



# Engineering Options Report West Midlands to Manchester

March 2012

HS2 Limited



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# Preface to March 2012 reports

This report was submitted to Government by HS2 Ltd at the end of March 2012 and is part of a suite of documents produced to provide preliminary advice to Government on potential options for phase two of the high speed rail network.

For details of the initial preferred scheme selected by Government, please see the Command Paper<sup>1</sup>. The initial preferred scheme will form the basis of further engagement. A preferred scheme will be published in 2013 that will form the basis of full public consultation.

Anyone reading the March 2012 reports should be aware of the following:

- The reports describe the development of options. The base proposition referred to is not a recommended or preferred scheme.
- The reports describe route and station options serving Heathrow T5. The options do not reflect an initial preferred scheme. The Government has announced its intention to suspend work on high speed rail options to Heathrow until the Airports Commission has reported.
- Where the Ordnance Survey Licence Number is shown on maps it should read 100049190.

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<sup>1</sup> *High Speed Rail: Investing in Britain's Future  
Phase Two: The route to Leeds, Manchester and beyond*



# Issue and revision record

| Revision | Date       | Originator                       | Checker                  | Approver  | Description |
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# 1. Introduction

## 1.1 This Engineering Options Report

MSG, made up of Mott MacDonald, Scott Wilson (now URS) and Grimshaw was appointed by HS2 Ltd in August 2010 to provide engineering services to support the development of the proposed high speed railway line between the West Midlands and Manchester.

MSG developed cost-effective and sustainable options for route alignment, city centre and parkway stations and connections to the existing rail network, undertaking a wide range of engineering, architectural design and feasibility studies to inform HS2 Ltd's business case and enable the Secretary of State to select a preferred route.

This engineering options report provides the detailed route descriptions for the West Midlands to Manchester, including city centre stations in Manchester, additional station locations prior to reaching Manchester, depots and connections to the existing West Coast Main Line railway (WCML). The history of options is also covered.

## 1.2 The Layout of This Report

This report is set out as follows:

- Section 1 (this Section) is introductory.
- Section 2 contains a series of descriptions of route sections.
- Section 3 describes the city centre, intermediate and interchange station options.
- Section 4 describes the infrastructure maintenance and rolling stock maintenance depot options.
- Section 5 describes the infrastructure that would be required to deliver classic compatible services onto the WCML at Crewe, Golborne (north of Warrington) and Brock (north of Preston).
- Section 6 links the route sections together into whole routes
- Section 7 provides the history of route options
- Section 8 provides the history of station options
- Section 9 provides the history of depot options
- Section 10 provides the history of classic compatible options
- Section 11 is a glossary

## 1.3 Remit

The scope of work as set out in remits from HS2 Ltd to MSG for the Manchester leg included consideration of the following core elements:

- provision of a route from the tie-in point near Lichfield on the London-West Midlands route to a station within Manchester. The station within Manchester is to have four platform faces, each suitable for a 400 metre long train;
- provision of one connection onto the existing West Coast Main Line (WCML) railway;
- provision of one infrastructure maintenance depot, ideally to be located towards the centre of the West Midlands to Manchester route; and
- provision of one rolling stock depot, ideally to be located towards Manchester.

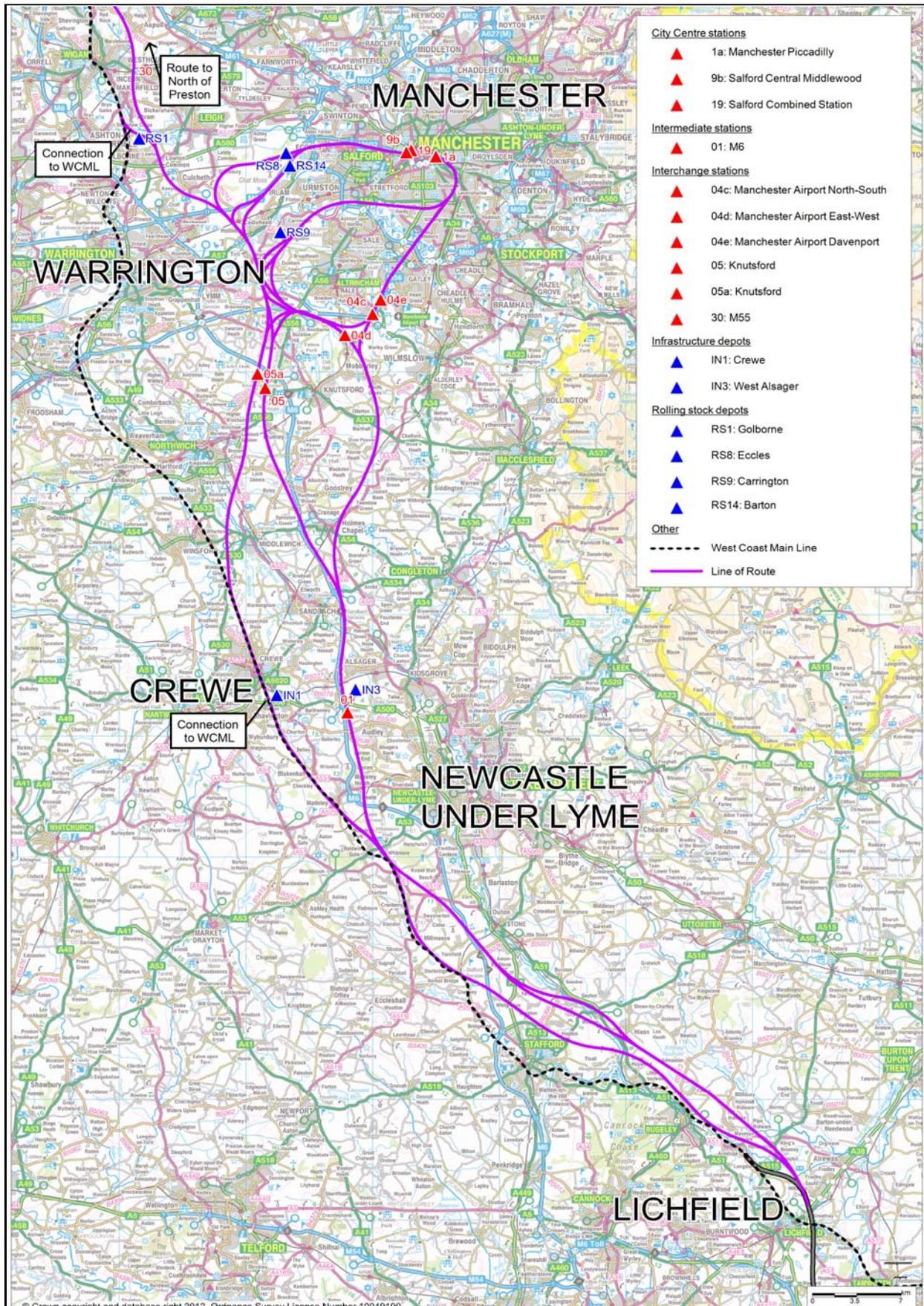
The scope of work also included the following optional elements:

- interchange stations within and on the edge of the Manchester conurbation;
- intermediate stations south of the Manchester conurbation;
- additional connections onto the existing WCML;
- high speed route from the route into Manchester to the north of Preston;
- high speed connection to Liverpool; and
- 'delta' connection to allow services from the Manchester city centre station to route to the north onto the West Coast Main Line connection and vice versa.

The remit specified that investigation be carried out for each of the main engineering disciplines, working closely with Temple-ERM, HS2 Ltd's sustainability consultant, and HS2 Ltd. These disciplines included:

- track alignment
- geotechnics
- structures
- highways
- tunnels and underground structures
- existing railway systems
- construction

The technical parameters set out in HS2 Ltd's Project Specification were used.



## 1.4 Introduction to the Routes

All options would start at the junction on the high speed route from the south for the West Coast Main Line north-east of Lichfield, adjacent to Streethay. The route options are shown on the map opposite.

There are two routes from Lichfield to a point near Newcastle-under-Lyme:

- One would pass south of King's Bromley, Hixon, Weston and Stone, with an alternative section that would pass north of Weston
- The other would be slightly further south passing north of Handsacre, Rugeley and Stafford and then following the route of the exiting West Coast Main Line.

North of Newcastle-under-Lyme there are three route options to the outskirts of Manchester:

- One would follow the West Coast Main Line corridor through Crewe, passing between Winsford and Middlewich, to the east of Northwich and to a point west of Knutsford. There could be a connection to the West Coast Main Line at Crewe to allow classic compatible trains to serve Crewe, Runcorn, Liverpool and North Wales.
- The other two would run west of Stoke-on-Trent. There is an option for an intermediate station adjacent to the M6. The routes would follow the M6 corridor, passing west of Alsager, to a point east of Sandbach where they would split. One option would follow the M6 corridor, pass west of Holmes Chapel to a point west of Knutsford. The second option would run north passing west of Goostrey to Mobberley

Both routes from the point west of Knutsford, where there are options for interchange stations, would run north. They would pass between Lymm and Partington, crossing over the Manchester Ship Canal to run between Warrington and Culcheth and between Golborne and Leigh. At Golborne a connecting route to the West Coast Main Line would be provided to allow classic compatible trains to serve Preston and the north.

From Mobberley the route would run east past Manchester Airport to then follow the route north from Lymm. A junction at Mobberley would provide a route past the airport and then in a long tunnel to a station option at Manchester Piccadilly. There are three options for an interchange station close to the airport.

Route options to the centre of Manchester from the point to the west of Knutsford would provide access to the station at Piccadilly via either

- The Airport and the long tunnel or
- East of Partington, along the Mersey Valley and in a long tunnel

North of the Manchester Ship Canal there are three route options towards station options in Salford; two follow the M62 to the outskirts of Eccles and the other follows the existing Chat Moss railway line. All three then run alongside the existing railway before using a tunnel to Salford.

A route option for a possible later phase would continue north to pass between Wigan and Hindley, west of Aspull, east of Standish and west of Coppull. After crossing the M6 the route would run east of Eccleston, through New Longton and Hutton before crossing the River Ribble west of Preston on a long viaduct. There is an option for an interchange station adjacent to the M55. The route would join the West Coast Main Line north of Bilsborrow, allowing classic compatible trains to run north to Scotland.

There are options for Rolling Stock Maintenance Depots at Golborne, Eccles, Barton and Carrington. Infrastructure Maintenance Depot options exist at Crewe and Alsager.

## 1.5 Route Geology and Geohazards

### Topography

From Lichfield in the south to Manchester and beyond in the north, this section of High Speed 2 extends a distance of 120km with a study corridor around 15km wide.

The topography of the south part of the alignment (Lichfield through east of Stafford and beyond) is generally low lying, relatively flat land; the central region (west of Stoke-on-Trent) is of higher relief. Further north, approaching Manchester from the west, the alignments are within the predominantly low lying Cheshire basin. Beyond Manchester to the north the alignment options continue on similarly low lying ground.

### Datasets

In order to assess the likely impact of geohazards along the HS2 route options and to delineate the approximate likely extent of such hazards, datasets illustrating both geology and geohazards at a scale of 1:50,000 have been utilised.

These datasets were procured from the British Geological Survey (BGS) by HS2 Ltd. and provide indicative information on the geographic extent of geohazards and the characteristics of the sub-surface. The datasets comprise the following layers:

- Geology:
  - Superficial geology;
  - Solid geology;
- Geohazards:
  - Compressible deposits;
  - Landslides hazard;
  - Running sand;
  - Soluble deposits;
  - Shrink/swell deposits;
  - Coal Mining (image data).

Data on active and historic landfills and areas of contaminated land was obtained from the Environment Agency (EA) by the project environmental consultant. Landfills by their nature comprise geohazardous conditions and it is assumed that the data on the extent and nature of these geohazards is complete and accurate.

The major geotechnical assumption in carrying out the geohazard assessments for the HS2 route options is that the information contained in the BGS hazard and geology datasets and the EA landfill data is correct and comprehensive, i.e. that there are no other geohazards than those for which information has been obtained and used. This assumption is reasonable at this stage of the project and the veracity of the information with respect to the preferred route option will be assessed at detailed investigation and design stage.

## Solid Geology

In the southern half of the area the routes are within the Permo-Triassic deposits of the Midland Plain. The routes then cross into the Carboniferous uplands of the southern Pennines. Further to the northwest the routes then pass into the Permo-Triassic deposits in the lowlands of the Cheshire basin. The Midland Plain Permo-Triassic deposits are divided into the Sherwood Sandstone and Mercia Mudstone groups. The younger Mercia Mudstone deposits (formerly the Keuper Marl) consist predominately of red brown mudstones and siltstones; however, two halite formations are also present. The Sherwood Sandstones are predominately sandstone, however in parts the group consists of conglomerates.

The Carboniferous rocks are divided into two stages, namely the Bolsovian and Westphalian D. The Bolsovian stage comprises the Pennine Upper Coal Measures. The Westphalian D stage consists of several sandstone formations.

The Cheshire Basin Permo-Triassic rocks have similar stratigraphic constituents to the Midland Plain Permo-Triassic rocks with halite formations also locally present. The exception is the inclusion of the Penarth group consisting of mudstones and limestone. As with the Midland Plain the other sediments within the basin comprise of mudstones, siltstones and sandstones.

## Quaternary Geology

The cover of superficial geology within the region between the midlands and Manchester and beyond is a function of glacial, periglacial and temperate processes. The limit of the last glacial ice extent has a large impact on the spatial distribution of the glacially and periglacially derived sediments, with greater spatial coverage of superficial deposits located to the northwest of the extent. This extent is located along an approximately north-east line some 10km north of Stoke-on-Trent to approximately 15km east of Manchester.

Within the area studies, from south to north, the alignments encounter local alluvium, river terrace gravel and local areas of glacial till until they cross over the limit of the last glacial ice described above, approximately 10km west of Stoke on Trent where they generally encounter glacial till and local areas of glacial sands and gravels, with rarer deposits of river terrace gravels.

## Geohazards

There are a number of types of geotechnical hazards (geohazards) impacting the route options between Lichfield and Manchester, and beyond. The geohazards comprise areas of varying shape and size and include compressible (soft) deposits; dissolution features (due to the progressive dissolving of soluble salts within the rock, including halites and gypsum); landslide zones; landfills; and ground with a history of coal mining activity.

Compressible deposits include alluvium, and more significantly, on the approaches to Manchester, peat, which poses a settlement risk to loads placed on it and which will require solutions involving piling through to a firm stratum or digging out and replacing. Dissolution features pose a risk due to collapsible or collapsed zones within the underlying rock. These areas may also have undergone salt mining associated with the Cheshire brinefields. Areas and zones with a known history of landslides or unstable ground pose risks to the project relating to instability if reactivated. Landfills (predominantly historic, though locally active) of varying size are fairly well dispersed along the route corridors and pose constraints to the project in terms of track support, earthworks stability, material disposal and environmental hazards. The hazards associated with areas containing coal mining

activity (both underground and opencast) are generally voids, ongoing subsidence and the spoil heaps which may need to be traversed.

## **Risk Management**

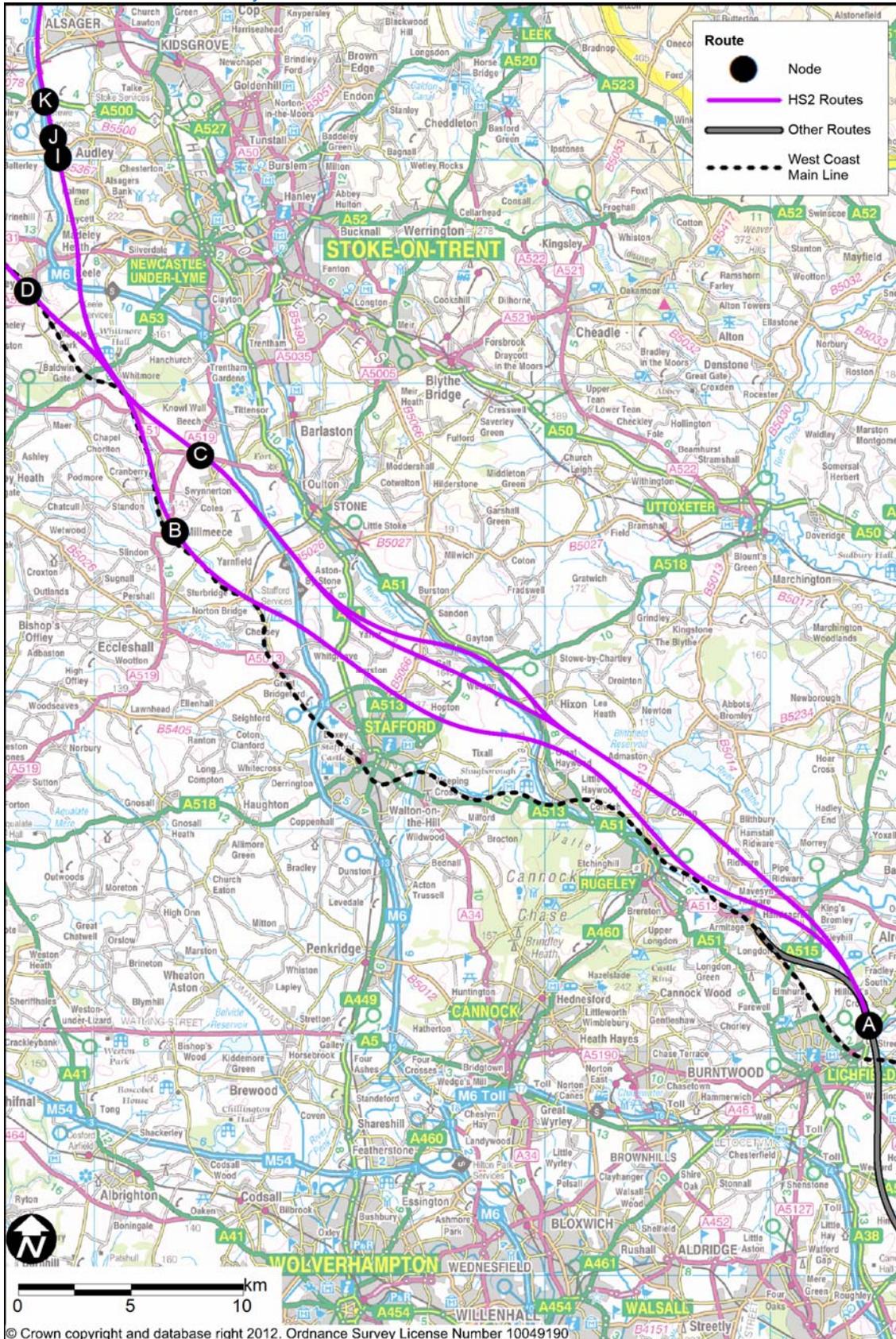
The risk management of the geohazards utilised an avoid-reduce-mitigate methodology. In attempting to avoid geohazards, routes were reviewed in order to adjust the them to avoid the geohazards. If this was not possible due to other influencing factors, then attempts were made at small adjustments to the route in order to reduce the length of route affected by the geohazards. Finally, if the geohazards were unavoidable, then mitigation measures were recommended so that the risk of the hazard impacting the operation of the railway would be reduced to an acceptable level.

## **Recommended Earthworks Design**

A common side slope of 1:2.5 has been adopted for earth structures and it is possible that more detailed desk-based and later intrusive geotechnical investigations might alter this assumption with the possibility of either steeper or slacker slopes being needed. The recommended side slope geometry relies on the accuracy of the BGS geology datasets and also assumes appropriate dewatering and drainage measures being in place during construction and operation of the railway.

It should be noted that while the geohazards mentioned above pose risks and constraints to the design and construction of the route options, the problems are not insurmountable. Following further desk study and intrusive investigations, appropriate solutions can be developed albeit at varying degrees of cost.

Lichfield - Newcastle-under-Lyme



## 2. Line of Route: Engineering Description of Sections

This chapter describes a series of route sections, which could be combined in a number of ways to form continuous routes from Lichfield to Manchester. There are also route sections that provide options to connect to the West Coast Main Line at Crewe and Bamfurlong and to extend the route north of Preston to the West Coast Main Line at Brock.

These route sections include three city centre station options at Manchester Piccadilly, Salford Middlewood and Salford Central as well as intermediate and interchange station options at Manchester Airport (3 options), Knutsford (2 options), the M6 near Stoke-on-Trent and the M55 near Preston.

The maps on this and the following pages show the route options. Nodes (e.g. A, B, C, etc.) are positioned at the start and end point of each route section. Each route section has been given a reference such as HSM01 and HSM03. This section of the report describes these sections. The route sections vary in length and in many cases are subdivided where the whole of the section cannot be shown on a map on one page with the relevant text on the opposite page.

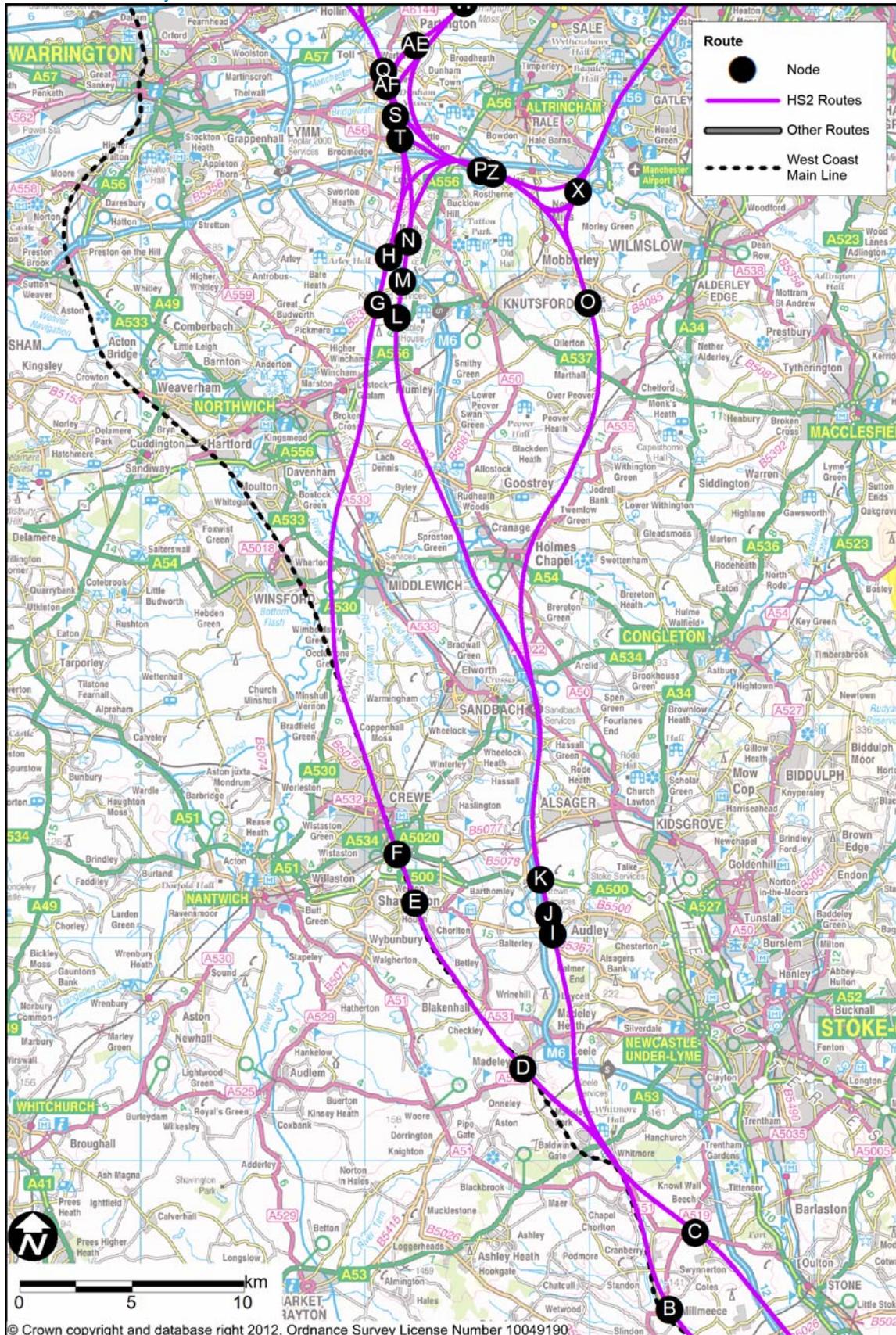
The maps show numbered features of interest to allow the reader to identify them in the accompanying text (e.g. **(4)**).

The Manchester route options would start at Streethay, east of Lichfield, where the HS2 route from the south would diverge, with a spur connecting to the West Coast Main Line and the through route continuing north towards Manchester.

The map opposite shows the southern end of the routes to Manchester between Lichfield and Newcastle-under-Lyme. The following sections are shown:

| Node From | To | Location From | To            | Route Section | Report Section | Notes  |
|-----------|----|---------------|---------------|---------------|----------------|--|
| A         | B  | Streethay     | Millmeece     | HSM01         | 2.1            |  |
| A         | C  | Streethay     | Swynnerton    | HSM02         | 2.2            |  |
| A         | C  | Streethay     | Swynnerton    | HSM03         | 2.3            | Similar to HSM02 but avoids Hixon and Weston |
| B         | D  | Millmeece     | Madeley       | HSM04         | 2.4            |  |
| B         | I  | Millmeece     | Shrayleybrook | HSM05         | 2.5            |  |
| C         | D  | Swynnerton    | Madeley       | HSM06         | 2.6            |  |
| C         | I  | Swynnerton    | Shrayleybrook | HSM07         | 2.7            |  |

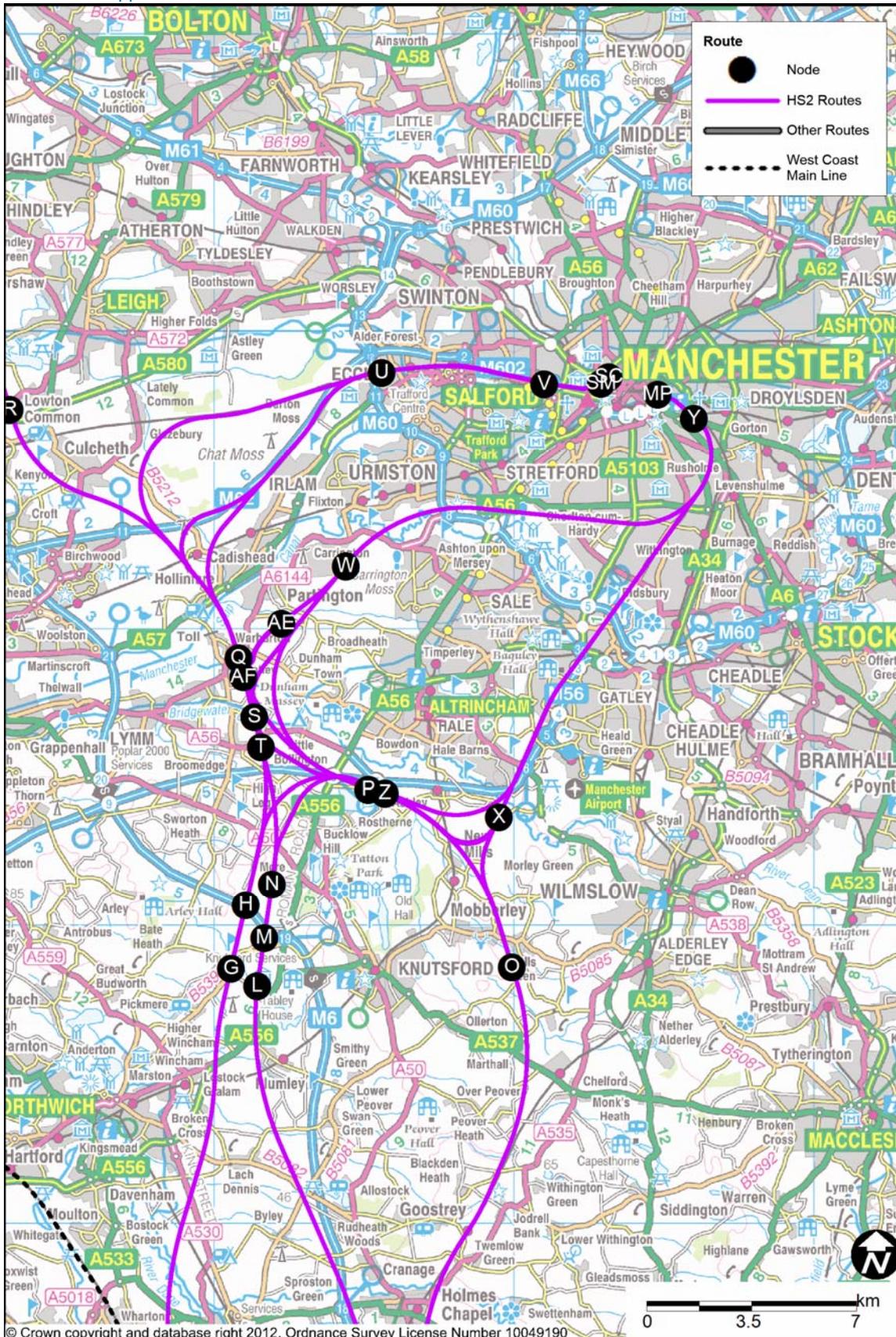
Newcastle-under-Lyme - Manchester Outskirts



The map opposite shows the routes from the Newcastle-under-Lyme area to Manchester outskirts. The following sections are shown:

| Node From | To | Location From      | To                    | Route Section | Report Section | Notes                                   |
|-----------|----|--------------------|-----------------------|---------------|----------------|---|
| D         | E  | Madeley            | Hough                 | HSM08         | 2.8            |   |
| E         | F  | Hough              | Crewe                 | HSM09         | 2.9            | WCML connection                         |
| E         | H  | Hough              | Winterbottom          | HSM10         | 2.10           |   |
| G         | H  | Pickmere           | Winterbottom          | HSM11         | 2.11           | Includes interchange station option 5A  |
| H         | Q  | Winterbottom       | Warburton             | HSM12         | 2.12           |   |
| I         | N  | Shrayleybrook      | Mere                  | HSM13         | 2.13           |   |
| J         | K  | Audley             | M6 Jn 16 Radway Green | HSM14         | 2.14           | Includes intermediate station option M6 |
| L         | M  | Tabley             | M6 Jn 19 Knutsford    | HSM15         | 2.15           | Includes interchange station option 5   |
| N         | Q  | Mere               | Warburton             | HSM16         | 2.16           |   |
| I         | O  | Shrayleybrook      | Mobberley             | HSM17         | 2.17           |   |
| O         | P  | Mobberley          | M56 Jn 7 Rostherne    | HSM18         | 2.18           |   |
| O         | P  | Mobberley          | M56 Jn 7 Rostherne    | HSM19         | 2.19           | Includes interchange station option 4D  |
| P         | Q  | M56 Jn 7 Rostherne | Warburton             | HSM20         | 2.20           |   |

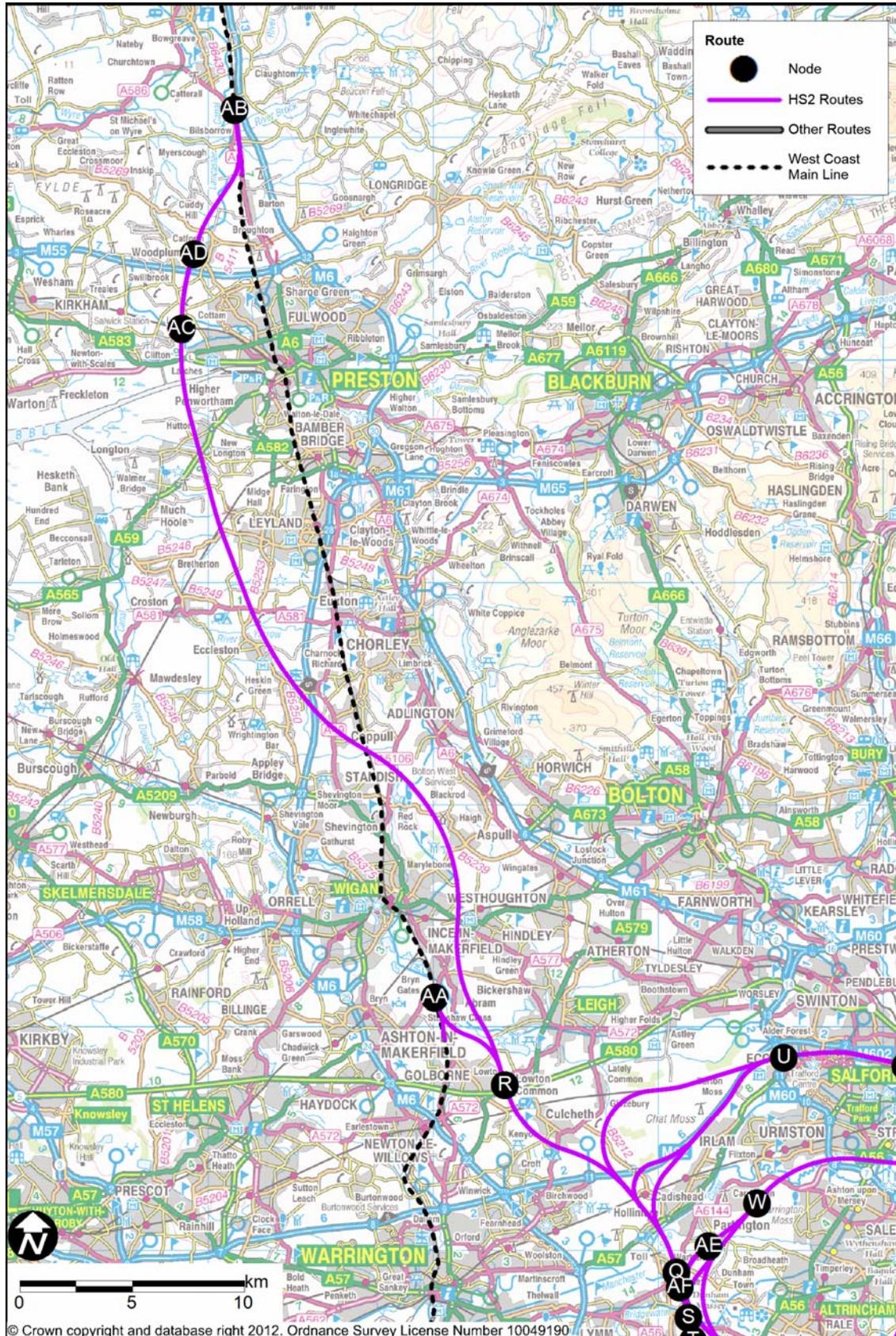
Manchester approaches and terminals



The map opposite shows the routes that form the Manchester approaches and terminals. The following sections are shown:

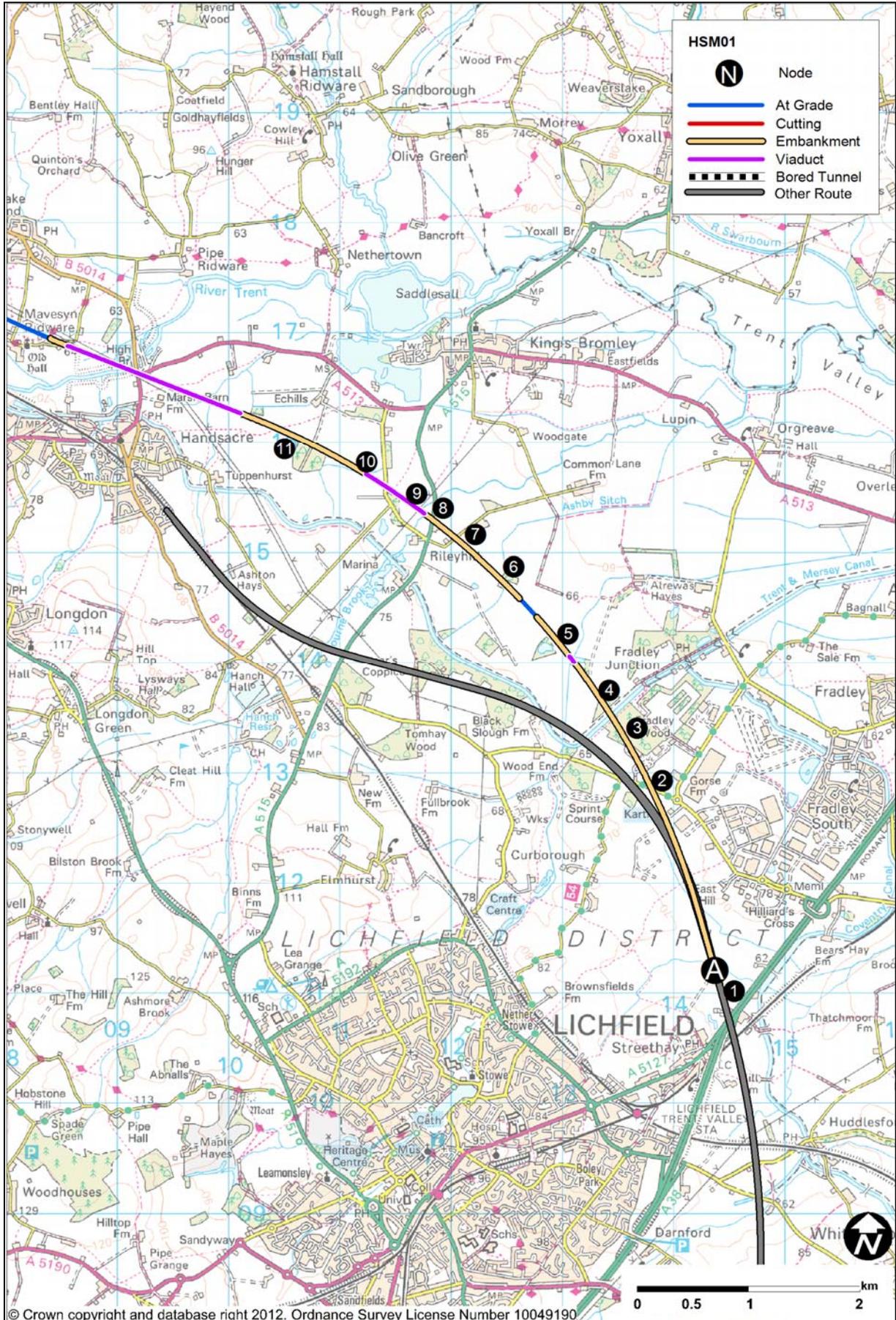
| Node From | To | Location From      | To                    | Route Section | Report Section | Notes                                  |
|-----------|----|--------------------|-----------------------|---------------|----------------|--|
| O         | Y  | Mobberley          | Ardwick               | HSM25         | 2.26           | Includes interchange station option 4C |
| Y         | MP | Ardwick            | Manchester Piccadilly | HSM26         | 2.27           | City centre station                    |
| P         | X  | M56 Jn & Rostherne | Thorn Green           | HSM27         | 2.28           |  |
| H         | Z  | Winterbottom       | Birkin Brook          | HSM28A        | 2.29           |  |
| Z         | Y  | Birkin Brook       | Ardwick               | HSM28B        | 2.30           | Includes interchange station option 4E |
| N         | Z  | Mere               | Rostherne             | HSM29         | 2.31           |  |
| Z         | Q  | Rostherne          | Warburton             | HSM30         | 2.32           |  |
| P         | W  | M56 Jn 7 Rostherne | Carrington            | HSM31A        | 2.33           |  |
| W         | Y  | Carrington         | Ardwick               | HSM31B        | 2.34           |  |
| AE        | AF | Partington         | Mossbrow              | HSM32         | 2.35           |  |
| S         | W  | Little Bollington  | Carrington            | HSM33         | 2.36           |  |
| T         | W  | Broomedge          | Carrington            | HSM34         | 2.37           |  |
| Q         | U  | Warburton          | Winton                | HSM35         | 2.39           | Fast route via M62 corridor            |
| U         | V  | Winton             | M602 Jn 3             | HSM36         | 2.40           |  |
| V         | SM | M602 Jn 3          | Salford Middlewood    | HSM37         | 2.41           | City centre station                    |
| V         | SC | M602 Jn 4          | Salford Central       | HSM38         | 2.42           | City centre station                    |
| Q         | U  | Warburton          | Winton                | HSM39         | 2.43           | Slow route via M62 corridor            |
| Q         | U  | Warburton          | Winton                | HSM40         | 2.44           | Via Chat Moss corridor                 |

Routes north of Manchester and WCML connections



The map opposite shows the routes north of Manchester and WCML connections at Bamfurlong and Brock. The following sections are shown:

| Node From | To | Location From | To           | Route Section | Report Section | Notes                                  |
|-----------|----|---------------|--------------|---------------|----------------|--|
| Q         | R  | Warburton     | Lowton       | HSM21         | 2.21           |  |
| R         | AA | Lowton        | Bamfurlong   | HSM22         | 2.22           | WCML connection                        |
| R         | AB | Lowton        | Brock        | HSM23         | 2.23           |  |
| AC        | AD | Lea           | Woodplumpton | HSM24         | 2.24           | Includes interchange station option 30 |



## 2.1 HSM01: Streethay (A) to Millmeece (B)

### Streethay to Handsacre

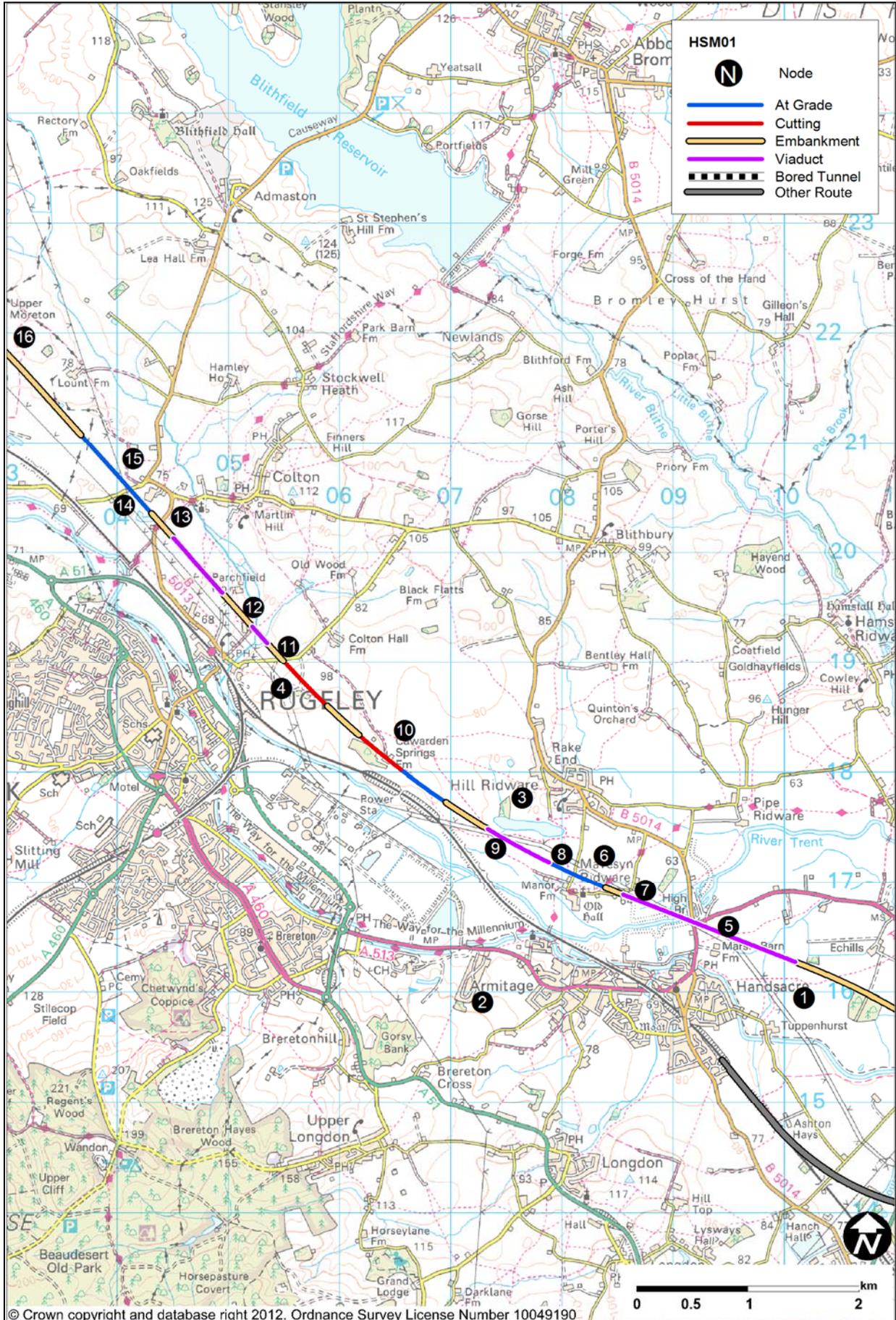
The route to Manchester would commence at the intersection point with the London to West Midlands route 700m north of Streethay and about 300m west of the A38.

The route section between Streethay and Millmeece would be 39.1km long. The design speed between Streethay and Millmeece would be 360kph for the first 7km, then 400kph. The 360kph section results from the need to use a design that allows the route to pass between Handsacre and Hill Ridware.

At this location the route would be on an embankment with a maximum height of 14m until just north of the crossing over the A38 **(1)**, then reducing to a height of 2m just before Fradley Wood. Wood End Lane **(2)** would be realigned onto a bridge over the route. The route would then rise, passing through Fradley Wood **(3)** to cross over the Trent and Mersey Canal **(4)** and Curborough Brook **(5)**. The crossing of the Curborough Brook flood plain would be on a 65m long viaduct with a height of 8m.

The route would then return to ground level, rising again to pass over Ashby Stitch (watercourse) **(6)**. Common Lane **(7)** would be closed at the crossing point and diverted for 500m from Barn Farm to the A515. The route would cross over the A515 **(8)**. The route would then cross the Bourne Brook flood plain on a 615m long viaduct with an average height of 8m. The route would pass through the route of overhead power lines **(9)**. Shaw Lane **(10)** would be closed at the crossing point and diverted for 600m to the A515.

West of Bourne Brook the route would be on an 8m high embankment, skirting New Plantation **(11)** and rising towards the River Trent at Handsacre.



### Handsacre to Upper Moreton

The route would pass between Handsacre **(1)**/Armitage **(2)** and Hill Ridware **(3)** and broadly continue to the east of overhead power lines **(4)** on the east side of Rugeley. The route is positioned to minimise impacts on these communities

The River Trent flood plain would be crossed on a 1.7km long viaduct rising to a maximum height of 11m (average height 7m). The route would also cross over the A513 **(5)** and pass through the route of overhead power lines on this viaduct.

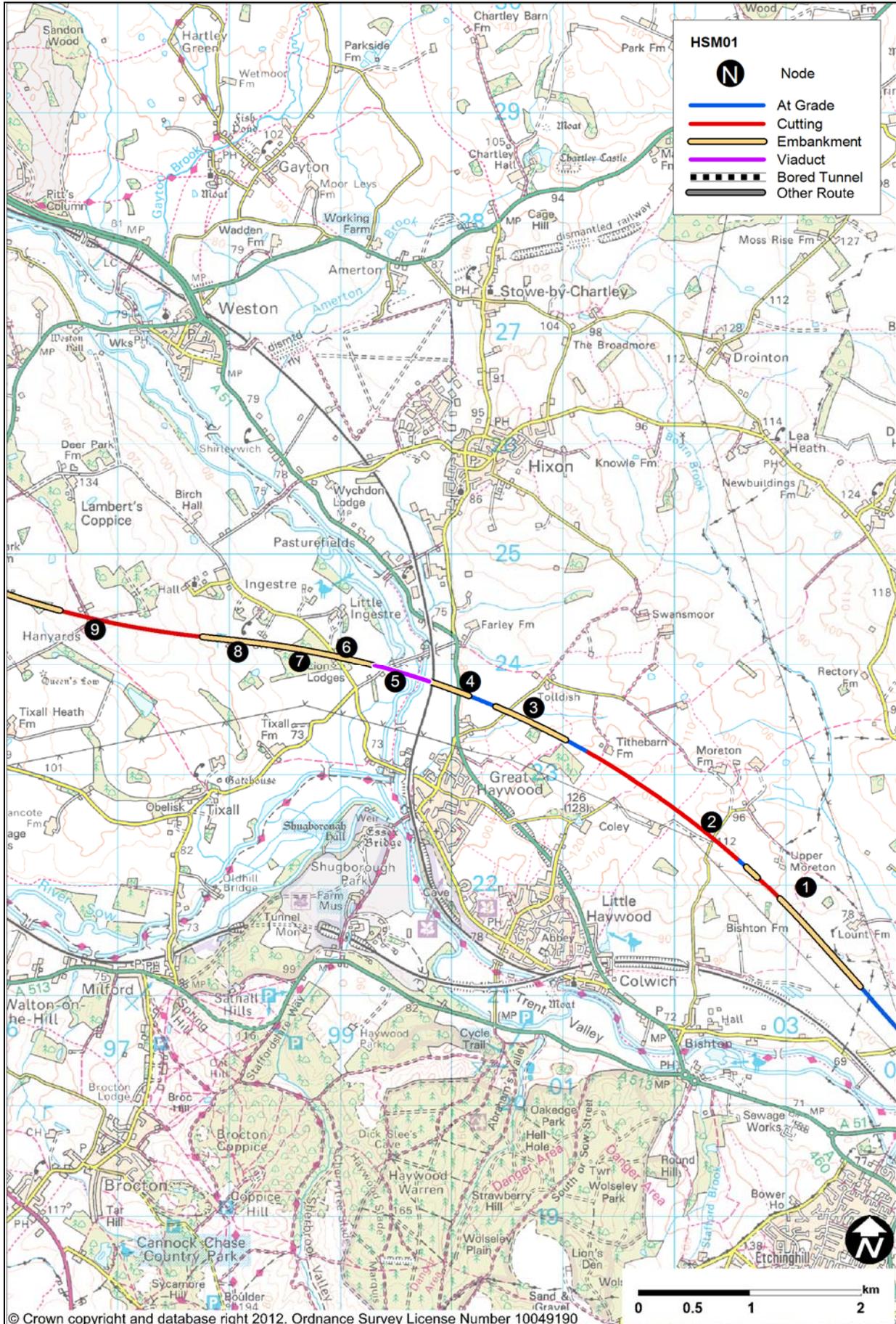
In seeking to minimise impacts on Handsacre, Armitage and Hill Ridware the route would pass to the north of Mavesyn Ridware **(6)**. The route would be at ground level and would require the first crossing **(7)** of Church Lane to be closed and the second crossing **(8)** to be realigned onto a new bridge over it.

The route would rise to cross another section of flood plain on a 640m long viaduct with a maximum height of 7m (average height 4m), which would also pass through the route of overhead power lines **(9)**.

The route would follow the hillside on embankments up to 4m high and then on the surface up to Cawarden Springs Farm **(10)**, followed by a cutting with a maximum depth of 4m. It would then cross a small valley on a 70m long viaduct (maximum height 15m) before entering a short cutting up to 10m deep.

The route would descend in the cutting passing through a historic landfill site and then crossing Blithbury Road **(11)**, which would be realigned for 750m onto a bridge over the route. A 195m long viaduct (maximum height 7m) over Moreton Brook **(12)** would be followed by a short section on embankment, then a 640m long viaduct over a flood plain (with an average height of 2m).

The B5013 (Colton Road) **(13)** would be closed and diverted for 500m to Bellamour Lane **(14)** on the south side of the route. Bellamour Lane would be realigned onto a bridge over the route. The route would pass again through the overhead power lines **(15)**. The route would follow the ground profile passing through a historic landfill site and then be on two embankments up to 5m high towards Upper Moreton **(16)**

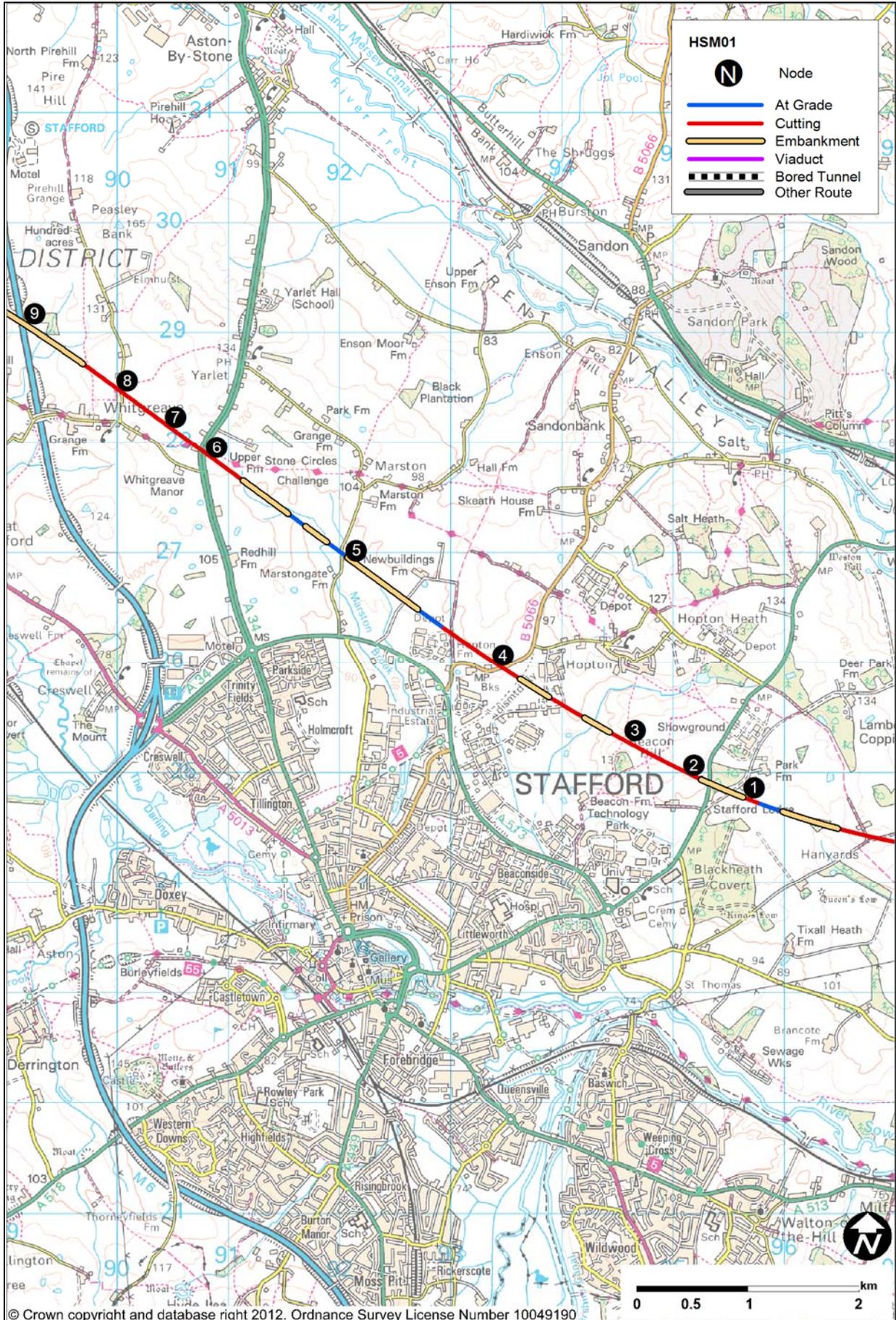


### **Upper Moreton to Hanyards**

From Upper Moreton **(1)** the route would follow the ground profile for the next 3km with a series of cuttings up to 7m deep and embankments up to 4m high. Bishton Lane **(2)** would be realigned to pass over the route. Tolldish Lane **(3)** would be closed at the crossing and diverted for 560m on the north side of the route to join the A51.

The route would cross the Trent Valley north of Great Haywood on an embankment up to 12m high, with the flood plain crossed on a 510m long viaduct with a maximum height of 12m. The route would cross over the A51 **(4)**, the railway line to Stoke-on-Trent, the Trent and Mersey Canal, the River Trent, Hoomill Lane **(5)** and Trent Lane **(6)**, passing through Lionlodge Covert **(7)** and Ingestre Park Golf Course **(8)** as it ascends the hill.

The route would then pass into a 16m deep cutting and under Hanyards Lane **(9)**.

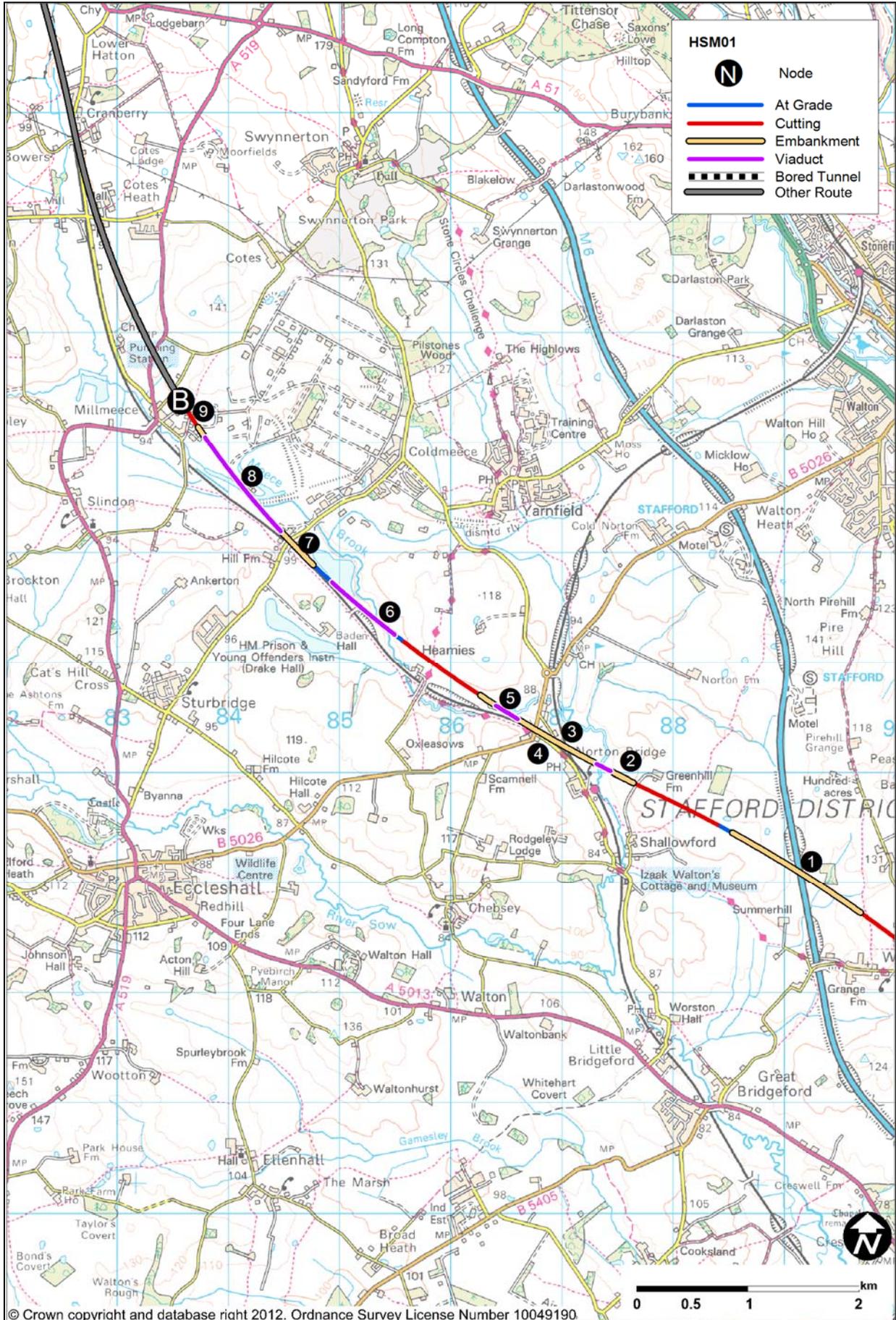


### **Hanyards to M6**

After a short section of embankment (up to 3m high) and then ground level the route would cross over Trent Walk **(1)** and the A518 **(2)** on an embankment 10m high and then pass into a 21m deep cutting descending through Beacon Hill **(3)**. The route would then pass between Hopton and MOD Stafford. The B5066 **(4)** would be realigned onto bridge over the route.

After passing through a historic landfill site in short cutting with a maximum depth of 10m, the route would be close to ground level on low embankments (up to 3m high) through an area of peat for the next 2km, with Marston Lane **(5)** realigned onto a bridge over the route. It would then pass under the A34 **(6)**, through a historic landfill site in a 7m deep cutting past Whitgreave **(7)** and under Green Lane, which would be realigned onto a bridge over the route **(8)**.

The route would then rise onto embankment with a maximum height of 13m, crossing over the M6 **(9)**,



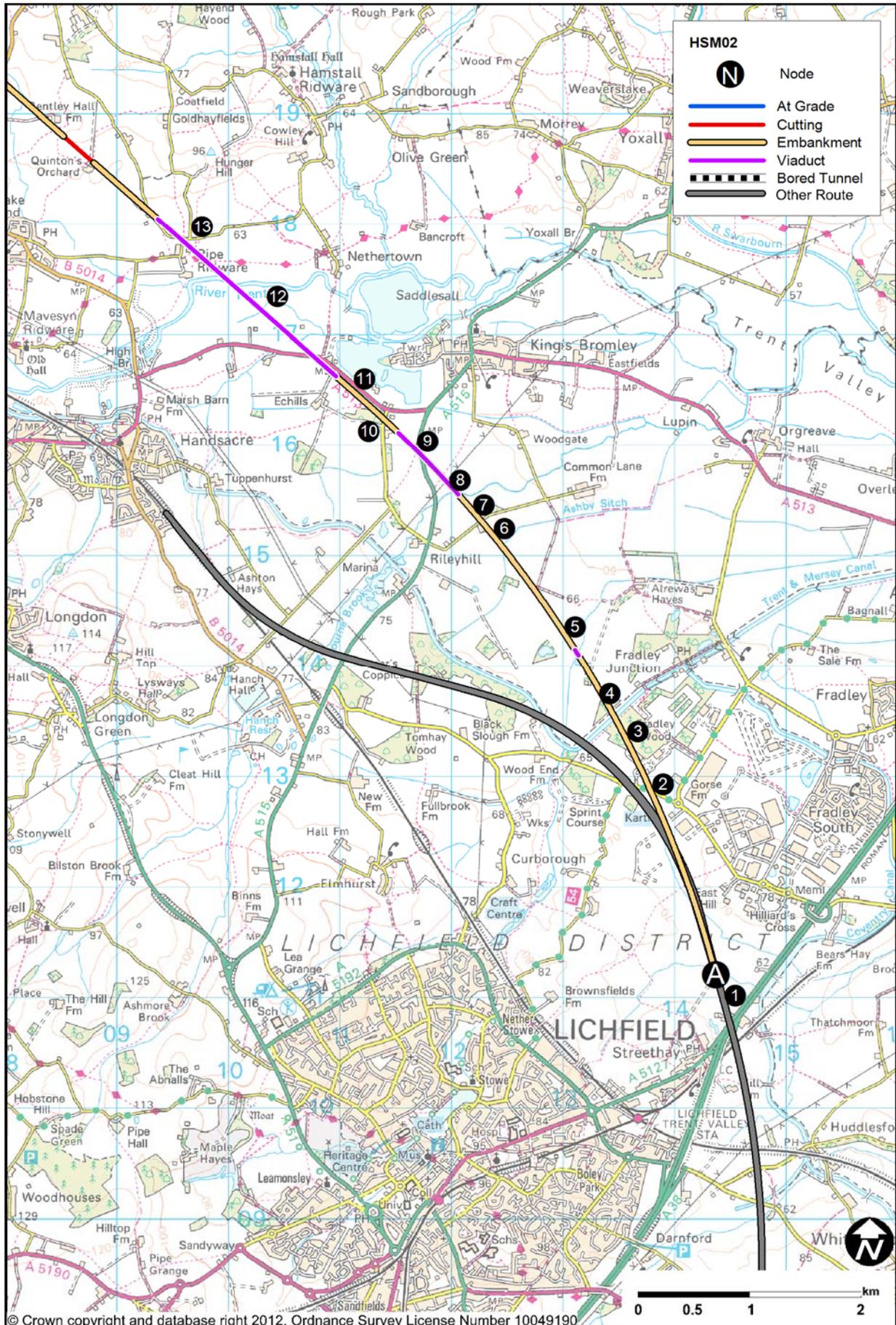
### **M6 to Millmeece**

After the crossing of the M6 **(1)** the route would be in a shallow cutting before crossing over the Meece Brook **(2)** flood plain on a 155m long viaduct with a maximum height of 12m. It would then be on an embankment (maximum height 8m) before crossing the Norton Bridge to Stone railway line at Norton Bridge **(3)**. Smithy Lane would be closed at the crossing. The B5026 **(4)** would be realigned to the west onto a bridge that would cross over both the route and the West Coast Main Line railway (WCML). Stabilisation of and support to the WCML would be required.

The route would again cross the Meece Brook **(5)** on a 250m long viaduct with a maximum height of 8m and run in a shallow cutting on the side of a hill at Heamies before crossing the Meece Brook **(6)** for a third time on a 735m long viaduct at a height of 4m.

The route would run alongside and at the same height as the WCML for 500m with the road at Badenhall **(7)** realigned onto a bridge, which would cross over both the route and the existing railway. It would then cross the Meece Brook on an 890m long viaduct at a height of 3m **(8)** and pass into a cutting at Millmeece. Old Hall Lane **(9)** would be closed.

At Millmeece the route would continue north either along section HSM04 to Madeley or HSM05 to Shrayleybrook.



## 2.2 HSM02: Streethay (A) to Swynnerton (C)

### Streethay to Handsacre

The route to Manchester would commence at the intersection point with the London to West Midlands route 700m north of Streethay and about 300m west of the A38.

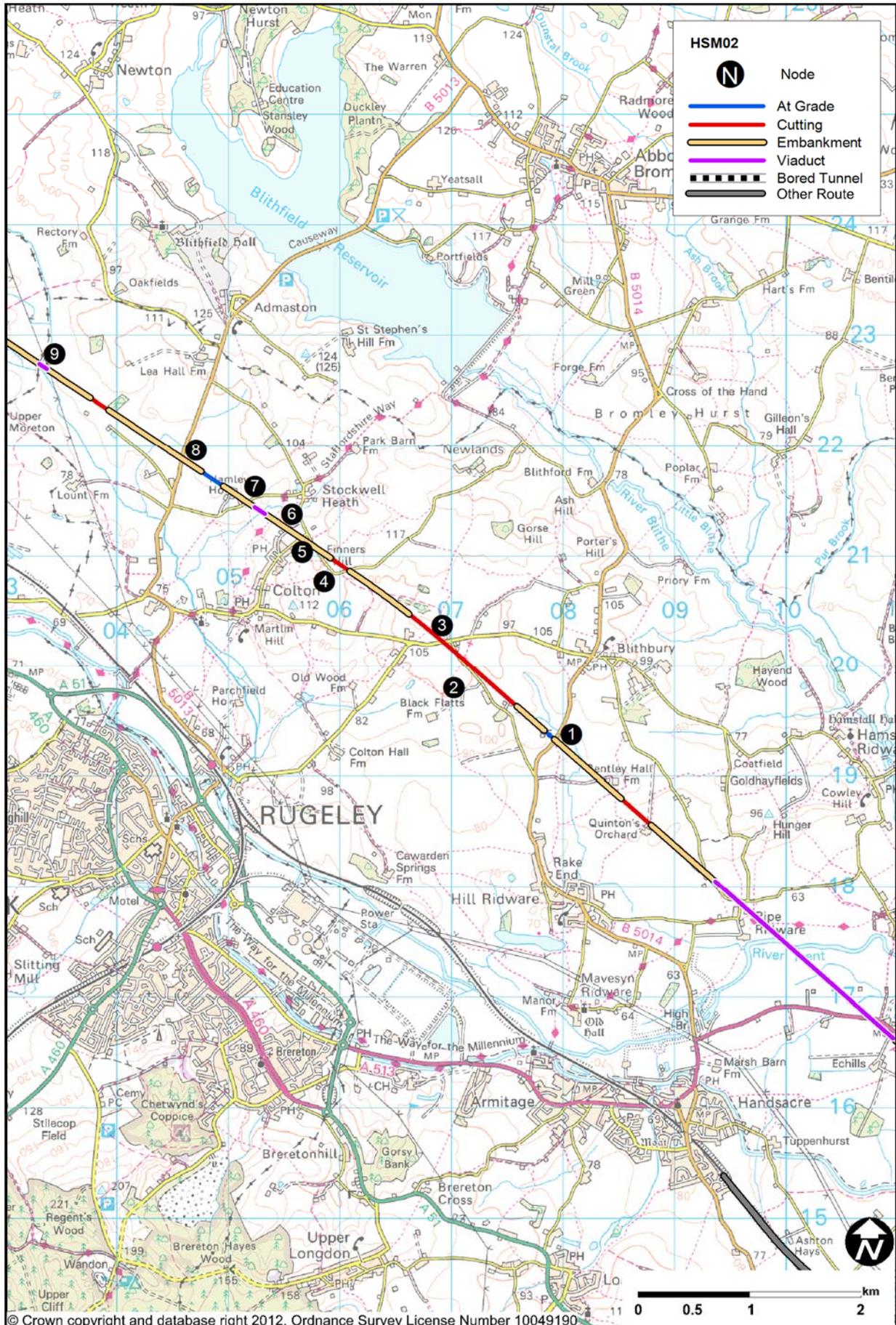
The route section between Streethay and Swynnerton would be 40.2km long, with a design speed of 400kph.

At this location the route would be on an embankment with a maximum height of 14m until just north of the crossing over the A38 **(1)**, then reducing to a height of 8m in Fradley Wood. The route would cross over Wood End Lane **(2)**. The route would then descend, passing through Fradley Wood **(3)** and Brokendown Wood to cross over the Trent and Mersey Canal **(4)** and Curborough Brook **(5)**. The crossing of the Curborough Brook flood plain would be on a 50m long viaduct with a height of 9m.

The route would then run on an embankment with an average height of 5m and pass over Ashby Stitch watercourse **(6)**. Common Lane **(7)** would be closed. The route would then cross Bourne Brook flood plain **(8)** on a 790m long viaduct with an average height of 6m. The viaduct would pass through the route of overhead power lines. The A515 **(9)** would be diverted for 1.6km onto a bridge over the route.

West of Bourne Brook the route would continue on a 6m high embankment. Shaw Lane **(10)** would be diverted to avoid the route and tie in to the A513. The route would pass through Tomlinson's Spinney and Little Spinney. The A513 **(11)** would be diverted in this area for 900m to run on the west side of the route from the A515 to avoid crossing the route.

The route would cross the River Trent flood plain **(12)** and Pipe Lane on a 2.1km long viaduct with a maximum height of 8m (average height 7m). A section of Pipewood Lane **(13)** immediately north of Pipe Ridware would be diverted for 750m to be on the east side of the route to avoid crossing it.

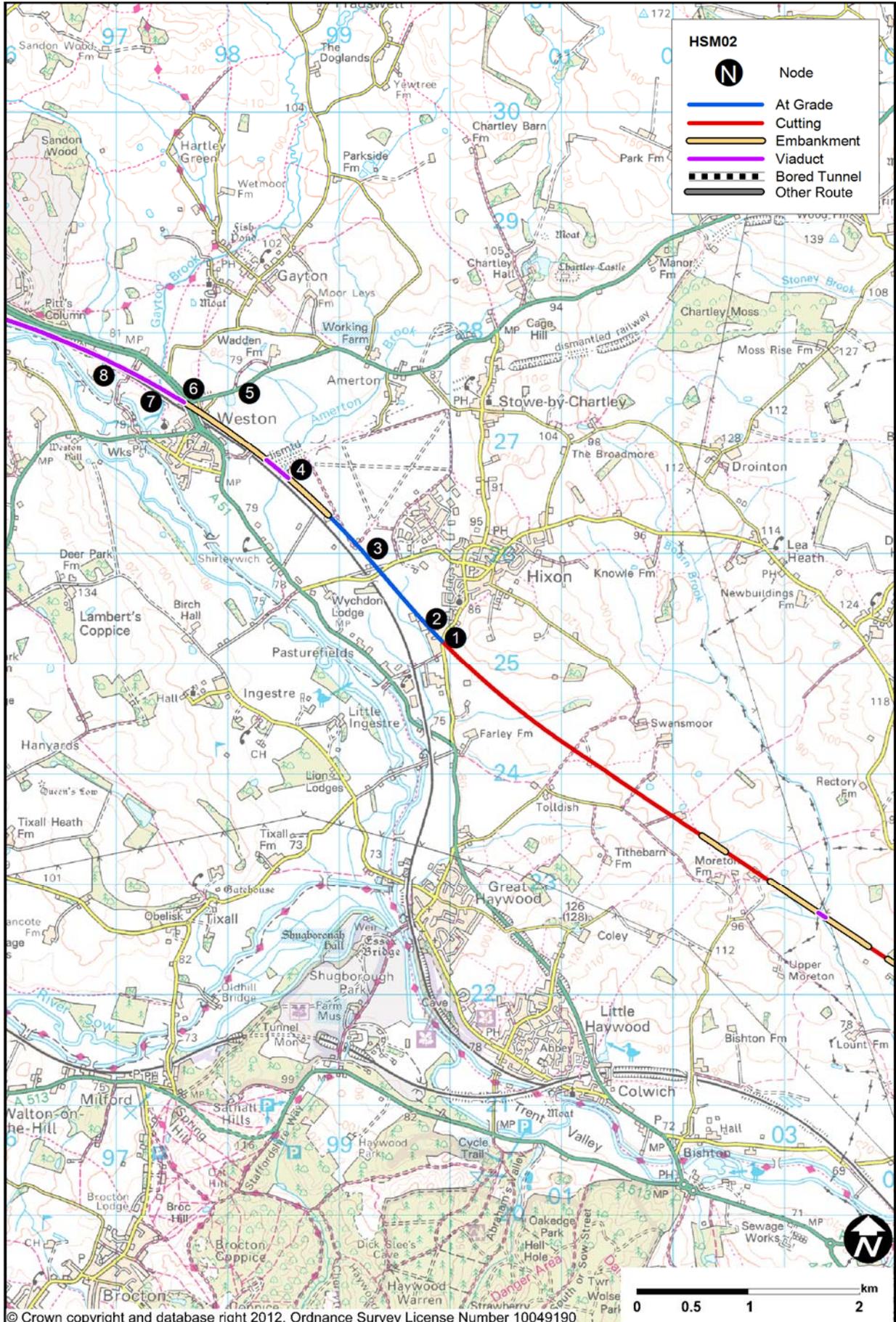


### Handsacre to Upper Moreton

The route would then follow the ground profile for 3km with a series of embankments up to 8m high and cuttings up to 4m deep, passing through a historic landfill site north-west of Pipe Ridware. The B5014 **(1)** would be realigned onto a bridge over the route. Stonyford Lane **(2)** would be diverted for 400m to Blithbury Road to avoid crossing the route. Blithbury Road **(3)** would be realigned to the south-east onto a bridge over the route.

The route would then cross a small valley on an embankment at a height of 15m. Newlands Lane **(4)** would be diverted for 800m to run on the north side of the route to avoid crossing it. The route would pass between Colton and Stockwell Heath on an embankment with a maximum height of 9m. The route would pass over High Street **(5)** and Narrow Lane **(6)** would be closed.

The route would cross a valley on an 115m long viaduct with a height of 16m. Moor Lane **(7)** would be realigned to cross under the viaduct. The route would then descend towards Moreton Brook mostly on embankments (up to 7m high) passing over the B5013 **(8)**, which would be realigned. The route would pass through overhead power lines. The route would cross the Moreton Brook **(9)** flood plain on an 85m long viaduct at a height of 8m.

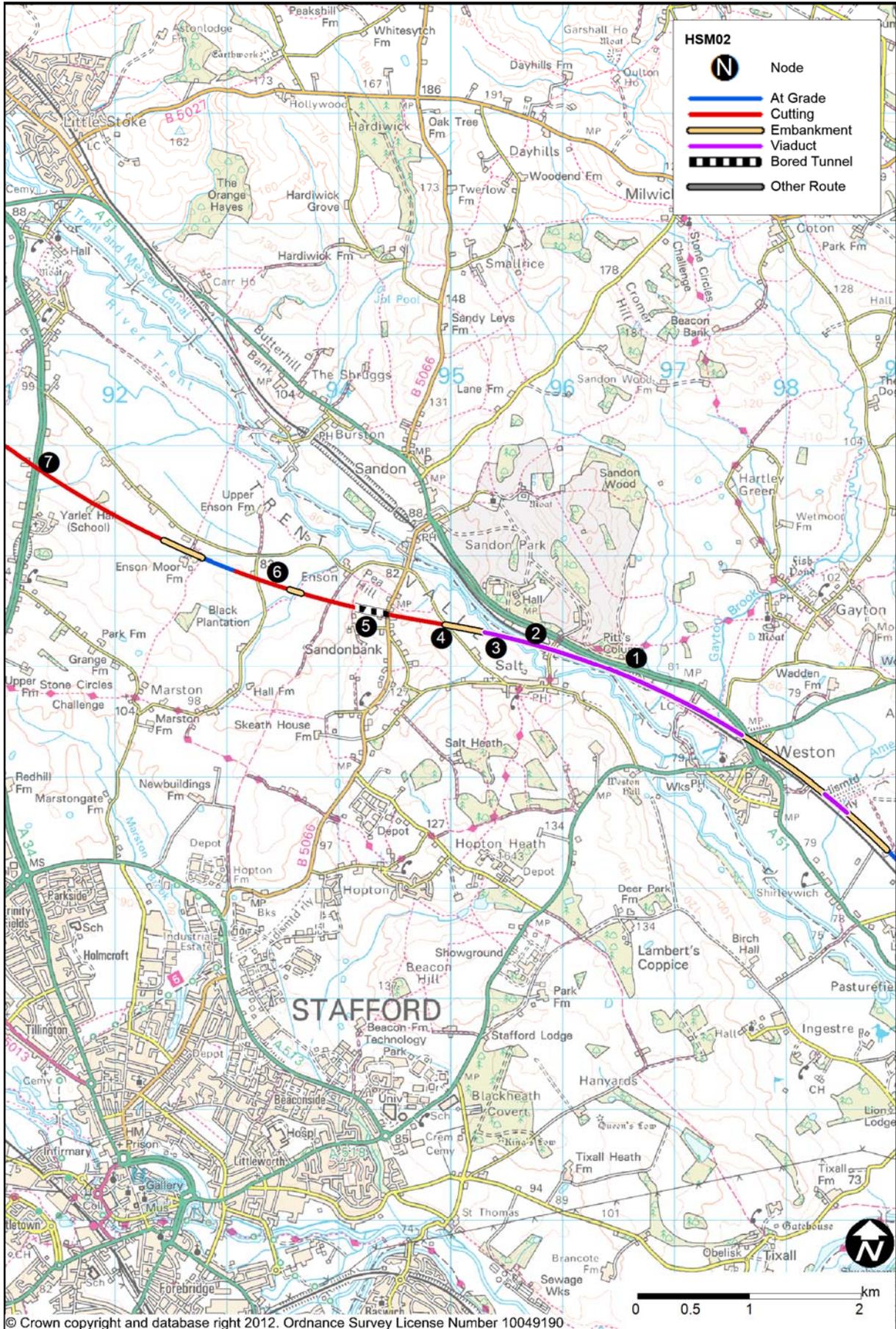


### Upper Moreton to Weston

For the next 4km the route would follow the ground profile with embankments up to 7m high and cuttings up to 7m deep. A cutting 14m deep would be required where the route passes along the side of the hill south of Hixon, with Church Lane **(1)** being realigned onto a bridge over the route.

The route would run on the surface passing through the Hixon Industrial Estate **(2)** and the edge of the airfield. New Road **(3)** would be realigned onto a bridge that would cross over both the route and the railway line to Stoke-on-Trent. The route would run alongside the railway line within 100m for 4.4km.

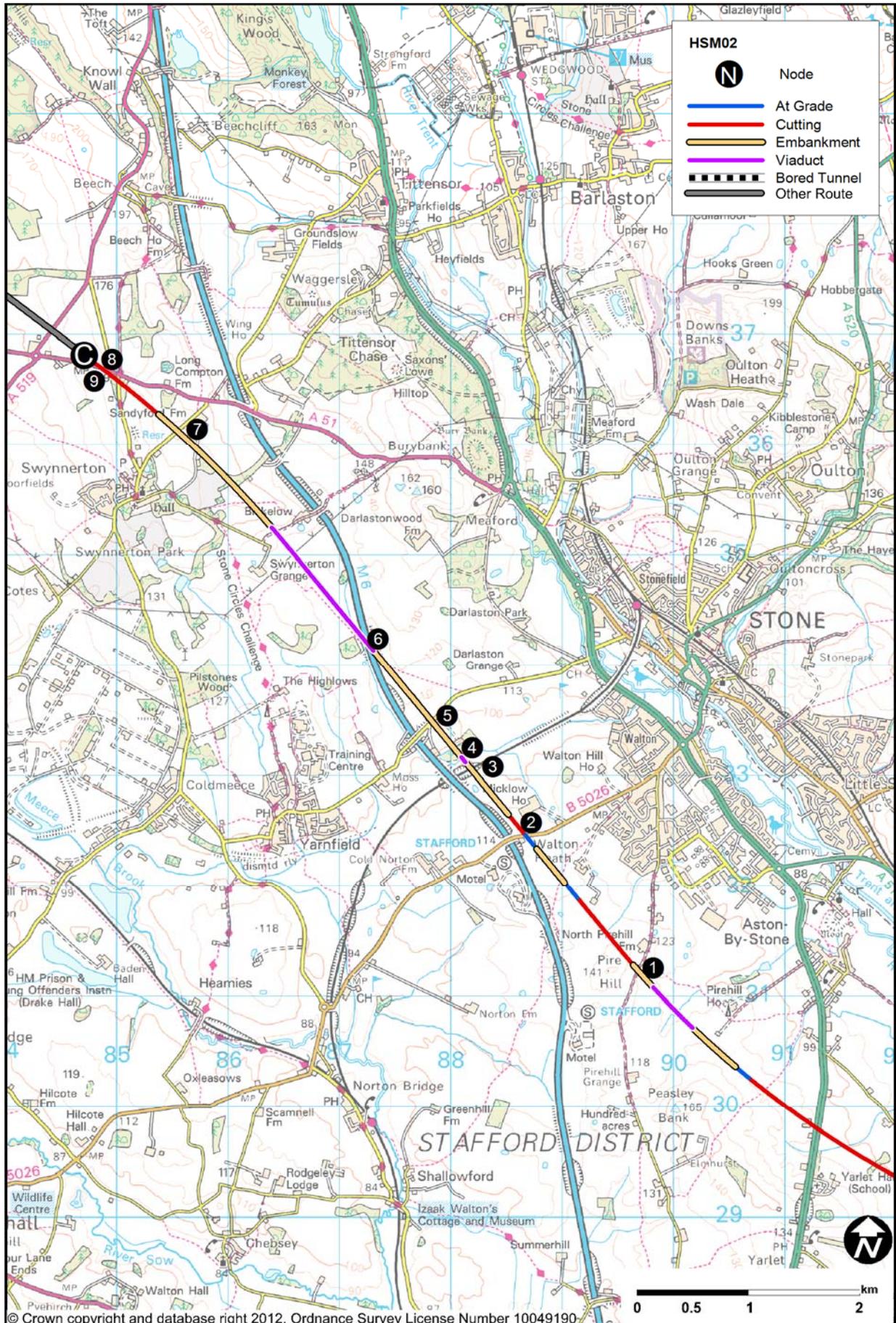
The route would rise onto a 365m long viaduct with a maximum height of 11m over the Amerton Brook **(4)** flood plain and the dismantled railway followed by a 13m high embankment. At Weston the route would be on the east side of the railway line to Stoke-on-Trent with the A518 **(5)** diverted for 700m to the north and the junction with the A51 moved away from the route to improve junction visibility. The adjoining access road would be closed. The route would then pass onto a 945m long viaduct with a maximum height of 12m (average height 9m) crossing the A51 **(6)**, the Gayton Brook **(7)** flood plain and Sandy Lane **(8)**.



### Weston to A34

The route would continue to run next to the railway line to Stoke-on-Trent and approach the A51 **(1)**. It would require to be carried on a 6m high embankment supported on one or both sides by retaining walls. The route would then transfer onto an 815m long viaduct with an average height of 7m. Due to the skew crossing angle, the viaduct structure would require to be supported on portal frames over part of its length where it spans across the existing railway and the Trent and Mersey canal **(2)**. The viaduct would also cross the flood plain of the River Trent **(3)**. Extensive temporary works would be required together with stabilisation of existing structures and earthworks to maintain the railway and the A51 during construction.

The route would move onto a 6m high embankment with Trentfield Lane **(4)** realigned onto a bridge over it. The route would then run in a deep cutting (maximum depth 18m), passing into a 315m long single bore tunnel under Sandonbank and the B5066 **(5)**. A further section of cutting would follow the tunnel, with the route then following the ground profile for the next 3km on low embankments (up to 2m high) or shallow cuttings (up to 6m deep). Marston Lane **(6)** would be realigned onto a bridge over the route. The route would pass over an area of mudstone with soluble deposits (risk of subsidence from dissolution) and then under the A34 **(7)**.



### **A34 to Swynnerton**

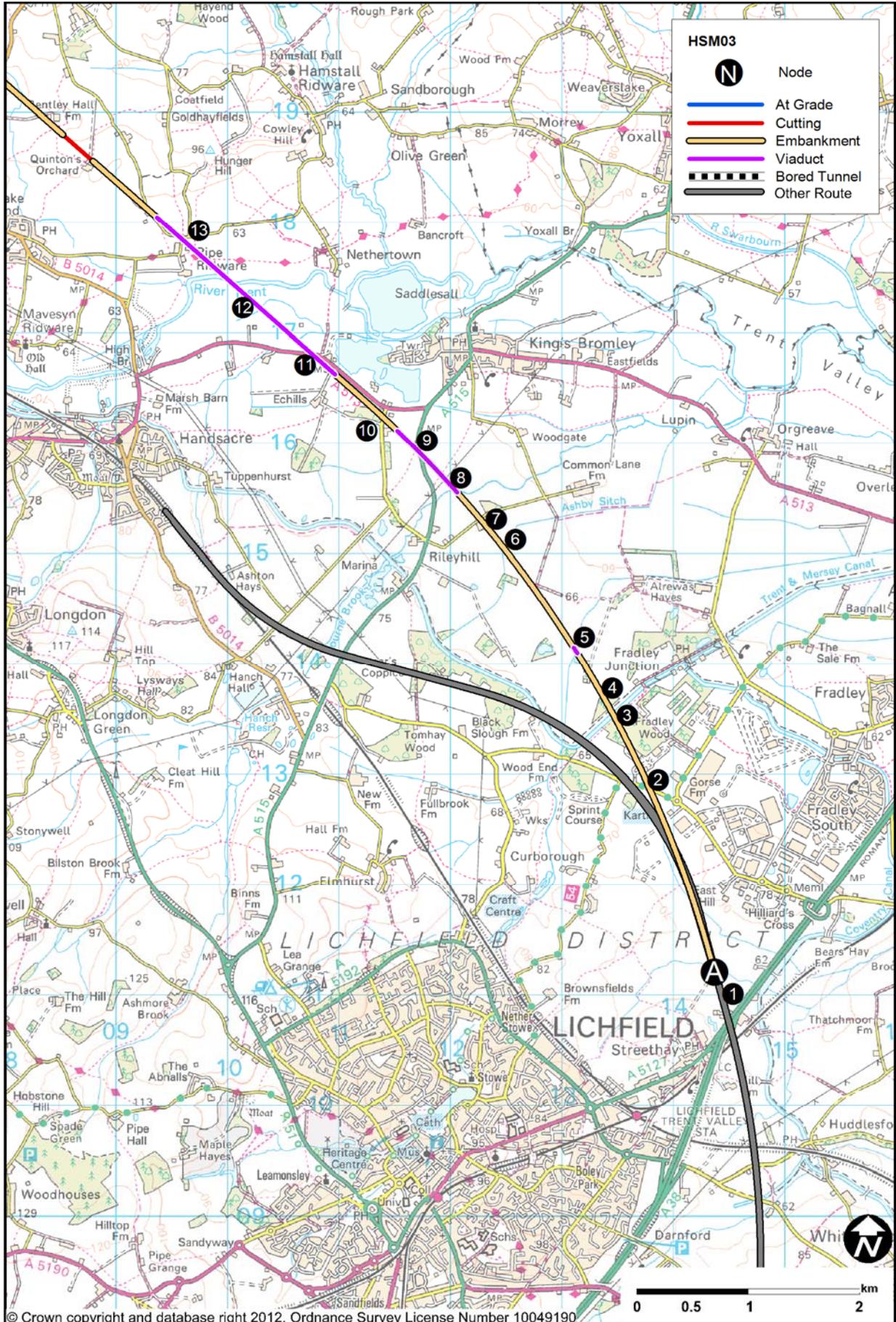
The route would be in a cutting (up to 10m deep) and would then move onto an embankment (maximum height 15m) before crossing a valley on a 510m long viaduct with a maximum height of 23m (average height 19m).

Pirehill Lane **(1)** would be realigned to pass under the route, which would then follow the slope down towards Filley Brook either in shallow cuttings (up to 4m deep) or at ground level. The B5026 (Eccleshall Road) **(2)** would be realigned onto a bridge over the route and the M6.

For the next 3km the route would run within 200m of the M6. The route would be on embankment (up to 11m high) crossing over the Norton Bridge to Stone railway **(3)** and then the Filley Brook **(4)** flood plain on a 60m long viaduct with a height of 11m. The route would pass through a historic landfill site. Yarnfield Lane **(5)** would be realigned onto a bridge over the route and the M6.

The route would rise on embankment crossing a flood plain and the M6 **(6)** and through the route of overhead power lines on a 1.4km long viaduct with a maximum height of 24m (average height 18m). An embankment (up to 10m high) would follow with the route passing over the road **(7)** between the A51 and Swynnerton and then into a deep cutting (maximum depth 19m). The route would pass under the A51 **(8)** and Bottom Lane **(9)** would be diverted for 600m to avoid crossing the route.

At Swynnerton the route would continue north either along section HSM06 to Madeley or HSM07 to Shrayleybrook.



## 2.3 HSM03: Streethay (A) to Swynnerton (C)

### Streethay to Handsacre

The route to Manchester would commence at the intersection point with the London to West Midlands route 700m north of Streethay and about 300m west of the A38.

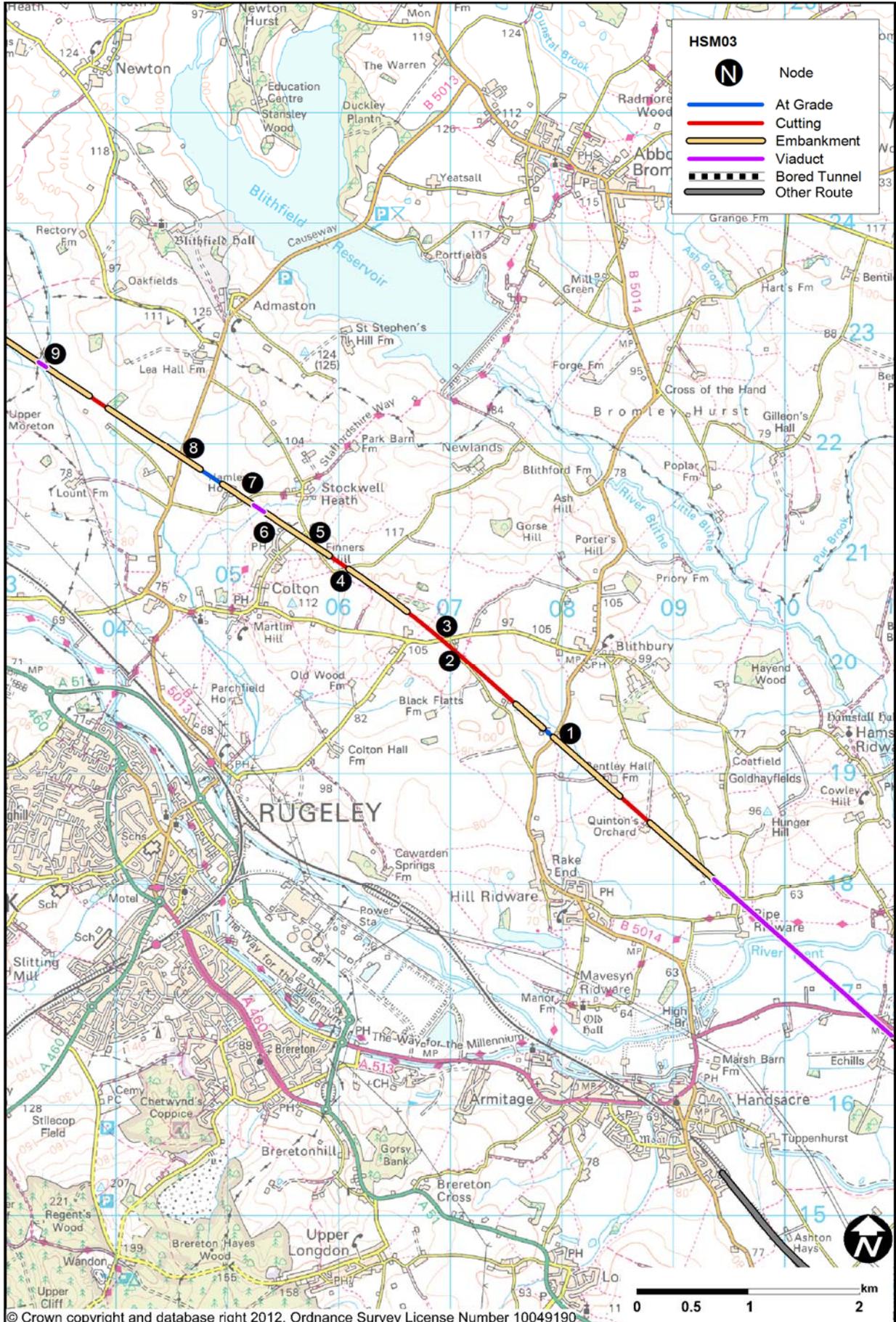
The route section between Streethay and Swynnerton would be 40.0km long with a design speed of 400kph

At this location the route would be on an embankment with a maximum height of 14m until just north of the crossing over the A38 **(1)**, then reducing to a height of 8m in Fradley Wood. The route would cross over Wood End Lane **(2)**. The route would then fall, passing through Fradley Wood and Brokendown Wood to cross over the Trent and Mersey Canal **(4)** and Curborough Brook **(5)**. The crossing of the Curborough Brook flood plain would be on a 50m long viaduct with a height of 9m.

The route would then run on an embankment with an average height of 5m and pass over Ashby Stitch watercourse **(6)**. Common Lane **(7)** would be closed. The route would then cross Bourne Brook flood plain **(8)** on a 790m long viaduct with an average height of 6m. The viaduct would pass through the route of overhead power lines. The A513 **(9)** would be diverted for 1.65km onto a bridge over the route.

West of Bourne Brook the route would continue on a 6m high embankment. Shaw Lane **(10)** would be diverted to avoid the route and tie in to the A513. The route would pass through Tomlinson's Spinney and Little Spinney. The A513 **(11)** would be diverted in this area for 900m to run on the west of the route from the A515 to avoid crossing the route.

The route would cross the River Trent flood plain **(12)** and Pipe Lane on a 2.1km long viaduct with a maximum height of 8m (average height 7m). A section of Pipewood Lane **(13)** immediately north of Pipe Ridware would be diverted for 750m to be on the east side of the route to avoid crossing it.

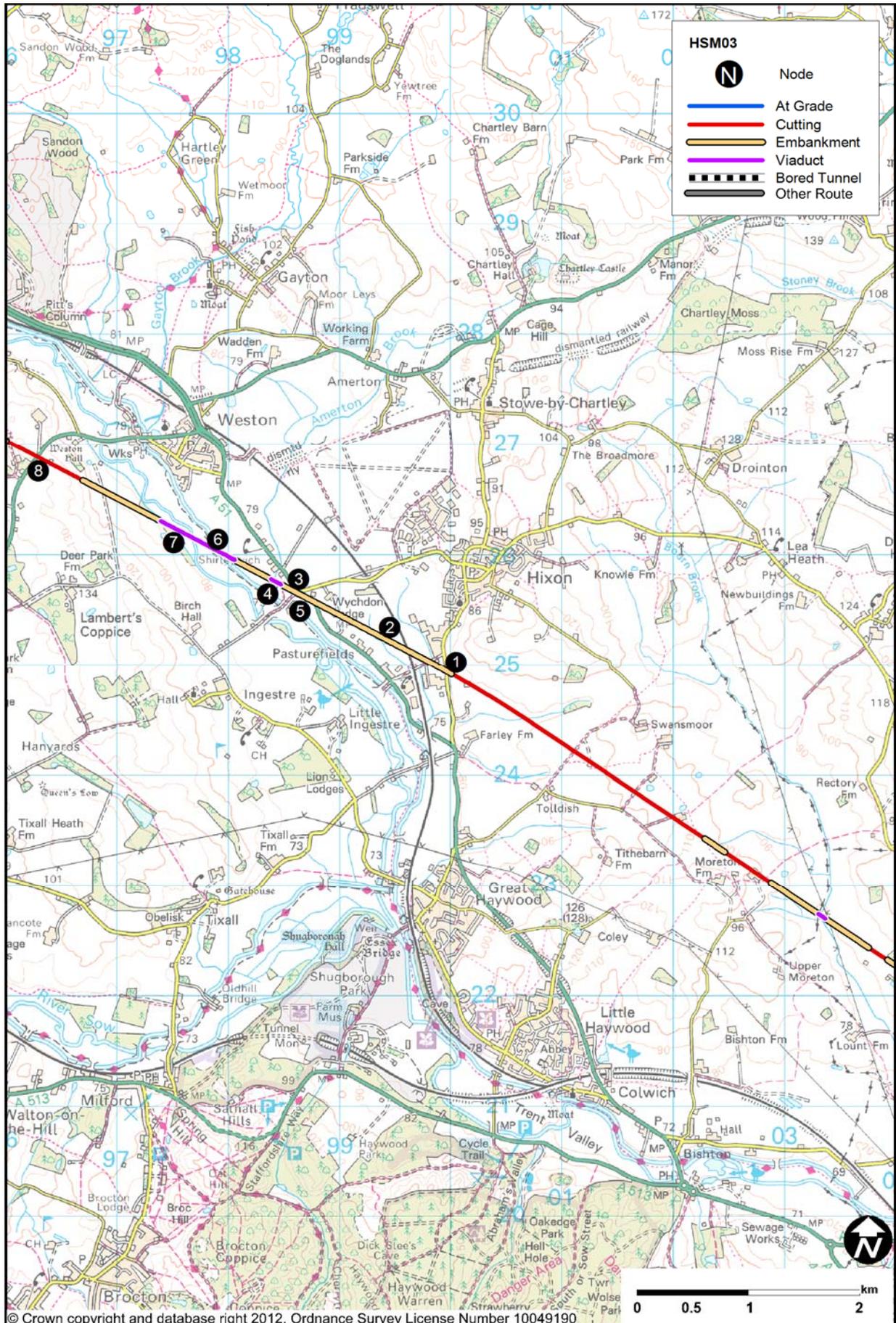


### Handsacre to Upper Moreton

The route would then follow the topography for 3km with a series of embankments up to 8m high and cuttings up to 4m deep, passing through a historic landfill site north-west of Pipe Ridware. The B5014 **(1)** would be realigned onto a bridge over the route. Stonyford Lane **(2)** would be diverted for 400m to Blithbury Road to avoid the route. Blithbury Road **(3)** would be realigned to the south east onto a bridge over the route.

The route would then cross a small valley on an embankment with a maximum height of 15m. Newlands Lane **(4)** would be diverted for 800m to run on the north side of the route to avoid crossing it. The route would pass between Colton and Stockwell Heath on an embankment with a maximum height of 9m. The route would pass over High Street **(5)** and Narrow Lane **(6)** would be closed.

The route would cross a valley on a 115m long viaduct with a height of 19m. Moor Lane **(7)** would be realigned to cross under the viaduct. The route would then descend towards Moreton Brook mostly on embankments (up to 7m high) passing over the B5013 **(8)**. The route would pass through overhead power lines. The route would cross the Moreton Brook **(9)** flood plain on a 70m long viaduct at a height of 8m.

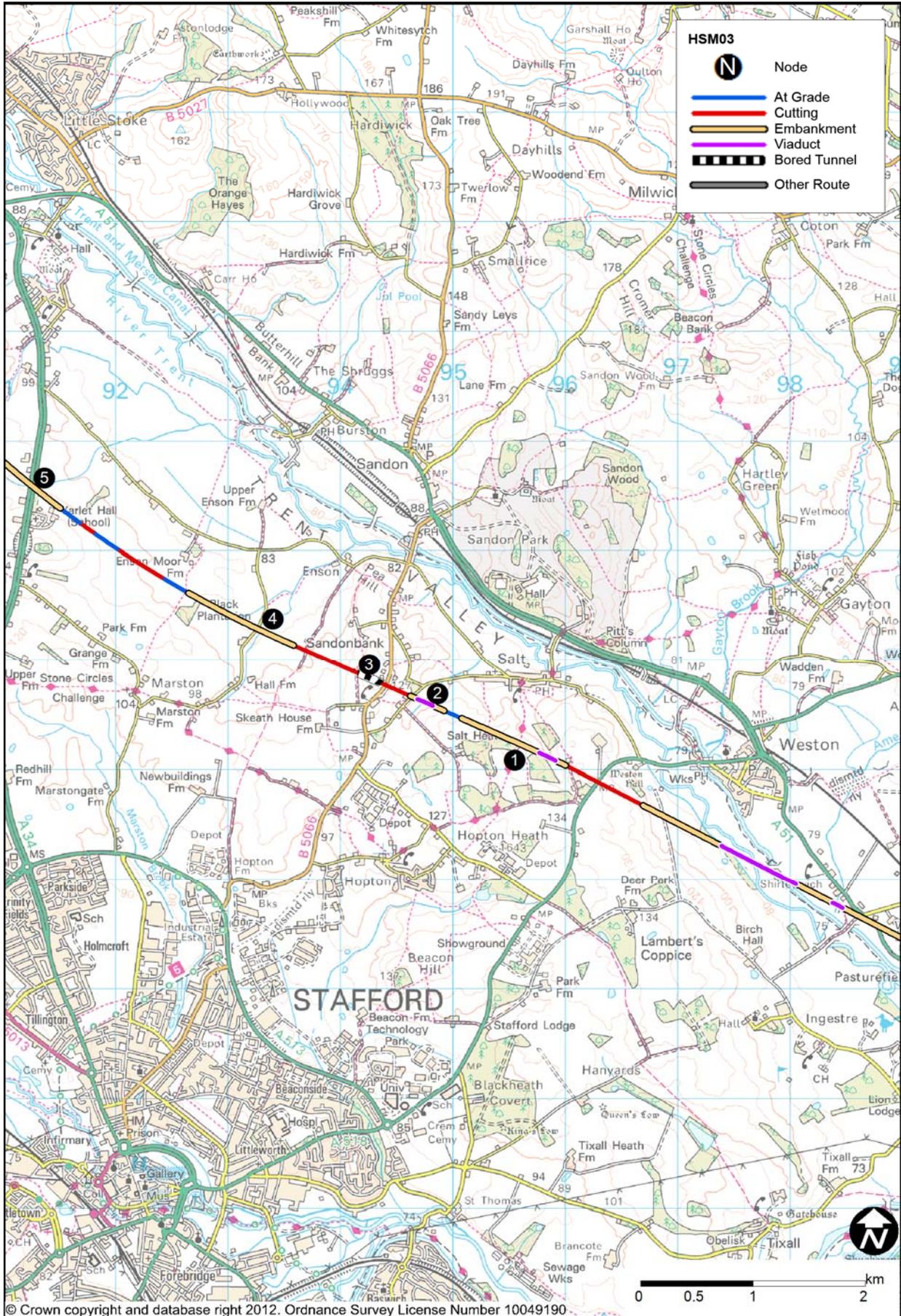


### Upper Moreton to Weston

For the next 4km the route would follow the topography with embankments up to 7m high and cuttings up to 9m deep. Church Lane **(1)** at Hixon would be realigned onto a bridge over the route.

The route would rise on an embankment up to 10m high passing between Hixon Industrial Estate and Pasturefields Enterprise Area then crossing over the railway line **(2)** to Stoke-on-Trent and the A51 **(3)**. The Amerton Brook **(4)** flood plain would be crossed on an 80m long viaduct (height 9m). Pasturefields Lane would be diverted for 200m to Church Lane. Trent Lane and New Road would be realigned **(5)** to avoid the route and tied in to the A51.

The route would cross the Trent and Mersey Canal **(6)** and the River Trent **(7)** flood plain on a 595m viaduct with a maximum height of 12m (average height 9m) followed by an embankment (maximum height 13m) then passing into a 15m deep cutting and under the A518 **(8)**.

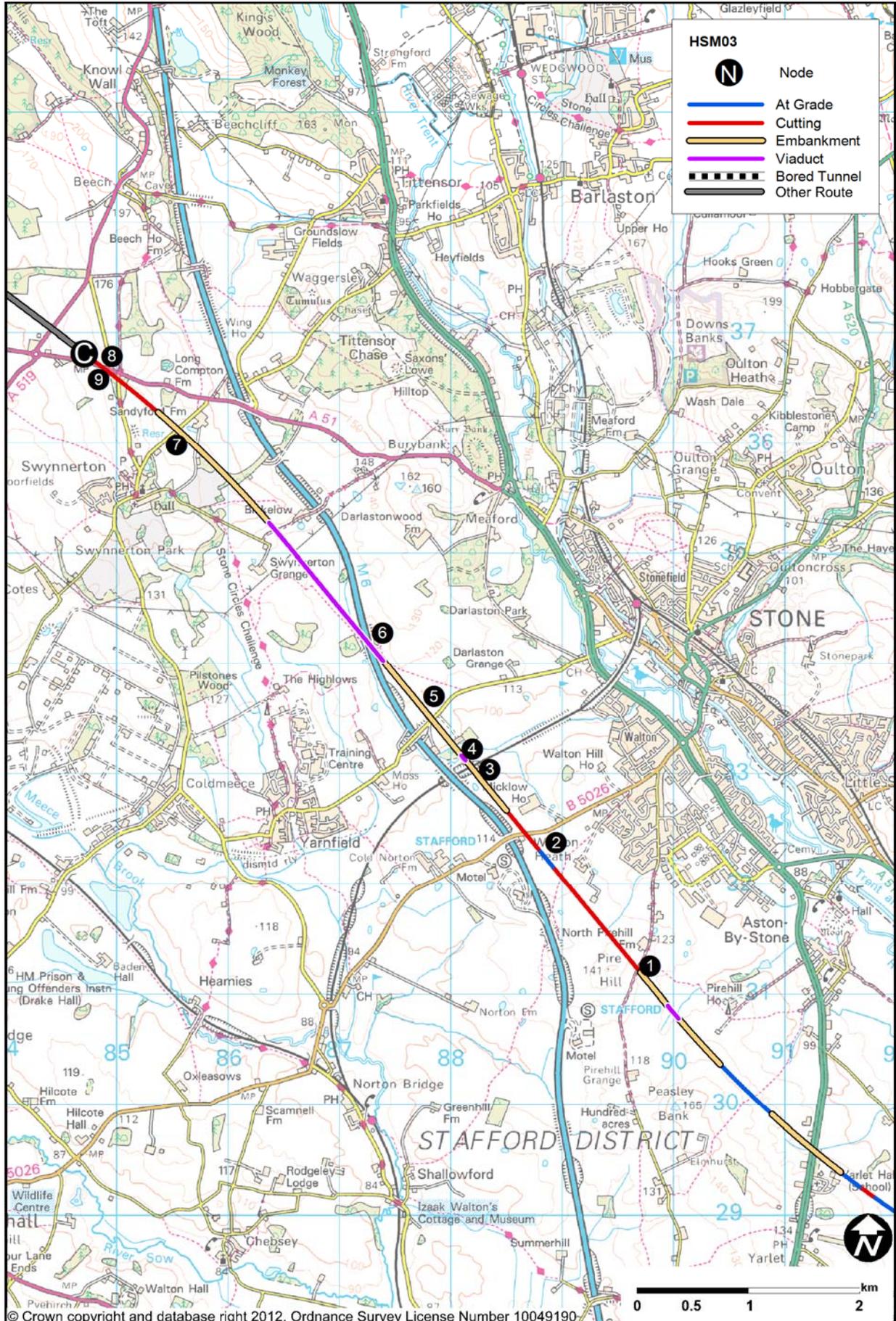


### **Weston to A34**

Over the next 1.5km the route would mostly be on an embankment (maximum height of 14m) with two viaducts, both 160m long with maximum heights of 16m. It would pass to the north of the Hopton Heath battlefield **(1)**. Salt Road **(2)** would be closed.

The route would pass into a deep cutting with a maximum depth of 25m, passing under the B5066 **(3)** south of Sandonbank. The route would then follow the ground profile for the next 3km with a low embankment (up to 5m high) and a shallow cutting (up to 3m deep). The route would pass over Marston Lane **(4)**, which would be realigned.

The route would then run on the surface for 1km before rising onto embankment (up to 13m high), over an area of mudstone with soluble deposits (risk of subsidence from dissolution), to pass over the A34 **(5)**.



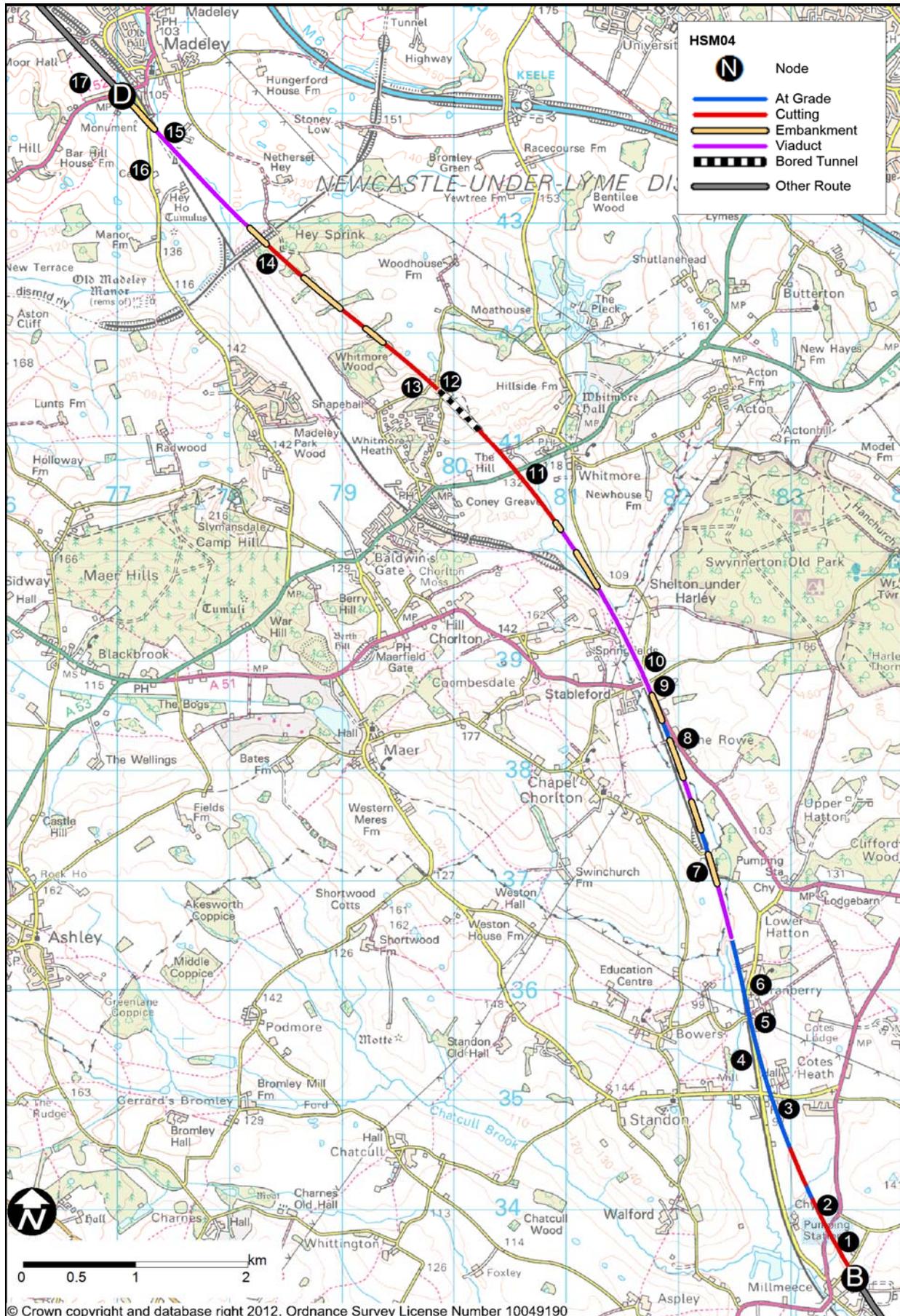
### **A34 to Swynnerton**

The route would run on the surface before moving onto an embankment (maximum height 16m). It would then pass onto a 155m long viaduct with a maximum height of 16m to cross a valley. Pirehill Lane **(1)** would be realigned onto a bridge over the route. The route would then follow the slope down towards Filley Brook in a cutting (up to 11m deep). Eccleshall Road (B5026) **(2)** would be realigned onto a bridge over the route and the M6.

The route would be on embankment (up to 13m high) and run within 200m of the M6 for 2.6km, crossing over the Norton Bridge to Stone railway **(3)** and then the Filley Brook **(4)** flood plain on a 45m long bridge with a height of 13m. The route would pass through a historic landfill site. Yarnfield Lane **(5)** would be realigned onto a bridge over the route and the M6.

The route would rise on embankment crossing a flood plain and the M6 **(6)** and through the route of overhead power lines on a 1.6km long viaduct with a maximum height of 26m (average height 20m). An embankment (up to 10m high) would follow with the route passing over the road **(7)** between the A51 and Swynnerton and then into a deep cutting (maximum depth 19m). The route would pass under the A51 **(8)** and Bottom Lane **(9)** would be diverted for 600m to avoid crossing the route.

At Swynnerton the route would continue either along section HSM06 to Madeley or HSM07 to Shrayleybrook.



## 2.4 HSM04: Millmeece (B) to Madeley (D)

The route section between Millmeece and Madeley would be 12.9km long. The section of route connecting to Millmeece from the south would be HSM01 from Streethay. The design speed would be 400kph.

The route would be in cutting for 1.3km with a maximum depth of 10m passing through a historic landfill site. The lane **(1)** running north-east from Millmeece would be closed with the A51 **(2)** crossing over the route. The route would be at ground level, low embankment or on viaducts (maximum height 4m) for the next 6km (to a point 1.5km north of Stableford).

Station Road **(3)** at Cotes Heath would be realigned onto a bridge over the route and the West Coast Main Line (WCML) railway. From a point 500m north of Cotes Heath the route would run next to the WCML for 4km. Extensive temporary works would be required to maintain the WCML operation during construction.

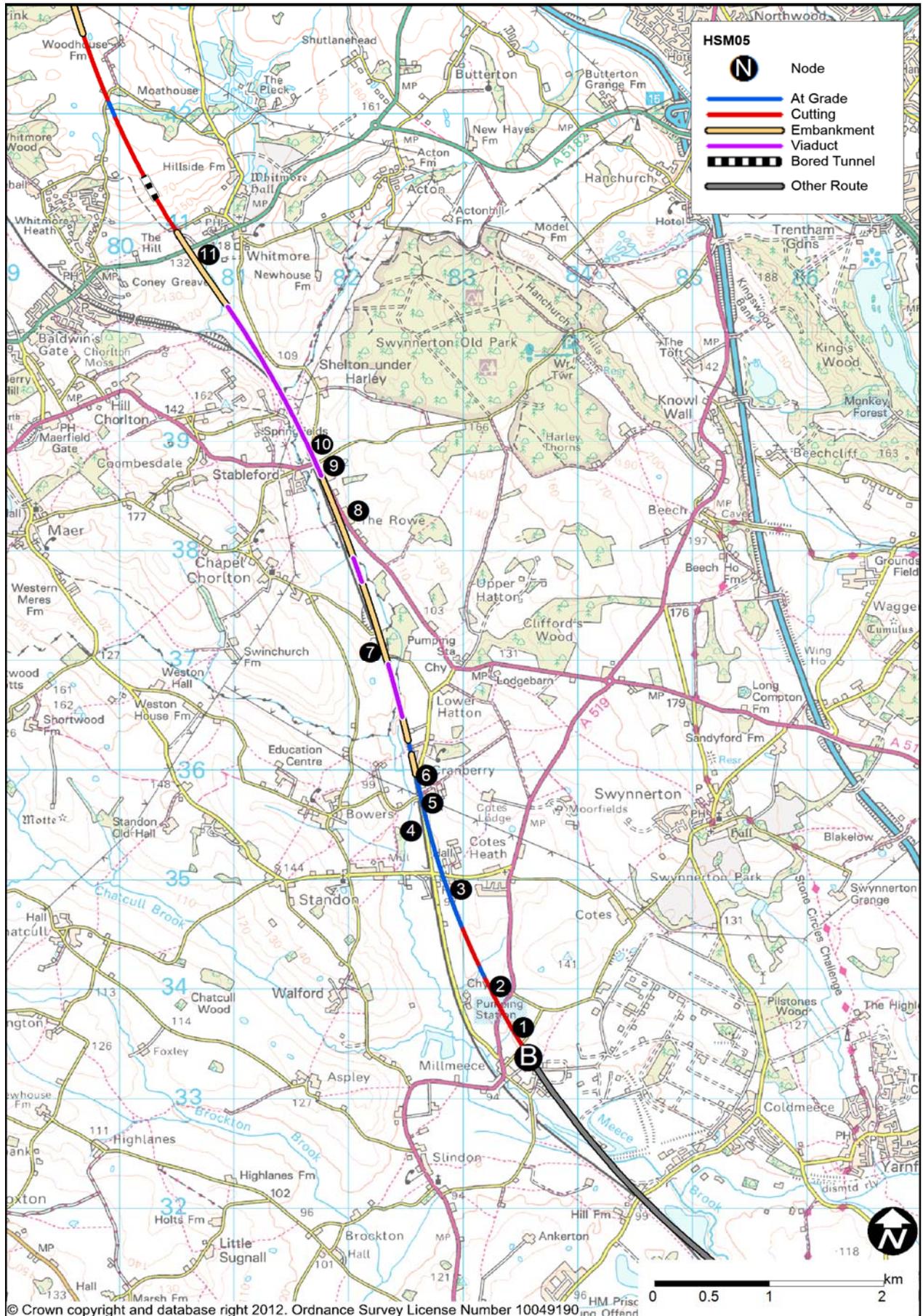
At Cranberry the route would pass through the route of overhead power lines. Cranberry Marsh (lane) **(4)** would be closed. Sandy Lane **(5)** would be realigned onto a bridge over the route and the WCML. Biddles Lane **(6)** would be diverted for 620m to avoid the route. The route would cross the Meece Brook flood plain north of Cranberry twice – on viaducts 520m and 300m long at a height of 4m. The road **(7)** alongside the WCML at Hatton Mill would be realigned onto a bridge under the route and the railway.

South of Stableford the A51 **(8)** would be diverted to cross over the route and the WCML running on the west of the route for 1.5km. Dog Lane **(9)** would be realigned onto a bridge over the route and the WCML. The route would cross a short section of flood plain in a 220m long concrete trough. Bent Lane **(10)** would be diverted for 230m to Dog Lane. The route would pass through the route of overhead power lines. North of Stableford the route would cross the Meece Brook flood plain twice on viaducts 840m and 290m long at a height of 4m.

The route would then rise up the hill entering a deep cutting (maximum depth 17m) before passing into a 515m long twin bore tunnel. The A53 **(11)** would be realigned onto a bridge over the railway. On the north side of the tunnel Heath Road **(12)** would be realigned to avoid the tunnel portal. Snape Hall Road **(13)** would be closed.

After leaving the tunnel the route would be in a 19m deep cutting then following the hillside down towards Madeley in cuttings up to 9m deep and embankments up to 9m high, crossing the Silverdale to Madeley railway **(14)**. The route would cross the flood plain and the WCML **(15)** on a viaduct 1.3km long with a maximum height of 16m (average height 10m).

At Madeley, Manor Road would be diverted for 980m from Hay House Lodge **(16)** to join the A524 (Bar Hill) **(17)**. A 2.6km long bypass for the A525 would be required to the west and north of the village to avoid a bridge 17m high over the route with raised approaches that would significantly impact on the village. Bar Hill would be closed with traffic diverted via the bypass. At Madeley the route would continue along section HSM08 to Hough.



## 2.5 HSM05: Millmeece (B) to Shrayleybrook (I)

### Millmeece to Whitmore

The route section between Millmeece and Shrayleybrook would be 17.8km long. The section of route connecting to Millmeece from the south would be HSM01 from Streethay. The design speed would be 400kph.

The route would be in cutting for 1.3km with a maximum depth of 10m passing through a historic landfill site. The lane **(1)** running north-east from Millmeece would be closed with the A51 **(2)** crossing over the route. The route would be at ground level, on low embankment or on viaducts (maximum height 4m) for the next 3km.

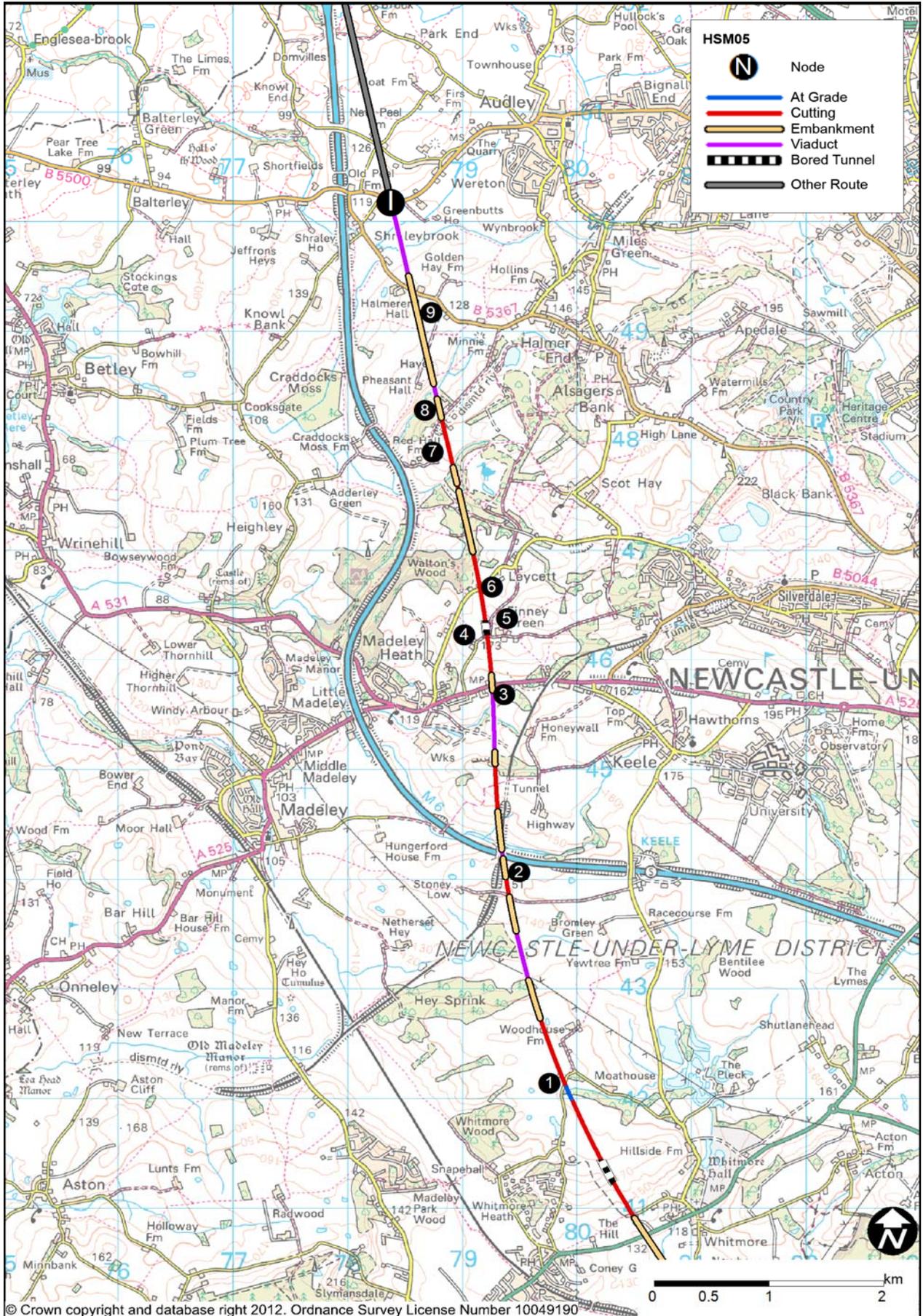
Station Road **(3)** at Cotes Heath would be realigned onto a bridge over the route and the West Coast Main Line (WCML) railway. From a point 500m north of Cotes Heath the route would run next to the West Coast Main Line for 4km. Extensive temporary works would be required to maintain the WCML operation during construction.

At Cranberry the route would pass through the route of overhead power lines. Cranberry Marsh (lane) **(4)** would be closed. Sandy Lane **(5)** would be realigned onto a bridge over the route and the WCML. Biddles Lane **(6)** would be diverted for 620m avoid the route. The route would cross the Meece Brook flood plain north of Cranberry twice – on viaducts 520m and 300m long at a height of 4m. The road **(7)** alongside the WCML at Hatton Mill would be realigned onto a bridge over the route and the railway.

South of Stableford the A51 **(8)** would be diverted to cross over the route and the WCML running on the west of the route for 1.5km. Dog Lane **(9)** would be realigned onto a bridge over the route and the WCML. Bent Lane **(10)** would be diverted for 560m to avoid the route and tie in to Dog Lane. The route would pass through the route of overhead power lines.

North of Stableford the route would cross the Meece Brook flood plain twice on viaducts 1.1km long with a maximum height of 7m and 280m long with a maximum height of 12m (average height 8m).

The route would then rise up the hill on embankment passing over the A53 **(11)**, which would be realigned to the south east and then enter a deep cutting (maximum depth 18m) to the west of Whitmore immediately prior to a 215m long single bore tunnel.



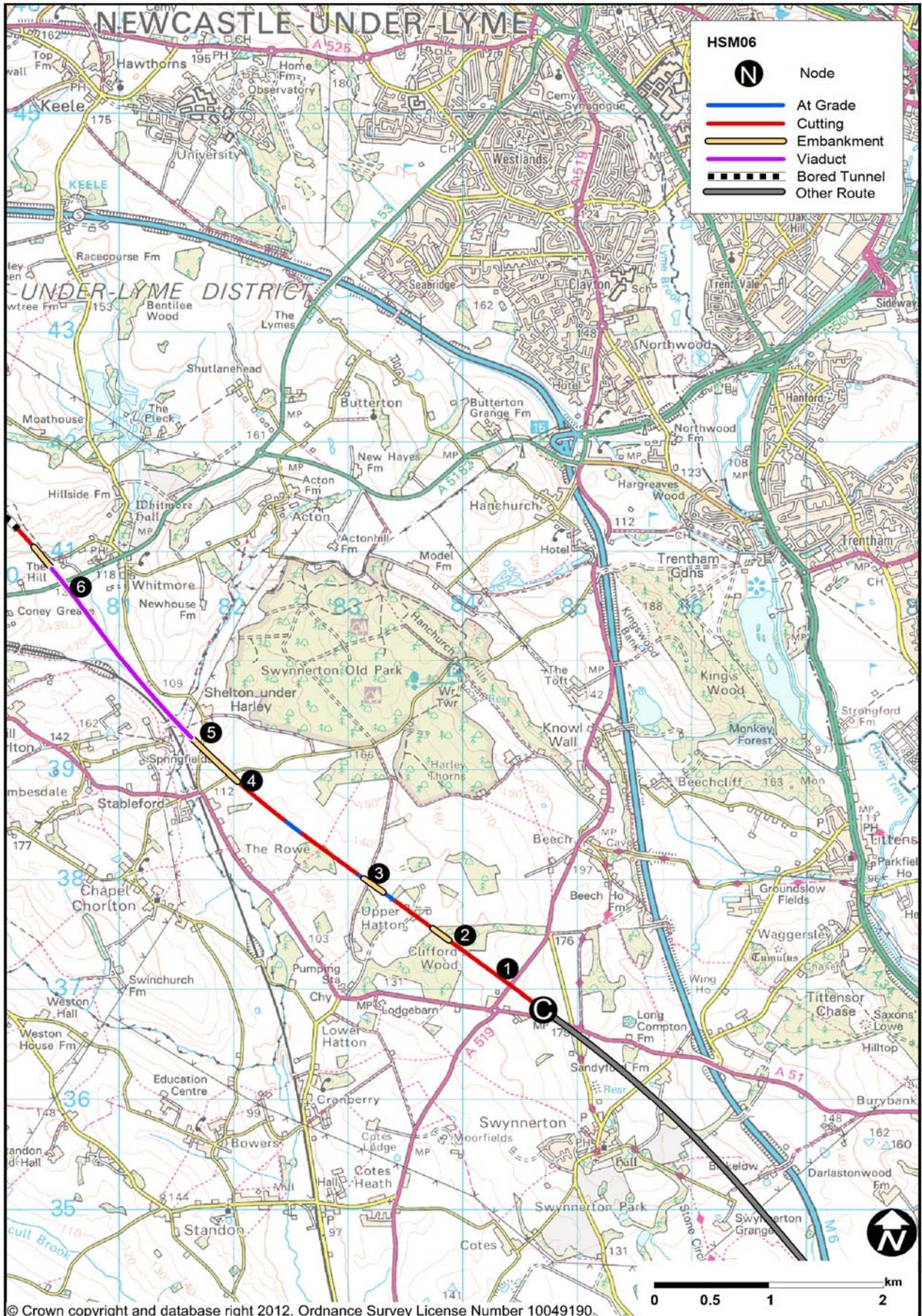
### Whitmore to Shrayleybrook

On the north side of the tunnel, after a section of cutting with a maximum depth of 21m, Heath Road **(1)** would be realigned onto a bridge over the route. A section of shallow cutting (maximum depth 6m) after Heath Road would be followed by an embankment (maximum height 15m) with a 470m long viaduct crossing a valley at a height of 24m. The route would pass through the route of overhead power lines.

The route would then cross the M6 and the Silverdale to Madeley railway **(2)** on a 90m long viaduct 18m high. The next 3.5km of route would cross an area that is prone to landslips, a former coal mining area and a number of historic landfill sites. Following a short section of embankment (maximum height 13m) the route would pass into a 400m long cutting with a maximum depth of 20m. The route passes to the east of Madeley Heath on an embankment (up to 15m high) and a viaduct 540m long with a maximum height of 23m, crossing over the A525 (Station Road) **(3)**. The route would pass into a cutting just over 1km in length with a maximum depth of 22m. To the west of Finney Green there would be a 330m long single bore tunnel. Agger Hill **(4)** and Hollywood Lane **(5)** would be realigned to avoid the tunnel portal. Leycett Lane **(6)** would be closed and diverted for 260m to Agger Hill to avoid crossing the route.

The route would run along the side of a hill on an embankment with a height of up to 12m and the pass into a cutting east of Red Hall Farm **(7)** with a maximum depth of 19m. Red Hall Lane **(8)** would be realigned onto a bridge over the route. The route would then cross a valley on 140m long viaduct with a maximum height of 22m followed by an embankment (max height 15m). The route would cross the B5367 (Shrayley Brook Road) **(9)** and then cross the flood plain on a 660m long viaduct with a maximum height of 22m (average height 19m).

At Shrayleybrook the route would continue along section HSM13 to Mere or HSM17 to Mobberley.



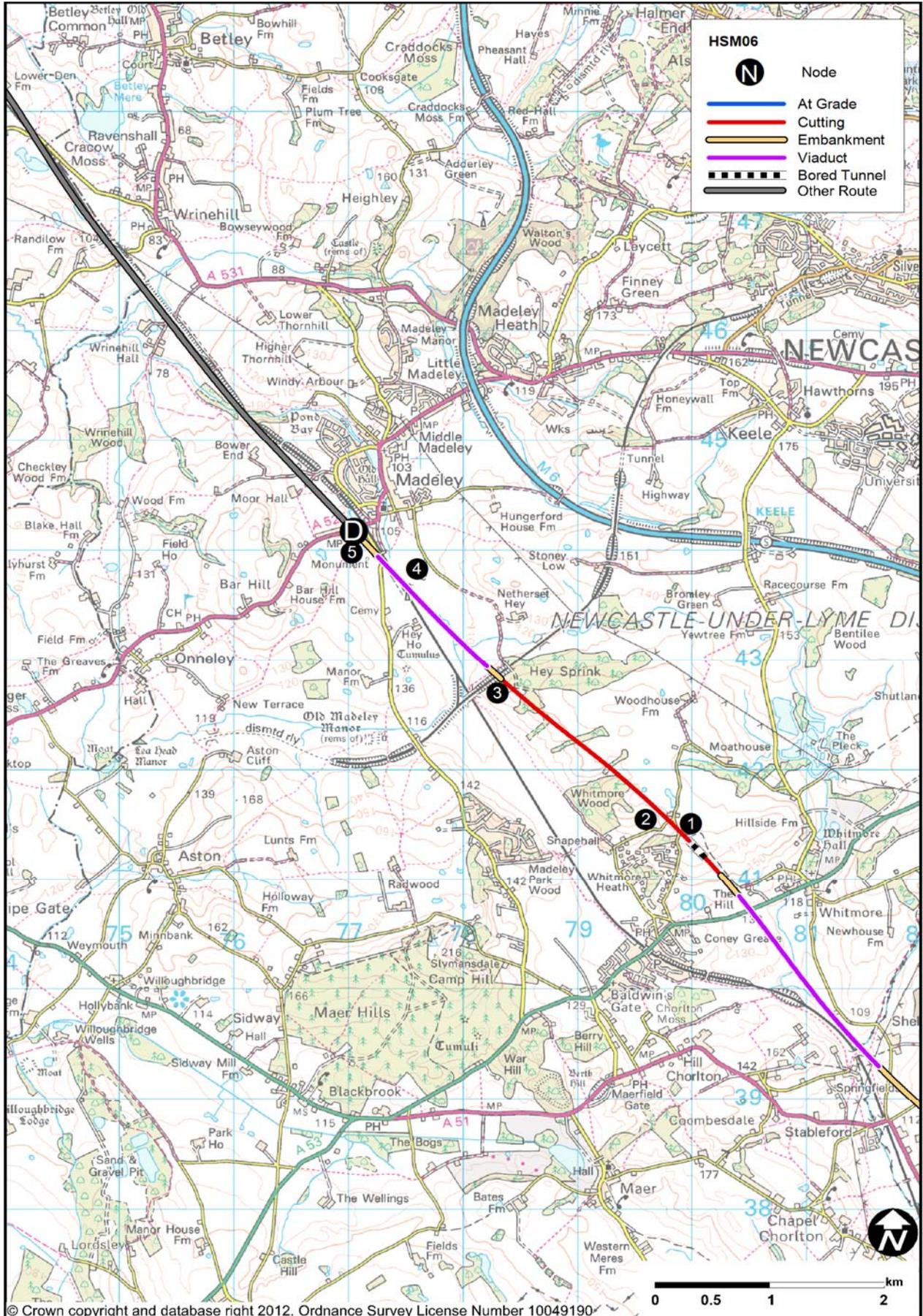
## 2.6 HSM06: Swynnerton (C) to Madeley (D)

### Swynnerton to Whitmore

The route section between Swynnerton and Madeley would be 10.7km long. The section of route connecting Swynnerton from the south would be either HSM02 or HSM03 from Streethay. The design speed would be 400kph.

The route would descend following the ground profile for the next 4 km, firstly passing under the A519 **(1)** in a cutting with a maximum depth of 18m. The route would then be on a short section of embankment 8m high through Clifford's Wood **(2)** followed by a cutting with a maximum depth of 3m. A short section on embankment (maximum height 6m) crossing over Common Lane **(3)** would lead to 2 sections of cutting with maximum depths of 7m and 8m.

The route would then descend towards the Meece Brook. Dog Lane **(4)** would be realigned to the south and on a bridge over the route. The route would pass over Bent Lane **(5)** and then onto a viaduct 1.9km long with a maximum height of 24m (average height 20m) to cross the flood plain and the A53 **(6)** west of Whitmore. The route would pass through the route of overhead power lines.



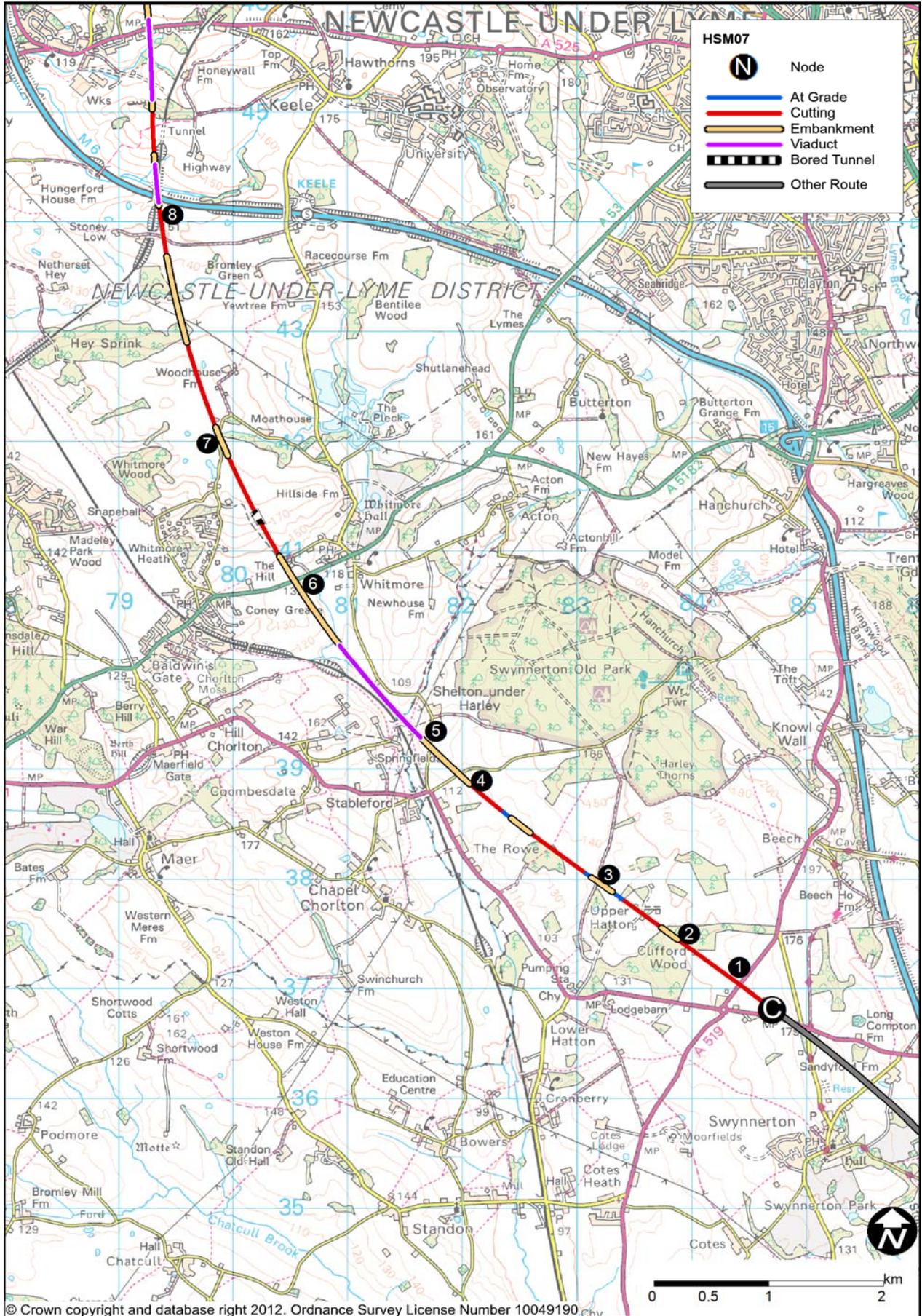
### **Whitmore to Madeley**

The route would then rise up the hill entering a deep cutting (maximum depth 19m) before passing into a 215m long single bore tunnel. On the north side of the tunnel Heath Road **(1)** would be realigned to avoid the tunnel portal. Snape Hall Road **(2)** would be closed.

North of the tunnel the route would be in a 19m deep cutting before following the hillside down towards Madeley in cuttings up to 15m deep and crossing over the Silverdale to Madeley railway **(3)**. The route would cross the flood plain and the WCML **(4)** on a viaduct 1.4km long with a maximum height of 18m (average height 14m).

At Madeley, Manor Road would be diverted for 980m from Hay House Lodge **(5)** to join the A525 (Bar Hill) **(6)**. A 2.6km long bypass for the A525 would be required to the west and north of the village to avoid a bridge 17m high over the route with raised approaches that would significantly impact on the village. Bar Hill would be closed with traffic diverted via the bypass.

At Madeley the route would continue along section HSM08 to Hough.



## 2.7 HSM07: Swynnerton (C) to Shrayleybrook (I)

### Swynnerton to M6

The route section between Swynnerton and Shrayleybrook would be 15.5km long. The section connecting Swynnerton from the south would be either HSM02 or HSM03 from Streethay. The design speed would be 400kph.

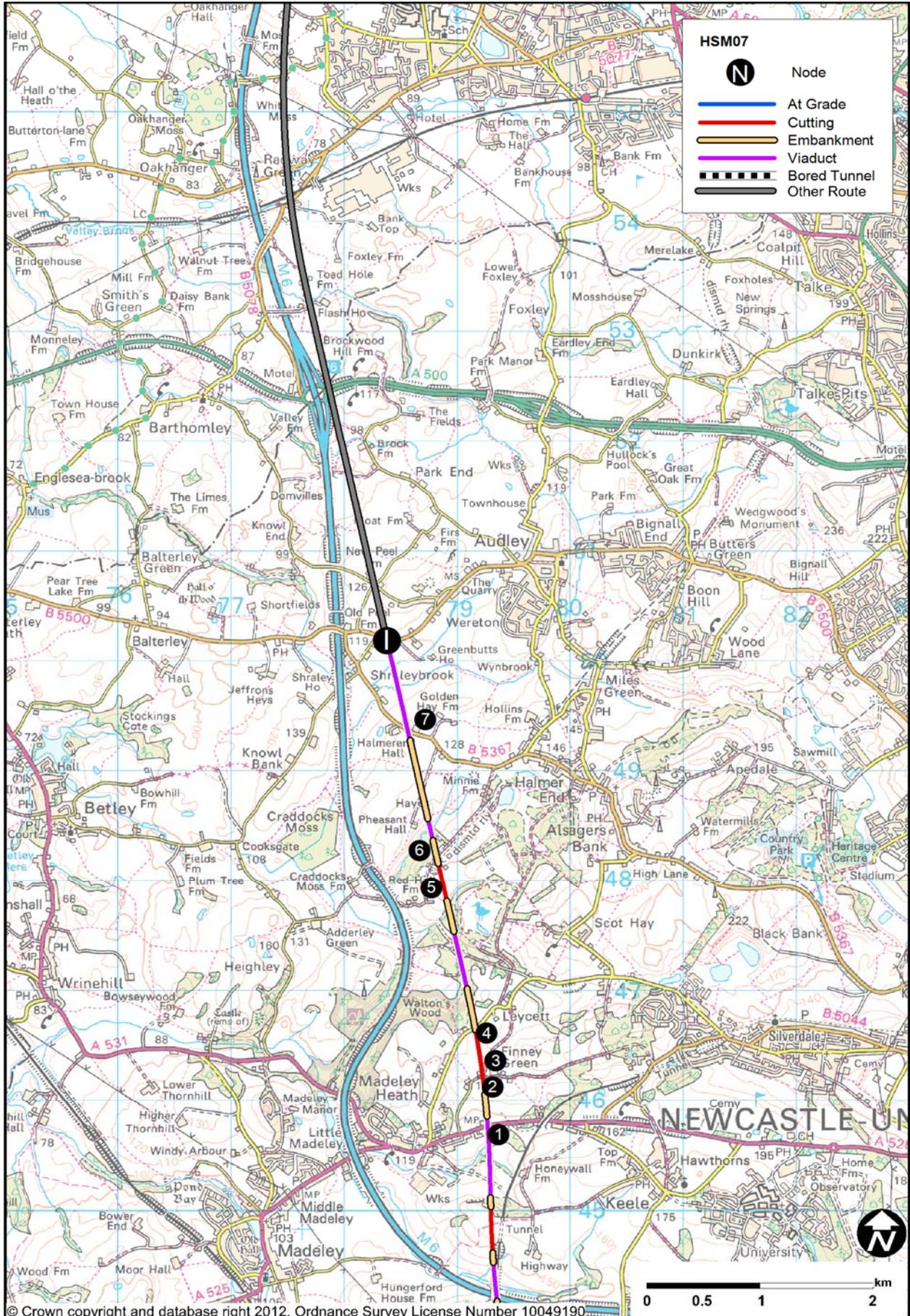
The route would descend following the round profile for the next 4km, firstly passing under the A519 **(1)** in a cutting with a maximum depth of 17m. The route would then be on a short section of embankment 7m high through Clifford's Wood **(2)** followed by a cutting with a maximum depth of 3m. A short section on embankment (maximum height 6m) crossing over Common Lane **(3)** would lead to 2 sections of cutting with maximum depths of 6m and 5m.

The route would then descend towards the Meece Brook. Dog Lane **(4)** would be realigned to the south and on a bridge over the route. Bent Lane **(5)** would be diverted for 650m on the east side of the route to avoid crossing it and tie in to Dog Lane. The route would pass onto a viaduct 980m long with a maximum height of 15m (average height 13m) to cross the flood plain. The route would pass through the route of overhead power lines. The route would continue on embankment to the west of Whitmore, crossing over the A53 **(6)**.

The route would then rise up the hill entering a deep cutting (maximum depth 18m) before passing into a 315m long single bore tunnel. On the north side of the tunnel Heath Road **(7)** would be realigned onto a bridge over the route.

A section of cutting (maximum depth 9m) after Heath Road would be followed by an embankment crossing a valley at a height of 15m. The route would pass through the route overhead power lines.

After a short cutting (maximum depth 8m) the route would cross the M6 and the Silverdale to Madeley railway **(8)** on an 180m long viaduct 16m high. The next 3.5km of route would cross an area that is prone to landslips, a former coal mining area and a number of historic landfill sites. The route would then pass into a 400m long cutting with a maximum depth of 17m.

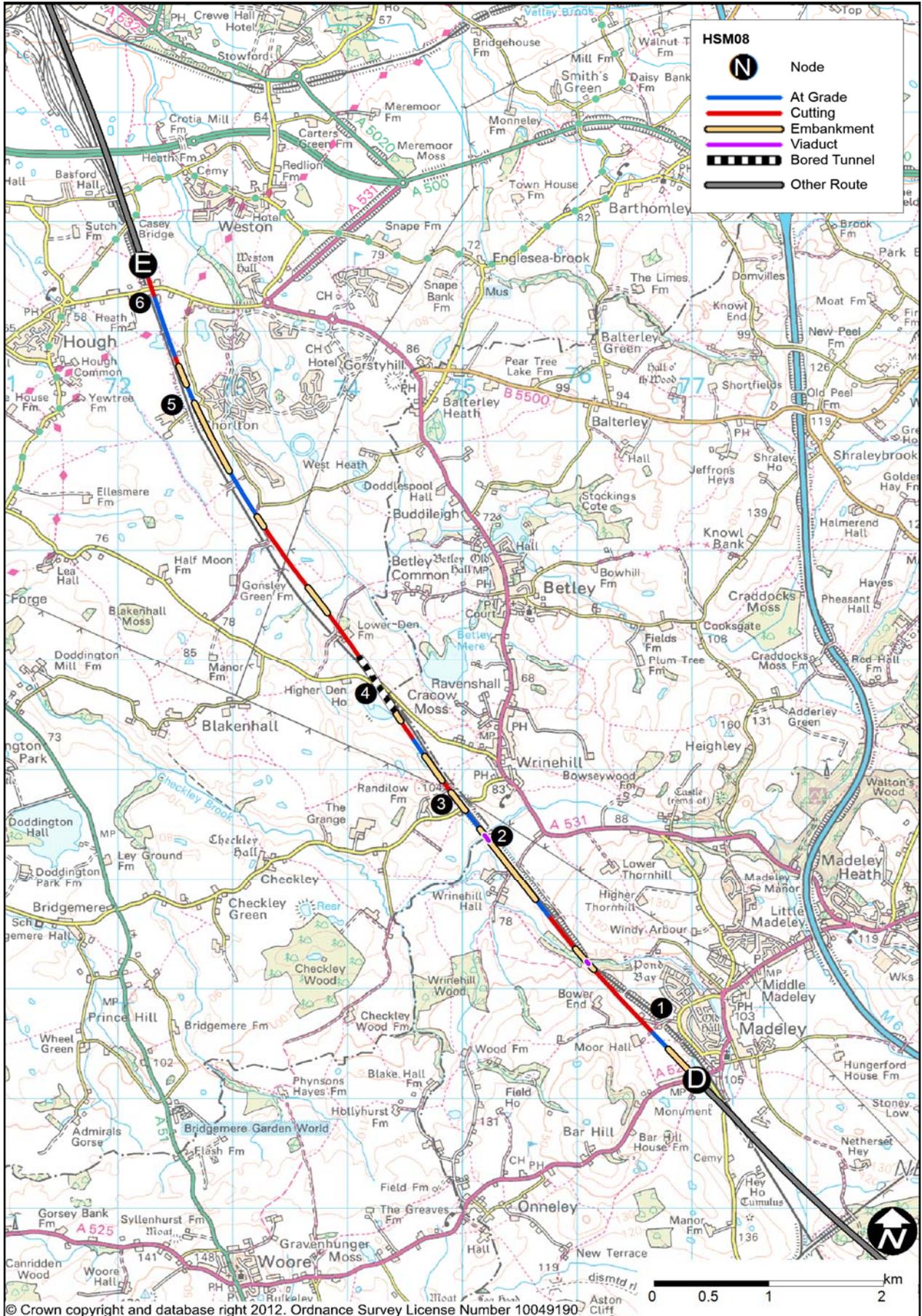


### **M6 to Shrayleybrook**

The route passes to the east of Madeley Heath on a viaduct 735m long with a maximum height of 34m, crossing over the A525 (Station Road) **(1)**. The route would then pass into a cutting with a maximum depth of 8m. Hollywood Lane **(2)** would cross over the route. Agger Hill **(3)** would be diverted for 200m on the east of the route to avoid it. Leycett Lane **(4)** would be closed and diverted for 350m to Agger Hill on the east side of the route to avoid crossing it.

The route would pass onto an embankment and viaduct. The viaduct would be 420m long at a maximum height of 18m. The route would then be in a cutting east of Red Hall Farm **(5)** with a maximum depth of 10m and would cross over Red Hall Lane **(6)**. The route would then cross a valley on 200m long viaduct with a maximum height of 26m followed by an embankment (max height 15m). The route would cross over the B5367 (Shrayley Brook Road) **(7)** and then cross the flood plain on a 680m long viaduct with a maximum height of 22m.

At Shrayleybrook the route would continue along either HSM13 to Mere or HSM14 to Mobberley.



## 2.8 HSM08: Madeley (D) to Hough (E)

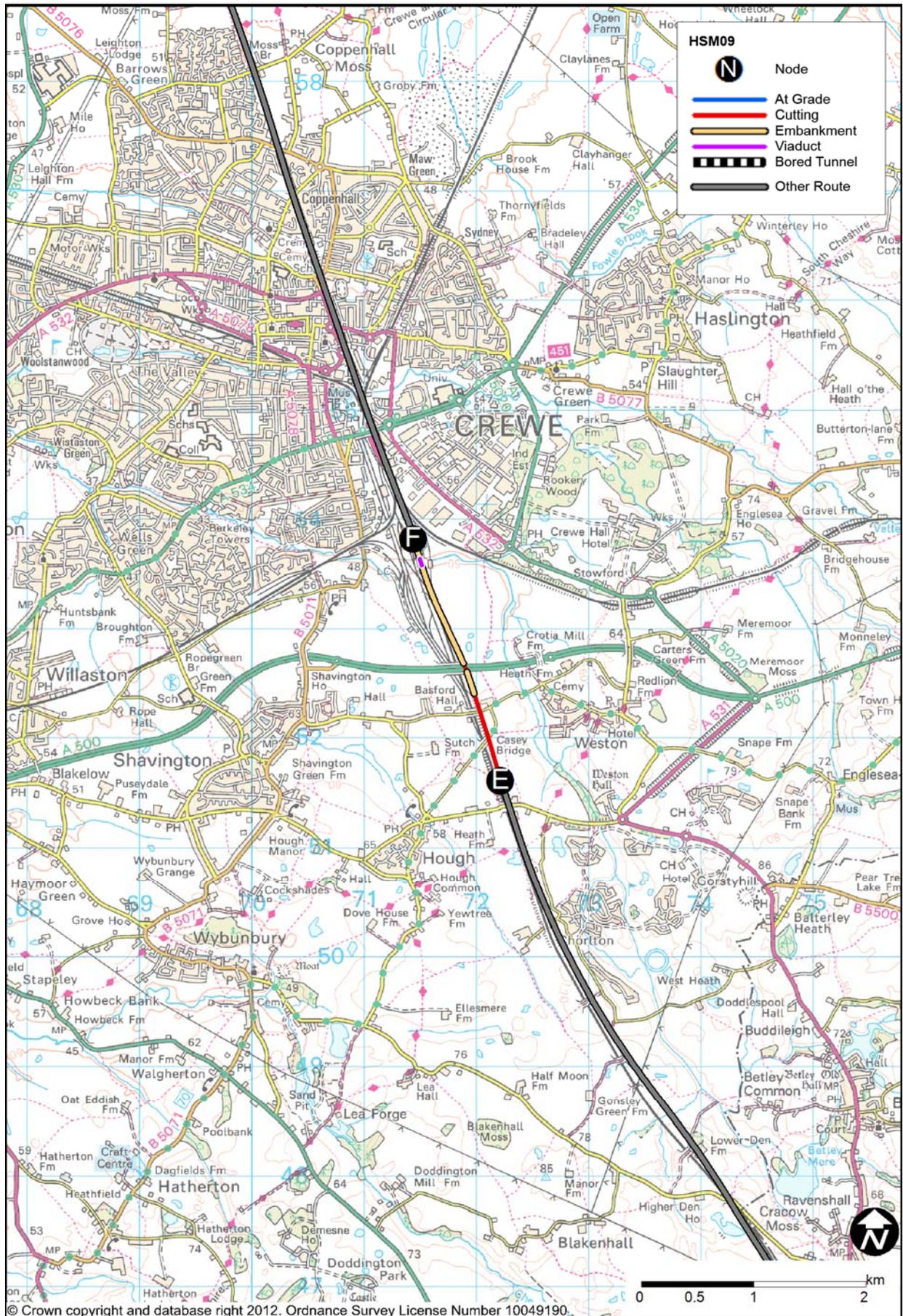
The route between Madeley and Hough would be 8.9km long. The section of route connecting Madeley from the south would be either HSM04 from Millmeece or HSM06 from Swynnerton. The design speed would be 400kph.

The route would run close to ground level to the west of the West Coast Main Line railway (WCML) and pass through a historic landfill site. Bower End Lane **(1)** would be closed and traffic diverted via the A525 Madeley bypass which the route would pass under. The route would cross the flood plain on a 45m long bridge at a height of 7m and would then run within 100m of the WCML for the next 10km to Crewe. During construction extensive temporary works would be required to stabilise and support the WCML. To achieve the required speed of 400kph the route would not be parallel to the existing railway for all of this distance.

Initially the route would be on the west side of the WCML in a series of embankments (up to 8m high) and cuttings (up to 7m deep). It would cross the flood plain **(2)** south of Wrinehill on a 50m long viaduct at a height of 9m. Checkley Lane **(3)** would be realigned onto a bridge over the route and the WCML. The route would pass through the route of overhead power lines. The remaining 6.5km of this route section would be over an area of mudstone with soluble deposits.

North of Wrinehill the route would pass under the WCML and Den Lane **(4)** and continue in a deep cutting for 700m (maximum depth 16m). The route would now be on the east side of the WCML and would require some embankments (up to 7m high) and cuttings (up to 5m deep). The route would pass through the route of overhead power lines and would be at ground level for the next 2km. Chorlton Lane **(5)** would be realigned onto a bridge over the route and the WCML. At Hough, Newcastle Road **(6)** would be realigned onto a bridge over the route and the WCML.

At Hough the route would continue along section HSM09 to connect to the WCML south of Crewe Station or HSM10 to Winterbottom.



## 2.9 HSM09: Hough (E) to Crewe (WCML connection) (F)

This route section between Hough and Crewe would be 2.3km long. The section of route connecting to Hough from the south would be HSM08 from Madeley.

This section would provide a connecting spur between the HS2 route and the West Coast Main Line railway (WCML) south of Crewe station. The design speed of the junction on the HS2 route is 230kph and on the WCML is 200kph. Both junctions are grade separated. The section is 2.3km long.

The HS2 route would run on the east side of the WCML between Hough and Crewe.

Casey Lane **(1)** would be diverted for 400m on the west side of the route to avoid crossing it. Weston Lane **(2)** would be realigned onto a bridge over the route and the WCML. The A500 **(3)** would be realigned onto a bridge to cross the route and the WCML.

The spur would be on a viaduct (at a maximum height of 12m) to cross the HS2 main route **(4)** which at this point would be in a retained cutting 21m below ground level heading down to a tunnel portal to pass under Crewe. The spur would also cross over some of the existing rail lines before descending to join the WCML. Alterations to the existing rail layout would be required and are described in section 5.1. In addition, the layout of the depot **(5)** on the east side of the WCML would require to be reconfigured. Extensive temporary works would be required during construction to maintain the existing lines.

An infrastructure maintenance depot option has been developed on the east side of this section of route, and is described in Section 4.1.1.



## 2.10 HSM10: Hough (E) to Winterbottom (H)

### Hough to Whalley's Green

The route section between Hough and Winterbottom would be 29.9km long. The section of route connecting to Hough from the south would be HSM08 from Madeley. The design speed would be 400kph.

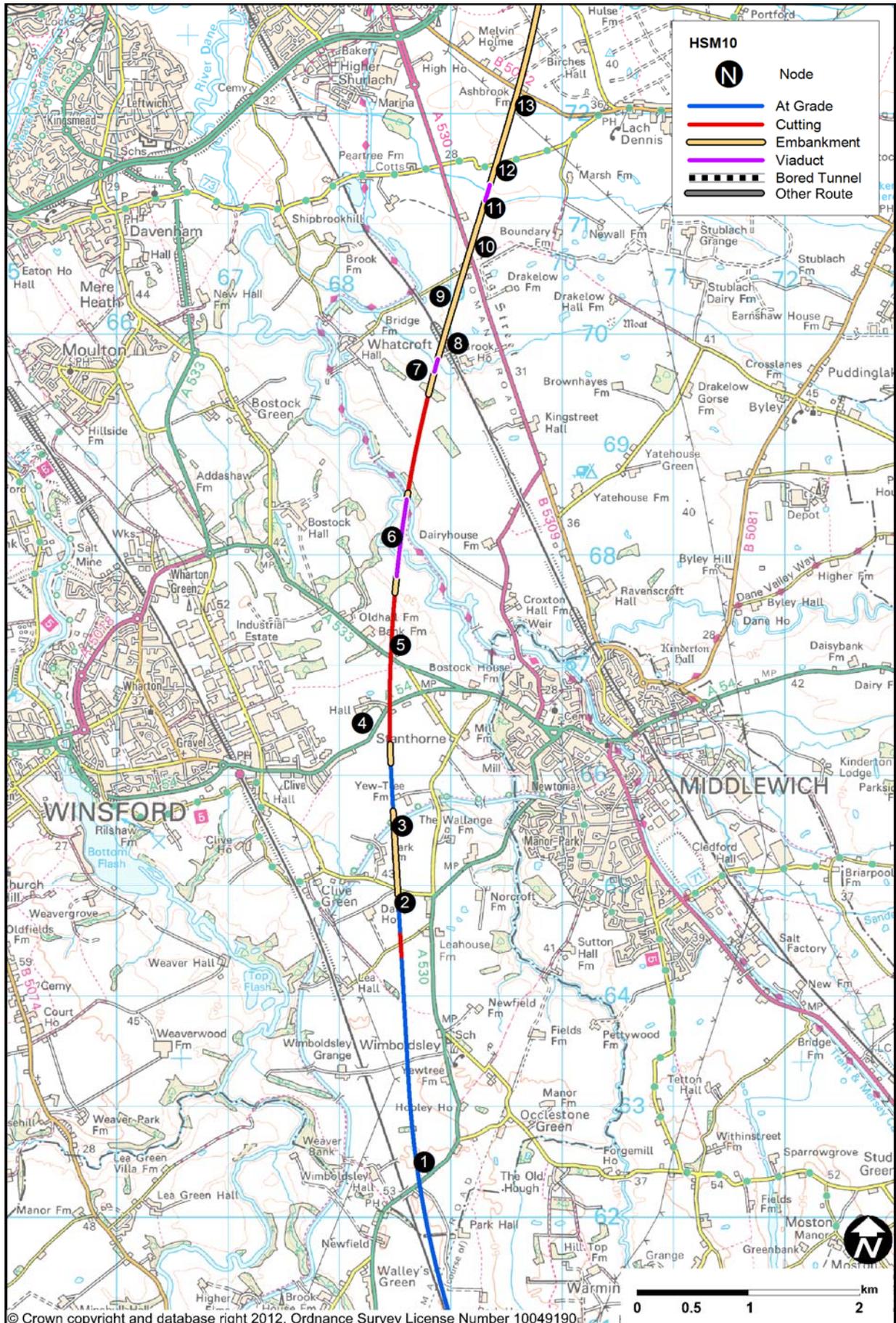
The HS2 route would run on the east side of the WCML between Hough and Crewe. During construction stabilisation of and support to the WCML would be required.

Casey Lane **(1)** would be realigned for 400m on the west side of the route to avoid crossing it. Weston Lane **(2)** would be realigned onto a bridge over the route and the WCML. The A500 **(3)** would be realigned onto a bridge to cross the route and the WCML.

The route would descend from Hough in a retained cutting to a tunnel portal to the immediately south of the existing depot. The twin bore tunnel under Crewe would be 4.65km long. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies.

The northern tunnel portal would be 400m south of Parkers Road bridge **(4)**. The route would rise from the portal in a retained cutting. Parkers Road would cross over the route and the WCML on a bridge. The route would reach ground level to the east of Spring Farm **(5)**.

From the tunnel portal the route would run within 50m of the WCML for almost 4km before bearing slightly east. The route would be within 1m of ground level for 6km. The route would pass through the route of overhead power lines. The remaining 21.5km of this route section would be over an area of mudstone with soluble deposits with active and historic salt mines (risk of subsidence).



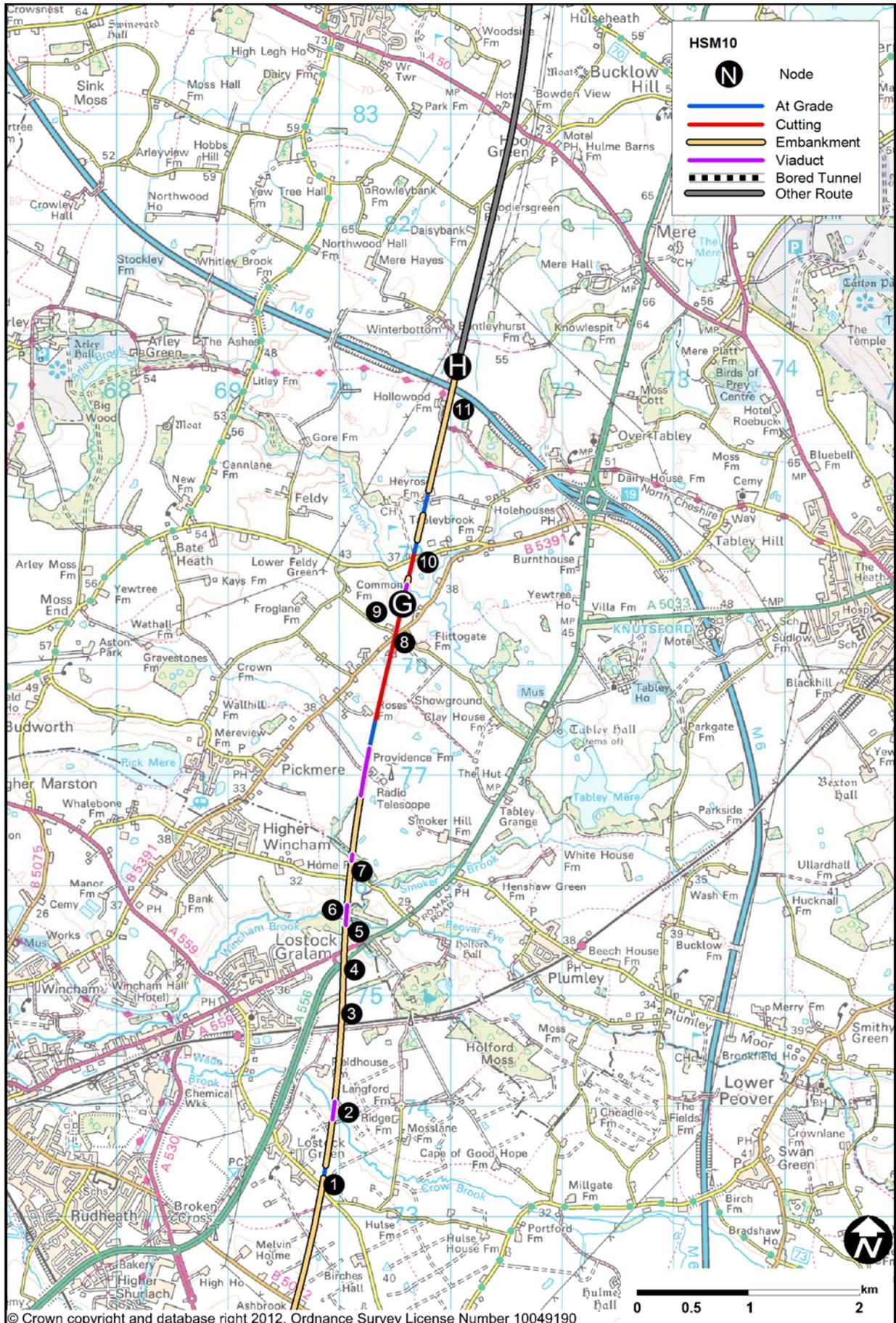
### Whalley's Green to Higher Shurlach

The A530 (Nantwich Road) **(1)** would be realigned onto a bridge over the route and the WCML. Clive Green Lane **(2)** would also be realigned onto a bridge over the route.

The route would then rise on embankment to cross over the Shropshire Union Canal **(3)** at a height of 6m before descending into a 1.3 km long cutting up to 11m deep. The A54 **(4)** would be realigned to the west of the route to a new roundabout at the A533. The A533 **(5)** would cross over the route. The route would then pass onto a 745m long viaduct **(6)** to cross the River Dane flood plain and the Trent and Mersey Canal at a maximum height of 10m.

The route would then run in a shallow cutting (up to 5m deep) for 900m through an active landfill site before crossing the Puddinglake Brook flood plain **(7)** on a 120 long viaduct at a height of 9m. A section of embankment (up to 9m high) follows with the route crossing over the Sandbach to Northwich railway **(8)**. Whatcroft Lane **(9)** would be diverted for 450m on the west side of the route to avoid it and to tie in to the A530. The route would pass over the A530 **(10)**.

For the next 3km the route would be on embankment (with a maximum height of 7m), crossing the Gad Brook flood plain **(11)** on a 150m viaduct at a height of 6m. Crowder's Lane **(12)** would be realigned onto a bridge over the route. The route would pass through the route of overhead power lines. The B5082 **(13)** would be realigned onto a bridge over the route.



### Higher Shurlach to Winterbottom

Birches Lane **(1)** would be realigned onto a bridge over the route. The route would cross the Wade Brook flood plain **(2)** on an 185m long viaduct with a maximum height of 14m. It would continue on embankment (maximum height of 12m) for a further 3.5km crossing over the Altrincham to Chester railway **(3)**, the A556 **(4)**, and the A559 **(5)**. Peover Eye and Smoker Brook flood plains **(6)** would be crossed on a 185m long viaduct at a height of 18m. The route would cross over Linnards Lane **(7)** (which would be realigned), followed by two crossings of a flood plain on viaducts 65m and 440m long at heights of 8m and 3m respectively.

Where the route passes into a shallow cutting (up to 4m deep), the B5391 (Pickmere Lane) **(8)** would be realigned onto a bridge over the alignment. School Lane **(9)** would be diverted for 350m on the west side of the route to avoid.

The route would rise onto a low embankment (maximum height 5m), crossing the Arley Brook flood plain on a 70m long viaduct at a height of 5m. Budworth Road **(10)** would be realigned onto a bridge over the route. The embankment height would increase to 8m to allow the route to pass over the M6 **(11)**.

There is an option for an interchange station to the south of the M56, between nodes G and H, which is described in HSM11 and section 3.9.

At Winterbottom the route would continue along section HSM12 to Warburton or HSM28 to Ardwick (and then to Manchester Piccadilly).



## 2.11 HSM11: Pickmere (G) to Winterbottom (H) – Knutsford Interchange Station

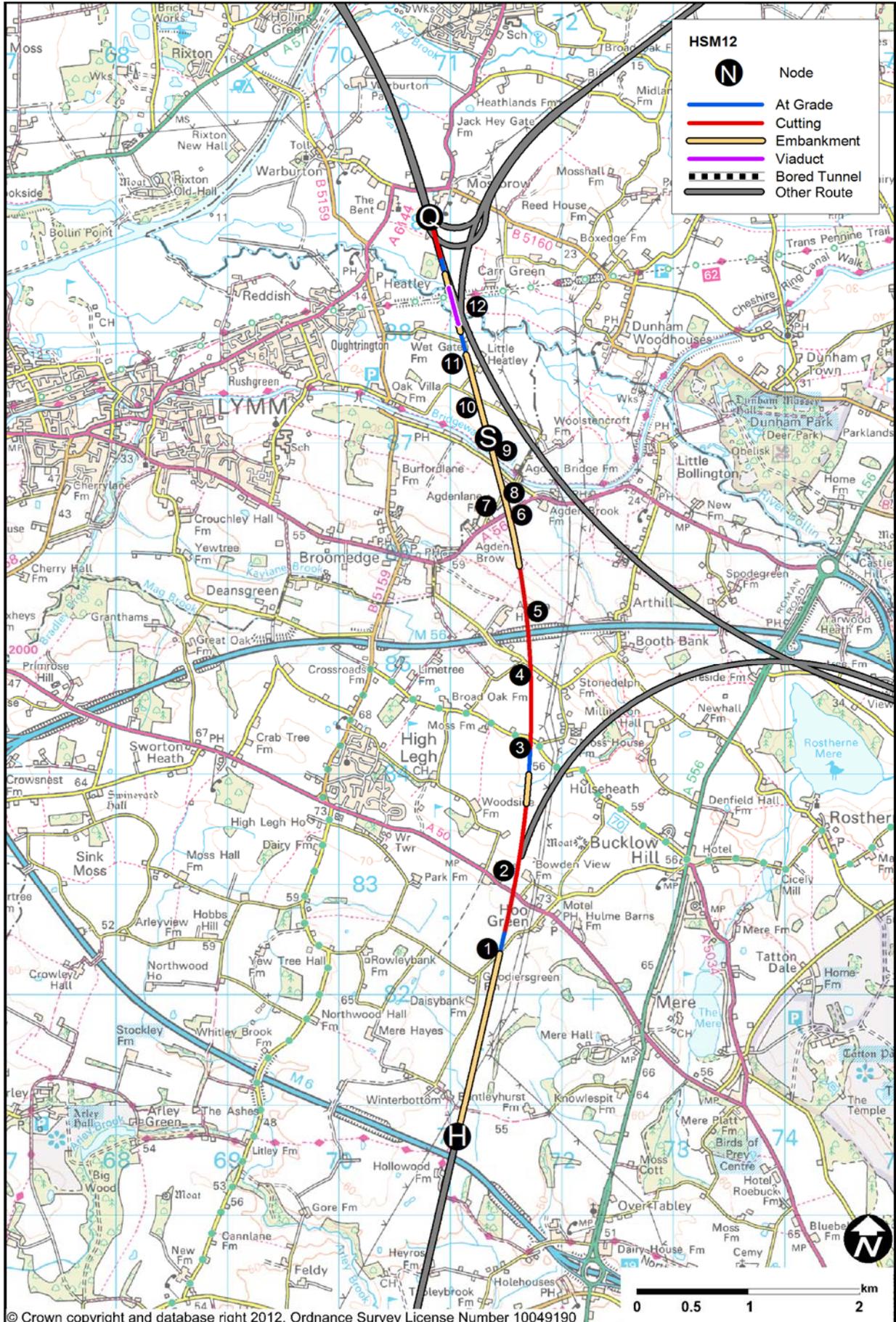
This route section for the Knutsford Interchange Station (Option 5A) is 2.2km long. The section of route connecting to it from the south would be HSM10 from Hough.

In addition to the 400kph through lines (which are part of HSM10) there would also be two additional lines, one on each side to allow trains to stop at the station platforms with a design speed of 230kph. This route section would be over an area of mudstone with soluble deposits.

The section starts just south of Arley Brook **(1)** with a junction to allow the two lines to become four. The route would rise onto a low embankment, crossing the Arley Brook flood plain on a 70m long viaduct at a height of 4m. Budworth Road **(2)** would be realigned onto a bridge over the route. The embankment height would increase to 6m. After the station location the lines would continue to rise to cross over the M6 **(3)**, joining the through route at a junction just north of the motorway.

The interchange station is described in Section 3.9

The route would continue north from this station along section HSM12 to Warburton or HSM28 to Ardwick (and then to Manchester Piccadilly).



## 2.12 HSM12: Winterbottom (H) to Warburton (Q)

The route section between Winterbottom and Warburton would be 8.5km long. The section of route connecting to Winterbottom from the south would be HSM10 from Hough.

The design speed for the section between Winterbottom and Warburton is 400kph reducing to 360kph just south of the M56. This reduction is driven by the design required for the route to pass between Mossbrow and Warburton.

The route would be on an embankment for 1.7km with a maximum height of 8m. The route would pass through the route of overhead power lines. Hoogreen Lane **(1)** would be realigned onto a bridge over the route. The route would then pass into a cutting for 1.3km with a maximum depth of 8m. The A50 **(2)** would be realigned onto a bridge over the route.

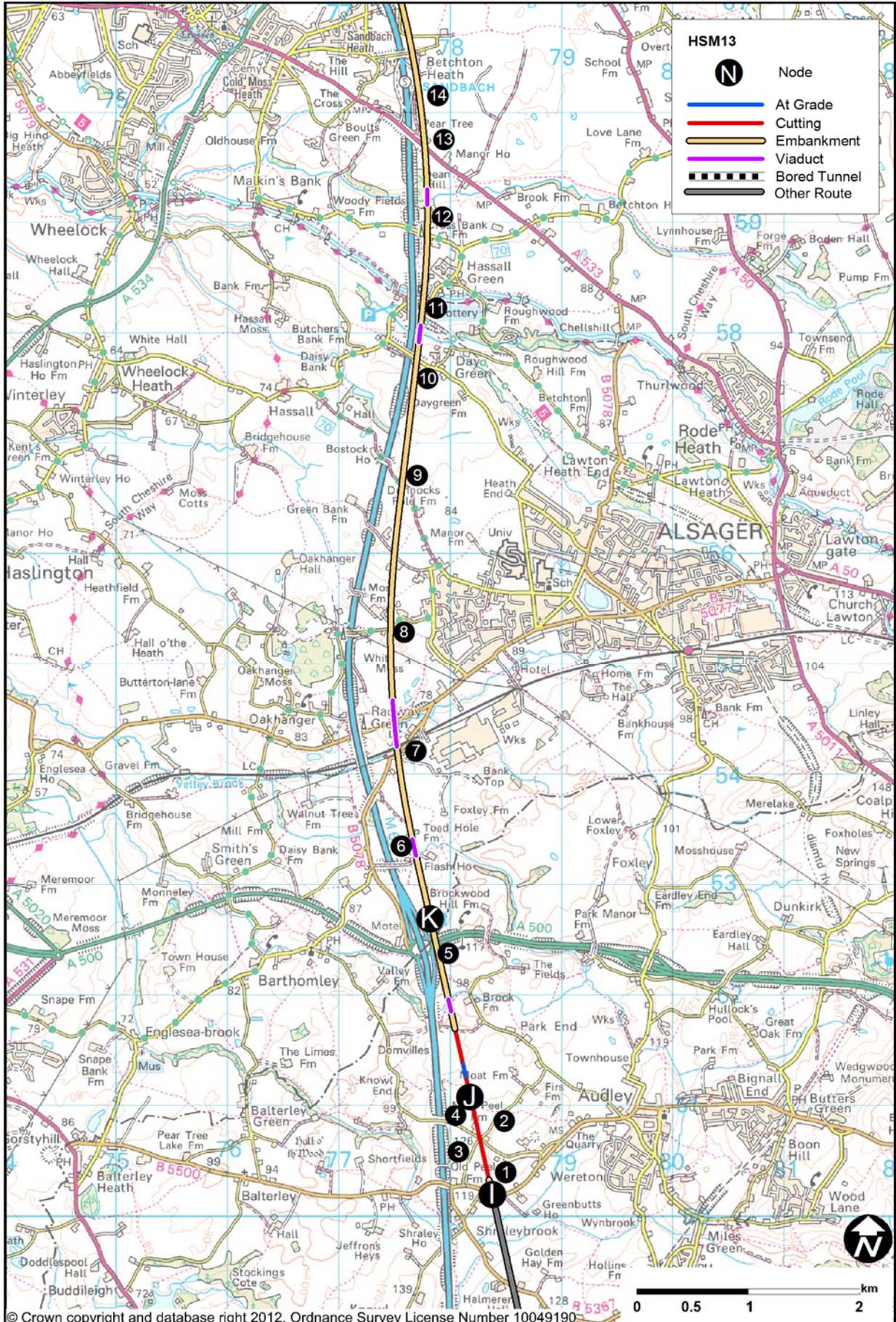
A short section of low embankment (up to 2m high) would be followed by a cutting with a maximum depth of 17m. Peacock Lane **(3)** would be realigned onto a bridge over the route. Agden Lane **(4)** would cross over the route on a bridge. The route would pass under the M56 **(5)** and then move onto an embankment (maximum height of 7m) for 2.8km crossing over the A56 **(6)**. Agden Lane **(7)** would be closed at the crossing and Warrington Lane **(8)** diverted for 800m on the west side of the route to avoid it. There may be requirements for temporary diversions and traffic management on the M56 during construction.

For the next 2km the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

The route would cross over the Bridgewater Canal **(9)** at a height of 5m. At node S there is an option for a spur to Manchester Piccadilly using route section HSM33. The route would cross over Spring Lane **(10)** (which would be realigned) and Wet Gate Lane **(11)** would be diverted for 900m on the west side of the route to avoid four crossings. The route would then cross over the River Bollin flood plain **(12)** on a 345m long viaduct at a height of 4m before passing into a cutting with a maximum depth of 9m.

To accommodate a junction for a spur to Salford along HSM35 it would be necessary to use a variation of this route option. The variant would diverge to the east of this route section by a maximum of 100m between the M6 and the A56. The engineering features as described are the same for both variants.

At Warburton the route would continue along section HSM21 to Lowton or HSM35, HSM39 or HSM40 to Winton (and then to Salford).



## 2.13 HSM13: Shrayleybrook (I) to Mere (N)

### Shrayleybrook to Sandbach

The route section between Shrayleybrook and Sandbach would be 32.7km long. The section of route connecting to Shrayleybrook from the south would be either HSM05 from Millmeece or HSM07 from Swynnerton. The design speed would be 400kph.

The route would run within 300m of the M6 for 17km. To achieve the design for a speed of 400kph the route cannot be parallel to motorway.

The route passes from a viaduct (see HSM07) onto a short embankment, crossing over the B5500 (Nantwich Road) **(1)**. The route follows the ground profile, firstly in cuttings up to 8m deep and then on embankments up to 10m high. Moat Lane **(2)** on the east side of the route and Peel Hollow **(3)** on the west side of the route would be diverted for 400m. Barthomley Road **(4)** would be realigned onto a bridge over the route. The route would cross a flood plain at Brook Farm on a 110m long viaduct at a height of 12m. The route would cross over the A500 **(5)**.

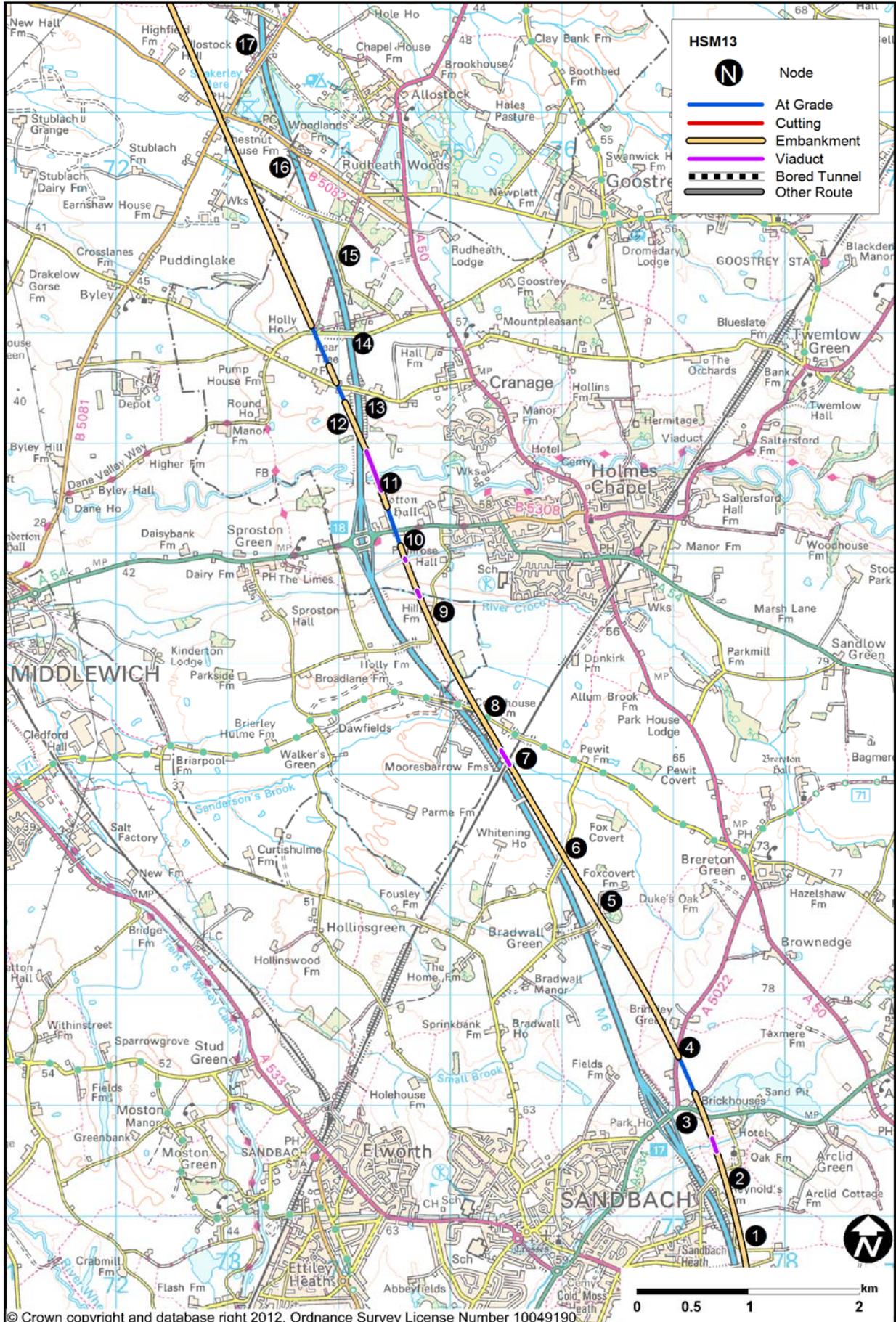
For the next 24km the route would be over an area of mudstone with soluble deposits with active and historic salt mines (risk of subsidence).

There is an option for an intermediate station between nodes J and K south of the A500, which is described in HSM14 and section 3.4.

The route would continue on embankment for the next 9km up to 15m high. It would pass over the flood plain at Toad Hole Farm **(6)** on a 545m long viaduct (maximum height of 17m) followed by a second viaduct **(7)** 605m long (maximum height 17m) to cross the B5078, the Crewe to Kidsgrove railway, the Valley Brook flood plain and the B5077 (Crewe Road). A third viaduct 205m long at a height of 15m would cross White Moss including an area of peat. The route would pass through the route of overhead power lines at the crossing of the B5077 and at White Moss.

The route would pass between the M6 and Alsager. Nursery Road **(8)** and Close Lane **(9)** would be realigned onto bridges over the route. The route then crosses a flood plain on a 145m long viaduct at a height of 19m. Hassall Road **(10)** would be diverted on the east of the route for 700m to avoid it. The route would cross over Smithy Grove and the Trent and Mersey Canal **(11)**. Betchton Road **(12)** would be diverted for 1km on the west side of the route to avoid it and would tie in to the A533.

The route crosses a flood plain on a 145m long viaduct at a height of 22m and then the A533 **(13)**. The route would then pass over the eastern side of the M6 Sandbach Services **(14)**, which would require extensive alterations.



### Sandbach to Shakerley Mere

The route would continue on embankment (with a maximum height of 12m). Reynolds Road would be closed at the first crossing by the route and at the second crossing **(1)** a bridge would be provided for the route to go over the road. To the north of this the road would be diverted to the west and tied in to Church Lane. The route would pass over Church Lane **(2)** and then cross the flood plain on a 125m long viaduct at a height of 16m.

The A534 (Congleton Road) **(3)** would be diverted for 1.8km to pass north of the sand pits and to cross over the route. The A5022 (Holmes Chapel Road) **(4)** would be diverted for 600m to stay on the east side of the route to join the A534.

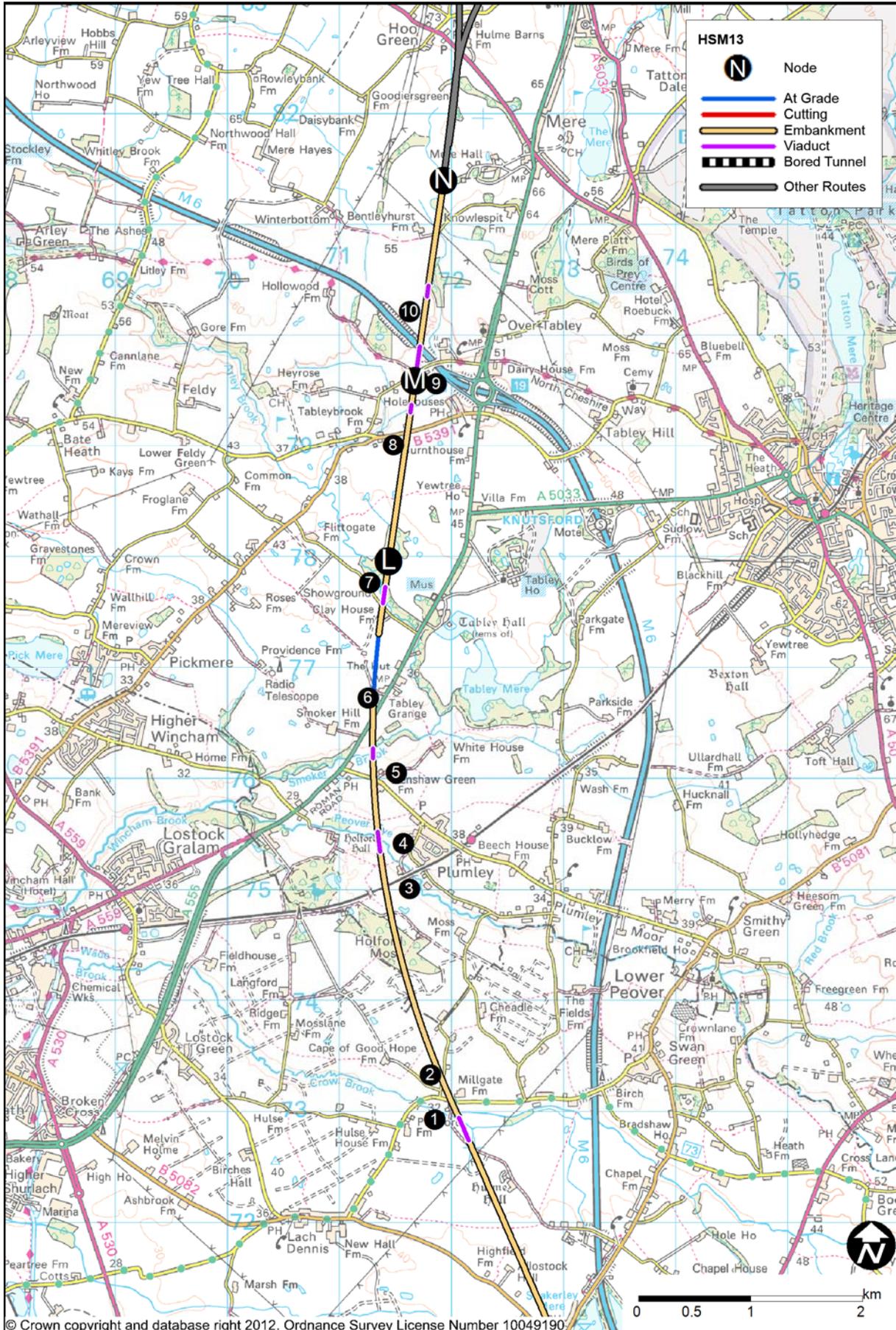
After 500m at ground level the route would be on embankment for the next 5km at a maximum height of 10m. Brindley Lane **(5)** would be diverted on the east side of the route for 500m to avoid it. Ward's Lane **(6)** would be realigned onto a bridge over the route and the M6.

The route would cross over the Crewe to Manchester railway and Sanderson's Brook flood plain **(7)** on a 125m long viaduct at a height of 11m and then over Brereton Lane **(8)**.

The River Croco flood plain would be crossed on a 50m long viaduct at a height of 12m. Broad Lane **(9)** would be diverted to pass under the viaduct. The route would then be at ground level requiring the A54 (Middlewich Road) **(10)** to be realigned onto a bridge over the route.

The route would cross the River Dane flood plain **(11)** on a 390m long viaduct at a height of 21m and then over the M6 **(12)**. The route would then be at ground level for the next 1km, followed by a shallow embankment (up to 5m high) for the next 3km. Byley Lane **(13)** would be diverted for 500m along the east side of the M6 to connect to Middlewich Road and avoid the route. Middlewich Road **(14)** would be realigned onto a bridge over the route.

King's Lane **(15)** would be closed. At Shakerley Mere the B5082 **(16)** would be diverted onto a bridge over the route and the B5081 **(17)** would be realigned on both sides of the route to avoid it.



### Shakerley Mere to Mere

The route would continue on embankment at a maximum height of 5m and pass through the route of overhead power lines. The route would cross the Crow Brook flood plain on a 220m long viaduct at a height of 8m. For the next 4km the route would be on embankment with a maximum height of 10m. Common Lane and Hulme Lane **(1)** would be realigned with one bridge provided to cross over the route. Patmos Lane **(2)** would be closed.

The route would pass through an area of peat at Holford Moss, cross over the Altrincham to Chester railway **(3)** and then cross the Peover Eye flood plain on a 185m long viaduct at a height of 15m.

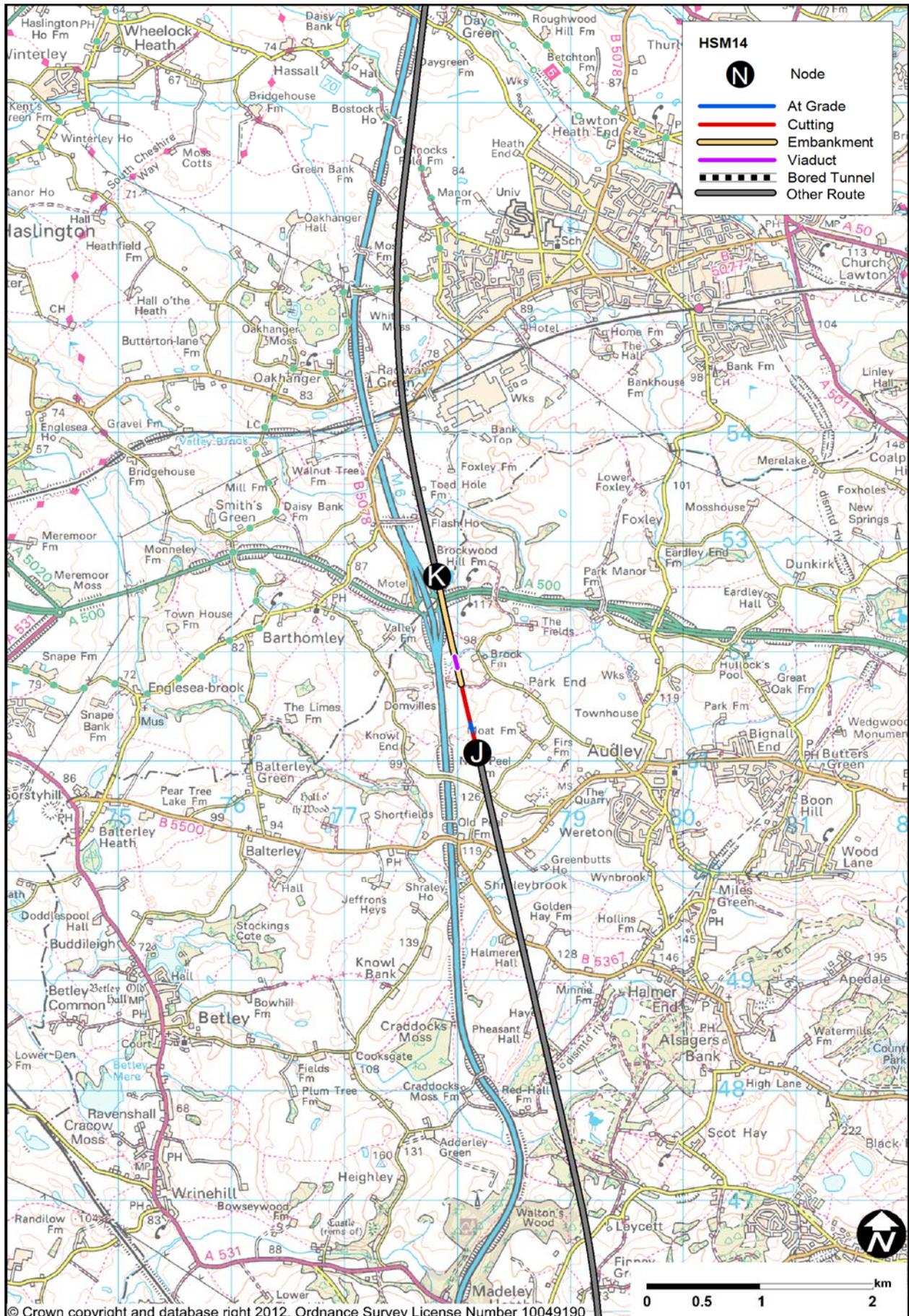
Whitehouse Lane **(4)** would be diverted for 300m on the east side of the route to avoid it. The route would pass over Plumley Moor Road **(5)** and then Smoker Brook flood plain would be crossed on a 90m long viaduct at a height of 11m. The A556 **(6)** would be realigned onto a bridge over the route. The route would then be at ground level for almost 1km. Flittongate Lane **(7)** would be realigned onto a bridge over the route. The route would rise to cross the Waterless Brook flood plain on a 175m long viaduct at a height of 9m.

The route would then pass into a cutting with a maximum depth of 7m. The B5391 (Pickmere Lane) **(8)** would be realigned onto a bridge over the route. The route would cross over the Tabley Brook flood plain on a 75m long viaduct at a height of 11m. Old Hall Lane **(9)** would be realigned for 550m on the east side of the route to tie in to Pickmere Lane. The route would cross over the M6 **(10)** before a second crossing of the Tabley Brook flood plain on an 85m long viaduct at a height of 10m. The route would pass through the route of overhead power lines.

There is an option for an interchange station to the south of the M56, between nodes L and M, which is described in HSM15 and section 3.8

At Mere the route would continue along section HSM16 to Warburton or HSM29 to Rostherne (and then to Manchester Piccadilly).

An infrastructure maintenance depot option has been developed on the east side of this section of route at Radway Green, and is described in Section 4.1.2.



## 2.14 HSM14: Audley (J) to M6 Junction 16 Radway Green (K) – M6 Intermediate Station

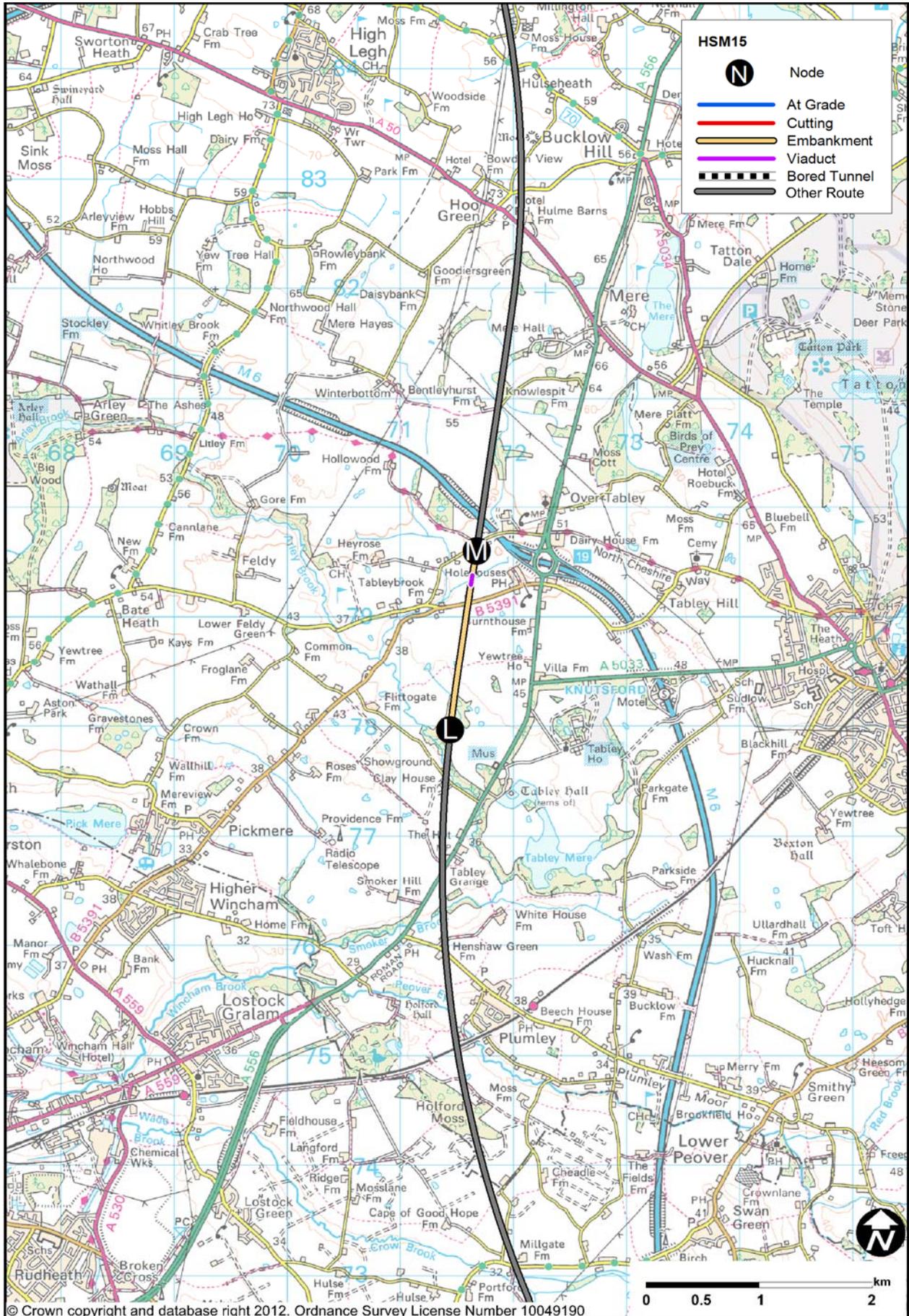
This route section for the M6 Intermediate Station option is 1.65km long. The section of route connecting to it from the south would be HSM12 from Shrayleybrook.

In addition to the 400kph through lines (which are part of HSM13 and HSM17) there would also be two additional lines, one on each side to allow trains to stop at the station platforms with a design speed of 230kph.

The section starts 300m north of Barthomley Road **(1)** with a junction to allow the two lines to become four. The route would fall in a cutting with a maximum depth of 6m. After the station location the lines would continue to fall, crossing over the A500 **(2)**, joining the through route at a junction 200m north of the road.

The intermediate station is described in Section 3.4.

The route would continue north from this station along section HSM13 to Mere.



## 2.15 HSM15: Tabley (L) to M6 Junction 19 Knutsford (M) – Knutsford Interchange Station

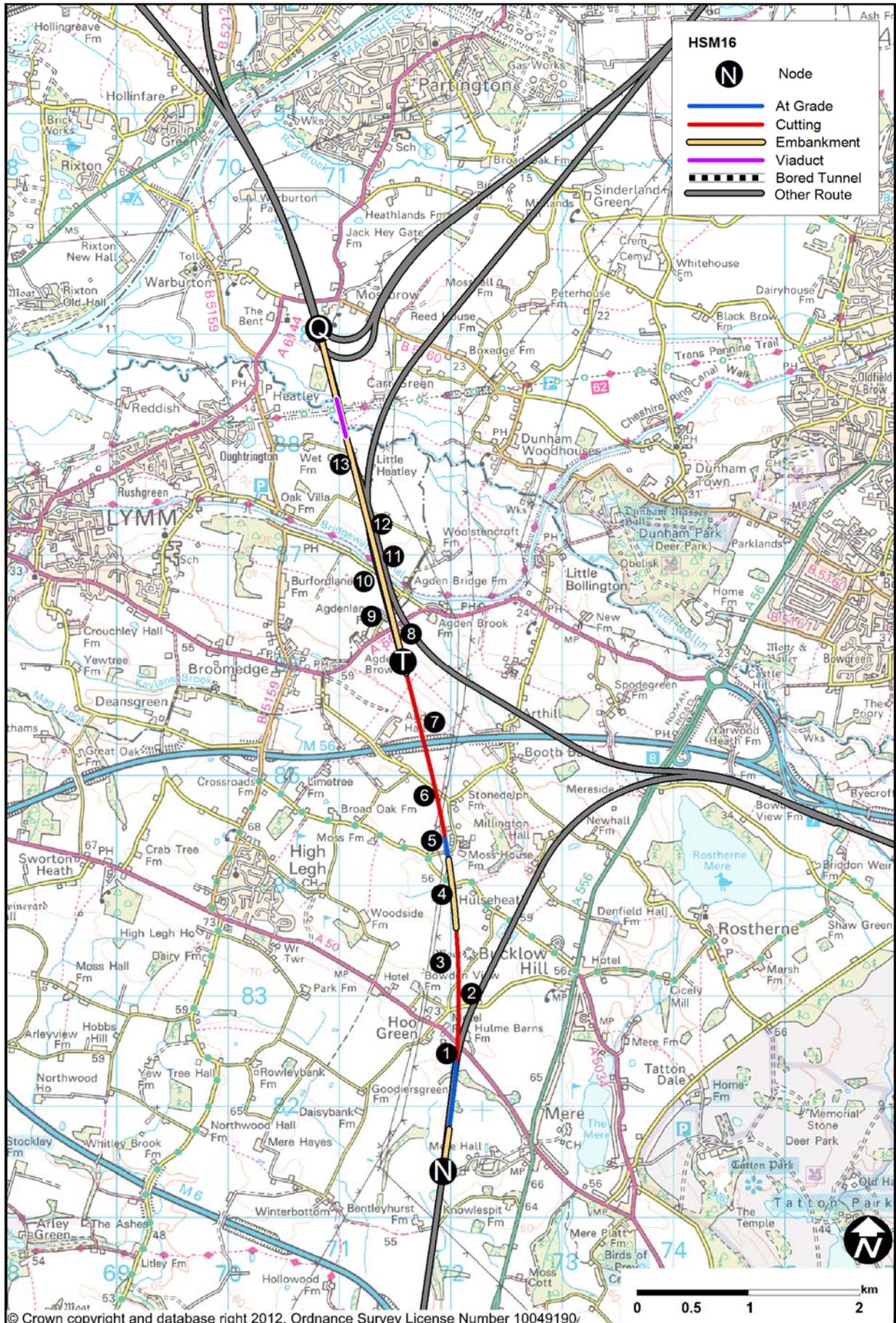
This route section for the Knutsford Interchange Station (Option 5) is 1.6km long. The section of route connecting to it from the south would be HSM13 from Shrayleybrook.

In addition to the 400kph through lines (which are part of HSM13) there would also be two additional lines, one on each side to allow trains to stop at the station platforms with a design speed of 230kph.

The section starts just north of Waterless Brook **(1)** with junction to allow the two tracks to become four. The route is on embankment with a height of 9m. After the station location the lines would continue to rise to cross Pickmere Lane **(2)**. They would then cross over the Tabley Brook flood plain **(3)** on a 75m long viaduct at a height of 11m rising towards the crossing of the M6 **(4)**, joining the through route at a junction south of Old Hall Lane **(5)**.

The interchange station is described in Section 3.8.

The route would continue north from this station along section HSM16 to Warburton or HSM29 to Rostherne.



## 2.16 HSM16: Mere (N) to Warburton (Q)

The route section between Mere and Warburton would be 7.8km long. The section of route connecting to Mere from the south would be HSM13 from Shrayleybrook. The design speed would be 400kph.

The route would be on an embankment with a maximum height of 7m and then pass into a cutting with a maximum depth of 11m. The route would pass under the A50 **(1)**, Bucklowhill Lane **(2)** and Hulseheath Lane **(3)**. The route would move onto a low embankment (height up to 3m). Chapel Lane **(4)** would be diverted for 320m on the east side of the route and Back Lane **(5)** for 600m on the west side to avoid it. The route would pass through the route of overhead power lines.

The route would then be in a cutting with a maximum depth of 18m and would pass under Agden Lane **(6)** and the M56 **(7)**.

At node T there is an option for a spur to Manchester Piccadilly using route section HSM34.

An embankment 3.3km long (maximum height 9m) would follow with the route crossing over the A56 Aden Brow **(8)**, which would be realigned. Agden Lane **(9)** would be closed at the crossing and Warrington Lane **(10)** diverted for 650m on the west side of the route to avoid it. For the next 2km the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

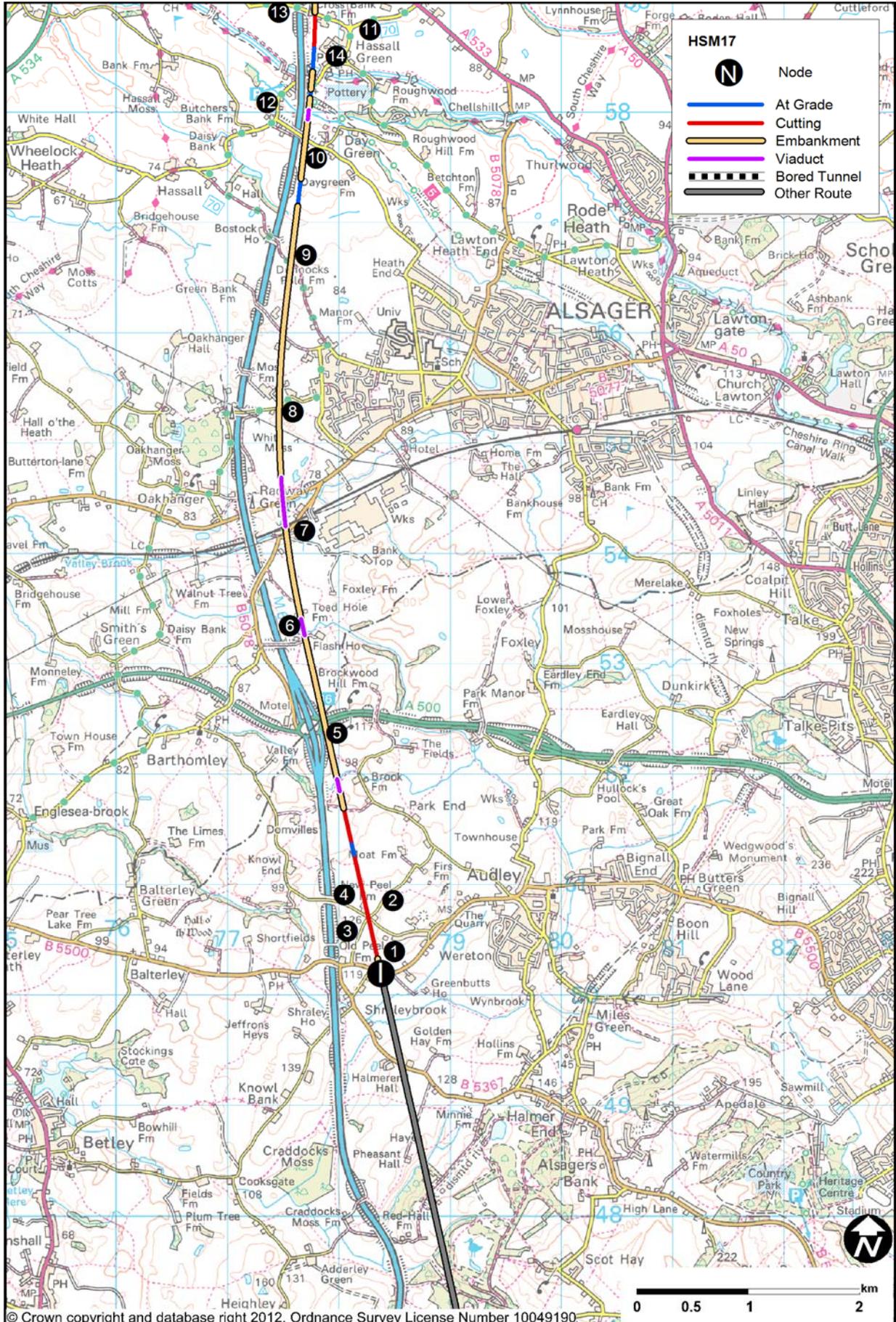
The route would cross over the Bridgewater Canal **(11)** at a height of 6m. Spring Lane **(12)** would be closed. Wet Gate Lane would be diverted for 400m on the east side of the route to avoid four crossings of it **(13)**.

The route would cross over the River Bollin flood plain on a 340m long viaduct at a height of 9m before passing onto an embankment at the same height.

To accommodate a junction for a spur to Salford along HSM35 it would be necessary to use a variation of this route option. The variant would diverge to the east of this route section by a maximum of 100m between the Mere and the Bridgewater Canal. The engineering features as described are the same for both variants.

At Warburton the route would continue along section HSM21 to Lowton or HSM35, HSM39 or HSM40 to Winton (and then to Salford).

An infrastructure maintenance depot option has been developed on the east side of this section of route at Radway Green, and is described in Section 4.1.2.



## 2.17 HSM17: Shrayleybrook (I) to Mobberley (O)

### Shrayleybrook to Hassall Green

The route section between Shrayleybrook and Mobberley is 29.4km long. The section of route connecting to Shrayleybrook from the south is either HSM05 from Millmeece or HSM07 from Swynnerton. The design speed would be 400kph.

The route would run within 300m of the M6 for 10km.

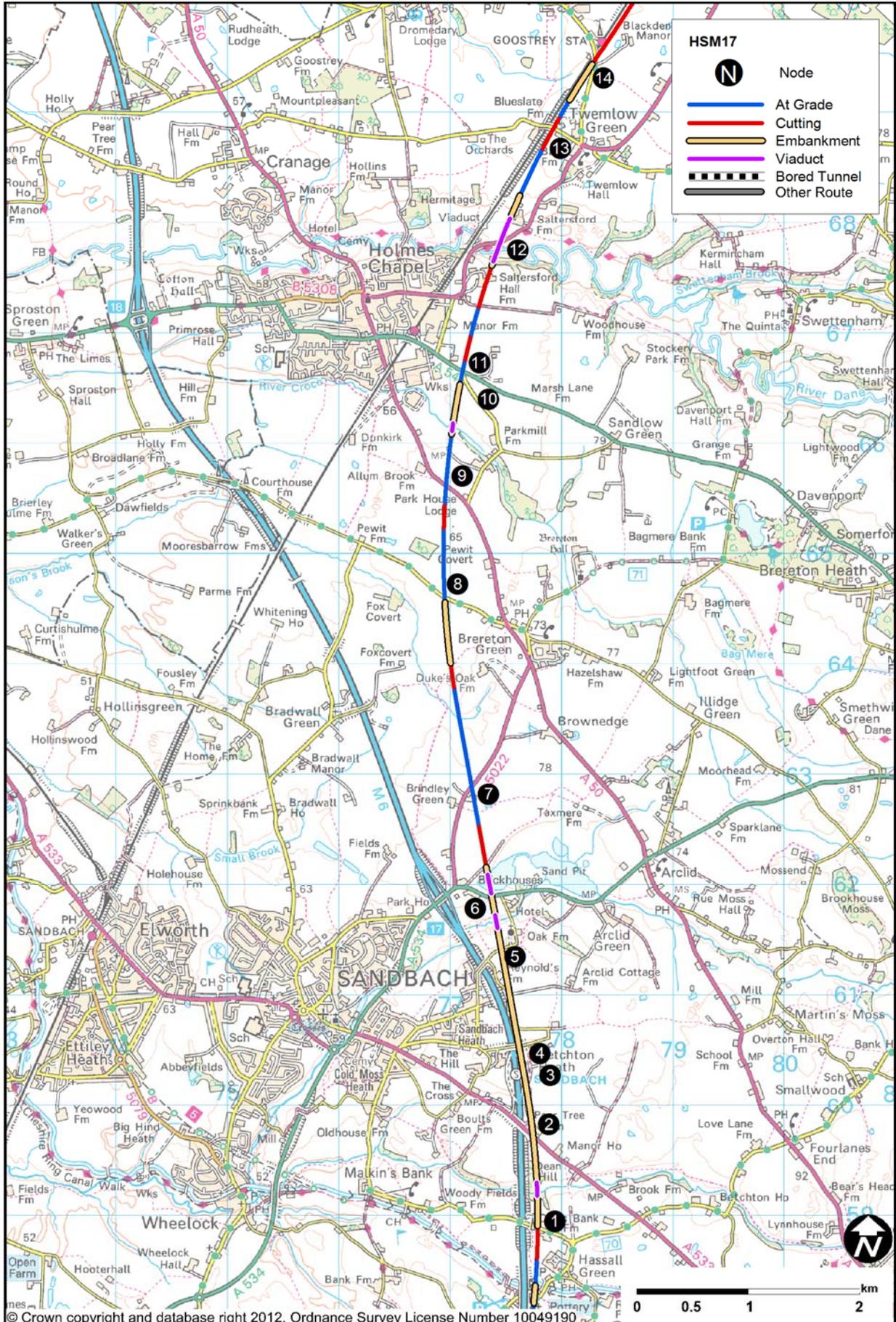
The route passes from a viaduct (see HSM7) onto a short embankment, crossing over the B5500 (Nantwich Road) **(1)**. The route follows the ground profile, firstly in cuttings up to 8m deep and then on embankments up to 10m high. Moat Lane **(2)** on the east side of the route and Peel Hollow **(3)** on the west side of the route would be diverted for 400m. Barthomley Road **(4)** would be realigned onto a bridge over the route. The route would cross a flood plain at Brook Farm on an 110m long viaduct at a height of 12m. The route would cross over the A500 **(5)**.

For the next 21km the route would be over an area of mudstone with soluble deposits with active and historic salt mines (risk of subsidence).

There is an option for an intermediate station between nodes J and K south of the A500, which is described in HSM14 and section 3.4.

The route would continue on embankment for the next 9km up to 12m high. It would pass over the flood plain at Toad Hole Farm **(6)** on a 145m long viaduct (maximum height of 10m) followed by a second viaduct **(7)** 435m long (maximum height 10m) to cross the B5078, the Crewe-Kidsgrove railway, the Valley Brook flood plain and the B5077 (Crewe Road). The route would cross White Moss, an area of peat, on an embankment (maximum height 11m). The route would pass through the routes of overhead power lines at the crossing of the B5077 and at White Moss.

The route would pass between the M6 and Alsager. Nursery Road **(8)** and Close Lane **(9)** would be realigned onto bridges over the route. The route then crosses a flood plain on a 90m long viaduct at a height of 18m. On the east side of the route Hassall Road would be closed and diverted for 1.1km from the west of Day Green **(10)** to New Inn Lane **(11)** in Hassall Green. On the west side of the route Smithy Grove would be closed with Alsager Road **(12)** being diverted on the west side of the M6 for 900m to tie in to Betchton Road **(13)**. The route would cross over the Trent and Mersey Canal **(14)**.



### Hassall Green to Goostrey

Betchton Road **(1)** would be realigned onto a bridge over the route and the M6. The route would cross a flood plain on a 110m long viaduct at a height of 20m and then the A533 **(2)**. The route would pass over the eastern side of the M6 Sandbach Services **(3)**, which would require extensive alterations. The route would cross over the first crossing of Reynolds Road **(4)**. To the north of this point the road would be diverted to the east and tied into Church Lane **(5)**. The route would pass over Church Lane and then cross the flood plain on a 125m long viaduct at a height of 18m.

The A534 (Congleton Road) **(6)** would be closed at the crossing and diverted for 1.8km to a bridge under the route north of the sand pits. The route would cross the lake at Arclid Sand Pit on a 170m long viaduct at a height of 16m.

The route would run within 2m of ground level for the next 5km. The A5022 (Holmes Chapel Road) **(7)**, Back Lane **(8)** and Dog Lane **(9)** would be realigned onto bridges over the route. The River Croco flood plain would be crossed on a 70m long viaduct at a height of 5m. Mill Lane **(10)** would be diverted for 240m on the east side of the route to avoid it. The A54 **(11)** would be realigned onto a bridge over the route. The route would pass through an area prone to landslides.

The River Dane flood plain and the A535 would be crossed on a 420m long viaduct **(12)** at a height of 24m. The route would continue to run close to ground level for the next 1.5km before passing into a 2.5m long cutting with a maximum depth of 8m. Twemlow Lane **(13)** and Goostrey Lane **(14)** would be realigned onto bridges over the route and the Crewe to Manchester railway. From Twemlow Lane the route runs within 50m of the railway for 4km.



### Goostrey to Mobberley

The route would approach the existing Crewe to Manchester railway passing just to the east of the existing Goostrey Station **(1)**. It would then start to drop into deeper cutting reaching approx 7m below existing ground level. In order to build the structure that would carry the route under the existing line it would be necessary to slew the existing lines to the east as part of the construction sequence.

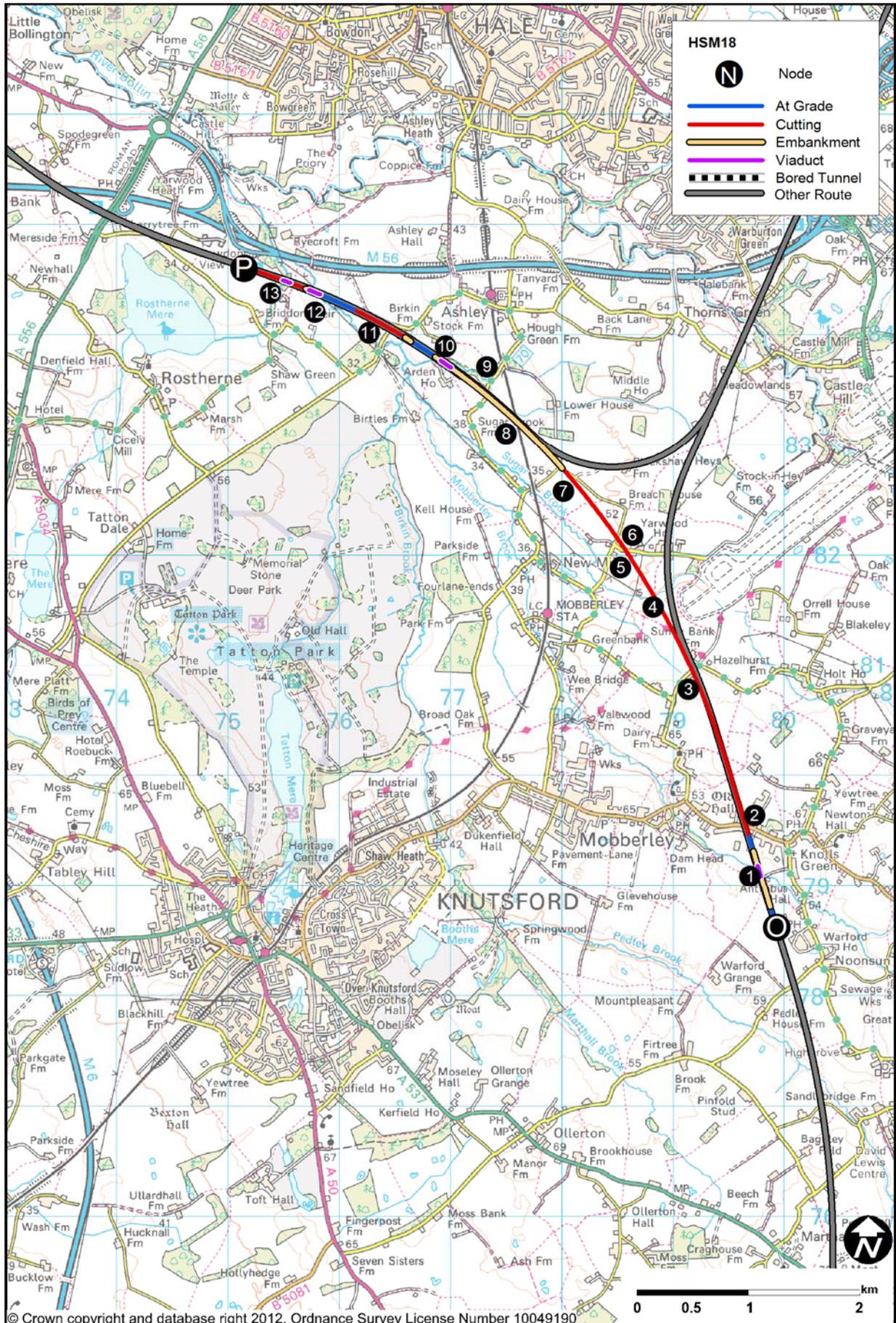
The route would be placed in open cut, then retained cut and fully enclosed box structure as it approaches and passes under the existing railway. The cutting and box structure would include a maintenance access road. As the route passes Toad Hall **(2)** the existing railway embankment would be retained in order to screen the listed building from the existing and high speed lines. The route would then emerge from the box structure in cutting with the Crewe to Manchester line to the east. The route would pass to the west of the Jodrell Bank radio telescope dish in cutting **(3)**. Staged construction and realignment of the Crewe to Manchester line would be required. It would also require support and stabilisation during construction.

Bomish Lane **(4)** would be realigned onto a bridge over the route. The route would cross the Peover Eye flood plain on a 170m long viaduct at a height of 13m. The route would then run within 2m of ground level for the next 5km. Batemill Lane **(5)** would pass under the route (it currently passes under the existing railway) and Snelson Lane **(6)** would be realigned onto a bridge over the route.

Cinder Lane **(7)** would be diverted for 200m on the east side of the route to tie into Common Farm Lane **(8)**. Common Farm Lane would also be diverted for 420m on the east side of the route to tie into Pepper Street **(9)**. Pepper Street would be realigned onto a bridge over the route. The A537 (Chelford Road) **(10)** would be closed at the crossing and diverted for 730m on the west side of the route to tie into Pepper Street. Sandle Bridge Lane would be realigned onto a bridge over the route at the first crossing **(11)**. At the second crossing it would be closed **(12)**.

The Pedley Brook flood plain would be crossed on a 75m long viaduct at a height of 7m. The route would then move onto an embankment up to 4m high. The route would cross over Pedley House Lane **(13)**, which would be realigned.

At Mobberley the route would continue along section HSM18 to M56 Junction 7 Rostherne, or HSM19 to M56 Junction 7 Rostherne with an interchange station option and in HSM25 to Ardwick (and then Manchester Piccadilly).



## 2.18 HSM18: Mobberley (O) to M56 Junction 7 Rostherne (P)

The route section between Mobberley and M56 Junction 7 Rostherne is 8.0km long. The section of route connecting to Mobberley from the south would be HSM17 from Shrayleybrook. The design speed of this section starts at 400kph and then reduces to 360kph 500m north of Hall Lane **(2)**. This reduction in speed is driven by the design required to allow the route to pass to the south side of the Airport runway and to pass between Tatton Park, Rostherne Mere and the M56. The first 6km of the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

The route would be at ground level and would cross over Mobberley Brook **(1)** on a 90m long viaduct at a height of 8m. The route would pass between Knolls Green and Mobberley descending into a cutting 3.7km long to pass the end of the Airport runway. The maximum depth of the cutting would be 20m. The B5085 (Hall Lane) **(2)** would be realigned onto a bridge over the route. Lady Lane **(3)** would cross over the route on a bridge. A bridge may be required at the end of the runway to maintain access to it.

The route would cross the Sugar Brook flood plain **(4)** in a concrete trough with an inverted siphon provided for the brook. The route would pass through the route of overhead power lines. Wood Lane **(5)** would be realigned for 900m onto a bridge over the route. Breach House Lane **(6)** would be closed at the crossing and diverted to Wood Lane. At the second crossing **(7)** of Breach House Lane the road would be realigned onto a bridge over the route.

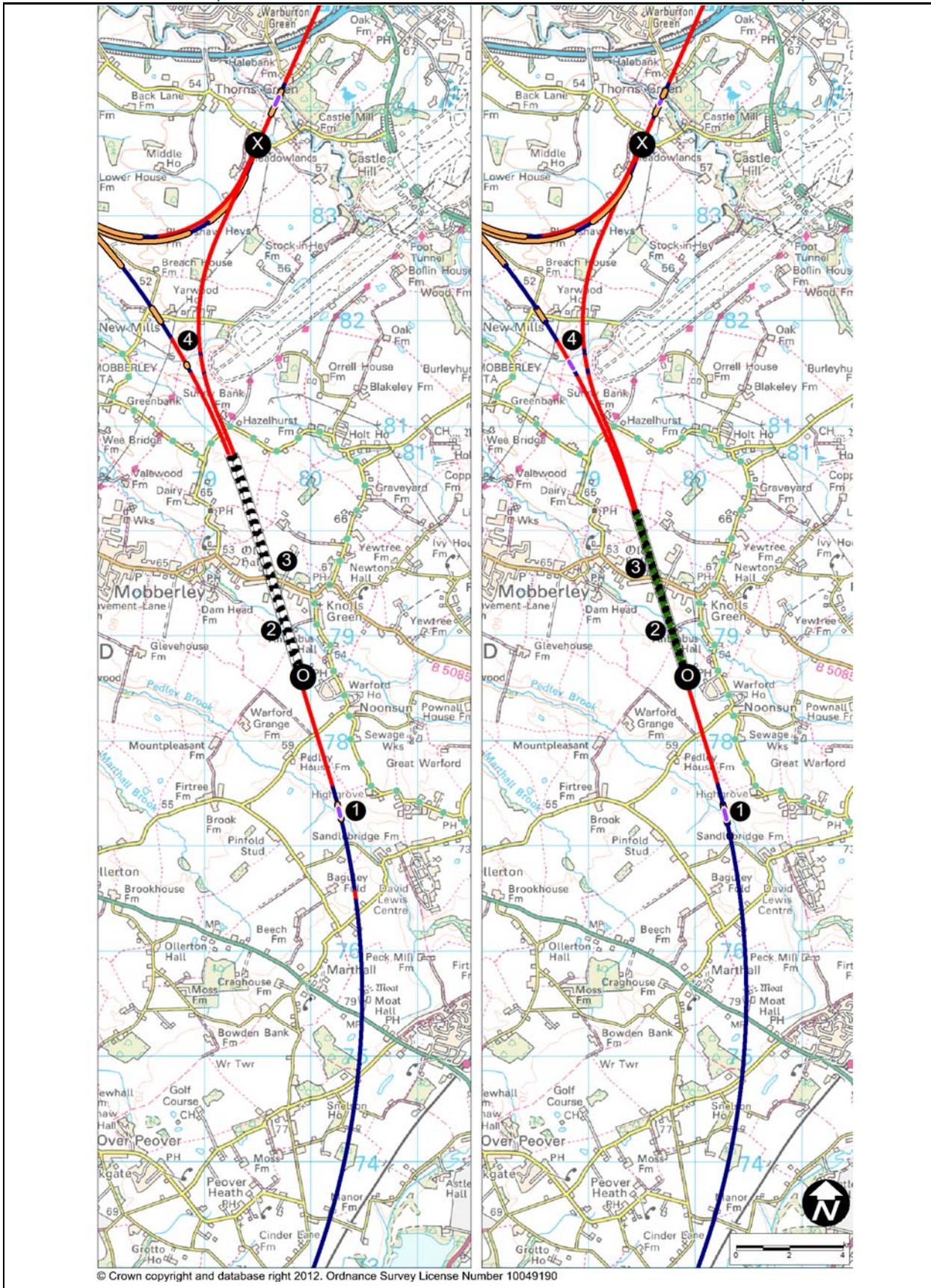
The route would then rise onto an embankment with a maximum height of 10m for 1km. The route would cross over the Altrincham to Chester railway **(8)** and Mobberley Road **(9)**. The route would then descend to ground level. A flood plain would be crossed on a 150m long viaduct at a height of 6m. Lamb Lane **(10)** and Ashley Road **(11)** would be realigned onto bridges over the route. The route would pass again through the route of overhead power lines.

The route would cross the River Bollin **(12)** on 115m long viaduct and Blackburn's Brook **(13)** on an 85m long viaduct both at a height of 3m.

At M56 Junction 7 Rostherne the route would continue along either section HSM20 to Warburton or HSM31 to Ardwick.

Bored Tunnel Option

Green Tunnel Option



### 2.18.1 Options for Tunnels at Mobberley

Two options to provide tunnels under the Mobberley conservation area were investigated in association with the spur to Manchester. One would use bored tunnels, constructed underground. The other would use a green tunnel, which would be constructed from the surface and then covered, with reinstatement of surface features. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies. The options describe how the route and spur would be configured with a junction.

#### **Bored tunnel option**

The position for the through route in the bored tunnel option would be very similar to that described for HSM18. It varies in that the two lines would move apart over a distance of 5km from a point 4km south of Pedley Brook **(1)**. The track spacing would increase from 5 m to 40m.

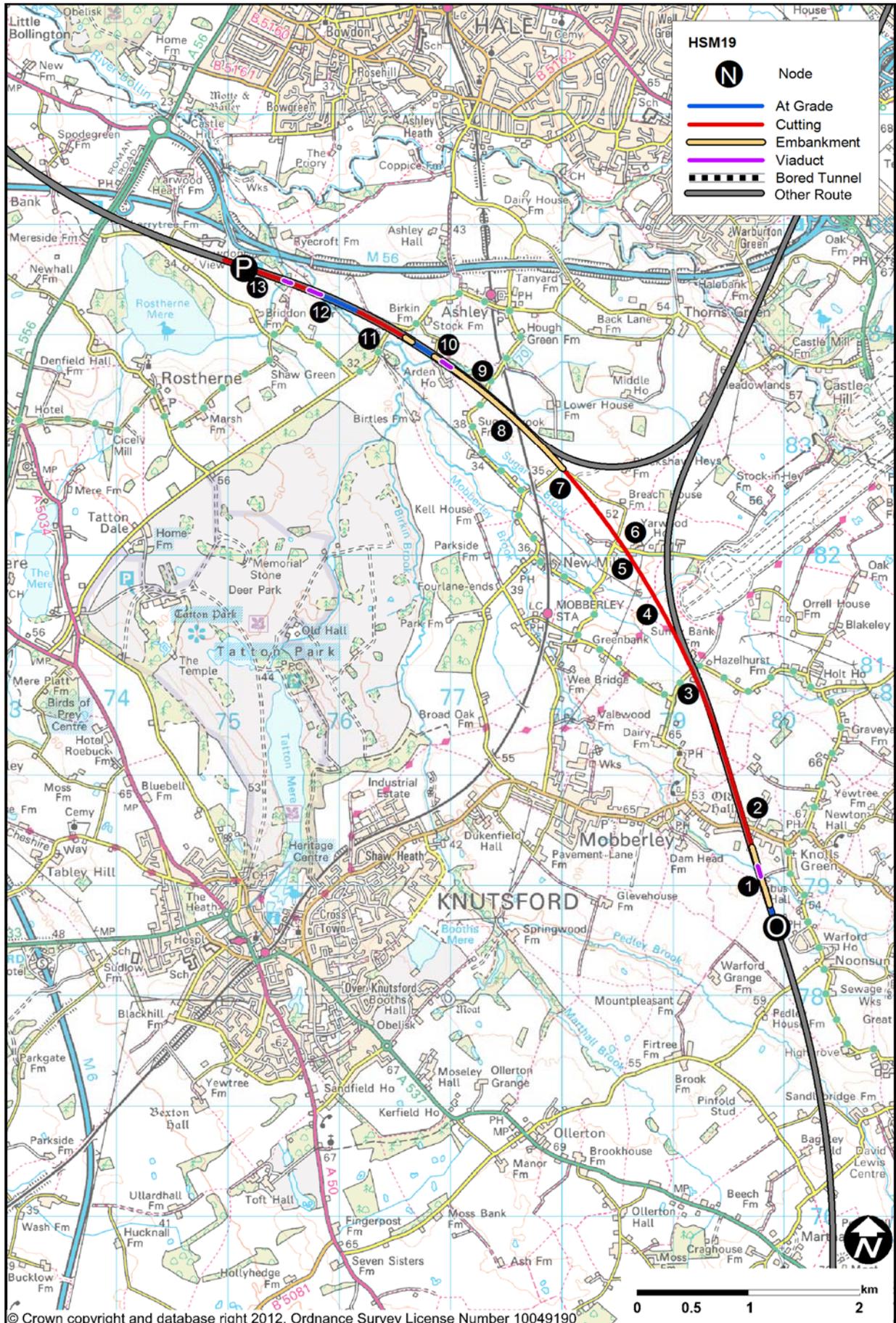
The route would descend into a deep cutting (up to 22m deep) immediately after crossing Pedley Brook. At a junction in this cutting the two lines would increase to four. The outside lines would be the through route with a design speed of 400kph and the centre 2 lines for the spur to Manchester Piccadilly with a design speed of 230kph. Three tunnel bores would be provided. A central bore for the route to Manchester Piccadilly and a bore on each side of it for the through route tracks. The tunnels would be 1.9km long and start 400m south of Mobberley Brook **(2)** and pass 30m below Hall Lane **(3)**.

On the north side of the tunnels the routes would be in cutting (maximum depth 22m) with the outside through route tracks rising to cross Sugar Brook **(4)**. The two centre tracks would rise more steeply to cross over the eastern track of the through route and then to cross over Sugar Brook, about 200m east of the through route.

#### **Green tunnel option**

The position for the through route in the green tunnel option would be very similar to that for HSM18. The route would descend into a cutting 1.5km long with a maximum depth of 17m immediately after crossing Pedley Brook **(1)**. The green tunnel would start 150m south of Mobberley Brook **(2)** which would be diverted into a wide aqueduct. The green tunnel would be 1.2km long.

The split from two lines to four for a grade separated junction would take place at a junction within the tunnel, with the four lines emerging into a cutting (maximum depth 12m) at the north end. For this option the two outer lines would form the diverging spur to Manchester Piccadilly with a design speed of 230kph. The centre lines of the through route would have a design speed of 400kph. The western diverging line would rise to cross over the two centre tracks, where it would be at ground level to join the eastern line and then cross over Sugar Brook **(4)** and continue towards the north. The centre tracks would also cross Sugar Brook and follow the route HSM18 to the west.



## 2.19 HSM19: Mobberley (O) to M56 Junction 7 Rostherne (P) – Airport Interchange Station

The route section between Mobberley and M56 Junction 7 Rostherne is 8.0km long. The section of route connecting to Mobberley from the south would be HSM17 from Shrayleybrook. The design speed of this section starts at 400kph and then reduces to 360kph 500m north of Hall Lane **(2)** and to 320kph at the crossing of Breach House Lane. This reduction in speed is driven by the design required to allow the route to pass to the south side of the Airport runway and to pass between Tatton Park, Rostherne Mere and the M56 whilst accommodating an interchange station. The first 6km of the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

The route would be at ground level and would cross over Mobberley Brook **(1)** on a 135m long viaduct at a height of 7m. The route would pass between Knolls Green and Mobberley descending into a cutting 3.7km long to pass the end of the Airport runway. The maximum depth of the cutting would be 20m. The B5085 (Hall Lane) **(2)** would be realigned onto a bridge over the route. Lady Lane **(3)** would cross over the route on a bridge. A bridge may be required at the end of the runway to maintain access to it.

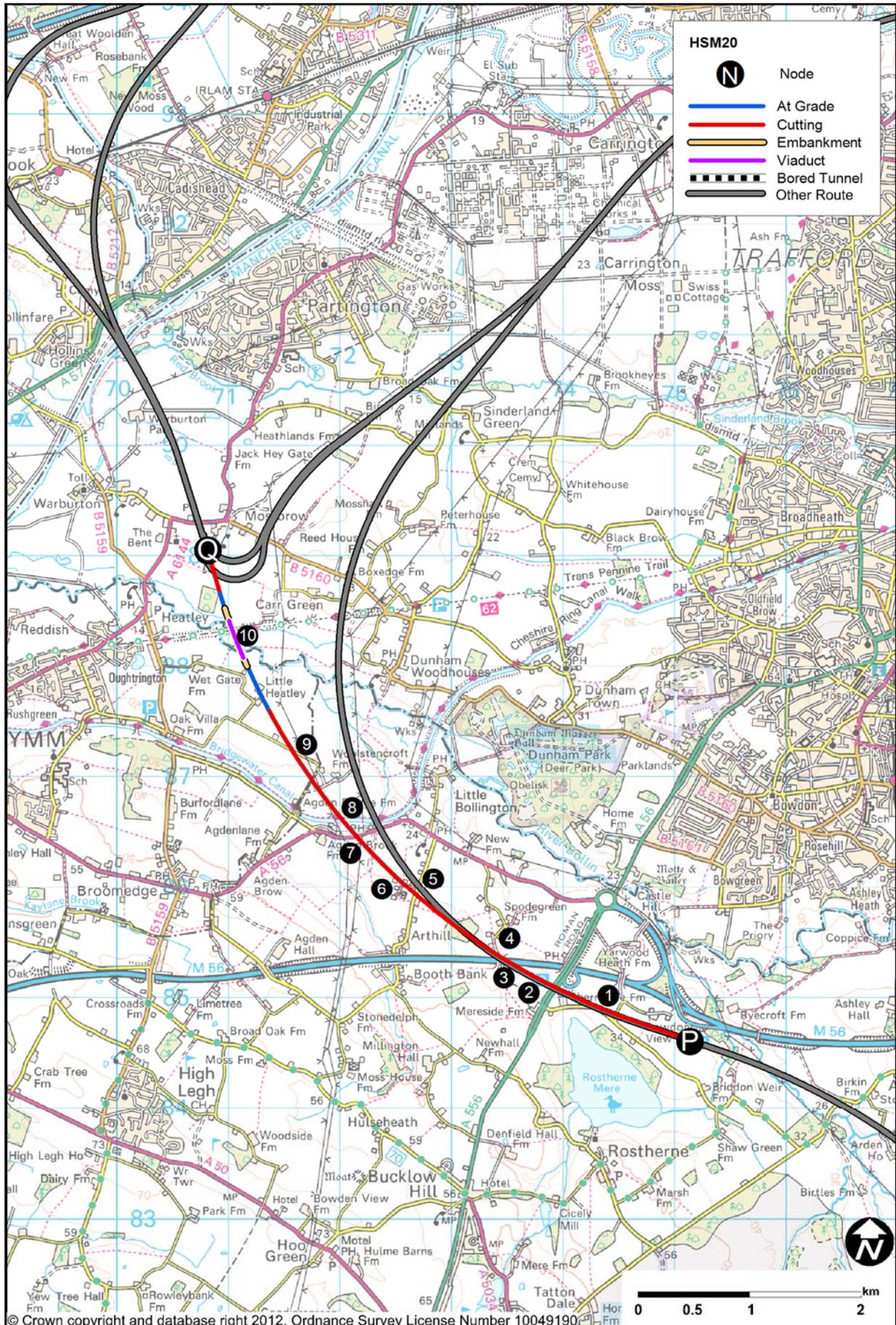
As well as the 360kph through lines at this point there would be two additional lines, one on each side to allow trains to stop at the station. The design speed for these additional lines would be 230kph. This four line section would be 6.9km long. This length is determined by the junctions which must be on straight track. The interchange station is described in Section 3.6. The four line section starts at a junction just north of Hall Lane **(2)**, with the additional lines following the same alignment and profile of the through route.

The route would cross the Sugar Brook flood plain **(4)** in a concrete trough with an inverted siphon provided for the brook. The route would pass through the route of overhead power lines. Wood Lane **(5)** would be realigned onto a bridge over the route. Breach House Lane **(6)** would be closed at the crossing and diverted to Wood Lane. At the second crossing **(7)** of Breach House Lane the road would be realigned onto a bridge over the route.

The route would then rise onto an embankment with a maximum height of 10m for 1km. The route would cross over the Altrincham to Chester railway **(8)** and Mobberley Road **(9)**. The route would then descend to ground level. A flood plain would be crossed on a 200m long viaduct at a height of 6m. Lamb Lane **(10)** would cross over the route on a bridge. Ashley Road **(11)** would be realigned onto a bridge over the route. The route would pass again through the route of overhead power lines.

The route would cross the River Bollin **(12)** on 115m long viaduct and Blackburn's Brook **(13)** on a 55m long viaduct both at a height of 3m. The four line section would end at a junction 400m to the west of Blackburn's Brook.

At M56 Junction 7 Rostherne the route would continue along either section HSM20 to Warburton or HSM31 to Ardwick.



## 2.20 HSM20: M56 Junction 7 Rostherne (P) to Warburton (Q)

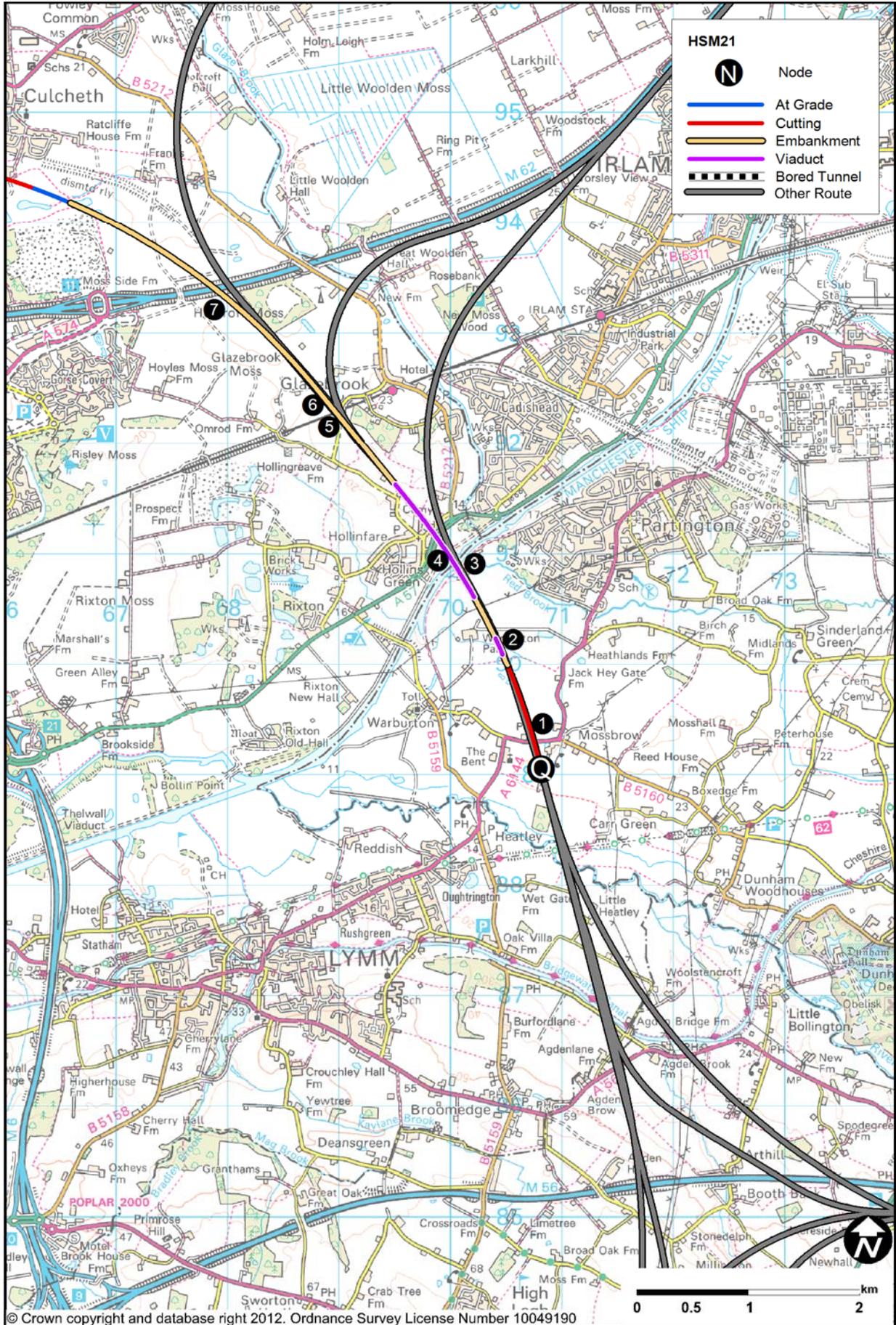
The route section between M56 Junction 7 Rostherne and Warburton would be 6.6km long. The section of route connecting to M56 Junction 7 Rostherne from the south would be either HSM18 or HSM19 from Mobberley. The design speed is 360kph. Speed is constrained by numerous settlements and environmental features in this area and to the north and south.

The route would run in a cutting for 5km to minimise the noise, landscape and visual impacts of the route on Rostherne Mere, Dunham Massey, and Little Bollington. The maximum depth would be 12m where the route is adjacent to Rostherne Mere. It will be necessary to prevent groundwater flows into the deep cutting and possibly to seal the cutting and provide a permeable flow route. The route would pass under Tom Lane running on the north side of Cherry Tree Lane **(1)** at Rostherne Mere. The route would pass under the A556 **(2)** and the M56 **(3)**. Stabilisation of and support to the A556 and traffic management on the M56 would be required during construction. Coe Lane **(4)** would be closed at the crossing. The route would pass under Reddy Lane **(5)** and Arthill Lane **(6)** would be diverted for 100m on the west side of the route to avoid it. For the next 2.7km the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

The A56 (Lymm Road) **(7)** would cross over the route on a bridge and an aqueduct would be provided for the Bridgewater Canal **(8)** to cross over the route at a height of 8m. The route would cross a short section of flood plain in a concrete trough.

In this area the route passes through two routes of overhead power lines. Spring Lane **(9)** would be diverted for 280m on the west side of the route to avoid it. The route would then rise to cross the River Bollin flood plain **(10)** on a 360m long viaduct at a height of 5m before passing into a cutting up to 8m deep.

At Warburton the route would continue along section HSM21 to Lowton or section HSM35, HSM39 or HSM40 to Winton (and then to Salford).



## 2.21 HSM21: Warburton (Q) to Lowton (R)

### Warburton to the M62

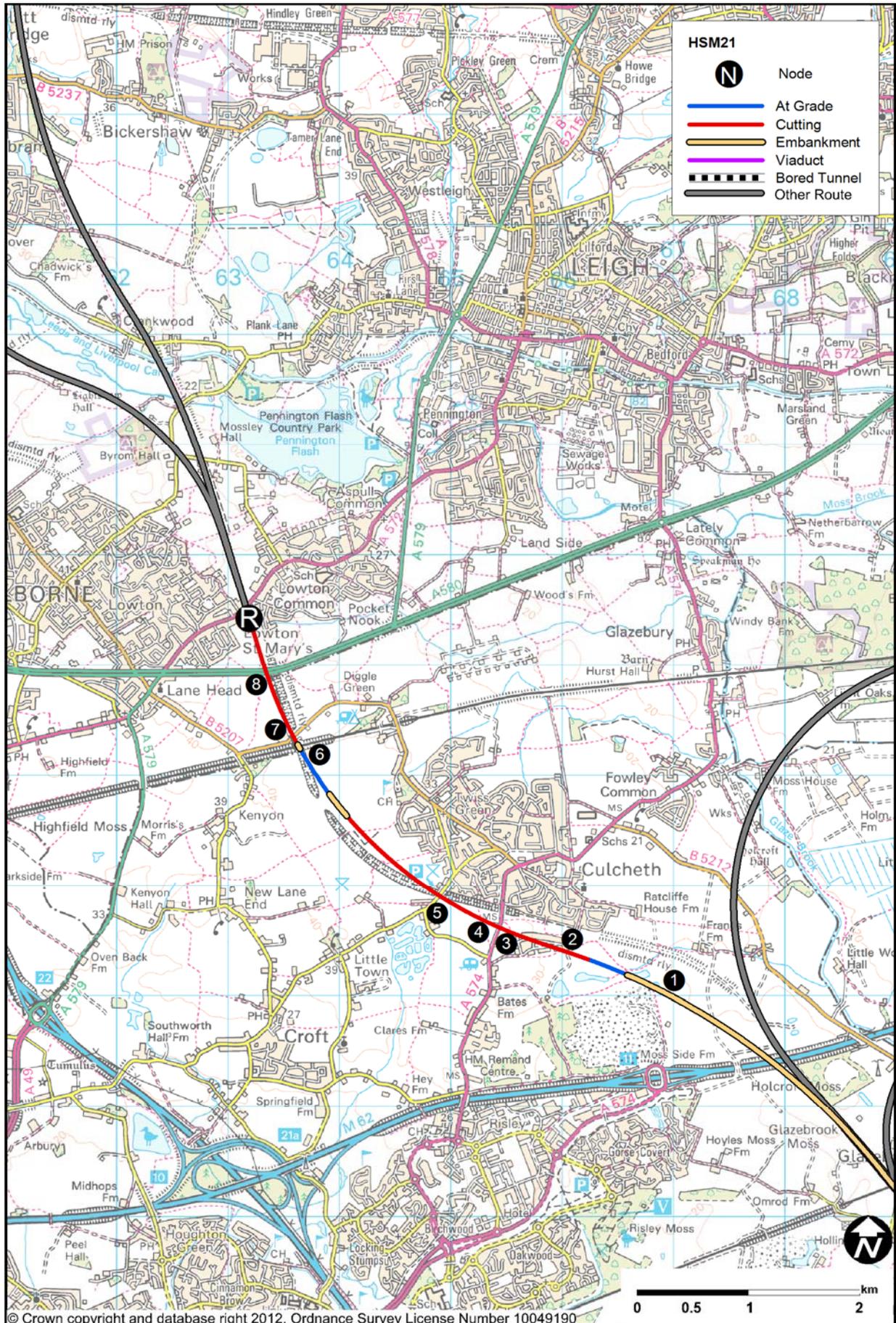
The route section between Warburton and Lowton would be 12.1km long. The section of route connecting to Warburton from the south would be either HSM12 from Winterbottom, HSM16 from Mere, HSM20 from M56 Junction 7 Rostherne or HSM30 from Rostherne.

The design speed would be 360kph then reducing to 300kph. The speed results from the design required to pass over the Manchester Ship Canal between Hollins Green and Cadishead, the landfill site at Risley, the west side of Culcheth and the route through Lowton on the line of the dismantled railway.

The route would be at ground level and then pass into a cutting with a maximum depth of 9m passing between Mossbrow and Warburton. The A6144 **(1)** would be realigned to the north on a bridge over the route. The B5160 would be extended to connect to it.

The flood plain **(2)** at Warburton Park would be crossed on an 180m long viaduct at a height of 7m. The route would then rise steeply pass through the route of overhead power lines. The route rises to a height of 28m on a high embankment to cross over the Manchester Ship Canal **(3)** between Hollins Green and Cadishead on a 1.2km long viaduct, providing navigation clearance. The viaduct also crosses Caldwell Brook, a historic landfill site, the A57 **(4)** and, Manchester Road.

The route continues on embankment for the next 3.6km reducing in height from the viaduct and an area of peat. Works to maintain the groundwater regime, including during the removal of peat, would be required during construction. The route would cross over Dam Head Lane **(5)**, the Manchester to Warrington railway **(6)** and the M62 **(7)**.

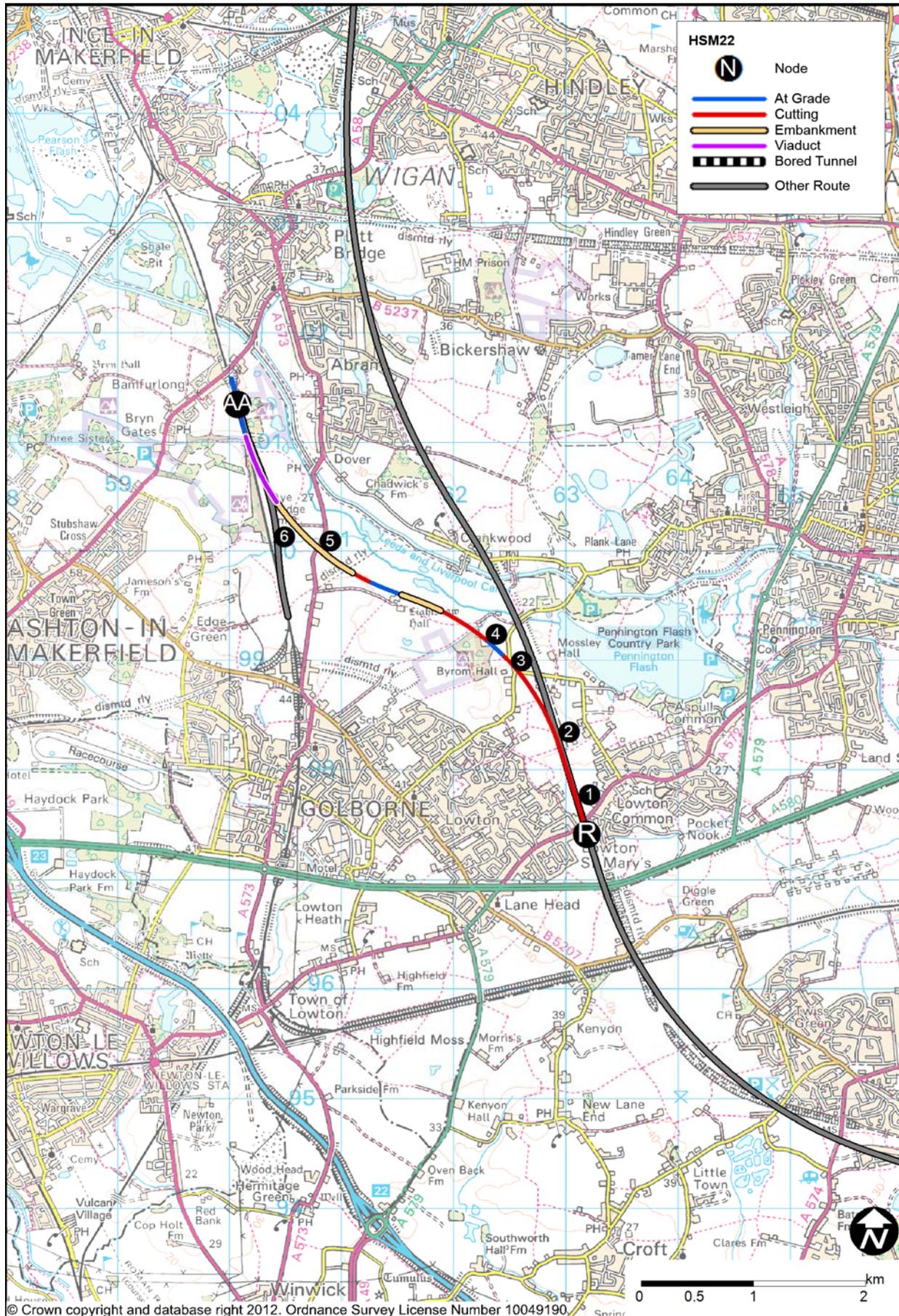


### **M62 to Lowton**

The route would pass through the north-east corner of the Risley landfill site **(1)** at ground level and then pass into a cutting for 2.6km with a maximum depth of 8m. The route passes through the Taylor Industrial Estate **(2)**. New Hall Lane **(3)** would be closed and the A574 **(4)** realigned onto a bridge over the route. The route passes west of Culcheth in a cutting between 6m and 8m deep to limit noise and visual impact. Wigshaw Lane **(5)** would cross over the route on a bridge at the location of the dismantled railway.

The route then runs at ground level for 700m before passing into a cutting with a maximum depth of 8m. The route would cross over the Liverpool to Manchester railway **(6)**. Wilton Lane **(7)** would be realigned onto a bridge over the route. The A580 **(8)** would cross over the route on a bridge.

At Lowton the route would continue along section HSM22 to connect to the WCML at Bamfurlong or section HSM23 to connect to the WCML at Brock, north of Preston.



## 2.22 HSM22: Lowton (R) to Bamfurlong (AA)

The route section between Lowton and Bamfurlong would be 5.2km long. The section of route connecting to Lowton from the south would be HSM21 from Warburton. The design is 230kph.

This section of route provides a connection to the West Coast Main Line. There is also an option to continue along a route section to the north of Preston (see HSM23).

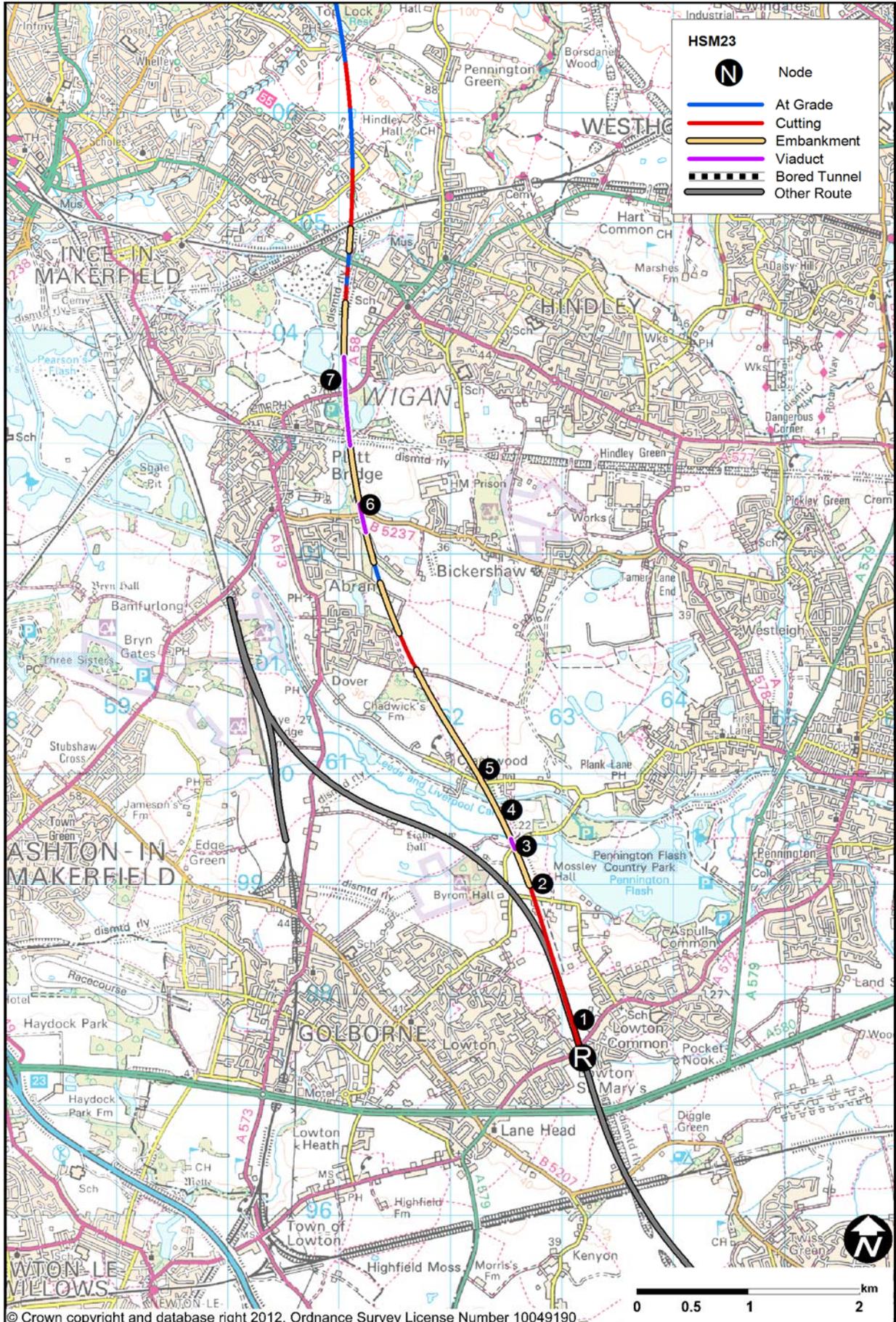
At Lowton Common the A572 **(1)** would be realigned onto a bridge over the route at the location of the dismantled railway.

A grade separated junction would be provided with the tracks increasing from two to four at a junction by the A572 (Newton Road). The route would be in a cutting, passing through a historic coal mining area and landfill site, which would extend for 1.6km at a maximum depth of 7m. The eastern track would rise (at a maximum height of 2m above ground level) to cross over the through route, which is in a 6m deep cutting, and join the western track to form this diverging route. **(2)**.

Byrom Lane **(3)** would be diverted for 700m on the north side of the route to avoid it. Slag Lane **(4)** would be realigned onto a bridge over the route east of Byrom Hall. After a short length at ground level the route would run in a shallow cutting (up to 4m deep), on a low embankment (up to 3m high), at ground level and then rise on an embankment with a maximum height of 12m. The A573 **(5)** would be realigned onto a bridge over the route.

The existing most easterly of the four WCML lines would be realigned up to 100m east **(6)** to allow this route to pass over it (at a height of 8m) and descend to connect to the WCML at a junction 300m south of A58 **(7)** at Bamfurlong in a historic coal mining area. The length of the realignment would be 2km.

A rolling stock maintenance depot option has been developed on the south side of this section of route, and is described in Section 4.2.1.



## 2.23 HSM23: Lowton (R) to Brock (AB)

### Lowton to Hindley

The route section between Lowton and Brock would be 45.9km long. The section of route connecting to Lowton from the south would be HSM21 from Warburton. The design speed is 360kph for the first 5km, then 400kph. The 360kph section results from a design to allow the route to pass from Lowton, past Pennington Flash and to the east of Abram and Platt Bridge. The speed reduces from 400kph to 360kph, and then to 230kph over the 7km before the connection to the WCML at Brock to run at the maximum permissible speed of the WCML.

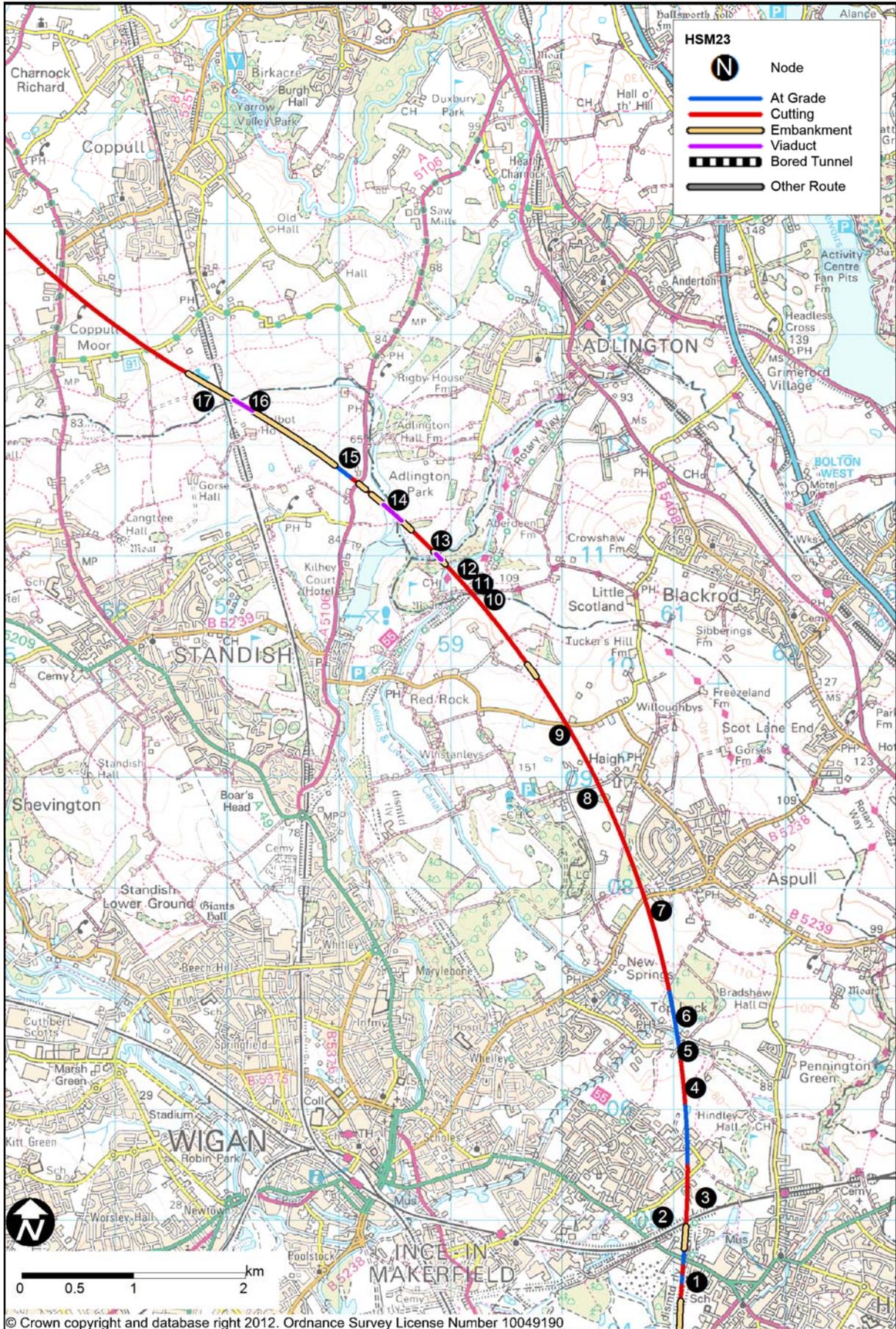
At Lowton Common the A572 **(1)** would cross over the route on a bridge at the location of the dismantled railway.

The route would be in a cutting, passing through a historic landfill site for 1.6km following the route of the dismantled railway with a maximum depth of 7m. Byrom Lane **(2)** would be diverted for 600m on the east side of the route to avoid it.

The route would rise onto an embankment 5.5km long, again passing through a historic landfill site. The first 1km would have a maximum height of 9m. The route would cross over Slag Lane **(3)**, the Hey Brook flood plain on a 125m long viaduct at a height of 6m and then the Leeds and Liverpool Canal **(4)**. Crankwood Road **(5)** would be realigned onto a bridge over the route. The next 2km of the embankment would have a maximum height of 6m, followed by a section with a maximum height of 11m. For the next 18km (to Ecclestone) the route would pass through areas of historic coal mining.

The flood plain and the B5237 **(6)** would be crossed on a 345m long viaduct at a height of 11m. A second viaduct 830m long would cross the Borsdane Brook flood plain, Low Hall Flash and the A58 **(7)** at Platt Bridge at a maximum height of 11m (average height 9m).

The route would rise following ground level within 3m on embankment or in cutting for the next 3km passing through three historic landfill sites.



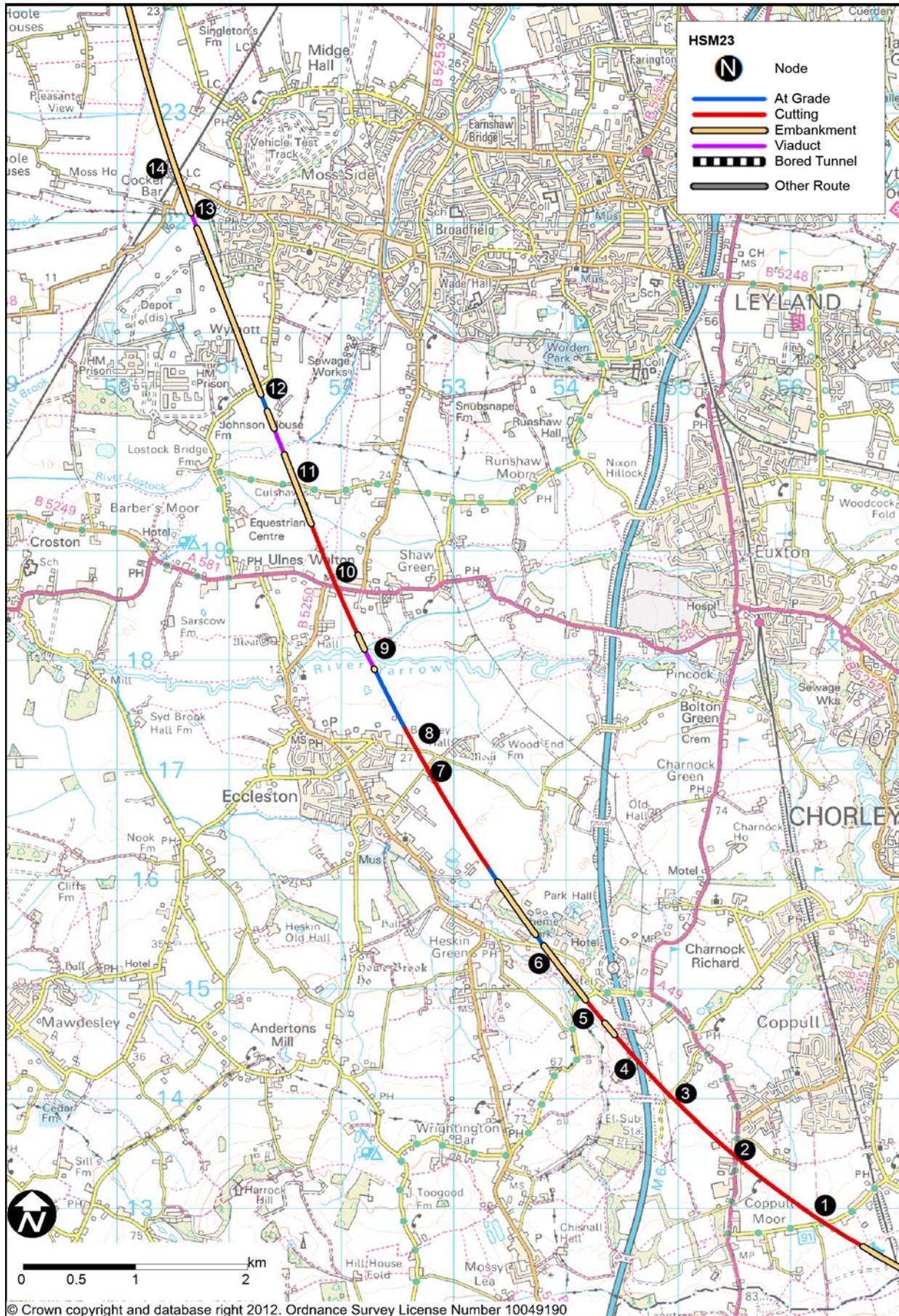
### Hindley to Coppull Moor

The A577 **(1)** would be realigned for 800m on the east side of the route to avoid it, passing under the Wigan to Manchester railway line to tie in to Makerfield Way **(2)**. Makerfield Way would be realigned for 850m onto a bridge over the route and to avoid the second crossing of the route. The route would pass into a cutting (maximum depth of 17m), under the Wigan to Manchester **(3)** railway and through the active landfill site **(4)** at Top Lock. The landfill may require complete removal. Cale Lane **(5)** would be realigned onto a bridge over the route. Withington Lane **(6)** would be diverted for 200m to avoid the route. A reservoir would also need to be infilled.

The route would rise, following the ground profile before passing into cutting for the next 3km. The maximum depth of the cutting would be 17m. The route would pass through a historic landfill site, under the B5238 (Wigan Road) **(7)** (which would be realigned) and then between Aspull and Haigh Country Park. Copperas Lane **(8)** and the B5239 (Meadow Pit Lane) **(9)** would cross over the route.

The route would descend following the ground profile for the next 3km with a series of cuttings (up to 10m deep) and embankments (up to 12m high). An aqueduct would be provided for Arley Brook **(10)** to cross over the route. Arley Lane **(11)** would cross over the route on a bridge. The route would pass under the Leeds and Liverpool Canal **(12)**, which would be diverted in an aqueduct. The River Douglas flood plain **(13)** at Arley Wood would be crossed on an 80m long viaduct at a height of 12m. This is an area which may be prone to landslides. The Bucklow Brook flood plain **(14)** would be crossed at Worthington Lakes on a 245m long viaduct at a height of 11m. The route would pass under the A5106 (Bores Hill) **(15)**.

The route would then rise on an embankment with a maximum height of 16m to cross a historic landfill site and then Bucklow Brook flood plain **(16)** on a 205m long viaduct at a height of 17m before crossing over the WCML and through another historic landfill site **(17)**. The route would then be in cutting for 3km passing between Coppull and Coppull Moor.



### **Coppull Moor to Cocker Bar**

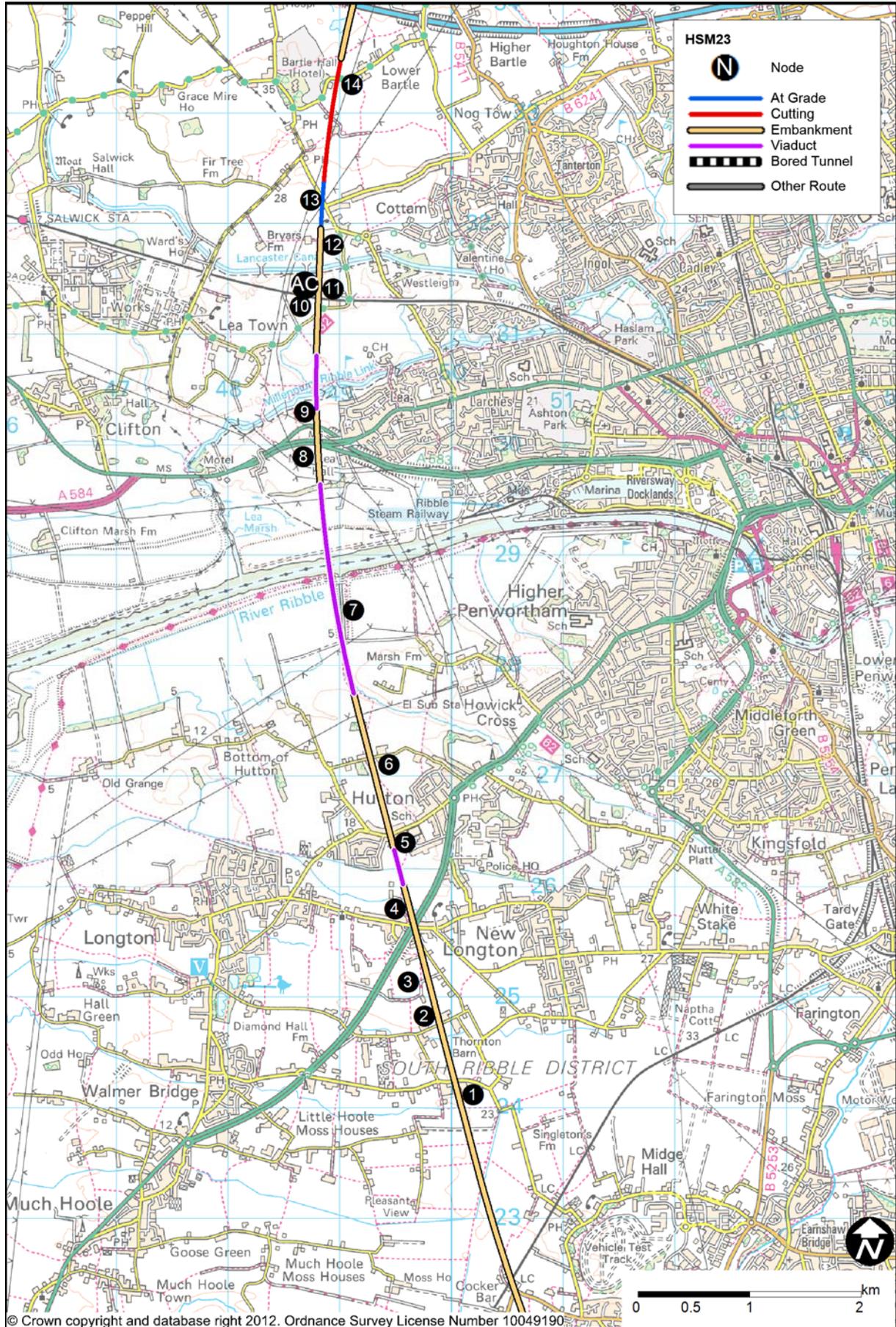
The route would pass under Coppull Moor Lane **(1)**, the A49 (Preston Road) **(2)** and Town Lane **(3)**. The route would pass through the route of overhead power lines and then under the M6 **(4)**. Construction under the M6 may require local temporary diversion and traffic management.

The route follows the ground profile for the next 4.5km to the east of Ecclestone in cuttings up to 9m deep and on embankments up to 10m high. Mill Lane **(5)** would be closed and Park Hall Road **(6)** realigned onto a bridge over the route. Bradley Lane **(7)** would be diverted for 300m on the west side of the route to avoid it. Park Lane **(8)** would be realigned onto a bridge over the route.

The River Yarrow flood plain **(9)** would be crossed on a 260m long viaduct at a height of 3m.

The route would then be in a cutting 8m deep and pass under the A581 **(10)** to the east of Ulnes Walton. The route would then rise to be on embankment for the next 9km until moving onto a viaduct to cross the River Ribble flood plain.

Holker Lane **(11)** would be realigned onto a bridge over the route. The route would cross the River Lostock flood plain on a 260m long viaduct at a height of 4m. Ulnes Walton Lane **(12)** would be realigned onto a bridge over the route. The Wymott Brook flood plain would be crossed on a 145m long viaduct at a height of 6m. The route would then pass to the west of Leyland through a historic landfill site. The B5248 (Cocker Bar Road) **(13)** would be diverted on a bridge over the route. The route would cross over the Preston to Ormskirk railway line **(14)** at Cocker Bar.



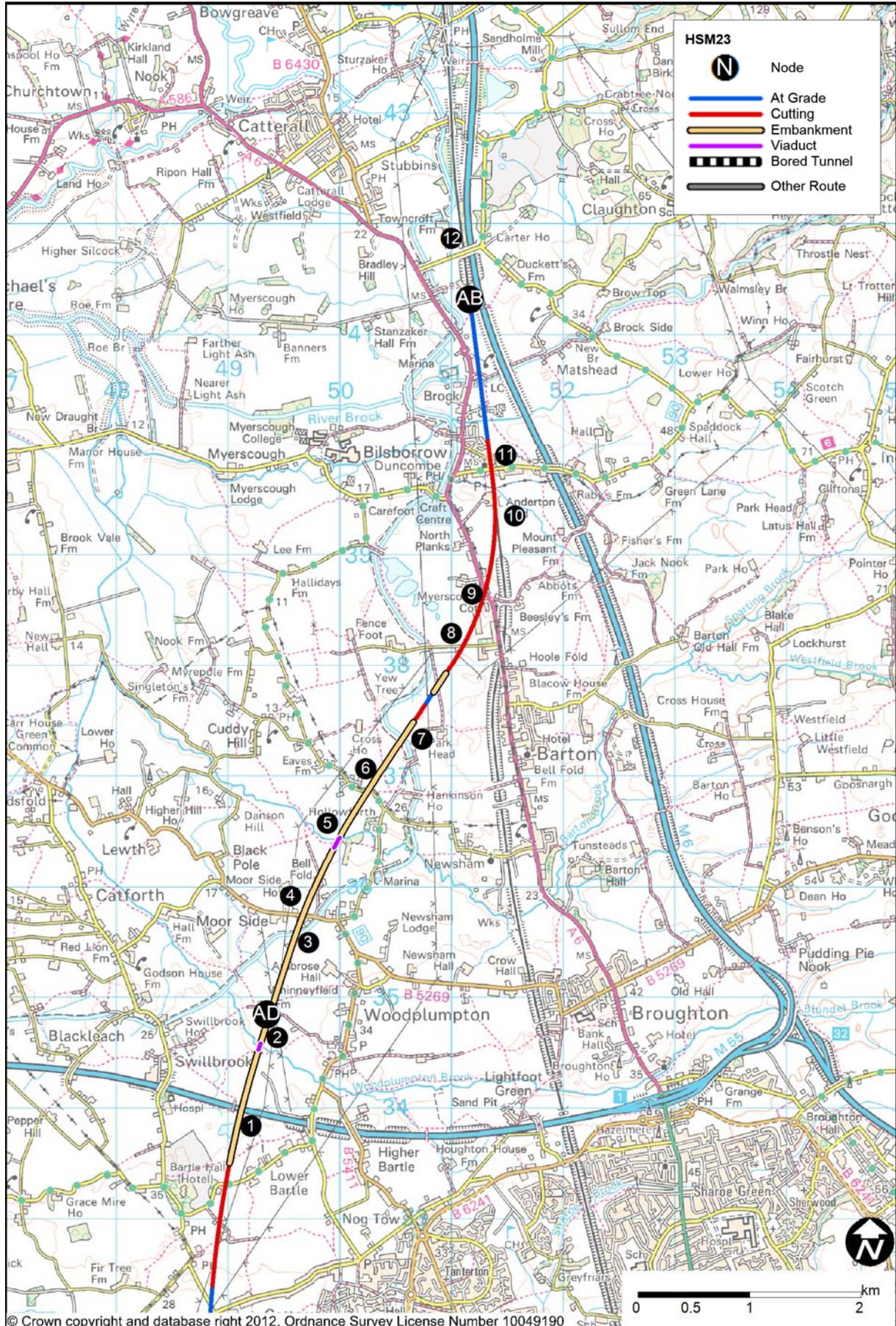
### Cocker Bar to Lower Bartle

Gill Lane **(1)** would be realigned onto a bridge over the route. Drumacre Lane East **(2)** would be closed at the crossing. Thropps Lane **(3)** would be diverted to avoid the route. The route would cross over Brownhill Lane, Chapel Lane, Chapel Park Road and the A59 (Longton Bypass) **(4)**. The Longton Brook flood plain would be crossed on a 320m long viaduct at a height of 10m. The route would cross over Moor Lane and Liverpool Road **(5)** at Hutton as well as Ratten Lane **(6)**. The route would pass through two routes of overhead power lines.

500m north of Ratten Lane the route would cross the Mill Brook and River Ribble flood plains **(7)** on a 1.4km long viaduct with a maximum height of 25m (average height 18m).

The route would continue for 350m over a historic landfill site on embankment with a maximum height of 12m, which would extend for 2.5km and would pass through two routes of overhead power lines. The route would cross over the A5083 and the A583 **(8)** which would both require significant works to be diverted. A 235m long viaduct with a height of 21m would cross over the Millenium Ribble Link **(9)** and Savick Brook followed by a second viaduct 120m long with a height of 16m to cross a hollow. The route would cross over Darkinson Lane **(10)**, the Preston to Blackpool railway **(11)**, the Lancaster Canal **(12)** and Sidgreaves Lane **(13)** before passing through two further routes of overhead power lines.

The route would pass into a shallow cutting where Bartle Lane **(14)** would be closed.



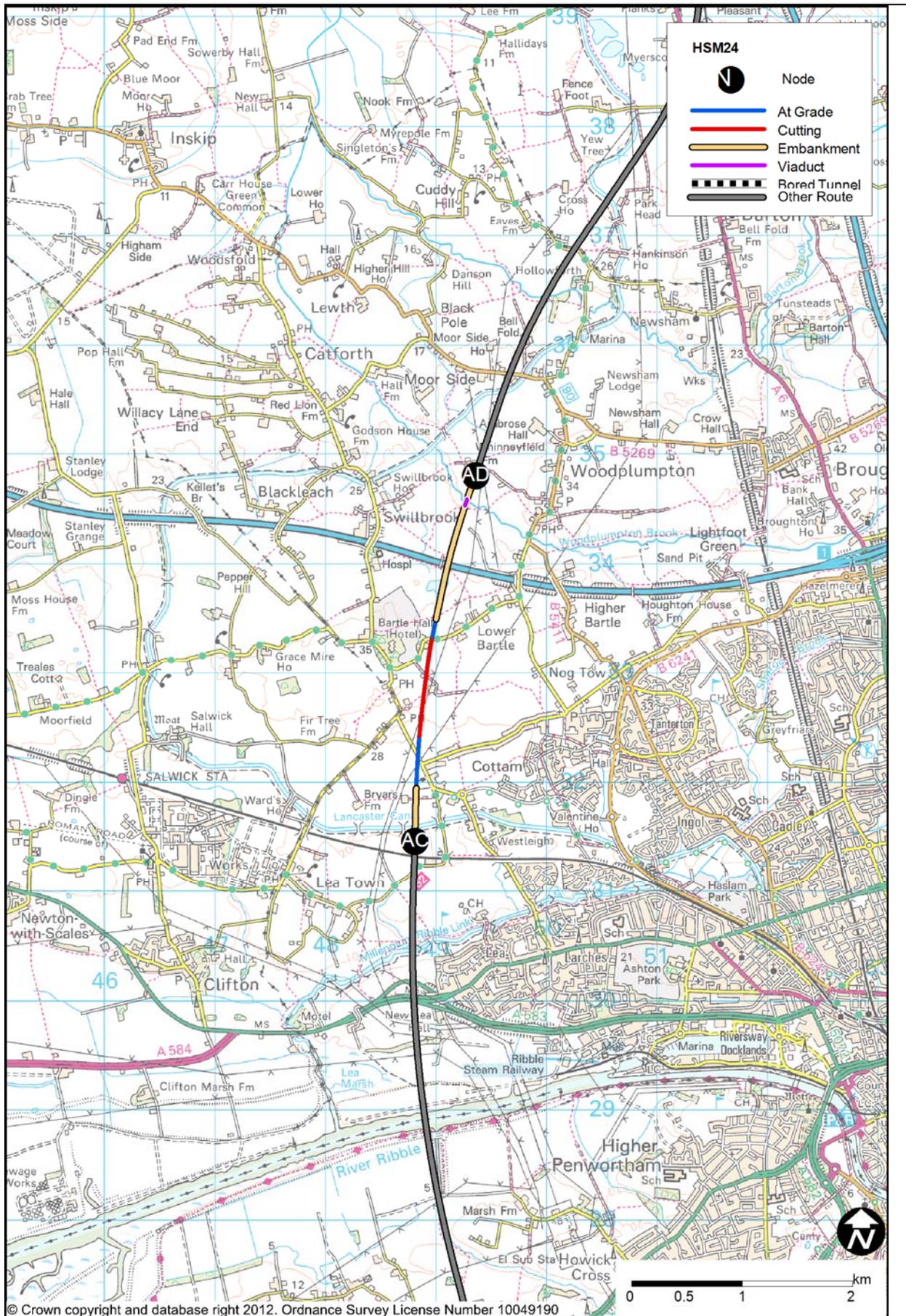
### Lower Bartle to Brock

The option for an interchange station between nodes AC and AD (between Lower Bartle and the M55) is described in HSM24 and Section 3.10.

The route would pass onto embankment with a maximum height of 10m for 4.5km and cross over the M55 **(1)**. A 60m long viaduct would cross Woodplumpton Brook **(2)** at a height of 12m. The route would pass through the route of overhead power lines and then cross over the Lancaster Canal **(3)** and the B5269 (Woodplumpton Road) **(4)**. The New Mill Brook flood plain **(5)** would be crossed on a 100m long viaduct at a height of 9m. The route would then cross over Eaves Lane **(6)** and the Lancaster Canal **(7)**.

The route would continue into a cutting with a maximum depth of 9m and through another route of overhead power lines. White Horse Lane **(8)** would be realigned onto a bridge over the route. The route would cross under the A6 (Myerscough Planks) **(9)** before crossing the Bacchus Brook flood plain **(10)** in a concrete trough alongside the WCML. The Brook would be diverted in an aqueduct. Bilsborrow Lane **(11)** would be realigned onto a bridge over the route.

A grade separated junction would be provided with the eastern high speed line crossing over the western line of the two track WCML at a maximum height of 8m before descending to join the eastern line of the WCML at Brock and crossing over the River Brock. At this location the eastern line of the WCML would be realigned to the east to provide space for the descending high speed line, which would join the WCML at a junction 400m south of the New Lane **(12)**. The length of this realignment would be 4km. New Lane would be diverted onto a bridge over the realigned WCML and the M6.



## 2.24 HSM24: Lea (AC) to Woodplumpton (AD) – M55 Interchange Station

This route section for the M55 interchange station option would be 3.4km long. The section of route connecting to it from the south would be HSM23 from Lowton

This section of route is an option for an interchange station. In addition to the 400kph through lines (which are part of HSM23) there would also be two additional lines with a design speed of 230kph, one on each side to allow trains to stop at the station platforms. This four line section would be 3.4km long.

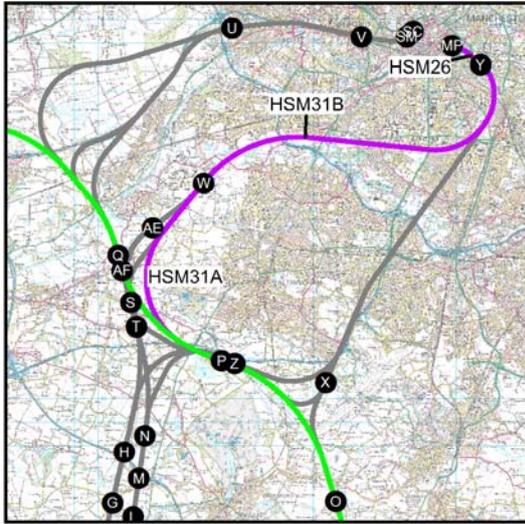
The section starts just north of the Preston to Blackpool railway **(1)** on an embankment 8m high with a junction to allow the two tracks to become four. It would cross the Lancaster Canal **(2)** and Sidgreaves Lane **(3)**. The route would pass into a shallow cutting. Bartle Lane would be closed. The station would be positioned between Bartle Lane **(4)** and the M55 **(5)**.

After the station the route would pass onto embankment with a maximum height of 10m and cross over the M55. A 60m long viaduct would cross Woodplumpton Brook **(6)** at a height of 12m. The two platform lines would join the through route at a junction 250m north of the viaduct.

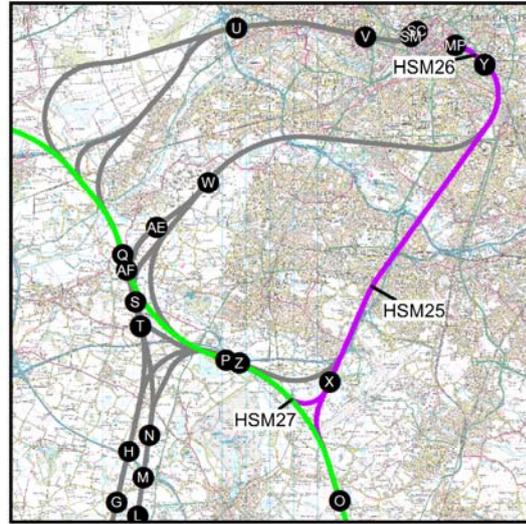
The interchange station is described in Section 3.10

The route would continue north from this station along section HSM23 to Brock.

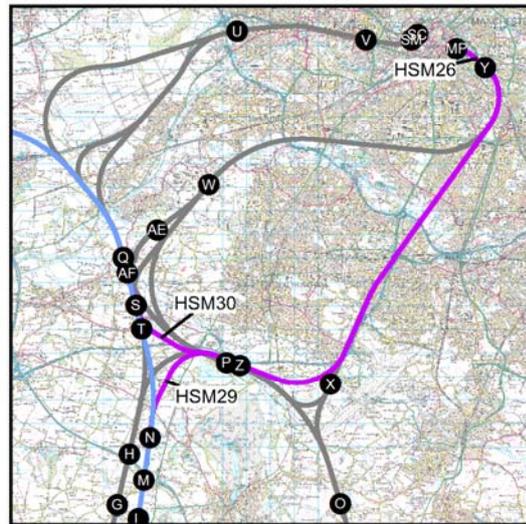
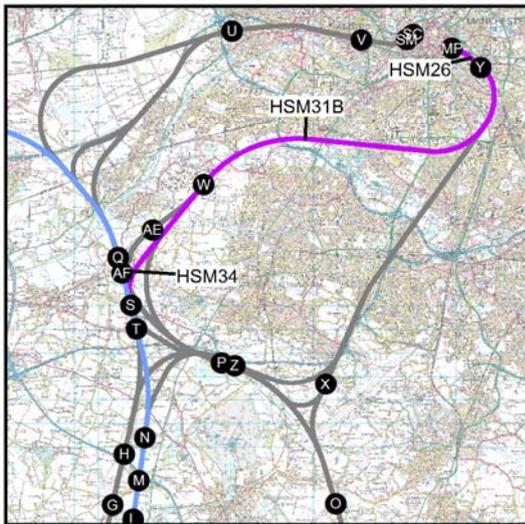
Mersey Valley and Tunnel Approach



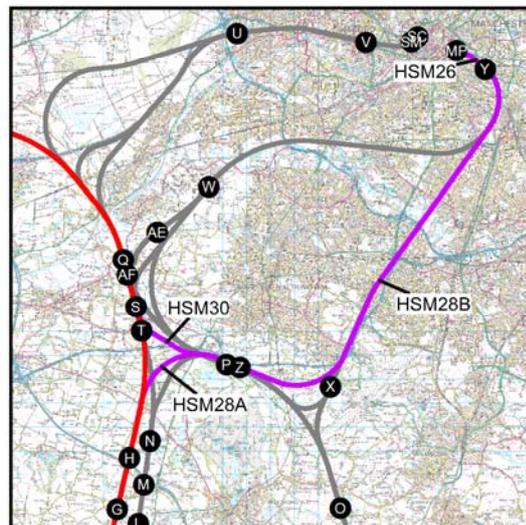
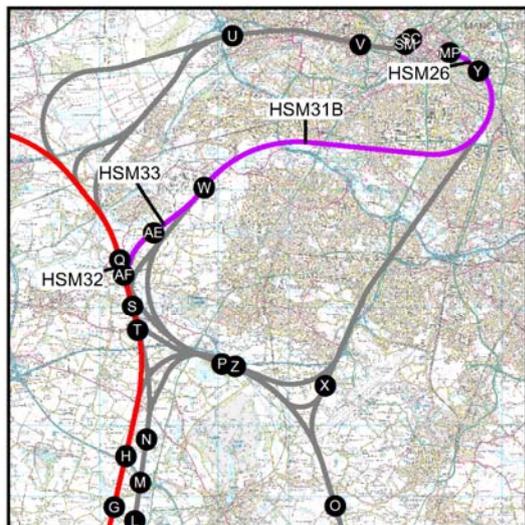
South Manchester & Airport Approach



Airport Route



M6 Route

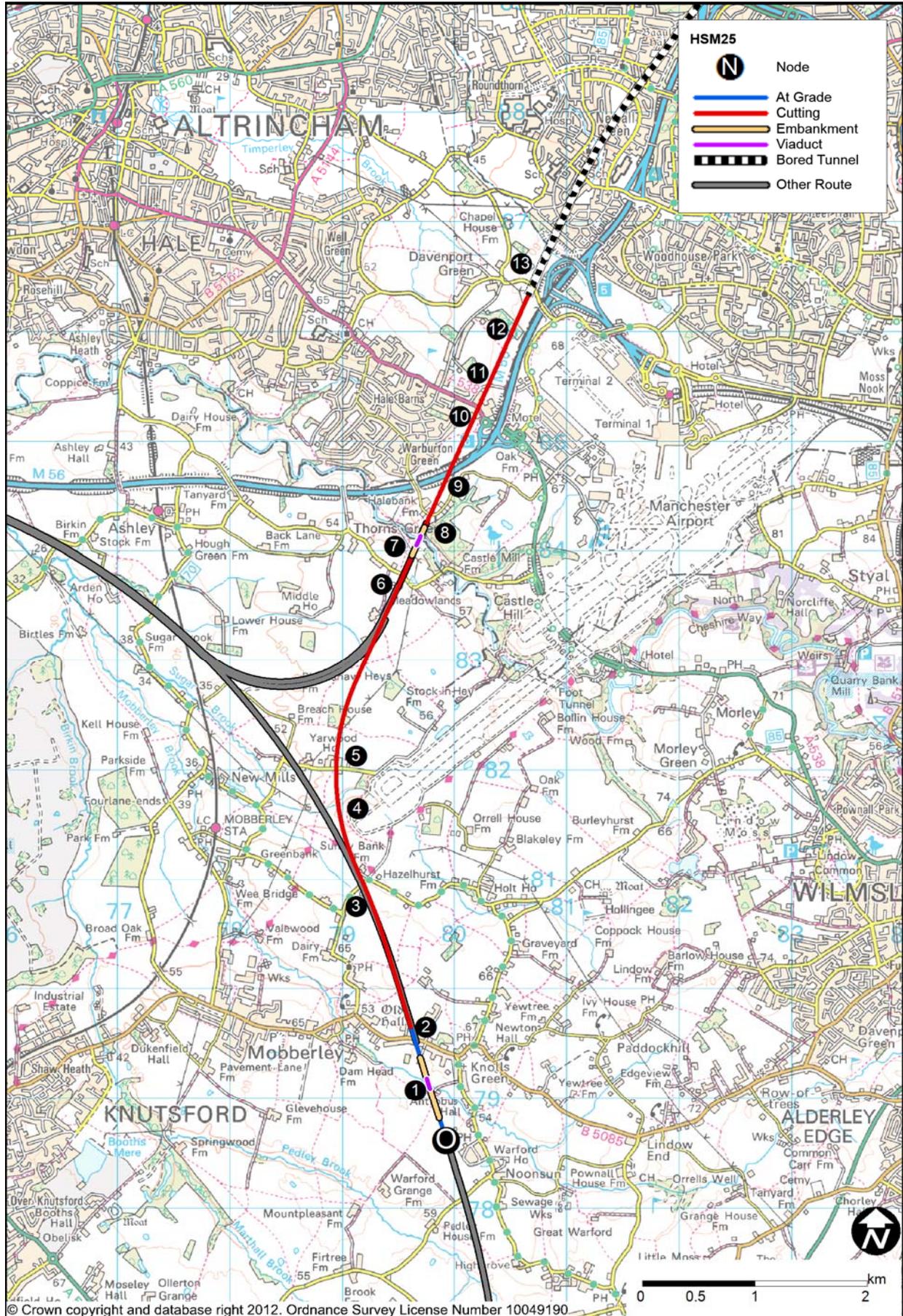


Western Route

### 2.25 Options for Spurs to Manchester Piccadilly Station Option

Options for spurs from the through route to the station option at Manchester Piccadilly are described in the following sections. The map shows the sections, the through routes from the south and to the north.

| Nodes  |    | Route Section | Description  |
|--|----|---------------|--|
| From   | To |               |  |
| <b>Via South Manchester and Airport Approach</b> |    |               |  |
| O  | Y  | HSM25         | This route section would diverge from the through route at Mobberley and run north to Ardwick, passing through an interchange station option for Manchester Airport (Option 4C -see section 3.5) and a long tunnel under the built up area |
| P  | X  | HSM27         | This section would be a northern chord to allow trains to travel to/from Manchester Piccadilly and the north. It would leave the through route at M56 Junction 7 Rostherne (P) and join the spur from Mobberley at Thorn Green (X)         |
| H  | Z  | HSM28A        | This route section would diverge from the through route from Crewe at Winterbottom to Rostherne. It would bear east past Rostherne Mere and then north towards Manchester Piccadilly   |
| Z  | Y  | HSM28B        | This route section would continue from Rostherne to Ardwick. It would head north with an option for an interchange at Manchester Airport (Option 4E – see Section 3.7) and then through the long tunnel under the built up area.           |
| N  | Z  | HSM29         | This section of route would diverge from the through route from Shrayleybrook at Mere and bear east to Rostherne to use HSM28A and HSM28B past the airport and the tunnel to Ardwick.  |
| <b>Via Mersey Valley and Tunnel Approach</b>     |    |               |  |
| P  | W  | HSM31A        | This route section would diverge from the through route from Mobberley at M56 Junction 7 Rostherne to run north-east to Carrington.  |
| W  | Y  | HSM31B        | This route section would continue from Carrington running north-east to the Mersey Valley and then in tunnel under the built up area to Ardwick.   |
| AE   | AF | HSM32         | This section would be a northern chord to allow trains to travel to/from Manchester Piccadilly and the north. It would leave the Mersey Valley spur at Partington and connect to the through route at Mossbrow.                            |
| S  | W  | HSM33         | This route section would diverge from the through route (HSM12) from Winterbottom at Little Bollington and run to Carrington to use HSM31 along the Mersey valley and the tunnel to Ardwick.   |
| T  | W  | HSM34         | This route section would diverge from the through route (HSM16) from Mere at Broomedge and run to Carrington to use HSM31 along the Mersey valley and the tunnel to Ardwick.   |
| <b>Final Station Approach</b>                    |    |               |  |
| Y  | MP | HSM26         | This route section would be the final 1.5km from Ardwick to the station option at Piccadilly   |



## 2.26 HSM25: Mobberley (O) to Ardwick (Y)

### Mobberley to Davenport Green

The route section between Mobberley and Ardwick would be 21.0km long. It forms part of the spur to Manchester Piccadilly. The section of route connecting to Mobberley from the south would be HSM17 from Shrayleybrook.

At the start of this section, 500m south of Mobberley Brook **(1)** a grade separated junction would be provided with the lines increasing from two to four at a junction, with one spur line to Manchester on each side of the through route. The design speed for this grade separated junction would be 230kph, as would the route to Ardwick. All four lines would cross the Mobberley Brook on a 90m long viaduct at a height of 9m. The B5085 (Hall Lane) **(2)** and Lady Lane **(3)** would cross over the lines. The two diverging lines would fall in a cutting to be 10m below ground level and 8m higher than the through lines which would be at ground level. This allows the western spur line to cross over the through route. The spur lines would pass immediately south of the Airport runway **(4)**. It is likely that a bridge would be required to maintain road access to the runway.

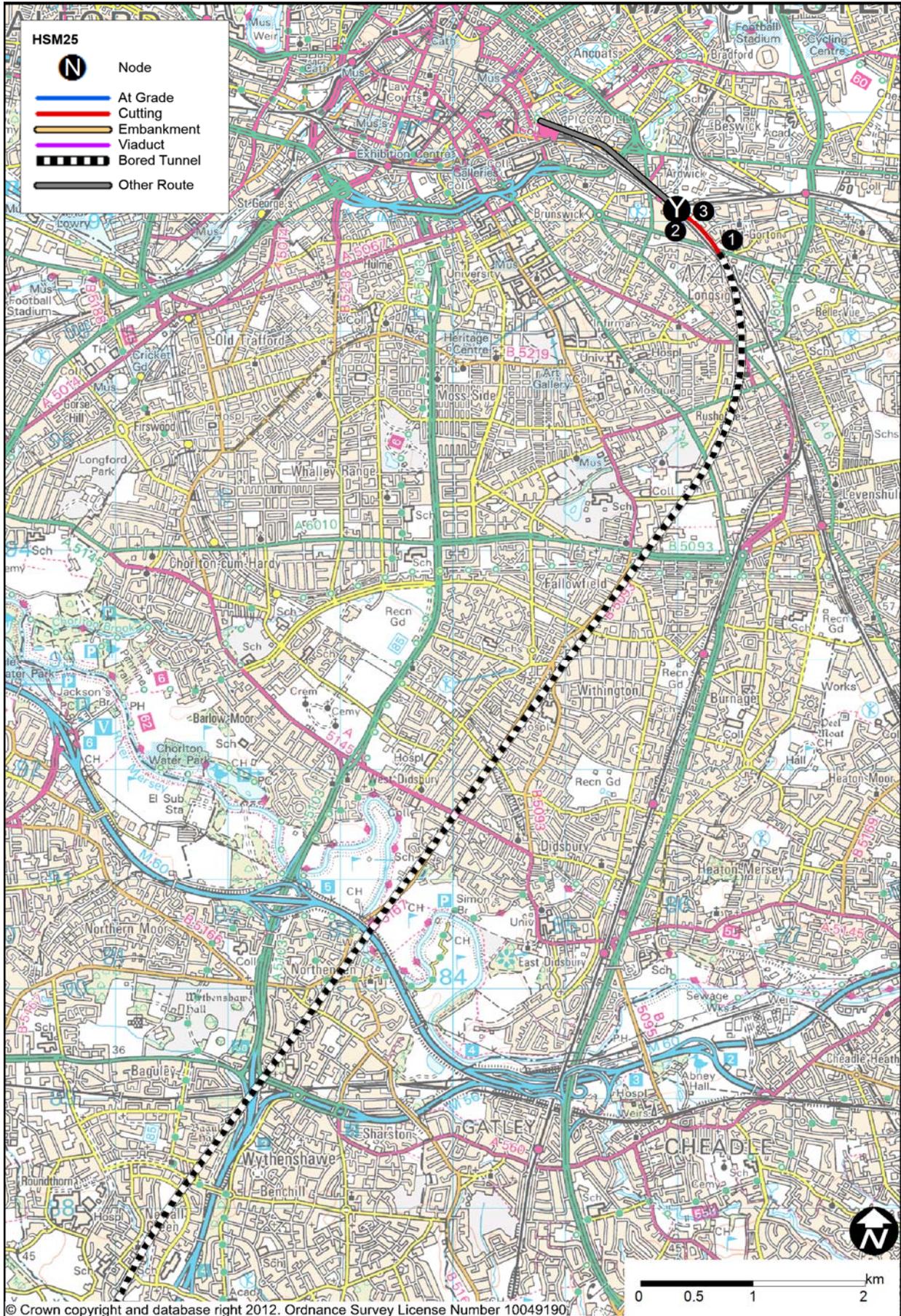
The route would cross the Sugar Brook flood plain in a concrete trough 45m long with an inverted siphon provided for the brook. The route would be in cutting up to 7m deep for 2.5 km. Wood Lane **(5)** would be realigned onto a bridge over the route. The route would pass through the route of overhead power lines.

At a junction 300m south of Mill Lane **(6)** the two line spur would increase to four lines for 1.8km, with one line on each side to allow trains to stop at the interchange station.

The interchange station is described in Section 3.5.

Castle Mill Lane would be realigned onto a bridge over the route. The route would pass through the route of overhead power lines. The River Bollin **(7)** would be crossed on a 65m long viaduct with a height of 16m. The route would then continue in a cutting up to 22m deep for 2.3km before reaching the portal of a tunnel. The route would pass under Sunbank Lane **(8)**, the M56 **(9)**, the A538 (Hale Road) **(10)**, Hasty Lane **(11)** and Timperley Brook **(12)**. The construction of the route under the M56 may require traffic management on the motorway.

The four track section would end between the M56 and Hale Road, where a junction would be provided to merge back into two lines. Between Hasty Lane and the tunnel portal the two lines move apart to pass into twin bore tunnels just before Thorley Lane **(13)**. Roaring Gate Lane would be realigned onto a bridge over the route. The route would pass through the route of overhead power lines at Davenport Green.

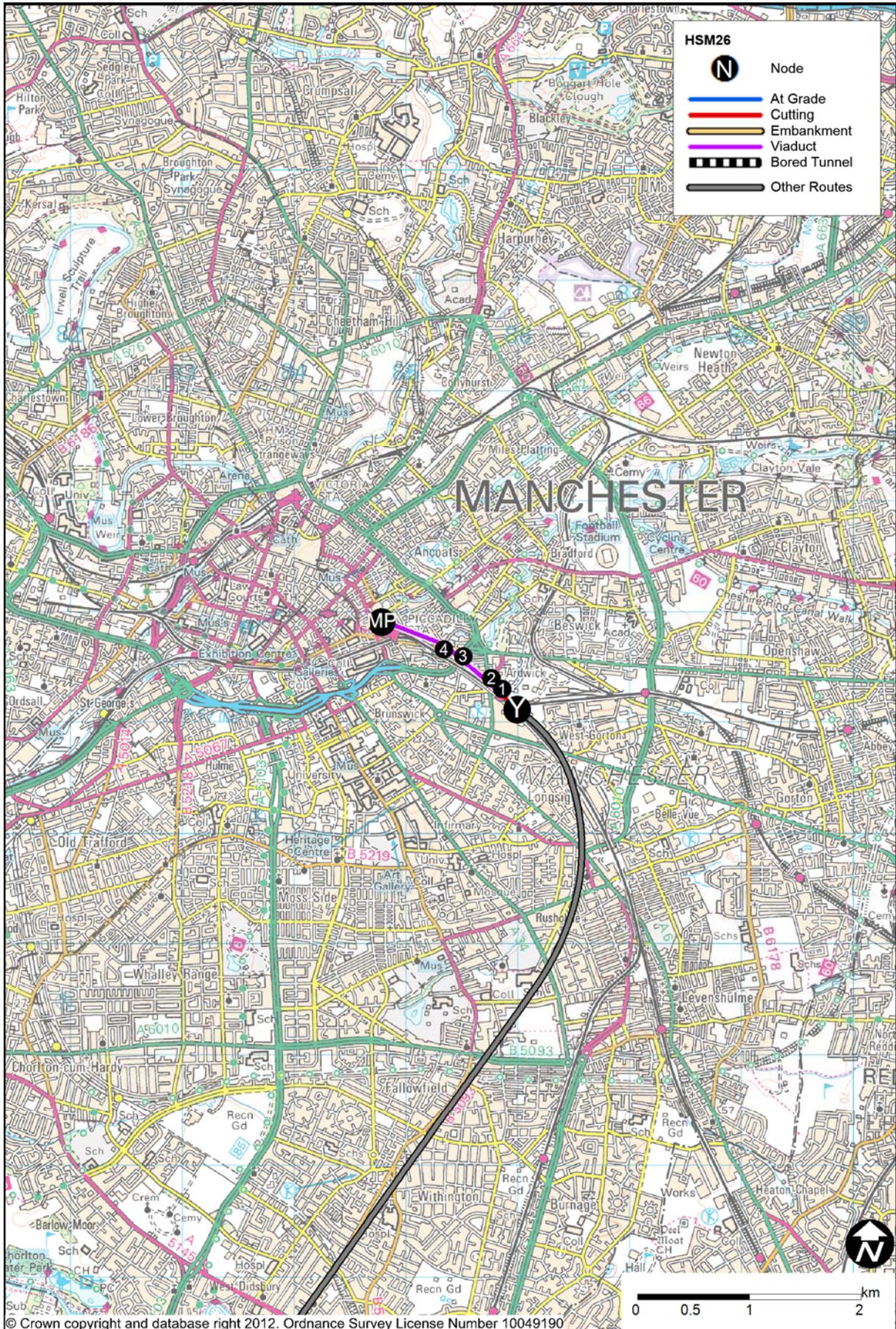


### **Davenport Green to Ardwick**

The tunnels are 11.9 km long and pass under the built up area between the Airport and Longsight. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies. The tunnels would pass through historic limestone workings. The design speed profile reduces from 230kph to 120kph speed over the last 2km of this section for the approach to the Manchester terminus station.

The route emerges from the tunnels immediately south of the A57 (Hyde Road) **(1)**, which would be realigned onto a bridge over it. The route rises in a cutting alongside the West Coast Main Line approaching Manchester Piccadilly station. The cutting would be fully retained as it would be in a section of flood plain. Bennett Street **(2)** would cross the route on a bridge and Rostron Avenue **(3)** would be closed. Underpinning works may be required to the adjacent WCML viaduct structure.

At Ardwick the route would continue along section HSM26 to the station at Manchester Piccadilly.



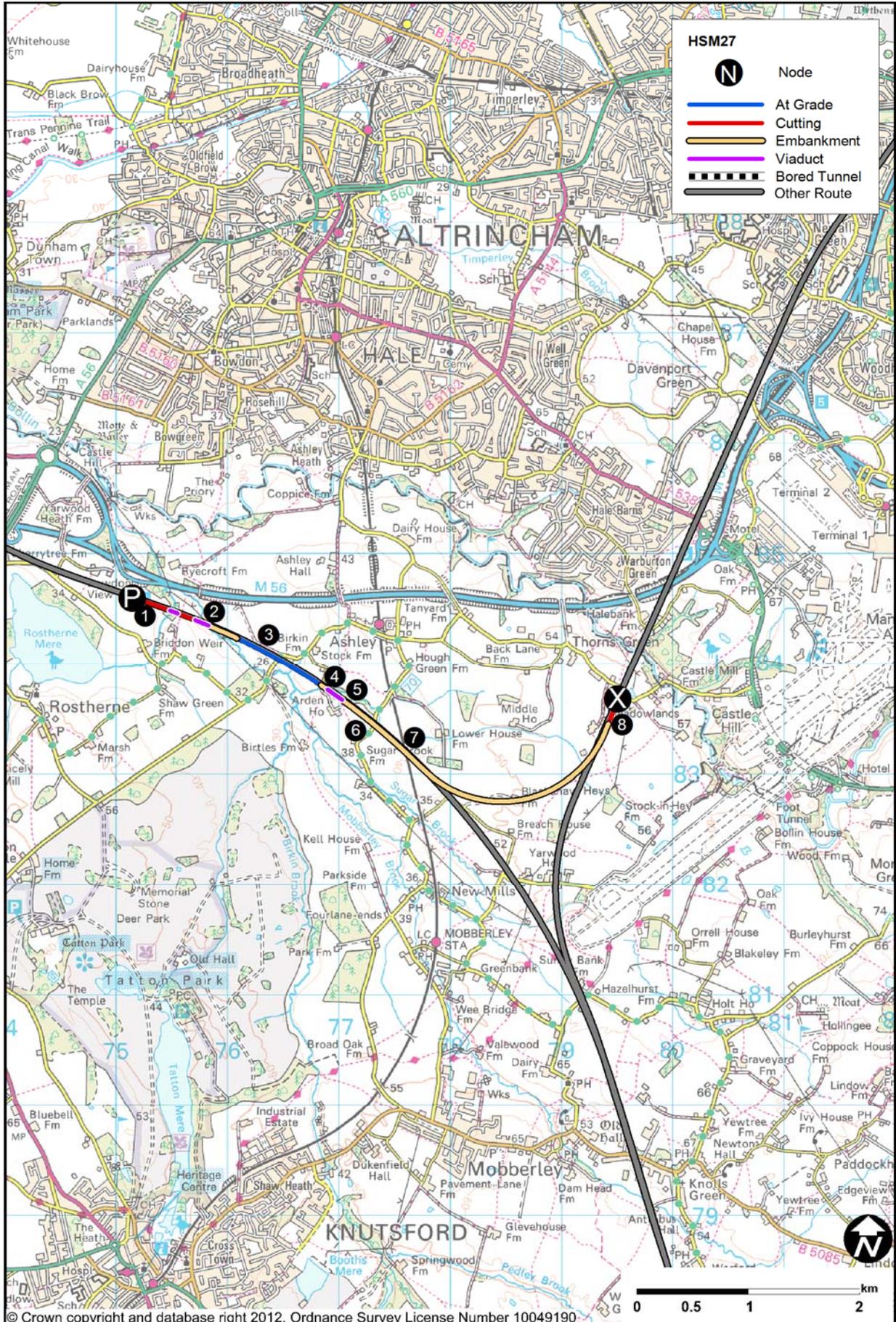
## 2.27 HSM26: Ardwick (Y) to Manchester Piccadilly (MP)

The route section between Ardwick and Manchester Piccadilly would be 1.5km long. The section of route connecting to Ardwick from the south would be either HSM25 from Mobberley, HSM28 from Winterbottom or HSM31 from M56 Junction 7 Rostherne. The design speed of the section is 115kph reducing to 80kph for the approach to the Manchester Piccadilly terminus station.

This section of route is the approach to the station at Manchester Piccadilly from the tunnel portal at Ardwick.

The route emerges from the tunnel in a cutting and then passes onto a viaduct. Blind Lane, Tongue Street, Dainton Street and Midland Street would be closed where route would be at grade **(1)** before rising on the viaduct. The A665 (Chancellor Way) **(2)** would be lowered under the route with associated alterations to connecting highways. Major road traffic management would be required during construction. North Western Street, Cresbury Street, Dark Lane and Union Street would be closed. The route would pass over the A635 (Manchunian Way) **(3)** with Chapelfield Road and Crane Street closed. The route would then pass over Fairfield Street **(4)**. Travis Street, Sheffield Street, Baird Street and Boad Street would be closed. There would be a number of alterations to the local highway network to provide access to the station.

The station is described in Section 3.1.



## 2.28 HSM27: M56 Junction 7 Rostherne (P) to Thorn Green (X)

The route section between M56 Junction 7 Rostherne and Thorn Green would be 5.3km long. The section of route connecting M56 Junction 7 Rostherne from the north would be HSM20 from Warburton. The design speed would be 230kph reducing to 115kph.

This route section would provide a chord between the main route to the north and the spur to Manchester Piccadilly from Mobberley. It would allow trains to travel to and from the north and Manchester Piccadilly.

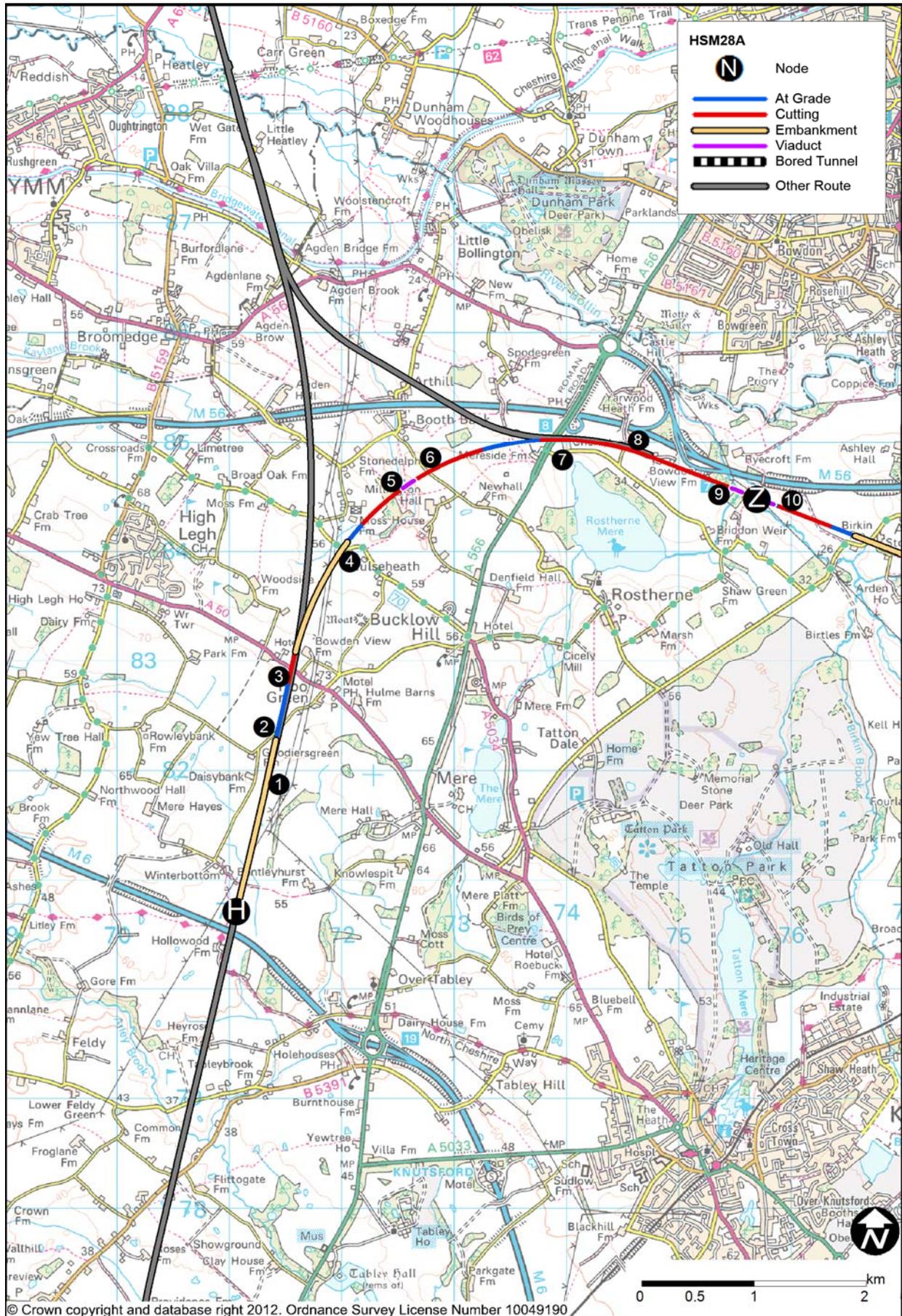
The route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution). It would start adjacent to Junction 7 of the M56 (at the same location as the western end of route sections HSM16 and HSM17). This position is dictated by the need for straight track for the junction. In addition to the 360kph through route there would also be two additional lines, one on each side for the chord. The design speed for these additional lines would be 230kph. This four line section would run for 3km to the east.

The route would cross Blackburn's Brook **(1)** on a 55m long viaduct at a height of 4m. It would pass through the route of overhead power lines and then over the Birkin Brook **(2)** on a 110m long viaduct at a height of 4m. Ashley Road **(3)** and Lamb Lane **(4)** would be realigned onto bridges over the route. The Birkin Brook **(5)** would be crossed again on a 150m long viaduct at a height of 7m. The route would cross over Mobberley Road **(6)**.

The two diverging lines would rise crossing over the Altrincham to Chester railway **(7)** at a height of 13m, with the southern line crossing over the through route, providing a grade separated junction. The design speed reduces at this point to 115kph to allow the design to connect with the spur to Manchester at the interchange station junction.

The route would be on embankment with a maximum height of 12m for approximately 1km before approaching the next grade separated junction connecting onto the spur from Mobberley to Manchester Piccadilly (HSM25). At this junction the southern line would cross over the spur at a height of 11m above ground level. Both lines would then descend to join the spur at a junction **(8)** immediately south of Mill Lane, to be incorporated into the interchange station layout.

At Thorn Green the route would continue north on HSM25 to Ardwick.



## 2.29 HSM28A: Winterbottom (H) to Rostherne (Z)

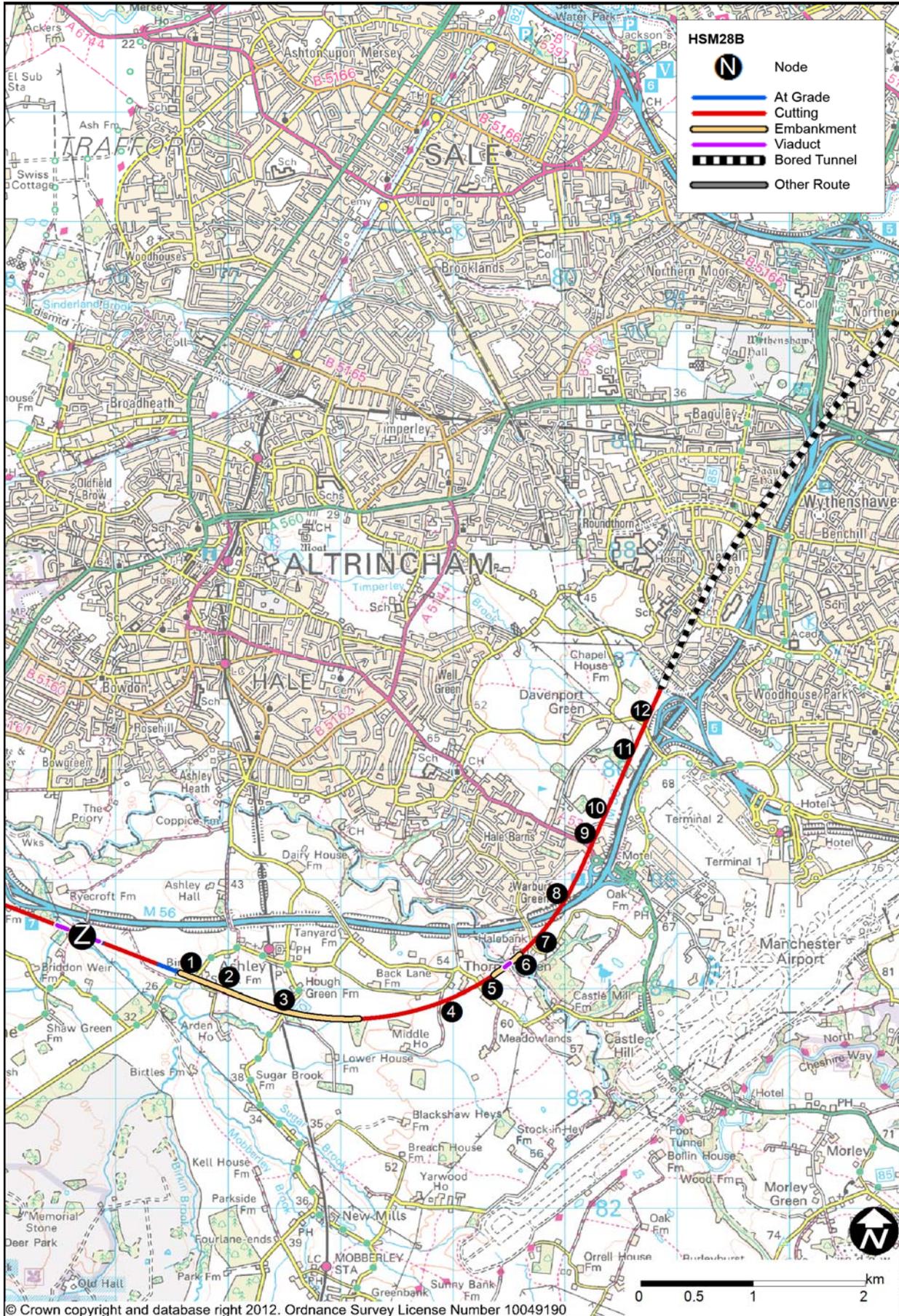
The route section HSM28 is split into two. HSM28A runs from node H to node Z and HSM28B from node Z to node Y.

The route between Winterbottom and Ardwick would be 26.8km long. The section of route connecting to Winterbottom from the south would be HSM10 from Hough or HSM11 from Pickmere. The design speed is 400kph south of the grade separated junction and 230kph through the junction and on the spur towards Ardwick.

The route would be on an embankment with a maximum height of 8m for 1km before the junction, where the route would pass through the route of overhead power lines. A grade separated junction **(1)** would be provided on the through route (HSM12) with the two lines splitting to four 500m south of Hoogreen **(2)** Lane. The outer two lines would form the diverging spur towards Manchester Piccadilly. Hoogreen Lane would be realigned onto a bridge over the route. The A50 **(3)** would be realigned onto a bridge over all four lines. The western diverging line would rise to cross over the through route joining the eastern line on an embankment with a maximum height of 5m, again passing through the route of overhead power lines. Peacock Lane **(4)** would be realigned onto a bridge over the route

The route would then pass into cutting with a maximum depth of 8m, cross the Agden Brook **(5)** flood plain on a 45m long viaduct (height 6m) and enter a further length of cutting up to 9m deep, passing under Millington Lane **(6)**. After 400m at ground level the route would pass under the A556 **(7)** and run between Rostherne Mere and the M56 in a cutting up to 11m deep. It will be necessary to prevent groundwater flows into the deep cutting and possibly to seal the cutting and provide a permeable flow route. Tom Lane **(8)** would cross over the route on a bridge.

Blackburn's Brook **(9)** would be crossed on a 75m long viaduct which would pass through the route overhead power lines. Birkin Brook **(10)** would be crossed on a 135m long viaduct at a height of 4m. A short length of cutting (maximum depth 4m) follows with the route then rising onto an embankment (height up to 8m).



## 2.30 HSM28B: Rostherne (Z) to Ardwick (Y)

### Rostherne to Davenport Green

Ashley Road **(1)** would be realigned onto a bridge over the alignment with Lamb Lane **(2)** diverted for 250m on the south side of the route to avoid it.

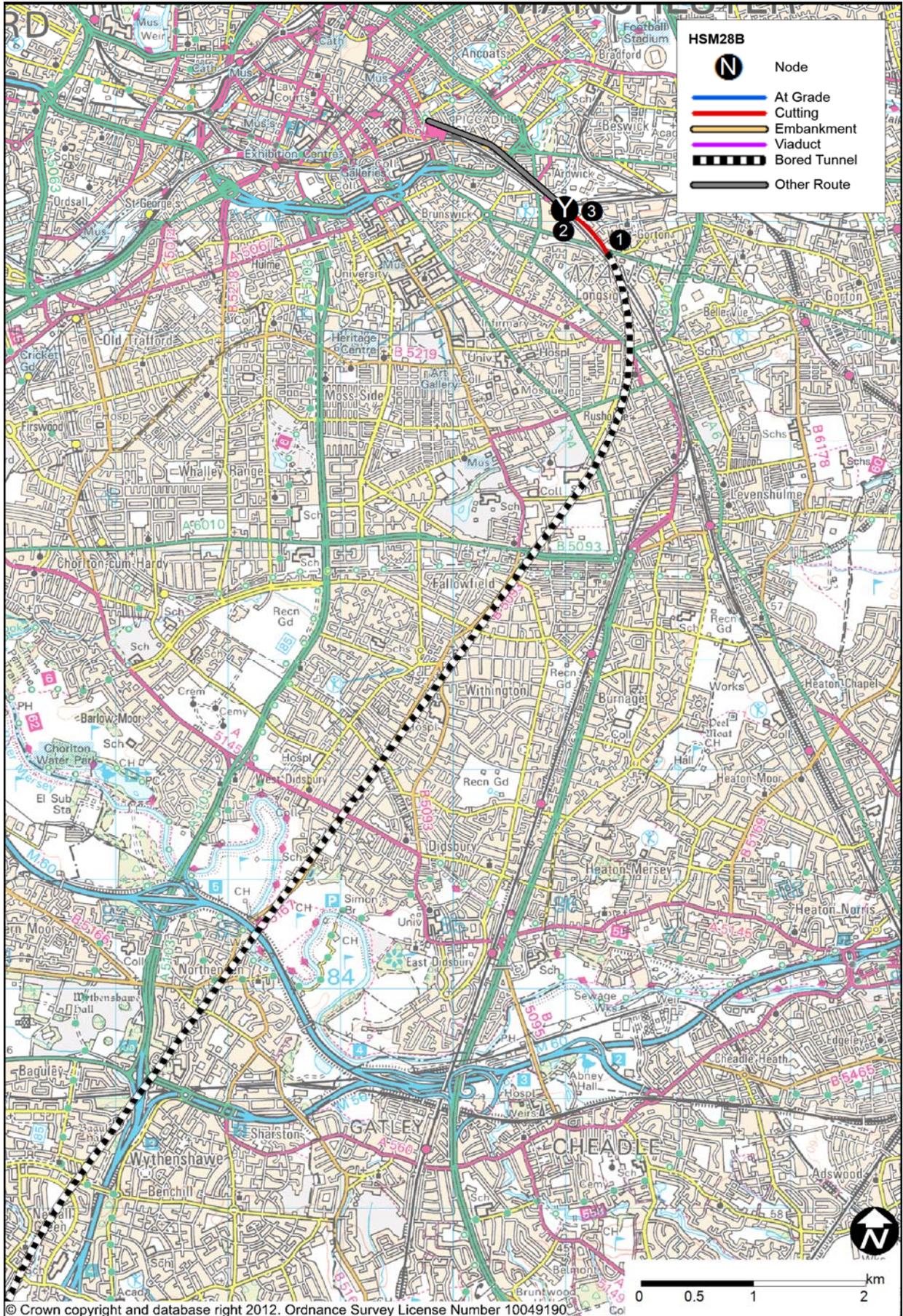
The route would cross over Mobberley Road and the Altrincham to Chester railway **(3)**. The road would be realigned to cross over the existing railway and the route. The route would then pass into a cutting with a depth up to 8m with Brickhill Lane **(4)** and Mill Lane **(5)** on bridges over the route. The River Bollin flood plain **(6)** would be crossed on a 110m long viaduct at a height of 11m where it would also pass through the route of overhead power lines.

The route would then continue in a cutting with a depth up to 22m for 2.7km to the portal of a tunnel. Sunbank Lane **(7)** would be realigned onto a bridge over the route. The route would pass under the M56 **(8)**, the A538 (Hale Road) **(9)**, Hasty Lane **(10)** and Timperley Brook **(11)**. The construction of the route under the M56 may require traffic management on the motorway.

At Sunbank Lane a junction would be provided to increase the two lines to four. The two outside lines would be the spur to Manchester Piccadilly and the two inside lines platform lines for the Airport interchange station, which would be located north of Hasty Lane.

The interchange station is described in Section 3.7.

After Timperley Brook the route would pass through the route of overhead power lines. Roaring Gate Lane **(12)** would cross over the route on a bridge. The two stopping lines rejoin the through lines at a junction north of the station. The through lines remain apart to pass into twin bore tunnels just before Thorley Lane.

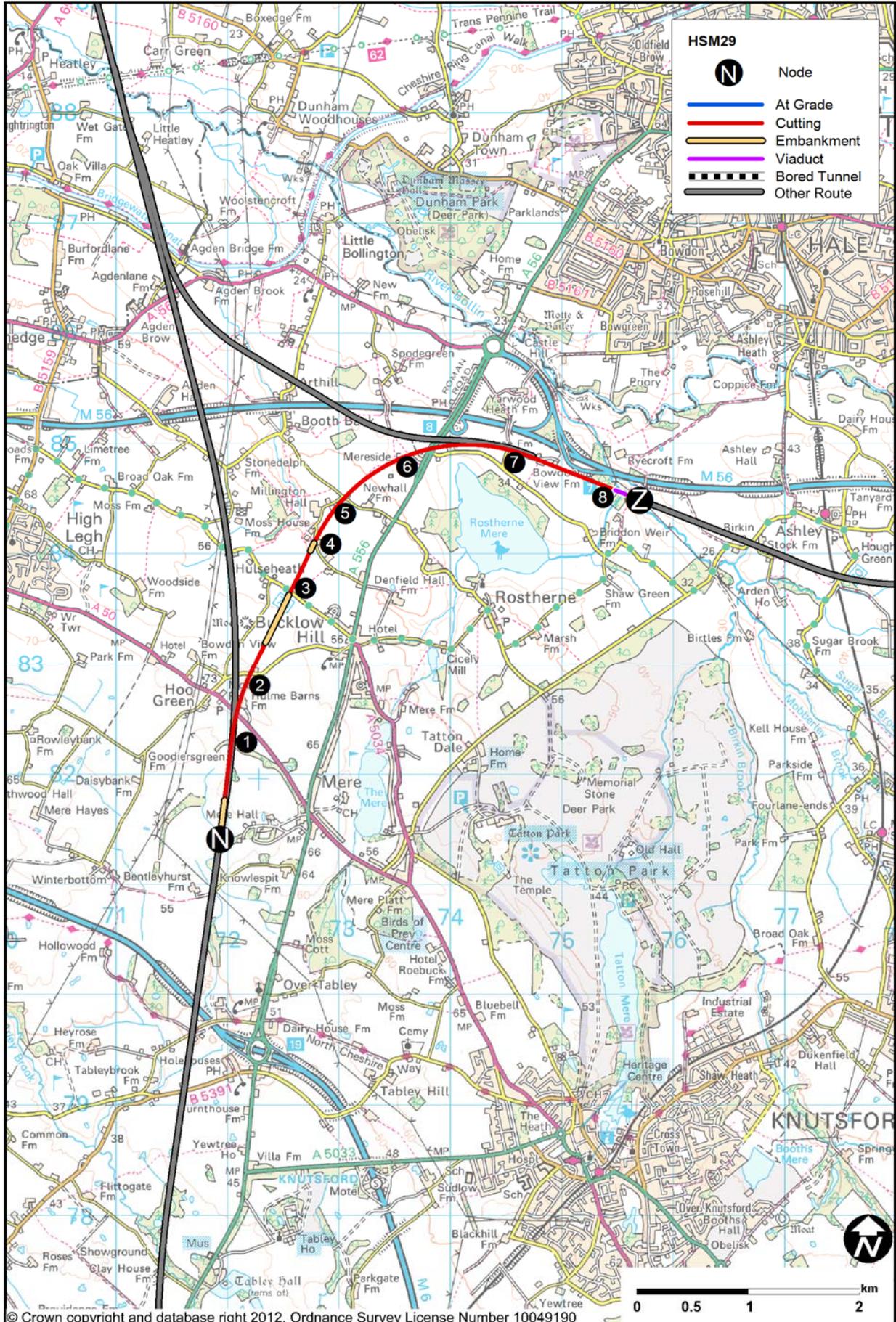


### **Davenport Green to Ardwick**

The tunnels are 11.9 km long and pass under the built up area between the Airport and Longsight, through historic limestone workings. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies. The design speed profile reduces from 230kph to 120kph over the last 2km of this section for the approach to the Manchester terminus station.

The route emerges from the tunnels immediately north of the A57 (Hyde Road) **(1)**. The route rises in a cutting alongside the West Coast Main Line approaching Manchester Piccadilly station. The cutting would be fully retained as it would be in a section of flood plain. Bennett Street **(2)** would cross over the route on a bridge and Rostron Avenue **(3)** would be closed. Underpinning works may be required to the adjacent WCML viaduct structure.

At Ardwick the route would continue along section HSM26 to the station at Manchester Piccadilly.



### 2.31 HSM29: Mere (N) to Rostherne (Z)

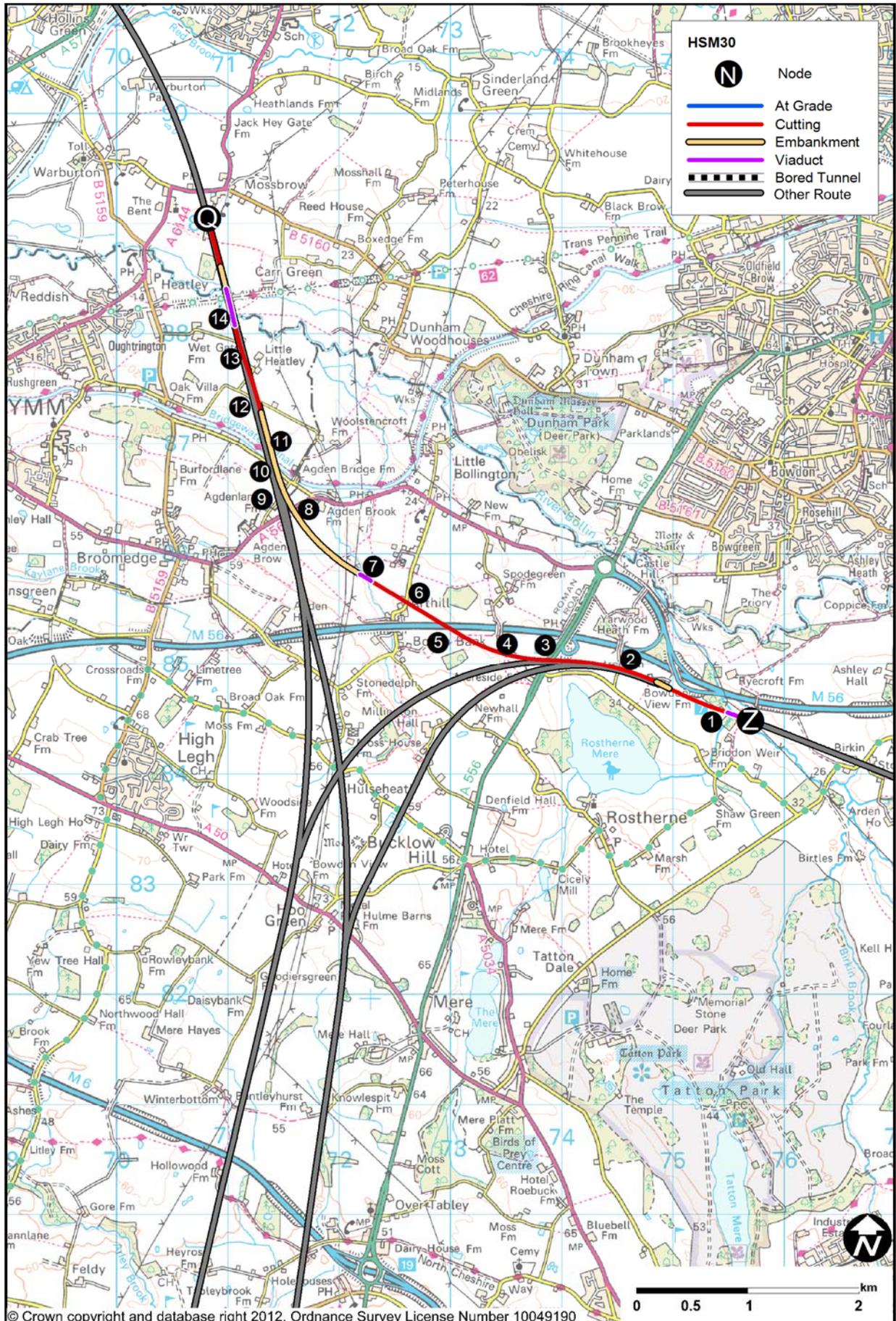
The route section between Mere and Rostherne would be 6.2km long. The section of route connecting to Mere from the south would be HSM13 from Shrayleybrook. The design speed would be 170kph based on the design required to pass to the north west of Rostherne Mere and head west towards the Airport.

The route would be on an embankment with a maximum height of 7m immediately west of the proposed route of the A556, passing over an area of mudstone with soluble deposits (risk of subsidence from dissolution) and then descending into a cutting. A grade separated junction would be provided on the through route (HSM16) 1.1km south of the A50 with the two lines splitting to four. The outer two lines would form the diverging spur towards Manchester Piccadilly, where the western diverging line would fall to cross under the through route joining the eastern line in a cutting with a maximum depth of 17m. The A50 **(1)** would be realigned onto a bridge over the route. Bucklowhill Lane **(2)** would cross over the route on a bridge.

The route would rise onto a low embankment with a maximum height of 2m. Chapel Lane **(3)** would be realigned onto a bridge over the route. The route would then pass into a shallow cutting with a depth of 3m. To avoid the route, Millington Hall Lane **(4)** would be diverted for 550m to stay on the east side of the route and tie in to Millington Lane **(5)**.

The route would continue in a cutting for 3km with a maximum depth of 16m passing under Millington Lane **(5)** and the A556 **(6)**. The cutting would be up to 10m deep between Rostherne Mere and the M56. It will be necessary to prevent groundwater flows into the deep cutting and possibly to seal the cutting and provide a permeable flow route. The route would pass under Tom Lane **(7)** and crossing Blackburn's Brook **(8)** on an 80m long viaduct at a height of 4m.

At Rostherne the route would continue along section HSM28B to Ardwick (and then to Manchester Piccadilly).



## 2.32 HSM30: Rostherne (Z) to Warburton (Q)

The route section between Rostherne and Warburton would be 7.4km long. The route connecting to Rostherne from the east would be the spur from Manchester Piccadilly (HSM28B from Ardwick). This section provides a chord from Manchester Piccadilly and the Airport interchange station to the through route heading north, HSM21. The design speed would be 200kph. 3.5km of the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

A grade separated junction would be provided on the spur from Manchester (HSM28B) with the two line spur increasing to four lines. One chord line would leave the spur on the south side, 200m east of Blackburn's Brook **(1)**. The Brook would be crossed on a 75m long viaduct with a height of 4m, followed by a cutting 4m deep. The other chord line would leave the spur on the north side 450m west of the Brook. The chord line on the south side would rise to cross over the spur and the other chord line 600m west of Blackburn's Brook **(1)** at a height of 1m above ground level, before descending back into cutting to run parallel to the spur for 700m. This cutting would be 2.4km long with a maximum depth of 13m. Tom Lane **(2)** would be realigned onto a bridge over the route. The route would pass under the A556 **(3)** with retaining walls supporting the M56 slip road. Coe Lane **(4)** would be closed with the route moving north west to pass under the M56 **(5)** and Reddy Lane **(6)**. Stabilisation of and support to the A556 and traffic management on the M56 would be required during construction.

The route would then cross Agden Brook **(7)** on a 95m long viaduct at a height of 4m before passing through the route of overhead power lines. The route would then rise onto an embankment with a maximum height of 7m. The A56 (Agden Brow) **(8)** would be realigned onto a bridge over the route.

Agden Lane **(9)** would be closed at the crossing and Warrington Lane **(10)** diverted for 500m on the west side of the route to avoid it. The route would cross over the Bridgewater Canal **(11)**. At this point a second grade separated junction would be provided to connect onto the route to the north (HSM21). The western chord line would join the eastern through route line at a junction 100m north of the canal. The eastern chord line would descend to cross under the through route 800m north of the canal, rising back to the level of the through route on the west side. Spring Lane **(12)** would be realigned onto a bridge over the route and Wet Gate Lane **(13)** would be diverted for 1km to the west of the route to avoid four crossings of it. The through route and the chord line on its west side would cross over the River Bollin flood plain **(14)** on a 345m long viaduct at a height of 4m. On the north side of the viaduct a junction would be provided for the chord line to join the through route.

At Warburton the route would continue along section HSM21 to Lowton.



### 2.33 HSM31A: M56 Junction 7 Rostherne (P) to Carrington (W)

The route section HSM31 is split into two. HSM31A runs from node P to node W and HSM31B from node W to node Y.

This spur from the through route to Manchester Piccadilly between M56 Junction 7 Rostherne and Ardwick would be 25.7km long. The section of route connecting to M56 Junction 7 Rostherne from the south would be either HSM18 or HSM19 from Mobberley. The design speed would be 230kph.

The two line through route would divide into four lines at a junction east of Tom Lane **(1)**, providing two additional lines, one on each side of the through route. Whilst adjacent to the through route, all lines would be in a cutting up to 13m deep and pass beneath Tom Lane **(1)** and the A556 **(2)**. A retaining wall would be used on the eastern side of the eastern line to avoid a direct impact on the A556 slip road. Cherry Tree Lane **(3)** would be realigned to be on the north side of the route. The route would pass under the M56 **(4)** and Coe Lane **(5)** would be closed. During construction temporary stabilisation and support works may be required at the A556 and temporary traffic management on the M56.

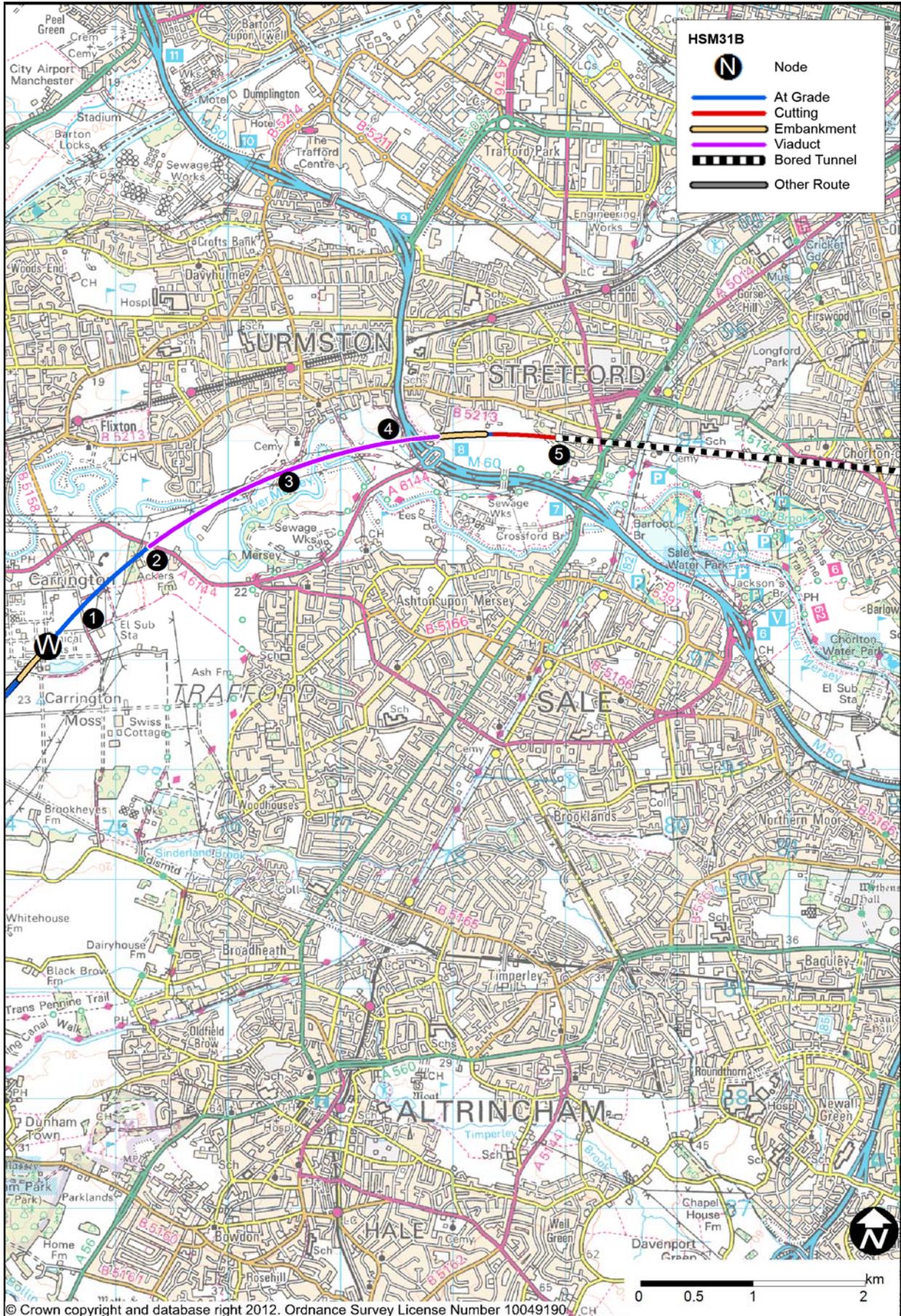
The western spur line would rise to be at ground level to cross over the through route (which would be in a 10m deep cutting) and then run parallel with the eastern spur line on the eastern side of the through route.

The route would cross under Reddy Lane **(6)** and remain in a cutting up to 10m deep to cross under the A56 (Lymm Road) **(7)** and the Bridgewater Canal **(8)**, which would be in an aqueduct. The route would pass through the route of overhead power lines, before continuing in cutting for a further 800m, reaching ground level and then crossing the River Bollin flood plain **(9)** on a 450m long viaduct. In this area the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution).

The route would then be at ground level for 450m, crossing a disused railway before entering a cutting with a maximum depth of 8m. Carrgreen Lane **(10)** would be closed and realigned for 250m on the west side of the route and tie in to the B5160 (Dunham Road). The B5160 **(11)** would be realigned onto a bridge over the route.

The route would again be at ground level for 400m and then pass onto an embankment with a maximum height of 5m. Moss Lane **(12)** would be realigned onto a bridge over the route.

The Caldwell Brook flood plain would be crossed on a bridge at a height of 3m. Chapel Lane **(13)** would be realigned onto a bridge over the route. The route would then cross the Sinderland Brook flood plain **(14)** on a 78m long viaduct at a height of 5m continuing on a low embankment (maximum height 2m) and crossing the disused railway line **(15)**. The route would cross Carrington Moss, an area of peat, **(16)** at ground level.



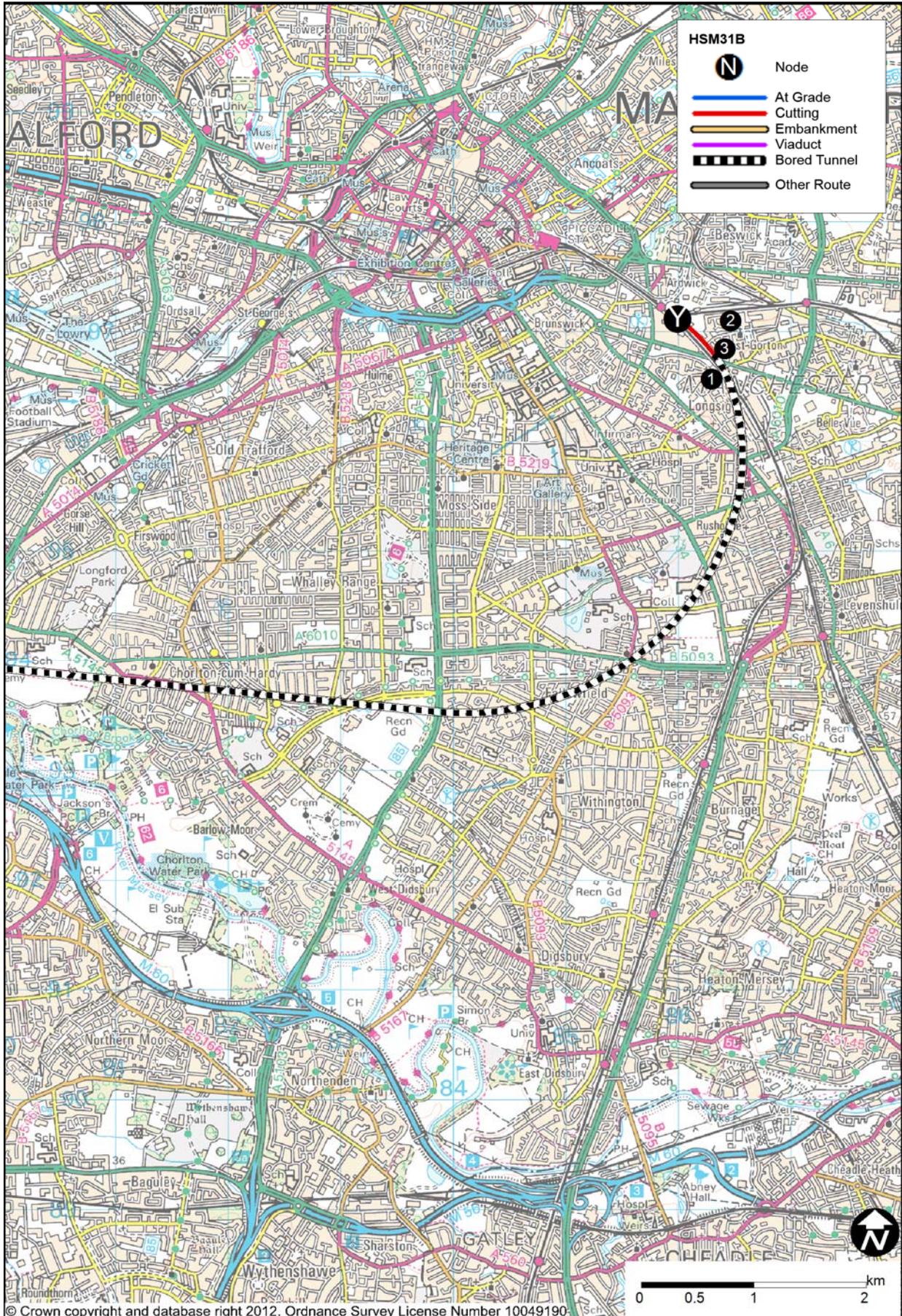
## 2.34 HSM31B: Carrington (W) to Ardwick (Y)

### **Carrington to Stretford**

Isherwood Road **(1)** and the A6144 (Carrington Lane) **(2)** would be realigned onto bridges over the route. The route would pass through two routes of overhead power lines.

The route would then cross the River Mersey and its flood plain **(3)** on a 2km long viaduct at a maximum of 6m, passing again through the route of overhead power lines. The route would then rise to a height of 13m to cross over the M60 **(4)** motorway and the flood plain on a 475m long viaduct. The route would cross a number of historic landfill sites in this area.

The route would descend on a steep gradient to enter a cutting, the two lines would move apart to pass into a twin bore tunnel **(5)** east of Stretford. The tunnel would be constructed through some areas of historic limestone workings and areas of voids.



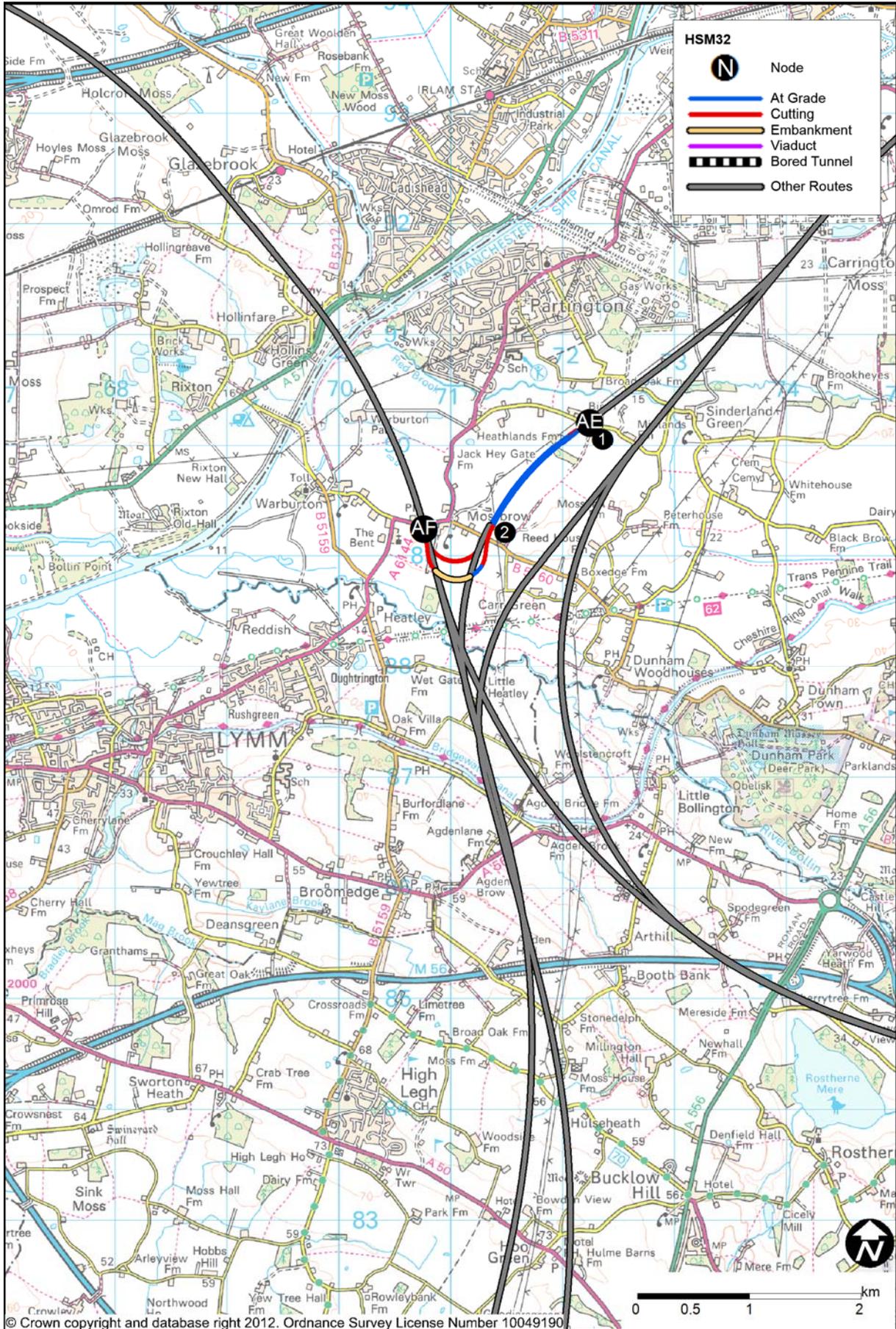
### **Stretford to Ardwick**

The route would remain in the tunnel under the built up area for 10.5km, emerging immediately south of the A57 (Hyde Road) **(1)**, which would be diverted onto a bridge over it. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies. The speed profile reduces from 230kph to 120kph over the last 2km of this section for the approach to the Manchester terminus station.

Emerging from the tunnel portal the route would then rise in a cutting alongside the Stockport to Manchester Piccadilly railway. The cutting would be fully retained as it would be in a section of flood plain. Bennett Street **(2)** would cross the route on a bridge and Rostron Avenue **(3)** would be closed.

At Ardwick the route would continue along section HSM26 to the station at Manchester Piccadilly.

A rolling stock maintenance depot option has been developed on the west side of this section of route in the Carrington Industrial Estate, and is described in Section 4.2.3.



### 2.35 HSM32: Partington (AE) to Mossbrow (AF)

The chord between Partington and Mossbrow would be 2.5km long. The spur route connecting to Partington from Manchester would be HSM33 from Carrington. The design speed would be 170kph, dropping to 70kph. This speed reduction is driven by the design required to allow the route to join the through route and head north.

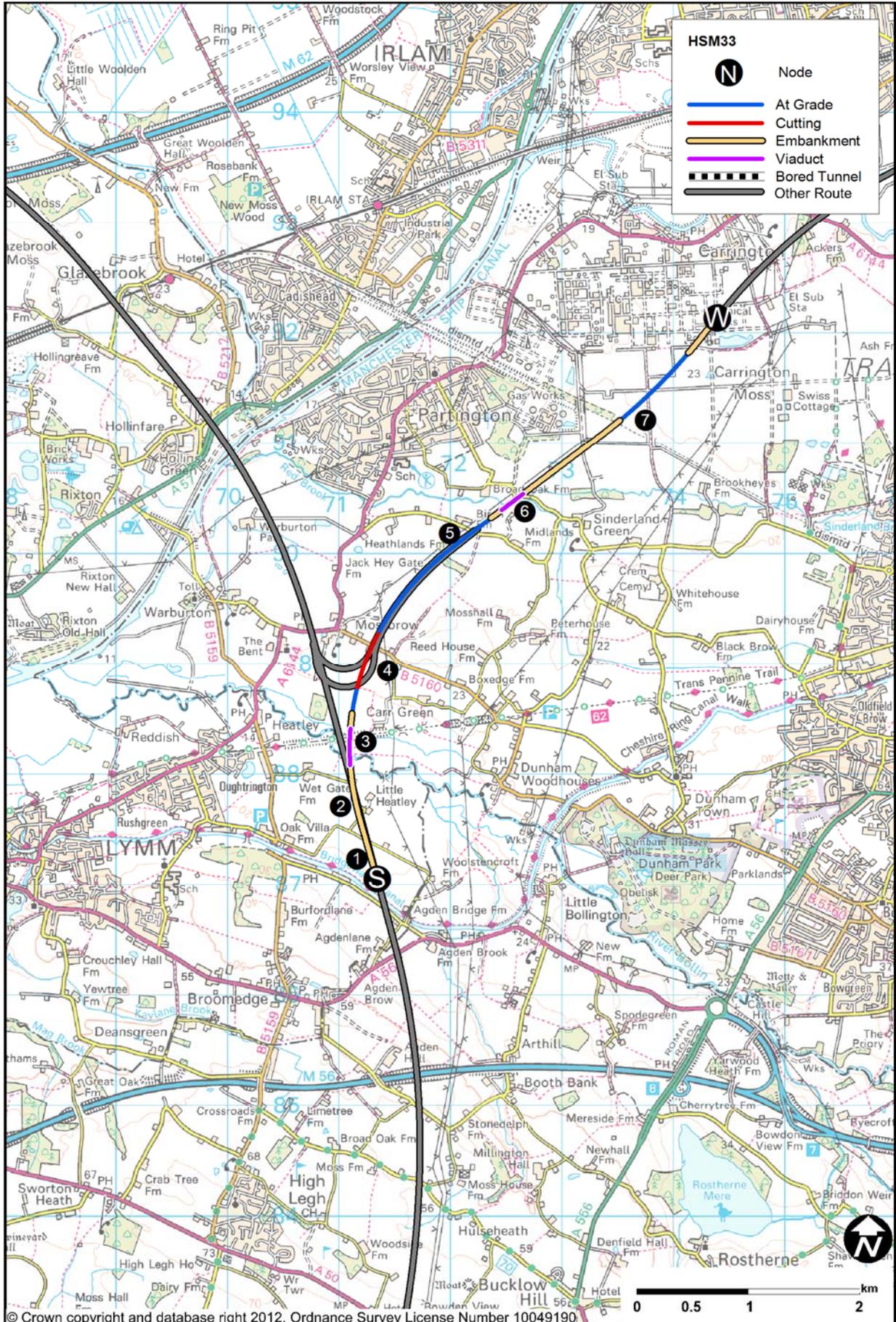
The two line spur from Manchester Piccadilly would divide into four lines at a junction at Partington. The two additional lines, one on each side of the spur lines would form the northern chord.

The two chord lines would be at grade and adjacent to the through route for 1.3km, passing Moss Lane **(1)**, which would be realigned onto a bridge over both routes. The route would pass through the route of overhead power lines.

The chord lines would then enter a cutting of approximately 4m deep and pass under the B5160 **(2)**, which would be realigned onto a bridge over all four lines. The eastern chord line would then rise to ground level and cross over the spur route.

Both chord lines would then turn through a sharp curve towards the junction connecting into the northbound through route whilst on an embankment (up to 5m high) for approximately 300m. They would then enter a cutting for 200m with a depth up to 6m before the eastern chord line would cross above the through route and connect into its west side. The western spur line would remain on and connect in to the through route on its eastern side.

At Mossbrow the route continues north on HSM12 and HSM16 to Warburton.



### 2.36 HSM33: Little Bollington (S) to Carrington (W)

The route section between Little Bollington and Carrington would be 6.5km long. The section of route connecting to Little Bollington from the south would be HSM12 from Winterbottom. The design speed would be 230kph.

At Little Bollington, a junction would be provided where the two line through route would divide into four lines, providing two additional lines, one on each side of the through route (HSM12). These additional lines form the spur to Manchester Piccadilly and would be on an embankment up to 10m high crossing over Spring Lane **(1)**. Wet Gate Lane **(2)** would be diverted for 750m on the west side of the route to avoid crossing the route four times.

After crossing Wet Gate Lane the western spur line would cross over the through route on a structure 10m above ground level and then descend to run parallel to the eastern spur line on the eastern side of the through route.

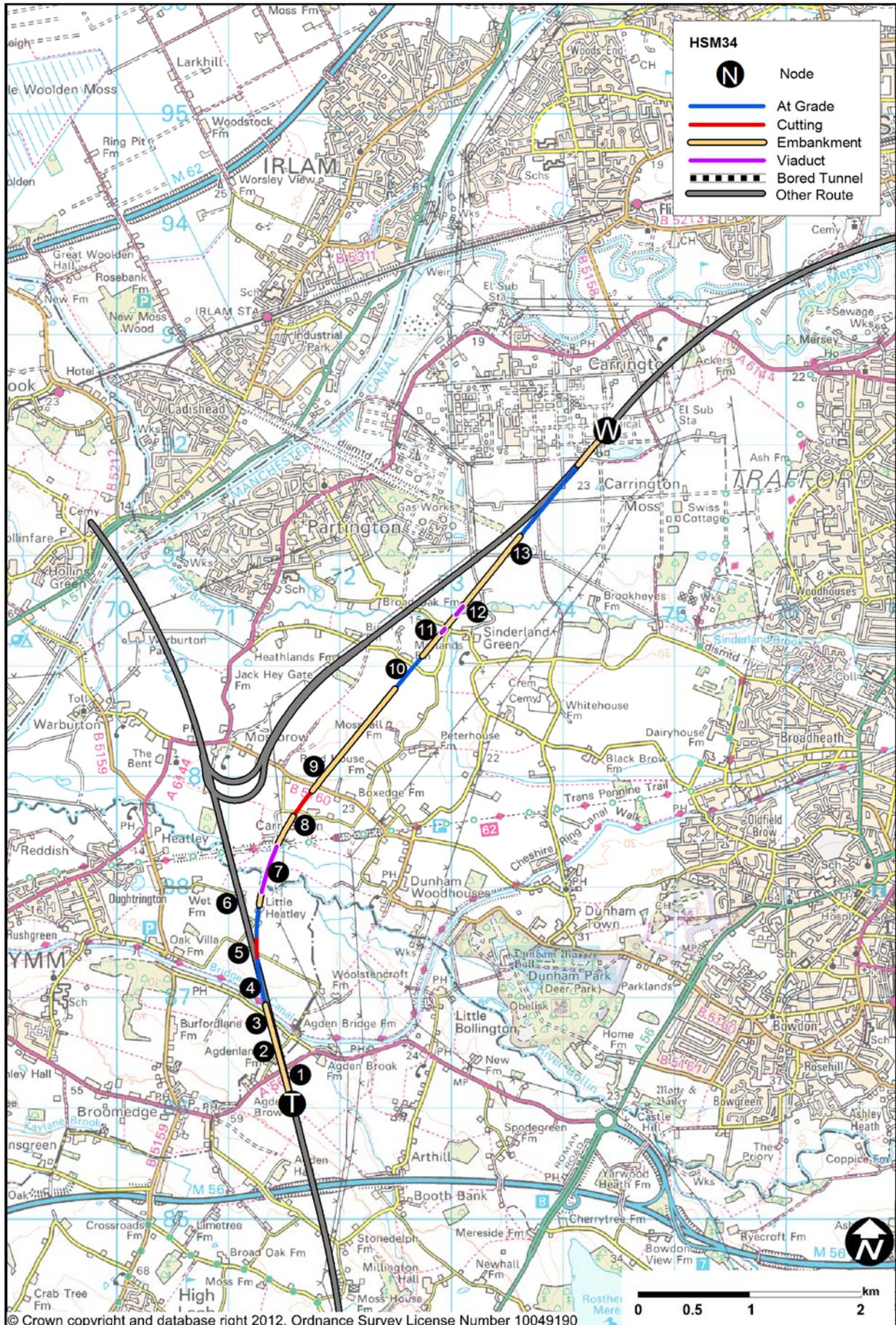
The spur route would then cross the River Bollin **(3)** and a cycle path on a 325m long viaduct at a height of 10m. In this area the route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution). The route would then descend to ground level and into a cutting for 600m, up to 7m deep. The B5160 (Dunham Road) **(4)** would be realigned onto a bridge over the route.

After Dunham Road the route would be at ground level for 1.2km. The route would pass through the route of overhead power lines. Moss Lane **(5)** would be realigned onto a bridge over the route.

The route would then cross Red Brook and Moss Lane again on a 200m long viaduct **(6)** at a height of 5m before crossing Carrington Moss, an area of peat, and then a disused railway **(7)** at ground level. The route would pass through the industrial estate.

At Carrington the route would continue along section HSM31B to Ardwick (and Manchester Piccadilly).

A rolling stock maintenance depot option has been developed on the west side of this section of route in the Carrington Industrial Estate, and is described in Section 4.2.3.



### 2.37 HSM34: Broomedge (T) to Carrington (W)

The route section between Broomedge and Carrington would be 7.3km long. The section of route connecting to Broomedge would be HSM16 from Mere.

The design speed would be 230kph.

At Broomedge, a junction would be provided where the through route would divide into four lines, providing two additional lines, one each side of the through route. These additional lines form the spur to Manchester Piccadilly and would be on embankment with a height of 7m crossing over the A56 (Agden Brow) **(1)**. Agden Lane **(2)** would be closed.

The route would descend toward ground level. Warrington Lane **(3)** would be diverted for 650m on the west side of the route and tie in to the A56. The route would cross over the Bridgewater Canal **(4)** at a height of 3m.

At this point the western spur line would cross beneath the through route before running parallel to the eastern spur line on the eastern side of the through route at ground level. The through route would be on an embankment 6m high. Spring Lane **(5)** would be closed. Wet Gate Lane **(6)** would be realigned for 400m on the west side of the through route to avoid all lines.

The route would then cross the River Bollin **(7)** and a cycle path on a 405m long viaduct at a height of 8m and then onto an embankment (maximum height 5m) for a further 150m. In this area the route would be over mudstone with soluble deposits (risk of subsidence from dissolution). The route would pass through the route of overhead power lines before passing into a shallow cutting (depth 2m). Carrgreen Lane **(8)** would be realigned onto a bridge over the route.

The route would rise onto an embankment for the next 500m (maximum height 5m). The B5160 (Dunham Road) **(9)** would be realigned onto a bridge over the route. The route would continue across Carrington Moss, an area of peat, at ground level.

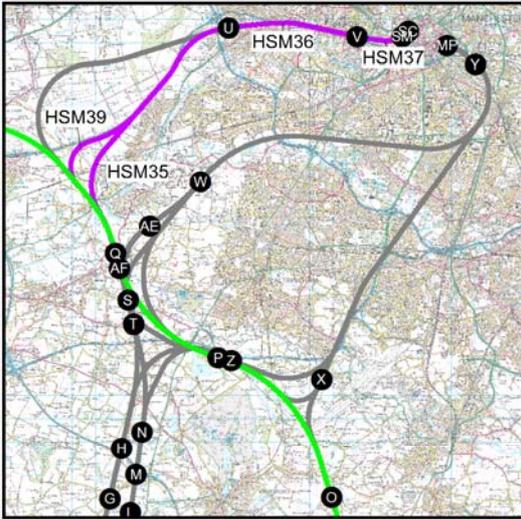
The route would be at ground level for 1.0km requiring Moss Lane **(10)** to be realigned onto on a bridge over it. The route would then rise onto an embankment with a maximum height of 5m before crossing the Caldwell Brook flood plain on a 35m long bridge **(11)** at a height of 3m. Moss Lane would be closed at this crossing. The Sinderland Brook flood plain **(12)** would then be crossed on a 72m long viaduct at a height of 5m.

The route would return to ground level, cross the disused railway line **(13)** and continue to Carrington. The route would pass through the industrial estate.

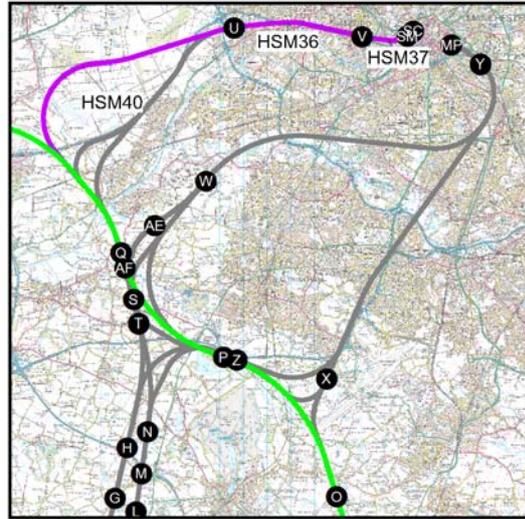
At Carrington the route continues in section HSM31B to Ardwick (and Manchester Piccadilly).

A rolling stock maintenance depot option has been developed on the west side of this section of route in the Carrington Industrial Estate, and is described in Section 4.2.3.

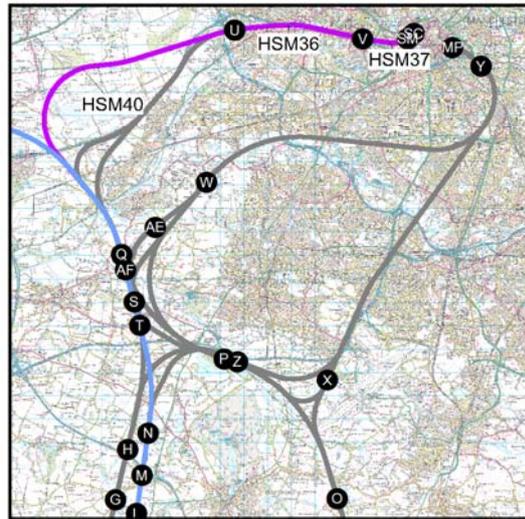
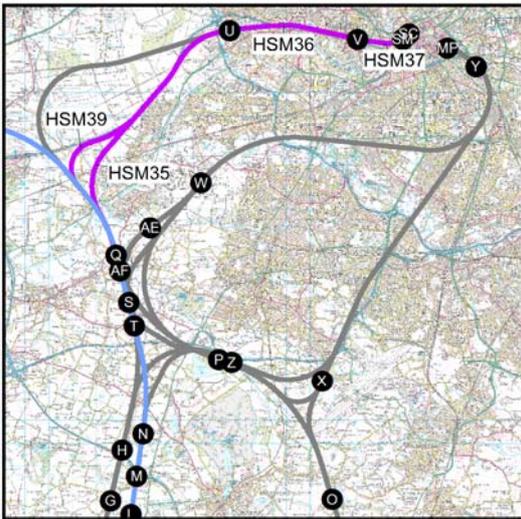
M62 Approach



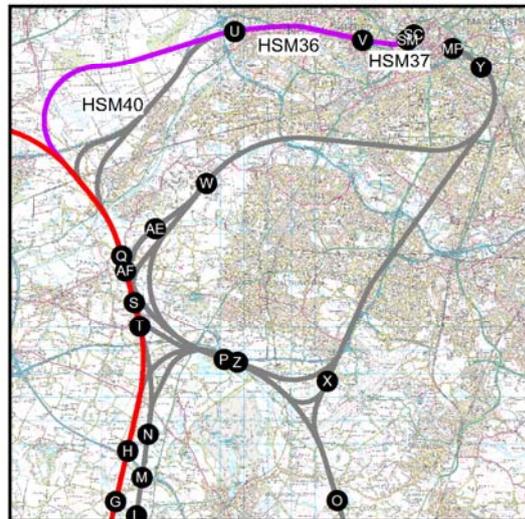
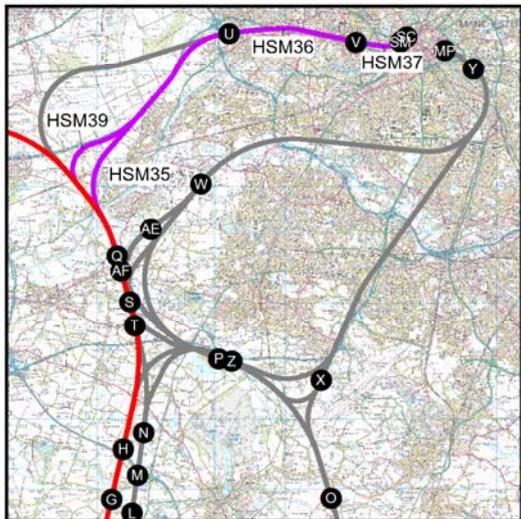
Chat Moss Approach



Airport Route



M6 Route



Western Route

### 2.38 Options for Spurs to Salford Station Options

Options for spurs from the through route to the station options at Salford Middlewood and Salford Central are described in the following sections. The map shows the sections, the through routes from the south and to the north.

| Nodes                  |    | Route Section | Description   |
|------------------------|----|---------------|---|
| From                   | To |               |   |
| Via M62 Corridor       |    |               |   |
| Q                      | U  | HSM35         | This route section would diverge from the through route (HSM12, HSM16 or HSM20) at Warburton, run north-east and then east at 230kph, including sections alongside the M62 and the Liverpool to Manchester railway to Winton. |
| Q                      | U  | HSM39         | This route section would diverge from the through route (HSM12, HSM16 or HSM20) at Warburton, run north-east and then east at 170kph, including sections alongside the M62 and the Liverpool to Manchester railway to Winton. |
| U                      | V  | HSM36         | This section would run from Winton alongside the Liverpool to Manchester Railway and then in tunnel to M602 Junction 3.   |
| Via Chat Moss Corridor |    |               |   |
| Q                      | U  | HSM40         | This section would diverge from the through route (HSM12 or HSM16) at Warburton and run north-east and the east, including a section alongside the Liverpool to Manchester railway over Chat Moss, to M602 Junction 3.        |
| Final Station Approach |    |               |   |
| V                      | SM | HSM37         | This route section would be the final 2.0km from M602 Junction 3 to the Salford Middlewood station option.  |
| V                      | SC | HSM38         | This route section would be the final 2.3km from M602 Junction 3 to the Salford Central station option.   |



### 2.39 HSM35: Warburton (Q) to Winton (U)

The route between Warburton and Winton would be 12.3km long. The section of route connecting Warburton from the south would be either HSM12 from Winterbottom, HSM16 from Mere or HSM20 from M56 Junction 7 Rostherne. The design speed would be 230kph.

At Warburton, the through route would divide at a junction into 4 lines, providing two additional spur lines, one on each side of the through route. Whilst adjacent to the through route, the spur lines would be in a cutting with a maximum depth of 7m. The A6144 **(1)** would be realigned to the north on a bridge over the route and the B5160 would be extended to tie in to the diverted A6144.

The western spur line would cross under the through route to join the eastern spur line and then run parallel on its eastern side. Rising steeply to be at the same level as the through route, all lines would then pass through the route of overhead power lines. The route would use an 850m long viaduct to cross the Manchester Ship Canal **(2)** at a height of 28m. The viaduct would also carry the route over a historic landfill site, the A57 **(3)** and Manchester Road just north of the Manchester Ship Canal.

The route would descend and the viaduct would end 100m north of Manchester Road. From this point the route would be on an embankment crossing over Bank Street **(4)** (which would be diverted) and the B5212 **(5)**. The route would then run on a 230m long viaduct at a height of 13m to cross above the Glaze Brook flood plain **(6)** and also the Manchester to Warrington railway **(7)**.

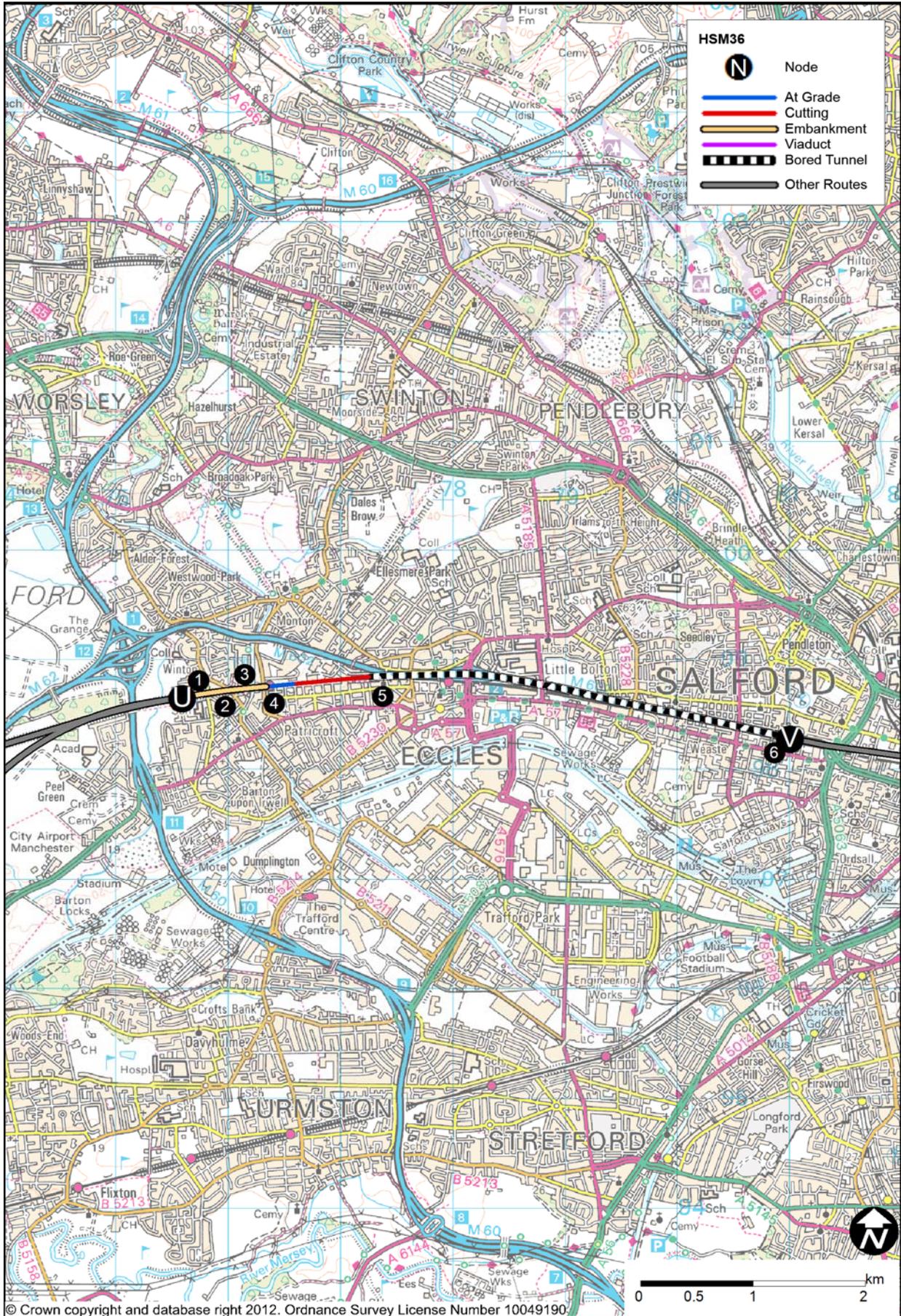
The route would then descend to continue at grade for 6km to cross Chat Moss and Barton Moss, areas of peat. Astley Road **(8)** would be realigned onto a bridge over the route and Roscoe Road **(9)** would be diverted for 250m to the south to avoid the route. The route would run adjacent and parallel to the M62 on its eastern side for 2.5km. Temporary stabilisation and support may be required to the M62 during construction. The Cutnook Lane **(10)** crossing of the M62 would be closed and the access track between Astley Road and Cutnook Lane would be improved. The route would pass through the route of overhead power lines. Barton Moss Road **(11)** would be realigned onto a bridge over the route.

The route would then diverge from the M62 and cross Barton Moss at ground level before descending into a cutting 8m deep to cross under the Liverpool to Manchester railway **(12)**. During construction the existing railway may require stabilisation and support.

The route would then rise passing through a historic landfill site to cross over the M60 **(13)** and Worsley Brook **(14)** on bridges at a height of 9m.

At Winton the route would continue along section HSM36 to M602 Junction 3.

A rolling stock maintenance depot option has been developed on the east side of this section of route at Barton Moss, and is described in Section 4.2.4.



## 2.40 HSM36: Winton (U) to M602 Junction 3 (V)

The route between Winton and M602 Junction 3 would be 5.5km long. The section of route connecting Winton from the south would be either HSM35, HSM39 or HSM40 from Warburton. The design speed is 230kph.

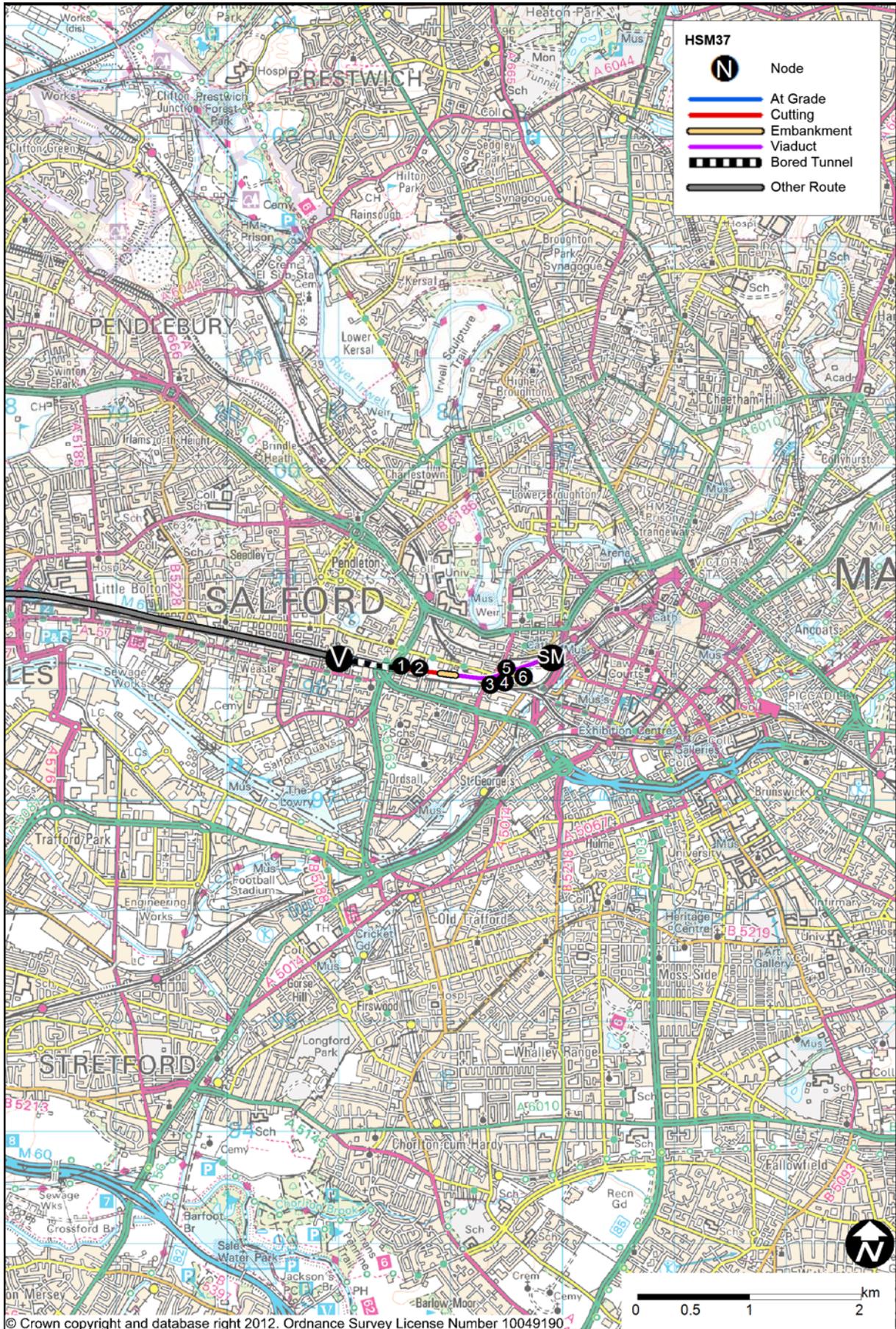
At Winton, just east of the M60 and Worsley Brook, the route would run adjacent to the Liverpool to Manchester railway on its north side, on a 5m high embankment at the same height.

The route would cross over New Lane **(1)**, the B5211 **(2)**, the Bridgewater Canal **(3)** and Green Lane **(4)**. Immediately east of Green Lane, the route would descend into a retained cutting for 600m. In this cutting, the lines would separate to a maximum width of 16m using the industrial site on the north side of the existing railway to minimise direct impacts on it.

The route would reach a depth of 22m just west of Old Wellington Road **(5)** and at this point would enter a twin bore tunnel. The route would remain in tunnel following the route of the M602 motorway for 4.0km. Ventilation, intervention and evacuation shafts would be positioned according to the HS2 Technical Specification and Strategies.

Approximately 500m west of the M602 and A57 junction, the route would start to ascend towards ground level, with the tunnel portal **(6)** located 50m east of this junction.

At M602 Junction 3 the route would continue along section HSM37 to Salford Middlewood or HSM38 to Salford Central.



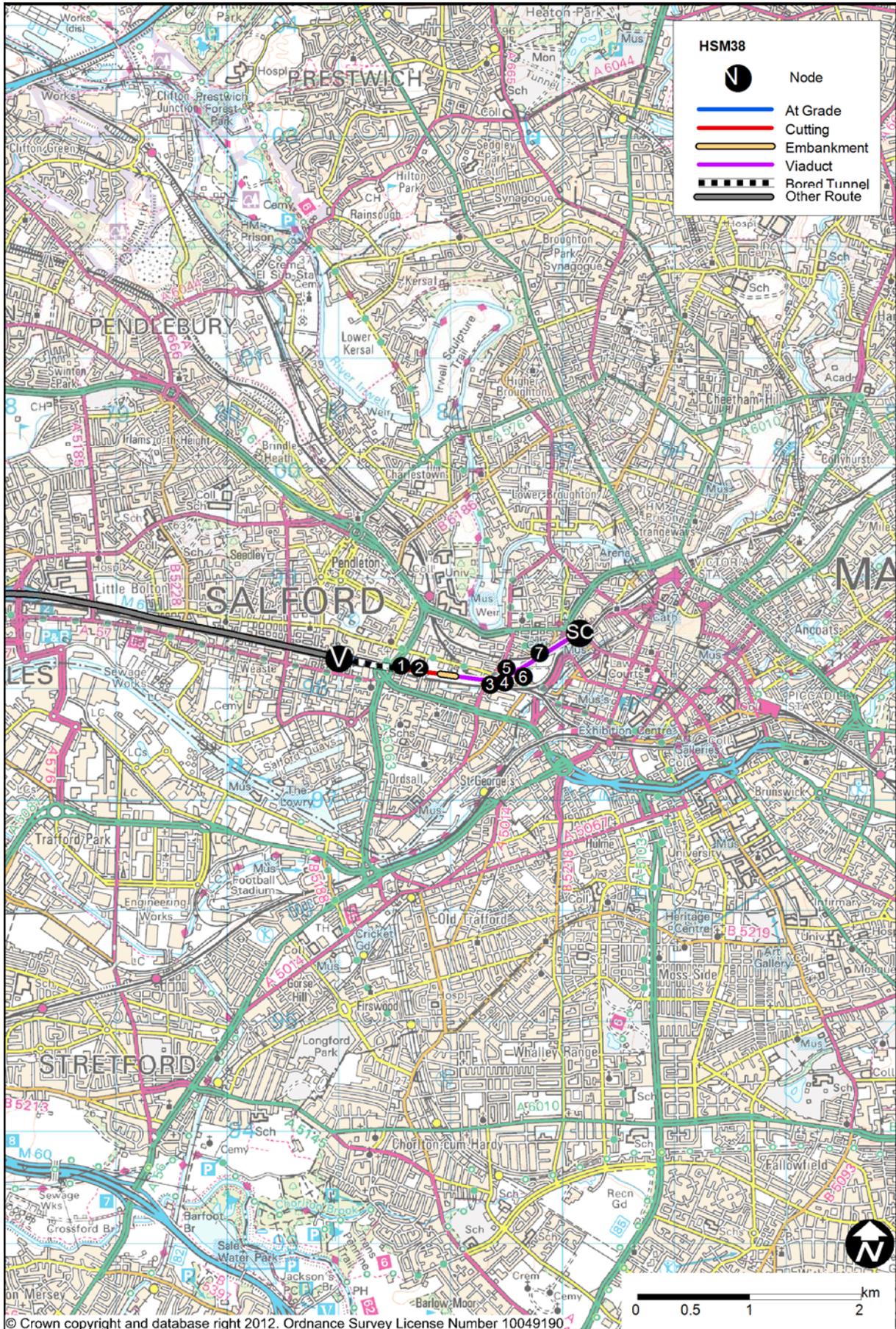
## 2.41 HSM37: M602 Junction 3 (V) to Salford Middlewood (SM)

The route between M602 Junction 3 and Salford Middlewood would be 2.0km long. The section of route connecting M602 Junction 3 from the south would be HSM36 from Winton. The design speed is 230kph reducing to 80kph, for the approach to the Salford Middlewood terminus station.

This section of route is the approach to the station at Salford Middlewood from the tunnel portal at M602 Junction 3.

The route would emerge from the tunnel in a cutting crossing under Windsor Street **(1)** and West Egerton Street **(2)** and then pass onto a viaduct and crossing over the existing railway that runs between Deangate and Salford Crescent. Oldfield Road **(3)**, Middlewood Street **(4)**, Hampson Street **(5)** and East Ordsall Lane **(6)** would be closed. There would be associated alterations to local highway network.

The station is described in Section 3.2.



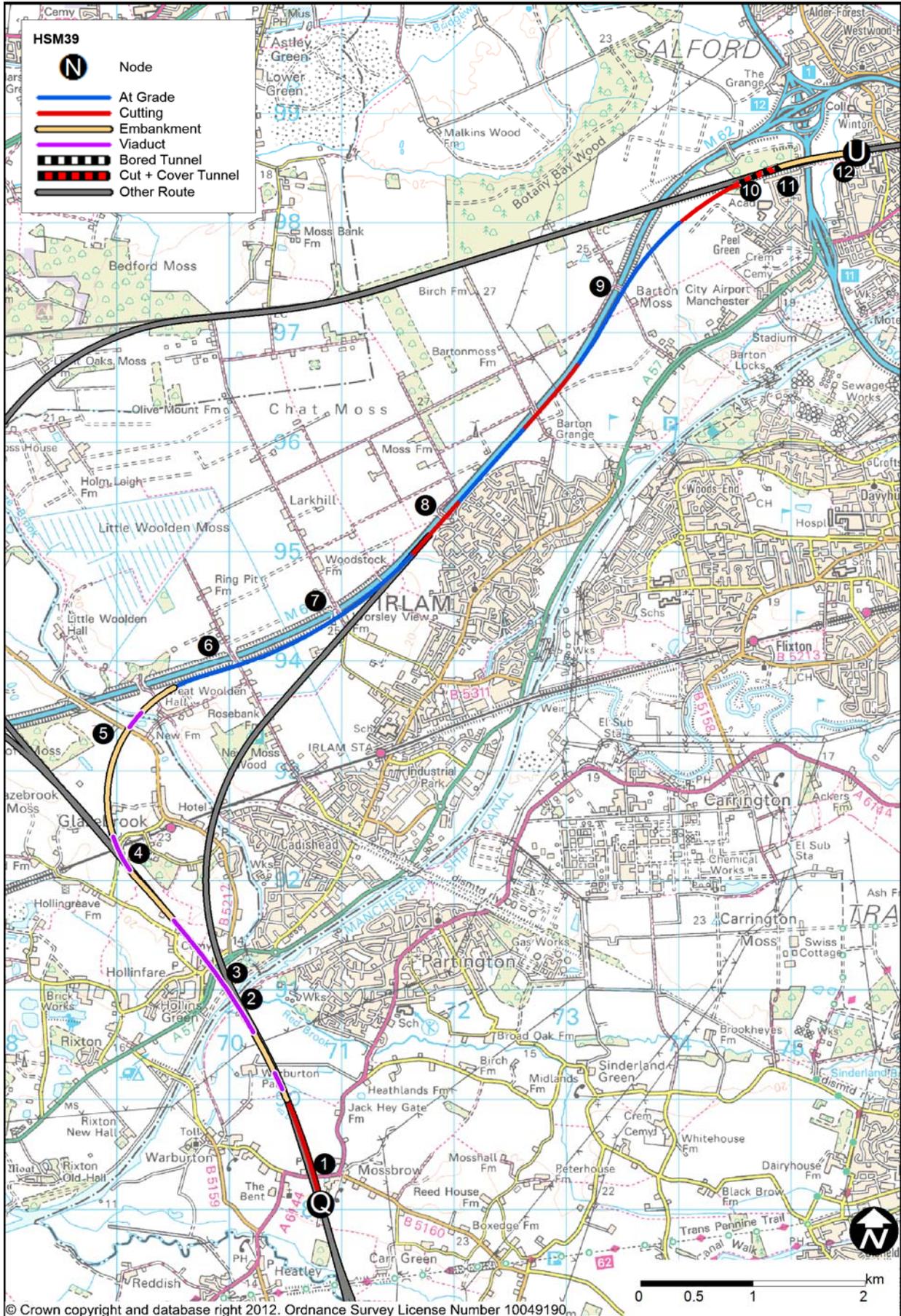
## 2.42 HSM38: M603 Junction 3 (V) to Salford Central (SC)

The route between M602 Junction 3 and Salford Central would be 2.3km long. The section of route connecting M602 Junction 3 from the south would be HSM36 from Winton. The design speed would be 230kph reducing to 80kph, for the approach to the Salford Central terminus station.

This section of route is the approach to the station at Salford Central from the tunnel portal at M602 Junction 3.

The route would emerge from the tunnel in a cutting crossing under Windsor Street **(1)** and West Egerton Street **(2)** and then pass onto a viaduct and crossing over the existing railway that runs between Deangate and Salford Crescent. Oldfield Road **(3)**, Middlewood Street **(4)**, Hampson Street **(5)** would be closed. East Ordsall Lane **(6)** would be diverted to avoid the route. There would be associated alterations to local highway network.

The station is described in Section 3.3.



### 2.43 HSM39: Warburton (Q) to Winton (U)

The route between Warburton and Winton would be 13.0km long. The section of route connecting Warburton from the south would be either HSM12 from Winterbottom, HSM16 from Mere or HSM20 from M56 Junction 7 Rostherne.

The design speed is 360kph and then 170kph at the grade separated junction and around a sharp curve to head east at Glazebrook, increasing to 230kph.

At Warburton the route would be in a cutting with a maximum depth of 9m. The A6144 **(1)** would be realigned onto a bridge over the route and the B5160 would be extended to tie in to the diverted A6144.

The route would then rise steeply passing through the route of overhead power lines. The route would use a 1.2km long viaduct to cross the Manchester Ship Canal **(2)** at a height of 28m, which would also carry the route over a historic landfill site, the A57 **(3)** and Manchester Road just north of the Manchester Ship Canal. 1km north of the Manchester Ship Canal the through route would divide at a junction into four lines, providing two additional spur lines to Manchester, one on each side of the through route.

Whilst adjacent to the through route, the spur lines would be on an embankment 12m high. After 500m the western spur line would cross over the through route at a height of 15m above ground level and then run parallel with the eastern spur line on the eastern side of the through route. As the lines diverge from the through route they cross over Dam Head Lane and the Manchester to Warrington railway **(4)** at a height of 15m before descending onto an embankment with a height of 5m. The B5212 (Glazebrook Lane) **(5)** would be realigned onto a bridge over the route.

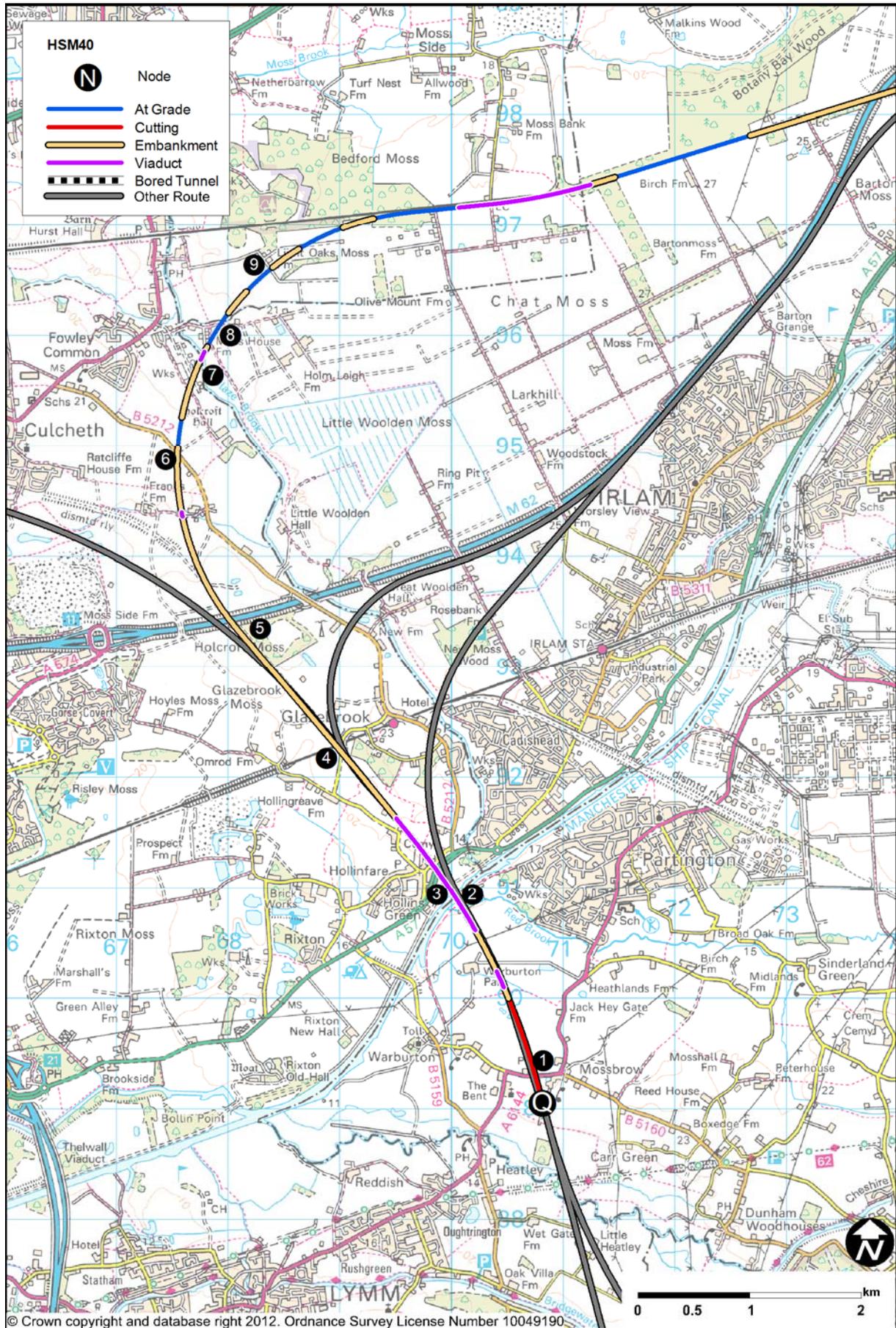
The route would cross the Glaze Brook flood plain on a 175m long viaduct at a height of 10m before descending to continue at ground level for 6km to cross Chat Moss and Barton Moss, areas of peat. Moss Road **(6)** and Astley Road **(7)** would be diverted onto bridges over the route as it runs adjacent to the M62 on its eastern side for 2.5km. Temporary stabilisation and support may be required to the M62 during construction. The Cutnook Lane bridge **(8)** crossing of the M62 would be closed and the access track between Astley Road and Cutnook Lane would be improved. The route would pass through the route of overhead power lines. Barton Moss Road **(9)** would be realigned onto a bridge over the route.

The route would then diverge from the M62 and cross Barton Moss at ground level before descending into a cutting 8m deep to cross under the Liverpool to Manchester railway **(10)**. During construction the existing railway may require stabilisation and support.

The route would then rise passing through a historic landfill site to cross over the M60 **(11)** and Worsley Brook **(12)** on bridges at a height of 9m.

At Winton the route would continue along section HSM36 to M602 Junction 3.

A rolling stock maintenance depot option has been developed on the east side of this section of route at Barton Moss, and is described in Section 4.2.4.



## 2.44 HSM40: Warburton (Q) to Winton (U)

### Warburton to Chat Moss

The route between Warburton and Winton would be 16.3km long. The section of route connecting Warburton from the south would be either HSM12 from Winterbottom, HSM16 from Mere or HSM20 from M56 Junction 7 Rostherne.

The design speed is 360kph reducing to 230kph at the grade separated junction and on the spur to Winton.

At Warburton the route would be in a cutting with a maximum depth of 9m. The A6144 **(1)** would be realigned onto a bridge over the route and the B5160 would be extended to tie in to the A6144.

The route would then rise steeply passing through the route of overhead power lines. The route would use a 1.2km long viaduct to cross the Manchester Ship Canal **(2)** at a height of 28m. The viaduct would also carry the route over a historic landfill site, the A57 **(3)** and Manchester Road just north of the Manchester Ship Canal.

At Glazebrook, 1.3km north of the Manchester Ship Canal, the through route would divide at a junction into four lines, providing two additional spur lines to Manchester, one each side of the through route.

Whilst adjacent to the through route, the spur lines would be on an embankment 9m high and cross above Dam Head Road and the Manchester to Warrington railway **(4)**. The western spur line would rise to cross above the through route at a height of 14m above ground level and then run parallel with the eastern spur line on the eastern side of the through route.

As this spur diverges from the through route it would cross above the M62 **(5)** before descending onto an embankment with a maximum height of 3m for the next 5km. The route would cross a narrow flood plain on a bridge at a height of 3m. The B5212 **(6)** would be realigned onto a bridge over the route, which would then cross the Glaze Brook flood plain **(7)** at Fowley Common on a 95m long viaduct at a height of 5m. The route would continue at grade for 200m, requiring Moss Lane **(8 and 9)** to be realigned onto bridges over the route.

