

Drive-time and fascia count methodology

1. This appendix describes the derivation of the drive-times used in the CC's analyses of the grocery market. The derivation of drive-times is technically complex and many different competing commercial drive-time systems are available. We commissioned CACI Ltd (CACI), a provider of marketing and information systems, to derive the drive-times used in our investigation.
2. We set out the methodology used by CACI to analyse the extent to which the UK population has a choice between different grocery retailers.

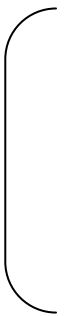

Deriving drive-times

3. We use drive-times to capture geographic proximity between people, grocery stores and other controlled landsites. Each store and landsite controlled by a grocery retailer in our database, and each output area,¹ has a geographic point, known as the centroid.² The Output Area (OA) centroid is a population-weighted point inside the boundary of the OA that indicates the concentration of residents. From each store and controlled landsite CACI estimated the time it takes to drive to each other store, landsite and OA, up to a maximum of 90 minutes' drive-time. We set out the drive-time methodology and assumptions used by CACI to estimate the drive-times in Annex 1.
4. There is no universally accepted methodology for the calculation of drive-times and the system used will depend on individual business requirements. The large grocery retailers use a number of alternative drive-time systems. Table 1 provides a brief summary of the different models used and highlights some key differences between them. Drive-time estimates are affected by different assumptions that are made concerning the use of average travel speeds in different areas, the impact and modelling of road junction delays and various other factors such as the underlying road network used.

¹An output area is the smallest level of geography for which the ONS releases statistical data.

²See Section 7 of the main report where we discuss barriers to entry arising from controlled land issues. We use a combination of postcodes and grid references taken from the parties' responses to various questions of the main party questionnaire and further follow-up questions to identify a geographic point for each site.

TABLE 1 Drive-time systems used by the large grocery retailers

Fascia	System provider	Link-node network	Speed/junction delay assumptions	Analysis type
		Ordnance Survey Oscar digitized road network	Road speeds assigned to different road/area-type links. Each link assigned to road/area type. Junction delay additional to link speed.	Point-to-point and isochrone-based
		Ordnance Survey Streetline	Road speeds assigned to different road/area type. Each link assigned to a road/area type. Junction delays reflected in lower link speed.	Isochrone-based
		Navteq	Unique road speed assigned to each individual link. Junction delays reflected in each individual link speed.	Point-to-point and isochrone-based

Source: Parties' submissions.

5. Alternative drive-time systems will not always generate the same drive-time between two points. We note that the role of a drive-time in our analyses was to incorporate *relative* proximity between two points. It was important that we used a consistent set of drive-times across our analyses at each stage of our investigation.
6. Asda and Tesco have both raised concerns that the CACI system generates drive-times which are typically slower than those produced by their own internal models. Hence, for a given travel time, the Tesco and Asda systems would typically estimate that one can travel a greater geographic distance. In particular, Tesco has raised concerns regarding the way the CACI system models road junction delays³ and the classification and application of slower road speeds in designated 'metropolitan' areas.⁴ CACI told us that the use of delay times and a metropolitan classification fitted with the urban experience of the average grocery shopper and, in its view, resulted in the production of realistic driving times.

Counting fascias by drive-time

7. We commissioned CACI to undertake an analysis of fascia choice from each UK output area (the results of which were reported in Section 3 of the main report).
8. The first step was to identify those grocery stores which were trading as at July 2006 and had a net sales area greater than 1,400 sq metres. Table 2 shows the resulting number of stores, by fascia, included in the analysis.

³Tesco told us that the CACI system treated each junction as a crossroad—and so added a delay—irrespective of whether a road had a designated 'right of way' across the junction in question. The precise delay added by CACI varies depending on the type of road.

⁴The CACI system attempts to reflect slower road speeds in more congested areas by using a 'metropolitan' classification, which means that in these areas average road speeds are reduced and the delay times are increased. Tesco told us that it was concerned that the 'metropolitan' classification did not appear to be applied on a consistent basis and that where the classification was applied it resulted in a 'blanket' alteration to every single road that fell within the boundary of the 'metropolitan' area without exception. Tesco said that, in reality, even in recognized congested areas there are fast urban roads and ring roads that avoid traffic delays and so the effect of the way CACI classifies areas as 'metropolitan' is to slow down modelled driving speeds to an unrealistic level.

TABLE 2 Number of stores, by fascia, included in the fascia choice analysis

<i>Fascia</i>	<i>Number of stores</i>
Asda	302
CGL and regional Co-ops	85
M&S	41
Morrisons	357
Sainsbury's	400
Somerfield	73
Tesco	534
Waitrose	105
Other*	15
Total	1,912

Source: CC analysis of MPQ responses.

*Includes stores belonging to: Booths, Proudfoot, Kwik Save, Spar and Nisa-Today's.

9. Output areas were then classified as urban and rural before being analysed using the store to drive-time matrix as follows:⁵

(a) Each OA was tested at each minute's drive-time (up to a maximum of 30 minutes) to ascertain the number of different fascias available within that drive-time. For example, if there was a relevant Tesco store at 3 minutes, another Tesco store at 6 minutes, a Morrisons store at 7 minutes and a CGL store at 9 minutes, the OA had access to one fascia at 6 minutes, two different fascias at 7 minutes and three different fascias at 9 minutes (even though there were four grocery stores present).

(b) The population of each OA was then used to calculate the proportion of the UK population that had access to at least three fascias at each minutes' drive-time. This was cumulative and so the proportion at 9 minutes also contributes to the 10-minute, 11-minute etc.⁶

⁵Each OA is classified as being either Rural or Urban. This classification is from the Department of Communities and Local Government (CLG). OAs are described as urban or rural depending on whether the majority of the population falls inside a settlement of population 10,000 or more. The settlement is usually the urban sprawl defined by the ordnance survey. The full methodology can be found here: www.statistics.gov.uk/geography/downloads/Methodology_Report.pdf.

⁶CACI 2006 population projections were used for the purposes of this analysis. This dataset builds on and updates population estimates from the 2001 census.

Drive-time methodology

1. The drive-times have been generated using a link and node network. This network has been built by CACI from the Navteq backcloth using an in-house macro.⁷ Links are equivalent to roads and contain all information regarding the length and class of each road. The nodes are road junctions and include attributes on delay characteristics.
2. From a start point (in this case the location of a store or other controlled landsite), cross-country speeds taken from the system defaults are used along with the distance, as the crow flies, to the nearest two nodes. This defines the time taken from start point to the point(s) of entry into the link and node network. From this point, the length and road type of each link determines the time taken to reach the next node. The principle of a drive-time is to create an isochrone (ie a contour) that defines the maximum limit of that drive-time from a given start point. Once the maximum time required has been reached by travelling along the road network, these points are then 'joined up' to create the contour. The contents of the contour (ie OA centroids and stores and controlled land) are collated and analysed to determine their distance/ time from the start point.
3. The assumed speeds on each road 'type' have been calibrated using a variety of sources, including local knowledge of areas around the country.⁸ The road speeds used are the 'normal' speeds in that they do not represent any particular time of day nor any particular day or days of the week. Table 1 shows the speeds that have been used to derive the drive-times used in the analysis.

⁷The Navteq backcloth is essentially a digitized map which is then converted into a link and node network in the format required to undertake a drive-time analysis.

⁸The categorization of links as being in 'metropolitan' areas allows for a slower road speed to be attributed to a link in more congested areas. Some areas have been recategorized as 'metropolitan' after feedback from previous users of the drive-time system that road speeds in the relevant area did not reflect the actual average speeds experienced.

TABLE 1 Normal road speed assumptions, by road type

<i>Road description</i>	<i>Road speed kmh</i>	<i>Junction delay mins</i>
Motorway (rural)	112	0.00
Motorway (urban)	85	0.00
Motorway (metropolitan)	64	0.20
Dual carriageway (rural)	90	0.10
Dual carriageway (urban)	65	0.25
Dual carriageway (metropolitan)	48	0.75
A road (rural)	72	0.10
A road (urban)	48	0.50
A road (metropolitan)	30	1.00
B/unclassified road (rural)	58	0.10
B/unclassified road (urban)	40	0.50
B/unclassified road (metropolitan)	25	1.00
Ferry	12	15.00
Motorway tunnel (rural)	112	0.10
Motorway tunnel (urban)	85	0.20
Motorway tunnel (metropolitan)	64	0.20
Dual carriageway tunnel (rural)	90	0.10
Dual carriageway tunnel (urban)	65	0.25
Dual carriageway tunnel (metropolitan)	48	0.75
A road tunnel (rural)	72	0.10
A road tunnel (urban)	48	0.50
A road tunnel (metropolitan)	30	1.00
B/unclassified road tunnel (rural)	58	0.10
B/unclassified road tunnel (urban)	40	0.50
B/unclassified road tunnel (metropolitan)	25	1.00
Congested motorway	80	0.15
Toll motorway (rural)	112	2.00
Toll motorway (urban)	85	3.00
Toll motorway (metropolitan)	80	3.00
Toll dual carriageway (rural)	100	2.00
Toll dual carriageway (urban)	70	3.00
Toll dual carriageway (metropolitan)	55	3.00
Toll A road (rural)	85	3.00
Toll A road (urban)	55	4.00
Toll A road (metropolitan)	36	4.00
Toll B/unclassified road (rural)	65	4.00
Toll B/unclassified road (urban)	45	5.00
Toll B/unclassified road (metropolitan)	30	5.00
Motorway under construction	112	0.00
Dual carriageway under construction	90	0.10
A road under construction	78	0.10
B/unclassified road under construction	58	0.10
Dual carriageway in congestion zone	52	0.80
A road in congestion zone	37	0.80
Dual carriageway bordering congestion zone	37	1.50
A road bordering congestion zone	24	1.50

Source: Department for Transport/CACI.

4. The CACI analysis uses the same methodology as was relied upon by the CC in the 2003 Safeway inquiry, albeit with improved road network and recalibrated speed to reflect changes in traffic and congestion in the intervening years.
5. Differences with other analyses undertaken by third parties can sometimes be attributed to how road speeds are calibrated and what roads are used. For instance, CACI told us that some did not include B/unclassified roads in their networks. For comparison, Tables 2 and 3 show how the speeds differ for 'off-peak' and 'peak time'.

TABLE 2 Off-peak road speed assumptions, by road type

<i>Road description</i>	<i>Road speed kmh</i>	<i>Junction delay mins</i>
Motorway (rural)	112	0.00
Motorway (urban)	94	0.00
Motorway (metropolitan)	70	0.10
Dual carriageway (rural)	99	0.05
Dual carriageway (urban)	72	0.13
Dual carriageway (metropolitan)	48	0.38

Source: Department for Transport/CACI.

TABLE 3 Peak road speed assumptions, by road type

<i>Road description</i>	<i>Road speed kmh</i>	<i>Junction delay mins</i>
Motorway (rural)	84	0.00
Motorway (urban)	64	0.00
Motorway (metropolitan)	38	0.25
Dual carriageway (rural)	68	0.13
Dual carriageway (urban)	49	0.31
Dual carriageway (metropolitan)	29	0.94

Source: Department for Transport/CACI.
