MULTI-MODAL STUDY

A453 NOTTINGHAM TO M1 JUNCTION 24

TRAVEL SURVEY REPORT

ADOPTED REPORT

July 2001

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SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Purpose of Report

1.1.1 This report has been prepared to outline the transport surveys undertaken to provide a databank for the development of a multi-mode transportation model for the A453 corridor Multi-Modal Study (A453 MMS). The surveys were undertaken in order to obtain information on existing quantum and patterns of movement within the corridor and hence to provide a basis for the development and evaluation of transport strategies for the corridor.

1.1.2 The A453 MMS is one of several transportation studies currently in progress within this area of the East Midlands. Liaison has been established with the bodies responsible for these studies in order to develop an integrated package of surveys to meet the communal data requirement, minimise duplication and ensure consistency in data collection; in particular the M1 Multi-Modal Study undertaken by WS Atkins and the Nottingham City Council Study to develop a transport model for Nottingham city centre. Subsequently, agreement was reached on which Study Team should take responsibility for each package of survey work and data exchange arrangements put in place.

1.2 Schedule of Surveys

1.2.1 This report provides a detailed description of the surveys undertaken by the Pell Frischmann Joint Venture (PFJV) for the A453 MMS and an outline of surveys undertaken by other bodies but made available for the study under the data exchange arrangement. The report does not cover data previously collected by other parties but kindly made available for the A453 MMS. The broad allocation of survey responsibility is summarised below:

Household Interview Surveys	
Household and Revealed Preference	Pell Frischmann JV
Stated Preference	Pell Frischmann JV
Traffic Surveys	
Roadside Interviews and Traffic Counts	
A453 Corridor Screenlines	Pell Frischmann JV
M1 Corridor Screenlines	WS Atkins
Nottingham Central Area Cordon	Nottingham City Council
M1 Through Traffic Surveys	WS Atkins
Journey Time Surveys	
A453 Corridor	Pell Frischmann JV
M1 Corridor	WS Atkins
Public Transport Surveys	
Bus Passenger Interviews and Counts	
A453 Corridor Screenlines	Pell Frischmann JV
M1 Corridor	WS Atkins
Coach Passenger Interviews and Counts	
All	WS Atkins
Rail Passenger Interviews and Counts	
All	WS Atkins

Bus Journey Time Surveys	
Nottingham Routes	Nottingham City Council
Pedestrian and Cycle Surveys	
Pedestrian Interviews and Counts	
A453 Corridor	Pell Frischmann JV
Cycle Interviews and Counts	
A453 Corridor	Pell Frischmann JV

1.2.2 More detail on the subdivision of work is given in ongoing sections of this report where appropriate.

1.3 Format of Report

1.3.1 The remainder of this Introduction provides a summary of A453 MMS and network characteristics together with some brief information on zoning and sector systems for data analysis. A further six sections outline the methodology and main results from each survey type, with key findings summarised in Section 8.

1.4 Overview of Study Area

1.4.1 The Study Area for the A453 MMS is shown in Figure 1.1. The area extends from central Nottingham in the east towards central Derby in the west, and includes the A52 in the north and J23A to the south. East Midlands Airport and several large settlements fall within the Study Area including Kegworth, Castle Donington, Alvaston, Spondon, Long Eaton, Beeston, Borrowash and Clifton. The Study Area therefore covers a number of different local authority areas including Nottingham City, Broxtowe and Rushcliffe Districts in Nottinghamshire, Northwest Leicestershire District in Leicestershire, South Derbyshire and Erewash Districts and Derby City in Derbyshire.

1.5 Road Networks

1.5.1 The A453 is the main link from Junction 24 of the M1 to Nottingham. At the north eastern end it links into the A52 Nottingham Ring Road and crosses the River Trent using Clifton Bridge.

1.5.2 The River Trent is a significant barrier to North-South movement within the Study Area. There are five bridges across the River Trent in the Study Area, but not all have strategic importance. Within Nottingham there are two bridges between Nottingham and West Bridgford (Trent Bridge and Lady Bay Bridge) and to the west of the city centre the only crossing is provided by the Ring Road (A52) at Clifton Bridge. In the centre of the Study Area strategic crossings are provided by the M1 and also the A50(T). Lesser crossings in this area include the B6540 (Castle Donington to Long Eaton) and the former A6 (Cavendish Bridge to Shardlow). There are two bridges across the River Derwent in the Study Area, the B5010 near Borrowash and the A5111 link from the A6 to the A52. A new bridge gives access from the A52 to the Pride Park development area, just west of the Study Area.

1.5.3 The principal trunk roads in the Study Area in addition to the A453 are as follows:

- A52 which is the principal route between Derby and Nottingham

- A6 which runs from the south east of the Study Area to the north west meeting the M1 at J24
- A50 Derby Southern bypass which links the M1 with the A38 and to Stoke beyond, it also provides a bypass of Shardlow on the old A6 between the M1 and Alvaston, also meeting M1 at J24
- A42 which runs from the south west of the Study Area to the M1 at J23A/J24, providing a link from the M42 and Birmingham into the Study Area

Junction 24 has become the key junction between strategic routes in this sub-region of the East Midlands.

1.5.4 There is one other significant "A" road in the Study Area. This is the A6005 which provides an alternative route from Nottingham to Derby through Beeston, Long Eaton and Borrowash.

1.5.5 Although not in the Study Area, the B679 provides an alternative route from the A453 into central Nottingham via Trent Bridge rather than Clifton Bridge. The A46/A606 meanwhile provides an alternative strategic route from Leicester to Nottingham and the A60 a direct route from Loughborough to Nottingham.

1.6 Rail

1.6.1 There are a number of railway lines within the Study Area. The main line from London splits at Trent Junction where the line crosses the River Trent. The majority of London to Sheffield services run via Derby, with the other line leading off into Nottingham. In addition there is a direct line from south to north from Trent Junction through Toton Yard which is mainly used by freight trains. There is a further freight only line from just north of Trent Junction which provides a link across to Willington power station on the Derby to Birmingham line.

1.6.2 With regard to the passenger train services provided on these lines, the following list gives a summary of the main weekday service frequencies, listed by section of line and operator.

- Midland Mainline (MML) Inter City services from London to Nottingham

  Hourly fast service from 05:32 to 19:32 (15 trains) to London
  Hourly stopping service from 05:54 to 21:32 (17 trains) to London
  Hourly fast service from 07:55 to 22:00 (16 trains) from London
  Hourly stopping service from 06:35 to (17 trains) from London

- MML Inter City services London to Sheffield via Derby

  Hourly fast service from Sheffield to London
  Hourly stopping service to London from Derby

- Central Trains (CTL) regional services Nottingham – Derby (Birmingham/Cardiff/Stoke)

  43 trains from Nottingham to Derby
  (Limited number of trains stop all stations, most stop at Long Eaton)
  47 trains Derby to Nottingham

N.B. Attenborough, Beeston and Spondon stations in the Study Area not served by all trains

- CTL Lincoln – Nottingham – Birmingham/Coventry (via Leicester)
  Hourly service to/from Coventry (12 return journeys per weekday)
  Limited service to Birmingham via Leicester
  All these services call at Beeston

- CTL (Norwich) – Nottingham – Sheffield – (Manchester/Liverpool)

  Hourly service each way 06:36 to 21:42 northbound 06:40 to 23:39 southbound,
  Supplemented by a limited number of early morning/late evening MML
  London – Sheffield services
  Combined service 18 trains northbound, 20 southbound per weekday
  Most services stop at all stations; some do not stop at Langley Mill situated just outside the Study Area.

1.7 Buses and Coaches

1.7.1 Bus services are provided by a number of operators in the Study Area. In the Greater Nottingham area the main bus operators are Nottingham City Transport (NCT)/Pathfinder, South Notts. and Barton Buses. There are a number of smaller operators who operate across the area. Trent Buses operate services towards Derby and Arriva operate services towards Leicester.

1.7.2 As might be expected the urban area of Greater Nottingham has the most comprehensive network of services in the Study Area. The more rural areas have a less frequent level of service, most with only limited evening services. City of Nottingham Council and Nottinghamshire County Council produce a comprehensive Travel Planner leaflet for the City and County areas which gives details of routes, operators and approximate service frequencies.

1.7.3 The Clifton area is well served during the day with most parts of the estate provided with a 7-8 minute frequency to the city centre via Clifton Bridge and the Meadows area as well as a combined frequency of about 10 minutes for services via West Bridgford. Nottingham Trent University has a campus in Clifton which is served by a number of routes from the city centre as well as a dedicated limited stop hourly daytime service running from the City Centre campus to the Clifton campus. Clifton is also linked to the Lenton Lane industrial area, the Queens Medical Centre and Arnold via the Ring Road with a direct bus service (route 53/54). A direct service also operates from Clifton to Beeston; however, this runs via the city centre. This service runs every 15 minutes at peak hours and 30 minutes off peak. A 15-minute service operates during the day on a service that links Nottingham, Clifton and Loughborough, with a 6-minute peak hour frequency as far south as Gotham. An hourly service links Nottingham, Clifton and East Midlands Airport. The Clifton area is also served by the Nightrider late night bus network, with four services between midnight and 3 a.m.

1.7.4 The wider Study Area is served by a comprehensive network of services. Derby and Nottingham are linked by a combination of local services with intermediate destinations such as Long Eaton, Stapleford, Sandiacre and Borrowash. Most of these services have a 15-minute service frequency during the day. Limited stop express services operate more infrequently (at least hourly) with journey times that

are more competitive with the private car. There are a number of local services that link Derby, Nottingham and intermediate destinations with East Midlands Airport as well as express limited stop services.

1.7.5 National Express Coaches operate a number of express coach services from Nottingham through the Study Area, including eight daily services to London. Regular services also link Nottingham with Birmingham, Leicester, and Sheffield. Flightlink provide direct services to Luton, Heathrow and Gatwick Airports eight times daily each way.

1.8 Transportation Analysis

1.8.1 A zoning system has been developed for the transport model, which has been based on the Local Authority Ward and District Boundaries. This ensures compatibility with the larger more strategic system developed by WS Atkins for the M1 North South Multi-modal Study and sources of planning data. Zones in Nottingham City Centre go below ward level to aggregations of individual Enumeration Districts where more detail is required. Certain large generators of trips (such as Ratcliffe-on-Soar Power Station and East Midlands Airport) have been included as zones in their own right. Origin-destination information gathered from the surveys outlined in this report has been allocated to this zoning system. The local zoning system is illustrated in Figure 1.2.

1.8.2 A system of sectors comprising groups of zones has been defined to facilitate presentation of survey findings. This is illustrated in Figure 1.3.

Figure 1.1: Study Area Boundary

Figure 1.2: Local Zone System

Figure 1.3: Local Sector System

SECTION 2

HOUSEHOLD INTERVIEW AND REVEALED PREFERENCE SURVEY

2 HOUSEHOLD INTERVIEW AND REVEALED PREFERENCE SURVEY

2.1 Introduction

2.1.1 The Household Interview Survey (HIS) was required to provide a database for the development of transportation models describing trips by residents of the Modelled Area. This included calibration of the demand, distribution and mode choice models. The interview sample was drawn from the electoral register, which was the most appropriate source from which to obtain addresses. The "firsting" technique, which is a quasi-random process, was adopted to select the sample of 3,000 households in the Greater Nottingham area.

2.1.2 A double sample was drawn from the south western sector of Nottingham to ensure that the models correctly reflected travel behaviour of residents of the main corridor of interest.

2.1.3 The survey response comprised a total of 782 households and 1703 persons. The survey method was based upon postal techniques supported by follow up procedures. An average household contained 2.2 persons and a total of 4812 trips were recorded. Expansion to reflect the total population was a complex process, involving comparison of survey demographic information with the year 2000 planning databank from DTLR (HETA), known as NTEM.

2.2 Survey Method

2.2.1 There are three main different data collection techniques available to carry out household interview surveys. These are as follows:

- Household self-completion surveys
- Household personal interview surveys
- Telephone surveys

2.2.2 These survey methods vary in complexity, in the types of information that can feasibly be collected, the types of bias that can occur and the level of interaction between the survey team and the respondents in the survey. The choice of the Study Team was the first method, "household self-completion survey", because it is a widely used survey technique in transportation research and was felt to be the most appropriate for this study.

2.2.3 The method of "firstings" was used to derive the main sample of 3,000 households. 2,000 households were sampled from across the Greater Nottingham area, with the remainder derived by further sampling from a smaller area of greater relevance to the A453 study. Figure 2.1 shows the standard and enhanced sample areas, a schedule of Ward names covered by the survey may be found in Table 2.1. Although it was important to obtain the information from the whole of Greater Nottingham, for the purposes of the A453 corridor study it was necessary to try to learn more about peoples' travel behaviour in that specific region. For this reason a greater number of questionnaires were sent to this area.

2.2.4 A reserve sample of 300 further households was selected from the south western sector.

2.2.5 After the main sample of 3,000 households had been selected, the identified member of each household was approached with a letter outlining the purpose of the study and inviting them to take part in the home travel survey. Those who did not wish to participate were asked to respond via a telephone freephone to decline and these households were omitted from the next stages.

2.2.6 The original 3,000 addresses were divided by electoral ward between nine survey effective days, which were the weekdays between Monday 10th July and Thursday 20th July 2000. Approximately nine wards were allocated to each survey day and these were distributed as evenly as possible across the Study Area. The reserve sample was given effective day nine.

2.2.7 The survey pack was sent to those who had not registered on the hotline as unwilling to participate approximately one week before the effective day. The packs consisted of a cover letter, instructions for completing the questionnaires, survey forms and a prepaid return envelope. The questionnaires themselves consisted of a "household" form, a "person" form and several "trip" forms. These forms sought the following information.

- "Household" Form: General information concerning the number of persons in the house, number of cars, bicycles and other modes of transport available. The form also asked for approximate annual car mileage and distance to the nearest bus stop and train stations and also the local food shop.

- "Person" Form: Information specific to each person within the household such as age, sex, economic activity, car availability and parking facilities.

- "Trip" Form: Trip diaries for each person in the house. The trip diary was for the specific day that had been allocated to the household.

Copies of the three survey forms may be found in Appendix 2.1.

2.2.8 In order to increase the rate of return, telephone contact was made with all sampled households where a number could be obtained from the telephone directory. However, only 31% of household numbers could be obtained in this way, the remainder were either ex-directory or not listed.

2.2.9 Between four and seven days after their effective day each household, which had not yet responded, was sent a follow-up letter requesting again that people complete the questionnaires. Households which had misplaced their forms could telephone the hotline to request a new set, or alternatively the questionnaires could be completed over the telephone with the help of one of Pell Frischmann's trained survey staff.

2.2.10 In order to further increase the rate of return, publicity notices were put up in the windows and on notice boards of the local shops. These posters emphasised the importance of the study, the fact that participants could win £250 in the prize draw and reiterated the importance of the information for the planning of future transportation facilities for Greater Nottingham.

Table 2.1: Wards Included in the Sample Frame

Ward Name	Ward Name	Ward Name
	46 Hucknall East	92 Stapleford West
1 Abbey	47 Hucknall North	93 Strelley
2 Ash Lea	48 Hucknall West	94 Strelley and Trowell
3 Aspley	49 Killisick	95 Thoroton
4 Attenborough	50 Kimberley	96 Tollerton
5 Awsworth and Cossall	51 Kingswell	97 Toton
6 Basford	52 Lady Bay	98 Trent
7 Beechdale	53 Lambley	99 Wilford
8 Beeston Central	54 Lamcote	100 Wiverton
9 Beeston North-East	55 Leake	101 Wolds
10 Beeston North-West	56 Lenton	102 Wollaton
11 Beeston Rylands	57 Leys	103 Woodborough
12 Bestwood Park	58 Lutterell	104 Woodthorpe
13 Bestwood Park	59 Malkin	105 Derby Road East
14 Bilborough	60 Manor	106 Derby Road West
15 Bingham	61 Manvers	107 Long Eaton Central
16 Bishop	62 Mapperley	108 Nottingham Road
17 Bonington	63 Mapperley Plains	109 Sawley
18 Bramcote	64 Melton	110 Wilsthorpe
19 Bridge	65 Musters	111 Sandiacre North
20 Brinsley	66 Netherfield	112 Sandiacre South
21 Bulwell East	67 Nevile	
22 Bulwell West	68 Newstead	
23 Burton Joyce and Stoke Bardolph	69 North Keyworth	
24 Byron	70 Nuthall	
25 Calverton	71 Oak	
26 Carlton	72 Oxclose	
27 Carlton Hill	73 Packham	
28 Cavendish	74 Park	
29 Chilwell East	75 Phoenix	
30 Chilwell West	76 Porchester	
31 Clifton East	77 Portland	
32 Clifton West	78 Priory	
33 Conway	79 Radford	
34 Cranmer	80 Rancliffe	
35 Dayncourt	81 Ravenshead	
36 Eastwood East	82 Robin Hood	
37 Eastwood North	83 Sherwood	
38 Eastwood South	84 Soar Valley	
39 Edwalton	85 South Keyworth	
40 Forest	86 St. Anne's	
41 Gedling	87 St. James	
42 Gotham	88 St. Mary's	
43 Greasley	89 Stanford	
44 Greenwood	90 Stapleford East	
45 Hucknall Central	91 Stapleford North	

2.3 Survey Response

2.3.1 The rate of return of completed questionnaires was initially slow, however this accelerated to around 60 per day during the second week. The rate of return then reduced slowly with the majority of the 789 completed packs having been received four weeks after the start of the survey period.

2.3.2 Telephone contact revealed occasional confusion over how to fill the forms in; some people did not seem to understand the completion instructions. It was clear that the letters and guidance notes were sometimes not read properly. Some individuals seemed to have difficulty comprehending basic issues, such as how many days' trips needed recording, although this seemed quite clear to the survey designers.

2.3.3 Many of the people who called the hotline or who were contacted through interview were not initially interested in participating until it was explained that the information would be used to help plan for future transport requirements in Nottingham. People were, naturally, more prepared to be helpful when they were aware of the potential benefits. Unfortunately the public can feel inundated with junk mail, often asking questions for commercial gain, which makes it difficult to persuade them to assist in a survey of this type.

2.3.4 A success rate of approximately 70% was achieved by telephone interview, i.e. seven out of ten people contacted in this manner promised to complete their questionnaires. It is unfortunate that this process could not have had a greater influence on the result of the study but, as mentioned previously, the amount of contact numbers obtained was unexpectedly low.

2.3.5 As can be seen in Table 2.2, the number of completed questionnaire returns per effective day was relatively evenly distributed. There was a slightly lower rate of return for Thursday 13th, but this was compensated by the fact that a higher number were received for Thursday 20th. The traffic model is day (rather than date) sensitive which meant that this situation was acceptable.

Table 2.2: Returns per Effective Day

Effective Day (July 2000)	Number of Returns
Monday 10th	85
Tuesday 11th	78
Wednesday 12th	95
Thursday 13th	69
Friday 14th	85
Monday 17th	95
Tuesday 18th	76
Wednesday 19th	82
Thursday 20th	117

2.3.6 The distribution of number of persons within each responding household is given in Table 2.3 and showed a large proportion of single and two-person households. This is to be expected, as there are likely to be lower numbers of larger families living in any given region. This is because children tend to provide the extra people and they

are inclined to leave home around the age of 20 and only persons over the age of 4 were included in the survey. In addition, as the number of individuals in the house increases, the task of completing the necessary forms becomes more onerous. It is probably also fair to say that larger families have less time available to fill in questionnaires such as this, as each family member will have different commitments.

Table 2.3: Distribution of Household Size

Household Size	Number of Households
1	216
2	357
3	104
4	78
5	18
6	8
7	1

2.3.7 The age distribution of persons responding is shown in Table 2.4. This shows that there were a significantly higher number of returns from people aged 30+. The lower return from the under 18 age group could be explained by the fact that families with children would have less time and inclination to complete what may seem like a lengthy questionnaire. The response from the 19-30 age range could be for similar reasons – this group of people are more likely to be socially active, resulting in less available time to fill in forms. In addition, 19-30 will statistically represent a smaller section of society than the other age brackets because it is a narrower range, i.e. 11 years compared to 18 or 20.

Table 2.4: Age Distribution of Persons Responding

Age Group	Number of Persons
0 – 18	227
19 – 30	195
31 – 50	468
51 – 65	399
66+	337

2.3.8 Table 2.5 gives a breakdown of the number of completed survey forms received per electoral ward and percentage of the number of questionnaires originally dispatched to each area. These percentages are also shown graphically on the map of the Study Area in Figure 2.2.

2.3.9 There was generally a slightly lower response from inner areas of the City of Nottingham itself than rural parts of the A453 corridor. Wards such as Manvers, Aspley, Bridge, Radford and Lenton typically provided responses of between 5% and 20%. These were also the areas where the number of available telephone numbers was at its lowest. More rural wards such as Keyworth, Leake, Clifton and Gotham had typical return rates of between 20 and 40%. It was also noticeable, and to be expected that, areas which are more directly affected by the A453 generally provided the higher rates of return.

2.4 Main Findings

2.4.1 The net survey return comprised 782 households and 1,703 persons, out of which 53 were under five years old. This meant an average household size of 2.2 persons. Travel data was obtained from 1,650 persons from the age of five upwards, of whom 1,428 (86.7%) stated that they were mobile on their effective day, i.e. they made at least one trip. Information was collected for 4,812 trips. This meant an average of 2.92 trips per person and 3.37 trips per mobile person.

2.4.2 The modal split recorded by the survey is shown in Figure 2.3: Omitting "other modes" 67% of all trips were made by using motorised private transport. Public transport was used for 11% of all trips, cycle by 3% and 18% made this journey on foot. A comparison of mode shares between Greater Nottingham and the study corridor is provided in Figure 2.7. As can be seen, the proportion of people travelling by each of the different modes of transport is virtually identical in the two areas.

2.4.3 The distribution of trip purposes is shown in Figures 2.4 and 2.5. The most frequently recorded trips were to home followed by shopping/personal business trips. The distribution of trip lengths is shown in Figure 2.6. 85% of all trips terminated within 16km and 46% were less than 4.8km long.

2.4.4 The fact that a high proportion of trips are relatively short adds importance to the Government's policy to encourage more people to travel short distances by walking or cycling. PPG13 advocates that car journeys under 2km could be substituted by walking and trips under 5km substituted by cycling. Based on these targets, and with reference to Figure 2.6, up to 46.2% of trips in the Nottingham area could be walked or cycled.

2.4.5 The household survey data was used for the development of a travel demand model, covering movements by residents of Greater Nottingham. The following data was used in calibration:

- Frequencies of journey, activity, or chains (see Table 2.6)
- Distribution of travel distances by trip purposes
- Modal split model proportions

2.4.6 Other data was used for model validation:

- Comparative matrices (aggregated level, e.g. districts)
- Modal split of each behavioural group

Table 2.5: Percentage Return by Electoral Ward

Map Code	Ward	Total Dispatched	Returned Number	Percentage
1	Abbey	88	22	25
2	Ash Lea	20	5	25
3	Aspley	39	4	10
4	Attenborough	45	13	29
6	Basford	39	3	8
7	Beechdale	36	6	17
8	Beeston Central	61	14	23
9	Beeston North-East	49	7	14
10	Beeston North-West	29	8	28
11	Beeston Rylands	36	11	31
12&13	Bestwood Park	34	4	12
14	Bilborough	27	8	30
17	Bonington	19	3	16
18	Bramcote	44	11	25
19	Bridge	77	7	9
21	Bulwell East	39	9	23
22	Bulwell West	46	3	7
24	Byron	49	9	18
26	Carlton	23	4	17
27	Carlton Hill	23	7	30
28	Cavendish	13	1	8
29	Chilwell East	50	16	32
30	Chilwell West	69	12	17
31	Clifton East	130	28	22
32	Clifton West	129	47	31
33	Conway	52	16	31
39	Edwalton	51	15	29
40	Forest	37	6	16
41	Gedling	20	4	20
42	Gotham	33	11	33
44	Greenwood	40	5	13
49	Killisick	17	6	35
51	Kingswell	22	6	27
52	Lady Bay	19	7	37
54	Lamcote	9	2	22
55	Leake	48	19	40
56	Lenton	75	7	9
57	Leys	27	5	19
58	Lutterell	71	25	35
60	Manor	6	1	17
61	Manvers	42	6	14
62	Mapperley	42	11	26
63	Mapperley Plains	20	9	45
65	Musters	40	16	40
66	Netherfield	28	4	14

Table 2.5: Percentage Return by Electoral Ward (Continued)

Map Code	Ward	Total Dispatched	Returned Number	Percentage
69	North Keyworth	6	2	33
70	Nuthall	23	8	35
73	Packham	28	7	25
74	Park	82	12	15
75	Phoenix	11	1	9
76	Porchester	21	7	33
77	Portland	41	6	15
78	Priory	9	2	22
79	Radford	36	2	6
80	Rancliffe	6	2	33
82	Robin Hood	47	6	13
83	Sherwood	40	9	23
84	Soar Valley	29	10	34
85	South Keyworth	21	6	29
86	St. Ann's	35	5	14
87	St. James'	20	8	40
88	St. Mary's	24	3	13
89	Stanford	5	3	60
90	Stapleford East	48	13	27
91	Stapleford North	49	3	6
92	Stapleford West	46	8	17
93	Strelley	33	2	6
94	Strelley & Trowell	9	3	33
96	Tollerton	6	3	40
97	Toton	46	12	26
98	Trent	37	8	22
99	Wilford	154	42	27
101	Wolds	11	7	64
102	Wollaton	103	35	34
104	Woodthorpe	21	6	29
105	Derby Road East	44	7	16
106	Derby Road West	50	12	24
107	Long Eaton Central	47	14	30
108	Nottingham Road	53	11	21
109	Sawley	57	14	25
110	Wilsthorpe	54	20	37
111	Sandiacre North	37	8	22
112	Sandiacre South	33	13	39
113	Kegworth	27	6	22
Total		**3362**	**789**	**23.5**

2.4.7 The response rate of the survey was modest at 23.5% but more than adequate for study purposes. Possible bias of the database (e.g. due to self-selection) was balanced through statistical weighting of the data. This weighting was based on the real distribution of the population within the survey area contained within the NTEM planning data. The weighting factors were calculated for suitable aggregates of wards (sectors) in order to ensure a sufficient number of observations per sector. Weighting variables were:

- Number of persons per sector
- Number of cars per household
- Age and sex

2.4.8 Whilst weighting factors are commonly computed at the sector level, generation of travel demand was still undertaken at the A453 model zone levels. All operations, which are carried out to provide data for the model directly, should be representative. The highest level of disaggregation will be needed for the frequencies of activity chains. Table 2.6 below shows examples of the number of observations for each type of trip chain likely to be considered for modelling purposes.

Table 2.6: Number of Observations Per Trip Chain

Activity Chain	Frequency
HWH	416
HSH	404
HLH	359
HEH	140
HWWH	121
HWSH	68
HWLH	45
HSSH	126
HSLH	46
HLWH	43
HLSH	60
HLLH	88

H = *Home* W = *Workplace* E = *Education*
S = *Shopping* L = *Leisure*

2.4.9 As one can see the number of observations is sufficient for the trip chains shown above. Some chain types recorded low frequencies and a method is being developed to combine these so that the information can be incorporated into the model. Low frequency chain types need not be modelled explicitly as their contribution to the total mobility generated by the demand model is very small.

2.4.10 For 4,328 (90%) trips geocoding was successful and a model zone number could be allocated. Out of these 3,192 trips (66.3% of all trips) could be assigned to the street network by using the MapOCX routing software.

2.5 Conclusions

2.5.1 The survey return comprises 782 households and 1,703 persons, out of which 53 are under five years old. This means an average household size of 2.2 persons. Travel data was obtained from 1,650 persons from the age of five upwards of whom 1,430 (86.7%) stated that they were mobile on their effective day. Information was collected from 4,812 trips. This means an average of 2.92 trips per person and 3.37 trips per mobile person.

2.5.2 Analysis of the trip purpose data shows that home accounts for 39.3% of all trip destinations. Of the other trip destinations (discounting home), shopping (31.6%), workplace (24.2%) and leisure destinations (16.1%) are the most popular trip purposes.

2.5.3 Analysis of the trip length data shows that 85% of all trips terminate within a range of up to 16km. PPG 13 advocates walking and cycling as substitutes for short car trips; specifically 2km for walking and 5km for cycling. 46.3% of trips recorded in the household interview survey terminated within 5km, therefore there is significant potential for modal shift of this nature.

2.5.4 Analysis of the modal split data shows 18.1% of trips are by walking, 3.3% by bicycle, 49.5% by car as driver, 16.6% by car as passenger and 11.2% by public transport.

Figure 2.1: Main Household Interview Survey Area and Enhanced Sample Area

Figure 2.2: Household Interview Survey Ward Return Percentages

Figure 2.3: Modal Split For Residents

Figure 2.4 Trip Purpose (All Trips For Residents)

Figure 2.5: Trip Purpose For Residents (Without Home and Other Journey Purpose)

Figure 2.6 Trip length Distribution – For Residents

Figure 2.7: Modal Split For Residents - Comparison Between Greater Nottingham and Enhanced Sample Area

SECTION 3

HOUSEHOLD INTERVIEW AND STATED PREFERENCE SURVEY

3 HOUSEHOLD INTERVIEW AND STATED PREFERENCE SURVEY

3.1 Introduction

3.1.1 The Stated Preference Survey was the second part of the Household Interview Survey. It was required to examine how people's travel habits might change in response to new transport initiatives and was used to calibrate the generalised cost model.

3.1.2 This part of the survey was based on the information collected during the Revealed Preference (RP) interviews, the details of which are explained in the previous section and also Working Paper 5. In total 1,220 persons who took part in the first survey were asked to participate in the Stated Preference (SP) section and were sent questionnaire packs.

3.2 Survey Method

3.2.1 Two types of SP survey were designed on the basis of the RP data: customised and standard. The customised SP was specific to each person who was invited to participate in the survey and was based on the real trips that were reported in the first survey stage. The standard SP was based on a fictitious trip starting at home, going to the inner city of Nottingham. The designs of the two SP elements were as follows:

SP 1 (Customised):	Car vs. Public Transport (PT)
Variables Car:	travel time; operating costs; parking charges
Variables PT:	transport system (bus/LRT); travel time; access & egress time; fare; headway; transfer necessity (yes/no)
SP 2 (Standardised):	Car vs. Park & Ride
Variables Car:	travel time; motoring costs; parking charges; search time for parking space
Variables P&R:	transport system (bus/LRT); travel time; access & egress time; fare; headway; transfer necessity (yes/no)

3.2.2 The variables for both public transport and park and ride are the same because the factors involved in choosing the particular modes are identical. However, the weighting of each variable for the two modes will be slightly different due to the changing perception of each attribute in the different situations.

3.2.3 As the customised SP questionnaires were based on real reported journeys, trips that were used were required to meet the following conditions:

- Car or public transport trip (no trips on foot or by pedal cycle)
- Person must be 17 or older
- Personal mobility
- Home-based trip
- Model zones allocated
- Routing identifiable

3.2.4 The number of persons who met these criteria and reported at least one trip of this kind was 511. These people were invited to complete a customised SP. This questionnaire was in two parts: the first compared the individual's unique reported trip with a real public transport alternative, in terms of travel time and the number of transfers, and the person was asked to give the reasons why public transport was not the mode chosen. The second part of the questionnaire offered the individual nine different situations, with modal options of private car or public transport in each, and the person was asked to select their preferred alternative for each scenario. The variables (as defined in paragraph 3.2.1 above) were modified to ensure that each of the nine situations was different.

3.2.5 To provide an accurate public transport alternative for the customised SP, information was gathered about the Greater Nottingham highway network and public transport services. Bus and rail routes and services were obtained from operators' timetables. Locations of bus stops and railway stations were identified using a Global Positioning System (GPS).

3.2.6 The standardised type of questionnaire placed people in the hypothetical situation of needing to travel to Nottingham city centre. The individual was offered nine different situations with a mode choice of either a private car or park and ride. Again, each scenario was made slightly different by modifying the variables of cost, time, number of transfers, etc. (see paragraph 3.2.1). The person was invited to select their preferred alternative in each situation. Examples of the covering letter and both types of questionnaire pack may be found in Appendix 3.1.

3.2.7 A telephone follow-up system was used for the RP part of the survey to encourage completion of the questionnaires. However, it was felt that this technique was not necessary for the SP stage as people were now familiar with the A453 Study and its surveys and, having participated once already, would be prepared to do so again. The follow-up approach was always available as a back-up measure in the event of a poor early response, although it was not required.

3.3 Survey Response

3.3.1 The overall response rate was good at 56.6%, much higher than the 23.5% achieved in the Revealed Preference phase of the survey. This was anticipated, as those people approached for the Stated Preference survey had already participated in the first stage and would therefore have a higher willingness to take part again.

3.3.2 The total number of survey returns for the customised SP was 290, which equated to a 56.8% response rate. Of the 290 questionnaires returns, approximately 87% had been completed properly; i.e. a selection was made in each of the nine situations. The total number of survey returns for the standardised SP was 401, which equated to a 56.6% response rate. Of the 401 returns, approximately 85% had been completed properly.

3.3.3 The main problem which seemed to be encountered by those asked to complete the questionnaire was a misunderstanding over the nine test situations. Some individuals only ticked one option out of the 18 available rather than one in each scenario, although it seemed to the questionnaire designers that the instructions were clear. The majority of people (85%) who participated appeared to understand what was required.

3.3.4 Other difficulties that were experienced through the telephone hotline included people who had sold their car or had their bus service removed, and therefore felt that they could not complete the questionnaire. In several cases it had to be explained to callers that in the Standardised SP the scenario was a hypothetical one rather than an actual situation.

3.4 Main Findings

3.4.1 The nine observations recorded from each of the successful interviews (approximately 593 successes) are used to calibrate the generalised cost model. The mode choices made within the pre-designed test situation form the basis of the weighting coefficient validation. This makes the model sensitive to travel costs, including non-quantifiable aspects of the perception of a mode (such as comfort, cleanliness, etc.) which affect mode choice. In total, over 5,000 observations were recorded which is considered sufficient for validation.

3.4.2 The customised SP also investigates the reasons why individuals did not use public transport for a particular trip. The results are illustrated in Figure 3.1.

Initial analysis of this data shows that less than 10% of those interviewed were unaware of a public transport connection, indicating that most people made a conscious decision not to travel by that mode. The majority of people responding, 68.6%, cited too much loss of time as a reason for not using PT and nearly 60% perceived PT as generally being too inconvenient.

3.4.3 The fact that most people believe that they would lose too much time travelling by PT should not be surprising: examination of the trip times for the PT alternative within the questionnaires reveals that most would take at least double the travel time by car. Some trips would take substantially longer than this if PT was the chosen mode.

3.4.4 The financial cost and accessibility of PT stops appears to be less of a problem for those interviewed: only 25% perceive PT as being too expensive, while the same percentage believe the stops have poor accessibility. 53.8% of respondents basically prefer to go by car.

3.5 Conclusions

3.5.1 A total of 691 questionnaires were returned, a response rate of 56.6%. Of the total returns, approximately 86% had been completed accurately, which meant that over 5,000 observations were recorded. This number is sufficient for calibration of the mode choice model which will be used to weight the various financial and non-financial cost factors. This will be reported in the model development and validation report.

3.5.2 Analysis of the reasons why people choose not to use PT reveals that the most popular explanation is too much loss of time. This is clearly not merely a public perception as the PT alternatives, for the real reported trips within the survey, took substantially longer than the journey time for the private car equivalent. Therefore if a significant modal shift is to be achieved, the improved speed of PT services will be an important contributing factor.

Figure 3.1: Reasons For Not Using Public Transport

Note: The percentages do not total 100% because each person could select more than one reason why they did not travel by PT.

SECTION 4

TRAFFIC DATA COLLECTION AND SURVEYS

4 TRAFFIC DATA COLLECTION AND SURVEYS

4.1 Introduction

4.1.1 This section contains details of the traffic surveys undertaken for PFC by sub-contractors outlining the purpose of the surveys, numbers, names, dates, time period and locations of survey sites and method of survey. The context of surveys undertaken for other studies is also outlined.

The surveys described in this section are:

- Roadside Interview Surveys
- Traffic Count Surveys
- Journey Time Surveys
- Network Inventory Surveys

4.1.2 In each case checks were made with the M1 Corridor Study Team to ensure compatibility of data and an integrated package of surveys designed to meet the requirements of both studies and avoid duplication.

4.2 Roadside Interview Surveys (RIS)

General

4.2.1 The Roadside Interview Survey comprised an integrated package of the following surveys at the same location at the same time:

Sample Driver Interviews (12 hours)	-	One direction
Manual Classified Counts (12 hours)	-	Each direction
Automatic Traffic Counts (2 weeks)	-	Each direction

4.2.2 The Manual Classified Count provided the prime basis of traffic data and for expansion of the sample interviews to represent total traffic flow. The Automatic Traffic Count provided a monitor that traffic conditions on the survey day were representative and a basis for adjustment if this was not the case.

RIS Site Locations

4.2.3 For the A453 corridor study survey sites were located on roads crossing a series of screenlines designed to intercept movements from the west and south into the Study Area and movements out of East Clifton. A further screenline in the vicinity of the Ring Road was considered to intercept movements in the corridor approaching the city centre, but this included difficult sites and was excluded in favour of adopting a cordon survey proposed by City of Nottingham some distance inside the Ring Road.

4.2.4 A screenline is an imaginary line which is usually created to facilitate validation and calibration of traffic models. It is assumed to be a watertight line that captures all possible traffic movement across it. Based on the Study Area and the locations of the traffic counts the location of the screenlines was determined. In this study we identified three screenlines; the first one is the Western Screenline which consists of RIS sites 1 to 4, the second is the Southern Screenline, which consists of sites 5, 6, 10, 11 and 12 and the third one is the Inner Screenline. This screenline consists of a number of sites where Nottingham City Council has undertaken their own RIS surveys. The locations of the three screenlines are shown in Figure 4.1.

4.2.5 Site locations were identified jointly by PFC and Count on Us[1]. The proposed sites were subsequently agreed through consultation with DTLR, Nottingham City Council, Derbyshire County Council and the appropriate Police Forces. When deciding on the site location, the highest priority was given to driver and survey staff safety and that the delay to traffic would be minimised.

4.2.6 Figure 4.2 shows the survey sites. The RIS site details are shown in Table 4.1. The location of the WS Atkins' sites that are most relevant to the A453 Study and locations of the Nottingham City Council sites are shown in Figure 4.3.

RIS Survey Forms

4.2.7 During the interviews a number of questions were asked which involved the following:

- Origin and destination
- Journey purpose for origin and destination
- Vehicle type and car ownership
- Workplace parking facilities at both origin and destination
- Number of occupants - observed by numerators

The sites were operated using a mixture of face-to-face interviews and self-completion postcards.

4.2.8 Face-to-face interviews were carried out at sites 1, 5, 6, 11 and 13. The other sites were operated entirely with postcards handed out to drivers in order to minimise congestion at survey sites. In addition, postcards were handed out at sites 1 and 6 when face to face interviews became impracticable due to traffic conditions.

4.2.9 An example of each of the forms is included in Appendix 4.1. Changes had to be introduced to a standard face to face interview form to incorporate the study's special needs such as workplace parking or no workplace parking at either "Origin" or "Destination".

[1] Count on Us were instructed by PFC to undertake 11 Roadside Interview Surveys, associated Manual Classified Counts and Automatic Traffic Counts along the A453 corridor - Nottingham

Table 4.1: PF – RIS Survey Details

Site No	Site Name	Date of Survey	Time Period	OSGR	Interview Direction	12 hr count	Interviews Obtained	Sample Size
1	A609 Ilkeston Road Trowell	07.06.00	07:00-19:00	4482 3399	EB	7317	1318*	18%
2	B5010 Station Road Sandiacre	08.06.00	07:00-19:00	4482 3364	EB	5761	976*	17%
3	A52 "Bardells" Roundabout West of B6003 Toton Lane Beeston	07.06.00	07:00-19:00	4495 3361	EB	15090	2864*	19%
4	A6005 Nottingham Road West of B6003	08.06.00	07:00-19:00	4502 3340	EB	10443	1178*	11%
5	A453 Thrumpton	15.06.00	07:00-19:00	4518 3312	NB	9510	1341	14%
6	Nottingham Road North of Gotham	13.06.00	07:00-19:00	4537 3309	NB	3058	1341*	44%
7	Green Lane, Clifton Near A453 Towards Nottingham	23.05.00	07:00-19:00	4548 3347	NB	1927	597	30%
8	Farnborough Road North, Clifton Near A453 Towards Nottingham	08.06.00	07:00-19:00	4555 3356	NB	6216	1049	17%
9	Green Lane, Clifton, Southeast Towards Ruddington	23.05.00	07:00-19:00	4561 3338	SB	3219	1264	39%
10	A60 Between Ruddington and Bradmore	13.06.00	07:00-19:00	4584 3318	NB	6100	1877*	31%
11	A46 South of A606	14.06.00	07:00-19:00	4650 3269	NB	9137	1110	12%
12	A606 East of A46	14.06.00	07:00-19:00	4664 3277	NB	2741	887*	32%
13	A52 Gamston Lings Bar Road, South of Gamston	12.06.00	07:00-19:00	4607 3365	SB	8082	1232	15%
14	A6514 Middleton Boulevard, Nottingham	12.06.00	07:00-19:00	4545 3395	SB	19875	1228*	6%
						97114	15352	16%

* = Including postcards return

Survey Conduct

4.2.10 Prior to commencing the survey all staff attended a detailed survey briefing. A comprehensive survey manual (which included copies of the RIS form and manual count form) was issued to each staff member as a permanent source of reference. The survey commenced on 23rd May and continued until 15th June 2001 during the hours 07:00 to 19:00.

4.2.11 Police Officers controlled the traffic throughout the survey period and liased with the supervisor regarding which vehicles should be stopped for interview in order to provide a representative sample. Drivers were directed to the survey stop line and politely asked to answer the interview questions.

4.2.12 Completed interview forms were collected at half-hour intervals and reviewed by the supervisor. The supervisor also carried out regular checks on the sample size in order to assist the Police Officer in targeting under-represented vehicle types and to eliminate any other bias.

4.2.13 The Police Officer, after liaison with the Site Supervisor, had sole discretion as to whether interviewing should be suspended, temporarily or otherwise, due to traffic congestion, poor visibility or light conditions.

4.2.14 The total number of postcard interviews returned in the 12-hour survey period at each site is shown in Table 4.2.

4.2.15 Manual Classified Counts (MCC) and Automatic Traffic Counts (ATC) were carried out at each RIS survey site. Both MCC and ATC were used to expand the RIS to 24-hour traffic flows. Further details will be given later in sections 4.3 and 4.5.

4.2.16 The surveys were carried out according to the standards and specifications laid down in Advice Note TA 11/81 and the current edition of the Traffic Signs Manual, Chapter 8. An example of a site layout is given in Appendix 4.2.

Interview Data Coding, Validation and Checks

4.2.17 The completed Roadside Interview forms were returned to the Contractors' offices for processing and checks. The interviews were fully coded, checked and postcodes completed, when possible, before being transferred to electronic format.

4.2.18 All the checked RIS data, in electronic format, was then processed further by the Study Team to convert the postcode of each survey record to a Grid Reference. Then each survey record was allocated to an A453 model zone, the last two stages of which were carried out by computer.

4.2.19 The data was then subjected to a series of validation checks which are summarised in Appendix 4.3. These were carried out according to Section 6.11 of the Design Manual for Roads and Bridges (DMRB), Volume 12.

Table 4.2: Percentage Survey Return for Postcards Sites

Site No	Site Name	Date of Survey	Postcards Issued	Postcards Returned	% Return
1	A609 Ilkeston Road Trowell	07.06.00	3665	960	26%
2	B5010 Station Road Sandiacre	08.06.00	4324	976	23%
3	A52 "Bardills" Roundabout, West of B6003 Toton Lane Beeston	07.06.00	12261	2864	23%
4	A6005 Nottingham Road West of B6003	08.06.00	5733	1178	21%
6	Nottingham Road North of Gotham	13.06.00	1165	542	47%
10	A60 Between Ruddington and Bradmore	13.06.00	4887	1877	38%
12	A606 East of A46	14.06.00	2603	887	34%
14	A6514 Middleton Boulevard Nottingham	12.06.00	4534	1228	27%
	Total		**39172**	**10512**	**27%**

Sample Expansion

4.2.20 Table 4.3 shows the sample size which is the actual number of interviews collected during the 12-hour period, the Annual Average Weekday Traffic (AAWT) which is grossing up the 12-hour MCC to 24-hour and also allowing for seasonal variation of the actual survey date.

Table 4.3: Calculation of Sample to Population Ratio

Site	RIS Location	Sample Size	AAWT	Sample Population Ratio	Census Point in the Transport Model
1	609 (Ilkeston Road) Trowell towards Nottingham	1318	10151	13.0%	1/66
2	B5010 (Station Road) Sandiacre towards Nottingham	976	7317	13.3%	2/67
3	A52(T) West of B6003 (Toton Lane) Sandiacre towards Nottingham	2864	22135	12.9%	3/68
4	A6005 River Erewash Bridge (Nottingham Road) West of B6003, Long Eaton towards Nottingham	1178	15203	7.7%	4/69
5	A453 Thrumpton towards Nottingham	1341	13888	9.7%	5/70
6	Nottingham Road North of Gotham towards Nottingham	1341	3893	34.4%	6/71
7	Green Lane, Clifton Near A453 towards Nottingham	597	2526	23.6%	7
8	Farnborough Road North, Clifton Near A453 towards Nottingham	1049	7365	14.2%	8
9	Green Lane, Clifton South-east towards Ruddington	1264	4404	28.7%	9
10	A60 (Loughborough Road) Between Bradmore and Bunny towards Nottingham	1877	7689	24.4%	10/72
11	A46(T) Broughton Farm South of A606 towards Nottingham	1113	13164	8.5%	25
12	A606 Hickling Pastures East of A46 towards Nottingham	884	3658	24.2%	12

4.3 RIS Surveys Findings

All Traffic Analysis

4.3.1 This analysis has been carried out primarily at sector level for the RIS sites (1 to 6, together with 10, 11, and 12). The "All Traffic" is a 24 hour count of vehicles which crosses through the Western and Southern screenlines, adjusted to allow for seasonal variation. The results of the "All Traffic Analysis" are shown in Table 4.4, parts A and B.

Table 4.4A: Percentage of Traffic to Each Destination Sector by Corridor (Percentages of Row Totals)

	A609		B5010		A52		A6005		A453		A60		A46/ A606		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
1	863	9	252	3	2913	30	864	9	2397	25	910	9	1510	16	9709	100
2	6710	11	4281	7	15397	26	11704	20	10256	18	4512	8	5655	10	58515	100
3	450	10	96	2	1059	23	516	11	1759	38	386	8	394	8	4660	100
4	1954	9	2518	11	2414	11	1753	8	2869	13	1693	8	8910	40	22110	100
T	9977	11	7147	8	21783	23	14837	16	17281	18	7501	8	16469	17	94994	100

1 = Central Nottingham
2 = Other Parts of Nottingham
3 = Beyond Nottingham
4 = Elsewhere
T = Total

- The proportions of traffic destined for "Central Nottingham" using the A52 and A453 are 30% and 25% respectively.

- The proportions of traffic destined for "Other Parts of Nottingham" using the A52 and A453 are 26% and 18% respectively.

- The proportions of traffic destined for "Beyond Nottingham" using the A52 and A453 are 23% and 38% respectively.

Table 4.4B: Percentage of Traffic in Each Corridor by Destination Sectors (Percentages of Columns Totals)

	A609		B5010		A52		A6005		A453		A60		A46/ A606		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
1	863	9	252	4	2913	13	864	6	2397	14	910	12	1510	9	9709	10
2	6710	67	4281	60	15397	71	11704	79	10256	59	4512	60	5655	34	58515	62
3	450	5	96	1	1059	5	516	3	1759	10	386	5	394	2	4660	5
4	1954	20	2518	35	2414	11	1753	12	2869	17	1693	23	8910	54	22110	23
T	9977	100	7147	100	21783	100	14837	100	17281	100	7501	100	16469	100	94994	100

1 = Central Nottingham
2 = Other Parts of Nottingham
3 = Beyond Nottingham
4 = Elsewhere
T = Total

- For the A453 and A52 corridors, the proportions of traffic destined for "Central Nottingham" are 14% and 13% respectively.

- For the A52 and A453 corridors, the proportions of traffic destined for "Other Parts of Nottingham" are 71% and 59% respectively.

- For the A453 and A52 corridors, the proportions of traffic destined for "Beyond Nottingham" are 10% and 5% respectively.

- The sum of traffic using the above seven corridors (i.e. A609. B5010, A52, A6005, A453, A60 and A46/A606) and directed towards one of these three destinations (i.e. Central Nottingham, Other Parts of Nottingham and Beyond Nottingham) is 72,883 vehicles. The number of vehicles destined elsewhere is 22,111 vehicles, 23% of all traffic.

- The number of vehicles crossing the above seven main corridors and destined to "Central Nottingham" is 9,707 vehicles. This equates to 10% of the total number of vehicles.

- The number of vehicles crossing the above seven main corridors and destined to "Other Parts of Nottingham" is 58,514 vehicles. This equates to 62% of the total number of vehicles.

- The number of vehicles crossing the above seven main corridors and destined to "Beyond Nottingham" is 4,660 vehicles. This equates to 5% of all vehicles.

Through Traffic Analysis

4.3.2 Through traffic is defined as all traffic in the corridor originating outside the Modelled Area and destined beyond the Modelled Area. Figure 4.4 shows the Modelled Area. The term "Beyond Nottinghamshire" was used later in Figures 4.7 to 4.13 to represent vehicle movements, which are destined beyond Nottinghamshire. This is to avoid ambiguity within the term "Through Traffic", which could have a different interpretation by the local communities. For example, "Through Traffic" in Clifton may be presumed to be any traffic that passes through Clifton which could include traffic from Gotham to Nottingham City. Utilising all the RIS, excluding sites 7, 8 and 9 in West Clifton produced the analysis of through traffic. This analysis indicates the following:

Table 4.5: Through Traffic Analysis

	A609		B5010		A52		A6005		A453		A60		A46/ A606		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
A	2092	8	2288	9	3177	13	1779	7	4562	18	1905	8	9100	37	24903	100
B	356	7	404	8	541	11	417	9	953	20	511	11	1674	34	4856	100
C	866	9	960	10	1340	14	690	7	1670	18	697	7	3204	34	9427	100
D	427	7	484	8	730	12	303	5	863	15	420	7	2713	46	5940	100
Sub Total Working Day (AM + PM + Interpeak)															**= 20225**	
Sub Total Overnight (20:00 to 06:00)															**= 4678**	

A = Daily TTM
B = AM Peak (07:00 – 10:00)
C = Interpeak (10:00 – 16:00)
D = PM Peak (16:00 – 19:00)

- The total of Through Traffic Movement (TTM) crossing the Modelled Area is 24,903 vehicles, this represents 26% of all traffic (94,994 vehicles).

- The proportions of TTM crossing the Modelled Area during the periods between 07:00 to 19:00 and 20:00 to 06:00 are 81% and 19% respectively.

- The proportions of TTM using the (A46/A606) and the A453 corridors are 37% and 18% respectively.

- The proportions of TTM crossing the Modelled Area during the a.m. peak (07:00 to 10:00), Interpeak (10:00 to 16:00) and p.m. peak (16:00 to 19:00) periods are 20%, 38% and 24% respectively.

- The proportions of (light and heavy[2]) vehicles in the TTM are 83% and 17% respectively.

- The percentages of TTM grouped by journey purpose are shown in Table 4.6. This indicates that 31% of the journeys were to home, 26% to work and 24% employer business.

- The graphical representation of TTM is shown in Figure 4.5.

Table 4.6: Percentages of Through Traffic Grouped by Journey Purpose

Home	Holiday Home	Work	Employer's Business	Educa -tion	Shopp -ing	Personal Business	Visit Friends	Recreation/ Leisure	Other
31%	1%	26%	24%	1%	3%	5%	4%	5%	1%

Select Link Analysis

4.3.3 This analysis includes identifying the origin and destination of all traffic at the survey points on the most relevant corridors within the Study Area such as the A453 and A52. The analysis was carried out for the direction of the roadside interviews (towards Nottingham).

4.3.4 Full details of this analysis, which include time of day, vehicle type, journey purpose and trips Origin - Destination sector are given in Appendix 4.4. The pattern of traffic movements (i.e. 16 groups of Origin - Destination) by time of day is shown in Appendix 4.4 Table 1.

4.3.5 An example of this analysis is given in Table 4.7. This shows the proportions of vehicles that originated from Leicestershire and directed towards Nottinghamshire (movement 8 in Appendix 4.4) which are using the various routes available e.g. (A46/A606) and A453 are 41% and 28% respectively.

[2] Light includes car/taxi, company car and LGV – heavy includes OGV1 and OGV2
Motor cycles and pedal cycles were insignificant numbers

Table 4.7: An Example of Select Link Analysis (Leicestershire to Nottinghamshire)

	A609		B5010		A52		A6005		A453		A60		A64/ A606		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
A	8	0	59	1	935	14	451	7	1900	28	589	9	2772	41	6714	100
B	0	0	13	1	212	12	109	6	396	23	235	13	784	45	1749	100
C	6	0	12	1	322	16	92	5	664	33	147	7	789	39	2032	100
D	0	0	25	1	232	14	202	12	430	26	130	8	648	39	1667	100

A = Total Traffic
B = AM Peak (07:00 – 10:00)
C = Interpeak (10:00 – 16:00)
D = PM Peak (16:00 – 19:00)

4.3.6 Vehicle movements (i.e. Origin – Destination) by vehicle type and journey purpose represented as percentages of total trips or as numbers are shown in Appendix 4.4 Tables 2 and 3. The results indicate that:

- The proportion of light vehicles ranges between 79% to 96%. The average proportion, excluding through traffic is 88%.
- The proportion of heavy vehicles ranges between 4% to 21%. The average proportion, excluding through traffic is 12%.
- There were approximately 8,000 vehicles travelling from Derbyshire to Nottinghamshire for work purpose (33% of all vehicles travelling from Derbyshire to Nottinghamshire).
- There were approximately 2,700 vehicles travelling from Derbyshire to Nottinghamshire for employer business purpose (11% of all vehicles travelling from Derbyshire to Nottinghamshire).
- The number of vehicles travelling for educational purposes is very small throughout all the 16 corridors. This is not unexpected for screenlines located outside the urban area.
- There were approximately 2,200 vehicles travelling from Derbyshire to Nottinghamshire for shopping purpose (9% of all vehicles travelling from Derbyshire to Nottinghamshire).
- There were approximately 1,800 vehicles travelling from Derbyshire to Nottinghamshire for personal business purpose (7% of all vehicles travelling from Derbyshire to Nottinghamshire).
- There were approximately 1,000 vehicles travelling from Derbyshire to Nottinghamshire to visit friends (4% of all vehicles travelling from Derbyshire to Nottinghamshire).
- There were approximately 1,200 vehicles travelling from Derbyshire to Nottinghamshire for recreation/leisure activities (5% of all vehicles travelling from Derbyshire to Nottinghamshire).

- There were approximately 24,000 vehicles travelling from Derbyshire to Nottinghamshire (25% of all vehicles crossed the Southern and Western screenlines). The proportions using the A6005, A609 and A52 are 42%, 25% and 15% respectively.

- A selected graphical sector-to-sector movement is shown in Figure 4.6. The figure shows the number of vehicles originating from Long Eaton and Sandiacre (Sector 20) and destined to a selected number of destination sectors in a day. For example, 5,891 vehicles destined to Nottingham W (Sector 7) represents 49% of all vehicles destined to Nottingham W. The total number of vehicles illustrated in Figure 4.6 represent 63% only of all vehicles originated from Long Eaton and Sandiacre.

- Full details of (Origin-Destination) vehicle movement between the 30 sectors of the Modelled Area is given in Appendix 4.5.

- Figures 4.7 to 4.13 show the percentage of vehicle movements (i.e. Origin-Destination) crossing one of the seven main roads (i.e. A609, B5010, A52, A6005, A453, A6 and A46/A606). These figures also show the proportion of traffic directed beyond Nottinghamshire (i.e. through traffic).

- For example, in Figure 4.7 the origin of traffic using the A453 is as follows:

    - 23% From the West
    - 8% Derbyshire
    - 18% Leicestershire
    - 25% South
    - 15% Others

4.3.7 The traffic using the A453 is destined towards:

- 14% Central Nottingham
- 59% Other parts of Nottingham
- 10% Other parts of Nottinghamshire and
- 17% Beyond Nottinghamshire

Car Occupancy

4.3.8 This information was collected during the Roadside Interview Surveys by the enumerators. The number of car occupants during a.m., p.m. and Interpeak grouped by vehicle type[3] is shown in Table 4.8.

Table 4.8: Average Occupancy by Vehicle Type and Time Period

Time Period	Car/Taxi	Company Car	Light Goods Vehicle	OGV1
AM	1.24	1.4	1.32	1.25
Interpeak	1.43	1.2	1.22	1.33
PM	1.35	1.4	1.37	2.04

[3] Vehicle type as shown in Roadside Interview Survey form (Appendix 4.1)

*Vehicle types (OGV2, Motorcycle and Pedal Cycles) are not listed above because of their small proportions.

4.3.9 The result indicates that the "company car" has the highest car occupancy during a.m. peak (1.4). During off-peak the "car/taxi" have the highest car occupancy (1.43). During p.m. peak the OGV1 has the highest car occupancy (2.04). The average number of occupancy grouped by journey purpose is shown in Table 4.9.

Table 4.9: Average Car Occupancy by Journey Purpose

Home	Holiday Home	Work	Employer Business	Educa -tion	Shopp -ing	Personal Business	Visit Friends	Recreation/ Leisure	Other
1.4	1.4	1.2	1.2	1.7	1.6	1.3	1.3	1.7	1.6

4.3.10 The result indicates that the highest car occupancy was for education and recreation/leisure (1.7).

4.4 Automatic Traffic Counts (ATC) Surveys

4.4.1 In order to obtain long term count data sets, pneumatic tubes were installed across the road surface at each of the designated counting points. These tubes were connected to an automatic traffic data logger and set to collect data at half-hourly intervals for a specific period.

4.4.2 ATC's were undertaken for a two-week period. The ATC was put in place on a date such that a minimum of two weeks clean data was provided including the week during which the RIS's took place. For information in respect of locations and dates of installation of the MCC's please refer to Table 4.1.

4.4.3 The ATC counts were undertaken at the same locations as the RIS's. This has enabled the interview data to be expanded to represent the whole day as well as providing a validation check for the manual counts. The ATC data was analysed to check that the survey had not influenced traffic levels (for example traffic re-routing to avoid delays).

4.5 Automatic Traffic Counts Findings

4.5.1 The observed traffic flows (ATC data) have been collected at half-hourly intervals to provide information about local 12, 16 and 24-hour flow.

4.5.2 Traffic flow has been compared with current road design capacities at the survey sites. The ratio of flow to capacity at these locations gives the first indication of potential bottleneck locations (flow to capacity ratio exceeding 0.85) within the Study Area. Two-way traffic flow for the a.m. peak is shown in Figure 4.14. The ratio between observed traffic flow and road capacity is shown in Figure 4.15.

4.5.3 The locations of ATC were predetermined by the locations of RIS sites which caused minimum inconvenience to road users. Hence, the traffic flows shown in Figures 4.14 and 4.15 are not necessarily reflecting an overall picture of current congestion problems in the network.

4.5.4 The observed traffic flows are used in the validation of the model as part of the Local Model Validation Report (LMVR).

4.5.5 Comparison between the temporal distributions of traffic flow for the Southern Screenline and A453 (two-way) flows over 24 hours is shown in Figure 4.16. The Southern Screenline has a pronounced a.m. peak (08:00 to 09:00) and evening peak (17:00 to 18:00). However, this was not observed at the A453 where traffic flows varied little between 08:00 and 10:00 and 16:00 to 18:00.

4.6 Manual Classified Counts (MCC)

4.6.1 Trained enumerators carried out directional MCC's by vehicle type (please refer to RIS forms) at half-hourly intervals. MCC counts were undertaken at the same locations as and concurrent the RIS's.

4.7 Manual Classified Counts Findings

4.7.1 The MCC counts are required to examine the traffic composition of the Study Area. This information is particularly important in an urban area such as Nottingham where the traffic composition may vary significantly by direction as well as during various time periods (a.m., p.m. and off-peak).

4.7.2 The observed traffic flows will be used in validating the model and the data will be utilised in the LMVR reporting process.

4.7.3 A comparison of traffic composition observed at Western Screenline, A453 and Southern Screenline is shown in Figure 4.17. This figure indicates that there are more commercial vehicles (i.e. LGV, OGV and OGV2) on the A453 than that on either screenline.

4.7.4 A comparison of traffic composition observed on the A52/A6200 and the A453 routes is shown in Figure 4.18. Two points were selected on each of the above roads to represent the inner and outer cordon. This figure indicates that the proportion of heavy vehicles is higher on the outer cordon sites than that at the inner ones and that the number of HGV's recorded on the A453 considerably exceeded that recorded on the A52.

4.8 Turning Counts

4.8.1 Turning counts have been observed at selected junctions within the Study Area. The turning movement counts were 12-hour classified counts. Details of turning count sites are given in Table 4.10. This data will be utilised in the validation process.

Table 4.10: Details of Classified Junction Turning Counts

Site No.	Site Name	Grid Ref.	Date of Survey	Type of Junction & No. of Arms	Survey Method
1	M1 J23A/A453/A42	447000-325500	13.06.00	G.S. R/A*	Video
2	M1 J24/A50/A453/ A6	447400-327700	13.06.00	G.S. R/A*	Video
3	M1 J25/A52 Grade Sep. R/A	447200-335500	13.06.00	G.S. R/A*	Video
4	A453 Clifton/ Farnborough Road/Fabis Drive	455500-335750	16.05.00	Traffic Signal	Video
5	A453 Clifton Lane/ Green Lane/Village Road	454900-334800	16.05.00	Priority Jun. (Staggered)	Video
6	A453 Clifton Lane/Hartness Road/A453 Barton Lane "Crusader R/A"	454500-334400	16.05.00	4-Arms R/A	Video

* G.S. = Grade Separated Roundabout

4.9 Link Count

4.9.1 A 12-hour manual classified link count at half-hourly intervals and 2-weeks ATC count was carried out as shown in Table 4.11. This site was selected as it is a logical extension of the A453 corridor and also it fills the gap in traffic flow information. This information will be used in the validation process.

Table 4.11: Details of Link Count

Site No.	Site Name	Grid Reference	Date of Survey	Survey Direction
1	B679 Between the A52 and the B680 Ruddington Lane	456300336700	17.05.00	2-way

4.10 Journey Time Survey (JTS)

4.10.1 Babtie Traffic and Transportation were commissioned to carry out the journey time survey. The surveys were undertaken during the period Tuesday 27th June to Friday 21st July 2000. The aim of the survey was to establish journey characteristics within the Study Area and to measure the journey times along particular sections of a road. Four routes were selected to be surveyed as shown in Figure 4.19 and listed below: -

Route 1 Nottingham City Centre to Spondon

Route 2	Nottingham City Centre to Junction 24 of the M1 Motorway
Route 3	Nottingham City Centre to Derby City Centre
Route 4	Derby City Centre to Junction 24 of the M1 Motorway

These routes were identified within the context of coverage of longer distance routes covered by the M1 Corridor Study.

4.10.2 The routes were surveyed in both directions during three periods of a typical weekday, as listed below: -

Morning Peak Period	07:00 - 10:00
Evening Peak Period	16:00 - 18:00
Interpeak Periods	10:00 - 13:00; 13:00 - 16:00

4.10.3 The number of runs conducted for each route was 8 which is in accordance with COBA Manual Chapter 11.

4.10.4 There are two main approaches for collecting journey time survey data, either stationary observer methods or moving observer methods. The stationary observer method is normally based on observers stationed at selected points along a route and recording licence plate numbers and the time at which the vehicle passed the timing point. By matching up the records of the different observers, the journey time can be calculated.

4.10.5 The stationary observer method is most effective when there is little traffic joining or leaving the route between the timing points or where junction delays are not required or the routes are short. Due to the extent of the routes, this method was not adopted and moving observer methods preferred.

The Floating Car Method

4.10.6 The "floating car" moving observer method was used for the A453 JTS. The vehicle was driven in line with the speed limits along the routes and should overtake the same number of vehicles that it was overtaken by.

4.10.7 Along the routes timing points were established that were readily identifiable by the survey staff. A video procedure was used to record the entire trip with the survey staff identifying the route and direction being undertaken, the time of departure and throughout the route recording the time at which the timing points were passed. On completion of the fieldwork the recorded data was extracted to computer files for analysis.

4.10.8 The results obtained were used to determine the journey time and speed. The timing points are established and the distances between them can be determined such that the journey speed between each timing point can be calculated. A summary of the average journey time by direction for all routes is shown in Table 4.12. The travel time includes the running time (i.e. when the vehicle is in motion) and the stopped time (i.e. when the vehicle is at rest at traffic signals or in traffic congestion).

Table 4.12: Summary of Overall Route Journey Times

Route	Direction	AM Peak	AM Interpeak	PM Interpeak	PM Peak
Route One	Nottingham to Spondon	31.54	29.06	30.29	35.16
	Spondon to Nottingham	34.36	30.08	30.17	32.40
Route Two	M1 to Nottingham	26.16	15.05	16.34	17.32
	Nottingham to M1	17.56	16.18	16.50	18.47
Route Three	Derby to Nottingham	30.50	28.01	20.56	26.50
	Nottingham to Derby	27.11	23.51	25.28	32.31
Route Four	Derby to M1	20.28	19.18	19.53	20.58
	M1 to Derby	21.44	18.03	18.55	18.51

4.10.9 Table 4.12 highlights the difference in time required to make the specified journey at different times of the day. In the a.m. peak it can be seen that the journeys towards Nottingham take longer than those leaving them. In the p.m. peak the reverse is true, that journeys leaving the conurbation take longer than those trips entering. This initial assessment suggests that the results are acceptable and can be subjected to more rigorous analysis.

4.10.10 The breakdown of each route into the individual timing sections reveals, in part, the effect on traffic speeds due to junction delay and congestion. This assumes that the Interpeak periods are used as the benchmark for the peak periods.

4.10.11 Whilst the surveys were being carried out, the operatives experienced congestion in several sections of the routes, both in the a.m. and p.m. peak periods. The main sections were junction 24 of the M1 motorway, at several points along the A453, along Derby Road to the north of Nottingham University and University Boulevard to the south of Nottingham University. The main queue locations are illustrated in Figure 4.20. The following analysis highlights links where there was a significant decrease in speeds during various time periods. Appendix 4.6 shows the locations of the timing points locations and summary statistics of journey times during various time periods and for all routes.

4.10.12 Analysis of Route One indicates that there are two links that are heavily affected by junction delay and congestion. For example, the average speed taken to pass through the second link (CP3 to CP4) decreases from 23.2 mph in the a.m. Interpeak to 17.9 in the a.m. peak and 44.3 mph to 34.6 mph for the following link (CP4 to CP5). This covers Castle Boulevard from the junction with Castle Bridge Road and Abbey Street to the grade separated junction with the A52. In the p.m. runs link (CP4 to CP5) decreases from 40.9 mph to 21.6 mph, as indicated in Table 4.13 which relates to the Abbey Street section of Route One.

Table 4.13: Route One Analysis (Westbound)

Route 1		AM Peak		AM Interpeak		PM Interpeak		PM Peak	
Link Between Nodes	Distance (Miles)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)
CP1 to CP 2	0.7	141	17.9	105	24.0	126	20.0	139	18.1
CP 2 to CP 3	0.18	32	20.3	28	23.1	26	24.9	28	23.1
CP 3 to CP 4	0.638	128	17.9	99	23.2	102	22.5	150	15.3
CP 4 to CP 5	1.5	156	34.6	122	44.3	132	40.9	250	21.6
CP 5 to CP 6	2.3	341	24.3	315	26.3	314	26.4	396	20.9
CP 6 to CP 7	0.842	138	22.0	127	23.9	110	27.6	126	24.1
CP 7 to CP 8	0.885	133	24.0	123	25.9	131	24.3	135	23.6
CP 8 to CP 9	0.994	145	24.7	152	23.5	146	24.5	190	18.8
CP 9 to CP 10	3.56	435	29.5	425	30.2	451	28.4	437	29.3
CP 10 to CP 11	1.83	266	24.8	249	26.5	291	22.6	263	25.0
TOTAL	13.429	1915	25.2	1745	27.7	1829	26.4	2114	22.9

4.10.13 Analysis of Route Two in Table 4.14 indicates that there is one link (CP2 to CP3) that is heavily affected by junction delay and congestion. The average speed taken to pass through this link decreases from 36.9 mph in the a.m. Interpeak to 17.4 in the a.m. peak. This covers Clifton Lane from the junction with the A52 to its junction with Farnborough Road.

Table 4.14: Route Two Analysis (Eastbound)

Route 2		AM Peak		AM Interpeak		PM Interpeak		PM Peak	
Link Between Nodes	Distance (Miles)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)
CP1 to CP 2	2.7	234	41.5	189	51.4	170	57.2	145	67.0
CP 2 to CP 3	3.46	716	17.4	338	36.9	317	39.3	334	37.3
CP 3 to CP 4	0.925	232	14.4	142	23.5	149	22.3	177	18.8
CP 4 to CP 5	1.24	126	35.4	112	39.9	111	40.2	114	39.2
CP 5 to CP 6	1.8	268	24.2	237	27.3	248	26.1	266	24.4
TOTAL	10.125	1576	23.1	1018	35.8	995	36.6	1036	35.2

4.10.14 The analysis of Route Three indicates that there is one link (CP6 to CP7) that is heavily affected by junction delay and congestion. The average speed taken to pass through this link decreases from 29.6 mph in the a.m. Interpeak to 10.7 mph in the a.m. peak, as indicated in Table 4.15. This covers the stretch of Route Three between the Derby Road/Woodside Road junction to Derby Road/Clifton Boulevard Junction.

Table 4.15: Route Three Analysis (Eastbound)

Route 3		AM Peak		AM Interpeak		PM Interpeak		PM Peak	
Link Between Nodes	Distance (Miles)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)
CP1 to CP 2	2.292	145	56.9	163	50.6	157	52.6	142	58.1
CP 2 to CP 3	5.21	289	64.9	299	62.7	313	59.9	324	57.9
CP 3 to CP 4	1.54	109	50.9	267	20.8	104	53.3	114	48.6
CP 4 to CP 5	1.29	114	40.7	98	47.4	98	47.4	113	41.1
CP 5 to CP 6	1.45	190	27.5	173	30.2	171	30.5	190	27.5
CP 6 to CP 7	1.2	403	10.7	146	29.6	153	28.2	156	27.7
CP 7 to CP 8	0.823	145	20.4	117	25.3	109	27.2	106	28.0
CP 8 to CP 9	0.577	169	12.3	138	15.1	134	15.5	174	11.9
CP 9 to CP 10	1.1	288	13.8	279	14.2	265	14.9	291	13.6
TOTAL	15.482	1852	30.1	1680	33.2	1504	37.1	1610	34.6

4.10.15 The analysis of Route Four indicates that there is one link that is heavily affected by junction delay and congestion. The average speed taken to pass through this link decreases from 55.7 mph in the a.m. Interpeak to 36.7 mph in the a.m. peak, as indicated in Table 4.16. This covers the section of Route Four between the London Road/Middle Road junction to the Cockpit Roundabout in Derby.

Table 4.16: Route Four Analysis (Eastbound)

Route 4		AM Peak		AM Interpeak		PM Interpeak		PM Peak	
Link Between Nodes	Distance (Miles)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)	Time (Secs)	Speed (mph)
CP1 to CP 2	0.495	155	11.5	113	15.8	133	13.4	101	17.6
CP 2 to CP 3	2.32	403	20.7	399	20.9	457	18.3	567	14.7
CP 3 to CP 4	1.37	185	26.7	234	21.1	214	23.0	187	26.4
CP 4 to CP 5	1.23	85	52.1	91	48.7	87	50.9	92	48.1
CP 5 to CP 6	2.61	145	64.8	153	61.4	135	69.6	144	65.3
CP 6 to CP 7	2.6	255	36.7	168	55.7	167	56.0	166	56.4
TOTAL	10.625	1228	31.1	1158	33.0	1193	32.1	1257	30.4

4.11 Journey Time Survey Findings

4.11.1 This survey work contributes to an understanding of how journeys within the Study Area alter throughout differing periods of the day. The study indicates the extent of congestion on journey times by comparing peak trips with off peak trips. There are several links within all the routes that are greatly affected by junction delay and congestion in the peak periods.

4.11.2 Figure 4.19 highlights the routes and indicates the average speed along particular sections of the road network in the a.m. peak in both directions. Figure 4.20 illustrate main queue locations.

4.11.3 The information obtained from this survey work can be used to assess the impacts of any road and traffic management improvements, assist in the transport planning/trip assignment/route diversion decisions and facilitate the economic analysis of various proposals.

4.12 Network Inventory

4.12.1 Geometric characteristics of the main and principal roads within the Study Area were collected by site inspection, which included number of lanes, road width, speed restrictions etc. Junction details were obtained from Nottingham City Council. This information was used to build the highway network and converted at a later stage to an electronic version to be part of the model-input files.

Figure 4.1: Locations of PFC Roadside Survey Interview Survey Sites

Figure 4.2: Locations of WS Atkins and Nottingham City Council RIS Sites

Figure 4.3: Location of RIS Screenlines

Figure 4.4 Modelled Area

Figure 4.5: Through Traffic Movements (TTM)

Figure 4.6: Sector-to-sector Movements

Figure 4.7: Select Link Analysis - A453 Corridor

Figure 4.8: Select Link Analysis – B5010 Corridor

Figure 4.9: Select Link Analysis – A52 Corridor

Figure 4.10: Select Link Analysis – A6005 Corridor

Figure 4.11 Select Link Analysis – A609 Corridor

Figure 4.12: Select Link Analysis – A60 Corridor

Figure 4.13: Select Link Analysis – A46/A606 Corridor

Figure 4.14:Two-way Traffic Flow and Road Design Capacity During AM Peak For Base Year 2000

Figure 4.15: Ratio Between Observed Flow and Road Design Capacity During AM Peak For Base Year 2000

Figure 4.16: Comparison Between Traffic Composition at A453 and Southern Screenline

Figure 4.17: Traffic Composition at Western Screenline, A453 and Southern Screenline 07:00 to 19:00

Figure 4.18: Traffic Composition at the A453 and A52 Sites

Figure 4.19: Journey Time Survey – Routes and Mean Speeds During AM Peak – Local and Route Average

Figure 4.20: Main Queue Locations

SECTION 5

BUS PASSENGER SURVEY

5 BUS PASSENGER SURVEY

5.1 Main Operators and Routes

5.1.1 The two largest bus operators in the Study Area are Nottingham City Transport/Pathfinder/South Notts (NCT), which are part owned by Nottingham City Council and Trent/Barton buses based in Langley Mill.

5.1.2 NCT operates services across the entire Nottingham City Council area, as well as the Districts of Broxtowe and Gedling on the north side of the River Trent. To the south of the River Trent NCT operates services throughout West Bridgford, Edwalton and elsewhere in Rushcliffe Borough, as well as Clifton/Wilford in the City Council's area. NCT provides a more limited service to the rural parts of the County except for the services to Gotham, East Leake and Loughborough.

5.1.3 Trent Buses serve the south and west of Nottingham City Council's area in particular, with frequent services to Long Eaton, Stapleford and Ilkeston. To the south of the River Trent, Barton Buses serve many of the more rural parts of the area in the Rushcliffe Borough Council area, as well as West Bridgford/Gamston.

5.1.4 A number of smaller operators provide services across the area, as well as services operated by large operators (such as Arriva and Stagecoach) from nearby towns/cities (including Derby and Leicester).

5.1.5 In the model area there are a number of important bus "corridors" which include:

- Nottingham - Beeston-Long Eaton-Derby (A6005)
- Nottingham - Stapleford-Derby/East Midlands Airport (A52/B5010)
- Nottingham - Clifton-Gotham-Loughborough-East Midlands Airport (A453)
- Nottingham - West Bridgford-Keyworth/Cotgrave (A60/A606)

5.1.6 Other significant bus corridors in Nottingham include (but are not limited to):

- Nottingham-Wollaton-Ilkeston (A609)
- Alfreton Road (A610)
- Mansfield Road (A60(N)
- Hucknall Road (A611)

5.2 Bus Screenline Locations

5.2.1 The bus passenger surveys were conducted at 14 locations across the Study Area, as illustrated in Figure 5.1. Surveys were undertaken in both directions on weekdays during the period Thursday 22nd June 2000 to Thursday 29th June 2000.

5.2.2 The sites can roughly be divided into two "screenlines" (Inner and Outer). The Outer Screen line links site 1 on the A609 at Trowell with site 7 on the A606 at Tollerton The Inner Screenline is to be found just outside the A6514/A52 Ring Road, including the A453 near Clifton and the A52 Derby Road near the University of Nottingham. The Outer Screenline was specified to obtain information on movements entering the Study Area and the Inner Screenline to provide a basis for independent checks (validation) on the public transport model.

5.3 Details of Bus Passenger Survey

5.3.1 The following elements were involved in conducting the surveys:-

- Distribution of self-completion postcard questionnaires to passengers crossing over the screenlines between 07:00 and 19:00, where interviewing was impracticable
- Passenger counts on board all buses where postcards had been distributed
- Kerbside passenger counts for all buses crossing the screenlines over the 12 hours, by direction
- Classified count of all buses (minbus, midibus, single deck, double deck or coach) by direction at each site

5.3.2 An example of the postcard distributed to passengers is included Appendix 5.1. The key items of information sought about each passengers' journey were as follows:

- Bus route number
- Time of day
- Origin and destination addresses
- Car availability
- Age group and sex of passenger

5.3.3 No interviews were undertaken at site 3 (A52 near Stapleford) since only coach/express services use this section and these were included in surveys undertaken by WS Atkins for the M1 North South Movements Multi-Modal Study at Derby and Nottingham bus stations.

5.4 Data Processing

5.4.1 Range and Consistency Checks were undertaken by the survey contractor (as detailed in Appendix 5.2).

5.4.2 The brief specified that at least 25% of all buses that passed each site should be boarded by survey staff in order to distribute the survey forms. This "sample rate" was easily exceeded, with between 35% and 100% of buses boarded. Appendix 5.3 illustrates these figures in more detail and also gives brief details of conditions on the survey day. Table 5.1 includes an analysis of the total number of people who were given a survey form as a percentage of all those counted on buses over the 12-hour survey period. It can be seen that an adequate sample rate of passengers was also achieved, (40% on average).

Table 5.1: Bus Survey Sample Rates

Site	No. of Buses	Total Buses on Which Forms Distributed	Bus Sample Rate	No. of Forms Given Out	No. of Passengers	Passenger Sample Rate
1	204	157	77%	762	1679	45%
2	157	71	45%	392	917	43%
3						
4	197	120	61%	1146	2240	51%
5	8	8	100%	7	11	73%
6	148	100	68%	551	1212	45%
7	144	51	35%	431	1459	30%
8	237	116	49%	1061	3195	33%
9	549	354	64%	3454	7657	45%
10	89	45	51%	161	344	47%
11	135	108	80%	1083	1586	68%
12	587	262	45%	2277	7871	29%
13	44	22	50%	119	334	36%
14	128	68	53%	338	909	37%
Total	**2627**	**1482**	**56%**	**11783**	**29414**	**40%**

5.5 Analysis of Data

Passenger Flow Profiles

5.5.1 Some basic analysis of the survey results has been undertaken for two specific sites, the A52 and A453 as well as the two screenlines.

5.5.2 The following graphs illustrate a number of comparisons of total passenger numbers on all buses by time of day.

5.5.3 Figure 5.2 shows that bus passenger flows across the Inner Screenline greatly exceed those at the Outer Screenline. A notable difference can be observed with regard to the overall daily profiles. The Outer Screenline has a pronounced morning peak from 07:00 to 09:00 and an evening peak from 16:00 to 18:00, with a much lower number of passengers in the Interpeak period. The Inner Screenline has a slightly later morning peak between 08:00 and 10:00, and an evening peak from 16:00 to 18:00. There is, however, a pronounced midday peak between 11:00 and 13:00.

5.5.4 Figure 5.3 shows that A453 site at Clifton has a significantly different profile to the screenlines. There are pronounced morning and evening peaks; however, passenger numbers are highest between 11:00 and 12:00.

5.5.5 Figure 5.4 shows passenger flows by time period for the A52 Derby Road site (Inner Screenline). Here the profile again shows the expected morning and evening peaks, but there is little evidence of the midday peak exhibited for the A453 corridor.

Bus Trips By Movement Type

5.5.6 Bus passenger movements have been broadly classified into the following four trip types to give an overall picture of the pattern of movements:

Through	=	Trips originating outside the Modelled Area as shown in Figure 4.4 and destined beyond the Modelled Area
Destination	=	Trips that began outside the Modelled Area and end within the Modelled Area (for example Leicester City to Nottingham city centre)
Origin	=	Trips that began in the modelled Area and ended beyond it (for example Nottingham city centre to Leicester City)
Internal	=	Trips made wholly within the Modelled Area (for example Beeston to Nottingham city centre)

This analysis has been undertaken based on the same sectors used in Section 4, illustrated in Figure 1.3

5.5.7 Figure 5.5 shows bus trips grouped by movement types. Unsurprisingly the internal trips were the highest (94% of the total), with no through trips recorded by the surveys.

Trips By Journey Purpose

5.5.8 Figure 5.6 shows the percentages of trips grouped by journey purpose. The analysis indicates that the highest percentage of people using the bus was to get to their work places (34%).

5.5.9 Further details of bus trip movements by journey purpose and time period is given in Appendix 5.4. For example there were 122 trips travelling to home made wholly within Nottingham City (please refer to the list of sectors equivalent in Appendix 5.4) during the p.m. peak (16:00 to 19:00)

Trips By Time Period

5.5.10 Three time periods were identified for more detailed analysis:

AM Peak	07:00 to 10:00
Off-peak	10:00 to 16:00
PM Peak	16:00 to 19:00

Figure 5.7 shows the percentages of the trips made during various time periods. Figure 5.7 indicates that the highest proportion of people using buses was during the off peak (44%). However, more significantly, over a third (38%) of all bus journeys were made in the a.m. peak.

5.5.11 Details of the Origin and Destination of bus trips by time period are given in Appendix 5.5. During the a.m. peak there were 194 trips travelling for work and originated from the Nottingham City and destined towards Nottingham centre sector. 187 bus trips originated and were destined within the Nottingham City sector. The rest of Nottinghamshire and Derbyshire also generated significant volumes of bus passengers in the a.m. peak. As would be expected, most shopping trips tended to be made in the off peak period.

The biggest single movement was 210 observed travelling from Nottingham City to Nottingham Centre sector in the off peak.

Car Availability

5.5.12 This analysis indicates that 71% of bus users did not have a car available on the day they made the trip. This corresponds to 37% for rail users. Figure 5.8 shows the bus trips grouped by car availability. The above comparison excludes the journey length factor. A further comparison of bus and rail split by journey length may show that this difference is a function of rail serving the long distance traveller, where rail is perceived to be more competitive in terms of journey time.

Bus Trips By Gender

5.5.13 Figure 5.9 shows the percentages of bus users grouped by gender. 66% of bus users were female compared to just 27% male users (a further 7% chose not to answer).

Bus Trips By Age Group

5.5.14 Figure 5.10 shows the percentages of bus users grouped by various age groups. The highest proportion of bus users were between 24 and 59 years (53%) followed by 31% for 65+. It should be noted that although children under 16 were not intended to be included in the survey, a small number did respond but have been excluded from the analysis.

5.6 Main Findings

- The temporal profile of the Inner Screenline is much flatter than the Outer Screenline.

- The A453 Clifton site is busiest between 11:00 and 12:00 although there are noticeable a.m. and p.m. peaks.
- Journeys to work were the largest individual trip purpose.
- Over a third of all journeys were made in the a.m. peak (39%) and 19% in the p.m. peak.
- 71% did not have a car available for the trip.
- Short distance trips were most evident in the sector analysis.
- Two-thirds of bus users (who responded to the survey) were female.

Figure 5.1: Location of Bus Passenger Survey Sites

Figure 5.2: Comparison of Inner and Outer Bus Survey Screenlines By Time of Day

Figure 5.3: Total Bus Passengers (Two-way) By Hour on A453 Near Clifton

Figure 5.4: Total Bus Passengers (Two-way) by Hour on A52 Derby Road (Near University)

Figure 5.5: Bus Trips By Movements

Figure 5.6: Bus Trips By Journey Purpose

Figure 5.7: Bus Trips By Time Period

Figure 5.8: Bus Trips – Car Availability

Figure 5.9: Bus Trips By Gender

Figure 5.10: Bus Trips By Age Group

SECTION 6

RAIL PASSENGER SURVEY

6 RAIL PASSENGER SURVEY

6.1 Main Operators and Routes

6.1.1 Two rail operators provide train services in the Study Area, Midland Mainline and Central Trains. Great North Eastern Railway (GNER) and Virgin operate Inter-City services in corridors to the east and west of the Study Area respectively.

6.1.2 Central Trains operate local services between Nottingham and Derby, Leicester, Grantham, Newark, Sheffield and Worksop, as well as long distance services to Birmingham/Wales, East Anglia and the Northwest. Midland Mainline operates services between Nottingham/Derby and intermediate stations to London St Pancras. Most Sheffield to London services run via Derby although some early morning and evening services run via Nottingham and Alfreton. GNER operates services on the East Coast Mainline through Newark and Grantham to the East. The majority of trains stopping at these stations are London Kings Cross to Leeds services, with connections available to the Northeast and Scotland at Doncaster. Virgin trains operate cross country trains from the Northeast and Scotland, through Derby to Birmingham, and the South West/South Coast

6.2 Rail Survey Locations

6.2.1 The rail passenger surveys were conducted at stations across the Study Area. They were co-ordinated by WS Atkins and undertaken by the rail operators as part of their annual quality surveys.

6.2.2 The stations covered by the strategic surveys were: Alfreton, Chesterfield, Derby, Grantham, Leicester, Loughborough, Mansfield, Newark Northgate, Nottingham, Retford and Sheffield.

6.2.3 The following stations were added to provide further local information for the A453 MMS - Attenborough, Beeston and Long Eaton.

6.3 Details of Rail Passenger Survey

6.3.1 Boarding and alighting passenger surveys were undertaken at all the above stations on a typical weekday during the period Monday 3rd July 2000 to Thursday 20th July 2000 (except GNER stations which were surveyed in October 2000).

6.3.2 The survey involved the distribution of self-completion questionnaires to passengers using the surveyed rail stations between 7 a.m. and 7 p.m., and the undertaking of counts of boarding and alighting passengers.

6.3.3 An example of the postcard distributed to passengers is included (Appendix 6.1).

6.3.4 The key items of information sought about each passengers' journey were as follows:

- Station and time of day
- Origin and destination journey purpose
- Boarding, interchange and alighting stations

- Mode of travel to access stations
- Access time
- Ticket type
- Car availability and party size
- Age group and gender
- Origin and destination addresses

6.3.5 Service quality information was also collected by the operators.

6.4 Data Processing and Matrix Derivation

6.4.1 WS Atkins have undertaken the data processing work. This processing of the raw data was a four-stage process. The First Stage was to create a station to station matrix. The Second Stage was to convert the station to station matrix to a zone to zone matrix. For instance three study zones will represent Derby Railway Station. All journeys were allocated to a destination or origin zone beyond the railway station. The Third Stage was to group the zone to zone O-D matrix into two categories. The first category was for people with car available and the second one was for people without car available. The Fourth Stage was to further subdivide the previous two categories, (with and without car available), into three time periods (a.m., p.m. and off peak).

6.4.2 Expansion factors, for expanding the observed rail demand sample to daily demand, were derived from the CAPRI[4] data to estimate a full day of observed rail movements.

6.5 Analysis of Data

Boarding and Alighting Analysis

Nottingham

6.5.1 Total numbers of rail passengers boarding and alighting trains at Nottingham station by time of day are shown in Figure 6.1. This is further broken down by rail operator. As noted previously there are only two operators that use Nottingham station, Central Trains and Midland Mainline. The key points to note are that the morning peak period is different for the two operators. Midland Mainlines' heaviest flow is southbound away from Nottingham in the morning with the largest amount of passengers boarding between 07:00 and 08:00. Numbers arriving are generally similar throughout the day, with 17:00 to 18:00 the busiest hour.

[4] Rail Matrix Data which has been developed by DETR from rail ticketing data. It is understood to have a base year of 1997

6.5.2 Central Trains meanwhile have much heavier flows into Nottingham in the morning with a pronounced peak between 08:00 and 09:00 when about 800 passengers alighted from trains. This is counterbalanced by an outbound peak between 17:00 and 18:00 when about 600 people boarded trains. Across the rest of the day flows are much lower, with between about 100 and 300 boarding, and similar volumes alighting per hour. This shows that Central Trains services currently carry the larger volume of commuters into/out of Nottingham in the peak periods.

Long Eaton

6.5.3 Figure 6.2 illustrates the number of passengers boarding and alighting services at Long Eaton station. This is displayed by direction (as opposed to operator). The two directions are south/east bound which includes trains heading towards Nottingham and Leicester and north/west bound which includes trains heading towards Derby.

6.5.4 As might be anticipated for a small edge of town station the station is a net generator of trips in the morning, with most of these trips returning between 16:00 and 19:00. More detailed analysis of the origin-destination data will allow us to assess where these journeys are being made to. Passenger volumes are much lower during the Interpeak period from 10:00 to 16:00.

6.5.5 Some preliminary analysis has revealed that over the course of the 12-hour survey period about 80% of rail journeys associated with trains departing south/east were towards Nottingham/ the east, whilst only 20% were towards Loughborough/London.

Beeston

6.5.6 Figure 6.3 illustrates the passenger arrival and departure profile for Beeston station. Again this is displayed by direction. The two directions are south/west bound (which includes trains heading towards Derby and Leicester) and east bound (towards Nottingham). The profile here is interesting since it shows that people are travelling to Beeston in the morning peak as well as travelling into Nottingham city centre from Beeston. This is most likely caused by commuters travelling to the Siemens complex and Boots (which adjoins Beeston railway station). Closer analysis of the raw data reveals that a large group of passengers boarded the 09:02 London train. This explains the surprisingly large number observed for the period 09:00 to 10:00 south/west bound. However even excluding this the flow would be higher than otherwise anticipated. This is likely to be due to the switch to off-peak fares (cheap day returns etc) after 9 a.m. There were a large number of eastbound alighting passengers between 17:00 and 18:00. Most of these passengers came from services from the south (MML and CT), with only a small number from services from the west (Derby).

Origin - Destination Analysis

6.5.7 Figure 6.4 illustrates pattern of rail trips by movement type. The four types were defined as follows:

- Through Trips (As defined in highway trips analysis, i.e. trips originating outside the Modelled Area in Figure 4.5 destined beyond the Modelled Area)

- Internal Trips = Trips made wholly within the Modelled Area (for example Beeston to Nottingham)
- Destination = Trips that began outside the Modelled Area that end within the Modelled Area (for example Leicester city centre to Nottingham city centre)
- Origin = Trips that began in the Modelled Area and ended beyond it (for example Nottingham city centre to Leicester city centre)

As in Section 5 this analysis was undertaken based on the sectors illustrated in Figure 1.3.

6.5.8 The most obvious point to make here is that through rail trips were the single most important type of rail trip observed in the survey (62%). Nearly a quarter of all rail trips were rail trips generated within the modelled Study Area.

6.5.9 Analysis of the processed interview records gives a picture of the most important flows of people by rail in the Modelled Area. The full tables of Origin-Destination movement analysis are included in Appendices 6.2 and 6.3. Of the 34,000 rail trips observed at the surveyed railway stations, only 5.5% were destined for Nottingham City centre. A further 8.5% were destined for other parts of Nottingham City. Of those travelling to Nottingham City Centre, about one-third were from Derbyshire (excluding Derby City). Around 20% of all rail journeys made were to London and the Southeast, with a further 24% to other parts of the country.

6.5.10 In the morning peak about 1,000 trips were observed to Nottingham City centre, with nearly a third of these originating in Derbyshire and Derby City. A third of all trips in the morning peak were destined for London and the Southeast.

6.5.11 In the evening peak 43% of trips were generated by Nottingham City and Nottinghamshire County, (which accounted for 26% and 17% respectively).

Trips By Journey Purpose

6.5.12 Figure 6.5 illustrates the split of rail trips by journey purpose. It can be seen that the largest percentage was journeys to home (42%) followed by journeys to work purpose (24%).

6.5.13 Nottingham city centre accounts for 20% of all work related rail trips, with a third of these from Derbyshire (excluding Derby City).

6.5.14 Just over half of all journeys made on employer's business are to London and the Southeast. Very few journeys are made within the Study Area by rail on employer's business.

6.5.15 There is a surprising lack of trips made for shopping and leisure/recreation purposes, especially when the large number of shops and other leisure opportunities in Nottingham (and other cities surveyed) are considered. Given the lack of significant volumes of rail journeys for other purposes there is no need for any further analysis summary.

Trips By Time Period

6.5.16 Figure 6.6 illustrates the distribution of rail trips by time period. The time periods referred to were defined as follows:

- AM peak = 07:00-10:00
- Off-peak = 10:00-16:00
- PM peak = 16:00-19:00
- Rest of day = before 07:00 and after 19:00

6.5.17 If the two peak periods are combined 46% of the observed trips were made in the peaks, which is a very much higher percentage than observed for private cars. A surprisingly high number of journeys were made before 07:00 and after 19:00. These were probably long distance trips (to London for example) where arrival times at the destination dictated the earlier departure time (and later arrival times on return journeys).

Trips By Car Availability

6.5.18 Figure 6.7 illustrates the distribution of rail trips by car availability. A very high proportion of rail passengers (63%) had a car available for the trip. This suggests that rail as mode already attracts a significant proportion of users who have a modal choice available to them.

6.6 Main Findings

6.6.1 The heaviest flows on Midland Mainline trains were outbound from Nottingham in the morning between 07:00 and 08:00 and inbound between 17:00 and 18:00.

6.6.2 Central Trains show a reverse pattern with 800 passengers arriving at Nottingham between 08:00 and 09:00 and 600 departing between 17:00 and 18:00.

6.6.3 80% of passenger movements from Long Eaton were towards the east (Nottingham).

6.6.4 Beeston Station generated trips to Nottingham and inbound trips to Beeston.

6.6.5 About one-third of rail trips to Nottingham City centre originated in Derbyshire.

6.6.6 20% of all rail journeys were made to/from London/Southeast.

6.6.7 Most rail trips were made by commuters with very few shopping trips observed.

6.6.8 Almost half of all rail trips were made in the peak periods.

6.6.9 63% of rail passengers had a car available for the trip being made.

Figure 6.1: Total Number of Rail Passengers at Nottingham Station By Time of Day

Figure 6.2: Total Number of Rail Passengers Boarding and Alighting at Long Eaton Station By Time of Day

Figure 6.3: Total Number of Rail Passengers Boarding and Alighting at Beeston Station By Time of Day

Figure 6.4: Rail Trips By Movement Type

Figure 6.5: Rail Trips By Journey Purpose

Figure 6.6: Rail Trips By Time Period

Figure 6.7: Rail Trips By Car Availability

SECTION 7

PEDESTRIAN AND CYCLIST INTERVIEW SURVEYS

7 PEDESTRIAN AND CYCLIST INTERVIEW SURVEYS

7.1 Locations of Survey Sites

7.1.1 The pedestrian and cyclist interview surveys were conducted as outlined in the following table (Table 7.1 which also shows the number interviewed) and illustrated in Figure 7.1. Each site was surveyed in both directions for a period of 12 hours between 07:00 and 19:00. The total number of people interviewed was 1,367 of which 79% were cyclist and 21% pedestrian.

Table 7.1: Locations of Pedestrian and Cyclist Interview Surveys

Site Number	Description of Section	Day and Date of Survey	Number Interviewed
1	A6005 University Boulevard (North side)	Tuesday 04.07.00	503
2	A6005 University Boulevard (South side)	Tuesday 04.07.00	262
3	Beeston Canal	Wednesday 05.07.00	75
4	Thane Road	Wednesday 05.07.00	77
5	Clifton Bridge	Monday 03.07.00	206
6	Silverdale Walk	Monday 03.07.00	244
		Total	**1367**

7.1.2 The sites selected were chosen because they formed a screenline to intercept all east to west and west to east movements between:-

- Clifton and Wilford/Lenton Lane
- Beeston/University and Lenton Lane/Dunkirk

7.1.3 These movements are parallel to the A453/A6005/A52 and are the most significant routes in terms of their potential affects on motorised travel volumes in these corridors.

7.1.4 At each survey site a two-way count was undertaken on the day of the survey for the same 12-hour period. This allowed expansion factors to be derived to factor the sample interview data up to the total observed pedestrian and cycle flows.

7.2 Design of Interview Survey Forms

7.2.1 During the interviews a number of questions were asked which involved the following:

- Origin and destination
- Journey purpose for origin and destination
- Cyclist or pedestrian
- Car availability for the trip

The interview survey form used was based on the roadside interview forms included in DMRB Volume 12 TAM. A copy of the form is attached in Appendix 7.1.

7.3 Data Processing

7.3.1 The coding, punching and verification of the interview data and the undertaking of range and consistency checks ensured that only clean data was retained for further use. This data has not been specifically used in the modelling process, although the results have been input into the process of strategy and option formulation.

7.4 Analysis of Data

Pedestrian and Cycle Flows

7.4.1 The survey results have been examined and the following section outlines the key findings of this analysis.

7.4.2 Figure 7.2 shows the total number of pedestrians observed crossing the screenlines of six sites for the 12-hour survey period. It can be seen that the volume of pedestrian movements is generally very small, except at Silverdale Walk where the higher volume is associated with movements to and from nearby schools and colleges.

7.4.3 Figure 7.3 shows the total number of cyclists observed crossing the screenline of six sites for the 12-hour survey period. Cycle movements are highest near to Nottingham University, with Clifton Bridge next highest. The more poorly surfaced Beeston canal path has a much lower level of usage.

7.4.4 Figure 7.4 shows the hourly figures for pedestrian and cycle movements at Silverdale Walk. This confirms peaks for pedestrian movements between 08:00-09:00, and 15:00-16:00. Cycle movements are generally lower except between 16:00 and 17:00, which maybe caused by older children travelling from schools/colleges unaccompanied by adults.

7.4.5 Figure 7.5 shows the hourly figures for pedestrian and cycle movements across Clifton Bridge. This shows that very few pedestrians use the bridge. Cycle movements are heaviest between 07:00-08:00 and 16:00-17:00 with a smaller peak after 1800. This suggests that many of the cyclists are working shifts in the Lenton Lane and Queens Drive industrial areas. Analysis of the interview information should help to confirm this.

Trips By Movement Type

7.4.6 Bus passenger movements have been broadly classified into the following trip types to give an overall picture of the pattern of movements.

Destination	=	Trips that began outside the Modelled Area and end within the Modelled Area
Origin	=	Trips that began in the Modelled Area and ended beyond it
Internal	=	Trips made wholly within the Modelled Area

The analysis has been undertaken based on the same sectors used in Sections 4, 5 and 6, illustrated in Figure 1.3.

7.4.7 Figure 7.6 shows pedestrian and cyclist trips by movement type. Unsurprisingly the internal trips were the highest (98% of the total) and 1% destination trips and 1% again origin trips. No through trips were recorded by the survey.

Trips By Journey Purpose

7.4.8 The analysis indicates the highest percentage of people walking or cycling was to get to their home (40%). Figure 7.7 shows the percentages of trips grouped by journey purpose.

7.4.9 Further details of origin and destination of pedestrian and cyclist movements by journey purpose and time period is given in Appendix 7.2. For example, there were two people walking within Nottingham City sector during the p.m. peak (16:00 to 19:00) and 13 cycling during the same period.

Trips By Time Period

7.4.10 Three time periods were identified for more detailed analysis:

AM Peak	07:00 to 10:00
Off-peak	10:00 to 16:00
PM Peak	16:00 to 19:00

7.4.11 Figure 7.8 shows that the proportion of people walking and cycling were almost evenly spread over these three time periods.

Car Availability

7.4.12 The analysis indicates that 57% of people walking and cyclists did not have a car available on the day they made the trip. This corresponds to 71% of bus users and 37% of rail users. Figure 7.9 shows pedestrian and cyclist trips grouped by car availability which indicates that 43% of these travellers had a car available for their trip.

7.5 Main Findings

7.5.1 The proportion of people cycling and walking of the total people interviewed was 79% and 21% respectively. It would be useful to group these trips by journey length.

7.5.2 The proportion of people walking and cycling for work was the second highest (35%) followed by 12% for leisure purpose.

7.5.3 There was no significant difference between proportions of people walking or cycling during various time periods.

Figure 7.1: Locations of Pedestrian and Cyclist Interview Surveys

Figure 7.2: Total Number of Pedestrians Observed Crossing the Screenline of Six Sites for the 12-Hour Period

Figure 7.3: Total Number of Cyclists Observed Crossing the Screenline of Six Sites for the 12-Hour Period

Figure 7.4: Hourly Figures for Pedestrian and Cycle Movements at Silverdale Walk

Figure 7.5: Hourly Figures for Pedestrian and Cycle Movements at Clifton Bridge

Figure 7.6: Pedestrian and Cyclist Trips By Movements

Figure 7.7: Pedestrian and Cyclist Trips By Journey Purpose

Figure 7.8: Pedestrian and Cyclist Trips By Time Period

Figure 7.9: Pedestrian and Cyclist Trips By Car Availability

SECTION 8

KEY SURVEY FINDINGS

8 KEY SURVEY FINDINGS

The main findings of all the surveys will be essential for those involved in option testing and policy formulation. The findings will help them to understand the current travel patterns and highlight problematic areas.

8.1 Household Interview Survey – Revealed Preference Survey

8.1.1 There was a lower response from areas of the City of Nottingham than for rural parts of the A453 corridor. Wards such as Manvers, Aspley, Bridge, Radford and Lenton typically provided responses of between 5% and 20%. These were also areas where the number of available telephone numbers was limited. More rural wards such as Keyworth, Leake, Edwalton and Gotham had typical return rates of between 20% and 40%. It was also noticeable that those areas which are more directly affected by the A453 generally provided the higher rates of return. The Study Team considers that the overall rate of return was adequate for study purposes.

8.1.2 Examination of the modal split data shows that some 67% of all trips were made using motorised private transport. Public transport was used for 11% of all trips and walk and cycle accounted for 22% together.

8.1.3 A comparison between the results from Greater Nottingham and those from the Study Corridor reveals that there is very little difference in the proportion of people travelling by each of the various modes of transport in the two areas.

8.1.4 Analysis of the trip purpose data shows that home accounts for 39% of all trip destinations. Of the other destination purposes (discounting home), shopping (32%), workplace (24%), and leisure destinations (16%) are the most popular trip purposes. Education and business account for the remainder.

8.1.5 Analysis of the trip length data shows that 85% of all trips terminate within a range of up to 10 miles. PPG 13 advocates walking and cycling as substitutes for the short car trips; specifically 2km for walking and 5km for cycling. 46% of trips recorded in the Household Interview Survey terminated within 5km, therefore there is potential for modal shift for trips of this nature.

8.2 Household Interview Survey - Stated Preference (SP) Survey

8.2.1 Analysis of the customised SP data provided information as to why individuals did not use public transport (PT) for a particular trip. This showed that less than 10% of those interviewed were unaware of a PT connection, indicating that most people made a conscious decision not to travel by that mode.

8.2.2 The majority of people responding (68%) cited too much loss of time as a reason for not using PT and nearly 60% perceived PT as generally being inconvenient. This shows that PT is not perceived to provide a viable alternative. Therefore if a significant modal shift is to be achieved, the improved journey speed, reliability and convenience factors must comprise elements of an overall package of service enhancements.

8.2.3 The observations recorded from each of the successful interviews are used to calibrate the generalised cost model. The mode choices made within the pre-designed test situation form the basis of the weighting coefficient validation. This makes the model sensitive to travel costs, including non-quantifiable aspects of the perception of a mode (such as comfort, cleanliness, etc.) which affect also mode choice.

8.2.4 The fare cost and accessibility of PT stops appears to be less of a problem for those interviewed: only 25% perceived PT as being too expensive and the same percentage believed the stops have poor accessibility. 54% of respondents basically prefer to go by car.

8.3 Traffic Data Collection and Surveys

8.3.1 The total number of vehicles crossing the Western and Southern screenlines during 24 hours was some 95,000. Of these 9,700 vehicles were destined for the centre of Nottingham (10% of the total traffic). The total number of vehicles destined for other parts of Nottingham amounted to 58,000 vehicles (62% of the total) and for areas beyond Nottingham, but still within the Modelled Area, was 4,660 (5% of the total traffic).

8.3.2 The largest proportion of traffic crossing the Western and Southern screenlines during 24 hours was using the A52 (21,783 vehicles representing 23%) followed by the A453 (17,281 vehicles representing 18%).

8.3.3 The amount of traffic with both origin and destination outside the Modelled Area (see Figure 4.4) was some 25,000 vehicles which represents 26% of all vehicles crossing the Western and Southern screenlines during 24 hours. This has been referred to as Through Traffic Movement (TTM).

8.3.4 The highest proportions of TTM observed crossing the Modelled Area were as follows. In the a.m. peak (07:00 to 10:00) 34% was on the A46/A606 followed by 20% on the A453. In the Interpeak (10:00 to 16:00) 34% was on the A46/A606 followed by 18% on the A453. In the p.m. peak (16:00 to 19:00) 46% again was on the A46/A606 followed by 15% on the A453.

8.3.5 The proportions of vehicles travelling to home, work and employer business in the TTM were 31%, 26% and 24% respectively.

8.3.6 Over the entire day the proportions of light and heavy vehicles in the TTM were 83% and 17% respectively.

8.3.7 Other traffic crossing the Western and Southern screenlines during 24 hours was 88% light vehicles and 12% heavy vehicles (excluding TTM).

8.3.8 There were insignificant numbers of vehicles travelling for the following journey purposes: education, holiday homes, visiting friends and leisure

8.3.9 A preliminary flow/capacity assessment at the RIS site locations has indicated potential future capacity problems. For instance, at site 5 of the RIS (i.e. A453, Thrumpton) the ratio between flow/capacity (F/C) for a.m. base year 2000 is 86% in the northbound direction and 91% in the southbound direction. It is generally accepted that any value of F/C which exceeds 85% is a potential problem.

8.3.10 Journey Time Survey analysis highlighted areas where queues were observed.

8.4 Bus Passenger Survey

8.4.1 The survey collected data on bus passenger volumes across the two screenlines, and also more detailed Origin-Destination information.

8.4.2 The highest passenger volumes were recorded at the "inner" site on the A52 Derby Road. This site also had the highest frequency of bus services. The A453 at Clifton was the next busiest site. Of particular interest to the A453 study is the fact that the busiest period of the day was the hour from 11:00 to 12:00. Overall the patronage profile is one that shows high levels of bus usage across the day. There were noticeable morning and evening peak periods.

8.4.3 A comparison of passenger volumes crossing the Inner and Outer screenlines reveals interesting results. The Inner Screenline has a profile very similar to the Clifton A453 site. There is a morning peak between 08:00 and 10:00, an evening peak 1600-1800 as well as a pronounced midday peak between 11:00 and 12:00. The Outer Screenline shows a flatter profile, with a much lower level of bus use across the day.

8.4.4 Journeys to work were the largest individual trip purpose and these were concentrated in the a.m. peak period. Over a third of all bus journeys were made in the a.m. peak. Shopping trips were generally made in the off-peak.

8.4.5 Some 71% of bus passengers did not have a car available for the trip. Furthermore, two-thirds of bus users were female (51% female in the whole population).

8.5 Rail Passenger Surveys

8.5.1 Analysis of boarding and alighting data for local stations reveals a number of key points.

Nottingham Station

At Nottingham station the peak hour for numbers of boarders varies by operator. Midland Mainline = 07:00-08:00, Central Trains = 17:00-18:00.

At Nottingham station the peak hour for numbers of alighters varies by operator. Midland Mainline = 17:00-18:00, Central Trains = 08:00-09:00.

Examination of the Origin – Destination pattern illustrates that Midland Mainline generally caters for long distance movements away from Nottingham, whereas Central Trains serves more local commuters/shoppers travelling into Nottingham.

Long Eaton Station

Long Eaton is a net generator of trips in the morning peak, with most return trips being made in the evening peak (16:00-19:00). The majority of these trips are made to/from Nottingham.

Beeston Station

Beeston station has significant flows towards Nottingham in the morning peak as well as flows into Beeston, which are probably associated with the Boots factory complex.

8.5.2 Analysis of the rail O-D patterns has revealed several important points. Of the 34,000 rail trips observed at the surveyed rail stations, only 5.5% were destined for Nottingham City centre. 1,000 trips were made by rail to Nottingham City centre in the morning peak, one third of these originating in Derby City and Derbyshire County (combined). Perhaps more significantly 26% of all trips generated in the p.m. peak originated in Nottingham City.

8.5.3 Analysis by journey purpose shows that journeys to work are the single most important category for rail journeys. Nottingham City centre accounts for 20% of all work journeys made by rail at the surveyed stations. The proportion of trips made for other purposes is low (particularly for shopping and leisure).

8.5.4 63% of rail passengers had a car available for the trip being made. This suggests that rail is already successful in attracting car users in a way that buses have (as yet) been unable to do.

8.6 Pedestrian and Cycling Interview Surveys

8.6.1 Pedestrian movements were generally very low across the screenline identified between Clifton/Beeston and Wilford/Abbey Bridge. The proximity of the busy A52 and A453 trunk roads partly explains this with their deterrent effect. Localised movements at the Silverdale Walk site are influenced by the close proximity of schools and colleges. The Beeston canal footpath is poorly lit and surfaced and use by pedestrians is low.

8.6.2 The number of cyclists observed was far greater. As would be expected sites near the University of Nottingham were busiest. However flows were also quite high at Clifton Bridge, Thane Road and Silverdale Walk. This may be due to the provision of a segregated route away from the fast, busy A52 Clifton Bridge highway with its dangerous, high speed traffic, weaving manoeuvres, where the A52 and A453 intersect.

8.6.3 Analysis of walking and cycling trips by mode revealed that 79% of the trips were by bicycle and 21% were walking.

8.6.4 Analysis of walking and cycling trips by movement type revealed unsurprisingly that 98% of the trips were internal to the Modelled Area.

8.6.5 There was no significant difference between the proportion of walking and cycling trips during various time periods (i.e. a.m., p.m. and off-peak).

8.6.6 Analysis of walking and cycling trips by journey purpose revealed that the highest proportion was for home (40%) followed by to work purpose (35%).

8.6.7 57% of the people walking and cycling did not have a car available to them when they made their journey.

8.7 Conclusions

The total A453 MMS survey programme comprised a substantial task of data collection, processing and analysis. This report has outlined successful completion of this work and the establishment of a comprehensive travel database suitable for the development of the transportation model.

The analysis of volumes and patterns of movement and journey characteristics has provided a valuable insight into the complex mix of journeys currently undertaken within and to/from the area of interest although the picture is as yet incomplete. Further analysis of the total package of movements will be facilitated by the transportation model when development and validation has been completed.

The transportation models have been designed to synthesise all movements within the main area of interest using relationships derived from the home travel surveys and planning data. Only external movements will be directly based upon surveys and the surveys were designed to this end.