	84	23	333	5.298
Industrial	15.000	50	6	1	30	20	182	2.175
Litter	4.200	14	1	0	14	0	88	308
Daily transports	110.200	367	24	3	319	48	1.060	18.477
DLRCC								
Household	50.000	167	7	1	174	-7	657	14.616
Commercial	27.000	90	10	1	60	30	379	5.733
Industrial	12.000	40	5	1	24	16	182	2.412
Litter	3.600	12	1	0	12	0	22	264
Daily transports	92.600	309	22	3	270	39	1.240	23.025
Transport Waste	520.000	1.733	140	20	1.138	595	**5.584**	89.471
Waste Round Trip			279	39				
Transport of Residues	125.000	568	20	3				
Residues Round Trips			40	6				
Total Trip W2E			**160**	**23**				
Total Round Trips W2E			**319**	**45**				

Using the ring-road M50 for transportation of waste from the baling stations the total distance required is increased by 2,078 km per day compared with scenario 1.

A summary from the seven scenarios can be seen in the table below

Summary Daily Waste Transport

	Scenario 1	**Scenario 2**	**Scenario 2A**	**Scenario 3**	**Scenario 3A**	**Scenario 4**	**Scenario 4A**
Total Trips to W2E. Nos.	206	189	189	174	174	160	160
Total Round Trips W2E. Nos.	412	377	377	349	349	319	319
Peak Hour Trips. Nos.	35	31	31	26	26	23	23
Peak Hour Round Trips. Nos.	71	62	62	53	53	45	45
Waste Through Baling Stations. Tonnes per day	0	246	246	816	816	1.138	1.138
Waste Direct to W2E. Tonnes per day	1.733	1.487	1.487	917	917	595	595
Compacting Collection Vehicles Km per day	2.400	2.206	2.260	1.852	1.852	1.824	1.824
Haulage Vehicles From Baling Stations Km per day	0	251	510	930	1.968	1.260	2.654
Skip Vehicles Km per day	1.106	1.151	1.106	1.106	1.106	1.106	1.106
TOTAL DRIVEN Km per DAY	3.506	3.608	3.876	3.888	4.926	4.190	5.584
Driven Tonnes Km.	33.757	38.035	44.143	48.415	73.822	56.023	89.471
North Wall/East Wall Roundabout Number of vehicles (round trips) peak hour. Nos.	33	27	29	23	32	19	28
Beach Road/Sean Moore Road Junction Number of vehicles (round trips) peak hour. Nos.	38	36	33	30	21	26	17

The calculations shows, that the traffic to the “Plant” can be reduced from 71 vehicles per hour to 45 vehicles per hour if a maximum use of the baling stations (transfer stations) are implemented.

However such a use of the baling stations will cause a considerable increase of transport km per day caused by the transport from baling stations to the “Plant”, but simultaneously the transport km performed by the compacting collection vehicles will be reduced.

Costs and environment

In order to get a better basis for a decision on what scenario to choose, or to reject all scenarios it is necessary to make some calculations on costs and environment for each scenario. However it is not possible to prepare cost estimates comparable with the existing situation.
Therefore the calculations only show the mutual difference between the seven scenarios. For the cost calculations some basic assumptions have been made. They are as followed:

- The collection fleet operates 1,800 hours per year (i.e. each vehicle)
- The calculations are based on the assumption that the compacting collection vehicle is filled up when it enter the scenario i.e. it is only transportation through the City, which enter into the calculation
- The average transportation speed through the City is 15 km per hour.
- The average transportation speed to the "Plant" following M50 is 40 km per hour.
- Price for baling (Compaction) is 20 € per tonnes
- The average consumption of diesel is 2 km per litre diesel
- The CO_2 emission from the engines is 2,71 kg per litre diesel
- The cost calculation do not comprise skip transports

An average price for the collection fleet in operation is calculated on the basis of economic and technical data obtained from the organisations operating the collection systems.
The average price is based on number of vehicles dedicated to waste collection for the "Plant" and the operation costs per year for each type of vehicle.

19	nos. of four axled vehicles (15 tonnes)	210,000 €/Year	120 €/hour
33	nos. of three axled vehicles (12 tonnes)	200,000 €/year	110 €/Hour
5	nos. three axled vehicles (8.5 tonnes)	180,000 €/year	100 €/hour
2	nos. of two axled vehicles (3.5 tonnes)	140,000 €/year	80 €/hour
59	Vehicles average price		111 €/hour

The price for haulage vehicles is estimated to 100 €/hour. The result of the calculations are shown in the table below.

Economic and Environment Daily Waste Transport

	Scenario 1	Scenario 2	Scenario 2A	Scenario 3	Scenario 3A	Scenario 4	Scenario 4A
Waste Through Baling Stations. Tonnes per day	0	246	246	816	816	1.138	1.138
Waste Direct to W2E. Tonnes per day	1.733	1.487	1.487	917	917	595	595
Compacting Collection Vehicles Km per day	2.400	2.206	2.260	1.852	1.852	1.824	1.824
Haulage Vehicles From Baling Stations Km per day	0	251	510	930	1.968	1.260	2.654
Skip Vehicles Km per day	1.106	1.151	1.106	1.106	1.106	1.106	1.106
TOTAL DRIVEN Km per DAY	3.506	3.608	3.876	3.888	4.926	4.190	5.584
Costs transportation Collection vehicles €	17.760	16.324	16.724	13.705	13.705	13.498	13.498
Costs transportation Haulage vehicles €	0	1.676	1.276	6.199	4.919	8.402	6.635
Total Transportation costs €	17.760	18.001	18.000	19.904	18.624	21.900	20.133
Baling costs €	0	4.920	4.920	16.320	16.320	22.760	22.760
Total Costs €	**17.760**	**22.921**	**22.920**	**36.224**	**34.944**	**44.660**	**42.893**
Emission of CO2 Kg	**3.252**	**3.330**	**3.754**	**3.769**	**5.176**	**4.179**	**6.068**

PREFERRED SCENARIO

From an economical and environmental point of view scenario 1 is the most feasible to implement. However the traffic situation in Dublin City can be rather busy and therefore it may be more feasible to chose a scenario which create less transports in the peak hours to the “Plant”

APPENDIX D

Junction Analysis

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 1**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Phases

Phase Data					
Phase Name		**Phase Type**	**Assoc Phase**	**Street Min**	**Cont Min**
A	Ringsend Road East Ahead Left Right	Traffic		7	7
B	Ringsend Road West Ahead Right Left	Traffic		7	7
C	South Lotts Road Right Left Ahead	Traffic		7	7
D	South Docks Rd Left Right Ahead	Traffic		7	7
E	Pedestrians across Crossing Ringsend Road West	Pedestrian		7	7
F	Ringsend Road West Ahead Right Left IGA	Ind. Arrow	B	7	7

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 2**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**					
	A	**B**	**C**	**D**	**E**	**F**
A			5	5	8	
B			5	5	5	
C	5	5			6	5
D	5	5			8	5
E	11	11	11	11		11
F			5	5	5	

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 3**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	1	3	C			2
2	2	3	B			3

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 4**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	**Prohibited Moves To Stage**		
	1	**2**	**3**
1			
2			
3			

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 5**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Stages

Stage Data	
Stage	**Phases In Stage**
1	**CD**
2	**ABF**
3	**E**

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 6**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Ringsend Road East Ahead Left Right	U	A				
2/1	Ringsend Road West Ahead Right Left	U	B	F			
3/1	South Lotts Road Right Left Ahead	U	C				
4/1	South Docks Rd Left Right Ahead	U	D				
5/1	Right turn Right	O	B	F	1/1	2	2

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project		**Page 7**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak		**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn (%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Ringsend Road East Ahead Left Right	Inf	0.00	4.20	24	12.00	1800	1976
2/1	Ringsend Road West Ahead Right Left	Inf	0.00	4.75	1	12.00	1800	2087
3/1	South Lotts Road Right Left Ahead	Inf	0.00	3.35	95	12.00	1800	1743
4/1	South Docks Rd Left Right Ahead	Inf	0.00	3.25	63	8.00	1800	1735
5/1	Right turn Right	Inf	0.00	3.25	100	13.00	1800	1739

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 8**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Traffic Flows

Traffic Flows								
Grp Num	**Time Start**	**Time End**	**Title**	**Link Number**				
				1/1	**2/1**	**3/1**	**4/1**	**5/1**
1	08:15	09:15	Existing AM Peak 2003	946	691	188	24	144
2	17:00	18:00	Existing PM Peak 2003	502	956	244	36	155
3	08:00	09:00	2008 AM Peak without Development	1004	487	273	0	89
4	17:00	18:00	2008 PM Peak without Development	1021	1029	388	0	100
5	08:00	09:00	2008 AM Peak with Development	1043	526	273	0	89
6	17:00	18:00	2008 PM Peak with Development	1060	1068	388	0	100
7	08:00	09:00	2003 AM with Plant	980	725	188	24	144
8	08:00	09:00	2003 PM with Plant	536	990	244	36	155

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project			**Page 9**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**

Parameters Selected

Parameters Selected	
Flow Group	Existing AM Peak 2003
Flow Group Period	08:15 to 09:15
Phase Minimum Type	Street
CycleTime	120
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings			
Stage Sequence	2	1	3
Stage Duration	77	12	7
Stage Change Point	0	88	105

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 10**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Link Results

Link Results												
Link Ref	**Link Name**	**Link Type**	**Full Phs**	**Arw Phs**	**Tot Grn**	**Dem Flow**	**Satn Flow**	**Cap pcu**	**Deg Sat%**	**Del s/pcu**	**TDel pcuh**	**Que' pcu**
1/1	Ringsend Road East Ahead Left Right	U	A		77	946	1976	1284	73.7	18.5	4.9	11.3
2/1	Ringsend Road West Ahead Right Left	U	B	F	77	691	2087	1357	50.9	12.8	2.5	8.3
3/1	South Lotts Road Right Left Ahead	U	C		14	188	1743	218	86.3	96.2	5.0	7.8
4/1	South Docks Rd Left Right Ahead	U	D		12	24	1735	188	12.8	50.6	0.3	0.7
5/1	Right turn Right	O	B	F	77	144	262	170	84.5	65.9	2.6	3.5
Cycle Time 120 s				**PRC 4.3 %**				**Total Delay 15.3 PCUh**				

Opposed Link Results

Opposed Movement Detail				
Link Ref	**Link Name**	**Arr Grn**	**Gaps /cyc**	**Ign /cyc**
5/1	Right turn Right	77	3.7	2.0

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste to Energy Project				Page 1
Location	Ringsend	File	0001ASH	SCN		Chkd	
Title	2003 Existing PM Peak			Controller	Generic	Appvd	

Phases

Phase Data						
Phase Name		Phase Type	Assoc Phase	Street Min	Cont Mln
A	Ringsend Road East Ahead Left Right	Traffic		7	7
B	Ringsend Road West Ahead Right Left	Traffic		7	7
C	South Lotts Road Right Left Ahead	Traffic		7	7
D	South Docks Rd Left Right Ahead	Traffic		7	7
E	Pedestrians across Crossing Ringsend Road West	Pedestrian		7	7
F	Ringsend Road West Ahead Right Left IGA	Ind. Arrow	B	7	7

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 2**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**					
	A	**B**	**C**	**D**	**E**	**F**
A			5	5	8	
B			5	5	5	
C	5	5			6	5
D	5	5			8	5
E	11	11	11	11		11
F			5	5	5	

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 3**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	1	3	C			2
2	2	3	B			3

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 4**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	**Prohibited Moves To Stage**		
	1	**2**	**3**
1			
2			
3			

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 5**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Stages

Stage Data	
Stage	**Phases In Stage**
1	**CD**
2	**ABF**
3	**E**

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 6**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Ringsend Road East Ahead Left Right	U	A				
2/1	Ringsend Road West Ahead Right Left	U	B	F			
3/1	South Lotts Road Right Left Ahead	U	C				
4/1	South Docks Rd Left Right Ahead	U	D				
5/1	Right turn Right	O	B	F	1/1	2	2

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project				**Page 7**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Lanes

Lane Data

Ref Num	Lane	Length (pcu)	Gradient (%)	Width (m)	Propn Turn (%)	Radius (m)	User Satn	RR67 Satn
1/1	Ringsend Road East Ahead Left Right	Inf	0.00	4.20	24	12.00	1800	1976
2/1	Ringsend Road West Ahead Right Left	Inf	0.00	4.75	1	12.00	1800	2087
3/1	South Lotts Road Right Left Ahead	Inf	0.00	3.35	95	12.00	1800	1743
4/1	South Docks Rd Left Right Ahead	Inf	0.00	3.25	63	8.00	1800	1735
5/1	Right turn Right	Inf	0.00	3.25	100	13.00	1800	1739

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 8**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Traffic Flows

Traffic Flows								
Grp Num	**Time Start**	**Time End**	**Title**	**Link Number**				
				1/1	**2/1**	**3/1**	**4/1**	**5/1**
1	08:15	09:15	Existing AM Peak 2003	946	691	188	24	144
2	17:00	18:00	Existing PM Peak 2003	502	956	244	36	155
3	08:00	09:00	2008 AM Peak without Development	1004	487	273	0	89
4	17:00	18:00	2008 PM Peak without Development	1021	1029	388	0	100
5	08:00	09:00	2008 AM Peak with Development	1043	526	273	0	89
6	17:00	18:00	2008 PM Peak with Development	1060	1068	388	0	100
7	08:00	09:00	2003 AM with Plant	980	725	188	24	144
8	08:00	09:00	2003 PM with Plant	536	990	244	36	155

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project				**Page 9**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Parameters Selected

Parameters Selected	
Flow Group	Existing PM Peak 2003
Flow Group Period	17:00 to 18:00
Phase Minimum Type	Street
CycleTime	120
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings			
Stage Sequence	2	1	3
Stage Duration	70	19	7
Stage Change Point	0	81	105

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 10**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Link Results

Link Results

Link Ref	Link Name	Link Type	Full Phs	Arw Phs	Tot Grn	Dem Flow	Satn Flow	Cap pcu	Deg Sat%	Del s/pcu	TDel pcuh	Que' pcu
1/1	Ringsend Road East Ahead Left Right	U	A		70	502	1976	1169	42.9	15.1	2.1	7.0
2/1	Ringsend Road West Ahead Right Left	U	B	F	70	956	2087	1235	77.4	23.9	6.4	13.3
3/1	South Lotts Road Right Left Ahead	U	C		21	244	1743	320	76.4	64.6	4.4	7.7
4/1	South Docks Rd Left Right Ahead	U	D		19	36	1735	289	12.4	44.2	0.4	1.0
5/1	Right turn Right	O	B	F	70	155	719	426	36.4	15.6	0.7	2.2
Cycle Time 120 s					**PRC 16.2 %**			**Total Delay 14.0 PCUh**				

Opposed Link Results

Opposed Movement Detail

Link Ref	Link Name	Arr Grn	Gaps /cyc	Ign /cyc
5/1	Right turn Right	70	12.2	2.0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 1**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phases

Phase Data					
	Phase Name	**Phase Type**	**Assoc Phase**	**Street Min**	**Cont Min**
A	Ringsend Road East Ahead Left Right	Traffic		7	7
B	Ringsend Road West Ahead Right Left	Traffic		7	7
C	South Lotts Road Right Left Ahead	Traffic		7	7
D	South Docks Rd Left Right Ahead	Traffic		7	7
E	Pedestrians across Crossing Ringsend Road West	Pedestrian		7	7
F	Ringsend Road West Ahead Right Left IGA	Ind. Arrow	B	7	7

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 2**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**					
	A	**B**	**C**	**D**	**E**	**F**
A			5	5	8	
B			5	5	5	
C	5	5			6	5
D	5	5			8	5
E	11	11	11	11		11
F			5	5	5	

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 3**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	1	3	C			2
2	2	3	B			3

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 4**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	**Prohibited Moves To Stage**		
	1	**2**	**3**
1			
2			
3			

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste to Energy Project				Page 5
Location	Ringsend	File	0001ASH	SCN		Chkd	
Title	2003 Existing AM Peak with "Plant" Traffic			Controller	Generic	Appvd	

Stages

Stage Data	
Stage	Phases In Stage
1	CD
2	ABF
3	E

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 6**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Ringsend Road East Ahead Left Right	U	A				
2/1	Ringsend Road West Ahead Right Left	U	B	F			
3/1	South Lotts Road Right Left Ahead	U	C				
4/1	South Docks Rd Left Right Ahead	U	D				
5/1	Right turn Right	O	B	F	1/1	2	2

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 7**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn (%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Ringsend Road East Ahead Left Right	Inf	0.00	4.20	24	12.00	1800	1976
2/1	Ringsend Road West Ahead Right Left	Inf	0.00	4.75	1	12.00	1800	2087
3/1	South Lotts Road Right Left Ahead	Inf	0.00	3.35	95	12.00	1800	1743
4/1	South Docks Rd Left Right Ahead	Inf	0.00	3.25	63	8.00	1800	1735
5/1	Right turn Right	Inf	0.00	3.25	100	13.00	1800	1739

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 8**	
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Traffic Flows

Traffic Flows								
Grp Num	**Time Start**	**Time End**	**Title**	**Link Number**				
				1/1	**2/1**	**3/1**	**4/1**	**5/1**
1	08:15	09:15	Existing AM Peak 2003	946	691	188	24	144
2	17:00	18:00	Existing PM Peak 2003	502	956	244	36	155
3	08:00	09:00	2008 AM Peak without Development	1004	487	273	0	89
4	17:00	18:00	2008 PM Peak without Development	1021	1029	388	0	100
5	08:00	09:00	2008 AM Peak with Development	1043	526	273	0	89
6	17:00	18:00	2008 PM Peak with Development	1060	1068	388	0	100
7	08:00	09:00	2003 AM with Plant	980	725	188	24	144
8	08:00	09:00	2003 PM with Plant	536	990	244	36	155

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project				**Page 9**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Parameters Selected

Parameters Selected	
Flow Group	2003 AM with Plant
Flow Group Period	08:00 to 09:00
Phase Minimum Type	Street
CycleTime	120
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings			
Stage Sequence	2	1	3
Stage Duration	78	11	7
Stage Change Point	0	89	105

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 10**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Link Results

Link Results												
Link Ref	**Link Name**	**Link Type**	**Full Phs**	**Arw Phs**	**Tot Grn**	**Dem Flow**	**Satn Flow**	**Cap pcu**	**Deg Sat%**	**Del s/pcu**	**TDel pcuh**	**Que' pcu**
1/1	Ringsend Road East Ahead Left Right	U	A		78	980	1976	1301	75.3	18.6	5.1	11.4
2/1	Ringsend Road West Ahead Right Left	U	B	F	78	725	2087	1374	52.8	12.6	2.5	8.5
3/1	South Lotts Road Right Left Ahead	U	C		13	188	1743	203	92.5	124.2	6.5	9.3
4/1	South Docks Rd Left Right Ahead	U	D		11	24	1735	174	13.8	51.8	0.3	0.7
5/1	Right turn Right	O	B	F	78	144	239	158	91.3	97.7	3.9	4.7
Cycle Time 120 s					**PRC -2.7 %**			**Total Delay 18.3 PCUh**				

Opposed Link Results

Opposed Movement Detail				
Link Ref	**Link Name**	**Arr Grn**	**Gaps /cyc**	**Ign /cyc**
5/1	Right turn Right	78	3.3	2.0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 1**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phases

Phase Data

	Phase Name	Phase Type	Assoc Phase	Street Min	Cont Min
A	Ringsend Road East Ahead Left Right	Traffic		7	7
B	Ringsend Road West Ahead Right Left	Traffic		7	7
C	South Lotts Road Right Left Ahead	Traffic		7	7
D	South Docks Rd Left Right Ahead	Traffic		7	7
E	Pedestrians across Crossing Ringsend Road West	Pedestrian		7	7
F	Ringsend Road West Ahead Right Left IGA	Ind. Arrow	B	7	7

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project			**Page 2**
Location	Ringsend	**File**	0001ASH	**SCN**	**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic		**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**					
	A	**B**	**C**	**D**	**E**	**F**
A			5	5	8	
B			5	5	5	
C	5	5			6	5
D	5	5			8	5
E	11	11	11	11		11
F			5	5	5	

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 3**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	1	3	C			2
2	2	3	B			3

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 4**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	Prohibited Moves To Stage		
	1	2	3
1			
2			
3			

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste to Energy Project				Page 5
Location	Ringsend	File	0001ASH	SCN		Chkd	
Title	2003 Existing PM Peak with "Plant" Traffic			Controller	Generic	Appvd	

Stages

Stage Data	
Stage	Phases In Stage
1	CD
2	ABF
3	E

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project			**Page 6**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Ringsend Road East Ahead Left Right	U	A				
2/1	Ringsend Road West Ahead Right Left	U	B	F			
3/1	South Lotts Road Right Left Ahead	U	C				
4/1	South Docks Rd Left Right Ahead	U	D				
5/1	Right turn Right	O	B	F	1/1	2	2

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 7**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn (%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Ringsend Road East Ahead Left Right	Inf	0.00	4.20	24	12.00	1800	1976
2/1	Ringsend Road West Ahead Right Left	Inf	0.00	4.75	1	12.00	1800	2087
3/1	South Lotts Road Right Left Ahead	Inf	0.00	3.35	95	12.00	1800	1743
4/1	South Docks Rd Left Right Ahead	Inf	0.00	3.25	63	8.00	1800	1735
5/1	Right turn Right	Inf	0.00	3.25	100	13.00	1800	1739

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project			**Page 8**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**

Traffic Flows

Traffic Flows								
Grp Num	**Time Start**	**Time End**	**Title**	**Link Number**				
				1/1	**2/1**	**3/1**	**4/1**	**5/1**
1	08:15	09:15	Existing AM Peak 2003	946	691	188	24	144
2	17:00	18:00	Existing PM Peak 2003	502	956	244	36	155
3	08:00	09:00	2008 AM Peak without Development	1004	487	273	0	89
4	17:00	18:00	2008 PM Peak without Development	1021	1029	388	0	100
5	08:00	09:00	2008 AM Peak with Development	1043	526	273	0	89
6	17:00	18:00	2008 PM Peak with Development	1060	1068	388	0	100
7	08:00	09:00	2003 AM with Plant	980	725	188	24	144
8	08:00	09:00	2003 PM with Plant	536	990	244	36	155

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste to Energy Project				**Page 9**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Parameters Selected

Parameters Selected	
Flow Group	2003 PM with Plant
Flow Group Period	08:00 to 09:00
Phase Minimum Type	Street
CycleTime	120
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings			
Stage Sequence	2	1	3
Stage Duration	71	18	7
Stage Change Point	0	82	105

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste to Energy Project				**Page 10**
Location	Ringsend	**File**	0001ASH	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Link Results

Link Results

Link Ref	Link Name	Link Type	Full Phs	Arw Phs	Tot Grn	Dem Flow	Satn Flow	Cap pcu	Deg Sat%	Del s/pcu	TDel pcuh	Que' pcu
1/1	Ringsend Road East Ahead Left Right	U	A		71	536	1976	1186	45.2	14.9	2.2	7.3
2/1	Ringsend Road West Ahead Right Left	U	B	F	71	990	2087	1252	79.1	24.1	6.6	13.5
3/1	South Lotts Road Right Left Ahead	U	C		20	244	1743	305	80.0	70.3	4.8	8.2
4/1	South Docks Rd Left Right Ahead	U	D		18	36	1735	275	13.1	45.2	0.5	1.0
5/1	Right turn Right	O	B	F	71	155	678	407	38.1	15.6	0.7	2.1
Cycle Time 120 s					**PRC 12.5 %**			**Total Delay 14.8 PCUh**				

Opposed Link Results

Opposed Movement Detail

Link Ref	Link Name	Arr Grn	Gaps /cyc	Ign /cyc
5/1	Right turn Right	71	11.6	2.0

```
-------------------------------------------------------------------------------
TRL               TRL VIEWER    2.0 AB R:\MDE0133\Tr\Ar\South Bank Road\0001ASH.vao - Page 1
-------------------------------------------------------------------------------

                         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:- "r:\MDE0133\Tr\Ar\South Bank Road\0001ASH.vai" at 15:44:59 on Wednesday, 28 April 2004


 ROUNDABOUT CAPACITY AND DELAY
 *****************************



 RUN TITLE
 *********
  Sean Moore Road / South Bank Road - Existing AM Peak 2003



 INPUT DATA
 **********
 ARM A - EastLink Road
 ARM B - South Bank Road (Pigeon Hse Rd)
 ARM C - South Bank Road
 ARM D - Sean Moore Road
 ARM E - Pigeon House Road


 GEOMETRIC DATA
 --------------


 -----------------------------------------------------------------------------------------------------------------------
 I ARM    I   V (M)   I    E (M)   I    L (M)   I    R (M)   I   D (M)   I   PHI (DEG)  I  SLOPE  I INTERCEPT (PCU/MIN)
 -----------------------------------------------------------------------------------------------------------------------
 I ARM A I     5.60   I     8.60   I     5.00   I    13.00   I   55.00   I     22.0     I  0.641  I        33.516
 I ARM B I     7.20   I     8.90   I     3.60   I    30.00   I   55.00   I     29.0     I  0.723  I        40.565
 I ARM C I     7.20   I     9.20   I    10.00   I    30.00   I   55.00   I     25.0     I  0.764  I        43.949
 I ARM D I     7.40   I     9.20   I    15.00   I    18.00   I   55.00   I     63.0     I  0.664  I        38.668
 I ARM E I     3.00   I     4.20   I     0.00   I    10.00   I   55.00   I     79.0     I  0.396  I        16.566
 -----------------------------------------------------------------------------------------------------------------------

 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 08.00 AND ENDS 09.30

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

```
 DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA


 -------------------------------------------------------------------------------
 I       I   NUMBER OF MINUTES FROM START WHEN     I    RATE OF FLOW (VEH/MIN) I
 I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I       I   TO RISE   I  IS REACHED IFALLING    I  PEAK  I OF PEAK I PEAK   I
 -------------------------------------------------------------------------------
 I ARM A I    15.00    I     45.00   I    75.00   I 10.38  I  15.56  I 10.38 I
 I ARM B I    15.00    I     45.00   I    75.00   I  0.46  I   0.69  I  0.46 I
 I ARM C I    15.00    I     45.00   I    75.00   I  0.52  I   0.79  I  0.52 I
 I ARM D I    15.00    I     45.00   I    75.00   I 10.75  I  16.13  I 10.75 I
 I ARM E I    15.00    I     45.00   I    75.00   I  0.00  I   0.00  I  0.00 I
 -------------------------------------------------------------------------------


 -------------------------------------------------------------------------------
 I                   I         TURNING PROPORTIONS                            I
 I                   I         TURNING COUNTS (VEH/HR)                        I
 I                   I        (PERCENTAGE OF H.V.S)                           I
 I                   -----------------------------------------------------------
 I       TIME        I FROM/TO I  ARM A I  ARM B I  ARM C I  ARM D I  ARM E I
 -------------------------------------------------------------------------------
 I  08.00 - 09.30    I         I        I        I        I        I        I
 I                   I  ARM A  I  0.000 I  0.019 I  0.077 I  0.904 I  0.000 I
 I                   I         I    0.0 I   16.0 I   64.0 I  750.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM B  I  0.622 I  0.000 I  0.162 I  0.216 I  0.000 I
 I                   I         I   23.0 I    0.0 I    6.0 I    8.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM C  I  0.524 I  0.048 I  0.000 I  0.429 I  0.000 I
 I                   I         I   22.0 I    2.0 I    0.0 I   18.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM D  I  0.887 I  0.012 I  0.101 I  0.000 I  0.000 I
 I                   I         I  763.0 I   10.0 I   87.0 I    0.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM E  I  0.000 I  0.000 I  0.000 I  0.000 I  0.000 I
 I                   I         I??????? I??????? I??????? I??????? I??????? I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 -------------------------------------------------------------------------------
 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
          -------------------------------------------------------


 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN   START   END      DELAY     GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW       QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/   I
 I                                (RFC)     (PEDS/MIN)  (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 08.00-08.15                                                                                    I
 I ARM A      10.38     29.68    0.350                   0.0     0.5       7.8                    I
 I ARM B       0.46     28.76    0.016                   0.0     0.0       0.2                    I
 I ARM C       0.52     32.52    0.016                   0.0     0.0       0.2                    I
 I ARM D      10.75     34.76    0.309                   0.0     0.4       6.6                    I
 I ARM E       0.00     11.64    0.000                   0.0     0.0       0.0                    I
 I                                                                                                I
 --------------------------------------------------------------------------------------------------

 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN   START   END      DELAY     GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW       QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/   I
 I                                (RFC)     (PEDS/MIN)  (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 08.15-08.30                                                                                    I
 I ARM A      12.39     29.52    0.420                   0.5     0.7      10.6                    I
 I ARM B       0.55     27.16    0.020                   0.0     0.0       0.3                    I
 I ARM C       0.63     31.06    0.020                   0.0     0.0       0.3                    I
 I ARM D      12.84     34.69    0.370                   0.4     0.6       8.6                    I
 I ARM E       0.00     10.68    0.000                   0.0     0.0       0.0                    I
 I                                                                                                I
 --------------------------------------------------------------------------------------------------
```

```
----------------------------------------------------------------------------------------------------------
I  TIME      DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
I          (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                (RFC)    (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.30-08.45                                                                                    I
I ARM A      15.17      29.31    0.518                  0.7    1.1       15.5                    I
I ARM B       0.68      24.98    0.027                  0.0    0.0        0.4                    I
I ARM C       0.77      29.06    0.026                  0.0    0.0        0.4                    I
I ARM D      15.72      34.58    0.455                  0.6    0.8       12.2                    I
I ARM E       0.00       9.36    0.000                  0.0    0.0        0.0                    I
I                                                                                                I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME      DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
I          (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                (RFC)    (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.45-09.00                                                                                    I
I ARM A      15.17      29.31    0.518                  1.1    1.1       16.0                    I
I ARM B       0.68      24.97    0.027                  0.0    0.0        0.4                    I
I ARM C       0.77      29.05    0.026                  0.0    0.0        0.4                    I
I ARM D      15.72      34.58    0.455                  0.8    0.8       12.4                    I
I ARM E       0.00       9.35    0.000                  0.0    0.0        0.0                    I
I                                                                                                I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME      DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
I          (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                (RFC)    (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 09.00-09.15                                                                                    I
I ARM A      12.39      29.52    0.420                  1.1    0.7       11.2                    I
I ARM B       0.55      27.13    0.020                  0.0    0.0        0.3                    I
I ARM C       0.63      31.03    0.020                  0.0    0.0        0.3                    I
I ARM D      12.84      34.69    0.370                  0.8    0.6        9.0                    I
I ARM E       0.00      10.67    0.000                  0.0    0.0        0.0                    I
I                                                                                                I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME      DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
I          (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                (RFC)    (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 09.15-09.30                                                                                    I
I ARM A      10.38      29.68    0.350                  0.7    0.5        8.2                    I
I ARM B       0.46      28.72    0.016                  0.0    0.0        0.2                    I
I ARM C       0.52      32.49    0.016                  0.0    0.0        0.2                    I
I ARM D      10.75      34.76    0.309                  0.6    0.4        6.8                    I
I ARM E       0.00      11.63    0.000                  0.0    0.0        0.0                    I
I                                                                                                I
----------------------------------------------------------------------------------------------------------

QUEUE AT ARM A
--------------

 TIME SEGMENT   NO. OF
  ENDING      VEHICLES
              IN QUEUE

  08.15           0.5  *
  08.30           0.7  *
  08.45           1.1  *
  09.00           1.1  *
  09.15           0.7  *
  09.30           0.5  *


QUEUE AT ARM B
--------------

 TIME SEGMENT   NO. OF
  ENDING      VEHICLES
              IN QUEUE

  08.15           0.0
  08.30           0.0
  08.45           0.0
  09.00           0.0
  09.15           0.0
  09.30           0.0
```

```
 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.0
   08.30           0.0
   08.45           0.0
   09.00           0.0
   09.15           0.0
   09.30           0.0


 QUEUE AT ARM D
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.4
   08.30           0.6   *
   08.45           0.8   *
   09.00           0.8   *
   09.15           0.6   *
   09.30           0.4


 QUEUE AT ARM E
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.0
   08.30           0.0
   08.45           0.0
   09.00           0.0
   09.15           0.0
   09.30           0.0


                QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                -------------------------------------------

 -----------------------------------------------------------------------------
 I  ARM  I   TOTAL DEMAND   I     * QUEUEING *     I  * INCLUSIVE QUEUEING *  I
 I       I                  I      * DELAY *       I         * DELAY *        I
 I       I-------------------------------------------------------------------I
 I       I  (VEH)   (VEH/H) I  (MIN)     (MIN/VEH) I   (MIN)       (MIN/VEH)  I
 -----------------------------------------------------------------------------
 I   A   I 1138.1 I  758.7 I    69.4 I    0.06     I     69.4  I     0.06     I
 I   B   I   50.7 I   33.8 I     1.9 I    0.04     I      1.9  I     0.04     I
 I   C   I   57.6 I   38.4 I     1.9 I    0.03     I      1.9  I     0.03     I
 I   D   I 1179.2 I  786.2 I    55.7 I    0.05     I     55.7  I     0.05     I
 I   E   I    0.0 I    0.0 I     0.0 I    0.00     I      0.0  I     0.00     I
 -----------------------------------------------------------------------------
 I  ALL  I 2425.7 I 1617.1 I   128.9 I    0.05     I    128.9  I     0.05     I
 -----------------------------------------------------------------------------

 * 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 15:45:49 on 28/04/2004]
```

```
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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
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Run with file:- "r:\MDE0133\Tr\Ar\South Bank Road\0002ASH.vai" at 15:46:35 on Wednesday, 28 April 2004


ROUNDABOUT CAPACITY AND DELAY
*****************************



RUN TITLE
*********
 Sean Moore Road / South Bank Road - Existing PM Peak 2003



INPUT DATA
**********
ARM A - EastLink Road
ARM B - South Bank Road (Pigeon Hse Rd)
ARM C - South Bank Road
ARM D - Sean Moore Road
ARM E - Pigeon House Road


GEOMETRIC DATA
--------------


-------------------------------------------------------------------------------------------------------------------
I ARM    I    V (M)    I     E (M)    I     L (M)    I     R (M)    I    D (M)    I    PHI (DEG)   I  SLOPE  I INTERCEPT (PCU/MIN)
-------------------------------------------------------------------------------------------------------------------
I ARM A I     5.60    I      8.60    I      5.00    I    13.00    I    55.00    I      22.0      I  0.641  I        33.516
I ARM B I     7.20    I      8.90    I      3.60    I    30.00    I    55.00    I      29.0      I  0.723  I        40.565
I ARM C I     7.20    I      9.20    I     10.00    I    30.00    I    55.00    I      25.0      I  0.764  I        43.949
I ARM D I     7.40    I      9.20    I     15.00    I    18.00    I    55.00    I      63.0      I  0.664  I        38.668
I ARM E I     3.00    I      4.20    I      0.00    I    10.00    I    55.00    I      79.0      I  0.396  I        16.566
-------------------------------------------------------------------------------------------------------------------

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 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

 -----------------------------------------------------------------------------
 I       I   NUMBER OF MINUTES FROM START WHEN    I    RATE OF FLOW (VEH/MIN) I
 I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I       I   TO RISE   I  IS REACHED IFALLING   I  PEAK  I OF PEAK I PEAK  I
 -----------------------------------------------------------------------------
 I ARM A I     15.00   I     45.00   I     75.00  I  8.91  I  13.37  I  8.91 I
 I ARM B I     15.00   I     45.00   I     75.00  I  0.71  I   1.07  I  0.71 I
 I ARM C I     15.00   I     45.00   I     75.00  I  1.49  I   2.23  I  1.49 I
 I ARM D I     15.00   I     45.00   I     75.00  I 11.15  I  16.72  I 11.15 I
 I ARM E I     15.00   I     45.00   I     75.00  I  0.00  I   0.00  I  0.00 I
 -----------------------------------------------------------------------------


 -----------------------------------------------------------------------------
 I                   I         TURNING PROPORTIONS                           I
 I                   I         TURNING COUNTS (VEH/HR)                       I
 I                   I        (PERCENTAGE OF H.V.S)                          I
 I                   -------------------------------------------------------
 I        TIME       I FROM/TO I  ARM A I  ARM B I  ARM C I  ARM D I  ARM E I
 -----------------------------------------------------------------------------
 I   16.45 - 18.15   I         I        I        I        I        I        I
 I                   I  ARM A  I  0.000 I  0.029 I  0.080 I  0.891 I  0.000 I
 I                   I         I    0.0 I   21.0 I   57.0 I  635.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM B  I  0.456 I  0.000 I  0.175 I  0.368 I  0.000 I
 I                   I         I   26.0 I    0.0 I   10.0 I   21.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM C  I  0.311 I  0.000 I  0.000 I  0.689 I  0.000 I
 I                   I         I   37.0 I    0.0 I    0.0 I   82.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM D  I  0.954 I  0.009 I  0.037 I  0.000 I  0.000 I
 I                   I         I  851.0 I    8.0 I   33.0 I    0.0 I    0.0 I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 I                   I  ARM E  I  0.000 I  0.000 I  0.000 I  0.000 I  0.000 I
 I                   I         I??????? I??????? I??????? I??????? I??????? I
 I                   I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                   I         I        I        I        I        I        I
 -----------------------------------------------------------------------------
 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
          ------------------------------------------------------


 ----------------------------------------------------------------------------------------------
 I  TIME      DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY    FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/   I
 I                                (RFC)    (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT)  TIME SEGMENT) I
 I 16.45-17.00                                                                                 I
 I ARM A       8.91     30.14    0.296                 0.0     0.4       6.1                      I
 I ARM B       0.71     30.34    0.023                 0.0     0.0       0.4                      I
 I ARM C       1.49     33.46    0.044                 0.0     0.0       0.7                      I
 I ARM D      11.15     34.63    0.322                 0.0     0.5       7.0                      I
 I ARM E       0.00     11.38    0.000                 0.0     0.0       0.0                      I
 I                                                                                              I
 ----------------------------------------------------------------------------------------------

 ----------------------------------------------------------------------------------------------
 I  TIME      DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY    FLOW      QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/   I
 I                                (RFC)    (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT)  TIME SEGMENT) I
 I 17.00-17.15                                                                                 I
 I ARM A      10.64     30.08    0.354                 0.4     0.5       8.0                      I
 I ARM B       0.85     29.06    0.029                 0.0     0.0       0.4                      I
 I ARM C       1.78     32.18    0.055                 0.0     0.1       0.9                      I
 I ARM D      13.31     34.53    0.386                 0.5     0.6       9.2                      I
 I ARM E       0.00     10.37    0.000                 0.0     0.0       0.0                      I
 I                                                                                              I
 ----------------------------------------------------------------------------------------------
```

```
---------------------------------------------------------------------------------------------------------------
I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
I            (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                  (RFC)  (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 17.15-17.30                                                                                    I
I ARM A        13.03     29.99    0.435                0.5     0.8      11.2                       I
I ARM B         1.04     27.30    0.038                0.0     0.0       0.6                       I
I ARM C         2.18     30.44    0.071                0.1     0.1       1.1                       I
I ARM D        16.31     34.39    0.474                0.6     0.9      13.2                       I
I ARM E         0.00      8.97    0.000                0.0     0.0       0.0                       I
I                                                                                                I
---------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------
I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
I            (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                  (RFC)  (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 17.30-17.45                                                                                    I
I ARM A        13.03     29.99    0.435                0.8     0.8      11.5                       I
I ARM B         1.04     27.29    0.038                0.0     0.0       0.6                       I
I ARM C         2.18     30.43    0.071                0.1     0.1       1.2                       I
I ARM D        16.31     34.39    0.474                0.9     0.9      13.5                       I
I ARM E         0.00      8.97    0.000                0.0     0.0       0.0                       I
I                                                                                                I
---------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------
I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
I            (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                  (RFC)  (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 17.45-18.00                                                                                    I
I ARM A        10.64     30.08    0.354                0.8     0.6       8.4                       I
I ARM B         0.85     29.04    0.029                0.0     0.0       0.5                       I
I ARM C         1.78     32.17    0.055                0.1     0.1       0.9                       I
I ARM D        13.31     34.53    0.386                0.9     0.6       9.6                       I
I ARM E         0.00     10.35    0.000                0.0     0.0       0.0                       I
I                                                                                                I
---------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------
I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
I            (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE    (VEH.MIN/       (VEH.MIN/    I
I                                  (RFC)  (PEDS/MIN) (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 18.00-18.15                                                                                    I
I ARM A         8.91     30.14    0.296                0.6     0.4       6.4                       I
I ARM B         0.71     30.32    0.024                0.0     0.0       0.4                       I
I ARM C         1.49     33.44    0.044                0.1     0.0       0.7                       I
I ARM D        11.15     34.63    0.322                0.6     0.5       7.3                       I
I ARM E         0.00     11.37    0.000                0.0     0.0       0.0                       I
I                                                                                                I
---------------------------------------------------------------------------------------------------------------

QUEUE AT ARM A
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.4
  17.15           0.5  *
  17.30           0.8  *
  17.45           0.8  *
  18.00           0.6  *
  18.15           0.4


QUEUE AT ARM B
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.0
  17.15           0.0
  17.30           0.0
  17.45           0.0
  18.00           0.0
  18.15           0.0
```

```
 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.0
   17.15           0.1
   17.30           0.1
   17.45           0.1
   18.00           0.1
   18.15           0.0


 QUEUE AT ARM D
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.5
   17.15           0.6   *
   17.30           0.9   *
   17.45           0.9   *
   18.00           0.6   *
   18.15           0.5


 QUEUE AT ARM E
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.0
   17.15           0.0
   17.30           0.0
   17.45           0.0
   18.00           0.0
   18.15           0.0


                QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                --------------------------------------------

 -------------------------------------------------------------------------------
 I  ARM  I   TOTAL DEMAND   I      * QUEUEING *      I  * INCLUSIVE QUEUEING *  I
 I       I                  I       * DELAY *        I          * DELAY *       I
 I       I--------------------------------------------------------------------I
 I       I  (VEH)   (VEH/H) I  (MIN)     (MIN/VEH)   I    (MIN)       (MIN/VEH)  I
 -------------------------------------------------------------------------------
 I   A   I  977.7 I  651.8 I   51.7 I    0.05     I      51.7  I    0.05     I
 I   B   I   78.2 I   52.1 I    2.8 I    0.04     I       2.8  I    0.04     I
 I   C   I  163.2 I  108.8 I    5.4 I    0.03     I       5.4  I    0.03     I
 I   D   I 1223.1 I  815.4 I   59.7 I    0.05     I      59.7  I    0.05     I
 I   E   I    0.0 I    0.0 I    0.0 I    0.00     I       0.0  I    0.00     I
 -------------------------------------------------------------------------------
 I  ALL  I 2442.1 I 1628.1 I  119.7 I    0.05     I     119.7  I    0.05     I
 -------------------------------------------------------------------------------

 * 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 15:47:03 on 28/04/2004]
```

```
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 Run with file:- "r:\MDE0133\Tr\Ar\South Bank Road\0007ASH.vai" at 15:47:40 on Wednesday, 28 April 2004


 ROUNDABOUT CAPACITY AND DELAY
 *****************************



 RUN TITLE
 *********
  Sean Moore Road / South Bank Road - Existing AM Peak 2003 with "Plant" Traffic



 INPUT DATA
 **********
 ARM A - EastLink Road
 ARM B - South Bank Road (Pigeon Hse Rd)
 ARM C - South Bank Road
 ARM D - Sean Moore Road
 ARM E - Pigeon House Road


 GEOMETRIC DATA
 --------------


 ---------------------------------------------------------------------------------------------------------------------
 I ARM    I   V (M)    I    E (M)    I    L (M)    I    R (M)    I   D (M)    I   PHI (DEG)  I  SLOPE  I INTERCEPT (PCU/MIN)
 ---------------------------------------------------------------------------------------------------------------------
 I ARM A I    5.60    I    8.60    I    5.00    I   13.00    I   55.00    I     22.0     I  0.641  I        33.516
 I ARM B I    7.20    I    8.90    I    3.60    I   30.00    I   55.00    I     29.0     I  0.723  I        40.565
 I ARM C I    7.20    I    9.20    I   10.00    I   30.00    I   55.00    I     25.0     I  0.764  I        43.949
 I ARM D I    7.40    I    9.20    I   15.00    I   18.00    I   55.00    I     63.0     I  0.664  I        38.668
 I ARM E I    3.00    I    4.20    I    0.00    I   10.00    I   55.00    I     79.0     I  0.396  I        16.566
 ---------------------------------------------------------------------------------------------------------------------

 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 08.00 AND ENDS 09.30

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

```
-----------------------------------------------------------------------------------
TRL              TRL VIEWER    2.0 AB R:\MDE0133\Tr\Ar\South Bank Road\0007ASH.vao - Page 2
-----------------------------------------------------------------------------------

 DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA


 ----------------------------------------------------------------------------------
 I        I  NUMBER OF MINUTES FROM START WHEN      I   RATE OF FLOW (VEH/MIN)  I
 I  ARM   I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I        I   TO RISE   I  IS REACHED IFALLING    I  PEAK  I OF PEAK I PEAK   I
 ----------------------------------------------------------------------------------
 I ARM A I      15.00    I      45.00    I      75.00    I 10.55  I  15.83   I 10.55 I
 I ARM B I      15.00    I      45.00    I      75.00    I  0.46  I   0.69   I  0.46 I
 I ARM C I      15.00    I      45.00    I      75.00    I  0.98  I   1.46   I  0.98 I
 I ARM D I      15.00    I      45.00    I      75.00    I 11.02  I  16.54   I 11.02 I
 I ARM E I      15.00    I      45.00    I      75.00    I  0.00  I   0.00   I  0.00 I
 ----------------------------------------------------------------------------------



 ----------------------------------------------------------------------------------
 I                     I         TURNING PROPORTIONS                              I
 I                     I         TURNING COUNTS (VEH/HR)                          I
 I                     I        (PERCENTAGE OF H.V.S)                             I
 I                     ------------------------------------------------------------
 I         TIME        I FROM/TO I  ARM A I  ARM B I  ARM C I  ARM D I  ARM E I
 ----------------------------------------------------------------------------------
 I   08.00 - 09.30     I         I        I        I        I        I        I
 I                     I  ARM A  I  0.000 I  0.019 I  0.092 I  0.889 I  0.000 I
 I                     I         I    0.0 I   16.0 I   78.0 I  750.0 I    0.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I        I        I
 I                     I  ARM B  I  0.622 I  0.000 I  0.162 I  0.216 I  0.000 I
 I                     I         I   23.0 I    0.0 I    6.0 I    8.0 I    0.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I        I        I
 I                     I  ARM C  I  0.462 I  0.026 I  0.000 I  0.513 I  0.000 I
 I                     I         I   36.0 I    2.0 I    0.0 I   40.0 I    0.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I        I        I
 I                     I  ARM D  I  0.865 I  0.011 I  0.124 I  0.000 I  0.000 I
 I                     I         I  763.0 I   10.0 I  109.0 I    0.0 I    0.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I        I        I
 I                     I  ARM E  I  0.000 I  0.000 I  0.000 I  0.000 I  0.000 I
 I                     I         I??????? I??????? I??????? I??????? I??????? I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I        I        I
 ----------------------------------------------------------------------------------
 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
          ----------------------------------------------------------


 -------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/   I
 I                                (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.00-08.15                                                                                      I
 I ARM A       10.55     29.50   0.358                   0.0     0.6        8.1                     I
 I ARM B        0.46     28.44   0.016                   0.0     0.0        0.2                     I
 I ARM C        0.98     32.52   0.030                   0.0     0.0        0.5                     I
 I ARM D       11.02     34.65   0.318                   0.0     0.5        6.8                     I
 I ARM E        0.00     11.45   0.000                   0.0     0.0        0.0                     I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/   I
 I                                (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.15-08.30                                                                                      I
 I ARM A       12.60     29.31   0.430                   0.6     0.7       11.0                     I
 I ARM B        0.55     26.77   0.021                   0.0     0.0        0.3                     I
 I ARM C        1.16     31.06   0.037                   0.0     0.0        0.6                     I
 I ARM D       13.16     34.55   0.381                   0.5     0.6        9.1                     I
 I ARM E        0.00     10.44   0.000                   0.0     0.0        0.0                     I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------
```

```
 -------------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND   CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE   QUEUE     (VEH.MIN/      (VEH.MIN/     I
 I                                   (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT)  I
 I 08.30-08.45                                                                                          I
 I ARM A       15.43      29.05    0.531                   0.7     1.1        16.4                      I
 I ARM B        0.68      24.51    0.028                   0.0     0.0         0.4                      I
 I ARM C        1.43      29.06    0.049                   0.0     0.1         0.8                      I
 I ARM D       16.12      34.41    0.469                   0.6     0.9        12.9                      I
 I ARM E        0.00       9.07    0.000                   0.0     0.0         0.0                      I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND   CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE   QUEUE     (VEH.MIN/      (VEH.MIN/     I
 I                                   (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT)  I
 I 08.45-09.00                                                                                          I
 I ARM A       15.43      29.05    0.531                   1.1     1.1        16.9                      I
 I ARM B        0.68      24.49    0.028                   0.0     0.0         0.4                      I
 I ARM C        1.43      29.05    0.049                   0.1     0.1         0.8                      I
 I ARM D       16.12      34.41    0.469                   0.9     0.9        13.2                      I
 I ARM E        0.00       9.06    0.000                   0.0     0.0         0.0                      I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND   CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE   QUEUE     (VEH.MIN/      (VEH.MIN/     I
 I                                   (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT)  I
 I 09.00-09.15                                                                                          I
 I ARM A       12.60      29.31    0.430                   1.1     0.8        11.6                      I
 I ARM B        0.55      26.74    0.021                   0.0     0.0         0.3                      I
 I ARM C        1.16      31.03    0.038                   0.1     0.0         0.6                      I
 I ARM D       13.16      34.55    0.381                   0.9     0.6         9.4                      I
 I ARM E        0.00      10.43    0.000                   0.0     0.0         0.0                      I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND   CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE   QUEUE     (VEH.MIN/      (VEH.MIN/     I
 I                                   (RFC)    (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT)  I
 I 09.15-09.30                                                                                          I
 I ARM A       10.55      29.50    0.358                   0.8     0.6         8.5                      I
 I ARM B        0.46      28.40    0.016                   0.0     0.0         0.3                      I
 I ARM C        0.98      32.49    0.030                   0.0     0.0         0.5                      I
 I ARM D       11.02      34.65    0.318                   0.6     0.5         7.1                      I
 I ARM E        0.00      11.43    0.000                   0.0     0.0         0.0                      I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------------

 QUEUE AT ARM A
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.6   *
   08.30           0.7   *
   08.45           1.1   *
   09.00           1.1   *
   09.15           0.8   *
   09.30           0.6   *


 QUEUE AT ARM B
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.0
   08.30           0.0
   08.45           0.0
   09.00           0.0
   09.15           0.0
   09.30           0.0
```

```
 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.0
   08.30           0.0
   08.45           0.1
   09.00           0.1
   09.15           0.0
   09.30           0.0


 QUEUE AT ARM D
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.5
   08.30           0.6   *
   08.45           0.9   *
   09.00           0.9   *
   09.15           0.6   *
   09.30           0.5


 QUEUE AT ARM E
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.0
   08.30           0.0
   08.45           0.0
   09.00           0.0
   09.15           0.0
   09.30           0.0


                 QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                 -------------------------------------------

 ---------------------------------------------------------------------------
 I  ARM   I   TOTAL DEMAND  I     * QUEUEING *     I  * INCLUSIVE QUEUEING *  I
 I        I                 I       * DELAY *      I        * DELAY *         I
 I        I---------------------------------------------------------------------I
 I        I  (VEH)   (VEH/H) I  (MIN)    (MIN/VEH) I     (MIN)       (MIN/VEH) I
 ---------------------------------------------------------------------------
 I   A    I 1157.3 I  771.5 I    72.6 I    0.06    I      72.6  I     0.06    I
 I   B    I   50.7 I   33.8 I     2.0 I    0.04    I       2.0  I     0.04    I
 I   C    I  107.0 I   71.3 I     3.6 I    0.03    I       3.6  I     0.03    I
 I   D    I 1209.4 I  806.3 I    58.5 I    0.05    I      58.5  I     0.05    I
 I   E    I    0.0 I    0.0 I     0.0 I    0.00    I       0.0  I     0.00    I
 ---------------------------------------------------------------------------
 I  ALL   I 2524.4 I 1682.9 I   136.7 I    0.05    I     136.7  I     0.05    I
 ---------------------------------------------------------------------------

 * 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 15:48:07 on 28/04/2004]
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                         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
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 Run with file:- "r:\MDE0133\Tr\Ar\South Bank Road\0008ASH.vai" at 15:48:40 on Wednesday, 28 April 2004


 ROUNDABOUT CAPACITY AND DELAY
 *****************************



 RUN TITLE
 *********
  Sean Moore Road / South Bank Road - Existing PM Peak 2003 with "Plant" Traffic



 INPUT DATA
 **********
 ARM A - EastLink Road
 ARM B - South Bank Road (Pigeon Hse Rd)
 ARM C - South Bank Road
 ARM D - Sean Moore Road
 ARM E - Pigeon House Road


 GEOMETRIC DATA
 --------------



 -----------------------------------------------------------------------------------------------------------------------
 I ARM   I   V (M)   I    E (M)   I    L (M)   I    R (M)   I   D (M)   I   PHI (DEG)  I  SLOPE  I INTERCEPT (PCU/MIN)
 -----------------------------------------------------------------------------------------------------------------------
 I ARM A I    5.60   I     8.60   I     5.00   I    13.00   I   55.00   I     22.0     I  0.641  I        33.516
 I ARM B I    7.20   I     8.90   I     3.60   I    30.00   I   55.00   I     29.0     I  0.723  I        40.565
 I ARM C I    7.20   I     9.20   I    10.00   I    30.00   I   55.00   I     25.0     I  0.764  I        43.949
 I ARM D I    7.40   I     9.20   I    15.00   I    18.00   I   55.00   I     63.0     I  0.664  I        38.668
 I ARM E I    3.00   I     4.20   I     0.00   I    10.00   I   55.00   I     79.0     I  0.396  I        16.566
 -----------------------------------------------------------------------------------------------------------------------

 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 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


 ---------------------------------------------------------------------------
 I       I   NUMBER OF MINUTES FROM START WHEN      I   RATE OF FLOW (VEH/MIN) I
 I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I       I   TO RISE   I  IS REACHED IFALLING    I  PEAK  I OF PEAK I PEAK  I
 ---------------------------------------------------------------------------
 I ARM A I      15.00  I      45.00  I      75.00  I  9.09  I  13.63  I  9.09 I
 I ARM B I      15.00  I      45.00  I      75.00  I  0.71  I   1.07  I  0.71 I
 I ARM C I      15.00  I      45.00  I      75.00  I  1.94  I   2.91  I  1.94 I
 I ARM D I      15.00  I      45.00  I      75.00  I 11.43  I  17.14  I 11.43 I
 I ARM E I      15.00  I      45.00  I      75.00  I  0.00  I   0.00  I  0.00 I
 ---------------------------------------------------------------------------



 ---------------------------------------------------------------------------
 I                    I         TURNING PROPORTIONS                          I
 I                    I         TURNING COUNTS (VEH/HR)                      I
 I                    I        (PERCENTAGE OF H.V.S)                         I
 I                    ------------------------------------------------------
 I        TIME        I FROM/TO I  ARM A I  ARM B I  ARM C I  ARM D I  ARM E I
 ---------------------------------------------------------------------------
 I   16.45 - 18.15    I         I        I        I        I        I        I
 I                    I  ARM A  I  0.000 I  0.029 I  0.098 I  0.873 I  0.000 I
 I                    I         I    0.0 I   21.0 I   71.0 I  635.0 I    0.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I        I        I
 I                    I  ARM B  I  0.456 I  0.000 I  0.175 I  0.368 I  0.000 I
 I                    I         I   26.0 I    0.0 I   10.0 I   21.0 I    0.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I        I        I
 I                    I  ARM C  I  0.329 I  0.000 I  0.000 I  0.671 I  0.000 I
 I                    I         I   51.0 I    0.0 I    0.0 I  104.0 I    0.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I        I        I
 I                    I  ARM D  I  0.931 I  0.009 I  0.060 I  0.000 I  0.000 I
 I                    I         I  851.0 I    8.0 I   55.0 I    0.0 I    0.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I        I        I
 I                    I  ARM E  I  0.000 I  0.000 I  0.000 I  0.000 I  0.000 I
 I                    I         I??????? I??????? I??????? I??????? I??????? I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I        I        I
 ---------------------------------------------------------------------------
 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
         ---------------------------------------------------------


 -----------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/   I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT)  TIME SEGMENT) I
 I 16.45-17.00                                                                                  I
 I ARM A        9.09     29.97   0.303                  0.0     0.4        6.4                  I
 I ARM B        0.71     30.02   0.024                  0.0     0.0        0.4                  I
 I ARM C        1.94     33.46   0.058                  0.0     0.1        0.9                  I
 I ARM D       11.43     34.51   0.331                  0.0     0.5        7.3                  I
 I ARM E        0.00     11.19   0.000                  0.0     0.0        0.0                  I
 I                                                                                              I
 -----------------------------------------------------------------------------------------------

 -----------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/   I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT)  TIME SEGMENT) I
 I 17.00-17.15                                                                                  I
 I ARM A       10.85     29.87   0.363                  0.4     0.6        8.4                  I
 I ARM B        0.85     28.67   0.030                  0.0     0.0        0.5                  I
 I ARM C        2.31     32.18   0.072                  0.1     0.1        1.1                  I
 I ARM D       13.64     34.39   0.397                  0.5     0.7        9.7                  I
 I ARM E        0.00     10.13   0.000                  0.0     0.0        0.0                  I
 I                                                                                              I
 -----------------------------------------------------------------------------------------------
```

```
----------------------------------------------------------------------------------------------------------
I  TIME        DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
I             (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
I                                  (RFC)   (PEDS/MIN)  (VEHS) (VEHS) TIME SEGMENT) TIME SEGMENT)  I
I 17.15-17.30                                                                                     I
I ARM A        13.29     29.73    0.447                  0.6    0.8      11.8                     I
I ARM B         1.04     26.83    0.039                  0.0    0.0       0.6                     I
I ARM C         2.83     30.44    0.093                  0.1    0.1       1.5                     I
I ARM D        16.71     34.22    0.488                  0.7    0.9      13.9                     I
I ARM E         0.00      8.69    0.000                  0.0    0.0       0.0                     I
I                                                                                                 I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME        DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
I             (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
I                                  (RFC)   (PEDS/MIN)  (VEHS) (VEHS) TIME SEGMENT) TIME SEGMENT)  I
I 17.30-17.45                                                                                     I
I ARM A        13.29     29.73    0.447                  0.8    0.8      12.1                     I
I ARM B         1.04     26.82    0.039                  0.0    0.0       0.6                     I
I ARM C         2.83     30.43    0.093                  0.1    0.1       1.5                     I
I ARM D        16.71     34.22    0.488                  0.9    1.0      14.2                     I
I ARM E         0.00      8.68    0.000                  0.0    0.0       0.0                     I
I                                                                                                 I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME        DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
I             (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
I                                  (RFC)   (PEDS/MIN)  (VEHS) (VEHS) TIME SEGMENT) TIME SEGMENT)  I
I 17.45-18.00                                                                                     I
I ARM A        10.85     29.87    0.363                  0.8    0.6       8.8                     I
I ARM B         0.85     28.65    0.030                  0.0    0.0       0.5                     I
I ARM C         2.31     32.17    0.072                  0.1    0.1       1.2                     I
I ARM D        13.64     34.39    0.397                  1.0    0.7      10.1                     I
I ARM E         0.00     10.12    0.000                  0.0    0.0       0.0                     I
I                                                                                                 I
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
I  TIME        DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
I             (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
I                                  (RFC)   (PEDS/MIN)  (VEHS) (VEHS) TIME SEGMENT) TIME SEGMENT)  I
I 18.00-18.15                                                                                     I
I ARM A         9.09     29.96    0.303                  0.6    0.4       6.7                     I
I ARM B         0.71     29.99    0.024                  0.0    0.0       0.4                     I
I ARM C         1.94     33.44    0.058                  0.1    0.1       0.9                     I
I ARM D        11.43     34.51    0.331                  0.7    0.5       7.6                     I
I ARM E         0.00     11.17    0.000                  0.0    0.0       0.0                     I
I                                                                                                 I
----------------------------------------------------------------------------------------------------------

QUEUE AT ARM A
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE


  17.00           0.4
  17.15           0.6   *
  17.30           0.8   *
  17.45           0.8   *
  18.00           0.6   *
  18.15           0.4



QUEUE AT ARM B
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE


  17.00           0.0
  17.15           0.0
  17.30           0.0
  17.45           0.0
  18.00           0.0
  18.15           0.0
```

```
 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.1
   17.15           0.1
   17.30           0.1
   17.45           0.1
   18.00           0.1
   18.15           0.1


 QUEUE AT ARM D
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.5
   17.15           0.7   *
   17.30           0.9   *
   17.45           1.0   *
   18.00           0.7   *
   18.15           0.5


 QUEUE AT ARM E
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   17.00           0.0
   17.15           0.0
   17.30           0.0
   17.45           0.0
   18.00           0.0
   18.15           0.0


                 QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                 --------------------------------------------

 ----------------------------------------------------------------------------
 I  ARM  I   TOTAL DEMAND  I     * QUEUEING *     I  * INCLUSIVE QUEUEING *  I
 I       I                 I      * DELAY *       I         * DELAY *        I
 I       I-----------------------------------------------------------------I
 I       I  (VEH)   (VEH/H) I  (MIN)     (MIN/VEH) I    (MIN)       (MIN/VEH)  I
 ----------------------------------------------------------------------------
 I   A   I  996.9 I  664.6 I    54.0 I     0.05    I       54.0  I     0.05    I
 I   B   I   78.2 I   52.1 I     2.9 I     0.04    I        2.9  I     0.04    I
 I   C   I  212.5 I  141.7 I     7.2 I     0.03    I        7.2  I     0.03    I
 I   D   I 1253.3 I  835.5 I    62.7 I     0.05    I       62.7  I     0.05    I
 I   E   I    0.0 I    0.0 I     0.0 I     0.00    I        0.0  I     0.00    I
 ----------------------------------------------------------------------------
 I  ALL  I 2540.9 I 1693.9 I   126.8 I     0.05    I      126.8  I     0.05    I
 ----------------------------------------------------------------------------

 * 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 15:49:00 on 28/04/2004]
```

TranED Results Summary

```
FileName : R:\MDE0133\Tr\TED\2003 AM Peak.DAT
Title : Sean Moore Road / Beach Road Junction - 2003 AM Peak
Date : Wed,28/04/04 15:53:47

Node     Num Double
 Num Stages Cycled       1    2    3    4    5    6    7

   1       2      N     16   72
   2       3      N     31   93    0

Link     Share  Control Total Demand Actual Ave. Sat Capacity Degree  Mean
Num.      Type     Type Green   Flow   Flow      Flow           Satn Max Q

  11 STANDARD SIGNAL       48    722      722      2387      975     74    20
  12 STANDARD SIGNAL       56    408      408      1832      868     47     9
  13 STANDARD SIGNAL       48    262      262      3825     1541     17     8
  14 STANDARD SIG+PRI     112    792      792      1130      880     90    23
  18 STANDARD BNECK         0    213      214      1709     1646     13     0
  19 STANDARD BNECK         0    994      994      1709     1713     58     7
  21 STANDARD SIGNAL       21    209      209      1915      348     60     7
  22 STANDARD SIGNAL       54    607      606      3600     1637     37     2
  23 STANDARD SIGNAL       81    370      371      2019     1374     27     3
  24 STANDARD SIGNAL       19    242      242      3800      636     38     7
  27 STANDARD BNECK         0    796      795      1709     1691     47    15
  28 STANDARD BNECK         0    128      128      1709     1600      8     0
  29 STANDARD BNECK         0    242      243      1709     1735     14     0
```

TranED Results Summary

```
FileName : R:\MDE0133\Tr\TED\2003 PM Peak.DAT
Title : Sean Moore Road / Beach Road Junction - 2003 PM Peak
Date : Wed,28/04/04 15:51:31

Node    Num Double
 Num Stages Cycled      1    2    3    4    5    6    7

   1      2      N    107    7
   2      3      N     17   63   93

Link    Share  Control Total Demand Actual Ave. Sat Capacity Degree  Mean
Num.     Type     Type Green   Flow   Flow    Flow             Satn Max Q

  11 STANDARD SIGNAL      12    244    244    3600       387     63     9
  12 STANDARD SIGNAL      92    602    602    1832      1433     42     7
  13 STANDARD SIGNAL      12    335    335    3825       413     81    13
  14 STANDARD SIG+PRI    112   1008   1008    1130       969    104    65
  18 STANDARD BNECK        0    283    282    1709      1658     17     0
  19 STANDARD BNECK        0   1265   1222    1709      1697     72    13
  21 STANDARD SIGNAL      34    315    315    1915       562     56     9
  22 STANDARD SIGNAL      38    364    364    3600      1174     31    11
  23 STANDARD SIGNAL      68    277    277    2060      1204     23     2
  24 STANDARD SIGNAL      22    313    313    3800       727     43     9
  27 STANDARD BNECK        0    657    657    1709      1728     38    10
  28 STANDARD BNECK        0    116    116    1709      1657      7     0
  29 STANDARD BNECK        0    161    161    1709      1788      9     0
```

TranED Results Summary

```
FileName : R:\MDE0133\Tr\TED\2003 AM Peak with Plant Traffic.DAT
Title : Sean Moore Road / Beach Road Junction - 2003 AM Peak with Plant Traffic
Date : Wed,28/04/04 15:52:00

Node    Num Double
 Num Stages Cycled      1    2    3    4    5    6    7

   1      2      N     10   65
   2      3      N     25   87  113

Link    Share  Control Total Demand Actual Ave. Sat Capacity Degree  Mean
Num.     Type     Type Green   Flow   Flow     Flow           Satn Max Q

  11 STANDARD SIGNAL      47    727    727     2400      956     76    20
  12 STANDARD SIGNAL      57    425    425     1832      885     48    10
  13 STANDARD SIGNAL      47    262    262     3825     1541     17     8
  14 STANDARD SIG+PRI    112    797    797     1130      885     90    24
  18 STANDARD BNECK        0    213    213     1709     1775     12     0
  19 STANDARD BNECK        0    999    999     1709     1722     58     7
  21 STANDARD SIGNAL      22    226    226     1915      364     62     8
  22 STANDARD SIGNAL      54    612    612     3600     1654     37     2
  23 STANDARD SIGNAL      80    387    387     2022     1382     28     3
  24 STANDARD SIGNAL      18    242    242     3800      605     40     7
  27 STANDARD BNECK        0    813    813     1709     1693     48    16
  28 STANDARD BNECK        0    145    145     1709     1812      8     0
  29 STANDARD BNECK        0    242    242     1709     1728     14     0
```

TranED Results Summary

```
FileName : R:\MDE0133\Tr\TED\2003 PM Peak with Plant Traffic.DAT
Title : Sean Moore Road / Beach Road Junction - 2003 PM Peak with Plant Traffic
Date : Wed,28/04/04 15:53:29

Node     Num Double
 Num Stages Cycled       1    2    3    4    5    6    7

   1       2      N     111   11
   2       3      N      35   79  112

Link     Share   Control Total Demand Actual Ave. Sat Capacity Degree  Mean
Num.      Type      Type Green   Flow   Flow     Flow             Satn Max Q

  11 STANDARD SIGNAL        12    249    249     3600      389     64      9
  12 STANDARD SIGNAL        92    619    619     1832     1406     44      7
  13 STANDARD SIGNAL        12    335    335     3825      413     81     13
  14 STANDARD SIG+PRI      112   1013   1013     1130      964    105     67
  18 STANDARD BNECK          0    283    283     1709     1664     17      0
  19 STANDARD BNECK          0   1270   1222     1709     1721     71     13
  21 STANDARD SIGNAL        33    332    332     1915      544     61     10
  22 STANDARD SIGNAL        36    369    369     3600     1118     33     12
  23 STANDARD SIGNAL        69    294    293     2057     1220     24      4
  24 STANDARD SIGNAL        25    313    313     3800      823     38      9
  27 STANDARD BNECK          0    679    679     1709     1697     40     11
  28 STANDARD BNECK          0    133    133     1709     1662      8      0
  29 STANDARD BNECK          0    161    161     1709     1788      9      0
```

```
                              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

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                                  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:- "r:\MDE0133\Tr\Ar\East Wall\0003ASH.vai" at 15:58:41 on Wednesday, 28 April 2004


ROUNDABOUT CAPACITY AND DELAY
*****************************



RUN TITLE
*********
 East Wall Road / North Wall Quay - Existing AM Peak 2003


INPUT DATA
**********
ARM A - East Wall Road
ARM B - East Link Bridge
ARM C - North Wall Quay


GEOMETRIC DATA
--------------


-------------------------------------------------------------------------------------------------------------------------
I ARM    I   V (M)    I    E (M)    I    L (M)    I    R (M)    I   D (M)    I   PHI (DEG)   I  SLOPE  I INTERCEPT (PCU/MIN)
-------------------------------------------------------------------------------------------------------------------------
I ARM A I    6.20    I    8.30    I    20.00    I    73.00    I   35.00    I      0.0      I  0.894  I          44.727
I ARM B I    3.50    I    5.40    I     0.00    I    15.00    I   35.00    I     66.0      I  0.548  I          23.419
I ARM C I    8.50    I    9.50    I     0.00    I    28.00    I   35.00    I     44.0      I  0.860  I          46.315
-------------------------------------------------------------------------------------------------------------------------

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 08.00 AND ENDS 09.30

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


DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA


-----------------------------------------------------------------------------
I        I   NUMBER OF MINUTES FROM START WHEN     I   RATE OF FLOW (VEH/MIN)  I
I  ARM   I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
I        I   TO RISE   I IS REACHED IFALLING     I  PEAK  I OF PEAK I PEAK  I
-----------------------------------------------------------------------------
I ARM A I     15.00    I     45.00    I    75.00   I  9.38  I  14.06  I  9.38 I
I ARM B I     15.00    I     45.00    I    75.00   I  8.91  I  13.37  I  8.91 I
I ARM C I     15.00    I     45.00    I    75.00   I  6.13  I   9.19  I  6.13 I
-----------------------------------------------------------------------------
```

```
 ------------------------------------------------------------------
 I                     I         TURNING PROPORTIONS          I
 I                     I         TURNING COUNTS (VEH/HR)      I
 I                     I        (PERCENTAGE OF H.V.S)         I
 I                     ----------------------------------------
 I         TIME        I FROM/TO I  ARM A I  ARM B I  ARM C I
 ------------------------------------------------------------------
 I   08.00 - 09.30     I         I        I        I        I
 I                     I  ARM A  I  0.000 I  0.775 I  0.225 I
 I                     I         I    0.0 I  581.0 I  169.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I
 I                     I  ARM B  I  0.827 I  0.000 I  0.173 I
 I                     I         I  590.0 I    0.0 I  123.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I
 I                     I  ARM C  I  0.441 I  0.559 I  0.000 I
 I                     I         I  216.0 I  274.0 I    0.0 I
 I                     I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                     I         I        I        I        I
 ------------------------------------------------------------------
 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
          ------------------------------------------------------


 -------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE  QUEUE     (VEH.MIN/       (VEH.MIN/    I
 I                                (RFC)     (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.00-08.15                                                                                      I
 I ARM A       9.38     37.61    0.249                   0.0    0.3        4.9                      I
 I ARM B       8.91     20.13    0.443                   0.0    0.8       11.4                      I
 I ARM C       6.13     35.80    0.171                   0.0    0.2        3.0                      I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE  QUEUE     (VEH.MIN/       (VEH.MIN/    I
 I                                (RFC)     (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.15-08.30                                                                                      I
 I ARM A      11.19     37.01    0.302                   0.3    0.4        6.4                      I
 I ARM B      10.64     19.91    0.535                   0.8    1.1       16.4                      I
 I ARM C       7.31     34.55    0.212                   0.2    0.3        4.0                      I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE  QUEUE     (VEH.MIN/       (VEH.MIN/    I
 I                                (RFC)     (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.30-08.45                                                                                      I
 I ARM A      13.71     36.19    0.379                   0.4    0.6        9.0                      I
 I ARM B      13.03     19.60    0.665                   1.1    1.9       27.4                      I
 I ARM C       8.96     32.87    0.273                   0.3    0.4        5.5                      I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE  QUEUE     (VEH.MIN/       (VEH.MIN/    I
 I                                (RFC)     (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 08.45-09.00                                                                                      I
 I ARM A      13.71     36.18    0.379                   0.6    0.6        9.1                      I
 I ARM B      13.03     19.60    0.665                   1.9    2.0       29.2                      I
 I ARM C       8.96     32.83    0.273                   0.4    0.4        5.6                      I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I           (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE  QUEUE     (VEH.MIN/       (VEH.MIN/    I
 I                                (RFC)     (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 09.00-09.15                                                                                      I
 I ARM A      11.19     37.00    0.303                   0.6    0.4        6.6                      I
 I ARM B      10.64     19.91    0.535                   2.0    1.2       18.2                      I
 I ARM C       7.31     34.50    0.212                   0.4    0.3        4.1                      I
 I                                                                                                  I
 -------------------------------------------------------------------------------------------------------------
```

```
 -----------------------------------------------------------------------------------------------------------
 I  TIME      DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
 I          (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/   I
 I                                (RFC)   (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
 I 09.15-09.30                                                                                    I
 I ARM A       9.38     37.60    0.249                  0.4    0.3       5.1                      I
 I ARM B       8.91     20.13    0.443                  1.2    0.8      12.4                      I
 I ARM C       6.13     35.75    0.171                  0.3    0.2       3.1                      I
 I                                                                                                I
 -----------------------------------------------------------------------------------------------------------


 QUEUE AT ARM A
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15          0.3
   08.30          0.4
   08.45          0.6   *
   09.00          0.6   *
   09.15          0.4
   09.30          0.3


 QUEUE AT ARM B
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15          0.8   *
   08.30          1.1   *
   08.45          1.9   **
   09.00          2.0   **
   09.15          1.2   *
   09.30          0.8   *


 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15          0.2
   08.30          0.3
   08.45          0.4
   09.00          0.4
   09.15          0.3
   09.30          0.2



                 QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                 --------------------------------------------

 ---------------------------------------------------------------------------
 I  ARM  I   TOTAL DEMAND  I      * QUEUEING *     I  * INCLUSIVE QUEUEING *  I
 I       I                 I       * DELAY *       I          * DELAY *       I
 I       I-------------------------------------------------------------------I
 I       I  (VEH)   (VEH/H) I  (MIN)     (MIN/VEH) I    (MIN)       (MIN/VEH) I
 ---------------------------------------------------------------------------
 I   A   I 1028.4 I  685.6 I   41.1 I    0.04    I     41.1  I     0.04     I
 I   B   I  977.7 I  651.8 I  115.0 I    0.12    I    115.0  I     0.12     I
 I   C   I  671.9 I  447.9 I   25.4 I    0.04    I     25.4  I     0.04     I
 ---------------------------------------------------------------------------
 I  ALL  I 2678.0 I 1785.3 I  181.4 I    0.07    I    181.5  I     0.07     I
 ---------------------------------------------------------------------------

 * 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 15:59:17 on 28/04/2004]
```

```
                         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
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          --------------------------------------------------------


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:- "r:\MDE0133\Tr\Ar\East Wall\0004ASH.vai" at 15:59:39 on Wednesday, 28 April 2004


ROUNDABOUT CAPACITY AND DELAY
*****************************



RUN TITLE
*********
 East Wall Road / North Wall Quay - Existing PM Peak 2003



INPUT DATA
**********
ARM A - East Wall Road
ARM B - East Link Bridge
ARM C - North Wall Quay


GEOMETRIC DATA
--------------


----------------------------------------------------------------------------------------------------------------------
I ARM   I  V (M)   I   E (M)   I    L (M)   I    R (M)   I   D (M)   I   PHI (DEG)  I  SLOPE  I INTERCEPT (PCU/MIN)
----------------------------------------------------------------------------------------------------------------------
I ARM A I   6.20   I    8.30   I   20.00    I   73.00    I   35.00   I      0.0     I  0.894  I          44.727
I ARM B I   3.50   I    5.40   I    0.00    I   15.00    I   35.00   I     66.0     I  0.548  I          23.419
I ARM C I   8.50   I    9.50   I    0.00    I   28.00    I   35.00   I     44.0     I  0.860  I          46.315
----------------------------------------------------------------------------------------------------------------------

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 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


------------------------------------------------------------------------------
I       I  NUMBER OF MINUTES FROM START WHEN     I    RATE OF FLOW (VEH/MIN) I
I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
I       I  TO RISE    I  IS REACHED IFALLING    I  PEAK  I OF PEAK I PEAK  I
------------------------------------------------------------------------------
I ARM A I     15.00   I     45.00   I     75.00  I 11.39  I  17.08  I 11.39 I
I ARM B I     15.00   I     45.00   I     75.00  I 11.68  I  17.51  I 11.68 I
I ARM C I     15.00   I     45.00   I     75.00  I  5.14  I   7.71  I  5.14 I
------------------------------------------------------------------------------
```

```
 ------------------------------------------------------------------
 I                       I          TURNING PROPORTIONS            I
 I                       I          TURNING COUNTS (VEH/HR)        I
 I                       I         (PERCENTAGE OF H.V.S)           I
 I                        ------------------------------------------
 I         TIME          I FROM/TO I  ARM A I  ARM B I  ARM C I
 ------------------------------------------------------------------
 I   16.45 - 18.15       I         I        I        I        I
 I                       I  ARM A  I  0.000 I  0.711 I  0.289 I
 I                       I         I    0.0 I  648.0 I  263.0 I
 I                       I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                       I         I        I        I        I
 I                       I  ARM B  I  0.801 I  0.000 I  0.199 I
 I                       I         I  748.0 I    0.0 I  186.0 I
 I                       I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                       I         I        I        I        I
 I                       I  ARM C  I  0.528 I  0.472 I  0.000 I
 I                       I         I  217.0 I  194.0 I    0.0 I
 I                       I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                       I         I        I        I        I
 ------------------------------------------------------------------
 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
           -------------------------------------------------------------


 -------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END        DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE     (VEH.MIN/        (VEH.MIN/   I
 I                                  (RFC)    (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)   TIME SEGMENT)  I
 I 16.45-17.00                                                                                          I
 I ARM A        11.39     38.50   0.296                   0.0    0.4        6.2                         I
 I ARM B        11.68     19.49   0.599                   0.0    1.5       20.7                         I
 I ARM C         5.14     34.13   0.151                   0.0    0.2        2.6                         I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END        DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE     (VEH.MIN/        (VEH.MIN/   I
 I                                  (RFC)    (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)   TIME SEGMENT)  I
 I 17.00-17.15                                                                                          I
 I ARM A        13.60     38.07   0.357                   0.4    0.6        8.2                         I
 I ARM B        13.94     19.14   0.728                   1.5    2.6       35.9                         I
 I ARM C         6.13     32.56   0.188                   0.2    0.2        3.4                         I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END        DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE     (VEH.MIN/        (VEH.MIN/   I
 I                                  (RFC)    (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)   TIME SEGMENT)  I
 I 17.15-17.30                                                                                          I
 I ARM A        16.65     37.49   0.444                   0.6    0.8       11.7                         I
 I ARM B        17.07     18.66   0.915                   2.6    7.9       95.6                         I
 I ARM C         7.51     30.60   0.246                   0.2    0.3        4.8                         I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END        DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE     (VEH.MIN/        (VEH.MIN/   I
 I                                  (RFC)    (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)   TIME SEGMENT)  I
 I 17.30-17.45                                                                                          I
 I ARM A        16.65     37.49   0.444                   0.8    0.8       11.9                         I
 I ARM B        17.07     18.65   0.915                   7.9    9.0      128.0                         I
 I ARM C         7.51     30.40   0.247                   0.3    0.3        4.9                         I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------

 -------------------------------------------------------------------------------------------------------
 I  TIME        DEMAND  CAPACITY  DEMAND/    PEDESTRIAN  START   END        DELAY        GEOMETRIC DELAYI
 I             (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE     (VEH.MIN/        (VEH.MIN/   I
 I                                  (RFC)    (PEDS/MIN)  (VEHS) (VEHS)  TIME SEGMENT)   TIME SEGMENT)  I
 I 17.45-18.00                                                                                          I
 I ARM A        13.60     38.07   0.357                   0.8    0.6        8.5                         I
 I ARM B        13.94     19.13   0.729                   9.0    2.8       50.3                         I
 I ARM C         6.13     32.22   0.190                   0.3    0.2        3.6                         I
 I                                                                                                      I
 -------------------------------------------------------------------------------------------------------
```

```
-----------------------------------------------------------------------------------------------------------
I  TIME         DEMAND   CAPACITY  DEMAND/    PEDESTRIAN  START    END        DELAY       GEOMETRIC DELAYI
I              (VEH/MIN) (VEH/MIN) CAPACITY      FLOW     QUEUE   QUEUE     (VEH.MIN/        (VEH.MIN/   I
I                                    (RFC)    (PEDS/MIN) (VEHS)  (VEHS)   TIME SEGMENT)   TIME SEGMENT) I
I 18.00-18.15                                                                                           I
I ARM A        11.39     38.49     0.296                    0.6     0.4        6.4                      I
I ARM B        11.68     19.49     0.599                    2.8     1.5       24.1                      I
I ARM C         5.14     34.01     0.151                    0.2     0.2        2.7                      I
I                                                                                                       I
-----------------------------------------------------------------------------------------------------------

QUEUE AT ARM A
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.4
  17.15           0.6  *
  17.30           0.8  *
  17.45           0.8  *
  18.00           0.6  *
  18.15           0.4


QUEUE AT ARM B
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           1.5  *
  17.15           2.6  ***
  17.30           7.9  ********
  17.45           9.0  *********
  18.00           2.8  ***
  18.15           1.5  **


QUEUE AT ARM C
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.2
  17.15           0.2
  17.30           0.3
  17.45           0.3
  18.00           0.2
  18.15           0.2


                 QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                 -------------------------------------------

-------------------------------------------------------------------------------------
I  ARM  I   TOTAL DEMAND   I     * QUEUEING *      I   * INCLUSIVE QUEUEING *   I
I       I                  I      * DELAY *        I          * DELAY *         I
I       I---------------------------------------------------------------------------I
I       I  (VEH)   (VEH/H) I  (MIN)    (MIN/VEH)   I   (MIN)       (MIN/VEH)    I
-------------------------------------------------------------------------------------
I   A   I 1249.2 I  832.8 I    52.9 I    0.04     I     52.9  I     0.04      I
I   B   I 1280.7 I  853.8 I   354.6 I    0.28     I    354.6  I     0.28      I
I   C   I  563.6 I  375.7 I    22.0 I    0.04     I     22.0  I     0.04      I
-------------------------------------------------------------------------------------
I  ALL  I 3093.5 I 2062.3 I   429.5 I    0.14     I    429.6  I     0.14      I
-------------------------------------------------------------------------------------

* 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 15:59:57 on 28/04/2004]
```

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---------------------------------------------------------------------------------
TRL               TRL VIEWER    2.0 AB R:\MDE0133\Tr\Ar\East Wall\0009WPR.vao - Page 1
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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
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 Run with file:- "r:\MDE0133\Tr\Ar\East Wall\0009WPR.vai" at 16:00:18 on Wednesday, 28 April 2004


 ROUNDABOUT CAPACITY AND DELAY
 *****************************



 RUN TITLE
 *********
  East Wall Road / North Wall Quay - Existing AM Peak 2003 with Plant



 INPUT DATA
 **********
 ARM A - East Wall Road
 ARM B - East Link Bridge
 ARM C - North Wall Quay


 GEOMETRIC DATA
 --------------


 ---------------------------------------------------------------------------------------------------------------------------
 I ARM    I   V (M)    I    E (M)    I    L (M)    I    R (M)    I   D (M)    I    PHI (DEG)   I  SLOPE   I INTERCEPT (PCU/MIN)
 ---------------------------------------------------------------------------------------------------------------------------
 I ARM A I     6.20    I     8.30    I    20.00    I    73.00    I   35.00    I       0.0      I  0.894   I        44.727
 I ARM B I     3.50    I     5.40    I     0.00    I    15.00    I   35.00    I      66.0      I  0.548   I        23.419
 I ARM C I     8.50    I     9.50    I     0.00    I    28.00    I   35.00    I      44.0      I  0.860   I        46.315
 ---------------------------------------------------------------------------------------------------------------------------

 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 08.00 AND ENDS 09.30

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


 DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA


 ----------------------------------------------------------------------------
 I       I   NUMBER OF MINUTES FROM START WHEN    I    RATE OF FLOW (VEH/MIN) I
 I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I       I   TO RISE    I  IS REACHED IFALLING    I  PEAK   I OF PEAK I PEAK   I
 ----------------------------------------------------------------------------
 I ARM A I     15.00    I     45.00    I    75.00   I  9.55  I  14.33  I  9.55 I
 I ARM B I     15.00    I     45.00    I    75.00   I  9.09  I  13.63  I  9.09 I
 I ARM C I     15.00    I     45.00    I    75.00   I  6.13  I   9.19  I  6.13 I
 ----------------------------------------------------------------------------
```

```
-----------------------------------------------------------------------
I                    I          TURNING PROPORTIONS          I
I                    I          TURNING COUNTS (VEH/HR)      I
I                    I         (PERCENTAGE OF H.V.S)         I
I                    ----------------------------------------
I          TIME      I FROM/TO I  ARM A  I  ARM B  I  ARM C  I
-----------------------------------------------------------------------
I    08.00 - 09.30   I         I         I         I         I
I                    I  ARM A  I  0.000  I  0.779  I  0.221  I
I                    I         I    0.0  I  595.0  I  169.0  I
I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
I                    I         I         I         I         I
I                    I  ARM B  I  0.831  I  0.000  I  0.169  I
I                    I         I  604.0  I    0.0  I  123.0  I
I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
I                    I         I         I         I         I
I                    I  ARM C  I  0.441  I  0.559  I  0.000  I
I                    I         I  216.0  I  274.0  I    0.0  I
I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
I                    I         I         I         I         I
-----------------------------------------------------------------------
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
          -------------------------------------------------------


-------------------------------------------------------------------------------------------------------
I  TIME       DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/    I
I                                 (RFC)   (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.00-08.15                                                                                      I
I ARM A         9.55     37.61    0.254                  0.0     0.3        5.0                    I
I ARM B         9.09     20.13    0.451                  0.0     0.8       11.8                    I
I ARM C         6.13     35.65    0.172                  0.0     0.2        3.1                    I
I                                                                                                  I
-------------------------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------------------------
I  TIME       DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/    I
I                                 (RFC)   (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.15-08.30                                                                                      I
I ARM A        11.40     37.01    0.308                  0.3     0.4        6.6                    I
I ARM B        10.85     19.91    0.545                  0.8     1.2       17.1                    I
I ARM C         7.31     34.37    0.213                  0.2     0.3        4.0                    I
I                                                                                                  I
-------------------------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------------------------
I  TIME       DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/    I
I                                 (RFC)   (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.30-08.45                                                                                      I
I ARM A        13.97     36.19    0.386                  0.4     0.6        9.2                    I
I ARM B        13.29     19.60    0.678                  1.2     2.0       28.9                    I
I ARM C         8.96     32.65    0.274                  0.3     0.4        5.6                    I
I                                                                                                  I
-------------------------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------------------------
I  TIME       DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/    I
I                                 (RFC)   (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 08.45-09.00                                                                                      I
I ARM A        13.97     36.18    0.386                  0.6     0.6        9.4                    I
I ARM B        13.29     19.60    0.678                  2.0     2.1       30.9                    I
I ARM C         8.96     32.61    0.275                  0.4     0.4        5.7                    I
I                                                                                                  I
-------------------------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------------------------
I  TIME       DEMAND   CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY      GEOMETRIC DELAYI
I           (VEH/MIN) (VEH/MIN) CAPACITY     FLOW      QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/    I
I                                 (RFC)   (PEDS/MIN)  (VEHS)  (VEHS)  TIME SEGMENT)  TIME SEGMENT) I
I 09.00-09.15                                                                                      I
I ARM A        11.40     37.00    0.308                  0.5     0.4        6.8                    I
I ARM B        10.85     19.91    0.545                  2.1     1.2       19.1                    I
I ARM C         7.31     34.31    0.213                  0.4     0.3        4.1                    I
I                                                                                                  I
-------------------------------------------------------------------------------------------------------
```

```
-------------------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END       DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE   QUEUE    (VEH.MIN/       (VEH.MIN/    I
 I                                 (RFC)    (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT)  TIME SEGMENT)  I
 I 09.15-09.30                                                                                      I
 I ARM A       9.55     37.60    0.254                  0.4     0.3        5.2                       I
 I ARM B       9.09     20.13    0.451                  1.2     0.8       12.9                       I
 I ARM C       6.13     35.60    0.172                  0.3     0.2        3.2                       I
 I                                                                                                  I
-------------------------------------------------------------------------------------------------------------

 QUEUE AT ARM A
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.3
   08.30           0.4
   08.45           0.6    *
   09.00           0.6    *
   09.15           0.4
   09.30           0.3


 QUEUE AT ARM B
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.8    *
   08.30           1.2    *
   08.45           2.0    **
   09.00           2.1    **
   09.15           1.2    *
   09.30           0.8    *


 QUEUE AT ARM C
 --------------

  TIME SEGMENT   NO. OF
   ENDING       VEHICLES
                IN QUEUE

   08.15           0.2
   08.30           0.3
   08.45           0.4
   09.00           0.4
   09.15           0.3
   09.30           0.2



                QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                --------------------------------------------

 -------------------------------------------------------------------------------
 I  ARM  I   TOTAL DEMAND  I     * QUEUEING *      I  * INCLUSIVE QUEUEING *  I
 I       I                 I       * DELAY *       I         * DELAY *        I
 I       I-----------------------------------------------------------------I
 I       I  (VEH)   (VEH/H) I  (MIN)     (MIN/VEH) I   (MIN)       (MIN/VEH)  I
 -------------------------------------------------------------------------------
 I   A   I 1047.6 I  698.4 I   42.2 I     0.04    I    42.2  I     0.04      I
 I   B   I  996.9 I  664.6 I  120.6 I     0.12    I   120.6  I     0.12      I
 I   C   I  671.9 I  447.9 I   25.6 I     0.04    I    25.6  I     0.04      I
 -------------------------------------------------------------------------------
 I  ALL  I 2716.4 I 1810.9 I  188.4 I     0.07    I   188.4  I     0.07      I
 -------------------------------------------------------------------------------

 * 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 16:00:47 on 28/04/2004]
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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:- "r:\MDE0133\Tr\Ar\East Wall\0010WPR.vai" at 16:01:11 on Wednesday, 28 April 2004


 ROUNDABOUT CAPACITY AND DELAY
 *****************************



 RUN TITLE
 *********
  East Wall Road / North Wall Quay - Existing PM Peak 2003 with Plant


 INPUT DATA
 **********
 ARM A - East Wall Road
 ARM B - East Link Bridge
 ARM C - North Wall Quay

 GEOMETRIC DATA
 --------------


 ------------------------------------------------------------------------------------------------------------------------
 I ARM    I  V (M)   I    E (M)   I    L (M)   I    R (M)   I   D (M)   I   PHI (DEG)  I  SLOPE  I INTERCEPT (PCU/MIN)
 ------------------------------------------------------------------------------------------------------------------------
 I ARM A I    6.20   I     8.30   I   20.00    I    73.00   I   35.00   I     0.0      I  0.894  I       44.727
 I ARM B I    3.50   I     5.40   I    0.00    I    15.00   I   35.00   I    66.0      I  0.548  I       23.419
 I ARM C I    8.50   I     9.50   I    0.00    I    28.00   I   35.00   I    44.0      I  0.860  I       46.315
 ------------------------------------------------------------------------------------------------------------------------

 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 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


 ---------------------------------------------------------------------------
 I       I   NUMBER OF MINUTES FROM START WHEN     I   RATE OF FLOW (VEH/MIN)  I
 I  ARM  I FLOW STARTS I TOP OF PEAK I FLOW STOPS I BEFORE I AT TOP  I AFTER I
 I       I   TO RISE   I  IS REACHED IFALLING    I  PEAK  I OF PEAK I PEAK  I
 ---------------------------------------------------------------------------
 I ARM A I    15.00    I    45.00    I    75.00   I 11.54  I  17.31  I 11.54 I
 I ARM B I    15.00    I    45.00    I    75.00   I 11.85  I  17.78  I 11.85 I
 I ARM C I    15.00    I    45.00    I    75.00   I  5.14  I   7.71  I  5.14 I
 ---------------------------------------------------------------------------
```

```
 ----------------------------------------------------------
 I                    I          TURNING PROPORTIONS          I
 I                    I          TURNING COUNTS (VEH/HR)      I
 I                    I         (PERCENTAGE OF H.V.S)         I
 I                    -----------------------------------------
 I        TIME        I FROM/TO I  ARM A I  ARM B I  ARM C I
 ----------------------------------------------------------
 I   16.45 - 18.15    I         I        I        I        I
 I                    I  ARM A  I  0.000 I  0.715 I  0.285 I
 I                    I         I    0.0 I  660.0 I  263.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I
 I                    I  ARM B  I  0.804 I  0.000 I  0.196 I
 I                    I         I  762.0 I    0.0 I  186.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I
 I                    I  ARM C  I  0.528 I  0.472 I  0.000 I
 I                    I         I  217.0 I  194.0 I    0.0 I
 I                    I         I ( 10.0)I ( 10.0)I ( 10.0)I
 I                    I         I        I        I        I
 ----------------------------------------------------------
 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
          -------------------------------------------------------


 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 16.45-17.00                                                                                  I
 I ARM A      11.54     38.50    0.300                  0.0     0.4      6.3                    I
 I ARM B      11.85     19.49    0.608                  0.0     1.5     21.4                    I
 I ARM C       5.14     33.99    0.151                  0.0     0.2      2.6                    I
 I                                                                                              I
 --------------------------------------------------------------------------------------------------

 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 17.00-17.15                                                                                  I
 I ARM A      13.78     38.07    0.362                  0.4     0.6      8.4                    I
 I ARM B      14.15     19.14    0.739                  1.5     2.7     37.7                    I
 I ARM C       6.13     32.38    0.189                  0.2     0.2      3.5                    I
 I                                                                                              I
 --------------------------------------------------------------------------------------------------

 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 17.15-17.30                                                                                  I
 I ARM A      16.87     37.49    0.450                  0.6     0.8     12.0                    I
 I ARM B      17.33     18.66    0.929                  2.7     8.9    104.6                    I
 I ARM C       7.51     30.42    0.247                  0.2     0.3      4.8                    I
 I                                                                                              I
 --------------------------------------------------------------------------------------------------

 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 17.30-17.45                                                                                  I
 I ARM A      16.87     37.49    0.450                  0.8     0.8     12.2                    I
 I ARM B      17.33     18.65    0.929                  8.9    10.3    144.9                    I
 I ARM C       7.51     30.20    0.249                  0.3     0.3      4.9                    I
 I                                                                                              I
 --------------------------------------------------------------------------------------------------

 --------------------------------------------------------------------------------------------------
 I  TIME       DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY       GEOMETRIC DELAYI
 I            (VEH/MIN) (VEH/MIN) CAPACITY     FLOW     QUEUE  QUEUE   (VEH.MIN/      (VEH.MIN/    I
 I                                 (RFC)   (PEDS/MIN) (VEHS)  (VEHS) TIME SEGMENT) TIME SEGMENT) I
 I 17.45-18.00                                                                                  I
 I ARM A      13.78     38.07    0.362                  0.8     0.6      8.7                    I
 I ARM B      14.15     19.13    0.740                 10.3     3.0     55.4                    I
 I ARM C       6.13     31.99    0.192                  0.3     0.2      3.6                    I
 I                                                                                              I
 --------------------------------------------------------------------------------------------------
```

```
-----------------------------------------------------------------------------------------------------
I  TIME        DEMAND  CAPACITY  DEMAND/   PEDESTRIAN  START   END      DELAY      GEOMETRIC DELAYI
I             (VEH/MIN) (VEH/MIN) CAPACITY    FLOW     QUEUE  QUEUE    (VEH.MIN/      (VEH.MIN/   I
I                                  (RFC)   (PEDS/MIN)  (VEHS) (VEHS) TIME SEGMENT)  TIME SEGMENT) I
I 18.00-18.15                                                                                     I
I ARM A       11.54     38.49    0.300                  0.6    0.4       6.5                      I
I ARM B       11.85     19.49    0.608                  3.0    1.6      25.1                      I
I ARM C        5.14     33.85    0.152                  0.2    0.2       2.7                      I
I                                                                                                 I
-----------------------------------------------------------------------------------------------------


QUEUE AT ARM A
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.4
  17.15           0.6   *
  17.30           0.8   *
  17.45           0.8   *
  18.00           0.6   *
  18.15           0.4


QUEUE AT ARM B
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           1.5   **
  17.15           2.7   ***
  17.30           8.9   *********
  17.45          10.3   **********
  18.00           3.0   ***
  18.15           1.6   **


QUEUE AT ARM C
--------------

 TIME SEGMENT   NO. OF
  ENDING       VEHICLES
               IN QUEUE

  17.00           0.2
  17.15           0.2
  17.30           0.3
  17.45           0.3
  18.00           0.2
  18.15           0.2



                QUEUEING DELAY INFORMATION OVER WHOLE PERIOD
                -------------------------------------------

-----------------------------------------------------------------------------
I  ARM  I   TOTAL DEMAND  I    * QUEUEING *     I  * INCLUSIVE QUEUEING *  I
I       I                 I     * DELAY *       I        * DELAY *         I
I       I-----------------------------------------------------------------I
I       I  (VEH)  (VEH/H) I  (MIN)    (MIN/VEH) I    (MIN)      (MIN/VEH)  I
-----------------------------------------------------------------------------
I   A   I 1265.6 I  843.8 I   54.1 I    0.04    I     54.1  I     0.04     I
I   B   I 1299.9 I  866.6 I  389.1 I    0.30    I    389.2  I     0.30     I
I   C   I  563.6 I  375.7 I   22.2 I    0.04    I     22.2  I     0.04     I
-----------------------------------------------------------------------------
I  ALL  I 3129.1 I 2086.1 I  465.4 I    0.15    I    465.4  I     0.15     I
-----------------------------------------------------------------------------

* 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 16:03:23 on 28/04/2004]
```

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Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Phases

Phase Data					
Phase Name		**Phase Type**	**Assoc Phase**	**Street Min**	**Cont Min**
A	Church Ave	Traffic		7	7
B	Londonbridge Rd Ahead Right	Traffic		7	7
C	Irishtown Rd N Right Ahead	Traffic		7	7
D	Irishtown Rd S	Traffic		7	7
E	Irishtown Rd N Left	Traffic		7	7
F	Londonbridge Rd Left	Traffic		7	7
G	Pedestrians across	Pedestrian		7	5
H	Pedestrians across	Pedestrian		6	6
I	Pedestrians across	Pedestrian		7	7
J	Irishtown Rd S Filter	Filter	D	7	0
K	Pedestrians across	Pedestrian		6	6
L	Pedestrians across	Pedestrian		6	0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 2**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
A		5	5	5			7		8	5		6
B	7		5	5	5		5			5		8
C	6	5					8		5	5		8
D	5	5					7		7		5	
E		5							5	5		
F								5				
G	6	6	6	6								
H						5						
I	8		8	8	8							
J	5	5	5		5						5	
K				6						6		
L	6	6	6									

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Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak		**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	2	3	G			2
2	2	3	L			7
3	3	1	D			1

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 4**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	Prohibited Moves To Stage			
	1	2	3	4
1				
2				
3				
4				

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project			Page 5
Location	Ringsend	File	0003WPR	SCN		Chkd
Title	2003 Existing AM Peak			Controller	Generic	Appvd

Stages

Stage Data	
Stage	**Phases In Stage**
1	AF
2	GHJL
3	CDEF
4	BFK

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 6**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Church Ave Ahead Right Left	U	A				
2/1	Londonbridge Rd Ahead Right	U	B				
2/2	Londonbridge Rd Left	U	F				
3/1	Irishtown Rd N Right Ahead	U	C				
3/2	Irishtown Rd N Left	U	E				
4/1	Irishtown Rd S Right Left Ahead	O	D	J	3/1	2	2

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 7**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn(%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Church Ave Ahead Right Left	Inf	0.00	3.25	70	13.00	1800	1795
2/1	Londonbridge Rd Left	Inf	0.00	3.00	100	32.00	1800	1829
2/2	Londonbridge Rd Ahead Right	Inf	0.00	4.25	33	20.00	1800	2127
3/1	Irishtown Rd N Left	Inf	0.00	3.25	0	Inf	1800	2080
3/2	Irishtown Rd N Right Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/1	Irishtown Rd S Left Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/2	Irishtown Rd S Right	5	0.00	3.25	0	Inf	1800	2080

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project			Page 8
Location	Ringsend	File	0003WPR	SCN		Chkd
Title	2003 Existing AM Peak			Controller	Generic	Appvd

Traffic Flows

Traffic Flows									
Grp Num	Time Start	Time End	Title	Link Number					
				1/1	2/1	2/2	3/1	3/2	4/1
1	08:15	09:15	2003 AM Peak	167	155	34	234	30	649
2	17:00	18:00	2003 PM Peak	134	225	40	251	57	335
3	08:00	09:00	2008 Am Peak with Plant	201	212	34	259	75	667
4	17:00	18:00	2008 PM Peak with Plant	168	235	41	254	145	341

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 9**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**	

Parameters Selected

Parameters Selected	
Flow Group	2003 AM Peak
Flow Group Period	08:15 to 09:15
Phase Minimum Type	Street
CycleTime	90
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings				
Stage Sequence	1	2	3	4
Stage Duration	14	18	16	10
Stage Change Point	0	21	46	75

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 10**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**
Title	2003 Existing AM Peak			**Controller**	Generic	**Appvd**

Link Results

Link Results													
Link Ref	**Link Name**	**Link Type**	**Full Phs**	**Arw Phs**	**Tot Grn**	**Dem Flow**	**Satn Flow**	**Cap pcu**	**Deg Sat%**	**Del s/pcu**	**TDel pcuh**	**Que' pcu**
1/1	Church Ave Ahead Right Left	U	A		14	167	1795	299	55.8	42.7	2.0	3.7
2/1	Londonbridge Rd Ahead Right	U	B		10	155	2127	260	59.6	48.2	2.1	3.8
2/2	Londonbridge Rd Left	U	F		60	34	1829	1240	2.7	5.1	0.0	0.3
3/1	Irishtown Rd N Right Ahead	U	C		16	234	2080	393	59.6	40.7	2.6	5.1
3/2	Irishtown Rd N Left	U	E		16	30	2080	393	7.6	31.2	0.3	0.6
4/1	Irishtown Rd S Right Left Ahead	O	D	J	49	649	1968	1093	59.4	16.2	2.9	7.4
Cycle Time 90 s				**PRC 50.9 %**				**Total Delay 9.9 PCUh**				

Opposed Link Results

Opposed Movement Detail				
Link Ref	**Link Name**	**Arr Grn**	**Gaps /cyc**	**Ign /cyc**
4/1	Irishtown Rd S Right Left Ahead	28	2.4	2.0

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project				Page 1
Location	Ringsend	File	0003WPR	SCN		Chkd	
Title	2003 Existing AM Peak with "Plant" Traffic			Controller	Generic	Appvd	

Phases

Phase Data					
Phase Name		Phase Type	Assoc Phase	Street Min	Cont Min
A	Church Ave	Traffic		7	7
B	Londonbridge Rd Ahead Right	Traffic		7	7
C	Irishtown Rd N Right Ahead	Traffic		7	7
D	Irishtown Rd S	Traffic		7	7
E	Irishtown Rd N Left	Traffic		7	7
F	Londonbridge Rd Left	Traffic		7	7
G	Pedestrians across	Pedestrian		7	5
H	Pedestrians across	Pedestrian		6	6
I	Pedestrians across	Pedestrian		7	7
J	Irishtown Rd S Filter	Filter	D	7	0
K	Pedestrians across	Pedestrian		6	6
L	Pedestrians across	Pedestrian		6	0

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project				**Page 2**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	Phase Intergreens To Phase											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
A		5	5	5			7		8	5		6
B	7		5	5	5		5			5		8
C	6	5					8		5	5		8
D	5	5					7		7		5	
E		5							5	5		
F								5				
G	6	6	6	6								
H						5						
I	8		8	8	8							
J	5	5	5		5						5	
K				6						6		
L	6	6	6									

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project				**Page 3**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	2	3	G			2
2	2	3	L			7
3	3	1	D			1

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 4**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	Prohibited Moves To Stage			
	1	2	3	4
1				
2				
3				
4				

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 5**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Stages

Stage Data	
Stage	**Phases In Stage**
1	**AF**
2	**GHJL**
3	**CDEF**
4	**BFK**

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 6**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Church Ave Ahead Right Left	U	A				
2/1	Londonbridge Rd Ahead Right	U	B				
2/2	Londonbridge Rd Left	U	F				
3/1	Irishtown Rd N Right Ahead	U	C				
3/2	Irishtown Rd N Left	U	E				
4/1	Irishtown Rd S Right Left Ahead	O	D	J	3/1	2	2

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Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn(%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Church Ave Ahead Right Left	Inf	0.00	3.25	70	13.00	1800	1795
2/1	Londonbridge Rd Left	Inf	0.00	3.00	100	32.00	1800	1829
2/2	Londonbridge Rd Ahead Right	Inf	0.00	4.25	33	20.00	1800	2127
3/1	Irishtown Rd N Left	Inf	0.00	3.25	0	Inf	1800	2080
3/2	Irishtown Rd N Right Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/1	Irishtown Rd S Left Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/2	Irishtown Rd S Right	5	0.00	3.25	0	Inf	1800	2080

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 8**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**

Traffic Flows

Traffic Flows

Grp Num	Time Start	Time End	Title	Link Number					
				1/1	2/1	2/2	3/1	3/2	4/1
1	08:15	09:15	2003 AM Peak	167	155	34	234	30	649
2	17:00	18:00	2003 PM Peak	134	225	40	251	57	335
3	08:00	09:00	2008 AM Peak with Plant	201	212	34	259	75	667
4	17:00	18:00	2008 PM Peak with Plant	168	235	41	254	145	341

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project			Page 9
Location	Ringsend	File	0003WPR	SCN		Chkd
Title	2003 Existing AM Peak with "Plant" Traffic		Controller	Generic	Appvd	

Parameters Selected

Parameters Selected	
Flow Group	2008 AM Peak with Plant
Flow Group Period	08:00 to 09:00
Phase Minimum Type	Street
CycleTime	90
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings				
Stage Sequence	1	2	3	4
Stage Duration	14	15	16	13
Stage Change Point	0	21	43	72

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 10**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing AM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Link Results

Link Results												
Link Ref	**Link Name**	**Link Type**	**Full Phs**	**Arw Phs**	**Tot Grn**	**Dem Flow**	**Satn Flow**	**Cap pcu**	**Deg Sat%**	**Del s/pcu**	**TDel pcuh**	**Que' pcu**
1/1	Church Ave Ahead Right Left	U	A		14	201	1795	299	67.2	47.9	2.7	4.8
2/1	Londonbridge Rd Ahead Right	U	B		13	212	2127	331	64.1	45.9	2.7	5.0
2/2	Londonbridge Rd Left	U	F		63	34	1829	1301	2.6	4.2	0.0	0.3
3/1	Irishtown Rd N Right Ahead	U	C		16	259	2080	393	65.9	43.2	3.1	5.8
3/2	Irishtown Rd N Left	U	E		16	75	2080	393	19.1	32.6	0.7	1.5
4/1	Irishtown Rd S Right Left Ahead	O	D	J	46	667	1930	1008	66.2	19.7	3.7	8.2
Cycle Time 90 s				**PRC 34.0 %**				**Total Delay 12.9 PCUh**				

Opposed Link Results

Opposed Movement Detail				
Link Ref	**Link Name**	**Arr Grn**	**Gaps /cyc**	**Ign /cyc**
4/1	Irishtown Rd S Right Left Ahead	25	2.0	2.0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 1**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phases

Phase Data					
Phase Name		**Phase Type**	**Assoc Phase**	**Street Min**	**Cont Min**
A	Church Ave	Traffic		7	7
B	Londonbridge Rd Ahead Right	Traffic		7	7
C	Irishtown Rd N Right Ahead	Traffic		7	7
D	Irishtown Rd S	Traffic		7	7
E	Irishtown Rd N Left	Traffic		7	7
F	Londonbridge Rd Left	Traffic		7	7
G	Pedestrians across	Pedestrian		7	5
H	Pedestrians across	Pedestrian		6	6
I	Pedestrians across	Pedestrian		7	7
J	Irishtown Rd S Filter	Filter	D	7	0
K	Pedestrians across	Pedestrian		6	6
L	Pedestrians across	Pedestrian		6	0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 2**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
A		5	5	5			7		8	5		6
B	7		5	5	5		5			5		8
C	6	5					8		5	5		8
D	5	5					7		7		5	
E		5							5	5		
F								5				
G	6	6	6	6								
H						5						
I	8		8	8	8							
J	5	5	5		5						5	
K				6						6		
L	6	6	6									

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project				**Page 3**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	2	3	G			2
2	2	3	L			7
3	3	1	D			1

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project				**Page 4**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Prohibited Moves

From Stage	**Prohibited Moves To Stage**			
	1	**2**	**3**	**4**
1				
2				
3				
4				

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 5**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Stages

Stage Data	
Stage	**Phases In Stage**
1	**AF**
2	**GHJL**
3	**CDEF**
4	**BFK**

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project			**Page 6**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**
Title	2003 Existing PM Peak with "Plant" Traffic		**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Church Ave Ahead Right Left	U	A				
2/1	Londonbridge Rd Ahead Right	U	B				
2/2	Londonbridge Rd Left	U	F				
3/1	Irishtown Rd N Right Ahead	U	C				
3/2	Irishtown Rd N Left	U	E				
4/1	Irishtown Rd S Right Left Ahead	O	D	J	3/1	2	2

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project		**Page 7**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic		**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn(%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Church Ave Ahead Right Left	Inf	0.00	3.25	70	13.00	1800	1795
2/1	Londonbridge Rd Left	Inf	0.00	3.00	100	32.00	1800	1829
2/2	Londonbridge Rd Ahead Right	Inf	0.00	4.25	33	20.00	1800	2127
3/1	Irishtown Rd N Left	Inf	0.00	3.25	0	Inf	1800	2080
3/2	Irishtown Rd N Right Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/1	Irishtown Rd S Left Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/2	Irishtown Rd S Right	5	0.00	3.25	0	Inf	1800	2080

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project			**Page 8**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Traffic Flows

Traffic Flows									
Grp Num	**Time Start**	**Time End**	**Title**	**Link Number**					
				1/1	**2/1**	**2/2**	**3/1**	**3/2**	**4/1**
1	08:15	09:15	2003 AM Peak	167	155	34	234	30	649
2	17:00	18:00	2003 PM Peak	134	225	40	251	57	335
3	08:00	09:00	2008 AM Peak with Plant	201	212	34	259	75	667
4	17:00	18:00	2008 PM Peak with Plant	168	235	41	254	145	341

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 9**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic		**Controller**	Generic	**Appvd**	

Parameters Selected

Parameters Selected	
Flow Group	2008 PM Peak with Plant
Flow Group Period	17:00 to 18:00
Phase Minimum Type	Street
CycleTime	90
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings				
Stage Sequence	1	2	3	4
Stage Duration	15	5	20	18
Stage Change Point	0	22	34	67

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 10**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak with "Plant" Traffic			**Controller**	Generic	**Appvd**	

Link Results

Link Ref	Link Name	Link Type	Full Phs	Arw Phs	Tot Grn	Dem Flow	Satn Flow	Cap pcu	Deg Sat%	Del s/pcu	TDel pcuh	Que' pcu
1/1	Church Ave Ahead Right Left	U	A		15	168	1795	319	52.6	40.5	1.9	3.6
2/1	Londonbridge Rd Ahead Right	U	B		18	235	2127	449	52.3	36.5	2.4	4.7
2/2	Londonbridge Rd Left	U	F		73	41	1829	1504	2.7	1.7	0.0	0.2
3/1	Irishtown Rd N Right Ahead	U	C		20	254	2080	485	52.3	34.9	2.5	4.9
3/2	Irishtown Rd N Left	U	E		20	145	2080	485	29.9	30.7	1.2	2.8
4/1	Irishtown Rd S Right Left Ahead	O	D	J	40	341	1836	836	40.8	18.4	1.7	4.7
Cycle Time 90 s				**PRC 71.0 %**				**Total Delay 9.7 PCUh**				

Opposed Link Results

Link Ref	Link Name	Arr Grn	Gaps /cyc	Ign /cyc
4/1	Irishtown Rd S Right Left Ahead	15	3.5	2.0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 1**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Phases

Phase Data					
	Phase Name	**Phase Type**	**Assoc Phase**	**Street Min**	**Cont Min**
A	Church Ave	Traffic		7	7
B	Londonbridge Rd Ahead Right	Traffic		7	7
C	Irishtown Rd N Right Ahead	Traffic		7	7
D	Irishtown Rd S	Traffic		7	7
E	Irishtown Rd N Left	Traffic		7	7
F	Londonbridge Rd Left	Traffic		7	7
G	Pedestrians across	Pedestrian		7	5
H	Pedestrians across	Pedestrian		6	6
I	Pedestrians across	Pedestrian		7	7
J	Irishtown Rd S Filter	Filter	D	7	0
K	Pedestrians across	Pedestrian		6	6
L	Pedestrians across	Pedestrian		6	0

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 2**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Phase Intergreens

From Phase	**Phase Intergreens To Phase**											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
A		5	5	5			7		8	5		6
B	7		5	5	5		5			5		8
C	6	5					8		5	5		8
D	5	5					7		7		5	
E		5							5	5		
F								5				
G	6	6	6	6								
H						5						
I	8		8	8	8							
J	5	5	5		5						5	
K				6						6		
L	6	6	6									

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 3**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Phase Delays

Phase Delays						
No	**From Stage**	**To Stage**	**Phase**	**Delay Time**		
				Abs	**Rel**	**Cntr**
1	2	3	G			2
2	2	3	L			7
3	3	1	D			1

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project				Page 4
Location	Ringsend	File	0003WPR	SCN		Chkd	
Title	2003 Existing PM Peak			Controller	Generic	Appvd	

Prohibited Moves

From Stage	Prohibited Moves To Stage			
	1	2	3	4
1				
2				
3				
4				

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 5**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Stages

Stage Data	
Stage	**Phases In Stage**
1	**AF**
2	**GHJL**
3	**CDEF**
4	**BFK**

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project			**Page 6**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak		**Controller**	Generic	**Appvd**	

Links

Link Data							
Ref Num	**Link**	**Type**	**Full Phase**	**Arrw Phase**	**Opposing Arm/Link**	**R Turn Storage**	**Max Turn**
1/1	Church Ave Ahead Right Left	U	A				
2/1	Londonbridge Rd Ahead Right	U	B				
2/2	Londonbridge Rd Left	U	F				
3/1	Irishtown Rd N Right Ahead	U	C				
3/2	Irishtown Rd N Left	U	E				
4/1	Irishtown Rd S Right Left Ahead	O	D	J	3/1	2	2

User	M.C.O'Sullivan & Co.Ltd.	**Project**	Dublin Waste To Energy Project				**Page 7**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Lanes

Lane Data								
Ref Num	**Lane**	**Length (pcu)**	**Gradient (%)**	**Width (m)**	**Propn Turn(%)**	**Radius (m)**	**User Satn**	**RR67 Satn**
1/1	Church Ave Ahead Right Left	Inf	0.00	3.25	70	13.00	1800	1795
2/1	Londonbridge Rd Left	Inf	0.00	3.00	100	32.00	1800	1829
2/2	Londonbridge Rd Ahead Right	Inf	0.00	4.25	33	20.00	1800	2127
3/1	Irishtown Rd N Left	Inf	0.00	3.25	0	Inf	1800	2080
3/2	Irishtown Rd N Right Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/1	Irishtown Rd S Left Ahead	Inf	0.00	3.25	0	Inf	1800	2080
4/2	Irishtown Rd S Right	5	0.00	3.25	0	Inf	1800	2080

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project				Page 8
Location	Ringsend	File	0003WPR	SCN		Chkd	
Title	2003 Existing PM Peak			Controller	Generic	Appvd	

Traffic Flows

Traffic Flows									
Grp Num	Time Start	Time End	Title	Link Number					
				1/1	2/1	2/2	3/1	3/2	4/1
1	08:15	09:15	2003 AM Peak	167	155	34	234	30	649
2	17:00	18:00	2003 PM Peak	134	225	40	251	57	335
3	08:00	09:00	2008 Am Peak with Plant	201	212	34	259	75	667
4	17:00	18:00	2008 PM Peak with Plant	168	235	41	254	145	341

User	M.C.O'Sullivan & Co.Ltd.	Project	Dublin Waste To Energy Project			Page 9
Location	Ringsend	File	0003WPR	SCN		Chkd
Title	2003 Existing PM Peak			Controller	Generic	Appvd

Parameters Selected

Parameters Selected	
Flow Group	2003 PM Peak
Flow Group Period	17:00 to 18:00
Phase Minimum Type	Street
CycleTime	90
Flow Factor	1.00
Sat Flows Used	RR67

Stage Results

Stage Timings				
Stage Sequence	1	2	3	4
Stage Duration	13	5	21	19
Stage Change Point	0	20	32	66

User	**M.C.O'Sullivan & Co.Ltd.**	**Project**	Dublin Waste To Energy Project				**Page 10**
Location	Ringsend	**File**	0003WPR	**SCN**		**Chkd**	
Title	2003 Existing PM Peak			**Controller**	Generic	**Appvd**	

Link Results

Link Results												
Link Ref	**Link Name**	**Link Type**	**Full Phs**	**Arw Phs**	**Tot Grn**	**Dem Flow**	**Satn Flow**	**Cap pcu**	**Deg Sat%**	**Del s/pcu**	**TDel pcuh**	**Que' pcu**
1/1	Church Ave Ahead Right Left	U	A		13	134	1795	279	48.0	41.3	1.5	3.0
2/1	Londonbridge Rd Ahead Right	U	B		19	225	2127	473	47.6	34.6	2.2	4.4
2/2	Londonbridge Rd Left	U	F		73	40	1829	1504	2.7	1.7	0.0	0.2
3/1	Irishtown Rd N Right Ahead	U	C		21	251	2080	508	49.4	33.3	2.3	4.8
3/2	Irishtown Rd N Left	U	E		21	57	2080	508	11.2	27.6	0.4	1.1
4/1	Irishtown Rd S Right Left Ahead	O	D	J	41	335	1826	852	39.3	17.6	1.6	4.6
Cycle Time 90 s					**PRC 82.3 %**				**Total Delay 8.1 PCUh**			

Opposed Link Results

Opposed Movement Detail				
Link Ref	**Link Name**	**Arr Grn**	**Gaps /cyc**	**Ign /cyc**
4/1	Irishtown Rd S Right Left Ahead	15	3.9	2.0

APPENDIX E

Reports

1. Development of a Heavy Goods Vehicle (HGV) Management Strategy for Dublin City to coincide with the opening of the Dublin Port Tunnel – Interim Report
2. East Wall Road Traffic Management Study
3. Information Session 4: Traffic
4. Blackrock Quality Bus Corridor – Public Exhibition, Pearse Street and Ringsend Road Environmental Improvement and Bus Priority Scheme
5. Ringaskiddy Waste Management Facility – Oral Hearing
6. An Bord Pleanála – Inspector's Report (Carranstown Waste Management Facility)
7. An Bord Pleanála – Inspector's Report (Herhof Waste Facility, Balbriggan)
8. Typical EIS chapter of 'Carranstown Waste Management Facility'

DEVELOPMENT OF A HEAVY GOODS VEHICLE (HGV) MANAGEMENT STRATEGY FOR DUBLIN CITY TO COINCIDE WITH THE OPENING OF THE DUBLIN PORT TUNNEL

INTERIM REPORT

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Development of a Heavy Goods Vehicle (HGV) Management Strategy for Dublin City to Coincide with the Opening of the Dublin Port Tunnel

Interim Report

Roads & Traffic Department
Dublin City Council
Civic Offices
Fishamble Street

13 February 2004

Submitted by
Delcan International Limited

DELCAN

TABLE OF CONTENTS

1 INTRODUCTION

The Dublin Port Tunnel (DPT), sponsored by the National Roads Authority, is being implemented by Dublin City Council to provide a motorway link between the existing M1 motorway and Dublin Port. The primary purpose of the DPT is to remove, as far as possible, port-related Heavy Goods Vehicle (HGV) through traffic from the city centre by providing high quality access between the M50 and Dublin Port. The DPT will also help to relieve traffic congestion in other areas of the city through utilization of the tunnel's remaining capacity for non-HGV traffic. A tolling regime will be implemented with the intent to discourage commuters from using the DPT as a direct access route to the city centre in peak periods. At all times, HGVs will not be tolled to use the DPT.

By providing the tunnel, it was anticipated that a significant proportion of port related HGV traffic would use it, to such an extent that the current public perception is that all HGVs will be removed from the city's street network. However HGVs will only use the DPT if it provides a quicker, safer, and more direct route between the port and M50. For the DPT to be successful, a HGV Management Strategy needs to be developed which will make the new route attractive, or alternatively restrictive measures need to be implemented to encourage use of the tunnel by HGVs. Notwithstanding this, the situation will still arise where certain HGV trips will not use the tunnel (e.g. local deliveries) or cannot use the tunnel (overheight vehicles). With regard to overheight vehicles, the tunnel is being constructed with a clear height of 4.65m, however, a proportion of HGVs (less than 2%) accessing the port exceed this height. These overheight vehicles will need to travel on the city's streets although they may be subjected to certain restrictions.

In addition to port related HGVs, recent research has shown that there are a significant number of HGV trips that have an origin and/or destination within the city. Some trips have an origin or a destination at the Port with the other end of the trip being within the City boundaries, while other trips have both their origins and destinations within the city but not at the port. Out of necessity, many of these trips will need to take place on the city's street network, as the DPT would not provide a convenient or efficient route.

This report provides a discussion on the scope of the problem, followed by the development of the HGV Management Strategy and recommendations. It is noted that the management strategy is to be implemented in conjunction with the scheduled opening of the DPT in 2005, and as such, management measures that necessitate significant infrastructure and investment may not be possible to implement in time. The HGV Management Strategy that is developed in this report is considered high level, and should form the basis for the development of implementable HGV management plans. The development of these detailed management plans is not within the scope of the current assignment and will require further investigation.

In Section 2 of the report, a discussion on the available data and previous reports is presented with a review of the key HGV issues in Dublin forming Section 3. Section 4 is a summary of experiences from other cities around the world with regard to HGV management. Section 5 documents the objectives of the HGV Management Strategy. Possible HGV management measures that could be incorporated in the strategy are then identified in Section 6, and these are then refined for the Dublin context in Section 7. The basis for selecting the preferred management option is included in Section 8, with Section 9 being a summary of the issues that are to be raised/clarified during the consultation process prior to finalization of HGV Management Plans.

This report is an interim report and the findings and recommendations are based on data that was available as at January 2004. As additional data becomes available, certain sections of the report will/may require revision to reflect new findings.

2 REVIEW OF DATA

A detailed review of available reports and data was performed in order to understand the existing and forecast movement of HGVs in the Dublin Area and also to review initiatives that had been previously undertaken. The findings are documented in the sub-sections that follow. The sources of information that were used have been referenced within the report as appropriate.

2.1 HGV Volume Data

There are two aspects with regard to HGV movements in the Dublin area and these can be generally categorized as "port related" and "non-port related" movements. Port related movements are characterized by having either a trip origin or destination at the port. Inter-port trips between the north and south port are included as port related trips. Non-port related trips have origins and destinations within the city (but not at the port) and include trips:

- With an origin and destination within the city;
- An origin in the city and a destination outside the city; and
- An origin outside the city and a destination in the city;

Generally the non-port related HGV trips are delivery type trips.

Available data pertaining to the two types of trips is discussed in the following sections.

2.1.1 Port Related Trips

In 1995 and 1998 24-hour surveys were undertaken at the port gates and the results from the surveys are summarized in ***Table 2.1.*** Notable facts from this table are:

- A 29.2 % increase in total HGV traffic to/from the port between 1995 and 1998. This equates to an 8.9% increase per annum;
- The inbound/outbound split is approximately 50/50; and
- The north port is responsible for approximately 93% of the total port related HGV trips.

	September 1995 HGV Survey						November 1998 HGV Survey							
Gate	In #	Out #	Total	% of North Port Total	% of South Port Total	% of Port Total	In #	Out #	Total	% of North Port Total	% of South Port Total	% of Port Total	Change 1995-1998	% Change
Tolka Quay	1561	2268	3829	70.8%		65.2%	2714	2927	5641	78.5%		74.3%	1812	47.3%
Alexandra Road	623		623	11.5%		10.6%	580	57	637	8.9%		8.4%	14	2.2%
Pandora Gate	469	486	955	17.7%		16.3%	453	451	904	12.6%		11.9%	-51	-5.3%
North Port Total	2653	2754	5407	100%		92.0%	3747	3435	7182	100%		94.6%	1775	32.8%
South Bank	214	255	469		100%	8.0%	197	210	407		100%	5.4%	-62	-13.2%
Total	2867	3009	5876			100%	3944	3645	7589			100%	1713	29.2%
In/Out Split %	48.8%	51.2 %					52.0%	48.0%						

Table 2.1 – Port HGV Survey Results (24 Hours)

In October 2001, Atkins McCarthy undertook a comprehensive origin and destination study for the Dublin Port (*Origin – Destination Surveys Dublin Port*). This study concentrated on Tolka Quay as it has historically had the greatest share (about 70% as determined in ***Table 2.1***) of the total port trips. The 24-hour two-way volume on Tolka Quay was approximately 4500 HGVs which is significantly lower than the previous counts undertaken in 1998. The quoted reasons for this reduction were increased congestion on Tolka Quay and the diversion of many trips to Alexandra Road. Previously vehicles were not permitted to exit Alexandra Road westbound.

Exhibit 2.2 illustrates the hourly HGV flows on Tolka Quay on July 26, 2001.

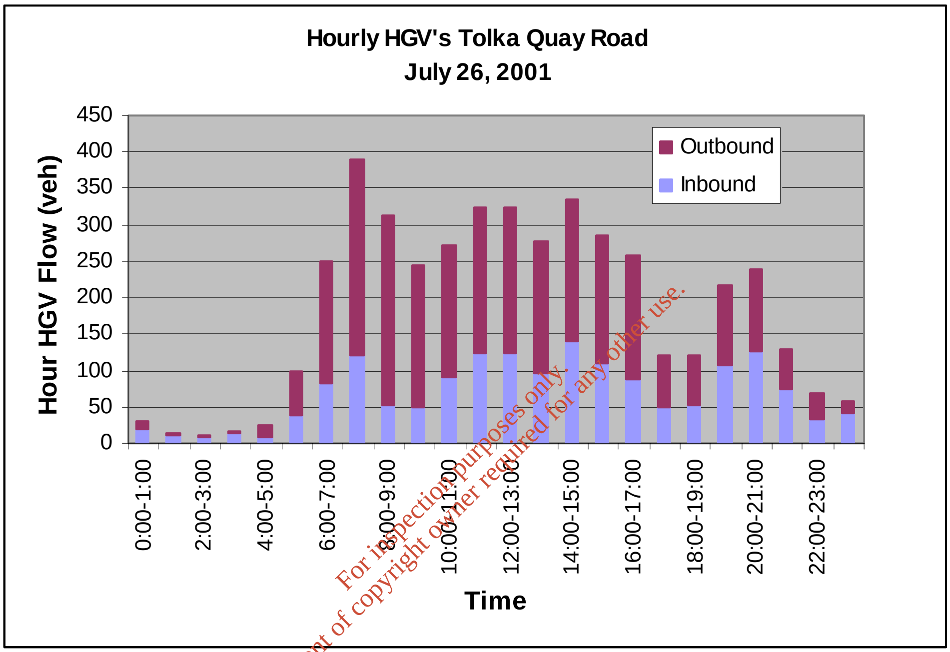


Exhibit 2.2 – 2001 Hourly HGV Volumes on Tolka Quay Road

From this exhibit, the following are noted:

- Outbound flows are greater than inbound flows (due to inbound vehicles also being able to enter the port via Alexandra Road);
- The peak total HGV flow occurs during the morning commuter peak 07:00 to 08:00;
- There are high flows during the mid day period;
- There is another peak between 14:00 and 15:00; and
- Between 22:00 and 05:00 HGV flows are low (<50 per direction).

Using data extracted from the 2003 National Institute for Transport and Logistics (NITL) report titled "*Dublin Port Vehicle Height Survey*" ***Exhibit 2.3*** has been prepared. This shows the hourly volumes of all cabs/oil tankers/car carriers accessing all the port access roads. Note that this data is not HGV data, but only select vehicle types.

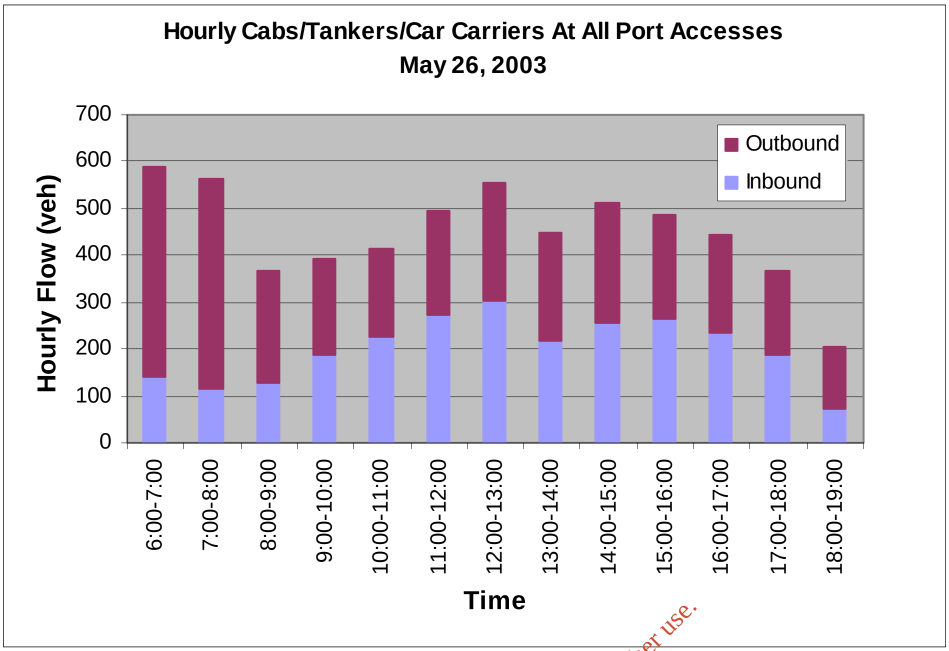


Exhibit 2.3 – Select Flows at All Port Accesses

This exhibit shows a shift in peak travel times compared to the 2001 Tolka Quay data, noticeably:

- Peak two-way flow occurs before 07:00;
- There is another peak at mid day; and
- Another peak between 14:00 and 15:00.

This suggests that there has been a shift in the way the port/ferries conduct their business since 2001 with less dependence on HGV travel during peak commuter times.

In the Atkins McCarthy report it is assumed that, with no HGV Management Strategy being in place once the DPT is opened:

- All HGV traffic to/from the Dublin Region and the rest of the country with the exception of the N11 (Bray Road) corridor would use the DPT (zones 31-35 and 37-44)
- 60% of HGV traffic to/from the North City and South City zones (near the M50) would use the DPT (zones 27-30).
- No HGV traffic from the city centre area (zones 1-26) would use the DPT.

It is noted that no discussion on how these assumptions were arrived at is included in the report. The balance of the HGVs trips is therefore assumed to be on the city's surface streets.

Based on the above assumptions, the north port trips to/from each zone that will/will not use the DPT is indicated In ***Table 2.2***.

	Inbound Trips					**Outbound Trips**				
Zone	**# from zone**	**% age use DPT**	**# use DPT**	**% not use DPT**	**# not use DPT**	**# to zone**	**% age use DPT**	**# use DPT**	**% not use DPT**	**# not use DPT**
23	38	0%	0	100%	38	74	0%	0	100%	74
24	15	0%	0	100%	15	89	0%	0	100%	89
25	118	0%	0	100%	118	211	0%	0	100%	211
26	21	0%	0	100%	21	132	0%	0	100%	132
27	161	60%	96.6	40%	64.4	209	60%	125	40%	84
28	84	60%	50.4	40%	33.6	188	60%	113	40%	75
29	83	60%	49.8	40%	33.2	156	60%	94	40%	62
30	52	60%	31.2	40%	20.8	170	60%	102	40%	68
31	153	100%	153	0%	0	215	100%	215	0%	0
32	27	100%	27	0%	0	56	100%	56	0%	0
33	44	100%	44	0%	0	99	100%	99	0%	0
34	58	100%	58	0%	0	59	100%	59	0%	0
35	74	100%	74	0%	0	127	100%	127	0%	0
36	28	0%	0	100%	28	63	0%	0	100%	63
37	129	100%	129	0%	0	204	100%	204	0%	0
38	31	100%	31	0%	0	87	100%	87	0%	0
39	100	100%	100	0%	0	138	100%	138	0%	0
40	56	100%	56	0%	0	87	100%	87	0%	0
41	85	100%	85	0%	0	101	100%	101	0%	0
42	97	100%	97	0%	0	111	100%	111	0%	0
43	97	100%	97	0%	0	138	100%	138	0%	0
44	59	100%	59	0%	0	71	100%	71	0%	0
45	49	0%	0	100%	49	50	0%	0	100%	50
Totals	**1659**		**1238**		**421**	**2835**		**1927**		**908**

Table 2.2 – 2001 Trips to/from North Port and DPT Utilization

From this table the following can be derived:

- 4494 total daily HGV trips to/from the north port;
- 3165 daily HGV trips would utilize the DPT (70% of total trips)
- 1329 daily HGV trips would not utilize the DPT (30% of total trips).

In 2003, Dublin City Council undertook manual classified counts at four sites in the vicinity of the port as listed below from 21:00 on Tuesday 25th November until 21:00 on Thursday 27th November 2003. The surveys were conducted over a continuous 48 hour period with two-way flow counts being recorded at all sites.

The surveys were carried out at the following sites (see map overleaf):

- Site 1 - Tolka Road Access
- Site 2 - Alexandra Road Access
- Site 3 - South Bank Road Access
- Site 4 - P & O Access on East Wall Road

A 16-fold vehicle classification was used, namely:

- Cars (CAR)
- Vans (VAN)
- Buses and Coaches (BUS)
- Fuel Tankers (TANKER)
- Car Transporters (TRANSP)
- 2-Axle Rigid Heavy Goods Vehicles (2R)
- 2-Axle Tractors (2T)
- 3-Axle Rigid Heavy Goods Vehicles (3R)
- 3-Axle Tractors (3T)
- 3-Axle Articulated Heavy Goods Vehicles (3A)
- 4-Axle Rigid Heavy Goods Vehicles (4R)
- 4-Axle Articulated Heavy Goods Vehicles (4A)
- 2-Axle Rigid Heavy Goods Vehicles with 2-Axle Trailer (2R2T)
- 5-Axle Articulated Heavy Goods Vehicles (5A)
- 2-Axle Rigid Heavy Goods Vehicles with 3-Axle Trailer (2R3T)
- 3-Axle Rigid Heavy Goods Vehicles with 2-Axle Trailer (3R2T)

For the purposes of this assignment, the data pertaining to November 26, 2003 was analysed in detail, as this was the only day for which full 24-hour data was available. In ***Table 2.3*** and ***Table 2.4*** the inbound and outbound volumes for all locations respectively are summarized.

Location	Daily Inbound Traffic Volume																	
	CAR	VAN	BUS	TANKER	TRANSP	2R	2T	3R	3T	3A	4R	4A	2R2T	5A	2R3T	3R2T	TOT	% of Total
Site 1	2079	445	28	425	9	97	223	48	39	2	11	148	1	989	1	10	4555	48%
Site 2	1113	201	25	196	29	109	88	13	21	0	4	216	0	624	0	1	2640	28%
Site 3	766	143	5	21	5	90	11	47	4	8	61	86	0	263	0	1	1511	16%
Site 4	137	41	0	41	18	9	126	13	5	0	4	86	0	288	2	1	771	8%
Total	4095	830	58	683	61	305	448	121	69	10	80	536	1	2164	3	13	9477	100%
% of Total	43%	9%	1%	7%	1%	3%	5%	1%	1%	0%	1%	6%	0%	23%	0%	0%	100%	

Table 2.3 – Classes of Vehicles Entering Port (Nov. 26, 2003)

From this table the following are noted:

- 48% of the total inbound traffic used Site 1 (Tolka Quay);
- 47% of all inbound traffic consisted of goods vehicles (i.e. excluding cars, vans, buses);
- The predominant types of goods vehicle were:
    - 5-Axle Articulated Heavy Goods Vehicles (5A) (23%);
    - Tankers (7%); and
    - 4-Axle Articulated Heavy Goods Vehicles (4A) (6%).

Location	Daily Outbound Traffic Volume																	
	CAR	VAN	BUS	TANKER	TRANSP	2R	2T	3R	3T	3A	4R	4A	2R2T	5A	2R3T	3R2T	TOT	% of Total
Site 1	2097	383	71	590	48	256	284	7	42	2	23	99	5	1917	1	4	5829	62%
Site 2	911	190	1	0	0	15	0	2	0	0	0	0	0	3	0	2	1124	12%
Site 3	823	189	6	12	1	103	10	37	3	1	79	54	0	311	0	0	1629	17%
Site 4	140	35	4	42	4	40	115	2	38	0	1	2	2	402	2	2	831	9%
Total	3971	797	82	644	53	414	409	48	83	3	103	155	7	2633	3	8	9413	100%
% of Total	42%	8%	1%	7%	1%	4%	4%	1%	1%	0%	1%	2%	0%	28%	0%	0%	100%	

Table 2.4 – Classes of Vehicles Exiting Port (Nov. 26, 2003)

From this table, the following can be noted:

- 62% of the total outbound traffic volume used Tolka Quay;
- 48% of all outbound traffic consisted of goods vehicles;
- The predominant types of goods vehicle were:
    - 5-Axle Articulated Heavy Goods Vehicles (5A) (28%); and
    - Tankers (7%).

Concentrating on goods vehicles (i.e. excluding cars, vans and buses) total daily flows have been summarized in ***Table 2.5*** and ***Table 2.6***. Note that goods vehicles have been split between < 3 axle and 3 + axles vehicles.

Location	Daily Inbound Traffic Volume			
	< 3 Axle	3 + Axle	Total	% of Total
Site 1	320	1249	1569	42%
Site 2	197	879	1076	29%
Site 3	101	470	571	15%
Site 4	135	399	534	14%
Total	753	2997	3750	100%
% of Total	20%	80%	100%	

Table 2.5 – Goods Vehicles Entering Port (Nov. 26, 2003)

The following are noted:

- 42% of the entering goods vehicle traffic passed through Site 1;
- 20% of the entering goods vehicle traffic consisted of < 3 axle vehicles; and
- 80% of the entering goods vehicle traffic consisted of 3+ axle vehicles.

Location	Daily Outbound Traffic Volume			
	< 3 Axle	3 + Axle	Total	% of Total
Site 1	540	2100	2640	68%
Site 2	15	7	22	1%
Site 3	113	485	598	15%
Site 4	155	451	606	16%
Total	823	3043	3866	100%
% of Total	21%	79%	100%	

Table 2.6 – Goods Vehicles Exiting Port (Nov. 26, 2003)

The following are noted:

- 68% of the exiting goods vehicle traffic used Site 1;
- 21% of the goods vehicle traffic consisted of < 3 axle vehicles;
- 79% of the goods vehicle traffic consisted of 3+ axle vehicles.

The four graphs overleaf ***(Exhibit 2.4)*** outline the inbound and outbound goods vehicle volumes for the four sites over the 24-hour period on November 26, 2003. From these charts, the following are noted:

Tolka Quay:

- Predominately outbound goods vehicle traffic flow from 5:00 to 19:00; and
- Peak two-way goods vehicle traffic flow from 6:00 to 8:00.

Alexandra Road:

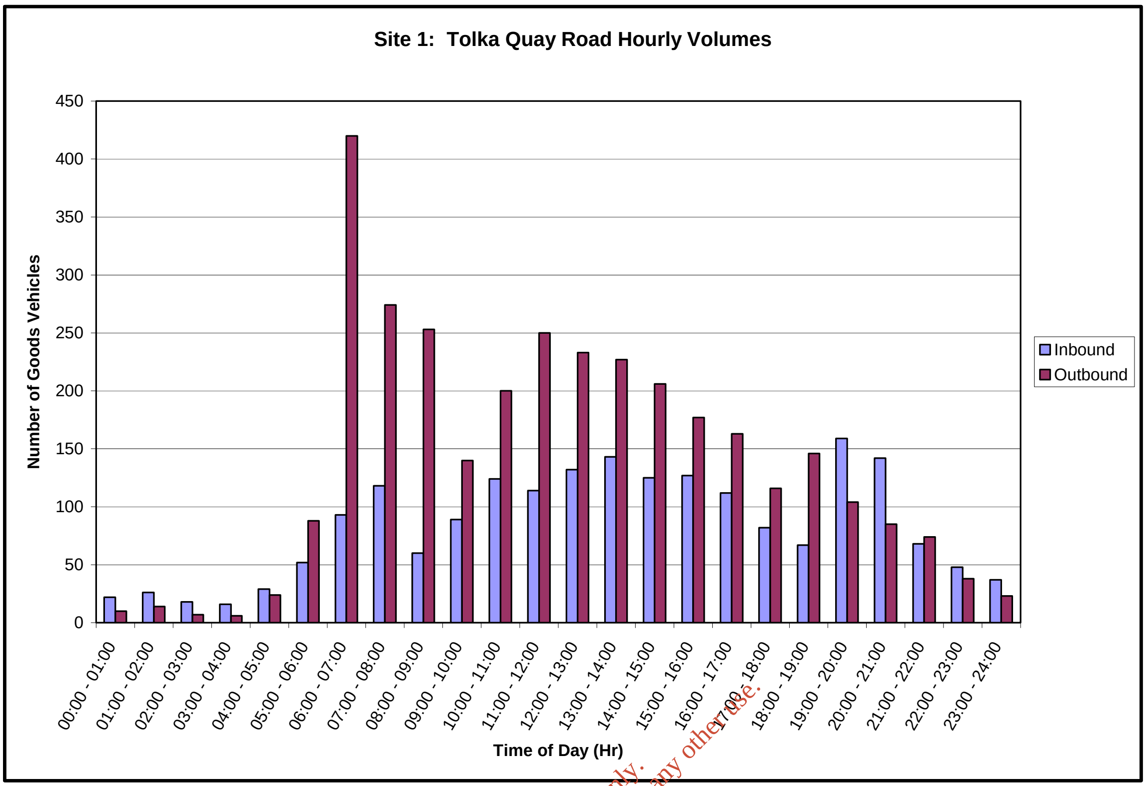
- Very little outbound movement throughout the day; and
- Peak inbound flow between 11:00 between 17:00.

MTI:

- Relatively balanced inbound/outbound split except for between 06:00 and 07:00 when there is a relatively high inflow; and
- Peaks two-way flows between 11:00 and 14:00.

P&O:

- Predominately outbound traffic movement between 00:00 to 15:00;
- Predominately inbound traffic movement from 15:00 to 00:00; and
- Peak two-way flow and outbound flow between 6:00 to 8:00;



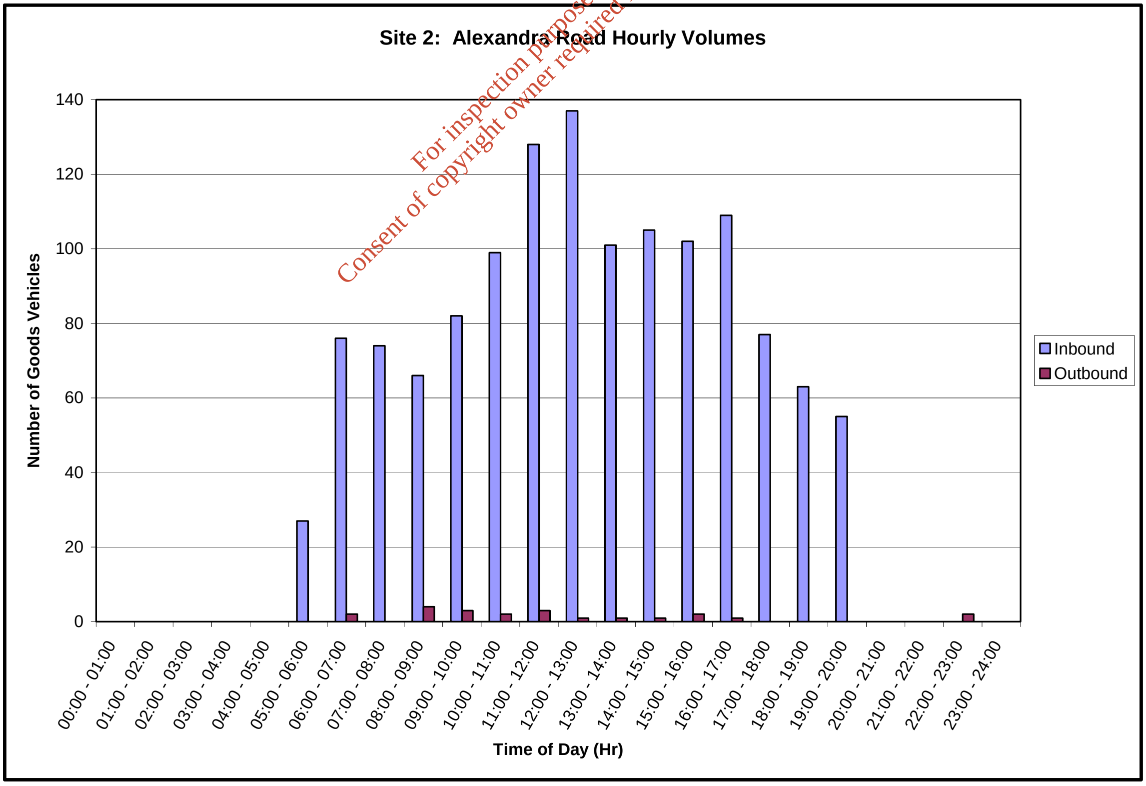
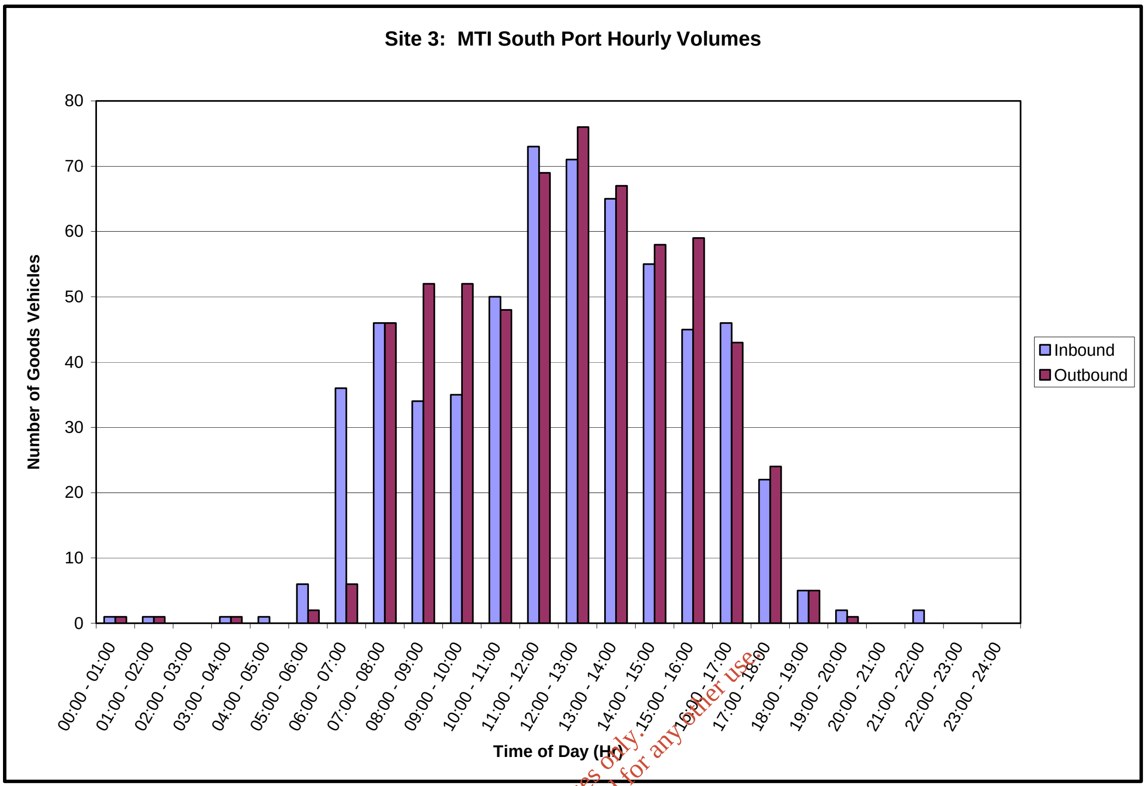


Exhibit 2.4 – Inbound/Outbound Hourly Volumes by site (Nov. 26, 2003)



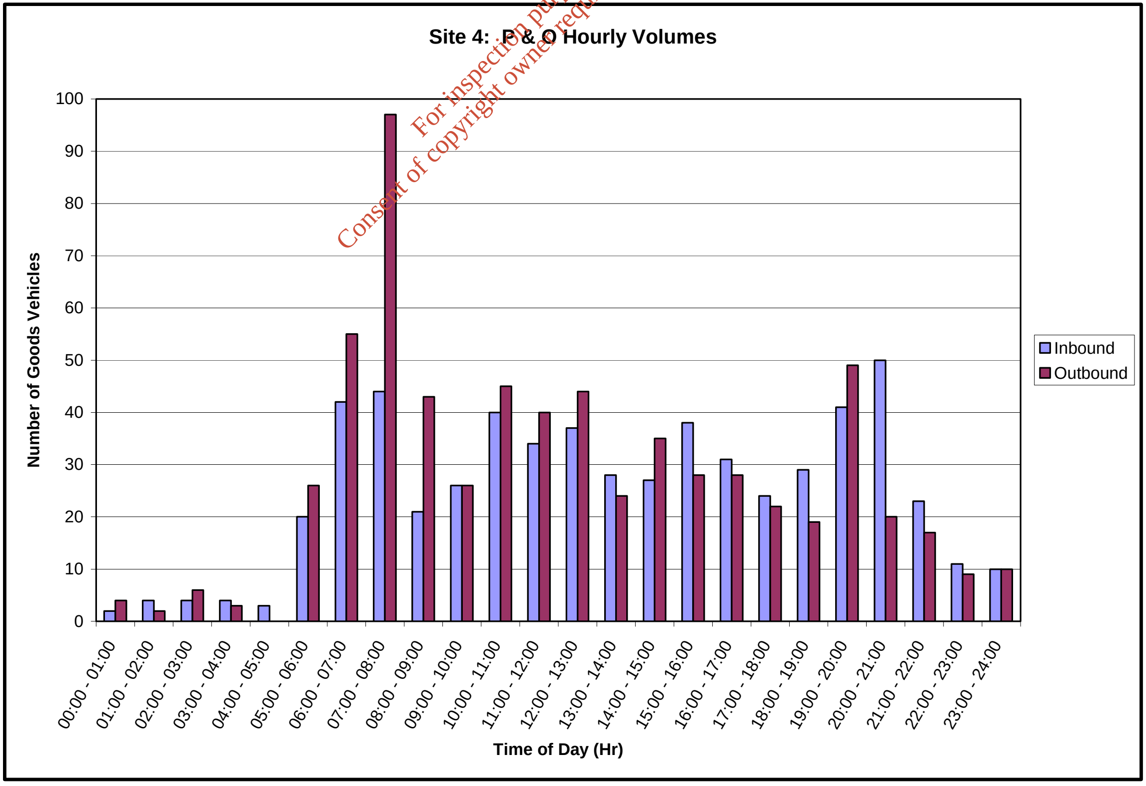


Exhibit 2.4 – Inbound/Outbound Hourly Volumes by Site (Nov. 26, 2003)

In ***Exhibit 2.5***, the total hourly goods vehicle volumes into/out of the port on the selected survey day for all sites combined are presented.

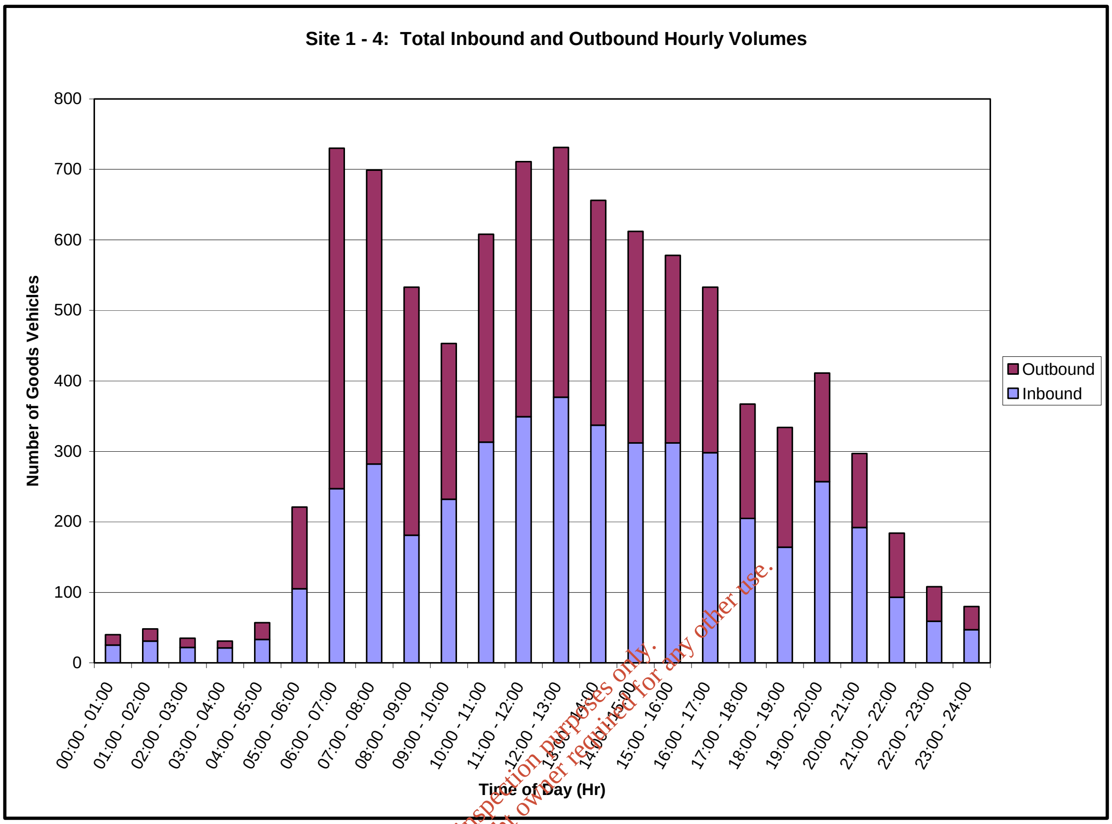


Exhibit 2.5 – Combined Hourly Flows (Nov. 26, 2003)

When the combined inbound/outbound flows from all port accesses are considered, the following are noted:

- Predominately outbound flows between 5:00 to 8:00;
- Predominately inbound flows from 8:00 to 24:00; and
- The peak two-way flows occur between 06:00 and 08:00 followed by a “dip” and then another peak between 11:00 and 14:00.

By comparing the November 2003 data with the 2001 data (Atkins McCarthy) the following are noted with regard to Tolka Quay:

- In 2001 there were 4500 HGVs (2 or more axles) in/out in 24 hours
- In 2003 there were 4209 goods vehicles (2 or more axles) in/out in 24 hours.

This suggests a slight decrease in goods vehicle volumes between 2001 and 2003, however the difference may be due to routing changes within the port as well as daily or seasonal variations.

Furthermore, by comparing the hourly volumes (***Exhibits 2.2*** and ***2.4***) for Tolka Quay the following are observed:

- In 2001, the peak hourly two-way flow occurred between 7:00 and 8:00 (389 HGVs);
- In 2003, the peak hourly two-way flow occurred between 06:00 and 07:00 (513 commercial vehicles); and
- In 2003, 392 goods vehicles used Tolka Quay between 07:00 and 08:00.

This clearly shows a shift in the peak travel times (earlier in 2003), but interestingly, the number of vehicles in the 07:00 to 08:00 period remains constant at about 390 vehicles.

By comparing 1998 data (***Exhibit 2.1***) with the 2003 data, the following are observed with regard to daily volumes:

- In 2003 there were 7616 goods vehicles in/out the port (all four accesses). This is almost equal to the 7589 vehicles recorded in 1998.
- In 1998, the daily two-way total for the south port was 407 goods vehicles. In 2003 the two-way flow was 1169 goods vehicles (598 out/571 in). There has thus been a significant increase in south port activity.
- In 1998 there were 5641 goods vehicles in/out of Tolka Quay. In 2003 there were 4209 (1569 in/2640 out). This is a significant decrease.

The above suggests that although overall truck volumes in/out the port have remained relatively constant since 1998, there appears to be a marked shift in activity from the north port to the south port. This is considered important with regard to the DPT, as a shift in truck movements to the south port is likely to result in the DPT being less attractive than if trucks were originating/destined for the north port.

Another issue that relates to goods vehicles and the DPT is the number of overheight (>4.65m) vehicles accessing the port. Surveys undertaken by the National Institute for Transport and Logistics (NITL) for the report "*Dublin Port Vehicle Height Survey*" showed that in May 2003, an average of 157 overheight HGVs per day accessed all the port entrances. It is noted that in the NITL report it is estimated that there are only 20 overheight HGVs exiting Tolka Quay per day based on information provided by the port. The 157 overheight vehicles represent 2% of the approximately 7600 trips per day from all port accesses. Out of necessity these overheight vehicles will need to travel on the city's surface streets as they cannot be accommodated in the DPT.

The findings/discussions above do not include HGV trips within the city that are non-port related. These HGV trips, when added to the port related trips that will not use the DPT, are likely to result in a continued presence of HGVs on the city streets unless an appropriate management strategy is in place. These non-port related trips are discussed in the next section.

2.1.2 Non-Port Related HGV Trips

In November 2002, a survey of inbound traffic was undertaken at the bridges over the canal cordon in the morning peak period (07:00 and 10:00). The results of this survey are summarized in ***Table 2.7*** and illustrated graphically in ***Exhibit 2.6.***

Vehicle Type	Vehicles Entering (3 hrs)	Average Vehicles Entering/hr
Buses	1576	525
Cars	63070	21023
Commercial Vehicles	2828	943
Taxis	2560	853
Total Vehicles	**70034**	**23345**

Table 2.7 – November 2002 Cordon Counts 07:00 – 10:00

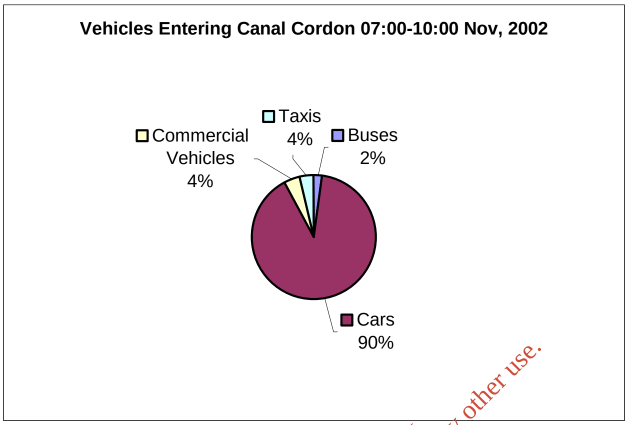


Exhibit 2.6 – Vehicle Classification Entering Canal Cordon

This survey indicated that 2828 commercial vehicles were recorded entering the canal cordon during the period 07:00 to 10:00. These constituted only 4% of the total vehicles entering the cordon. Unfortunately the number of commercial vehicles by class (LGV, HGV, etc.) was not counted so it is not possible to determine how many of the entering vehicles are HGVs. Furthermore, the cordon count only considered vehicles entering the cordon and there is no information available that documents exiting vehicles.

The principal entry points for commercial vehicles are illustrated in ***Exhibits 2.7*** and ***Exhibit 2.8*** overleaf***.*** From these exhibits the following are noted/derived:

- From the south, the major commercial vehicle entry points (volume > 100) are:
  - Ringsend Road
  - Dolphins Barn Bridge (N7 extension)
  - St John’s Road West (N4 extension)

- From the north, the major commercial vehicle entry points (volume > 100) are:
  - Conyngham Road (N4 extension)
  - Phibsborough Road (Ballum Road extension)
  - Drumconda Road (M1 extension)
  - Sheriff Street (from port)
  - North Wall Quay (from port)

- 1654 (58%) commercial vehicles enter from north of the Liffey River, with 1174 (42%) from the south during the 07:00 to 10:00 period.

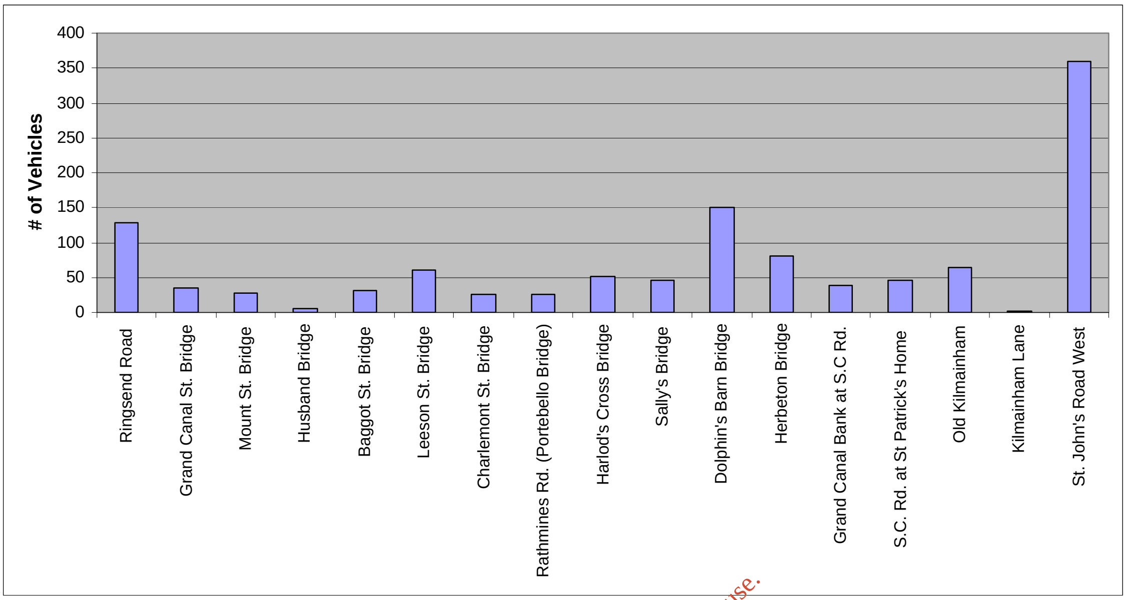


Exhibit 2.7 – Commercial Vehicles Entering Canal Cordon from South of Liffey River

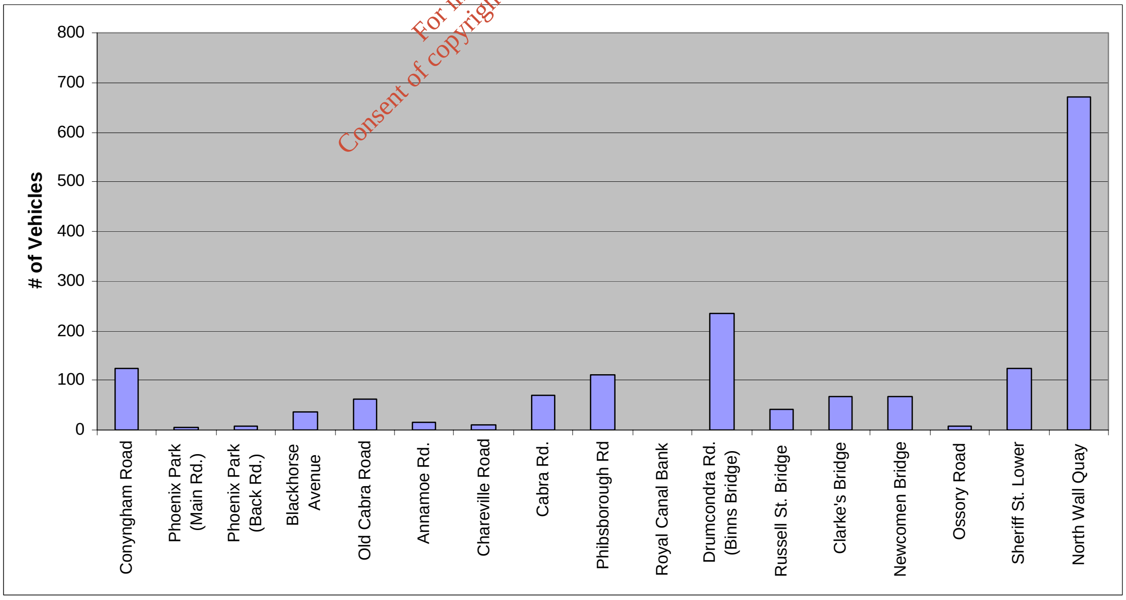


Exhibit 2.8 – Commercial Vehicles Entering Canal Cordon from North of Liffey River

In 2003, Carl Bro Intelligent Solutions and Goodbody Economic Consultants submitted a report to the Dublin Transportation Office titled "*Regional Freight Study*" which looked at both port related trips and non-port related trips. The study area was the Greater Dublin Area and included the administrative areas of Dublin City Council and the County Councils of Fingal, Dun Laoghaire Rathdown and South Dublin as well as the counties of Kildare, Meath and Wicklow.

Estimates of 2000 road freight trips in the Greater Dublin Area are summarized in ***Table 2.8***.

Type of Journey	Trips per annum (Millions)	Proportion of Total
Origin and Destination Within Greater Dublin	14.76	76.7%
Journeys to/from Dublin and rest of Ireland	3.99	20.7%
International Journeys	0.49	2.6%
Total	**19.24**	**100%**
Of which Port related traffic	1.14	5.9%

Table 2.8 – 2000 Road Freight Trips in Greater Dublin

Of relevance in this table is the fact that nearly 77% of freight trips in the Dublin area have both their origins and destinations within Greater Dublin (i.e. local deliveries). Furthermore, port related traffic only constitutes 5.9% of the total trips in the Dublin area. It is to be noted that total commercial vehicle trips are indicated in the table and not HGV trips. The only indication of light vehicle/heavy vehicle trips provided in the report is with regard to the trips within Dublin. Of the estimated 14.76 million trips, 10.55 million (72%) are undertaken by vehicles less than 2 tonnes unladen weight (ULW). The remainder (4.21 million trips) is undertaken with vehicles greater than 2 tonnes ULW.

The Carl Bro report also highlighted a number of findings relating to all HGV (port and non-port) trips. These are summarized below:

- Inbound HGV traffic begins to build up in the early morning and remains constant until about 16:00 when it begins to taper off;
- Outbound HGV traffic shows a similar trend except that the peak occurs later in the morning; and
- The HGV content of the total traffic flow is at its highest during non-peak periods.

Between December 1 and December 8, 2003, the Dublin City Council undertook surveys at a number of the road links crossing the canal cordon. These surveys specifically targeted goods vehicles and data pertaining to the following classes of vehicles were recorded:

- Class 2 - 2 axle rigid truck
- Class 3 - 3 axle rigid truck
- Class 4 - 4 axle rigid truck
- Class 2/1 – 2 axle rigid truck/1 axle trailer
- Class 2/2 - 2 axle rigid truck/2 axle trailer
- Class 3/1 - 3 axle rigid truck/1 axle trailer
- Class 3/2 - 3 axle rigid truck/2 axle trailer
- Class 2+2 - 2 axle tractor/2 axle trailer
- Class 2+3 – 2 axle tractor/3 axle trailer
- Class 3+2 – 3 axle tractor/2 axle trailer
- Class 3+3 - 3 axle tractor/3 axle trailer

City centre bound (inbound) goods vehicles were surveyed in the morning between 08:00 and 10:00 and outbound goods vehicles in the afternoon between 16:00 and 18:30. The locations of the surveys were as follows:

- Conynagham Rd
- Blackhorse Ave
- Old Cabra Rd
- New Cabra Rd
- Binns Bridge
- Newcomen Bridge
- Navan Rd (Garda Station)
- St Johns Rd West
- Palmerston The Oval (QBC)
- N-11-Fosters Ave
- Harolds Cross Bridge
- Leeson St Bridge

- Portebello Bridge (Rathmines)
- Ballyfermot Rd (Opp.Gala)
- Mount St Bridge
- Dolphins Barn Bridge
- Old Kilmainham

It is to be noted that this 2003 cordon count was carried out at 17 locations whereas the 2002 survey discussed earlier covered 34 locations. The findings from the 2003 cordon count surveys are highlighted in the following sections.

Morning Peak Period

In ***Table 2.9,*** the goods vehicles entering the canal cordon on all surveyed routes are summarized by vehicle class and time of day.

Time	Class 2	Class 3	Class 4	Class 2/1	Class 2/2	Class 3/1	Class 3/2	Class 2+2	Class 2+3	Class 3+2	Class 3+3	Total
8:00-8:30	134	13	32	1	7	0	20	1	28	1	17	254
8:30-9:00	114	10	17	0	11	0	18	1	19	1	15	206
9:00-9:30	125	9	22	0	24	0	26	2	34	0	11	253
9:30-10:00	174	20	37	5	27	1	20	2	33	2	21	342
Total	547	52	108	6	69	1	84	6	114	4	64	1055
% of Total	52%	5%	10%	1%	7%	0%	8%	1%	11%	0%	6%	100%
Avg Hr Volume	274	26	54	3	35	1	42	3	57	2	32	528

Table 2.9 – Classes of Goods Vehicle Entering Canal Cordon (Dec. 2003)

This table highlights that:

- 52% of all trucks entering the canal cordon in the morning are 2 axle vehicles;
- The next most common truck type is Class 2+3 (i.e. articulated tractor and 3 axle trailer) constituting 11% of the total trucks; and
- Before 9:30, the number of trucks entering the cordon in each 30-minute period is relatively consistent, but there appears to be an increase after 09:30.

Afternoon Peak Period

In ***Table 2.10***, the total commercial vehicles exiting the canal cordon on all surveyed routes are summarized by vehicle class.

Time	Class 2	Class 3	Class 4	Class 2/1	Class 2/2	Class 3/1	Class 3/2	Class 2+2	Class 2+3	Class 3+2	Class 3+3	Total
16:00-16:30	160	10	28	0	16	2	7	0	31	1	28	283
16:30-17:00	153	4	16	1	20	0	15	2	23	0	23	257
17:00-17:30	132	6	10	0	13	0	12	1	22	1	19	216
17:30-18:00	126	10	21	0	14	1	9	0	27	0	22	230
18:00-18:30	105	10	18	0	13	0	4	0	26	0	21	197
Total	676	40	93	1	76	3	47	3	129	2	113	1183
% of Total	57%	3%	8%	0%	6%	0%	4%	0%	11%	0%	10%	100%
Avg Hr Volume	270	16	37	0	30	1	19	1	52	1	45	473

Table 2.10 – Classes of Goods Vehicle Exiting Canal Cordon (Dec. 2003)

From this table it is observed that:

- 57% of all trucks exiting the canal cordon in the afternoon are 2 axle vehicles;
- The next most common truck type is Class 2+3 (i.e. articulated tractor and 3 axle trailer) constituting 11% of the total trucks; and
- From 16:00 there is a general decrease in the number of trucks exiting the cordon.

Morning/Afternoon Comparisons

By comparing the 2003 morning/afternoon data, it is noted that there are no significant differences in proportional splits between the two peak periods. The average hourly volumes are also mostly equitable.

Whilst this survey provided information on the various classes of commercial vehicles entering/exiting the cordon by peak period, it failed to provide any indication of whether the vehicles are originating/destined within the canal cordon. Furthermore, having only data for the morning and afternoon peak periods and in one direction only has not enabled a picture of HGV movements throughout the day to be compiled.

2.1.3 Data Deficiencies/Problems

From the review of the available data there are a number of deficiencies/problems that were noted:

- Origins and destinations of non-port related HGV trips throughout the city are unknown.
- Origins and destinations for port related HGV trips that use access roads other than Tolka Quay are unknown.
- HGV time of travel trends for the canal cordon are not available.
- A common HGV vehicle classification has not been used in the previous surveys, which makes the determination of a HGV Management Strategy difficult to achieve. For example, the City counts “commercial vehicles”, the Atkins McCarthy report refers to HGV1 (2 or 3 axles) and HGV2 (4 or more axles) classes, and the Carl Bro report refers to vehicles greater than and less than 2 tonne unladen weight. The 2003 data collected by Dublin City Council that classifies vehicle by axle configurations is the most comprehensive set of data available.
- A citywide HGV forecasting model is not available.

These deficiencies make the evaluation of any HGV management strategy difficult to undertake on a quantitative basis. Before any firm decisions can be made on a HGV Management Strategy, more detailed and accurate data pertaining to both port and non-port related HGV movements may be required. At the outset, a common definition is required of what a HGV is. This is discussed in later sections of the report.

2.1.4 Preliminary Conclusions

Notwithstanding the data deficiencies/problems, it is possible to make a number of conclusions based on the available data. These are listed below:

- Between 1998 and 2003 the total number of goods vehicles in/out the port has remained constant at about 7600 veh/day;
- There has been a shift in truck movements from the north port to the south port since 1998;
- Based on the estimate that 30% of port related trucks would not use the DPT, this equates to 2280 port related trucks per day on the city streets upon opening of the DPT and no HGV Management Strategy in place;
- 20% of all port related trucks have less than 3 axles;
- 80% of all port related trucks have 3 or more axles;
- 52-57% of trucks crossing the canal cordon have less than 3 axles;
- 43-48% of trucks crossing the canal cordon have 3 or more axles; and
- approximately 157 overheight HGVs access the port per day.

2.2 Review of Previous HGV Management Initiatives

A review of the reports provided by the City and those filed at the Dublin Port Tunnel offices has revealed a number of previous HGV/commercial vehicle management initiatives. Points from these reports that are relevant to the development of a HGV Management Strategy are presented and discussed briefly in the sections below.

“Commercial Vehicle Management Strategy for the Inner City - 1998”, MVA
This study was concerned with HGV movements within the city centre, and not through (i.e. port) traffic. A number of recommendations were made regarding management of deliveries and loading, and prohibiting HGVs greater than 17.5 tonne in the city centre during business hours. Most of the recommendations were incorporated into the report summarized below.

“Control of Road Space and Commercial Vehicle Management Strategy for Dublin City”, Office of the Director of Traffic, Dublin Corporation, April 2000
This initiative was aimed at controlling all commercial vehicles in the city, with limited focus on the DPT. Some key findings included in the report relating to goods deliveries include the following:

- Whilst commercial vehicles contribute to city centre congestion, other vehicles also cause problems that can impact on goods vehicles. For example cars parked in loading bays cause goods vehicles to double park.
- Effective enforcement is critical to the success of any HGV management strategy and there was concern at the level of enforcement of short duration offences.
- The delivery process is inefficient in that deliverers are often required to off load goods and sometimes place them on store shelves. All the while the vehicles occupies valuable road space.
- The size of vehicles being used to deliver goods is increasing.

Within the context of a HGV Management Strategy, the following recommendations are considered worthy of note:

- The allocation of road space between different users is to be reassessed in an attempt to provide additional loading facilities.
- Loading facilities are to be clearly identifiable.
- Innovation in the management of commercial vehicle activity will be promoted.
- Enforcement is to be improved through changes in the penalties payable.
- Implement 12-hour clearways (i.e. no stopping/parking/loading permitted) between 07:00 to 19:00) on strategic routes.
- Introduce metered loading bays with 30-minute limits.
- Imposing restrictions on the hours of access of all vehicles to certain streets within the city centre.
- Introducing a time of day and size limitation on commercial vehicles using city streets within the canal ring. The times of restriction are 07:00 to 19:00 Monday to Saturday, but there is allowance for special cases.
- In the case of new developments, provision of service areas within the curtilage of the site will be required wherever possible.

The precise basis for restriction (unladen weight, GVW, number of axles, etc) is not provided in this document.

<u>"Dublin City Centre Commercial Vehicle Delivery Strategy", Dublin City Council, September 2003.</u>

According to an information pamphlet distributed by the City, a pilot clearways scheme is being introduced on a number of strategic city centre roads in March 2004. In accordance with this scheme, no on-street deliveries will be permitted on the routes between 7:00 and 10:00 and between 12:30 and 19:00 except where there are indented loading bays. Deliveries will be permitted between 19:00 and 7:00 and between 10:00 and 12:30.

The scheme, which has been jointly agreed by various trade associations, is to be monitored with a formal review to be undertaken in May 2004.

<u>"Regional Freight Study – Draft Final Report", Carl Bro Intelligent Solutions and Goodbody Economic Consultants, August 2003.</u>

In this report to the Dublin Transportation Office, various recommendations relating to HGV management in the Dublin regional area are made. These include:

- An alternative routing strategy for the HGVs that cannot enter the tunnel and are forced to travel through the city centre;
- Implement an inner city cordon to restrict HGVs entering the city centre and travelling to the port on alternative routes other than the M50;
- Explore the potential for urban consolidation centres.

<u>"Freight and Fleet Management Common Task – Traffic Information Needs of the Freight Industry", Arup/IBI Group, December 2002.</u>

This report to the National Road Authority discussed the STREETWISE project (Seamless TRavel EnvironmEnT for the Western ISles of Europe) and considered the ITS needs related to the freight industry. Some useful background information obtained from this report is summarized below:

- 55% of Irish freight hauliers are one-vehicle companies.
- Only 4% of Irish freight haulier companies have more than 10 vehicles.
- The European Commission Working Time Directive imposes a limit on the number of hours a driver may drive. This obviously affects scheduling, but there is another issue in that lay bys for driver resting (especially in Ireland) are generally not provided. The NRA is however taking steps to address this.
- The importance of on-time delivery associated with narrow arrival windows is creating pressure on drivers with the resultant potential safety implications.
- Road freight accounted for 93% of all freight movements in Ireland in 1998.

“HGV Management Study Stage 2 Report”, Geoconsult Arup, October 1997

This study was commissioned to consider complementary measures to the DPT to minimize the penetration of goods vehicles, particularly those with port related journeys in the city centre. The study examined four scenarios and their impact on HGV traffic within the city with the use of an EMME/2 model. The scenarios that were tested were the banning of through HGVs in the city centre, within the canal cordon, and across two screenlines in the city centre. The modelling and evaluation process only considered the impacts on HGVs and other traffic was ignored. Clear recommendations on a preferred option were not provided, however there were a number of other recommendations, namely:

- Restrictions should be applied to vehicles over 17 tonne GVW (3 or more axles).
- HGV management measures should apply 24 hours a day. (Note: This recommendation was based on the need to reduce noise at night, and not on traffic operations grounds)
- Any scheme will require statutory authority for the appropriate road signing and enforcement.
- Extensive consultation will be required prior to selection of a HGV management plan.

“HGV Policy Paper”, Dublin City Centre Business Association LTD

In this paper, the DCCBA made the following suggestions considered relevant to this study:

- Restrict HGV deliveries to the city centre between 07:00 – 10:00 and 16:30 – 19:00.
- All HGV through traffic must not use the city centre streets between the canals once DPT is operational.
- All HGV deliveries to the city centre above 3.5 tonne unladen weight are to be by permit.
- Refrigerated goods deliveries to be treated by way of special policy.
- Shopper’s cars are to be facilitated between 10:00 and 16:30.
- Restrict builders HGVs between 07:00 –10:00 and 16:30 to 19:00.
- Carry out persistent enforcement of all traffic, loading, unloading and parking.

From the above documentation it can be seen that there is lack of consensus with regard to the vehicle classifications, and the time and extent of restrictions.

Important issues were however raised regarding the lack of an effective legislative framework with which the authorities can impose and enforce HGV restrictions. The need for public and interagency consultation, and acceptance of a management plan also became apparent.

3 REVIEW OF ISSUES

In this section a number of key issues that will need to be considered during the development of the HGV Management Strategy have been presented. These issues were identified during the data review, the stakeholder consultation, and in some cases have been based on our previous experience.

3.1 HGV Classification

The various agencies and consultants have differing views on what a HGV actually is. The Dublin City Council currently uses a 3 tonne unladen weight restriction in a number of residential areas to limit HGV use of local streets. In the reports prepared by Geoconsult Arup, reference is made to 17 tonne (3 or more axles), and the National Roads Authority in the “Dublin Port Tunnel Toll Scheme Explanatory Statement” the cut off for tolling purposes is 3500 kilograms (3.5 tonne) GVW or 1524 kilograms (1.524 tonne) unladen weight. In the “Origin-Destinations Surveys Final Report” undertaken for the Dublin Port Company, a HGV is a Heavy Goods Vehicle with two or more axles. The MVA report uses 7.5 tonne unladen weight as the division between a light goods vehicle and a HGV.

In preparing a HGV Management Strategy, there is a requirement at the outset to define what an “HGV” is. In order to define a HGV for the purposes of this assignment a review of the HGV volume data was carried out to try and ascertain the proportions of two axle, three axle, articulated vehicles, etc. accessing the port and canal cordon. As identified earlier the following proportions of good vehicles are known:

- 20% of all port related trucks have less than 3 axles;
- 80% of all port related trucks have 3 or more axles;
- 52-57% of trucks crossing the canal cordon have less than 3 axles; and
- 43-48% of trucks crossing the canal cordon have 3 or more axles;

According to the Road Traffic Regulations the maximum laden weight of a two axle rigid truck is 17 tonne. Any truck that exceeds 17 tonne GVW is thus required to have three or more axles. The definition of a HGV as any truck that exceeds 17 tonne GVW or has 3 or more axles, will enable the HGV Management Strategy to address 80% of port related HGV trips and about 45% of canal cordon trips.

In the absence of truck volumes by classification, it is recommended that 17 tonne GVW or 3 axles be set as the lower limit for a HGV for the purposes of this assignment. As part of the additional investigation that needs to be completed outside of the current assignment, an analysis of the classes of HGVs that are being used for delivery purposes within the city should be undertaken. The proposed 3 axle/17 tonne GVW limit should then be reviewed.

In ***Exhibit 4.1*** the typical HGV vehicle classes as included in the Road Traffic Regulations have been presented. This provides an indication of the type of HGVs that would be affected by the HGV Management Strategy.

Exhibit 4.1

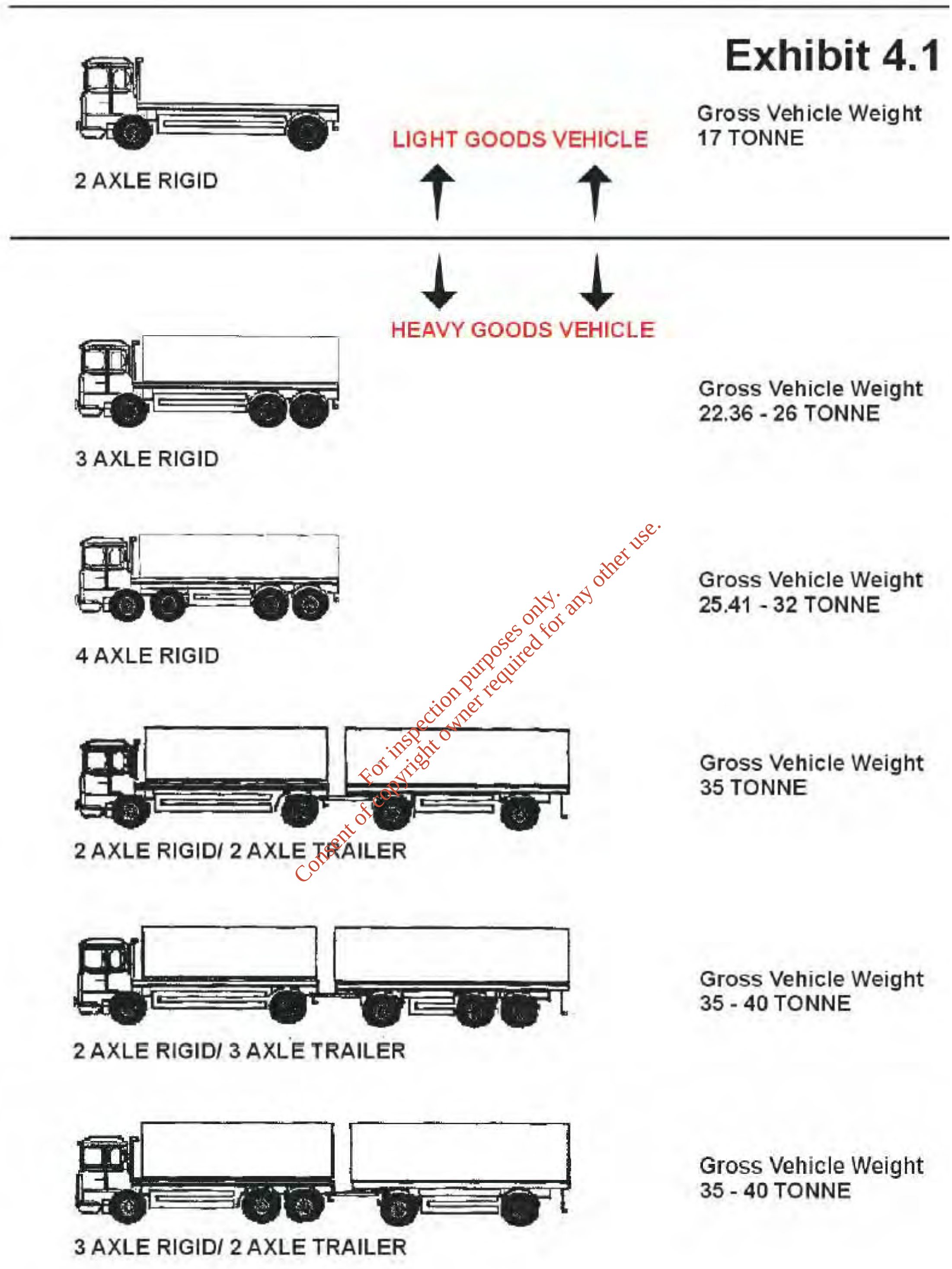
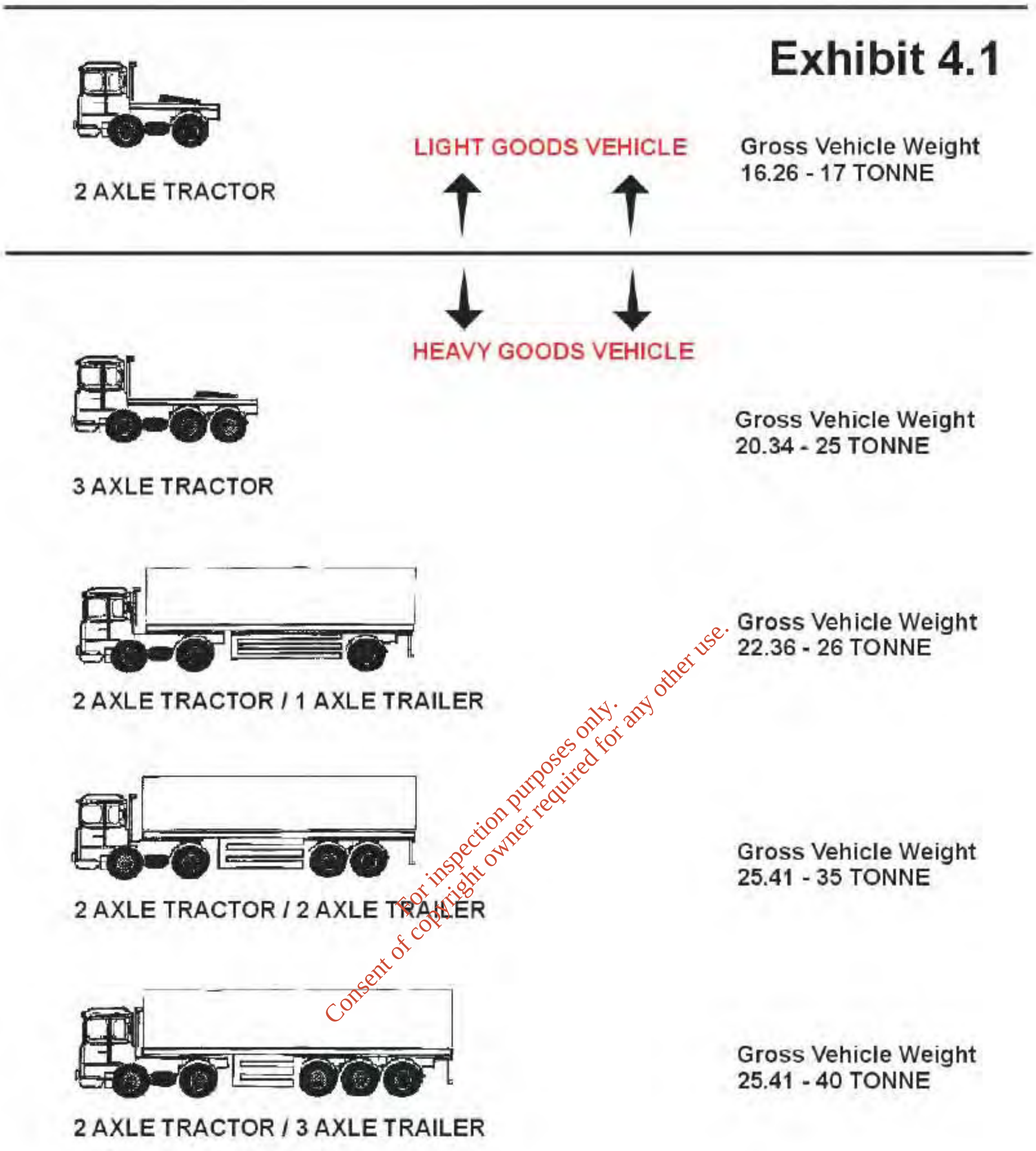

2 AXLE RIGID
LIGHT GOODS VEHICLE
Gross Vehicle Weight
17 TONNE
HEAVY GOODS VEHICLE
3 AXLE RIGID
Gross Vehicle Weight
22.36 - 26 TONNE
4 AXLE RIGID
Gross Vehicle Weight
25.41 - 32 TONNE
2 AXLE RIGID/ 2 AXLE TRAILER
Gross Vehicle Weight
35 TONNE
2 AXLE RIGID/ 3 AXLE TRAILER
Gross Vehicle Weight
35 - 40 TONNE
3 AXLE RIGID/ 2 AXLE TRAILER
Gross Vehicle Weight
35 - 40 TONNE

Exhibit 4.1


2 AXLE TRACTOR
LIGHT GOODS VEHICLE
Gross Vehicle Weight
16.26 - 17 TONNE
HEAVY GOODS VEHICLE
3 AXLE TRACTOR
Gross Vehicle Weight
20.34 - 25 TONNE
2 AXLE TRACTOR / 1 AXLE TRAILER
Gross Vehicle Weight
22.36 - 26 TONNE
2 AXLE TRACTOR / 2 AXLE TRAILER
Gross Vehicle Weight
25.41 - 35 TONNE
2 AXLE TRACTOR / 3 AXLE TRAILER
Gross Vehicle Weight
25.41 - 40 TONNE

3.2 Competing Interests

For a HGV Management Strategy to be successful it must consider the needs of all parties affected by it. The needs/wishes of the parties are however different and often compete. In the ***Table 3.1***, some of the generic needs of the different agencies/parties have been presented as an illustration.

Agency/Sector	**Needs/Wishes**
Dublin City Council	• Optimise overall traffic operations for all users without penalizing one sector unfairly. • Provide infrastructure that ensures safe and efficient movement of people and goods. • Reduce the conflict between HGVs and non-motorized road users (pedestrians and cyclists). • Create/maintain a viable city that is accessible. • Be able to enforce HGV restrictions effectively and efficiently. • Restrictions to be unambiguous and clearly understandable by operators.
Dublin Port	• Operate a port that is accessible to goods movement. • To reduce costs, limit the hours of operation as far as possible.
Transport Operators	• Deliver goods within the shortest possible time and at least expense (i.e. shortest route with no tolls and no restrictions).
Garda Siochana	• Be able to enforce HGV restrictions effectively and efficiently. • Restrictions to be unambiguous and clearly understandable by operators.
City Residents	• Remove HGVs from streets that pass through residential areas. • Remove HGVs from streets during peak periods to reduce commute times.
Commercial Business Sector	• Be able to have goods delivered, whilst at the same time have customer parking in close proximity. • Deliveries to take place when staff are available to receive/dispatch – usually during morning. • Deliveries to be regular so as to reduce the amount of floor space allocated to storage (i.e. maximize retail floor space)
Building Material Suppliers	• Access to construction sites to facilitate placement of materials without having to double handle
Food and Drink Sector	• Deliveries required throughout the day – perishables in early morning, non-perishables could be later. • Beer deliveries during the day due to noise associated with keg loading/unloading. • Beer deliveries to pubs to be completed in the morning after staff arrives and before the lunch rush.
Car Transportation	• Dealer deliveries to take place during normal working hours when staff available to receive vehicles.
Service vehicles	• Access to all potential sites at all times

Table 3.1 – Illustration of Typical Needs

From the above table it can be seen that satisfying all needs/wishes will be a challenging task and ultimately compromises will need to be made to appease all parties.

3.3 Length of Detour

At present, HGVs that enter/leave the Dublin metropolitan area have the choice of using any of a number of primary routes that intersect with the M50 or cross the city boundary to the south. With the construction of the DPT it is anticipated that most of the port related HGVs (excluding overheight vehicles) would use the tunnel, the M1 and the M50. It is however felt that without restrictive measures, this may be an unreasonable expectation especially for HGVs that have origins/destinations to the south or southwest. Notwithstanding the construction of the tunnel, it may still be quicker for HGVs to use alternative routes such as the N7, N81 or N11 for port access. In addition, many non-port related trips start/end in other parts of the city and these HGVs are unlikely to use the tunnel, especially for those trips to/from the south and western sectors.

3.4 Tolling

There are currently two tolled facilities in the Dublin area, namely at the East Link and West Link crossings of the River Liffey. National Toll Roads, a private company, administer these facilities. Provision has been made for electronic tagging, and in 2002 electronic tolling of HGVs has grown to approximately 40% of all HGVs passing through the West Link toll. At the East Link 30% of HGVs are using electronic tolling. Tagging is however optional at the discretion of the HGV operator and no legislation exists to make tagging compulsory.

After completion of the DPT, the tolling of HGVs on the M50 may need to be reviewed as it may encourage diversion off the M50 and M1/DPT corridor especially for those HGVs to/from the south and west. The tolling of HGVs at the East Link could also be a significant factor as the current tolls are unlikely to deter HGVs to/from the south from using this route. From discussions with City officials, the HGV Management Strategy should not rely on any amendments to HGV tolling at the two links.

The National Roads Authority has advised that as part of the tolling schemes that are being developed nationally, a universal tag is being considered. At this stage however, the concept of a universal tag is in its infancy and it will take some time for clear direction on this issue. The NRA did however wish to ensure that any systems that are implemented can be integrated and use a common architecture. Further consultation with the NRA will be required to ensure that if additional tolling is to be part of the HGV Management Strategy, it is compatible with national strategies.

3.5 HGV Routing and Signing

At present the City does not have a defined HGV route system in place. HGVs are thus able to use any roads within the city, with the exception of those where signs have been posted restricting access to vehicles in excess of 3 tonne unladen weight.

Although the HGV operators have on their own accord apparently identified preferred routes, the City has not designated the routes per se.

From a traffic engineering perspective, it may be preferable to define HGV routes such that all trucks use these routes, with the exception of those trucks that need to deviate to make local deliveries. It is however acknowledged that the designation of routes is likely to be highly controversial as residents may object to this action, even though trucks are currently using the routes.

There is provision in the Traffic Signs Manual for weight restriction signs (unladen), vehicle weight (laden) restriction signs, axle weight restriction signs and height restriction signs. Provision has also been made for “Route subject to restriction” signs, which illustrate the routes that are the subject of the restrictions. For the purpose of defining truck routes, it is our opinion that it is better to provide positive guidance signage (identifying where trucks can go), as opposed to restrictive signage (identifying where trucks can’t go). This type of positive signage is however not provided in the Traffic Signs Manual should it be required as part of the strategy.

3.6 Overheight Vehicles

Once the DPT is completed, any vehicles in excess of the maximum permitted height through the tunnel will be required to follow alternative routes.

Discussions with the City staff responsible for approving abnormal load routes have advised that there is a process whereby HGV operators request a permit to use a vehicle, or transport a load that exceeds the limits stipulated in the Road Traffic (Construction, Equipment and Use of Vehicles) Regulations. On the permit, restrictions are imposed in terms of route, time of travel, and Garda Siochana escort requirements. Applications for the permit are submitted to the Commissioner of the Garda Siochana four days in advance. Once approved by the Garda, the application is submitted to the City for approval and preparation of the permit. The Garda can charge the applicant for escort services if they deem them necessary. The City currently charges a 31Euro flat rate for the permit.

Generally abnormal vehicles are only permitted on the city streets between 23:00 and 07:00. At present there are no restrictions on the height of vehicle included in the Regulations. There was a 4.25 meter height restriction, but this has been repealed. The city does not therefore process applications for overheight HGVs, but will become involved in cases where the vehicle or load is excessively high.

As an interim measure, the existing permitting process could be adapted to cater for, and deter those vehicles that exceed the tunnel height limits.

3.7 Enforcement

The Traffic Signs Manual currently makes provision for restrictions based on unladen weight, vehicle weight (applicable to bridges), axle weight and height. A sign regulating vehicles by number of axles or GVW is not provided. At present, the predominant means of restricting HGV use of a road is with the 3 tonne unladen weight signs as provided in the Traffic Signs Manual and regulations. This restriction (which equates to a gross vehicle weight of approximately 7.5 tonne) would still enable light goods vehicles to use a road. This limit is however significantly lower than the 17 tonne GVW limit set earlier as the HGV classification for the purpose of the HGV Management Strategy.

Enforcement of a weight-based restriction is however considered problematic for the Garda as by looking at a vehicle they cannot determine the unladen weight or GVW. While "weigh-in-motion" equipment is available, it only measures individual axle loads (not vehicle weight). To facilitate enforcement, HGV restrictions should generally be based on vehicle size and visual aspects such as length or number of axles (3 for the purposes of the HGV Management Strategy).

Any HGV Management Strategy restrictions that are based on GVW, vehicle length or number of axles will require an amendment to the Traffic Signs Manual and the Regulations.

3.8 Port Operations

From the Atkins McCarthy report it is noted that 75% of the total daily HGVs using Tolka Quay Road pass through between 07:00 and 19:00. 86% pass through between 06:00 and 20:00. Notwithstanding the recent NITL data which indicates a shift in travel times, a significant proportion of HGVs travelling to/from the port are using the city's streets when general purpose traffic volumes are at their highest. It is understood that the need for peak travel time is associated with the ferry schedules and the roll on/roll off HGVs that use the ferries. Amendments to the ferry schedules may be possible, but consideration will need to be given to the impacts at the other end of the ferry route

In liaison with Dublin Port Company, the ferry operators and the major trip generators within the port area, an amendment of the operating hours could help in reducing the number of HGV vehicles using the city streets during peak periods.

3.9 Jurisdictional Issues

The HGV Management Strategy that is to be developed is intended to manage HGVs on the streets within Dublin City. Any management strategy that is implemented will, however, have an impact on surrounding counties and on the national roads in the Greater Dublin Area. The HGV Management Strategy should therefore be developed on a regional basis, and not on a city only basis. As will become evident in later sections of the report, the requirement to develop the strategy for the city only restricts the number of options that can be considered for implementation.

3.10 Recent Trends in Business Operations

Internationally in the past, commercial businesses tended to hold an adequate stock holding on site. Over the years, there has been a shift with the businesses relying more and more on "just in time" deliveries thus reducing the stock holding requirement, and freeing up floor space for retail display. The trend has therefore been towards more frequent and smaller deliveries as opposed to large infrequent deliveries.

The growth in Internet shopping is also likely to have an impact on the movement of goods within the city. Customers no longer need to visit a shop to select/buy/take delivery of all their required goods. Orders that are placed over the Internet can either be distributed from the retail store or from warehouses/depots that can be situated outside of urban areas. The net result is that the need for supplier/retailer deliveries (e.g. to the city centre) reduces.

Both of these trends are likely, in the long term, to result in a reducing need for HGV deliveries to/from the city centre with a shift to smaller delivery vehicles.

4 INTERNATIONAL EXPERIENCE OF HGV MANAGEMENT STRATEGIES/OPTIONS

In this section of the report, experiences or proposed management measures in other cities around the world have been summarized.

4.1 City of Vancouver, Canada

Vancouver has implemented a truck route system whereby all trucks with 3 or more axles and G.V.W greater than 4.5 tonne must use the designated routes. The routes generally skirt the city centre but extend through industrial/commercial and residential areas. Trucks must use the designated routes on a 24-hour basis and may only deviate to make local deliveries.

In the city centre, no vehicle with a length greater than 15.25m may enter the area between 7AM and 6PM seven days a week. As such city centre deliveries take place at night or through the use of smaller vehicles (<15.25m length).

4.2 New York City, USA

New York has implemented a system of “through truck routes” and “local truck routes” in various Boroughs. A truck is defined as a goods vehicle that has either two axles and six tires, or three or more axles. The “through truck routes” are intended to carry trucks that have neither an origin nor destination in an area. The “local truck routes” are intended to carry trucks that have an origin or destination (for the purpose of delivery) in an area. Operators may divert off local truck routes to make deliveries using the shortest and most direct route.

Certain areas within the City of New York are designated as “Limited Truck Zones” whereby no truck can enter except for the purpose of deliveries. Restrictions are in place 24/7 or only for certain hours depending on area.

4.3 Kent County Council, England

Kent has adopted a set of policies that relate to the management of HGVs and these include:

- Where practical, identify and signpost HGV routes;
- Considering converting bus lanes to bus/HGV lanes;
- Route signing to direct trucks to commercial areas by the most appropriate routes.

4.4 France

France has a history of developing freight distribution centres. Private developers develop these and in 1993 there were about 150 freight centres nationally. In some cities time (hours of operation) and weight restrictions for deliveries have been imposed. In Paris, trucks above 24m in length are prohibited from the city centre between 07:30 and 19:00.

4.5 The Netherlands

Urban Distribution Centres (UDC's) are identified in the national transport policy to solve the accessibility and environmental problems associated with freight transport in cities. A number of UDC's have been set up but have not proved successful. The UDC's are set up by the cities that issue freight distribution licenses to applicant carriers. Strict operating regulations are imposed on the licensees in exchange for extended usage of street space and delivery hours. This arrangement has resulted in monopolies of distribution where a limited number of registered carriers dominate the market.

In some cities time (hours of operation), weight and size restrictions for deliveries have been imposed. Experiments with permits have also been undertaken.

4.6 Japan

In 1997 the Japanese government authorized a set of policies on freight transport titled "Comprehensive Program of Logistic Policies. The following measures (relevant to the Dublin HGV Management Strategy) were included in the policies:

- Improve joint collection and delivery points in urban areas where the sorting of goods for final consumers is carried out.
- Voluntary co-operation by role players in areas such as:
  - Joint collection and delivery points in urban areas;
  - Stopping facilities for on-road collection and delivery;
- A shift from own-transport by private companies towards transport by professional carriers.

Weight restrictions are also used, as are permits to limit truck access to enter shopping malls.

4.7 Summary

From the above it is evident that there is not a common approach to the management of goods vehicles around the world. Measures that have been implemented or considered include:

- Urban Distribution Centres
- Designating HGV routes
- Area wide or local street restrictions on HGV movements.

5 SETTING OBJECTIVES FOR THE HGV MANAGEMENT STRATEGY

Transportation organizations like the City of Dublin are increasingly faced with the dilemma of (1) needing to accommodate commercial vehicles to foster economic development, while (2) dealing with a public that is increasingly vocal in it's demands that truck traffic and noise be minimized or eliminated wherever possible. As such, the general objective of a HGV Management Strategy is to facilitate the efficient movement of HGVs in recognition of their vital role in the economy of the region, while at the same time limiting their impact on general traffic and the communities through which trucks need to travel.

Within the context of a citywide HGV Management Strategy for Dublin, there are two separate but overlapping aspects that need to be considered. These are the management of port related trips associated with the DPT, and local delivery trips. As identified in previous sections of the report, the local delivery trips are far in excess of the port related trips with the later only contributing approximately 6% to the total trips in the Dublin region. The objectives of managing the port related and non-port related trips are presented below:

5.1 Port Related HGV Management Objectives

- Maximize use of the DPT by HGVs to/from the port;
- Minimize use of the city streets by port related HGVs;
- Manage overheight HGVs that cannot use the DPT on the city's surface streets; and
- Manage diverted HGVs under partial or full tunnel closure conditions.

5.2 Non-Port Related HGV Management Objectives

- Minimize the number of HGVs on the city surface streets especially during peak commuter periods;
- Minimize the conflicts between delivery and service requirements of businesses and all other road users;
- Effectively manage the available road space for parking/loading; and
- Manage HGVs in such a way as not to add significant additional delivery costs.

6 REVIEW OF POSSIBLE HGV MANAGEMENT MEASURES

In this section, a number of commonly used HGV management measures that could be considered as part of the overall strategy have been presented and briefly discussed. The measures identified could be used to manage either or both types of HGV traffic (i.e. port related and non-port related). Their suitability/applicability in the Dublin context is discussed further in Section 7. However, before presenting the measures, it is considered appropriate to discuss the issue of enforcement as it is pivotal to the success of the HGV Management Strategy and will have a bearing on the strategy components.

6.1 HGV Enforcement

As mentioned in Section 3, it has been assumed in the absence of supporting data, that, for now, and for the purpose of the HGV Management Strategy that a HGV is a goods vehicle exceeding 17 tonne GVW or having more than 3 axles. This may require review once more data becomes available.

In addition to the need for a new regulatory framework relating to signage that was discussed in Section 3, there are a number of operational issues relating to enforcement that require discussion. Enforcement of the HGV Management Strategy can be carried out in a number of ways:

- **Manually, based on visual observation** (e.g. counting axles) in which case the offending operator is issued a fine by the enforcement officer observing the transgression;
- **Using "weigh-in-motion" technology** to measure axle loading. It may be used at specific locations where there is a need to manage HGVs in areas where a weight restriction is required for other purposes (e.g. bridge loading). However, within the context of the HGV Management Strategy where area wide restrictions are proposed based on GVW, weigh in motion technology would not be suitable for enforcement purposes.
- **Automated using electronic license plate readers** to identify transgressing vehicles. An up to date database of all vehicles that may travel in Ireland (both Irish and international vehicles) would have to be maintained. By linking the license plate reader equipment to a central computer, the issuing of fines to the offending operator could be automated. There are issues related to license plate readers, namely, the accuracy of identification (e.g. dirty or defaced plates, multiple lanes and concealed vehicles, etc.), and the need for a reader to be located on each lane to be monitored. Significant infrastructure would be required on site and this may be problematic in an urban environment where space is limited.
- **Automated using electronic vehicle identification technology.** This could include technology such as electronic tag/bar code or Easypass. HGVs that violate a restriction can thus be automatically detected. New laws will have to be enacted requiring all HGVs that wish to travel in Ireland (both Irish and international vehicles) to be fitted with approved vehicle identification technology. The use of an approved identification technology and the maintaining of an up to date database linking the technology to specific vehicles and vehicle types, and

hence HGV operators, then becomes a major issue especially considering the high number of foreign vehicles on Ireland's roads. Significant infrastructure will also be required on site.

- **By permit** whereby permits are issued to vehicles exempt from restrictions by the road authority. For example all vehicles may be prohibited from a certain area except for those vehicles that carry/display the approved permit. The permit may be a sticker, bar code, or simple paper document. Enforcement can be carried out manually based on visual observation, or in conjunction with vehicle identification technology. The principal is that non-permit holders that enter a restricted area are fined.

From the above it can be seen that there are a number of ways of enforcing HGV movements ranging from the traditional on-street fine to various "hi-tech" methods. The suitability of these methods needs to be evaluated in the Dublin and Ireland context where:

- There is currently no national legislation or standards with regard to tags;
- There are significant numbers of foreign HGVs on the road and maintaining a database with tags/license plate information will be challenging;
- For enforcement purposes, there is no incentive on operators to ensure that tags are operational at all times;
- In the case of the DPT and HGV Management Strategy that are both to be operational in 2005, there is limited time (and funding) to plan, legislate and implement enforcement infrastructure.

It is therefore, our opinion, that enforcement of the HGV Management Strategy will, in the immediate term, have to rely on traditional "spot fines" based on visual observations (e.g. counting axles) and permit violations. Other methods that rely on automatic vehicle identification should, however, not be precluded from future implementation and the City should still pursue these for future implementation in liaison with the national regulatory agencies.

6.2 HGV Management Measures

In this section, some of the more common HGV management measures have been discussed.

6.2.1 Prohibit HGVs

By imposing a prohibition on HGVs within an area or on specific streets, all HGVs can be prohibited from entering the area/streets at all times. This prohibition can be achieved by the posting of appropriate signs, and in cases, physical restrictions bearing in mind the need for service and emergency vehicle access. The restriction can be incorporated into bylaws if required.

6.2.2 Restrict HGV Size

Instead of prohibiting all HGVs in an area or on specified streets, a selective restriction based on vehicle size, weight, or number of axles could be imposed. This type of restriction would typically allow the smaller HGVs into an area, but restrict the heavier or larger ones on a full time basis. Signage and physical restrictions can be used supported by bylaws if required.

6.2.3 Restrict HGV Operation by Time/Day

With this type of restriction, the presence of HGVs in a particular area or street/s can be restricted by means of signage displaying the time/s of day, and day/s of week that the restriction is in operation. Outside of the displayed time restriction, HGVs can access the area. The restriction can be incorporated into bylaws if required.

6.2.4 Restrict HGVs by Size and Time/Day

This restriction is a combination of the previous two restrictions, and is achieved through signage. It provides flexibility to the road authority in that different classes of vehicle can be permitted into an area or on specific streets at different times of day or week. The restriction can be incorporated into bylaws if required.

6.2.5 Restrict HGV Access to Permit Holders Only

By providing a special permit based on the vehicle registration number, a controlling authority can allow certain vehicles to access an area. The permit can be an open permit (full access) or have restrictions such as time of day, routing, parking/loading, etc. imposed. The permit can be issued free of charge or have a price attached to it. The permit system has to be supplemented with signs on street to advise non-permit holders that the area is restricted.

The actual permit can be in a number of different forms ranging from an electronically readable tag, a bar code/disc attached to the windscreen, or a simple paper document. This type of restriction should be incorporated into bylaws as the permit application and approval process will need to be documented.

6.2.6 Designate HGV Routes

With signage, an authority can clearly designate HGV routes that have to be used by all or some HGVs. Only trucks that need to deviate for local deliveries are permitted outside of the truck route and this scenario is usually enforceable by special legislation (bylaws) stipulating a “shortest and most direct route” approach. Generally the implementation of HGV routes is done in conjunction with other area-based restrictions, and the restrictions are applicable on a full time basis.

6.2.7 Dedicated Roads For HGVs

Strategic roads can be dedicated for use by HGVs only, through the implementation of signage. This type of measure is particular suited where there are clear desire lines where HGVs wish to travel. In the Dublin context, this measure is not considered appropriate due to the numerous desire lines and the general shortage of spare roadway capacity. The dedication of a road for HGV use only, will result in the diversion of general-purpose traffic to other routes, resulting in higher volumes and associated congestion. As such this measure has not been taken forward as an option for the purpose of the HGV Management Strategy. There may, however, be local roads within Dublin where this measure may be possible for consideration.

6.2.8 Lane Restrictions for HGVs

Specific lane/s on key routes can be dedicated for use by HGVs. HGVs are then required to use the dedicated lanes with the result that other lanes are freed up for general-purpose traffic use. It is noted that in some cities, HGVs and buses share dedicated priority lanes. The success of this arrangement would obviously be dependent on the respective number of buses/HGVs and the treatment of bus stops (on-street or in lay by).

In order for this type of restriction to be effective, there needs to be a continually high percentage of HGVs in the traffic stream throughout the day, and the remaining general purpose lanes have the capability to accommodate the general traffic. With the generally limited number of lanes provided on Dublin Roads, this measure is unlikely to be effective, and has not been taken forward as an option. There may, however, be local roads within Dublin where this measure may be possible.

6.2.9 HGV Tolling

The imposition of a toll fee on HGVs that wish to, or have to use routes on which their presence is not desired can be used as a means of making other routes more desirable. An alternative is to toll all vehicles with the exception of HGVs as is planned for the DPT. This can make a route more attractive to HGV operators.

Tolling could be performed using traditional methods (tollbooths) or electronically through the use of vehicle identification or license plate recognition technology. Either way, a significant amount of on street infrastructure will be required.

6.2.10 HGV Identification and Tracking

This is an expansion of the tolling measure described above in that the HGV is identified at two or more points either using license plate identification or vehicle identification technology.

This method could be used to manage HGVs that should use the DPT but elect not to, as well as manage HGVs that enter the city centre. The principle is that a HGV is identified as it passes detectorized zones. The detector stations would be linked back to a central computer system that will determine when each HGV enters/leaves the zones. There are a number of scenarios where this measure could be used as described below.

If a HGV enters and leaves a zone (e.g. canal cordon) within a determined time period, it could be assumed that the HGV has travelled through the zone without stopping (i.e. making a delivery). If this is the case, the HGV could then be fined or tolled for using the route. The difficulty arises in how to determine the permissible time period. If a HGV makes a short duration delivery it would still appear to be a through trip. If a HGV gets delayed in traffic, it will appear as a delivery trip, when it is actually a through trip.

If a HGV is detected as it enters a specific zone (e.g. canal cordon), and if it is then detected at the port within a certain time period, it is tolled/fined for not using the DPT. The same argument about the time period presented above applies.

Detectors are placed at the DPT toll and at the port access. If a HGV is detected at both sites it is not tolled. However, if a HGV is detected at the port only, it means that that HGV has not used the DPT and could be tolled. The problem with this approach is that HGVs that need to make local deliveries and do not use the DPT cannot be identified, and will be tolled.

Enforcement of the above scenarios will be difficult to achieve effectively, as the methodology is not considered robust enough to stand up in court. This option has not therefore been carried forward as an option.

6.2.11 HGV Demand Management

In consultation with the Dublin Port Company, ferry operators, trucking companies and the businesses at the origins and destinations, it is possible to manage the demand for HGVs in an area. Dublin is a prime example where demand management may offer significant benefits in that most port related HGV movements are concentrated in the 6AM - 7PM period. The amendment of port operating hours either by shifting the window or having extended hours, and/or changing ferry schedules, could result in significant reductions in HGV movements during the commuter peak periods. Judging from the 2003 data, there already seems to be shift in travel times since 2001, but there are still a significant number of port related HGVs on the road between 6AM and 7PM.

Furthermore, in the city centre most deliveries take place during the day and in consultation with businesses it may be possible to amend delivery times to at night or at least out of peak commute times.

These measures are likely to result in increased costs as port/business staff would need to be able to process deliveries during the extended hours and overtime pay may be required.

6.2.12 Urban Delivery Centres (UDC's)

In association with any restriction on HGV access to the city centre for delivery purposes, HGV hauliers could make deliveries to UDC's outside the urban areas. HGV loads would then be "broken up" and then consolidated at the UDC's so that a single vehicle will then deliver a variety of goods to a particular receiver, instead of multiple vehicles to a single receiver. Fleets of courier size vans could then be utilized to make the urban deliveries. A problem with this approach is that it could result in more (but smaller) delivery vehicles on the city centre (2 or 3 LGVs for each HGV). The provision and management of the transfer stations either by the public or private sector or by public/private partnership arrangements can however be challenging as is evident from the success of UDC's in other parts of Europe.

For the purposes of the HGV Management Strategy, the provision of UDC's may assist in the management of local city centre deliveries but will not have a significant impact on port related traffic.

6.2.13 Promote Modal Shift

The port is currently reliant on a significant volume of goods being transported by HGV. Other possibilities may exist which could be used in lieu of HGVs, for example rail. In terms of street operations, this may, however, create additional traffic problems as the rail crossings in the port area are generally at grade. Any upgrade of the rail system will require significant and expensive infrastructure and is considered a potential long-term measure.

Another option is to improve the transportation of fluids/gases via pipelines between the port and outlying depots thus reducing the reliance on road tanker traffic at the port. It is noted that planning permission has been granted for an aviation fuel pipeline between the port and Dublin Airport.

6.2.14 Road Pricing/Preferential Tolls

Instead of having standard toll fees on a 24/7 basis, by introducing variable toll fees on a time of day/day of week basis, it is possible to modify HGV (as well as general purpose traffic) travel patterns. Simplistically, toll fees for HGVs are made higher in peak periods than in off peak periods, resulting in more HGV movements during off peak periods and a corresponding decrease in peak travel.

6.2.15 Manage Loading in the City Centre

Dublin City has already prepared a strategy for managing loading in the city centre. This includes some of the elements outlined above, but there are others such as metered loading and planning that are mentioned.

6.3 Complementary Elements

In addition to the HGV Management measures discussed above, there will be a number of complementary elements that will need to be formulated in support of the HGV strategy. These have been outlined below.

6.3.1 Compliance and Enforcement

Any HGV strategy will require compliance by HGV operators, or alternatively, rigorous enforcement. Since the HGV management plan will pose some restrictions on HGV movements, there will always be a tendency for some operators to find "holes" in the system. An enforcement strategy will thus need to be developed in liaison with the Garda. It is, however, suggested that due to resource commitments, a separate HGV enforcement unit may be required in either the local authority or within the Garda Siochana.

6.3.2 Stakeholder Consultation

The development and implementation of the approved HGV Management Plan will require extensive consultation with a number of stakeholders, including:

- Dublin City Council;
- Other Local Authorities in the GDA
- Dublin Transportation Office;
- National Roads Authority;
- Dublin Port Company;
- An Garda Siochana;
- Revenue Commission;
- East Link/West Link Toll operators;
- Iarnrod Eireann;
- Shipping/Ferry agencies;
- Bus companies;
- HGV operators;
- Business organizations; and
- Civic organizations.

6.3.3 Institutional Arrangements

There are a number of city, county and governmental agencies that are involved in transportation issues in the Greater Dublin Area. The development, implementation, and management of the HGV Management Strategy will require a clear definition of the responsibilities of the respective agencies. Notwithstanding the fact that the DPT is funded by the NRA, Dublin City Council should lead the implementation of the HGV Management Strategy, as the major impacts will be on the city's streets.

6.3.4 Regulatory Framework

As has been pointed out earlier the existing legislation does not facilitate the implementation of a HGV Management Strategy. Amendments to the traffic legislation and Traffic Signs Manual may/will be required to support the strategy.

6.3.5 Education and Publicity

For the HGV Management Strategy to be successful, the general public and HGV operators will require education on the requirements and restrictions of the approved plan. A comprehensive publicity campaign will thus be required.

6.3.6 Signage

There are three aspects with regard to signage namely, regulatory signage which has already been mentioned, information signage and direction signage. With the opening of the DPT and the implementation of the HGV Management Strategy, direction signs will be required to guide HGV operators to/from the port and advance information signs will be required advising of any restrictions.

7 DEVELOPMENT OF HGV MANAGEMENT STRATEGY/ OPTIONS

As mentioned previously, there are two types of HGV traffic present in the Dublin area, namely port related and non-port related. Management of each type however requires a slightly different approach given the different objectives identified previously. In this section of the report, the various options are discussed in more detail.

7.1 Port Related HGV Management

In the absence of a HGV Management Strategy, the tunnel will be open for travel and all port related HGV trips that find the tunnel route attractive should use the tunnel. HGVs that will not use the tunnel will be overheight vehicles (approximately 160 per day), those that make local deliveries, and a proportion of those whose origins and destinations are to the south and southwest of the city. This number of HGVs could however be significantly reduced by the implementation of a HGV Management Strategy and various measures that will force HGVs to use the tunnel (e.g. regulatory restrictions), or make the tunnel route more attractive (e.g. tolling of other routes).

The strategy that is to be developed will be required to consider a number of tunnel operating scenarios with the two extreme cases being full operation in both tunnel bores, and both bores closed. Between these two extremes there are a number of permutations that may have an impact on HGV and general traffic movements in the vicinity of the tunnel portals, but they will not impact on the overall strategy.

As mentioned above under the “do nothing” scenario, there will be an estimated 2280 HGV trips per day (30% of 7600) that will not use the tunnel if a management strategy is not implemented. However in the event that both bores are closed (worst case scenario) the number of HGV trips that will need to be accommodated outside of the tunnel will increase substantially. In this scenario, all HGVs will be required to make alternative arrangements for the duration of the closure. These alternative arrangements could include using the street network, holding in stop areas, etc. Based on the estimated 7600 HGV trips generated by the port per day in 2003, this type of closure could potentially result in approximately 275 HGVs per hour (assuming 12% occur in the peak hour) diverting onto the street network.

One of the challenges in developing the HGV Management Strategy, will thus be to make sure that whatever measures are developed to improve upon the “do nothing” scenario will also be able to cope with the 100% HGV diversion that could result from the worst case scenario.

7.2 Non-Port Related HGV Management

From the work undertaken by Carl Bro that relates to commercial trips (not HGVs) it is evident that the number of non-port related trips far exceeds the number of port related trips. In ***Table 2.8*** compiled from their report, only 6% of the total commercial trips in the Dublin region are port related which means 94% are non-port related. Of the 94% of the total commercial trips, a significant, but unknown, proportion will be undertaken using HGVs in the city centre. From the data that is available, it is not possible to estimate the number of non-port related HGV trips that take place in the city.

7.3 Measure Applicability

Within the context of the City Wide HGV Management Strategy that is to be developed, the target HGVs are those with 3 or more axles, or in excess of 17 tonne GVW as discussed earlier. Some of the previously identified management measures make reference to restrictions based on variable HGV size by time of day. This implies that different classes of HGVs can be permitted within an area depending on the time of day. Since the HGV Management Strategy is only targeting HGVs with 3 or more axles or in excess of 17 tonne GVW, management measures that make allowance for different classes of HGV have not been considered further in this report. This type of restriction may however still be applicable on a more localized basis (e.g. residential areas) where the posting of a lower limit may still be required.

Within the Dublin area, each of the remaining HGV management elements identified in Section 7 will have a number of pros and cons. These have been summarized in ***Table 7.1*** where the focus has been on the traffic engineering aspects, but there are other aspects such as property development potential, community, and environmental aspects that need to be borne in mind.

Each of the previously identified elements of HGV management also has their limitations with regard to where they can be applied. In the Greater Dublin area, there are three zones that are generally used for geographic descriptions, namely the city centre, the canal cordon, and the M50 ring. The city centre is not clearly defined but is generally considered as that area bounded by:

- King Street North and Parnell Street to the north
- Church Street to the west
- Merrion Street/Westland Street/Lombard Street and Gardiner Street to the east
- St Stephens Green and the extension of Dame Street to the south

As such, the "City Centre" falls completely within the canal cordon and has two of the major HGV routes (the River Liffey Quays) passing through it. The imposition of HGV restrictions only in the city centre would result in HGVs deviating onto other streets within the canal cordon, which is clearly undesirable. City centre restrictions will thus have to be compatible with canal cordon restrictions. For this reason the application of restrictions on a city centre only basis is not considered appropriate. Any restrictions within the canal cordon will thus need to cover the city centre as well.

In ***Table 7.1*** the applicability of the management measures within the M50 ring and the canal cordon have also been presented. Factors that have been taken into account when deciding if a measure is applicable are:

- the land use and the need for HGV deliveries in an area,
- the need for HGVs to travel through the area if there are no viable alternatives,
- the possibility of reducing HGV demand by using smaller vehicles, and
- the location of the zone in relation to the port (with the port and the East Link toll being outside of the canal cordon).

			Applicability		
Element	**Pros**	**Cons**	**Within Canals**	**Within M50 Ring**	**Comments**
Prohibit HGVs (Full time)	• no HGVs permitted in an area • can encourage shift to smaller goods vehicles • safety and traffic operational benefits inside area	• can result in more vehicles on the road (e.g. 3 LGVs for 1 HGV) • • can result in safety and operational disbenefits outside the area	No	No	Not reasonable to restrict HGVs on a full time basis as delivery and service HGVs will be required to enter at some time.
Restrict HGV Operation by Time/Day	• can encourage shift to smaller goods vehicles • keeps all HGVs off the area network at times when there are high parking and mobility demands on the street network • safety and traffic operational benefits inside area during restricted periods	• can result in more vehicles on the road (e.g. 3 LGVs for 1 HGV) during restricted periods • encourages HGV detouring around area and possibly rat running during restricted periods • All HGVs may have to hold outside of an area awaiting the "opening" time • All HGV deliveries will be required outside of the restricted periods possibly resulting in noise complaints • can result in safety and operational disbenefits outside the area during restricted period	Yes	No	Excessively onerous to restrict HGV travel and deliveries within the M50 ring in the short term, but may be necessary in the longer term. During restricted hours smaller goods vehicles permitted in area.
Restrict HGV Access to Permit Holders Only	• limits the number of HGVs in the restricted area during restricted periods • allows the flexibility to permit those HGVs that have to enter the restricted area for delivery purposes • permit fees can be used to defray expenses • safety and traffic operational benefits inside area during restricted periods	• can result in more vehicles on the road (e.g. 3 LGVs for 1 HGV) during restricted periods • encourages detours and rat running during restricted periods • Some HGVs may have to hold outside of an area awaiting the "opening" time • Some HGV deliveries will still be required outside of the restricted periods possibly resulting in noise complaints • permit approval process required • safety and operational disbenefits outside zone during restricted periods	Yes	No	Excessively onerous to restrict HGV deliveries within M50 ring to permit holders only during restricted periods in the short term, but may be necessary in the longer term.

Element	Pros	Cons	Applicability		Comments
			Within Canals	Within M50 Ring	
Designate HGV Routes	• concentrates HGVs on specific routes, while removing them from other less desirable routes • safety and traffic operational benefits on non-truck routes	• extensive evaluation required in deciding route • enforcement of HGVs off the route difficult • no limit on number of HGVs on road • detours to access truck routes required • safety and operational disbenefits on truck routes • likely to be met with strong resistance from residents	Yes	Yes	Public opposition will be a significant issue.
HGV Tolling	• income generating • can form part of an overall commercial vehicle operations strategy • by not tolling HGVs on a route, that route can be made attractive compared to other tolled routes	• infrastructure requirements • high capital and operating cost • encourages detours and rat-running if restrictions are not placed on non-tolled routes • may create safety and operational problems on non-tolled routes if diversion is not anticipated or prohibited	Yes	Yes	Tolling to take place at limited access points e.g. at the canal cordon and on the routes that intersect with the M50
HGV Demand Management	• manages HGVs at start and end points • less HGVs on the road during peak periods • safety and traffic operational benefits	• labour issues • port scheduling and operational issues • HGV holding areas may be required	Yes	Yes	Reliant on other agencies/ organizations
Promote Modal shift	• less HGVs on road • safety and traffic operational benefits	• will require additional alternative mode infrastructure e.g. rail and pipe lines • trains crossing at at-grade rail crossings will disrupt traffic as well as create safety issues	No	Yes	Dependant on alternative modes being available which are limited in the canal cordon
Road Pricing/ Differential Tolls	• less HGVs on road during peak periods	• variable tolls can result in HGVs stopping off to wait for reduced toll rates to come in	Yes	Yes	Variable tolls by time of day. High HGV tolls during the day and lower tolls at night Increase HGV tolls at East Link

			Applicability		
Element	**Pros**	**Cons**	**Within Canals**	**Within M50 Ring**	**Comments**
					and reduce HGV tolls at West Link to encourage HGVs from south to use M50/M1/DPT. Reliant on outside agencies
Manage City Centre Loading	- reduces parking/loading conflicts - metered loading increase turnover		Yes	No	The existing strategy is only applicable to the city centre

Table 7.1 – Applicability of HGV Management Measures

8 Basis for Selecting Options

In Section 7, the various measures of a HGV Management Strategy and their applicability in Dublin from a traffic engineering perspective were presented. In discussion with City officials, a number of the elements were, however, ruled out. These, and the reason for the decisions are as follows:

Designating HGV Routes – All existing routes between the port and M50 pass through residential areas, alongside schools, etc. Notwithstanding the fact that HGVs currently use the roads, the designation of these roads as HGV Routes will be met with significant public opposition, and any signage that is erected is likely to be vandalized/removed. Whilst it is possible to restrict HGVs on all roads with the exception of those that the City desires them to use, this is likely to be met with the same opposition.

HGV Tolling at the M50 Ring – To toll all HGVs entering/leaving the M50 ring, tolling would need to take place between the M50 and the nearest intersection on the city side of the M50. In many cases, this would be outside of the Dublin City Council boundary and would create interagency issues.

Promoting Modal Shift – The state of the rail system in Ireland does not lend itself to providing improved goods transportation service. In the port area many of the road/rail crossings are at grade, and any increased numbers of train movements across the road network will exacerbate the current problems at these crossings.

It is to be noted that the unacceptability of the above management elements restricts the number of options that can be considered as part of the strategy development.

In addition, ***HGV Demand Management*** is an element that should be pursued irrespective of the HGV Management Strategy. It is also likely to be a consequence of other management elements that may be imposed. As such, it has not been included in subsequent discussions as an option. Similarly, the **Management of City Centre Loading** and **Road Pricing/Differential tolls** at East Link, West Link and at Canal Cordon are measures that should be pursued irrespective of other HGV management measures.

With the exclusion of the above, the following options remain for further consideration:
- **Option 1** - Restrict HGVs within the Canal Cordon by Time of Day
- **Option 2** - Restrict HGV access to Canal Cordon to Permit Holders Only
- **Option 3** - HGV Tolling at the Canal Cordon

These options either applied on their own or in combination, thus form the basis of the HGV Management Strategy. They could however be supported by other localized measures to increase their effectiveness.

Whilst the above are intended to deal with HGVs in general, special attention also needs to be given to the management of overheight HGVs.

Management of overheight vehicles after detection and voluntary diversion from the traffic streams on the approaches to the tunnel can be accommodated in the same way as general HGVs that do not use the tunnel. By making these compliant overheight HGVs use less direct and more congested routes instead of the DPT, it is suspected that, with time, the number of overheight HGVs will reduce. There is, however, the risk that HGV operators may deliberately acquire overheight vehicles such that they cannot use the tunnel and thus have to use the surface streets. This will need to be monitored.

The treatment of overheight HGVs that fail to comply with the height restriction and arrive at the tunnel portals is however a more serious issue. Due to the significant delays that these vehicles will cause at the tunnels if they do not divert, a more severe penalty should be considered.

The overheight vehicle detection methodology has been discussed in previous reports. The operational procedures that will be need to be implemented to deal with overheight vehicles at the portals are not currently defined, and are also beyond the scope of this assignment. The discussion that follows is thus related to dealing with overheight HGVs after they have been detected at the portals, and removed to a safe place.

It has been assumed that height restriction signs that are in accordance with the Traffic Signs Manual will be erected on the approaches to the tunnel and on all access routes. In addition to fines that should be levied for failing to obey a regulatory sign, other punitive measures can be imposed on HGVs that arrive at the tunnel portals. These include:

- Impoundment until an off peak period when the vehicle will be directed to an alternative route at great cost to the HGV operator due to down time.
- Impoundment and requirement of a permit issued in terms of the Regulations at great cost to the HGV operator due to down time, plus the added burden of having to apply for a permit.

8.1 Option Assessment

In this section the remaining three options that are considered applicable and viable within the Dublin City Council area are expanded, with some preliminary discussion on their implementation, likely impacts, and enforcement.

In order to quantify the impacts of the options an assignment or micro-simulation model will need to be created. To do this, a realistic HGV origin and destination model and HGV forecasting model will be required for the Greater Dublin Area including the port. These models are currently not available, and since this modelling is outside of the scope of the current assignment, a quantitative evaluation has not been undertaken. The comments on the impacts of each element presented below are thus largely qualitative.

The aspects that have been included in the assessment are:

How implemented – this relates to the infrastructure that needs to be provided and the specific legislation changes that will be required. Legislation that relates to HGV definition (3 axles or 17 tonne GVW), amendment to the Road Traffic Act and Regulations and Traffic Signs Manual to accommodate new signage, and changes to legislation that currently exempts HGVs that need to make local deliveries restrictions are common to all options.

Traffic Impacts (Tunnel Open) – this relates to the traffic impacts that are likely to result if the tunnel is fully operational.

Traffic Impacts (Tunnel Closed) - this relates to the traffic impacts that are likely to result from the worst-case scenario if the tunnel is fully closed for emergency/maintenance purposes. As such all HGV will be required to operate on the city's surface streets.

Promote DPT use – this relates to how the measure will meet the objective of promoting use of the DPT.

Management of Overheight HGVs – this relates to how HGVs that are too high to use the DPT are accommodated within the option.

Enforcement – this relates to how enforcement can be carried out and potential problems associated therewith.

Other issues – other issues that are not included in the above aspects are raised in this section as they may have a bearing on the final selection of the option.

8.1.1 Option 1 – Restrict HGVs within the Canal Cordon by Time of Day

Intent
The intent is to prohibit all HGVs within the canal cordon during peak periods (e.g. 07:00 to 19:00) but allow them into the cordon area in off peak periods (e.g. 19:00 to 07:00) for delivery and through routing purposes. The determination of the duration of the restrictions will require further investigation based on new data relating to city centre deliveries that is to be obtained.

How Implemented
Placement of appropriate part time HGV restriction signs on all approaches to the canal cordon. HGVs are then only permitted within the cordon outside of the restricted periods (i.e. during off peak periods).

Special attention will need to be given to accommodating HGVs when the tunnel is closed, as these HGVs will have to be diverted onto the city's streets. This would necessitate HGV travel through the canal cordon and as such the restriction would have to be lifted (i.e. Garda do not enforce access to cordon). Variable message signs (VMS's) should therefore be located on the M50, at the port, and on the radial routes advising on the status of the canal cordon restrictions. Typically, these VMS's would display messages "Tunnel Open – City Centre HGV Restriction in Effect" or "Tunnel Closed – City Centre HGV Restriction Lifted". At night, when the canal cordon restriction is not in place, the VMS's can be blanked out irrespective of tunnel conditions.

Traffic Impacts (tunnel open)
During restricted periods:

- There should be no HGVs in the city centre and canal cordon
- There would likely to be an increase in the number of smaller goods vehicles in lieu of HGVs in the canal cordon
- There should be a reduction in the number of HGVs on the radial routes that cross the canal cordon
- There could be an increase in HGVs on non radial routes outside of the canal cordon as HGVs divert off radial routes

During unrestricted periods:

- HGVs will travel into/through canal cordon
- HGVs volumes on radial routes may increase, as deliveries to the canal will have to take place during unrestricted periods.

Traffic Impacts (tunnel closed)
During restricted periods:

- HGVs will have to travel in the canal cordon
- There would be significant HGV volumes on the routes between the canal cordon and M50 ring.

During unrestricted periods:

- Significant HGV volumes in the canal cordon

Promote Use of DPT
During restricted periods:

- Most trips to/from the north and western sectors should divert to DPT.
- Some trips to/from the south will continue to use N11 corridor and East Link as diversion along M50/M1/DPT is unattractive.

During unrestricted periods:

- Most trips to/from the north sector should divert to DPT
- Some trips from the western sector should divert to DPT, with balance using canal cordon routes
- Some trips to/from south will continue to use N11 corridor and East Link as diversion along M50 to M1 is unattractive.

Management of Overheight HGVs

- Overheight HGVs can be treated in the same way as other HGVs that do not use the DPT (i.e. comply with cordon restrictions), or additional restrictions can be imposed.

Enforcement
Any HGV within the canal cordon during restricted periods would be liable for prosecution, unless the cordon has been “lifted” by the Garda due to closed tunnel or other conditions. Enforcement can be manual, or by using vehicle identification technology to identify prohibited HGVs.

Under tunnel closure conditions, enforcement will have to be stopped if the Garda decide to lift the cordon. If enforcement is electronic, it should be linked to a central system so that it can be disabled.

Issues

- The VMS's at the M50 and port will be remote from the cordon. Between the time that a HGV passes the VMS and the time that the HGV arrives at the cordon the cordon restriction may have been lifted or imposed. The introduction of a time delay is not practical, as the travel time between the VMS's and the canal cordon will be variable depending on the route taken and congestion.

- As the restriction is imposed on all HGVs, there is no provision to allow select HGVs into the cordon for delivery purposes during restricted periods.

8.1.2 Option 2 – Restrict HGV Access to Canal Cordon to Permit Holders Only

Intent

The intent is that HGV movements into the canal cordon are restricted to off peak periods (e.g. 19:00 to 07:00), however, allowance is made for those HGVs that have compelling reasons to travel within the cordon during peak times. These exempt HGVs are, upon application, issued permits and all other HGVs are prohibited from the cordon. The granting of permits to exempt HGVs should only be considered when the operator has valid reasons for entry into the cordon during peak periods. An "exception rather than the rule" methodology is to be applied in the issuing of permits. Note that the exception conditions for granting of permits will be determined from the public consultation exercise.

How Implemented

Appropriate combination HGV restriction, time of day and "Except Permit Holders" signs are placed on all approaches to the canal cordon. Legislation amendments will be required, as "prohibited" HGVs are currently exempt from restrictions for delivery purposes.

Permits are to be issued by the City with additional restrictions (e.g. routes, loading, etc.) if required. The permit can be a simple disc or an electronic tag that has to be readable at all times. Due to the restricted right of ways on the roads crossing the canal cordon, and the inability to construct areas where stationary vehicle identification (e.g. license plate readers) can be carried out, electronic identification will have to take place with the HGVs in motion. This may necessitate appropriate new legislation that will require all HGVs to be fitted with electronic tags or, alternatively license plate recognition can be used.

As with Option 1, variable message signs will be required on the M50, at the port, and on the radial routes advising on the status of the canal cordon restrictions that may be lifted by the Garda under closed tunnel conditions.

Traffic Impacts (tunnel open)

- Only permitted HGVs in the city centre and canal cordon during restricted periods
- Reduction in number of HGVs on radial routes that cross the canal cordon
- Possible increase in HGVs on non radial routes outside of the canal cordon as prohibited HGVs divert off radial routes

Traffic Impacts (tunnel closed)

- Only permitted HGVs in the canal cordon, unless directed by Garda
- Significant HGV volumes on the routes between the canal cordon and M50 ring.

Promote use of DPT

- Most trips to/from the north and western sectors should divert to DPT.
- Some trips to/from the south will continue to use N11 corridor and East Link as diversion along M50/M1/DPT is unattractive.

Management of Overheight HGVs

- Overheight HGVs can be treated in the same way as other HGVs that do not use the DPT, or additional restrictions can be imposed.

Enforcement

Any prohibited HGV within the canal cordon during restricted periods would be liable for prosecution, unless the cordon has been "lifted" by the Garda due to closed tunnel or other conditions. Enforcement can be manual, or by using vehicle identification technology. Under tunnel closure conditions enforcement will have to be stopped if the Garda decide to lift the cordon. If enforcement is electronic, it should be linked to a central system so that it can be disabled when the tunnel is closed.

Issues

- There is an incentive to HGV operators to use a readable tag as it permits them into the canal cordon. There is however no incentive to use a tag for tolling purposes (see Option 3 below), as by using the tag the HGVs operator will be subjected to a toll.
- The implementation of a universal tag is not foreseen in the foreseeable future, so in the interim, enforcement would have to involve manual spot checks to identify those vehicles without a permit.
- The VMS's at the M50 and port will be remote from the cordon. Between the time that a HGV passes the VMS and the time that the HGV arrives at the cordon the cordon restriction may have been lifted or imposed dependant on tunnel conditions. The introduction of a time delay or clearance is not practical as the travel time between VMS and the canal cordon will be variable depending on the route taken and congestion.

8.1.3 Option 3 – HGV Tolling at the Canal Cordon

Intent

The intent of HGV tolling at the canal cordon is to make the routes within the cordon unattractive, and in so doing, make the M1/DPT route attractive.

How implemented

Due to the restricted right of ways on the roads crossing the canal cordon, traditional tollbooths will not be possible, and electronic tolling will have to take place with the HGVs in motion. This will necessitate appropriate new legislation that will require all HGVs to be fitted with electronic tags.

To be effective and reduce though routing, the toll fee should be paid at entry and exit to/from the canal cordon. The amount payable should also be high enough to act as a deterrent to through route trips. It could also be possible to structure the tolling system so that HGVs that enter and leave the area on the same route (i.e. delivery trips) will not be tolled.

Signage will be required on the M50, at the port, and on the approach routes to advise on tolls payable.

In the event of tunnel closure due to incident/maintenance and diversion of all HGVs away from the tunnel, it would be considered unreasonable to toll HGVs that could not use the tunnel. Under these conditions, tolling should be discontinued for sufficient time to allow those HGVs affected by the closure to clear the canal cordon. The tolling system should therefore be linked to the DPT control centre. The determination of the clearance period will however be almost impossible to estimate, as there are many factors that will affect it. This is compounded by the fact that in the event of a closure during the weekday, citywide congestion is likely to result, and rerouted HGVs could be delayed in congestion for extended periods.

Traffic Impacts (tunnel open)
- HGVs that are prepared to pay the toll to travel through the cordon, and HGVs required for delivery purposes will be present in the canal cordon
- Reduction in number of HGVs on radial routes that cross the canal cordon
- Possible increase in HGVs on non radial routes outside of the canal cordon as HGVs divert off radial routes to avoid tolls

Traffic Impacts (tunnel closed)
As described previously, tolling will need to be disabled during and after tunnel closure.
- Significant HGV volumes in the canal cordon
- Significant HGV volumes on the routes parallel to the DPT

Promote use of DPT
- Most trips to/from the north and western sectors should divert to DPT.
- Some trips to/from the south will continue to use N11 corridor and East Link as diversion along M50/M1/DPT is unattractive.

Management of Overheight HGVs
- Overheight HGVs can be treated in the same way as other HGVs that do not use the DPT, or additional restrictions can be imposed.

Enforcement
Bearing in mind that there are about 20 access points to the canal cordon, manual enforcement will not be effective. Electronic enforcement may however present opportunities. All HGVs will be required to carry a readable tag. Those that do not will be liable for prosecution if the Garda can identify those HGVs. It will however be difficult to determine if the tag is read as the HGV crosses the cordon. The alternative is to have a vehicle identification system, linked to the tolling system, which identifies those HGVs that are not tolled.

Issues

- Electronic tags are an aid to HGV operators under normal tolling operations where the HGV needs to pass a tollbooth. This is reflected in the 30-40% use of electronic tolling at the existing West Link and East Link tolls. In the canal cordon application, having a tag will result in a toll being levied. It is thus in the operators' interests not to have a tag, or to "disable" it at the tolling location.
- The other major deficiency of this option relates to the disabling of the tolling system under closed tunnel conditions. To reduce the number of contested cases against non-payers, tolling would have to be disabled for an extended period after a tunnel closure.

8.4 Preferred Option

In terms of meeting the goals and objectives of the HGV Management Strategy and within the geographic, social and political constraints, the only option that is implementable, enforceable, and will manage a large proportion of HGVs in the City of Dublin is Option 2. This option will promote usage of the DPT, reduce the number of HGV through and delivery trips in the canal cordon, and at the same time be able to accommodate overheight HGVs. Under tunnel closure conditions, HGVs may enter the canal cordon if directed by the Garda. This option will not however remove all HGVs outside of the canal cordon, and even after diversion to the DPT takes place after completion, significant numbers of HGVs will still be present between the canals and the M50.

As mentioned previously, the impacts of this option on port and non-port related HGVs and general traffic couldn't be quantified with the currently available data and models. Confirmation of the impacts will however need to precede implementation. As part of this further evaluation, particular attention should be given to the capability of the road network outside of the canal cordon, including the DPT, to cope with the diverted HGV traffic.

This strategy is considered high level and the extent of the canal cordon restrictions in so far as actual road designation, time of day, technology, etc. has not been defined. This will require further investigation during the development of the actual management plan.

The preliminary implementation concept is as follows:

- Arrange for the necessary amendments to the road traffic legislation, Traffic Signs Manual and City bylaws;
- Arrange the necessary permit process to exempt certain HGV vehicles from the canal cordon restrictions including the issue of clearly identifiable permits;
- Place appropriate regulatory signs on the roads approaching the canal cordon;
- Place VMS's on the M50, at the port, and on the radial routes leading to the city centre advising on the canal cordon restriction status;
- Arrange enforcement based on the following methodology:
  - If the DPT is open and a HGV without the necessary permit is in the canal cordon during restricted hours, then prosecute the operator;

- If either tube of the DPT is closed for maintenance/emergency purposes, no enforcement is to be carried out in the canal cordon until some time (approximately 30 minutes) after the tunnel is re-opened;
- No enforcement is required in the canal cordon outside of the restricted hours.

To complement this strategy, a number of additional localized measures should be considered:

a) Abandoning or Reducing Tolling of HGVs at West Link
In order to make the DPT more attractive for HGV trips to/from the south, the existing tolling of HGVs at West Link should be abolished or, alternatively, the toll fee reduced. It is acknowledged that there are jurisdictional and contractual issues associated with this.

b) Increasing HGV Toll Fee at East Link
Once the canal cordon restrictions are in place, HGVs to/from the south will be diverted to the East Link route. By increasing the toll fee at East Link, the number of HGV trips across the bridge and passing through the southern areas could be reduced, with the diverted trips using the more attractive DPT route. As with the West Link toll, there are similar issues with East Link.

c) Prohibition of HGVs on Certain Roads Outside of Canal Cordon
The implementation of the strategy will result in HGVs having to travel through the area outside of the Canal Cordon. To reduce this impact, HGVs should be prohibited on those routes where their presence is undesirable.

d) Localized Loading Restrictions
As per the "Commercial Vehicle Management Strategy", localized restrictions should be implemented in the city centre.

e) Extension of the Cordon
The proposed cordon is unlikely to have any affect on HGV trips to/from the south that use the N11 corridor and the East Link. Extension of the cordon into the Irishtown/Sandymount area, but excluding the south port accesses, may be a consideration.

8.5 Additional Comments

The recommended HGV Management Strategy for the City of Dublin is to restrict HGV access to the area of the city within the canal cordon to permit holders only. In the analysis and evaluation that lead to this recommendation, there were a number of options identified with significant potential that could not be considered further due to geographic and political constraints (e.g. the limitation of the study to the Dublin City area only). It is suggested that HGV movements are a regional issue and in order to effectively manage them within the Greater Dublin area, a more regional approach is required. This should involve all of the local authorities and road agencies in an effort to more effectively manage HGV movements within the M50 ring and beyond.

A lack of current data pertaining to all HGV trips in the city has required the evaluation of the various options presented in this report to be performed on a qualitative basis. The recommended strategy that has been developed is focussed on port related HGV traffic that travels through the canal cordon. From a review of the cordon counts and the port traffic volumes it is apparent that an extremely high proportion of HGV trips into the canal cordon are not port related. It is unknown if these trips end in the canal cordon or are through trips. It is, however, felt that this strategy will reduce the number of HGV through trips in the canal cordon, while still allowing local deliveries by permitted vehicles. The impacts of this strategy on the road network both within and outside the canal cordon however cannot be quantified with existing data.

Whilst a strategy has been recommended, additional investigation is required to better define the strategy and determine its impacts. These additional investigations include:

- Undertaking a stakeholder/public consultation exercise to assess the reaction to the proposed strategy
- Determine the origins and destinations of all HGV trips throughout the city through a comprehensive data collection program;
- Determine the classes of HGVs that are being used for delivery trips in the canal cordon;
- Evaluate and review the appropriateness of the proposed 17 tonne GVW or 3 axle limit based on the HGV class proportions;
- Determine the times of the proposed restrictions based on an analysis of HGV delivery trends in the canal cordon;
- Develop a realistic assignment and forecasting model that includes all HGV and general purpose traffic trips;
- Evaluate the impacts of implementing the strategy both within and outside the canal cordon;
- Refine the cordon boundary as appropriate;
- Develop the legislative framework;
- Develop the permit process;
- Develop the enforcement process in consultation with the Garda; and
- Develop detailed HGV management plans for implementation.

9 ISSUES FOR CONSULTATION

As highlighted in the previous section, extensive consultation needs to be undertaken to assess the public response to the proposed HGV Management Strategy. In addition to general public consultation, the public agencies/organizations that administer transportation and the industries that rely on HGV transportation, including the operators, need to be consulted.

Some of the issues that need to be brought to the attention of the public/stakeholders are listed below:

9.1 Benefits of the DPT

The general public is under the impression that upon opening of the DPT, all HGVs will be removed from the city streets. As has been shown in our research, there are still going to be a significant number of HGV trips per day that are not going to use the DPT without an adequate HGV Management Strategy in place. HGVs will of course still be present outside of the cordon, as all HGVs are not going to simply disappear underground.

9.2 Impacts on Businesses

The lack of data makes the impact of the HGV Management Strategy on businesses difficult to assess. In all likelihood, it will result in increased costs, as staff would have to work during off peak periods to load/unload/receive goods. Businesses need to be informed of the proposed restrictions so that they can evaluate the impacts and start to make alternative arrangements. Feedback from the businesses would also help in finalizing the restricted hours and HGV classes to be incorporated into the final HGV Management Plans.

9.3 Impacts on HGV Operators

Similar to the businesses described above, the impacts of the HGV Management Strategy on the HGV operators are unknown. Rerouting could result in increased costs, and the cordon restriction could result in a shift from HGV to LGV transportation in the city centre. Feedback from the operators with regard to the financial and operational impacts of the strategy will assist in fine-tuning it.

9.4 NRA

The HGV Management Strategy targets a certain vehicle type (3 or more axles or 17 tonne GVW) whereas the NRA DPT tolling strategy exempts goods vehicles with an unladen weight of 1524 kg and a GVW of 3500 kg. With the review of the DPT tolling strategy, care must be taken not to introduce a weight restriction that is incompatible with the HGV Management Strategy.

EAST WALL ROAD TRAFFIC MANAGEMENT STUDY

Arup Consulting Engineers

Dublin City Council

East Wall Road Traffic Management Study

Summary Traffic Report

Arup Consulting Engineers

Dublin City Council

East Wall Road Traffic Management Study

Summary Traffic Report

June 2003

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Job number D2599/10

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TABLES

FIGURES

APPENDICES

1. INTRODUCTION

Arup Consulting Engineers was appointed by Dublin City Council to undertake the work required to progress development of the proposed East Wall Road Traffic Management Study from concept stage to planning consent stage. The work involved consists of the following stages:

1. Preliminary options assessment
2. Traffic and Transportation Studies
3. Preliminary Design
4. Compulsory Purchase Order (CPO) mapping
5. Environmental Report

The first stage was completed in July 2001 and the report "East Wall Road Traffic Management Study – Route Options Study" was submitted by Arup Consulting Engineers to Dublin City Council.

This report addresses the second stage of the project and deals with issues related to the Traffic Management of East Wall Road.

In *Section 2* the background to the study is explained in further detail with reference to the aforementioned report.

The following part of the report is divided into two sections: *Section 3* deals with the various scheme options that were considered, the SATURN transportation modelling exercises, evaluation of the scheme options and identification of the preferred scheme option.

In *Section 4* the detailed traffic management considerations of the preferred scheme option are discussed in terms of the options available, the methodology used to determine the preferred design and the evaluation of the various approaches.

Finally in *Section 5* the way forward is stated, given the outcome of the evaluation of the preferred scheme option and its design.

2. BACKGROUND TO THE STUDY

In the following section the background to the study and the motivation for the study will be summarised. The focus is on the background information that may have a direct impact on this part of the study in terms of the Traffic Management of East Wall Road. For more detail on the history and other background information on the project, please refer to the aforementioned report.

Figure 1 shows the location of the section of East Wall Road that is the subject of this study. The Study Area is also indicated on *Figure 1* and discussed in more detail in *Section 3.1.*

In *Figure 2* the "committed" Future Environment is illustrated. The following section summarises the official plans with respect to transportation infrastructure and land use developments for the future.

2.1 Transportation Infrastructure

2.1.1 Existing Transportation Infrastructure

2.1.1.1 Local Road Network

The section of East Wall Road between Tolka Quay Road and Sheriff Street Upper accommodates two-way traffic with roughly 2 lanes north bound and 1 lane south bound. The northbound lanes are not marked (except for the centre line marking) and the road width varies between approximately 10m to 15m.

The junctions between East Wall Road & Tolka Quay Road; and East Wall Road & Sheriff Street Upper are signalised. The right turn from Alexandra Road onto East Wall Road is banned. The right turn from East Wall Road onto Sheriff Street Upper is banned between 7h00 and 10h00. The junction at East Wall Road & North Wall Quay is a roundabout and the southern arm connects with the East Link Toll Bridge.

2.1.1.2 Sustainable Transport

Bus Services

Two bus routes run along East Wall Road, namely the number 53 between Beresford Place and East Wall (Alexandra Gates) and the number 53A between Beresford Place and North Wall (Alexandra Road). Refer to ***Figure 3***. Busses are generally scheduled every 20min to 30min during the peak periods. Bus stops are located along both sides of East Wall Road, but there are no indented bus bays.

Rail Services

There is a level rail crossing at the junction between East Wall Road and Alexandra Road. The rail line runs east-west and is used to transport freight to and from the Port. The frequency of the service is approximately 18 trains per day. The junction is boom-controlled to allow rail traffic to cross East Wall Road.

Pedestrian footpaths and Cycle paths

There are footpaths on both sides of East Wall Road. No dedicated cycle paths exist in the study area. Pedestrian stages are incorporated at the signalised junctions between East Wall Road & East Road; and North Wall Quay & Guild Street.

2.1.2 Future Transportation Infrastructure

The Dublin Transportation Office's (DTO) "A Platform for Change" strategy report for 2000 to 2016 outlines a number of transportation infrastructure projects relevant to the study area:

2.1.2.1 Dublin Port Tunnel

The main influence on the East Wall area in terms of new Transportation Infrastructure will be the opening of the Dublin Port Tunnel. The tunnel will provide a new strategic access between the Port and the Strategic Road Network to the north of the City Centre. One of the aims of the Tunnel scheme is to eliminate the need for Heavy Goods Vehicles to travel through the City Centre and residential areas. Private car users will be tolled when using the tunnel.

The tunnel will have a capacity of approximately 1200 pcus/lane/hour. It is comprised of approximately 5.6km of dual carriageway and includes a 4.4km long road tunnel. Tolka Quay Road will be closed as part of the scheme and port traffic will be redirected to a proposed new roundabout at the junction between Dublin Port Tunnel Access and a new road linking with Promenade Road. The Dublin Port Tunnel is in the process of construction and will be opened by in 2005.

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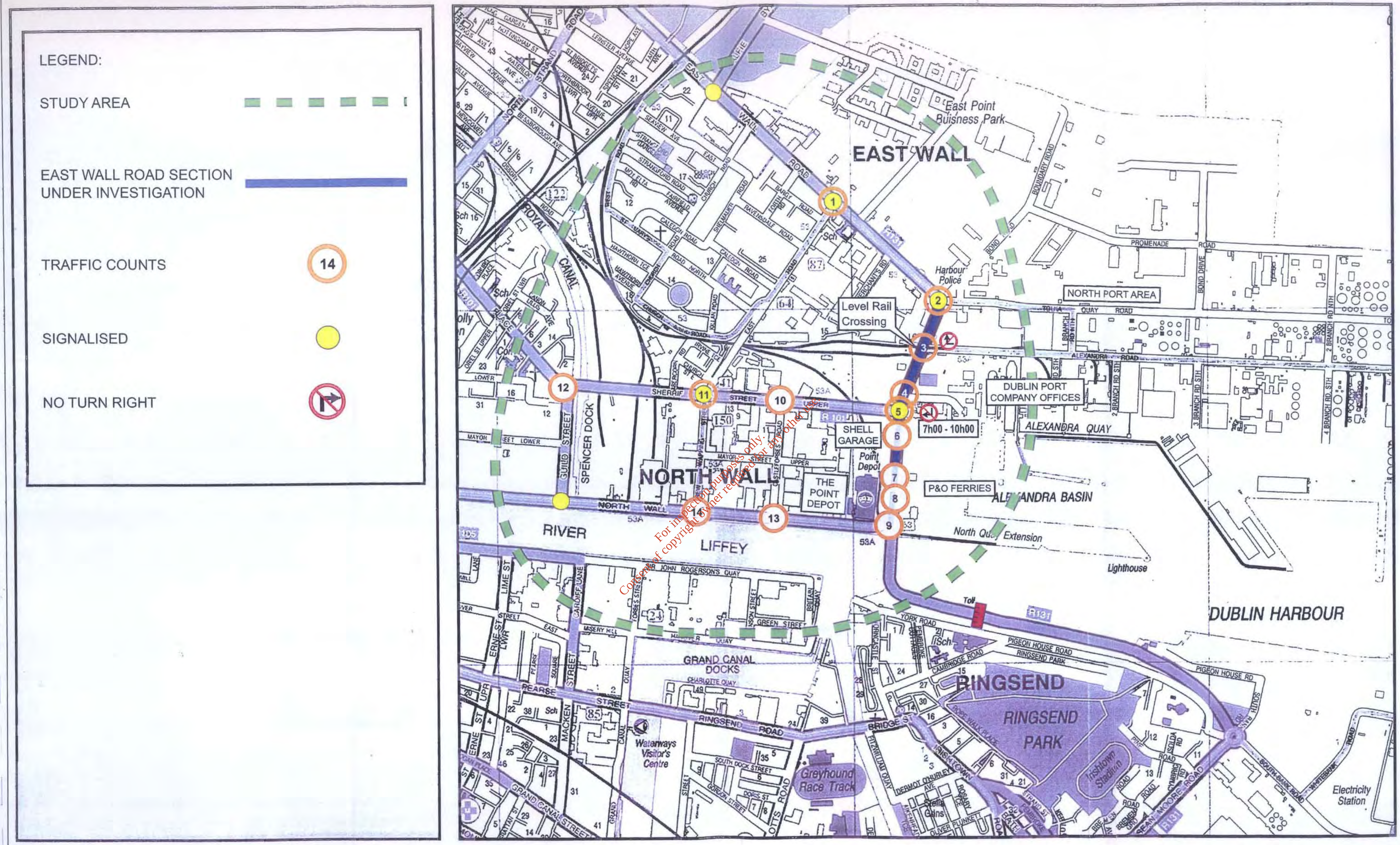


ARUP

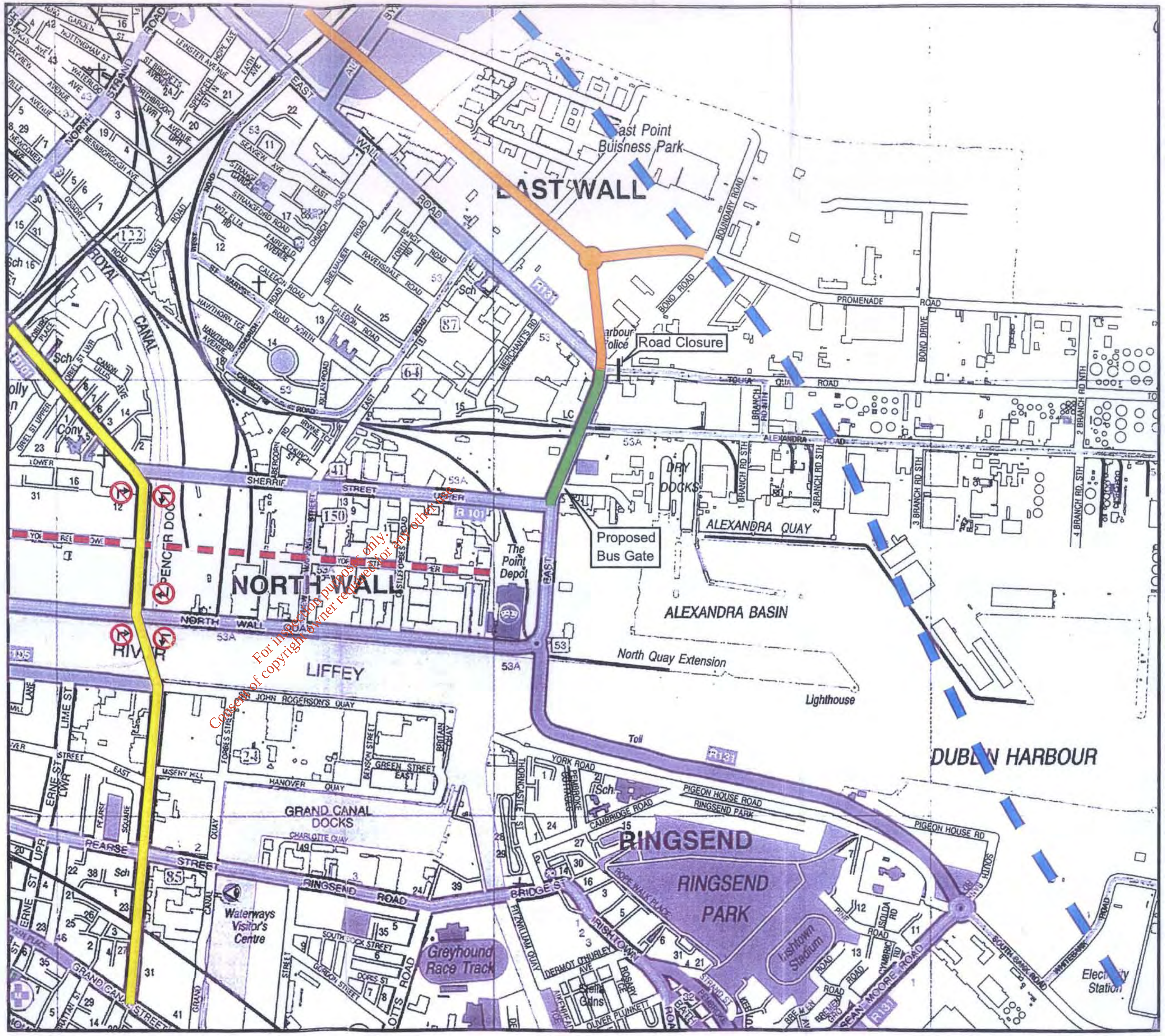
The Existing Environment

East Wall Road Traffic Management Study

D2599-10	June 2003	Figure 01

LEGEND:

DUBLIN PORT TUNNEL Scheduled Opening End of 2004	🟧
SECTION OF EAST WALL ROAD TO BE DUALLED BASED ON DUBLIN CITY DEVELOPMENT PLAN, 1999	🟩
POSSIBLE FUTURE EXTENSION OF LUAS Scheduled for 2006	🟥
EASTERN BYPASS Scheduled for 2010	🟦
MACKEN STREET BRIDGE SCHEME Scheduled for 2003	🟨
NO TURN LEFT/RIGHT (MACKEN STREET BRIDGE SCHEME)	🚫 🚫



ARUP

The Future Environment

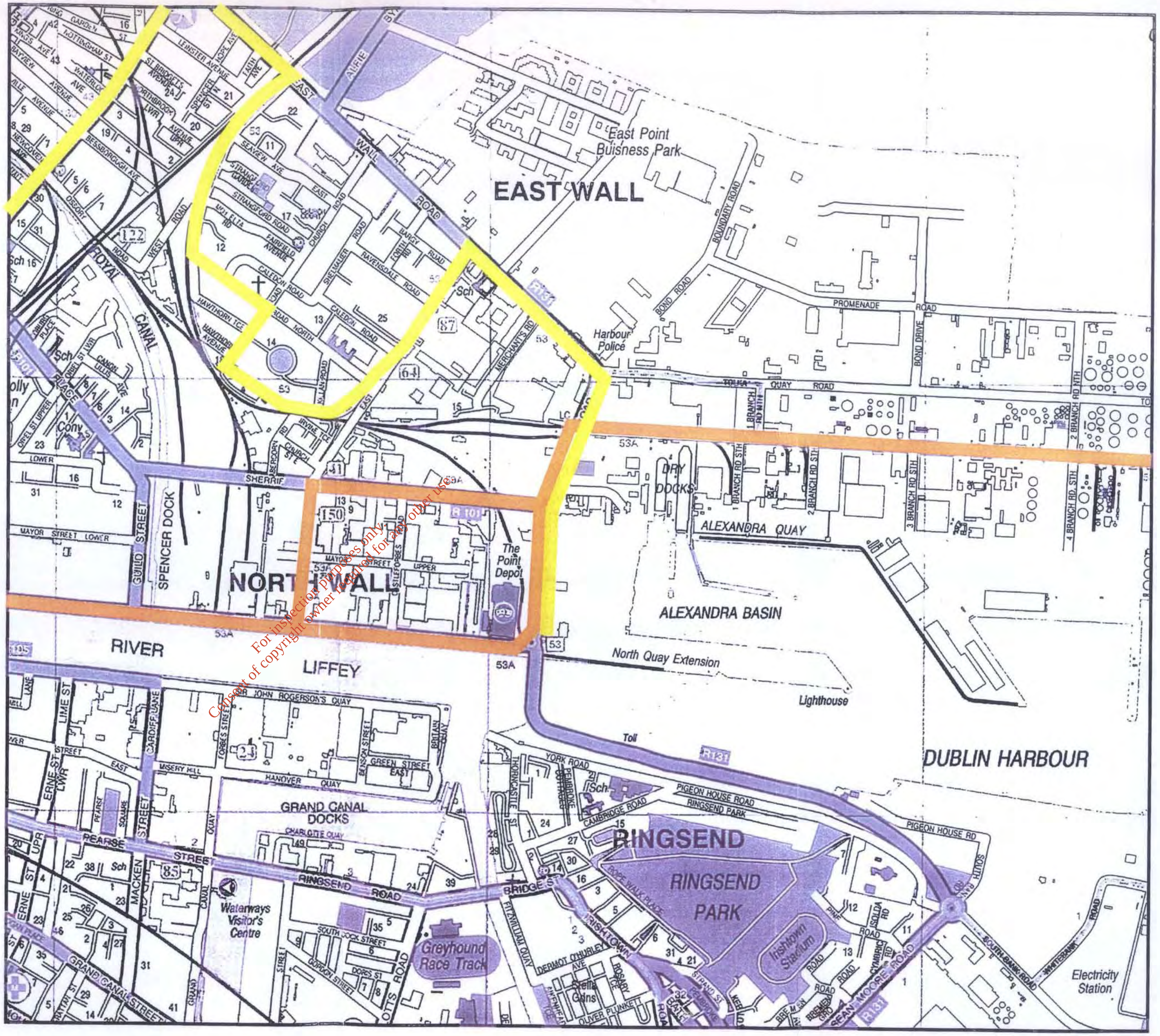
East Wall Road Traffic Management Study

D2599-10 | June 2003 | Figure 02

LEGEND:

🟨 Dublin Bus Route 53

🟧 Dublin Bus Route 53A



ARUP

Existing Bus Services

East Wall Road Traffic Management Study

D2599-10 | June 2003 | Figure 03

2.1.2.2 East Wall Road

In anticipation of the opening of the Dublin Port Tunnel, the Dublin City Development Plan 1999 makes provision for the road improvement of East Wall Road between Tolka Quay and Sheriff Street Upper. The scheme is listed as a "Category 1 Scheme" and should therefore be initiated and/or implemented in the five-year period of the Development Plan, i.e. before 2004.

The aim of this study is to assist with the development of this scheme to implementation stage, before the opening of the Dublin Port Tunnel.

2.1.2.3 Macken Street Bridge

Dublin City Council was granted permission to construct Macken Street Bridge, which would link Guild Street north of the River Liffey with Cardiff Lane south of the River Liffey. The scheme will extend to the north with the upgrading and widening of Guild Street. Two-way traffic will be accommodated with 2 lanes per direction. One lane per direction will be dedicated to public transport to provide a sustainable transport link between the areas north and south of the River Liffey. The following turning movements will be banned as part of this scheme:

Table 1: Macken Street Bridge - Banned Turning Movements

Junction	Banned Turning Movement
North Wall Quay & Guild Street (Macken Street Bridge)	No right-turn from Macken Street Bridge to North Wall Quay No right-turn from Guild Street to North Wall Quay No left-turn from North Wall Quay to Macken Street Bridge
Sheriff Street Upper & Guild Street	No right-turn from Guild Street to Sheriff Street Upper No left-turn from Sheriff Street Upper to Guild Street

These banned turning movements would facilitate the implementation of Environmental Traffic Cells for the area, which are intended to create discrete cells allowing local circulation, but no through-traffic. The intention is that through-traffic would remain on the strategic distributor network. The Macken Street Bridge Scheme was scheduled for opening by 2003. Macken Street Bridge will not provide linkage with East Wall Road.

2.1.2.4 Eastern Bypass:

The Eastern Bypass will be constructed in order to complete the orbital motorway around Dublin. According to "A Platform for Change" it was scheduled to start construction in 2003 and to be completed by 2010, its construction is currently under study. The Eastern Bypass will result in the diversion of through-traffic from local roads in the city centre, including East Wall Road. In this regard the delay of the construction of the Eastern Bypass will result in prolonged traffic congestion along East Wall Road.

2.1.2.5 Sustainable Transport

<u>LUAS (light rail)</u>

Based on "A Platform for Change" the extension of the LUAS (light rail) System to The Point is scheduled for implementation in the period 2003 to 2006. The most feasible route for this line has been identified as Mayor Street.

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Bus Services

East Wall Road is indicated to form part of a Quality Bus Corridor / Bus Priority Network in "A Platform for Change". At this stage there are no official plans indicating East Wall Road specifically to accommodate dedicated bus lanes.

Dublin Bus is currently in the process of investigating the possibility of providing Bus Priority measures between the IFSC and Dublin Port including providing a bus gate at the existing access to the Dublin Port Company's Offices approximately 40m north of the junction of East Wall Road & Sheriff Street Upper. A draft report "Dublin Port - City Centre Bus Route Feasibility Study" has been prepared in this regard by consultants (SIAS) acting on their behalf. The scheme would involve creating an additional access into the port area just to the north of the existing junction creating a staggered junction.

Pedestrian and Cycle Network

East Wall Road lies on the route identified for the Sutton to Sandycove Cycle Route which is part of the Dublin City Strategic Cycle Network. Dublin City Council is in the process of reviewing this Network, and it is likely that new proposals will emerge for the cycle network within the study area. In this regard, improved cyclist and pedestrian facilities will be provided along East Wall Road..

2.2 Land Use Developments and Traffic Operations

2.2.1 Existing Land Use Developments and associated Traffic Operations

The main land use developments in the East Wall Study Area are the following:

- The East Wall Commercial Area, which is the area between Spencer Dock in the west and East Wall Road in the east.
- The North Port which is the area east of East Wall Road and north of North Wall Quay.
- The International Financial Services Centre (IFSC) which is the area just west of Guild Street and north of North Wall Quay.
- The South Port which is the area south-east of the River Liffey

The developments that have direct access from East Wall Road are:

- The North Port through Tolka Quay Road and Alexandra Road (no right turn from Alexandra Road)
- The Dublin Port Company Offices
- The P&O Ferries site (left-in left-out access)
- The Point Depot
- The Shell Garage

2.2.1.1 Traffic Counts

In order to determine traffic operations in the area, traffic counts were conducted by Abacus Transportation Surveys on Tuesday 4 December 2001 and Wednesday 5 December 2001 at the following junctions (refer to *Figure 1*):

Table 2: Location of Traffic Counts

Number on *Figure 1*	Junction	Control	Description
1	East Wall Road & East Road	Signalised	Junction with 3 approaches
2	East Wall Road & Tolka Quay Road	Signalised	Junction with 3 approaches
3	East Wall Road & Alexandra Road	Priority	Junction with 3 approaches Right-turn banned from Alexandra Road to East Wall Road Level rail crossing with boom control
4	East Wall Road & Dublin Port Company Offices	Priority	Access with 3 approaches
5	East Wall Road & Sheriff Street Upper	Signalised	Junction with 3 approaches Right-turn banned between 7h00 and 10h00 from East Wall Road to Sheriff Street Upper
6	East Wall Road & Access to Shell Garage	Priority	3 accesses to Shell Garage with 3 approaches each
7	East Wall Road & Access to P&O Ferries site	Priority	Left-in left-out access with 3 approaches
8	East Wall Road & The Point Depot	Priority	Access with 3 approaches
9	East Wall Road & North Wall Quay	Roundabout	Junction with 3 approaches
10	Sheriff Street Upper & Castleforbes Street	Priority	Junction with 3 approaches
11	Sheriff Street Upper & New Wapping Street	Priority	Junction with 3 approaches
12	Sheriff Street Upper & Guild Street	Priority	Junction with 3 approaches
13	North Wall Quay & Castleforbes Street	Priority	Junction with 3 approaches
14	North Wall Quay & New Wapping Street	Priority	Junction with 3 approaches

The peak hours for the purpose of the study were defined as 8h00-9h00 for the AM peak hour and 14h00-15h00 for the Off peak hour and this is discussed in more detail in ***Section 3.5.1.2.*** In ***Figure 4 and 5*** the turning volumes at the surveyed junctions are schematically shown for the AM and Off peak hours.

Queue lengths were observed on Monday 18 February 2002 and Friday 12 April 2002 during the AM and Off Peak hours.

Figure 4: 2001 AM Traffic Counts

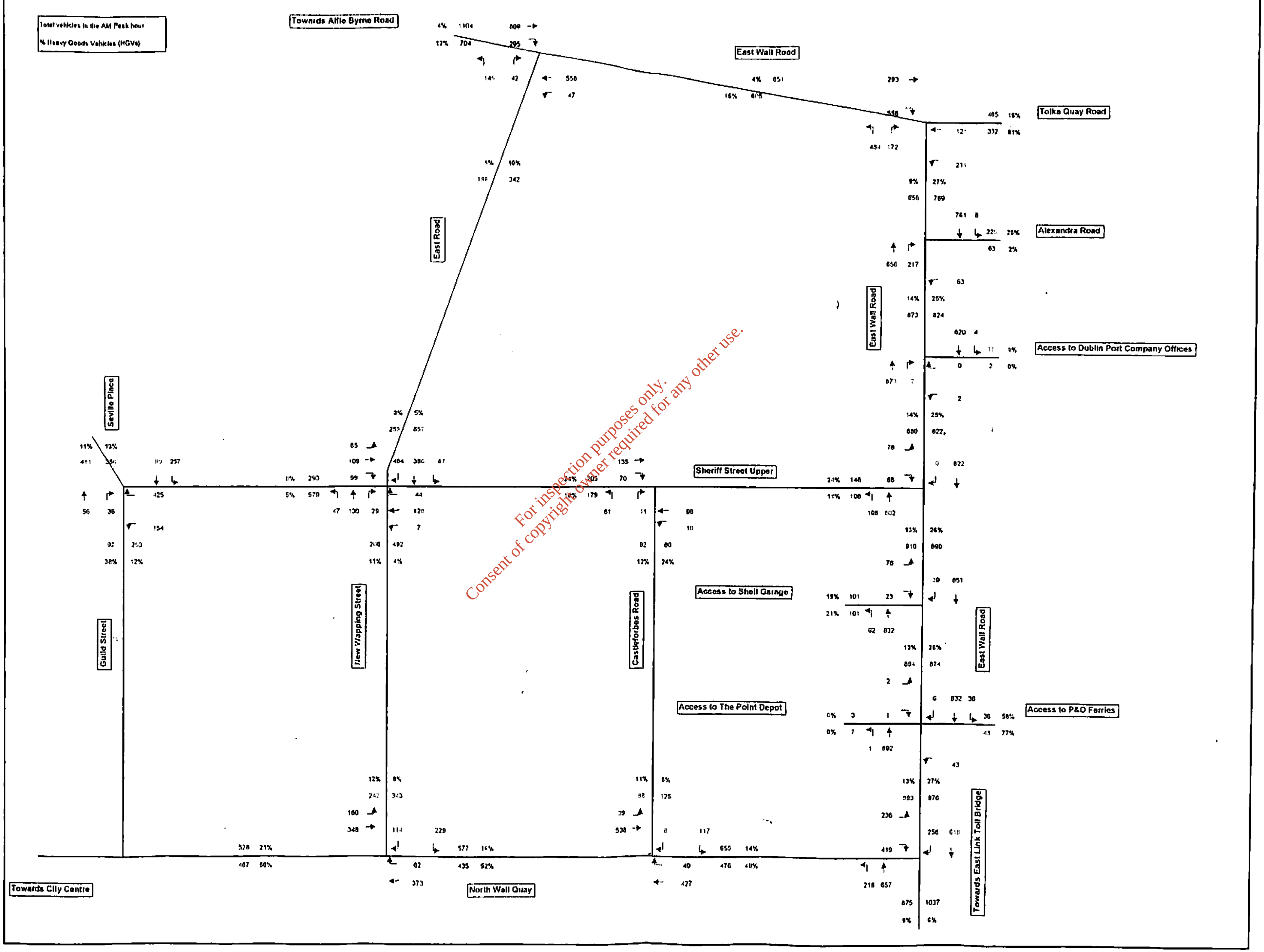
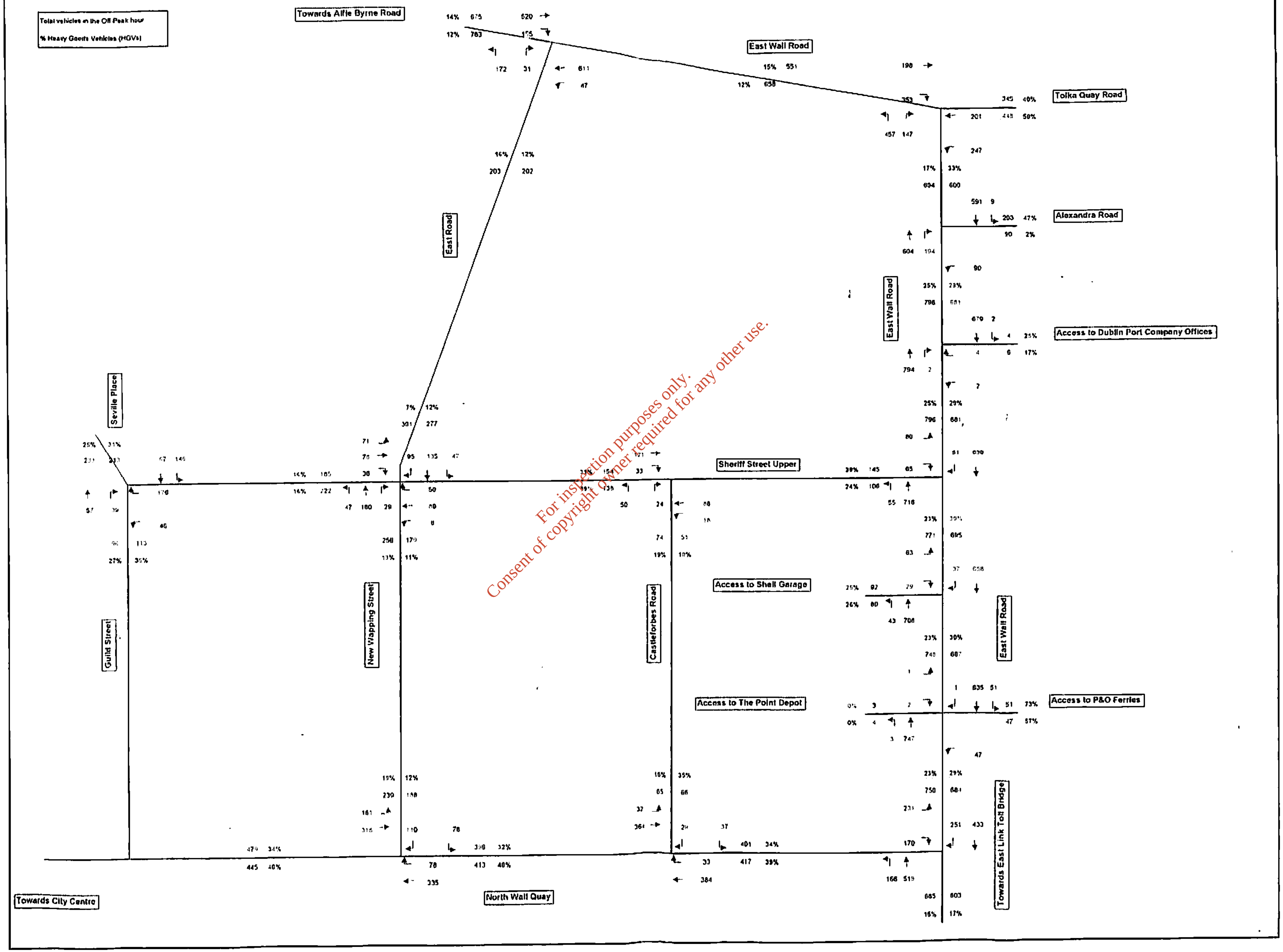


Figure 5: 2001 Off Peak Traffic Counts



2.2.1.2 Accident Statistics

Accident statistics were obtained from the Dublin City Council and are indicated in *Table 3*. A complete list of accidents are included in *Appendix A*.

Table 3: Accident Statistics

Location	No. of Minor Accidents (1997-2001)	No. of Serious Accidents (1997-2001)	No. of Fatal Accidents (1997-2001)
East Wall Road / Alfie Byrne Road	6	1	-
East Wall Road / Church Road	3	-	-
East Wall Road / West Road	6	-	-
East Wall Road / Merchants Road	1	-	-
East Wall Road / Alexandra Road (Private Road)	2	-	1
East Wall Road / Annesley Bridge Road (Include Bridge)	3	1	1
East Wall Road / East Link Bridge	1	-	-
East Wall Road / Forth Road	1	-	-
East Wall Road / North Strand Road	2	-	-
East Wall Road / North Wall Quay	5	-	-
East Wall Road / Poplar Row	2	-	-
East Wall Road / Sheriff Street Upper	4	1	-
East Wall Raod / Stoney Road	1	-	-
East Wall Road / Tolka Road	1	-	-
East Wall Road	15	1	-
East Road / East Wall Road	1	-	-
TOTAL	54	4	6

From the statistics the location of the accidents are not entirely clear, it is however shown that at least 8 accidents occurred on the road section between Tolka Quay and Sheriff Street Upper of which one, at the junction with Alexandra Road, was fatal. In total 2 fatal accidents and 4 serious accidents have occurred in 5 years time along the total length of East Wall Road. It is also shown that pedestrians were involved in 6 out of the 60 accidents (10%) that took place of which 2 were serious accidents. Approximately 47% of the accidents took place during the AM and PM peak periods (i.e. 7h00 – 10h00 and 16h00 – 19h00).

Based on the review of the accident data it is clear that the congested situations that currently exist in the area in general and along East Wall Road between Tolka Quay and Sheriff Street Upper are not promoting safe conditions for vulnerable road users. It is therefore required to provide safer facilities for vulnerable road users along the proposed scheme as well as at the future proposed junctions.

2.2.1.3 Traffic Operations

Based on the traffic counts, queue length observations, visual observation and accident statistics the following is concluded in respect of the existing traffic operations:

- The road network is currently operating at capacity and long delays and queues are experienced during the peak period periods.

- Long delays are especially experienced along East Wall Road southbound in the AM peak hour. The queue on the southbound approach extends onto Clontarf Road along Alfie Byrne Road.
- Long delays are also experienced throughout the remainder of the road network including North Wall Quay and East Road.
- A large proportion (approximately 75%) of the southbound light vehicle traffic on East Wall Road is commuter through-traffic and does not have a destination in the East Wall Study Area.
- Heavy Goods Vehicles (HGV) are an important component of the total traffic on East Wall Road. More than 25% of vehicle traffic southbound between Tolka Quay Road (North Port) and North Wall Quay is HGVs.

2.2.2 Future Land Use Developments and associated Traffic Operations

The Dublin Docklands Development Authority set out development objectives for the study area in the "Dublin Docklands Area Master Plan 1997". The main objective is to seek its economic, physical and social rejuvenation within the constraints and opportunities afforded by the urban context. The North Lotts Area Planning Scheme was proposed by the Dublin Docklands Development Authority and given permission by the Minister for the Environment and Local Government. This Planning Scheme includes for the development of a significant area of the Northern Docklands bounded by Guild Street, Sheriff Street Upper and East Wall Road.

Based on the existing SATURN Transportation Model by Dublin Transportation Office (DTO), the land use development in the area will increase substantially in future (refer to *Section 3.5* for further information on Transportation Modelling relevant to this study).

A comparison of 2001 and 2006 trip matrices shows an increase of around 18% per annum in the total AM peak hour vehicle trip generation of the 4 land use development areas (internal zones) in the study area, i.e. the East Wall Road Commercial Area, the North Port, the IFSC area and the South Port. In 2001 a total of 4 141 vehicle trips are generated by these 4 internal zones in the AM peak hour and by 2006 it increases to 9 397 vehicle trips (refer to ***Table 4***).

Table 4: Future Land Use Developments (Vehicle Trips)

Zones	2001 AM			2006 AM			Increase per annum
	Produced Out of Study Area	Attracted Into Study Area	Total	Produced Out of Study Area	Attracted Into Study Area	Total	%
East Wall Road Commercial Area (11102)	184	752	936	1106	2094	3200	28%
North Port (11103)	785	1042	1827	1629	2882	4511	20%
IFSC Area (13133)	10	29	39	33	24	57	8%
South Port (22125)	773	566	1339	868	761	1629	4%
Total	1752	2389	4141	3636	5761	9397	18%

Furthermore, the background vehicle traffic (trips generated by external zones) in the area will increase from 5 938 vehicle trips in 2001 to 9 589 vehicle trips in 2006. This is an increase of 10% per annum (refer to ***Table 5***).

Table 5: Future Background Traffic (Vehicle Trips)

Zones	2001 AM			2006 AM*			Increase
	Produced Into Study Area	Attracted Out of Study Area	Total	Produced Into Study Area	Attracted Out of Study Area	Total	per annum %
All External Zones (Background Traffic)	3287	2651	5938	5215	4374	9589	10%

* 2006 traffic volumes exclude vehicle trips generated by Additional Road Infrastructure, i.e. Macken Street Bridge and Dublin Port Tunnel.

The proposed new infrastructure in the study area represents two additional external zones and a further increase in future background traffic. An additional 880 vehicle trips will be generated by Macken Street Bridge and 4 316 vehicle trips (2 704 southbound and 1 611 northbound) will be generated by the Dublin Port Tunnel by 2006 in the AM peak hour (refer to ***Table 6***).

Table 6: Additional Road Infrastructure (Vehicle Trips)

Zones	2006 AM		
	Produced Into Study Area	Attracted Out of Study Area	Total
Dublin Port Tunnel (91709)	2704	1611	4316
Macken Street Bridge (91703)	536	345	880

The matrices are balanced, which means that the total trips produced and attracted by the external and internal zones are equal. This means that the total vehicle trips produced by internal and external zones in the 2001 AM peak is 1 752 + 3 287 = 5 040. The total trips attracted by internal and external zones in the 2001 AM peak is the same, i.e. 2 389 + 2 651 = 5 040. Similarly the total vehicle trips produced by internal and external zones in the 2006 AM peak is 3 636+5 215+2 704+536 = 12 091, which is equal to the total trips attracted, i.e. 5 761 + 4 374 + 1 611 + 345 = 12 091.

It follows that vehicle trips in the area will increase from 5 040 vehicle trips in the 2001 AM Peak to 12 091 vehicle trips in the 2006 AM Peak. This represents a total increase of 140% over 5 years and 19% per annum.

2.3 Motivation for the study

It is clear that the existing environment will undergo fundamental changes in the future – land use developments will increase and new transportation infrastructure will be constructed. Both of these will cause additional trips to go to and from the study area, or to pass through the study area. The need for the East Wall Road Traffic Management Scheme therefore arises primarily from the introduction of the Dublin Port Tunnel into the local road network, in addition to the ongoing increase in economic activity at Dublin Port and the continuing development of the Docklands Area north of the Liffey.

The existing road network in the study area is already operating at capacity. When completed, the Dublin Port Tunnel will introduce more traffic loading onto East Wall Road, and in particular the section of the road between Tolka Quay Road and Sheriff Street Upper. Increased economic activity at Dublin Port will also lead to increased traffic demand on East Wall Road, particularly from the South Port Estate. The ongoing development of the Docklands Area, including significant increases in residential and commercial floor space, will also create additional traffic loading on East Wall Road, particularly north of Sheriff Street Upper.

The Dublin Port Tunnel is designed to cater for Heavy Goods Vehicle traffic from both the North and South Ports. For this reason, and given that a proportion of Port traffic will use East Wall Road to access the city centre or destinations south of Dublin, enhancement of this section of East Wall Road is a vital requirement for the successful implementation of the Dublin Port Tunnel scheme.

There is also a need to upgrade East Wall Road to improve facilities for pedestrians and cyclists. There is a need in particular to provide cyclist facilities on East Wall Road in the context of its location on the Dublin City Council "Sutton to Sandycove Coast Cycle Route", which is part of the Strategic Cycle Network for Dublin. Also, the current and future high levels of traffic demand an improvement in pedestrian crossing facilities along the road.

Finally, in the context of emergency planning for the Dublin Port Tunnel, it is desirable that there should be adequate space for vehicular storage both on the network approach and on egress routes from the Tunnel.

Therefore an upgraded East Wall Road is necessary to serve the Dublin Port Tunnel, Dublin Port and the ongoing redevelopment of the Docklands Area. It will provide improved facilities for vulnerable road users, and play a role in the emergency planning of the Dublin Port Tunnel.

As mentioned earlier, the Dublin City Development Plan 1999 makes provision for the road improvement of East Wall Road between Tolka Quay and Sheriff Street Upper. The scheme is listed as a "Category 1 Scheme" and should therefore be initiated and/or implemented in the five-year period of the development plan, i.e. before 2004.

3. SCHEME OPTION EVALUATION

3.1 Study Area

The opening of Dublin Port Tunnel will have a citywide impact on traffic conditions. This impact has already been addressed in the Environmental Impact Assessment (EIA) for the Dublin Port Tunnel. The EIA went through a process of Public Enquiry and was approved by the Minister. The DPT is now in the process of being constructed.

The purpose of this study is to investigate and design the required traffic management measures to be implemented along the section of East Wall Road between Tolka Quay Road and North Wall Quay. The focus is therefore on the detailed traffic management level and how to effectively accommodate the predicted future traffic volumes on this section of the road network. The proposed traffic management strategy will also have an impact on the immediate local environment. The study area was therefore confined to the area as shown in *Figure 1*.

3.2 Analysed Scheme Alternatives

The Dublin City Development Plan 1999 lists Tolka Quay Road to Sheriff Street Upper Improvement as a Category One Scheme i.e. a road scheme that has "*been adopted by the City Council and/or approved by the DTI and will, subject to the availability of funding, be initiated and/or implemented in the five-year period of the Plan*". This Scheme therefore proposes to widen East Wall Road according to the Development Plan.

Two basic alternative schemes were developed namely a "Do Minimum" and a "Do Something" scheme. The "Do Something" scheme would be based on the proposals made in the Dublin City Development Plan, 1999. In *Figure 6* schematic presentations of each of these

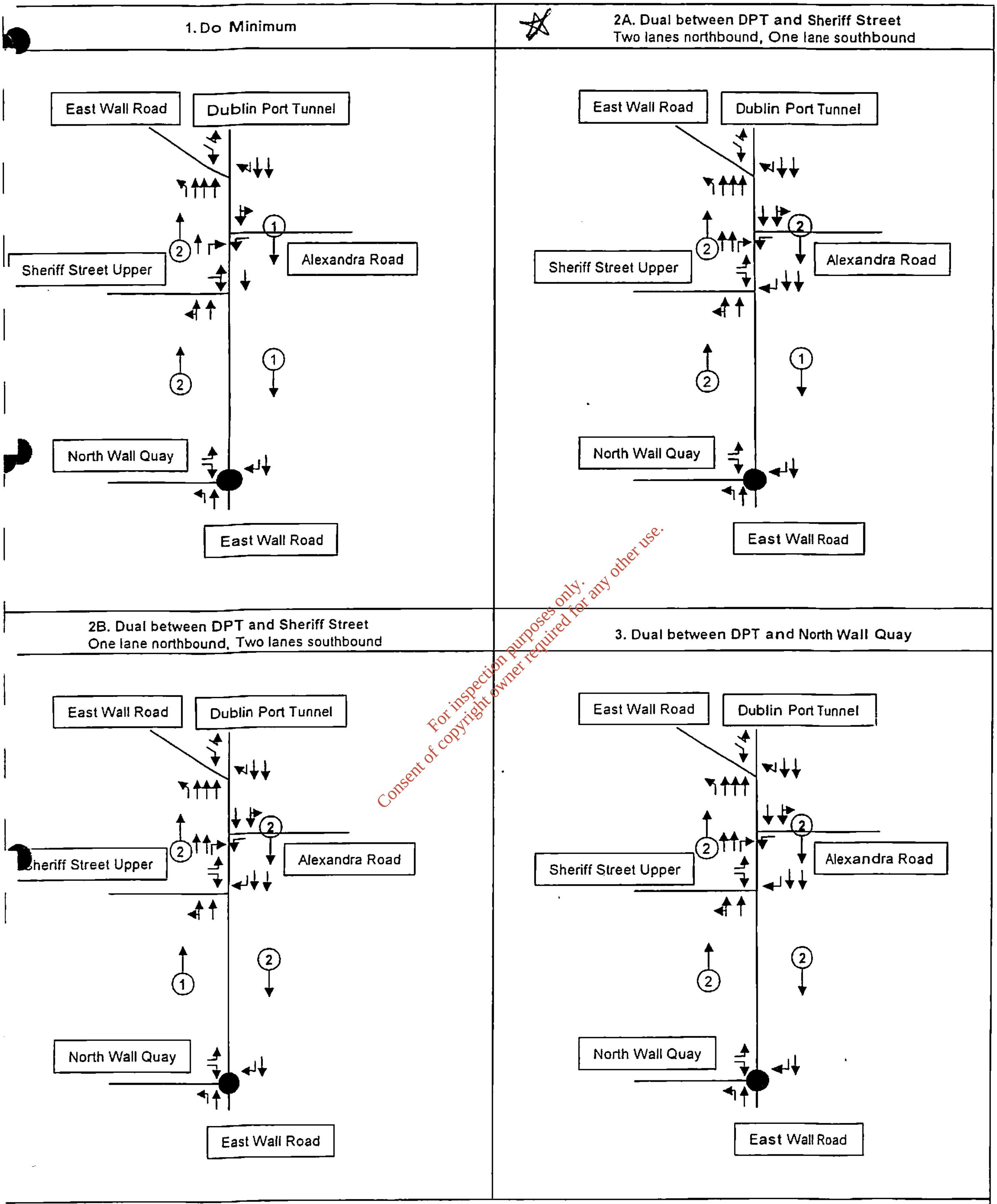


Figure 6: Analysed Scheme Alternatives

alternatives are shown. Refer to *Section 4* for details on the traffic management design considerations related to these alternatives.

3.2.1 Alternative 1: Do Minimum

The total length of East Wall Road would remain as it is at the moment with 2 lanes northbound and 1 lane southbound. The junction between East Wall Road & the Dublin Port Tunnel Access will be upgraded by Dublin City Council to accommodate the closure of Tolka Quay Road.

3.2.2 Alternative 2: Do Something

East Wall Road would be dualled between the Dublin Port Tunnel Access and Sheriff Street Upper.

The existing right-turn ban from East Wall Road onto Sheriff Street Upper was re-evaluated. Initial modelling runs showed a substantial demand for right-turners (up to 500 pcu's in the AM peak hour). Should the right-turn be permitted a dedicated right-turn lane will have to be provided and 2 through lanes will have to be constructed. This will facilitate maximum capacity for the major southbound movement along East Wall Road. Accesses to developments along the total section of East Wall Road between Dublin Port Tunnel Access and North Wall Quay will be converted to left-in left-out accesses (the right turn from East Wall Road onto Alexandra Road will be retained).

Such a scheme will adhere to the Development Plan. It will however be required to address the logical continuation of lane capacity between Sheriff Street Upper and North Wall Quay. In this regard, the following 2 options were considered:

Alternative 2A: Two lanes northbound, one lane southbound

Two lanes northbound, but only one lane southbound are provided between Sheriff Street Upper and North Wall Quay. One of the lanes northbound will be dedicated for traffic heading northbound in the direction of Alfie Byrne Road and the North Port. Such a scheme will prevent commuter and Port traffic not heading for the Dublin Port Tunnel, from experiencing delays because of the high traffic volumes heading towards the tunnel. This scheme is similar to the existing situation on this section of the road, with the exception of the permitted right-turn from East Wall Road to Sheriff Street Upper.

Alternative 2B: One lane northbound, two lanes southbound

Only one lane northbound and two lanes southbound would be provided between Sheriff Street Upper and North Wall Quay. Two lanes southbound will maximise the capacity available for the evacuation of the Dublin Port Tunnel in the event of an emergency. The right turn from East Wall Road to Sheriff Street Upper will be permitted.

3.3 Transportation Modelling

3.3.1 Dublin Transportation Office's SATURN Transportation Model

In order to evaluate and compare the different scheme alternatives the Dublin Transportation Office's (DTO) existing SATURN Transportation Model was utilised.

3.3.1.1 Study Area

The DTO developed a cordon model with a study area that corresponds with the study area earlier indicated in *Figure 1*. In *Figure 7* an indication of the zone locations and boundaries within the cordoned model are given.

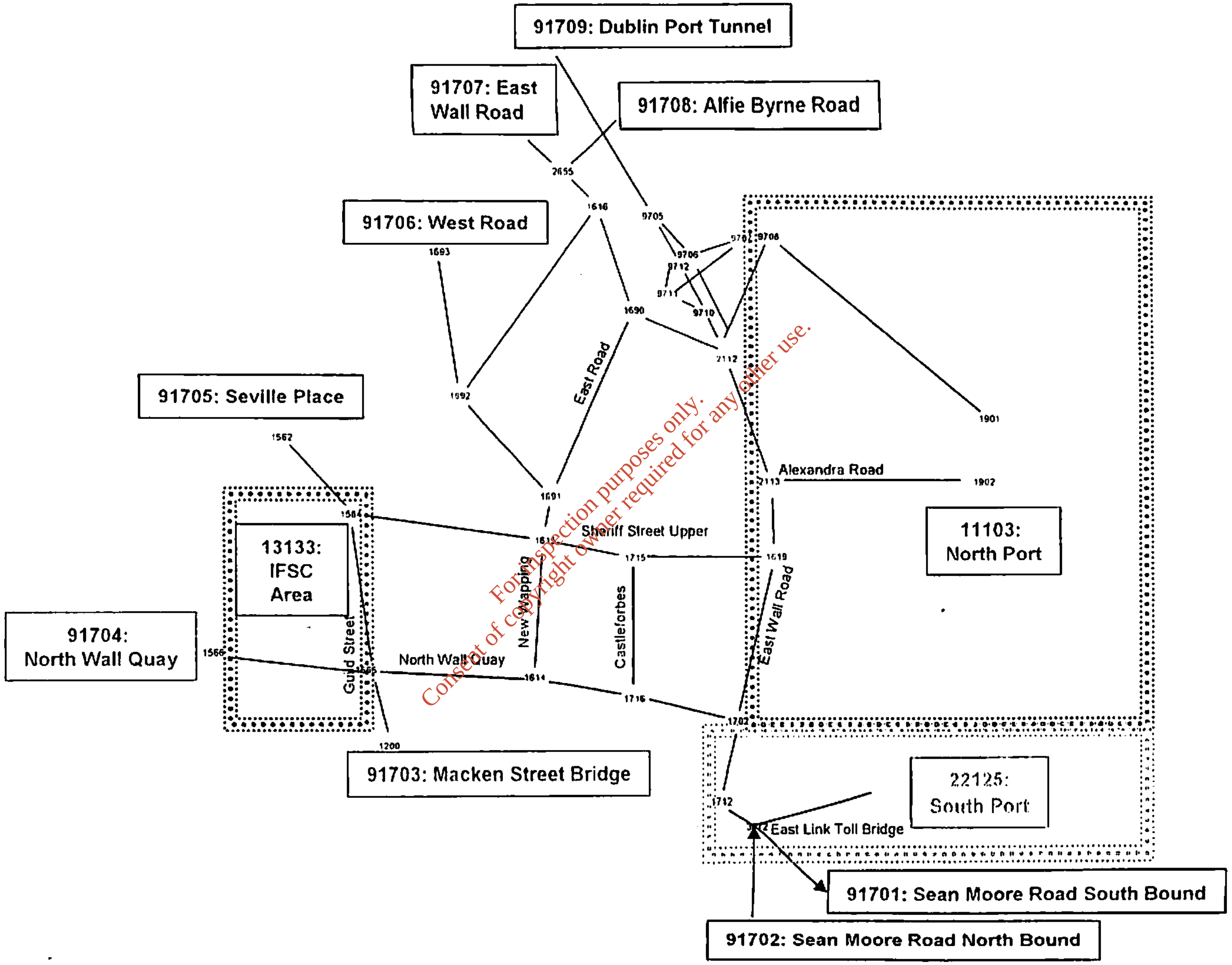


Figure 7: Zone boundaries – DTO's Saturn Transportation Model, 2006 Road Network

- Actual cordoned Private Car Trip **matrices** and HGV trip matrices, in pcu's, for all 2006 and selected 2016 scenarios (electronic).
- **Optimised signal settings**, at selected junctions, for all 2006 AM peak hour and selected 2016 AM peak hour scenarios (electronic).
- **Link volumes**, throughout the study area, for all 2006 and selected 2016 scenarios (A2 hard copies).
- **Average traffic speeds**, throughout the study area, for Do Minimum (1) and Two North – One South 2006 (2A) and 2016 AM Peak hour scenarios (A4 hard copies).

In *Figures 8.1, 8.2a, 8.2b and 8.3* the results of the 2006 AM model runs for the modelled network schemes listed in *Section 3.4* are summarised.

In *Table 8* a summary of the origins and destinations of the trips in the study area is given, based on the extracted matrix for the cordoned model of Road Network Scenario 2A (i.e. "Two North, One South") for the 2006 AM Peak hour.

Table 8: Total Origin – Destination Matrix (pcu's)

Zones		Internal Destinations		External Destinations					Total
		North Port	Other Internal Destinations	DPT	City Centre	Macken Str Bridge	East Link Toll Bridge	Other External Destinations	(pcu's)
Internal Origins	North Port (11103)	0 0% 0%	30 1% 1%	1279 50% 36%	263 18% 7%	0 0% 0%	953 37% 27%	1027 31% 29%	3551 100%
	Other Internal Origins (11102 & 13133)	54 1% 5%	25* 1% 2%	126 5% 11%	140 10% 12%	10 3% 1%	77 3% 7%	725 22% 63%	1157 100%
External Origins	Dublin Port Tunnel (91709)	1484 40% 40%	382 17% 10%	0 0% 0%	495 34% 13%	0 0% 0%	546 21% 15%	763 23% 21%	3671 100%
	City Centre via North Wall Quay (91704)	568 15% 33%	627 28% 37%	386 15% 22%	0 0% 0%	56 18% 3%	71 [illegible] 4%	9 0% 1%	1719 100%
	Macken Street Bridge (91703)	0 0% 0%	15 1% 2%	0 0% 0%	201 14% 33%	0 0% 0%	0 0% 0%	388 12% 64%	603 100%
	East Link Toll Bridge (91701, 91702 & 22125)	501 14% 19%	183 8% 7%	574 22% 22%	304 21% 12%	0 0% 0%	816* 31% 31%	262 [illegible] 10%	2639 100%
	Other External Origins (91705, 91706, 91707, 91708)	1095 30% 39%	940 43% 33%	203 8% 7%	35 2% 1%	249 79% 9%	139 5% 5%	154* 5% 5%	2815 100%
Total	(pcu's)	3702 100%	2203 100%	2567 100%	1438 100%	316 100%	2601 100%	3327 100%	16155

* Internal trips due to the aggregation of zones

In *Table 9* an indication is given of the number Heavy Goods Vehicle (HGV) pcu's extracted from the same 2006 AM trip matrix.

Table 9: Heavy Goods Vehicle Origin – Destination Matrix (pcu's)

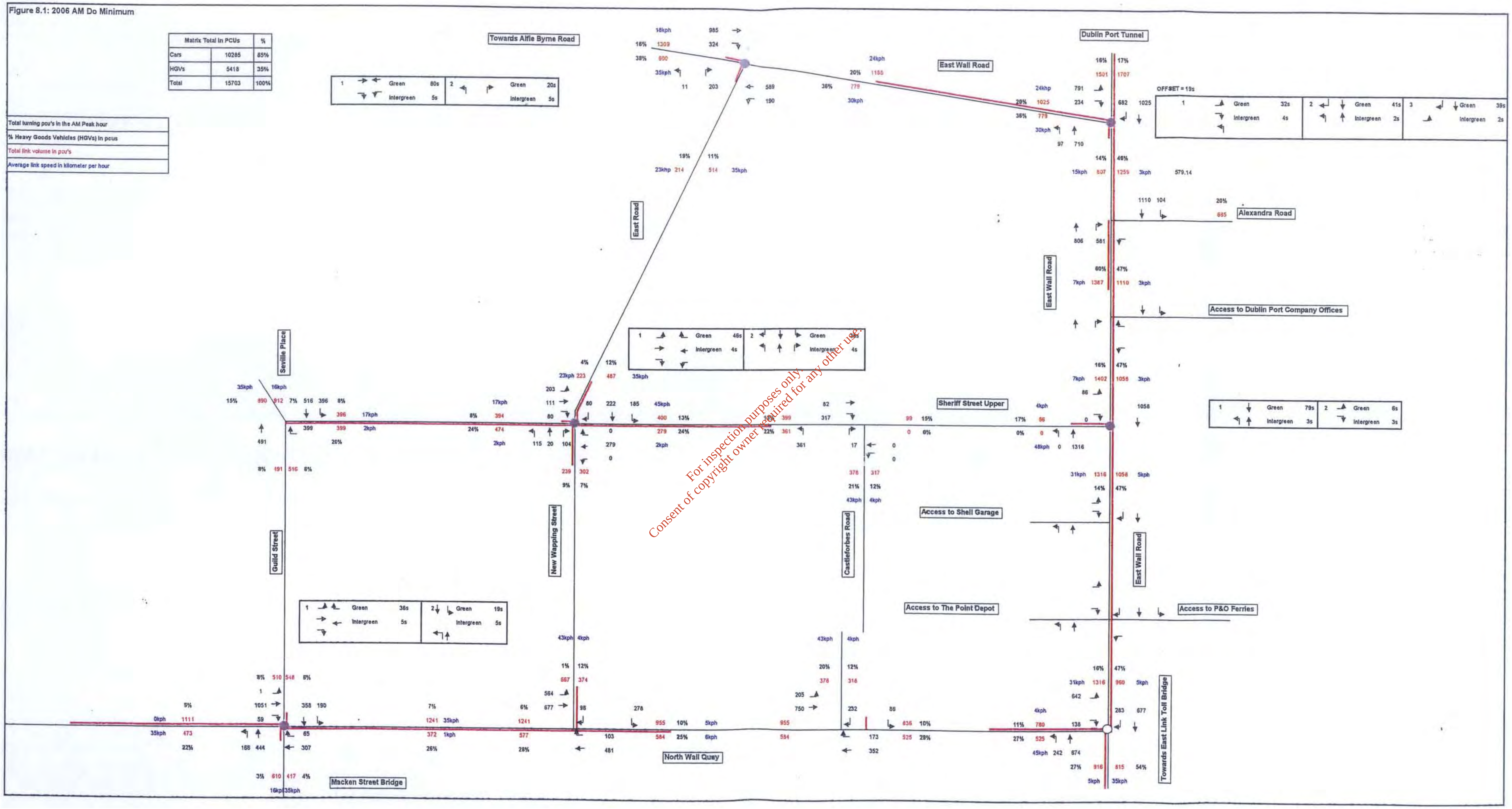
Zones		Internal Destinations		External Destinations					Total
		North Port	Other	DPT	City Centre	Macken Str Bridge	East Link Toll Bridge	Other	(pcu's)
Internal Origins	**North Port** **(11103)**	0	0	1131	166	0	856	558	2710
	Other Internal Origins **(11102 &13133)**	19	0	24	1	4	0	2	51
External Origins	**Dublin Port Tunnel** **(91709)**	715	78	0	21	0	180	74	1068
	City Centre via North Wall Quay **(91704)**	63	1	19	0	2	26	2	113
	Macken Street Bridge **(91703)**	0	1	0	5	0	0	15	22
	East Link Toll Bridge **(91701, 91702 & 22125)**	211	0	139	182	0	479	139	1149
	Other External Origins **(91705, 91706, 91707 & 91708)**	251	10	10	3	13	19	13	320
Total (pcu's)		1259	91	1323	378	19	1560	802	5433

3.4 Evaluation of Scheme Alternatives

The various schemes were evaluated based on the outcome of the DTO's modelling runs as well as other considerations discussed earlier. In general the main findings were the following:

- Unacceptable queue lengths exist along the southbound movement of East Wall Road during the AM Peak Hour.
- Queue lengths are reduced when East Wall Road is improved.
- Increased capacity along East Wall Road results in an increase in traffic attracted to East Wall Road. Compare 1259 pcu's southbound in the Do Minimum Scenario (1) with 2286 pcu's southbound in the Two North – One South Scenario (2A).
- A high demand for right-turning traffic from East Wall Road to Sheriff Street Upper and from East Wall Road to Alexandra Road exists.
- Average traffic speeds southbound along East Wall Road increase when East Wall Road is improved.
- The proportion of Heavy Goods Vehicles remains the same (around 46%) with or without an improvement to East Wall Road. In real terms it represents an increase, for example an increase from 579 HGV pcu's to 983 HGV pcu's due to more traffic attracted to East Wall Road when increased capacity is provided.

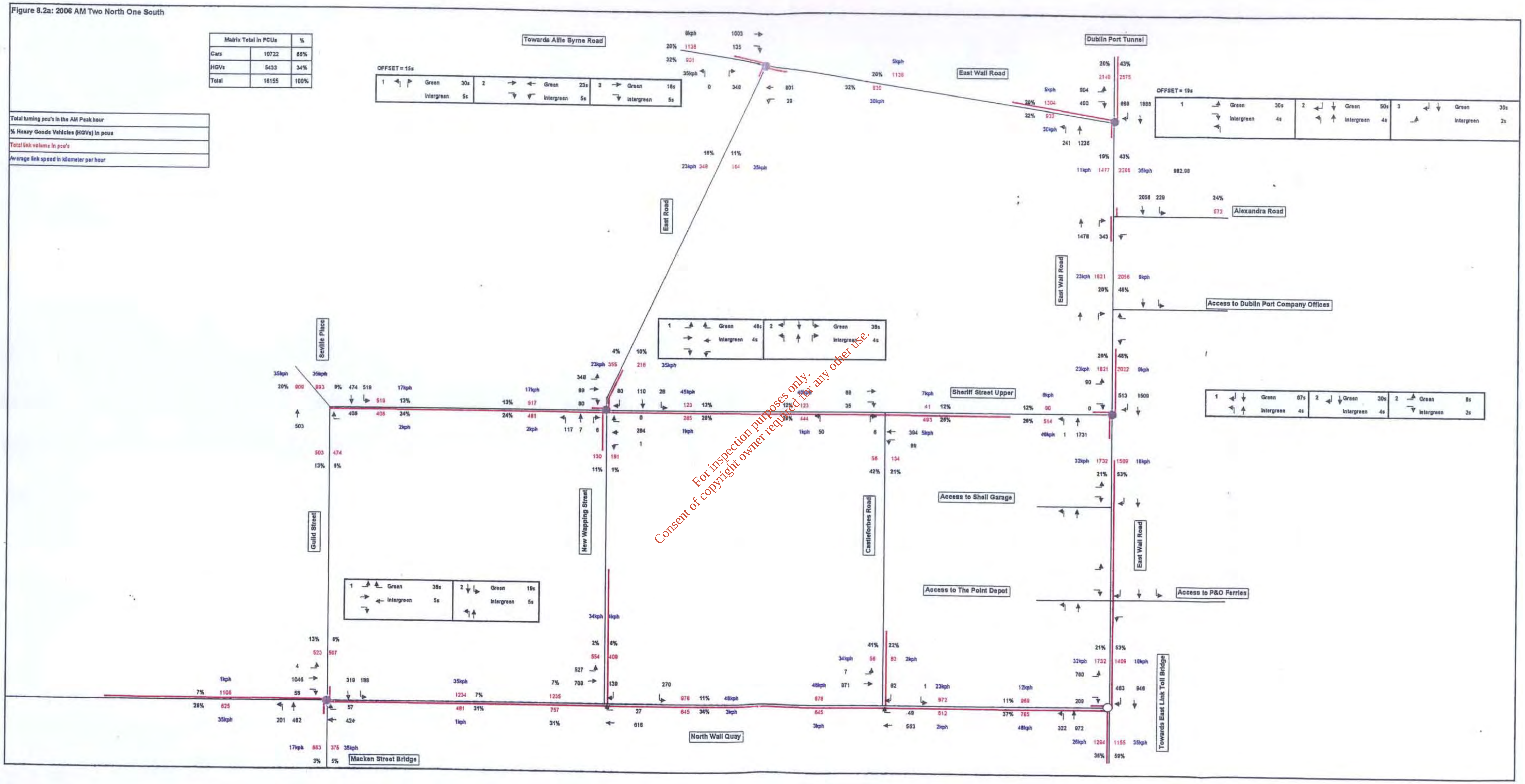
Figure 8.1: 2006 AM Do Minimum



Matrix Total in PCUs		%
Cars	10285	65%
HGVs	5418	35%
Total	15703	100%

Total turning pcu's in the AM Peak hour
% Heavy Goods Vehicles (HGVs) in pcus
Total link volume in pcu's
Average link speed in kilometer per hour

Figure 8.2a: 2006 AM Two North One South



Matrix Total in PCUs		%
Cars	10722	66%
HGVs	5433	34%
Total	16155	100%

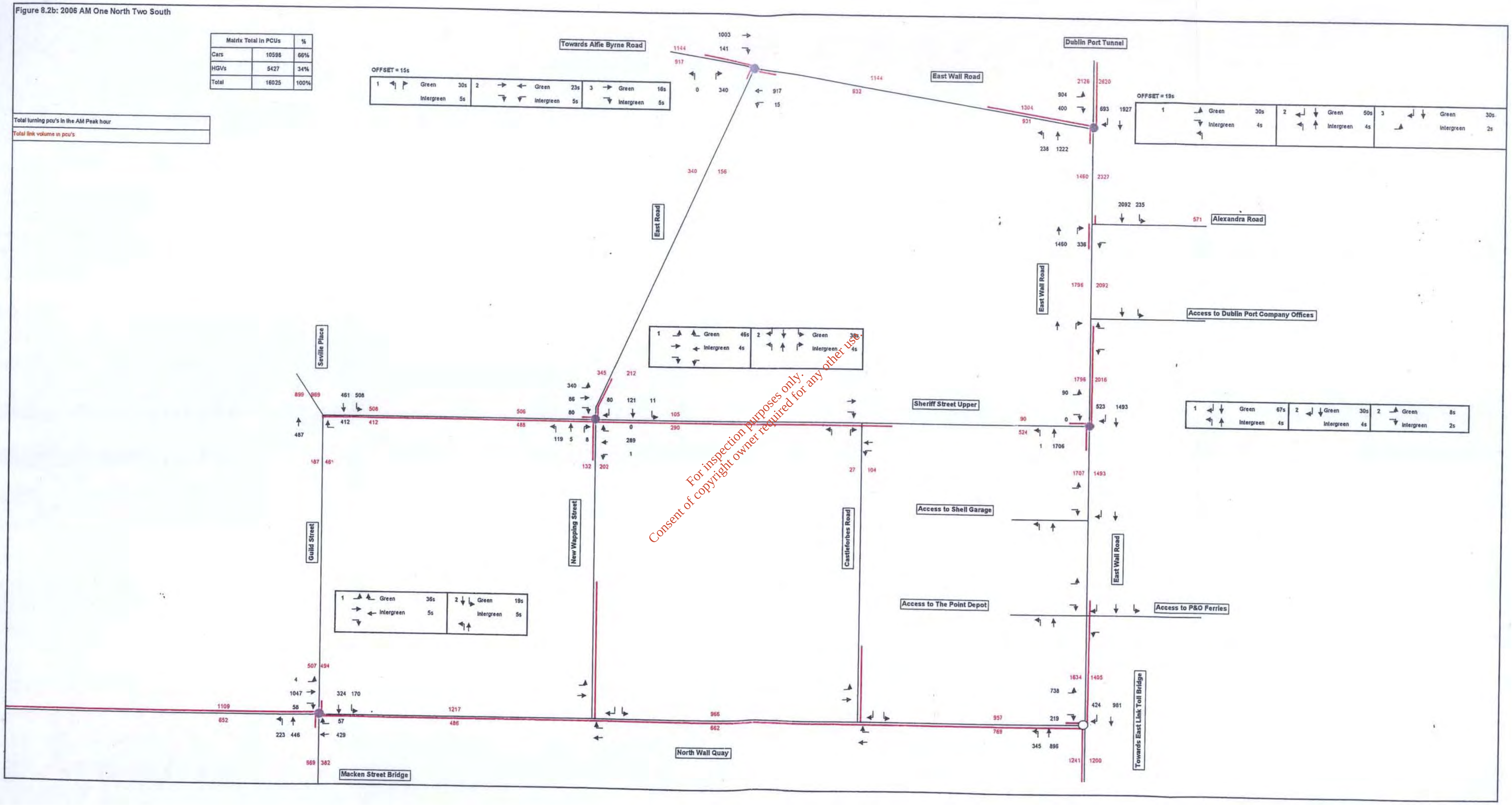
Total turning pcu's in the AM Peak hour

% Heavy Goods Vehicles (HGVs) in pcus

Total link volume in pcu's

Average link speed in kilometer per hour

Figure 8.2b: 2006 AM One North Two South

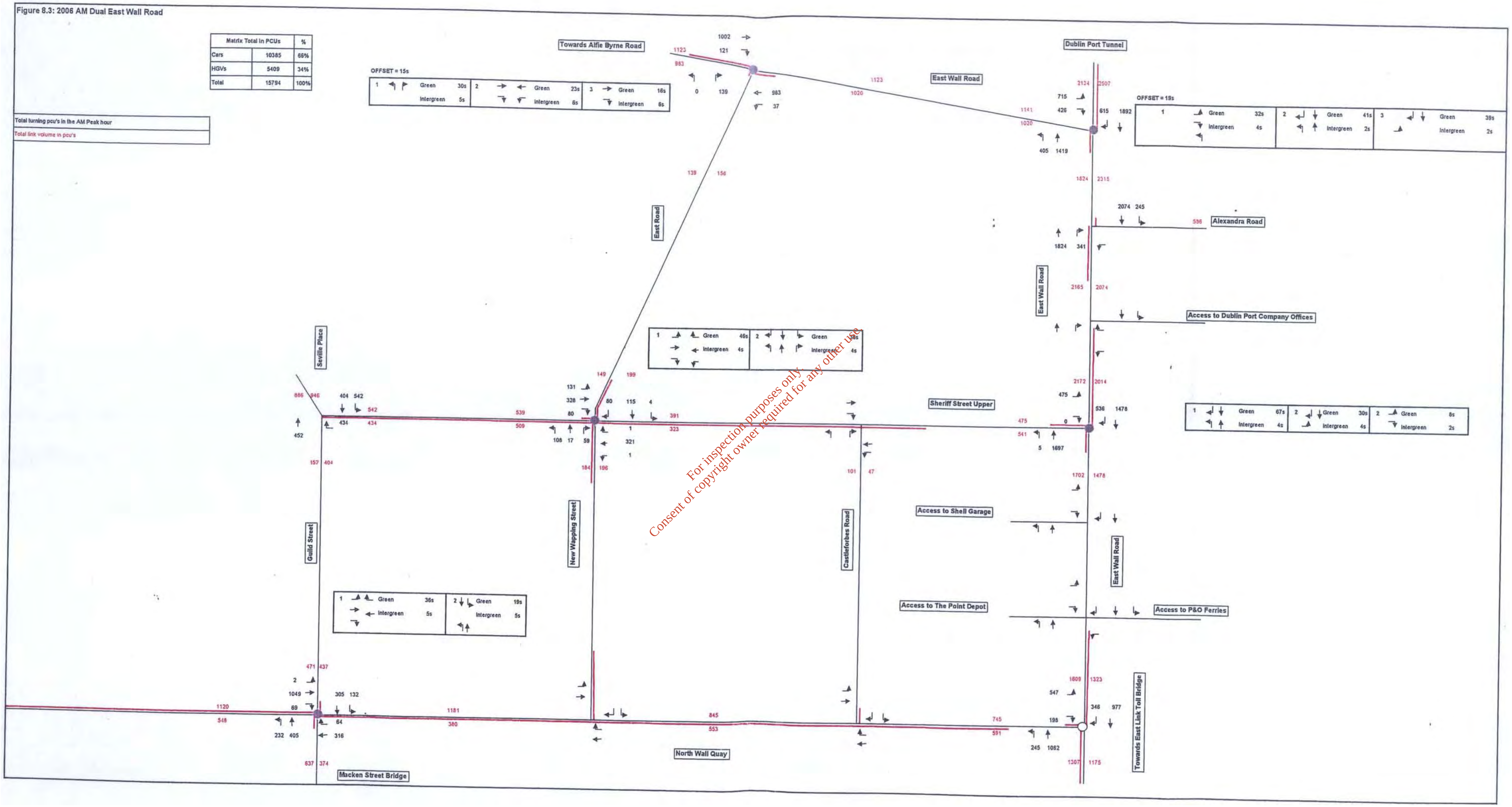


Matrix Total in PCUs		%
Cars	10598	66%
HGVs	5427	34%
Total	16025	100%

Total turning pcu's in the AM Peak hour

Total link volume in pcu's

Figure 8.3: 2006 AM Dual East Wall Road



Matrix Total in PCUs		%
Cars	10385	66%
HGVs	5409	34%
Total	15794	100%

Total turning pcu's in the AM Peak hour

Total link volume in pcu's

3.4.1 Alternative 1: Do Minimum

Notwithstanding the fact that none of the schemes would resolve the predicted levels of congestion successfully, the "Do Minimum" alternative, is not viable based on the following:

- The existing road network in the study area is already operating at capacity. The Dublin Port Tunnel will undoubtedly add more traffic onto East Wall Road. In terms of safety it is important to be able to evacuate the tunnel in the event of an emergency. Additional capacity along East Wall Road will be required for this purpose alone.
- The DTO model shows a large increase in traffic volumes in the study area from approximately 7 500 pcus in the 2001 AM peak hour to around 16 000 pcus in the 2006 AM peak hour. The increase is mainly due to high traffic generation of local land use developments and additional infrastructure such as Macken Street Bridge and the Dublin Port Tunnel.
- The DTO model indicated a reduction in queue lengths when the "Do Minimum" situation is compared to any of the other "Do Something" schemes. A scheme will therefore provide some relief, even though it will not solve the problem entirely.
- The road network will be in danger of gridlocking if the capacity on East Wall Road is not increased. This will have a negative impact on the whole road network in the study area and will extend into the City Centre.
- Extensive queuing in the area will block access to the Port and have an impact on economic activity generated by the Port.
- The DTO model indicates a reduction in traffic volumes in 2016 when the Eastern Bypass is included in the road network. The construction of the Eastern Bypass depends on the outcome of independent studies and the availability of funding. It can therefore not be assumed that the construction of the Eastern Bypass will relieve congestion on East Wall Road by 2016. The possibility that traffic volumes by 2016 will even be worse than in 2006 if the Eastern Bypass is not constructed, has to be considered.
- There are also some indications of a possible extension of the LUAS line up to The Point Depot, an enhanced Bus service along East Wall Road and an improved Rail service along the existing rail track. These plans are not proceeding as of the time of this writing and subject to the outcome of various studies (and also not included in the DTO's SATURN Transportation Model). It can therefore not be assumed that this additional and improved public transportation infrastructure will reduce private car travel and thereby alleviate congestion in the area.
- In addition there are also indications of large-scale development proposals in the area that will generate additional trips to and from the study area. The access to these future developments has to be unrestricted. One step towards improved access to the study area will be the upgrading of East Wall Road.

3.4.2 Alternative 2: Do Something

3.4.2.1 Alternative 2A: Two lanes northbound, one lane southbound

Since only one lane is provided southbound the queue length in the AM peak hour will be longer than if two lanes are provided southbound on the section between Sheriff Street Upper and North Wall Quay.

However, commuter through-traffic heading northbound towards Alfie Byrne Road and traffic heading towards the North Port will not be delayed by traffic heading towards the Dublin Port Tunnel.

3.4.2.2 Alternative 2B: One lane northbound, two lanes southbound

Two lanes southbound will provide more capacity on the section between Sheriff Street Upper and North Wall Quay and reduce queue lengths. Even though this scheme also adheres to the Development Plan, it may not be viable since traffic on the northbound approach, not heading into the tunnel, but heading towards Alfie Byrne Road and the North Port will be delayed by Dublin Port Tunnel traffic.

3.5 Preferred Scheme Alternative

Based on the analysis it follows that the preferred scheme alternative is to dual East Wall Road between the Dublin Port Tunnel Access and Sheriff Street Upper and to provide 2 lanes northbound and 1 lane southbound between Sheriff Street Upper and North Wall Quay. East Wall Road will therefore be widened in accordance with the Development Plan.

It is recommended that the dualing of East Wall Road between Sheriff Street Upper and North Wall Quay be included in the Dublin City Development Plan of 2004 so as to enable the Preferred Option to be implemented in full.

4. TRAFFIC MANAGEMENT DESIGN

4.1 Study Area

Given the preferred scheme alternative, the study area was refined to the local section of East Wall Road and access roads off East Wall Road, between the Dublin Port Tunnel Access and North Wall Quay.

4.2 Traffic Management Design (T)

In considering various scheme alternatives, account was taken of current road design standards as set out in the NRA Design Manual for Roads and Bridges (DMRB). Recommended dimensions for various cross sectional elements were adopted and where possible, departures from standard avoided.

4.2.1 Access Restrictions

Due to the high volume of traffic expected along East Wall Road, it is proposed that all the accesses be converted to left-in left-out accesses, with the following exceptions.

The right-turn inbound from East Wall Road into the North Port at Alexandra Road will be retained at the junction between East Wall Road and Alexandra Road. Also, the right turn from East Wall Road into Sheriff Street Upper will be retained.

The accesses from East Wall Road to the Dublin Port Company Offices, the Shell Garage and The Point Depot will be converted into left-in left-out only accesses. existing access to the Dublin Port Company just north of the junction with Sheriff Street Upper will also have to be converted to a left-in left-out access.

4.2.2 Junction Design and Control

It is recommended that the following two junctions be signalised as part of a traffic management strategy to minimize through traffic on Castleforbes Road:

- North Wall Quay & Castleforbes Road
- Sheriff Street Upper & Castleforbes Road

Additional Transyt analyses were also conducted to progress the junction design and control of the following junctions (the results are discussed in *Section 4.3.2)*:

- East Wall Road & Dublin Port Tunnel Access
- East Wall Road & Alexandra Road
- East Wall Road & Sheriff Street Upper
- Roundabout: East Wall Road & North Wall Quay

4.2.3 Sustainable Transport

4.2.3.1 Pedestrians and Cyclists

As part of the scheme facilities for vulnerable road users will be improved.

A pedestrian footpath was designed on both sides of East Wall Road.. A pedestrian bridge crossing at the northern end of the scheme is being provided as part of the Dublin Port Tunnel scheme.

One-way cycle lanes will be provided on the western (northbound) and eastern (southbound) sides of East Wall Road. The cycle lanes will be slightly elevated off the main roadway for safety reasons but will be designed to maximize continuity at junctions.

Advanced stoplines will be provided at the junctions between East Wall Road & Alexandra Road and East Wall Road & Dublin Port Tunnel Access to enable cyclists to turn right safely.

The impact of the inclusion of pedestrian facilities on the junctions along East Wall Road was analysed in detail and discussed in *Section 4.3.3*

4.2.3.2 Bus Services

The pro vision of bus lanes along East Wall Road was considered at an early stage in the scheme development but was not taken forward to detailed optioneering as two further traffic lanes would have to have been provided as part of the scheme, resulting in significant additional land take implications. Also, the provision of bus lanes was not considered critical given that there were no immediate plans to include this section of East Wall Road within the Dublin Quality Bus Network.

The provision of dedicated bus lanes along East Wall Road, would have significantly reduced the capacity for general traffic along East Wall Road and would have limited the amount of traffic that would be able to exit the Dublin Port Tunnel in the case of emergency.

The bus stops along East Wall Road will be maintained.

4.2.4 Land-take Restrictions and Lane Width

In considering the design of the scheme options, land-take was kept to a minimum and consideration was given to maintaining efficient and safe access to properties.

Dublin Port Company requested that the wall on the eastern side of East Wall Road be retained if East Wall Road is upgraded. Therefore all of the land-take will have to take place on the western side of East Wall Road.

Due to the high expected volume of Heavy Goods Vehicles it is proposed to provide 3.65m wide lanes as recommended by the "Design Manual for Roads and Bridges" (DMRB) (see Dimensions of Cross Section Elements for Urban Motorways, Chapter 3, Volume 6, Section1, Part 2 TD27/96, p3/10).

In addition pedestrian footpaths and cycle lanes will be provided on both sides of East Wall Road.

It is proposed that the right-turn from East Wall Road onto Sheriff Street Upper be permitted. A dedicated right-turn lane will have to be provided and two southbound through-lanes will have to be constructed adjacent to it. The additional lane will have an impact on the width of the road and the required land-take for the scheme implementation will increase to the south of the Sheriff Street Upper junction. For the purpose of lane continuity the distance over which this merging has to take place is at least 100m from the signal location. This is based on the standard as given in the "Design Manual for Roads and Bridges"(DMRB) in Chapter 2, Volume 6, Section 2, Part 3.

4.3 Traffic Management Design (2)

A number of specific traffic management design issues were examined and supported by more in depth transportation modelling exercises and analysed in more detail. These included:

- Lane Allocation on approach to Dublin Port Tunnel Access
- Junction Design and Control of the 4 main junctions along East Wall Road
- Pedestrian Staging at junctions along East Wall Road
- Finalised Scheme Micro Simulation

4.3.1 Lane Allocation

Delays caused by the closure or congestion of the Dublin Port Tunnel could result in delays for traffic heading towards Alfie Byrne Road and North Port. Attempts should be made to limit the delays on this traffic, and therefore possibly allocating a dedicated lane for this purpose.

4.3.1.1 Option 1: Flare length to continuation of East Wall Road

The left turn filter lane, which offers access to the continuation of East Wall Road at the Dublin Port Tunnel Access, has been lengthened to accommodate a 100m queue of vehicles. It is expected that this will allow the majority of vehicles unimpeded access into the lane without obstruction by Port bound traffic. In summary Port bound and East Wall Road bound traffic share one lane up to Alexandra Road. Conversely the adjacent lane is for access into the Dublin Port Tunnel.

4.3.1.2 Option 2: Dedicated use of off side lane for East Wall Road bound traffic

At the request of Dublin City Council an option for the same section of roadway was considered that made provision for a dedicated lane on East Wall Road to East Wall Road (local traffic) was assessed. Therefore all port and tunnel bound traffic share one approach lane, which flares to 3 lanes at the stopline.

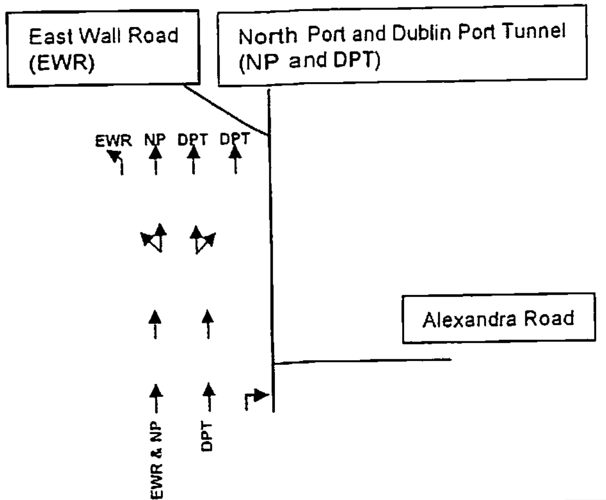
4.3.1.3 Option 3: Additional northbound lane between Sherrif Street and East Wall Road

The provision of an extra northbound lane between Sherrif Street and East Wall Road was considered.

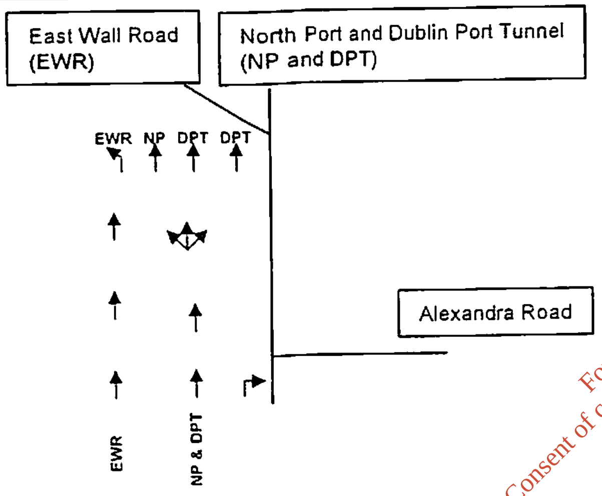
Transyt modelling software were utilised to model the various options in terms of lane allocations. In *Figure 9* diagrams of the three analysed options are shown.

The 2006 AM peak hour traffic volumes were extracted from the information obtained from the DTO's SATURN Transportation Model (Two North – One South Scenario (2A)). PM Peak hour traffic volumes were estimated by inverting the AM peak hour traffic volumes and multiplying it by a factor of 0.9.

Lane Allocation Option 1: Flare length to continuation of East Wall Road



Lane Allocation Option 2: Dedicated use of off side lane for East Wall Road bound traffic



Lane Allocation Option 3: Additional northbound lane between Sheriff Street and East Wall Road

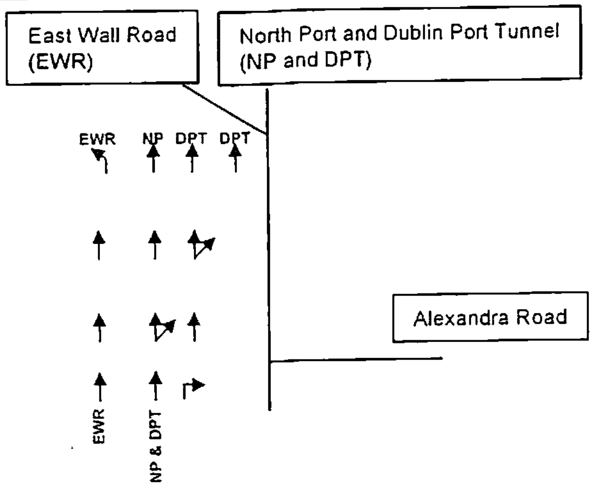


Figure 9: Lane Allocation Options

In *Figures 10.1 and 10.2* the Transyt link diagrams for Option 1 and 2 are shown, indicating the traffic volumes and saturation flows for each movement.

The options were analysed based on Degree of Saturation, Delay and Mean Maximum Queue on each movement. Also indicated on *Figures 10.1 and 10.2* are the movements where the Degree of Saturation is higher than 90%; and/or the Delay is longer than the cycle time of 120s; and/or the Mean Maximum Queue is in excess of the distance to the upstream junction and therefore unacceptable.

The optimised Transyt runs are included in *Appendix B*.

Based on the Transyt modelling it became clear that the North Port and the Dublin Port Tunnel require more than one lane to feed the stoplines at the junction between East Wall Road and the Dublin Port Tunnel Access. Capacity problems are likely to be more prominent on the approach during the PM peak, where vehicles queuing to either enter the North Port or the Dublin Port Tunnel may block back far enough to restrict entry into the flare offering access to the continuation of East Wall Road.

There does not appear to be much merit in constructing an extra lane as it appears that the 100m flare lane will remain accessible for traffic virtually all the time. Therefore, whilst the provision of the lane may improve general traffic movement it will do little in terms of improving the capacity (or reducing the delay) of vehicles travelling onto East Wall Road (local traffic).

The preferred option in this regard is therefore Option 1, i.e. Flare length to continuation of East Wall Road.

4.3.2 Junction Design and Control

4.3.2.1 East Wall Road & Dublin Port Tunnel Access

This junction will be improved to cater for the significant traffic loading forecast at this location. Four lanes will be provided on the East Wall Road (south) arm described as above. Two lanes will be provided on the East Wall Road (west) arm, and three lanes will be provided on the Dublin Port Tunnel arm.

The staging of right-turning movement from the Dublin Port Tunnel Access to the northern section of East Wall Road was considered.

Firstly it can run together with the through-movements going between the Dublin Port Tunnel Access and the North Port. This will mean that the right-turners will have to find gaps between the through-movements and will be opposed by traffic travelling northbound from East Wall Road towards the North Port and the Dublin Port Tunnel Access.

In addition the right-turners can then run during a second phase where northbound traffic on East Wall Road will be stopped. The right-turners will therefore not be opposed by the northbound through-movements during this phase.

Because of the heavy traffic volumes expected on the through-lanes and the fact that right-turners will have to cross 4 opposing lanes, it was concluded that these right-turning movements would not be able to find significant gaps during the peak periods to reduce their delay considerably. Therefore such a staging arrangement will not improve the capacity of the junctions significantly during the peak periods. In order to improve safety during the Peak Hours, it is recommended to only allow right-turning during a separate unopposed phase.

4.3.2.2 East Wall Road & Alexandra Road

As was mentioned earlier - the right-turn from Alexandra Road to East Wall Road will be banned, however the right-turn from East Wall Road to Alexandra Road will be permitted. It

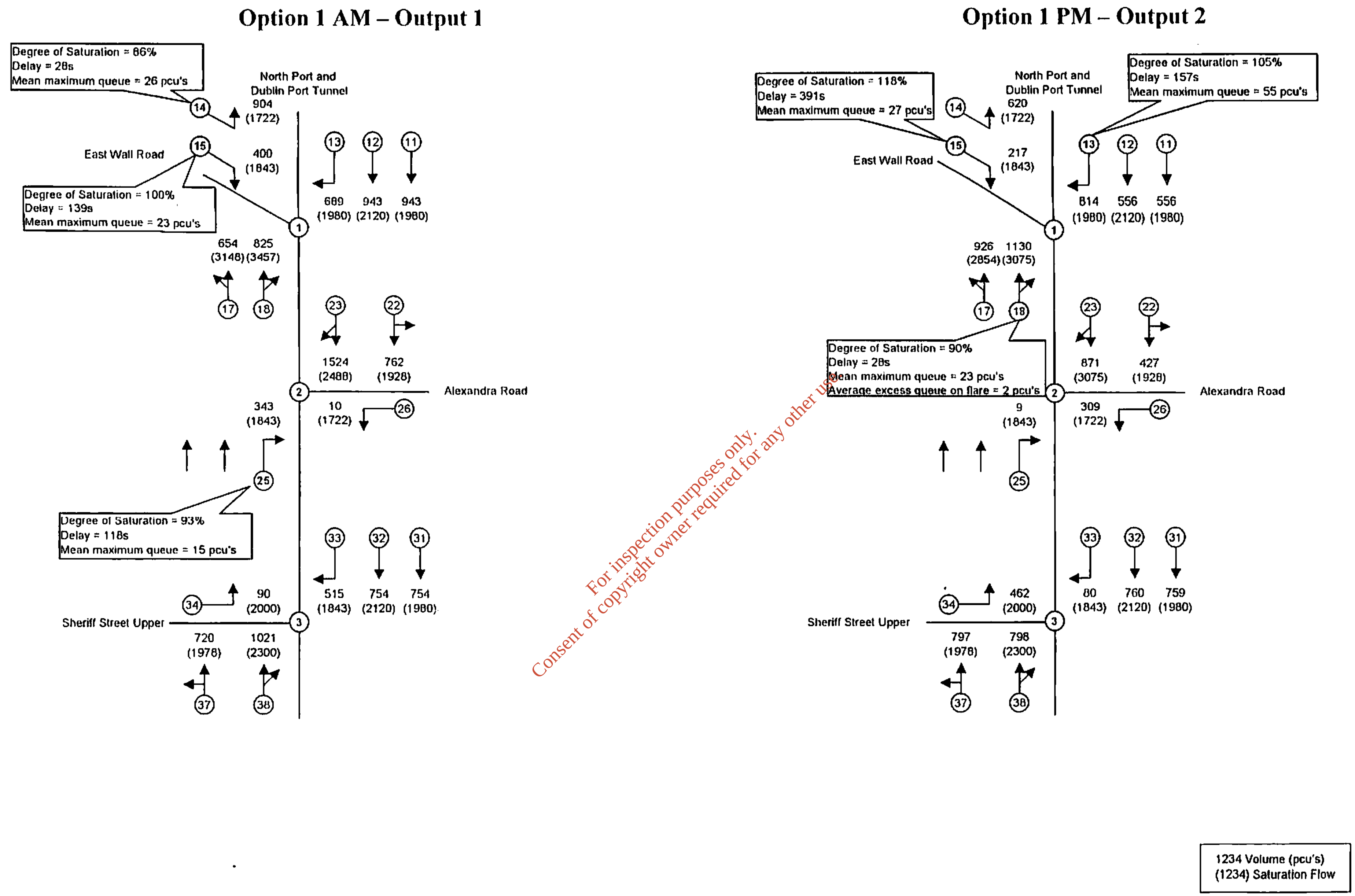
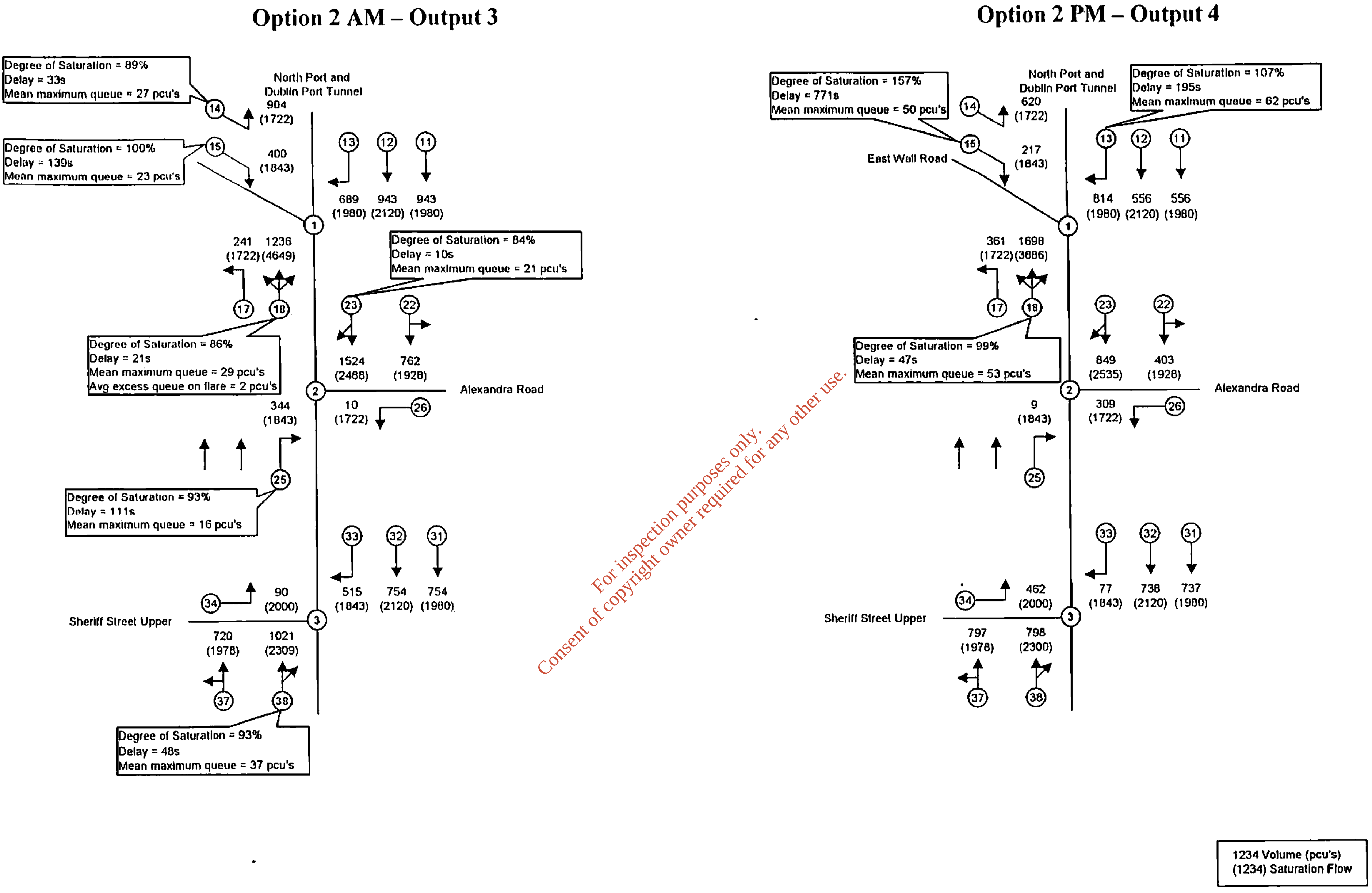


Figure 10.1: Transyt Link Diagrams and Output – Option 1



Option 2 AM – Output 3

Option 2 PM – Output 4

Figure 10.2: Transyt Link Diagrams and Output – Option 2

is proposed that the junction between East Wall Road and Alexandra Road be signalized, to allow for traffic turning right into the Port, and the occasional use of the level rail crossing.

4.3.2.3 East Wall Road & Sheriff Street Upper

It was concluded that the right-turn from East Wall Road to Sheriff Street Upper should be permitted given the fact that only one lane southbound is provided onwards. A dedicated right-turn lane will have to be provided and 2 through lanes will have to be constructed. This will facilitate maximum capacity for the major southbound movement along East Wall Road.

The right-turn from Sheriff Street Upper to East Wall Road should be removed. The DTO's SATURN Transportation Model indicated an insignificant demand for this movement. As a result, the junction will be more focused on providing northbound and southbound capacity.

In terms of the staging arrangements at this junction the same argument regarding the right-turning movement was followed as in for the East Wall Road & Dublin Port Tunnel Access junction. In order to improve safety during the Peak Hours, it is recommended to only allow right-turning during a separate unopposed phase.

4.3.2.4 Roundabout: East Wall Road & North Wall Quay

A set of analysis runs was carried out to investigate traffic operations at the roundabout junction between North Wall Quay and East Wall Road. Analysis was carried out using Arcady software. Traffic volume information was extracted from DTO's SATURN Transportation Model (Two North – One South Scenario (2A)). The results are summarised here:

In *Table 10* the AM peak hour Input Matrix is given.

Table 10: AM peak hour Input Matrix (2006 pcu's)

ARM	East Wall Road	East Link Toll Bridge	North Wall Quay	Total
East Wall Road	0	946	463	1409
East Link Toll Bridge	972	0	322	1294
North Wall Quay	760	209	0	969
Total	1732	1155	785	3672

The results of the AM peak hour runs are given in *Table 11*.

Table 11: Degree of Saturation (2006 AM peak hour)

ARM	Degree of Saturation
East Wall Road	1.062
East Link Toll Bridge	1.748
North Wall Quay	0.654

PM Peak hour traffic volumes were estimated by inverting the AM peak hour traffic volumes and multiplying it by a factor of 0.9. In *Table 12* the PM peak hour Input Matrix is given.

Table 12: PM peak hour Input Matrix (2006 pcu's)

ARM	East Wall Road	Toll Bridge	North Wall Quay	Total
East Wall Road	0	875	684	1559
Toll Bridge	851	0	188	1039
North Wall Quay	417	290	0	707
Total	1268	1165	872	3305

The results of the PM peak hour runs are given in *Table 13*.

3.6

Table 13: Degree of Saturation (2006 PM peak hour)

ARM	Degree of Saturation
East Wall Road	1.226
Toll Bridge	1.546
North Wall Quay	0.475

The roundabout analyses showed that the East Link Toll Bridge arm has significant capacity issues in the AM peak hour. The results for the East Wall Road arm give a reasonable level of confidence that there will not be serious blocking back along East Wall Road towards the Dublin Port Tunnel.

With regard to the PM Peak Hour it was shown that the East Link Toll Bridge arm still has significant capacity issues. The results for the East Wall Road arm show significant capacity problems.

The capacity of the East Wall Road arm will, however, be highly dependent on the assumed right turn flow from North Wall Quay to the East Link Toll Bridge. This is expected to be less than used in the analysis because of the opportunity for N-S crossings afforded by the Macken Street Bridge further upstream, and the simplistic method of deriving the flow in the first place.

The signalisation of the junction will not be a viable solution, since the right-turning movement from East Wall Road to North Wall Quay will require a separate phase in the signal settings and a dedicated right-turn lane. This will also limit the capacity of the movements exiting the toll bridge.

Furthermore the signalisation of the roundabout will require the re-evaluation of the existing left-in left-out access to the P&O Ferries site. At the moment exiting traffic is able to travel to the south, but not to the north, unless they turn to the south, make a u-turn at the existing roundabout, and proceed to the north.

Entering traffic is able to approach from the north, but not from the south, unless they travel via North Wall Quay, New Wapping Street, East Road and southbound along East Wall Road and then enter the site from the north (there is a heavy vehicle restriction in place along Sheriff Street Upper).

The signalisation of the roundabout will therefore cause the exiting traffic travelling to the north not to be able to make a u-turn at the roundabout anymore. The alternative will be that they will also have to travel along North Wall Quay, New Wapping Street, East Road and proceed along East Wall Road to their destination in the north, in a similar way as is currently the case with entering traffic from the south.

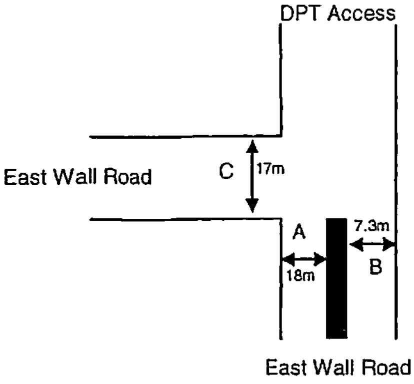
The roundabout exit width has been adjusted to provide a c6.0m adjacent lane width (through the retention of the exiting splitter island alignment). During congested conditions this section may act as a 2 lane northbound road.

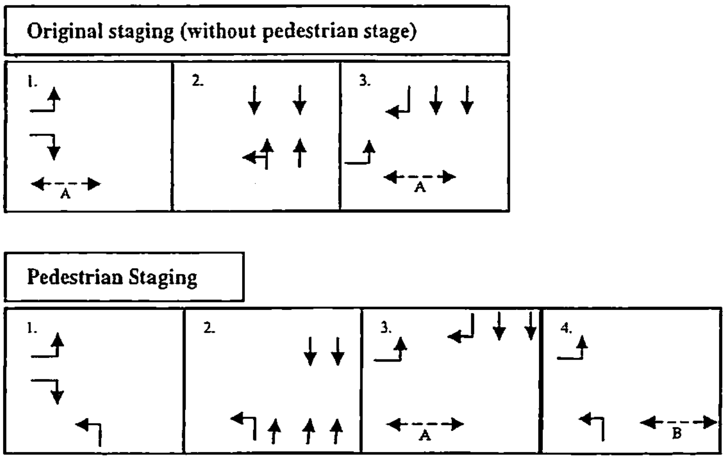
4.3.3 Pedestrian Staging at East Wall Road & Dublin Port Tunnel Access

The impact of the inclusion of pedestrian facilities on the signal settings of the junction at East Wall Road & Dublin Port Tunnel Access was determined.

The scheme layout with the flare length continuation of East Wall Road was accepted. Based on this "Option 1 - lane configuration" the inclusion of pedestrian staging was analysed.

4.3.3.1 East Wall Road and Tolka Quay





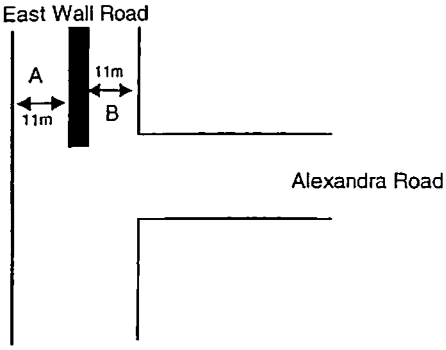
Given the existing optimised signal settings (without pedestrian staging) it is possible for movement A to cross during Stage 1 and 3.

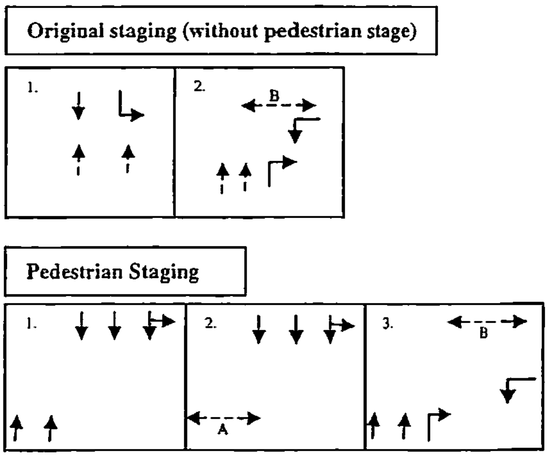
However, for movement B and C to cross it is required that some or all of the vehicular movements are stopped.

Movement C will be accommodated at a location further north along East Wall Road. An additional stage is therefore only required for movement B.

4.3.3.2 East Wall Road & Alexandra Road

An at-grade pedestrian crossing will be provided at the East Wall Road & Alexandra Road junction.



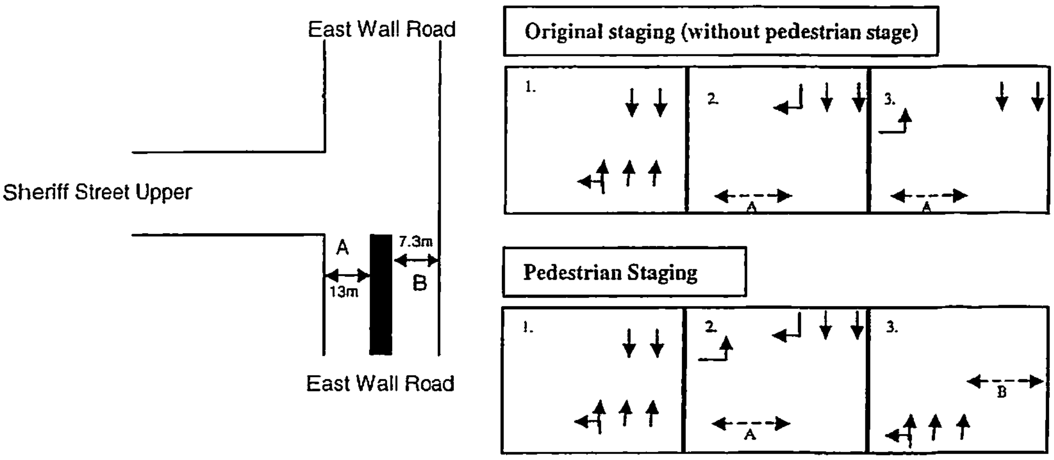


Given the existing optimised signal settings (without pedestrian staging) it is possible for movement B to cross during Stage 2.

However, for movement A to cross it is required that some or all of the vehicular movements are stopped.

An additional stage is therefore created where the northbound through movements are stopped to allow movement A to cross.

4.3.3.3 East Wall Road & Sheriff Street



Given the existing optimised signal settings (without pedestrian staging) it is possible for movement A to cross during Stages 2 and 3.

However, for movement B to cross it is required that some or all of the vehicular movements are stopped.

An additional stage is therefore created where the southbound through movements are stopped to allow movement B to cross.

4.3.3.4 Transyt Modelling and Evaluation of Options

The duration of the pedestrian stage was calculated based on the crossing distance of the relevant critical movement taking into consideration the walking speed of 1.25m/s, a minimum green time of 7s and an all-red time of 2s. This time was proportionally deducted from the optimised signal settings that were the outcome of the initial Transyt runs utilised to analyse the lane allocation and junction design and control discussed in ***Sections 4.3.1 and 4.3.2.***

The Transyt outputs for the 2006 AM and PM scenarios for the revised signal settings are included in ***Appendix C.***

A summary of the Transyt runs indicating the saturation flow, practical capacity, demand, degree of saturation, and green time for each movement at each junction is given in ***Figures 11.1, 11.2, 11.3***

It is obvious from the initial Transyt runs that the junction at East Wall Road & the Dublin Port Tunnel Access will operate at capacity even without allowing for pedestrian movements in the staging. Links 13 and 15 will especially experience delays during the peak hours.

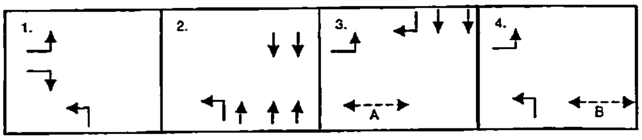
When pedestrian stages are included in the signal settings of the three junctions the capacity of the junctions are further reduced and the demand not accommodated increases. This is most visible at the junction between East Wall Road and Dublin Port Tunnel Access.

4.3.4 Finalised Scheme Micro-Simulation

4.3.4.1 Background

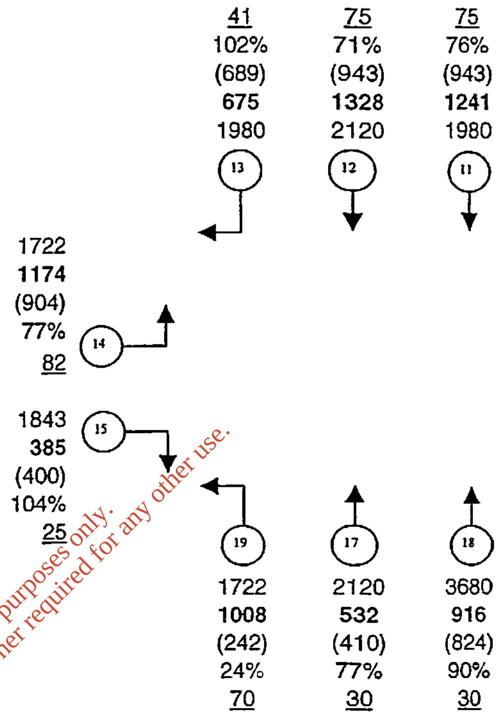
Following the analysis of the DTO's modelling figures the preferred option was identified. This option was then refined in terms of traffic management design based on the considerations given in ***Section 4.3.*** The finalised scheme option was modelled by utilising

Figure 11.1: East Wall Road & Dublin Port Tunnel Access



2006 AM

Legend	Junction Totals
Saturation Flow (pcu/h)	17167
Practical capacity (pcu/h)	7259
(Demand (pcu/h))	5355
Degree of Saturation %	74%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*29*



2006 PM

Legend	Junction Totals
Saturation Flow (pcu/h)	16721
Practical capacity (pcu/h)	7750
(Demand (pcu/h))	5354
Degree of Saturation %	69%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*395*

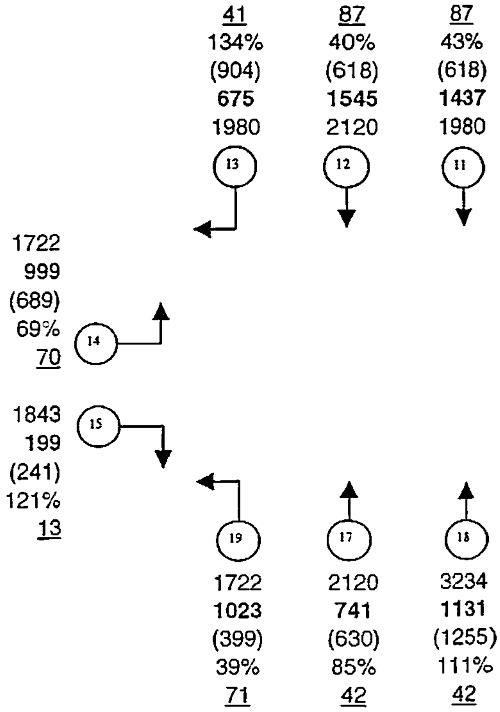
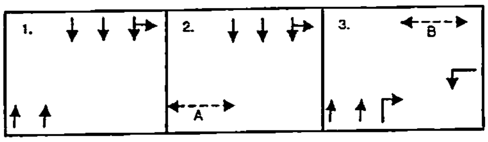
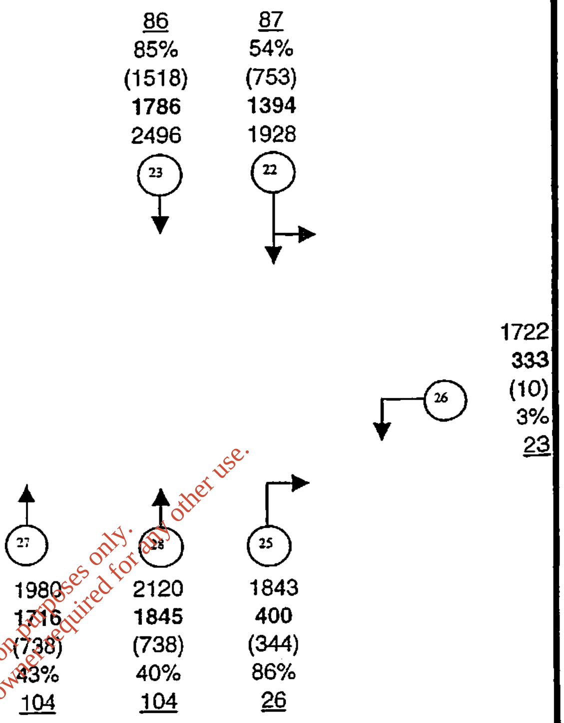


Figure 11.2: East Wall Road & Alexandra Road



2006 AM

Legend	Junction Totals
Saturation Flow (pcu/h)	12089
Practical capacity (pcu/h)	7474
(Demand (pcu/h))	4101
Degree of Saturation %	55%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*0*



2006 PM

Legend	Junction Totals
Saturation Flow (pcu/h)	12128
Practical capacity (pcu/h)	7447
(Demand (pcu/h))	3847
Degree of Saturation %	52%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*0*

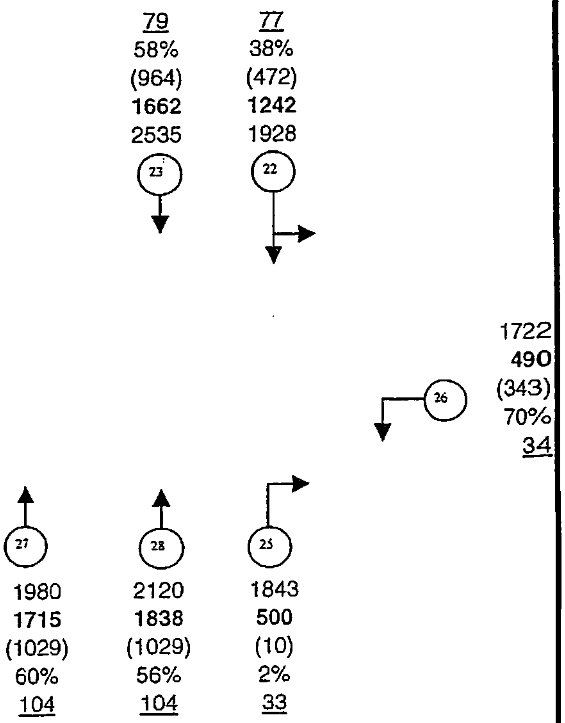
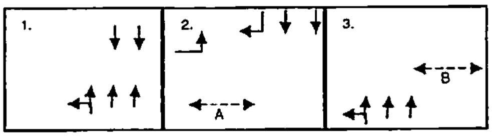
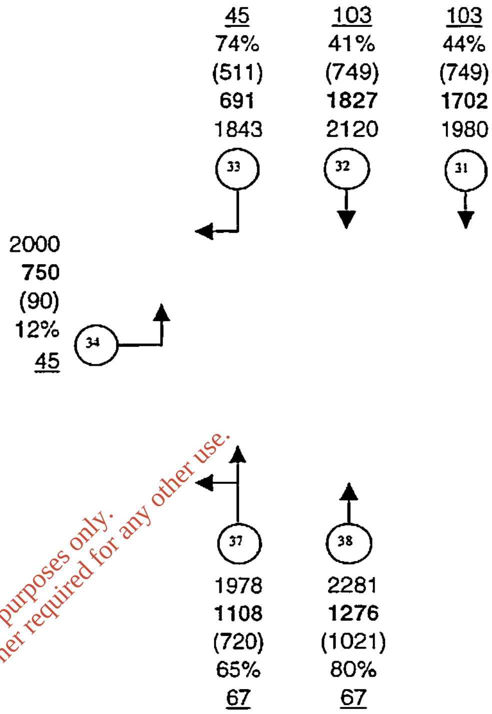


Figure 11.3: East Wall Road & Sheriff Street Upper



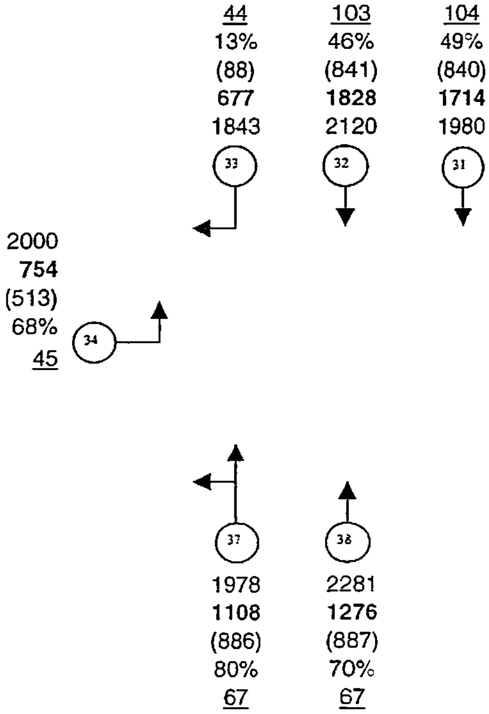
2006 AM

Legend	Junction Totals
Saturation Flow (pcu/h)	12202
Practical capacity (pcu/h)	7354
(Demand (pcu/h))	3840
Degree of Saturation %	52%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*0*



2006 PM

Legend	Junction Totals
Saturation Flow (pcu/h)	12202
Practical capacity (pcu/h)	7357
(Demand (pcu/h))	4055
Degree of Saturation %	55%
Green Time s	Cycle Length = 120s
Demand not accommodated (pcu / h)	*0*



the micro-simulation software Paramics. The purpose of this modelling was to visually check the traffic management strategies to be implemented along East Wall Road, such as junction controls, traffic signal settings, turning movement bans, access off East Wall Road and traffic operations.

The Paramics model was based on input from the DTO's SATURN Transportation Model as well as surveys such as traffic counts (refer to *Section 2.2.1*), queue length observations, road network surveys, and traffic signal settings.

4.3.4.2 Base Year Model Development

The first step in the development of this model was to build a base year model, representing the existing situation in the study area.

Base Year Road Network

The road network was coded based on road network surveys and available OS mapping for the area. The existing traffic signal settings were obtained from the Dublin City Council. Most of the traffic signals in the area are however part of a SCATS / AUTC system which means that the traffic signal settings are not fixed. Various road network characteristics were taken into consideration to estimate the capacity of the various links in the road network. These included information on road widths, surface quality, bus operations, on-street parking, pedestrian flows, lane configurations, flares, free flow speeds, gradients, etc.

Base Year Trip Matrices

A number of internal and external zones were identified within the study area. Internal zones included the North Port access at Tolka Quay, the North Port access at Alexandra Road, the Dublin Port Company Offices, the P&O Ferries site, The Point Depot, the Shell Garage, the East Wall Commercial area around Mayor Street, and the residential area west of East Road. The zone system is different and more refined than the one defined in the DTO's SATURN Transportation Model.

Classified traffic counts were conducted throughout the study area (refer to *Section 2.1.2*) and the number of private car trips and heavy goods vehicles entering and exiting each zone were based on information from the traffic counts.

Based on the traffic counts a base year trip matrix was developed in which the trip-ends associated with each zone was known, i.e. the column and row totals of the matrix were known. The distribution of the trips between the zones, were however not known, i.e. the cells within the matrix were empty. Information on the distribution of trips between zones was based on the DTO's model.

The DTO provided 2001 AM and Off Peak matrices for the study area, from which the proportion distribution between zones could be deducted. However, since the DTO's model's zoning system is different and more robust than the Paramics model, these matrices had to be disaggregated into the zones as defined in the Paramics model. The percentage distribution between cells were then applied to the matrix trip-ends to create a base year matrix. The matrix totals were balanced by applying a Furness Technique.

This Prior Matrix was assigned to the road network and Paramics estimated the link delay of trips through the network. The Prior Matrix together with the information on link delay and the traffic counts were then utilised in the Matrix Estimation module of the Paramics package.

Base Year Model Calibration

The final estimated matrix was assigned to the road network. The assignment procedure was refined through an iterative process to give the best model calibration results. The available traffic counts for the area were fairly comprehensive and detailed and assisted in achieving a good calibration. The model was calibrated according to the standards and principles as given by the "Design Manual for Roads and Bridges (DMRB)" in Chapter 4, Volume 12, Section 2, Part 1. The calibration results are given in ***Table 14***.

Based on the information in ***Table 14*** it was concluded that the Base Year model is calibrated to a satisfactory level and gives a fair representation of the real situation in terms of traffic flow in the study area.

Table 14: Calibration Results.

Standard	GEH Statistic	Flow	
85% of the investigated cases should conform to the following standards	The GEH Statistic for individual flows should be less than 5	Individual flows should be within 15% for flows between 700 veh/hour and 2700 veh/hour	Individual flows should be within 100 veh/hour for flows less than 700 veh/hour
Link Volumes			
AM Peak Hour Number of Cases	40	13	27
% cases that conform to standard	90%	100%	93%
Off Peak Hour Number of Cases	40	13	27
% cases that conform to standard	88%	100%	100%
Turning Volumes			
AM Peak Hour Number of Cases	86	12	74
% of cases that conform to standard	87%	100%	96%
Off Peak Hour Number of Cases	87	3	84
% of cases that conform to standard	77%	100%	94%

4.3.4.3 Future Year Model Development

Future Year Road Network

The 2006 road network included the Macken Street Bridge scheme, and this was reflected in the 2006-cordoned matrices. The 2016-cordoned matrices reflected the effect of the Eastern Bypass on the study area.

Future Year Matrix Development

The future year matrix for the preferred scheme option was supplied by the DTO. The matrix was disaggregated into the new zone system as discussed earlier. The 2006 matrix was also factorised to take into account the fact that the DTO's model was not calibrated to the traffic counts used in this study. i.e. the difference between the original 2001 matrix provided by the DTO and the calibrated 2001 matrix based on the traffic counts and matrix estimation process, were expressed in terms of relative factors. These factors were applied to the original 2006 matrix provided by the DTO for the sake of consistency and accuracy.

5. CONCLUSION

Based on the evaluation of the traffic management design options, the preliminary design of the scheme was completed. A drawing showing the preliminary design and Compulsory Purchase Order line is included in *Appendix D*.

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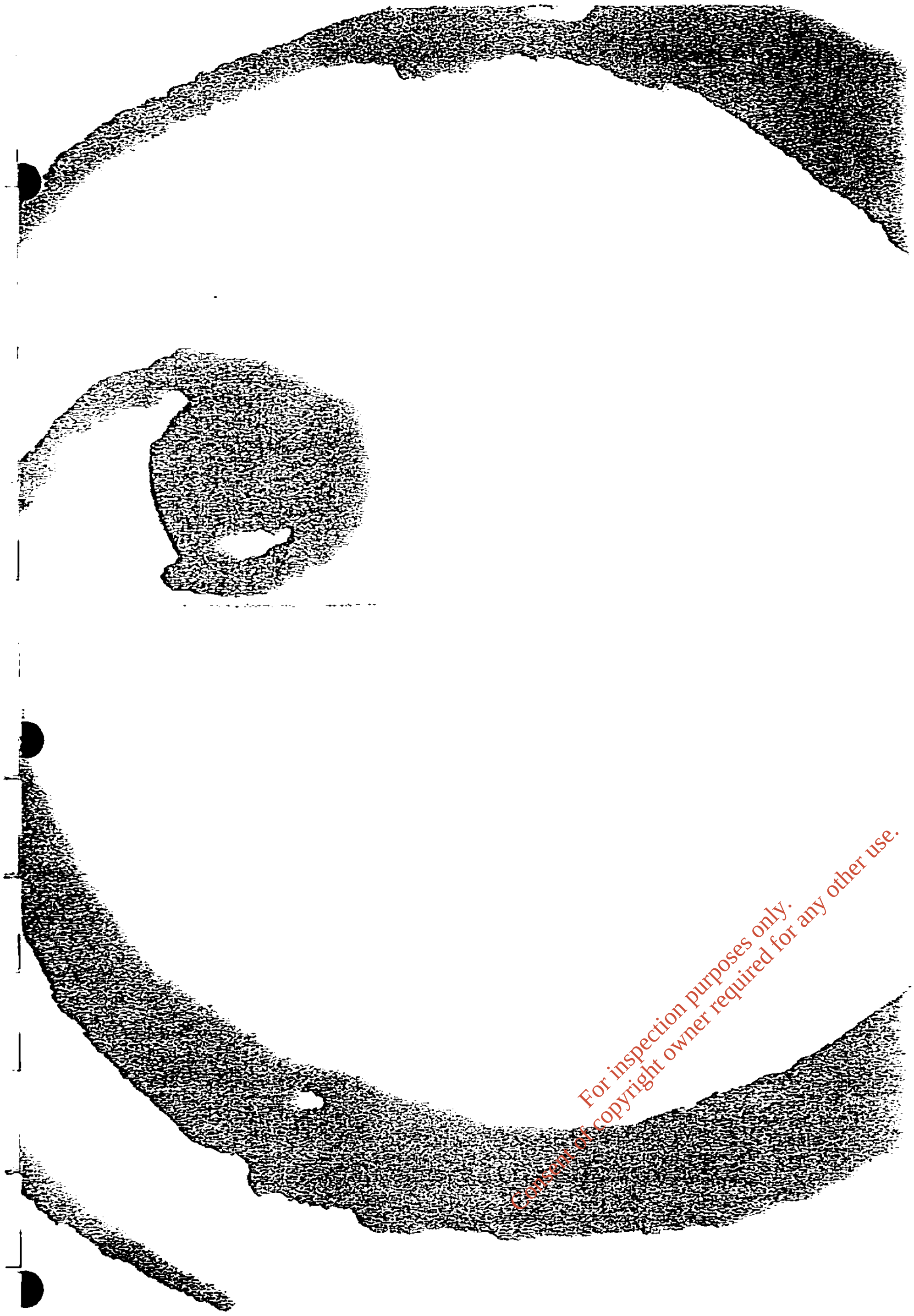


Arup Consulting Engineers

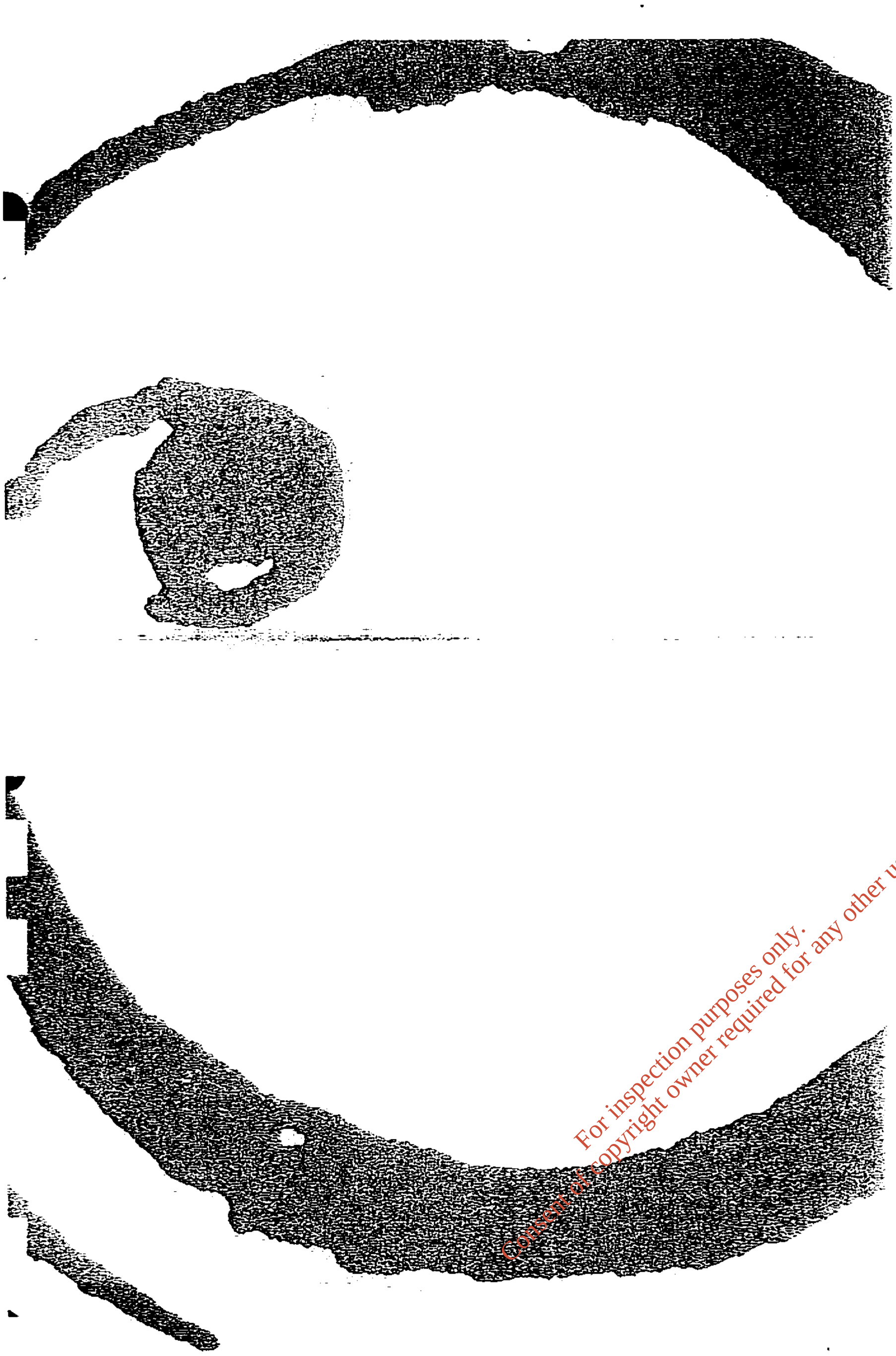
APPENDIX A

ACCIDENT STATISTICS

Cover Ltd.

Acc No.	Street 1	Street 2	Type	Year	Hour	No Vehs	No Peds	Light	Weat1	Skidd	Prim Col Type	Cont Act1	Cont Act2	Class1	Castyp1	Age1	Sex1	Sev1
3747	EAST WALL ROAD		minor	2001	16	2		Day-Good Visibility	Dry	N	Angle Both Straight	Other Action	Other Action	2 Wheeled Motor Vehicle	MC Driver	38	Male	Minor
6846	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	2001	6	2		Dark-Good Lighting	Wet	U	Angle, Right Turn		Drove through Stop/Yield	Private Car	Car Driver	60	Female	Minor
6236	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	2001	22	2		Day-Poor Visibility	Dry	N	Angle, Right Turn			Private Car	Car Driver		Female	Not Inj.
6925	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	2001	19	2		Dark-Good Lighting	Frost/Ice	N	Angle, Right Turn		Drove Through Traffic Signal	Taxi	Taxi Driver	40	Female	Not Inj
5690	EAST WALL ROAD	CHURCH ROAD	minor	2001	16	2		Day-Good Visibility	Dry	U	Other			Private Car	Car Driver	54	Male	Minor
5897	EAST WALL ROAD	MERCHANTS ROAD	minor	2001	19	3		Day-Poor Visibility	Dry	Y	Rear End, Straight			Private Car	Car Driver	24	Male	Not Inj.
5565	EAST WALL ROAD	WEST ROAD	minor	2001	7	2		Day-Good Visibility	Dry	U	Angle, Right Turn		Improper Overtaking	Private Car	Car Driver	40	Female	Not Inj.
7232	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	minor	1998	11	2		Day-Good Visibility	Dry	N	Rear End, Straight			Private Car	Car Driver		Male	Not Inj.
163	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	fatal	2000	11	2		Day-Good Visibility	Dry	N	Other		Other Action	Goods, Artic with Semi Trailer	Goods Driver	50	Male	Not Inj.
8542	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	minor	1997	13	2		Day-Good Visibility	Dry	U	Angle, Right Turn	Other Action	Other Action	2 Wheeled Motor Vehicle	MC Driver	29	Male	Minor
6324	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	1998	23	2		Dark-Good Lighting	Dry	U	Head-On Right Turn	Other Action	Other Action	Private Car	Car Driver	77	Male	Not Inj.
1103	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	1999	16	2		Dark-Poor Lighting	Dry	N	Angle, Right Turn		Other Action	Private Car	Car Driver		Female	Minor
6321	EAST WALL ROAD	ALFIE BYRNE ROAD	minor	1999	20	2		Dark-Good Lighting	Wet	U	Other		Drove Through Traffic Signal	Taxi	Taxi Driver	51	Male	Minor
8167	EAST WALL ROAD	ALFIE BYRNE ROAD	serious	1998	17	1	1	Dark-Good Lighting	Dry	U	Pedestrian			2 Wheeled Motor Vehicle	MC Driver	25	Male	Serious
4	EAST WALL ROAD	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	fatal	1999	16	2		Dark-Good Lighting	Wet	Y	Other	Other Action	Other Action	Goods, Artic with Semi Trailer	Goods Driver	59	Male	Not Inj.
7322	EAST WALL ROAD	CHURCH ROAD	minor	1998	9	2		Day-Good Visibility	Dry	N	Other		Drove through Stop/Yield	Private Car	Car Driver	65	Female	Minor
3372	EAST WALL ROAD	CHURCH ROAD	minor	1999	16	2		Day-Good Visibility	Dry	N	Head-On Right Turn	Other Action		Private Car	Car Driver		Female	Not Inj.
1222	EAST WALL ROAD	EAST LINK BRIDGE	minor	2000	17	2		Day-Good Visibility	Dry	U	Other		Other Action	Private Car	Car Driver	27	Male	Not Inj.
4290	EAST WALL ROAD	FORTH ROAD	minor	1998	18	2		Day-Good Visibility	Wet	N	Rear End, Straight			Artic, Tractor only	Goods Driver		Male	Not Inj
5447	EAST WALL ROAD	NORTH STRAND ROAD	minor	1997	13	1	1	Day-Good Visibility	Dry	N	Pedestrian			Goods, Artic with Semi Trailer	Goods Driver	59	Male	Not Inj.
2415	EAST WALL ROAD	NORTH WALL QUAY	minor	1998	17	2		Day-Good Visibility	Dry	U	Other	Other Action		Goods, over 2 tons, rigid	Goods Driver		Male	Not Inj.
7193	EAST WALL ROAD	NORTH WALL QUAY	minor	2000	12	2		Day-Good Visibility	Wet	U	Rear End, Straight		Other Action	Private Car	Car Driver	45	Male	Minor
5739	EAST WALL ROAD	NORTH WALL QUAY	minor	1998	15	2		Day-Good Visibility	Dry	N	Rear End, Straight		Other Action	Private Car	Car Driver	40	Female	Minor
5504	EAST WALL ROAD	POPLAR ROW	minor	1998	7	2		Day-Good Visibility	Dry		Angle, Right Turn		Drove Through Traffic Signal	Other	Other Driver	29	Male	Not Inj.
1317	EAST WALL ROAD	SHERIFF STREET UPPER	serious	2000	12	2		Day-Good Visibility	Dry		Other	Other Action	Other Action	Goods, Artic with Semi Trailer	Goods Driver	25	Male	Not Inj.
3176	EAST WALL ROAD	SHERIFF STREET UPPER	minor	1998	17	2		Unknown	Unknown	U	Other			Other	Other Driver			Not Inj.
2331	EAST WALL ROAD	SHERIFF STREET UPPER	minor	1997	9	2		Day-Good Visibility	Dry	U	Rear End, Left Turn			Taxi	Taxi Driver			Minor
3911	EAST WALL ROAD	SHERIFF STREET UPPER	minor	1998	13	2		Day-Good Visibility	Dry	N	Other	Failed to Signal		Van	Van Driver	35	Male	Not Inj.
7767	EAST WALL ROAD	SHERIFF STREET UPPER	minor	2000	15	2		Day-Good Visibility	Dry	N	Rear End, Straight	Other Action		Other	Other Driver		Male	Not Inj.
4460	EAST WALL ROAD	STONEY ROAD	minor	1998	17	2		Day-Good Visibility	Dry	U	Head-On Right Turn	Drove through Stop/Yield		Private Car	Car Driver		Male	Not Inj.
7637	EAST WALL ROAD	TOLKA ROAD	minor	2000	8	2		Day-Good Visibility	Dry	N	Rear End, Right Turn	Other Action		Pedal Cycle	Pedal Cyclist	65	Male	Minor
4218	EAST WALL ROAD	WEST ROAD	minor	1998	12	3		Day-Poor Visibility	Wet	U	Other			Other	Other Driver	43	Male	Not Inj.
7479	EAST WALL ROAD	WEST ROAD	minor	2000	12	2		Day-Good Visibility	Dry	Y	Other			Private Car	Car Driver		Male	Not Inj
3302	EAST WALL ROAD	WEST ROAD	minor	1998	11	2		Day-Good Visibility	Dry	U	Angle, Right Turn	Failed to Signal	Improper Overtaking	Goods, over 2 tons, rigid	Goods Driver	43	Male	Not Inj
2315	EAST WALL ROAD	WEST ROAD	minor	1997	9	2		Day-Good Visibility	Dry	N	Other	Other Action	Other Action	Other	Other Driver	27	Male	Not Inj
7400	EAST WALL ROAD	WEST ROAD	minor	2000	8	2		Day-Good Visibility	Dry	U	Head-On Right Turn	Other Action	Other Action	Private Car	Car Driver	30	Male	Not Inj.
4027	EAST WALL ROAD		minor	1999	6	2		Day-Good Visibility	Dry	N	Angle, Right Turn		Other Action	Goods, not over 2 tons, unladen	Goods Driver	55	Male	Not Inj.
5244	EAST WALL ROAD		minor	1997	16	2		Day-Good Visibility	Dry	N	Other			Private Car	Car Driver			Not Inj.
2000	EAST WALL ROAD		minor	1997	20	3		Dark-Poor Lighting	Dry	U	Rear End, Straight			Other	Other Driver		Male	Not Inj.
6964	EAST WALL ROAD		minor	1998	19	2		Day-Poor Visibility	Dry	N	Other	Other Action	Other Action	Goods, Artic with Semi Trailer	Goods Driver	29	Male	Not Inj.
8001	EAST WALL ROAD		minor	2000	17	2		Day-Good Visibility	Dry	N	Other	Other Action	Went to Wrong Side of Road	Private Car	Car Driver	40	Male	Not Inj
1893	EAST WALL ROAD		minor	2000	12	2		Day-Good Visibility	Dry	U	Angle Both Straight	Other Action	Other Action	Private Car	Car Driver		Male	Not Inj
1533	EAST WALL ROAD		minor	1998	11	2		Day-Good Visibility	Dry	N	Other		Improper Overtaking	Private Car	Car Driver			Not Inj.
1898	EAST WALL ROAD		minor	1997	18	2		Dark-Good Lighting	Dry	N	Other	Other Action		Private Car	Car Driver			Not Inj
1813	EAST WALL ROAD		minor	1998	17	2		Day-Good Visibility	Dry		Head-On Conflict		Other Action	Van	Van Driver	35	Male	Not Inj
3438	EAST WALL ROAD		minor	1999	12	2		Day-Good Visibility	Dry	U	Rear End, Left Turn	Other Action		Goods, over 2 tons, rigid	Goods Driver	33	Male	Not Inj.
2061	EAST WALL ROAD		minor	1999	17	3		Day-Good Visibility	Dry	N	Other	Other Action		Private Car	Car Driver		Male	Not Inj.
6649	EAST WALL ROAD		minor	1997	19	2		Dark-Good Lighting	Dry		Rear End, Right Turn	Other Action		Private Car	Car Driver	50	Male	Not Inj.
7694	EAST WALL ROAD		minor	1997		2		Day-Good Visibility	Dry	N	Rear End, Straight		Other Action	Private Car	Car Driver		Female	Minor
5605	EAST WALL ROAD		minor	1998	12	1	1	Day-Good Visibility	Dry	N	Pedestrian			Private Car	Car Driver		Male	Not Inj.
8289	EAST WALL ROAD		serious	1997	2	1	1	Dark-Good Lighting		U	Pedestrian	Other Action		Private Car	Car Driver		Male	Not Inj.
2546	EAST ROAD	EAST WALL ROAD	minor	2001	11	1	1	Day-Good Visibility	Dry	N	Pedestrian	Improper Overtaking		Other	Other Driver		Male	Not Inj.
2657	NORTH WALL QUAY	EAST WALL ROAD	minor	2001	18	1	1	Dark-Good Lighting	Dry	N	Pedestrian			Private Car	Car Driver	35	Male	Not Inj
0588	POPLAR ROW	EAST WALL ROAD	minor	2001	12	2		Day-Good Visibility	Dry	U	Head-On Right Turn	Other Action	Improper Overtaking	Private Car	Car Driver	32	Male	Not Inj
1436	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	serious	1999	16	2		Day-Poor Visibility	Wet	Y	Other	Other Action	Other Action	Goods, Artic with Semi Trailer	Goods Driver	59	Male	Not Inj.
2657	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	minor	1999	9	2		Day-Good Visibility	Dry	U	Angle, Right Turn	Other Action		Private Car	Car Driver	34	Female	Not Inj.
3283	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	minor	1998	7	2		Day-Good Visibility	Wet	Y	Angle Both Straight	Other Action		Private Car	Car Driver		Female	Minor
2416	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	minor	1998	9	2		Day-Good Visibility	Dry	N	Rear End, Straight		Other Action	Private Car	Car Driver		Male	Minor
7351	NORTH STRAND ROAD	EAST WALL ROAD	minor	2000	19	2		Dark-Good Lighting	Wet	U	Angle, Right Turn		Other Action	Private Car	Car Driver	50	Female	Not Inj.
5292	NORTH WALL QUAY	EAST WALL ROAD	minor	1998	0	1		Dark-Good Lighting	Wet	Y	Single Vehicle Only	Exceeded Safe Speed		Private Car	Car Driver	27	Male	Minor

Acc No.	Street 1	Street 2	Class2	Castyp2	Age2	Sex2	Sev2	CastypPed	Ageped	Sexped	Sevped
3747	EAST WALL ROAD		Goods, Artic with Semi Trailer	Goods Driver							
6846	EAST WALL ROAD	ALFIE BYRNE ROAD	Goods, Artic with Semi Trailer	Goods Driver							
6236	EAST WALL ROAD	ALFIE BYRNE ROAD	Private Car	Car Driver	45	Male	Minor				
6925	EAST WALL ROAD	ALFIE BYRNE ROAD	Private Car	Car Driver							
5690	EAST WALL ROAD	CHURCH ROAD	Private Car	Car Driver							
5897	EAST WALL ROAD	MERCHANTS ROAD	Private Car	Car Driver	50	Male					
5565	EAST WALL ROAD	WEST ROAD	2 Wheeled Motor Vehicle	MC Driver							
7232	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	Van	Van Driver		Male	Not Inj.				
163	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	Pedal Cycle	Pedal Cyclist	50	Male	Fatal				
8542	EAST WALL ROAD	ALEXANDRA ROAD (PRIVATE ROAD)	Goods, Artic with Semi Trailer	Goods Driver	39	Male	Minor				
6324	EAST WALL ROAD	ALFIE BYRNE ROAD	2 Wheeled Motor Vehicle	MC Driver	20	Male	Minor				
1103	EAST WALL ROAD	ALFIE BYRNE ROAD	Private Car	Car Driver		Female	Minor				
6321	EAST WALL ROAD	ALFIE BYRNE ROAD	Private Car	Car Driver	24	Male	Minor				
8167	EAST WALL ROAD	ALFIE BYRNE ROAD						Pedestrian	25	Male	Minor
4	EAST WALL ROAD	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	2 Wheeled Motor Vehicle	MC Driver	27	Male	Fatal				
7322	EAST WALL ROAD	CHURCH ROAD	Van	Van Driver	29	Male	Not Inj.				
3372	EAST WALL ROAD	CHURCH ROAD	2 Wheeled Motor Vehicle	MC Driver		Male	Minor				
1222	EAST WALL ROAD	EAST LINK BRIDGE	2 Wheeled Motor Vehicle	MC Driver	18	Male	Not Inj.				
4290	EAST WALL ROAD	FORTH ROAD	Pedal Cycle	Pedal Cyclist	50	Male	Minor				
5447	EAST WALL ROAD	NORTH STRAND ROAD						Pedestrian		Female	Minor
2415	EAST WALL ROAD	NORTH WALL QUAY	Pedal Cycle	Pedal Cyclist		Male	Minor				
7193	EAST WALL ROAD	NORTH WALL QUAY	Private Car	Car Driver	35	Male	Not Inj.				
5739	EAST WALL ROAD	NORTH WALL QUAY	Private Car	Car Driver	40	Male	Not Inj.				
5504	EAST WALL ROAD	POPLAR ROW	Taxi	Taxi Driver	40	Male	Minor				
1317	EAST WALL ROAD	SHERIFF STREET UPPER	Pedal Cycle	Pedal Cyclist	50	Male	Serious				
3176	EAST WALL ROAD	SHERIFF STREET UPPER	Pedal Cycle	Pedal Cyclist	35	Male	Minor				
2331	EAST WALL ROAD	SHERIFF STREET UPPER	Pedal Cycle	Pedal Cyclist		Male	Minor				
3911	EAST WALL ROAD	SHERIFF STREET UPPER	Pedal Cycle	Pedal Cyclist		Female	Minor				
7767	EAST WALL ROAD	SHERIFF STREET UPPER	Private Car	Car Driver		Male	Minor				
4460	EAST WALL ROAD	STONEY ROAD	Pedal Cycle	Pedal Cyclist	40	Male	Minor				
7637	EAST WALL ROAD	TOLKA ROAD	Artic, Tractor only	Goods Driver	53	Male	Not Inj.				
4218	EAST WALL ROAD	WEST ROAD	Van	Van Driver	33	Male	Not Inj.				
7479	EAST WALL ROAD	WEST ROAD	Pedal Cycle	Pedal Cyclist	11	Male	Minor				
3302	EAST WALL ROAD	WEST ROAD	2 Wheeled Motor Vehicle	MC Driver	23	Male	Minor				
2315	EAST WALL ROAD	WEST ROAD	2 Wheeled Motor Vehicle	MC Driver	20	Female	Minor				
7400	EAST WALL ROAD	WEST ROAD	Private Car	Car Driver	30	Male	Minor				
4027	EAST WALL ROAD		Pedal Cycle	Pedal Cyclist	59	Male	Minor				
5244	EAST WALL ROAD		Pedal Cycle	Pedal Cyclist		Female	Minor				
2000	EAST WALL ROAD		Other	Other Driver		Male	Minor				
6964	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver	25	Male	Minor				
8001	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver	30	Male	Minor				
1893	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver		Male	Minor				
1533	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver	34	Male	Minor				
1898	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver		Male	Minor				
1813	EAST WALL ROAD		2 Wheeled Motor Vehicle	MC Driver	30	Male	Minor				
3438	EAST WALL ROAD		Private Car	Car Driver	25	Male	Minor				
2061	EAST WALL ROAD		Private Car	Car Driver		Male	Not Inj.				
6649	EAST WALL ROAD		Private Car	Car Driver	20	Male	Minor				
7694	EAST WALL ROAD		Private Car	Car Driver		Male	Minor				
5505	EAST WALL ROAD							Pedestrian		Male	Minor
8289	EAST WALL ROAD							Pedestrian		Male	Serious
2546	EAST ROAD	EAST WALL ROAD						Pedestrian		Male	Minor
2657	NORTH WALL QUAY	EAST WALL ROAD						Pedestrian	30	Male	Minor
6588	POPLAR ROW	EAST WALL ROAD	2 Wheeled Motor Vehicle	MC Driver							
1436	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	Pedal Cycle	Pedal Cyclist	27	Male	Serious				
2657	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	2 Wheeled Motor Vehicle	MC Driver	22	Male	Minor				
3283	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	Goods, Artic with Semi Trailer	Goods Driver		Male	Not Inj.				
2416	ANNESLEY BRIDGE ROAD (INCLUDE BRIDGE)	EAST WALL ROAD	Private Car	Car Driver		Male	Not Inj.				
7351	NORTH STRAND ROAD	EAST WALL ROAD	Goods, Rigid & Trailer	Goods Driver	50	Male	Not Inj.				
5292	NORTH WALL QUAY	EAST WALL ROAD									



Arup Consulting Engineers

APPENDIX B

TRANSYT ANALYSES - LANE ALLOCATIONS

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                                        T R A N S Y T
                                        -------------
                                   TRAffic Network StudY Tool


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 entation for IBM-PC or compatible, running under Microsoft Windows 95

ram TRANSYT 11, Analysis Program Version 1.1

 th file:- "2006 AM DO SOMETHING1.DAT"   at 14:51   on 10/03/03

  1 AM - Output 1


 ETERS CONTROLLING DIMENSIONS OF PROBLEM :
 -----------------------------------------

BER OF NODES                   =    3
BER OF LINKS                   =   17
 R OF OPTIMISED NODES          =    3
 UM NUMBER OF GRAPHIC PLOTS    =    0
 R OF STEPS IN CYCLE           =   60
IMUM NUMBER OF SHARED STOPLINES =   0
IMUM NUMBER OF TIMING POINTS   =    3
 UM LINKS AT ANY NODE          =    7


 REQUESTED =    5322 WORDS
 AVAILABLE =   72000 WORDS
```

```
     DATA INPUT :-
     ~~~~ ~~~~~

   CARD
   TYPE
   TITLE:- Option 1 AM - Output 1

   CARD   CYCLE  NO. OF   TIME EFFECTIVE-GREEN  EQUISAT 0=UNEQUAL FLOW    CRUISE-SPEEDS    OPTIMISE  EXTRA  HILL-     DELAY    STOP
   TYPE   TIME    STEPS  PERIOD DISPLACEMENTS  SETTINGS   CYCLE   SCALE    SCALE  CARD32    0=NONE   COPIES  CLIMB     VALUE    VALUE
                   PER   1-1200  START    END    0=NO   1=EQUAL  10-200   50-200 0=TIMES   1=O/SET    FINAL  OUTPUT    P PER    P PER
          (SEC)   CYCLE   MINS.  (SEC)   (SEC)   1=YES   CYCLE      %        %   1=SPEEDS  2=FULL    OUTPUT  1=FULL    PCU-H     100
    1      120     60      60      2       3       1       0        0        0       1         2        1       0      1100      200

   CARD                                     LIST  OF  NODES  TO  BE  OPTIMISED
   TYPE
    2       1       2       3       0       0       0       0       0       0       0       0       0       0       0        0

                                 NODE  CARDS:   STAGE  CHANGE  TIMES  AND  MINIMUM  STAGE  TIMES
   CARD   NODE        STAGE 1          STAGE 2           STAGE 3          STAGE 4          STAGE 5           STAGE 6           STAGE 7
   TYPE    NO.    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN
   13       1       0       12       34      12       69      12        0       0        0       0        0       0        0       0
   12       2       0       12       90      12        0       0        0       0        0       0        0       0        0       0
   13       3       0       12       48      12       80      12        0       0        0       0        0       0        0       0

                                             PERFORMANCE INDEX OPTIONS
   CARD  IGNORE   IGNORE    1=OLD
   TYPE STOP WT. DEL WT. STOP WT.
   29       0       0       1       0       0       0       0       0       0       0       0       0       0       0        0

                                               LINK  CARDS:   FIXED  DATA
                                   FIRST   GREEN                       SECOND  GREEN
   CARD   LINK     EXIT       START            END             START            END          LINK    STOP     SAT    DELAY   DISPSN
   TYPE    NO.     NODE   STAGE    LAG    STAGE    LAG    STAGE    LAG    STAGE    LAG   LENGTH WT.X100  FLOW  WT.X100    X100
   31      11       1       2       5       1       0       0       0       0       0     200       0    1980       0       0
   31      12       1       2       5       1       0       0       0       0       0     200       0    2120       0       0
   31      13       1       3       5       1       0       0       0       0       0     200       0    1980       0       0
   31      14       1       1       5       2       0       3       5       1       0     200       0    1722       0       0
   31      15       1       1       5       2       0       0       0       0       0     200       0    1843       0       0
   31      17       1       2       5       3       0       0       0       0       0     140       0    2120       0       0
   31      18       1       2       5       3       0       0       0       0       0     140       0    2120       0       0
   31      22       2       1       5       2       0       0       0       0       0     140       0    1928       0       0
   31      23       2       1       5       2       0       0       0       0       0     140       0    2120       0       0
   31      25       2       2       5       1       0       0       0       0       0     190       0    1843       0       0
   31      26       2       2       5       1       0       0       0       0       0     200       0    1722       0       0
   31      31       3       1       0       3       0       3       0       1       0     190       0    1980       0       0
   31      32       3       1       0       3       0       3       0       1       0     190       0    2120       0       0
   31      33       3       2       5       3       0       0       0       0       0     190       0    1843       0       0
   31      34       3       3       5       1       0       0       0       0       0     200       0    2000       0       0
   31      37       3       1       5       2       0       0       0       0       0     200       0    1978       0       0
   31      38       3       1       5       2       0       0       0       0       0     200       0    2120       0       0

                                               LINK CARDS:   FLOW DATA
                                 ENTRY 1 ...........     ENTRY 2 ...........     ENTRY 3 ...........     ENTRY 4 ...........
   CARD   LINK   TOTAL  UNIFORM  LINK          CRUISE    LINK          CRUISE    LINK          CRUISE    LINK          CRUISE
   TYPE    NO.    FLOW    FLOW    NO.    FLOW   SPEED     NO.    FLOW   SPEED     NO.    FLOW   SPEED     NO.    FLOW   SPEED
   32      11     943      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      12     943      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      13     689      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      14     904      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      15     400      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      17     653      0      34      26      48      37     313      48      38     313      48       0       0       0
   32      18     824      0      34      33      48      37     395      48      38     395      48       0       0       0
   32      22     762      0      11     536      48      15     226      48       0       0       0       0       0       0
   32      23    1524      0      11     407      48      12     943      48      15     174      48       0       0       0
   32      25     343      0      34      27      48      38     316      48       0       0       0       0       0       0
   32      26      10      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      31     755      0      22     195      48      23     550      48      26      10      48       0       0       0
   32      32     755      0      22     195      48      23     550      48      26      10      48       0       0       0
   32      33     513      0      22     132      48      23     371      48      26      10      48       0       0       0
   32      34      90      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      37     720      0       0       0      48       0       0       0       0       0       0       0       0       0
   32      38    1021      0       0       0      48       0       0       0       0       0       0       0       0       0

                   LINK CARDS : FLARE SATURATION FLOW DATA
                  ..LANE  1..      ..LANE  2..     ..LANE  3..
   CARD   LINK   SAT.      CAPAC  SAT.      CAPAC  SAT.      CAPAC
   TYPE    NO.   FLOW       VEH.  FLOW       VEH.  FLOW       VEH.
   33      17    1722       10      0        0      0         0
   33      18    2120       13      0        0      0         0
   33      23    2120        9      0        0      0         0
   33      38    2120        3      0        0      0         0

                                        LINK DATA:  QUEUE CONSTRAINTS
   CARD   LINK   LIMIT   QUEUE   LINK   LIMIT  QUEUE   LINK   LIMIT  QUEUE   LINK   LIMIT  QUEUE   LINK     LIMIT  QUEUE
   TYPE    NO.   QUEUE  WEIGHT    NO.   QUEUE  WEIGHT   NO.   QUEUE  WEIGHT   NO.   QUEUE  WEIGHT   NO.     QUEUE  WEIGHT
   38      13     86     9990     17     12    9990     18     12    9990     22     12    9990     23       12   9000
   38      25     20     9990     31     20    9990     32     20    9990     33     20    9990      0        0      0

 END OF SUBROUTINE TINPUT*****
```

```
 0 SECOND CYCLE   60 STEPS

 L SETTINGS
-CONDS)

    NUMBER    STAGE    STAGE    STAGE    STAGE    STAGE   STAGE    STAGE
O   OF STAGES   1        2        3        4        5       6        7

         3        0       34       69
         2        0       90
         3        0       48       80

K     FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------   ----STOPS----   ----QUEUE----  PERFORMANCE  EXIT   GREEN TIMES
ER    INTO    FLOW    OF     PER PCU    UNIFORM RANDOM+ COST     MEAN    COST   MEAN             INDEX.     NODE   START  START
      LINK            SAT   CRUISE              OVERSAT  OF.    STOPS    OF     MAX.  AVERAGE  WEIGHTED SUM           END       END
                                  DELAY (U+R+O=MEAN Q) DELAY    /PCU    STOPS          EXCESS  OF ( ) VALUES          1ST      2ND
   (PCU/H) (PCU/H)  (%)   (SEC) (SEC)    (PCU-H/H)     ($/H)     (%)    ($/H)   (PCU)  (PCU)      ($/H)               (SECONDS)

1      943   1980    70     15    16    3.0 +  1.1  ( 45.7)     59   ( 13.7)    20                  45.7       1     39   0
       943   2120    65     15    14    2.8 +  0.9  ( 41.4)     55   ( 12.8)    18                  41.4       1     39   0
       689   1980    89     15    53    6.5 +  3.7  (112.1)    104   ( 17.8)    25   ( 0.0)*       112.1       1     74   0
       904   1722    82     15    22    3.4 +  2.2  ( 61.5)     80   ( 17.8)    23                  61.5       1      5  34   74    0
5      400   1843    87     15    70    4.8 +  3.0  ( 85.6)    113   ( 11.2)    16                  85.6       1      5  34
7      607<  3281f   72     11    22    2.4 +  1.2  ( 40.4)     83   ( 13.4)    20   ( 0.7)*       110.5       1     39  69
       766<  3629f   82     10    26    3.3 +  2.2  ( 60.5)     91   ( 18.4)    27   ( 2.1)*       271.1       1     39  69
       762   1928    55     11     8    1.0 +  0.6  ( 17.6)     26   (  5.0)     7   ( 0.0)*        17.6       2      5  90
      1525   2496f   85     11    20    5.6 +  2.8  ( 92.2)     77   ( 29.1)    33   ( 6.3)*       659.5       2      5  90
       296<  1843    74     14    76    4.8 +  1.4  ( 68.6)     97   (  8.2)    11   ( 0.0)*        68.6       2     95   0
6       10   1722     3     15    42    0.1 +  0.0  (  1.3)     80   (  0.2)     0                   1.3       2     95   0
1      754   1980    38     14     1    0.0 +  0.3  (  3.4)      2   (  0.5)     0   ( 0.0)*         3.4       3      0  80   80    0
       754   2120    36     14     1    0.0 +  0.3  (  3.1)      2   (  0.4)     0   ( 0.0)*         3.1       3      0  80   80    0
       515   1843   120     14   368    7.5 + 45.2  (578.8)    231   ( 29.2)    63   ( 9.9)*      1563.0       3     53  80
        90   2000    15     15    34    0.8 +  0.1  (  9.4)     73   (  1.6)     2                   9.4       3     85   0
       720   1978    99     15    99    7.6 + 12.2  (217.1)    140   ( 24.9)    36                 217.1       3      5  48
      1021   2365f  118     15   332   14.2 + 80.0  (999.9)    223   ( 56.3)   117                1036.6       3      5  48
            *** f - average saturation flow for flared link ***

 L           TOTAL      MEAN         TOTAL     TOTAL     TOTAL       TOTAL         PENALTY      TOTAL
IANCE         TIME     JOURNEY      UNIFORM   RANDOM+     COST        COST           FOR      PERFORMANCE
ELLED        SPENT      SPEED        DELAY    OVERSAT      OF          OF          EXCESS       INDEX
                                               DELAY      DELAY       STOPS        QUEUES
 M/H)      (PCU-H/H)    (KM/H)    (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)        ($/H)

...4         269.2        7.9        67.8      157.2     (2475.3) + (    0.0) + (1832.1)   =    4307.5     TOTALS
**********************************************************************************************************************

                        CRUISE              DELAY              STOPS              TOTALS
                    LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR

 CONSUMPTION PREDICTIONS   113.0      +      258.8     +      154.2      =        526.0


   ENTRIES TO SUBPT  =     1
   LINKS RECALCULATED=    17


 0 SECOND CYCLE   60 STEPS

RMEDIATE SETTINGS - INCREMENTS SO FAR :-    18
SECONDS)

         3     102      16      51
         2      18     108
         3       0      48      80

'AL          TOTAL      MEAN         TOTAL     TOTAL     TOTAL       TOTAL         PENALTY      TOTAL
NCE           TIME     JOURNEY      UNIFORM   RANDOM+     COST        COST           FOR      PERFORMANCE
LED          SPENT      SPEED        DELAY    OVERSAT      OF          OF          EXCESS       INDEX
                                               DELAY      DELAY       STOPS        QUEUES
KM/H)      (PCU-H/H)    (KM/H)    (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)        ($/H)

 .4          268.3        7.9        66.9      157.2     (2465.2) + (    0.0) + (1342.5)   =    3807.6     TOTALS

F ENTRIES TO SUBPT  =     8
F LINKS RECALCULATED=    95
```

5t

```
 0 SECOND CYCLE   60 STEPS

IEDIATE SETTINGS - INCREMENTS SO FAR :-    18   48
?CONDS)

        3    102       16      51
        2     18      108
3       3      0       48      80

 L         TOTAL      MEAN        TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
 NCE        TIME     JOURNEY     UNIFORM   RANDOM+    COST        COST          FOR       PERFORMANCE
. LED      SPENT      SPEED       DELAY    OVERSAT     OF          OF          EXCESS        INDEX
                                            DELAY     DELAY       STOPS        QUEUES
-KM/H)    (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)         ($/H)         ($/H)

 .4         268.3      7.9        66.9      157.2    (2465.2) + (     0.0)  +  (1342.5)   =    3807.6     TOTALS

)F ENTRIES TO SUBPT   =     7
   LINKS RECALCULATED=    83


120 SECOND CYCLE   60 STEPS

 EDIATE SETTINGS - INCREMENTS SO FAR :-    18   48   -1
 CONDS)

L       3    105       14      53
2       2     17      110
        3    107       42      94

 L         TOTAL      MEAN        TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
 ANCE       TIME     JOURNEY     UNIFORM   RANDOM+    COST        COST          FOR       PERFORMANCE
 LLED      SPENT      SPEED       DELAY    OVERSAT     OF          OF          EXCESS        INDEX
                                            DELAY     DELAY       STOPS        QUEUES
 M/H)     (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)         ($/H)         ($/H)

 ..4        162.6      13.0       53.6       64.8    (1302.5) + (     0.0)  +  ( 274.8)   =    1576.5     TOTALS

  ENTRIES TO SUBPT   =    55
  LINKS RECALCULATED=  495


 0 SECOND CYCLE   60 STEPS

 EDIATE SETTINGS - INCREMENTS SO FAR :-    18   48   -1   18
 CONDS)

        3    105       14      53
        2     17      110
        3      5       60     112

AL         TOTAL      MEAN        TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
ANCE        TIME     JOURNEY     UNIFORM   RANDOM+    COST        COST          FOR       PERFORMANCE
 ED        SPENT      SPEED       DELAY    OVERSAT     OF          OF          EXCESS        INDEX
                                            DELAY     DELAY       STOPS        QUEUES
 M/H)     (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)         ($/H)         ($/H)

0.4         169.5      12.5       60.5       64.8    (1378.2) + (     0.0)  +  ( 192.3)   =    1570.5     TOTALS

  ENTRIES TO SUBPT   =     7
  LINKS RECALCULATED=    83


 ) SECOND CYCLE   60 STEPS

MEDIATE SETTINGS - INCREMENTS SO FAR :-    18   48   -1   18   48
ECONDS)

        3    105       14      53
        2     17      110
        3      5       60     112

AL         TOTAL      MEAN        TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
 ICE        TIME     JOURNEY     UNIFORM   RANDOM+    COST        COST          FOR       PERFORMANCE
 ED        SPENT      SPEED       DELAY    OVERSAT     OF          OF          EXCESS        INDEX
                                            DELAY     DELAY       STOPS        QUEUES
KM/H)     (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)         ($/H)         ($/H)

 4          169.5      12.5       60.5       64.8    (1378.2) + (     0.0)  +  ( 192.3)   =    1570.5     TOTALS

F ENTRIES TO SUBPT   =     7
F LINKS RECALCULATED=    83
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5'

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 . SECOND CYCLE  60 STEPS

IEDIATE SETTINGS - INCREMENTS SO FAR :-    18  48  -1  18  48   1
 ONDS)

       3     102      11      50
       2      17     110
       3     114      49     101

             TOTAL     MEAN      TOTAL   TOTAL    TOTAL      TOTAL       PENALTY     TOTAL
 ICE          TIME   JOURNEY    UNIFORM RANDOM+    COST       COST         FOR    PERFORMANCE
LLED         SPENT    SPEED      DELAY  OVERSAT     OF         OF        EXCESS      INDEX
                                         DELAY    DELAY      STOPS       QUEUES
KM/H)     (PCU-H/H)  (KM/H)   (PCU-H/H)(PCU-H/H)  ($/H)      ($/H)       ($/H)       ($/H)

  4          165.2     12.8       56.2     64.8  (1330.8) + (     0.0)  +  ( 131.6)  =   1462.4     TOTALS

F ENTRIES TO SUBPT  =   21
  LINKS RECALCULATED=  218


20 SECOND CYCLE  60 STEPS

 DIATE SETTINGS - INCREMENTS SO FAR :-    18  48  -1  18  48   1  -1
 ONDS)

       3     100      10      49
       2      17     109
       3     114      58     101

             TOTAL     MEAN      TOTAL   TOTAL    TOTAL      TOTAL       PENALTY     TOTAL
ANCE          TIME   JOURNEY    UNIFORM RANDOM+    COST       COST         FOR    PERFORMANCE
LLED         SPENT    SPEED      DELAY  OVERSAT     OF         OF        EXCESS      INDEX
                                         DELAY    DELAY      STOPS       QUEUES
  /H)     (PCU-H/H)  (KM/H)   (PCU-H/H)(PCU-H/H)  ($/H)      ($/H)       ($/H)       ($/H)

0.4          138.3     15.3       54.7     39.4  (1035.2) + (     0.0)  +  ( 187.2)  =   1222.3     TOTALS

  ENTRIES TO SUBPT  =   25
  LINKS RECALCULATED=  251
```

52

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         TRL VIEWER   2.0 AA H:\My Documents\Projects\D2599-10 New East Wall Road\TRANSYT\2006 AM Do Something1.PRT - Page 6
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 0 SECOND CYCLE   60 STEPS

 SETTINGS OBTAINED WITH INCREMENTS :-   18  48  -1  18  48   1  -1   1
 CONDS)

    NUMBER    STAGE    STAGE   STAGE   STAGE   STAGE   STAGE   STAGE
 )  OF STAGES   1        2       3       4       5       6       7

        3      99        9      48
        2      17      109
        3     115       59     102

 (   FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------   ----STOPS----   ----QUEUE----   PERFORMANCE  EXIT   GREEN TIMES
 ER  INTO    FLOW    OF     PER PCU   UNIFORM RANDOM+ COST    MEAN    COST    MEAN            INDEX.       NODE   START  START
     LINK            SAT   CRUISE               OVERSAT  OF·   STOPS    OF    MAX.  AVERAGE   WEIGHTED SUM            END      END
                                  DELAY  (U+R+O=MEAN Q) DELAY  /PCU   STOPS          EXCESS   OF ( ) VALUES           1ST      2ND
   (PCU/H) (PCU/H)   (%)  (SEC) (SEC)    (PCU-H/H)    ($/H)   (%)     ($/H)   (PCU)   (PCU)     ($/H)               (SECONDS)

 L     943   1980     66    15    13     2.4 +  1.0  ( 37.4)    52  ( 12.1)    18                 37.4       1    14  99
       943   2120     62    15    12     2.3 +  0.8  ( 34.0)    49  ( 11.3)    17                 34.0       1    14  99
       689   1980     89    15    53     6.5 +  3.7  (112.1)   104  ( 17.7)    25  ( 0.0)*       112.1       1    53  99
       904   1722     86    15    28     4.1 +  3.0  ( 78.5)    92  ( 20.6)    26                 78.5       1   104   9   53   99
 5     400   1843    100    15   139     5.2 + 10.2  (169.6)   159  ( 15.8)    23                169.6       1   104   9
 7     654   3148f    71    11    26     3.4 +  1.2  ( 51.0)    53  (  8.6)    13  ( 0.0)*        53.5       1    14  48
       825   3457f    82    10    29     4.4 +  2.2  ( 72.9)    61  ( 12.4)    19  ( 0.5)*       121.8       1    14  48
       762   1928     54    11    12     1.9 +  0.6  ( 26.9)    58  ( 10.9)    17  ( 0.4)*        62.5       2    22 109
      1524   2488f    84    11    10     1.5 +  2.5  ( 44.4)    43  ( 16.2)    21  ( 0.9)*       122.7       2    22 109
 3     344   1843     93    14   118     6.4 +  4.9  (124.1)   129  ( 10.9)    15  ( 0.0)*       124.1       2   114  17
 5      10   1722      3    15    45     0.1 +  0.0  (  1.4)    82  (  0.2)     0                  1.4       2   114  17
 1     754   1980     39    14     2     0.0 +  0.3  (  3.5)     3  (  0.6)     1  ( 0.0)*         3.5       3   115 102  102  115
       754   2120     36    14     1     0.0 +  0.3  (  3.2)     3  (  0.6)     1  ( 0.0)*         3.2       3   115 102  102  115
       515   1843     86    14    49     4.2 +  2.9  ( 77.4)   108  ( 13.6)    19  ( 0.0)*        77.4       3    64 102
        90   2000     60    15    83     1.3 +  0.7  ( 22.8)   117  (  2.6)     4                 22.8       3   107 115
 )     720   1978     73    15    30     4.7 +  1.3  ( 66.5)    80  ( 14.1)    20                 66.5       3     0  59
 3    1021   2300f    89    15    38     7.0 +  3.7  (118.2)    93  ( 23.6)    33                118.2       3     0  59
             *** f - average saturation flow for flared link ***

  L          TOTAL      MEAN         TOTAL    TOTAL    TOTAL       TOTAL       PENALTY      TOTAL
 TANCE        TIME     JOURNEY      UNIFORM  RANDOM+    COST        COST         FOR      PERFORMANCE
 ELLED       SPENT      SPEED        DELAY   OVERSAT     OF          OF         EXCESS       INDEX
                                              DELAY     DELAY       STOPS       QUEUES
  M/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)   ($/H)       ($/H)       ($/H)        ($/H)

 ...4        139.1      15.2         55.5     39.4    (1043.8) + (    0.0) + ( 165.4)  =    1209.2      TOTALS
 ********************************************************************************************************************

                            CRUISE              DELAY              STOPS            TOTALS
                       LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR

 CONSUMPTION PREDICTIONS     113.0       +      109.1       +      113.6       =     335.8


   ENTRIES TO SUBPT   =    8
 ;: LINKS RECALCULATED=    95

 RAM TRANSYT FINISHED
  ============================================ end of file =================================================


 ited at 14:51:59 on 10/03/2003]
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                                   T R A N S Y T
                                   ~~~~~~~~~~~~~
                             TRAffic Network StudY Tool

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..:ntation for IBM-PC or compatible, running under Microsoft Windows 95

am TRANSYT 11, Analysis Program Version 1.1

 .h file:- "2006 PM DO SOMETHING2.DAT"  at 14:52   on 10/03/03

'n 1 PM - Output 2


 :TERS CONTROLLING DIMENSIONS OF PROBLEM :
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

.ER OF NODES                   =    3
 R OF LINKS                    =   17
 R OF OPTIMISED NODES          =    3
..JM NUMBER OF GRAPHIC PLOTS   =    0
:ER OF STEPS IN CYCLE          =   60
MUM NUMBER OF SHARED STOPLINES =    0
 JM NUMBER OF TIMING POINTS    =    3
 JM LINKS AT ANY NODE          =    7


: REQUESTED =    5322 WORDS
' \VAILABLE =   72000 WORDS
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```
     DATA INPUT :-
     ---- -----

 CARD
 TYPE
 TITLE:- Option 1 PM - Output 2

 CARD   CYCLE  NO. OF   TIME EFFECTIVE-GREEN  EQUISAT 0=UNEQUAL FLOW   CRUISE-SPEEDS   OPTIMISE  EXTRA  HILL-   DELAY   STOP
 TYPE   TIME    STEPS  PERIOD DISPLACEMENTS  SETTINGS  CYCLE   SCALE   SCALE  CARD32    0=NONE  COPIES  CLIMB   VALUE   VALUE
                 PER   1-1200  START   END     0=NO  1=EQUAL  10-200  50-200 0=TIMES   1=O/SET  FINAL  OUTPUT  P PER   P PER
        (SEC)   CYCLE   MINS.  (SEC)  (SEC)    1=YES  CYCLE     %       %   1=SPEEDS  2=FULL   OUTPUT  1=FULL  PCU-H    100
   1     120     60      60      2      3        1      0       90      0       1        2        1       0     1100     200

 CARD                                          LIST  OF  NODES  TO  BE  OPTIMISED
 TYPE
   2      1       2       3      0      0        0      0        0      0       0        0        0       0       0       0

                               NODE  CARDS:  STAGE  CHANGE  TIMES  AND  MINIMUM  STAGE  TIMES
 CARD    NODE         STAGE 1         STAGE 2          STAGE 3          STAGE 4          STAGE 5          STAGE 6          STAGE 7
 TYPE     NO.    CHANGE     MIN   CHANGE    MIN    CHANGE     MIN   CHANGE     MIN   CHANGE     MIN   CHANGE     MIN   CHANGE     MIN
  13       1        0        12     19       12      66        12      0         0      0         0      0         0      0         0
  12       2        0        12     78       12       0         0      0         0      0         0      0         0      0         0
  13       3        0        12     68       12      80        12      0         0      0         0      0         0      0         0

                                               PERFORMANCE INDEX OPTIONS
 CARD  IGNORE   IGNORE   1=OLD
 TYPE STOP WT. DEL WT. STOP WT.
  29      0       0       1      0      0        0      0        0      0       0        0        0       0       0       0

                                                 LINK  CARDS:   FIXED  DATA
                                  FIRST   GREEN                          SECOND  GREEN
 CARD    LINK     EXIT        START             END               START             END          LINK    STOP     SAT    DELAY   DISPSN
 TYPE     NO.     NODE    STAGE     LAG    STAGE     LAG     STAGE     LAG     STAGE     LAG   LENGTH WT.X100  FLOW  WT.X100    X100
  31      11       1        2        5       1        0        0        0        0        0     200      0    1980      0        0
  31      12       1        2        5       1        0        0        0        0        0     200      0    2120      0        0
  31      13       1        3        5       1        0        0        0        0        0     200      0    1980      0        0
  31      14       1        1        5       2        0        3        5        1        0     200      0    1722      0        0
  31      15       1        1        5       2        0        0        0        0        0     200      0    1843      0        0
  31      17       1        2        5       3        0        0        0        0        0     140      0    2120      0        0
  31      18       1        2        5       3        0        0        0        0        0     140      0    2120      0        0
  31      22       2        1        5       2        0        0        0        0        0     140      0    1928      0        0
  31      23       2        1        5       2        0        0        0        0        0     140      0    2120      0        0
  31      25       2        2        5       1        0        0        0        0        0     190      0    1843      0        0
  31      26       2        2        5       1        0        0        0        0        0     200      0    1722      0        0
  31      31       3        1        0       3        0        3        0        1        0     190      0    1980      0        0
  31      32       3        1        0       3        0        3        0        1        0     190      0    2120      0        0
  31      33       3        2        5       3        0        0        0        0        0     190      0    1843      0        0
  31      34       3        3        5       1        0        0        0        0        0     200      0    2000      0        0
  31      37       3        1        5       2        0        0        0        0        0     200      0    1978      0        0
  31      38       3        1        5       2        0        0        0        0        0     200      0    2120      0        0

                                                 LINK CARDS:   FLOW DATA
                               ENTRY 1 ............    ENTRY 2 ............     ENTRY 3 ............     ENTRY 4 ............
 CARD    LINK   TOTAL  UNIFORM  LINK           CRUISE   LINK           CRUISE    LINK           CRUISE    LINK           CRUISE
 TYPE     NO.    FLOW    FLOW    NO.     FLOW   SPEED    NO.     FLOW   SPEED     NO.     FLOW   SPEED     NO.     FLOW   SPEED
  32      11     618      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      12     618      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      13     904      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      14     689      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      15     241      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      17    1029      0      34      230     48      37      400     48       38      399     48        0        0      0
  32      18    1257      0      34      281     48      37      488     48       38      488     48        0        0      0
  32      22     493      0      11      368     48      15      125     48        0        0      0        0        0      0
  32      23     984      0      11      250     48      12      618     48       15      116     48        0        0      0
  32      25      10      0      34       10     48      38       10     48        0        0      0        0        0      0
  32      26     343      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      31     860      0      22      230     48      23      467     48       26      163     48        0        0      0
  32      32     860      0      22      229     48      23      468     48       26      163     48        0        0      0
  32      33      90      0      22       24     48      23       49     48       26       17     48        0        0      0
  32      34     513      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      37     886      0       0        0     48       0        0      0        0        0      0        0        0      0
  32      38     887      0       0        0     48       0        0      0        0        0      0        0        0      0

                   LINK CARDS :  FLARE SATURATION FLOW DATA
                  ..LANE  1..     ..LANE  2..     ..LANE  3..
 CARD    LINK   SAT.       CAPAC  SAT.      CAPAC  SAT.      CAPAC
 TYPE     NO.   FLOW        VEH.  FLOW       VEH.  FLOW       VEH.
  33      17    1722         10     0          0     0          0
  33      18    2120         13     0          0     0          0
  33      23    2120          9     0          0     0          0
  33      38    2120          3     0          0     0          0

                                              LINK DATA:  QUEUE CONSTRAINTS
 CARD    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE
 TYPE     NO.    QUEUE  WEIGHT     NO.    QUEUE  WEIGHT     NO.    QUEUE  WEIGHT     NO.    QUEUE  WEIGHT     NO.    QUEUE  WEIGHT
  38      13      113    9990      17      12     9990      18      12     9990      22      12     9990      23      12     9000
  38      25       20    9990      31      20     9990      32      20     9990      33      20     9990       0       0        0

END OF SUBROUTINE TINPUT*****
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   SECOND CYCLE  60  STEPS

 L SETTINGS
  ONDS)

    NUMBER    STAGE    STAGE    STAGE    STAGE    STAGE   STAGE   STAGE
   OF STAGES    1        2        3        4        5       6       7

       3        0       19       66
       2        0       78
       3        0       68       80

    FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------   ----STCPS----   ----QUEUE----   PERFORMANCE  EXIT   GREEN TIMES
 R  INTO    FLOW    OF     PER PCU    UNIFORM RANDOM+ COST    MEAN   COST    MEAN              INDEX.     NODE   START  START
    LINK            SAT    CRUISE             OVERSAT  OF ·   STOPS   OF     MAX.  AVERAGE   WEIGHTED SUM             END      END
                                DELAY (U+R+O=MEAN Q) DELAY   /PCU   STOPS          EXCESS   OF ( ) VALUES          1ST      2ND
   (PCU/H) (PCU/H)  (%)   (SEC) (SEC)   (PCU-H/H)    ($/H)   (%)    ($/H)   (PCU)   (PCU)      ($/H)                (SECONDS)

     556    1980     35    15     5     0.5 +  0.3  (  8.2)    24   (  3.3)    5                   8.2      1      24   0
     556    2120     32    15     5     0.5 +  0.2  (  7:7)    23   (  3.2)    5                   7.7      1      24   0
     814    1980     99    15    87     7.8 + 11.8  (215.8)   133   ( 26.8)   38   ( 0.0)*        215.8      1      71   0
     620    1722     66    15    23     2.9 +  1.0  ( 43.1)    74   ( 11.3)   14                  43.1      1       5  19   71    0
     217    1843     94    15   131     3.1 +  4.7  ( 86.7)   152   (  8.1)   12                  86.7      1       5  19
     926·   2957f    87    10    34     5.4 +  3.3  ( 96.0)    94   ( 21.5)   31   ( 3.9)*        485.2      1      24  66
    1130    3208f    98    10    63     7.2 + 12.7  (218.7)   123   ( 34.5)   50   (14.6)*       1674.9      1      24  66
     444    1928     37    10    10     1.0 +  0.3  ( 14.0)    33   (  3.6)    5   ( 0.0)*         14.0      2       5  78
     887    2557f    56    10    12     2.4 +  0.6  ( 32.9)    41   (  9.0)   12   ( 0.0)*         33.0      2       5  78
       9    1843      2    14    36     0.1 +  0.0  (  1.0)    68   (  0.2)    0   ( 0.0)*          1.0      2      83   0
     309    1722     57    15    42     2.9 +  0.7  ( 39.4)    86   (  6.6)    9                  39.4      2      83   0
     775    1980     39    14     2     0.0 +  0.3  (  3.8)     5   (  0.9)    5   ( 0.0)*          3.8      3       0  80   80    0
     775    2120     37    14     1     0.0 +  0.3  (  3.3)     3   (  0.6)    3   ( 0.0)*          3.3      3       0  80   80    0
      81    1843     66    14    90     1.1 +  0.9  ( 22.3)   129   (  2.6)    4   ( 0.0)*         22.3      3      73  80
     462    2000     77    15    51     4.9 +  1.6  ( 71.9)    98   ( 11.1)   16                  71.9      3      85   0
     797    1978     76    15    29     4.8 +  1.5  ( 70.1)    79   ( 15.6)   22                  70.1      3       5  68
     798    2288f    65    15    22     4.0 +  0.9  ( 53.9)    67   ( 13.2)   19                  53.9      3       5  68
            *** f - average saturation flow for flared link ***

            TOTAL       MEAN          TOTAL     TOTAL     TOTAL        TOTAL        PENALTY       TOTAL
 ..CE        TIME      JOURNEY       UNIFORM   RANDOM+    COST         COST           FOR       PERFORMANCE
 LLED       SPENT       SPEED         DELAY    OVERSAT     OF           OF          EXCESS        INDEX
                                                DELAY     DELAY        STOPS        QUEUES
  /H)     (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)        ($/H)         ($/H)         ($/H)

   2        127.6       14.2          48.6      41.3    ( 988.8)  + (   0.0)  +  (1845.5)   =    2834.3      TOTALS
*************************************************************************************************************************

                          CRUISE            DELAY             STOPS             TOTALS
                     LITRES PER HOUR   LITRES PER HOUR   LITRES PER HOUR   LITRES PER HOUR

 CONSUMPTION PREDICTIONS      96.6      +     103.4      +      101.9       =     301.9


   ENTRIES TO SUBPT   =     1
 . LINKS RECALCULATED=     17



   SECOND CYCLE  60 STEPS

 MEDIATE SETTINGS - INCREMENTS SO FAR :-     18
 ECONDS)

       3      102        1       48
       2        0       78
       3        0       68       80

 L          TOTAL       MEAN          TOTAL     TOTAL     TOTAL        TOTAL        PENALTY       TOTAL
  CE         TIME      JOURNEY       UNIFORM   RANDOM+    COST         COST           FOR       PERFORMANCE
  ED        SPENT       SPEED         DELAY    OVERSAT     OF           OF          EXCESS        INDEX
                                                DELAY     DELAY        STOPS        QUEUES
 CU/H)    (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)        ($/H)         ($/H)         ($/H)

   2        127.3       14.2          48.3      41.3    ( 985.7)  + (   0.0)  +  (1514.9)   =    2500.6      TOTALS

 ' ENTRIES TO SUBPT   =     8
 ' LINKS RECALCULATED=     91
```

```
   SECOND CYCLE  60 STEPS

 EDIATE SETTINGS - INCREMENTS SO FAR :-   18  48
 :ONDS)

        3     102       1      48
        2       0      78
        3       0      68      80

 ICE         TOTAL      MEAN        TOTAL    TOTAL    TOTAL       TOTAL        PENALTY     TOTAL
 ICE          TIME     JOURNEY     UNIFORM  RANDOM+    COST        COST          FOR     PERFORMANCE
 LED         SPENT      SPEED       DELAY   OVERSAT     OF          OF         EXCESS      INDEX
                                             DELAY     DELAY       STOPS        QUEUES
 KM/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)         ($/H)       ($/H)

   2         127.3      14.2        48.3     41.3    ( 985.7) + (     0.0)  +  (1514.9)   =   2500.6     TOTALS

 F ENTRIES TO SUBPT  =    7
   LINKS RECALCULATED=   80


 20 SECOND CYCLE  60 STEPS

  :DIATE SETTINGS - INCREMENTS SO FAR :-   18  48  -1
  :ONDS)

        3     102     117      50
        2     115      77
        3       0      66      85

 NCE         TOTAL      MEAN        TOTAL    TOTAL    TOTAL       TOTAL        PENALTY     TOTAL
 NCE          TIME     JOURNEY     UNIFORM  RANDOM+    COST        COST          FOR     PERFORMANCE
 LLED        SPENT      SPEED       DELAY   OVERSAT     OF          OF         EXCESS      INDEX
                                             DELAY     DELAY       STOPS        QUEUES
  :/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)         ($/H)       ($/H)

 1.2         150.4      12.0        48.8     63.9    (1239.2) + (     0.0)  +  ( 181.3)   =   1420.4     TOTALS

   ENTRIES TO SUBPT  =   32
   LINKS RECALCULATED=  282


   SECOND CYCLE  60 STEPS

  :DIATE SETTINGS - INCREMENTS SO FAR :-   18  48  -1  18
 ECONDS)

        3     102     117      50
        2     115      77
        3       0      66      85

 AL          TOTAL      MEAN        TOTAL    TOTAL    TOTAL       TOTAL        PENALTY     TOTAL
 ANCE         TIME     JOURNEY     UNIFORM  RANDOM+    COST        COST          FOR     PERFORMANCE
  ED         SPENT      SPEED       DELAY   OVERSAT     OF          OF         EXCESS      INDEX
                                             DELAY     DELAY       STOPS        QUEUES
  :/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)         ($/H)       ($/H)

 1.2         150.4      12.0        48.8     63.9    (1239.2) + (     0.0)  +  ( 181.3)   =   1420.4     TOTALS

   ENTRIES TO SUBPT  =    7
 F LINKS RECALCULATED=   83


   SECOND CYCLE  60 STEPS

 MEDIATE SETTINGS - INCREMENTS SO FAR :-   18  48  -1  18  48
 ECONDS)

        3     102     117      50
        2     115      77
        3       0      66      85

             TOTAL      MEAN        TOTAL    TOTAL    TOTAL       TOTAL        PENALTY     TOTAL
  CE          TIME     JOURNEY     UNIFORM  RANDOM+    COST        COST          FOR     PERFORMANCE
  ED         SPENT      SPEED       DELAY   OVERSAT     OF          OF         EXCESS      INDEX
                                             DELAY     DELAY       STOPS        QUEUES
 KM/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)         ($/H)       ($/H)

   2         150.4      12.0        48.8     63.9    (1239.2) + (     0.0)  +  ( 181.3)   =   1420.4     TOTALS

 F ENTRIES TO SUBPT  =    7
 F LINKS RECALCULATED=   83
```

```
 ) SECOND CYCLE   60 STEPS

MEDIATE SETTINGS - INCREMENTS SO FAR :-    18   48   -1   18   48    1
CONDS)

        3      103      118       51
        2      116       78
        3      118       64       83

 L           TOTAL       MEAN           TOTAL     TOTAL     TOTAL        TOTAL          PENALTY         TOTAL
 NCE          TIME     JOURNEY         UNIFORM   RANDOM+     COST         COST            FOR        PERFORMANCE
 LED         SPENT       SPEED          DELAY    OVERSAT      OF           OF            EXCESS         INDEX
                                                  DELAY      DELAY        STOPS          QUEUES
-KM/H)     (PCU-H/H)    (KM/H)       (PCU-H/H) (PCU-H/H)    ($/H)        ($/H)           ($/H)          ($/H)

 .2          149.6       12.1           48.0      63.9     (1230.7) + (     0.0)    +   ( 176.9)    =     1407.6       TOTALS

OF ENTRIES TO SUBPT   =    9
 F LINKS RECALCULATED=  101


120 SECOND CYCLE   60 STEPS

 EDIATE SETTINGS - INCREMENTS SO FAR :-    18   48   -1   18   48    1  -1
 CONDS)

        3      102      118       51
        2      116       78
        3      119       63       83

             TOTAL       MEAN           TOTAL     TOTAL     TOTAL        TOTAL          PENALTY         TOTAL
ANCE          TIME     JOURNEY         UNIFORM   RANDOM+     COST         COST            FOR        PERFORMANCE
LLED         SPENT       SPEED          DELAY    OVERSAT      OF           OF            EXCESS         INDEX
                                                  DELAY      DELAY        STOPS          QUEUES
 /H)       (PCU-H/H)    (KM/H)       (PCU-H/H) (PCU-H/H)    ($/H)        ($/H)           ($/H)          ($/H)

 ...2        148.9       12.2           48.5      62.7     (1222.6) + (     0.0)    +   ( 172.2)    =     1394.8       TOTALS

  ENTRIES TO SUBPT   =    18
  LINKS RECALCULATED=   185
```

```
..J SECOND CYCLE   60 STEPS

  SETTINGS OBTAINED WITH INCREMENTS :-   18   48   -1   18   48    1   -1    1
 CONDS)

       NUMBER    STAGE    STAGE    STAGE    STAGE    STAGE   STAGE    STAGE
)    OF STAGES     1        2        3        4        5       6        7

          3      102      118       51
          2      116       78
          3      117       61       81

(     FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------   ----STOPS----    ----QUEUE----   PERFORMANCE   EXIT   GREEN TIMES
?D    INTO    FLOW    OF     PER PCU    UNIFORM RANDOM+ COST   MEAN    COST    MEAN               INDEX.      NODE   START  START
      LINK            SAT   CRUISE              OVERSAT  OF ·  STOPS    OF     MAX.   AVERAGE   WEIGHTED SUM             END      END
                                  DELAY (U+R+O=MEAN Q) DELAY   /PCU    STOPS             EXCESS  OF ( ) VALUES           1ST      2ND
    (PCU/H) (PCU/H)  (%)   (SEC) (SEC)    (PCU-H/H)    ($/H)    (%)    ($/H)    (PCU)   (PCU)      ($/H)                 (SECONDS)

L      556   1980     34    15     4    0.4 +  0.3   (  6.7)     21  (  2.9)    4                    6.7         1      3 102
       556   2120     31    15     4    0.3 +  0.2   (  6.3)     20  (  2.7)    4                    6.3         1      3 102
       814   1980    105    15   157    8.7 + 26.8   (390.6)    172  ( 34.6)   55    ( 0.0)*       390.6         1     56 102
       620   1722     73    15    29    3.7 +  1.4   ( 55.1)     85  ( 13.0)   16                   55.1         1    107 118   56 102
;      217   1843    118    15   391    4.4 + 19.2   (259.4)    232  ( 12.4)   27                  259.4         1    107 118
7      926·  2854f    79    10    21    3.5 +  1.9   ( 59.4)     46  ( 10.5)   16    ( 0.2)*        81.8         1      3  51
·     1130   3075f    90    10    28    4.4 +  4.2   ( 95.2)     57  ( 16.0)   23    ( 1.5)*       240.1         1      3  51
       427<  1928     34    10    10    0.9 +  0.3   ( 12.8)     40  (  4.4)    7    ( 0.0)*        12.8         2      1  78
       871<  2535f    53    10    10    1.9 +  0.6   ( 26.7)     34  (  7.4)   11    ( 0.0)*        26.7         2      1  78
:        9   1843      2    14    46    0.1 +  0.0   (  1.3)     79  (  0.2)    0    ( 0.0)*         1.3         2     83 116
;      309   1722     63    15    48    3.2 +  0.9   ( 44.9)     92  (  7.0)   10                   44.9         2     83 116
I      759<  1980     39    14     2    0.0 +  0.3   (  3.8)      5  (  0.9)    6    ( 0.0)*         3.8         3    117  81   81 117
       760<  2120     37    14     1    0.0 +  0.3   (  3.3)      3  (  0.6)    2    ( 0.0)*         3.3         3    117  81   81 117
        80   1843     32    14    56    1.0 +  0.2   ( 13.7)     99  (  2.0)    3    ( 0.0)*        13.7         3     66  81
       462   2000     87    15    65    5.4 +  3.0   ( 92.1)    110  ( 12.6)   18                   92.1         3     86 117
       797   1978     81    15    34    5.6 +  2.0   ( 83.5)     86  ( 17.0)   24                   83.5         3      2  61
}      798   2300f    69    15    26    4.6 +  1.1   ( 62.9)     73  ( 14.4)   20                   62.9         3      2  61
            *** f - average saturation flow for flared link ***

 L          TOTAL      MEAN          TOTAL     TOTAL     TOTAL       TOTAL       PENALTY      TOTAL
TANCE        TIME     JOURNEY       UNIFORM   RANDOM+     COST        COST         FOR     PERFORMANCE
ILLED       SPENT      SPEED         DELAY    OVERSAT      OF          OF        EXCESS       INDEX
                                               DELAY      DELAY       STOPS       QUEUES
 M/H)     (PCU-H/H)    (KM/H)     (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)        ($/H)        ($/H)

..2         148.4       12.2         48.0      62.7     (1217.7) + (    0.0) + ( 167.3)  =    1385.0      TOTALS
**********************************************************************************************************************

                           CRUISE             DELAY               STOPS             TOTALS
                       LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR

CONSUMPTION PREDICTIONS        96.6       +       127.3      +        93.9      =      317.8


   ENTRIES TO SUBPT  =     9
JF LINKS RECALCULATED=   101

?AM TRANSYT FINISHED
 ================================= end of file==========================================


ıted at 14:52:43 on 10/03/2003]
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54

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                                              T R A N S Y T
                                              -------------
                                          TRAffic Network StudY Tool

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 entation for IBM-PC or compatible, running under Microsoft Windows 95

ram TRANSYT 11, Analysis Program Version 1.1

 th file:- "2006 AM DO SOMETHING3.DAT"  at 14:52   on 10/03/03

.. 2 AM - Output 3


 ETERS CONTROLLING DIMENSIONS OF PROBLEM :
 -----------------------------------------

BER OF NODES                    =    3
 R OF LINKS                     =   17
 R OF OPTIMISED NODES           =    3
 UM NUMBER OF GRAPHIC PLOTS     =    0
BER OF STEPS IN CYCLE           =   60
IMUM NUMBER OF SHARED STOPLINES =    0
 MUM NUMBER OF TIMING POINTS    =    3
 UM LINKS AT ANY NODE           =    7


E REQUESTED =   5322  WORDS
E AVAILABLE =  72000  WORDS
```

6c

```
   DATA INPUT :-
   ---- -----

CARD
TYPE
TITLE:- Option 2 AM - Output 3

CARD   CYCLE  NO. OF   TIME EFFECTIVE-GREEN  EQUISAT 0=UNEQUAL FLOW   CRUISE-SPEEDS  OPTIMISE  EXTRA  HILL-   DELAY   STOP
TYPE   TIME   STEPS   PERIOD DISPLACEMENTS  SETTINGS  CYCLE   SCALE   SCALE  CARD32  0=NONE   COPIES  CLIMB   VALUE   VALUE
               PER    1-1200  START    END    0=NO   1=EQUAL  10-200  50-200 0=TIMES 1=O/SET   FINAL  OUTPUT  P PER   P PER
       (SEC)  CYCLE   MINS.   (SEC)   (SEC)   1=YES   CYCLE     %       %   1=SPEEDS 2=FULL   OUTPUT 1=FULL  PCU-H    100
 1     120     60      60       2       3       1       0       0       0       1       2       1      0     1100    200

CARD                                        LIST  OF  NODES  TO  BE  OPTIMISED
TYPE                                                  .
 2       1      2       3       0       0       0       0       0       0       0       0       0       0       0       0

                          NODE  CARDS:   STAGE  CHANGE  TIMES  AND  MINIMUM  STAGE  TIMES
CARD   NODE        STAGE 1          STAGE 2          STAGE 3          STAGE 4          STAGE 5          STAGE 6          STAGE  7 .
TYPE   NO.     CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN
13      1        0       12       33      12       70      12       0        0        0       0        0       0        0       0
12 .    2        0       12       90      12       0        0       0        0        0       0        0       0        0       0
13      3        0       12       48      12       80      12       0        0        0       0        0       0        0       0
        .
                                          PERFORMANCE INDEX OPTIONS
CARD  IGNORE   IGNORE    1=OLD
TYPE STOP WT. DEL WT. STOP WT.
29      0        0       1        0       0       0       0       0       0       0       0       0       0       0       0

                                              LINK  CARDS:   FIXED  DATA
                                   FIRST   GREEN                            SECOND  GREEN
CARD   LINK     EXIT        START            END              START             END          LINK    STOP     SAT   DELAY   DISPSN
TYPE    NO.     NODE    STAGE    LAG    STAGE    LAG    STAGE    LAG    STAGE    LAG    LENGTH  WT.X100  FLOW  WT.X100    X100
31      11       1       2        5       1       0       0       0        0       0      200      0      1980     0        0
31      12       1       2        5       1       0       0       0        0       0      200      0      2120     0        0
31      13       1       3        5       1       0       0       0        0       0      200      0      1980     0        0
31      14       1       1        5       2       0       3       5        1       0      200      0      1722     0        0
31      15       1       1        5       2       0       0       0        0       0      200      0      1843     0        0
31      17       1       2        5       3       0       0       0        0       0      140      0      1722     0        0
31      18       1       2        5       3       0       0       0        0       0      140      0      2120     0        0
31      22       2       1        5       2       0       0       0        0       0      140      0      1928     0        0
31      23       2       1        5       2       0       0       0        0       0      140      0      2120     0        0
31      25       2       2        5       1       0       0       0        0       0      190      0      1843     0        0
31      26       2       2        5       1       0       0       0        0       0      200      0      1722     0        0
31      31       3       1        0       3       0       3       0        1       0      190      0      1980     0        0
31      32       3       1        0       3       0       3       0        1       0      190      0      2120     0        0
31      33       3       2        5       3       0       0       0        0       0      190      0      1843     0        0
31      34       3       3        5       1       0       0       0        0       0      200      0      2000     0        0
31      37       3       1        5       2       0       0       0        0       0      200      0      1978     0        0
31      38       3       1        5       2       0       0       0        0       0      200      0      2120     0        0

                                             LINK CARDS:    FLOW DATA
                                   ENTRY 1 ............    ENTRY 2 ............    ENTRY 3 ............    ENTRY 4 ............
CARD   LINK   TOTAL  UNIFORM    LINK           CRUISE   LINK            CRUISE   LINK            CRUISE   LINK            CRUISE
TYPE    NO.    FLOW    FLOW     NO.     FLOW   SPEED    NO.     FLOW    SPEED    NO.     FLOW    SPEED    NO.     FLOW    SPEED
32      11     943      0        0       0      48       0       0        0       0       0        0       0       0        0
32      12     943      0        0       0      48       0       0        0       0       0        0       0       0        0
32      13     689      0        0       0      48       0       0        0       0       0        0       0       0        0
32      14     904      0        0       0      48       0       0        0       0       0        0       0       0        0
32      15     400      0        0       0      48       0       0        0       0       0        0       0       0        0
32      17     241      0       34      10      48      37     116       48      38     115       48       0       0        0
32      18    1236      0       34      49      48      37     593       48      38     594       48       0       0        0
32      22     762      0       11     536      48      15     226       48       0       0        0       0       0        0
32      23    1524      0       11     407      48      12     943       48      15     174       48       0       0        0
32      25     343      0       34      27      48      38     316       48       0       0        0       0       0        0
32      26      10      0        0       0      48       0       0        0       0       0        0       0       0        0
32      31     755      0       22     195      48      23     550       48      26      10       48       0       0        0
32      32     755      0       22     195      48      23     550       48      26      10       48       0       0        0
32      33     513      0       22     132      48      23     371       48      26      10       48       0       0        0
32      34      90      0        0       0      48       0       0        0       0       0        0       0       0        0
32      37     720      0        0       0      48       0       0        0       0       0        0       0       0        0
32      38    1021      0        0       0      48       0       0        0       0       0        0       0       0        0

                     LINK CARDS :  FLARE SATURATION FLOW DATA
                    ..LANE   1..       ..LANE   2..       ..LANE   3..
CARD   LINK   SAT.        CAPAC   SAT.        CAPAC   SAT.        CAPAC
TYPE    NO.   FLOW         VEH.   FLOW         VEH.   FLOW         VEH.
33      18    2120         13     2120         13      0            0
33      23    2120          9      0            0      0            0
33      38    2120          3      0            0      0            0

                                         LINK DATA:  QUEUE CONSTRAINTS
CARD   LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE    LINK    LIMIT   QUEUE
TYPE    NO.    QUEUE   WEIGHT    NO.    QUEUE   WEIGHT    NO.    QUEUE   WEIGHT    NO.    QUEUE   WEIGHT    NO.    QUEUE   WEIGHT
38      13      67     9990     17       12     9990     18       12     9990     22       12     9990     23       12     9000
38      25      20     9990     31       20     9990     32       20     9990     33       20     9990      0        0        0

END OF SUBROUTINE TINPUT*****
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```
ı2O SECOND CYCLE  60 STEPS

ı ıL SETTINGS
 ONDS)

--   NUMBER    STAGE    STAGE    STAGE    STAGE    STAGE   STAGE    STAGE
)   OF STAGES    1        2        3        4        5       6        7

        3        0       33       70
        2        0       90
        3        0       48       80

K    FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------  ----STOPS----   ----QUEUE----   PERFORMANCE  EXIT  GREEN TIMES
--   INTO    FLOW    OF     PER PCU   UNIFORM RANDOM+ COST    MEAN    COST   MEAN               INDEX.     NODE  START  START
     LINK            SAT   CRUISE             OVERSAT  OF·   STOPS    OF    MAX.  AVERAGE   WEIGHTED SUM          END     END
                                 DELAY (U+R+O=MEAN Q) DELAY   /PCU    STOPS         EXCESS   OF ( ) VALUES        1ST     2ND
   (PCU/H) (PCU/H)  (%)  (SEC) (SEC)    (PCU-H/H)    ($/H)    (%)    ($/H)  (PCU)   (PCU)      ($/H)              (SECONDS)

1     943   1980     69    15    15    2.9 +  1.1  ( 43.5)    57  ( 13.3)   19                   43.5      1    38   0
      943   2120     64    15    14    2.7 +  0.9  ( 39.5)    53  ( 12.4)   18                   39.5      1    38   0
      689   1980     91    15    58    6.7 +  4.4  (121.8)   108  ( 18.4)   26   ( 0.0)*        121.8      1    75   0
.     904   1722     84    15    25    3.7 +  2.5  ( 69.1)    85  ( 19.0)   25                   69.1      1     5  33   75    0
5     400   1843     90    15    78    4.9 +  3.8  ( 95.4)   120  ( 11.8)   17                   95.4      1     5  33
7     224<  1722     47    11    19    0.8 +  0.4  ( 13.3)    72  (  4.3)    6   ( 0.0)*         13.3      1    38  70
     1147<  4956f    84    11    23    4.7 +  2.6  ( 79.8)    87  ( 26.5)   39   ( 4.2)*        500.5      1    38  70
      762   1928     55    11     8    1.0 +  0.6  ( 17.6)    26  (  4.9)    7   ( 0.0)*         17.6      2     5  90
     1525   2496f    85    11    19    5.3 +  2.8  ( 89.5)    77  ( 28.9)   33   ( 6.2)*        650.2      2     5  90
5     296<  1843     74    14    76    4.8 +  1.4  ( 68.6)    97  (  8.2)   11   ( 0.0)*         68.6      2    95   0
6      10   1722      3    15    42    0.1 +  0.0  (  1.3)    80  (  0.2)    0                    1.3      2    95   0
'     754   1980     38    14     1    0.0 +  0.3  (  3.4)     2  (  0.5)    0   ( 0.0)*          3.4      3     0  80   80    0
      754   2120     36    14     1    0.0 +  0.3  (  3.1)     2  (  0.4)    0   ( 0.0)*          3.1      3     0  80   80    0
      515   1843    120    14   367    7.4 + 45.2  (578.1)   231  ( 29.2)   63   ( 9.8)*       1556.7      3    53  80
       90   2000     15    15    34    0.8 +  0.1  (  9.4)    73  (  1.6)    2                    9.4      3    85   0
      720   1978     99    15    99    7.6 + 12.2  (217.1)   140  ( 24.9)   36                  217.1      3     5  48
8    1021   2365f   118    15   332   14.2 + 80.0  (999.9)   223  ( 56.3)  117       +         1036.6      3     5  48
                *** f - average saturation flow for flared link ***

 L          TOTAL      MEAN          TOTAL    TOTAL     TOTAL        TOTAL       PENALTY       TOTAL
TANCE        TIME     JOURNEY       UNIFORM   RANDOM+    COST         COST         FOR      PERFORMANCE
ELLED       SPENT      SPEED         DELAY    OVERSAT     OF           OF         EXCESS       INDEX
                                              DELAY     DELAY        STOPS        QUEUES
 M/H)     (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)    ($/H)        ($/H)        ($/H)        ($/H)

20.4        270.3       7.8          67.5     158.6     (2487.2) + (   0.0) +   (1959.9)   =    4447.1        TOTALS
**************************************************************************************************************************

                          CRUISE              DELAY                STOPS              TOTALS
                     LITRES PER HOUR     LITRES PER HOUR     LITRES PER HOUR     LITRES PER HOUR

 CONSUMPTION PREDICTIONS      113.0      +       260.0      +       154.5      =       527.6


 ' ENTRIES TO SUBPT   =     1
OF LINKS RECALCULATED=     17



 0 SECOND CYCLE   60 STEPS

RMEDIATE SETTINGS - INCREMENTS SO FAR :-     18
SECONDS)

       3      102       15       52
       2       18      108
3      3        0       48       80

 L          TOTAL      MEAN          TOTAL    TOTAL     TOTAL        TOTAL       PENALTY       TOTAL
NCE          TIME     JOURNEY       UNIFORM   RANDOM+    COST         COST         FOR      PERFORMANCE
LED         SPENT      SPEED         DELAY    OVERSAT     OF           OF         EXCESS       INDEX
                                              DELAY     DELAY        STOPS        QUEUES
-KM/H)    (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)    ($/H)        ($/H)        ($/H)        ($/H)

 ı.4        270.7       7.8          67.9     158.6     (2491.8) + (   0.0) +   (1378.4)   =    3870.2        TOTALS


OF ENTRIES TO SUBPT   =     8
OF LINKS RECALCULATED=     95
```

```
-- ) SECOND CYCLE  60 STEPS

 MEDIATE SETTINGS  -  INCREMENTS  SO FAR :-    18   48
   ONDS)

         3      102        15        52
 2       2       18       108
 3       3        0        48        80

                TOTAL       MEAN          TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
  ICE            TIME      JOURNEY       UNIFORM    RANDOM+    COST        COST          FOR       PERFORMANCE
 LLED            SPENT      SPEED         DELAY     OVERSAT     OF          OF          EXCESS        INDEX
                                                     DELAY     DELAY       STOPS        QUEUES
-KM/H)         (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)         ($/H)

  .4           270.7         7.8          67.9      158.6    (2491.8) + (     0.0)   +  (1378.4)   =    3870.2       TOTALS


 F ENTRIES TO SUBPT   =     7
   LINKS RECALCULATED=     83


120 SECOND CYCLE  60 STEPS

   EDIATE SETTINGS  -  INCREMENTS  SO FAR :-    18   48   -1
   ONDS)

         3      105        14        55
         2       17       110
         3      109        42        96

                TOTAL       MEAN          TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
 ANCE            TIME      JOURNEY       UNIFORM    RANDOM+    COST        COST          FOR       PERFORMANCE
 LLED            SPENT      SPEED         DELAY     OVERSAT     OF          OF          EXCESS        INDEX
                                                     DELAY     DELAY       STOPS        QUEUES
  /H)          (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)         ($/H)

 0.4           179.1        11.8          55.1       79.8    (1484.0) + (     0.0)   +  ( 339.4)   =    1823.4       TOTALS


   ENTRIES TO SUBPT   =    55
   LINKS RECALCULATED=    485


  ) SECOND CYCLE  60 STEPS

  DIATE SETTINGS  -  INCREMENTS  SO FAR :-    18   48   -1   18
 ECONDS)

         3      105        14        55
         2       17       110
         3      109        42        96

 AL             TOTAL       MEAN          TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
 ANCE            TIME      JOURNEY       UNIFORM    RANDOM+    COST        COST          FOR       PERFORMANCE
  ED             SPENT      SPEED         DELAY     OVERSAT     OF          OF          EXCESS        INDEX
                                                     DELAY     DELAY       STOPS        QUEUES
  /H)          (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)         ($/H)

 0.4           179.1        11.8          55.1       79.8    (1484.0) + (     0.0)   +  ( 339.4)   =    1823.4       TOTALS


   ENTRIES TO SUBPT   =     7
 F LINKS RECALCULATED=     83


  ) SECOND CYCLE  60 STEPS

 MEDIATE SETTINGS  -  INCREMENTS  SO FAR :-    18   48   -1   18   48
 ECONDS)

         3      105        14        55
         2       17       110
         3      109        42        96

                TOTAL       MEAN          TOTAL     TOTAL     TOTAL       TOTAL        PENALTY       TOTAL
  ICE            TIME      JOURNEY       UNIFORM    RANDOM+    COST        COST          FOR       PERFORMANCE
  ED             SPENT      SPEED         DELAY     OVERSAT     OF          OF          EXCESS        INDEX
                                                     DELAY     DELAY       STOPS        QUEUES
 KM/H)         (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)         ($/H)         ($/H)

  4            179.1        11.8          55.1       79.8    (1484.0) + (     0.0)   +  ( 339.4)   =    1823.4       TOTALS


 F ENTRIES TO SUBPT   =     7
 F LINKS RECALCULATED=     83
```

```
  SECOND CYCLE  60 STEPS

IEDIATE SETTINGS - INCREMENTS SO FAR :-   18   48   -1   18   48    1
ONDS)

      3     102       11       52
      2      17      110
      3     109       42       96

          TOTAL      MEAN        TOTAL    TOTAL     TOTAL       TOTAL         PENALTY      TOTAL
ICE        TIME    JOURNEY     UNIFORM  RANDOM+     COST        COST           FOR      PERFORMANCE
ED        SPENT      SPEED       DELAY  OVERSAT      OF          OF          EXCESS       INDEX
                                          DELAY    DELAY       STOPS         QUEUES
KM/H)   (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)          ($/H)        ($/H)

 4        179.1      11.8        55.0     79.8    (1483.9) + (     0.0)  +  ( 210.4)   =   1694.2      TOTALS

F ENTRIES TO SUBPT  =   10
 LINKS RECALCULATED=  119


20 SECOND CYCLE  60 STEPS

DIATE SETTINGS - INCREMENTS SO FAR :-   18   48   -1   18   48    1   -1
ONDS)

      3     101       11       52
      2      17      109
      3     109       50       96

          TOTAL      MEAN        TOTAL    TOTAL     TOTAL       TOTAL         PENALTY      TOTAL
ANCE       TIME    JOURNEY     UNIFORM  RANDOM+     COST        COST           FOR      PERFORMANCE
LLED      SPENT      SPEED       DELAY  OVERSAT      OF          OF          EXCESS       INDEX
                                          DELAY    DELAY       STOPS         QUEUES
/H)     (PCU-H/H)   (KM/H)    (PCU-H/H) (PCU-H/H)  ($/H)       ($/H)          ($/H)        ($/H)

.4        140.5      15.1        53.2     43.2    (1059.9) + (     0.0)  +  ( 313.5)   =   1373.4      TOTALS

 ENTRIES TO SUBPT   =   23
 LINKS RECALCULATED=  230
```

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    ---------------------------------------------------------------------
          TRL VIEWER    2.0 AA H:\My Documents\Projects\D2599-10 New East Wall Road\TRANSYT\2006 AM Do Something3.PRT - Page 6
   ----------------------------------------------------------------------


 ) SECOND CYCLE  60  STEPS

 SETTINGS OBTAINED WITH INCREMENTS :-    18  48  -1  18  48   1  -1   1
 CONDS)

       NUMBER    STAGE    STAGE   STAGE   STAGE   STAGE  STAGE   STAGE
      OF STAGES    1        2       3       4       5      6       7

          3       99        9      50
          2       17      109
          3      109       50      96

       FLOW    SAT   DEGREE  MEAN TIMES  --------DELAY---------   ----STOPS----   ----QUEUE----  PERFORMANCE   EXIT   GREEN TIMES
 ER    INTO    FLOW    OF     PER PCU    UNIFORM RANDOM+ COST     MEAN    COST    MEAN            INDEX.       NODE   START  START
       LINK            SAT   CRUISE              OVERSAT  OF ·    STOPS    OF     MAX.  AVERAGE  WEIGHTED SUM             END       END
                                   DELAY  (U+R+O=MEAN Q) DELAY    /PCU    STOPS          EXCESS  OF ( ) VALUES          1ST      2ND
     (PCU/H) (PCU/H)  (%)  (SEC) (SEC)     (PCU-H/H)     ($/H)     (%)    ($/H)    (PCU)  (PCU)      ($/H)             (SECONDS)

        943    1980    66    15    13    2.4 +  1.0  ( 37.4)     52   ( 12.1)     18                 37.4       1     14  99
        943    2120    62    15    12    2.3 +  0.8  ( 34:0)     49   ( 11.3)     17                 34.0       1     14  99
        689    1980    93    15    64    6.9 +  5.4  (134.7)    114   ( 19.3)     27   ( 0.0)*      134.7       1     55  99
        904    1722    89    15    33    4.6 +  3.7  ( 90.9)    102   ( 22.7)     27                 90.9       1    104   9   55   99
        400    1843   100    15   139    5.2 + 10.2  (169.6)    159   ( 15.8)     23                169.6       1    104   9

        241    1722    45    11    17    0.8 +  0.4  ( 12.9)     49   (  2.9)      5   ( 0.0)*       12.9       1     14  50
       1236    4649f   86    11    21    4.3 +  3.0  ( 80.9)     64   ( 19.6)     29   ( 1.7)*      246.1       1     14  50
        762    1928    54    11    12    1.9 +  0.6  ( 26.9)     58   ( 10.9)     17   ( 0.4)*       62.5       2     22 109
       1524    2488f   84    11    10    1.5 +  2.5  ( 44.4)     43   ( 16.2)     21   ( 0.9)*      122.7       2     22 109
        344    1843    93    14   111    5.7 +  4.9  (117.0)    126   ( 10.7)     16   ( 0.0)*      117.0       2    114  17
         10    1722     3    15    45    0.1 +  0.0  (  1.4)     82   (  0.2)      0                  1.4       2    114  17
        754    1980    39    14     2    0.0 +  0.3  (  3.5)      3   (  0.6)      1   ( 0.0)*        3.5       3    109  96   96 109
        754    2120    36    14     1    0.0 +  0.3  (  3.2)      3   (  0.6)      1   ( 0.0)*        3.2       3    109  96   96 109
        515    1843    80    14    39    3.6 +  1.9  ( 61.1)     98   ( 12.4)     17   ( 0.0)*       61.1       3     55  96
         90    2000    60    15    83    1.3 +  0.7  ( 22.8)    117   (  2.6)      4                 22.8       3    101 109
        720    1978    77    15    34    5.2 +  1.6  ( 75.0)     85   ( 15.0)     21                 75.0       3    114  50
       1021    2309f   93    15    48    7.8 +  5.8  (149.6)    104   ( 26.2)     37                149.6       3    114  50
                *** f - average saturation flow for flared link ***

               TOTAL       MEAN           TOTAL    TOTAL    TOTAL        TOTAL         PENALTY      TOTAL
 ANCE           TIME      JOURNEY        UNIFORM  RANDOM+    COST         COST           FOR      PERFORMANCE
 LLED           SPENT      SPEED          DELAY   OVERSAT     OF           OF          EXCESS       INDEX
                                                   DELAY     DELAY        STOPS         QUEUES
  I/H)       (PCU-H/H)    (KM/H)       (PCU-H/H) (PCU-H/H)   ($/H)        ($/H)          ($/H)        ($/H)

 0.4           141.0       15.0           53.7     43.2     (1065.3)  + (   0.0)  + ( 279.2)   =    1344.4        TOTALS
  ·******************************************************************************************************************************

                                CRUISE             DELAY              STOPS             TOTALS
                             LITRES PER HOUR   LITRES PER HOUR   LITRES PER HOUR   LITRES PER HOUR

 CONSUMPTION PREDICTIONS         113.0       +     111.4      +      117.9       =      342.3


   ENTRIES TO SUBPT  =     9
 F LINKS RECALCULATED=   107

  TRANSYT FINISHED
   =================================== end of file==================================================


 d at 14:53:02 on 10/03/2003]
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                                        T R A N S Y T
                                        -------------
                                   TRAffic Network StudY Tool


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  ntation for IBM-PC or compatible, running under Microsoft Windows 95

am TRANSYT 11, Analysis Program Version 1.1

  h file:- "2006 PM DO SOMETHING4.DAT"   at 14:53   on 10/03/03

n 2 PM - Output 4


  TERS CONTROLLING DIMENSIONS OF PROBLEM :
  ----------------------------------------

ER OF NODES                    =    3
 . OF LINKS                    =   17
 : OF OPTIMISED NODES          =    3
  M NUMBER OF GRAPHIC PLOTS    =    0
ER OF STEPS IN CYCLE           =   60
MUM NUMBER OF SHARED STOPLINES =    0
  M NUMBER OF TIMING POINTS    =    3
  M LINKS AT ANY NODE          =    7


 REQUESTED =    5322 WORDS
 AVAILABLE =   72000 WORDS
```

```
  DATA INPUT :-
  ---- -----

:ARD
'YPE
'ITLE:- Option 2 PM - Output 4

CARD   CYCLE  NO. OF   TIME EFFECTIVE-GREEN  EQUISAT 0=UNEQUAL FLOW   CRUISE-SPEEDS   OPTIMISE EXTRA  HILL-   DELAY   STOP
TYPE   TIME   STEPS  PERIOD DISPLACEMENTS   SETTINGS  CYCLE  SCALE   SCALE  CARD32   0=NONE  COPIES  CLIMB   VALUE   VALUE
               PER   1-1200  START    END     0=NO  1=EQUAL 10-200  50-200 0=TIMES  1=O/SET  FINAL  OUTPUT  P PER   P PER
       (SEC)  CYCLE   MINS.  (SEC)   (SEC)    1=YES  CYCLE    %       %   1=SPEEDS 2=FULL  OUTPUT 1=FULL  PCU-H    100
 1      120    60      60      2       3        1       0      90       0      1        2       1      0     1100    200

CARD                                          LIST  OF  NODES  TO  BE  OPTIMISED
TYPE
 2       1      2      3      0      0      0      0      0      0      0      0      0      0      0      0

                             NODE  CARDS:  STAGE  CHANGE  TIMES  AND  MINIMUM  STAGE  TIMES
CARD    NODE         STAGE 1          STAGE 2          STAGE 3          STAGE 4          STAGE 5          STAGE 6          STAGE 7
TYPE    NO.     CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN    CHANGE    MIN
13       1        0       12       18      12       69      12        0       0        0       0        0       0        0       0
12       2        0       12       78      12        0       0        0       0        0       0        0       0        0       0
13       3        0       12       68      12       80      12        0       0        0       0        0       0        0       0

                                           PERFORMANCE INDEX OPTIONS

:ARD  IGNORE  IGNORE   1=OLD
TYPE STOP WT. DEL WT. STOP WT.
29      0       0       1       0      0      0      0      0      0      0      0      0      0      0      0

                                             LINK  CARDS:  FIXED  DATA
                                  FIRST   GREEN                   SECOND  GREEN
:ARD    LINK     EXIT       START             END           START             END        LINK    STOP     SAT    DELAY   DISPSN
TYPE    NO.      NODE    STAGE    LAG    STAGE    LAG    STAGE    LAG    STAGE    LAG   LENGTH  WT.X100  FLOW   WT.X100   X100
31      11        1        2       5       1       0       0       0       0       0     200      0     1980      0        0
31      12        1        2       5       1       0       0       0       0       0     200      0     2120      0        0
31      13        1        3       5       1       0       0       0       0       0     200      0     1980      0        0
31      14        1        1       5       2       0       3       5       1       0     200      0     1722      0        0
31      15        1        1       5       2       0       0       0       0       0     200      0     1843      0        0
31      17        1        2       5       3       0       0       0       0       0     140      0     1722      0        0
31      18        1        2       5       3       0       0       0       0       0     140      0     2120      0        0
31      22        2        1       5       2       0       0       0       0       0     140      0     1928      0        0
31      23        2        1       5       2       0       0       0       0       0     140      0     2120      0        0
31      25        2        2       5       1       0       0       0       0       0     190      0     1843      0        0
31      26        2        2       5       1       0       0       0       0       0     200      0     1722      0        0
31      31        3        1       0       3       0       3       0       1       0     190      0     1980      0        0
31      32        3        1       0       3       0       3       0       1       0     190      0     2120      0        0
31      33        3        2       5       3       0       0       0       0       0     190      0     1843      0        0
31      34        3        3       5       1       0       0       0       0       0     200      0     2000      0        0
31      37        3        1       5       2       0       0       0       0       0     200      0     1978      0        0
31      38        3        1       5       2       0       0       0       0       0     200      0     2120      0        0

                                             LINK CARDS:   FLOW DATA
                                ENTRY 1 ............   ENTRY 2 ............   ENTRY 3 ............   ENTRY 4 ............
:ARD    LINK   TOTAL  UNIFORM   LINK            CRUISE   LINK           CRUISE   LINK           CRUISE   LINK           CRUISE
TYPE    NO.    FLOW    FLOW     NO.     FLOW    SPEED    NO.    FLOW    SPEED    NO.    FLOW    SPEED    NO.    FLOW    SPEED
32      11      618     0        0        0       48      0       0       0       0       0       0       0       0       0
32      12      618     0        0        0       48      0       0       0       0       0       0       0       0       0
32      13      904     0        0        0       48      0       0       0       0       0       0       0       0       0
32      14      689     0        0        0       48      0       0       0       0       0       0       0       0       0
32      15      241     0        0        0       48      0       0       0       0       0       0       0       0       0
32      17      400     0       34       89       48     37     155      48      38     155      48       0       0       0
32      18     1886     0       34      415       48     37     735      48      38     736      48       0       0       0
32      22      493     0       11      368       48     15     125      48       0       0       0       0       0       0
32      23      984     0       11      250       48     12     613      48      15     116      48       0       0       0
32      25       10     0       34       10       48     38      10      48       0       0       0       0       0       0
32      26      343     0        0        0       48      0       0       0       0       0       0       0       0       0
32      31      860     0       22      230       48     23     467      48      26     163      48       0       0       0
32      32      860     0       22      229       48     23     468      48      26     163      48       0       0       0
32      33       90     0       22       24       48     23      49      48      26      17      48       0       0       0
32      34      513     0        0        0       48      0       0       0       0       0       0       0       0       0
32      37      886     0        0        0       48      0       0       0       0       0       0       0       0       0
32      38      887     0        0        0       48      0       0       0       0       0       0       0       0       0

                 LINK CARDS : FLARE SATURATION FLOW DATA
                ..LANE  1..      ..LANE  2..      ..LANE  3..
CARD    LINK   SAT.      CAPAC  SAT.      CAPAC  SAT.      CAPAC
TYPE    NO.    FLOW       VEH.  FLOW       VEH.  FLOW       VEH.
33      18     2120       13    2120       13      0         0
33      23     2120        9      0         0      0         0
33      38     2120        3      0         0      0         0

                                       LINK DATA:  QUEUE CONSTRAINTS
CARD    LINK    LIMIT   QUEUE   LINK    LIMIT   QUEUE   LINK    LIMIT   QUEUE   LINK    LIMIT   QUEUE   LINK    LIMIT   QUEUE
TYPE    NO.     QUEUE   WEIGHT  NO.     QUEUE   WEIGHT  NO.     QUEUE   WEIGHT  NO.     QUEUE   WEIGHT  NO.     QUEUE   WEIGHT
38      13       113    9990    17       12     9990    18       12     9990    22       12     9990    23       12     9000
38      25        20    9990    31       20     9990    32       20     9990    33       20     9990     0        0        0

END OF SUBROUTINE TINPUT*****
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        TRL VIEWER    2.0 AA H:\My Documents\Projects\D2599-10 New East Wall Road\TRANSYT\2006 PM Do Something4.PRT - Page 3
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   SECOND CYCLE  60 STEPS

\L SETTINGS
--ONDS)

    NUMBER    STAGE     STAGE    STAGE    STAGE    STAGE   STAGE    STAGE
 ,  OF STAGES   1         2        3        4        5       6        7

         3      0        18       69
         2      0        78
         3      0        68       80

:     FLOW     SAT   DEGREE  MEAN TIMES  --------DELAY--------    ----STOPS----    ----QUEUE----   PERFORMANCE   EXIT   GREEN TIMES
R     INTO     FLOW    OF     PER PCU    UNIFORM RANDOM+ COST     MEAN     COST     MEAN              INDEX.       NODE   START   START
      LINK            SAT    CRUISE              OVERSAT  OF.     STOPS     OF      MAX.  AVERAGE   WEIGHTED SUM              END       END
                                   DELAY (U+R+O=MEAN Q) DELAY     /PCU     STOPS           EXCESS   OF ( ) VALUES           1ST      2ND
    (PCU/H)  (PCU/H)   (%)   (SEC)  (SEC)   (PCU-H/H)    ($/H)     (%)     ($/H)    (PCU)  (PCU)      ($/H)                (SECONDS)

       556   1980      34     15      4    0.4 +  0.3  (  7.6)     23   (  3.1)      5                    7.6       1     23   0
       556   2120      32     15      4    0.4 +  0.2  (  7.2)     22   (  3.1)      5                    7.2       1     23   0
       814   1980     105     15    162    9.8 + 26.8  (402.6)    172   ( 34.7)     55   ( 0.0)*        402.6       1     74   0
       620   1722      71     15     27    3.4 +  1.2  ( 50.8)     81   ( 12.4)     16                   50.8       1      5  18    74     0
 .     217   1843     101     15    185    3.3 +  7.9  (122.4)    181   (  9.7)     15                  122.4       1      5  18
 .     361   1722      54     10     22    1.7 +  0.6  ( 24.8)     72   (  6.4)      9   ( 0.0)*         24.8       1     23  69
      1698   4111f    105     10    134   11.1 + 52.0  (693.9)    165   ( 69.1)    110   (26.5)*       3341.5       1     23  69
       443   1928      37     10     10    1.0 +  0.3  ( 14.0)     33   (  3.6)      5   ( 0.0)*         14.0       2      5  78
       886   2557f     56     10     12    2.3 +  0.6  ( 32.9)     41   (  8.9)     12   ( 0.0)*         32.9       2      5  78
 .       9   1843       2     14     36    0.1 +  0.0  (  1.0)     68   (  0.2)      0   ( 0.0)*          1.0       2     83   0
 ,     309   1722      57     15     42    2.9 +  0.7  ( 39.4)     86   (  6.6)      9                   39.4       2     83   0
       774   1980      39     14      2    0.0 +  0.3  (  3.8)      5   (  0.9)      5   ( 0.0)*          3.8       3      0  80    80     0
       774   2120      37     14      1    0.0 +  0.3  (  3.3)      3   (  0.6)      3   ( 0.0)*          3.3       3      0  80    80     0
        81   1843      66     14     90    1.1 +  0.9  ( 22.3)    129   (  2.6)      4   ( 0.0)*         22.3       3     73  80
       462   2000      77     15     51    4.9 +  1.6  ( 71.9)     98   ( 11.1)     16                   71.9       3     85   0
 |     797   1978      76     15     29    4.8 +  1.5  ( 70.1)     79   ( 15.6)     22                   70.1       3      5  68
 .     798   2288f     65     15     22    4.0 +  0.9  ( 53.9)     67   ( 13.2)     19                   53.9       3      5  68
           *** f - average saturation flow for flared link ***

  .        TOTAL       MEAN          TOTAL    TOTAL     TOTAL        TOTAL          PENALTY        TOTAL
'ANCE       TIME      JOURNEY       UNIFORM  RANDOM+    COST         COST             FOR       PERFORMANCE
:LLED      SPENT       SPEED         DELAY   OVERSAT     OF           OF            EXCESS        INDEX
                                              DELAY    DELAY        STOPS           QUEUES
 !/H)    (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)           ($/H)          ($/H)

 _.2       185.2        9.8          51.2     96.3     (1622.0) + (    0.0)  +   (2647.6)    =     4269.6     TOTALS
*************************************************************************************************************

                     CRUISE              DELAY               STOPS              TOTALS
                LITRES PER HOUR     LITRES PER HOUR     LITRES PER HOUR     LITRES PER HOUR

CONSUMPTION PREDICTIONS     96.6        +      169.6      +       119.5        =      385.6


   ENTRIES TO SUBPT   =     1
 .. LINKS RECALCULATED=    17


 , SECOND CYCLE  60 STEPS

MEDIATE SETTINGS - INCREMENTS SO FAR :-    18
ECONDS)

         3      0        18       69
         2      0        78
         3      0        68       80

'AL        TOTAL       MEAN          TOTAL    TOTAL     TOTAL        TOTAL          PENALTY        TOTAL
 ICE        TIME      JOURNEY       UNIFORM  RANDOM+    COST         COST             FOR       PERFORMANCE
.ED        SPENT       SPEED         DELAY   OVERSAT     OF           OF            EXCESS        INDEX
                                              DELAY    DELAY        STOPS           QUEUES
KM/H)    (PCU-H/H)    (KM/H)      (PCU-H/H) (PCU-H/H)  ($/H)        ($/H)           ($/H)          ($/H)

  2        185.2        9.8          51.2     96.3     (1622.0) + (    0.0)  +   (2647.6)    =     4269.6     TOTALS


F ENTRIES TO SUBPT   =     7
F LINKS RECALCULATED=    80
```

```
-- SECOND CYCLE   60 STEPS

EDIATE SETTINGS - INCREMENTS SO FAR :-    18  48
 ONDS)

       3        0       18       69
       2        0       78
       3        0       68       80

            TOTAL      MEAN          TOTAL     TOTAL     TOTAL          TOTAL          PENALTY        TOTAL
 CE          TIME     JOURNEY       UNIFORM   RANDOM+    COST           COST             FOR       PERFORMANCE
LLED        SPENT      SPEED         DELAY    OVERSAT     OF             OF            EXCESS        INDEX
                                               DELAY     DELAY          STOPS          QUEUES
 /H)      (PCU-H/H)   (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

  2         185.2       9.8          51.2      96.3     (1622.0) + (     0.0)   +   (2647.6)   =    4269.6       TOTALS


F ENTRIES TO SUBPT   =    7
  LINKS RECALCULATED=    80


20 SECOND CYCLE   60 STEPS

 DIATE SETTINGS - INCREMENTS SO FAR :-    18  48  -1
 ONDS)

       3        1       14       69
       2      116       77
       3        3       67       88

            TOTAL      MEAN          TOTAL     TOTAL     TOTAL          TOTAL          PENALTY        TOTAL
ANCE         TIME     JOURNEY       UNIFORM   RANDOM+    COST           COST             FOR       PERFORMANCE
LLED        SPENT      SPEED         DELAY    OVERSAT     OF             OF            EXCESS        INDEX
                                               DELAY     DELAY          STOPS          QUEUES
  /H)     (PCU-H/H)   (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

1.2         185.7       9.8          49.4      98.6     (1627.8) + (     0.0)   +   (2184.6)   =    3812.4       TOTALS


  ENTRIES TO SUBPT   =   33
  LINKS RECALCULATED=   289


  SECOND CYCLE   60 STEPS

 DIATE SETTINGS - INCREMENTS SO FAR :-    18  48  -1  18
ECONDS)

       3        1       14       69
       2       14       95
       3        3       67       88

AL          TOTAL      MEAN          TOTAL     TOTAL     TOTAL          TOTAL          PENALTY        TOTAL
 NCE         TIME     JOURNEY       UNIFORM   RANDOM+    COST           COST             FOR       PERFORMANCE
 ED         SPENT      SPEED         DELAY    OVERSAT     OF             OF            EXCESS        INDEX
                                               DELAY     DELAY          STOPS          QUEUES
 M/H)     (PCU-H/H)   (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

1.2         185.6       9.8          49.3      98.6     (1626.5) + (     0.0)   +   (2184.6)   =    3811.1       TOTALS


  ENTRIES TO SUBPT   =    7
F LINKS RECALCULATED=    83


  SECOND CYCLE   60 STEPS

MEDIATE SETTINGS - INCREMENTS SO FAR :-    18  48  -1  18  48
 CONDS)

       3        1       14       69
       2       14       95
       3        3       67       88

            TOTAL      MEAN          TOTAL     TOTAL     TOTAL          TOTAL          PENALTY        TOTAL
 ICE         TIME     JOURNEY       UNIFORM   RANDOM+    COST           COST             FOR       PERFORMANCE
 ED         SPENT      SPEED         DELAY    OVERSAT     OF             OF            EXCESS        INDEX
                                               DELAY     DELAY          STOPS          QUEUES
KM/H)     (PCU-H/H)   (KM/H)      (PCU-H/H) (PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

  2         185.6       9.8          49.3      98.6     (1626.5) + (     0.0)   +   (2184.6)   =    3811.1       TOTALS


F ENTRIES TO SUBPT   =    7
  LINKS RECALCULATED=    83
```

```
  ) SECOND CYCLE   60 STEPS

 IEDIATE SETTINGS - INCREMENTS SO FAR :-   18  48  -1  18  48   1
 ONDS)

        3        1        14        69
!       2       12        93
!       3        3        67        88

 ,           TOTAL        MEAN            TOTAL    TOTAL     TOTAL          TOTAL          PENALTY       TOTAL
 ICE          TIME       JOURNEY         UNIFORM  RANDOM+     COST           COST            FOR      PERFORMANCE
 LLED        SPENT        SPEED           DELAY   OVERSAT      OF             OF           EXCESS        INDEX
                                                   DELAY     DELAY          STOPS          QUEUES
 KM/H)     (PCU-H/H)     (KM/H)        (PCU-H/H)(PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

  .2         185.6         9.8            49.3     98.6     (1626.4) + (     0.0)  +  (2184.6)   =    3811.0      TOTALS


)F ENTRIES TO SUBPT  =    9
  LINKS RECALCULATED=   97


.20 SECOND CYCLE   60 STEPS

 EDIATE SETTINGS - INCREMENTS SO FAR :-   18  48  -1  18  48   1  -1
 ONDS)

.       3      119        12        69
!       2       10        92
        3        2        66        87

             TOTAL        MEAN            TOTAL    TOTAL     TOTAL          TOTAL          PENALTY       TOTAL
 NCE          TIME       JOURNEY         UNIFORM  RANDOM+     COST           COST            FOR      PERFORMANCE
 LLED        SPENT        SPEED           DELAY   OVERSAT      OF             OF           EXCESS        INDEX
                                                   DELAY     DELAY          STOPS          QUEUES
  /H)      (PCU-H/H)     (KM/H)        (PCU-H/H)(PCU-H/H)   ($/H)          ($/H)          ($/H)         ($/H)

.1.2         190.7         9.5            50.2    102.8     (1683.0) + (     0.0)  +  (1084.9)   =    2767.8      TOTALS

  ENTRIES TO SUBPT  =    19
  LINKS RECALCULATED=   190
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u SECOND CYCLE  60 STEPS

=ETTINGS OBTAINED WITH INCREMENTS :-   18  48  -1  18  48   1  -1   1
 )NDS)

 NUMBER    STAGE    STAGE    STAGE    STAGE    STAGE   STAGE    STAGE
OF STAGES    1        2        3        4        5       6        7

    3        0       13       70
    2       10       92
    3        2       66       87

 FLOW    SAT   DEGREE  MEAN TIMES  -------DELAY--------  ----STOPS----   ----QUEUE----  PERFORMANCE   EXIT   GREEN TIMES
 INTO    FLOW    OF     PER PCU   UNIFORM RANDOM+ COST   MEAN    COST    MEAN             INDEX.       NODE   START  START
 LINK           SAT    CRUISE             OVERSAT  OF .  STOPS    OF     MAX.  AVERAGE   WEIGHTED SUM            END      END
                              DELAY (U+R+O=MEAN Q) DELAY  /PCU   STOPS          EXCESS   OF ( ) VALUES          1ST      2ND
(PCU/H) (PCU/H)  (%)   (SEC) (SEC)    (PCU-H/H)    ($/H)  (%)    ($/H)   (PCU)  (PCU)      ($/H)               (SECONDS)

   556   1980    33     15     3    0.3 +  0.2  (  5.5)   17  (  2.4)     4                  5.5        1    18   0
   556   2120    31     15     3    0.3 +  0.2  (  5.2)   16  (  2.2)     3                  5.2        1    18   0
   814   1980   107     15   195   10.5 + 33.6  (484.9)  185  ( 37.2)    62  ( 0.0)*       484.9        1    75   0
   620   1722    79     15    35    4.2 +  1.8  ( 65.8)   94  ( 14.4)    18                 65.8        1     5  13   75    0
   217   1843   157     15   771    5.7 + 40.7  (511.1)  252  ( 13.5)    50     +          511.1        1     5  13

   361   1722    47     10    14    1.0 +  0.5  ( 15.6)   49  (  4.3)     7  ( 0.0)*        15.6        1    18  70
  1698   3886f   99     10    47    5.5 + 16.5  (242.5)   99  ( 41.5)    53  (10.8)*      1324.1        1    18  70
   403<  1926    32     10    10    0.8 +  0.2  ( 11.9)   35  (  3.9)     6  ( 0.0)*        11.9        2    15  92
   849<  2535f   52     10    10    1.9 +  0.5  ( 26.6)   34  (  7.4)    11  ( 0.0)*        26.6        2    15  92
     9   1843     2     14    40    0.1 +  0.0  (  1.1)   65  (  0.1)     0  ( 0.0)*         1.1        2    97  10
   309   1722    63     15    48    3.2 +  0.9  ( 44.9)   92  (  7.0)    10                 44.9        2    97  10
   737<  1980    38     14     2    0.0 +  0.3  (  3.5)    4  (  0.8)     4  ( 0.0)*         3.5        3     2  87   87    2
   738<  2120    35     14     1    0.0 +  0.3  (  3.1)    3  (  0.6)     2  ( 0.0)*         3.1        3     2  87   87    2
    77   1843    30     14    52    0.9 +  0.2  ( 12.3)   94  (  1.9)     3  ( 0.0)*        12.3        3    71  87
   462   2000    89     15    72    5.5 +  3.7  (101.5)  116  ( 13.2)    18                101.5        3    92   2
   797   1978    81     15    34    5.6 +  2.0  ( 83.5)   87  ( 17.0)    24                 83.5        3     7  66
   798   2300f   69     15    26    4.6 +  1.1  ( 62.9)   73  ( 14.4)    20                 62.9        3     7  66
          *** f - average saturation flow for flared link ***

AL           TOTAL      MEAN         TOTAL     TOTAL     TOTAL       TOTAL       PENALTY      TOTAL
ANCE         TIME     JOURNEY       UNIFORM   RANDOM+    COST        COST          FOR     PERFORMANCE
 ED          SPENT     SPEED         DELAY    OVERSAT     OF          OF         EXCESS       INDEX
                                               DELAY     DELAY       STOPS        QUEUES
 /H)       (PCU-H/H)   (KM/H)     (PCU-H/H) (PCU-H/H)    ($/H)       ($/H)        ($/H)        ($/H)

1.2          190.6      9.5          50.1      102.8    (1681.9)  +  (   0.0)  +  (1081.7)   =   2763.6       TOTALS
*******************************************************************************************************************

                         CRUISE              DELAY               STOPS            TOTALS
                     LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR    LITRES PER HOUR

NSUMPTION PREDICTIONS       96.6      +      175.8      +       107.7       =      380.1


F ENTRIES TO SUBPT   =     7
F LINKS RECALCULATED=     83

 TRANSYT FINISHED
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d at 14:53:28 on 10/03/2003]
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