

# **2011 Travel Times for Accessibility Statistics**

## **Quality Review**

**Working Paper 2**

**Version 1.0**

**28 May 2012**



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## 1.0 Introduction

- 1.1 This report describes the results of checks on the travel times for the 2011 DfT accessibility statistics DAS.
- 1.2 The quality control tasks seek to:
- Identify the potential for error
  - Clarify whether data/calculations are acceptable
  - Define what happens if quality criteria are not met
  - Ensure that confidence requirements for reporting are defined.
- 1.3 The potential for error arises from errors and inconsistencies in the input data and calculation and output of results. The input data checks are reported in Working Paper 1 – Review of Input Data.
- 1.4 Working Paper 2 covers the quality control checks on the calculation and output of results.
- 1.5 Table 1.1 shows the quality checks being undertaken.

**Table 1.1 – Quality Checks on Calculation and Reporting**

Step	Criteria for data acceptance	Action to achieve acceptance
1. Calculate shortest 10 travel times for 3 modes	Travel times in indicator results should be within 5 minutes of times calculated manually.	Undertake manual checks of travel times from COA centroids to nearest destinations. Three random COA to be checked for each trip purpose and each mode making a total of 72 manual checks
2. Check results against geography of England	Low travel times should only be in locations proximate to a service. Travel times should follow transport networks	Map journey times to nearest services. 24 maps to be prepared for England to highlight any potential problems
3. Check results against previous years	Report COA where travel times differ between 2010 and 2011 by more than 5 minutes AND 10%, or 10 minutes AND 20%.	Compare 24 results spreadsheets with equivalent results for 2010. Analyse differences and map the location of changes

## 2.0 Manual Checks on Travel Times

### Approach

- 2.1 In order to validate the DAS times, manual checks were made with the times output from the Department for Transport's Transport Direct website. Transport Direct uses broadly the same source data as the DAS, but calculates results for single journeys using its own routing algorithm.
- 2.2 Transport Direct (TD) provides journey times for cycle, car, and public transport journeys allowing comparisons to be made with the DAS results. However some points are of note:
- Cycle speeds can be input into TD using the same default value in the DAS. However TD automatically adjusts cycle speeds based on the gradient of the road which is not attempted in the DAS.
  - For public transport journeys, it is not possible to match all of the assumptions for walking and interchange options. Default TD settings were used, selecting a typical user and typical interchange times.
  - Transport direct calculates routes and times from selected locations. Census output area centroids are not generally locations that can be selected in TD, so unit postcode centroids were used for the origin location of the OA and the selected destination (school, shop etc.) was selected where available. The postcode centroid of the facility was used where the facility itself was not selectable. For the test locations the difference between the OA centroid and postcode centroid could account for a difference in journey time of up to 2 minutes.
  - For public transport journeys, arrival for Tuesday 9am was tested in TD, but, where the service frequencies were low, further comparisons throughout the day were undertaken to investigate whether or not the DAS fell within an acceptable range. The DAS are based on a representative time based on journey times throughout the day.
  - Transport Direct (TD) uses estimated traffic speeds based on the link type, rather than estimated road travel times from observed (Trafficmaster) data in the DAS. Some differences between the DAS and the TD results are therefore expected.
- 2.3 For each trip purpose and mode, the origin and destination locations were entered into the Transport Direct journey planner, to give estimated journey times for car, public transport and cycle trips for six destination types: primary school, secondary school, further education, GP, hospital, and food shop.
- 2.4 The results of the two calculation methods were then compared and discussed. 540 detailed comparisons of journeys were undertaken in

three parts of the country providing a detailed insight into where and when the DAS provide an accurate representation of travel times.

### **Locations Used for Verification**

2.5 Three random locations from around the country were chosen as starting points. In the dense urban areas most of the journeys are under 5 minutes by car and under 10 minutes by public transport so locations outwith the major cities were selected. The three selected locations were out of centre residential locations in:

- Penrith, Cumbria - COA centroid (reference 16UFHD0002) located at E351472, N531019. The centroid is located in the area between Monnington Street and Graham Street, in the northern part of Penrith town centre.
- Church Stretton, Shropshire - COA centroid (reference 39UFGP0006) located at E345438, N293232. The centroid lies between Bromleys Court and Crossways, near to the junction with Swain's Meadow
- Reading, Berkshire - COA centroid (reference 00MCMZ0002) located at E470416, N173006. The COA centroid lies where Maitland Road and Downshire Square meet, next to All Saints Junior School.

2.6 These locations were chosen to ensure that different public transport data collection regions were included with locations in the north, south and central areas of England.

### **Results**

2.7 Table 2.1 summarises the comparisons of times.

2.8 There are a substantial number of instances where Transport Direct (TD) provides people with very different travel times from the DAS. However in almost every case the investigations reported in Appendices A to C show that the DAS times appear to be more accurate than the TD results.

2.9 There are many reasons for discrepancies but key points are that:

- The road travel times can be substantially different, but the use of the Trafficmaster data in the DAS delivers much more accurate journey times.
- Competitive rail journey options are often not available from TD without specific settings being used to exclude bus journeys. The DAS seem to be able to select bus or rail journeys whichever is faster.

Table 2.1 – Comparison of Transport Direct and DAS Times

	All Times in Minutes					
	Car		PT		Cycle	
	TD	DAS	TD	DAS	TD	DAS
<b>Penrith</b>						
FE	6	5	18	16	6	6
Food	4	5	19	15	4	4
Primary School	3	5	15	5	2	5
Secondary School	6	5	17	18	7	6
GP	6	6	15	24	8	8
Hospitals	6	6	16	24	8	8
<b>Church Stretton</b>						
FE	18	14	30	37	50	52
Food	2	5	8	7	4	5
Primary School	3	5	14	14	5	4
Secondary School	3	5	14	14	5	4
GP	2	5	11	10	3	5
Hospitals	23	25	60	50	81	-
<b>Reading</b>						
FE	6	5	11	10	6	5
Food	5	5	5	5	1	5
Primary School	0	5	0	5	0	5
Secondary School	6	5	18	10	6	5
GP	4	5	11	10	3	5
Hospitals	6	4	15	10	11	9

#### Car Journey Times

- 2.10 A minimum journey time by car of 5 minutes was given in the DAS analysis, since below this level the statistics cannot be assumed to be an accurate representation of journey times. Times of less than 5 minutes from TD are reported but differences from the minimum of 5 in DAS are not then viewed as relevant to the QA analysis.

#### Public Transport Journey Times

- 2.11 It was impractical to check TD for all 23 times of day in the DAS but when comparing the results daily timetables were inspected. In nearly every case the differences between TD and the DAS is consistent with the variations in PT times throughout the day.

#### Cycle Journey Times

- 2.12 The cycle times generally correlate well between the TD results and the DAS analysis. However there are some discrepancies largely for longer journeys. It seems that the ability of TD to modify cycle speeds based on the gradient of the road network may be leading to more accurate journey times, but, further work would be needed to modify the DAS algorithms to include this sort of functionality.

### 3.0 Observational Checks

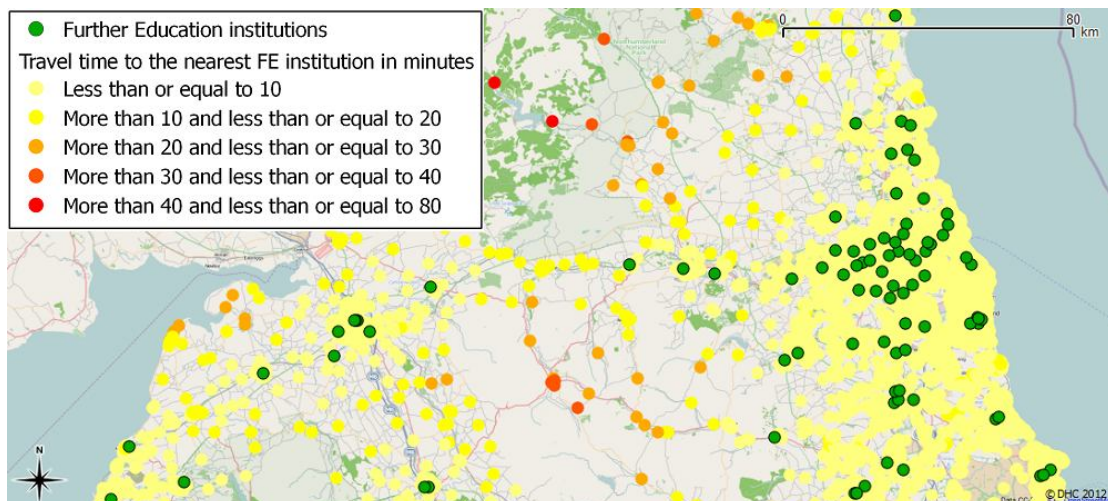
3.1 In order to observe how DAS data matches geographical features, the travel times for each trip purpose and mode have been mapped. Two types of maps have been prepared:

- Maps of journey times to nearest services - 24 maps for England with a selection of local areas shown to illustrate compliance with the criteria
- Maps showing apparent non-compliance issues.

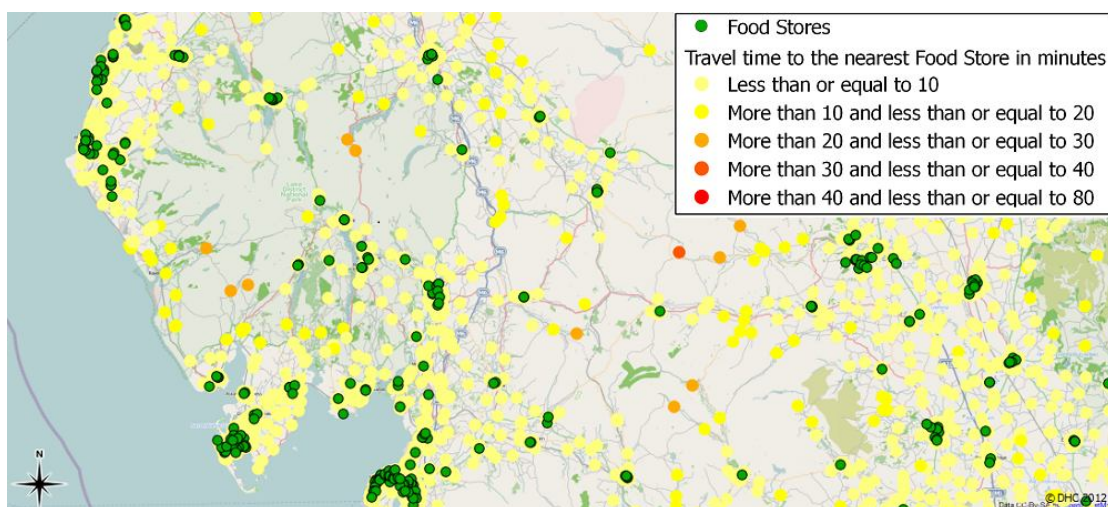
#### Car

3.2 For each trip purpose, the car travel times to the nearest provider have been mapped. Figures 3.1 to 3.8 show the travel times by trip purpose. The travel times increase logically from the destination locations across most of the country.

**Figure 3.1 – Compliance of the data for Travel Times to Further Education by Car, Newcastle/Carlisle area**

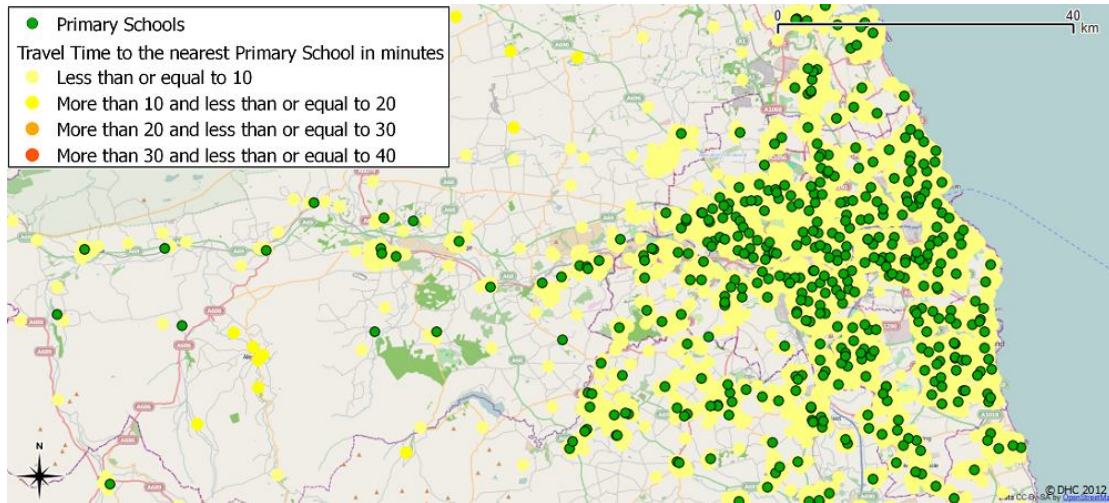


**Figure 3.2 - Compliance with the data for Travel Times to Food Stores by Car, Cumbria**

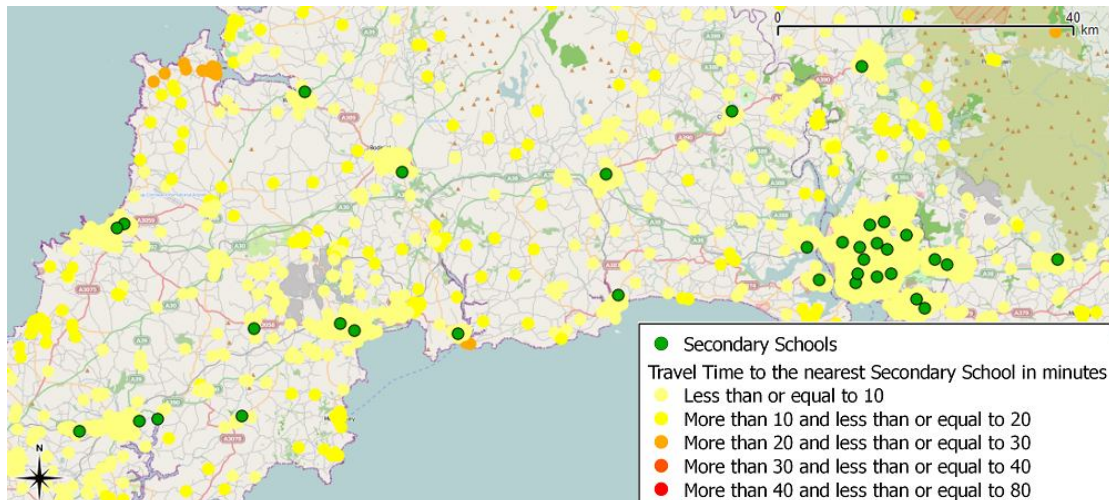




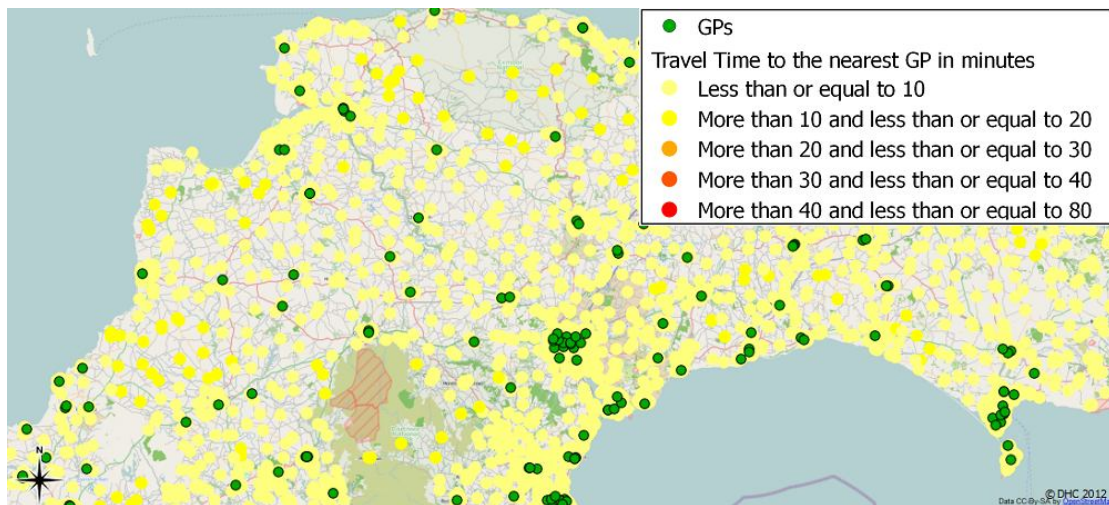
**Figure 3.3 - Compliance with the data for Travel Times to Primary Schools by Car, Tyne and Wear and South Northumbreland**



**Figure 3.4 - Compliance with the data for Travel Times to Secondary Schools by Car, Cornwall**

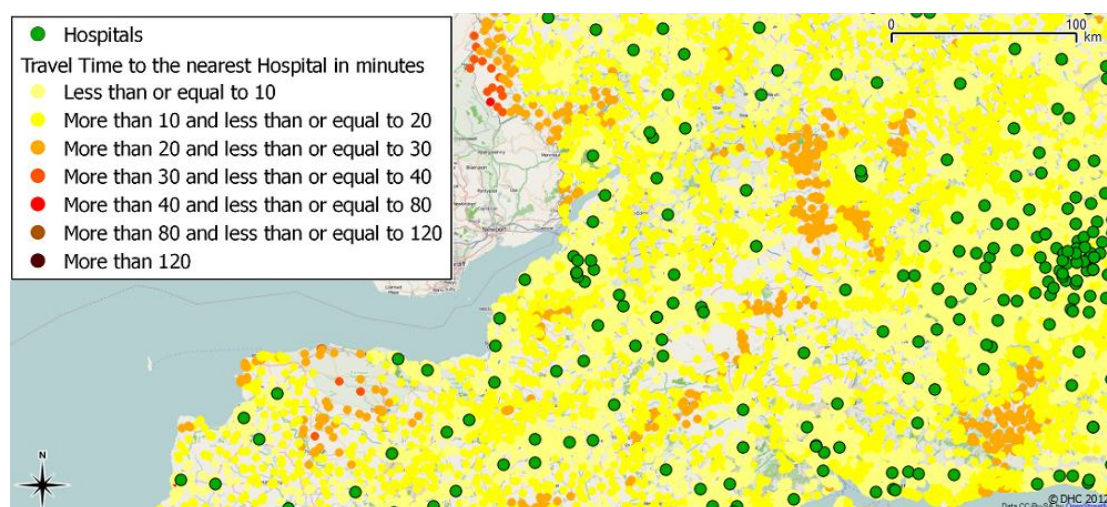


**Figure 3.5 - Compliance with the data for Travel Times to GPs by Car, Devon**

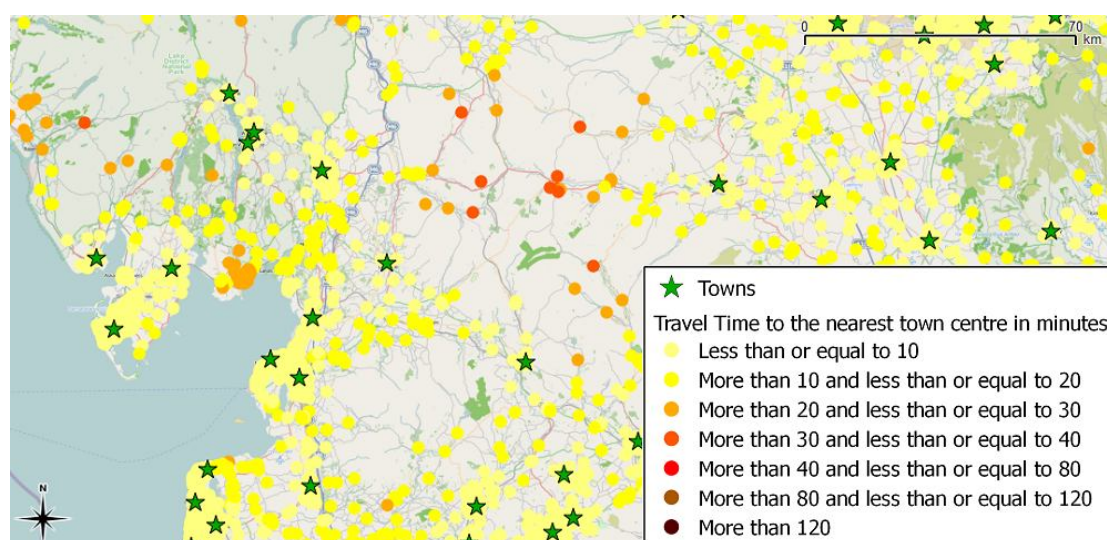




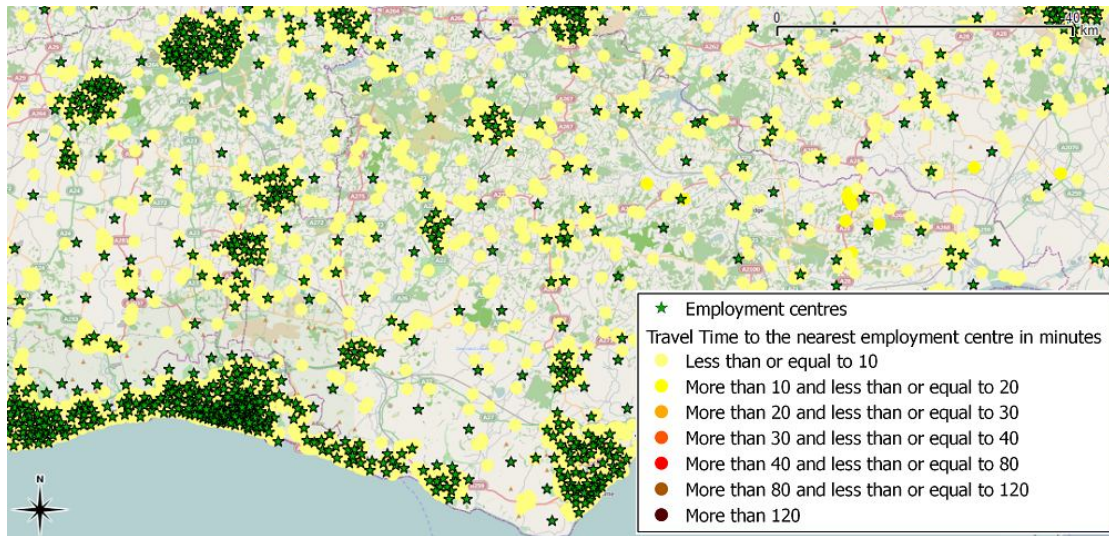
**Figure 3.6 – Compliance with the data for Travel Times to Hospitals by Car, West of England**



**Figure 3.7 - Compliance with the data for Travel Times to Towns by Car, Yorkshire Dales**



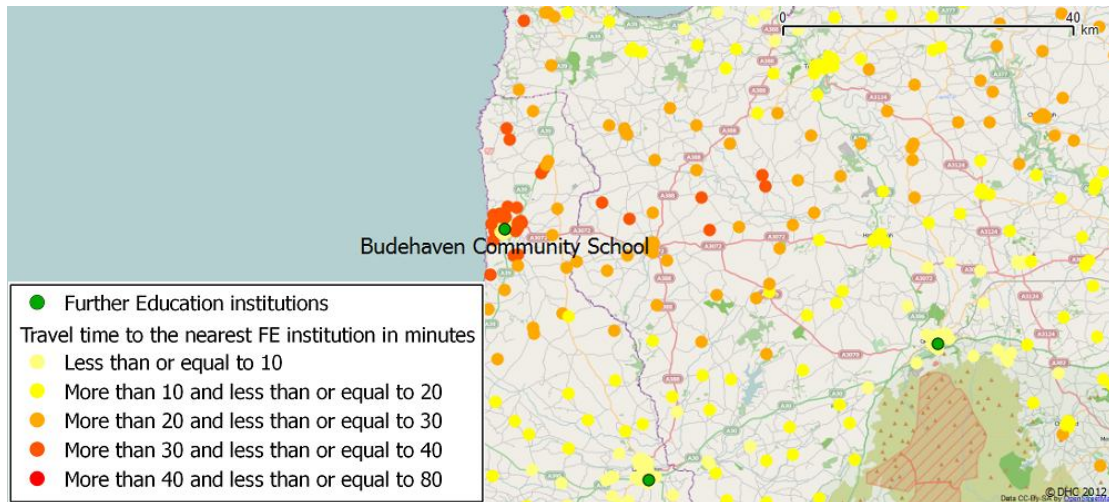
**Figure 3.8 - Compliance with the data for Travel Times to Employment by Car, East Sussex**



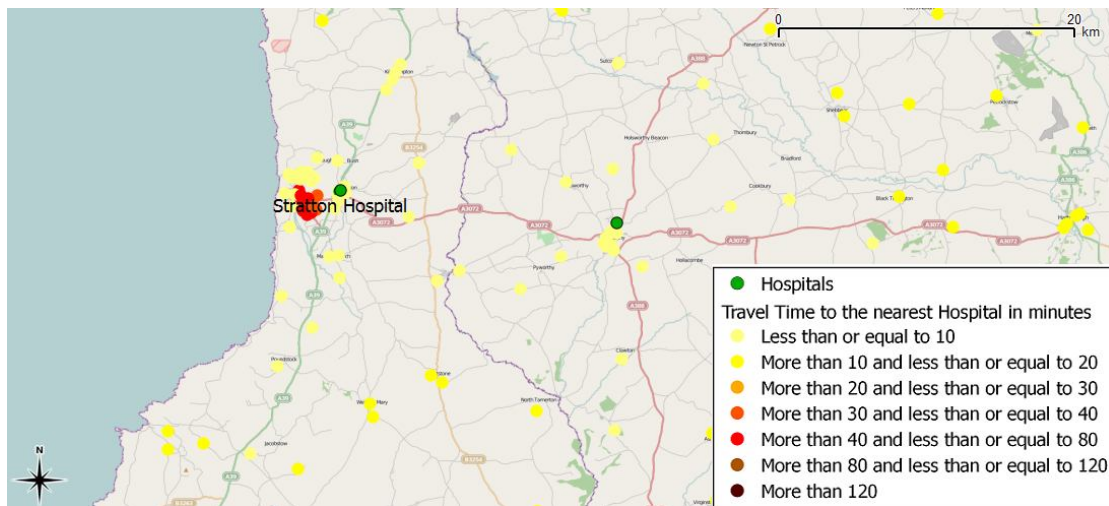
- 3.3 Although there is general compliance for all trip purposes there appear to be some errors in north Cornwall. These errors probably have some impact on all trip purposes but are only clearly visible for Further Education and Hospital as shown in Figures 3.9 and 3.10.
- 3.4 Further examination suggests that there are some unrealistically slow journeys taking place in this location. This is most likely to be related to a data error in the Trafficmaster data or a discontinuity in the ITN road network data, or a combination of both. There are likely to be very few tracked vehicle movements in this part of the network, so it is possible that the Trafficmaster data is inaccurate since tracked vehicles have been stopping to deliver goods or have parked for a short time.
- 3.5 Given that this is a local problem it is not possible to correct the analysis methodology to fix this problem. However before publication the travel times should be replaced. One option would be to replace the journey times by car in north Cornwall with journey times that are about 5 times the cycle time to give a better approximation to the actual drive time.



**Figure 3.9 – Apparent Error in Travel times to Further Education, Bude area, Cornwall**



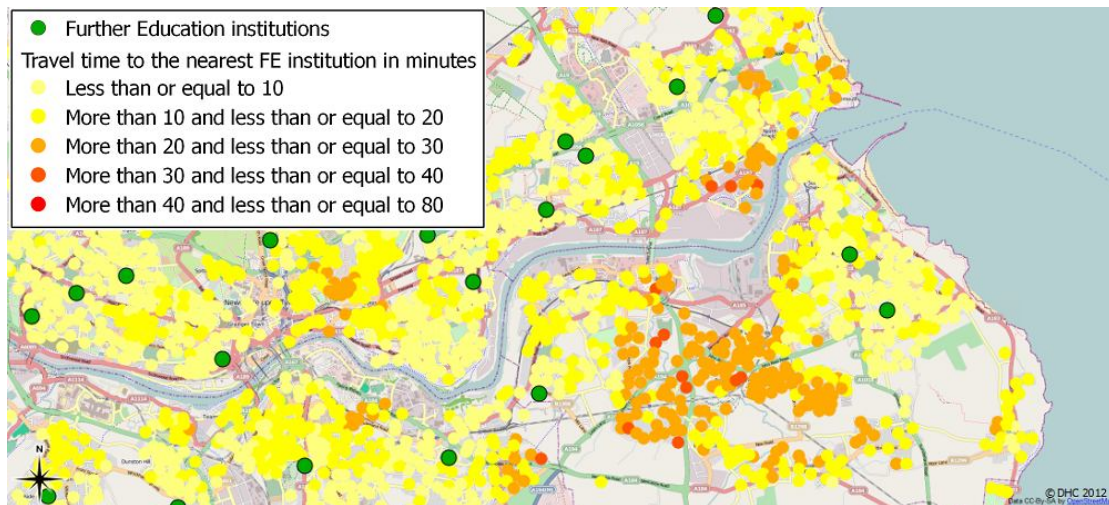
**Figure 3.10 – Apparent Error in Travel times to Hospitals, Bude area, Cornwall**



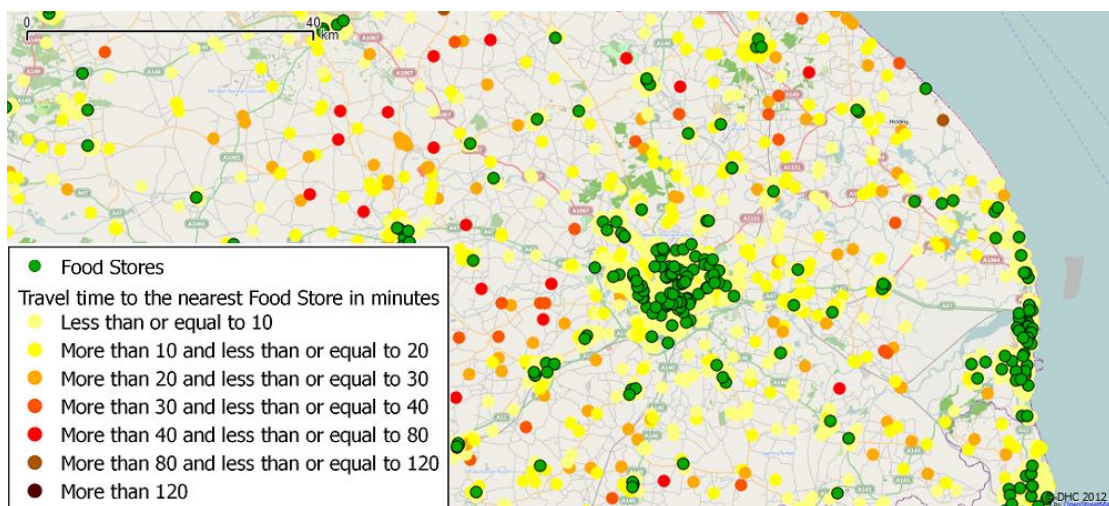
### Public Transport

- 3.6 Travel times by public transport also match geographical features. There is general compliance for all trip purposes as shown in Figures 3.11 to 3.18.

**Figure 3.11 – Compliance with the data for Travel Times to Further Education, Newcastle**

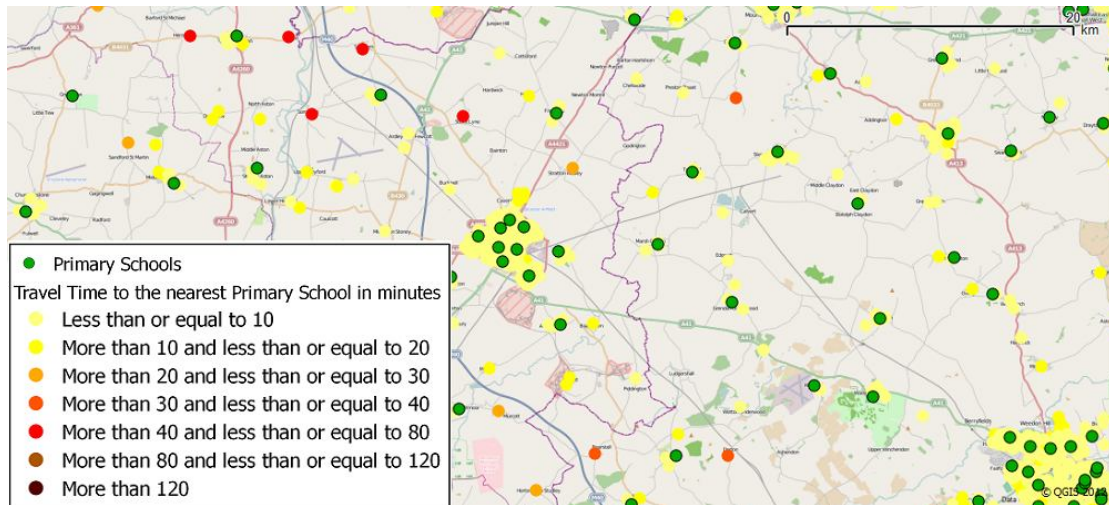


**Figure 3.12 – Compliance with the data for Travel Times to Food Stores by Public Transport, Norwich area**





**Figure 3.13 – Compliance with the data for Travel Times to Primary School by Public Transport, Bicester, Oxfordshire**



**Figure 3.14 - Compliance with the data for Travel Times to Secondary School by Public Transport, Cambridge**

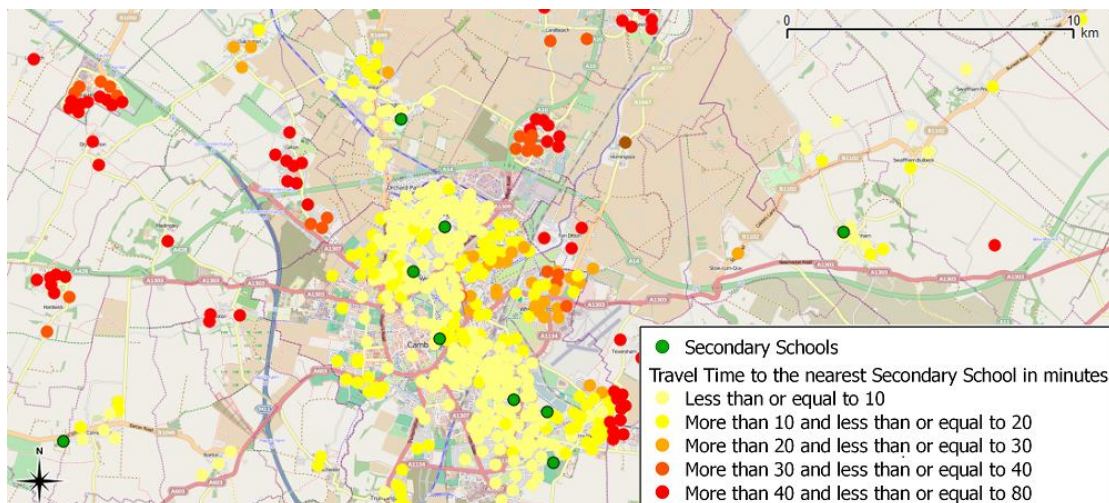




Figure 3.15 - Compliance with the data for Travel Times to GPs by Public Transport, West Midlands

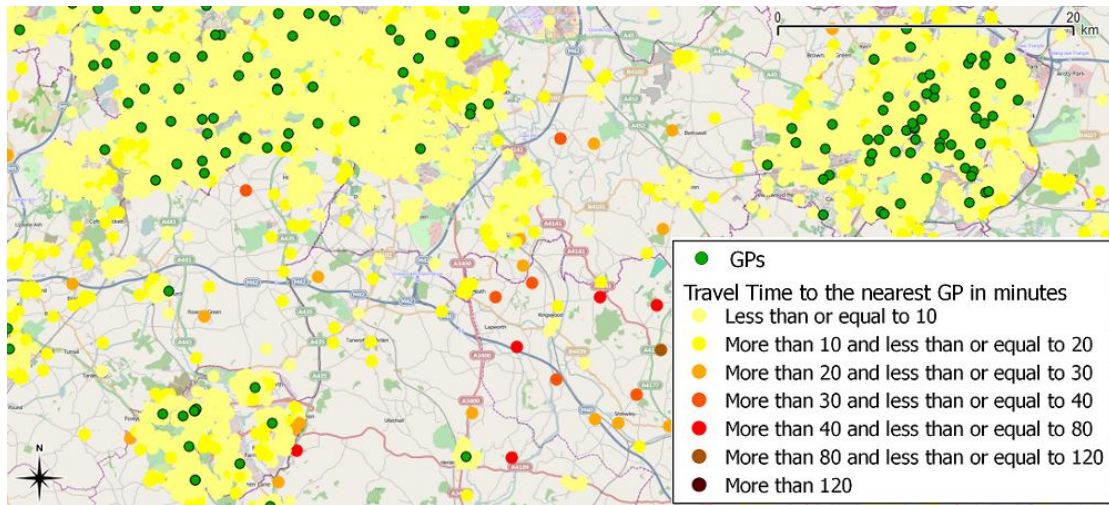


Figure 3.16 - Compliance with the data for Travel Times to Hospitals by Public Transport, West Midlands

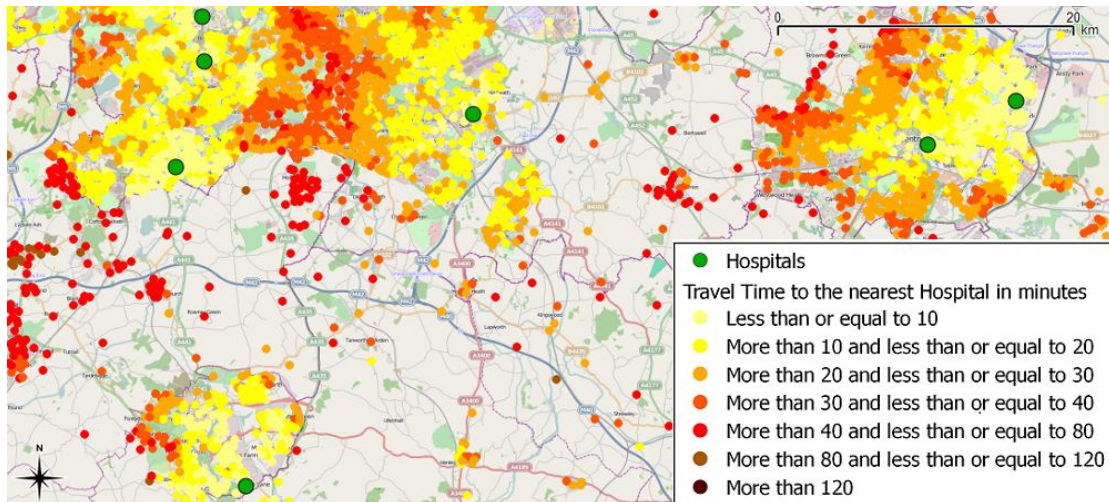
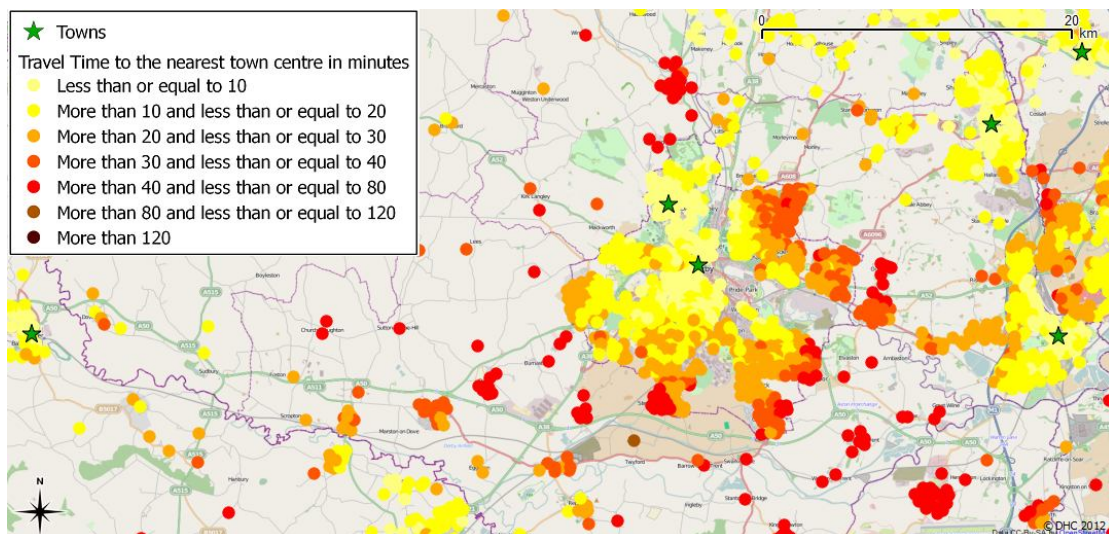
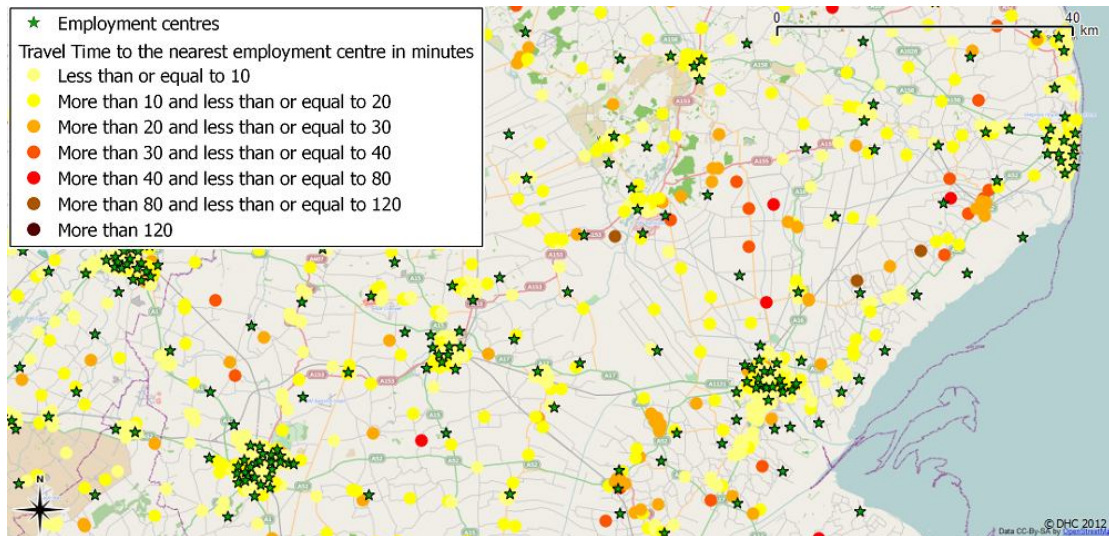


Figure 3.17 - Compliance with the data for Travel Times to Town centres by Public Transport, Derby



**Figure 3.18 - Compliance with the data for Travel Times to Employment centres by Public Transport, Lincolnshire**



- 3.7 There are a number of local places where journey times do not comply fully with what might be expected. Figures 3.19 to 3.21 show these instances of non-compliance.
- 3.8 In the town of King's Lynn there are areas located within 1.2 km of the destination shown as with more than 30 minutes travel time to FE. The DAS results should allow walking for shorter distances like this. A similar problem is observed in Ipswich with the DAS output showing 20-30 minute journeys within 1.2 km. This implies an error of at least 5 minutes in the results.
- 3.9 The routing algorithm should keep building paths out from key public transport nodes to more minor nodes until no better route can be found. The error in this approach is rarely more than 2 to 3 minutes. However in these rare locations, it seems that the analysis has built paths through public transport nodes and stopped searching for new routes. As a result it has missed some local walk journeys with resulting errors of more than 5 minutes for a few output areas. The analysis covers the whole country and increasing the sensitivity of the search dramatically affects the runtimes. There is therefore no easy automated solution to this problem.
- 3.10 Given that these are not locations where there is likely to be any real concern about access to services it is recommended that these errors are accepted, but notes added when the statistics are published highlighting that in a very few locations walk journeys of less than 1.2Km may not have been identified correctly, with the analysis showing instead the shortest public transport journey.
- 3.11 A more important problem is also shown in Figure 3.22. The digital networks do not allow pedestrians to cross the A50 dual carriageway road in Leicester. The COA centroids located south to Leicester Firth Hospital and Glenfield Hospital are shown as having 40 minutes travel time to the nearest hospital. The analysis appears to correctly identify



the public transport solutions, but walk journeys have not been identified for COA within 1.2 km of the hospital. Since the A50 is a dual carriageway with few formal crossing points, it seems the analysis has not allowed pedestrians to cross via the central reservation but this is not an accurate reflection of real behaviour. Aerial photography shows worn areas of grass on the central reservation where people are crossing the road. It is therefore incorrect to show these COA as having travel times of 40 minutes when they are in many cases less than 15 minutes walk from the hospitals.

- 3.12 Simply seeking to undertake manual corrections for these identified errors could distort the DAS since these extreme situations show a type of situation across the country where the statistics will not always reflect reality. Perhaps the easiest way to resolve this issue would be to add a crow flies distance to the DAS. Where users find that the travel times seem very long compared with a short crow flies distance then users of the statistics could be recommended to check that the barriers causing the high travel times (a river, motorway, dual carriageway, etc.) is being correctly represented.

**Figure 3.19 - Apparent Error in Travel times to Further Education, King's Lynn, East Anglia**

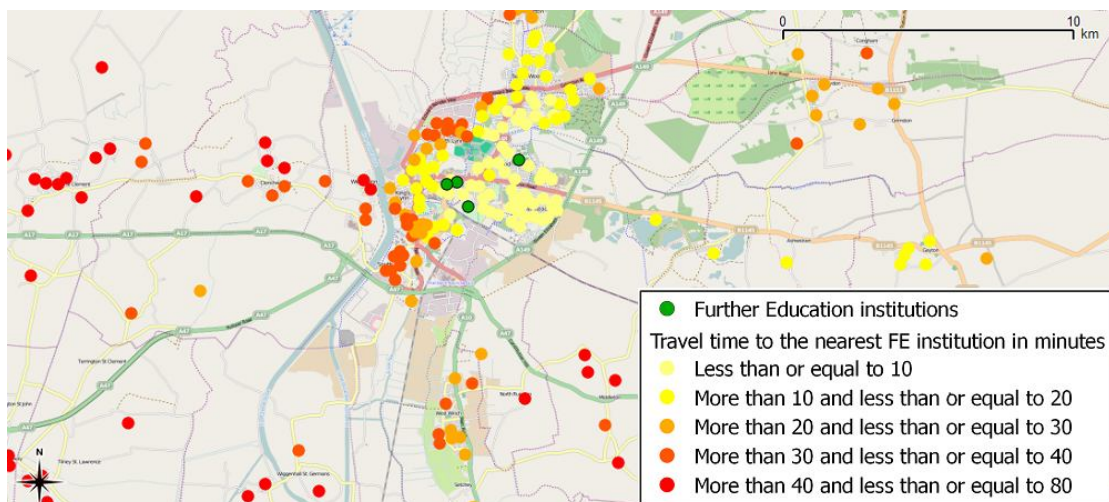


Figure 3.20 - Apparent Error in Travel times to Further Education, Ipswich, Suffolk

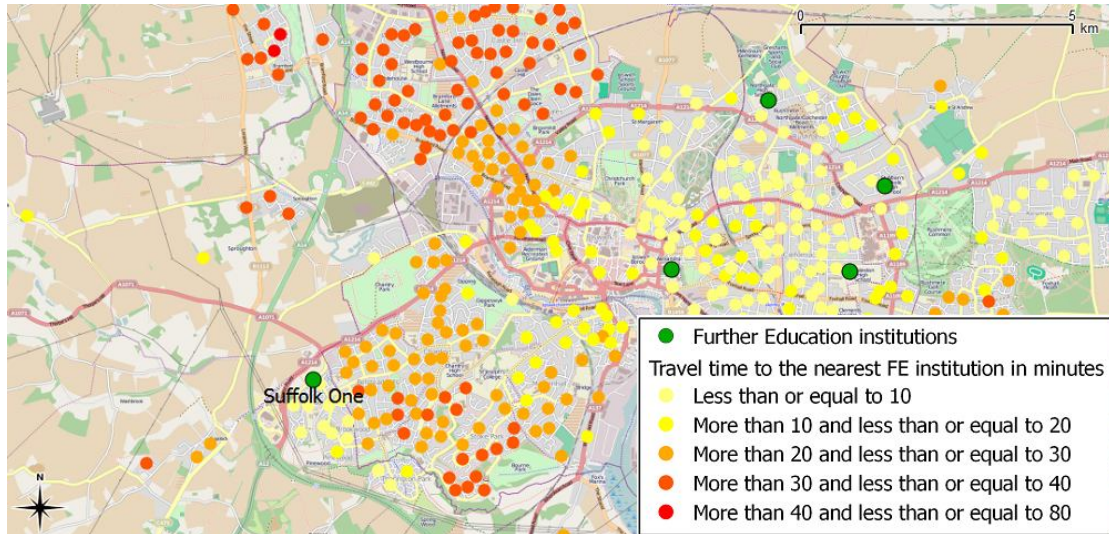


Figure 3.21 - Apparent Error in Travel times to Secondary Schools, Newton Pagnell, Milton Keynes

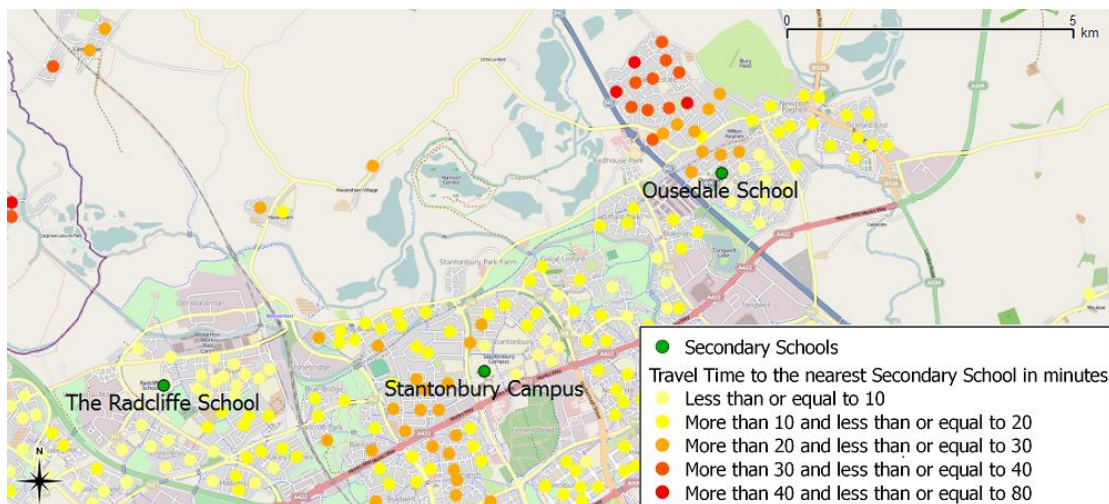
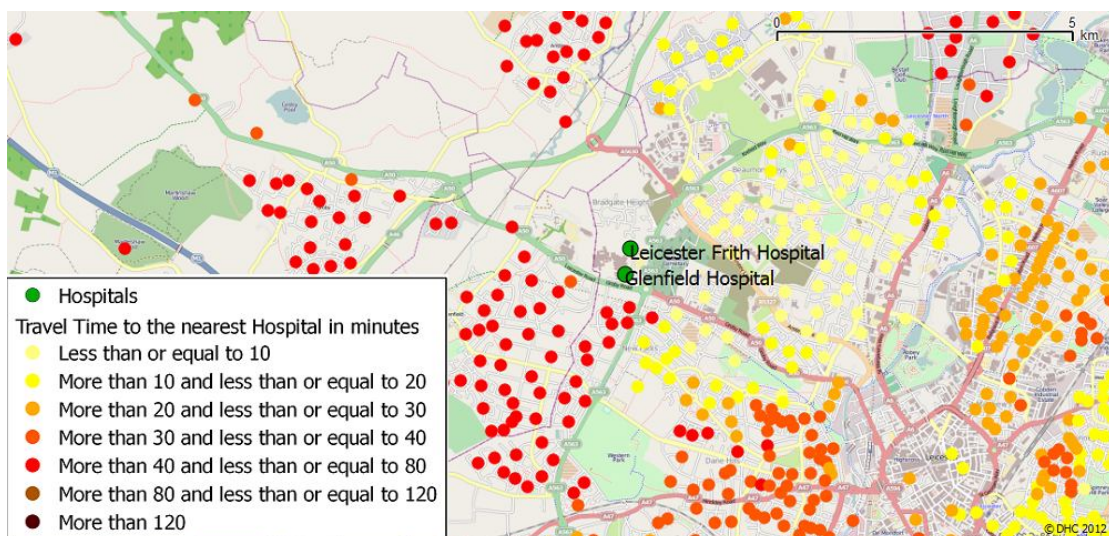


Figure 3.22 - Apparent Error in Travel Times to Hospitals, Leicester

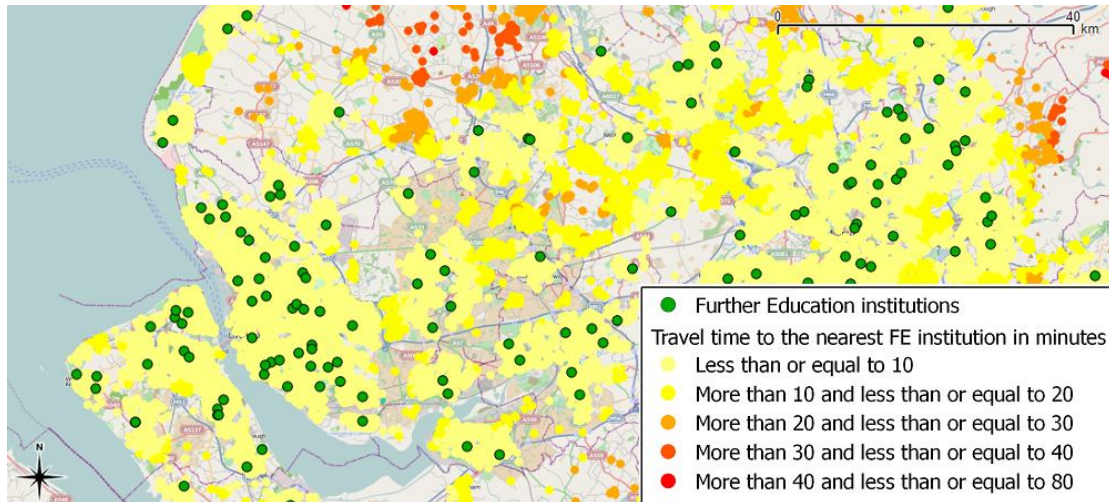




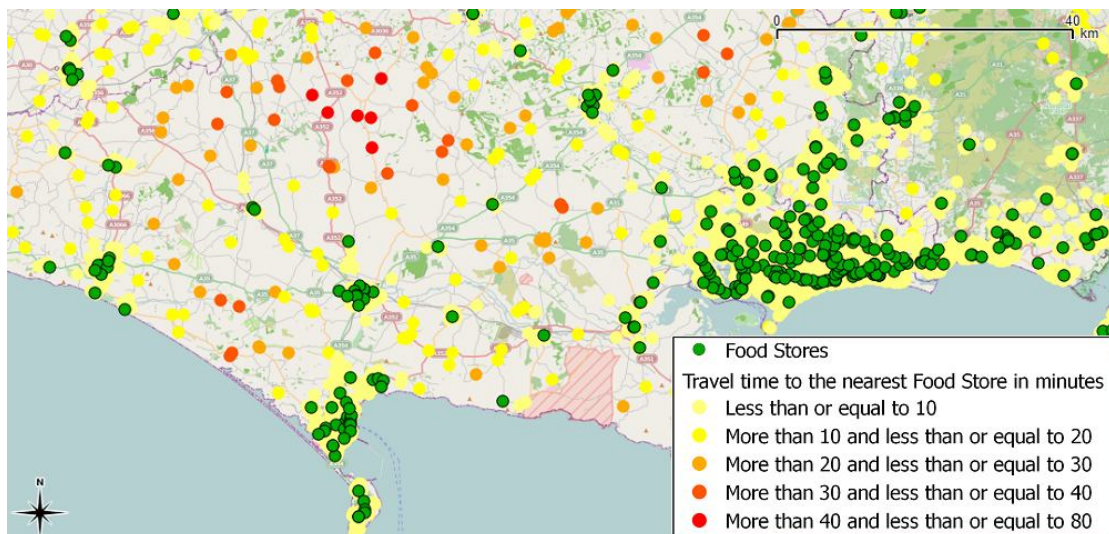
## Cycling

- 3.13 Good compliance of geographical features with the data from the DAS has been noted for the all types of destinations. No noticeable discrepancies are apparent as shown in Figures 3.23 to 3.30.

**Figure 3.23 - Compliance with the data for Travel Times to Further Education by Cycling – Liverpool/Manchester Area**

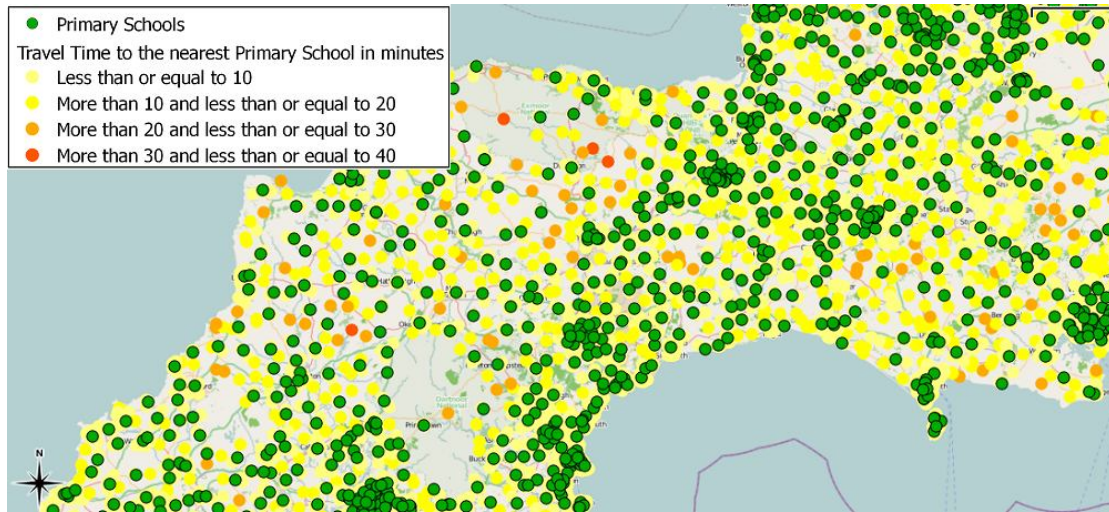


**Figure 3.24 - Compliance with the data for Travel Times to Food Stores by Cycling – Weymouth/Bournemouth**





**Figure 3.25 - Compliance with the data for Travel Times to Primary Schools by Cycling – Cornwall/Devon**



**Figure 3.26 - Compliance with the data for Travel Times to Secondary Schools by Cycling – York**

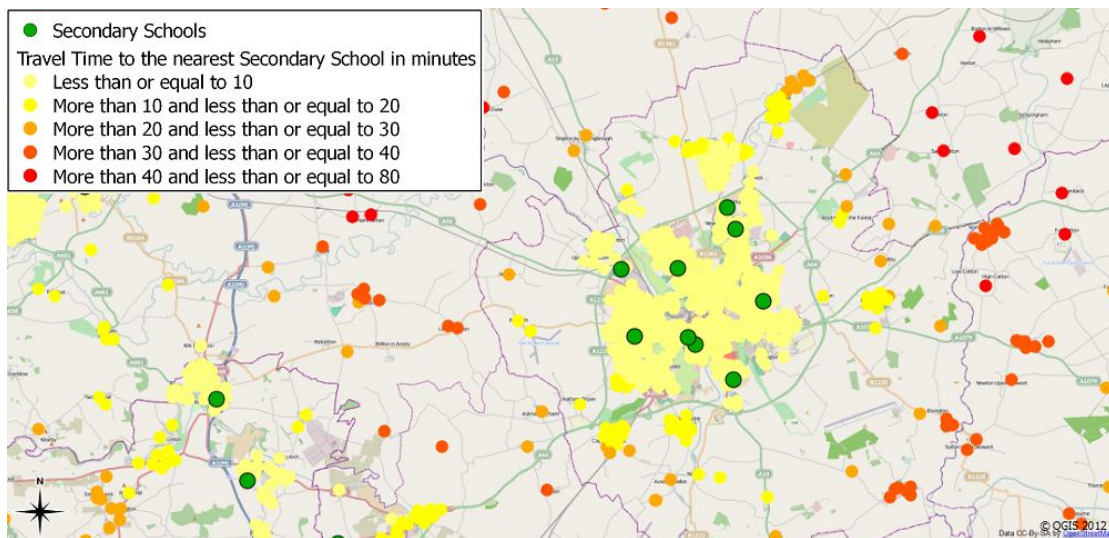


Figure 3.27 - Compliance with the data for Travel Times to GP by Cycling – Lincolnshire

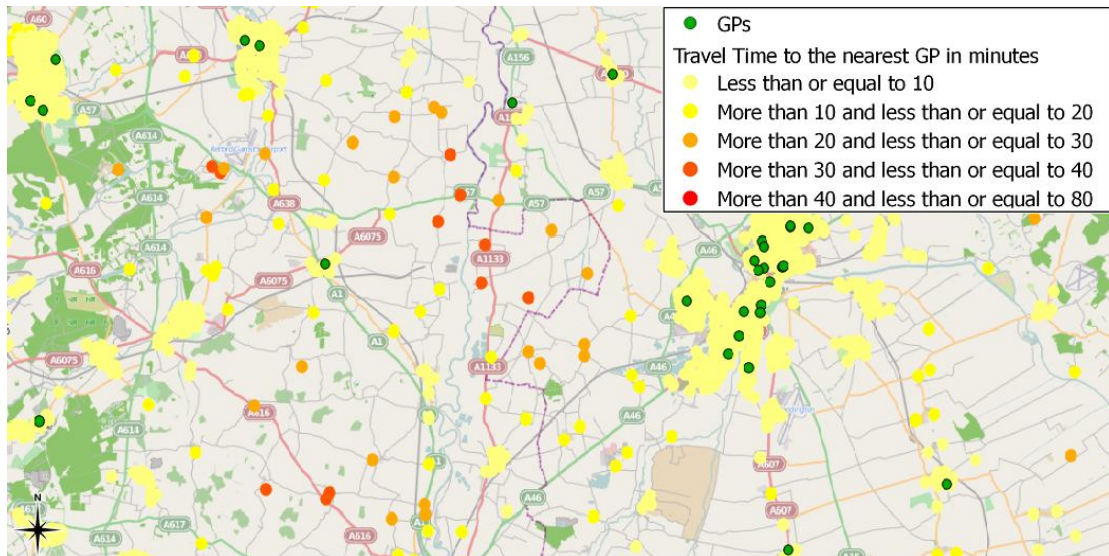
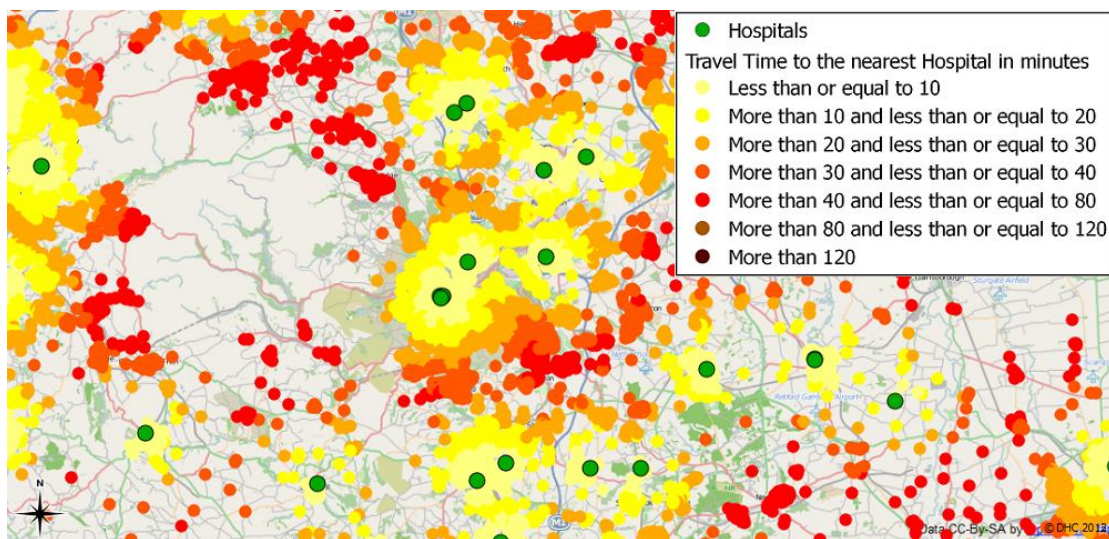
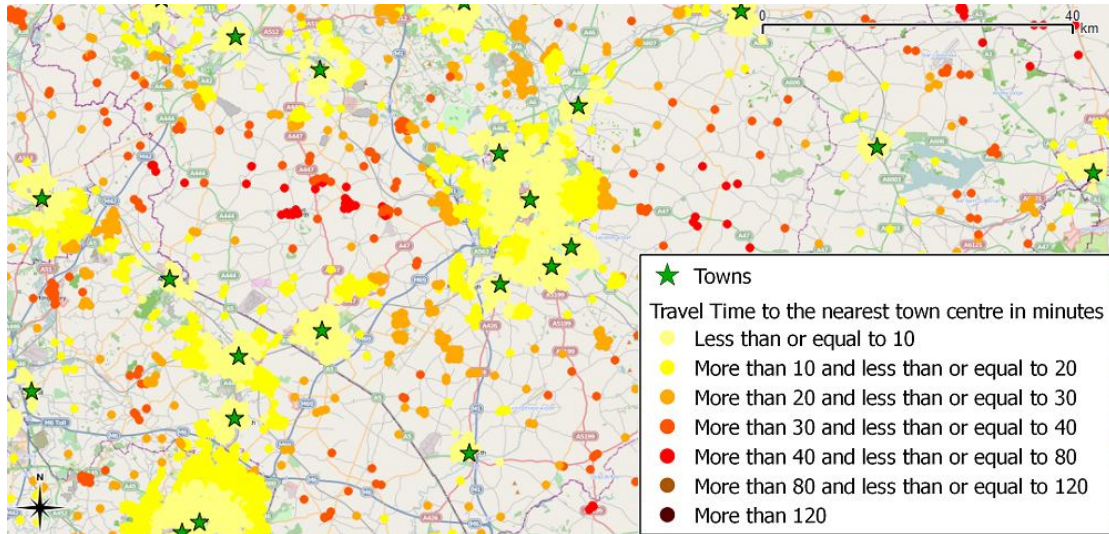


Figure 3.28 - Compliance with the data for Travel Times to Hospitals by Cycling – Sheffield

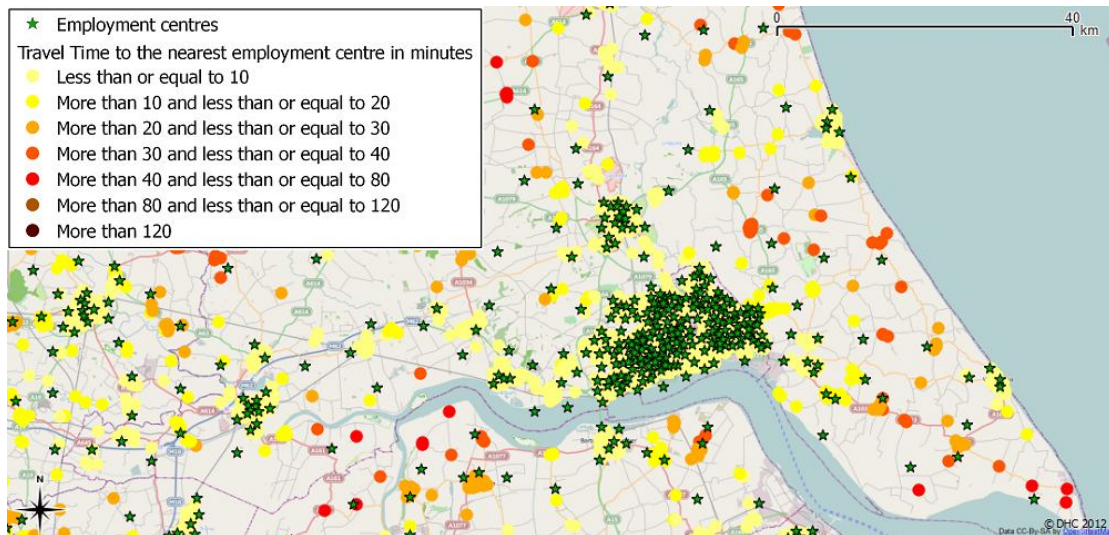




**Figure 3.29 - Compliance with the data for Travel Times to Town Centres by Cycling – Leicestershire**



**Figure 3.30 - Compliance with the data for Travel Times to Employment centres by Cycling, Kingston upon Hull**



## 4.0 Comparison with 2010

- 4.1 The travel times calculated for the 2011 data have been compared with the 2010 travel times. The numbers of COA experiencing larger changes in travel times are reported in Tables 4.1 to 4.3. For COA where larger differences have been observed, these have been mapped to check the locations.

### Car

- 4.2 For car, Table 4.1 shows a summary of the total number of COAs with larger travel time changes between the 2010 and 2011 data.

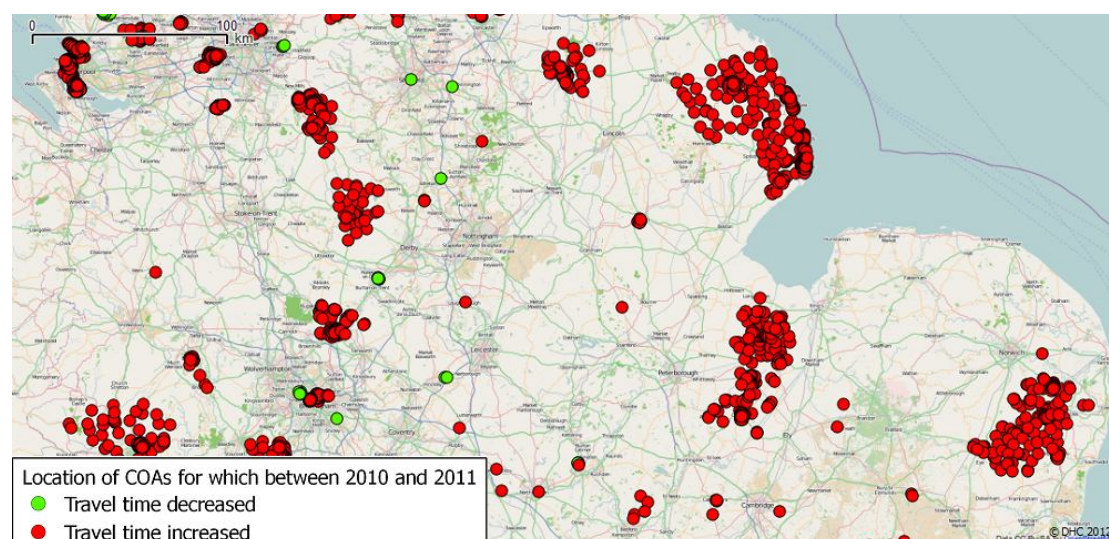
**Table 4.1: COAs where Car travel time has changed by more than 5 minutes  
AND by more than 10% and 20%**

Destination Type	Total COAs where Travel time changed by more than 5 minutes and more than 10%	Total COAs where Travel time changed by more than 5 minutes and more than 20%	Total COAs where Travel time changed by more than 5 minutes and more than 50%	% of COA where Travel time changed by more than 5 minutes and more than 10%	% of COA where Travel time changed by more than 5 minutes and more than 20%	% of COA where Travel time changed by more than 5 minutes and more than 50%
Employment 1	215	215	208	0.13	0.13	0.12
Employment 2	460	460	444	0.28	0.28	0.27
Employment 3	7388	7080	5058	4.46	4.27	3.05
Further Education	1110	1110	1044	0.67	0.67	0.63
Food Stores	283	283	278	0.17	0.17	0.17
General Practices (GP)	310	310	301	0.19	0.19	0.18
Hospitals	6984	6979	6170	4.22	4.22	3.73
Primary Schools	106	106	106	0.06	0.06	0.06
Secondary Schools	549	549	525	0.33	0.33	0.32
Town Locations	819	818	721	0.49	0.49	0.44

- 4.3 This is a very low level of change overall indicating a high degree of stability in the accessibility statistics for most trip purposes even in the current economic climate.
- 4.4 Figure 4.1 shows that, as would be expected, the COAs with the greatest change are clustered. Further analysis shows that the largest changes are where hospitals have moved or closed. The COAs where travel times have decreased are largely away from major centres and located near motorways and main roads where there could have been improvements like new road junctions.

- 4.5 There is no suggestion from these checks that the statistics should not be compliant.

**Figure 4.1 - Location of COAs where car travel times to Hospitals changed by more than 5 minutes and more than 50% between 2010 and 2011, Midlands**





## Cycle

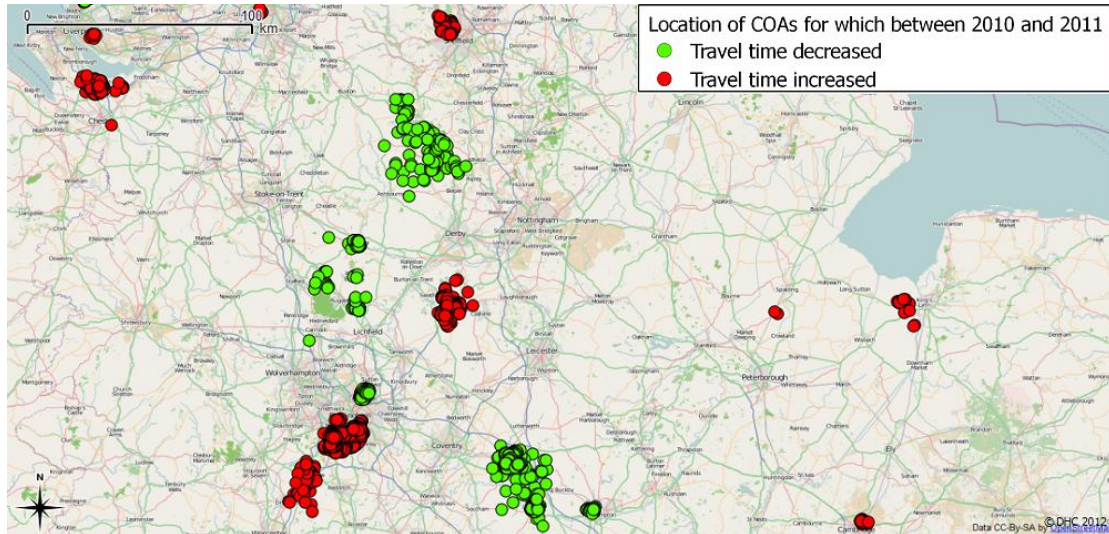
- 4.6 For cycle, Table 4.2 shows a summary of the total number of COAs with larger travel time changes between the 2010 and 2011 data.

**Table 4.2: COAs where cycle travel time has changed by more than 5 minutes AND by more than 10% and 20%**

Destination Type	Total COAs where Travel time changed by more than 5 minutes and more than 10%	Total COAs where Travel time changed by more than 5 minutes and more than 20%	Total COAs where Travel time changed by more than 5 minutes and more than 50%	% of COA where Travel time changed by more than 5 minutes and more than 10%	% of COA where Travel time changed by more than 5 minutes and more than 20%	% of COA where Travel time changed by more than 5 minutes and more than 50%
Employment 1	1786	1781	1590	1.08	1.08	0.96
Employment 2	3601	3560	3029	2.17	2.15	1.83
Employment 3	9918	9365	6455	6.72	6.35	4.37
Further Education	2657	2589	2149	1.61	1.57	1.30
Food Stores	1614	1600	1313	0.97	0.97	0.80
General Practices (GP)	2161	2153	1946	1.30	1.30	1.17
Hospitals	11328	10966	9044	7.10	6.87	5.67
Primary Schools	197	196	184	0.11	0.11	0.11
Secondary Schools	778	772	697	0.47	0.47	0.42
Town Locations	0	0	0	0.00	0.00	0.00

- 4.7 As might be expected the Town locations have not changed and the cycle routes have not changed but the destination location changes have impacted on the statistics for some other trip purposes. As shown in Figure 4.2 these are highly clustered around the locations where the destinations have changed.

**Figure 4.2 - Location of COAs where cycling travel times to Large Employment Centres (Employment3) have changed by more than 5 minutes and more than 50% between 2010 and 2011, Midlands**



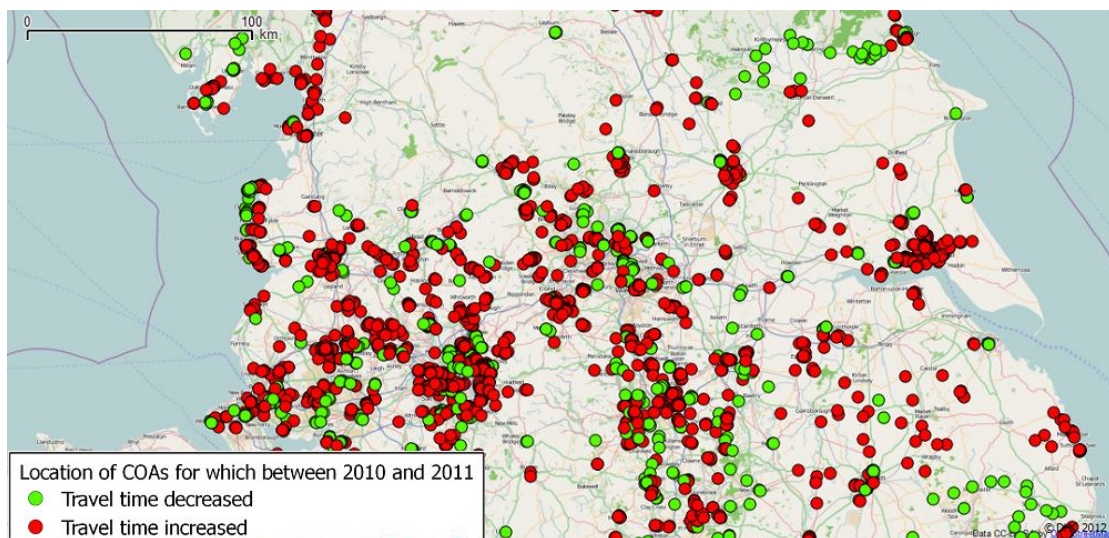
### **Public transport**

- 4.8 For public transport, Table 4.3 shows a summary of the total number of COAs with larger travel time changes between the 2010 and 2011 data. As might be expected the public transport changes reflect a complex picture with restructuring of local bus networks being evident in some locations.
- 4.9 The greatest increases in journey times have been for trip to hospitals perhaps reflecting the fact that many of these services were dependent on public funding and the greatest reductions in journey times have been for employment reflecting changes in the bus network to focus on profitable commuter services.
- 4.10 Figure 4.3 shows that the changes are scattered, so must be more dependent on changes in public transport networks than for cycle and car travel where the changes depend much more on the locations of facilities. However clustering is still evident around locations where destinations have changed.
- 4.11 Overall there is no indication of non compliance within the DAS statistics, with the vast majority of travel times changing very little between 2010 and 2011.

**Table 4.3: COAs where public transport travel time has changed by more than 5 minutes AND by more than 10% and 20%**

Destination Type	Total COAs where Travel time changed by more than 5 minutes and more than 10%	Total COAs where Travel time changed by more than 5 minutes and more than 20%	Total COAs where Travel time changed by more than 5 minutes and more than 50%	% of COA where Travel time changed by more than 5 minutes and more than 10%	% of COA where Travel time changed by more than 5 minutes and more than 20%	% of COA where Travel time changed by more than 5 minutes and more than 50%
Employment 1	9628	9542	8423	5.69	5.64	4.98
Employment 2	12447	12287	10005	7.34	7.25	5.91
Employment 3	30431	23709	11457	18.65	14.52	7.02
Further Education	15086	13614	6832	8.93	8.05	4.04
Food Stores	8173	8092	6929	4.82	4.77	4.08
General Practices (GP)	8660	8576	7102	5.12	5.07	4.20
Hospitals	36160	29919	15677	21.73	17.98	9.42
Primary Schools	2031	2005	1596	1.20	1.19	0.94
Secondary Schools	11218	10655	5917	6.67	6.34	3.52
Town Locations	13414	12077	5887	7.99	7.19	3.50

**Figure 4.3 - Location of COAs where PT travel times to nearest Employment changed by more than 5 minutes and more than 50% between 2010 and 2011, Liverpool/Yorkshire**



## **5.0 Conclusions and Recommendations**

5.1 The DAS as supplied to DfT should be suitable for publication subject to the following qualifications:

- There are a number of instances where the public transport journeys shown are incorrect as people are able to make shorter journeys by walking. A correction could be made to the indicators so that the PT time was never more than twice the cycle time for cycle journeys up to 5 minutes. This would ensure that the cycle and PT results were more consistent.
- A manual adjustment should be made to the car travel times for all trip purposes in the Bude area of North Cornwall to five times the cycle time. It appears that the Trafficmaster data misrepresents the car travel times.

5.2 The notes accompanying the publication of the statistics should explain that:

- The minimum walk, cycle and car travel times are 5 minutes since journey times below this may not have been calculated accurately using a COA zoning system. A 5 minute statistic simply represents a short journey and actual journey times may be lower.
- There are some walk journeys of up to 1.2km which may be possible but which are not identified in the analysis. This may lead to errors of 5 to 10 minutes in these relatively short trips in a few locations.

## 6.0 Appendix A – Comparison of DAS and TD in Penrith, Cumbria

- 6.1 Each journey time output by the Core Accessibility Indicators analysis has been manually checked for quality assurance purposes using the Transport Direct website ([www.transportdirect.info](http://www.transportdirect.info)). Where large discrepancies have arisen, these have been checked using Google Maps ([maps.google.com](http://maps.google.com)) and Bing (<http://www.bing.com/maps/>) to confirm journey times and establish which time is most likely for the given route.

### **Further Education**

- 6.2 Tables A.1, A.2 and A.3 give a comparison of the journey times for trips from the COA centroid location in Penrith to the closest (by travel time) further education establishments by car, public transport and cycling respectively.

**Table A.1 Penrith Further Education Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Queen Elizabeth Grammar School	CA11 7EG	6	5
Ullswater Community College	CA11 8NG	7	5
Appleby Grammar School	CA16 6XU	24	19
Richard Rose Central Academy	CA1 3SL	28	20
Newman Catholic School	CA1 1NA	27	23

- 6.3 Discrepancies in travel time are evident from the table. Further investigation was therefore undertaken as follows:
- The journey time to Richard Rose Central Academy varies by 8 minutes. Manual check from Transport Direct matches journey times derived from Google Maps and Bing (28 minutes). The greatest part of this journey takes places using M6 motorway. As the DAS uses Trafficmaster data to represent actual journey times, observed speeds on this section may be higher than those expected by TD. This is also a potential reason for discrepancies in journey times for Newman Catholic School (M6) and Appleby Grammar School (when rural section of A66 is used)
  - The journey times for Queen Elizabeth Grammar School and Ullswater Community College as calculated by TD differ from DAS times. Again, actual traffic conditions could allow faster journeys than those expected by Transport Direct.
- 6.4 For public transport, the three nearest further education colleges are the same as the three nearest from the car analysis.



**Table A.2 Penrith Further Education Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Ullswater Community College	CA11 8NG	18	16
Queen Elizabeth Grammar School	CA11 7EG	10	20
Appleby Grammar School	CA16 6XU	81 (-)	47
Caldew School	CA5 7NN	83	72
Richard Rose Morton Academy	CA2 6LB	72	82

6.5 Public transport journey times between Penrith and the further education establishments vary throughout the day and use a variety of different routes. Some buses stop in more places than others. FE colleges with limited evening or off peak bus services are correctly shown as lower down the list of the nearest colleges compared with other colleges served by more frequent services.

6.6 Points of note are that:

- Richard Rose Morton Academy is found to be 72 minutes from Penrith by Transport Direct, while 82 minutes was computed by the DAS analysis. This discrepancy in public transport times can be attributed to the inclusion in the DAS of many much longer journey options. The 72 minute journey time can only be achieved once or twice per hour so each arrival also can have an early arrival penalty of up to 15 minutes. As journey times vary throughout the day, and further education establishments often require access off peak, it is likely that the DAS result gives the more accurate representation of the perceived accessibility of each college.
- The journey to Caldew School takes 83 minutes according to TD, while the DAS time for this connection is 72 minutes. The public transport links depend on train timetables for trains between Penrith and Whitehaven, with an interchange in Carlisle. For morning hours there is no convenient train connection. Hence, TD suggests taking two bus journeys instead, but at other times of the day this travel may take less than 1 hour by train. Overall, 72 minutes is likely to be a more accurate representation of the journey times experienced by users than 83 minutes given by TD.
- The journey time to Queen Elizabeth Grammar School computed from TD is found to be 10 minutes, while DAS time for this public transport link comes to 20 minutes. However, this connection solely depends on 108 Stagecoach-in-Cumbria service, which operates only once a day on schooldays only. Therefore, more representative journey time appears to be the one derived from DAS.
- The journey time to Appleby Grammar School from Transport Direct indicates that no journey is possible for arrival at 9am using the regular 563 service so alternative longer travel time options

are used. However, there is a 563 Grand Prix Coaches service from Penrith to Appleby that runs 6 times a day, with its first arrival to Appleby just after 9am. The 47 minutes DAS time, represents travel times by the 563 service throughout the whole day, so appears to accurately represent this journey.

**Table A.3 – Penrith Further Education Travel Time by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Ullswater Community College	CA11 8NG	6	6
Queen Elizabeth Grammar School	CA11 7EG	7	6
Appleby Grammar School	CA16 6XU	90	-
Richard Rose Central Academy	CA2 6LB	133	-
Newman Catholic School	CA1 1NA	133	-

- 6.7 The Core Accessibility Indicators produced only two cycle times from Penrith to further education establishments. For Ullswater Community College and Queen Elizabeth Grammar School there is a good match between cycle times from DAS and TD checks. The DAS do not seem to be picking up some longer journey times since the 90 minutes to Appleby Grammar from TD does appear to be achievable.

#### **Food Stores**

- 6.8 Tables A.4, A.5 and A.6 give a comparison of the journey times for trips from the COA centroid in Penrith to the closest (by travel time) food stores by car, public transport and cycling respectively.

**Table A.4 Penrith Food Stores Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
SPAR	CA11 7TA	4	5
The Penrith Co-op	CA11 7TD	4	5
Morrisons	CA11 7JU	4	5
SPAR	CA11 7EH	6	5
The Co-operative Food	CA11 7AG	5	5

- 6.9 There are no major discrepancies evident from the results. For short distances, the journey times computed from TD tend to be slightly higher than DAS times.

**Table A.5 Penrith Food Stores Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Morrison's	CA11 7JU	19	15
The Co-operative Food	CA11 7AG	15	17
ALDI	CA11 7EH	29	18
SPAR	CA11 7TA	14	22
The Penrith Co-op	CA11 7TD	14	22

6.10 Both the TD/manual checks and the Core Accessibility Indicators identified the same five stores as the quickest to access from the COA centroid.

6.11 Points of the note for evident discrepancies are:

- Public transport DAS times for SPAR and the Penrith Co-op are 22 minutes, while time checks with TD suggest journeys of 14 minutes. These food stores are adjacent and the public transport travel time depends on timetable of Stagecoach-In-Cumbria 104 service. At the tested times of day a 14 minute connection is available, but throughout the day the service has higher journey times resulting in the discrepancy between the two times.
- The journey time to ALDI computed from DAS is 18 minutes, while TD advises 29 minutes. The store and COA are connected by 103 Stagecoach-In-Cumbria bus service that runs only twice a day and takes 29 minutes. However Bing and Google maps show that a walking journey is only 25 minutes. Given the sizes of the COA and the approximation of the DAS to COA level, it may be that the DAS measure is a slightly underestimated travel time for a walk journey.

**Table A.6 Penrith Food Stores Travel Time by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Penrith Co-op	CA11 7TD	4	5
SPAR	CA11 7TA	4	5
Morrison's	CA11 7JU	4	5
ALDI	CA11 7EH	10	5
The Co-operative Food	CA11 7AG	5	6

6.12 The locations from the DAS analysis match the five locations chosen for manual checks as being the five closest food stores to the COA centroid in Penrith. The only location to which TD travel time from chosen COA centroid differs from DAS time is the ALDI superstore. Transport Direct suggests cycling using quieter Wetheriggs Lane and Clifford Road, rather than shorter way through the town centre.



### Primary Schools

- 6.13 Tables A.7, A.8 and A.9 give a comparison of the journey times for trips from the COA centroid location in Penrith town centre to the closest (by travel time) primary schools by car, public transport and cycling respectively.

**Table A.7 Penrith Primary School Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Catherine's Catholic Primary School	CA11 9EL	3	5
Beaconside CofE Primary School	CA11 8EN	6	5
Brunswick School	CA11 7LX	4	5
North Lakes School	CA11 8NU	8	5
Plumpton School	CA11 9PA	12	5

- 6.14 The schools identified as the nearest within TD matched those reported by the Core Accessibility Indicators. Travel time to Plumpton School is reported as 12 minutes in TD, yet the DAS gives a result of 5 minutes. Plumpton is a village school on the rural area with a very large COA. The DAS assumes the school is located at the COA centroid, but in rural areas this can lead to larger errors in travel time. Checks with other Google and Bing confirm the journey time as 10-12 minutes so the DAS statistics seem to underestimate the journey time by about 5 minutes.

**Table A.8 Penrith Primary School Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Catherine's Catholic Primary School	CA11 9EL	19	5
North Lakes School	CA11 8NU	22	11
Beaconside CofE Primary School	CA11 8EN	22	14
Plumpton School	CA11 9PA	33	17
Calthwaite CofE School	CA11 9QT	-(unobtainable)	21
Brunswick School	CA11 7LX	15	24

- 6.15 Discrepancies are evident for all of primary school establishments. Points of note are that:

- Transport Direct is unable to find a public transport connection to Calthwaite CofE School but the DAS time is 21 minutes. This is very similar to the drive time and these rural schools appear to draw students from Penrith with various school services meeting this need. For the DAS time to have been calculated it appears that there are services shown in the NPTDR but which are not picked up from journey planning queries in TD.
- Four locations, all apart from Calthwaite CofE School and Plumpton School, are within the walking distance from the COA centroid, with North Lakes School being the furthest (1.3 miles).

Transport Direct finds public transport connections and suggests the bus journey even if walking to those facilities would be the quickest and most reasonable option. The DAS times are therefore based on walking links, being representative for potential journeys from the COA centroid.

- For Brunswick School Transport Direct suggests a 15 minute travel time for arrival for 9am. However the 104 Stagecoach-in-Cumbria service which delivers this travel time is only available a few times a day and at other times of day the journey time is longer so the representative journey time in DAS seems reasonable.

**Table A.9 Penrith Primary School Travel Time by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Catherine's Catholic Primary School	CA11 9EL	2	1
Brunswick School	CA11 7LX	4	4
Beaconside CofE Primary School	CA11 8EN	5	5
North Lakes School	CA11 8NU	7	6
Clifton Primary School	CA10 2EG	33	17

- 6.16 TD times match DAS times for nearby schools with short journey times. For Clifton Primary School there is a discrepancy of 16 minutes between TD and DAS. If the gradient is changed in TD to assume cycle speeds for flat terrain then the DAS matches TD. The TD journey time is therefore likely to be more accurate but the DAS time is consistent with the intended methodology.

### **Secondary Schools**

- 6.17 Tables A.10, A.11 and A.12 give a comparison of the journey times for trips from Penrith to the closest (by travel time) secondary schools by car, public transport and cycling respectively.

**Table A.10 Penrith Secondary School Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Queen Elizabeth Grammar School	CA11 7EG	6	4
Ullswater Community College	CA11 8NG	7	5
Richard Rose Central Academy	CA1 3SL	28	19
Appleby Grammar School	CA16 6XU	24	20
Newman Catholic School	CA1 1NA	27	23

**Table A.11 Penrith Secondary School Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Ullswater Community College	CA11 8NG	17	18
Queen Elizabeth Grammar School	CA11 7EG	25	20
Appleby Grammar School	CA16 6XU	81(-)	47
Caldew School	CA5 7NN	83	68
Richard Rose Morton Academy	CA2 6LB	72	76

- 6.18 Discrepancies for car and public transport travel times to Secondary School establishments follow the same pattern as for Further Education as discussed in Para 6.3, as they largely refer to the same campuses in which both FE and SS institutions are located.

**Table 2.12 Penrith Secondary School Travel Time by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Queen Elizabeth Grammar School	CA11 7EG	7	6
Ullswater Community College	CA11 8NG	6	7
Appleby Grammar School	CA16 6XU	90	-
Newman Catholic School	CA1 1NA	133	-
Richard Rose Central Academy	CA1 3SL	146	-

- 6.19 Only two secondary schools are found by Core Accessibility Indicators as within the cycling distance from the COA centroid. There is a good match between travel times from Transport Direct and the DAS. Again it appears that DAS omits a long cycle journey of 90 minutes.

### GPs

- 6.20 Tables A.13, A.14 and A.15 give a comparison of the journey times for trips from Penrith to the closest (by travel time) GPs by car, public transport and cycling respectively.

**Table A.13 Penrith GPs Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Lakes Medical Practice	CA11 8HW	6	6
Temple Sowerby Medical Practice	CA10 1RW	17	13
Court Thorn Surgery	CA4 0HP	19	14
Kirkoswald Surgery	CA10 1DQ	23	14
St Paul's Medical Centre	CA1 3SR	27	18

- 6.21 Discrepancies are most evident for St Paul's Medical Centre and Kirkoswald Surgery. The major part of car journey to St Paul's Medical Centre uses M6 section, where actual speeds above the limit may occur. Hence, the DAS time, based on observed vehicular



movements, suggests a faster journey. A Bing query gives 16 minutes for this unclassified road journey, so the DAS time matches this well. Similarly, Bing suggests 16 minutes as the travel time to Court Thorn Surgery, comparing to the DAS time of 14 minutes. Hence, the DAS times in this case may be taken as accurate.

**Table A.14 Penrith GPs Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Lakes Medical Practice	CA11 8HW	15	24
Court Thorn Surgery	CA4 0HP	46	25
Temple Sowerby Medical Practice	CA10 1RW	95	32
Brunswick House Medical Group	CA1 3QZ	43	41
St Paul's Medical Centre	CA1 3SR	53	50

6.22 Given the fact that TD-computed public transport journey to Temple Sowerby Medical Practice is 95 minutes, this practice is not among five with the shortest journey time while doing manual checks. According to TD, Fusehill Medical Practice (64 minutes travel time), Eden Medical Group and Stanwix Medical Practice (both 65 minute) are more accessible by public transport than the TSMP. However when the services and frequencies are checked in detail the DAS results seem to be reasonable as follows:

- The Temple Sowerby Medical Practice is connected with Penrith by 563 Penrith – Kirby Stephen service, with the journey time of 24 minutes. Given the walking time to and from the bus stops, the journey time of 32 minutes, as computed from the DAS appears to be correct.
- For the Lakes Medical Practice, TD suggests 15 minutes travel time and the DAS 24 minutes. This is located on the route of 104 Stagecoach-in-Cumbria bus and the difference can be accounted for by the low frequency of the service. Although faster journey times can be achieved 24 minutes is more representative.
- For the Court Thorn Surgery the bus journey to Low Hesket takes around 20 minutes. Allowing for 5 minutes to walk to the bus stop the DAS time seems reasonable.

**Table A.15 Penrith GP Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Lakes Medical Practice	CA11 8HW	8	8
Temple Sowerby Medical Practice	CA10 1RW	71	47
Kirkoswald Surgery	CA10 1DQ	54	48
Court Thorn Surgery	CA4 0HP	83	60
Shap Medical Practice	CA10 3LW	64	64

- 6.23 The evident discrepancies for cycle travel times are related to the Transport Direct algorithm that takes route gradients into consideration. The greatest discrepancy is for Court Thorn Surgery, when TD finds 83 minutes travel time while the DAS time is 60 minutes. This journey includes total climb of 270m, hence the difference between the manually checked time and the results from the DAS. For the same reason, cycle time to Temple Sowerby Medical Practice differs by 24 minutes between the TD and DAS.

### **Hospitals**

- 6.24 Tables 2.16, 2.17 and 2.18 give a comparison of the journey times for trips from the COA centroid location in Penrith town centre to the closest (by travel time) hospitals by car, public transport and cycling respectively.

**Table A.16 Penrith Hospitals Travel Time by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Penrith Hospital	CA11 8HX	6	6
Mary Hewetson Cottage Hospital	CA12 5PH	30	25
Cumberland Infirmary	CA2 7HY	31	29
Brampton War Memorial Hospital	CA8 1TX	40	29
Caldew NHS Outpatient Centre	CA2 5NW	31	30

- 6.25 The journey times to Brampton War Memorial Hospital and Mary Hewetson Cottage differ between TD and the DAS analysis. Brampton War Memorial Hospital car journey involves travelling 15 miles along the M6. For that reason actual journey times may appear lower than those computed from TD, bringing down the DAS time. For Mary Hewetson Cottage both Bing and Google Maps show 28 minutes travel time, so DAS Time is acceptable.

**Table A.17 Penrith Hospitals Travel Time by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Penrith Hospital	CA11 8HX	16	24
Cumberland Infirmary	CA2 7HY	66	65
Royal Lancaster Infirmary	LA1 4RP	100	87
Brampton War Memorial Hospital	CA8 1TX	112	88
Wigton Hospital	CA7 9DD	97	91

- 6.26 Penrith Hospital is within the walking distance from the COA centroid. The reasons for discrepancy are similar to those given for The Lakes Medical Practice, which is located next to the hospital.
- 6.27 The hospital travel times to Royal Lancaster Infirmary, Brampton War Memorial Hospital and Wigton Hospital are quite long with many different public transport options. These include faster times of less than the 87 minutes in DAS but the time shown for TD is for arrival at 9am.

**Table A.18 Penrith Hospitals Travel Time by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Penrith Hospital	CA11 8HX	8	8
Mary Hewetson Cottage Hospital	CA12 5PH	117	-
Wigton Hospital	CA7 9DD	118	-
Caldew NHS Outpatient Centre	CA2 5NW	129	-
Cumberland Infirmary	CA2 7HY	132	-

- 6.28 The DAS analysis outputs contains only one hospital within the 120 minutes cycling time. For Penrith Hospital, there is a match between travel time from TD and the DAS analysis



## 7.0 Appendix B - Comparison of DAS and TD in Church Stretton, Shropshire

### Further Education

- 7.1 Tables B.1, B.2 and B.3 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) further education establishments by car, public transport and cycling respectively.

**Table B.1 Church Stretton Further Education Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Condover College Limited	SY5 7AH	18	14
Shrewsbury College of Arts and Technology	SY2 6PR	23	20
The Community College, Bishop's Castle	SY9 5AY	21	21
William Brookes School	TF13 6NB	35	22
Ludlow College	SY8 1GD	28	23

- 7.2 Transport Direct gives travel time of 35 minutes to the William Brookes School. Google gives a time of 30 minutes. However, the DAS gives a travel time of 22 minutes similar to that from Bing. There are several possible rural routes between the COA and the school, and journey times are sensitive to the route chosen. If high speeds are possible on some of the minor routes then the DAS analysis should be correct.

**Table B.2 Church Stretton Further Education Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Condover College Limited	SY5 7AH	39	37
Ludlow College	SY8 1GD	30	40
Sir John Talbot's Technology College	SY13 2BY	64	41
Shrewsbury College of Arts and Technology	SY2 6PR	49	55
Royal National College for the Blind	HR1 1EB	68	60

- 7.3 There are significant discrepancies for four of five Further Education establishments. Points of note are:
- Travel time to Ludlow College is 30 minutes, while it is 40 minutes by the DAS. Based on the available train service and walking to the station the DAS time is as expected.
  - Shrewsbury College of Arts and Technology times are sensitive to assumptions about convenient bus connections so there is no

reason to suspect that overall the DAS time is not representative of the 23 time periods.

- For Sir John Talbot's Technology College the DAS time is 41 minutes, but TD shows 64 minutes. The most convenient journey in Transport Direct involves using the train to Wem and then changing into bus to get to Whitchurch. However, there is an existing direct connection between Church Stretton and Whitchurch. For it, the Arriva Train Wales journey takes 32 or 35 minutes, depending on time of the day, so the DAS time seems to be more representative than the one from manual checks
- Travel time to the Royal National College for the Blind also depends on the train timetable. The Church Stratton – Hereford journey takes about 40 minutes, and the discrepancy relates to travel between the Hereford station and the college. For this part, TD suggests a bus journey, but it is also convenient to walk. As walking can be co-ordinated with the train timetable, the DAS time may be taken as accurate.

**Table B.3 Church Stretton Further Education Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Condover College Limited	SY5 7AH	50	52
The Community College, Bishop's Castle	SY9 5AY	65	-
Shrewsbury College of Arts and Technology	SY2 6PR	75	-
William Brookes School	TF13 6NB	79	-
Ludlow College	SY8 1GD	86	-

- 7.4 There is only one Further Education institution computed from the DAS analysis within the cycle time of 120 minutes.

### **Food Stores**

- 7.5 Tables B.4, B.5 and B.6 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) food stores by car, public transport and cycling respectively.

**Table B.4 Church Stretton Food Stores Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Co-Operative Food	SY6 6BX	2	5
SPAR, Church Stretton	SY6 6AZ	1	5
Londis	SY5 7JB	10	9
SPAR, Craven Arms	SY7 9NE	12	10
Thorouggoods	SY3 0HT	19	18

- 7.6 The manual checks and the DAS analysis output the same five locations as being the nearest to the Church Stretton COA centroid.

There is a match between the DAS times and those computed from Transport Direct.

**Table B.5 Church Stretton Food Stores Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Co-Operative Food	SY6 6BX	13	7
SPAR, Church Stretton	SY6 6AZ	8	10
SPAR, Craven Arms	SY7 9NE	26	26
Londis	SY5 7JB	27	26
ALDI	SY8 1DA	31	30

- 7.7 Small discrepancies are apparent for the shortest journeys within the village. Both, The Co-Operative Food and SPAR are within the walking distance so any dissimilarities may be caused by different centroid locations for TD and the DAS.

**Table B.6 Church Stretton Food Stores Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
The Co-Operative Food	SY6 6BX	4	5
SPAR, Church Stretton	SY6 6AZ	3	5
Londis	SY5 7JB	40	39
SPAR, Craven Arms	SY7 9NE	50	45

- 7.8 No major discrepancies are apparent for the cycle comparison. 5 minutes difference between the DAS and manual check times for SPAR in Craven Arms is likely to be caused by gradients on the route. The DAS only finds four locations within the cycling distance.

### **Primary Schools**

- 7.9 Tables B.7, B.8 and B.9 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) primary schools by car, public transport and cycling respectively.



**Table B.7 Church Stretton Primary Schools Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Lawrence CofE Primary School	SY6 6EX	3	5
Rushbury CofE Primary School	SY6 7EB	11	8
Longnor CofE Primary School	SY5 7PP	10	8
Wistanstow CofE Primary School	SY7 8DQ	11	10
Stokesay Primary School	SY7 9NW	12	11

7.10 For Primary Schools, there is a good match between car travel times computed from Transport Direct and the DAS analysis output.

**Table B.8 Church Stretton Primary Schools Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Lawrence CofE Primary School	SY6 6EX	14	14
Stokesay Primary School	SY7 9NW	22	22
Longnor CofE Primary School	SY5 7PP	36	22
Wistanstow CofE Primary School	SY7 8DQ	30	29
Ludlow Infant School	SY8 1HG	29	31

7.11 There is discrepancy in travel times to Longor CofE Primary School. Transport Direct suggests use of 435 bus service, with its timetable journey time to Longnor of 12 minutes. Hence, the difference in travel times computed from TD and the DAS times depends on walking time to and from bus stops which should be no more than 10-15 minutes based on the distance.

**Table B.9 Church Stretton Primary Schools Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
St Lawrence CofE Primary School	SY6 6EX	5	5
Rushbury CofE Primary School	SY6 7EB	23	24
Longnor CofE Primary School	SY5 7PP	31	32
Wistanstow CofE Primary School	SY7 8DQ	40	35
Dorrington CofE (Aided) Primary School	SY5 7JL	39	40

7.12 No major discrepancies are apparent for the cycle comparison.

### **Secondary Schools**

7.13 Tables B.10, B.11 and B.12 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) secondary schools by car, public transport and cycling respectively.

**Table B.10 Church Stretton Secondary Schools Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton School	SY6 6EX	3	5
The Community College, Bishop's Castle	SY9 5AY	21	20
Ludlow Church of England School	SY8 1GJ	24	21
Meole Brace School Science College	SY3 9DW	22	21
The Priory School, A Business and Enterprise College	SY3 9EE	21	21

7.14 No major discrepancies have been found when car travel times to secondary schools were taken into consideration.

**Table B.11 Church Stretton Secondary Schools Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton School	SY6 6EX	14	14
The Wakeman School and Arts College	SY2 6AA	35	33
Sir John Talbot's Technology College	SY13 2BY	64	41
Ludlow Church of England School	SY8 1GJ	40	42
The Corbet School Technology College	SY4 2AX	58	59

7.15 There is a small discrepancy evident for Sir John Talbot's Technology College. The reasons for it are similar the ones for FE, and are given above.

**Table B.12 Church Stretton Secondary Schools Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton School	SY6 6EX	5	5
The Community College, Bishop's Castle	SY9 5AY	65	-
Meole Brace School Science College	SY3 9DW	73	-
The Priory School, A Business and Enterprise College	SY3 9EE	75	-
The Wakeman School and Arts College	SY2 6AA	80	-

7.16 Only one school has been found by the DAS analysis as within the cycling distance. For Church Stretton School, there is no difference in the cycle times from manual checks and the DAS analysis.

## GPs

7.17 Tables B.13, B.14 and B.15 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) GPs by car, public transport and cycling respectively.

**Table B.13 Church Stretton GPs Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton Medical Practice	SY6 6BL	2	5
The Beeches Medical Practice, Dorrington	SY5 7LD	12	11
Drs Winter and Appleby	SY7 9PY	11	11
The Beeches Medical Practice, Bayston Hill	SY3 0PF	19	17
Bishops Castle Medical Practice	SY9 5ER	20	19

7.18 The DAS analysis output the same five locations as were used for the manual checks. Travel times derived from the DAS match those computed from TD.

**Table B.14 Church Stretton GPs Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton Medical Practice	SY6 6BL	11	10
Drs Winter and Appleby	SY7 9PY	22	26
Station Drive Surgery	SY8 2AB	28	28
Portcullis Surgery	SY8 1GT	31	30
The Beeches Medical Practice, Dorrington	SY5 7LD	35	32

7.19 For GPs manual checks match travel times coming from the DAS analysis.

**Table B.15 Church Stretton GPs Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Church Stretton Medical Practice	SY6 6BL	3	5
The Beeches Medical Practice, Dorrington	SY5 7LD	39	39
Drs Winter and Appleby	SY7 9PY	51	45
The Beeches Medical Practice, Bayston Hill	SY3 0PF	64	-
Bishops Castle Medical Practice	SY9 5ER	69	-



- 7.20 The DAS analysis finds 3 medical practices within the cycling distance. The only discrepancy for Drs Winter and Appleby appears to be related to gradients on the trip leading to slower cycle journeys than on the flat as assumed by DAS.

### **Hospitals**

- 7.21 Tables B.16, B.17 and B.18 give a comparison of the journey times for trips from the COA in Church Stretton to the closest (by travel time) hospitals by car, public transport and cycling respectively.

**Table B.16 Church Stretton Hospitals Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Royal Shrewsbury Hospital	SY3 8XQ	23	25
Shelton Hospital	SY3 8DN	27	25
The Princess Royal Hospital	TF1 6TF	38	34
Bridgnorth Hospital	WV16 4EU	49	35
Tenbury and District Hospital	WR15 8AP	40	38

- 7.22 The only major discrepancy is for travel times to Bridgnorth Hospital. The Google Maps shows driving time of 41 minutes and Bing computes 39 minutes. Hence, travel time from Transport Direct, which suggests the route using B4371 and B4368, seems to be overestimated.

**Table B.17 Church Stretton Hospitals Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Whitchurch Hospital	SY13 1NT	62	50
The County Hospital, Wye Valley NHS Trust	HR1 2ER	60	69
Tenbury and District Hospital	WR15 8AP	77	93
West Park Hospital	WV1 4PW	97	97
Royal Shrewsbury Hospital	SY3 8XQ	28 (GM), 55 (TD)	-
Shelton Hospital	SY3 8DN	29 (GM), 52 (TD)	-

- 7.23 There are discrepancies in travel times to Whitchurch Hospital and the County Hospital, Wye Valley NHS Trust. For Whitchurch Hospital, travel time depends on the train connection between Church Stretton and Whitchurch. The difference then comes from various walking time and from train stations. Google Maps shows 53 minutes of travel time, being close to the DAS time. Similarly, the County Hospital in Hereford is connected with Church Stretton via direct train service. Differences relate to various walking times involved in this journey.
- 7.24 The public transport journey to Tenbury and District Hospital includes interchange in Ludlow. 77 minutes connection is possible due to availability of service 755 in Ludlow at given time. As this service runs only once a day, and at other times it is necessary to undertake

journeys involving more interchanges, 93 minutes as suggested by the DAS analysis may be treated as representative.

**Table B.18 Church Stretton Hospitals Travel Times by Cycling**

<b>Name</b>	<b>Postcode</b>	<b>Manual Check Time (mins)</b>	<b>DAS Time (mins)</b>
Royal Shrewsbury Hospital	SY3 8XQ	81	-
Shelton Hospital	SY3 8DN	87	-
The Princess Royal Hospital	TF1 6TF	115	-
Bridgnorth Hospital	WV16 4EU	115	-
Tenbury and District Hospital	WR15 8AP	127	-

7.25 No hospitals have been found by the DAS analysis as within the cycling distance from the COA location. Manual checks show that the journey time to the closest one, which is the Royal Shrewsbury Hospital, is 81 minutes.

## 8.0 Appendix C - Comparison of DAS and TD in Reading, Berkshire

### Further Education

- 8.1 Tables B.1, B.2 and B.3 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) further education establishments by car, public transport and cycling respectively.

**Table C.1 Reading Further Education Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Blessed Hugh Faringdon Catholic School	RG30 3EP	6	5
Kendrick School	RG1 5BN	6	5
Prospect School	RG30 4EX	6	5
Reading School	RG1 5LW	8	7
Reading Girls' School	RG2 7PY	10	7

- 8.2 There is a good match between the times of the TD and DAS analysis.

**Table B.2 Reading Further Education Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Blessed Hugh Faringdon Catholic School	RG30 3EP	11	10
Prospect School	RG30 4EX	18	10
Reading School	RG1 5LW	36	25
The Willink School	RG7 3XJ	32	28
Reading Girls' School	RG2 7PY	33	33

- 8.3 Two discrepancies are evident from the results. Prospect School is connected with the COA centroid by 33 Reading Buses service, with travel time by bus of 5 minutes. The difference between manual check time and the one generated by the DAS seems to relate to the walk time to the bus stops. The difference may therefore be caused by the school being some distance from the centroid of the COA and therefore the travel time being underestimated in DAS.
- 8.4 Similarly, the public transport journey to Reading School, takes 36 minutes according to TD, using buses: 9, 17, 144 and 26. The bus trip takes up to 15 minutes, depending on bus service. Google Maps finds 30 minutes travel time between those locations. Taking into account various walking times to bus stops the DAS time may be taken as credible but slightly underestimated.



**Table B.3 Reading Further Education Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Blessed Hugh Faringdon Catholic School	RG30 3EP	6	5
Kendrick School	RG1 5BN	10	6
Prospect School	RG30 4EX	12	9
Reading School	RG1 5LW	12	10
Reading Girls' School	RG2 7PY	15	11

- 8.5 The locations from the DAS cycle analysis match the five locations chosen from the TD checks with the TD times being slightly higher than in DAS.

### **Food Stores**

- 8.6 Tables B.4, B.5 and B.6 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) food stores by car, public transport and cycling respectively.

**Table B.4 Reading Food Stores Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Premier	RG2 0BH	5	5
Morrisons	RG2 0SN	4	5
Londis	RG1 6JS	4	5
Tesco Express	RG1 2SE	5	5
Marks & Spencer-Simply Food CN	RG1 7TW	2	5

- 8.7 The manual checks and the DAS analysis output the same five locations. As travel times are all equal or less than 5 minutes, any differences can be ignored.

**Table B.5 Reading Food Stores Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Marks & Spencer-Simply Food CN	RG1 7TW	5	5
ASDA	RG30 4EL	17	9
Tesco-Express-Concessions	RG30 2EU	15	9
ALDI	RG30 2HB	17	11
Morrisons	RG2 0SN	27	11

- 8.8 Discrepancies are evident for most of the locations:
- For ASDA, travel time computed from TD is 17 minutes, while the DAS analysis finds 9 minutes. The ASDA store TD travel time is derived from relying on 33 bus service. The bus journey time

between given areas takes 5 minutes throughout the whole day. Hence, any differences depend on walking times to and from the bus stops. Google Maps finds the total travel time of 14 minutes. Consequently, travel time to Tesco-Express-Concessions is 15 minutes with TD manual checks, while the DAS output is 9 minutes. The TD shortest connection uses 26 service, so the differences are again coming from walking times. Google Maps finds travel time of 13 minutes.

- Public transport travel time from the COA centroid to ALDI is 17 minutes, while the DAS analysis computes 11 minutes. Google Transit output is 12 minutes, matching closely to the DAS time.
- There is a noticeable discrepancy in the travel times to Morrison's. The DAS show an 11 minutes journey but TD suggests 27 minutes. Google Transit suggests walk of 24 minutes without using any bus services. There are a very wide range of possible bus and walk combinations but with any of these the 11 minutes in DAS seems quite low. Again the reason for DAS underestimating the travel time appears to be that the supermarket is not close to the COA centroid.

**Table B.6 Reading Food Stores Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Marks & Spencer-Simply Food CN	RG1 7TW	1	5
Londis	RG1 6JS	5	5
Sainsbury's	RG1 1DX	8	5
The Co-operative Food	RG1 1TZ	5	5
McColl's (Convenience)	RG1 6DJ	7	5

- 8.9 The discrepancies follow the same pattern as for FE. As all DAS travel times are less than 5 minutes, discrepancies can be neglected.

### **Primary Schools**

- 8.10 Tables B.7, B.8 and B.9 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) primary schools by car, public transport and cycling respectively.

**Table B.7 Reading Primary Schools Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
All Saints Junior School	RG1 6NN	0	5
All Saints Church of England Aided Infant School	RG1 6NP	1	5
Coley Primary School	RG1 6AZ	5	5
St Mary and All Saints Church of England Voluntary Aided Primary School	RG1 6DU	7	5
Katesgrove Primary School	RG1 2NL	5	5

8.11 Similarly to Food Stores, car travel times for the short journey show some discrepancies, with the TD finding longer times than the DAS. As all DAS times are less than 5 minutes, it is within accuracy criteria.

**Table B.8 Reading Primary Schools Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
All Saints Junior School	RG1 6NN	0	5
All Saints Church of England Aided Infant School	RG1 6NP	2	5
Battle Primary School	RG30 2TD	10	9
Southcote Primary School	RG30 3EJ	10	10
Manor Primary School	RG30 3LJ	13	10

8.12 There is a good match between manually checked travel times and those from the DAS analysis.

**Table B.9 Reading Primary Schools Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
All Saints Junior School	RG1 6NN	0	5
All Saints Church of England Aided Infant School	RG1 6NP	1	5
Oxford Road Community School	RG1 7PJ	3	5
Coley Primary School	RG1 6AZ	5	5
St Mary and All Saints Church of England Voluntary Aided Primary School	RG1 6DU	7	5

8.13 The discrepancies follow the same pattern as for FE and Food Stores, with TD cycling travel times being generally longer when compared with the DAS output



## Secondary Schools

8.14 Tables B.10, B.11 and B.12 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) secondary schools by car, public transport and cycling respectively.

**Table B.10 Reading Secondary Schools Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Blessed Hugh Faringdon Catholic School	RG30 3EP	6	5
Prospect School	RG30 4EX	6	5
Kendrick School	RG1 5BN	6	5
The Avenue Special School	RG30 4BZ	10	6
Reading Girls' School	RG2 7PY	10	7

8.15 There is a small discrepancy between the DAS times and those coming from TD checks. Discrepancies then follow the pattern for short travel times from the DAS.

**Table B.11 Reading Secondary Schools Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Prospect School	RG30 4EX	18	10
Blessed Hugh Faringdon Catholic School	RG30 3EP	11	10
Reading School	RG1 5LW	35	24
The Avenue Special School	RG30 4BZ	15	24
The Willink School	RG7 3XJ	30	28

8.16 There are some discrepancies coming from manual checks for the DAS analysis times. Points of note are:

- The TD checked travel time to Prospect School is 18 minutes, while the DAS time is 10 minutes. Transport Direct suggests that the 33 bus service is the most convenient option. This is also suggested by Google Transit, with total travel time of 14 minutes. The discrepancy appears to be related to different walking times to and from the bus stops which again is likely to be related to the distance of the destination from the COA centroid.
- The DAS travel time to Reading School is 24 minutes, while manual check shows 35 minutes. The journey suggested by TD involves using the 144 bus with walking time to a bus stop of 25 minutes. For travel between those locations, Google Maps show 30 minutes travel time. Given the number of possible journeys through the city centre and the different options by time of day, there is no reason to imply that DAS time travel time is less accurate than the one coming from TD.
- The travel to The Avenue Special School takes 15 minutes according to TD, while the DAS time is 24 minutes. As this travel

relies mainly on the frequent 33 bus route taking about 8 minutes, differences relate to different walking times. The walk journey on Google is estimated at 10 minutes which would make a total journey time of 18 minutes quite close to the DAS value.

**Table B.12 Reading Secondary Schools Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Blessed Hugh Faringdon Catholic School	RG30 3EP	6	5
Kendrick School	RG1 5BN	10	5
The Avenue Special School	RG30 4BZ	16	9
Prospect School	RG30 4EX	12	9
Reading School	RG1 5LW	12	10

- 8.17 The discrepancies follow the same pattern as for FE, Food Stores and Primary Schools, with TD cycling travel times being generally higher than those from the DAS output. Again the DAS may be underestimating the travel time to The Avenue Special School.

### **GPs**

- 8.18 Tables B.13, B.14 and B.15 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) GPs by car, public transport and cycling respectively.

**Table B.13 Reading GPs Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Drs Essa & Harrold	RG1 4SJ	4	5
Dr Sharma Rp & Partners	RG1 7JE	3	5
The Abbey Medical Centre	RG1 7XD	3	5
Dr Swami MI & Partners, Wensley Road	RG1 6DN	5	5
Dr Swami MI & Partners, Russell Street	RG1 7XG	2	5

- 8.19 As the DAS travel times are within 5 minutes, the differences between manual checks and the DAS output are negligible.

**Table B.14 Reading GPs Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Dr Dodson Mj & Partners	RG30 3AN	11	10
Dr Williams Se & Partners	RG30 3QP	11	10
Dr Swami MI & Partners, Wensley Road	RG1 6DN	17	11
Dr. Boulos and Partners	RG30 6BW	25	19
Dr D'cruz GI & Partners	RG1 4DT	28	20

8.20 There are some evident discrepancies. For Dr Swami MI & Partners the travel time by TD is 17 minutes while the DAS time is 11 minutes. The TD journey is made on foot. Google Maps calculates 15 minutes for this distance so the discrepancy is explained by approximating the location of the GP to the COA centroid.

8.21 For Dr. Boulos and Partners and Dr D'cruz GI & Partners Google Maps shows times of 21 and 23 minutes respectively, closer to the DAS analysis output than times coming from TD.

**Table B.15 Reading GPs Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Dr Swami MI & Partners, Russell Street	RG1 7XG	3	5
The Abbey Medical Centre	RG1 7XD	3	5
Western Elms Surgery	RG30 1AT	3	5
Dr Sharma Rp & Partners	RG1 7JE	4	5
Dr Swami MI & Partners, Wensley Road	RG1 6DN	6	5

8.22 All DAS times are less than 5 minutes. There is a good match between the TD travel times and those from the DAS analysis.

### **Hospitals**

8.23 Tables B.16, B.17 and B.18 give a comparison of the journey times for trips from the COA in Reading to the closest (by travel time) hospitals by car, public transport and cycling respectively.

**Table B.16 Reading Hospitals Travel Times by Car**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Prospect Park Hospital	RG30 4EJ	6	5
Royal Berkshire Hospital	RG1 5AN	6	8
Wokingham Hospital	RG41 2RE	23	24
Broadmoor Hospital	RG45 7EG	27	25
The Huntercombe Hospital - Maidenhead	SL6 0PQ	28	26

8.24 Travel times to hospital from the DAS analysis match closely those coming from manual checks.

**Table B.17 Reading Hospitals Travel Times by Public Transport**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Prospect Park Hospital	RG30 4EJ	15	10
Royal Berkshire Hospital	RG1 5AN	29	22
Wokingham Hospital	RG41 2RE	43	48
Basingstoke and North Hampshire Hospital	RG24 9NA	50	49
Upton Hospital	SL1 2BJ	72	59

8.25 There are some noticeable discrepancies in travel times for Prospect Park Hospital, Royal Berkshire Hospital and Upton Hospital. For those locations, Google Transit shows travel times of 12, 24 and 63 minutes respectively, matching closely travel times coming from the DAS.

**Table B.18 Reading Hospitals Travel Times by Cycling**

Name	Postcode	Manual Check Time (mins)	DAS Time (mins)
Prospect Park Hospital	RG30 4EJ	11	9
Royal Berkshire Hospital	RG1 5AN	10	9
Wokingham Hospital	RG41 2RE	46	48
Henley (Townlands) Community Hospital	RG9 2EB	54	51
Broadmoor Hospital	RG45 7EG	69	-

8.26 The DAS analysis only output four hospitals. There is a good match between manually checked travel times and those from the DAS analysis.