Halcrow Group Limited
Arndale House Otley Road Headingley Leeds LS6 2UL
Tel +44 (0)113 220 8220 Fax +44 (0)113 274 2924
www.halcrow.com

Halcrow

Technical Note 1

Project	Hackney Carriage Unmet Demand Study	**Date**	17 March 2009
Note	Snapshot Study - York	**Ref**	CTDAFG721
Author	Liz Eccles		

1 Introduction

1.1 The purpose of this Technical Note is to present the results of a 'snapshot' rank observations survey undertaken by Halcrow in York during February and March 2009. The purpose of the survey is to assess the effectiveness of the recent increase in the number of licences issued in York. An additional 15 licences were issued from 1st July 2008 and a further 2 are planned for 1st July 2009.

2 Overview

2.1 Section 2 provides a definition of significant unmet demand derived from experience of over 100 unmet demand studies since 1987. This leads to an objective measure of significant unmet demand that allows clear conclusions regarding the presence or absence of this phenomenon to be drawn. Following this, a description is provided of the SUDSIM model which is a tool developed to determine the number of additional hackney licences required to eliminate significant unmet demand, where such unmet demand is found to exist.

2.2 Significant Unmet Demand (SUD) has two components:

- patent demand – that which is directly observable; and
- "suppressed" demand – that which is released by additional supply.

2.3 Patent demand is measured using rank observation data. Suppressed (or latent) demand is assessed using data from the rank observations and public attitude interview survey. Both are brought together in a single measure of unmet demand, ISUD (Index of Significant Unmet Demand).

3 Defining Significant Unmet Demand

3.1 The provision of evidence to aid licensing authorities in making decisions about hackney carriage provision requires that surveys of demand be carried out. Results based on observations of activity at hackney ranks have become the generally accepted minimum requirement.

3.2 The definition of significant unmet demand is informed by two Court of Appeal judgements:

- R v Great Yarmouth Borough Council ex p Sawyer (1987); and
- R v Castle Point Borough Council ex p Maude (2002).

3.3 The Sawyer case provides an indication of the way in which an Authority may interpret the findings of survey work. In the case of Sawyer v. Yarmouth City Council, 16 June 1987, Lord Justice Woolf ruled that an Authority is entitled to consider the situation from a temporal point of view as a whole. It does not have to condescend into a detailed consideration as to what may be the position in every limited area of the Authority in relation to the particular time of day. The area is required to give effect to the language used by the Section (Section 16) and can ask itself with regard to the area as a whole whether or not it is satisfied that there is no significant unmet demand.

3.4 The term "suppressed" or "latent" demand has caused some confusion over the years. It should be pointed out that following Maude v Castle Point Borough Council, heard in the Court of Appeal in October 2002, the term is now interpreted to relate purely to demand that is measurable. Following Maude, there are two components to what Lord Justice Keene prefers to refer to as "suppressed demand":

- what can be termed inappropriately met demand. This is current observable demand that is being met by, for example, private hire cars illegally ranking up; and
- that which arises if people are forced to use some less satisfactory method of travel due to the unavailability of a hackney carriage.

3.5 If demand remained at a constant level throughout the day and week, the identification and treatment of significant unmet demand

would be more straight-forward. If there were more cabs than required to meet the existing demand there would be queues of cabs on ranks throughout the day and night and passenger waiting times would be zero. Conversely, if too few cabs were available there would tend to be queues of passengers throughout the day. In such a case it would, in principle, be a simple matter to estimate the increase in supply of cabs necessary to just eliminate passenger queues.

3.6 Demand for hackney carriages varies throughout the day and on different days. The problem, introduced by variable demand, becomes clear when driver earnings are considered. If demand is much higher late at night than it is during the day, an increase in cab supply large enough to eliminate peak delays will have a disproportionate effect on the occupation rate of cabs at all other times. Earnings will fall and fares might have to be increased sharply to sustain the supply of cabs at or near its new level.

3.7 The main implication of the present discussion is that it is necessary, when considering whether significant unmet demand exists, to take account of the practicability of improving the standard of service through increasing supply.

Measuring Patent Significant Unmet Demand

3.8 Taking into account the economic, administrative and legal considerations, the identification of this important aspect of significant unmet demand should be treated as a three stage process as follows:

- identify the demand profile;
- estimate passenger and cab delays; and
- compare estimated delays to the demand profile.

3.9 The broad interpretation to be given to the results of this comparison are summarised in Table 3.1.

Table 3.1 Existence of Significant Unmet Demand (SUD) Determined by Comparing Demand and Delay Profiles

	Delays during peak only	**Delays during peak and other times**
Demand is:		

Highly Peaked	No SUD	Possibly a SUD
Not Highly Peaked	Possibly a SUD	Possibly a SUD

3.10 It is clear from the content of the table that the simple descriptive approach fails to provide the necessary degree of clarity to support the decision making process in cases where the unambiguous conclusion is not achievable. However, it does provide the basis of a robust assessment of the principal component of significant unmet demand. The analysis is therefore extended to provide a more formal numerical measure of significant unmet demand. This is based on the principles contained in the descriptive approach but provides greater clarity. A description follows.

3.11 The measure feeds directly off the results of observations of activity at the ranks. In particular it takes account of:

- case law that suggests an authority should take a broad view of the market;
- the effect of different levels of supply during different periods at the rank on service quality;
- the need for consistent treatment of different authorities, and the same authority over time.

3.12 The Index of Significant Unmet Demand (ISUD) was developed in the early 1990's and is based on the following formula. The SF element was introduced in 2003 and the LDF element was introduced in 2006 to reflect the increased emphasis on latent demand in DfT Guidance.

ISUD = APD x PF x GID x SSP x SF x LDF

Where:

APD = Average Passenger Delay calculated across the entire week.

PF = Peaking Factor. If passenger demand is highly peaked at night the factor takes the value of 0.5. If it is not peaked the value is 1. Following case law this provides dispensation for the effects of peaked demand on the ability of the Trade to meet that demand. To identify high peaking we are generally looking for demand at night

(at weekends) to be substantially higher than demand at other times.

GID = General Incidence of Delay. This is measured as the proportion of passengers who travel in hours where the delay exceeds one minute.

SSP = Steady State Performance. The corollary of providing dispensation during the peaks in demand is that it is necessary to focus on performance during "normal" hours. This is measured by the proportion of hours during weekday daytimes when the market exhibits excess demand conditions (i.e. passenger queues form at ranks).

SF = Seasonality factor. Due to the nature of these surveys it is not possible to collect information throughout an entire year to assess the effects of seasonality. Experience has suggested that hackney demand does exhibit a degree of seasonality and this is allowed for by the inclusion of a seasonality factor. The factor is set at a level to ensure that a marginal decision either way obtained in an "untypical" month will be reversed. This factor takes a value of 1 for surveys conducted in September to November and March to June, i.e. "typical" months. It takes a value of 1.2 for surveys conducted in January and February and the longer school holidays, where low demand the absence of contract work will bias the results in favour of the hackney trade, and a value of 0.8 for surveys conducted in December during the pre Christmas rush of activity. Generally, surveys in these atypical months, and in school holidays, should be avoided.

LDF = Latent Demand Factor. This is derived from the public attitude survey results an provides a measure of the proportion of the public who have given up trying to obtain a hackney carriage at either a rank or by flagdown during the previous three months. It is measured as 1+ proportion giving up waiting. The inclusion of this factor is a tactical response to the latest DfT guidance.

3.13 The product of these six measures provides an index value. The index is exponential and values above the 80 mark have been found to indicate significant unmet demand. This benchmark was defined by applying the factor to the 25 or so studies that had been conducted at the point it was developed. These earlier studies had used the

same principles but in a less structured manner. The highest ISUD value for a study where a conclusion of no significant unmet demand had been found was 72. The threshold was therefore set at 80. The ISUD factor has been applied to over 80 studies by Halcrow and has been adopted by others working in the field. It has proved to be a robust, intuitively appealing and reliable measure1.

3.14 Suppressed/latent demand is explicitly included in the above analysis by the inclusion of the LDF factor and because any known illegal plying for hire by the private hire trade is included in the rank observation data. This covers both elements of suppressed/latent demand resulting from the Maude case referred to above and is intended to provide a 'belt and braces' approach. A consideration of latent demand is also included where there is a need to increase the number of hackney carriage licences following a finding of significant unmet demand. This is discussed in the next section.

Determining the Number of New Licences Required to Eliminate Significant Unmet Demand

3.15 To provide advice on the increase in licences required to eliminate significant unmet demand, Halcrow has developed a predictive model. SUDSIM is a product of 20 years experience of analysing hackney carriage demand. It is a mathematical model, which predicts the number of additional licences required to eliminate significant unmet demand as a function of key market characteristics.

3.16 SUDSIM represents a synthesis of a queue simulation work that was previously used (1989 to 2002) to predict the alleviation of significant unmet demand and the ISUD factor described above (hence the term SUDSIM). The benefit of this approach is that it provides a direct relationship between the scale of the ISUD factor and the number of new hackney licences required.

3.17 SUDSIM was developed taking the recommendations from 14 previous studies that resulted in an increase in licences, and using

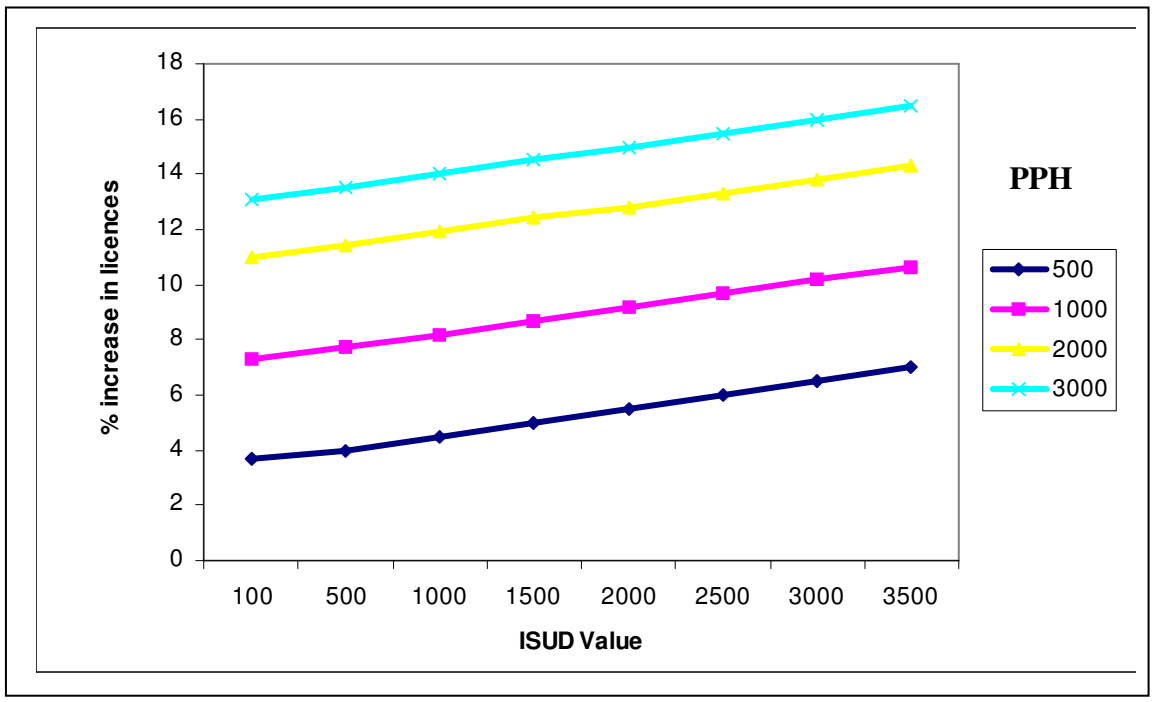
1 The cut off was devised without reference to latent demand as defined in 3.4.5. The inclusion of the LDF factor makes it much more likely that a finding of significant unmet demand will be reached.

these data to calibrate an econometric model. The model provides a relationship between the recommended increase in licences and three key market indicators:

- the population of the licensing Authority;
- the number of hackneys already licensed by the licensing Authority; and
- the size of the ISUD factor.
-

3.18 The main implications of the model are illustrated in Figure 3.1 below. The figure shows that the percentage increase in a hackney fleet required to eliminate significant unmet demand is positively related to the population per hackney (PPH) and the value of the ISUD factor over the expected range of these two variables.

Figure 3.1 Forecast Increase in Hackney Fleet Size as a Function of Population Per Hackney (PPH) and the ISUD Value



3.19 Where significant unmet demand is identified, the recommended increase in licences is therefore determined by the following formula:

New Licences = SUDSIM x Latent Demand Factor

Where:

- Latent Demand Factor = (1 + proportion giving up waiting for a hackney at either a rank or via flagdown).

Note on Scope of Assessing Significant Unmet Demand

3.20 It is useful to note the extent to which a licensing authority is required to consider peripheral matters when establishing the existence or otherwise of significant unmet demand. This issue is informed by R v Brighton Borough Council, exp p Bunch 1989[2]. This case set the precedent that it is only those services that are exclusive to hackney carriages that need concern a licensing authority when considering significant unmet demand. Telephone booked trips, trips booked in advance or indeed the provision of bus type services are not exclusive to hackney carriages and have therefore been excluded from consideration.

4 Rank Observation Results

4.1 The section of the technical note highlights the results of the rank observation survey. During the hours observed some 11,352 passengers and 7,293 cab departures were recorded. The rank observations were carried out from Tuesday 24th February 2009 to Sunday 15th March 2009. The Rank observations are included as Appendix 1.

4.2 The results presented in this section attempt to summarise the information and draw out its implications. This is achieved by using five indicators:

- **The Balance of Supply and Demand** – this indicates the proportion of the time that the market exhibits excess demand, equilibrium and excess supply;

- **Average Delays and Total Demand** – this indicates the overall level of passenger and cab delays and provides estimates of total demand;

2 See Button JH 'Taxis – Licensing Law and Practice' 2nd edition Tottel 2006 P226-7

- **The Demand/Delay Profile** – this provides the key information required to determine the existence or otherwise of significant unmet demand;

- **The Proportions of Passengers Experiencing Given Levels of Delay** – this provides a guide to the generality of passenger delay; and

- **The Effective Supply of Vehicles** – this indicates the proportion of the fleet that was off the road during the survey.

The Balance of Supply and Demand

4.3 The results of the analysis are presented in Table 2.1 below. The predominant market state is one of equilibrium. Excess supply (queues of cabs) was experienced during 21% of the hours observed while excess demand (queues of passengers) was experienced in 14% of hours. Conditions are most favourable to customers during the weekday daytime and weekday night time periods. During the crucial Monday to Friday daytime period, excess demand was observed during 6% of the hours.

Table 2.1 The Balance of Supply and Demand in the York Rank-Based Hackney Carriage Market (Percentages – Rows Sum to 100)

Period		Excess Demand	Equilibrium	Excess Supply
Weekday	Day	16	68	16
	Night	0	83	17
Weekend	Day	31	19	50
	Night	64	24	12
Sunday	Day	33	33	33
Total		**31**	**46**	**23**

Excess Demand = Maximum Passenger Queue ≥3. Excess Supply = Minimum Cab Queue ≥3 (values derived over 12 time periods within an hour).

Average Delays and Total Demand

4.4 The following estimates of average delays and throughput were produced for each of the main ranks in the licensing district and for the district as a whole (Table 2.2).

4.5 The survey suggests some 11,211 passenger departures occur per week from ranks in York involving some 7,195 cab departures.

Table 2.2 Average Delays and Total Demand (Delays in Minutes)

Rank	Passenger Departures	Cab Departures	Average Passenger Delay	Average Cab Delay
Clifford Street (Gallery)	1,127	605	0.84	1.46
Railway Station	4,801	2,988	0.94	7.51
St Saviourgate	3,181	2,432	0.70	8.45
Rougier Street	2,102	1,170	0.75	5.25
2009	**11,211**	**7,195**	**0.83**	**6.95**
Equiv ranks in 2008	**19,758**	**11,613**	**3.61**	**5.82**

4.6 From the survey it is evident that the taxi trade in York is most prominent at York Railway Station with 42% of the total trade being observed in this location. On average passengers wait 0.83 minutes for a cab. Passengers experience the greatest delay at the Railway Station rank where an average delay of 0.94 minutes is experienced.

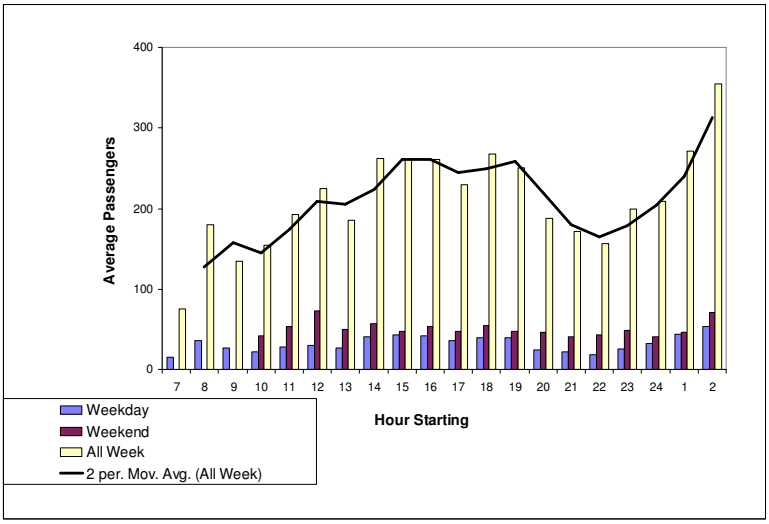
4.7 Since the unmet demand study was undertaken in 2008 it is clear that passenger demand has decreased significantly – a potential indicator of the current recession. However there are daytime hours where unmet demand occurs at the Rail Station.

4.8 The average cab delay was observed as being 6.95minutes during the 2009 snapshot observation period.

The Demand/Delay Profile

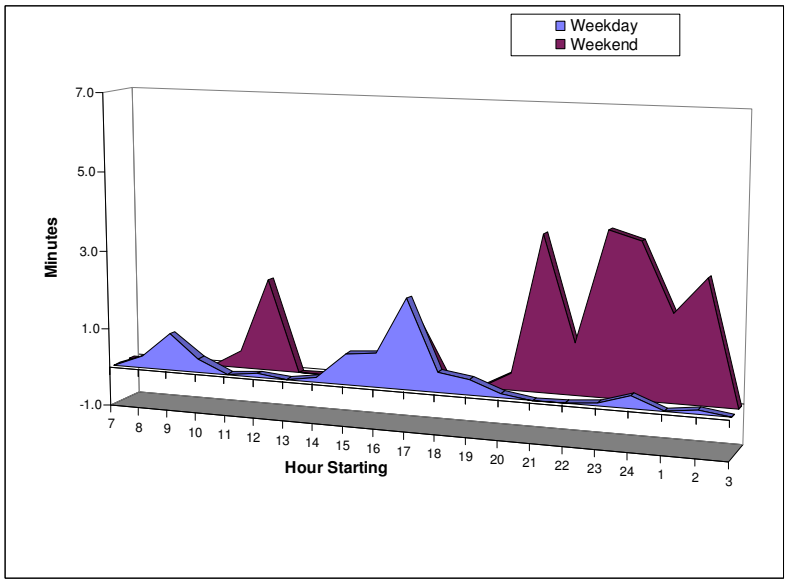
4.9 Figure 2.1 provides a graphical illustration of passenger demand for the Monday to Saturday periods between the hours of 0700 and 0300. The figure shows that the overall rank demand in York is not characterised by a sharp peak.

Figure 2.1 Passenger Demand by Time of Day during Feb/March 2009 (Monday to Saturday)



4.10 Figure 2.2 provides an illustration of passenger delay by time of day for the weekday and weekend periods. Figure 2.2 indicates that passenger delay occurs throughout the day in York and is generally less than two minutes. The greatest delay is during the evening and late at night on a weekend.

Figure 2.3 Passenger Delay by Time of Day in Feb/March 2009 (Monday to Saturday)



The Generality of Passenger Delay

4.12 The rank observation data can be used to provide a simple assessment of the likelihood of passengers encountering delay at ranks. Table 2.3 gives the results for the Feb/March period in 2009.

Table 2.3 General Incidence of Passenger Delay (Percentages)

Year	Delay > 0	Delay > 1 minute	Delay > 5 minutes
2009	18.38	9.60	0.00

4.13 Table 2.3 shows that 18.38% of those observed using ranks travelled in an hour where some delay at the rank was observed. The proportion likely to experience delays of over a minute is 9.6%.

5 Deriving the Significant Unmet Demand Index Value

5.1 The data above can be summarised using Halcrow's ISUD factor described in Section 2. The component parts of the index, their source and their values are given below:

- Average Passenger Delay (Table 2.2) 0.83
- Peak Factor (Figure 2.1) 1
- General Incidence of Delay (Table 2.3) 9.60
- Steady State Performance (Table 2.1) 16

- Seasonality Factor 1
- Latent Demand Factor (value from UDS) 1.124

ISUD (0.83*1*9.6*16*1*1.124) **143**

5.2 The cut off level for a significant unmet demand is 80. It is clear that York is above this cut off point, indicating that there IS significant unmet demand. This conclusion covers both patent and latent demand. However it should be noted that all the unmet demand identified is at the rail station. We are aware that only one of the 15 plates issued in July 2008 has secured permits for the station.