HS3 Route and Service Plans

HS3 Route Mk2

As a consequence of experience with the original route design, in particular the new outlook on services made possible by the availability of service time estimates, and of the desirability of adding further services, beyond the capacity of that design, the route has been significantly amended and enhanced. The main driver is the requirement to (be able to) have 4 tracks between London and Loughborough (Stanford Junction), to provide the necessary capacity. This would simply not have been possible with the original route. Other changes include 4 tracks between Nuthall South and Beighton Junctions, but this is possible with the existing route, so no other changes are necessary. The section between Nottingham station and Strelley Junction is replaced by the direct tunnel route, previously described as an alternative possibility in appendix C, but now adopted as the preferred option. In effect, this means that there are 4 tracks all the way between London and Garforth, c.17 miles south of York, though in several cases the two pairs of tracks take different routes.

In brief, the new route follows the alignment of the M1 between Edgware / Scratchford and Leicester. The original route followed this alignment from Leagrave onwards. The original plan for a station at Luton Airport Parkway has been replaced by Luton and Dunstable Parkway, where the M1 passes between Luton and Dunstable, with access thence to Luton, Dunstable and Luton Airport via the restored and enhanced (relevant portion of the) former GN Welwyn – Dunstable branch. Northampton station is now on a branch (like Leicester and Nottingham), with the main line continuing along the M1.

As few changes have been made to the existing article as are essential, to cover the new situation. The Route sections between London and Leicester, and around Nottingham, have of course been completely rewritten and remapped, but elsewhere the changes are minor.

Extra service plans are provided to illustrate the introduction of and the benefits enabled by the 4 track sections.

The Purpose, Background and Method

This article refers to and should be read in conjunction with my article ‘Towards a High Speed **Network**’. That article sought to make the case for developing a network plan for all the HS routes which will eventually be needed, and, as a contribution to getting the discussion started, gave my own thoughts of what such a network could look like. Naturally, this involved describing a number of routes, in varying but superficial detail. This lays me open to the charge, something on the lines of ‘That’s all very easy to say, but how would you actually go about doing it?’ Accordingly, a decent respect to the opinions of the interested public requires that I should go into more detail on the individual routes. The present article deals with HS3, the route from London to Yorkshire, the North East and Scotland.

The general route is decided on strategic and business grounds, thus which locations are to be served. This gives the general alignment, at a very high, superficial level. I plan the detailed route using Ordnance Survey maps, taking careful account of the shape of the landscape, from the contours. I note the location of all significant infrastructure, thus tunnels (generally, over about a quarter mile in length), viaducts and major river crossings. I simultaneously make a virtual tour of the route from my computer, via satellite

maps, to make sure, as far as possible, that there is actually room for my lines where I wish to put them, and that, for example, a housing estate has not materialised in an inconvenient location since the (paper) map was published. (I understand that the images used by satellite maps are up to a maximum of three years old, so not exactly real-time, but still pretty good.) I make a great effort to avoid any housing. I'm blasé about demolishing warehouses – after all, all that's required there is to build a (better) new one nearby, and the owners will be very happy. But I regard demolishing housing (or even getting very close to it) as a thoroughly bad idea; people just don't like it, and I understand their feelings. If ever I must (knowingly) propose to demolish housing, I will point out the fact. These considerations apply in extreme form when, as in the present case, the route starts from London. Here there are simply no free routes available. The design has to follow an existing route, widened where there is space for it, (this involves searching, via satellite maps at a high magnification, where there is space to fit extra tracks within the existing alignment or where there is adjoining space to widen the alignment,) with recourse to tunnelling where there isn't.

In general I try to follow an existing alignment, railway or motorway, (or, very occasionally, of a non-motorway road,) if there is a suitable one available, simply because it's there already, in the right place, with good layout, (somebody else has done all the hard work!) and, except in a very few places, there's plenty of room available adjacent to it. (In this context, motorways are particularly helpful. Nobody wants to live close to one, so house builders don't develop new estates at the side of motorways, leaving plenty of space available for new railways.) Also, most importantly, it minimises disruption, and so I (optimistically, perhaps) expect it to maximise public support and minimise opposition.

When I am following an existing alignment, (this obviously includes taking over the route and trackbed of a former railway, now closed,) I don't generally worry about gradients, confident that they will be well within the capacity of HS trains. Very occasionally, when following a motorway or (more likely) non-motorway road, the contour pattern suggests that there might be a problem, and then I do check the gradients, (and state what these are, in the route plan). When I am obliged to design a completely new alignment, then the gradient profile forms part of the design, and will be stated, (unless, from the contours, it's obviously essentially level, or undulating but with no significant underlying change of level). The present article contains gradients only for those sections of the route between Derwent Hill Junction, north of Consett, and Stocksfield Junction, before Hexham, and between Ravenswood Junction, near St. Boswells, and Millerhill, Edinburgh, since all the rest follows existing or former alignments.

I believe that this approach gives a route which in general terms is practicable and satisfies the requirements, though obviously a lot of work, especially detailed surveying on the ground, would be needed to turn it into an implementable design. Specifically, I can say nothing about cuttings and embankments, though I may note that a particular piece of landscape is strongly undulating, so cuttings and embankments will be required. Also, when I take the route alongside an existing railway or motorway alignment, I don't attempt to design it in any detail around (particularly motorway) junctions, although I do note on which side it runs, and wherever it is necessary to cross over to the other side.

The Maps

Naturally, the chosen route must be illustrated with maps. I briefly describe the route, giving the map reference of all significant points (invariably of tunnel end points and significant river bridges), but the accompanying maps are the real definition. Mapping software can be very expensive, but fortunately the

Ordnance Survey makes available, free of charge, the OS OpenData product suite, of which I use two components, the 1:250000 Scale Colour Raster data set and the Strategi Dataset. The former comes as a set of TIFF files, each containing one of the standard National Grid 100km Reference squares. These are easily converted into Microsoft Paint files and edited. These are, in other words, pure graphics, and are the basis of the detailed maps in the 'Route' section. The maps reproduced in the text all represent an area 20km in width (unless noted otherwise) and 10 km high (if the detail I wish to show will fit within that, but otherwise as high as necessary). They do actually contain contours, but not many; the scale is too small for contours to be really informative. For the present purposes, this scale is adequate; if you need more detail, use them as an index to the corresponding 1:50000 Landranger or 1:25000 Explorer maps.

The Strategi Dataset contains GIS (Geographical Information Systems) data, which has to be processed by special software; I have used the Open Source QGIS product. This has been used to produce an overall map of HS3, including sections of other routes over which HS3's services run. These overall maps come at the end of the 'Route' description, and also show HS3's classic compatible services on classic lines (these are shown as dotted lines). Also included there are maps of the overall HS Network.

In all the maps I use the following colour scheme for the various routes:

As the various route plans have been developed, the maps have been updated, so now they show all routes, as relevant. The maps in the present article are thus not limited to HS3.

The Service Plans

The Route section of this document describes the complete lines in their final, full configuration (as far ahead as the plans consider). The service plans explain how that final state is reached: the order in which sections are opened, and the services which run on these partial configurations. The aim is always to get useful services running as soon as possible, to maximise return on the investment.

The service plans deliberately envisage maximum frequencies, to give an impression of just how much the system **could** accommodate. Initial services would certainly not be so intensive, probably no more than half of the frequencies quoted.

HS3 GC gauge services fall into two categories:

1. Long Distance, limited stop, Ultra-High-Speed services to the North East and Scotland, first stop York, South Yorkshire or Sheffield. (When the Mk2 route enhancements are fully implemented, a UHS service to Nottingham and Derby is also proposed.)
2. High Speed Metro on that part of the route south of Leeds / York, stopping at all stations. It is envisaged that HS Metro services will use double deck trains.

A standard HS station has two island platforms, thus two platformed tracks in each direction. If some of the services passing through the station are non-stop, then the main line must pass through the layout without adjacent platforms, either through the centre of the alignment, in tunnel below or on viaduct above, or the station must be on a branch loop off the main line, which thus bypasses it completely. All stations south of Leeds / York have main lines avoiding the station platforms, through the middle of the alignment (Luton & Dunstable Parkway, South Yorkshire), or the station is on a loop away from the main line (Northampton, Leicester, Nottingham). This allows category 1 services to overtake. Leeds, York and the later Sheffield HS station, and all HS3 stations (except Lauder) to the north of them, are served by all services, so don't need overtaking/avoiding lines. At the end(s) of a route, the traffic density may not be sufficient to warrant this level of provision, so a single island platform (or two single platforms within some other arrangement) would suffice; this is the case with HS3 at Lauder.

Several service plans are developed, reflecting the piecemeal development of the network. As new sections open, further services come into operation. In all cases, consideration is given to maximum loadings – which section(s) are fully loaded and thus determine the maximum service frequencies. In general I take 16tph as the maximum throughput; if this is ever exceeded, the fact will be highlighted.

In the present article, the northern half of HS7, the NE-SW route, must also be considered, as HS3 and HS7 are intimately linked, sharing the same route from Nuthall North Junction (Nottingham) to Newcastle. HS5, the route from London to Brighton and other Sussex / Hampshire / Kent locations, must also be considered, in the later service plans, as HS3's GC-gauge services are all inter-regional with HS5.

Two types of services are contained in the plans, those featuring High Speed trains (GC gauge and classic compatible) which travel on HS3 for at least part of their journey, and those featuring Regional Metro (semi-fast) services on the corresponding classic route(s). Connections between the services (both HS and RM) are shown for the relevant interchange stations (the connections are usually cross-platform), together with the clock-face hourly departure plan. (Note that these plans are **representative**; the **actual** times are determined by the coordination of interchanges at multiple locations).

In the service plans I distinguish some of the GC gauge services as double deck. Originally this linked the Brighton services of HS5 with the HS Metro services of HS3, to York and Preston. It's all rather arbitrary, at present. Provided that there are no difficult technical issues in running double deck trains at 225mph, and that public reaction to them is favourable, I would like to see all GC gauge services run with double deck trains. (The Swiss like them.)

It is important always to bear in mind that the HS network is **not** a separate, stand-alone system, but an integral part of the complete railway network, hence the importance I attach to showing precisely how HS

services interact with classic (RM) ones. (In this context it is worth pointing out that if, when HS lines come into service, the current ridiculous and illogical franchising system is still in operation, it will be necessary to include the corresponding classic route(s) in the same franchise as a HS route, with a strict contractual obligation on the franchisee to ensure close integration of HS and classic services. It certainly won't happen otherwise.)

Estimated Journey Times

Following the service plans, estimated journey times are produced for all GC-gauge services, and for several CC services also. The assumptions and approximations made are explained.

The Mk2 route brings some slight accelerations, compared with the original plans, and the implementation of 4 tracking brings more.

HS3 Route – Introduction and Assumptions

Except for that part of the route north of the former Relly Mill Junction, near Durham, HS3 closely follows existing alignments, railway and motorway. (Even within that section, it **loosely** follows many former alignments – with frequent variation to ease curves, since none of these former lines was designed for high speed!)

HS3's long-term classic-compatible services begin at St. Pancras West (the MML platforms), and the GC-gauge services all begin at Pancras Cross. This is an underground station with 6 platforms, (passive provision for 8). It is located between St. Pancras and King's Cross stations, the precise location, horizontal position and depth, to be determined by the configuration of all the other tunnels in that area. Initially it is a terminal station, but with the tunnels joining at the south end of the platforms, and extending some distance further, so that tunnelling work may be resumed at a later date, for HS5, without affecting the operation of the station. The assumption in making the initial service plans is that this terminal station will be able to handle 12tph (but in practice only 10 are actually required). Once HS5 opens, and Pancras Cross becomes a through station, then nothing starts or terminates there; HS3's services via Pancras Cross continue into Sussex, West Kent and Hampshire, as route HS5. Later, HS6's GC-gauge services also serve Pancras Cross, balanced by further services on HS5. Appendix A gives full details of Pancras Cross and its surroundings. Full details of the services on HS6/HS10 are contained in the article 'HS Eastern Routes and Service Plans (HS6 and HS10)', and of those on HS5 in article 'HS5 Route and Service Plans'. Summary details of the inter-regional services are in the service plans of the present article. There is a connection from classic to HS lines immediately west of West Hampstead Thameslink, to allow classic-compatible services from St. Pancras to join the HS route.

The maximum speed for HS3 is 360kph, 225mph, south of Darlington. North of Darlington the non-stop runs are not long enough to take advantage of this speed, so a lower limit of 300kph, 187.5mph, applies there, with no detriment to the service provided, and with significant savings in construction costs. However the final section, between Riccarton North Junction and Edinburgh, reverts to 360kph. This section is intended to be shared with the (extra-highly-speculative) Scottish extension of HS2, which has that line speed throughout

HS3 is based closely on the classic MML alignment, on the immediate approach to London, and between Leicester and Toton. North of Edgware, it follows the alignment of the M1 as far as Leicester, for the final part, above Rugby, taking over the alignment of the Great Central Railway into Leicester, and re-joining the MML there (Leicester London Rd. is the HS station). From Loughborough, a branch diverges on a new alignment to approach Nottingham from the east; Nottingham Midland is the HS station. The main line of HS3 follows the alignment proposed by HS2 Ltd. for the Leeds arm from Toton (no station there!) to Ulleskelf. The Nottingham branch rejoins the main line at Nuthall South Junction, a little to the north of which HS7 joins, at Nuthall North Junction, sharing the alignment from there all the way to Newcastle. HS3's approach to Leeds is quite different from HS2 Ltd.'s proposal, for reasons explained in the route description. An extension beyond Leeds, (actually a very early section of HS9, the Northern Transpennine HS route,) re-joins the HS3 main line at Garforth. HS tracks continue beyond Ulleskelf to York. Between York and the former Relly Mill Junction, just before Durham, HS3 closely follows the alignment of the ECML. Beyond there the alignments are new, but making use of several former alignments.

HS3 Route – Junctions

There are various junctions on the route of HS3, enabling connections with other HS and classic routes. These are identified in the description of the route, but it is convenient to list them all here, together with their map references and identifying remarks, since, when discussing the capacity/loading of different sections of route, the end points are usually junctions (occasionally stations). The junction names are my own suggestions (in all but three cases – Ardsley, Gelderd Road and Ravenswood – where there were junctions formerly).

One feature of the following list needs clarification: certain of the junctions are given as north / south (could equally well be east / west, as a few are). These are all the junctions of station loops, and are where the services stopping at that station diverge from / rejoin the main line. Their location is precisely defined by the acceleration / deceleration rates of the trains. (They decelerate more rapidly than they accelerate, which is probably just as well.) The junction where a service re-joins the main line, having accelerated up to the turnout limit speed from a stop is thus further from the station than the junction where trains diverge, at the turnout limit speed, and decelerate to standing at the platform. (**Very** roughly the acceleration distance is about 50% greater than the stopping distance.) Note that this **only** applies to station loops; for a genuine route junction, where one route diverges from another, and no station is involved, junctions in both directions can be and usually are at the same location.

I make the distinction between a station loop and a station branch. A loop is where the main line passes through the centre of the station, but not adjacent to any platforms – the platforms are served by loops off the main line, the position of the junction with the main line at each end of the loop being precisely specified, as described above, (Luton & Dunstable Parkway is an example of this). A station branch is where the station is off the route of the main line, served by a branch which diverges from the main line, serves the station then re-joins the main line, (Nottingham is an example of this). The distinction is, however, not hard and fast. Thus Leicester is undoubtedly on a station branch, since the main line does not pass through the station, but the branch is actually shorter than a station loop would be, so the positions of the end junctions are prescribed. Northampton, likewise on a branch, is close enough to the main line at the southern end to have its junctions positions prescribed, as for a loop, but the rest of the branch is long enough that it re-joins the main line in a normal route junction.

• Canley St.	TQ300831	HS6 diverges from HS3 immediately north of Pancras Cross (in tunnel). When the 4-track extensions of HS3 Mk2 are implemented, the direct, tunnel route to Scratchwood Junction also diverges here.
• West Hampstead	TQ250848	Allows classic-compatible services from St. Pancras to join HS3
• Scratchwood	TQ204935	The direct, tunnel route from Pancras Cross emerges from tunnel, and the lines following the existing alignment join it on either side. All four tracks then diverge from the MML alignment, and join the south side of the alignment of the M1. This is a route, not a track junction.
• Slip End(*)	TQ090163	(South) Southbound services from the Luton & Dunstable Parkway (L&DP) station loop, having stopped at L&DP, re-join the main line.
	TQ082192	(North) Northbound services for the L&DP station loop, stopping at L&DP, diverge from the main line.
• Chalton(*)	TL037261	(South) Southbound services for the L&DP station loop, stopping at L&DP, diverge from the main line.
`	TL030288	(North) Northbound services from the L&DP station loop, having stopped at L&DP, re-join the main line.
• Collingtree(*)	SP758547	(East) Southbound services from the Northampton station loop, having stopped at Northampton Castle, re-join the main Line.
	SP739565	(West) Northbound services for the Northampton station loop, stopping at Northampton Castle, diverge from the main line.
• Langborough	SP604671	Northampton branch re-joins main line.
• Watford Gap	SP589697	HS2-CV's southern interconnection diverges from HS3.
• Cotesbach	SP546820	HS2-CV's northern interconnection joins HS3.
• Aylestone(*)	SP559984	(South) Southbound services from the Leicester station loop, having stopped at Leicester, rejoin the main line.
	SK569010	(North) Northbound services for the Leicester station loop, stopping at Leicester, diverge from the main line.
• Watkin Rd.	SK577030	HS3 Leicester station branch diverges from main line. This is a route, not a track, junction.
• Regent St.	SK593038	Classic line joins Leicester station branch (just south of Leicester station)
• Swain St.	SK596044	Classic line diverges from Leicester station branch (just north of Leicester station)
• Humberstone Rd.	SK599049	HS3 Leicester station branch rejoins main line. This is a route, not a track, junction.
• Thurmaston(*)	SK613078	(South) Southbound services for the Leicester station loop, stopping at Leicester, diverge from the main line.
	SK622104	(North) Northbound services from the Leicester station loop, having stopped at Leicester, re-join the main line.
• Stanford	SK543215	HS3 Nottingham station loop diverges from main line
• Edwalton	SK601347	Classic route from Melton Mowbray joins HS3 Nottingham station loop. (Later becomes junction with HS8.)

- Manvers St. SK588393 HS3 Nottingham station loop joins alignment of classic route east of station. Allows connections both ways between classic and HS.
- Strelley SK512423 Connects HS3 Nottingham station loop to HS7
- Nuthall South SK509425 HS3 Nottingham station loop re-joins main line
- Awsworth SK484444 Spur to HS3 Nottingham station loop (passing over HS3 main line) diverges from HS7
- Nuthall North SK514469 HS7 joins HS3
- Beighton SK447838 Connection to Retford – Sheffield route, later to HS8 instead
- Woodhouse SK433856 Connection from Retford – Sheffield route to HS8.
- Altofts SE370243 HS3 Leeds branch diverges from main line to York
- Ardsley SE302265 HS3 Leeds branch joins classic route to Leeds
- Gelderd Road South SE279320 HS3 diverges from classic Leeds route to reach New Lane station, via the viaduct line.
- Gelderd Road North SE282232 HS9 joins HS3 west of Leeds New Lane station.
- Garforth West SE387342 Spur to HS3 diverges from HS9.
- Garforth East SE395341 Spur from HS9 joins HS3 main line to York.
- Micklefield HS SE439327 HS9 joins classic route to York at relocated and expanded Micklefield station.
- Derwent Hill NZ103537 HS3 route to Hexham and Edinburgh diverges from route to Newcastle
- Paradise NZ220634 HS3 route from Consett joins Hexham – Newcastle (north bank) route
- Stocksfield NZ050610 HS3 route from Consett joins Newcastle – Hexham – Edinburgh route
- Tynegreen NY923651 HS3 route to Edinburgh connects to classic route to Carlisle
- Riccarton North NY531988 HS3 route to Edinburgh joins the former Waverley North route north of the original Riccarton Junction
- Ravenswood NT575339 HS3 diverges from the Waverley route

Micklefield is an existing junction, where the Selby and Hull line diverges from the Leeds – York line

There are various other links between HS3 and classic lines, for operational purposes and not intended for regular services, so not relevant in the present context.

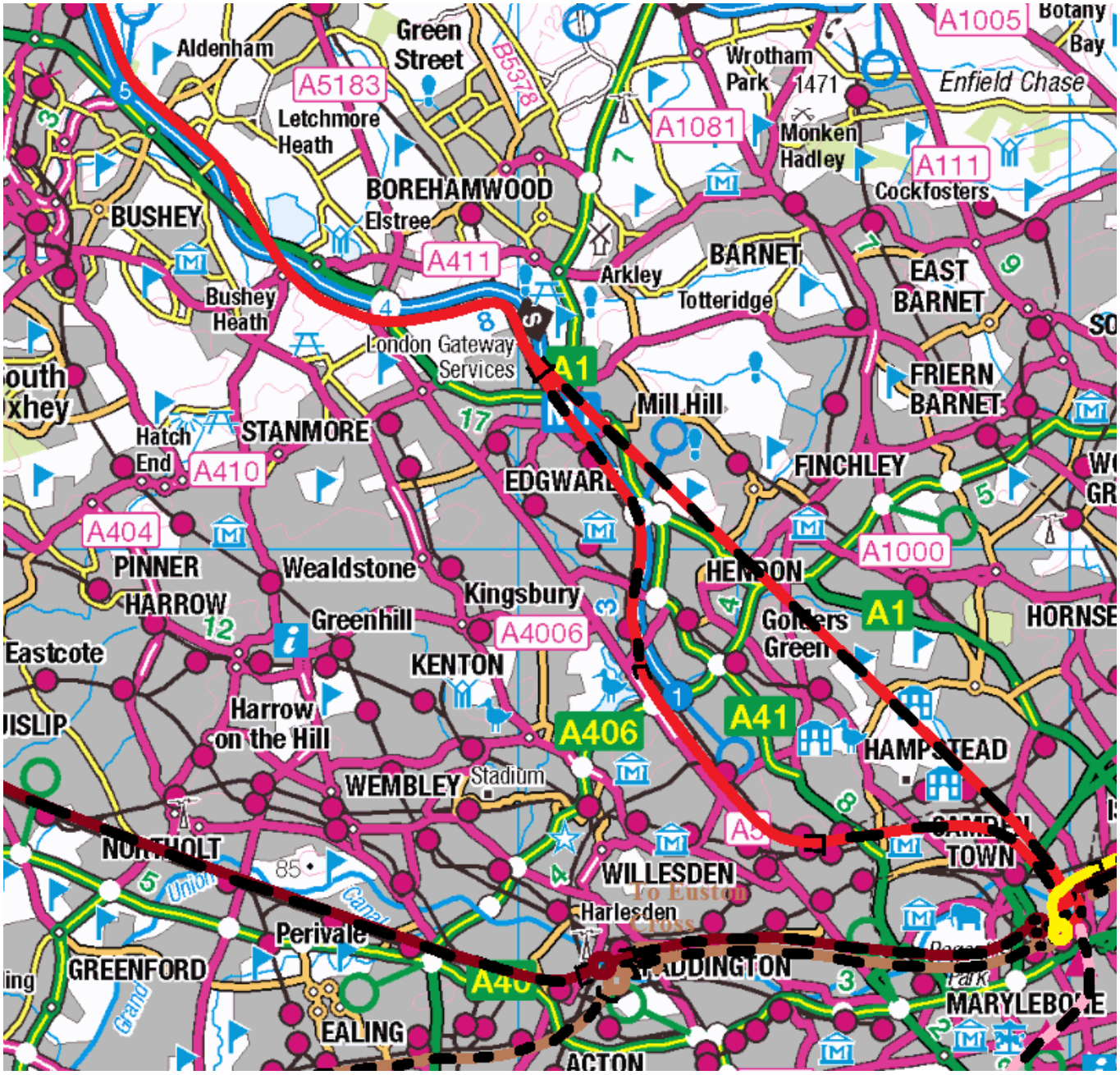
(*) Slip End, Collingtree and Aylestone junctions are at the southern end of the Luton & Dunstable Parkway, Northampton and Leicester station loops/branches, respectively. When the HS3 Mk2 quadrupling is implemented, the outer two tracks will diverge and become the station loops/branch. There will still be the connections from the main line – the inner two tracks – but these will probably no longer be used in normal service. (They're there already, so they might as well stay; we do need the occasional connections to and from the main lines, in the 4-track sections) Chalton and Thurmaston junctions are likewise at the north end of the L&DP and Leicester station loops/branches, and the same remarks apply. Langborough Junction, at the north end of the Northampton station branch, is a normal route junction.

There now follows the definition of the actual route, in several logical sections.

1. *Pancras Cross / St. Pancras West – Luton & Dunstable Parkway*

HS3 follows the route of the MML, underground all the way until immediately before West Hampstead station, at TQ255848, a distance of slightly under 2 miles. From West Hampstead it takes over the two freight tracks on the south side of the alignment. Immediately to the west of West Hampstead is the connection from the classic line to the HS line, to allow HS classic-compatible services from St. Pancras West to join.

HS3 occupies the former freight lines all the way to TQ230870, where the freight lines from Dudding Hill would have merged. These freight lines are now extended along a widened alignment, which will involve the relocation of several warehouses. HS3 crosses to the NE side of the alignment entering a tunnel at TQ221882 (immediately before Hendon station), and from that location, the freight lines resume their original location, on to the Silkstream flyover.

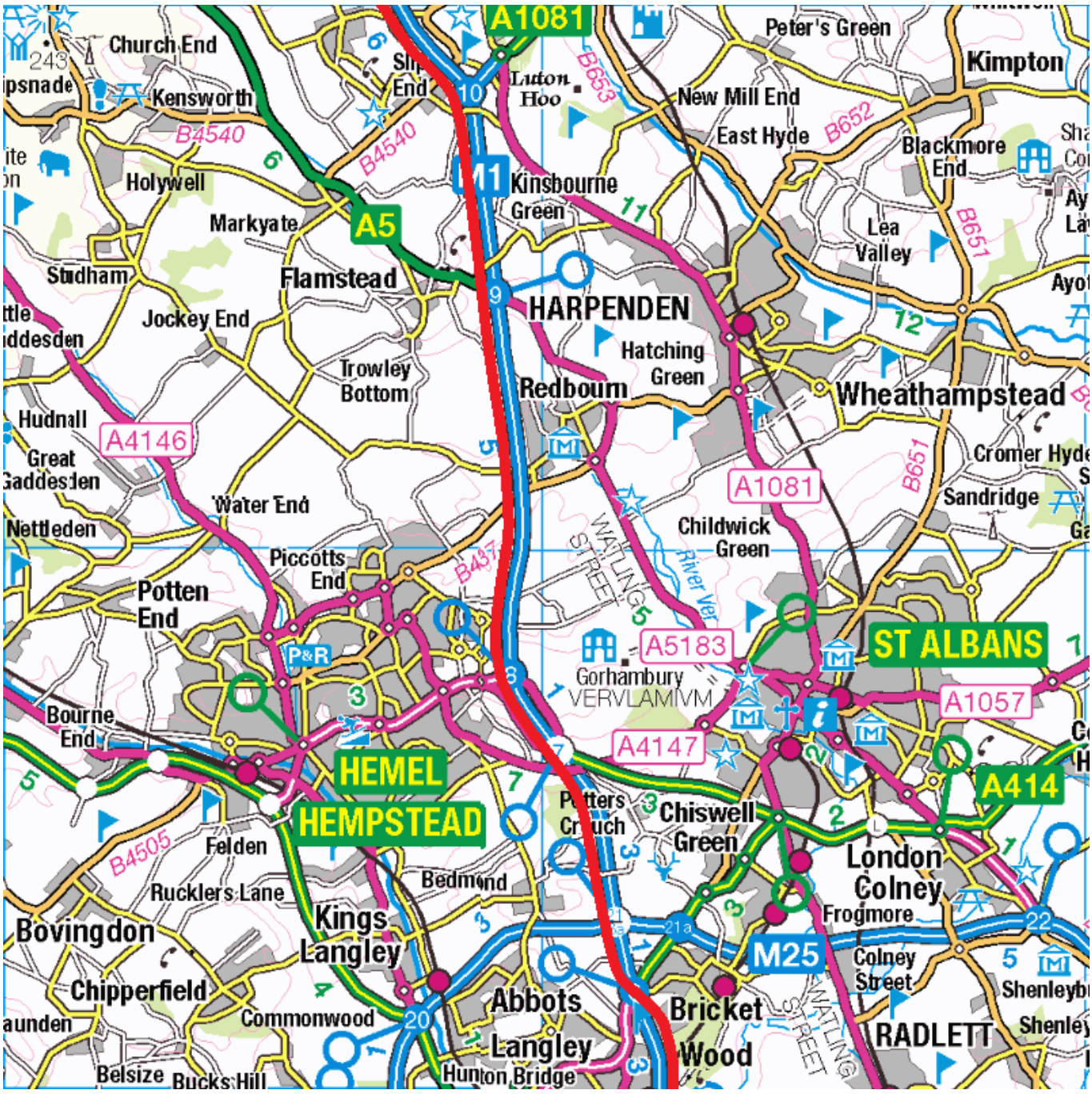


1.1 Somers Town– Meriden

HS3 emerges from tunnel 3.5 miles later, at TQ204935, Scratchwood Junction, where the M1 diverges from the Midland alignment. When the 4-tracking of HS3 Mk2 is implemented, the additional 2 tracks of the direct, tunnel route from Pancras Cross also emerge from tunnel here, and become the central 2 tracks of a 4-track, parallel arrangement.

From Scratchwood Junction, HS3 follows the south side of the M1 until TQ155959, where it crosses to the north side, also easing a curve in the motorway. It follows the north side for just over 5 miles, crossing back to the now west side at TL121045. These two crossings are purely to avoid extensive housing at Meriden and Bricket Wood respectively. HS3 remains on the west side of the M1 until Luton.

Luton & Dunstable Parkway station is located at TQ055221. There may be a slight problem with the approach. The height at TQ071208 is 170m and at the station 150m, these being 1.5km apart. That gives a gradient of 1 in 60, which is no problem. However, there is a quite step hill in between, which the M1

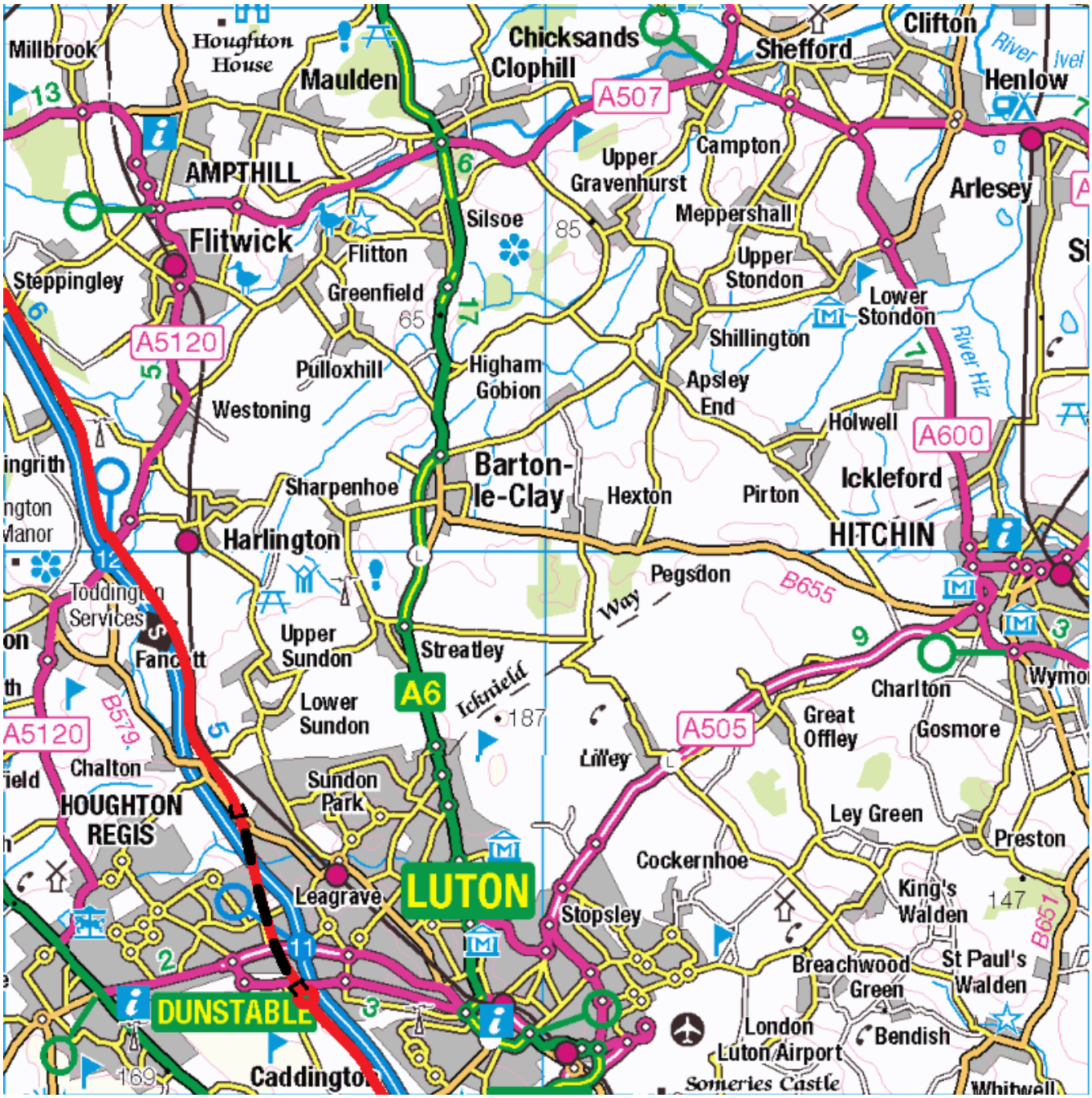


1.2 Bricket Wood – Slip End

climbs over, followed by a steep descent. It might be advisable for HS3 to tunnel under this, but that is a decision for the detailed design phase; I merely flag it up for consideration.

The station loop junctions south of the station are Slip End, South and North junctions, at TQ090163 and TQ082192, and are respectively for trains stopping there re-joining / diverging from the main line. (See the remarks on p.6 preceding the list of junctions for an elucidation of this.)

The main lines of HS3 pass through the centre of the alignment at the station, alternatively in tunnel between Slip End North Junction and Calton South Junction. See (the new) appendix C, for the connections from Luton & Dunstable Parkway to Luton, Dunstable and the airport.



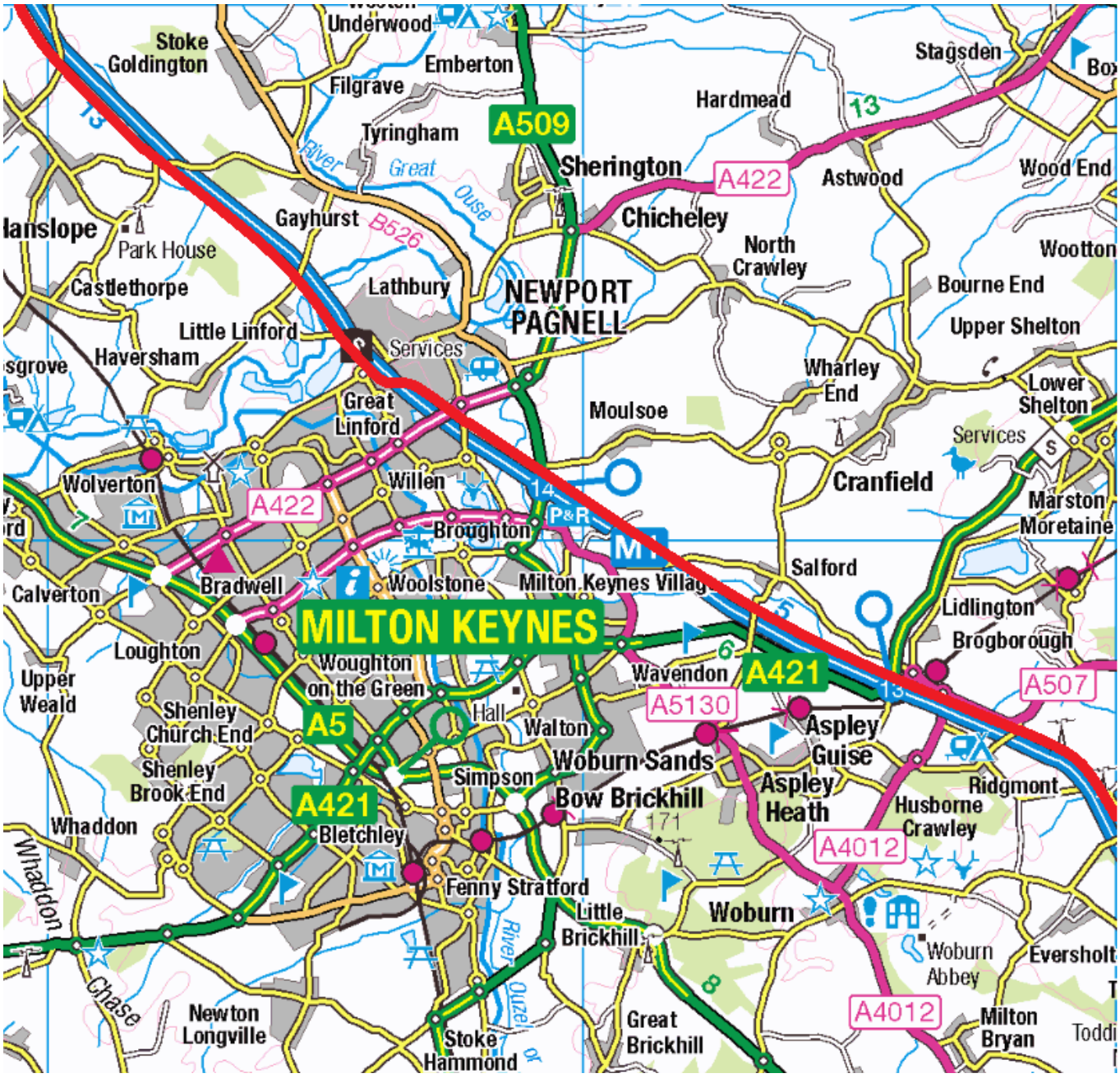
1.3/2.1 Luton – Steppingley

2. *Luton & Dunstable Parkway – Northampton*

HS3 enters a 2 mile tunnel on the west side of the M1, immediately north of the station, at TL085216, emerging at TL045247, on the **east** side. The station loop junctions on the north side are Calton South and North junctions, at TL037261 and TL030288, and are respectively for trains stopping there diverging from / re-joining the main line.

HS3 follows the M1 all the way to Northampton. It follows the E/NE side of the M1 as far as Newport Pagnell, then switches at SP863430 to the SW side, following this as far as SP794506 where it crosses back to the NE side; these two crossings are purely to avoid housing.

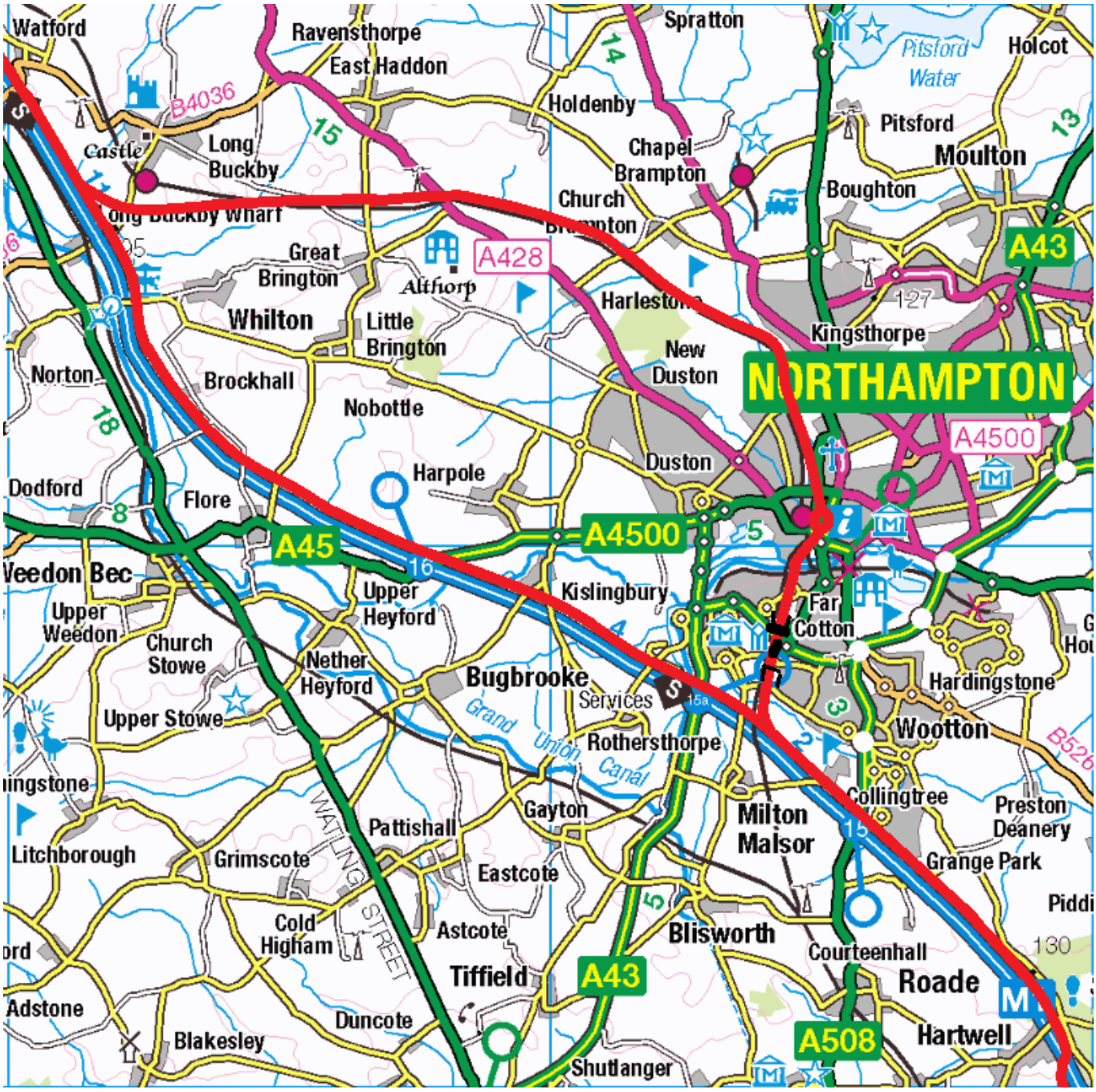
Approaching Northampton, the station loop/branch junctions are at Collingtree East and West junctions, at SP758547 and SP739565, and are respectively for trains stopping there re-joining / diverging from the main line.



2.2 Eversholt – Hanslope

Immediately after Collingtree West Junction, at SP738564, the Northampton station branch diverges from the main line, and follows the east side of the WCML into Northampton, where there is plenty of room on the east side of Northampton Castle station for the double HS3 island platforms.

There is a connection from HS3 to the classic route at Northampton Castle station. This is a temporary arrangement (though probably lasing a long time) to allow HS3's CC services to Birmingham and on to Liverpool/Chester and Worcester to gain the WCML and on to Birmingham via Rugby and Coventry. Eventually, when HS2-CV opens, this will make a connection with HS3 at Watford Gap Junction (SP589697), and the CC services will then travel on HS tracks as far as Warwick Rd. Junction, Coventry.

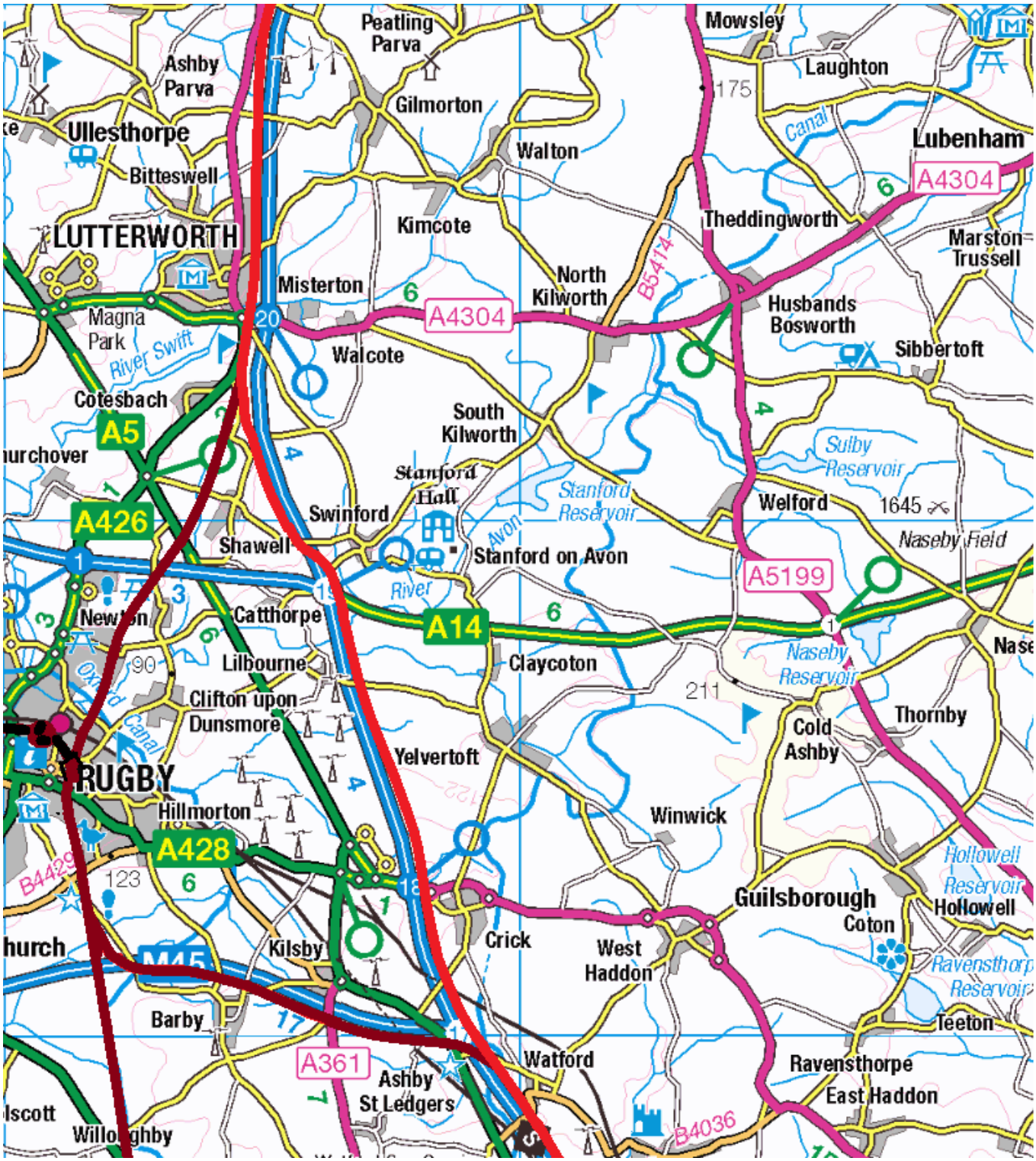


2.3/3.1 Roade – Watford

3. *Northampton – Leicester*

The main line of HS3 follows the north / east side of the M1 alignment until junction 19, where the M6 diverges. Immediately after the junction, it crosses to the west side of the M1 and follows that for the next 2 miles, where, at SP550815 it diverges and takes over the route and trackbed of the former GC line, at SP546820. This will eventually be Cotesbach Junction, where the northern interconnection between HS2-CV and HS3 joins.

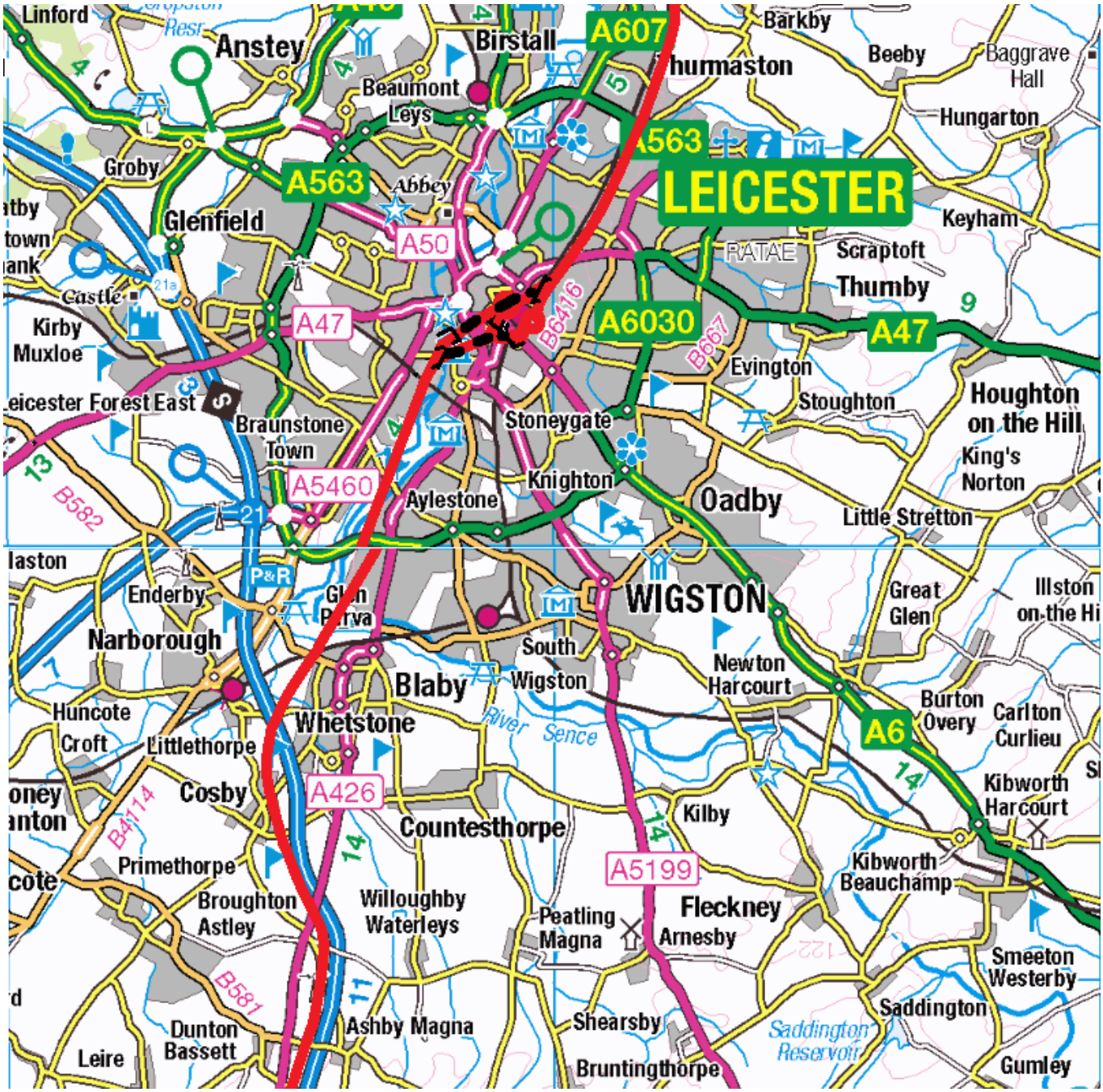
HS3 follows the GC alignment all the way to Leicester. (We may say that it's still following the west side of the M1, since that follows the GC alignment closely, as far as Cosby.)



The Northampton station branch of HS3 follows closely the east / north side of the alignment of the WCML Northampton branch until SP660661, where it crosses to the south side and diverges, re-joining the main line of HS3 at SP604671, Langborough Junction.

HS3 continues along the GC trackbed almost to the centre of Leicester. The alignment is, as far as I can judge, completely unobstructed except in the Whetstone area, where, for a short distance around SP555974 the alignment has been built over, but there is free space a short distance to the west, so it could be slewed slightly to the west and continue. Likewise, houses have been built on the alignment at SP557980, between the B582 underbridge and the (Leicester – Hinckley) railway line underbridge – a distance of about 200yds! This will either be tunnelled under or, for such a small distance and such a few houses, I would even consider demolishing them!

As far as I can judge, the alignment is available as far as Upperton Road (SK578034). The Leicester station branch of HS3 diverges from the main line at Watkin Rd. Junction, SK577030, and shortly



3.3/4.1 Ashby Magna – Thurmaston Contains Ordnance Survey data © Crown copyright and database right 2013

afterwards, at SK578032, enters a 1 mile tunnel leading directly to Leicester London Road station, where a junction is made with the classic route. The station branch is actually shorter than a station loop would be. The junctions for the station branch are Aylestone South and North junctions, at SP559984 and SK569010, and are respectively for trains stopping there re-joining / diverging from the main line.

The main line continues from Watkin Rd. Junction, itself entering a 2¼ mile tunnel at Sk579033, emerging on the eastern side of the MML alignment at SK5990149 (Humberstone Rd. Junction) where it is re-joined by the station branch.

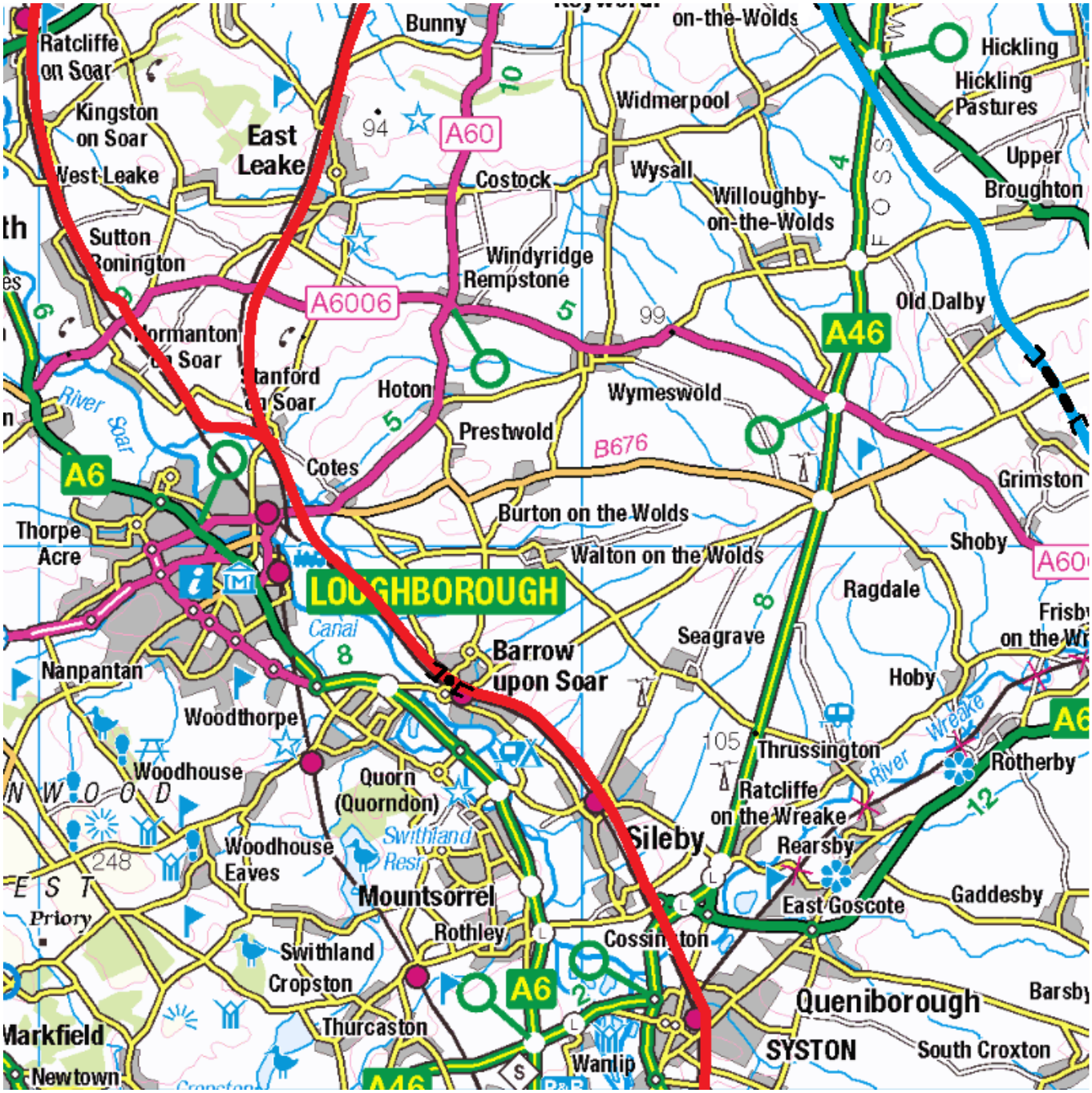
The arrangements at Leicester London Road are very tricky, due to the cramped nature of the site. Appendix B explains how this might be effected, using the available infrastructure to best advantage, and minimising the extra land take.

See also appendix G, on the impact on HS3 of the Coventry Variant of HS2.

4. *Leicester – Nuthall North Junction*

HS3 follows the eastern side of Midland alignment from Leicester as far as Toton. The Leicester Station branch is re-joined by the main line at Humberstone Road junction (refer to Appendix B for the detailed arrangements). Humberstone Rd. Junction is a route junction, not a track junction, The actual track junctions for the station branch are Thurmaston South and North junctions, at Sk613078 and SK622104, and are respectively for trains stopping there re-joining / diverging from the main line.

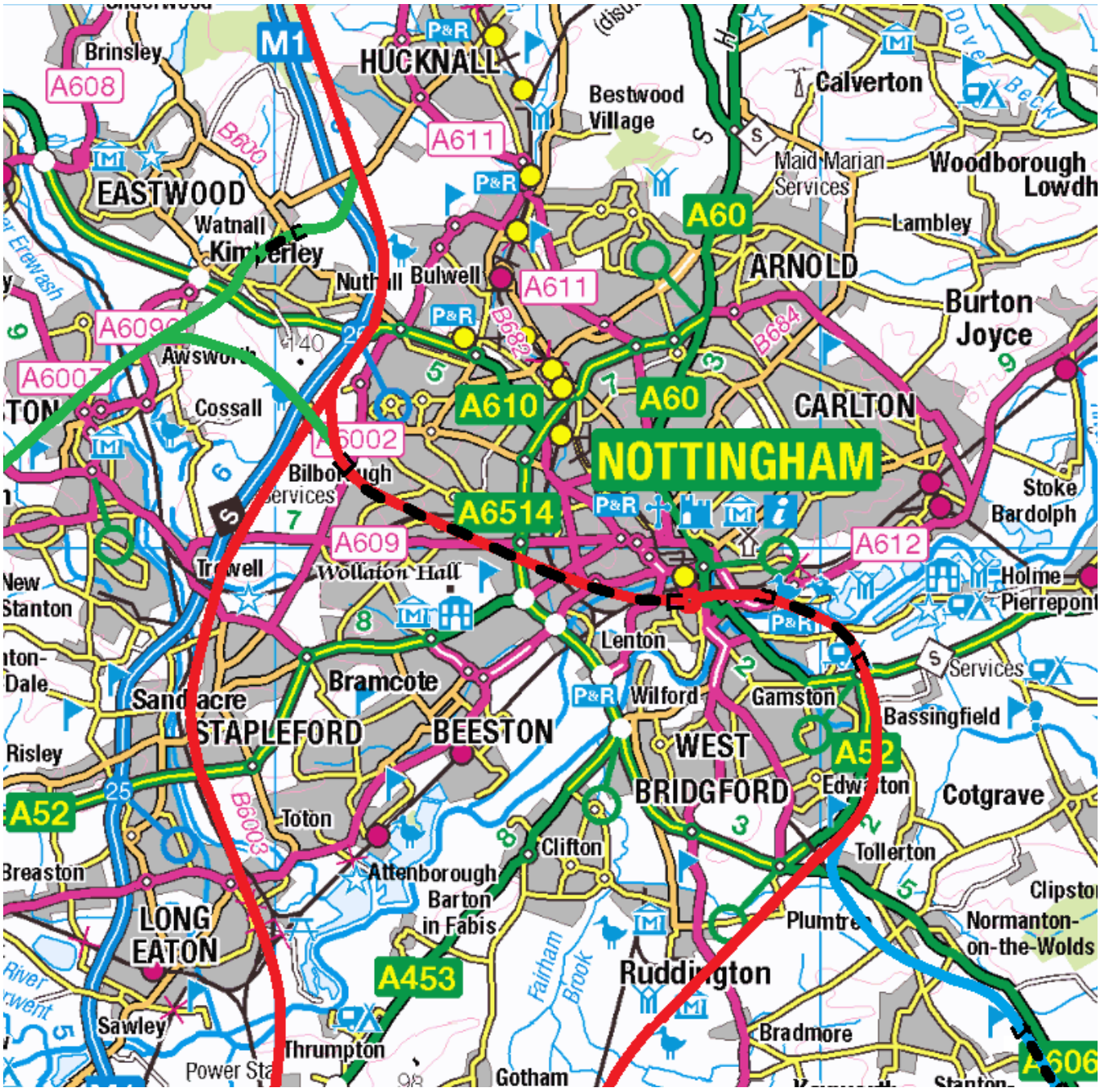
HS3 crosses over the junctions at Syston on a viaduct. A very short tunnel (c. quarter mile) is required under the centre of Barrow on Soar. (When the 4-tracking of HS3 Mk2 is implemented, the additional 2 tracks would probably best tunnel under Sileby and Barrow on Soar. While I judge that there is room for another 2 tracks on this section, there almost certainly isn't for yet another 2.) The few buildings which encroach seem to be of warehouse / industrial type, but there are remarkably few obstructions. The most



4.2 Systen – Ratcliffe on Soar

serious is the Brush works at Loughborough, but even here, there is plenty of open space behind, enabling HS3 simply to go round it. Just south of Loughborough station, at SK548201, HS3 diverges from the MML alignment and follows closely to the east of the GC alignment for 1 mile to Stanford on Soar (SK543215). Here the Nottingham Loop of HS3 (see below) diverges from the main line, which veers west through Loughborough Meadows, re-joining the MML alignment at SK530220, and completing the circumvention of the Brush works. A similar (much smaller) works obstructs the route a little over a mile further on, at SK514241, just beyond the site of the former Hathern station. This is easily avoided by a short diversion behind it (if, indeed, it is still there at construction time). HS3 runs alongside the East Midlands Parkway station. No HS station is provided here; the HS3 station is in the centre of Nottingham, on the branch. (But East Midlands Parkway will be well served by classic compatible HS services.)

The HS3 main line joins the alignment proposed by HS2 Ltd., for the eastern arm of HS2 phase 2, at SK496305, and follows that for the rest of the way to York. This is fully detailed in the HS2



4.3/5.1 Thrumpton – Hucknall

documentation, and will not be repeated here, except insofar as these proposals differ from it (particularly in Leeds and near Sheffield). Maps are, however, provided here, to the same standards as the others, documenting the route.

The Nottingham station branch diverges from the main line at Stanford on Soar, (Stanford Junction,) as noted above. It follows closely, slightly to the east of, the GC alignment, as far as SK554285. It then curves to the right, passing north west of Bradmore and south east of Edwalton, then following the east side of the A52(T) ring road (Gamston Lings Bar Road) from SK593342 to SK605377 (not forgetting to provide an adequate bridge over the currently disused Grantham Canal). It then tunnels under the Trent for ~1 mile to join the south side of the alignment of the classic line from Lincoln, Newark and Grantham at SK588393 (Manvers Street Junction), allowing for each-way connections between classic and HS tracks, on the approach to Nottingham station. (Speeds are very low here, so nothing fancy is required in the way of point work.) This approach to Nottingham has an entirely unexpected and serendipitous benefit, in that it can be shared with the classic Midland route to Nottingham, from Melton Mowbray, allowing it to be reopened readily. (Trying to restore this on its original alignment through West Bridgford / Trent Bridge would now be very problematic.) Of course, Network Rail will have to find itself a new test track! The classic route joins HS3 Nottingham branch at Edwalton Junction (SK601347).

That was the original idea, but in fact it's even better – the section from Edwalton Junction (SK601347) to Asfordby Junction, near Melton Mowbray, also forms part of HS8's route to Peterborough and Ely (and Norwich).

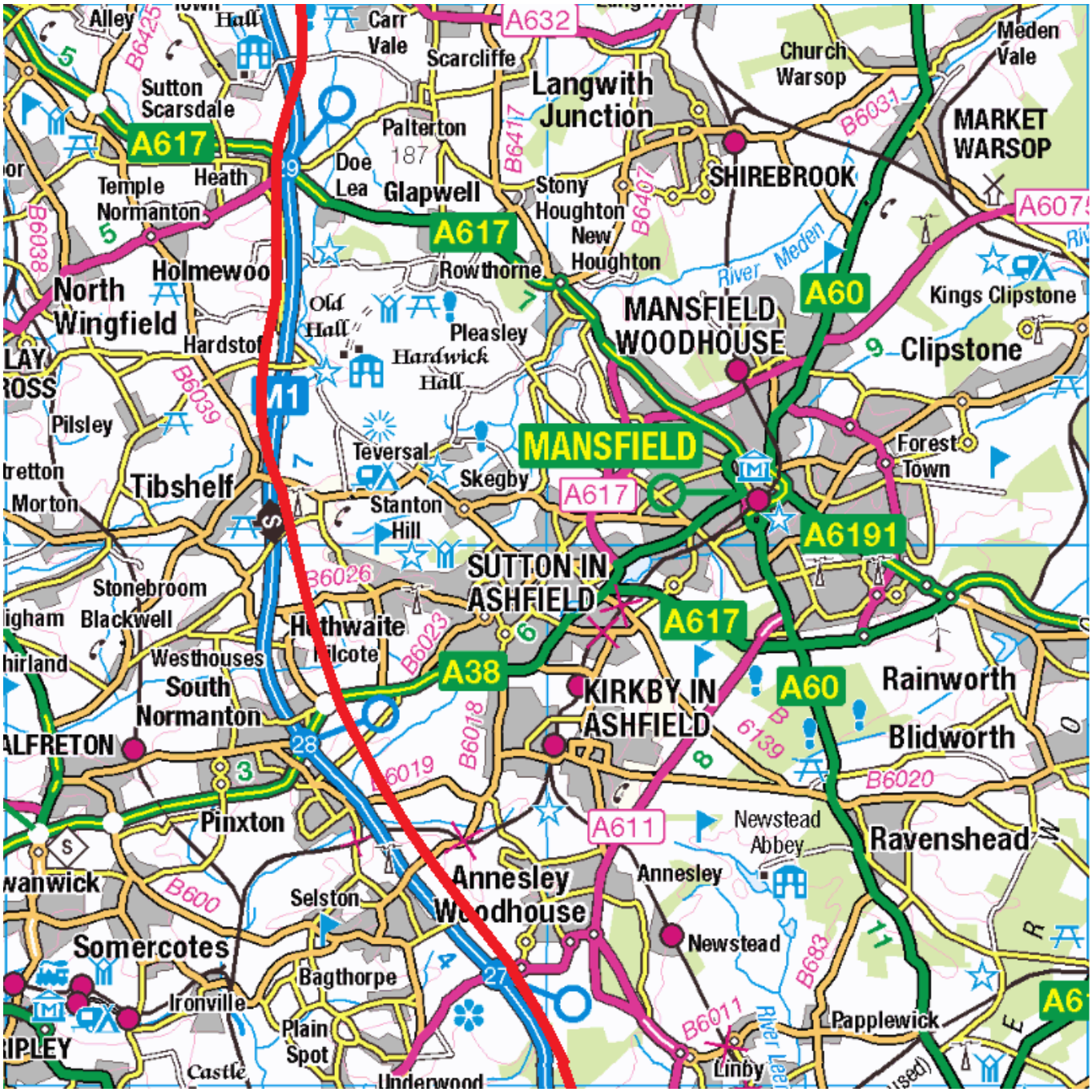
Nottingham Midland **is** the HS station. Two GC-gauge island platforms, thus 4 platform faces, are provided on the south side of the station (there's plenty of room – it's currently a car park).

Leaving Nottingham Midland, the station branch immediately enters a 4 mile tunnel, emerging immediately before Strelley Junction (SK512423) where the Nottingham connection of HS7 diverges. It finally re-joins the HS3 main line at Nuthall South Junction (SK509425).

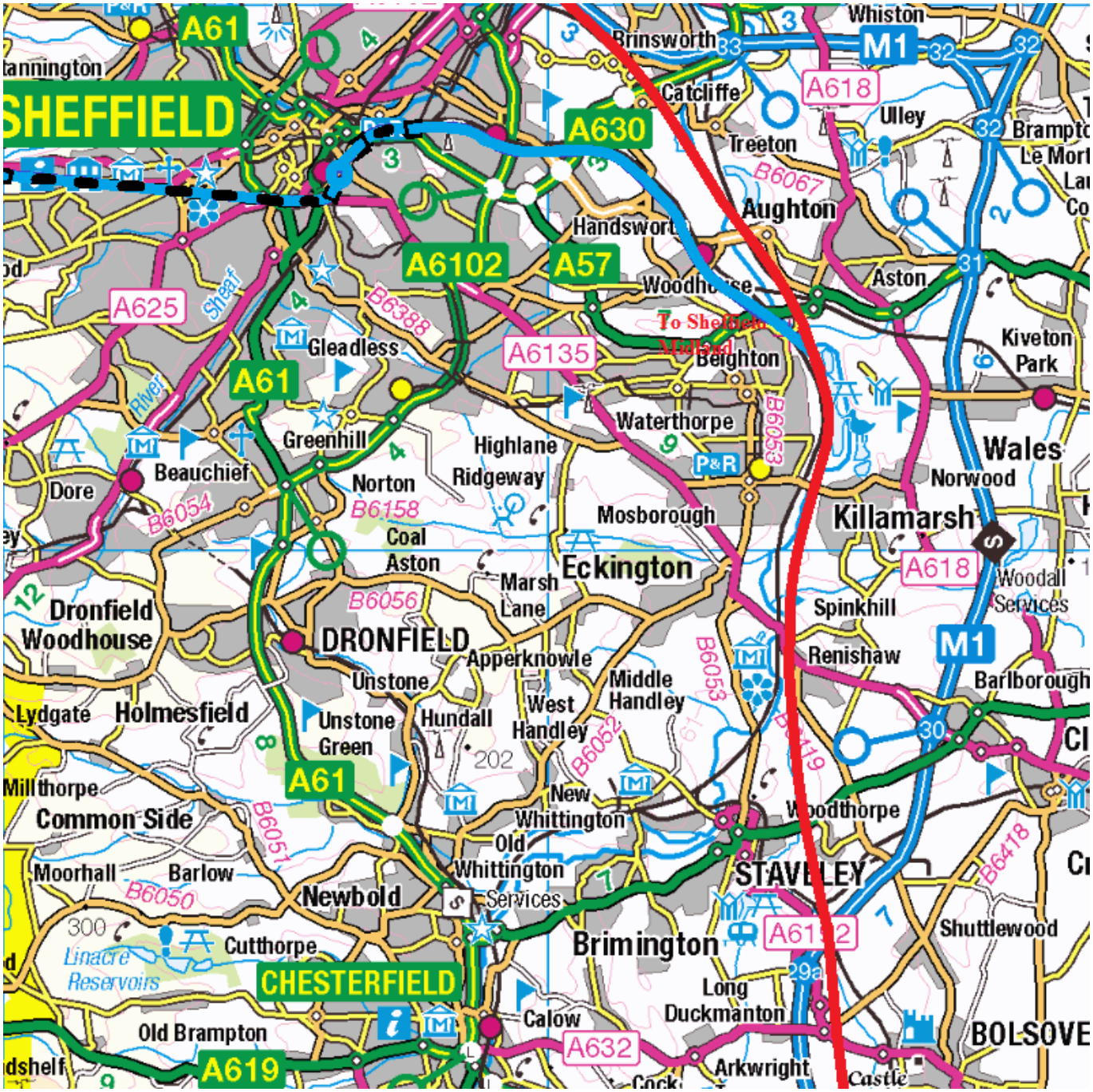
Shortly beyond this, the route of HS7 from Derby joins HS3 at Nuthall North Junction (SK514469). A short spur links HS7 at Awsworth Junction (SK484444) to HS3 (Nottingham branch) at Strelley Junction, as noted above, passing over the HS3 main line, and providing a HS route between Nottingham and Derby.

5. *Nuthall North Junction – Beighton / Sheffield*

HS3's alignment in this section is exactly that proposed by HS2 Ltd., with the sole exception of the addition of a junction at Beighton (SK447838) giving access to Sheffield HS station via the Southern Transpennine route, HS8.



5.2 Annesley Woodhouse – Sutton Scarsdale

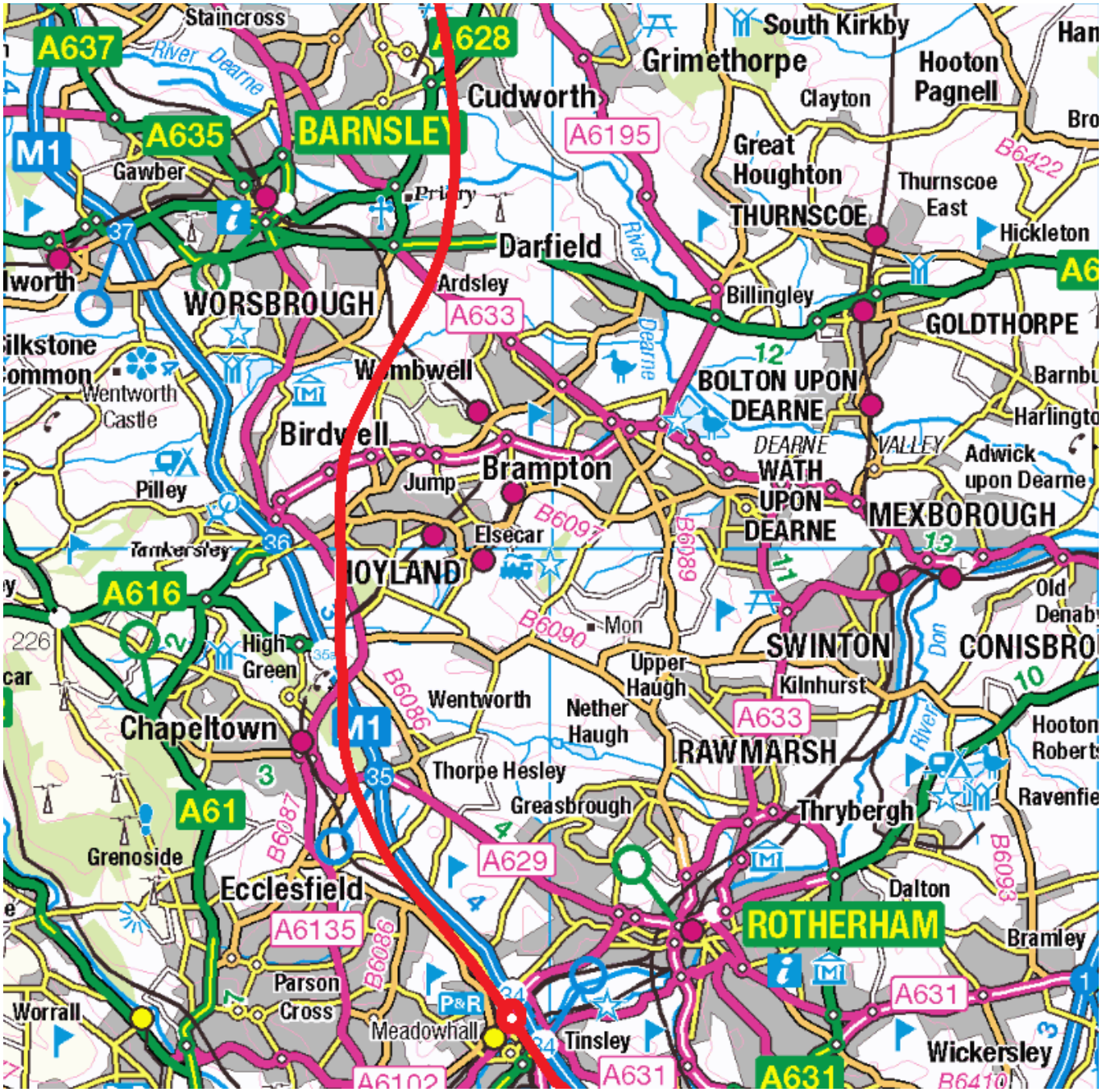


5.3 Bolsover – Brinsworth

6. *Beighton – Leeds and York*

HS3's alignment in this section is exactly that proposed by HS2 Ltd., except for the approach to Leeds and the alignment of Leeds New Lane station.

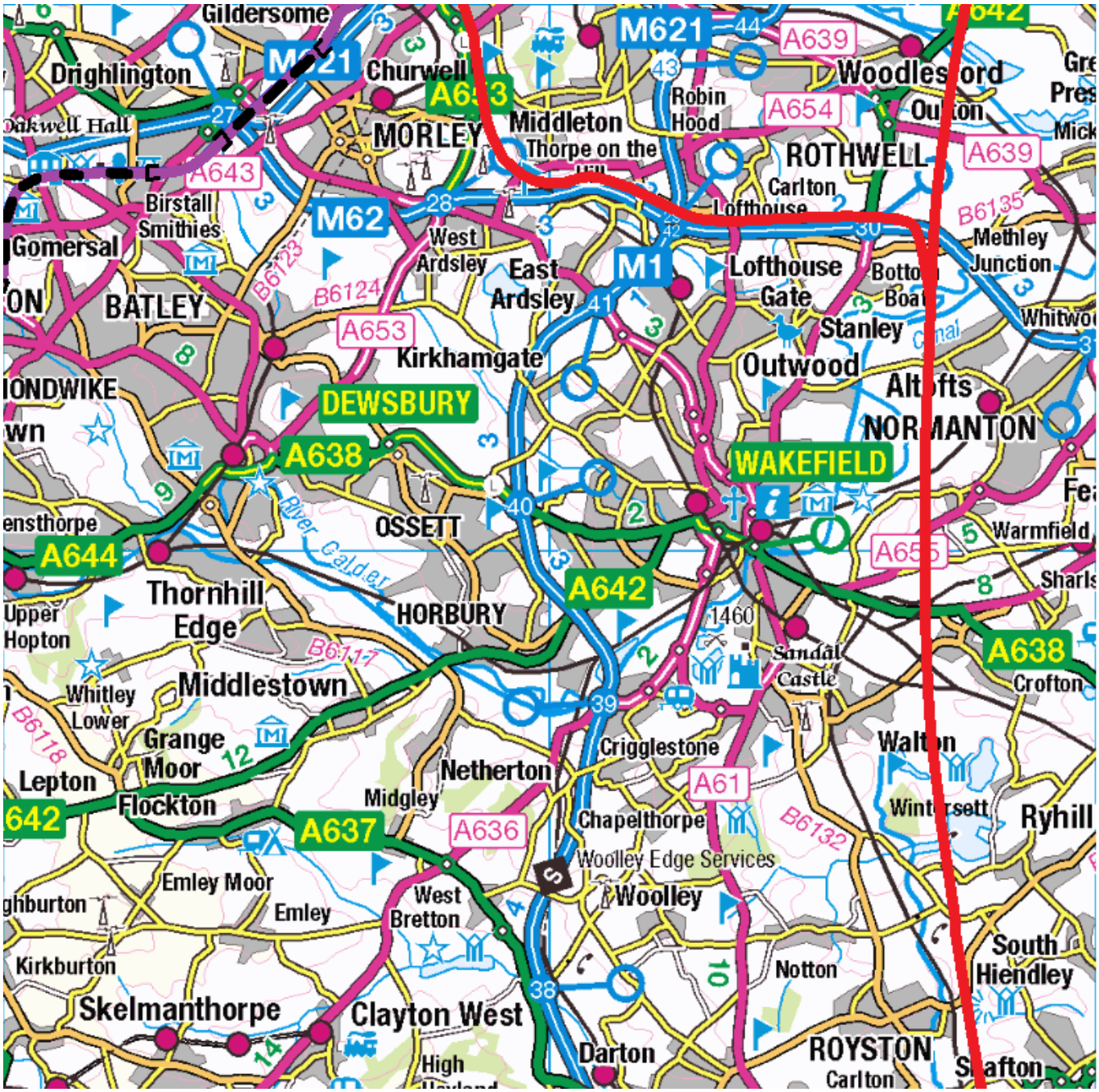
Leeds HS station must be on a through route, joining the HS line to York. The New Lane station as planned is completely unsuitable for this, as it is on an axis pointing in a N/NW direction straight at the existing station, and as it is an elevated structure, there is no scope in the available space for dropping the line into a tunnel. Leeds New Lane is a perfectly decent location for the HS station. It's just that it needs to be rotated through 90 degrees. Then it will be pointing in the right direction for extending the line through to York. The planned approach from Hunslet is quite unsuitable for this, so a new approach to Leeds must be chosen. Accordingly the Leeds branch now diverges from the York route just after it crosses the River Calder, at SE370243, (Altofts Junction,) curving to the left to cross the M62 at



6.1 Tinsley – Cudworth

SE363259 and following the north side of the M62 alignment to where this crosses the East Coast route to Leeds at Ardsley Common, (SE303265). It then joins the East Coast route (enlarged to GC-gauge) to the former Wortley (Gelderd Road) Junction (SE279320), where it joins the viaduct line (using the same route as the later, Northern Transpennine – HS9) to reach the new, improved, rotated Leeds New Lane.

The York line, as proposed by HS2 Ltd, terminates in a junction with the Leeds – York line at SE514388, just south of Ulleskelf.

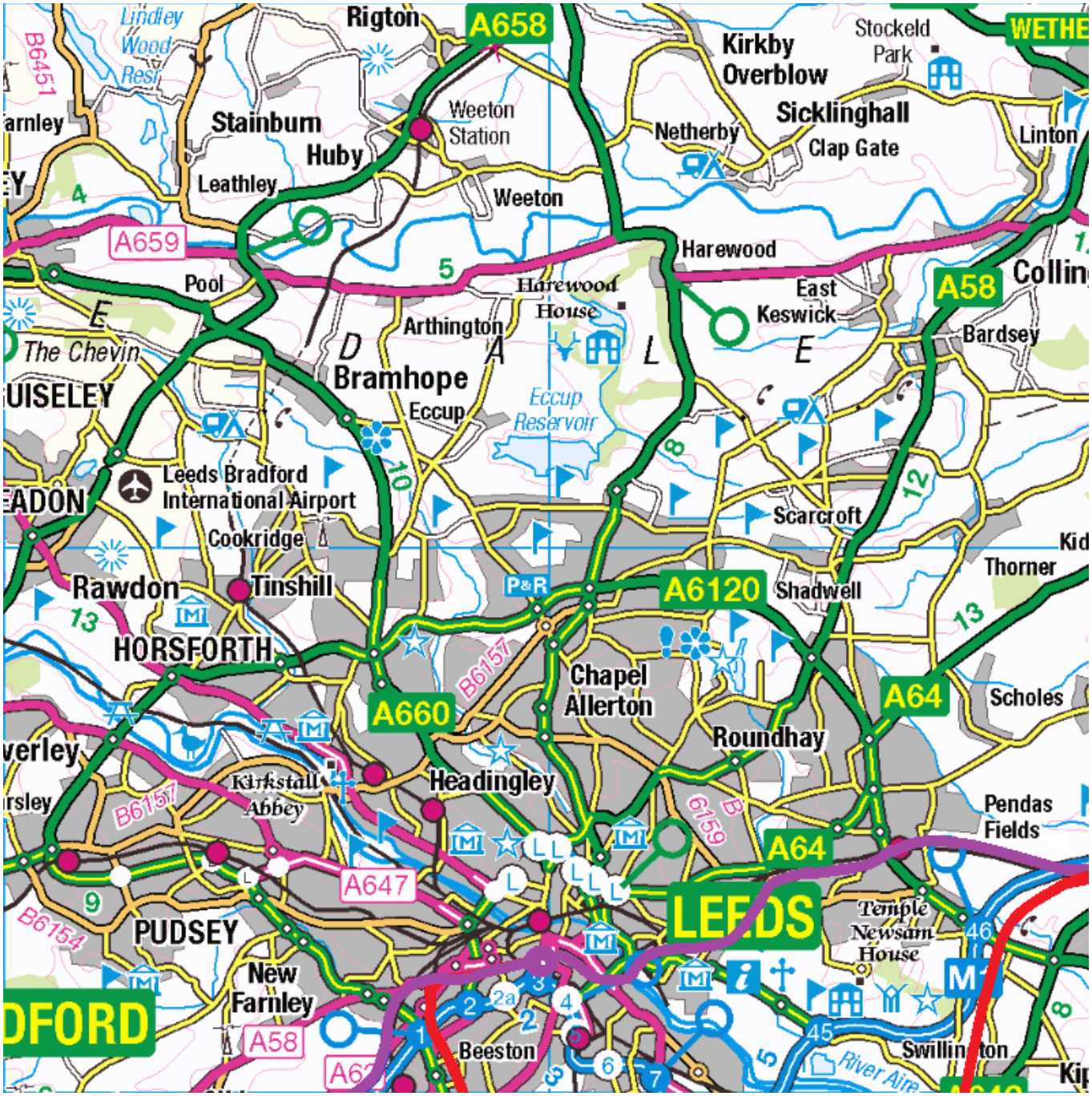


6.2 Royston – Woodlesford Contains Ordnance Survey data © Crown copyright and database right 2013

7. *Leeds New Lane – York*

This is actually, as far as Garforth, a very early instalment of HS9, the HS Northern Transpennine route, provided in advance of all the rest to allow services initially terminating at Leeds to proceed on to York, and terminate there. It also allows HS7 services to York and Newcastle to travel via Leeds, instead of proceeding directly to York.

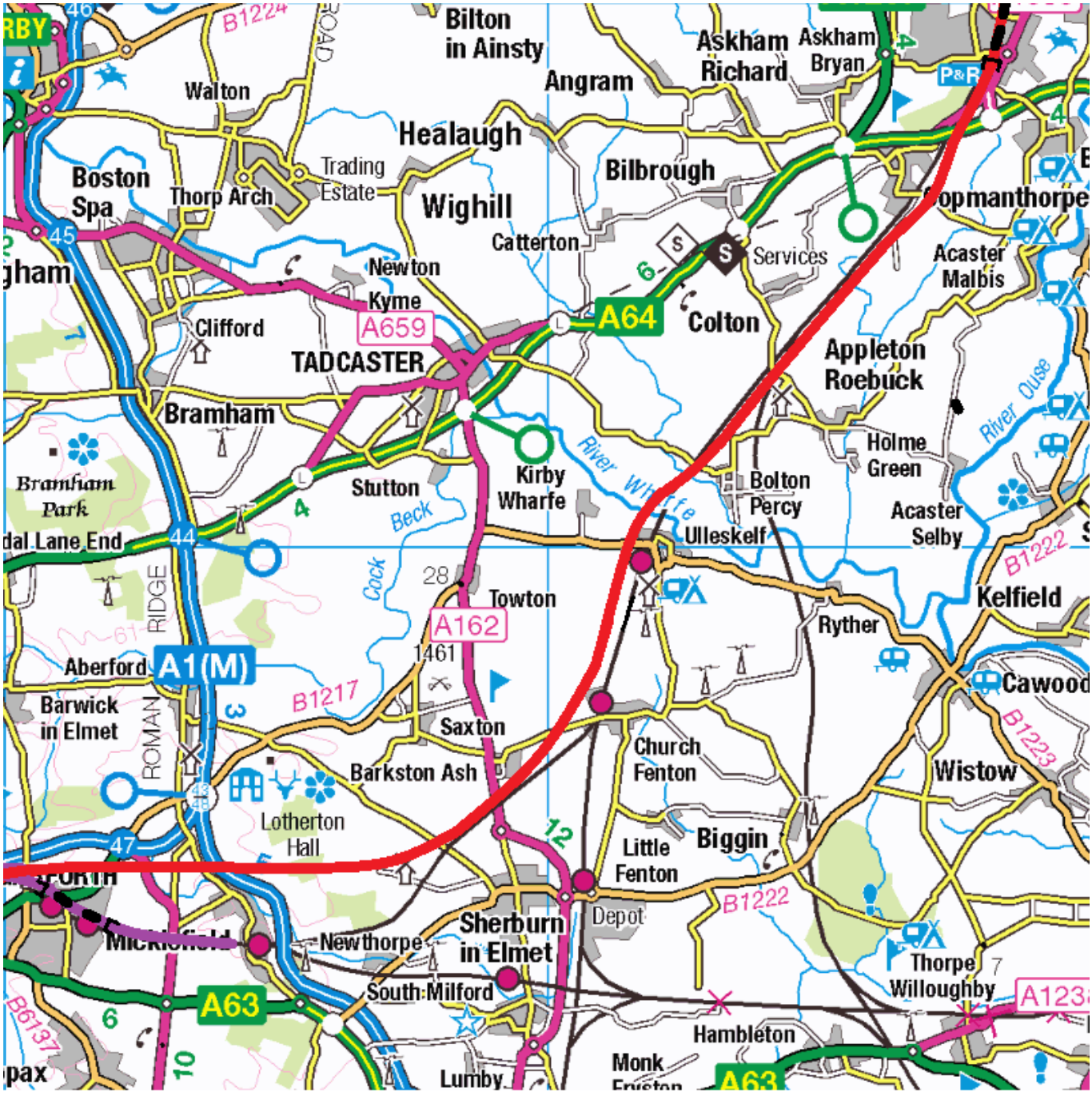
I propose an unashamedly grandiose design to get across Leeds. New Lane Station is an elevated structure, with a long approach viaduct. The continuation (as HS9) eastward continues on viaduct, first along the south side of Great Wilson Street (A653) then Hunslet Lane (A61) and later Hunslet Road. From SE304328 the route crosses, still on viaduct, into the centre of the A61 dual carriageway (there's plenty of room between the carriageways) as far as SE309323, then turning east (it's still the A61), still on viaduct along the centreline. It crosses to the north side of the road when the South Accommodation



6.3/7.1 Beeston – Pendas Fields

Road comes in on a flyover. It crosses to the south side of the road just after the river bridge (at SE315324), and finally descends to ground level, to join the Hunslet East branch at SE316325, following this round to join the south side of the Leeds and Selby line at Neville Hill. This all sounds very extensive, but in fact it's barely a mile from New Lane station to joining the Hunslet East branch. The area traversed is warehousing / industrial, emphatically not residential, and has experienced a lot of new road building in recent years, so clearly it is not regarded as environmentally sensitive! I think that New Lane station and its approach from the west will be a splendid enhancement for Leeds, and this magnificent eastern approach even more so. I don't often make spectacular proposals, but this is definitely one.

The Strategi maps, at the end of the Route sections, contain a large scale map of the traverse of Leeds. This should clarify the above description.



7.2 Garforth – Copmanthorpe

After the Lord Mayor's Show … HS9 then proceeds boringly along the south side of the Leeds and Selby route, crossing to the north side of the alignment just before Cross Gates station, and follows that until it joins HS3, at Garforth East Junction (SE395341). Shortly before this, at Garforth West Junction (SE387342), a spur diverges to provide a connection to the classic line at Micklefield HS Junction (SE439327), for classic compatible services to York and beyond and Hull (Northern Transpennne).

7.3 York – Easingwold

8. York – Darlington

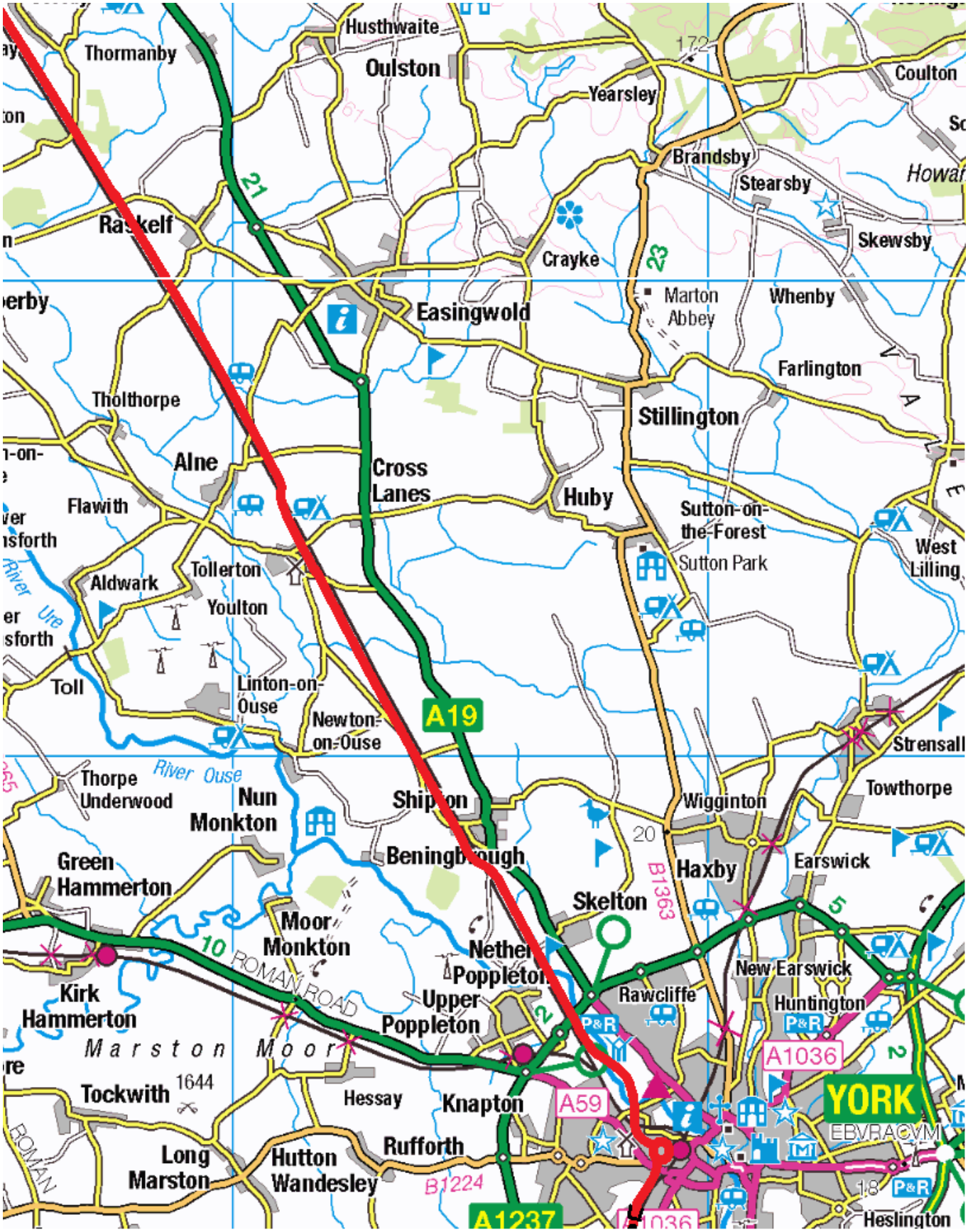
Since HS3 is continuing to York and beyond, there is no need for the junction at Ulleskelf. So remove it from the plans. HS3 goes round the West End district of Ulleskelf, crosses the Wharfe at SE518407and crosses to the SE side of the alignment at SE523410. It remains on this side until Dringhouses, avoiding several lineside properties and small settlements. Passing Copmanthorpe, it veers slightly away from the alignment to avoid a few properties and a sewage works. At SE582490, just south of Hogg's Pond, it enters a half-mile tunnel, emerging at SE585501, on the NW side of the alignment, and follows this all the way to York station.

The York HS station is behind the classic one, in the former works area and station avoiding line. Given the service pattern to be supported, with several services terminating at York, four island platforms, thus eight platform lines, are desirable, the two outer pairs, 1-2 and 7-8 to accommodate through services, with cross-platform connections, and 3-6 to accommodate terminating services.

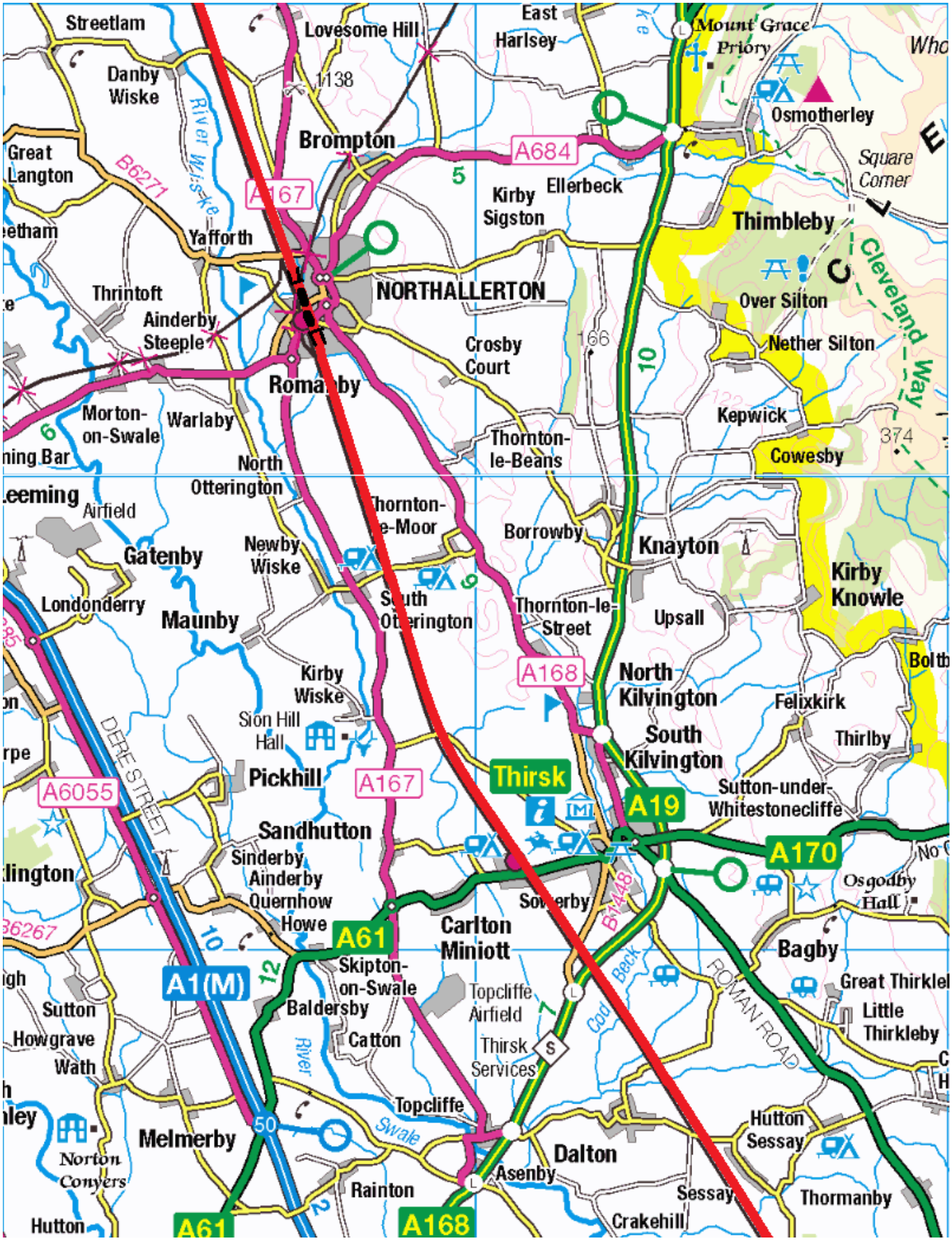
Emerging from York HS station, HS3 crosses the ECML at SE585522 and the Ouse at SE584526, to avoid a built-up area between the ECML and the river. It runs through Clifton Ings, then re-crosses the Ouse at SE577538, rejoining the east side of the ECML at SE573540. HS3 crosses to the west side of ECML just before Shipton, at SE553577. It will be necessary to relocate a few agricultural buildings in Tollerton. HS3 recrosses to the east side of ECML at SE507660, to avoid significant demolition at Alne Station (settlement), then stays on the east side all the way to Darlington. The only feature of note in between is a short (half mile) tunnel at Northallerton, between SE364930 and SE361942.

Darlington Bank Top station is rebuilt, with the existing station taken over by HS3 and the Tees Valley Metro, reconfigured internally with two island platforms, and new platforms built on the former through lines. Darlington has always been an architecturally superb station, with a chronically and perversely inefficient track layout. The coming of HS3 gives the opportunity to put this right, while retaining all the superb architecture. Appendix D gives details.

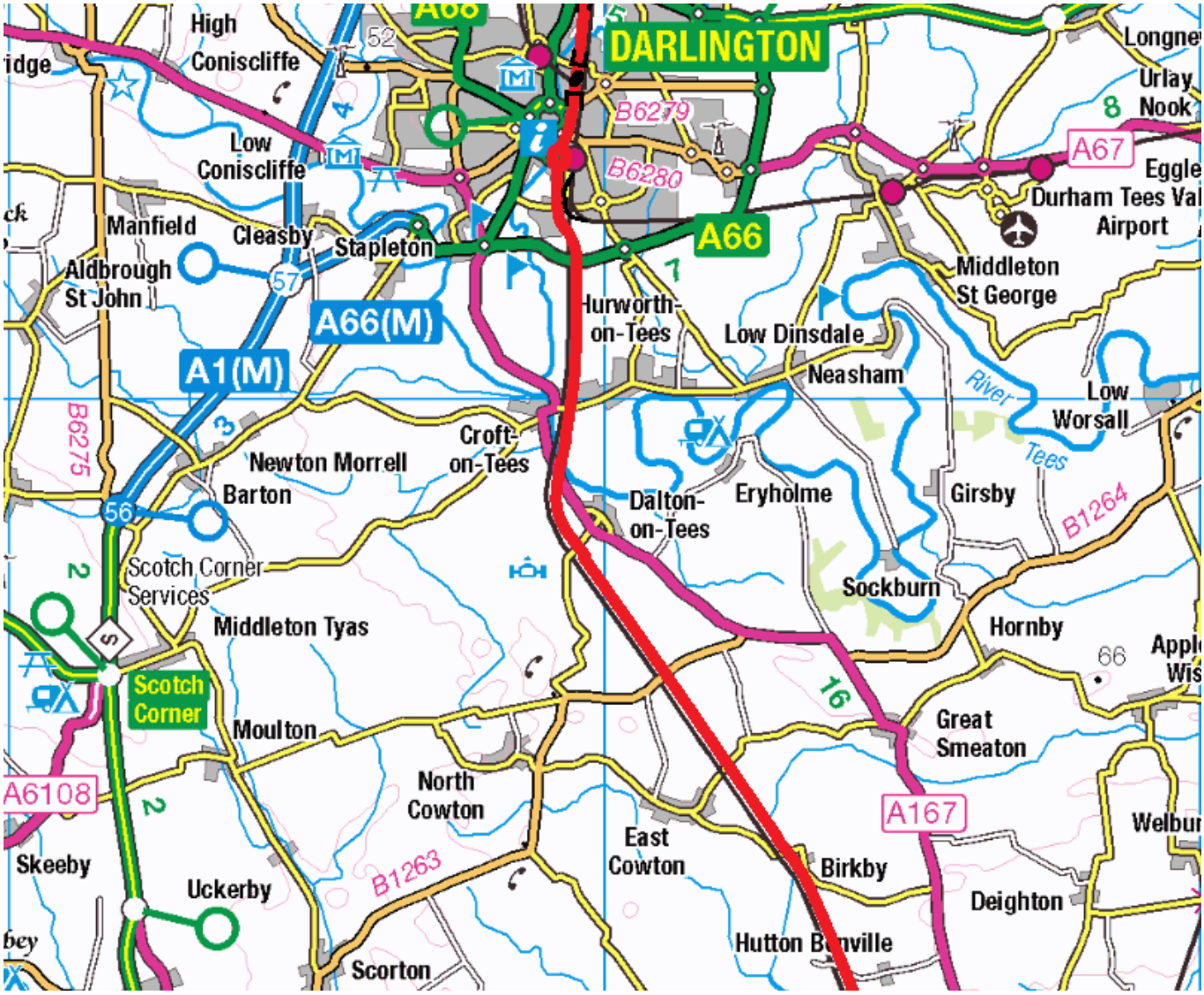
Immediately before Darlington station, at NZ294134, HS3 crosses the ECML by flyover, sharing this with the Tees Valley Metro tracks from Middlesborough and Saltburn.



8.1 York – Thormanby



8.2 Thormanby – Northallerton



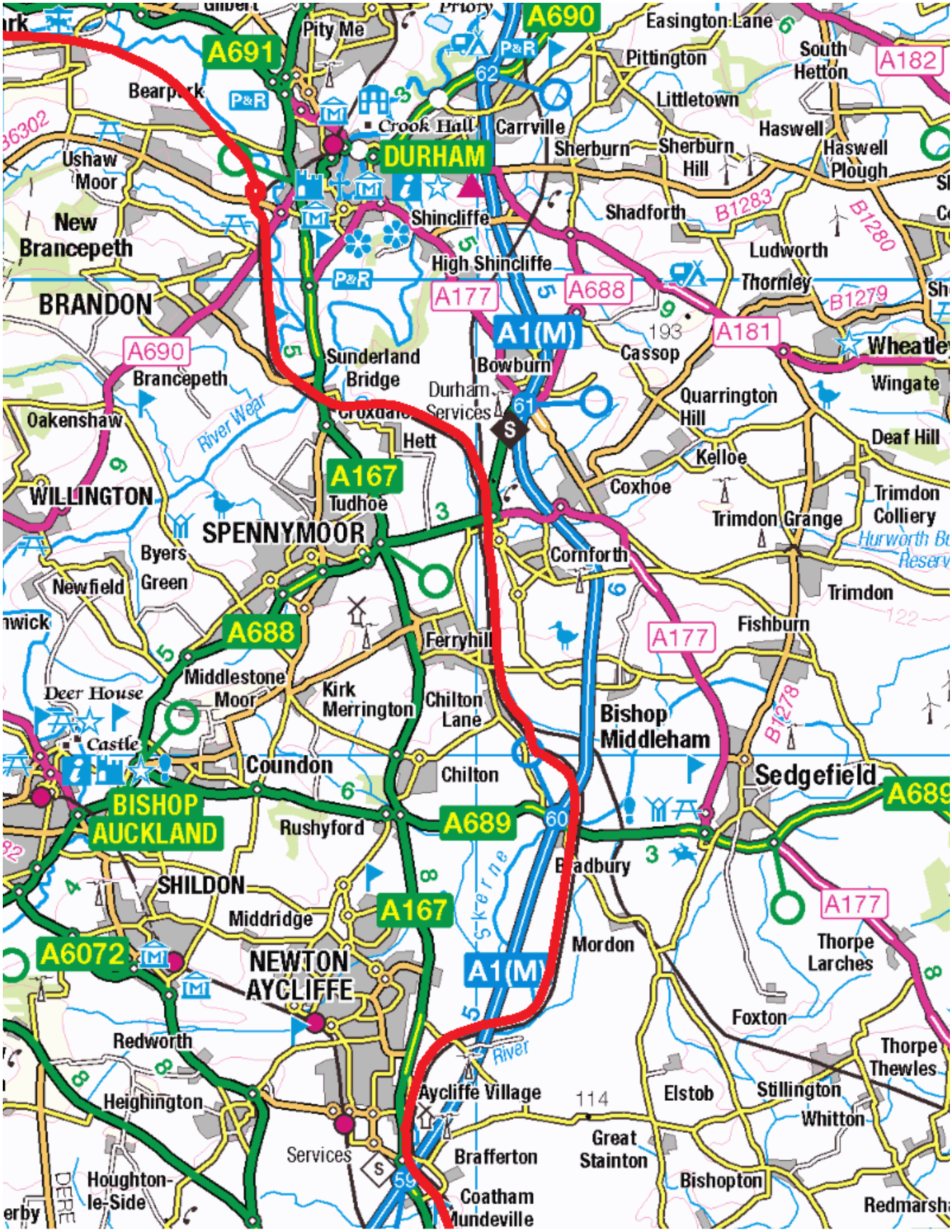
8.3 Hutton Bonville – Darlington

9. Darlington – Newcastle (via Consett) and Newcastle – Hexham

Leaving Darlington, HS3 remains on the west side of the ECML, passing through two short (half-mile) tunnels, between NZ296150 and NZ297157 (passing under the line to Bishop Auckland) and between NZ298168 and NZ298173 (beneath a housing estate). It follows the west side of the ECML alignment until just before Ferryhill, where it switches to the east side (at NZ310305) to avoid a built-up area. It then follows the east side to NZ254408, just before the site of the former Relly Mill Junction, where it crosses to the west side and arrives at the new Durham (Relly Mill) HS station (NZ254418). (It grieves me to propose a parkway-type station for Durham, but it's that or nothing at all. Some connecting service, bus or tram, will be required between there and Durham ECML, via the city centre.)

From here on, all the way to Newcastle, HS3 uses the alignments of railways long closed, much of which was single track, and all of which was built with no concern for high speed. For all that, the alignments are by no means bad, and they are almost completely unobstructed. They **are** in use as long distance footpaths or cycleways, and their redevelopment must preserve these facilities (albeit on slightly different alignments). I will note specific variations from the original alignment, where this is necessary to avoid demolition of property, or where desirable to gain a better (i.e. faster) alignment. But generally,

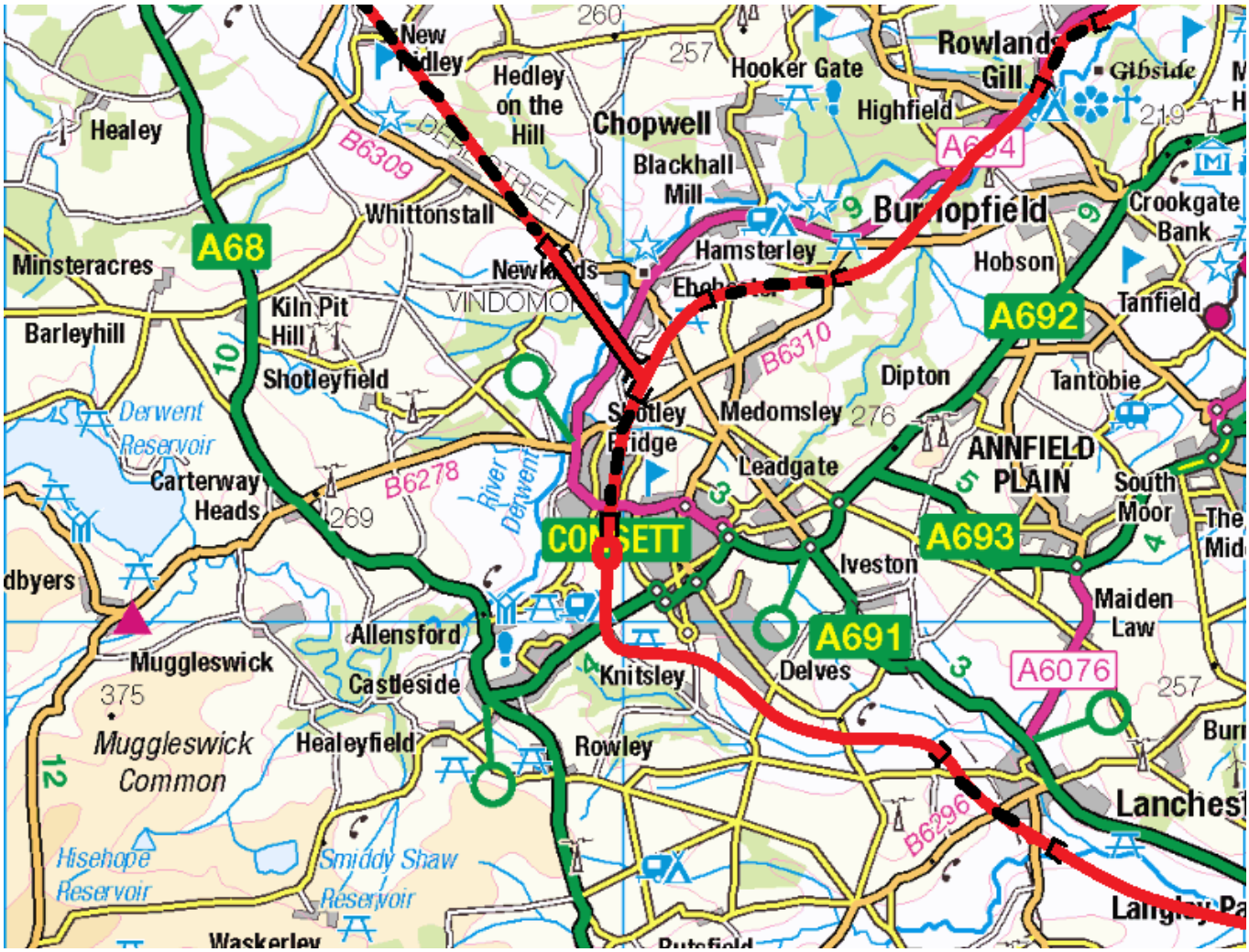
throughout, minor variations will be necessary to ease curves. It will result in a very fine, scenic route, as well as a fast one.



9.1 Newton Aycliffe – Durham

Lanchester is bypassed, to avoid extensive demolition (and also improve the alignment), via a 2 mile tunnel between NZ172468 and NZ159480. The former alignment is followed to Consett. There is a sharp curve approaching Consett, but since all trains stop there, it hardly matters. The Consett HS station is on the south side of the town, at NZ099513. Immediately to the north of the station , the line tunnels for 2 miles under Consett, to avoid demolition (and, again, to gain a better alignment), emerging at NZ103537 (Derwent Hill Junction, where HS3 to Hexham and Edinburgh diverges – see below). A further 1½ mile tunnel, between NZ109551 and NZ131559 is purely to straighten the alignment. A 1 mile tunnel between NZ167582 and NZ172594 avoids demolition in Rowlands Gill (and also …)

HS3 finally arrives near Blaydon. Extensive road junctions and the Metro Centre block further progress, so it enters 2 mile tunnel at NZ200621, passing under the Tyne and emerging at NZ220634, and following the alignment of the North Tyne line of the Newcastle and Carlisle from there into Newcastle Central station. (There is still track in place from NZ232631 to the station.)



9.2/10.1 Lanchester – Rowlands Gill

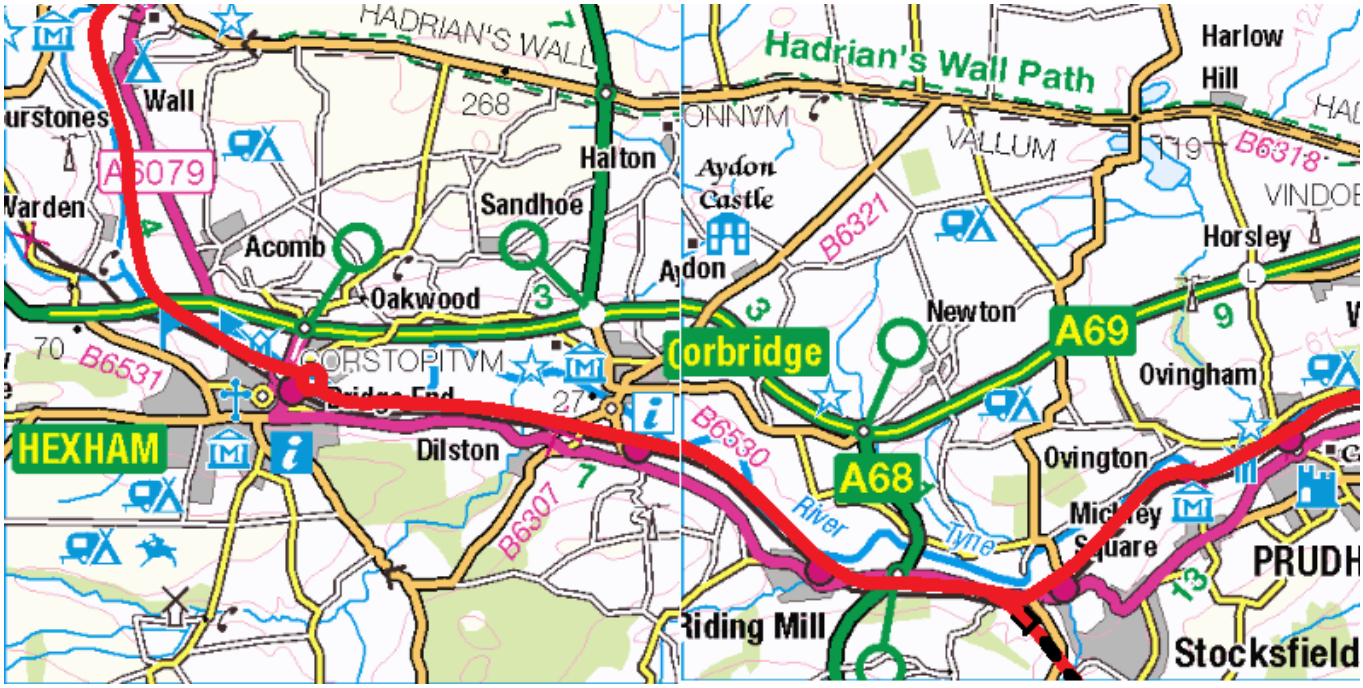
9.3 Newcastle – Wylam

The branch of HS3 from Newcastle to Hexham follows the north bank of the Tyne, diverging from the above line at NZ220634, Paradise Junction (the name is irresistable, though I doubt if the place is – it's just upstream). The Hexham branch follows the original north bank alignment (passing through Paradise, indeed), and crosses the Tyne at Scotswood Bridge – the original bridge is still there and might even be still (re-)usable, then it joins the current alignment of the Newcastle and Carlisle at NZ187635, just before Blaydon station. The odd warehouse will need to be relocated between Scotswood Bridge and Blaydon.

The line whose alignment HS3 has followed from Consett originally took a sharp S-bend at Blaydon, to gain access to the Scotswood Bridge, and the north bank line into Newcastle. That portion of the route has been obliterated by roadworks, hence tunnelling under the Tyne (which gives us a much better alignment of course).

The Newcastle – Hexham branch follows the north side of the Newcastle and Carlisle alignment all the way to Hexham, building a slight embankment out into the river when it approaches too closely. Very remarkably, there is precisely one (- one!!) obstruction in this entire distance: a few houses encroach where the A695 crosses the line just before Riding Mill station. Even here, demolition is not unavoidable – there is room on the other side to slew the classic lines to the south, making space for HS3.

There's also space at Hexham, but not quite enough for an additional two island platforms (which are definitely necessary as Hexham is an important interchange station). Fortunately there are a few warehouses on the north side, which could be relocated, to make room.

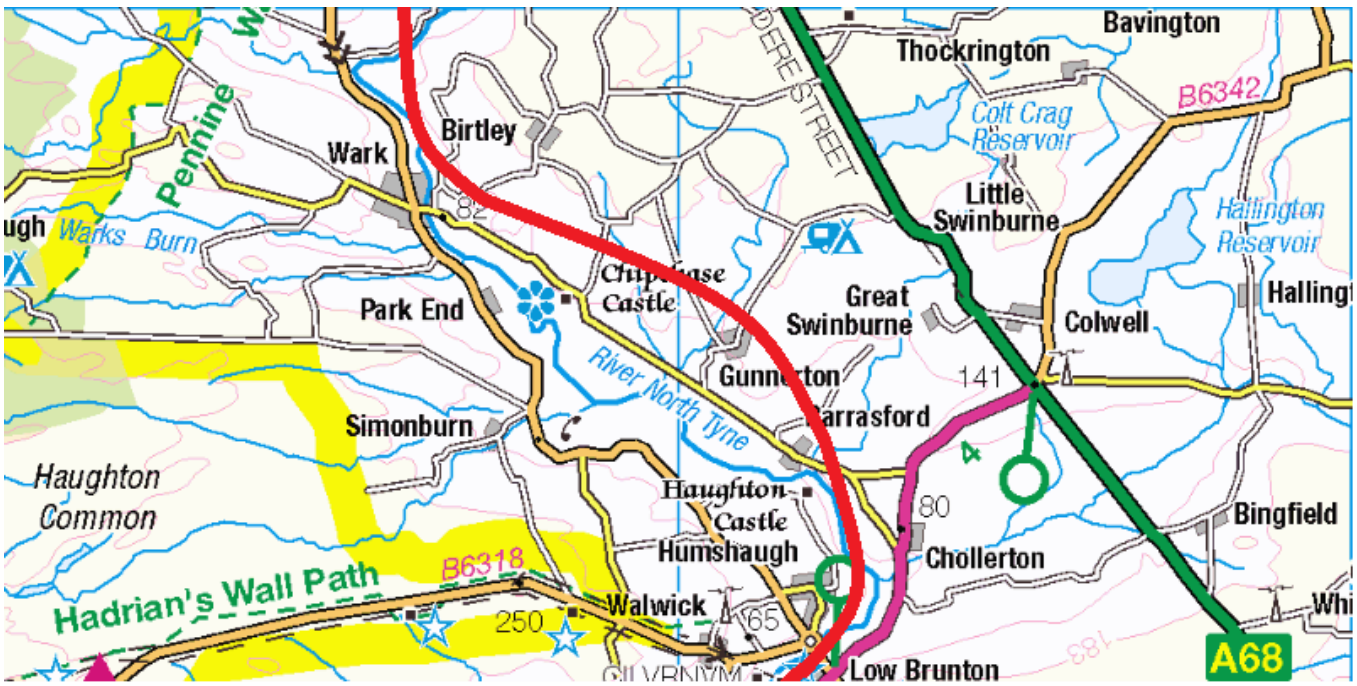


9.4/10.2 Prudhoe – Hexham Contains Ordnance Survey data © Crown copyright and database right 2013

10. Consett – Hexham – Edinburgh

The section between Consett and Hexham is in maps 9.2/10.1 and 9.2/10.2, above.

The main route to Edinburgh leaves the Newcastle line just after Consett, on emerging at NZ103537 from the tunnel under the centre of the town – Derwent Hill Junction. There follows the major engineering feature of the line, a 1½ mile long viaduct 200ft high across the valley, gaining the north side at NZ087560. It immediately enters a 4 mile tunnel, emerging at NZ050610, just west of Stocksfield station, where it joins the HS3 Newcastle – Carlisle branch, (Stocksfield Junction,) and travels with that to

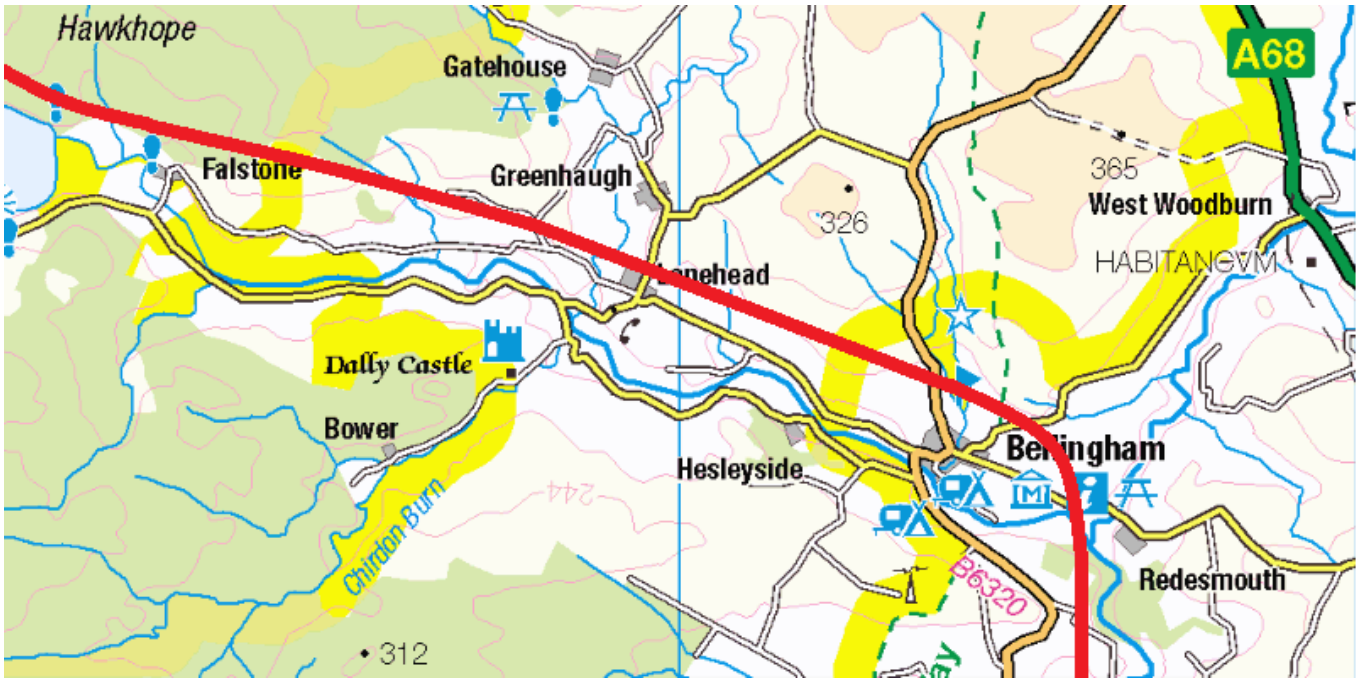


10.3 Low Brunton – Wark Contains Ordnance Survey data © Crown copyright and database right 2013

Hexham. The gradient of this section is 1 in 47 if the descent is confined to the tunnel section, or 1 in 65 if it extends over the viaduct also.

HS3 continues beyond Hexham on the north side of the Newcastle and Carlisle until NY923651, where it diverges to the north up the valley of the River North Tyne. At this point there is a junction with the classic route – Tynegreen Junction – to allow classic-compatible services from Newcastle to join the classic route to Carlisle.

From here on, HS3 **roughly** follows the alignment of the long-closed line to Riccarton Junction, via Kielder, a single track branch built with little concern for speed. Accordingly, HS3 will diverge freely from the former alignment to keep down curvature. Except around Bellingham, there are no obstructions to worry about. But there has been one rather significant change in the years since the line closed – between Falstone and Kielder stations, the original route is now under water – Kielder Water, to be precise. This is of less significance than might be expected; what it means in practice is that the route must gain the altitude of 650ft, by Falstone, say, rather than at Kielder. Assuming the extra climbing starts at Redesmouth (the original part of the route is essentially flat) this still only means an average gradient of 1 in 170 to Falstone – pretty trivial stuff. Following the eastern bank of Kielder Water actually allows for a much straighter alignment than the original line had, following the valley floor. I fix 3 locations, to ensure the desired gradient, and a 4th one to indicate the desired route along the reservoir: NY840843, just above Bellingham, at an altitude of 450ft, (I need to avoid Bellingham anyway; the only built-up area anywhere,) NY780865 at altitude 550ft, NY726880, above Falstone at the required altitude of 650ft, and NY690898 at the Soney Gap – a saddle point in the hill between two arms of the reservoir.



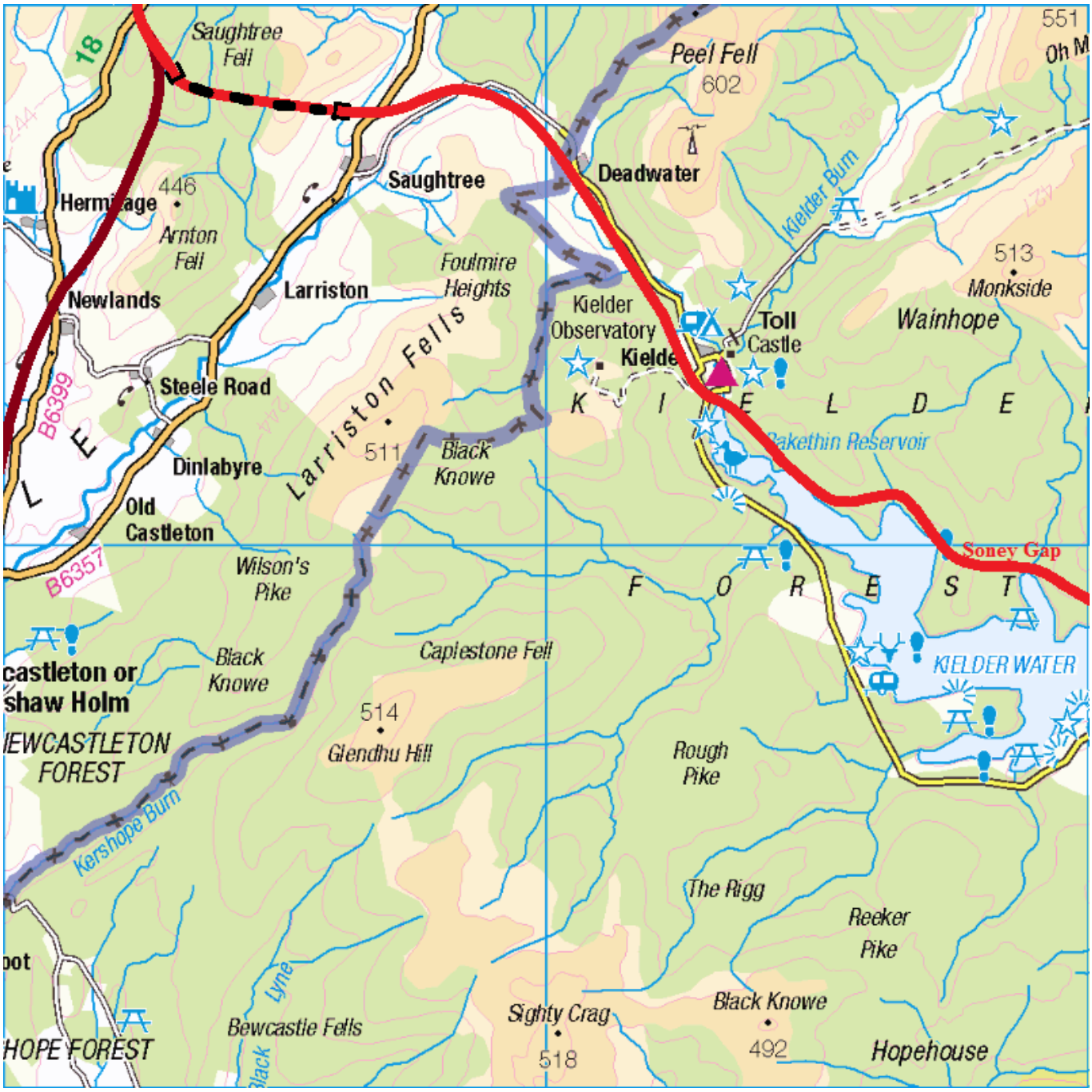
10.4 Redesmouth – Falstone

Beyond Kielder, HS3 diverges from the route at NY568980, where it crosses the Dawston Burn, entering a 2 mile tunnel, and emerging at NY531988, where it joins the Waverley route at Riccarton North Junction (the stretch through the original Ricarton Junction is severely curved – the tunnel diversion is specifically to avoid that). It then takes over the trackbed of the Waverley route to Ravenswood Junction, beyond Newtown St. Boswells. Tunnels are provided between NT524000 and NT522018 (1 mile, replacing the existing Whitrope tunnel, which is poorly aligned), NT529036 and NT529049 (½ mile) and between NT521061 (immediately after the viaduct) and NT509068 (¾ mile), specifically to eliminate

curves. The alignment is otherwise generally good; the curves approaching Hawick scarcely matter as everything will stop there. The section between Riccarton North and Ravenswood junctions is shared with the Regional Metro Waverley service between Carlisle and Edinburgh.

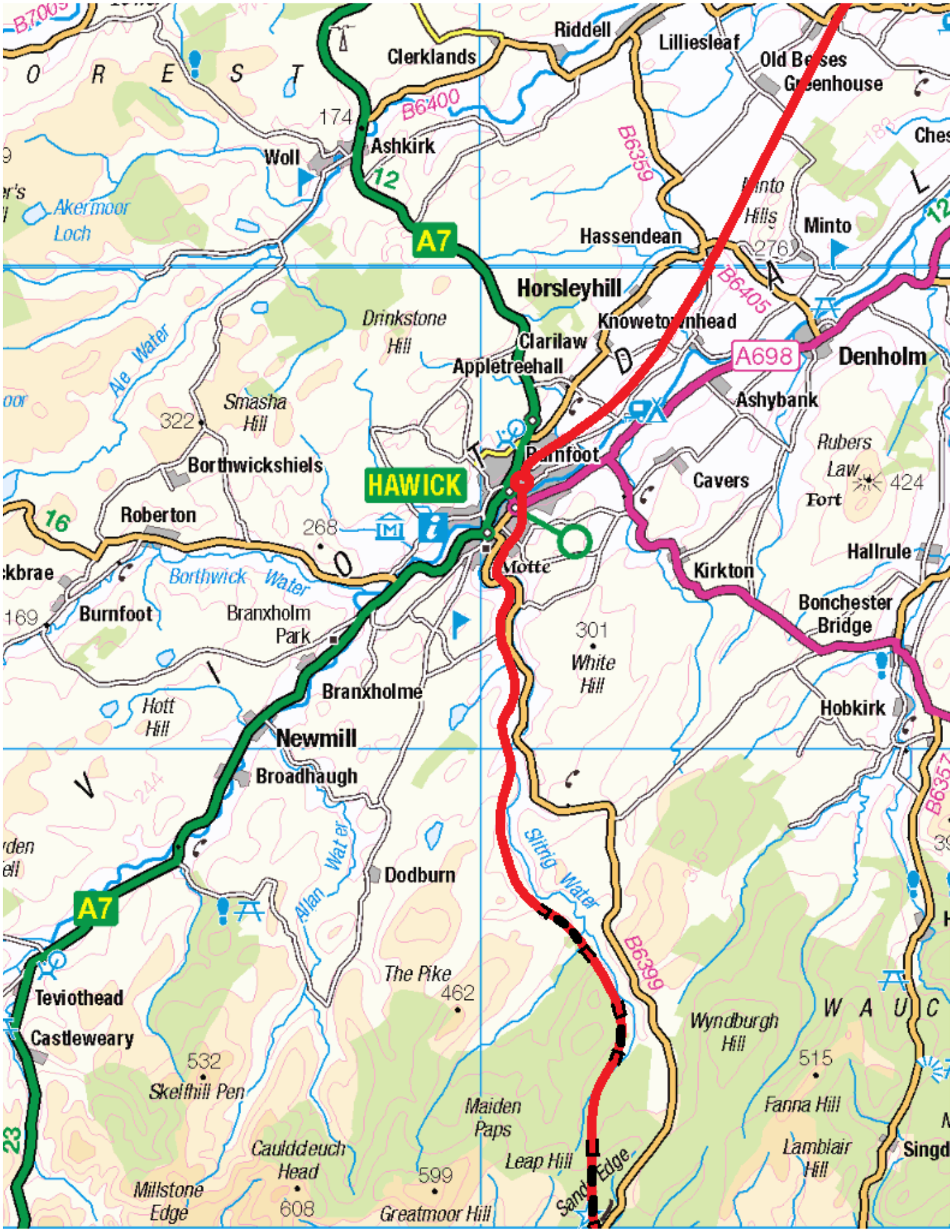
The arrangements at Hawick are deliberately left vague. Campaign for Borders Rail are pressing for reopening from Tweedbank to Hawick, but have not as yet developed any detailed plans for Hawick. Most of the alignment seems fairly free of obstruction, except in the very centre of the town, where the original station site is now occupied by a leisure centre. The most straightforward solution would seem to be to relocate this.

HS3 diverges from the Waverley route at Ravenswood Junction (NT575339), and follows, roughly, the route of the former branch to Duns and Reston for the first 2½ miles. The magnificent Leaderfoot Viaduct (grade A listed, a local authority listing – I'm not sure what protection it conveys) is still in position across the Tweed, and apparently in good condition, having been renovated in the 1990s. Unfortunately it



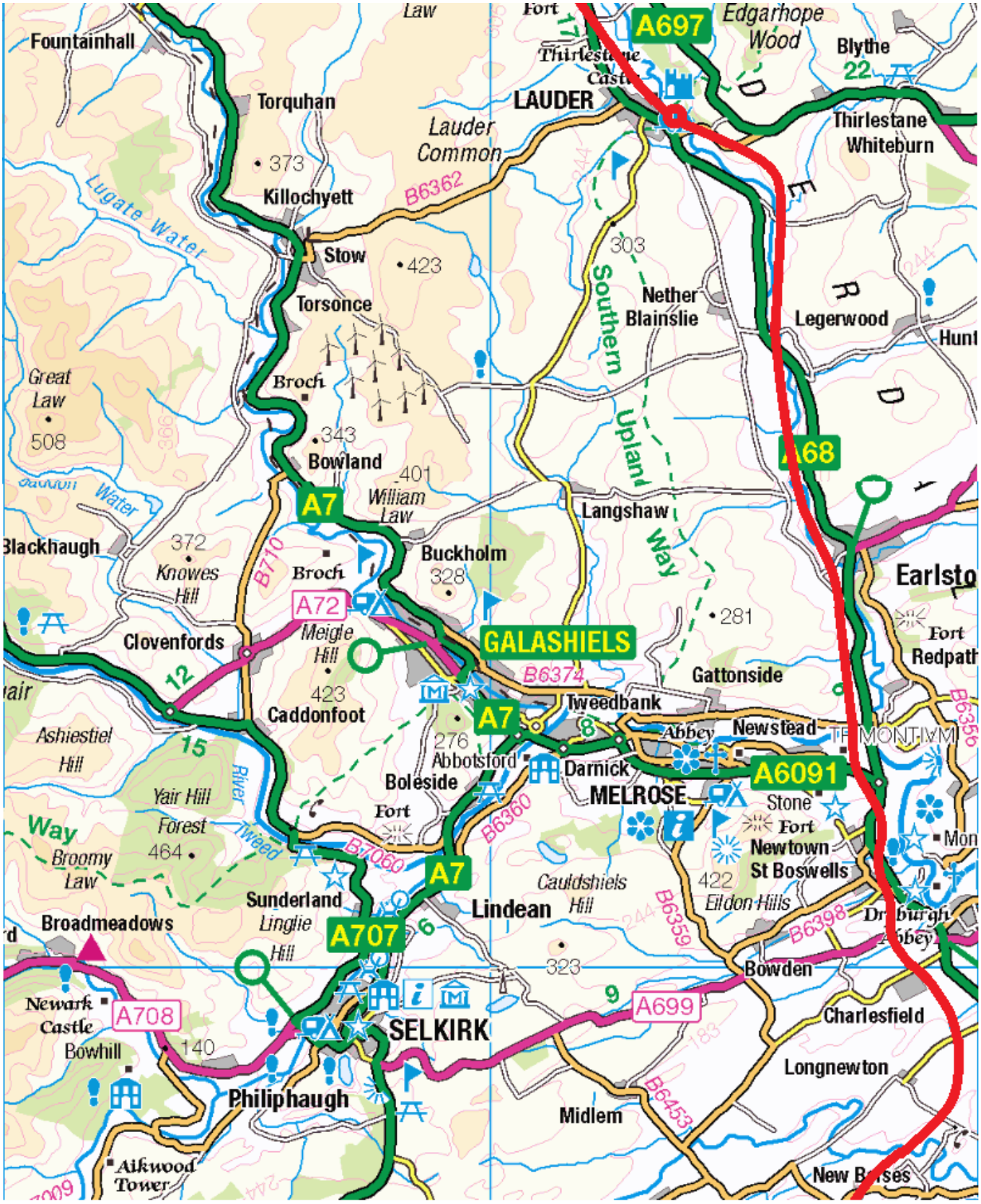
10.5 Kielder Water – Riccarton North Junction

is (of course) only single track, but, given the likely loadings on this part of the route, that could probably be tolerated (shocking though the idea of a single-track section on a HS route might seem). For all its grade A status, it seems improbable that anyone could seriously object to its being re-used for its intended



purpose, especially as that would guarantee continuing, regular maintenance.

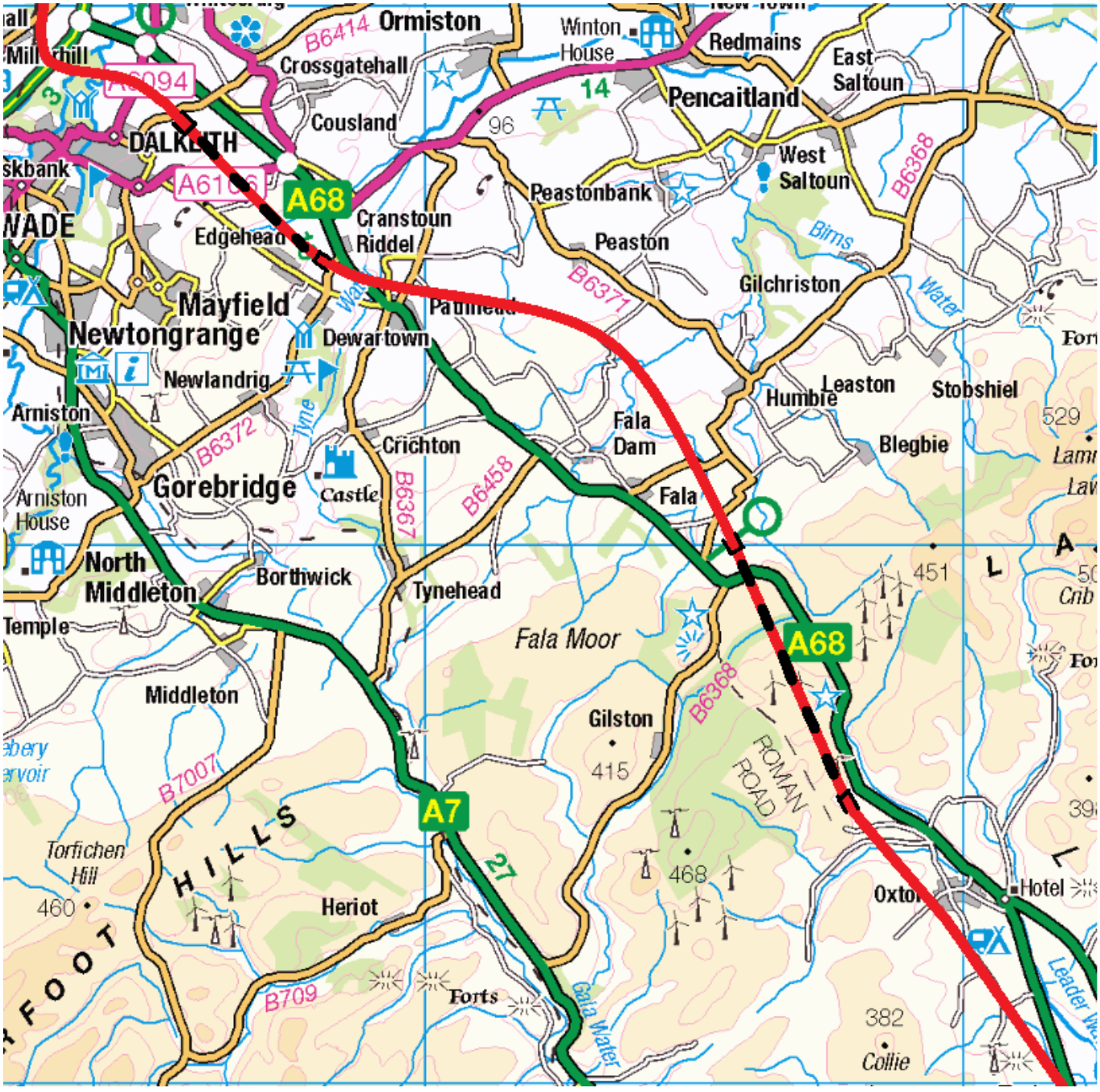
HS3 passes to the west of Earlston, on a completely new alignment and proceeds up Lauderdale. I like the idea of a station at Lauder. It has clearly grown considerably since it lost its branch railway, years ago, and would now be an excellent commuter town for Edinburgh, but currently is inhibited in this by poor transport links. I don't envisage stopping the London trains there, but the Newcastle service would seem



10.7 Longnewton – Lauder

very suitable. Again, given the likely loadings on this part of the route, the full HS station would seem excessive, so a simple two-platform station, with no crossing loops, should suffice. A suggested location is NT534475. (Hawick, on the other hand, does need the full HS treatment, being an important interchange station.) HS3 continues beyond Lauder to New Channelkirk (NT479553) where it enter a 3 mile tunnel, emerging at Woodcote Park (NT462605). Average gradients on these sections: 1 in 300 Ravenswood Junction – Lauder, 1 in 80 Lauder – New Channelkirk, and 1 in 100 (descending) through the tunnel to Woodcote Park. HS3 curves round the north of Pathhead and enters a 2½ mile tunnel at NT380650, emerging at NT355680. It then joins the alignment of the Waverley route at Millerhill and follows the east / north side of this into Edinburgh. Average gradients on this section are 1 in 100 Woodcote Park – tunnel entrance, 1 in 50 through the tunnel, and 1 in 100 tunnel exit – Millerhill.

At Newcraighall, NT319708, a new station – Newcraighall HS – is provided on HS3. It is a terminal station, facing towards Edinburgh, so although accessed via HS3, cannot actually be served by HS3 (from

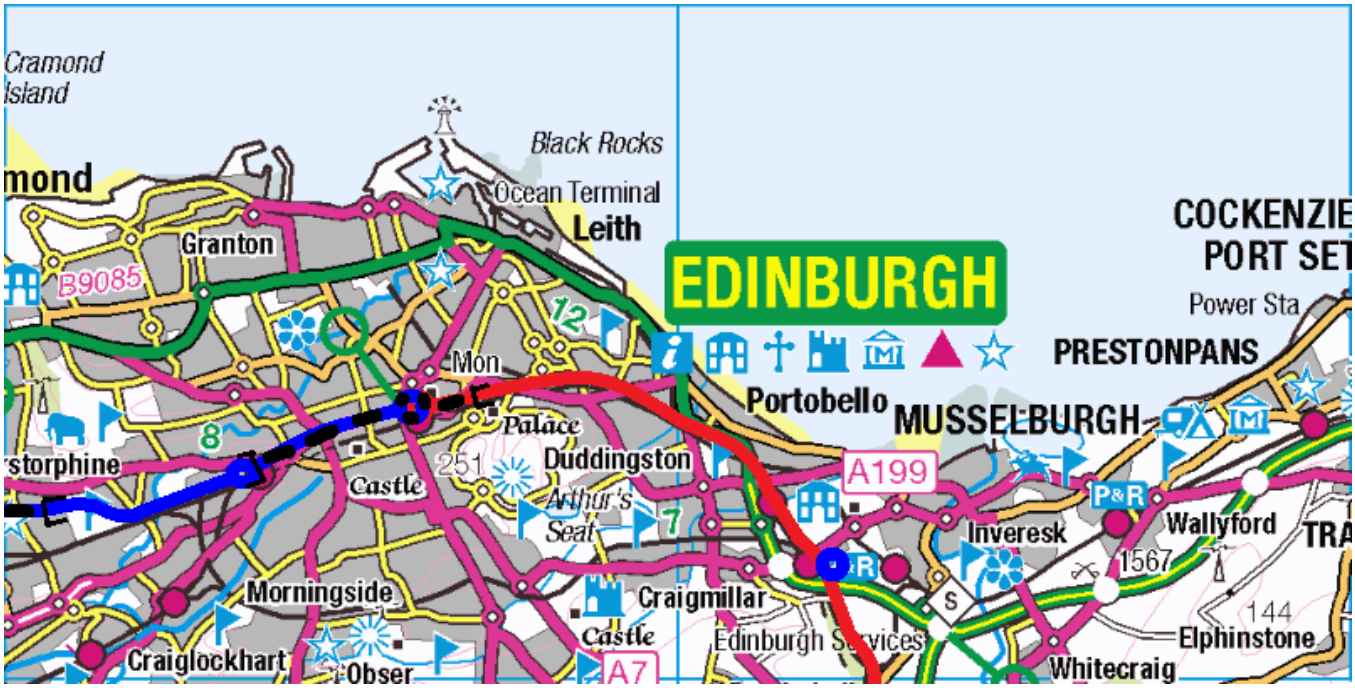


10.8 Oxton – Millerhill

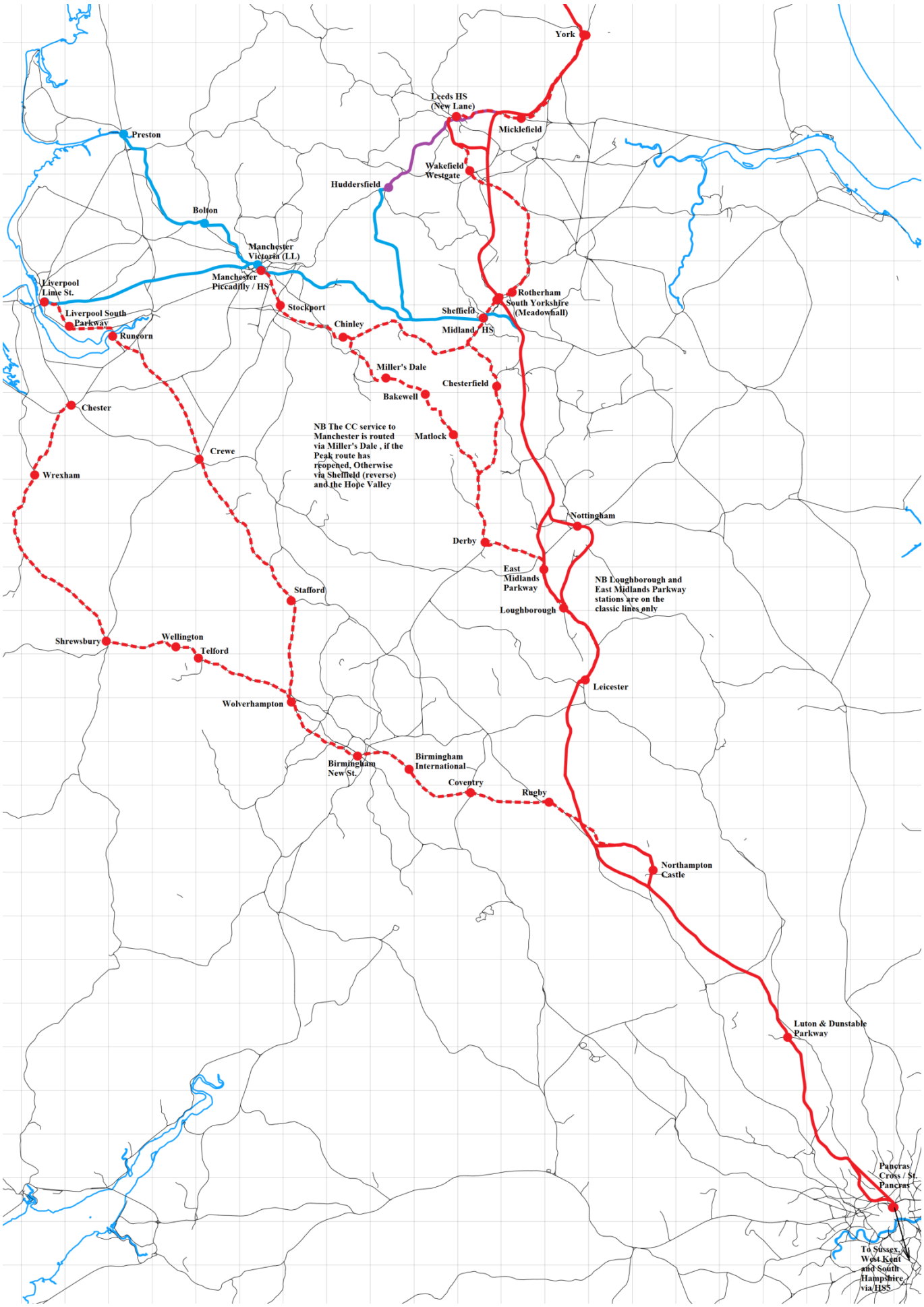
the south). Its purpose is as an end point for the Scottish HS lines HS13 and HS14; no HS services start or terminate in Edinburgh Waverley. It is shown on the map below in blue, as an HS13 station.

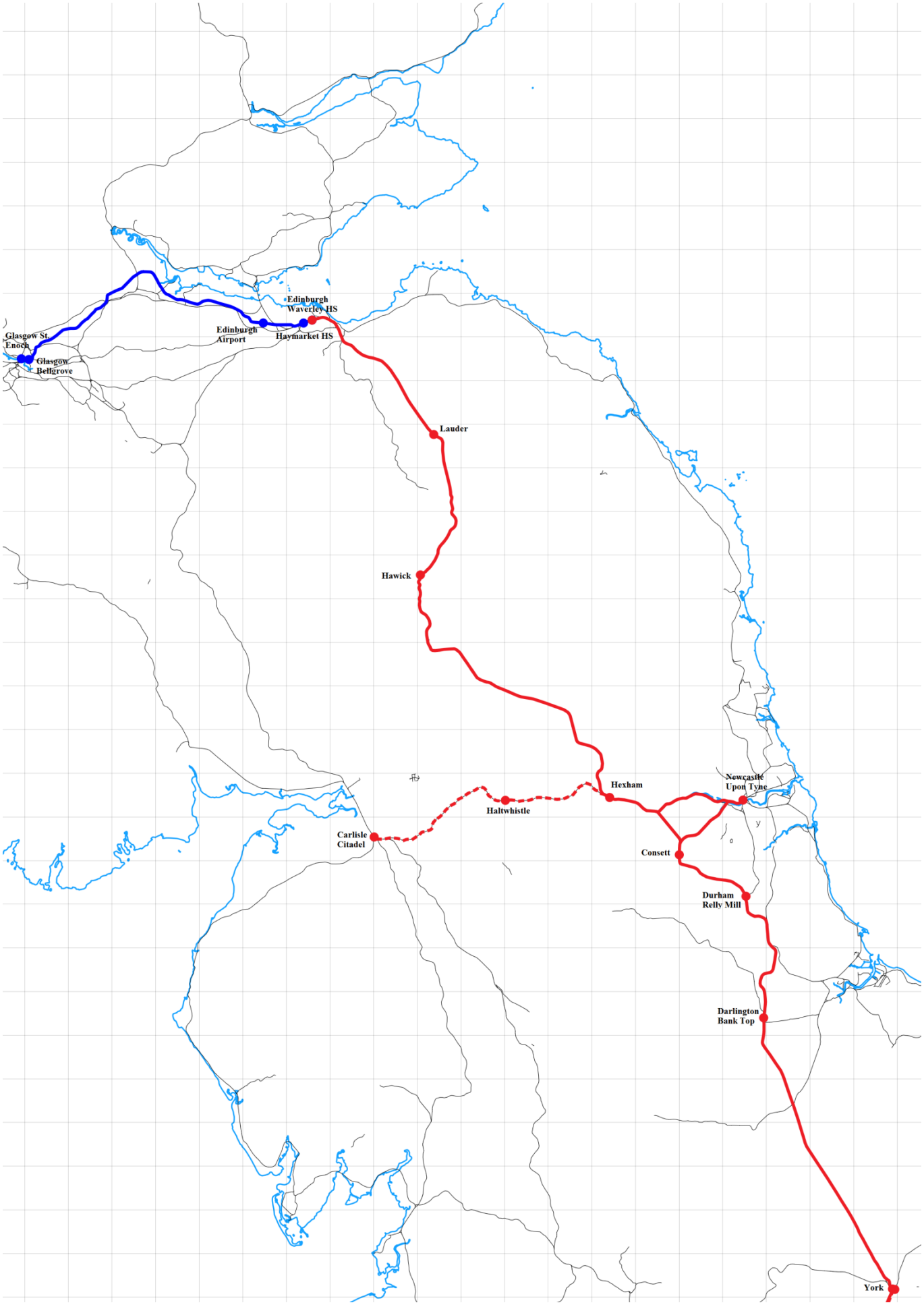
HS3 follows the alignment of the Waverley route, on the east / north side, into Edinburgh Waverley HS, via Protobello Junction, and with its own tunnel under Calton Hill. Initial thoughts were that the HS station would be of 4-platforms, on the north side of Waverley, underneath Princes St. This is certainly one option, though it could equally well (better!) be part of a redeveloped Waverley, keeping its overall roof but replacing everything else with 14 through platforms, on 7 islands.

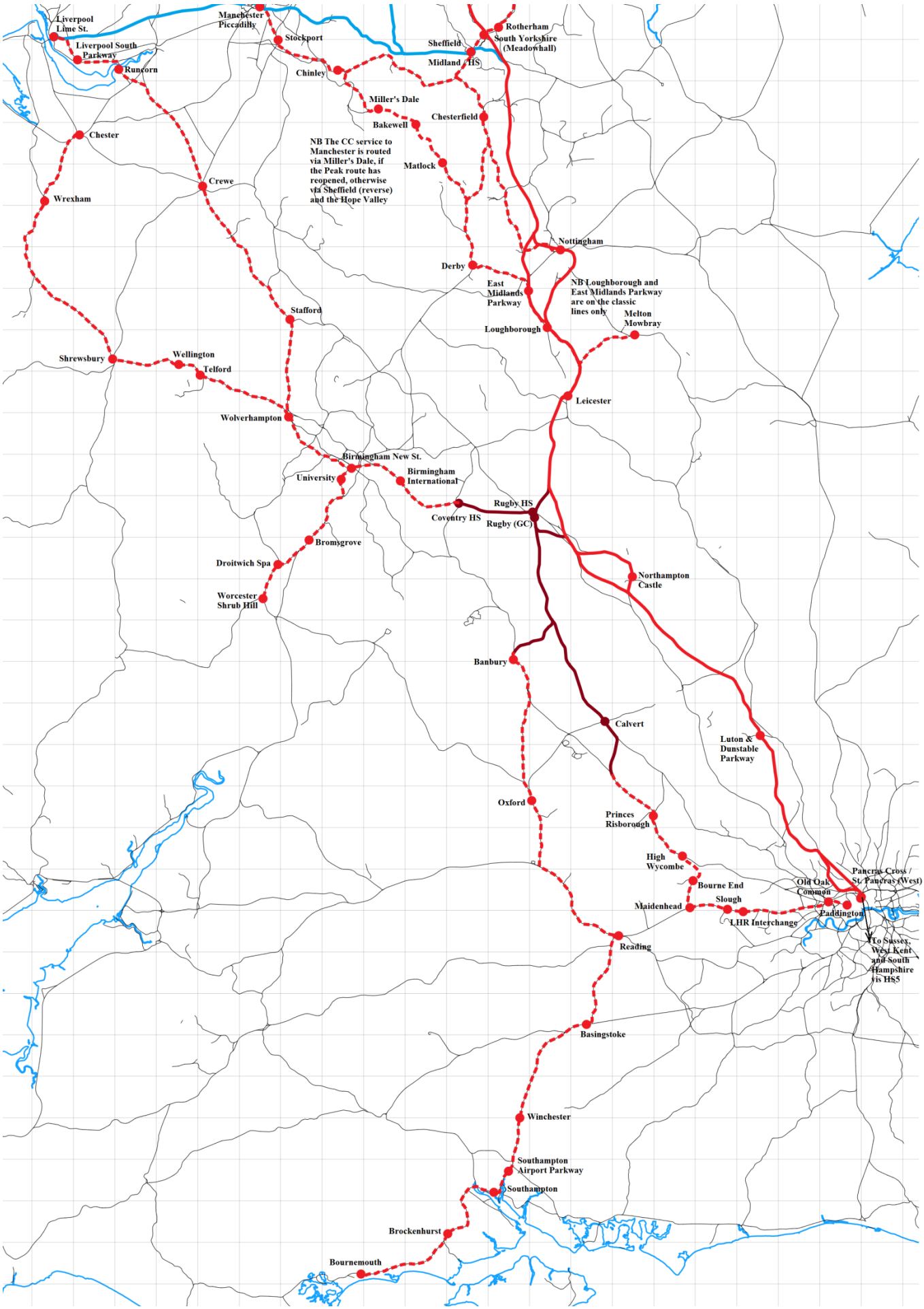
Full details of these proposals, and of everything beyond Waverley, are contained in the article 'HS Scottish Routes and Service Plans'. HS3's services, from London (Eastbourne!) and Newcastle, continue through to Glasgow and terminate there. Refer to the Scottish article for all further information.

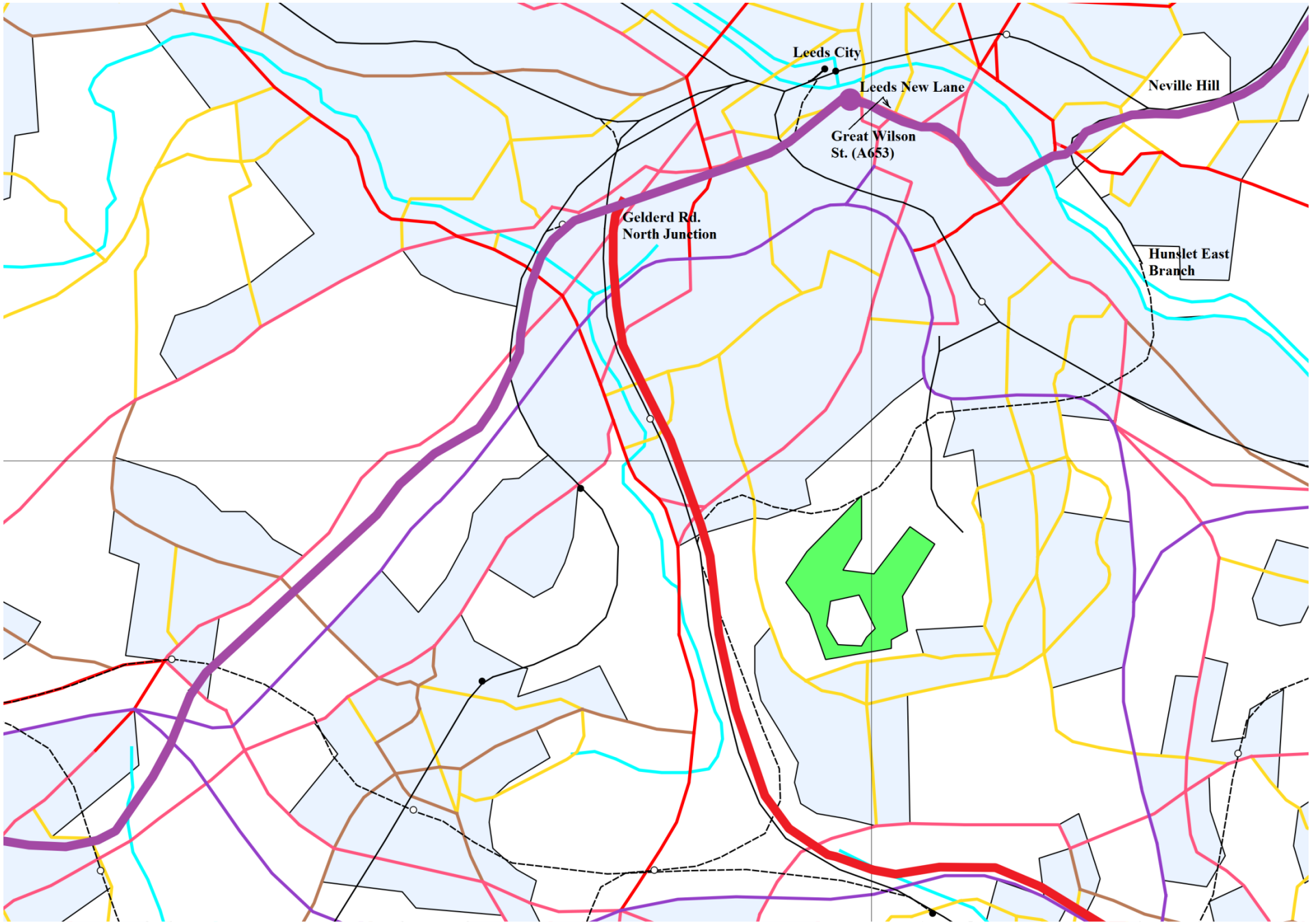


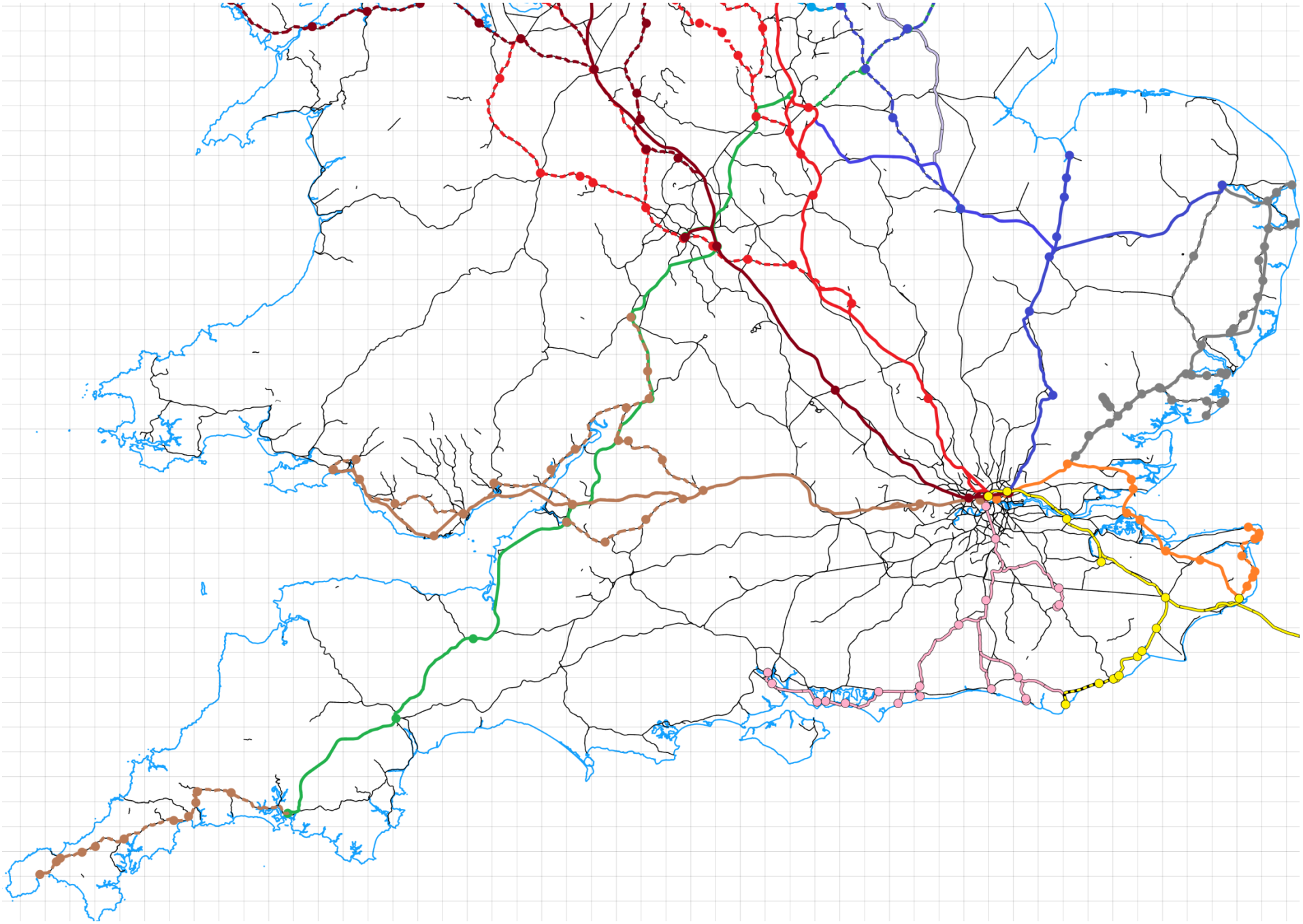
10.9 Newcraighall – Edinburgh



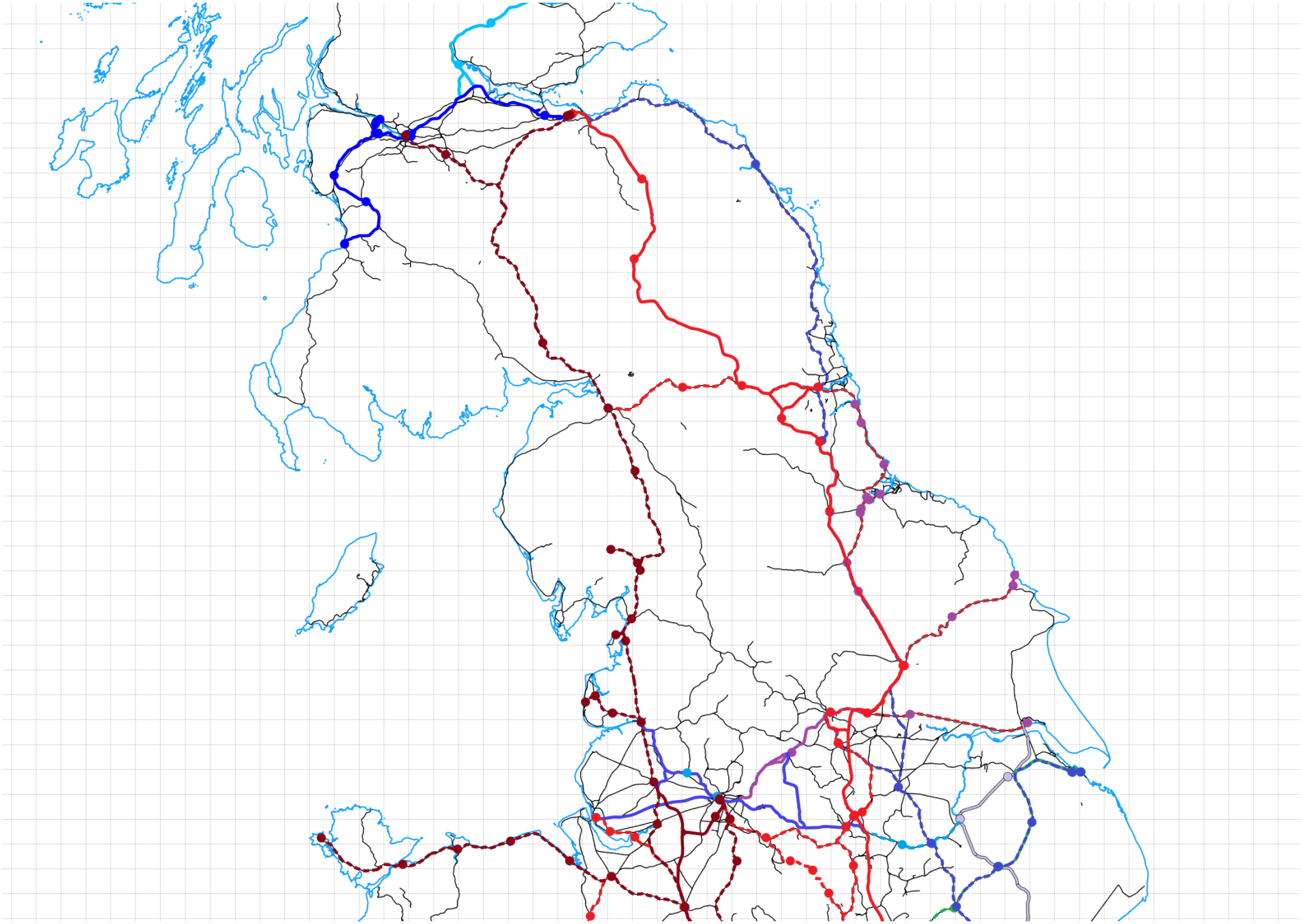


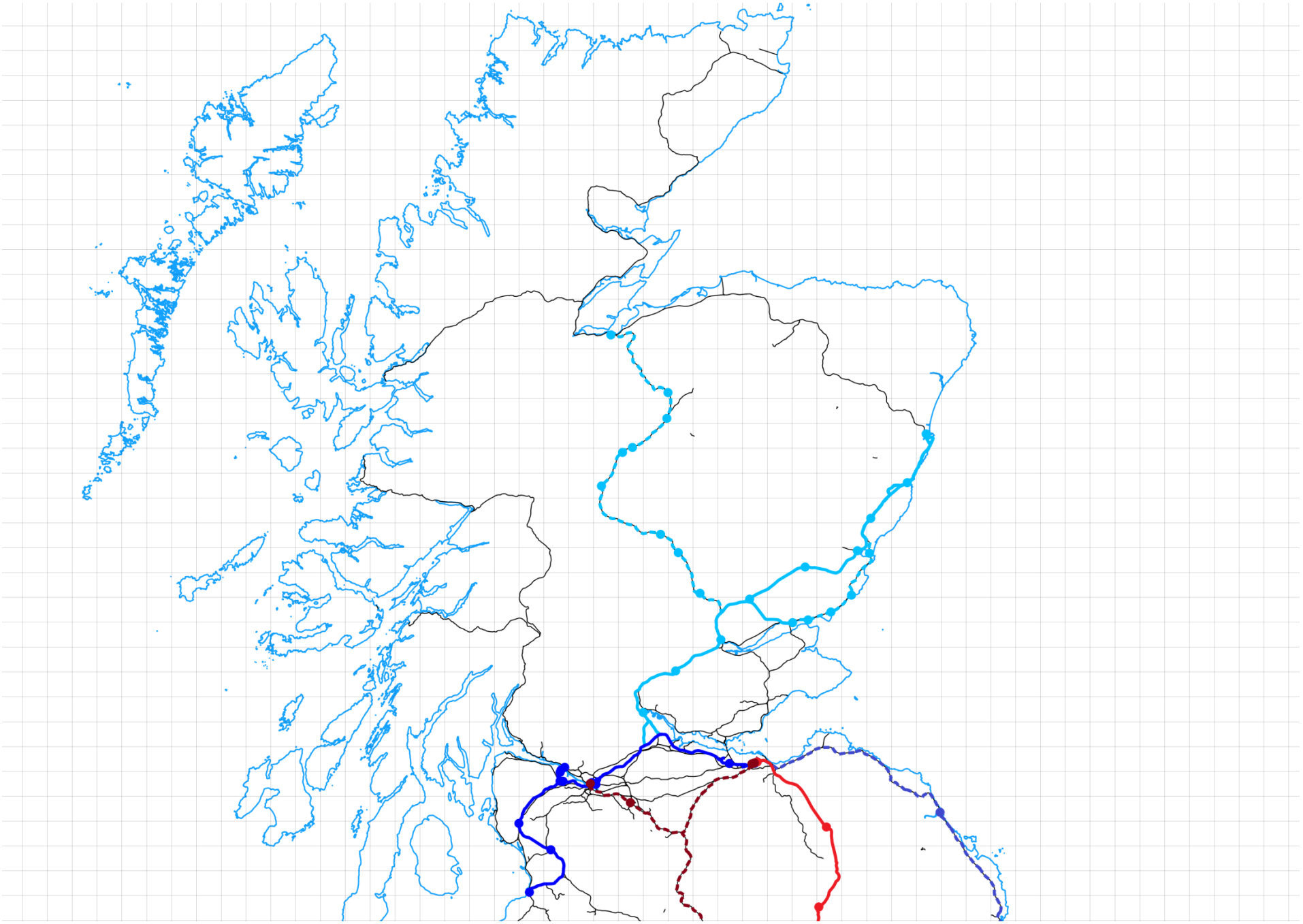


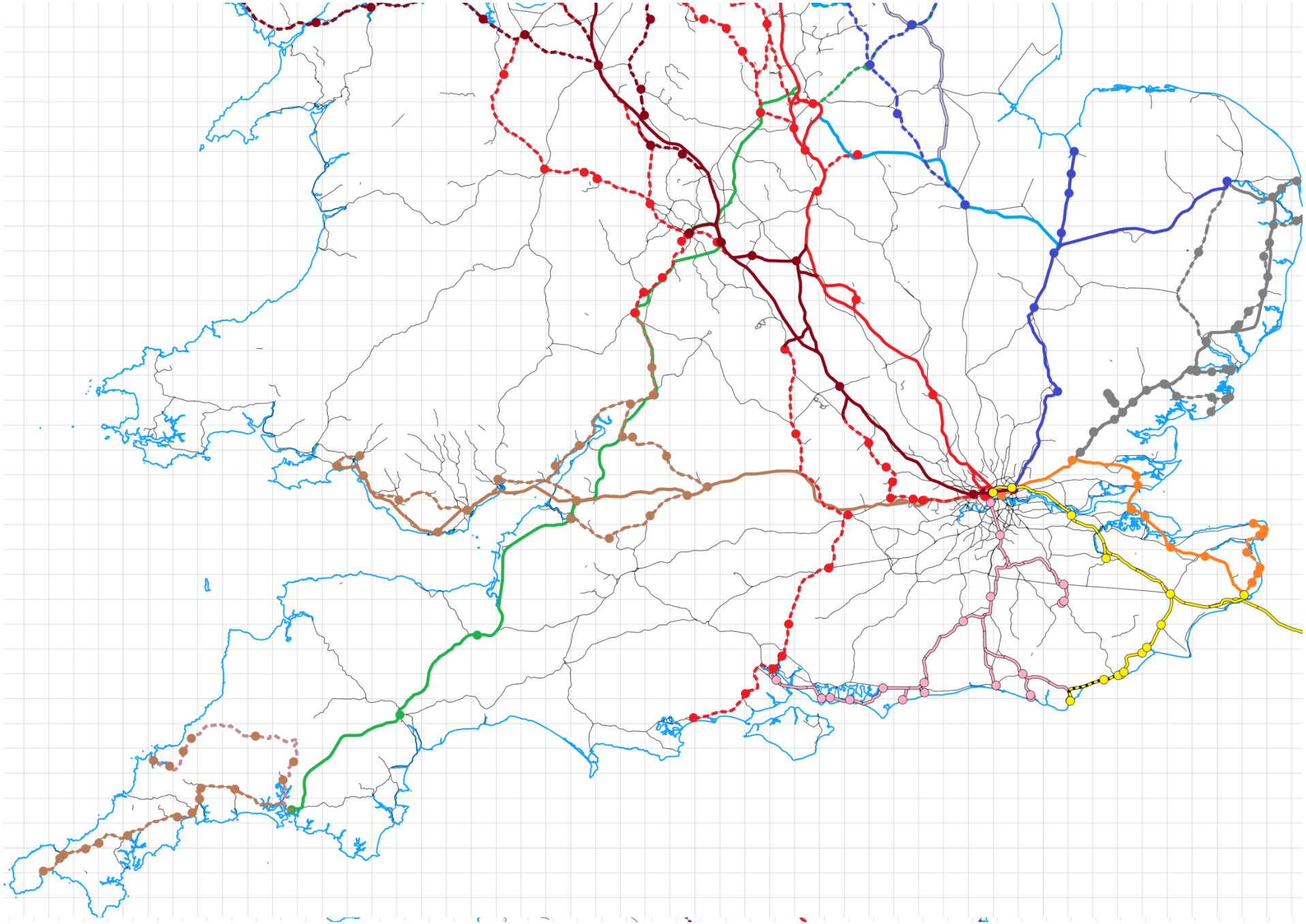




Complete HS Network, South Sheet







The Service Plans

A new service plan comes into effect when some significant change takes place which causes a change to the service loadings of one or more sections of HS3 itself. This most commonly occurs when a new section of HS3 opens, but it may also be a consequence of a change on some other HS route.

The service plans use the following notation:

- tph trains per hour
- G GC gauge train
- GG GC gauge, double deck train
- C classic-compatible train
- R Regional Metro train, semi-fast service
- RS Regional Metro train, stopping service (all stations)

Occasionally other notations are used; these will be defined when used.

As was mentioned earlier, the service plans deliberately envisage maximum frequencies. The results may thus seem, at least initially, somewhat optimistic.

Service Plan 1

The first service plan comes into effect as soon as the section from West Hampstead Junction to Northampton opens. Only classic-compatible services are involved, from St. Pancras, and these, most unusually, provide a completely new service on a classic route other that the one directly associated with HS3, specifically to Rugby, Coventry, Birmingham and stations to Liverpool and Chester. The intention is to give Coventry a good HS service (Coventry is otherwise a loser from HS2) and also to free up slots on the WCML south of Rugby. Simultaneously, the classic route form Bedford to Northampton via Olney is reopened, and the following RM services introduced / extended.

- 2tphC St. Pancras – Luton & Dunstable Parkway – Northampton – Rugby – Coventry – Birmingham Int'l – Birmingham New Street – Wolverhampton (splits/joins) – : – Stafford – Crewe – Runcorn – Liverpool S. Parkway – Liverpool Lime St. – Telford – Wellington – Shrewsbury – Wrexham – Chester
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Olney – Northampton – Rugby – Coventry –Birmingham Int'l – Birmingham New Street – University – Bromsgrove – Droitwich Spa – Worcester Shrub Hill
- 2tphR (Thameslink) Brighton –> Bedford – Olney – Northampton

See also appendix G on the impact of the Coventry Variant of HS2 on these services.

Service Plan 1A

This is also the first service plan, but comes into effect shortly afterwards, when the section from Northampton to Leicester opens. Again, only classic compatible services from St. Pancras are involved,

and the new ones do indeed replace the classic services to Sheffield and Manchester on the associated classic route. The RM services on the classic route are included, for completeness.

- 2tphC St. Pancras– Luton & Dunstable Parkway – Northampton – Rugby – Coventry – Birmingham International – Birmingham New Street – Wolverhampton –> Liverpool/Chester
- 2tphC St. Pancras– Luton & Dunstable Parkway – Northampton – Leicester – Loughborough – Derby – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphC St. Pancras– Luton & Dunstable Parkway – Northampton – Leicester – East Midlands Parkway – Derby – Matlock – Bakewell – Miller's Dale (from/to Buxton) – Chinley – Stockport – Manchester Piccadilly (alternatively: – Derby – Chesterfield – Sheffield (reverse) – Chinley – if the Peak route has not yet been reopened.)
- 2tphR St. Pancras – St. Albans – Luton & Dunstable Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – Loughborough – Attenborough – Beeston – Nottingham
- 2tphR St. Pancras – St. Albans – Luton & Dunstable Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – East Midlands Parkway – Attenborough – Beeston – Nottingham
- 2tphR St. Pancras – St. Albans – Luton & Dunstable Parkway – Luton – Bedford – Wellingborough – Kettering – Corby
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Olney – Northampton – Rugby – Coventry – Birmingham Int'l – Birmingham New St. – University – Bromsgrove – Droitwich Spa – Worcester Shrub Hill.
- 2tphR (Thameslink) Brighton –> Bedford – Olney – Northampton

With this service plan, Loughborough, East Midlands Parkway, Derby, Chesterfield, Sheffield, Rotherham, Wakefield and Leeds all retain their existing services to St. Pancras, at the same or better frequencies, but somewhat faster, and Matlock, Bakewell, Miller's Dale, Buxton and Chinley have their former services restored, but much, much improved. (This assumes that the Peak route has by then been reopened. If this is not the case, then the Manchester service travels from Derby to Chinley via Sheffield, with a reversal at Sheffield.)

Representative Hourly Non-Cross-Platform Interchange Pattern at Bedford:

00R St. Pancras – Corby
R (Thameslink) Brighton –> Northampton

07R St Pancras – Nottingham
(no connection)

15R St. Pancras – Birmingham New St. – Worcester
R (Thameslink) Gatwick Airport –> Bedford

23R St Pancras – Nottingham
(no connection)

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Interchange Pattern at Northampton (not cross-platform):

00C St. Pancras – Wolverhampton –> Liverpool / Chester
R (Thameslink) Brighton –> Northampton
R Euston – Rugby

07C St. Pancras – Derby – Sheffield – York
R Euston – Birmingham New St.

15R St. Pancras – Birmingham New St. – Worcester
R Euston – Rugby

23C St. Pancras – Derby – Matlock (or Sheffield) – Manchester
(no connection at this SP)

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Leicester:

00C St. Pancras – East Midlands Parkway – Nottingham
R St. Pancras – Loughborough – Derby – Sheffield –York

15C St. Pancras – East Midlands Parkway – Derby – Matlock (or Sheffield) – Manchester
R St. Pancras – Loughborough – Nottingham

– repeating at 30 and 45 minutes past. Note that these services depart in the order stated, thus the RM St. Pancras – Nottingham service, calling at East Midlands Parkway (but not Loughborough) departs before the CC St. Pancras – York service, calling at Loughborough (but not East Midlands Parkway). This ensures that Loughborough and East Midlands Parkway stations each have 4tph, alternatively to Derby and points north, or to Nottingham, but no CC or RM train serves both. (There is a stopping service between Leicester and Derby, which does.)

Service Plan 1 overall imposes the following loadings on HS3:

- Pancras Cross – Canley St. Junction 0tph
- Canley St. Junction – West Hampstead Junction 0tph
- St. Pancras – West Hampstead Junction 14tph
- West Hampstead Junction – Northampton 6tph
- Northampton – Watkin Road Junction 4tph
- Watkin Rd. Junction – Humberstone Rd. Junction (main line) 0tph
- Watkin Rd. Junction – Regent St. Junction 4tph
- Regent St Junction – Swain St. Junction 8tph
- Swain St. Junction – Humberstone Rd. Junction 0tph
- Humberstone Rd. Junction – Stanford Junction 0tph
- Stanford Junction – Nuthall South Junction (main line) 0tph
- Stanford Junction – Edwalton Junction 0tph
- Edwalton Junction – Manvers St. Junction 0tph
- Manvers St. Junction – Nottingham HS station 4tph
- Nottingham HS station – Strelley Junction 0tph
- Awsworth Junction – Strelley Junction 0tph

- Strelley Junction – Nuthall South Junction 0tph
- Nuthall South Junction – Nuthall North Junction 0tph
- Awsworth Junction – Nuthall North Junction 0tph
- Nuthall North Junction – Beighton Junction 0tph
- Beighton Junction – Altofts Junction 0tph
- Altofts Junction – Gelderd Road North Junction 0tph
- Altofts Junction – Garforth East Junction 0tph
- Gelderd Road North Junction – Garforth West Junction 0tph
- Garforth West Junction – Micklefield HS Junction 0tph
- Garforth West Junction – Garforth East Junction 0tph
- Garforth East Junction – York HS station 0tph
- York HS station – Derwent Hill Junction 0tph
- Derwent Hill Junction – Paradise Junction 0tph
- Derwent Hill Junction – Stocksfield 0tph
- Newcastle – Paradise Junction 0tph
- Paradise Junction – Stocksfield 0tph
- Stocksfield – Tynegreen Junction 0tph
- Tynegreen Junction – Hawick 0tph
- Hawick – Ravenswood Junction 0tph
- Ravenswood Junction – Newcraighall 0tph
- Newcraighall – Edinburgh 0tph

The above includes Regional Metro as well as HS services, hence the sudden appearance and disappearance of 4tph between Regent St. and Swain St. Junctions, either side of Leicester station

Service Plan 2

There is a long hiatus before the next section of HS3 opens. It actually opens as part of HS7's extension from Birmingham (Water Orton North Junction) to Leeds and York, HS3 providing the section from Nottingham station to Nuthall North Junction, where HS7 joins, and onwards to the north. HS7 also provides the link between Awsworth Junction and Strelley Junction, so its services can reach Nottingham. At the same time, the first section of HS9 opens, between Gelderd Rd. North Junction and Garforth East Junction (and between Garforth West Junction and Micklefield Junction), so, from the beginning, HS services can reach York either directly or via Leeds.

SP2 is not actually a service plan, as far as HS3 is concerned, since no new HS3 services are involved, but it does involve a change to the route loadings, due entirely to HS7. It also involves changes to the interchange patterns.

The HS7 services north of Birmingham are:

- 2tphG Plymouth – Exeter St. David's – Taunton – Bristol Temple Meads HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – South Yorkshire – Leeds HS – York

- 2tphG Cardiff HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Nottingham
- 2tphGG Birmingham HS – Derby – South Yorkshire – Leeds HS – York
- 2tphC Birmingham HS – Derby – Nottingham – Newark Castle – Lincoln Central – Market Rasen – Grimsby Town - Cleethorpes

The following Regional Metro services are introduced / exist already:

- 2tphR Bournemouth – Brockenhurst – Southampton – Southampton Airport Parkway – Winchester – Basingstoke – Reading – Oxford – Banbury – Leamington Spa – Kenilworth – Coventry – Birmingham Int'l – Birmingham New St. (reverse) – Tamworth – Burton-on-Trent – Derby – Chesterfield – Sheffield – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphR Plymouth – Ivybridge – Totnes – Newton Abbot – Teignmouth – Dawlish – Exeter St. David's – Cullompton – Tiverton Junction – Taunton – Bridgwater – Highbridge – Weston Super Mare – Bristol Temple Meads – Bristol Parkway – Gloucester (reverse) – Cheltenham Spa – Ashchurch – Worcester Shrub Hill – Droitwich Spa – Bromsgrove – University – Birmingham New St. – Tamworth – Burton on Trent – Derby – Chesterfield – Sheffield – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York

Representative Hourly (non-cross-platform) Interchange Pattern at Derby:

00G HS7 Plymouth – York
R Bournemouth – York

07GG HS7 Birmingham – York
R Plymouth – York

15G HS4/HS7 Cardiff – Nottingham
C St. Pancras – York

23C HS7 Birmingham – Cleethorpes
C St. Pancras – Manchester

– repeating at 30, 37, 45 and 53 minutes past.

Service Plan 2A

This service plan comes into effect when HS3 (as HS7) opens from York to Newcastle, HS8 opens from (Liverpool –) Kenyon West Junction and Preston to Sheffield HS and Beighton Junction, and HS9 opens from (Liverpool / Preston –) Guide Bridge HS Junction to Gelderd Rd. North Junction. As with SP2, this is not really a service plan as far as HS3 is concerned, since no new HS3 services are involved, but it does involve a change to the loadings, due to HS7, HS8 and HS9. It also involves changes to the interchange patterns.

This is a very significant event, of course. Darlington station is rebuilt to give interchange between HS3 (HS7) and the Tees Valley Metro. Durham is served by the new Relly Mill station, and Consett station opens.

HS7's service from Plymouth is extended:

- 2tphG Plymouth – Exeter St. David's – Taunton – Bristol Temple Meads HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – South Yorkshire – Leeds HS – York HS – Darlington – Durham (Relly Mill) – Consett – Newcastle

The other services are unaffected.

The services on HS8 are:

- 2tphGG Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Sheffield HS – Nottingham

The services on HS9 are:

- 2tphGG Liverpool Lime St. – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – York HS – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphC Liverpool Lime St. – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Thornaby – Middlesborough
- 2tphC Liverpool Lime St. – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Stockton – Hartlepool – Seaham – Sunderland – Newcastle
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – Selby – Hull
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Malton – Seamer – Scarborough

A new Regional Metro service is introduced on the ECML:

- 2tphR York – Thirsk – Northallerton – Darlington – Durham – Chester le Street – Newcastle – Morpeth – Alnmouth – Berwick-upon-Tweed – Dunbar – Drem – Edinburgh Waverley

The Tees Valley Metro may or may not have been in service previously:

- 2tphRS Bishop Auckland – Shildon – Newton Aycliffe – Heighington –North Road – Darlington – Dinsdale – Tees-Side Airport – Allen's West – Eaglescliffe – Thornaby – Middlesborough – British Steel (Redcar) – Redcar Central – Redcar East – Marske – Saltburn

Representative Hourly Cross-Platform Interchange Pattern at Darlington:

00G Plymouth – Newcastle
RS Bishop Auckland – Middlesborough – Saltburn

– repeating at 30 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Newcastle:

00G Plymouth – Newcastle
R York – Edinburgh

– repeating at 30 minutes past.

Adding the new services introduced in the several stages of service plan 2 to those of plan 1 imposes the following loadings on HS3:

- Pancras Cross – Canley St. Junction 0tph
- Canley St. Junction – West Hampstead Junction 0tph
- St. Pancras – West Hampstead Junction 14tph
- West Hampstead Junction – Northampton 6tph
- Northampton – Watkin Road Junction 4tph
- Watkin Rd. Junction – Humberstone Rd. Junction (main line) 0tph
- Watkin Rd. Junction – Regent St. Junction 4tph
- Regent St Junction – Swain St. Junction 8tph
- Swain St. Junction – Humberstone Rd. Junction 0tph
- Humberstone Rd. Junction – Stanford Junction 0tph
- Stanford Junction – Nuthall South Junction (main line) 0tph
- Stanford Junction – Edwalton Junction 0tph
- Edwalton Junction – Manvers St. Junction 0tph
- Manvers St. Junction – Nottingham HS station 2tph
- Nottingham HS station – Strelley Junction 6tph
- Awsworth Junction – Strelley Junction 4tph
- Strelley Junction – Nuthall South Junction 2tph
- Nuthall South Junction – Nuthall North Junction 2tph
- Awsworth Junction – Nuthall North Junction 4tph
- Nuthall North Junction – Beighton Junction 6tph
- Beighton Junction – Altofts Junction 4tph
- Altofts Junction – Gelderd Road North Junction 4tph
- Altofts Junction – Garforth East Junction 0tph
- Gelderd Road North Junction – Garforth West Junction 14tph
- Garforth West Junction – Micklefield HS Junction 8tph
- Garforth West Junction – Garforth East Junction 6tph
- Garforth East Junction – York HS station 6tph
- York HS station – Derwent Hill Junction 4tph
- Derwent Hill Junction – Paradise Junction 4tph
- Derwent Hill Junction – Stocksfield 0tph
- Newcastle – Paradise Junction 4tph
- Paradise Junction – Stocksfield 0tph
- Stocksfield – Tynegreen Junction 0tph
- Tynegreen Junction – Hawick 0tph
- Hawick – Ravenswood Junction 0tph
- Ravenswood Junction – Newcraighall 0tph
- Newcraighall – Edinburgh 0tph

At this stage, no services are using the section between Altofts Junction and Garforth East Junction – all are travelling via Leeds.

Service Plan 3

This service plan comes into effect when HS3 opens from Pancras Cross to West Hampstead Junction and from Leicester to Nuthall South Junction and Nottingham, and HS8 opens between Ladybower Junction and Paddock Junction. Three category1 GC-gauge services are introduced, to Manchester and Liverpool via Sheffield, to York via Leeds and to Newcastle. HS Metro services are introduced to York and Preston. In addition, the classic route between Melton Mowbray and Nottingham reopens, and the St. Pancras – Corby service is extended to York.

With the opening of HS8 between Ladybower Junction and Paddock Junction, HS7's services to York and Newcastle are rerouted via Sheffield HS and Huddersfield.

HS3 Long Distance UHS:

- 2tphG Pancras Cross – South Yorkshire – York HS – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphG Pancras Cross – South Yorkshire – Leeds HS – York HS
- 2tphG Pancras Cross – Sheffield HS – Manchester HS – Victoria LL – Liverpool Lime St.

HS3 Metro:

- 2tphGG Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Huddersfield – Leeds HS – York HS
- 2tphGG Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston

Regional Metro:

- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Corby – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton & Mansfield Parkway – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Pontefract – York.
- 2tphR Birmingham New St. – Coleshill Parkway – Nuneaton – Hinckley – Leicester – Melton Mowbray – Oakham – Stamford – Peterborough – March – Ely – Bury St. Edmunds – Ipswich – Harwich International – Harwich Town

There are new interchange facilities at Leicester, between the HS Metro service to Preston and the above Regional Metro service from Birmingham to Harwich, and at Nottingham, between the HS Metro service to York via Leeds, and the Regional Metro service from St. Pancras to York via Melton Mowbray.

Representative Hourly Cross-Platform Interchange Pattern at Leicester:

00R St. Pancras – East Midlands Parkway – Nottingham
C St. Pancras – Loughborough – Derby – Sheffield –York

07GG Pancras Cross – York
(no connection)

15C St. Pancras – East Midlands Parkway – Derby – Matlock (or Sheffield) – Manchester
R St. Pancras – Loughborough – Nottingham

23GG Pancras Cross – Preston
R Birmingham New St. – Harwich Town

– repeating at 30, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Nottingham:

00GG Pancras Cross – Leeds (HS Metro)
R St. Pancras – Melton Mowbray – York

– repeating at 30 minutes past.

This service plan imposes a load on HS3 of 10tph between Pancras Cross and Watkin Rd. Junction, 4tph between Watkin Rd. Junction and Nuthall South Junction (main line), 6tph between Watkin Rd. Junction and Nuthall South Junction (Leicester station and Nottingham branches), 10tph between Nuthall South Junction and Beighton Junction, 4tph between Beighton Junction and Altofts Junction, and 2tph elsewhere. (The loading between Beighton Junction and Gelderd Rd. North Junction is reduced by 4tph because the HS7 services now run via Sheffield HS and Huddersfield.) Additionally the restored classic service via Melton Mowbray imposes 2tph between Edwalton and Manvers St. Junctions.

Service Plan 3A

This service plan comes into effect when HS3 opens between Derwent Hill Junction and Edinburgh, and simultaneously the HS route between Newcastle and Hexham. The classic-compatible services from London to Scotland via HS2 and the WCML are withdrawn, and all HS Scottish services now run on HS3, and are GC gauge. It is likely that HS services in Scotland will have been running for some time, at least between Edinburgh and Glasgow, before HS3 reaches Edinburgh. The article 'HS Scottish Routes and Service Plans' give full details of these, and also of the RM services from Hawick, mentioned below, and this will not be repeated here.

There are four extra services:

- 2tphG Pancras Cross – York – Darlington – Durham (Relly Mill) – Consett – Hexham – Hawick – Edinburgh – Haymarket – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphC Newcastle – Hexham –stations to Carlisle
- 2tphG Newcastle – Hexham – Hawick – Lauder – Edinburgh – Haymarket – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphC Hawick – Lauder – Edinburgh –> Inverness

Representative Hourly Cross-Platform Interchange Pattern at Hexham:

00G Pancras Cross – Glasgow
C Newcastle – Carlisle
RS Newcastle – Hexham (all stations)

15G Newcastle – Glasgow
(no interchange)

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Hawick:

00G Pancras Cross – Glasgow
C Hawick – Inverness
R Hawick – Aberdeen via the bridges

15G Newcastle – Glasgow
R Hawick – Dundee via the bridges

– repeating at 30 and 45 minutes past.

This imposes a load of 2tph between Pancras Cross and Hexham, 4tph between Newcastle and Hexham, 4tph between Hexham and Hawick, and 6tph between Hawick and Edinburgh. In addition the RM services from Hawick travel on HS3 as far as Ravenswood Junction, adding a further 4tph, and the Scottish HS services starting at Newcraighall HS add an extra 10tph between there and Edinburgh (see the HS Scottish Routes and Service Plans article for full details).

Adding the new services introduced in the several stages of service plan 3 to those of plan 2 imposes the following loadings on HS3:

- Pancras Cross – Canley St. Junction 12tph
- Canley St. Junction – West Hampstead Junction 12tph
- St. Pancras – West Hampstead Junction 14tph
- West Hampstead Junction – Collingtree Junctions 18tph
- Collingtree Junctions – Langborough Junction (direct – main line) 8tph
- Collingtree Junctions – Northampton Castle station 10tph
- Northampton Castle station – Langborough Junction 8tph
- Langborough Junction – Watkin Road Junction 16tph
- Watkin Rd. Junction – Humberstone Rd. Junction (main line) 8tph
- Watkin Rd. Junction – Regent St. Junction 8tph
- Regent St Junction – Swain St. Junction 14tph
- Swain St. Junction – Humberstone Rd. Junction 4tph
- Humberstone Rd. Junction – Stanford Junction 12tph
- Stanford Junction – Nuthall South Junction (main line) 8tph
- Stanford Junction – Edwalton Junction 4tph
- Edwalton Junction – Manvers St. Junction 6tph
- Manvers St. Junction – Nottingham HS station 6tph
- Nottingham HS station – Strelley Junction 10tph
- Awsworth Junction – Strelley Junction 4tph
- Strelley Junction – Nuthall South Junction 6tph
- Nuthall South Junction – Nuthall North Junction 14tph
- Awsworth Junction – Nuthall North Junction 4tph
- Nuthall North Junction – Beighton Junction 18tph
- Beighton Junction – Altofts Junction 6tph
- Altofts Junction – Gelderd Road North Junction 2tph
- Altofts Junction – Garforth East Junction 4tph
- Gelderd Road North Junction – Garforth West Junction 18tph

- Garforth West Junction – Garforth East Junction 10tph
- Garforth West Junction – Micklefield HS Junction 8tph
- Garforth East Junction – York HS station 14tph
- York HS station – Derwent Hill Junction 8tph
- Derwent Hill Junction – Stocksfield 2tph
- Derwent Hill Junction – Paradise Junction 6tph
- Newcastle – Paradise Junction 10tph
- Paradise Junction – Stocksfield Junction 4tph
- Stocksfield Junction – Tynegreen Junction 6tph
- Tynegreen Junction – Hawick 4tph
- Hawick – Ravenswood Junction 10tph
- Ravenswood Junction – Newcraighall 6tph
- Newcraighall – Edinburgh 16tph

The critical sections for capacity are thus Nuthall North Junction – Beighton Junction and Gelderd Rd. North Junction – Garforth West Junction, each with 18tph.

HS3 is now complete. There are further service plans, reflecting changes elsewhere, but only marginal, peripheral changes to HS3's route loadings and interchange patterns.

Service Plan 4

This service plan comes into effect when HS5 opens between Pancras Cross and Brighton / Newhaven / Eastbourne. This is an immensely important event, but the only change made to HS3's services is that they now start in Sussex, rather than at Pancras Cross, specifically:

HS3 Long Distance UHS:

- 2tphG Eastbourne – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – York – Darlington – Durham (Relly Mill) – Consett – Hexham – Hawick – Edinburgh Waverley HS – Haymarket – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphG Newhaven Marine – Newhaven Town – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – York – Darlington – Durham (Relly Mill) – Newcastle
- 2tphG East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – Leeds HS – York HS
- 2tphG East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – (Mancjester) Victoria LL – Liverpool Lime St.

HS3 Metro:

- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Huddersfield – Leeds HS – York HS
- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston

Service Plan 4A

This service plan comes into effect when HS5 opens between East Croydon and Tunbridge Wells. The UHS service to York now begins in Tunbridge Wells:

- 2tphG Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – Leeds HS – York HS
- 2tphG Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – (Manchester) Victoria LL – Liverpool Lime St.

Service plan 4 overall makes no change to HS3's route loadings, nor to the various interchange patterns.

Service Plan 5

Service Plan 5 comes into effect when the Southampton arm of HS5 opens as far as the Bognor and Littlehampton branches, and, simultaneously, HS6 opens between Pancras Cross and King's Lynn. This involves no changes to HS3's services, but obviously affects the route loadings at Pancras Cross itself.

Service Plan 5A

Service Plan 5A comes into effect when HS5 opens between Barnham Junction (Bognor) and Southampton and, simultaneously, HS6 opens between Ely and Norwich. At the same time, HS8 opens between Asfordby Junction (Melton Mowbray) and Ely. Again, this involves no change to HS3 itself, but the existing services from Cardiff HS and Preston to Nottingham are extended through to Norwich.

The Regional Metro service is introduced:

- 2tphR Norwich – Wymondham – Thetford – Ely (reverse) –
  2tphR Stansted Airport – Cambridge – Ely (join/split) –
  – March – Peterborough – Stamford – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton and Mansfield Parkway – Chesterfield – Sheffield (reverse) – Chinley – Stockport – Manchester Piccadilly – Manchester Oxford Road – Salford Crescent – Bolton – Horwich Parkway – Chorley – Leyland – Preston – Lancaster – Morecambe

Representative Hourly Cross-Platform Interchange Pattern at Nottingham:

00GG HS8 Norwich – Preston (no connection)

07GG Pancras Cross – York (HS Metro)
C Cleethorpes – Birmingham HS
R St. Pancras – Melton Mowbray – York
R Norwich / Stansted Airport – Morecambe

23GG HS3/HS8 Brighton – Preston (HS Metro)
G HS8/HS7 Norwich – Cardiff

– repeating at 30, 37 and 53 minutes past.

The main point of the Nottingham interchanges is to provide a HS London – Derby service, by a single change.

Representative Hourly Cross-Platform Interchange Pattern at Sheffield HS (ignoring, for the moment, the Southern Transpennine Regional Metro services at Sheffield Midland):

00GG HS3 Brighton –York (HS Metro)
GG HS8 Norwich – Preston

07G HS7 Plymouth – Newcastle
(no connection)

15GG HS3/HS8 Pancras Cross – Preston
C HS7 Birmingham HS – York

23G HS3/HS8 Tunbridge Wells – Liverpool
(no connection)

– repeating at 30, 37, 45 and 53 minutes past.

Service Plan 5B

This service plan comes into effect when HS4 opens between Cardiff HS and Swansea. The existing HS7 service from Cardiff to Nottingham is extended to start from Swansea. This has no effect on HS3 loadings. The HS7 services to the north of Birmingham are thus now:

- 2tphG Plymouth – Exeter St. David's – Taunton – Bristol Temple Meads HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Sheffield HS – Huddersfield – Leeds HS – York – Darlington (Relly Mill) – Consett – Newcastle
- 2tphGG Birmingham HS – Derby – Sheffield HS – Huddersfield – Leeds HS – York
- 2tphG Swansea – Port Talbot – Cardiff (Rhoose) Airport – Cardiff HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Nottingham – Peterborough – Norwich
- 2tphGG Birmingham HS – Derby – Nottingham

Adding the new services introduced in the several stages of service plan 5 to those of plan 4 (3, actually) imposes the following, final (according to the present plans) loadings on HS3:

- Pancras Cross – Canley St. Junction 18tph
- Canley St. Junction – West Hampstead Junction 12tph
- St. Pancras – West Hampstead Junction 14tph
- West Hampstead Junction – Collingtree Junctions 18tph
- Collingtree Junctions – Langborough Junction 8tph
- Collingtree Junctions – Northampton Castle station 10tph
- Northampton Castle station – Langborough Junction 8tph
- Langborough Junction – Watkin Road Junction 16tph
- Watkin Rd. Junction – Humberstone Rd. Junction (main line) 8tph
- Watkin Rd. Junction – Regent St. Junction 8tph

- Regent St Junction – Swain St. Junction 14tph
- Swain St. Junction – Humberstone Rd. Junction 4tph
- Humberstone Rd. Junction – Stanford Junction 12tph
- Stanford Junction – Nuthall South Junction (main line) 8tph
- Stanford Junction – Edwalton Junction 4tph
- Asfordby Junction – Edwalton Junction 6tph
- Edwalton Junction – Manvers St. Junction 10tph
- Manvers St. Junction – Nottingham HS station 10tph
- Manvers St. Junction – Nottingham classic station 2tph
- Nottingham HS station – Strelley Junction 10ph
- Strelley Junction – Awsworth Junction 4tph
- Strelley Junction – Nuthall South Junction 6tph
- Nuthall South Junction – Nuthall North Junction 14tph
- Awsworth Junction – Nuthall North Junction 4tph
- Nuthall North Junction – Beighton Junction 18tph
- Beighton Junction – Woodhouse HS Junction 12tph
- Woodhouse HS Junction – Ladybower Junction 12tph
- Ladybower Junction – Guide Bridge HS Junction 6tph
- Ladybower Junction – Paddock Junction 6tph
- Paddock Junction – Gelderd Rd. North Junction 14tph
- Beighton Junction – Altofts Junction 6tph
- Altofts Junction – Gelderd Road North Junction 2tph
- Altofts Junction – Garforth East Junction 4tph
- Gelderd Road North Junction – Garforth West Junction 16tph
- Garforth West Junction – Garforth East Junction 12tph
- Garforth West Junction – Micklefield HS Junction 6tph
- Garforth East Junction – York HS station 14tph
- York HS station – Derwent Hill Junction 8tph
- Derwent Hill Junction – Stocksfield Junction 2tph
- Derwent Hill Junction – Paradise Junction 6tph
- Newcastle – Paradise Junction 10tph
- Paradise Junction – Stocksfield Junction 4tph
- Stocksfield Junction – Tynegreen Junction 6tph
- Tynegreen Junction – Hawick 4tph
- Hawick – Edinburgh 6tph

There two most critical sections for capacity are still Nuthall North Junction – Beighton Junction and Gelderd Road North Junction – Garforth West Junction, with 18tph each, and secondly the two sections West Hampstead Junction – Crick Junction, as before, and the extended section Manvers St. Junction – Radford Junction, each with 16tph.

Service Plan 5 Summary

It's worth summarising the full set of services at service plan 5, as this represents the final, complete state of these plans, and the services have so far been introduced piecemeal, at the various stages. This is, of course, the initial, 2-track railway. The effect of quadrupling will be examined later.

HS3 Long Distance UHS:

- 2tphG Eastbourne – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – York – Darlington – Durham (Relly Mill) – Consett – Hexham – Hawick – Edinburgh Waverley HS – Haymarket – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphG Newhaven Marine – Newhaven Town – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – York – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphG Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – Leeds HS – York HS
- 2tphG Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – (Manchester) Victoria LL – Liverpool Lime St.
- 2tphC Newcastle – Hexham – stations to Carlisle
- 2tphG Newcastle – Hexham – Hawick – Edinburgh Waverley HS – Haymarket – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphC Hawick – Edinburgh –> Inverness

(Note that the Newcastle – Hexham and Hawick – Inverness services are included in the UHS section because they interface with the Glasgow service.)

HS3 Metro:

- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Huddersfield – Leeds HS – York HS
- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton – Leicester – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston
- 2tphC St. Pancras – Luton & Dunstable Parkway – Northampton – Leicester – Loughborough – Derby – Chesterfield – Sheffield Midland – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphC St. Pancras– Luton & Dunstable Parkway – Northampton – Leicester – East Midlands Parkway – Derby – Matlock – Bakewell – Miller's Dale (from/to Buxton) – Chinley – Stockport – Manchester Piccadilly (alternatively: – Derby – Chesterfield – Sheffield (reverse) – Chinley – if the Peak route has not yet been reopened.)
- 2tphC St. Pancras – Luton & Dunstable Parkway – Northampton – Rugby – Coventry – Birmingham International – Birmingham New Street – Wolverhampton – :
  1) – Stafford – Crewe – Runcorn – Liverpool South Parkway – Liverpool Lime Street
  2) – Telford – Wellington – Shrewsbury – Wrexham – Chester

MML and other Regional Metro:

- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – Loughborough – Attenborough – Beeston - Nottingham
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – East Midlands Parkway – Attenborough – Beeston - Nottingham
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Corby – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton & Mansfield Parkway – Chesterfield – Sheffield Midland – South Yorkshire (Meaadowhall) – Rotherham – Pontefract – York (note that this uses HS3 on the approach to Nottingham)
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Olney – Northampton – Rugby – Coventry – Birmingham Int'l – Birmingham New St. – University – Bromsgrove – Droitwich Spa – Worcester Shrub Hill.
- 2tphR (Thameslink) Brighton –> Bedford – Olney – Northampton
- 2tphR Birmingham New St. – Coleshill Parkway – Nuneaton – Hinckley – Leicester – Melton Mowbray – Oakham – Stamford – Peterborough – March – Ely – Bury St. Edmunds – Ipswich – Harwich International – Harwich Town
- 2tphR Bournemouth – Brockenhurst – Southampton – Southampton Airport Parkway – Winchester – Basingstoke – Reading – Oxford – Banbury – Leamington Spa – Kenilworth – Coventry – Birmingham Int'l – Birmingham New St. (reverse) – Tamworth – Burton-on-Trent – Derby – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphR Plymouth – Ivybridge – Totnes – Newton Abbot – Teignmouth – Dawlish – Exeter St. David's – Cullompton – Tiverton Junction – Taunton – Bridgwater – Highbridge – Weston Super Mare – Bristol Temple Meads – Bristol Parkway – Gloucester (reverse) – Cheltenham Spa – Ashchurch – Worcester Shrub Hill – Droitwich Spa – Bromsgrove – University – Birmingham New St. – Tamworth – Burton on Trent – Derby – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphR Norwich – Wymondham – Thetford – Ely (reverse) –
  2tphR Stansted Airport – Cambridge – Ely (join/split) –
  – March – Peterborough – Stamford – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton and Mansfield Parkway – Chesterfield – Sheffield (reverse) – Chinley – Stockport – Manchester Piccadilly – Manchester Oxford Road – Salford Crescent – Bolton – Horwich Parkway – Chorley – Leyland – Preston – Lancaster – Morecambe
- 2tphR York – Thirsk – Northallerton – Darlington – Durham – Chester le Street – Newcastle – Morpeth – Alnmouth – Berwick-upon-Tweed – Dunbar – Drem – Edinburgh Waverley
- 2tphRS (Tees Valley Metro) Bishop Auckland – Shildon – Newton Aycliffe – Heighington – North Road – Darlington – Dinsdale – Tees-Side Airport – Allen's West – Eaglescliffe – Thornaby – Middlesborough – British Steel (Redcar) – Redcar Central – Redcar East – Marske – Saltburn

HS7 North of Birmingham:

- 2tphG Plymouth – Exeter St. David's – Taunton – Bristol Temple Meads HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Sheffield HS – Huddersfield – Leeds HS – York – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphG Swansea – Port Talbot – Cardiff (Rhoose) Airport – Cardiff HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Nottingham – Peterborough – Norwich
- 2tphGG Birmingham HS – Derby – Sheffield HS – Huddersfield – Leeds HS – York
- 2tphC Birmingham HS – Derby – Nottingham – Newark Castle – Lincoln Central – Market Rasen – Grimsby Town – Cleethorpes

HS8:

- 2tphGG Norwich – Peterborough – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria LL – Bolton – Preston

HS9:

- 2tphGG Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – York HS – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphC Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Thornaby – Middlesborough
- 2tphC Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Stockton – Hartlepool – Seaham – Sunderland - Newcastle
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – Selby – Hull
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Malton – Seamer – Scarborough

HS6:

- 2tphC St. Pancras (East) – Stratford HS – Stansted Airport – Cambridge – Ely – Peterborough – Doncaster – York – Darlington – Durham – Newcastle – Berwick upon Tweed – Edinburgh Waverley

Representative Hourly Non-Cross-Platform Interchange Pattern at Bedford:

00R St. Pancras – York via Melton Mowbray
R (Thameslink) Brighton – Bedford

07R St. Pancras – Nottingham
(Thameslink) Horsham – Northampton

15R (Thameslink) Brighton – Corby
(no connection)

23R St. Pancras – Nottingham
(Thameslink) Horsham – Northampton

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Interchange Pattern at Northampton (the HS3/MML connections are not cross-platform, but the intra-WCML ones are; see the WCML Service Plans article for full details of these):

00C St. Pancras – Wolverhampton –> Liverpool / Chester
R (Thameslink) Brighton –> Northampton
R Euston – Crewe via Stoke
R Euston – Rugby

07C St. Pancras – Derby – Sheffield – York
R Euston – Birmingham New St.

15R St. Pancras – Birmingham New St. – Worcester
R Euston – Crewe via Stafford
R Euston – Rugby

23C St. Pancras – Derby – Matlock (or Sheffield) – Manchester
R Euston – Barrow in Furness

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Leicester:

00R St. Pancras – East Midlands Parkway – Nottingham
C St. Pancras – Loughborough – Derby – Sheffield –York

07GG Brighton – York
(no connection)

15C St. Pancras – East Midlands Parkway – Derby – Matlock/Sheffield – Manchester
R St. Pancras – Loughborough – Nottingham

23GG Brighton – Preston
R Birmingham New St. – Harwich Town

– repeating at 30, 45 and 53 minutes past. Note that these services depart in the order stated, thus the RM St. Pancras – Nottingham service, calling at East Midlands Parkway (but not Loughborough) departs before the CC St. Pancras – York service, calling at Loughborough (but not East Midlands Parkway). This ensures that Loughborough and East Midlands Parkway stations each have 4tph, alternatively to Derby and points north, or to Nottingham, but no CC or RM train serves both. (There is a stopping service between Leicester and Derby, which does.)

Representative Hourly (non-cross-platform) Interchange Pattern at Derby:

00G HS7 Plymouth – Newcastle
R Bournemouth – York

07GG HS7 Birmingham – York
R Plymouth – York

15G HS4/HS7 Swansea – Norwich
C St. Pancras – York

23C HS7 Birmingham – Cleethorpes
C St. Pancras – Manchester

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Nottingham:

00GG HS8 Norwich – Preston (no connection)

07GG Pancras Cross – York (HS Metro)
C Cleethorpes – Birmingham HS
R St. Pancras – Melton Mowbray – York
R Norwich / Stansted Airport – Morecambe

23GG HS3/HS8 Brighton – Preston (HS Metro)
G HS8/HS7 Norwich – Swansea

– repeating at 30, 37 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Sheffield HS/Midland (refer to the HS Transpennine Routes and Service Plans article for full details of the Regional Metro services). The HS services have cross-platform interchange, and the RM services have longer stops, to allow for the platform change. The pattern is:

00GG Brighton –York (HS Metro)
GG HS8 Norwich – Preston
R Skegness - Liverpool

07G HS7 Plymouth – Newcastle
(no cross-platform connection)
R Cleethorpes – Blackpool

15GG HS3/HS8 Brighton – Preston
GG HS7 Birmingham HS – York
R Norwich / Stansted Airport – Morecambe

23G HS3/HS8 Tunbridge Wells - Liverpool
(no cross-platform connection)
R Hull – Southport

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange and Terminating Pattern at York

00G Eastbourne – Glasgow
GG Brighton – York (HS Metro)

07G Tunbridge Wells – York (UHS, Leeds fast)
G Plymouth – Newcastle
C St.Pancras (West) – York (via Derby – not cross platform)

15G Newhaven – Newcastle
GG Birmingham HS – York

23GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh
R St. Pancras (West) – York (via Melton Mowbray – not cross-platform)

– repeating at 30, 40, 45 and 55 minutes past. The services terminating at 07 and 23 minutes past are obviously intended for (non-cross-platform) connection into those 7 / 8 minutes later.

Representative Hourly Cross-Platform Interchange Pattern at Darlington:

00G Eastbourne – Glasgow
RS Bishop Auckland – Middlesborough – Saltburn

07G Plymouth – Newcastle
RS Bishop Auckland – Middlesborough – Saltburn

15G Newhaven – Newcastle
RS Bishop Auckland – Middlesborough – Saltburn

23GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh (not cross-platform – uses ECML platforms)
RS Bishop Auckland – Middlesborough – Saltburn

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Newcastle:

00G Plymouth – Newcastle
R York – Edinburgh

07G Newhaven – Newcastle
(no connection)

15GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Hexham:

00G Eastbourne – Glasgow
C Newcastle – Carlisle
R Newcastle – Hexham (all stations)

15G Newcastle – Glasgow
(no interchange)

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Hawick:

00G Eastbourne – Glasgow
C Hawick – Inverness
R Hawick – Aberdeen via the bridges
15G Newcastle – Glasgow
R Hawick – Dundee via the bridges

– repeating at 30 and 45 minutes past.

Estimated Journey Times

The conditions governing acceleration, deceleration, behaviour at junctions and line capacity of high speed lines are dealt with exhaustively in appendix B of the article 'Same Speed Railways'. Technically-minded readers, who want all the hard details, should look there. Only the required results are quoted here.

The following calculations are only approximate. Distances, to the nearest km, are derived from my own maps. However, comparing my estimated distances with actual distances, where these are appropriate, (thus York – Darlington my estimate 70km, actual 70.4km, Darlington – Durham Relly Mill my estimate 33km, actual Darlington – former Relly Mill Junction 33.6km,) leads me to believe they are accurate to well within 2%.

The crudest approximation is the assumption that, once line speed has been reached, that speed (360kph as far as Darlington, and north of Hawick, and 300kph elsewhere, also between Sheffield and Leeds via Huddersfield) is maintained until it becomes necessary to decelerate for a junction or a station stop.

The results are, nonetheless, valuable in giving a **feel** for the journey times possible.

My estimated distances (between stations) are:

- Pancras Cross – Luton & Dunstable Parkway 51km (#)
- Luton & Dunstable Parkway – Northampton Castle 50km
- Northampton Castle – Rugby HS (HS2-CV) 33km
- Rugby HS – Coventry HS (HS2-CV) 18km
- Northampton Castle – Langborough Junction 18km
- Luton & Dunstable Pkwy – Langborough Jn direct 63km
- Langborough Junction – Leicester station 40km

- Northampton Castle – Leicester station 58km
- Leicester – Nottingham 43km
- Nottingham – Sheffield HS 60km
- Sheffield HS – Huddersfield 53km
- Huddersfield – Leeds New Lane 24km
- Leeds New Lane – York HS 39km
- Sheffield HS – Manchester HS 54km
- Manchester HS – Victoria LL 0.5km
- Victoria LL – Bolton 17km
- Bolton – Preston 32km
- Victoria – Liverpool Lime St. 49km
- Pancras Cross – Leicester (direct and non-stop) 154km
- Leicester – South Yorkshire / Sheffield HS (direct) 96km
- Pancras Cross – South Yorkshire (non-stop) (*) 248km
- Pancras Cross – Sheffield HS (non-stop) (*) 248km
- South Yorkshire – Leeds (direct) 52km
- South Yorkshire – York (direct) 73km
- Pancras Cross – York (non-stop) 321km
- York – Darlington 70km
- Darlington – Durham Relly Mill 33km
- Durham Relly Mill – Consett 20km
- Consett – Newcastle 22km
- Consett – Hexham 23km
- Newcastle – Hexham 33km
- Hexham – Hawick 80km
- Hawick – Lauder 37km
- Lauder – Edinburgh 45km
- Hawick – Edinburgh (non-stop) 82km

(*) Travelling non-stop through Leicester avoids the station, which saves a (very) short distance (<1km!)

(#) Travelling from Pancras Cross via the direct, tunnel route (when this becomes available, with the 4-tracking) saves 3km compared with the original route along the MML.

Acceleration/deceleration distances and times (taken from ‘Same Speed Railways’ appendix B) are:

- Acceleration from stationary to 360kph takes 16.67km and 333 seconds
- Acceleration from stationary to 300kph takes 11.57km and 278 seconds
- Deceleration from 360kph to stationary takes 10.00km and 200 seconds
- Deceleration from 300kph to stationary takes 6.945km and 167 seconds
- Time to travel from Rugby HS to Coventry HS (start to stop) is 438 seconds
- Time to travel from Manchester HS to Victoria LL (start to stop) is 73 seconds
- Time to travel from Victoria LL to Bolton (start to stop) is 426 seconds

The final times need elucidation. When the distance between stations is less than 18.5km, and the line speed is 300kph, (the corresponding distance for 360kph is 26.7kph,) a train accelerating from the first

station is not able to reach line speed, before it has to begin decelerating for the next station. ‘Same Speed Railways’ contains a table of times taken to travel between adjacent stations, for inter-station distance of up to 300kph/18.5km, (and another for 360kph/26.7km,) and the times are taken from those (all from the first, in fact). These three sections are the only ones in the above list so affected.

The procedure in calculating journey times between station stops is to take the two values of acceleration / deceleration distance, and the two times, as given in the first 4 lines of the above list, and sum them, thus acceleration / deceleration takes 16.67 + 10.00 = 26.67km, and 333 + 200 = 533 seconds, at line speed 360kph, and 11.57 + 6.95 = 18.52km and 278 + 167 = 445 seconds at line speed 300kph. The appropriate distance value is subtracted from the inter-station distance, and the remaining length is assumed to be travelled at line speed, taking time = distance / speed. This time is then added to the acceleration / deceleration time to obtain the actual journey time between the stations. This is all very laborious (error-prone, too!) to perform manually, so I have developed spreadsheets to do the work and present the results. For those sections less than 18.5km in length, the time-calculating formula in the spreadsheet cell is replaced by the actual value, as given in the above list. The various section times are accumulated to obtain the overall journey times. One further refinement: a standard wait time of 3 minutes is assumed at stations, and this is added into the accumulated time at each stop.

Certain sections of the route incur time penalties because of junctions. (Refer to the ‘Same Speed Railways’ article, specifically the sections ‘The Effect of Junctions’ and ‘Adjacent Junctions’. These penalties apply only at junctions which are taken at high speed, and not those on the approach to stations. Specifically:

- Northampton – Rugby incurs a time penalty of 26 seconds at Crick Junction, where the connection to HS2-CV diverges from the main line to Leicester.
- Leicester – Nottingham incurs a time penalty of 26 seconds at Stanford Junction, where the Nottingham station loop diverges from the main line.
- Nottingham – Sheffield incurs a double-junction penalty of 28 seconds at Strelley and Nuthall South junctions, where the Nottingham station loop rejoins the main line, and a further penalty of 26 seconds at Beighton Junction, where the route via Sheffield diverges from the main line/
- Sheffield – Huddersfield incurs a time penalty of 52 seconds line speed 300kph!) at Ladybower Junction, where the route to Huddersfield diverges from the main line of HS8, Southern Transpennine, to Manchester.
- South Yorkshire – Leeds (direct) incurs a time penalty of 26 seconds at Altofts Junction, where it diverges from the main line to York.
- Leeds – York incurs a double junction penalty of 30 seconds at Garforth West and East Junctions, where it diverges from the main line of HS9, Northern Transpennine, and rejoins the main line of HS3 to York.
- Newcastle – Hexham incurs a time penalty of 52 seconds (line speed 300kph!) at Stocksfield Junction, where it joins the main line of HS3 from Consett to Heaham.
- Hexham – Hawick incurs a time penalty of 26 seconds at Riccarton North Junction, where the HS2 Scottish extension from Carlisle joins it (HS2 is considered the main line at this junction).

HS3 does indeed have an unusually large number of junctions. No other route has them in this profusion.

The time penalties are simply added in as explicit amounts to the spreadsheet formula for the section time.

For those sections of classic route included in CC schedules, the section journey times are taken from current timetables. These are all arrival times, so the station wait time is already included. There is thus no need to add 3 minutes per station stop on these sections. With that summary, we now proceed to the results.

As compared with the original route design, the HS3 Mk2 route is 6km shorter on the direct route from Pancras Cross to Sheffield / South Yorkshire (and thus on to York and points north), but 1km longer travelling via the Northampton station branch. These differences manifest themselves in a saving of c.1 minute for UHS services, and a penalty of c.12secs for HS Metro and CC services serving Northampton. (Journey times are not, of course, the point of the redesign; capacity enhancement through the availability of 4-tracking is what it's all about.)

1. UHS Services London – Liverpool / York / Newcastle (3/2/5 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
Pancras Cross - Sheffield HS	248	248	45.8	45.8	45.8
Sheffield HS - Manchester HS	54	302	14.5	60.3	63.3
Manchester HS - Victoria LL	0.5	302.5	1.2	61.5	67.5
Victoria LL - Liverpool Lime St.	49	351.5	12.6	74.1	83.1
Pancras Cross - South Yorkshire	248	248	45.8	45.8	45.8
South Yorkshire - Leeds New Lane	52	300	13.5	59.3	62.3
South Yorkshire - York	73	321	16.6	62.4	65.4
York - Darlington	70	391	16.1	78.5	84.5
Darlington - Durham Relly Mill	33	424	10.3	88.8	97.8
Durham Relly Mill - Consett	20	444	7.7	96.5	108.5
Consett - Newcastle	22	466	8.1	104.6	119.6

Current fastest time (minutes) from London (with HS2 Ltd.'s estimates) [and the above values] to:

- Sheffield 120 (69/79*) [46]
- Leeds 131 (83) [63]
- York 110 [66]
- Darlington 139 [85]
- Durham 173 [98]
- Newcastle 169 [120]
- Manchester 127 (68) [64]
- Liverpool 128 (96) [83]

(*) 69 minutes is HS2 Ltd.'s estimate from London to South Yorkshire (Meadowhall), and 79 minutes to Sheffield Midland. These values, and that for Leeds, show very clearly the time penalty imposed by the ridiculous routing via Birmingham.

Pancras Cross – Sheffield HS is the same distance as Pancras Cross – South Yorkshire. Either journey, non-stop, thus takes 46 minutes at an average speed of 203.2mph. Pancras Cross – Manchester HS with 1 stop takes 64 minutes at an average speed of 180mph. This actually takes 3 minutes less than HS2's time from Euston Cross to Manchester, although that journey is 6km shorter, but of course that journey has 2 intermediate stops rather than just 1, and the extra stop, Manchester Interchange, is only 5 miles from Manchester HS, which means in effect that the deceleration for the final station begins 5 miles further out, and the final 5 miles are taken at an average speed of only 60mph, and the overall journey at an average speed of 167mph.

The above time Pancras Cross – Liverpool is 10 minutes longer than HS2 by my plans, GC-gauge all the way, but 18 minutes shorter than my value for the CC service to Liverpool, along the classic route between Crewe and Liverpool (using current timetable times between Crewe and Liverpool) and 13 minutes shorter than HS2 Ltd.'s time to Liverpool (they've clearly assumed some acceleration on the WCML).

2. UHS Services London / Newcastle – Edinburgh (6/3 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
Pancras Cross - York	321	321	57.9	57.9	57.9
York - Darlington	70	391	16.1	74.0	77.0
Darlington - Durham Relly Mill	33	424	10.3	84.4	90.4
Durham Relly Mill - Consett	20	444	7.7	92.1	101.1
Consett - Hexham	23	467	8.3	100.4	112.4
Hexham - Hawick	80	547	19.7	120.1	135.1
Hawick - Edinburgh	82	629	18.1	138.2	156.2
Newcastle - Hexham	23	23	8.3	8.3	8.3
Hexham - Hawick	80	103	19.7	28.0	31.0
Hawick - Lauder	37	140	10.6	38.6	44.6
Lauder - Edinburgh	45	185	11.9	50.6	59.6

Current fastest time (minutes) from London [and the above values] to:

- York 110 [58]
- Darlington 139 [77]
- Durham 173 [91]
- Edinburgh 260 [157]

And from Newcastle:

- Edinburgh 85 (via ECML, of course). [60]

3. UHS Elapsed Times Summary:

Section	Pancras Cross - Liverpool	Pancras Cross - York	Pancras Cross - Newcastle	Pancras Cross - Edinburgh	Newcastle - Edinburgh
Pancras Cross - Sheffield HS	45.8				
Sheffield HS - Manchester HS	63.3				
Manchester HS - Victoria LL	67.5				
Victoria LL - Liverpool Lime St.	83.1				
Pancras Cross - South Yorkshire		45.8	45.8		
South Yorkshire - Leeds New Lane		62.3	| |		
South Yorkshire - York			65.4		
York - Darlington			84.5		
Darlington - Durham Relly Mill			97.8		
Durham Relly Mill - Consett			108.5		
Consett - Newcastle			119.6		
Pancras Cross - York				57.9	
York - Darlington				77.0	
Darlington - Durham Relly Mill				90.4	
Durham Relly Mill - Consett				101.1	
Consett - Hexham				112.4	
Hexham - Hawick				135.1	
Hawick - Edinburgh				156.2	
Newcastle - Hexham					8.3
Hexham - Hawick					31.0
Hawick - Lauder					44.6
Lauder - Edinburgh					59.6

4. HS Metro Services London – York / Preston (7/8 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
Pancras Cross - Luton & Dunstable Parkway	51	51	12.9	12.9	12.9
Luton & Dunstable Parkway - Northampton Castle	50	101	12.8	25.7	28.7
Northampton Castle - Leicester	58	159	14.1	39.8	45.8
Leicester - Nottingham	43	202	12.0	51.9	60.9
Nottingham - Derby	26	228	8.9	60.8	72.8
Nottingham - Sheffield HS	60	262	15.3	67.2	79.2
Sheffield HS - Huddersfield	53	315	15.2	82.4	97.4
Huddersfield - Leeds New Lane	24	339	9.4	91.8	109.8
Leeds New Lane - York	39	378	11.4	103.2	124.2
Sheffield HS - Manchester HS	54	316	14.5	81.7	96.7
Manchester HS - Victoria LL	0.5	316.5	1.2	82.9	100.9
Victoria LL - Bolton	17	333.5	7.1	90.0	111.0
Bolton - Preston	39	372.5	11.5	101.5	125.5

Note that the service to Derby involves one change – a (cross-platform) connection at Nottingham into an HS7 service, either Norwich – Swansea or Cleethorpes – Birmingham.

Current fastest time (minutes) from London (with HS2 Ltd.'s estimates) [and the above values] to:

- Northampton 51 [29]
- Leicester 62 [46]
- Nottingham 100 (51/68*) [61]
- Derby 85 (51/71*) [73]
- Sheffield 120 [80]
- Huddersfield 162 (with 1 change) [98]
- Leeds 131 [110]
- York 110 [125]
- Manchester HS 127 [97]
- Bolton 164 (with 1 change) [111]
- Preston 128 [126]

(*) 51 minutes is HS2 Ltd.'s estimate from London to Toton (with 1 stop), 68 minutes to Nottingham Midland and 71 to Derby Midland. HS3's value of 61 minutes to Nottingham is with 3 stops, and 73 minutes to Derby is with 4 stops and 1 change. Purely for illustration, a non-stop London – Nottingham service by HS3 would take 38 minutes, and reach Derby in 49 minutes. I was not actually proposing such a service, initially, but, having seen what would be possible, this will certainly be one of the additional services enabled by HS3 Mk2's capacity enhancements. (See below for illustrative non-stop times.)

Okay, so even a HS Metro train can't, travelling via Huddersfield and with 7 intermediate stops, beat a non-stop service to York, straight up the ECML. But see the corresponding UHS services to York. Remarkably, it still beats the fastest service to Leeds, by a comfortable margin (but, again, see the UHS service to Leeds and on to York).

Moreover, even travelling via the East Midlands, with 5 intermediate stops, the HS Metro service still beats the current best time to Manchester (comfortably) and, with 8 intermediate stops, to Preston (just).

Specimen non-stop times:

Pancras Cross to:	Distance (km)	Non-Stop Time (minutes)	Average Speed (kph)	Average Speed (mph)
Luton Airport Parkway	51	12.9	236.5	147.8
Northampton Castle	101	21.3	284.9	178.1
Leicester	154	30.1	306.9	191.8
Nottingham	197	37.7	313.5	195.9
Sheffield HS	248	45.8	325.1	203.2
South Yorkshire	248	45.8	325.1	203.2
Leeds New Lane	300	54.9	328.0	205.0
York	321	57.9	332.4	207.8

5. CC St. Pancras West – Birmingham New St. / York (5/13 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
St. Pancras - Luton & Dunstable Parkway	51	51	12.9	12.9	12.9
Luton & Dunstable Parkway - Northampton Castle	50	101	12.8	25.7	28.7
Northampton Castle - Rugby HS	33	134	10.7	36.5	42.5
Rugby HS - Coventry HS	18	152	7.3	43.8	52.8
Coventry HS - Birmingham International	19	171	11.0	54.8	63.8
Birmingham International - Birmingham New St.	12	183	9.0	63.8	72.8
Northampton Castle - Leicester	55	156	13.6	39.3	45.3
Leicester - Loughborough	19	175	11	50.3	56.3
Loughborough - East Midlands Parkway	11	186	10	60.3	66.3
East Midlands Parkway - Derby	17	203	17	77.3	83.3
Derby - Chesterfield	40	243	20	97.3	103.3
Chesterfield - Sheffield	20	263	14	111.3	117.3
Sheffield - South Yorkshire Parkway	5	268	6	117.3	123.3
South Yorkshire Parkway - Rotherham	4	272	7	124.3	130.3
Rotherham - Wakefield Westgate	34	306	33	157.3	163.3

Wakefield Westgate - Leeds City	16	322	14	171.3	177.3
Leeds City - Micklefield	15	337	15	186.3	192.3
Micklefield - York	15	352	15	201.3	207.3

Note: the time between Rotherham and Wakefield Westgate is an estimate – there are no non-stop services between them.

Current fastest time (minutes) from London [and the above values] to:

- Northampton 51 [29]
- Rugby 48 [43]
- Coventry 59 [53]
- Birmingham Int'l 70 [64]
- Birmingham New St. 82 [73]
- Leicester 62 [46]
- Loughborough 73 [57]
- East Midlands Pkwy 81 [67]
- Derby 85 [84]
- Chesterfield 105 [104]
- Sheffield 120 [118]
- Wakefield Westgate 114 [164]
- Leeds 131 [178]
- York 110 [208]

The last three (current) times are, of course, via the ECML, which isn't really comparing like with like.

The CC times to Birmingham are slightly better than the current best, but that to Northampton very much better (naturally).

Likewise the CC times as far as Leicester are very much better than current times, but the extra stops at Loughborough and East Midlands Parkway bring the times back up to current best times, to Derby and beyond.

6. HS Metro and CC Elapsed Times Summary:

Section	HS Metro Pancras Cross - York	HS Metro Pancras Cross - Preston	CC St. Pancras - Birmingham New St.	CC St. Pancras - York
Pancras Cross - Luton & Dunstable Parkway	12.9	12.9		
St. Pancras - Luton & Dunstable Parkway	| |	| |	12.9	12.9
Luton & Dunstable Parkway - Northampton Castle	28.7	28.7	28.7	28.7
Northampton Castle - Leicester	45.8	45.8	| |	45.8
Leicester - Nottingham	60.9	60.9	|	|
Nottingham - Derby	72.8	72.8	|	|
Nottingham - Sheffield HS	79.2	79.2	|	|
Sheffield HS - Huddersfield	97.4	|	|	|
Huddersfield - Leeds New Lane	109.8	| |	| |	| |
Leeds New Lane - York	124.2	|	|	|
Sheffield HS - Manchester HS		96.7	|	|
Manchester HS - Victoria LL		100.9	|	|
Victoria LL - Bolton		111.0	|	|
Bolton - Preston		125.5	|	|
Northampton Castle - Rugby HS			42.5	| |
Rugby HS - Coventry HS			52.8	|
Coventry HS - Birmingham International			63.8	| |
Birmingham International - Birmingham New St.			72.8	| |
Leicester - Loughborough				56.3
Loughborough - East Midlands Parkway				66.3
East Midlands Parkway - Derby				83.3
Derby - Chesterfield				103.3
Chesterfield - Sheffield				117.3
Sheffield - South Yorkshire Parkway				123.3

South Yorkshire Parkway - Rotherham				130.3
Rotherham - Wakefield Westgate				163.3
Wakefield Westgate - Leeds City				177.3
Leeds City - Micklefield				192.3
Micklefield - York				207.3

HS3 Mk2 Enhancements

All the preceding service plans are as proposed for the original 2-track HS3, albeit now with an improved alignment south of Leicester, which involves very slight changes to the journey times. The only 4-tracking is in the station loops or branches (Northampton now also being on a branch off the main line). There are effectively 4 tracks between Beighton Junction and Leeds, and between Beighton Junction and Garforth East Junction, but that is because there are two quite separate routes available between each of those pairs of points.

The improved alignment of Mk2 enables the provision of 4 tracks over all the rest of the route between London and Beighton Junction. This involves only one section of new line, the direct, tunnel route between Pancras Cross and Scratchwood Junction. Elsewhere the quadrupling is in-situ, by adding an extra track on each side of the original pair, (passive provision for this having been made during the original construction, of course,) in a parallel running arrangement. Since the original layout has high-speed turnouts for each of Luton & Dunstable Parkway, Northampton Castle and Leicester stations, and for the Nottingham branch, this means that there are more connections between main (the centre pair) and the (equally fast) relief tracks than are strictly necessary, since the UHS services would normally use the main tracks, and the HS Metro and CC services the reliefs. But that is hardly a fault, and provides an extra degree of operational flexibility and resilience.

Service Plan 6

The following new services are introduced. It is assumed that the HS2 Coventry Variant is also available (see appendix G).

UHS:

- 2tphG Tunbridge Wells West – Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston
- 2tphG Tunbridge Wells West – Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – Leeds HS
- 2tphG Portsmouth & Southsea – Hayling Island – Chichester – Arundel HS – Horsham – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Nottingham – Derby

HS Metro:

- 2tphC St. Pancras West – Luton & Dunstable Parkway – Northampton Castle – Rugby HS – Coventry HS – Birmingham International – Birmingham New St. – University – Bromsgrove – Droitwich Spa – Worcester Shrub Hill (NB this was formerly a RM service)
- 2tphC Bournemouth – Brockenhurst – Southampton – Southampton Airport Parkway – Winchester – Basingstoke – Reading (reverse) – Oxford – Banbury – Rugby (GC) – Leicester – Nottingham –South Yorkshire HS – York HS – Darlington – Durham Relly Mill – Consett – Newcastle (NB this is in addition to the RM Bournemouth – York service)
- 2tphC Hull Paragon – Brigg – Gainsborough Central – Retford (LL) – Worksop – Sheffield HS – Manchester HS – Victoria LL – Liverpool Lime St.
- 2tphC Cleethorpes – Grimsby Town – Brigg – Gainsborough Central – Retford (LL) – Worksop – Sheffield HS – Manchester HS – Victoria LL – Bolton – Preston

The full service plan is:

HS3 UHS:

- 2tphG Eastbourne – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – York HS – Darlington Bank Top – Durham Relly Mill – Consett – Hexham – Hawick – Edinburgh Waverley HS – Haymarket HS – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphG Newhaven Marine – Newhaven Town – Lewes – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – York HS – Darlington Bank Top – Durham Relly Mill – Consett – Newcastle
- 2tphG Tunbridge Wells West – Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Liverpool Lime St.
- 2tphG Tunbridge Wells West – Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston
- 4tphG Tunbridge Wells West – Tunbridge Wells – Tonbridge – East Croydon – Victoria (LL) – Pancras Cross – South Yorkshire – Leeds HS
- 2tphG Portsmouth & Southsea – Hayling Island – Chichester – Arundel HS – Horsham – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Nottingham – Derby
- 2tphG Newcastle – Hexham – Hawick – Lauder – Edinburgh Waverley HS – Haymarket HS – Edinburgh Airport – Bellgrove – Glasgow St. Enoch
- 2tphC Newcastle – Hexham – Haydon Bridge – Bardon Mill – Haltwhistle – Brampton – Wetheral – Carlisle Citadel
- 2tphC Hawick – Lauder – Edinburgh Waverley HS – Haymarket HS – Edinburgh Airport – Stirling – Gleneagles – Perth – Dunkeld & Birnam – Pitlochry Blair Atholl Dalwhinnie – Newtonmore – Kingussie - Aviemore – Carrbridge - Inverness

(Note that the Newcastle – Hexham and Hawick – Inverness services are included in the UHS section because they interface with the Glasgow service. Note also that the Tunbridge Wells – Leeds service, now doubled in frequency, used to continue on to York, but now connects at Leeds into services to Newcastle.)

HS Metro:

- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton Castle – Leicester – Nottingham – Sheffield HS – Huddersfield – Leeds HS – York HS
- 2tphGG Brighton – Gatwick Airport – East Croydon – Victoria (LL) – Pancras Cross – Luton & Dunstable Parkway – Northampton Castle – Leicester – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria (LL) – Bolton – Preston
- 2tphC St. Pancras West – Luton & Dunstable Parkway – Northampton Castle – Leicester – Loughborough – Derby – Chesterfield – Sheffield Midland – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphC St. Pancras West – Luton & Dunstable Parkway – Northampton Castle – Leicester – East Midlands Parkway – Derby – Matlock – Bakewell – Miller's Dale (from/to Buxton) – Chinley – Stockport – Manchester Piccadilly (alternatively: – Derby – Chesterfield – Sheffield Midland (revers) – Chinley – if the Peak route has not yet been reopened.)

- 2tphC St. Pancras West – Luton & Dunstable Parkway – Northampton Castle – Rugby HS – Coventry HS – Birmingham International – Birmingham New St. – Wolverhampton (splits/joins):
  1. – Stafford – Crewe – Runcorn – Liverpool South Parkway – Liverpool Lime St.
  2. – Telford – Wellington – Shrewsbury – Wrexham – Chester
- 2tphC St. Pancras West – Luton & Dunstable Parkway – Northampton Castle – Rugby HS – Coventry HS – Birmingham International – Birmingham New St. – University – Bromsgrove – Droitwich Spa – Worcester Shrub Hill (NB this was formerly a RM service)
- 2tphC Bournemouth – Brockenhurst – Southampton – Southampton Airport Parkway – Winchester – Basingstoke – Reading (reverse) – Oxford – Banbury – Rugby (GC) – Leicester – Nottingham –South Yorkshire HS – York HS – Darlington – Durham Relly Mill – Consett - Newcastle
- 2tphC Paddington – Old Oak Common – LHR Interchange – Slough – Maidenhead – Bourne End (to/from Marlow) – High Wycombe – Princes Risborough – Calvert – Rugby (GC) Leicester – Melton Mowbray

MML and other Regional Metro:

- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – Loughborough – Attenborough – Beeston - Nottingham
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Market Harborough – Leicester – East Midlands Parkway – Attenborough – Beeston - Nottingham
- 2tphR St. Pancras – St. Albans – Luton Airport Parkway – Luton – Bedford – Wellingborough – Kettering – Corby – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton & Mansfield Parkway – Chesterfield – Sheffield Midland – South Yorkshire (Meaadowhall) – Rotherham – Pontefract – York (note that this uses HS3 on the approach to Nottingham)
- 2tphR (Thameslink) Brighton –> Bedford – Olney – Northampton
- 2tphR Birmingham New St. – Coleshill Parkway – Nuneaton – Hinckley – Leicester – Melton Mowbray – Oakham – Stamford – Peterborough – March – Ely – Bury St. Edmunds – Ipswich – Harwich International – Harwich Town
- 2tphR Bournemouth – Brockenhurst – Southampton – Southampton Airport Parkway – Winchester – Basingstoke – Reading – Oxford – Banbury – Leamington Spa – Kenilworth – Coventry – Birmingham Int'l – Birmingham New St. (reverse) – Tamworth – Burton-on-Trent – Derby – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphR Plymouth – Ivybridge – Totnes – Newton Abbot – Teignmouth – Dawlish – Exeter St. David's – Cullompton – Tiverton Junction – Taunton – Bridgwater – Highbridge – Weston Super Mare – Bristol Temple Meads – Bristol Parkway – Gloucester (reverse) – Cheltenham Spa – Ashchurch – Worcester Shrub Hill – Droitwich Spa – Bromsgrove – University – Birmingham New St. – Tamworth – Burton on Trent – Derby – Chesterfield – Sheffield – South Yorkshire (Meadowhall) – Rotherham – Wakefield Westgate – Leeds City – Micklefield – York
- 2tphR Norwich – Wymondham – Thetford – Ely (reverse) –
  2tphR Stansted Airport – Cambridge – Ely (join/split) –
  – March – Peterborough – Stamford – Oakham – Melton Mowbray – Nottingham – Langley Mill – Alfreton and Mansfield Parkway – Chesterfield – Sheffield (reverse) – Chinley – Stockport –

Manchester Piccadilly – Manchester Oxford Road – Salford Crescent – Bolton – Horwich Parkway – Chorley – Leyland – Preston – Lancaster – Morecambe

- 2tphR York – Thirsk – Northallerton – Darlington – Durham – Chester le Street – Newcastle – Morpeth – Alnmouth – Berwick-upon-Tweed – Dunbar – Drem – Edinburgh Waverley
- 2tphRS (Tees Valley Metro) Bishop Auckland – Shildon – Newton Aycliffe – Heighington – North Road – Darlington – Dinsdale – Tees-Side Airport – Allen's West – Eaglescliffe – Thornaby – Middlesborough – British Steel (Redcar) – Redcar Central – Redcar East – Marske – Saltburn

HS7 North of Birmingham:

- 2tphG Plymouth – Exeter St. David's – Taunton – Bristol Temple Meads HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Sheffield HS – Huddersfield – Leeds HS – York – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphG Swansea – Port Talbot – Cardiff (Rhoose) Airport – Cardiff HS – Bristol Parkway HS – Cheltenham Spa – Worcester Shrub Hill – Birmingham Interchange – Derby – Nottingham – Peterborough – Norwich
- 2tphGG Birmingham HS – Derby – Sheffield HS – Huddersfield – Leeds HS – York
- 2tphC Birmingham HS – Derby – Nottingham – Newark Castle – Lincoln Central – Market Rasen – Grimsby Town - Cleethorpes

HS8:

- 2tphGG Norwich – Peterborough – Nottingham – Sheffield HS – Manchester HS – Manchester Victoria LL – Bolton – Preston
- 2tphC Hull Paragon – Brigg – Gainsborough Central – Retford (LL) – Worksop – Sheffield HS – Manchester HS – Victoria LL – Liverpool Lime St.
- 2tphC Cleethorpes – Grimsby Town – Brigg – Gainsborough Central – Retford (LL) – Worksop – Sheffield HS – Manchester HS – Victoria LL – Bolton – Preston

HS9:

- 2tphGG Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – York HS – Darlington – Durham (Relly Mill) – Consett – Newcastle
- 2tphC Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Thornaby – Middlesborough
- 2tphC Liverpool Lime Street – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Thirsk – Northallerton – Yarm – Eaglescliffe – Stockton – Hartlepool – Seaham – Sunderland - Newcastle
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – Selby – Hull
- 2tphC Preston – Bolton – Manchester Victoria (LL) – Manchester HS – Huddersfield – Leeds HS – Micklefield – York – Malton – Seamer – Scarborough

HS6:

- 2tphC St. Pancras (East) – Stratford HS – Stansted Airport – Cambridge – Ely – Peterborough – Doncaster – York – Darlington – Durham – Newcastle – Berwick upon Tweed – Edinburgh Waverley

Representative Hourly Non-Cross-Platform Interchange Pattern at Bedford:

00R St. Pancras – York via Melton Mowbray
R (Thameslink) Brighton – Bedford

07R St. Pancras – Nottingham
(Thameslink) Horsham – Northampton

15R (Thameslink) Brighton – Corby
(no connection)

23R St. Pancras – Nottingham
(Thameslink) Horsham – Northampton

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Interchange Pattern at Northampton (the HS3/MML connections are not cross-platform, but the intra-WCML ones are; see the WCML Service Plans article for full details of these):

00C St. Pancras – Wolverhampton –> Liverpool / Chester
R (Thameslink) Brighton –> Northampton
R Euston – Crewe via Stoke
R Euston – Rugby

07C St. Pancras – Derby – Sheffield – York
R Euston – Birmingham New St.

15C St. Pancras – Birmingham New St. – Worcester
R Euston – Crewe via Stafford
R Euston – Rugby

23C St. Pancras – Derby – Matlock (or Sheffield) – Manchester
R Euston – Barrow in Furness

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Leicester:

00R St. Pancras – East Midlands Parkway – Nottingham
C St. Pancras – Loughborough – Derby – Sheffield –York

07GG Brighton – York
C Bournemouth – Newcastle

15C St. Pancras – East Midlands Parkway – Derby – Matlock/Sheffield – Manchester
R St. Pancras – Loughborough – Nottingham

23GG Brighton – Preston
R Birmingham New St. – Harwich Town

– repeating at 30, 45 and 53 minutes past. Note that these services depart in the order stated, thus the RM St. Pancras – Nottingham service, calling at East Midlands Parkway (but not Loughborough) departs before the CC St. Pancras – York service, calling at Loughborough (but not East Midlands Parkway). This ensures that Loughborough and East Midlands Parkway stations each have 4tph, alternatively to Derby and points north, or to Nottingham, but no CC or RM train serves both. (There is a stopping service between Leicester and Derby, which does.)

Representative Hourly (non-cross-platform) Interchange Pattern at Derby:

00G HS7 Plymouth – Newcastle
R Bournemouth – York

07GG HS7 Birmingham – York
R Plymouth – York

15G HS4/HS7 Swansea – Norwich
C St. Pancras – York

23C HS7 Birmingham – Cleethorpes
C St. Pancras – Manchester

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Nottingham:

00GG HS8 Norwich – Preston
C Bournemouth – Newcastle

07GG Pancras Cross – York (HS Metro)
C Cleethorpes – Birmingham HS
R St. Pancras – Melton Mowbray – York
R Norwich / Stansted Airport – Morecambe

23GG HS3/HS8 Brighton – Preston (HS Metro)
G HS8/HS7 Norwich – Swansea

– repeating at 30, 37 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Sheffield HS/Midland (refer to the HS Transpennine Routes and Service Plans article for full details of the Regional Metro services). The HS services have cross-platform interchange, and the RM services have longer stops, to allow for the platform change. The pattern is:

00GG Brighton –York (HS Metro)
GG HS8 Norwich – Preston
R Skegness – Liverpool

07G HS3/HS8 Tunbridge Wells – Preston
G HS7 Plymouth – Newcastle

C HS8 Hull – Liverpool
R Cleethorpes – Blackpool

15GG HS3/HS8 Brighton – Preston
GG HS7 Birmingham HS – York
R Norwich / Stansted Airport – Morecambe

23G HS3/HS8 Tunbridge Wells – Liverpool
C HS8 Cleethorpes – Preston
R Hull – Southport

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange and Terminating Pattern at Leeds HS:

00G Tunbridge Well – Leeds
G Plymouth – Newcastle

15G Tunbridge Well – Leeds
G Liverpool – Newcastle

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange and Terminating Pattern at York:

00G Eastbourne – Glasgow
C Bournemouth – Newcastle
GG Brighton – York (HS Metro)

07G Plymouth – Newcastle
C St.Pancras (West) – York (via Derby)

15G Newhaven – Newcastle
GG Birmingham HS – York

23GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh
R St. Pancras (West) – York (via Melton Mowbray – not cross-platform)

– repeating at 30, 40, 45 and 55 minutes past. The services terminating at 07 and 23 minutes past are obviously intended for (non-cross-platform) connection into those 7 / 8 minutes later.

Representative Hourly Cross-Platform Interchange Pattern at Darlington:

00G Eastbourne – Glasgow
RS Bishop Auckland – Middlesborough – Saltburn
C Bournemouth – Newcastle

07G Plymouth – Newcastle
RS Bishop Auckland – Middlesborough – Saltburn

15G Newhaven – Newcastle
RS Bishop Auckland – Middlesborough – Saltburn

23GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh (not cross-platform – uses ECML platforms)
RS Bishop Auckland – Middlesborough – Saltburn

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Newcastle:

00G Plymouth – Newcastle
R York – Edinburgh

07G Newhaven – Newcastle
(no connection)

15GG Liverpool – Newcastle
C St. Pancras (East) – Edinburgh

23C Bournemouth – Newcastle
(no connection)

– repeating at 30, 37, 45 and 53 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Hexham:

00G Eastbourne – Glasgow
C Newcastle – Carlisle
R Newcastle – Hexham (all stations)

15G Newcastle – Glasgow
(no interchange)

– repeating at 30 and 45 minutes past.

Representative Hourly Cross-Platform Interchange Pattern at Hawick:

00G Eastbourne – Glasgow
C Hawick – Inverness
R Hawick – Aberdeen via the bridges
15G Newcastle – Glasgow
R Hawick – Dundee via the bridges

– repeating at 30 and 45 minutes past.

Adding the new services introduced in service plan 6 to those of plan 5 imposes the following loadings on HS3; note that we now, between London and Beighton Junction, and between Garforth East Junction and York, distinguish between main lines (the inner pair of 4 tracks) and relief lines (the outer tracks). Also the main lines are the two tracks directly linking Beighton and Garforth East Junctions via Altofts Junction, also Altofts Junction to Leeds. Generally speaking, the main lines carry the UHS services, and the relief lines the HS Metro and CC services, though this is not an absolute distinction, since UHS services travel to Manchester and Liverpool / Preston via Sheffield, and to Derby via Nottingham. North of York there are only 2 tracks anyway, so the main/relief distinction expires.

Main Lines:

- Pancras Cross – Stanford Junction 14tph
- Stanford Junction – Beighton Junction 12tph
- Beighton Junction – Altofts Junction 8tph
- Altofts Junction – Gelderd Rd. North Junction 4tph
- Altofts Junction – Garforth East Junction 4tph
- Garforth East Junction – York HS station 12tph
- York HS station – Derwent Hill Junction 8tph
- Derwent Hill Junction – Paradise Junction 6tph
- Derwent Hill Junction – Stocksfield Junction 2tph
- Newcastle – Paradise Junction 10tph
- Paradise Junction – Stocksfield Junction 4tph
- Stocksfield – Tynegreen Junction 6tph
- Tynegreen Junction – Hawick 4tph
- Hawick – Edinburgh 6tph

Relief Lines:

- Pancras Cross – West Hampstead Junction 4tph
- St. Pancras – West Hampstead Junction 14tph
- West Hampstead Junction – Watford Gap Junction 12tph
- Watford Gap Junction – Onley Junction (HS2-CV) 4tph
- Watford Gap Junction – Cotesbach Junction 8tph
- Rugby HS Junctn (HS2-CV) – Cotesbach Junction 4tph
- Cotesbach Junction – Regent St. Junction 12tph
- Regent St. Junction – Swain St. Junction 16tph
- Swain St. Junction – Stanford Junction 6tph
- Stanford Junction – Edwalton Junction 8tph
- Asfordby Junction (HS8) – Edwalton Junction 6tph
- Edwalton Junction – Manvers St. Junction 14tph
- Manvers St. Junction – Nottingham HS station 12tph
- Manvers St. Junction – Nottingham (classic) station 4tph
- Nottingham HS station – Strelley Junction 12tph
- Strelley Junction – Awsworth Junction 6tph
- Strelley Junction – Nuthall North Junction 6tph
- Awsworth Junction – Nuthall North Junction 4tph
- Nuthall North Junction – Beighton Junction 10tph
- Beighton Junction – Woodhouse HS Junction 14tph
- Woodhouse HS Junction – Ladybower Junction 18tph
- Ladybower Junction – Guide Bridge HS Junction 12tph
- Ladybower Junction – Paddock Junction 6tph
- Paddock Junction – Gelderd Rd. North Junction 16tph
- Gelderd Rd. North Junction – Leeds HS (New Lane) station 20tph
- Leeds HS (New Lane) station – Garforth West Junction 16tph
- Garforth West Junction – Garforth East Junction 8tph
- Garforth West Junction – Micklefield Junction 8tph

The 20tph loading between Gelderd Rd. North Junction and Leeds New Lane looks worrying, but in fact this is a very short distance (c.1 mile) and speeds are low on the approach to the station, so I'm fairly relaxed about it. The 18tph between Woodhouse HS Junction and Ladybower Junction, through Sheffield HS station are slightly more worrying, but HS2 Ltd. is entirely relaxed about this loading.

Estimated Journey Times

The only change due to the 4-tracking is the saving of 3km via the direct, tunnel route between Pancras Cross and Scratchwood Junction. This affects only the UHS services. Thus:

1. UHS Services London – Derby/Liverpool/Preston/Leeds/Newcastle (1/3/4/1/5 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
Pancras Cross - Nottingham HS	194	194	37.2	37.2	37.2
Nottingham HS - Derby	26	220	8.8	46.0	49.0
Pancras Cross - Sheffield HS	245	245	45.3	45.3	45.3
Sheffield HS - Manchester HS	54	299	14.5	59.8	62.8
Manchester HS - Victoria LL	0.5	299.5	1.2	61.0	67.0
Victoria LL - Liverpool Lime St.	49	348.5	12.6	73.6	82.6
Victoria LL - Bolton	17	365.5	7.1	68.1	77.1
Bolton - Preston	39	404.5	11.5	79.6	91.6
Pancras Cross - South Yorkshire	245	245	45.3	45.3	45.3
South Yorkshire - Leeds New Lane	52	297	13.5	58.8	61.8
South Yorkshire - York	73	318	16.6	61.9	64.9
York - Darlington	70	388	16.1	78.0	84.0
Darlington - Durham Relly Mill	33	421	10.3	88.3	97.3
Durham Relly Mill - Consett	20	441	7.7	96.0	108.0
Consett - Newcastle	22	463	8.1	104.1	119.1

Current fastest time (minutes) from London (with HS2 Ltd.'s estimates) [and the above values] to:

- Nottingham 100 (51/68*) [38]
- Derby 85 (51/71*) [49]
- Sheffield 120 (69/79#) [46]
- Leeds 131 (83) [62]
- York 110 [65]
- Darlington 139 [84]
- Durham 173 [98]
- Newcastle 169 [119]
- Manchester 127 (68) [63]
- Liverpool 128 (96) [83]
- Bolton 164 (with 1 change) [77]
- Preston 128 [92]

(*) 51 minutes is HS2 Ltd.'s estimate from London to Toton, 68 minutes to Nottingham Midland and 71 minutes to Derby Midland. (#) 69 minutes is HS2 Ltd.'s estimate from London to South Yorkshire (Meadowhall), and 79 minutes to Sheffield Midland. These values, and that for Leeds, all show very clearly the time penalty imposed by the ridiculous routing via Birmingham.

Pancras Cross – Sheffield HS is the same distance as Pancras Cross – South Yorkshire. Either journey, non-stop, thus takes 46 minutes at an average speed of 202.8mph. Pancras Cross – Manchester HS with 1 stop takes 63 minutes at an average speed of 178.5mph. This actually takes 5 minutes less than HS2's time from Euston Cross to Manchester, although that journey is 6km shorter, but of course that journey has 2 intermediate stops rather than just 1, and the extra stop, Manchester Interchange, is only 5 miles from Manchester HS, which means in effect that the deceleration for the final station begins 5 miles further out, and the final 5 miles are taken at an average speed of only 60mph, and the overall journey at an average speed of 167mph.

The above time Pancras Cross – Liverpool is 10 minutes longer than HS2 by my plans, GC-gauge all the way, but 18 minutes shorter than my value for the CC service to Liverpool, along the classic route between Crewe and Liverpool (using current timetable times between Crewe and Liverpool) and 13 minutes shorter than HS2 Ltd.'s time to Liverpool (they've clearly assumed some acceleration on the WCML).

2. UHS Services London / Newcastle – Edinburgh (6/3 stops):

Section	Distance (km)	Cumulative Distance (km)	Start - Stop Time (minutes)	Cumulative Journey Time (minutes)	Elapsed Time from London, inc. Station Wait Times
Pancras Cross - York	318	318	57.4	57.4	57.4
York - Darlington	70	388	16.1	73.5	76.5
Darlington - Durham Relly Mill	33	421	10.3	83.9	89.9
Durham Relly Mill - Consett	20	441	7.7	91.6	100.6
Consett - Hexham	23	464	8.3	99.9	111.9
Hexham - Hawick	80	544	19.7	119.6	134.6
Hawick - Edinburgh	82	626	18.1	137.7	155.7
Newcastle - Hexham	23	23	8.3	8.3	8.3
Hexham - Hawick	80	103	19.7	28.0	31.0
Hawick - Lauder	37	140	10.6	38.6	44.6
Lauder - Edinburgh	45	185	11.9	50.6	59.6

Current fastest time (minutes) from London [and the above values] to:

- York 110 [58]
- Darlington 139 [77]
- Durham 173 [90]
- Edinburgh 260 [1567]

And from Newcastle:

- Edinburgh 85 (via ECML, of course). [60]

3. UHS Elapsed Times Summary:

Section	Pancras Cross - Derby	Pancras Cross - Liverpool	Pancras Cross - Preston	Pancras Cross - York	Pancras Cross - Newcastle	Pancras Cross - Edinburgh	Newcastle - Edinburgh
Pancras Cross - Nottingham	37.2						
Nottingham - Derby	49.0						
Pancras Cross - Sheffield HS		45.3	45.3				
Sheffield HS - Manchester HS		62.8	62.8				
Manchester HS - Victoria LL		67.0	67.0				
Victoria LL - Liverpool Lime St.		82.6	| |				
Victoria LL - Bolton			77.1				
Bolton - Preston			91.6				
Pancras Cross - South Yorkshire				45.3	45.3		
South Yorkshire - Leeds New Lane				61.8	| |		
South Yorkshire - York					64.9		
York - Darlington					84.0		
Darlington - Durham Relly Mill					97.3		
Durham Relly Mill - Consett					108.0		
Consett - Newcastle					119.1		
Pancras Cross - York						57.4	
York - Darlington						76.5	
Darlington - Durham Relly Mill						89.9	
Durham Relly Mill - Consett						100.6	
Consett - Hexham						111.9	
Hexham - Hawick						134.6	
Hawick - Edinburgh						155.7	
Newcastle - Hexham							8.3
Hexham - Hawick							31.0
Hawick - Lauder							44.6
Lauder - Edinburgh							59.6

Appendix A – Pancras Cross and the Inter-Regional Connections

General

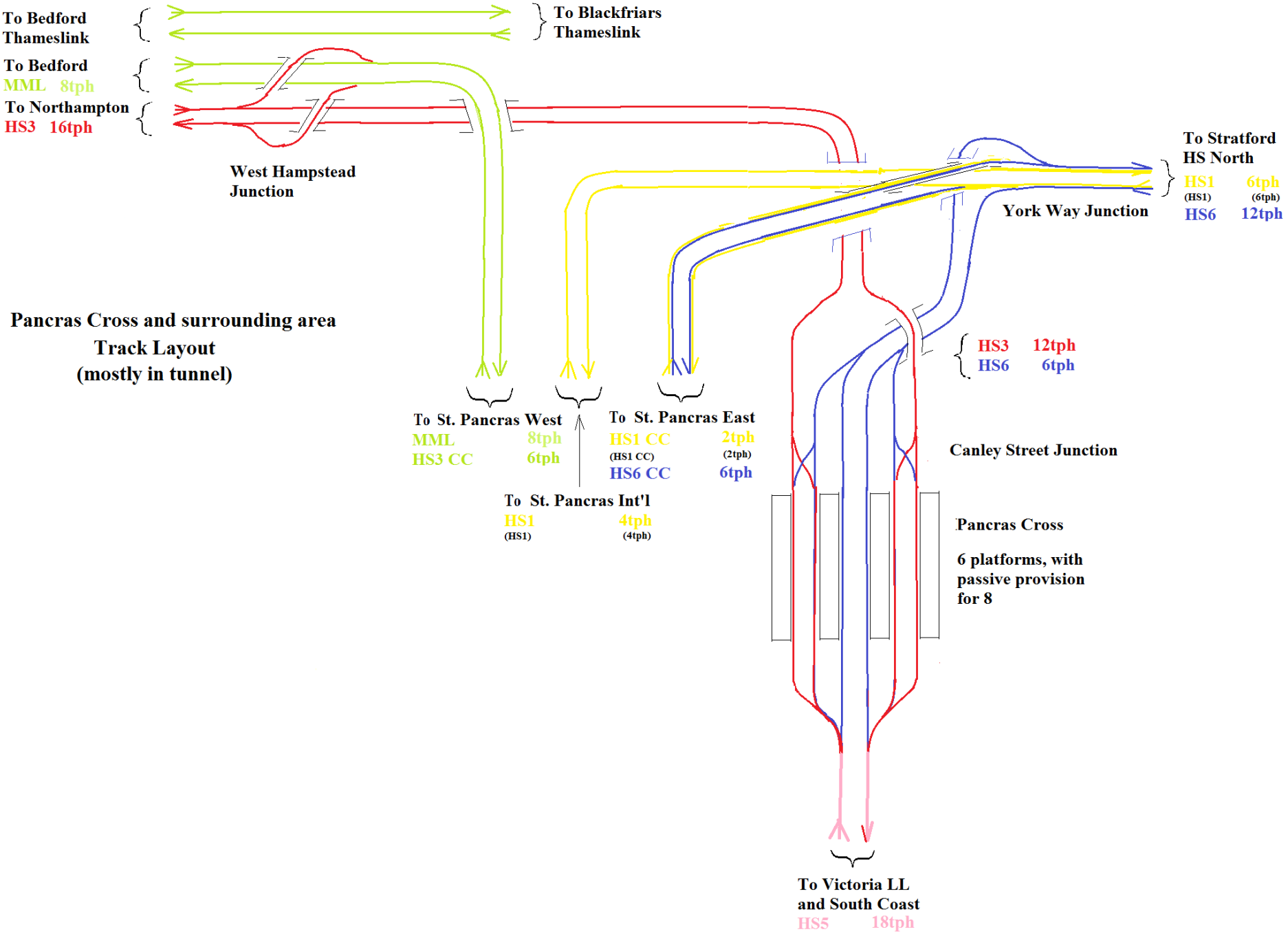
By routing the classic-compatible services of HS3 into St. Pancras West (the MML platforms), and of HS6 into St. Pancras East (the 'Javelin' platforms), and all the GC-gauge services of both routes through Pancras Cross and on to HS5 (which has no classic-compatible services), superlative cross-London inter-regional HS services are enabled, between Scotland, the North East, Yorkshire and the East Midlands (HS3), likewise West Anglia and Lincolnshire (HS6/HS10), and Sussex, West Kent and Hampshire. Given the GC-gauge loadings of the London end of HS3 (12tph) and of HS6/HS10 (6tph), balancing exactly those of HS5(18tph) – these are at the final service plans of each route – a single tunnel in each direction and 6 platform faces, (passive provision for 8,) would suffice. That a single Pancras Cross station, with a single pair of approach tunnels, would serve two HS inter-regional routes should seriously enhance its business case.

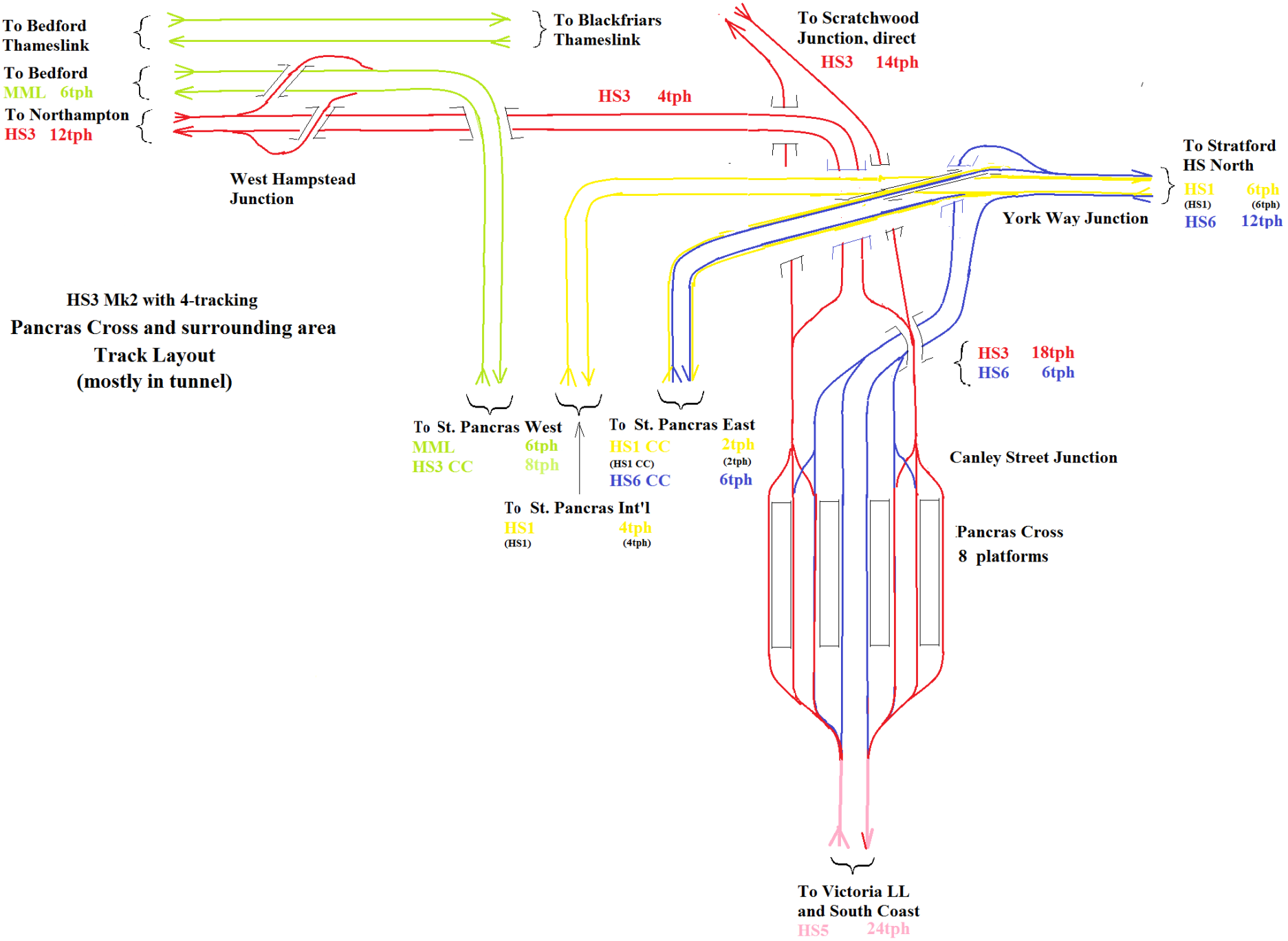
The track diagram of Pancras Cross and its surroundings is on the next page. The layout is not especially complicated, but there are a few points to note.

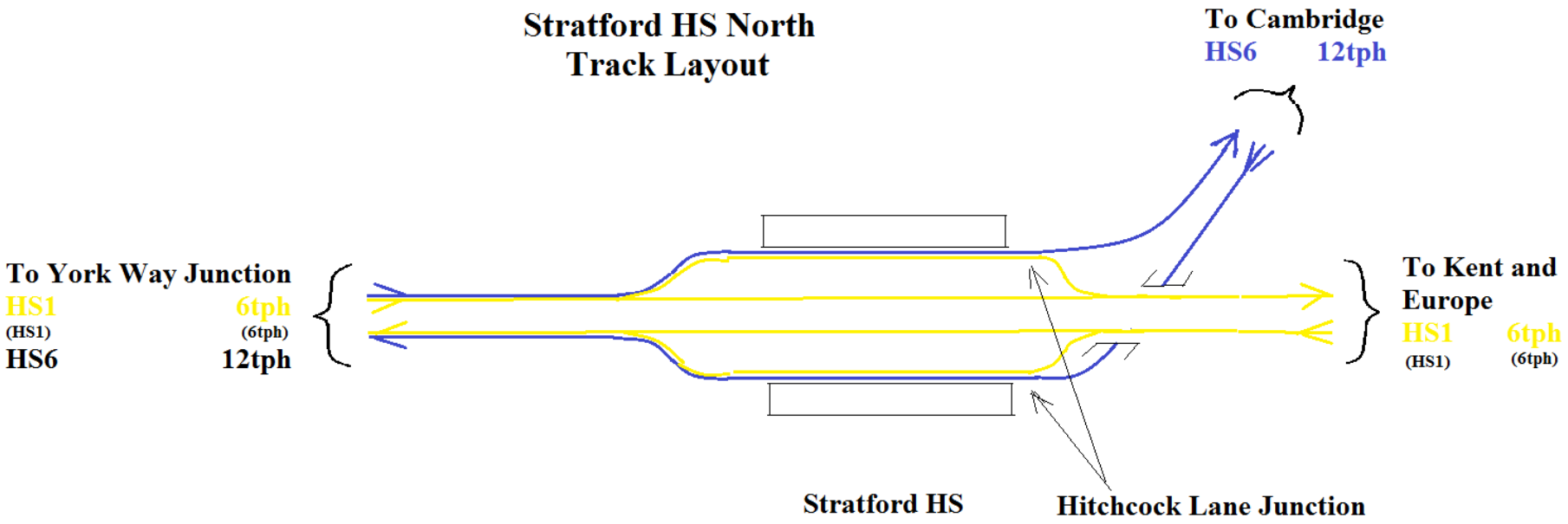
The middle two platform faces at Pancras Cross would ordinarily be used by HS6 trains and the two outer pairs by HS3. The scissors crossovers are provided for operational flexibility, but should not normally be used. I would like to see **passive** provision for 8 platforms, as is indicated in the diagram.

HS6's GC-gauge services from Pancras Cross, and its classic-compatible services from St. Pancras East, (and also HS1's single classic-compatible service,) all join HS1's GC-gauge route from St. Pancras International, at York Way Junction. They then all share the same tracks as far as Stratford HS North station (formerly Stratford International, which it never was). The track diagram for Stratford HS North is deliberately simplified, omitting the extra through tracks and the connection to Temple Mills. The station exists already, and has a single platformed track in each direction (a rather inadequate provision; it may well prove necessary to add extra platform faces on the outside). This is served by all HS6/HS10 services, and also by HS1's single classic-compatible service. HS1's international services pass through the centre, as they always have. (HS1's GC-gauge inter-regional services join HS1 later, from Euston Cross at Woodgrange Road Junction.) HS6 diverges from HS1 at Hitchcock Lane Junction, immediately east of the station, without rejoining the main lines of HS1. There is the existing connection from the platform lines to the main lines, used by HS1's classic-compatible service.

Since the above was written, the Mk2 version of HS3's route has been developed. The track diagrams still accurately depict HS3 Mk2 in its initial state, before 4-tracking. An additional track diagram is provided for Pancras Cross, to show the enhanced provision after 4-tracking. It is assumed that by then (c.2060, perhaps), automatic train control will enable 24tph and more over the single tracks south of Pancras Cross.


To Bedford
Thameslink
To Blackfriars
Thameslink
To Bedford
MML 8tph
To Northampton
HS3 16tph
West Hampstead
Junction
To Stratford
HS North
HS1 6tph
(HS1) (6tph)
HS6 12tph
York Way Junction
Pancras Cross and surrounding area
Track Layout
(mostly in tunnel)
HS3 12tph
HS6 6tph
To St. Pancras West
MML 8tph
HS3 CC 6tph
To St. Pancras East
HS1 CC 2tph
(HS1 CC) (2tph)
HS6 CC 6tph
Canley Street Junction
To St. Pancras Int'l
HS1 4tph
(HS1) (4tph)
Pancras Cross
6 platforms, with
passive provision
for 8
To Victoria LL
and South Coast
HS5 18tph


To Bedford
Thameslink
To Bedford
MML 6tph
To Northampton
HS3 12tph
To Blackfriars
Thameslink
HS3 4tph
To Scratchwood
Junction, direct
HS3 14tph
West Hampstead
Junction
To Stratford
HS North
HS1 6tph
(HS1) (6tph)
HS6 12tph
York Way Junction
HS3 Mk2 with 4-tracking
Pancras Cross and surrounding area
Track Layout
(mostly in tunnel)
HS3 18tph
HS6 6tph
To St. Pancras West
MML 6tph
HS3 CC 8tph
To St. Pancras East
HS1 CC 2tph
(HS1 CC) (2tph)
HS6 CC 6tph
Canley Street Junction
To St. Pancras Int'l
HS1 4tph
(HS1) (4tph)
Pancras Cross
8 platforms
To Victoria LL
and South Coast
HS5 24tph


Stratford HS North
Track Layout
To Cambridge
HS6 12tph
To York Way Junction
HS1 6tph
(HS1) (6tph)
HS6 12tph
To Kent and
Europe
HS1 6tph
(HS1) (6tph)
Stratford HS
Hitchcock Lane Junction

Appendix B – Leicester Station Arrangements

Fitting the HS platforms into London Road station is distinctly tricky. There's no single suitably large space available. But there's a large car park on the western side, and goods lines on the eastern side.

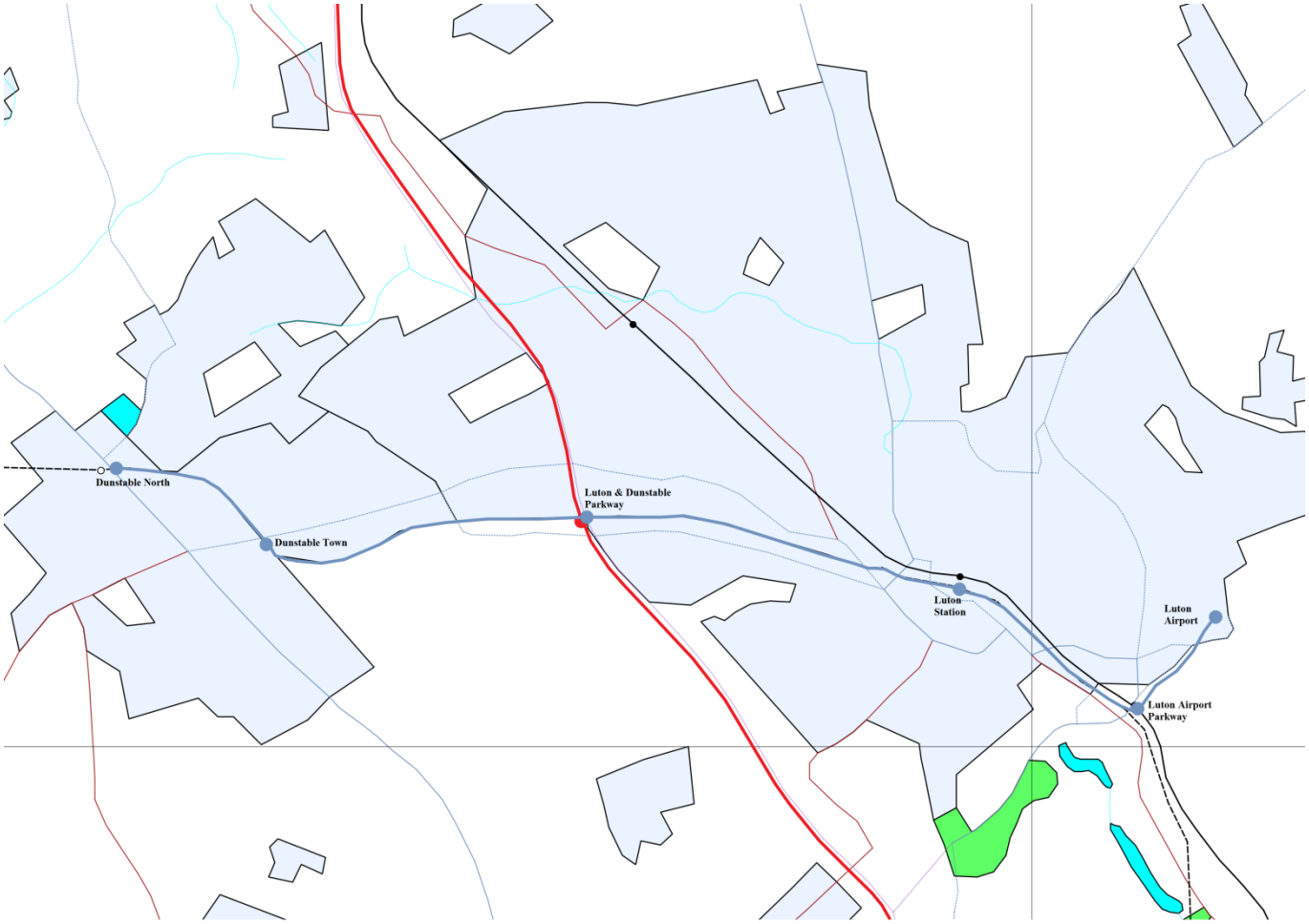
HS3 approaches London Road station in tunnel from SK578032, on the Great Central alignment. Since the main lines carry non-stopping traffic, they could advantageously avoid the station altogether. So we need a separate (short) branch for Leicester station. This would diverge from the main line slightly to the south of the above map reference (at SK577030 – Watkin Road Junction), and travel in the above tunnel to just before London Road station, at SK592034, emerging from tunnel **between** the classic tracks. The HS tracks take over the existing two island platforms, enlarged as required to GC gauge and made variable platforms, so they can be served by both GC-gauge and classic trains. (See appendix B of my 'Network' article for an explanation of variable platforms.) The classic tracks make a junction with the HS tracks, at SK593038 (Regent St. Junction) so they can access the existing platforms, but also continue straight ahead, each to access a new, single-faced platform on the outside of the alignment (these are for stopping services on the classic route). There **is** sufficient room for these. The HS tracks make a junction with the classic tracks just north of the station, at SK596044 (Swain St. Junction) so Regional Metro and classic-compatible services can get back on the classic lines. The southbound classic track crosses the HS tracks on a flyover, to allow them to gain the east side of the alignment. Ordinarily, HS3 services would use the innermost pair of tracks, and RM services the outer faces of the two island platforms (and also the outermost tracks), but scissors crossovers between HS and classic tracks at each end of the island platforms allow for complete operational flexibility.

HS3 main line proceeds a little further along the Great Central alignment beyond Watkin Road junction, then enters a 2.3 mile tunnel at SK579033, emerging on the eastern side of the Midland alignment at SK599049 (Humberstone Road Junction), where it is rejoined by the Leicester station branch.

The freight lines need to avoid all this. Accordingly, they enter a 2 mile tunnel at SK603057, (where the line to Belgrave Road used to pass underneath the Midland,) well to the north of Humberstone Road Junction, and emerge again at SK590032, well to the south of the emergence of the HS3 Leicester station branch, and on the west side of the passenger lines, which have been slewed to the east. Thus, between Leicester and Wigston North Junction, freight and passenger lines have switched places, which is exactly what is required to avoid conflicting movements where the Midland Main Line is crossed by the strategic freight route from Felixstowe to Nuneaton and the West Midlands. (Ideally, this work should have been carried out during the MML electrification.)

Appendix C – Luton & Dunstable Parkway

(The previous contents of appendix C, further thoughts on Nottingham station and surrounding infrastructure, are now the preferred option, and appear in the main text.)



Luton & Dunstable Light Rail

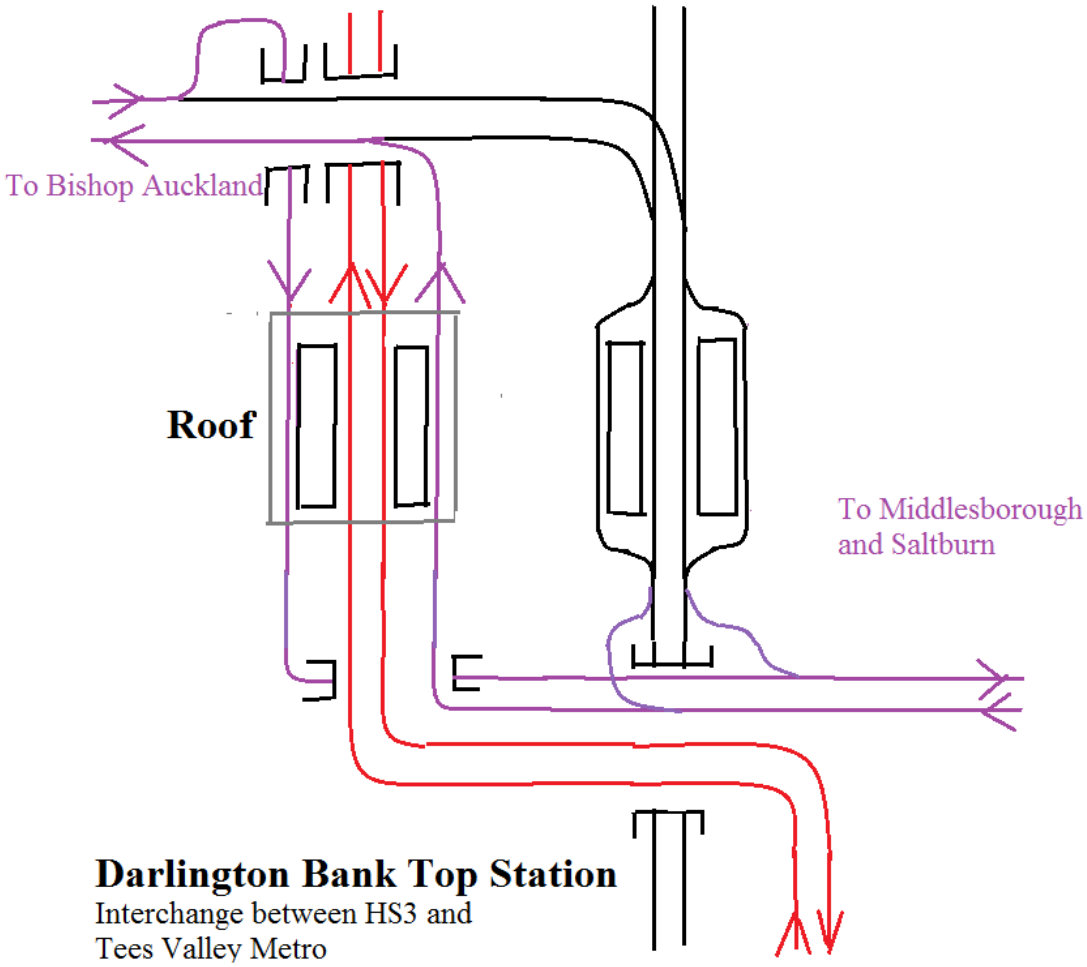
A light rail system along the route of the relevant section of the former Welwyn – Luton – Leighton Buzzard line would provide excellent connections between Luton & Dunstable Parkway station and Dunstable, Luton and the airport. Part of this route (between just short of Dunstable North and just short of Luton Airport Parkway station) is currently occupied by the Luton Dunstable Busway. This seems aimed purely at local traffic, in that it does not provide connections between the Parkway station and the airport. Instead this connection is provided by a dedicated bus transfer service, which is evidently highly unpopular. So much so that Luton Council is currently (April 2016) planning to replace it by a 1.3-mile light rail link to the nearest station – Luton Airport Parkway. (So serious are they, in fact, that the Council, which owns the airport, proposes to fund the development itself.) The proposal even has the light-rail platforms above the heavy-rail ones – they've got almost everything right! All that's missing is to take over the current busway as well, which will future-proof the system by providing for connections to and from HS3. (Many of the services will still, doubtless, run as a shuttle between Parkway and airport, since the main route to the airport is likely to remain always MML and Thameslink.)

Appendix D – Darlington Station Arrangements

The inside of the station is completely rebuilt. The buildings on the central platform are all demolished, and two new through lines provided through the centre (extending the former south-facing bays. New facilities are provided on the two new island platforms. To the south of the station, HS3 and the Tees Valley metro line from Redcar and Middlesborough share the same bridge over the ECML, and share the roofed platforms, arranged in contraflow. The diagram below should make this clear. The entire point of this arrangement is to provide interchange facilities giving a HS connection between Middlesborough and London, with just the one, cross-platform change at Darlington. (The custom colour for the Tees Valley Metro is purrple – R/G/B 143/100/183.)

These changes mean that the original station entrance, in Victoria Road / Park Lane, comes back into use, together with the magnificent station buildings, and the grotty current approach between the tracks is very properly abolished.

New platforms are provided for the ECML. There is no guaranteed interchange between HS3 and ECML services (that's at Newcastle).



Appendix E – Sheffield HS Station

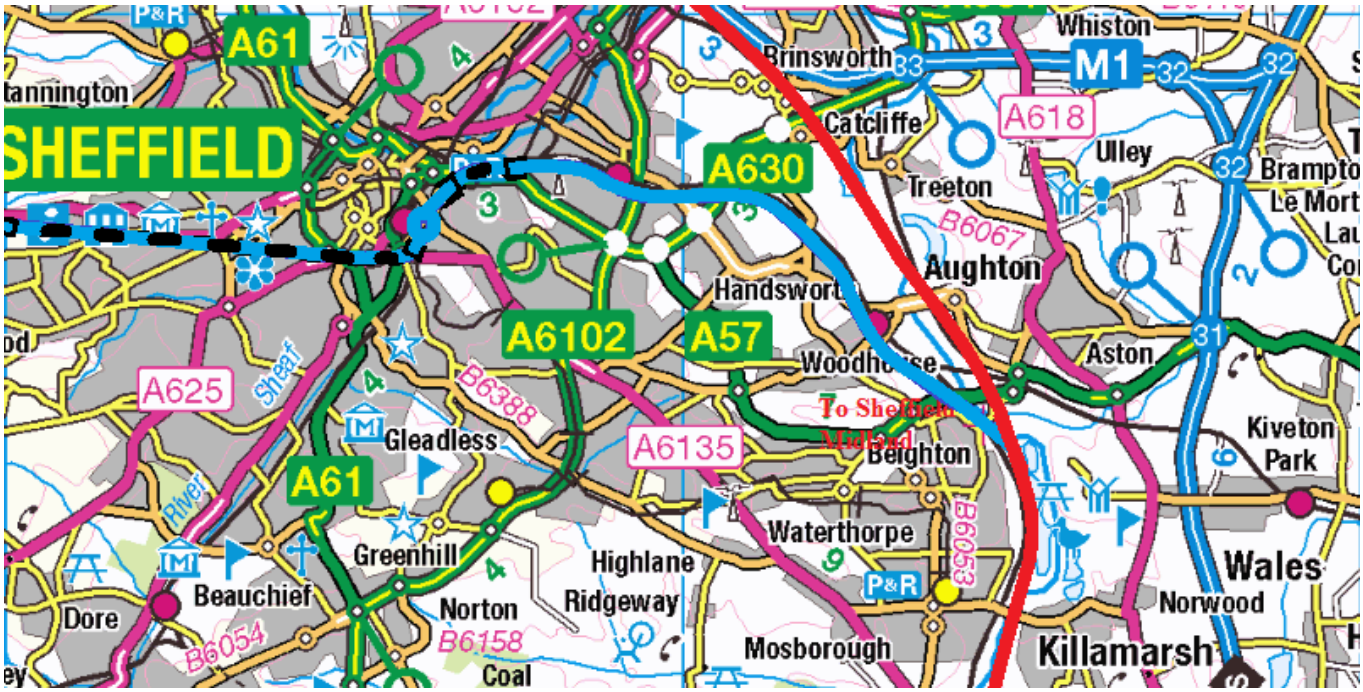
This is not, strictly, HS3, but rather HS8, Southern Transpennine. But certain transpennine services do use part of HS3, so it is certainly relevant.

First ideas were to locate the station at Pond Street, in the area occupied by the bus station. However, close examination of the area by satellite maps shows that this is no longer practicable (without quite a lot of demolition). Many buildings have gone up in this area in recent years, arbitrarily, to no obvious overall plan, so there is no longer any clear way through. Accordingly a different approach is now favoured, which provides rather more of an engineering challenge.

The station will be behind and above the existing Midland station, at the bottom of Park Hill. There is plenty of space for it. I have plotted three possible locations for a standard size HS station, allowing 300m by 50m – the usual two island platforms, and long enough to accommodate a 12-car Velaro (25m cars) –

- adjacent to the existing supertram (requires most excavation of Park Hill, with substantial retaining walls
- taking over the supertram alignment, with less excavation
- extending over the eastern island platform (platforms 6 and 8, + bay 7) of Midland station – more structural work but fairly little excavation

– all at the level of the supertram alignment, so the footbridge crossing the tracks at Midland station could extend straight ahead as a subway under the HS platforms. All but the first of the above options require relocation of the supertram alignment, but that's not much of a problem.



Beighton – Rivelin Valley

The approach from HS3 is from Beighton Junction along the south side of the Retford line alignment; there are no significant obstructions (beyond the odd warehouse to be relocated). At Woodhouse HS Junction (SK433850) a connection joins from the classic tracks from Retford (this allows classic compatible HS8 services from Liverpool to Hull and Cleethorpes via Gainsborough). From SK370878 it

runs in tunnel or adjacent to (at a higher level than) the existing cutting, above the existing tracks (with which the Retford line connects).

South of the HS station, the route enters a 3 mile tunnel at SK359866, curving to the right and then heading in almost a straight line to Manchester (emerging from tunnel in the Rivelin Valley, at SK300872). There shouldn't be any problem with the tunnel's entrance, to pass underneath the A6135 (Granville Road), but it then has to go significantly deeper, to pass beneath the Midland line, also beneath the former diveunder where the line from London passed underneath the Hope Valley lines, to reach the north side of the station (and the then through, northbound lines). This has been out of use (and indeed filled in) for the past 50 years, but we may well wish at some time to reinstate it so care should be taken not to damage it.

Appendix F – Interchange at Newcastle

I've defined an hourly cross-platform interchange pattern for Newcastle; the interchange pattern could certainly be implemented, but not, going north, cross-platform, as Newcastle Central station is at present laid out.

There are currently 4 terminal platforms, 9-12, (or, rather 12-9, going eastwards,) at the west end of the station, and a single terminal platform, 1, at the east end. Platform 2 is the through platform for trains going north to Scotland. Platform 1 is on the opposite side to 2 of a semi-island. Platforms 3 and 4 are on each side of an island platform, used by southbound ECML and Cross-Country services. Platforms 5 / 6 and 7 / 8, although through, are used for terminating services (and are shorter than 2, 3 and 4).

What I really want is a new through platform, created by joining 9 to 1 (call it 1). This would then be the platform for northbound ECML services, and platform 2 the arrival platform for the HS3/HS7 services terminating at Newcastle. These would then pass through to the east of the station for servicing, and return to platform 3 for departure, with connections on platform 4 from southbound ECML services. Then we have the desired cross-platform interchange.

That's what I would like, but I don't know if it's possible, except at vast expense. I am not familiar with Newcastle station, and have been unable to find the necessary information on the web to clarify the situation. Such pictures as I have located seem cautiously optimistic.

Appendix G – The Coventry Variant of HS2

The Coventry Variant of HS2 (HS2-CV) is described in appendix B of the HS2 Route and Service Plans article. Effectively it is an additional section of HS2 diverging from the existing route at Brackley and rejoining it at Berkswell, passing through Rugby and Coventry, allowing those cities also to be served.

As for as HS3 is concerned, two interconnections between HS2-CV and HS3 are planned:

1. From Crick Junction, now a junction with HS2-CV rather that with the classic route, joining the main line of HS2-CV at Onley Junction, on the southern side of Rugby.
2. A branch of HS2-CV continues along the ex-GC alignment north of Rugby, joining HS3 at Cotesbach Junction, where HS3 takes over that alignment.

The CC service from St. Pancras to Birmingham and Wolverhampton, thence to Liverpool and Chester, travels on HS2-CV as far as Warwick Road Junction, just west of Coventry, where it joins the classic route. The RM service from St. Pancras to Birmingham and on to Worcester, itself becomes CC and travels on HS3 between West Hampstead and Crick Junctions, instead of via Bedford, likewise joining the classic route at Warwick Road Junction. This increases the loading of HS3 between West Hampstead and Crick junctions to 18tph, and decreases the loading between West Hampstead Junction and Bedford by 2tph.

An extra 4tph join HS3 from HS2-CV at Cotesbach Junction. The loading thence to Watkin Road Junction is likewise raised to 18tph. The details of these services are not yet fixed.