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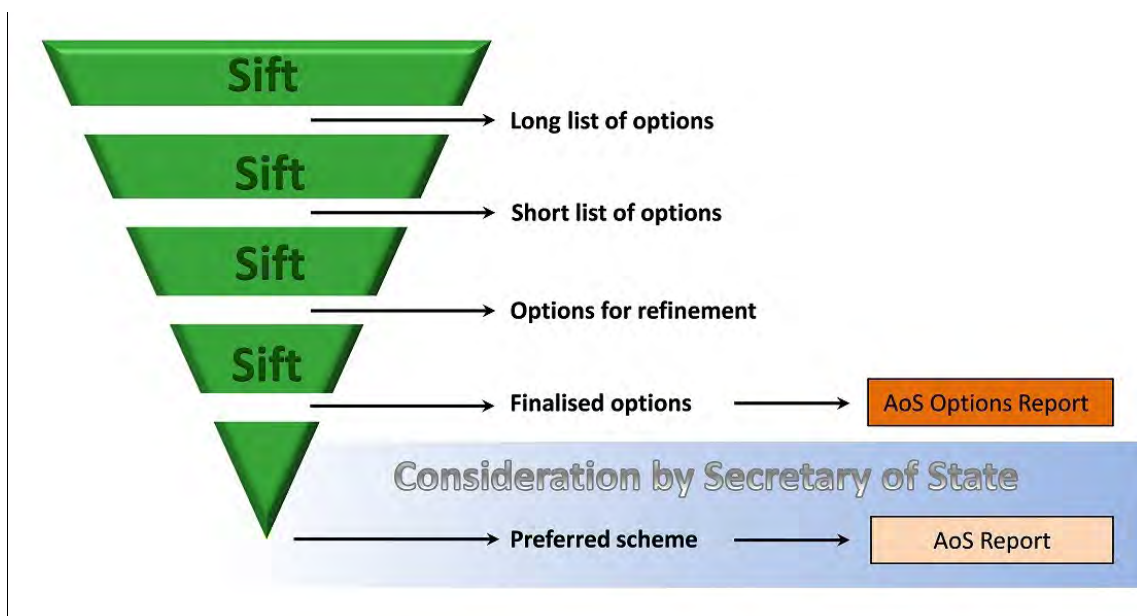
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## 1. Introduction

### 1.1. The sifting process

- 1.1.1. The AoS process has consisted of a sequentially more detailed appraisal of options. At the end of each appraisal stage, sustainability performance was formally considered, alongside other cost, operational and engineering information by HS2 Ltd who decided which options should be progressed to the next sift. The selected options then entered the next sift for more detailed appraisal.
- 1.1.2. Figure 1.1 illustrates the sequence of sifts aimed to reduce the number of options in play. In the later sifts, the engineering and sustainability teams worked on the remaining options to mitigate the predicted impacts by refining the vertical and/or horizontal alignments and by introducing certain structures such as green tunnels, viaducts or cuttings with retained walls. In this way, the route development process has ensured that mitigation is inherent within the designs from the outset.

**Figure 1.1 Sifting has reduced and improved the options**



- 1.1.3. The option sifting and selection process involved an increasingly more detailed examination of sustainability impacts as the number of options reduced. The iterative and structured nature of this process ensured that all sustainability issues were fully considered in the development of a preferred option for the scheme.
- 1.1.4. The information assessed at each stage of the sift process is shown in the AoS Framework contained in Appendix 1.

### 1.2. Sifting stages

#### Long listing

- 1.2.1. An initial list of options was established by HS2 Ltd which included; a review of existing proposals, internal review of possible route locations, and discussions with industry and other stakeholders. Options were proposed for geographical sections of the HS2 phase two (Manchester-Leeds scheme). These were initially tested in terms of their conformance with the stated scheme objectives. An appraisal was then undertaken considering demand,

engineering, operational feasibility, cost and major sustainability impacts. Options presenting obvious significant operational difficulties; or impacts that were considered to be particularly adverse for other reasons were parked.

### Short listing

- 1.2.2. Short listing of options was undertaken on the basis of Ordnance Survey (OS) mapping in order to produce indicative centre-line alignments. Vertical alignments, junction locations and turnout geometry were not considered, except where these could be a serious constraint on the horizontal alignment.
- 1.2.3. With a list of over 500 options emerging from the long listing, the short listing applied a more refined level of examination. In order to differentiate relative sustainability performance more efficiently, comparison of paired options was undertaken.

### Selecting options for further refinement

- 1.2.4. The next stage of the sifting process was undertaken on the basis of a more developed project specification. The design was progressed to meet this specification, it included:
  - alignments and alignment geometry;
  - profiles;
  - cut depths;
  - fill heights;
  - earthworks profiles; and
  - structures including tunnels, viaducts retained cuttings and over bridges.

### Finalisation of options

- 1.2.5. The options selected for refinement included mitigation. The AoS specialists worked with the project team to provide a log of key impacts. Where practicable, the alignments were revised, either horizontally and/or vertically, and structures were introduced such as green tunnels, viaducts or cuttings in order to mitigate these. The options reported in the main text include these refinements.

## 1.3. Using this appendix

- 1.3.1. This appendix summarises the options, and groups of options, that were considered at each of the three preceding stages, but were not taken forward. The wider decisions for their not being progressed (which would have included sustainability considerations) are provided in the main *Options for phase 2 of the high speed rail network* report.
- 1.3.2. The options have been grouped geographically for convenience and any sustainability themes are highlighted, although in many cases they were assessed on their own merits.
- 1.3.3. The appendix presents the Manchester options and breaks these down into each of the three stages of long listing, short listing, and selecting options for further refinement. It considers first routes and then stations. This is then repeated for Leeds (which also covers East Midlands and South Yorkshire).
- 1.3.4. This appendix outlines the broad conclusions of AoS work undertaken at the time. It presents the main sustainability characteristics of each option, or group of options, that were considered. This sustainability information was reviewed together with cost, engineering and demand. The views of stakeholders were also considered for the station options at all stages of the process (with the exception of long listing).

## 2. Manchester route and stations – long listing

- 2.1.1. A high level sustainability appraisal was carried out on all options at the long listing stage. This looked at whether high priority sustainability features were directly affected across all options. This information was fed into the option selection process.
- 2.1.2. The options parked at this stage were as follows:

Manchester	No. options considered	No. options parked	Options parked (reference)
Manchester Line of route	NA	NA	No routes were parked at long listing stage
Manchester Stations	30	16	1c, 1d, 2, 4, 5, 7a, 8a, 8b, 9c, 11a, 11c, 12, 14a, 14b, 16, 17
Manchester Interchanges	36	32	Option 1, Option 2, Option 3, Option 4, Option 4a, Option 4b, Option 6, Option 6a, Option 7, Option 8, Option 9, Option 10, Option 10a Option 11, Option 12, Option 13, Option 14, Option 15, Option 16, Option 17, Option 17a, Option 19, Option 20, Option 21, Option 22, Option 23, Option 24, Option 25, Option 26, Option 27, Option 28, Option 29
Manchester Intermediates	8	7	2-Stoke on Trent East, 3-Stoke on Trent East, 4-Crewe South, 5-Crewe Central, Option 6, Option 7, Option 8

### **3. Manchester routes – short listing**

3.1.1. See Figure 3.1.

#### **3.2. Peak District group**

3.2.1. The group comprised three routes (at the most easterly part of the route corridor) connecting Lichfield with Dunkinfield, south-east of Manchester. The group would have had a direct impact on the Peak District National Park, which would have been crossed for a substantial distance by all three routes. Opportunities for mitigation would have been limited and to avoid the National Park would have required a section of tunnel of at least 20km in length. The northern half of the group would have had a direct impact on: one Grade II\* registered park and garden (Lyme Park); 14 SSSIs; one SPA (Peak District Moors Phase 1); two SACs (South Pennine Moors, Peak District Dales); and over 20 Grade II listed structures. The southern half of the group would have had significant landscape and visual impacts.

#### **3.3. Churnet Valley group**

3.3.1. The group connected east of Cheadle with Macclesfield. It would have had a direct impact on three SSSIs (Churnet Valley, Dimmings Dale and Ranger). The group would have required a large viaduct to cross the Churnet Valley SSSI, resulting in significant landscape and visual impacts. Opportunities for mitigation would have been limited.

#### **3.4. Central (Power) corridor group**

3.4.1. The group comprised one route which connected Lichfield with south of Macclesfield. The group would have crossed one Phase 1 Ramsar site (Midland Meres and Mosses); one SAC (West Midlands Mosses); one SSSI and NNR (Chartley Moss); and would have had a direct impact on two scheduled monuments (Blithewood Moated Site and Paynsley Hall Moated Site). The southern half of the route would have had significant landscape and visual impacts.

#### **3.5. East of Stoke group**

3.5.1. The group comprised a single route connecting the north-east side of Stoke-On-Trent with Brereton Heath, just west of Congleton. This group would have required a high number of residential demolitions, mainly at Biddulph and Norton Green. The group would have had a direct impact on one SSSI (Roe Park Woods) and an indirect impact on six SSSIs (Bagmere, Brookhouses Moss, Ford Green Reedbed, Gannister Quarry, Holly Banks, River Dane); and two Ramsar sites (Midland Meres and Mosses Phase 1 and 2).

#### **3.6. West of Stoke group**

3.6.1. The group comprised a single route connecting north of Stone with Over Peover, passing partly in tunnel west of Stoke-On-Trent. The group would have required a comparatively high number of residential demolitions and a significant number of properties would have experienced noise impacts; particularly at Stone and Stoke-On-Trent. The group would have required six crossings of, and had a potential impact on, the River Trent (a major river) and would have crossed the Trent and Mersey Canal. It would have also had a direct impact on one SSSI (River Dane); two Grade II registered parks and gardens (Rode Hall, Peover Hall); and an indirect impact on three scheduled monuments; five Grade II\* listed structures; and one Grade II\* registered park and garden (Trentham Gardens).



### **3.7. Eastern approaches group**

- 3.7.1. The group comprised a number of approaches connecting core route options at Macclesfield with stations in east Manchester. Some of the approaches split to the north to connect with city centre station options. The surface routes would have required a high number of residential demolitions and significant numbers of properties would have experienced noise impacts in south and east Manchester. The group would have crossed the Peak District National Park (two eastern-most routes only) and Reddish Vale Country Park and would have had an impact on two scheduled monument; three Grade II\* listed structures; one Grade II\* registered park and garden (Adlington Hall); and two Grade II registered parks and gardens (Philips Park, Philips Park Cemetery).

### **3.8. Western approaches group**

- 3.8.1. The group comprised five approaches, connecting core line of route options with stations in the west of Manchester. These approaches extended north from either Lymm (two approaches), Altrincham (two approaches), or north-east of Holmes Chapel (eastern-most approach), to connect with St. George's. The group would have required a high number of residential demolitions (Urmston, West Disbury, and Newall Green). As such, some options were also re-designed as tunnel approaches for further refinement in the next development stage. It would have crossed one SSSI (Dunham Park). It would have also had an impact on Dunham Massey National Trust site; two Grade II\* registered parks and gardens (Tatton Park, Dunham Massey); three Grade II registered parks and gardens (Alexandra Park, Wythenshawe Park, Manchester Southern Cemetery); one Grade II\* listed structure (Barton Bridge), one Grade I listed structure (Church of All Saints) and one scheduled monument (Bowl Barrow).

### **3.9. South Manchester spine group**

- 3.9.1. The group connected Wilmslow with Wigan, linking routes from Birmingham to Manchester and the WCML (West Coast Main Line). The group would have crossed one SAC (Manchester Mosses, which includes Risley Moss SSSI), a SSSI (Brookheys Covert); and would have crossed the Manchester Ship Canal with landscape and visual impacts. The group would also have had landscape and visual impacts where it crossed the Pennington Flash Country Park on viaduct. Mitigation considered bypassing the country park (the southern-most spine route); however, a high number of residential properties would have experienced noise impacts and there would have been a high number of residential demolitions at Golborne.

### **3.10. WCML, Warrington & Wigan connections group**

- 3.10.1. The group connected Warrington, Wigan and the WCML with the core Birmingham to Manchester routes. The group ran from Northwich to the south, and Altrincham and Knutsford to the south-east, north to Preston. The group would have required residential demolitions in numerous built-up areas including at Euxton, Coppull, Orrell, Abram, Hartford, and Warrington. The group would have crossed two SSSIs (Abram Flashes, Woolston Eyes); and would have had an impact on two Grade II registered parks and gardens (Tabley House, Avenham Park); and three Grade II\* listed structures (Lower House Farmhouse, Lightshaw Hall, Church of All Saints).

### **3.11. West Pennine Hills group**

- 3.11.1. The group connected Manchester with north-east of Preston, with the exception of one route which would have followed the M61 corridor to Westhoughton. The group would have required a high number of residential demolitions, particularly to the north of Manchester. It would have had a direct impact on two SSSIs, (Rochdale Canal, Red Scar & Tun Brook

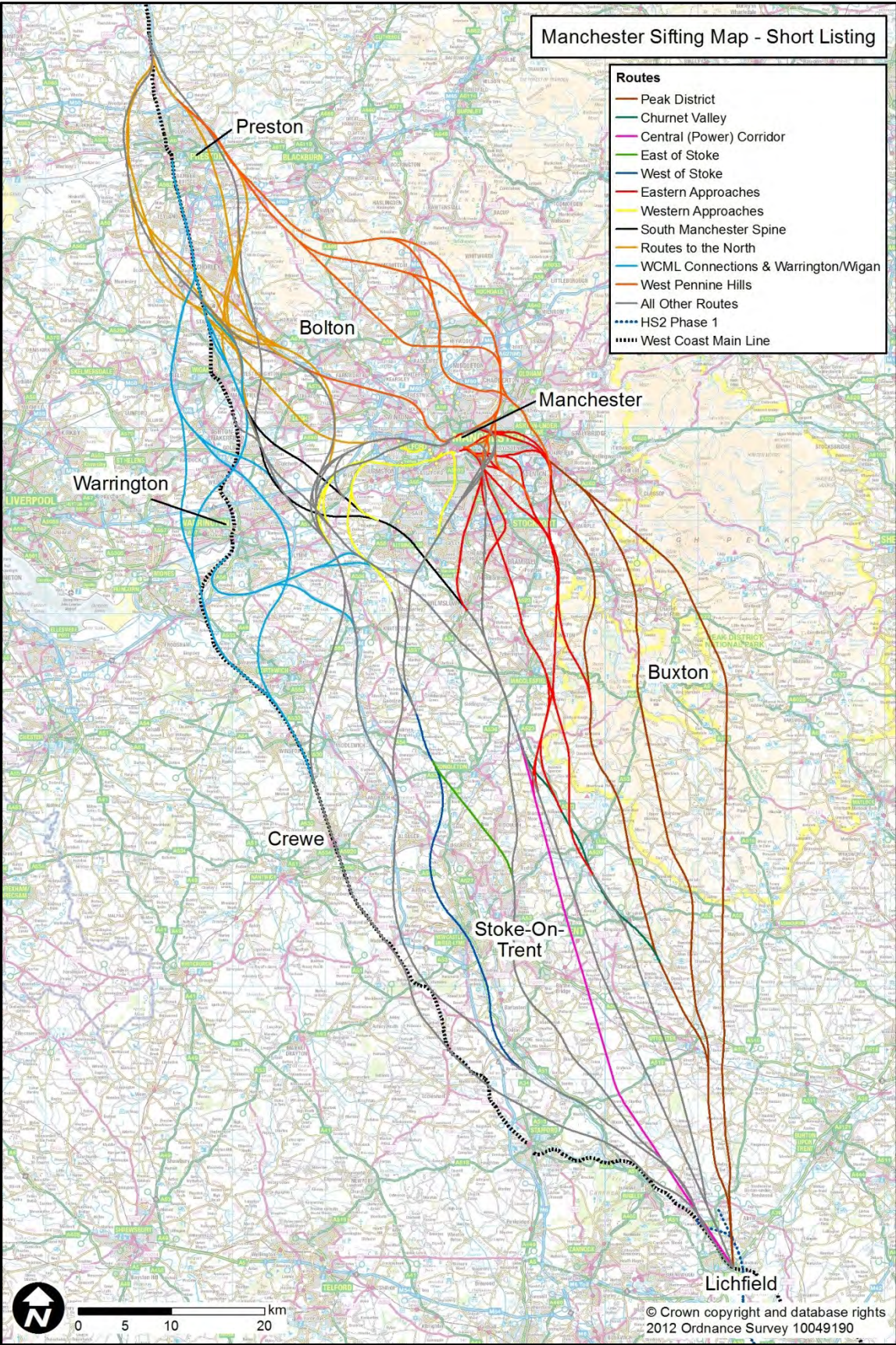
woods); one SAC (Rochdale Canal); two Grade II registered parks and gardens (Hoghton Tower, Heaton Park); and a National Trust site (Stubbins Estate). Opportunities for mitigation would have been limited in urban areas without extensive tunnelling.

### **3.12. Routes to the north group**

- 3.12.1. The group connected routes from Golborne and west Manchester to the West Coast Main Line north of Preston, with some routes skirting around east and west of Preston. The group would have had a direct impact on three scheduled monuments (the Moat House, Bretters Farm, Moated Site at Arley Hall). It would have crossed the River Ribble, at a point 2.2km upstream of the Ribble & Alt Estuaries Ramsar site. It would also have crossed several other major rivers and canals (River Yarrow, Bridgewater Canal, Leeds and Liverpool, Lancaster, Millennium Ribble Link) resulting in visual impacts on users of waterway footpaths. It would have had an indirect impact on one SSSI (Red Moss); one Grade I listed structure; and 13 Grade II\* listed structures.



Figure 3.1 - Manchester routes parked at short listing





## **4. Manchester stations – short listing**

4.1.1. See Figure 4.1.

### **4.2. Manchester Piccadilly group**

4.2.1. The group comprised options MPM 1E, MPL 1F and Uni 3. The group was located at Manchester Piccadilly. Option 1e was located to the immediate south of Piccadilly Station; it would have had minimal residential demolition (being located mainly within a light industrial area). All options were located within walking distance of the city centre and Piccadilly Station, although option Uni 3 was located to serve both. Options 1e and 1f were located further west and would have required the demolition of Manchester University buildings. Option 1f would have required the demolition of a substantial number of residential properties at the start of the station throat (within one block). All options would have been in conflict with the Mayfield Site (identified by the local authority for major regeneration initiatives) but would have had the potential to support a high number of future jobs and houses. No options would have directly impacted historic or natural resources.

### **4.3. Manchester Victoria group**

4.3.1. The group comprised options GSB6, MVG7B and MEN18. The group was located on an east-west axis, parallel to the existing railway (that serves Salford Central and Victoria). Option 6 to the far north of the Victoria Station, would have had the fewest impacts of the three, with lower numbers of residential demolitions and no impact on heritage. However, it was some distance from the Salford and Manchester Centres, Victoria Station and tram stops. It would have had moderate potential to support future jobs and houses.

4.3.2. Option 18 was located at Victoria Station with the approach running to the north requiring a few residential demolitions and demolition of two grade II listed structures. It would have had a conflict with the MEN exhibition centre and two extant planning consents. Option 7b was located to the immediate south of the station with the approach running south through a number of large blocks of flats resulting in high residential demolitions and demolition of five grade II listed structures. It would have also been in conflict with development proposed by The Exchange Planning Guidance (2007). Both options were located within walking distance of Manchester and Salford Centres, Salford Central and Victoria Stations and tram stops. The potential to support future jobs and houses would both have been high (although not as high as the Manchester Piccadilly Group). All options would have had an impact on Flood Zone 3.

### **4.4. Salford Central group**

4.4.1. The group comprised option LST10. It was located parallel to, and south of, Liverpool Street in Salford, following the alignment of existing railway tracks serving Salford Central. The location was relatively remote (not within 10-15 minutes' walk of Salford or Manchester City Centres, tram or mainline train services). It would have had moderate potential to support future jobs and houses. Demolitions would have been low; mainly light industrial with no residential. There would have been no impacts on historic or natural resources.

#### 4.5. **Salford Quays group**

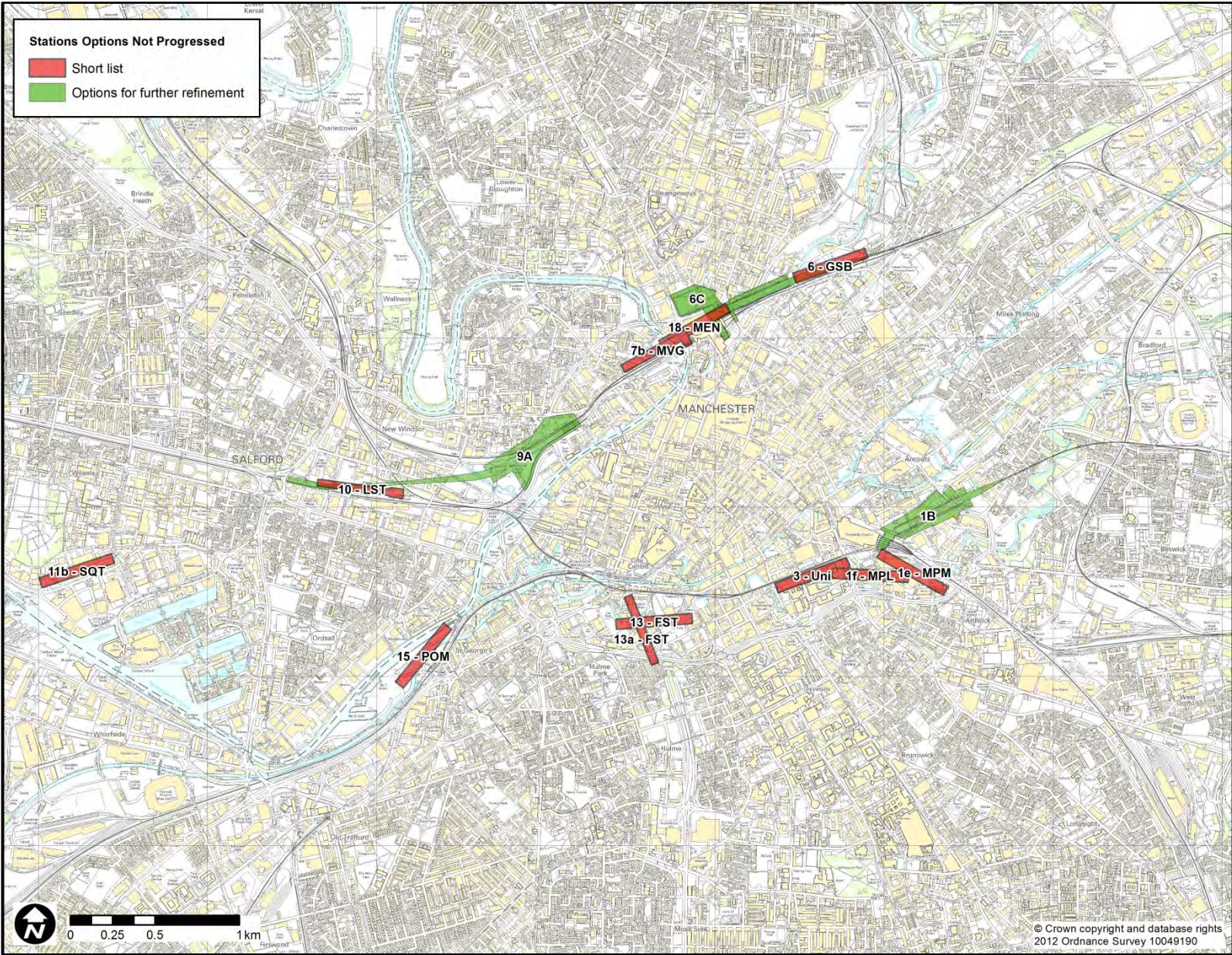
- 4.5.1. The group comprised options SQT11B and POM15. The group was located at Salford Quays and Pomona Docks. Option 11B was located to the north of Salford Quays; the station was to the north of Broadway on light industrial land; the throat spanned the Irwell and ran through Trafford Park (a designated industrial area) to Trafford Park Road. It would have had no residential demolitions. Option 15 was located on Pomona Island with the station to the north and the throat running north of the Bridgewater Canal, over Pomona Docks and the River Irwell; and would have resulted in three residential demolitions. Both options were relatively remote with access to Metrolink but no mainline train stations. They would have had moderate potential to support future jobs and houses. Neither option would have had a direct impact on historic or natural resources.

#### 4.6. **G-Mex group**

- 4.6.1. The group comprised options FST13 and FST13A. The group was located to the south-west of Manchester City Centre. Option 13 was located on a north-south axis traversing the A57(M). The station was located at Castle Street with the throat running south to the immediate west of Princess Road. Option 13A was located east-west with the station at First Street in the east and the throat running west under the A57 (M). Option 13 would have been in conflict with the Manchester First development at First Street (a major regeneration scheme currently underway); and one extant planning consent. It would have also required the demolition of a high number of flats in and around Great Jackson Street. Option 13A would have required an even higher number of residential demolitions affecting the same flats as Option 13; and also a number of houses to the south near Princess Road. Both options were located close to Manchester City Centre, Metrolink, Deansgate and Oxford Road railway stations, and would have had the potential to support high numbers of future jobs and houses. Neither option would have directly impacted historic or natural resources.



Figure 4.1 - Manchester stations parked at short listing and selection of options for further refinement





## **5. Manchester routes – selection of options for further refinement**

5.1.1. See Figure 5.1.

### **5.2. Churnet Valley group**

5.2.1. The group comprised a single route connecting Lichfield with Macclesfield passing to the west of Leek. The group would have crossed one SSSI (Churnet Valley), one area of National Trust land (Hawksmoor), two canals (Trent & Mersey, Caldon and Macclesfield); and two major rivers (Rivers Dane, Team & Blithe), which may have also required works. The group would have had a major landscape and visual impact on the surrounding area (which includes the Peak District National Park and Churnet Valley).

### **5.3. Central (Power) corridor group**

5.3.1. The group comprised a short route passing to the east of Stoke-on-Trent, connecting Gratwich (west of Uttoxeter) to Bradshaw (west of Leek). The group would have directly impacted on several floodplains including crossing the Caldon Canal and River Blithie. It would have had a visual impact on open landscape at its southern extent where it passes through rural countryside.

### **5.4. East of Stoke group**

5.4.1. The group comprised a single route connecting Lichfield with Macclesfield, passing in tunnel through Stoke-on-Trent (on the east side). The group would have had an impact on three conservation areas (Hilderstone, Trent and Mersey Canal, Macclesfield Canal); seven BAP habitats; and five ancient woodlands, and an indirect impact on seven Natura 2000 sites (within 10km). It would have also crossed one abstraction site (at Moddershall; 3,500 cubic metres/day). The group would have had a major visual impact on a National Trust site (Congleton Cloud) a Grade II\* registered park and garden (Gawsworth Old Hall); three scheduled monuments (Gawsworth Hall Gardens, Hilderstone Hall, Moated Site at Great Hartwell Farm) and over 40 Grade II listed structures.

### **5.5. Eastern approaches group**

5.5.1. The group comprised five approaches into east Manchester. All approaches diverged from a core route option between Macclesfield and Altrincham to terminate at one of three eastern city-centre station options. All of the approaches were tunnelled from the outskirts of Manchester. The group would have required a high number of residential demolitions at Mottram St Andrews & Dean Row, and Alderley Edge; a significant number of properties would have also experienced noise impacts. There would also have been landscape and visual impacts at Alderley Edge. The group would have crossed a National Trust site (Hare Hill), and there would have been impacts on the setting of a Grade II\* registered park and garden and scheduled monument (Gawsworth Old Hall).

### **5.6. Western approaches group**

5.6.1. The group comprised six approaches to terminus station options located in the west of Manchester. The group diverged from the main route at one of four locations: near the M6 crossover (west of Tatton Park); south-west of Altrincham (north of Rostherne Mere); to the north-east of Lymm; or east of Culcheth. Although all routes in this group included 4km-6km tunnels on the approach to the terminals, the group would have required a high number of residential demolitions including some at Eccles (in an area of high deprivation). The group would have crossed a National Trust site (Dunham Massey) and would have had a visual impact on the associated Grade II\* registered park and garden (Dunham

Massey). The group would have had an impact on one scheduled monument (a promontory fort), one Grade II\* listed structure (Barton Bridge); and would have passed within close proximity of two SACs (Manchester Mosses, Rixton Clay Pits). The group would have also had an indirect impact on two Ramsar sites (Rostherne Mere - also an NNR, Midland Meres and Mosses Phase 1); and eight SSSIs (Abram Flashes, Rixton Clay Pits, Risley Moss, Holcroft Moss, Astley and Bedford Mosses, Rostherne Mere, Bryn Marsh & Ince Moss, Dunham Massey). Three approach options (the western-most three) would have crossed, and had a major visual impact on, the Manchester Ship Canal.

## **5.7. WCML connections group**

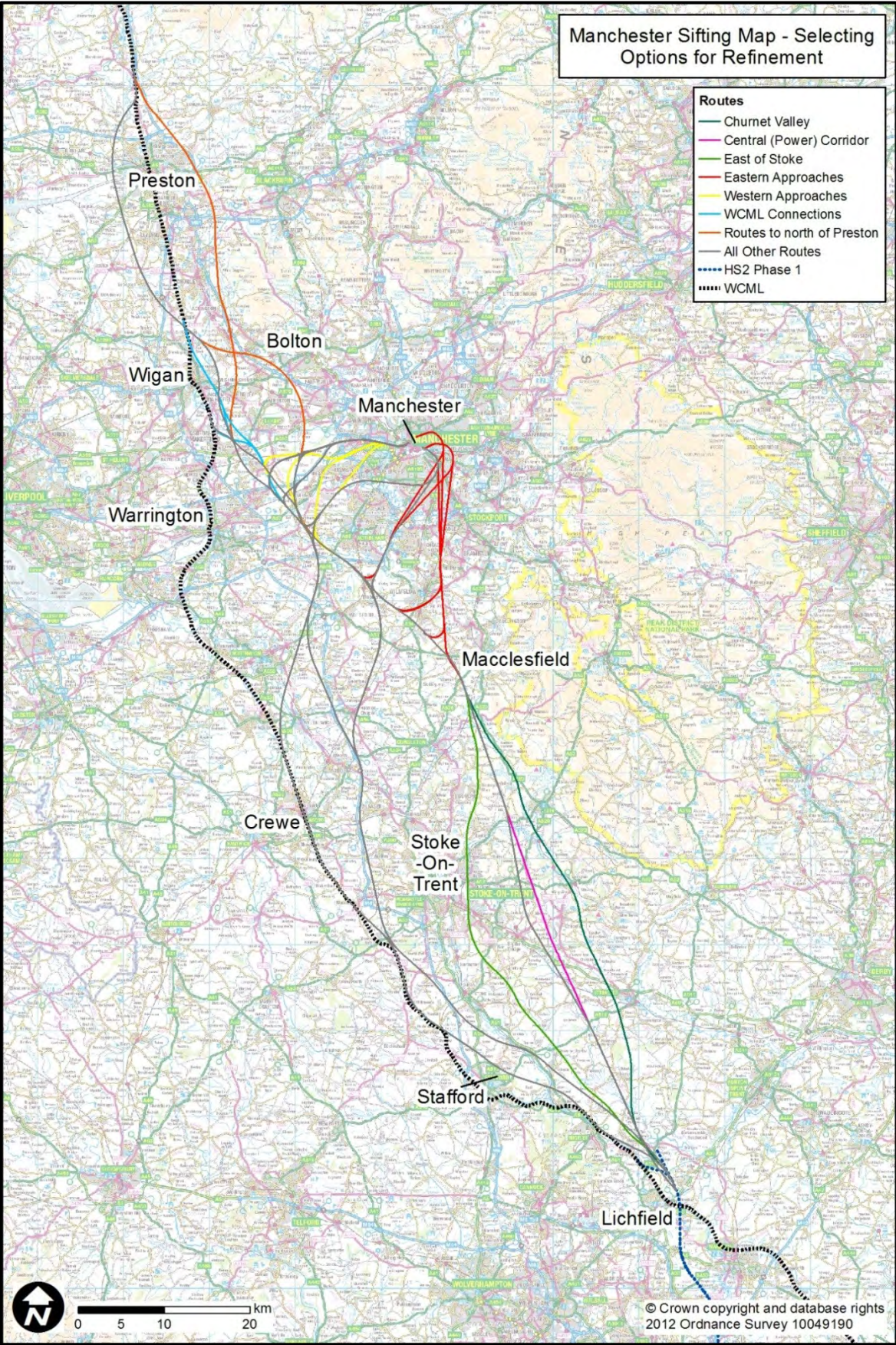
- 5.7.1. The group ran from east of Warrington to south of Coppull, connecting the Birmingham to Manchester line of route to the WCML. The group would have crossed the Pennington Flash Country Park on viaduct and would have had a major impact on the landscape. A number of properties would have experienced noise impacts. The group would have required residential demolitions at Hollins Green and would have had a direct impact on one scheduled monument (Haigh Sough); and an indirect impact on two SACs (Manchester Mosses, Rixton Clay Pits); and five SSSIs (Abram Flashes, Bryn Marsh & Ince Moss, Holcroft Moss, Risley Moss and Rixton Clay Pits).

## **5.8. Routes to north of Preston group**

- 5.8.1. The group comprised three routes connecting with the WCML. Two of the routes originated to the south-west of Altrincham to terminate to the east and west of Aspull. The third route connected Golborne to the WCML north of Preston, running east of the M61. The group would have required residential demolitions at Tyldesley, Horwich, Crankwood and Wheelton. The group would have had a direct impact on one SSSI (Red Scar & Tun Brook Woods); a National Trust site (Dunham Massey); Worthington Lakes Country Park; and would have had an indirect impact on two SACs (Manchester Mosses, Rixton Clay Pits); and an AONB (Forest of Bowland). The group would have also had a visual impact on the Ribble Valley, Dunham Park SSSI and Dunham Massey Grade II\* Registered Park and Garden.



Figure 5.1 - Manchester routes parked during selection of options for further refinement





## 5.9. Alternative options not progressed to finalised option stage

- 5.9.1. The two routes outlined below were alternatives to the preferred spine and central (power) corridor route options that emerged at the end of selection process detailed above. These groups were not parked at Gate 2.5; however, they were not progressed to Gate 3.

### Central (Power) corridor route

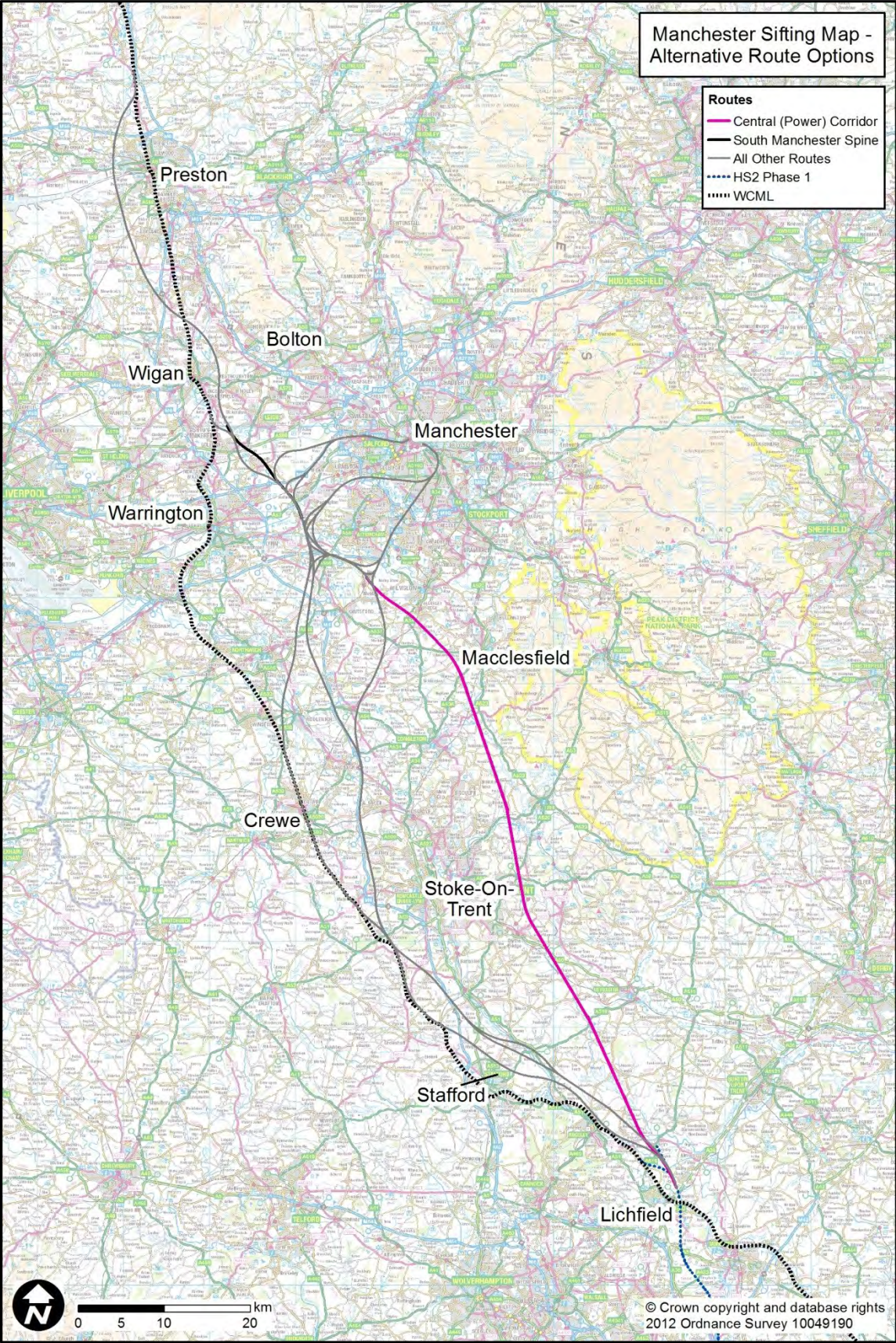
- 5.9.2. This route was the most easterly route remaining at the final options stage and is commonly referred to as the *eastern route option*. It connected Lichfield to Mobberley, passing to the east of Stoke-on-Trent and to the west of Leek and Macclesfield. The route would have passed within 2km of the Peak District National Park impacting on views from higher ground. There would have been five major river diversions (River Blithe x4, River Dane x1) and 17,230m of the route, in cut or tunnel, would have crossed good yield and good quality aquifers. The route would have had a direct impact on approximately 20 ancient woodlands. It would also have required some residential demolitions (with 13 at Key Green). There would have been noise impacts on some residential properties; a visual impact on Dane Valley; and an indirect impact on three scheduled monuments, four Grade II\* listed structures and two Grade II\* registered parks and gardens (Gawsworth Old Hall, Tatton Park).

### Spine route (tunnel under Lowton)

- 5.9.3. This route was located to the northeast of Lymm and ran north-west to past Pennington Flash Country Park to terminate at Crankwood, northeast of Golborne. The route would have had a direct impact on a zone 1 source protection zone and public borehole at Lowton Common. It would have required 10 residential demolitions; and there would have been vibration impacts for over 200 residents at Lowton Common. It would have had an indirect impact on Manchester Mosses SAC (that part which is Holcroft Moss SSSI).



**Figure 5.2 – Alternative Manchester route options parked during selection of options for further refinement**





## **6. Manchester stations – selection of options for further refinement**

6.1.1. See Figure 4.1.

### **6.2. City centre stations**

#### **Option 1b: Manchester Piccadilly Baird Street**

6.2.1. The option was located to the east of Manchester Piccadilly Station. It ran east-west perpendicular to the existing railway station. The option was located at Sheffield Street, abutting the existing station building. The approach ran east to the River Medlock. The station was located within 10-15 minutes' walk of the city centre, Piccadilly Station and Metrolink. There would have been a high number of residential demolitions mostly located within five large residential blocks (three within the station throat and two within the construction boundary); and two community demolitions and the demolition of one Grade II listed structure. The option would have been in conflict with two extant planning consents. It would have displaced approximately 2,000 jobs but would have had the potential to support approximately 30,000 jobs and 3,400 houses. The option would have had a moderate adverse impact on townscape character but would not have had a direct impact on natural resources.

#### **Option 6c (a variant of Option 6 - GSB)**

6.2.2. The option was located at Victoria Station with the approach running north-east parallel to existing tracks. The station option was located within 10-15 minutes' walk of Manchester city centre, Victoria Station and Metrolink. There would have been a high number of residential demolitions mostly located within three large new blocks of flats; one community demolition and the demolition of two Grade II listed structures. The option would have been in conflict with one extant planning consent. It would have displaced approximately 1,500 jobs but would have had the potential to support approximately 14,000 jobs and 1,800 houses. The option would have had a moderate adverse impact on townscape character and would also have potentially required works to one river.

#### **Option 9a**

6.2.3. The option was located at Salford Central Station with the approach running east-west across Middlewood Locks. The station was located within 10-15 minutes' walk of Manchester city centre, Salford Central Station and Metrolink. The option would have required a moderate number of residential demolitions (all from one block of flats); and two community demolitions. The option would have been in conflict with two extant planning consents. It would have displaced approximately 750 jobs but would have had the potential to support approximately 17,200 jobs and 3,500 houses supported. This option would have had a major adverse impact on townscape character (principally due to the 'double decker' station located above the existing Salford Central platforms). The option would have had no direct impact on historic or natural resources.

## **7. Manchester interchange stations**

7.1.1. See Figure 7.1.

### **7.2. EWC2 airport east – west**

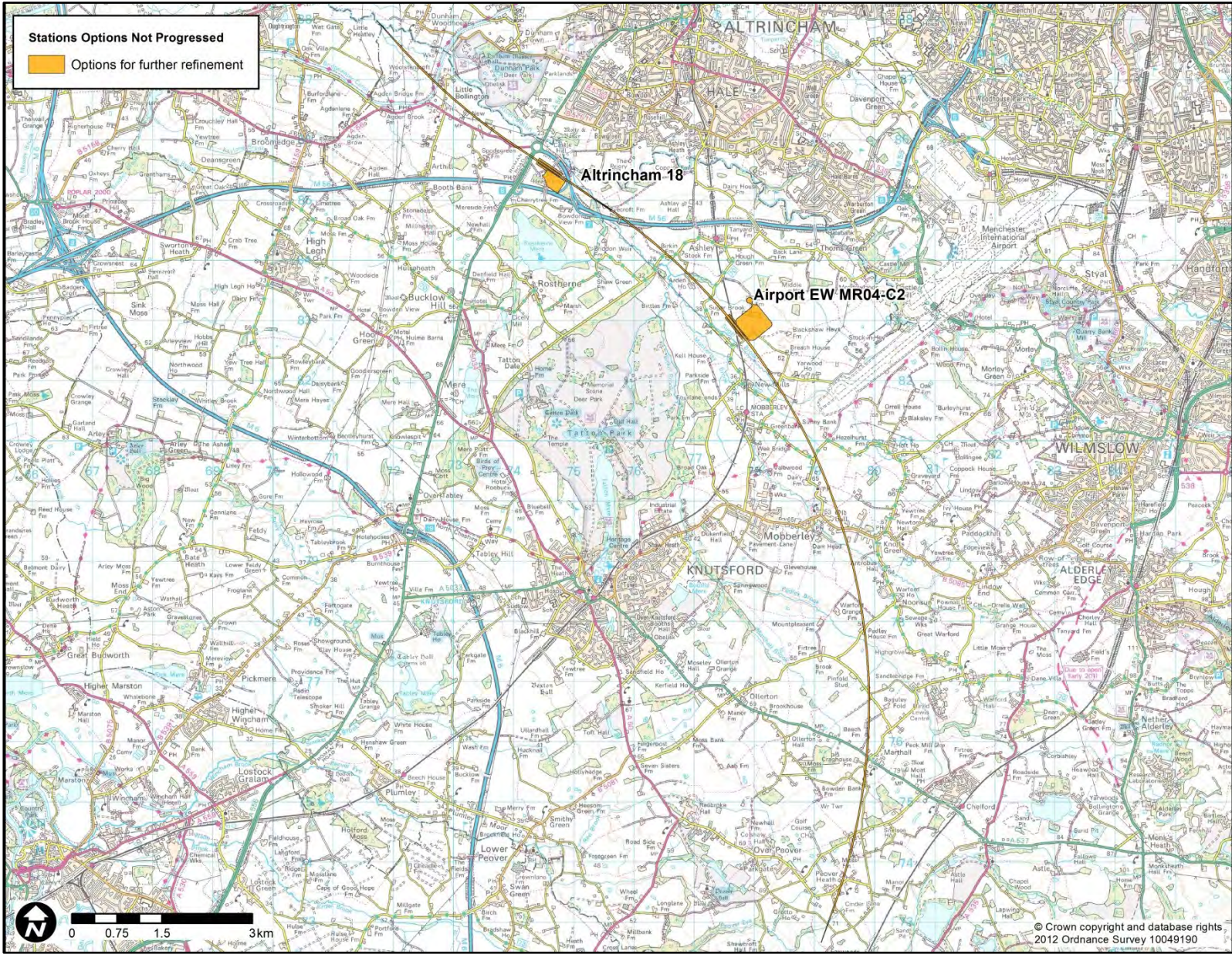
7.2.1. The option was located on green belt around 7km west of Manchester Airport. There would have been a small number of residential demolitions and the demolition of one Grade II listed structure. There would have been no jobs displaced; and no jobs or houses supported. The option would have had a major adverse impact on the townscape and may have required works to two minor rivers.

### **7.3. Altrincham**

7.3.1. The option was located on green belt around 7km west of Manchester Airport. There would have been a small number of residential demolitions. There would have been no jobs displaced and no jobs or houses supported. The option would have had a major adverse impact on the townscape but would have had no direct impact on historic or natural resources.



Figure 7.1 - Manchester interchange stations parked during selection of options for further refinement





## 8. Leeds routes and stations (terminus and intermediates) - long listing

- 8.1.1. A high level sustainability appraisal was carried out on all options at the Long Listing Stage. This looked at whether high priority sustainability features were directly affected across all options. This information was fed into the option selection process.
- 8.1.2. The options parked at this stage were as follows:

Leeds	No. options considered	No. options parked	Options Parked (reference)
Leeds line of route	217	32	Groupings parked: Leicester, Peak District, Nottingham, Doncaster, Midland Mainline
Leeds Stations	30	20	LST01b, LST03, LST04, LST05, LST06, LST07, LST08, LST11, LST12, LST15b, LST16, LST13a, LST14, LST17, LST18, LST19, LST20, LST22, LST23, LST24
East Midlands Stations	34	23	EMI02, EMI03, EMI06, EMI07, EMI08, EMI09, EMI10, EMI11, EMI12, EMI14, EMI15, EMI16, EMI18, EMI20, EMI22, EMI24, EMI25b, EMI26, EMI27, EMI28, EMI29, EMI30, EMI31
South Yorkshire Stations	30	21	SYI01, SYI05, SYI06, SYI09, SYI11 SYI12, SYI13, SYI15, SYI16, SYI19, SYI20, SYI21, SYI22, SYI23, SYI24, SYI25, SYI26, SYI27, SYI28, SYI29, SYI30

## **9. Leeds routes – short listing**

9.1.1. See Figure 9.1.

### **9.2. River Mease group**

9.2.1. The group comprised three routes running north-east between north of Tamworth and Ashby de la Zouch. Two routes would have had a direct impact on the River Mease SAC and SSSI. The most westerly route would have also had a direct impact on Alvecote Pools SSSI, north of Tamworth. The remaining two routes would have avoided direct impacts to the SSSI and SAC. The group would have had a direct impact on two Grade II listed structures.

### **9.3. West of Derby group**

9.3.1. The group comprised a small number of routes (which would have bypassed Derby) running from Burton upon Trent to south of Belper. The group would have intersected the Derwent Valley Mills World Heritage Site for 2km. It would have also crossed the River Dove, the River Derwent and the Trent & Mersey Canal and had an impact on the setting of two scheduled monuments (Mackworth medieval settlement and Monks Bridge), Kedleston Hall Grade I Registered Park and Garden and a number of listed structures.

### **9.4. Elvaston Castle group**

9.4.1. The group comprised a single route running through the Nottingham and Derby gap, between south-east Derby and Ilkeston. The group would have required some residential demolitions, in West Hallam and Borrowash. The group would have had a direct impact on one Grade I registered park and garden (Elvaston Castle); and one scheduled monument (Heavy Anti-Aircraft Gunsite 340m South East of Gardens Farm). Opportunities for mitigation to avoid the RPG would have been limited as it spanned approximately 1km either side of the route.

### **9.5. Through Nottingham group**

9.5.1. The group comprised a number of routes connecting Kegworth with east Sheffield. The routes ran north-east from Kegworth, passing east of Nottingham before running north to east Sheffield. The eastern route option (between Burton Joyce and Rainworth) would have required some residential demolitions at Carlton, Burton Joyce and Lowdham. The group would have crossed two SSSIs (Sherwood Forest Golf Course and Hills, and Holes & Sookholme Brook) and would have had a direct impact on three scheduled monuments (a Romano-British settlement at Glebe Farm, Ash Tree Cave, and Palaeolithic and prehistoric sites at Cresswell Gorge), and one Grade II\* listed structure (Church of the Holy Rood, West Bridgford).

### **9.6. West of Chesterfield group**

9.6.1. The group comprised a single route connecting Ripley with Sheffield, running west of Chesterfield. The group would have had a direct impact on one scheduled monument (Smelt Mill in Linacre Wood) and one Grade II listed structure (The Crown Inn, Heeley). A significant number of properties would have experienced noise impacts, mainly on the approach into Sheffield.



## **9.7. Doncaster group**

- 9.7.1. The group comprised routes running between the eastern outskirts of Sheffield and Leeds. The routes passed west of Doncaster and provided a connection onto the ECML at Ulleskelf. The group would have required a number of residential demolitions, mainly in Rothwell, Mickletown and Castleford. It would have had a direct impact on two SSSIs (Cadeby Quarry and Sprotbrough Gorge), two scheduled monuments (a Romano-British enclosure in Pot Ridings wood and Steeton Hall) and two Grade II listed structures.

## **9.8. West of Barnsley (M1) group**

- 9.8.1. The group comprised routes along the most westerly corridor, running between the northern outskirts of Sheffield and west of Leeds, joining the Trans Pennine approach into Leeds city centre. All options included large sections of tunnel to avoid residential areas west of Barnsley and Wakefield, and on the southern approach into Leeds. The group would have had a direct impact on two Grade II registered parks and gardens (Bretton Hall and Wortley Hall); one scheduled monument (Middleton Park Shaft Mounds); and five Grade II listed structures.

## **9.9. West of Leeds group**

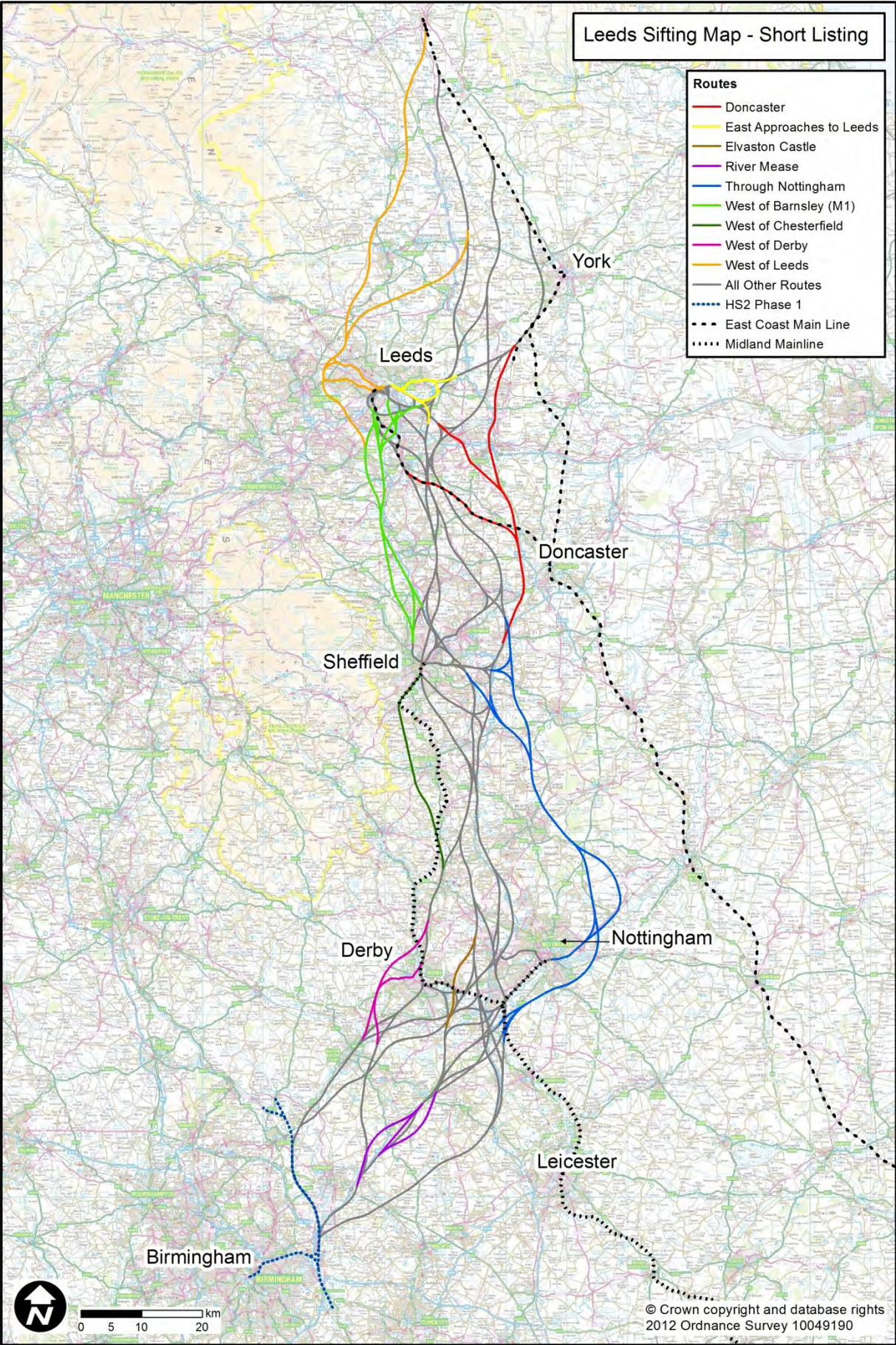
- 9.9.1. The group comprised routes to the west of Leeds running north to Northallerton, and north-east to east of Knaresborough, before joining the ECML connection group. The group also included spurs into Leeds following the existing Pudsey or Wharfedale lines. The group would have required a major number of residential demolitions and a significant number of properties would have experienced noise impacts, particularly on the western side of Leeds. The group would have had a direct impact on a large number of Grade II listed structures, predominantly on the western side of Leeds, and would have crossed a SSSI twice (Leeds-Liverpool Canal).

## **9.10. East approaches to Leeds group**

- 9.10.1. The group comprised two spur options into an east facing Leeds city station. The group would have had a direct impact on one Grade II registered park and garden (Temple Newsam) and an indirect impact on several listed structures in Leeds (Grade I, II\* and II).



Figure 9.1 - Leeds route options parked at short listing





## 10. Leeds stations – short listing

10.1.1. See Figure 10.1.

### 10.2. Western approach

10.2.1. The group comprised options LDS1d, LDS11a and LDS11b. Option 1d was located at the existing Leeds Station; Option 11a and Option 11b were located to the south of Leeds city centre, in Holbeck. Option 1d was located within walking distance of Leeds Station and city centre and would have had the potential to support a high number of future jobs and houses. Options 11a and 11b were located some distance to the south of the centre, with poor transport links. All of the options would have required low or zero residential demolitions, although LST1d, which was located on the footprint of the current Leeds station, would have required the demolition of a number of surrounding key commercial buildings. Option 11b would have had a direct impact on a Grade I listed structure and would have directly affected a conservation area (Option 11a would have affected the setting of the Grade I listed structure); Option 1d would have required the demolition of three Grade II listed structures and also directly affected three conservation areas. Options 11a and 11b would have been in conflict with two, and Option 1d one, extant planning consents. All options would have had a high potential to support future jobs and houses. All options would have had an impact on Flood Zone 3.

### 10.3. Southern approach

10.3.1. The group comprised only option LDS15a. It was located to the south of Leeds city centre, east of Crown Point Retail Park. The option was located within 10-15 minutes' walk of Leeds city centre and Leeds Station. It would have required no residential demolitions; but would have required the demolition of one Grade II listed structure. The option would have had the potential to conflict with the South Bank Planning Statement. It would have had a high potential to support future jobs and houses. It would have had an impact on Flood Zone 3.

### 10.4. South eastern approach

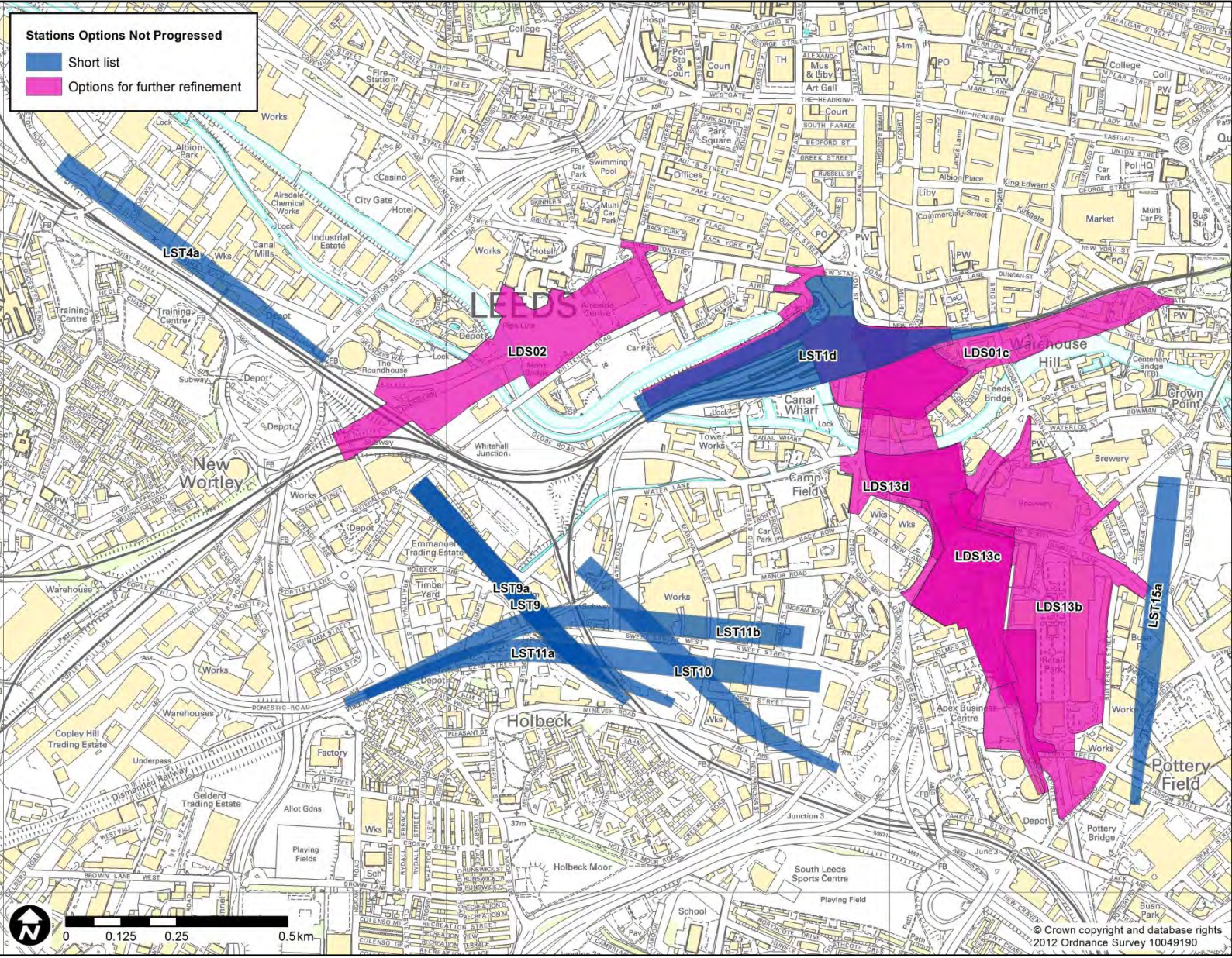
10.4.1. The group comprised options LDS4a, LDS9, LDS9a and LDS10. The group was located in two distinct areas; Option 4a was located to the west of Leeds Station, north of the A58; and Options 9, 9a and 10 were located further south in Holbeck. All options were located more than 10-15 minutes' walk from the city centre, although Option 4a was not within this walking distance of Leeds Station. None of the options would have required residential demolitions; with the exception of Option 4a which would have required demolition of one dwelling and one Grade II listed structure. Options 9 and 10 would have been in conflict with three, and Option 9a two, extant planning consents. All options would have had high potential to support future jobs and houses. Options 9, 9a and 10 would have had an impact on conservation areas and Flood Zone 3.

### 10.5. Eastern approach

10.5.1. The group comprised only option LDS21. It was located to the east of the city centre at Quarry Hill. It was not within 10-15 minutes' walk from the city centre or train station. It would have had a high potential to accommodate future jobs and houses. The option would have required one residential demolition, and would also have demolished Quarry House (the Headquarters for the Department Work and Pensions and Department of Health). It would have had no direct impact on heritage or natural resources.



Figure 10.1 - Leeds stations parked at short listing and selection of options for further refinement





## 11. East Midlands stations – short listing

11.1.1. See Figure 11.1

### 11.2. Derby group

11.2.1. The group comprised options EMI04 and EMI05. The group was located near Derby Station. Option 4 was located on existing railway sidings to the north-east of the station and Option 5 was located to the south-east at Wilmorton, on the north side of the existing railway. Only Option 4 was located within 10-15 minutes' walk of Derby Station and none of the options were located within 10-15 minutes' walk of the City Centre. None of the options would have required residential or community demolitions. All options would have had high potential to support future jobs and houses. Option 5 would have had an impact on Flood Zone 3.

### 11.3. Derby-Nottingham gap

11.3.1. The group comprised options EMI12a, EMI12b, EMI13 and EMI23. The options were located on a north-south axis in the gap between Derby and Nottingham. None of the options were located within 10-15 minutes' walk of Derby or Nottingham city centres, railway stations or tram stops. Options 12a and 12b were located at Draycott. Option 13 was located west of Breaston and Option 23 was located at Nuthall. Option 23 would have required a low number of residential demolitions; and two community demolitions. All options would have been located within green belt and would have had low potential to support future jobs or houses. None of the options would have had a direct impact on historic resources; and Option 12b would have had an impact on Flood Zone 3.

### 11.4. Parkway/M1 group

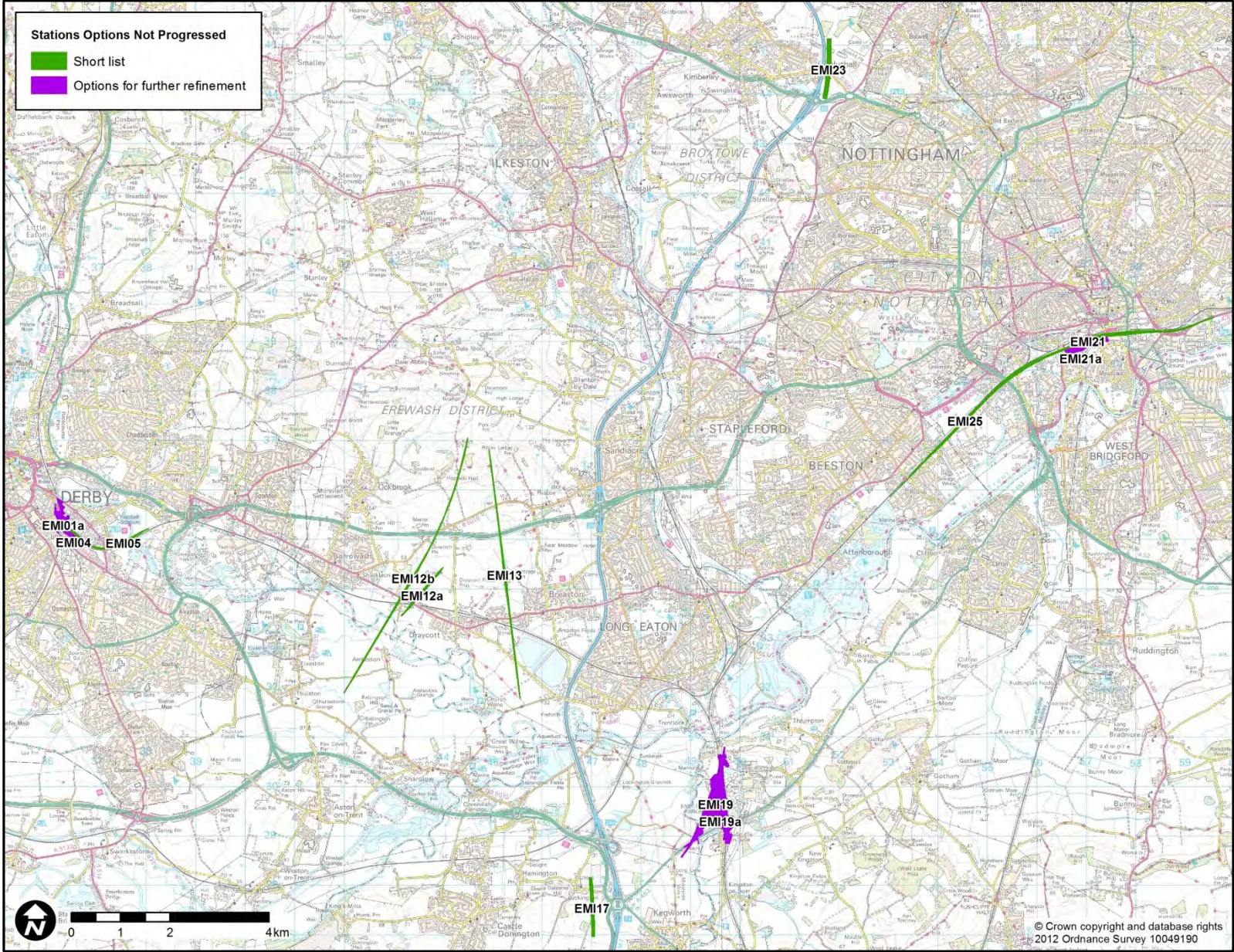
11.4.1. The group comprised only option EMI17. It was located between Lockington Village and the M1 (Junction 24). The option was not within 10-15 minutes' walk of either Nottingham or Derby city centres, railway stations or tram stops. It would have required no residential or community demolitions and would have had medium potential to support future jobs and houses. It would have had a direct impact on a conservation area and Flood Zone 3.

### 11.5. Nottingham group

11.5.1. The group comprised options EMI21 and EMI25. Option 21 was located at Nottingham station; it was within 10-15 minutes' walk of Nottingham city centre, tram services and railway station. It would have required two residential and two community demolitions (Nottingham station and Castle College). Option 25 was located north of the existing railway and Boots Campus; it was not within 10-15 minutes' walk of Nottingham city centre, tram services or railway station. It would not have required any residential or community demolitions (but would have required some retail warehouses). Both options would have had a high potential to support future jobs and houses. Option 21 would have had a direct impact on Nottingham station (Grade II\* listed structure and conservation area). Both options would have had an impact on Flood Zone 3.



Figure 11.1 – East Midland station options parked during short listing and selection of options for further refinement





## 12. South Yorkshire stations – short listing

12.1.1. See Figure 12.1.

### 12.2. Sheffield Midland group

12.2.1. The group comprised options SYI02, SYI03a and SYI03b. The group was located within the vicinity of Sheffield Midland Station. Option 02 was located to the south of the station at Lowfield, on the east side of the existing tracks. Option 03 would have been located at Sheffield Midland Station with the throat running south. There were two variants of Option 03 (3a and 3b). However, as they had the similar footprints they would have had very similar impacts and are therefore addressed together here. Both options were located within walking distance of Sheffield city centre, train station and Supertram stops. Option 02 would have had no residential demolitions and Option 03 one. However, both options would have demolished the council salt depot and Option 03 would have demolished the superstores to the south of Sheffield Station. Option 03 would have high potential and Option 02 low potential to support future jobs and houses. Option 03 would have required substantial works to the existing Sheffield Midland Station (Grade II listed). Both options would have had an impact on Food Zone 3.

### 12.3. Great Central group

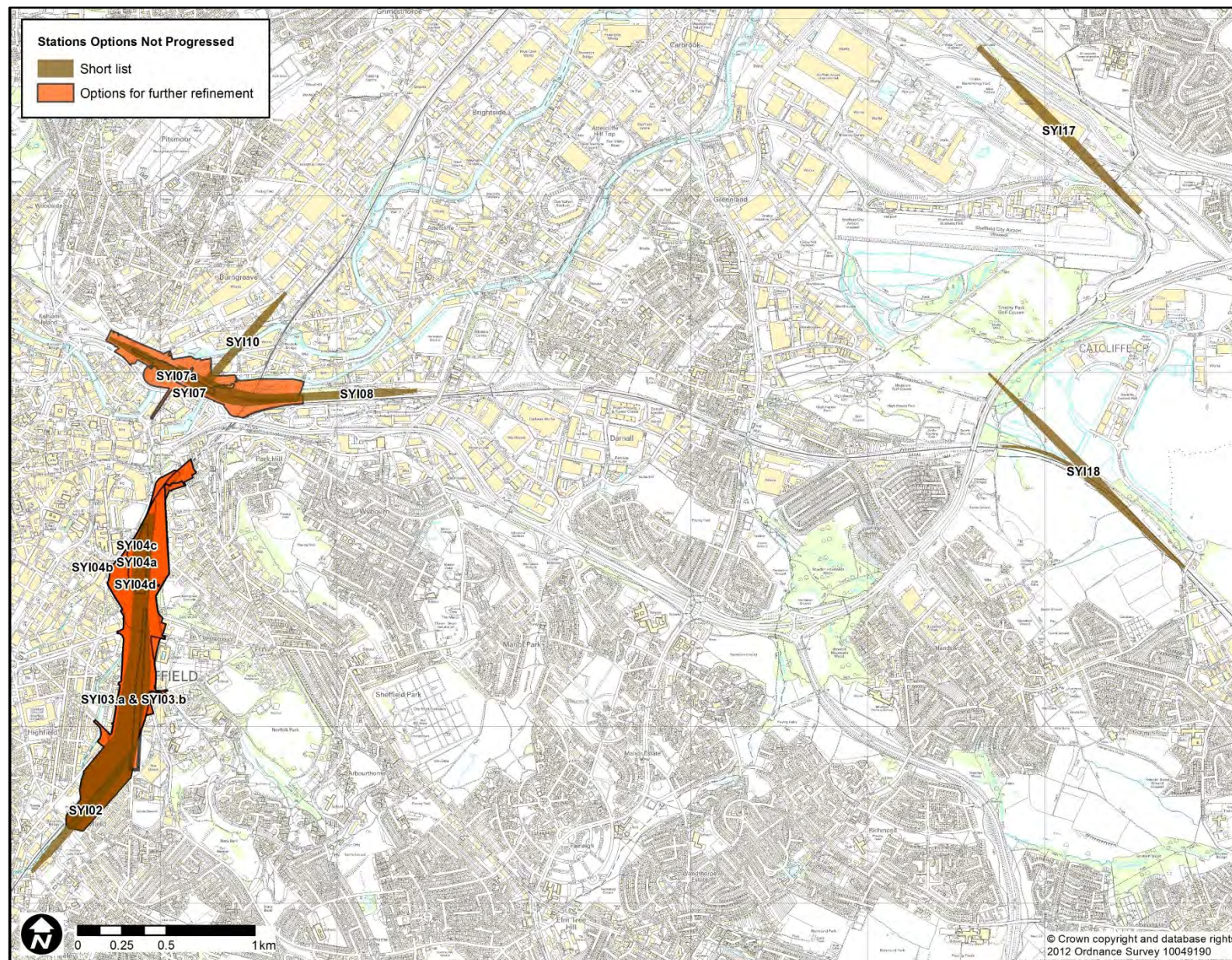
12.3.1. The group comprised options SYI07, SYI08 and SYI10. The group was located to the north of Sheffield Midland Station. Options 07 and 08 were located on an east-west axis; with Option 07 running parallel to the A61 and Option 08 further east, north of the A57. Option 10 was located to the north of the A61 but on a north-south axis. All options were within 10-15 minutes' walk from a Supertram stop but not from Sheffield city centre or train station. Options 08 and 10 would have had no residential demolitions; Option 07 would have had one residential demolition and would have been in conflict with one extant planning consent. Options 08 and 10 would have had low potential to support future jobs and houses; Option 07 would have had moderate potential. Option 07 would have required works to the Grade II\* Wicker Arch and the demolition of one Grade II listed structure; and Option 08 would have required the demolition of two Grade II listed structures. All options would have had an impact on Flood Zone 3.

### 12.4. Meadowhall group

12.4.1. The group comprised options SYI17 and SYI18. The group was located to the south-east of Meadowhall. Option 17 was located to the east of the disused Sheffield City Airport running parallel to the M1, and then under the A630 to the south. Option 18 was located to the south of the airport and the A630. Both options were located within 10-15 minutes' walk from Sheffield City Centre, train station or Supertram. Both options would have had no residential demolitions but would have taken some green belt, and Option 17 would have been in conflict with two extant planning consents. Both options would have had low potential to support future jobs and houses. Neither option would have had a direct impact on historic or natural resources.



**Figure 12.1 – South Yorkshire station options parked during short listing and selection of options for further refinement**





## 13. Leeds routes – selection of options for further refinement

13.1.1. See Figure 13.1.

### 13.2. Lichfield connection group

13.2.1. The group comprised three routes connecting Water Orton with south Derby, via Burton upon Trent and Swadlincote. The two most westerly options would have required some residential demolitions and noise impacts at Burton upon Trent. They would also have had a direct impact on three scheduled monuments. Mitigation would have been difficult due to the size of the scheduled monument designation and the proximity of the A38 and Burton upon Trent. The group would have crossed and potentially required works to the River Trent, Trent and Mersey Canal, and River Dove. The two routes which diverged to the north-east would have had a direct impact on two further scheduled monuments (Bretby Castle Fortified Manor and settlement sites north east of Sittles Farm), Bretby Hall Grade II Registered Park and Garden, and would have crossed the River Mease SAC/SSSI at Croxall.

### 13.3. East of Coalville group

13.3.1. The group formed the most easterly route corridor between Water Orton and Nottingham. The routes diverged east of Coalville where they veered north, following the M1 to south-east of Nottingham. The group would have had a direct impact on two Grade II registered parks and gardens (Garendon and Whatton House) and four scheduled monuments. Opportunities for mitigation would have been limited due to the proximity of existing transport corridors. The group would have crossed the Ashby Canal SSSI, and would have crossed, and may have required works to, the River Derwent and River Trent. The group may have also had an indirect impact on a large number of SSSIs.

### 13.4. Spurs into Derby and Nottingham

13.4.1. The two Derby spurs approached the city from the west, via Borrowash and Spondon. Both spurs would have had a direct impact on Elvaston Castle Grade II\* Registered Park and Garden, although the impact from the more northerly spur would have been more severe. Both spurs would have resulted in multiple crossings of the River Derwent, high noise impacts, and residential demolitions. However, the more southerly spur would have resulted in a significantly higher number of residential demolitions (as the route would not have followed an existing rail corridor).

13.4.2. The Nottingham spurs comprised:

- a sub group of two routes which converged at Beeston (to approach Nottingham from the south-west);
- a delta junction at Aston on Trent (also converging with the Beeston group to approach Nottingham from the south-west); and
- a spur from Trowell (approaching Nottingham from the west).

13.4.3. The Beeston sub group and the delta junction would have had a direct impact on two SSSIs (Lockington Marshes and Attenborough Gravel Pits) and required a major crossing of the River Trent. The Trowell spur would have crossed a conservation area at Attenborough and have required a significant number of residential demolitions. The spur would also have had a direct impact on one scheduled monument (Iron Age settlement and cursus).

### 13.5. East of Bolsover

- 13.5.1. The group comprised one route running from south-west of Kirkby in Ashfield to Killamarsh via Bolsover, passing on the eastern side of Hardwick Hall. The group would have run through Annesley Woodhouse SSSI (on the western edge) and adjacent to Bogs Farm Quarry SSSI. It would have been difficult to avoid the SSSIs due to the proximity of the M1 and the town of Selston. The group would have also required residential demolitions at Killamarsh.

### 13.6. Nottingham Derby gap group

- 13.6.1. The group comprised three routes running through the Nottingham Derby Gap between Ashby de la Zouch and Heanor/Eastwood. The group would have had a direct impact on Elvaston Castle Grade II\* Registered Park and Garden, which would have been difficult to avoid (given the proximity of Ambaston and other villages). There would also have been an impact on Shipley Country Park, surrounding ancient woodland and conservation area; and a direct impact on Carnfield Hall Conservation Area and ancient woodland. Opportunities for mitigation at Shipley and Carnfield would have been limited due to the proximity of the motorway and neighbouring towns. The group would have also crossed the River Derwent and the River Trent.

### 13.7. North of Nottingham group

- 13.7.1. The group comprised one route running north of Toton and Nottingham, connecting Stapelford with south-west of Kirkby. The group would have had a direct impact on one scheduled monument (Beauvale Carthusian Priory), surrounding ancient woodland, a BAP habitat, and one SSSI (Bogs Farm Quarry). The group would have also required several crossings of the River Erewash (between Stapelford and Eastwood). Residential properties would have experienced noise impacts at Eastwood, Kimberley, Ilkeston and Awsworth.

### 13.8. Serving Sheffield

- 13.8.1. The group comprised routes into Sheffield, serving Sheffield Midland and Sheffield Victoria stations. The group approached Sheffield from west of Bolsover in the south, departing Sheffield and running north towards the east of Barnsley, largely in tunnel.
- 13.8.2. The group would have had landscape and visual impacts and would have affected the setting of a scheduled monument and several listed structures at Sutton Scarsdale; and had a direct impact on a conservation area. The group would have also had a direct impact on large areas of ancient woodland, and multiple BAP habitats. The more easterly route (via Eckington) would have had a more severe impact, directly crossing Moss Valley SSSI and with a direct impact on number of listed structures. The routes through Sheffield Midland station would have required residential demolitions on the northern approach to the station.
- 13.8.3. The Sheffield Victoria station loop would have required residential demolitions at Darnall, and would have had a direct impact on a SSSI at Neepsend Railway Cutting.

### 13.9. East of Rotherham group

- 13.9.1. The group comprised long routes extending from west of Bolsover in the south, closely following the M18 to Bramley, where the route split east and west of Mexborough and continued north to Normanton. The group also comprised a delta junction into Sheffield at Aughton. Both routes east and west of Mexborough would have had an indirect impact on a scheduled monument and several listed structures at Sutton Scarsdale; and a direct impact on a conservation area. Residential properties would

have experienced noise impacts at Bramley (where the route would have been in cutting) and in Swinton and Mexborough. Potentially high noise impacts would have remained after mitigation. In addition, the route west of Mexborough would have had potential hydrological impacts at Winterset Reservoir.

### **13.10. Wakefield tunnel group**

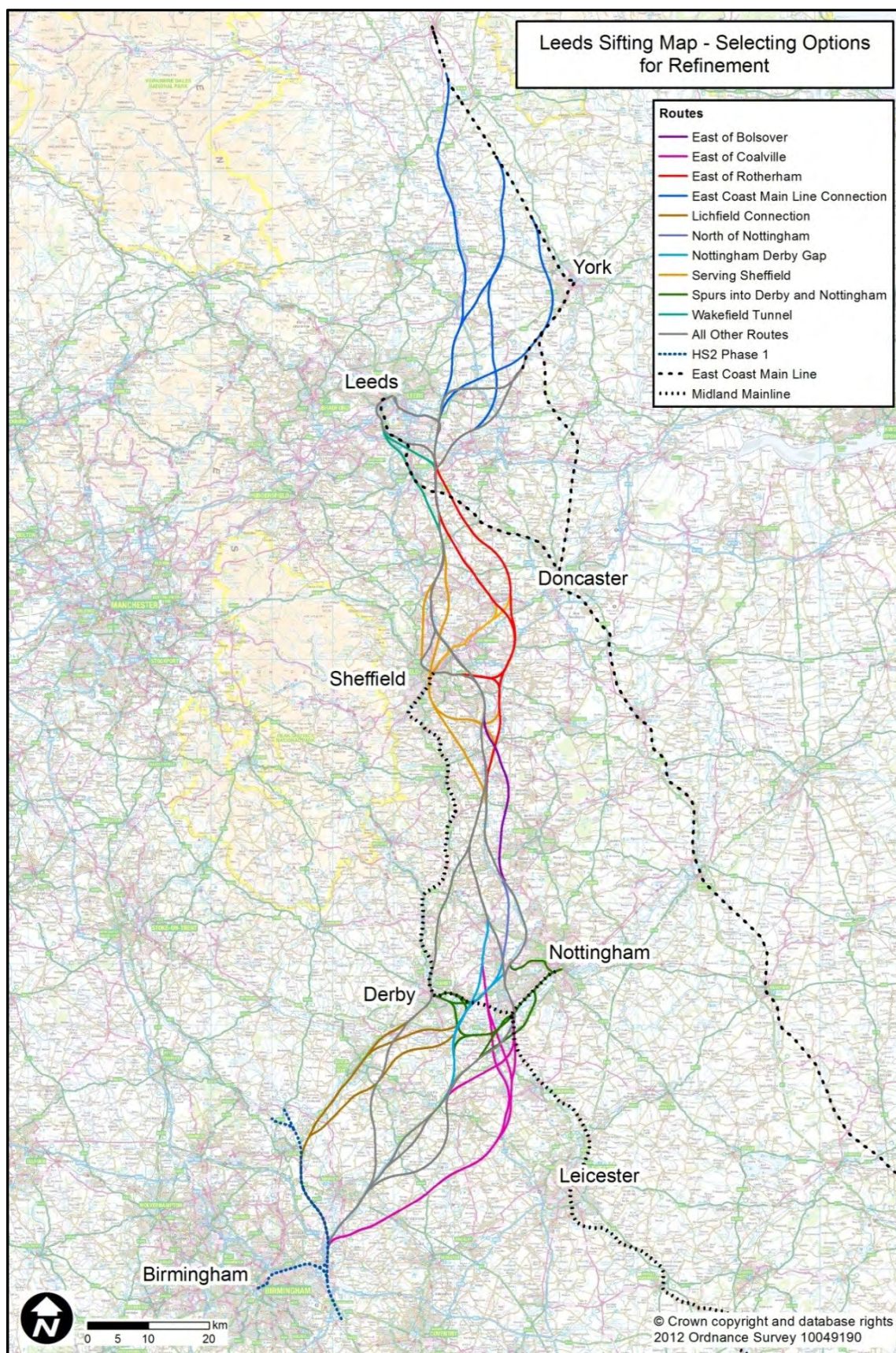
- 13.10.1. The group comprised two routes approaching Leeds from the south-west, both predominantly in tunnel. The northern route was mainly on embankment and viaduct around Stanley. This would have required residential demolitions at Stanley Ferry; crossing and possible diversion of the River Calder; and would have had landscape and visual impacts. The southern route would have had an impact on a number of Grade II listed structures; and would have affected the setting of Grade I and a Grade II\* listed structures.

### **13.11. ECML connection group**

- 13.11.1. The group comprised four route options north of Leeds, each connecting into the ECML at different points to the west and north-west of York. The group would have had landscape and visual impacts on Woodlesford and Swillington; and users of the Trans Pennine Trail and Aire and Calder Navigation Canal. In addition, the group would have had an impact on a Grade I registered park and garden (Bramham Park) and surrounding ancient woodland; and on the settings of a number of battlefields (including Boroughbridge, Marston Moor and Towton). It may also have required the diversion of the River Nidd, had an impact on areas of high tranquillity (Bolton Percy and outside of Linton-on-Ouse and Tholthorpe) and on several scheduled monuments including a Roman Fort at Boroughbridge, Aberford Dyke, and a cluster of Roman structures west of Newton Kyme.



**Figure 13.1 - Leeds route parked during selection of options for further refinement**





## **14. Leeds stations - selection of options for further refinement**

14.1.1. See Figure 10.1.

### **14.2. Western approach**

14.2.1. The group comprised only option LDS02. It was located to the north-west of Leeds Station, parallel to Whitehall Road. The option was located on vacant land to the east of northern street, with the throat running west over the River Aire on a disused railway corridor. It was located within a 10-15 minutes' walk from the city centre and Leeds Station. There would have been no residential demolitions; and one community demolition. The option would have been in conflict with two extant planning consents and the development of Wellington Place. No jobs would have been displaced and it would have had the potential to support approximately 5,200 jobs and 1,700 houses. The option would have had a direct impact on one Grade II listed railway viaduct and would have had an impact on Flood Zone 3.

### **14.3. Eastern approach**

14.3.1. The group comprised only option LDS01c. It was located on an east-west axis to the immediate south of the Leeds Station, with the throat running east parallel to existing tracks. It was located on land which has a substantial number of residential and commercial uses which lie to the south of the existing railway, requiring a high number of residential and one community demolition; and the demolition of two Grade II listed structures. It was within 10-15 minutes' walk of Leeds city centre and train station. It would have displaced approximately 5,000 jobs but would have had the potential to support approximately 8,000 jobs and 2,200 houses. Option 1c would have had a major adverse impact on the townscape and would have directly affected two conservation areas. The option would have had an impact on Flood Zone 3.

### **14.4. Southern approach**

14.4.1. The group comprised options LDS13b, LDS13c and LDS13d. They were located south of the River Aire and city centre. They were all located on a north-south axis with Option 13b sited on Crown Point Retail Park and 13c located to the immediate west. Option 13d was located on the same alignment as 13c but further north traversing the River Aire and terminating at Leeds Station.

14.4.2. All options were within 10-15 minutes' walk of the city centre and train station; however Option 13d would have provided the best connectivity, terminating at the mainline train station.

14.4.3. None of the options would have required residential or community demolitions, however Option 13b would have required the demolition of all shopping units at Crown Point Retail Park; Options 13c would have required demolition of some units; and Options 13c and 13d would have required the demolition of Asda Headquarters. Option 13b would have displaced approximately 7,500 jobs but would have had the potential to support approximately 5,000 jobs and 1,500 houses; Option 13c would have displaced approximately 3,000 jobs but would have had the potential to support approximately 9,500 jobs and 1,800 houses; and Option 13d would have displaced approximately 3,500 jobs but would have had the potential to support 9,000 jobs and 2,200 houses.

- 14.4.4. All options would have been in conflict with the South Bank Planning Statement and Option 13d would also have been in conflict with the Sovereign Street Planning Statement and one extant planning consent.
- 14.4.5. Option 13b would have had no impact on the townscape, Option 13c would have had a moderate impact and Option 13d would have had a major adverse impact (principally due to the high level river crossing). Options 13b and 13d would have had a direct impact on a conservation area; and Option 13d may have required works to a major river. All options would have had an impact on Flood Zone 3.

## **15. East Midlands stations - selection of options for further refinement**

15.1.1. See Figure 11.1.

### **15.2. Derby**

15.2.1. The group comprised only option EMI01a (spur). It was located on the east side of the existing station with the throat running to the south. It was located within 10-15 minutes' walk of Derby Station but not the town centre. It would have required no residential demolitions; but two community demolitions. The option would have displaced approximately 750 jobs but would have potentially supported approximately 4,700 jobs and 500 houses. It would have had moderate impact on the townscape (including the setting of four Grade II\* buildings) and would have impacted one conservation area. There would have been an impact on Flood Zone 3.

### **15.3. East Midlands Parkway**

15.3.1. The group comprised options EMI19 and EMI19a (both through). The options were located at Ratcliffe-on-Soar adjacent to the existing Parkway Station. Both options were located alongside the existing station with Option 19 cutting across existing fields. Both options were located within 10-15 minutes' walk of Parkway Station. Both options would have required minor residential demolitions and Option 19a would have demolished one community building. They would have been located on green belt with little potential to support jobs and houses as a result. Option 19 would have had a moderate impact on the townscape (due the diagonal and elevated alignment), and Option 19a would have had a minor impact. Both options would have had a direct impact on a scheduled ancient monument, whilst Option 19 may have also required works to a major river and would have had an impact on a BAP habitat. Both options would have had an impact on Flood Zone 3.

### **15.4. Nottingham**

15.4.1. The group comprised only option EMI21a (spur). It was located to the east of Nottingham Station. It was within 10-15 minutes' walk of Nottingham city centre, Nottingham Express Transit and Nottingham Station. The option would have required no residential or community demolitions but would have been in conflict with three extant planning consents. It would have displaced approximately 3,250 jobs but would have had the potential to support approximately 5,750 jobs and 650 houses. The option would have had a moderate impact on the townscape and would have directly impacted one conservation area. This option may have required works to one major and one minor river; and would have had an impact on Flood Zone 3.

## 16. South Yorkshire stations – selection of options for further refinement

16.1.1. See Figure 12.1.

### 16.2. Sheffield Midland group

16.2.1. The group comprised options SYI04a, SYI04b, SYI04c and SYI04d. The group was located at Sheffield Midland Station. Option 4a was on a spur from the north, Options 4b and 4c were loop options with 4b on the west side and 4c on the east side. Option 4d was on a through line on the west side. All options had their concourse to the west as per the existing station. All options were within 10-15 minutes' walk of the city centre, train station and supertram.

16.2.2. Options 4a and 4c would have required the demolition of a moderate number of residential properties located in two groups; flats to the south-east of the existing station and a group of houses to the north. Options 4b and 4d would have had a lower number of residential demolitions only affecting the flats to the south-east of the station. All options would have required the demolition of four community buildings. Options 4a and 4c would have displaced approximately 2,500 jobs and potentially supported approximately 8,000 jobs and 600 houses. Options 4b and 4d would have displaced approximately 3,000 jobs but would have potentially supported approximately 7,500 jobs and 600 houses. All options would have been in conflict with one extant planning consent. All options would have had a major adverse impact on townscape and required major works to the Grade II listed station. They may also have required works to one major and three minor rivers; and would have had an impact on Flood Zone 3.

### 16.3. Great Central group

16.3.1. The group comprised only option SYI07a (spur). It was located on the site of the former Victoria Station with the throat to the east. It was located within 10-15 minutes' walk from the city centre and Supertram; but not Sheffield Midland Station. The option would have required no residential demolitions; one community demolition; and would have demolished two Grade II listed structures. It would have been in conflict with one extant planning consent. It would have displaced approximately 3,000 jobs and potentially supported approximately 6,500 jobs and 650 houses. The option would have had a major adverse impact on townscape (including the setting of the Grade II\* listed Wicker Arch). It would have had an impact on Flood Zone 3.



## 17. Depots

### 17.1. Long listing

17.1.1. A high level sustainability appraisal was carried out on all options at the Long Listing Stage. This looked at whether high priority sustainability features were directly affected across all options. Options for both Infrastructure Maintenance Depots (IMDs) and Rolling Stock Maintenance Depots (RSDs) were identified. This information was fed into the option selection process.

17.1.2. The options parked at this stage were as follows:

Leeds	No. options considered	No. options parked	Options Parked (reference)
IMD and RSD	48	39	1a,1b,2a,2b,3a,3b,4a,4b,5a,5b,6a,6b, ,6e,7a,7b,7c,8a,8b,8c,9c,9d, ,10a10c,11,13a,13b,14b,14c,15,16a,16c,16d,17a,17b,18a, 18b,18c,19, s20
<b>Manchester</b>			
IMD	15	13	2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.
RSD	24	18	2, 3, 5, 6, 7, 8b, 8c, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21.

### 17.2. Options for further refinement

17.2.1. There was no short listing stage for depots. See Figures 17.1 Manchester and 17.2 Leeds.

#### Manchester south A RSD

17.2.2. The option comprised a single ended depot located north of Mobberley, between the M56 and the M6 through route. It would have required two residential demolitions. The site would have been in close proximity to Rostherne Mere (Ramsar, SSSI & NNR) with potential disturbance to birds. It would have also had an impact on the setting, and wider views of the Grade II\* registered park and garden at Tatton Park; and a landscape and visual impact on Ashley.

#### Manchester south B RSD

17.2.3. The option comprised a double ended depot located north of Mobberley, between the Manchester Airport tunnel approach and the M6 through route. It would have required four residential demolitions. It would have had an impact on the setting of a Grade II\* registered park and garden at Tatton Park, with a direct impact on Mobberley Conservation Area, and a landscape impact on the surrounding countryside.

#### Leeds Cudworth RSD

17.2.4. The option comprised a single ended depot located approximately 32km south of Leeds and 6km north east of the centre of Barnsley. It would have required two residential demolitions and may have required the diversion of the River Dearne (major river).

### **Leeds Methley RSD**

- 17.2.5. The option comprised a single ended depot located south of the village of Oulton, adjacent to the M62. It would have required 40 residential demolitions with clusters at Scholey Hill (10 dwellings), Pinder Green (11 dwellings) and Methley Junction (9 dwellings). The associated viaduct would have had a major impact on the Calder Valley landscape.

### **Leeds Awsworth IMD**

- 17.2.6. The option comprised a single ended depot located in the Erewash Valley; south of the village of Eastwood. It may have required several diversions of the River Erewash (a major river) and would have been located within Flood Zone 3. It would also have had an impact on a Grade II\* listed structure (the Bennerley Viaduct).

### **Leeds Staveley 1 IMD**

- 17.2.7. The option comprised a double ended depot located on former industrial land north of Staveley. It would have required 17 residential demolitions (mainly at Hartington). This option would have been supportive of local planning aspirations which designate the site for industrial and business use. However it would have been in conflict with an application at Hartington Quarry for the recovery of secondary aggregates, opencast coal and ancillary development at the eastern end of the site. The option would have required two diversions of the River Rother (a major river).

### **Leeds Tinsley IMD**

- 17.2.8. The option comprised a double ended depot located in cutting between Catcliffe and Sheffield City Airport. It was sited to the southern end of a former railway marshalling yard land (a brownfield site). It would have required 37 residential demolitions. The site would have been supportive of the local planning policy for employment growth in the Sheffield Core Strategy (Adopted 2009). It would also have supported the Sheffield Enterprise Zone.
- 17.2.9. This site was also considered, but rejected, as a potential location for a Combined Infrastructure Maintenance and Rolling Stock Depot.



Figure 17.1 Manchester depots parked during selection of options for further refinement

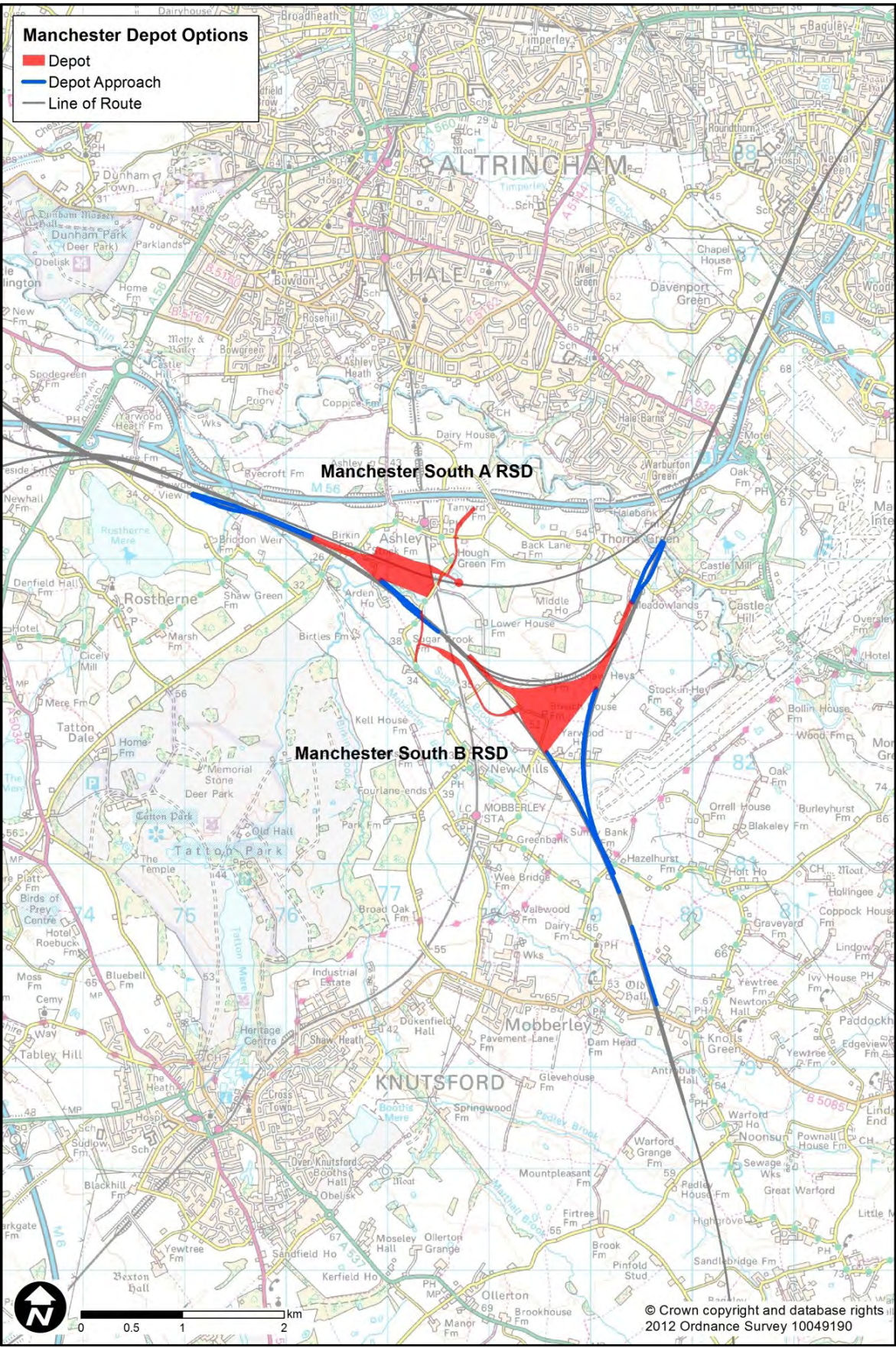
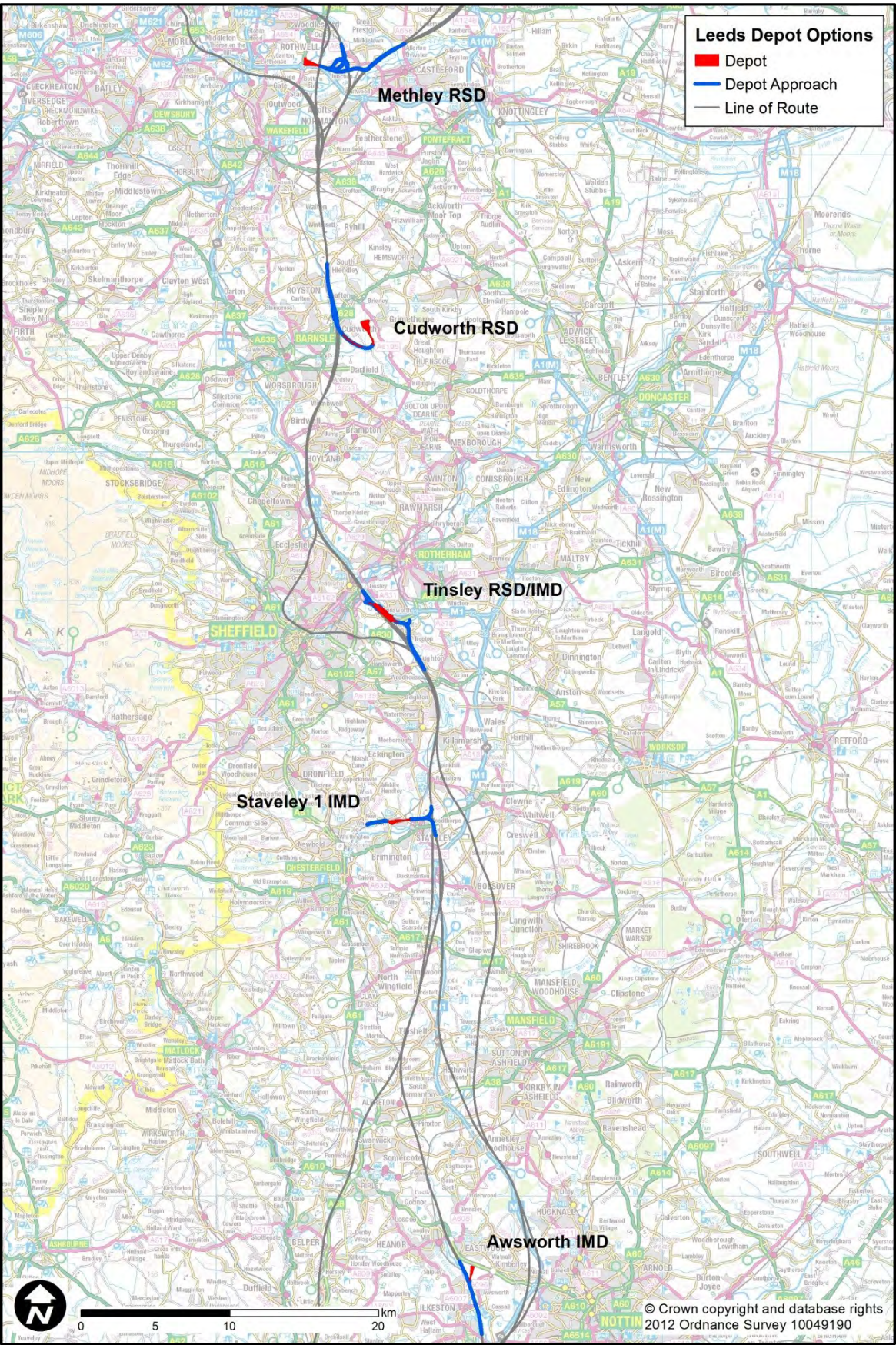




Figure 17.2 Leeds depots parked during selection of options for further refinement





## 18. Heathrow

### 18.1. Long listing

18.1.1. See Figure 18.1.

18.1.2. A full sustainability appraisal was carried out on all options at the Long Listing Stage. This looked at whether high priority sustainability features were directly affected across all options.

18.1.3. The options parked at this stage were:

Heathrow	No. options considered	No. options Parked	Options Parked (reference)
Stations	2	1	East West Station
Spurs	5	3	M25 West East West Station, M25 West North South Station, M25 East East West Station,
Loops	2	1	M25 West North South Station

### 18.2. Short listing

18.2.1. See Figure 18.2.

#### Twin track surface

18.2.2. This option was located at West Ruislip. It would have required nine residential demolitions and the shortening of the proposed tunnel for HS2 Phase1 at West Ruislip. A long viaduct over the Colne Valley would have caused landscape and visual impacts. The option would also have had a direct impact on Denham Lock Wood SSSI, and a scheduled monument at Brackenbury Farm.

#### Single track surface

18.2.3. This option was located at West Ruislip. It would have required eleven residential demolitions as the horizontal alignment of the single track would have differed from the twin track surface option outlined above. As with the twin track alignment this option would require the shortening of the proposed tunnel for HS2 Phase 1 and cause similar landscape and visual impacts on the Colne Valley and direct impacts on the Denham Lock Wood SSSI and Brackenbury Farm scheduled monument.

#### Single track tunnel

18.2.4. This option was located north of Ickenham. It would have used the proposed tunnel for the HS2 Phase 1 alignment at West Ruislip but would have also required two Colne Valley viaduct structures. There were no sustainability impacts identified, however, the twin viaducts were not appraised.

#### M25 east north south station

18.2.5. This option would have been located north of Ickenham. It would have required six residential demolitions and a diversion of the Colne Brook (a major river). The option would have intersected a Grade 1 source protection zone with four major abstractions, and would have potentially had an indirect impact on ten SSSIs through changes in hydrology.

### **M25 east loop north south station**

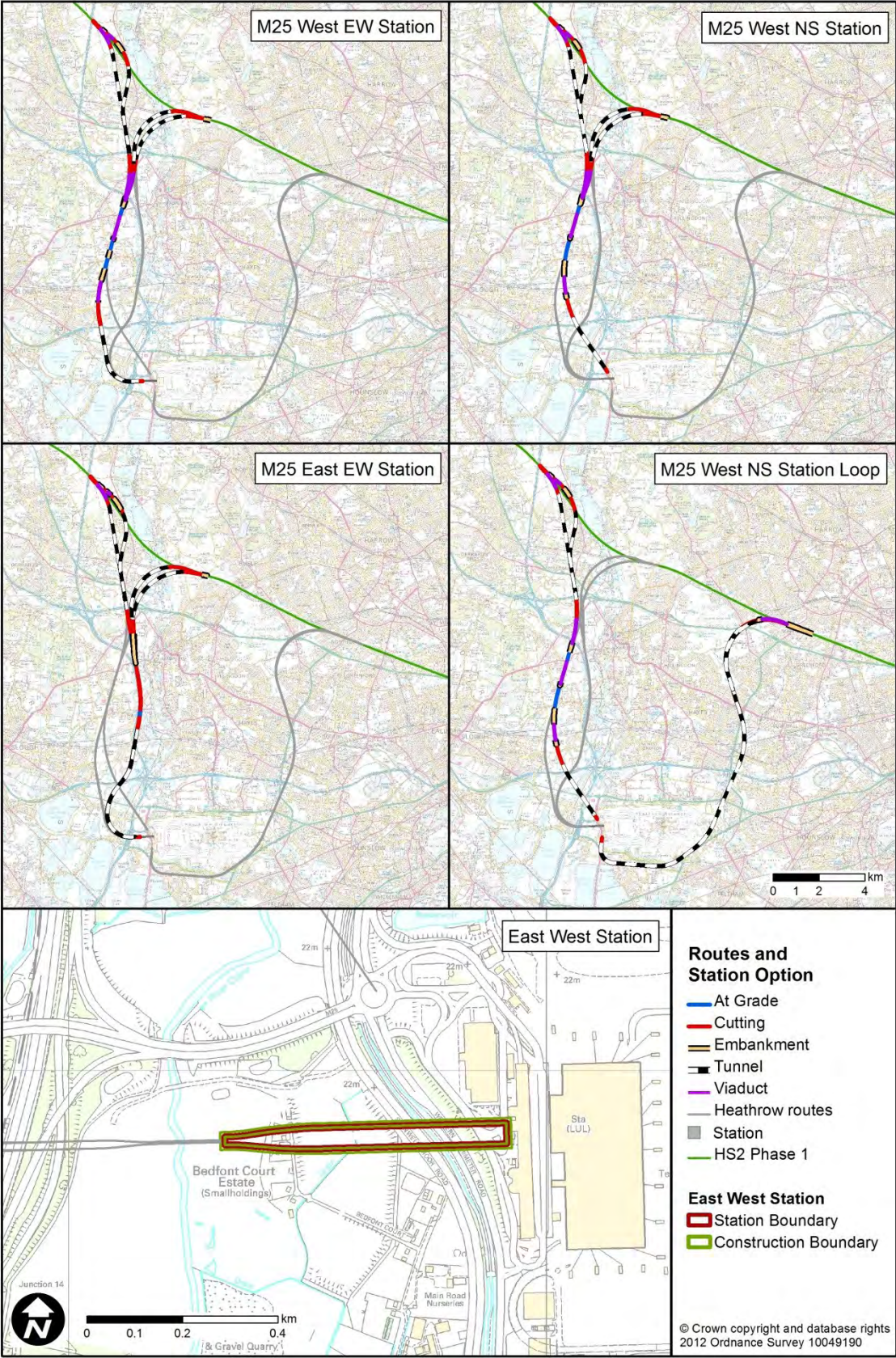
- 18.2.6. This option was located south of Terminal 5 Heathrow. It would have required 30 residential demolitions (with a group at Northolt); and the diversion of the Colne Brook (a major river). The route would have intersected a Grade 1 source protection zone with four major abstractions; and potentially have had an indirect impact on nine SSSIs through changes in hydrology. The option would have a direct impact on a Grade II listed Polish War Memorial at Northolt.

### **18.3. Selection of options for further refinement**

#### **Single track tunnel (single viaduct)**

- 18.3.1. This option was located north of Ickenham. It would have intersected a number of lakes which are components of the Mid Colne Valley SSSI, and have had a major impact on the landscape of the Colne Valley. It would also have an impact on recreational users of the Hillingdon Outdoor Activities Centre and the Grand Union Canal.

Figure 18.1 Heathrow routes and station option parked at long listing





**Figure 18.2 Heathrow routes parked at short listing and options for further refinement**

