DEFINING THE MAJOR ROAD NETWORK

Introduction

This paper provides background detail to support the narrative in Sections 3.2 ('An objective approach') and 3.3 ('Three tiers') of our Main Report. It reflects initial scoping work with our Advisory Panel (see Annex B to Main Report) during 2015, and subsequent development work using the analytical tool devised for the Study.

Principles for defining the Major Road Network

We sought to focus from the outset on roads which perform two key roles:

(i) Adding value through servicing and supporting national, regional and local economies. The more significant roads in a network are, by their place within that overall network, particularly suited for longer-distance traffic, and we know that the more economically significant travel purposes – commuting and business travel – have longer than average journey lengths, as do light vans; and HGVs have much longer average haul lengths. This is why, for example, we see higher HGV percentages on motorways and most trunk roads, and also, but to a lesser extent, on the more important local authority 'A' roads.

We needed to home in on the economically significant roads – the roads whose effective operation and service to users does most to support and enhance local and regional economies. This does not imply that we ignore the significance for the public of major roads in facilitating other journey purposes too – access to education and health, personal business, retail, leisure; these contribute to the economy as well as to well-being, but focusing on roads with most commercial traffic should capture those adding economic value most directly. We have used a combination of traffic volume overall, and the proportions of commercial vehicles (HGVs and Light Vans) within that, to represent the value that a road adds.

(ii) Serving the largest possible number of origin and destination pairs. Closely associated with value added, the roads of interest also provide connectivity between key 'nodes' – geographical centres where a wide range of economic activities are clustered - mainly urban areas, but also

ports and airports, logistics centres, and tourism destination areas. Our network should also be able to connect new economic development areas as they grow in importance, and so must be a dynamic concept. There is a need to ensure good accessibility to all parts of the country, including more remote regions and sub-regions. We have embraced *connectivity* by ensuring that those key nodes are sufficiently plugged in to the network, as are remoter regions and sub-regions dependent on connections over longer distances.

Methodology

We commissioned the Centre for Transport and Society at the University of the West of England to develop a simple analytical and visualisation tool enabling us to explore various options for the extent of our evolving network of interest. The tool uses ArcGIS software to interrogate a database of all 14,500 motorway and 'A' road links in England in order to generate different variants for our network of interest, each of whose links or nodes satisfy a set of criteria.

The database was adapted from DfT's traffic count data for 2014, for every junction-to-junction 'A' road link that then existed. We adjusted the recorded traffic levels to reflect the relative shift in the distribution of traffic that is forecast for 2040, drawing on the National Road Traffic Forecast 2015 data for 2040 under Scenario 2 (see Supporting Document 9) on variation in forecast growth rate by region and by type of road; we have not made any changes to the underlying 'A' road network to reflect actual or planned changes since 2014. We then aimed to come up with a coherent, continuous network , rather than a collection of often disconnected links. We therefore manually adapted the outputs using judgment to:

- add links which didn't quite meet the chosen criteria but which served to join up others to complete a new corridor; or

- remove links above the thresholds which formed less than half of a potential new corridor, or which were wholly isolated

We focused on three specific iterations, applying increasingly tight criteria on added value:

- a '**Level 1 network'**, with the lowest qualifying criteria: all links where annual average daily flow (AADF) for all vehicles is greater than 15,000; plus any other links with AADF exceeding a lower threshold of 7,500, as

long as either the proportion of HGVs in that AADF total is greater than 5%, or of light van traffic is greater than 15%. This generates a large network, some 13,500 miles, around three times the length of the Strategic Road Network (SRN), so comparable in scale to the 11,900-mile Primary Route Network in England[1].

- a **'Level 2 network -** based on those links having AADF greater than 20,000; plus any other links with AADF exceeding a lower bound of 10,000, as long as either the proportion of HGVs traffic is greater than 5%, or of light van traffic is greater than 15%. This central iteration produced the network we have developed further - see below.

- a '**Level 3 network',** with the highest qualifying criteria: AADF greater than 50,000 (or greater than 25,000 if the HGV% > 5 or the light van % > 15). This variant contains only 3,400 miles of road, some 20% less than the SRN - but it does reasonably closely resemble the core motorway and planned expressway elements of the SRN. (A variant run used the slightly less demanding thresholds of 40,000 / 20,000, and this generated a 4,700 mile network, 10% bigger than the SRN.)

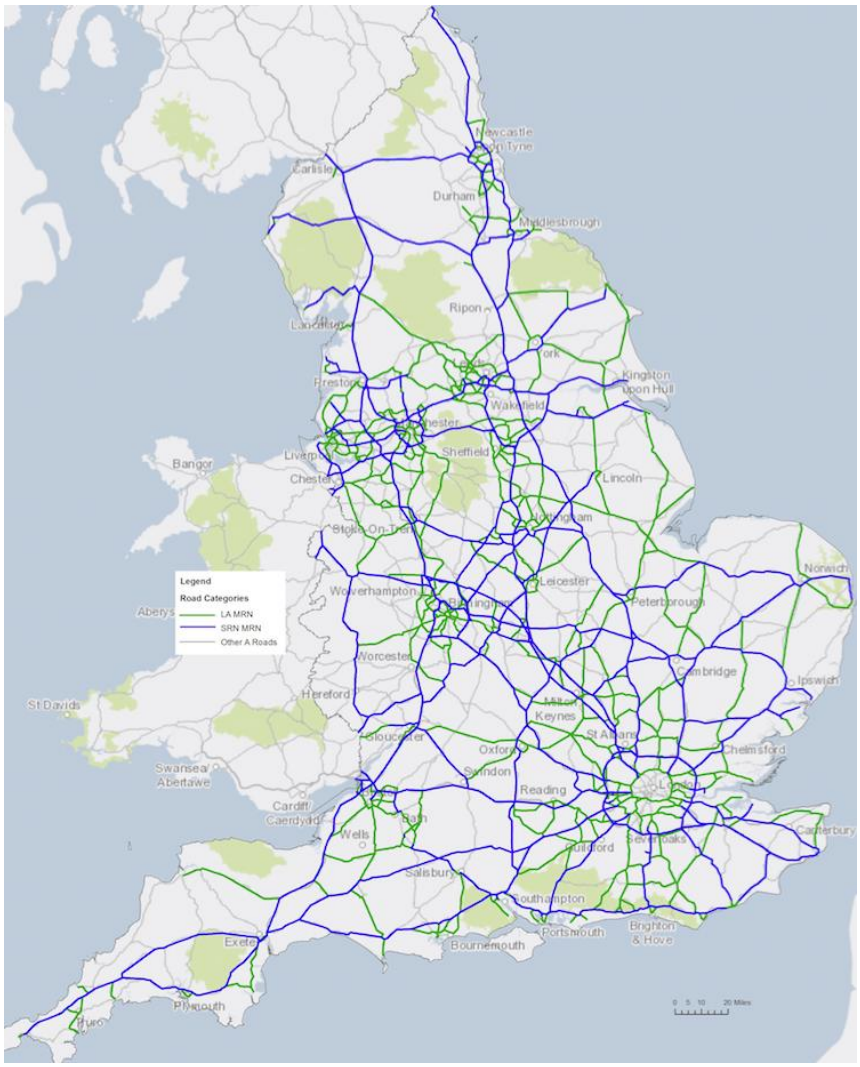
Developing the preferred network

Thereafter, we focused our thinking on the Level 2 network, coming in at roughly twice the size of the SRN. We developed this further to explicitly bring in the *connectivity* criterion: The ArcGIS tool shows all towns of greater than 50,000 or 25,000 population; this makes possible a visual check to ensure all such towns are on this selected network, and that they are not just reliant on a single spur if there is more than one main approach. This threshold was lowered to 25,000 in peripheral areas, adding to the network, for example, coastal towns such as Bridlington and Falmouth, and inland centres such as Buxton and Bishops Auckland / Shildon. In exceptional cases we further extended the network to connect towns with seasonal traffic generation such as Penzance, Skegness and Cromer that are smaller still.

We have taken care to ensure that major ports and airports are directly served by this network: all ports with over 2 million tonnes traffic p.a. are on the network (all but Heysham and London Gateway are also served by the SRN), and the twenty busiest airports in England (by passenger traffic) are also all

[1] The 'Primary Route Network' (with green-backed road signs) is designed to highlight the best through routes for road users. It accounts for over half the 20,900 miles of 'A' road in England (no data is consistently reported for the PRN). Although embodying connectivity the PRN does not reflect relative economic value in the way we are seeking to define for the MRN.

connected (only 10 of these are served by the SRN). As part of a round of soundings taken from selected local highway authorities and LEPs in autumn 2015 we identified a few additional links which would provide valuable connectivity for growth areas (eg A43 from Corby to Stamford).
And in our discussions with the each of the three emerging sub-national transport bodies (Transport for the North, Midlands Connect and England's Economic Heartland) we obtained confirmation that this Level 2 network was capable of providing the desired connectivity across their areas.



The indicative Major Road Network
Larger version of map available at http://www.futureroadsengland.org/s/MRN-England-fig-31.jpg

Features of the Major Road Network

The end result is our Major Road Network (MRN), comprising approximately 8,000 miles of road, 3,800 of which are local authority roads. An important feature is the inclusion of corridors adding resilience to the SRN, and providing greater connectivity for growth areas. In the South-East, for example, the MRN includes:

- A24 and A22 between London and the south coast;

- the network of roads (A31/A331/A325) around Guildford / Aldershot / Farnham;

- A41 via Aylesbury all the way from London to the M40, crossing both the Oxford / Luton / M11 corridor of A418 / A505, and the Oxford to Milton Keynes A421 corridor;

- A414 route across from Stevenage to Chelmsford, linked with the A130/A127/A13 in south Essex

- A140 Ipswich/Norwich;

- A420 Oxford/Swindon;

- A605 Thrapston/Peterborough

Whilst the prominence of many of these is not that surprising, some less expected stretches of non-SRN also make the grade – eg A142 / A141 Newmarket to Wisbech, as a result of its high (19%) HGV flow.

The MRN includes the vast majority of the SRN - the exceptions are A458 from Shrewsbury to the Welsh border, and stretches of the A36 on the Wiltshire / Somerset border, where the parallel route through Trowbridge is more heavily trafficked and connects better to the M4. The statistics derived from our database of road links produced an SRN component of the MRN of around 4,200 miles, around 200 miles less than the officially recorded length of the network in DfT road length statistics. Fewer than 20 miles of the SRN are not included in our SRN, so the discrepancy is mainly attributable to the exclusion of sliproads at junctions, and to a lesser extent our use of straight line end-to-end mileage for each link, rather than the actual on-the-ground length of a road, with its curvature.

Some stretches of the SRN have been retained in the MRN even where not strictly justified on current traffic grounds, because of the important back-up function they provide to major motorways - for example the A5 in Northamptonshire, parallel to the M1, and the M45 (the only SRN motorway falling below the Level 2 threshold).

In the MRN more broadly, we have not generally sought to add links solely to provide further resilience (one exception is the inclusion of the A34 / A536 route through Congleton to Macclesfield, given the absence otherwise of any alternative to the overloaded M6 in Cheshire[2]). But the focus on a more extensive network should already provide greater opportunities to maintain traffic flow when there is disruption to one link in the network. And in any case, the first priority for the operator of a road should be to maintain traffic flow within the affected route itself, making the most of multi-lane roads, for example, and so avoid where possible creating greater problems through diverting traffic on to less suitable roads.

We must emphasise that this particular end-product MRN is only indicative of the scale and role that is needed. Whilst it has the important advantage of being determined at national level, based on objective criteria, local knowledge will need to be applied across the country to validate the selection of some routes and propose the inclusion of others. In our discussions with local authorities we recognised that our methodology has resulted in the omission of some roads already of a generally acceptable standard which could accommodate extra traffic, but which currently fell below the thresholds for inclusion. Conversely, some links in our MRN are carrying heavy traffic mainly as a consequence of inadequacies on the SRN, and they might not need to be in the future MRN where planned investment in the SRN goes ahead.

Tiers within the Major Road Network

[2] As with other links added to the MRN, most parts of this route only just fall short of the qualifying thresholds.

Whilst the Report makes clear that consistency should be central to the concept of the MRN, the network cannot be uniform. There clearly has to be different treatment of, and expectations from, a stretch of core motorway carrying AADF of 187,000, as against a rural through-route that scrapes into the MRN mainly for connectivity reasons, with only a twentieth of the traffic flow.
We have therefore identified three main tiers of road within the MRN, based around the different service that different levels of road should reasonably be expected to provide users. These are:

Tier 1: limited access roads: roads (not just motorways) providing links between major urban areas and facilitating the highest average speeds, so well suited for longer-distance traffic in particular; largely devoted to 'movement', they will have high volume of traffic in a tightly-managed environment. They are almost all dual carriageway roads and mostly purpose-built.

- and within that, a **Tier 1A subset**: **limited access urban** roads: the axes of movement within conurbations, with exceptionally high traffic volume; the volume of traffic and frequency of junctions means only a lower level of service can be provided (see Supporting Document 6).

Tier 2: multiple access rural roads: mainly all-purpose rural 'A' roads, with frontages and local access, usually on long-established alignments. They provide links between secondary urban areas and facilitate reasonable speeds, given the need to cope with some conflicting usage. Suitable for medium-distance traffic in particular. but also sometimes serving the 'place' needs of communities they run through.

Tier 3: multiple access – urban: Major Roads in urban areas, with extensive frontages and the greatest mix of user types and conflicting movements. On most stretches, significant 'place' functions will need to be acknowledged. They will only be able to facilitate quite low average speeds, so are better suited to shorter-distance journeys.

Indicative Major Road Network - by Tier

Management of roads in Tier 3, and to some extent in Tier 1A too, will have to be subject to the wider transport policy framework and traffic management strategies set by the city or regional authority.

Table 3.1 in the Main Report summarises the statistics arising from our indicative breakdown of the MRN by Tier .

As a starting point, we are basing this categorisation simply on the current standard of the road. But as the MRN is developed, attribution to Tier should more fully reflect the function the road performs and the service level its users might reasonably expect, given the route context. Where the current standard is then at odds with what its function would suggest, this would identify a case for investment to bring the standard up to meet the route expectation.

We believe that this exercise provides a valuable indication of the scale and extent of the Major Road Network we need to focus on; as noted above, local knowledge of current circumstances and future plans will be required to validate a definitive Network. The ArcGIS tool can be manipulated, and the underlying traffic count data updated or extra fields added, to meet the needs of strategic client bodies taking forward the concept of the Major Road Network.