

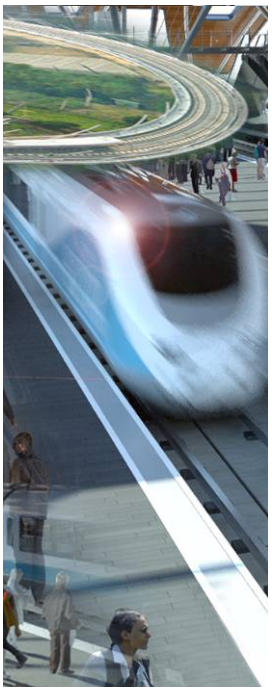

MSG
MOTT MACDONALD SCOTT WILSON GRIMSHAW

Engineering Options Report West Midlands to Manchester

March 2012

HS2 Limited

MSG, Mott MacDonald House, 8-10 Sydenham Road, Croydon CR0 2EE, United Kingdom
T +44(0) 20 8774 2000 F +44 (0) 20 8681 5706, www.railways.mottmac.com

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MSG, Mott MacDonald House, 8-10 Sydenham Road, Croydon CR0 2EE, United Kingdom
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Content

Chat Moss to Winton

The route would then run adjacent to the south side of the Liverpool to Manchester railway on Chat Moss, an area of peat, for 500m before rising onto embankment, crossing above it at a maximum height of 9m and then descending on the north side **(1)**. During construction the existing railway may require stabilisation and support. A range of engineering solutions would be available to support a route crossing Chat Moss ranging from piling to replacement of peat. Works to maintain the groundwater regime, including during the removal of peat, would be required during construction.

The route would continue at ground level and at the same level of the existing railway, running adjacent it and passing through the route of overhead power lines. To remain at similar levels to the existing railway, the route would then rise to cross over the M62 **(2)** (at a height of 8m) at Barton Moss, an area of peat. It would then run on an embankment with a height of 6m, passing through a historic landfill site, before crossing over the M60 **(3)** and Worsley Brook **(4)**.

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

A rolling stock maintenance depot option has been developed on the north side of this section of route to the west of the M62, and is described in Section 4.2.2.

3. Stations

This section describes the city centre (Sections 3.1), intermediate (Section 3.2) and interchange (Section 3.3) station options.

3.1 City Centre Stations

The city centre station options were developed in four distinct stages:

1. the long listing stage;
2. the short listing stage;
3. the selection of options for further development stage; and
4. the development and finalisation stage.

During each stage, a sifting process parked some of the options based on established criteria and selected others to be developed in more detail until the final stage. The sifting process and historic station options are described in section 8.1. The following options were selected to be developed and finalised:

- 1a – Manchester Piccadilly by Platform 1 – see section 3.1.1
- 9b – Salford Central Middlewood - see section 3.1.2
- 19 – Salford Combined Station – see section 3.1.3

The development of these final options focussed on accessibility, connectivity with local transport networks, permeability and constructability to ensure that the stations would be practicable and function effectively.

Figure 3.1 shows the location of the three options, and figures 3.2 to 3.4 show the individual stations.

At Manchester Piccadilly the HS2 station would be located to the immediate north of the existing station. The site benefits from good connections to major highways, existing Metrolink and bus services, which would aid good onward dispersal of passengers. The close proximity of the HS2 and existing rail stations presents a variety of options for how interchange could take place between the two rail services.

Salford Central Middlewood station would be located to the west of the existing Salford Central station. The site benefits from good connections to major highways but suffers from poor connections to existing Metrolink services and would require minor re-routing of existing bus services to serve the HS2 station efficiently. The existing station would be retained in its original configuration. The passenger transfer distance between Salford Central station and the HS2 station would be 530m. This transfer would take place at grade via a covered area under the existing cast iron viaduct to the south side of the station.

At Salford Combined Station the HS2 lines and platforms would be located at the existing Salford Central station. The existing railway lines would be spread apart to provide the necessary space for the HS2 station, increasing the width of the existing viaduct from 53m to 96m. The site benefits from good connections to major highways and local bus services, however Metrolink services do not currently extend as far as Salford. Passengers transferring between the HS2 and existing rail services would do so through the combined concourse at grade. Due to the integrated design of this option there would be considerable disruption to existing rail services during construction.

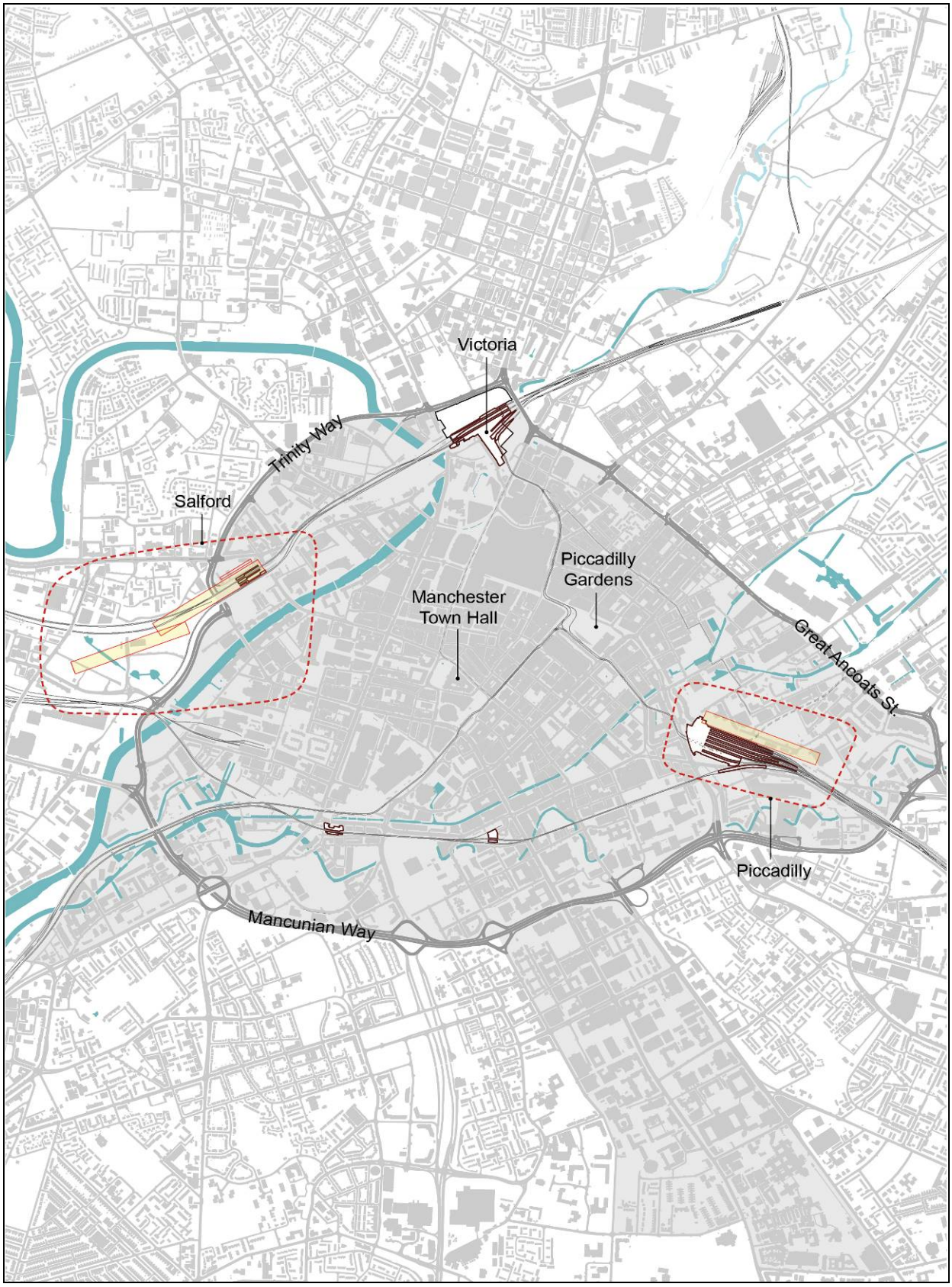


Figure 3.1: Finalised Options For City Centre Stations

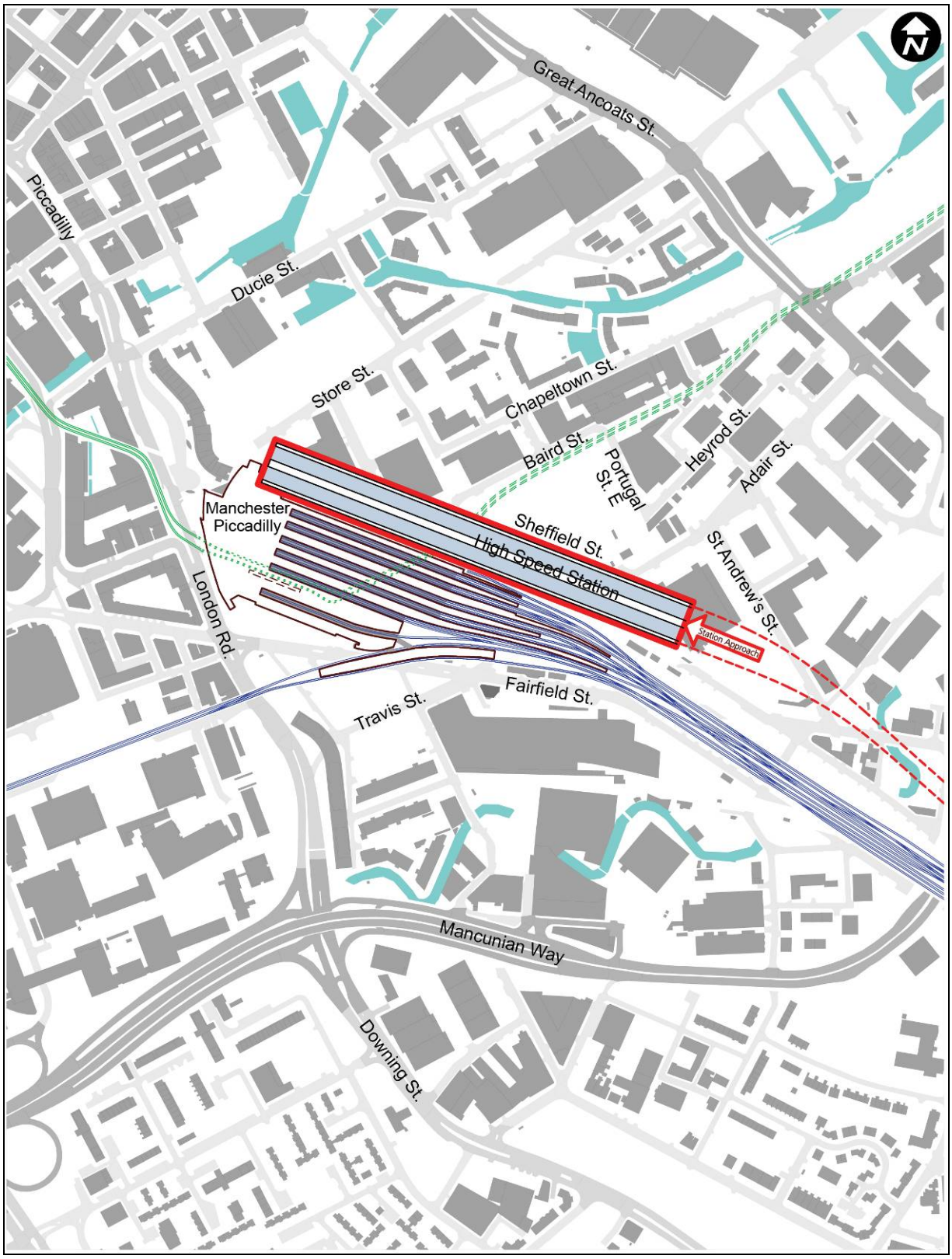


Figure 3.2: Option 1a Manchester Piccadilly By Platform 1

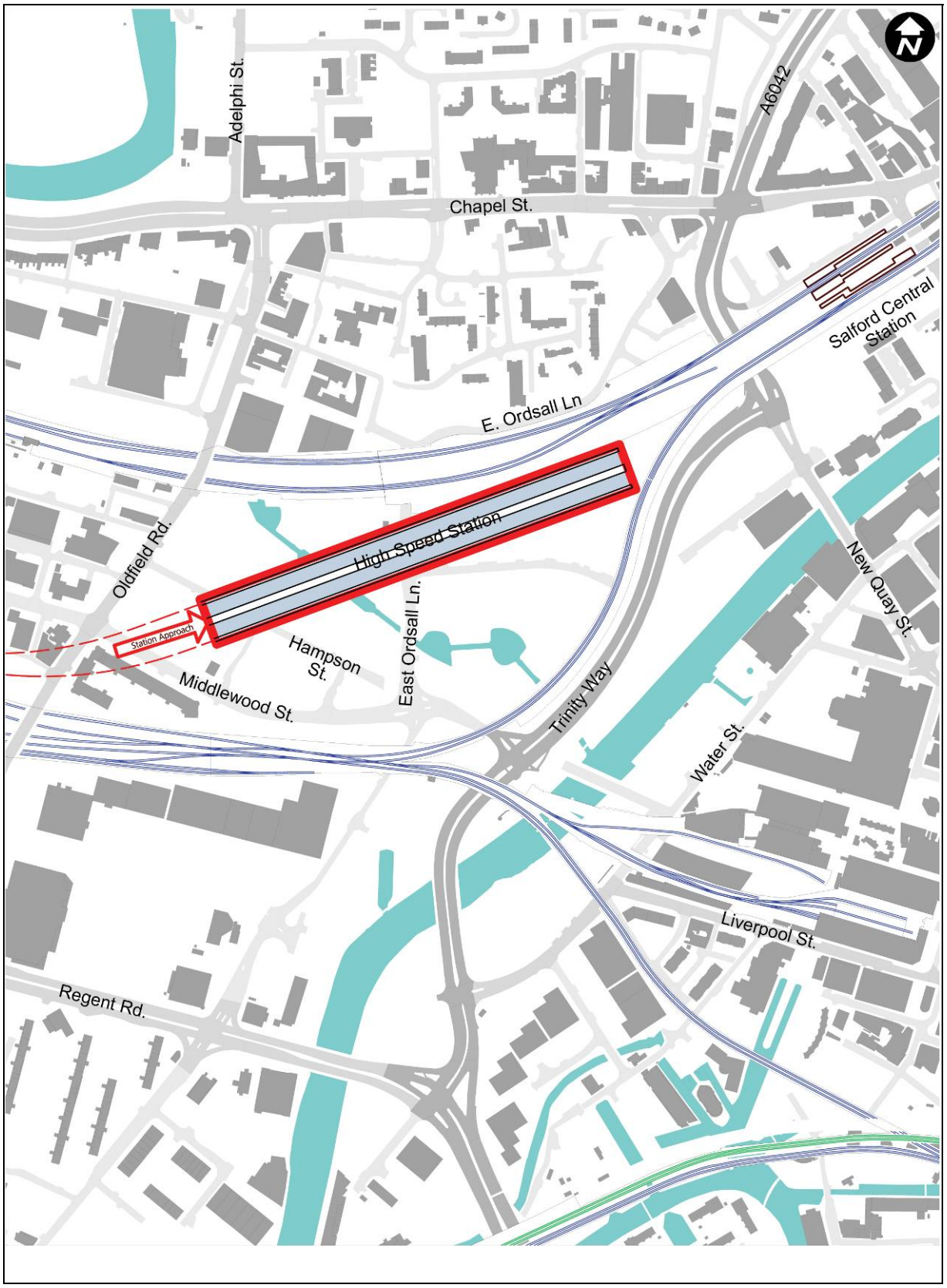


Figure 3.3: Option 9b Salford Central Middlewood

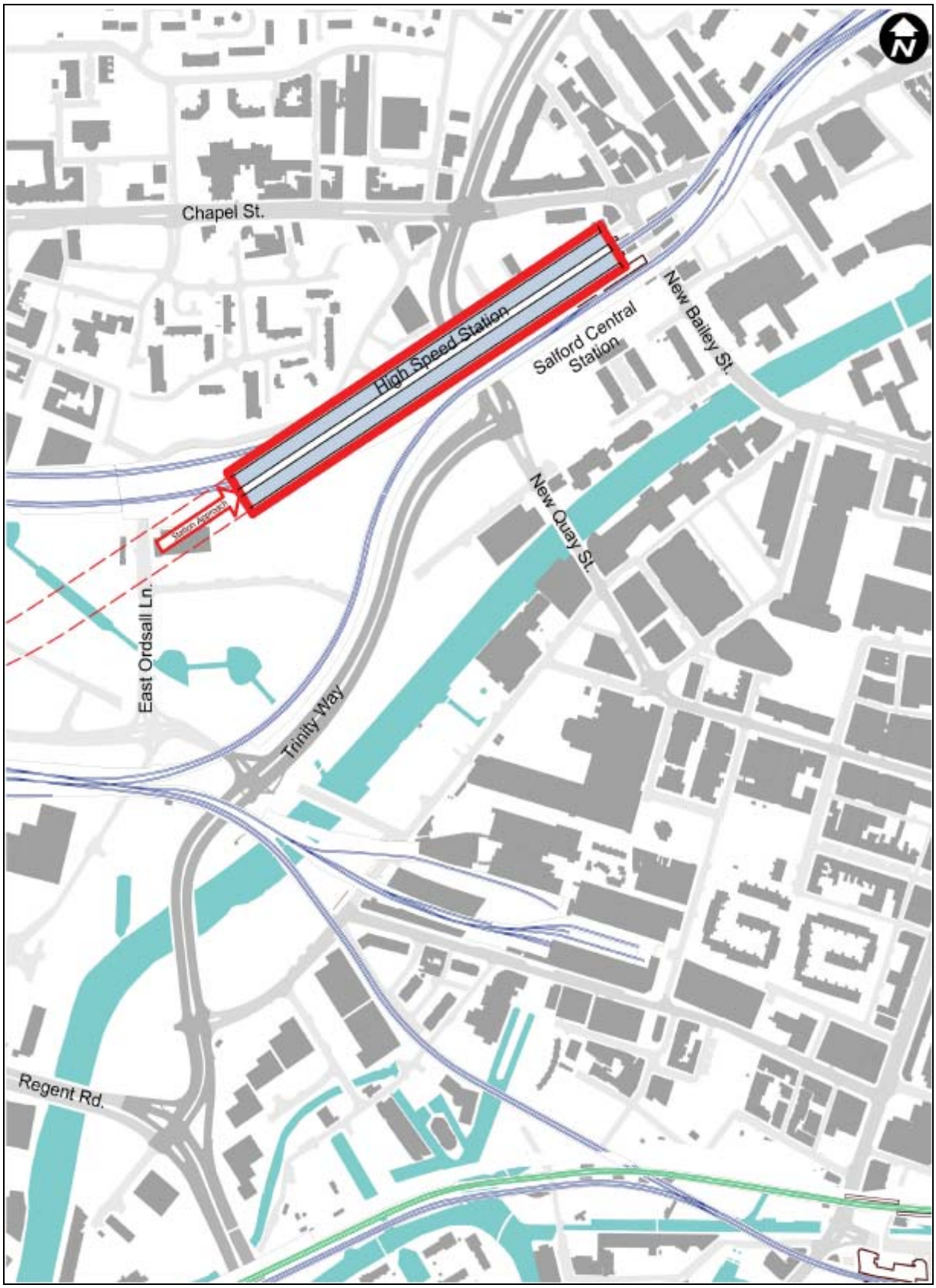


Figure 3.4: Option 19 Salford Combined Station

3.1.1 Manchester Piccadilly

Station Approach

The existing Piccadilly station in relation to the proposed station option is illustrated in Figure 3.6. The HS2 lines and platforms would be located to the immediate north of the existing station. Approaching from the east, the spur route from the south would be in a twin-bore tunnel and would emerge at a tunnel portal immediately north of A57 Hyde Road. The route would rise at a gradient of 2.5%, continuing in a retained cutting alongside the existing elevated railway lines. It would then cross underneath the Ardwick branch railway line, which would be carried on a new structure. A junction would be located adjacent to the branch line where the route would increase from two lines to four.

Beyond the crossing of the Ardwick branch railway, the lines would continue to rise. At A665 Chancellor Lane, the lines would not have achieved sufficient height to cross over the existing Chancellor Lane highway on a new bridge structure and ultimately either a lowering of Chancellor Lane/Devonshire Street North, construction of a new alignment for the A665 to the east or rerouting of traffic would be required. The lowering, of up to 6.5m would also require the closure of Temperance Street and North Western Street.

The lines would then rise to a level slightly above that of the existing adjacent railway tracks and would be at a sufficient height to cross over A635 Mancunian Way and B6469 Fairfield Street. The level of the lines would then fall slightly to achieve HS2 platform levels similar to the existing platform levels. See also Section 2.27, HSM26 for further route details.

Station Description - Existing Station

The existing site is illustrated in Figure 3.5 overleaf. The existing station is located directly south-east of Manchester city centre on a site bounded by London Road to the west, Fairfield Street to the south and Sheffield Street to the north. The train shed is a grade II listed structure; the station opened in 1842 as London Road station and has undergone major rebuilding and renovation works at several stages since then. The most recent major improvement programme was carried out in time for the 2002 Commonwealth Games.

Manchester Piccadilly station handles over 83,000 passengers and 1,000 train movements every day. The station is served by six train operating companies serving intercity routes to London Euston, Birmingham New Street, South Wales, the south coast of England, Edinburgh and Glasgow Central, as well as routes throughout northern England. The station consists of 14 rail platforms elevated to approximately 9m above the adjacent ground level. 12 of these platforms terminate within the main train shed. Two through platforms, platforms 13 and 14, are on a viaduct to the south of the station. The longest platforms are 360m which, together with the concourse, result in an overall station length of 435m.

Future expansion of the station as part of the proposed Northern Hub works would result in two new through platforms, 15 and 16 also to the south of the station, and a direct link to Victoria station via a new curve at Ordsall.

Piccadilly station serves as a terminus for Manchester Metrolink services to Bury, Altrincham, Eccles and MediaCityUK. These services are accessed via two platforms within the brick undercroft of the station. An East Manchester Metrolink extension is under construction which will create a through station with new services running north to south through Piccadilly to Droylsden in Tameside. This is planned for opening during the summer of 2012. A further extension to Ashton-under-Lyne is planned to open by winter 2013/14. Passenger parking is located to the north side of the station.

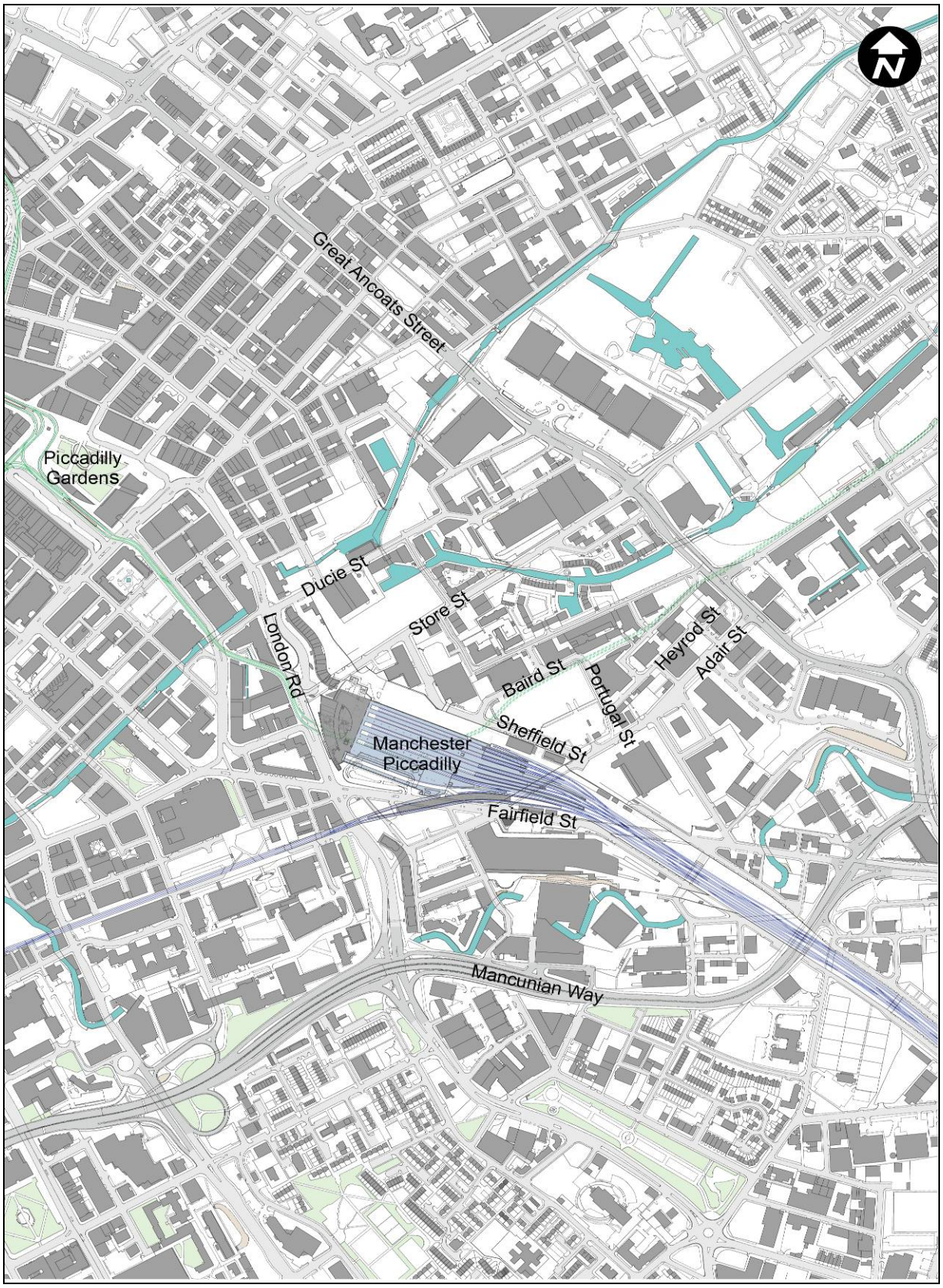


Figure 3.5: Option 1a - Existing Siteplan

Figure 3.6: Option 1a - Proposed Station Footprint

Station Description - Proposed Station (See Figures 3.7-3.15)

The brief for the HS2 station requires 4x440m long platforms **(1)**, servicing four arriving and four departing trains per hour carrying approximately 1100 passengers each. The overall length of the station is 442.7m, which accommodates a structural zone to the end of the platforms. The overall width of the platforms is 47.3m. Accommodating the new station requires the demolition of a number of buildings to the north of the existing station.

The proposed station consists of four elevated station platforms (two islands) parallel with, and alongside, platform 1 of Manchester Piccadilly station. The platforms would be elevated to the same level as the existing platforms at Piccadilly station. The four platforms would be a consistent 14m width in order to accommodate vertical access cores and the necessary clearance to the platform edge. Platforms would be straight along their whole length. Escalators and stairs to platforms would be located as central as possible, within the given site constraints, to aid efficient dispersal of passengers and encourage intuitive wayfinding by means of filtering passengers through one concourse area.

The station roof would cover the full length of the HS2 platforms and be approximately the same height as that of the existing train shed of Manchester Piccadilly Station.

Concourse (See Figure 3.7 & 3.10)

HS2 concourse facilities **(2)** would be located at ground level, beneath the elevated platforms and to the west side of the Metrolink. The route between concourse and platforms would be via stairs, escalators and lifts through the platforms.

Forecourt and Carpark (See Figure 3.7, 3.8 & 3.10)

A new combined station forecourt and car park **(3)** is proposed to the northern edge of the site. A new 2100 space multi-storey car park (MSCP) would serve both existing rail and HS2 passengers and accommodate spaces displaced through the demolition of existing car parks.

Servicing and Operations (See Figure 3.10)

Areas directly adjacent to the west side of the concourse have been identified as zones for servicing and operational support **(4)** to platforms and the concourse areas. Locating the servicing to the west end of the station would avoid conflict with passenger movements towards the concourse.

Site Specific Constraints

There are three primary constraints on the site which have dictated how the scheme could be developed for construction (See Figure 3.13):

The East Manchester Metrolink extension **(1)**.
The proposed Inacity Tower development **(2)**.
Gateway House **(3)**.

The Metrolink extension dictates the concourse location and prevents the concourse being centrally located with the platforms above. The proposed Inacity Tower development prevents the HS2 station from being located closer to the city. In its current configuration Gateway House is somewhat of a barrier to intuitive wayfinding towards the city centre. While the HS2 station proposal works within these three constraints further opportunity exists at detailed planning stages for improved integration of the HS2 station around these constraints.

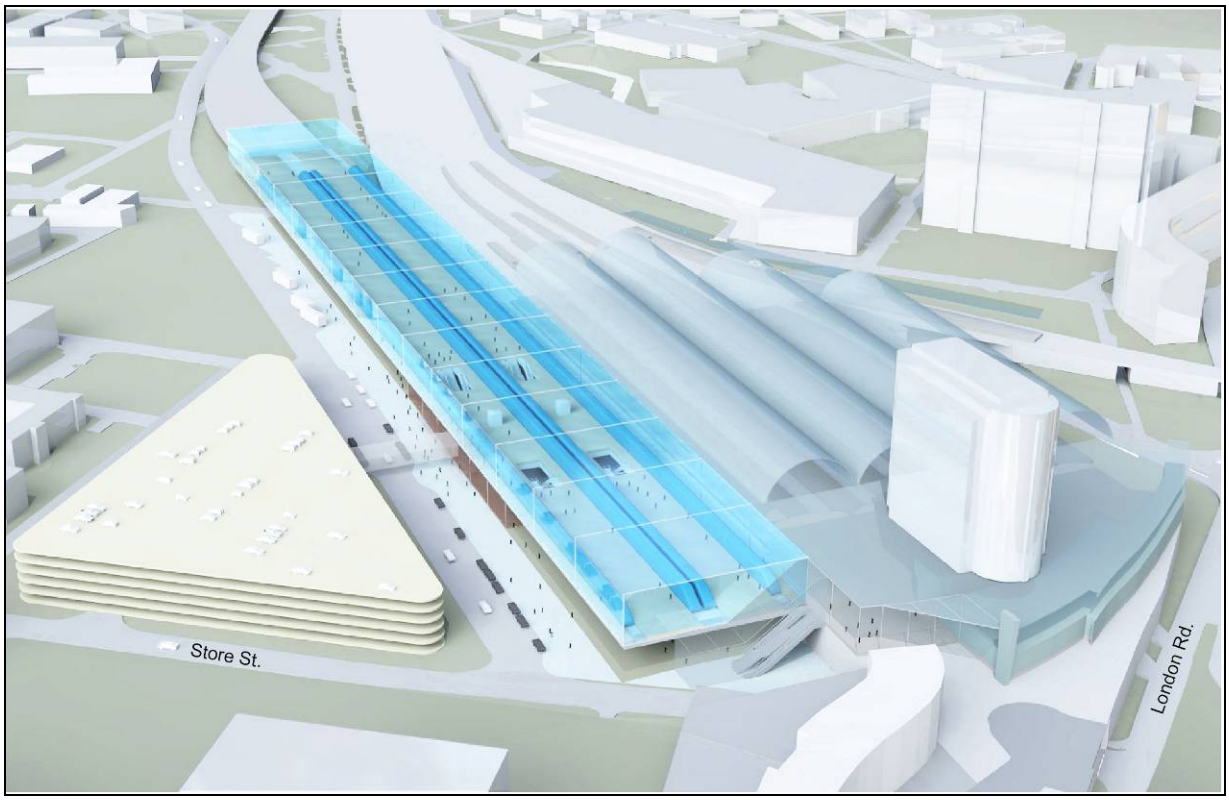


Figure 3.7: Option 1a – Visualisation Of Proposed Station Arrangement

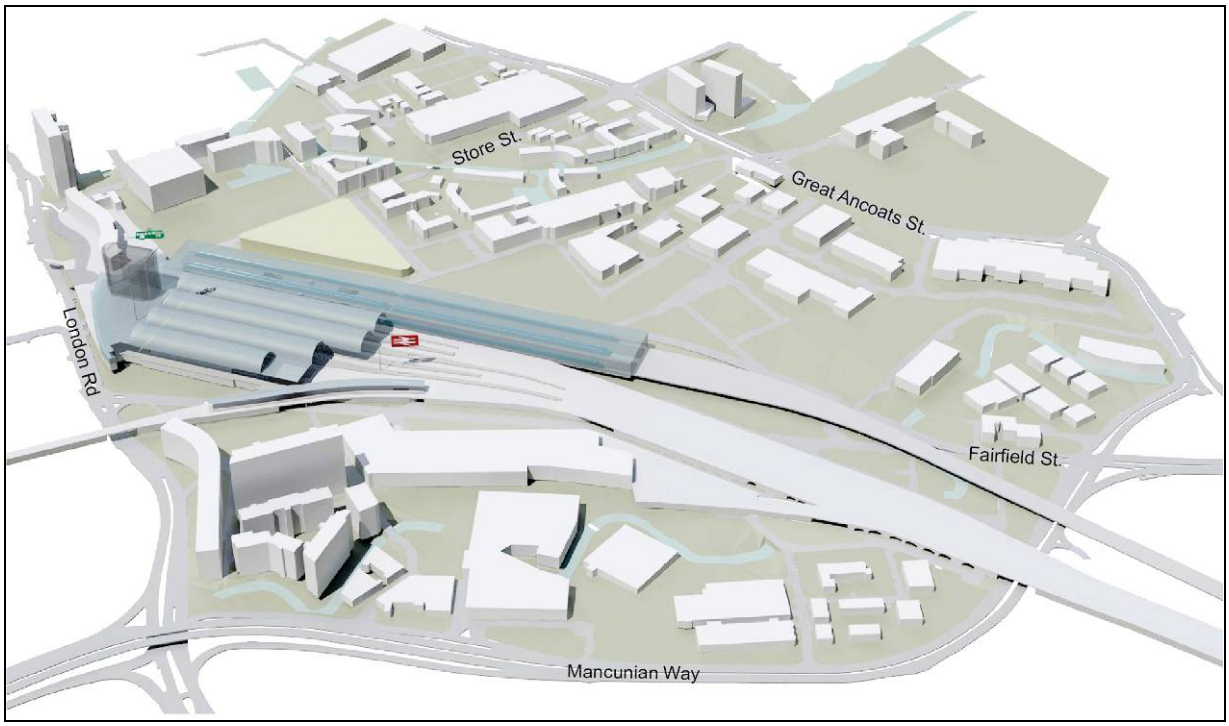


Figure 3.8: Option 1a – Birds Eye View Of Proposed Station Arrangement

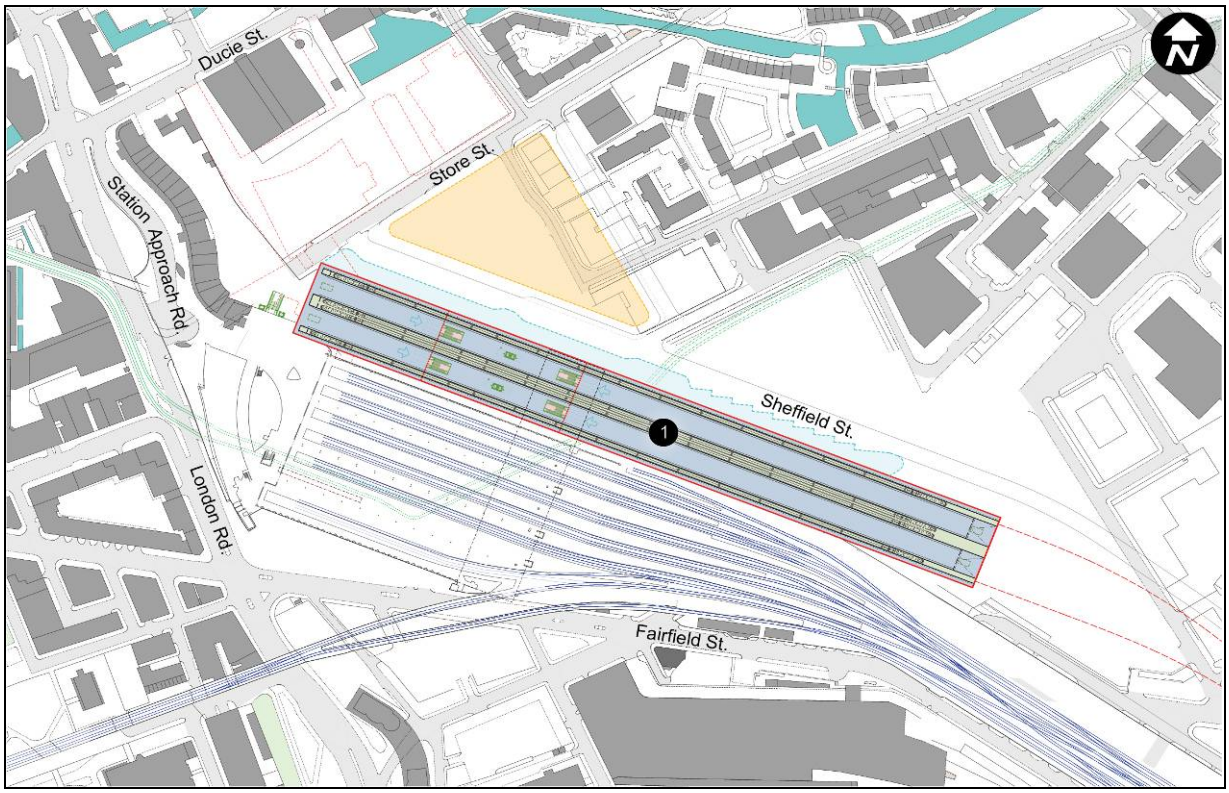


Figure 3.9: Option 1a – Proposed Platform Level Plan

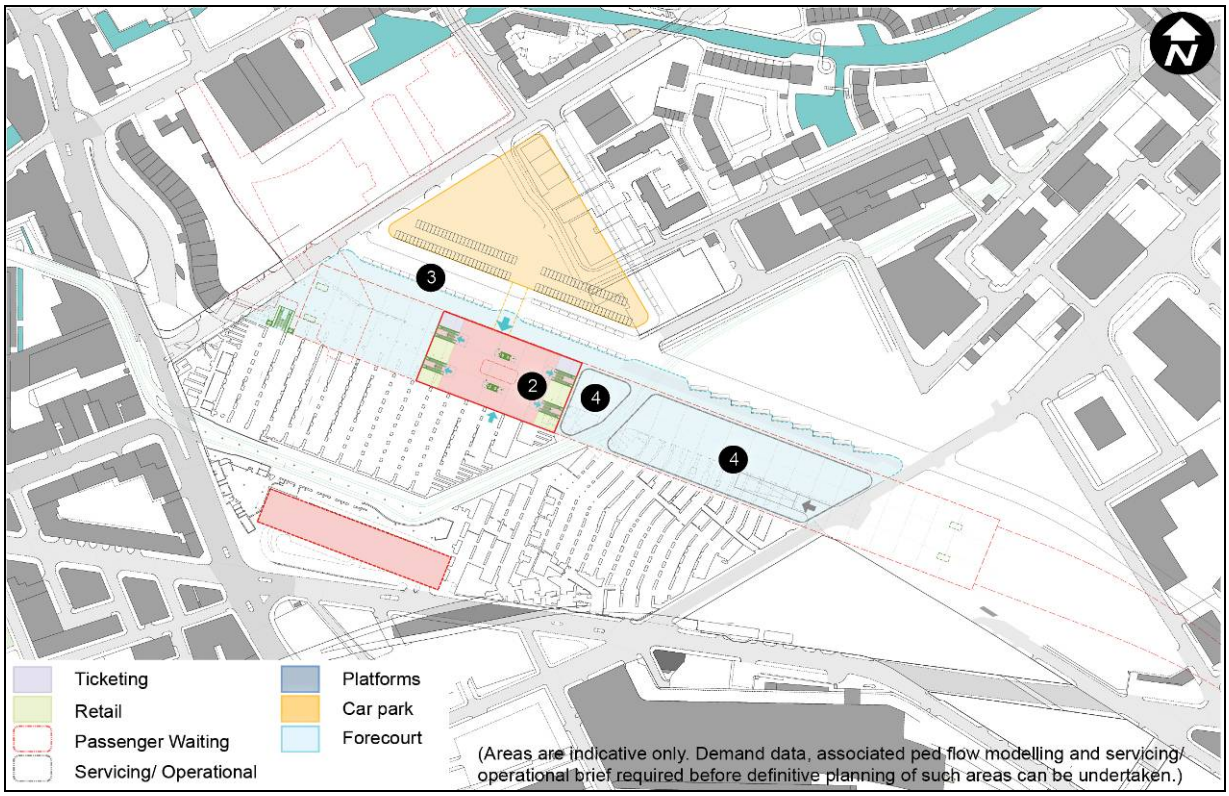


Figure 3.10: Option 1a – Proposed Concourse Level Plan

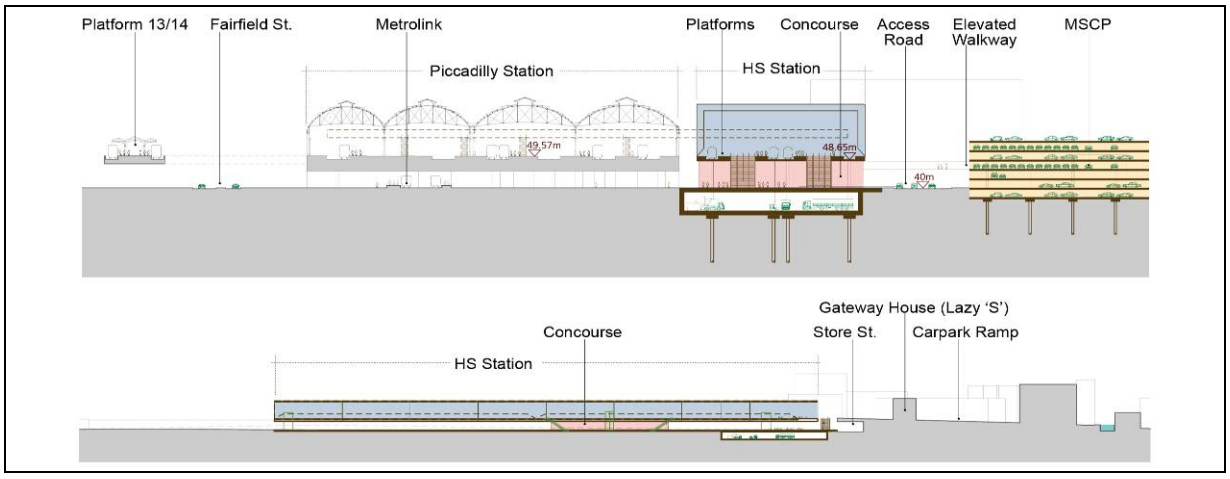


Figure 3.11: Option 1a – Cross And Long Sectional Views Of Proposed Station

Accessibility (See Figure 3.10)

The primary pedestrian entrance to the HS2 concourse would be from the realigned Sheffield Street parallel with, and to the north of, the HS2 station. On ward pedestrian travel from the concourse to the city centre would be either via Store Street and London Road, or via the pedestrian link between Store Street and Ducie Street which is proposed as part of the adjacent Inacity Tower development.

The existing entrances to Piccadilly station from the Station Approach road and Fairfield Street would be retained. Passengers would transfer directly between the existing rail and HS2 concourses via a new vertical circulation core adjacent to the western end of the HS2 platforms.

Vehicular access to the site from the inner ring road would be via a new spur off the Fairfield Street junction with Mancunian Way. Traffic accessing the station would travel from this junction along a realigned Sheffield Street running in a one way system parallel to the HS2 station. Traffic connecting back onto the inner ring road would either turn right at the top of Sheffield Street onto Store Street and onto Great Ancoats Street or turn left at the top of Sheffield Street and left onto London Road which connects with Mancunian Way.

Intermodal Interchange (See Figure 3.12)

The site benefits from good connections to major highways, existing Metrolink and bus services which would aid good onward dispersal of passengers. A newly combined existing rail and HS2 forecourt and car park is proposed for the northern edge of the site **(1)**.

The close proximity of the HS 2 and existing rail stations presents a variety of optio ns for how interchange could take pla ce between the two rail services. Passengers transferring from the existing rail concourse would descend one level via a new ci rculation core adjacent to the we stern end of the HS2 platforms and continue a short distance to the HS2 concourse **(2)**.

The undercroft of Manchester Piccad illy station presents opportunities for direct at-grade links between the Metrolink platforms and the HS2 concourse. Rail passengers connecting to Metrolin k services would continue to use the existing links between the Piccadilly station and Metrolink concourses **(3)**.

A new forecourt running parallel with the station and a realigned Sheffield Street would combine drop off/pick up and taxi facilities for both HS2 and Piccadilly station passenge rs. Car parki ng would be located in a 2100 space multi storey car park directly opposite the HS2 concourse **(4)**.

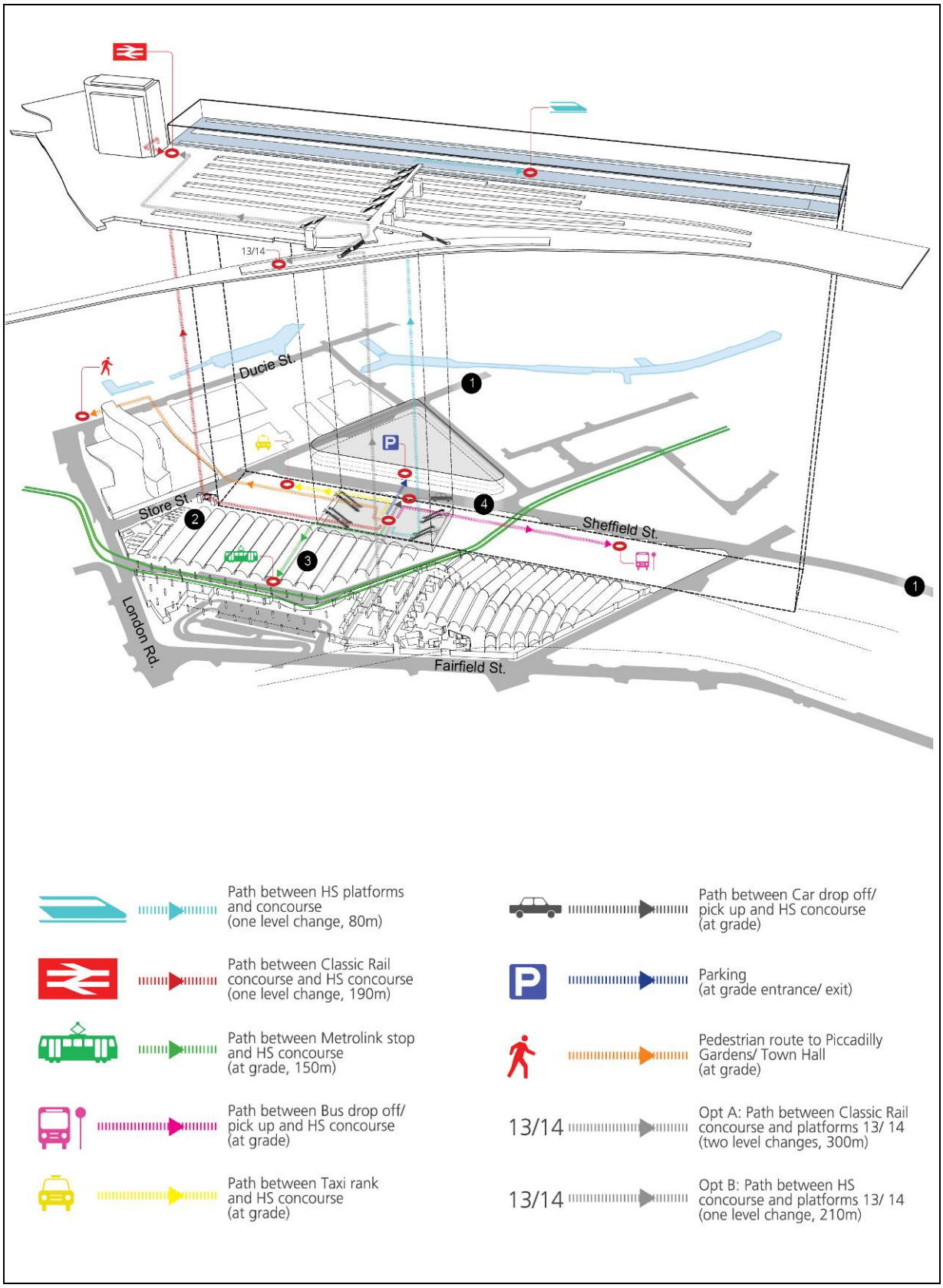


Figure 3.12: Option 1a - Intermodal Interchange

Constructability

The work would be carried out in 3 main stages. Initial studies were carried out to identify methods of constructing the station with the following primary objectives:

1. Identifying any major risks associated with the site.
2. Minimising the number of demolitions and extent of disruption to existing infrastructure.
3. Minimising the land take associated with the station development.

Stage 1 (18 Months – See Figure 3.13)

- Prepare access off Mancunian Way at the junction with Fairfield Street.
- Demolish and clear the working and construction site east of the Metrolink and the area for the new MSCP only, including the stabilisation of the existing railway arches.
- Construct temporary accommodation for the train drivers behind the Station Approach buildings.
- Construct a temporary unloading bay off Store Street, north of the railway bridge to be used for servicing the existing station facilities.
- Part-construct the new MSCP around the old car park.
- Construct new foundations and station structure to platform level east of the Metrolink.
- Construct a temporary at-grade parking area for cars currently located in the undercroft.

Stage 2 (24 Months – See Figure 3.14)

- Divert train drivers accommodation, station car parking, undercroft car-parking and service unloading.
- Demolish the remaining buildings including the old MSCP and including the stabilisation of the existing railway arches.
- Construct the remainder of new foundations and station structure to platform level.
- Complete the construction of new MSCP.
- Construct a new ground level concourse.

Stage 3 (36 Months – See Figure 3.15)

- Construct the station roof.
- Install escalators.
- Construct new station facilities below, above and at platform level.
- Construct a new loading bay and access for servicing station facilities and any amendments to existing servicing infrastructure.
- Construct new drop-off, taxi and bus ranks including the final road layout and carry out any amendments to the Metrolink station.

As there would be considerable overlap between the stages it is expected that the overall programme would continue for four and a half to five years.

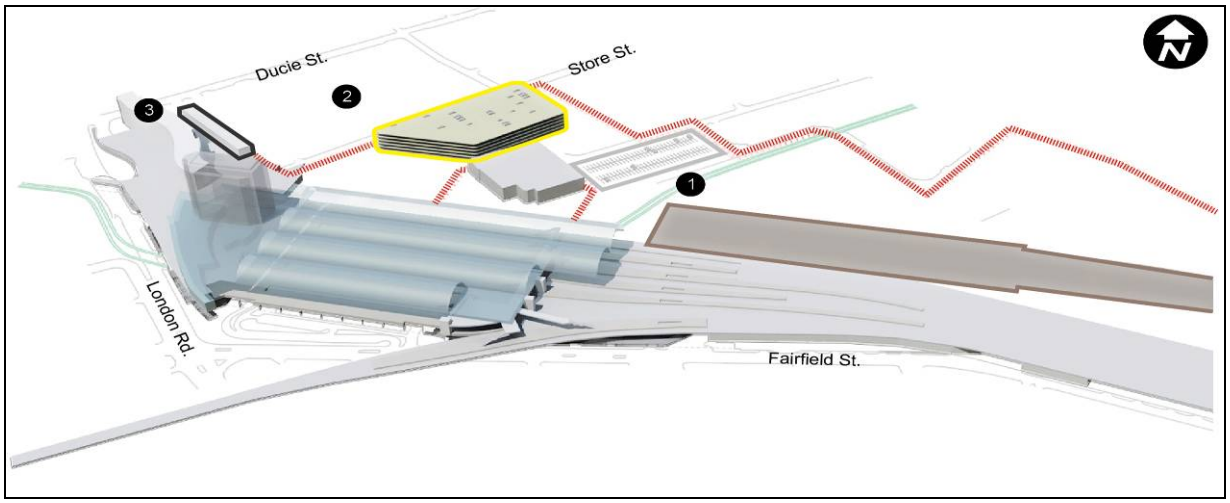


Figure 3.13: Option 1a - Construction Sequence Stage 1

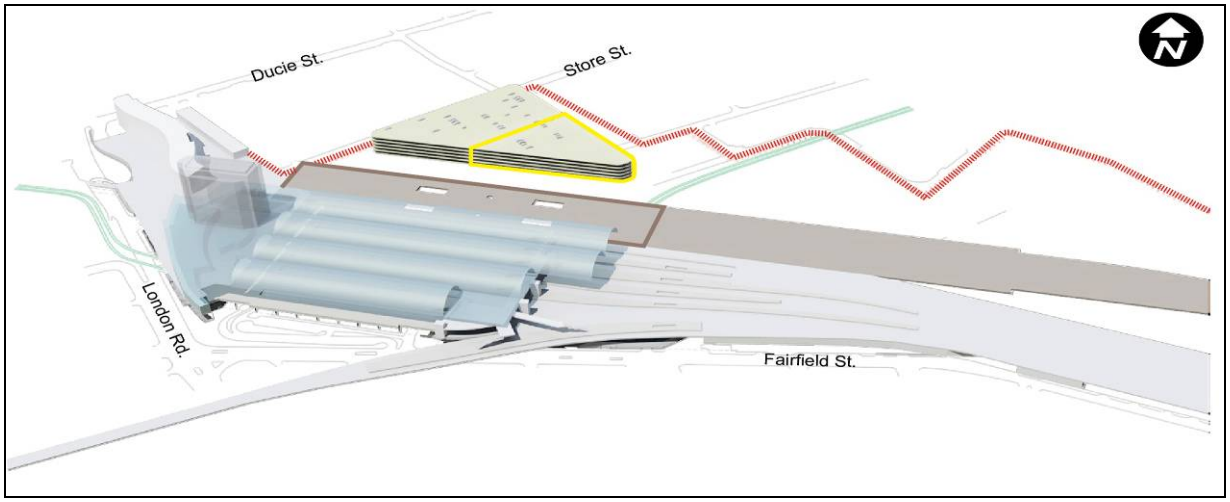


Figure 3.14: Option 1a - Construction Sequence Stage 2

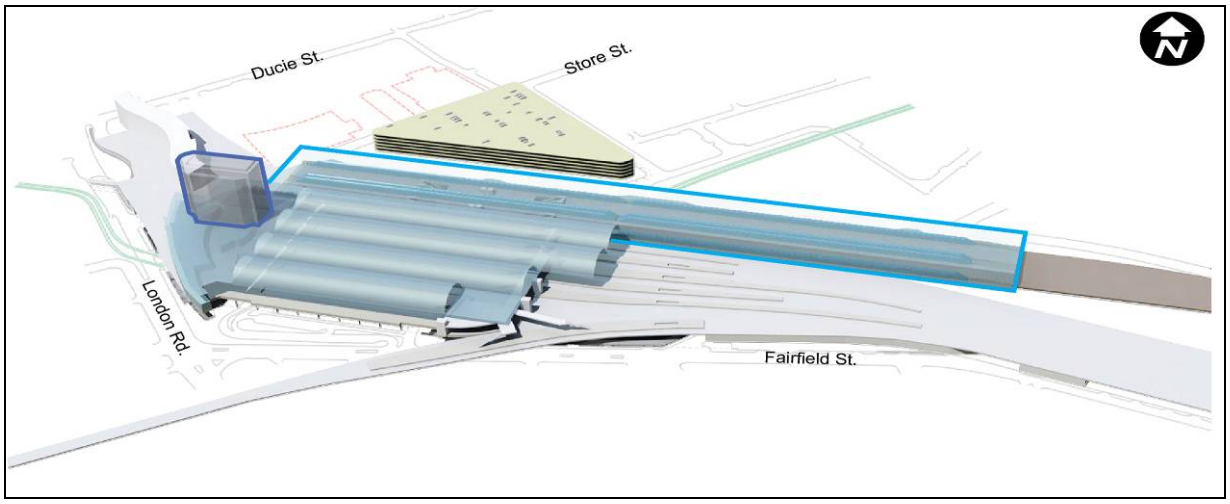


Figure 3.15: Option 1a - Construction Sequence Stage 3

3.1.2 Salford Middlewood

Station Approach

The HS2 lines and platforms would be located to the west of the existing Salford Central station. Approaching from the west, the spur route from south Manchester would be in twin-bore tunnel and would emerge at a tunnel portal immediately east of the M602 junction 3 roundabout with A57 Regent Road. See also Section 2.41, HSM37 for further line of route detail. A junction would be located at Windsor Street where the two lines that emerged from the twin bore tunnel would increase to four lines.

The lines would rise at a gradient of 1.95%, crossing over the Liverpool to Manchester railway west of Oldfield Road on a new structure (See Figure 3.17). At Oldfield Road, the lines would not have achieved sufficient height to cross over the existing highway on a new bridge structure and therefore closure of Oldfield Road would be required.

Station Description - Existing Site (See Figure 3.16 - 3.17)

Option 9b would be situated directly west of Salford Central station on a brownfield site known as Middlewood Locks. The site is bounded to the north, south and east by the existing rail viaduct approaches to Salford Central station and to the west by Oldfield Road. The areas north of the site contain residential communities. Light industrial structures occupying areas to the south and west of the site. The area immediately east of the site is further bounded by the River Irwell and Trinity Way which forms part of the Manchester Inner Ring Road (IRR). A recently restored canal and locks, which form part of the Bolton Bury Canal, run in a north-west south-east orientation across the site, before linking with the River Irwell via a chamber under the railway viaduct and the IRR.

Salford Central station, which lies directly east of the site, opened in 1838 and recently underwent a major refurbishment which was completed in 2008. The station consists of two 100m long platforms and two through running tracks. The platforms are elevated to approximately 8.5m above the adjacent ground level. The concourse is located at grade and faces onto New Bailey Street. The station provides regional services to the north and west and connects with Manchester Victoria station to the east.

Future planned works as part of the proposed Northern Hub development could include Salford Central station in the Manchester Loop via a new curve at Ordsall which would link Manchester Victoria, Manchester Piccadilly and Manchester Airport. This new section of rail line would link two existing rail lines and is expected to increase capacity in the region and reduce journey times into Manchester.

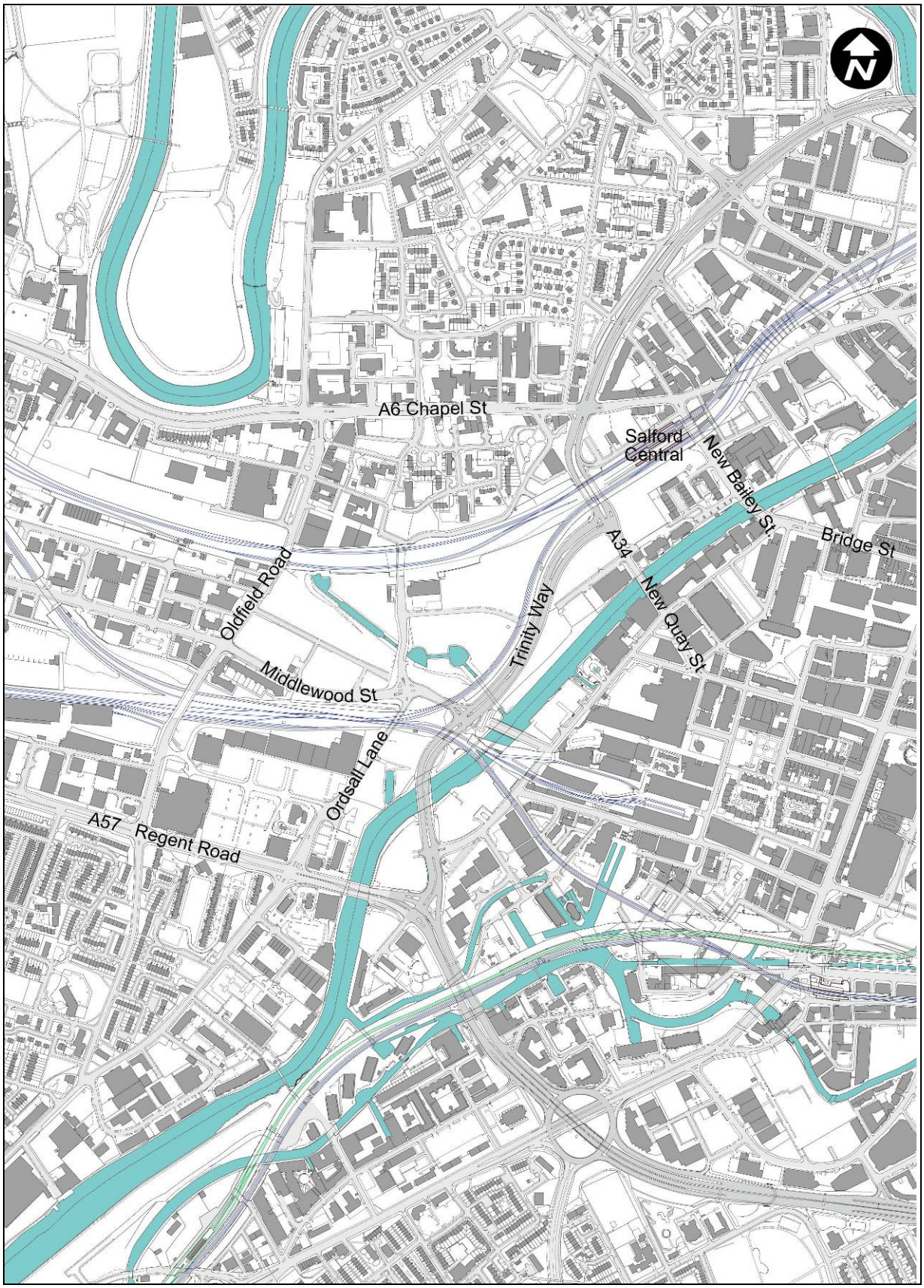


Figure 3.16: Option 9b - Existing Siteplan

Figure 3.17: Option 9b - Proposed Station Footprint

Station Description - Proposed Station (See Figure 3.18 - 3.23)

Platforms (See Figure 3.20)

The brief for the HS2 station requires 4x440m long platforms **(1)** servicing four arriving and four departing trains per hour carrying approximately 1100 passengers each. The overall length of the station would be 442.7m and the width would be 47.3m. In order to improve pedestrian connectivity between the site and the city centre it is proposed to realign a section of Trinity Way (IRR) in cut and cover tunnel through the site.

The proposed station would consist of four elevated station platforms (two islands) elevated approximately 9m above adjacent ground level. The existing ground level would be raised to accommodate the passage of the realigned Trinity Way through the site. The four platforms would be a consistent 14m width in order to accommodate vertical access cores and the necessary clearance to the platform edge. Platforms would be straight along their whole length. Escalators and stairs would be located central to the platforms to aid an efficient dispersal of passengers and encourage intuitive wayfinding by means of filtering passengers through one concourse area. The station roof would cover the full length of the HS2 platforms at height of approximately 15m above platform level.

Concourse (See Figure 3.18 & 3.21)

HS2 concourse facilities **(2)** would be located at ground level beneath the elevated platforms and central to the platforms above. The route between concourse and platforms would be via stairs, escalators and lifts through the platforms.

Forecourt and Carpark (See Figure 3.18 & 3.21)

The HS2 forecourt **(3)** would be in a linear arrangement parallel to the southern city-facing side of the station. A new MSCP would be located directly opposite the concourse and would accommodate 1,500 cars

Servicing and Operations

Areas directly adjacent to the west side of the concourse have been identified as zones for servicing and operational support **(4)** to platforms and concourse areas. Locating the servicing to the west end of the station would avoid conflict with passenger movements towards the concourse.

Site Specific Constraints

Existing rail and highways infrastructure in this location have set the parameters within which the HS2 station could be planned and constructed: (See Figure 3.24)

The rail infrastructure forms a boundary to the north **(1)**.
To the east, the fixed rail infrastructure forms a boundary and the realigned Trinity Way sets the platform level, which is approximately five metres above the existing adjacent rail viaducts **(2)**.
The height of the throat, station approach and the HS2 platforms have been dictated by the rail tracks and existing highways to the west **(3)**.

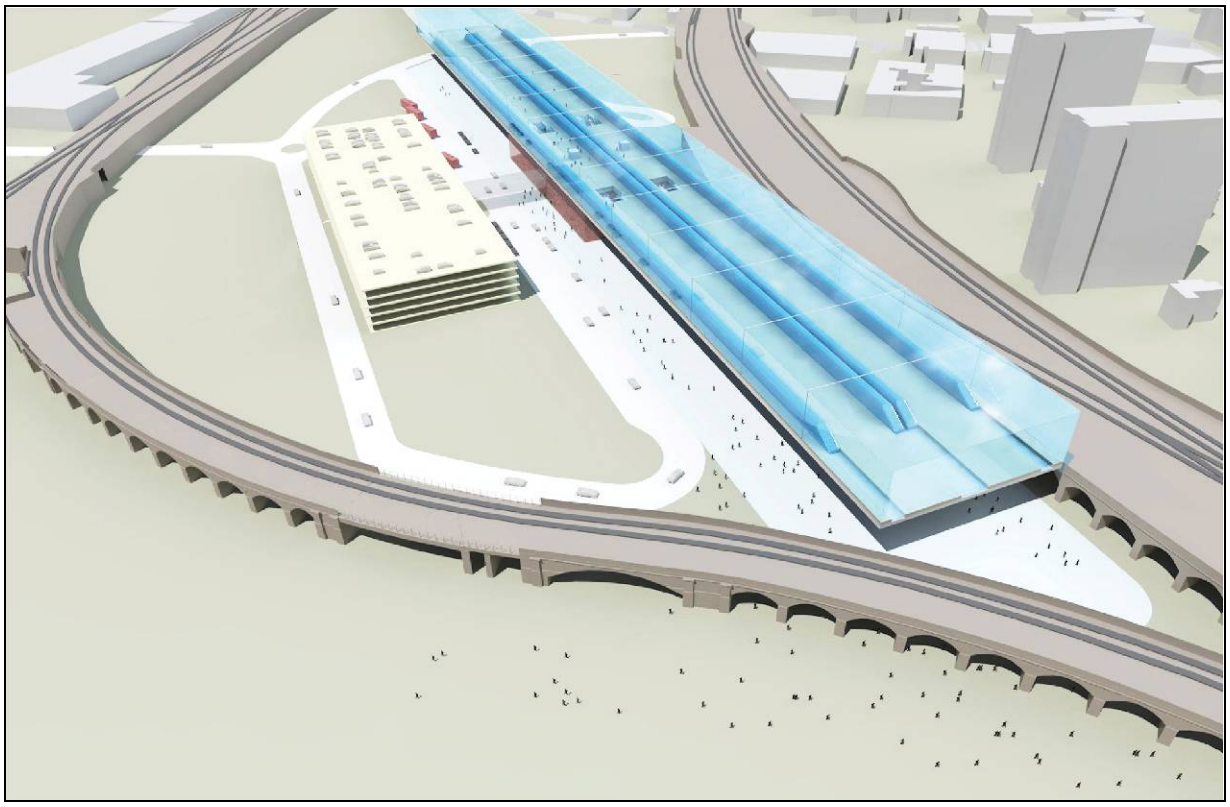


Figure 3.18: Option 9b - Visualisation Of Proposed Station Arrangement

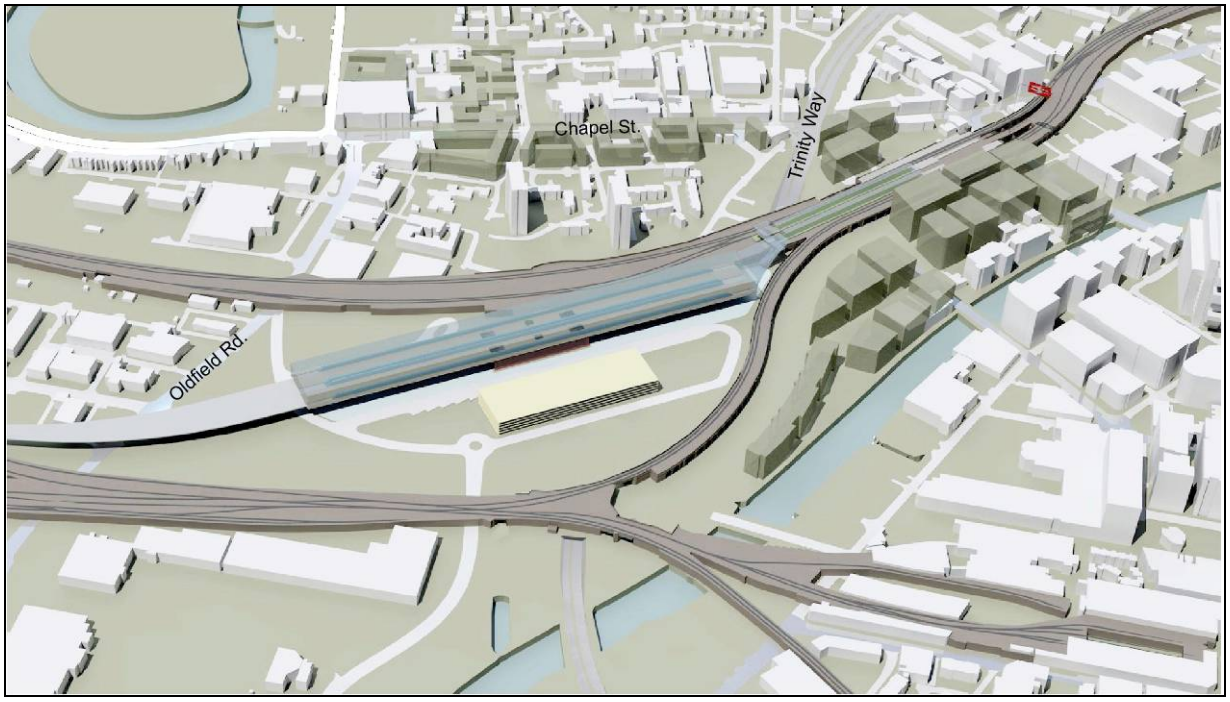


Figure 3.19: Option 9b - Birds Eye View Visualisation Of Proposed Station (Including Buildings Proposed As Part Of Local Materplan)

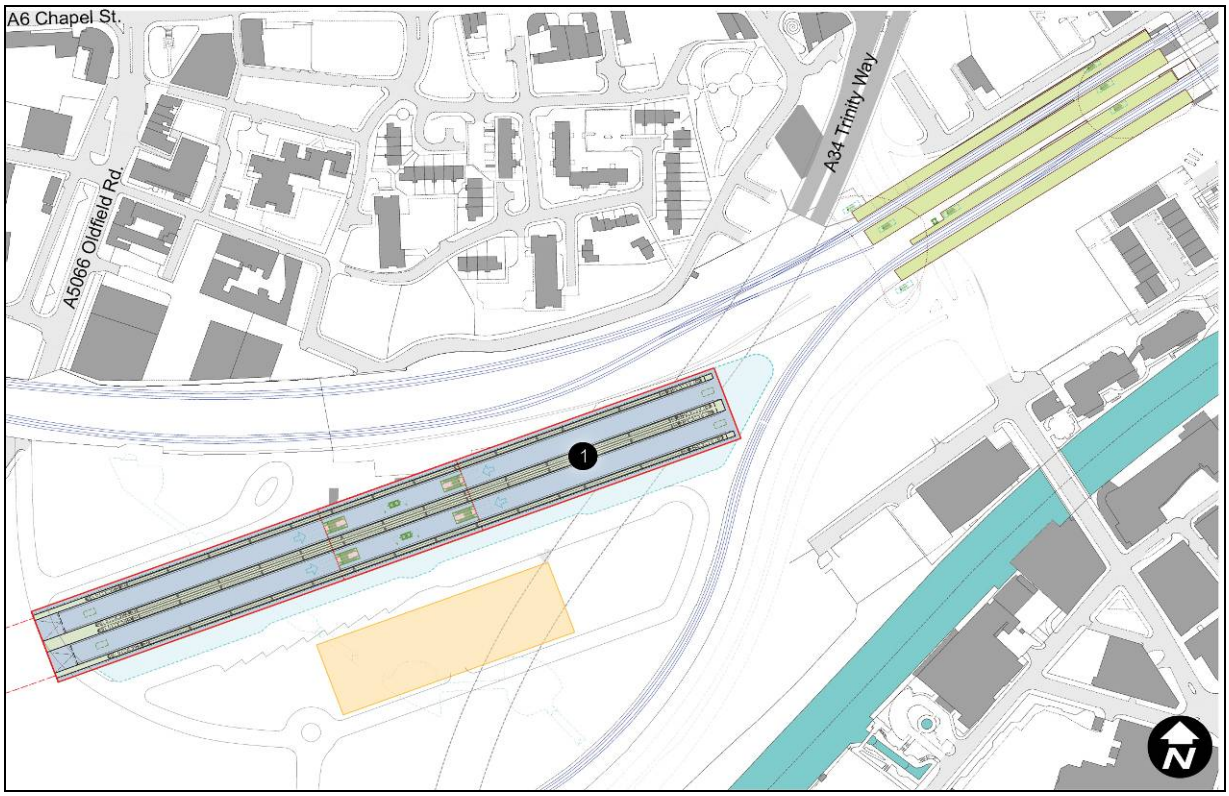


Figure 3.20: Option 9b – Proposed Platform Level Plan

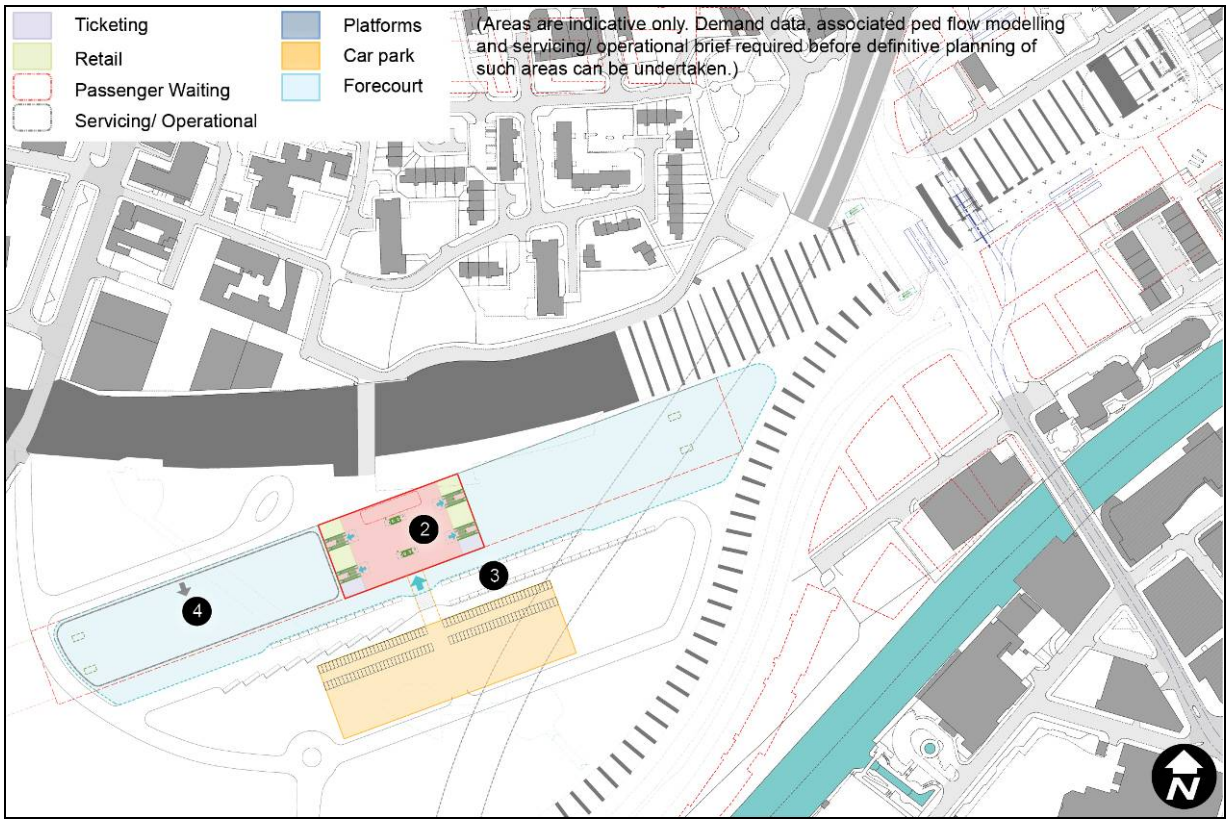


Figure 3.21: Option 9b - Proposed Concourse Level Plan

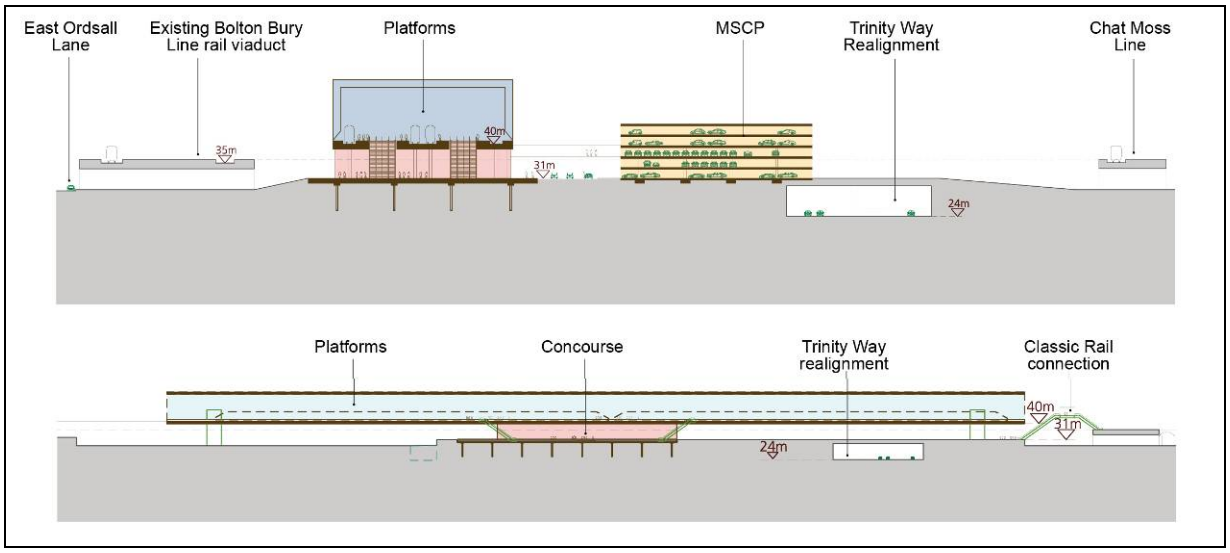


Figure 3.22: Option 9b – Cross And Long Sectional Views Of Proposed Station

Accessibility (See Figure 3.21)

The primary pedestrian entrance to the HS2 concourse is from the station forecourt which is located parallel with, and to the south of, the HS2 station. Onward pedestrian travel from the concourse to the city centre would be through the arches of the existing rail viaducts via Irwell Street and New Quay Street which lead into Spinningfields.

Principle access to the station would be via the existing A6 Chapel Street to the north, the A34 Trinity Way (IRR), to the east and the M602/A57 Regents Road to the south of the station site. Highway access to the proposed station site and adjacent MSCP will be via a network of new access roads connecting the forecourt and MSCP with the A5066 Oldfield Road, for access to/from the A6 and Ordsall Lane, for access to the A34/IRR, A57 and M602.

Intermodal Interchange (See Figure 3.23)

The site benefits from good connections to major highways but suffers from poor connections to existing Metrolink services and would require minor re-routing of existing bus services to serve the HS2 station efficiently. The nearest Metrolink stop would be Deansgate which would be approximately 15 minutes walk. There are frequent bus services along Chapel Street and passengers would be required to walk approximately 5 minutes to existing bus stops **(1)**.

Salford Central station would be retained in its original configuration. Passengers would transfer at grade between the HS2 and rail concourses using the covered area under the existing viaduct to the south side of the station. The distance between the concourses would be approximately 530m **(2)**.

Consideration has also been given to a more direct transfer at the western end of the platforms which would utilise a new western entrance to the existing rail station, as laid out in Salford City Council's masterplan for the station. This masterplan proposes an extension of the existing platforms and the provision of new vertical access cores and over-bridge immediately west of Trinity Way. This would reduce the transfer distance to approximately 340m **(3)**.

A new forecourt running parallel with the station would support drop off/pick up and taxi facilities and transfer to the MSCP directly opposite the HS2 concourse **(4)**.

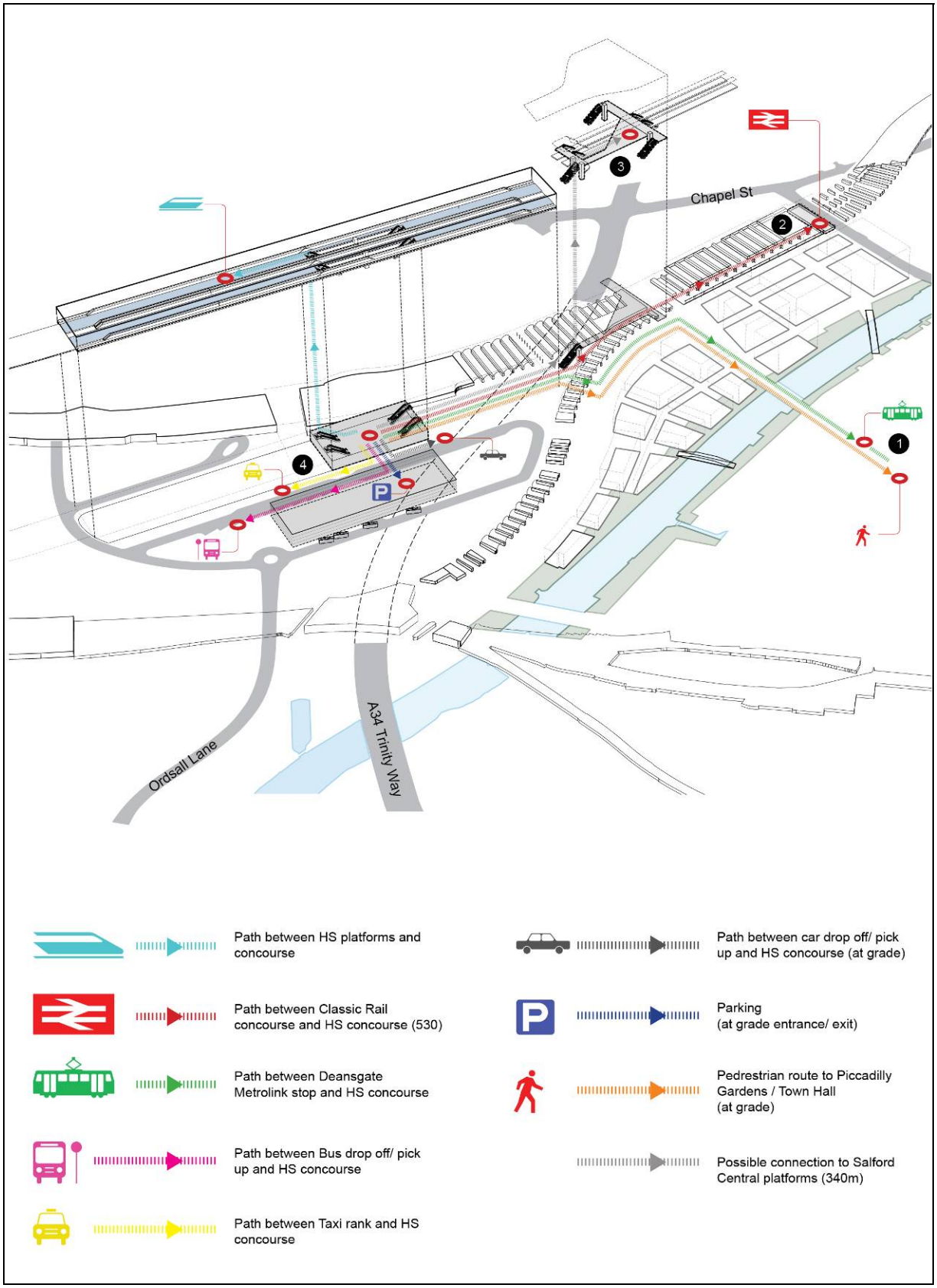


Figure 3.23: Option 9b - Intermodal Interchange

Constructability

The work would be carried out in 3 main stages. Initial Studies were carried out to identify methods of constructing the station with the primary objectives of:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure
- Minimising the land take associated with the station development

The works would be carried out in 3 main stages. The overall schedule would be four and a half to five years as there is opportunity to overlap the stages.

Stage1 (18 months – See Figure 3.24)

- Clear the construction area and set-up site camp.
- Relocate railway junction to run-round loop to clear new Trinity Way (north) Bridge.
- Construct new Trinity Way skew bridge under Salford Lines and new thrust bore bridges under the Bolton and Chat Moss Lines.
- Construct retained and cut and cover structures for the realigned Trinity Way.
- Construct box structures under the Salford, Bolton and Chat Moss Lines for the new alignment for Ordsall Lane.

Stage 2 (27 months – See Figure 3.25)

- Extend existing rail platforms towards Middlewood site
- Construct new station foundations and structure to platform level.

Stage 3 (30 months – See Figure 3.26)

- Construct station roof.
- Construct ground level concourse.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new MSCP.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Construct new Ordsall Lane and Trinity Way including connections north and south and divert traffic.
- Completion works including removing the old Trinity Way, constructing footpaths, landscaping, etc.

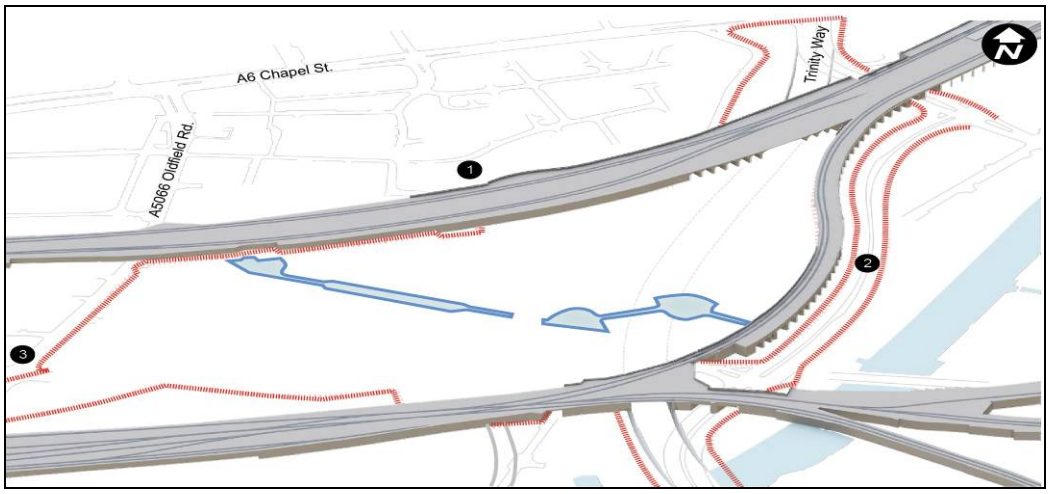


Figure 3.24: Option 9b - Construction Sequence Stage 1

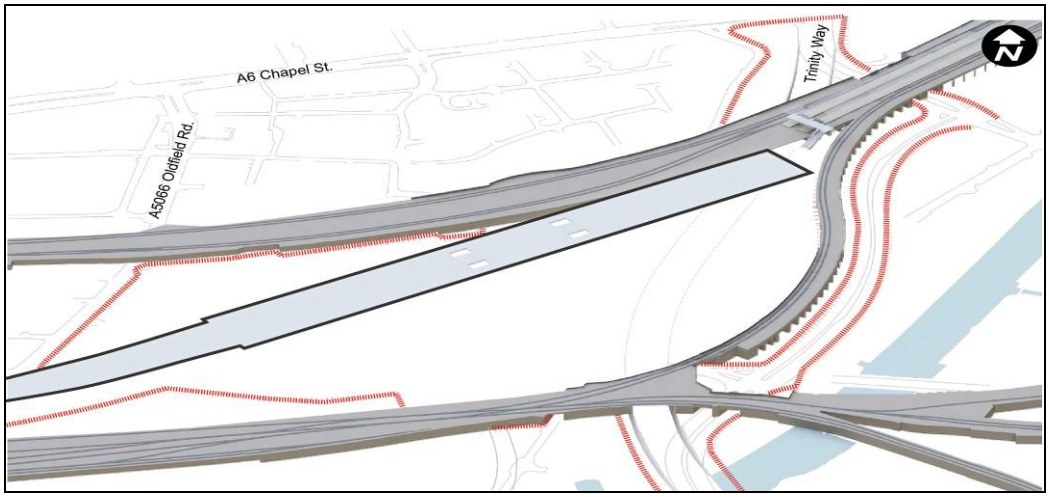


Figure 3.25: Option 9b - Construction Sequence Stage 2

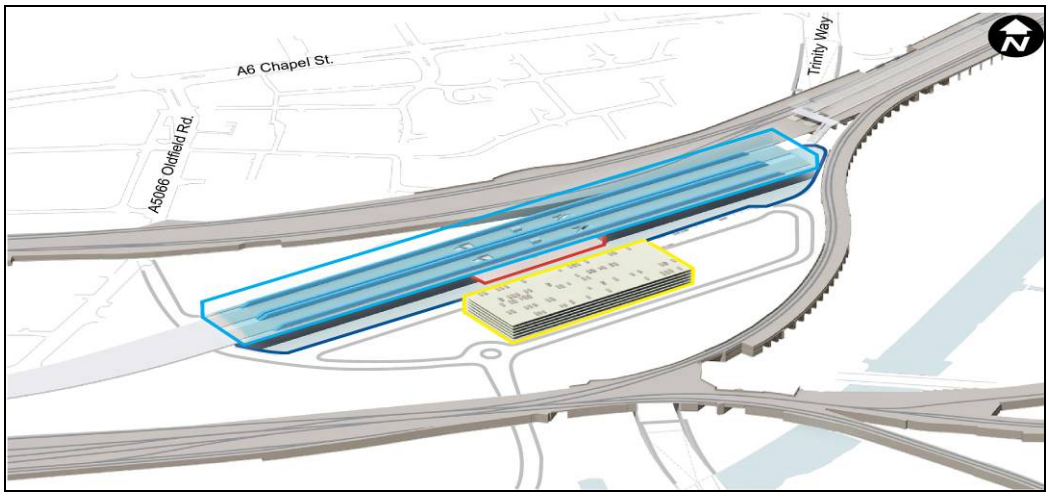


Figure 3.26: Option 9b - Construction Sequence Stage 3

Highway Diversion

The diversion of Trinity Way through the station site would require the following interventions:

Trinity Way West:

The new 2-lane dual carriageway road would pass as an almost square crossing some 8m under the embankments of the existing eastbound and westbound Bolton Lines and Chat Moss Lines. The new structure would be constructed as two adjacent boxes using thrust bore techniques. This would require speed restrictions on the lines above which may be exacerbated by the switch and crossing facilities immediately over the crossing.

Trinity Way East:

The new 2-lane dual carriageway road would pass as a skew (60 degrees) crossing through the existing brick arch structure some 8m below the existing eastbound and westbound Salford Lines. It is considered that thrust bore techniques in this situation would pose a major risk on the stability of the existing arches. Instead the main crossing carrying the 2 tracks would be formed of a single 50m span structure founded on abutments formed within 2 discreet arches. The deck would be constructed to the south and slid in a 72-hour occupation of the lines. Speed restrictions will apply during the construction of the abutment structures.

Advance works:

These would be required to move the railway junction to the arrival/departure and runround loops to the north so as to be clear of the new bridge. Also strengthening works to the south western ends of the brick arches which may require truncating in order to construct the new road west of the new bridge crossing.

Ordsall Lane:

The new single carriageway road passes as a square crossing some 8m under the embankment of the existing eastbound and westbound Bolton Lines and Chat Moss Lines. The new structure would be constructed as a single box using thrust bore techniques. This would require speed restrictions on the lines above which may be exacerbated by the switch and crossing facilities immediately over the crossing.

3.1.3 Salford Central

Station Approach

The HS2 lines and platforms would be located at the existing Salford Central station. The existing railway lines would be spread laterally apart to provide the necessary width for the HS2 station, increasing the width of the viaduct from 53m to 96m. Approaching from the west, the spur route from south Manchester would be in twin-bore tunnel and would emerge at a tunnel portal immediately east of the M602 junction 3 roundabout with A57 Regent Road. See also Section 2.42, HSM38 for more line of route detail. A junction would be located at Windsor Street where the two lines that emerge from the twin bore tunnel increase to four lines.

The lines would rise at a gradient of 1.95%, crossing over the Liverpool to Manchester railway west of Oldfield Road on a new structure (See Figure 3.27). At Oldfield Road, the lines would not have achieved sufficient height to cross over the existing highway on a new bridge structure and therefore closure of Oldfield Road would be required. East of Oldfield Road, the lines would reduce in level at a gradient of 2.2% prior to the station platforms, to achieve a platform level at the station similar to that of the existing railway platforms at Salford Central station.

Station Description - Existing Station

Option 19 would be situated on the footprint of the existing Salford Central station which would create a combined HS2 and rail interchange station (See Figures 3.27 and 3.28).

Salford Central Station opened in 1838 and underwent a major refurbishment which was completed in 2008. The station consists of two 100m long platforms and two through running tracks. The platforms are elevated to approximately eight and a half metres above the adjacent ground level. The concourse is located at grade and faces onto New Bailey Street. The station provides regional services to the north and west and connects with Manchester Victoria station to the east.

Future planned works as part of the proposed Northern Hub development could include Salford Central station in the Manchester Loop via a new curve at Ordsall which would link Manchester Victoria, Manchester Piccadilly and Manchester Airport. This new section of rail line would link two existing rail lines and is expected to increase capacity in the region and reduce journey times into Manchester.

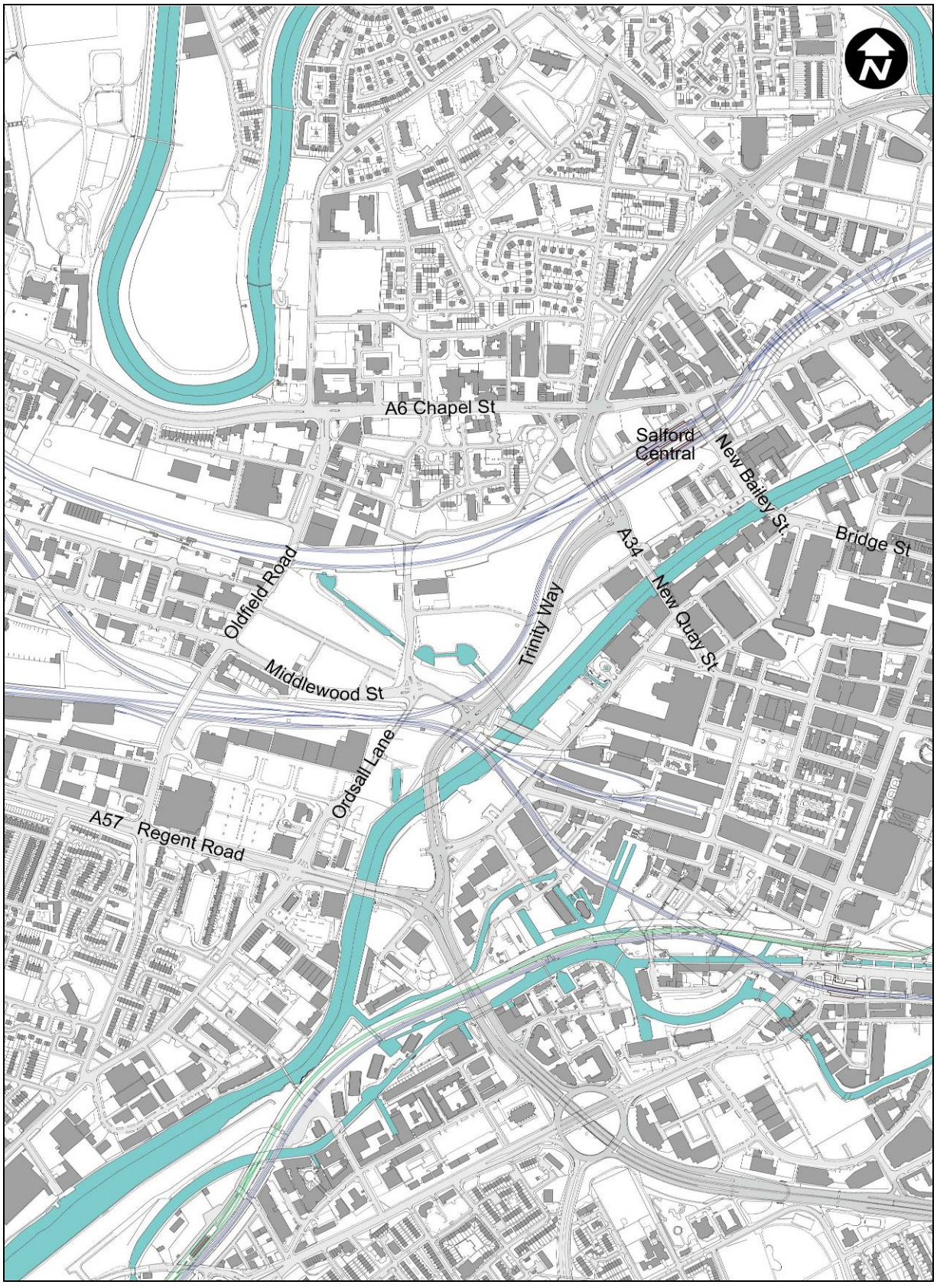


Figure 3.27: Option 19 – Existing Siteplan

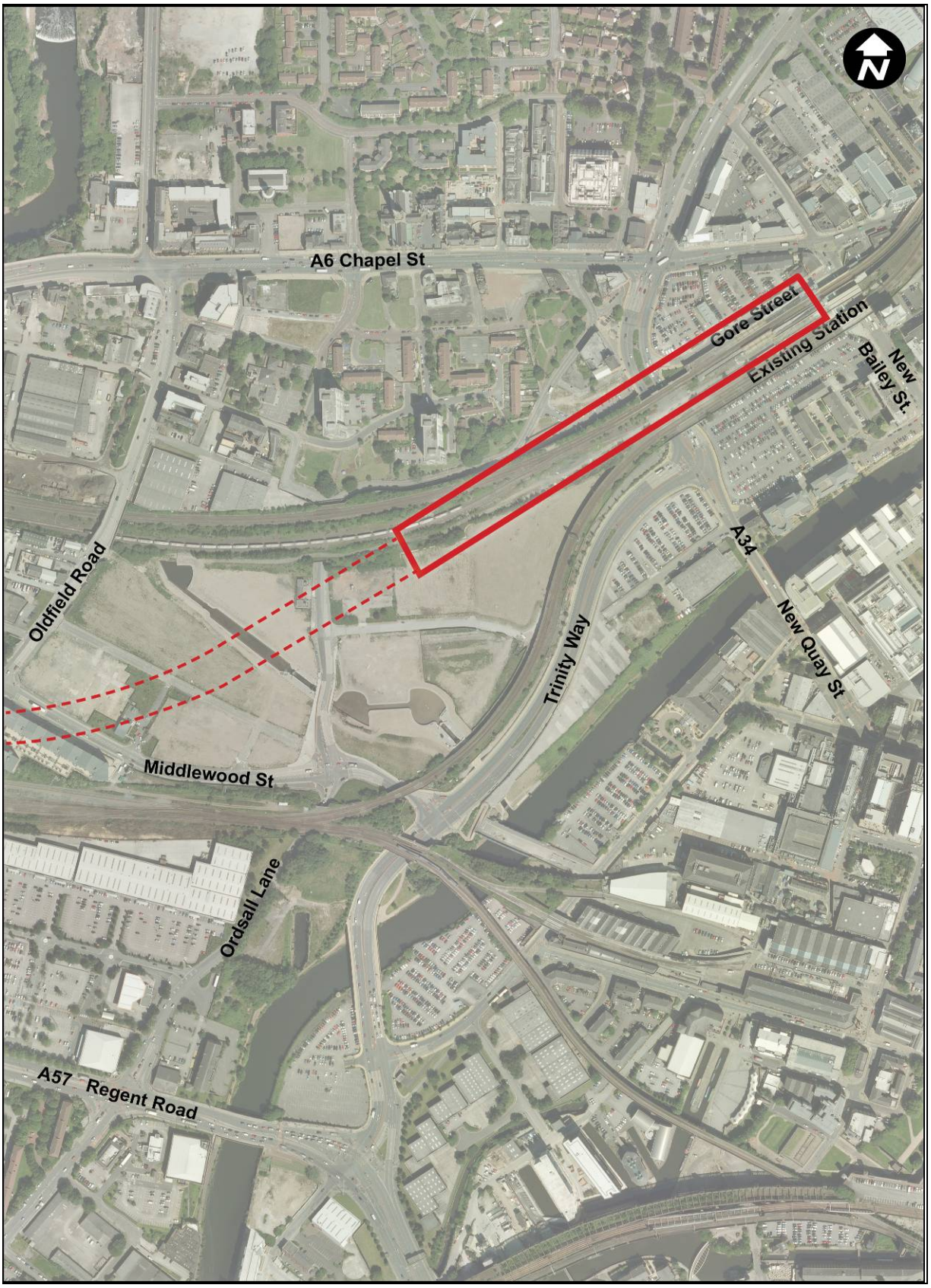


Figure 3.28: Option 19 – Proposed Station Footprint

Station Description - Proposed Station (See Figure 3.29-3.34)

Platforms (See Figure 3.29 & 3.31)

The brief for the HS2 station requires 4x440m long platforms **(1)** and either two or four rail platforms (dependent on Northern Hub plans). The existing rail platforms would be split two to the north and two to the south with the HS2 platforms in between. Accommodating these four HS2 platforms would require the relocation of the eastbound and westbound Salford lines onto a new viaduct to the north of their current location. This in turn would necessitate the demolition of a number of buildings and a section of the existing brick arched viaduct.

The station would service four arriving and four departing trains per hour carrying approximately 1100 passengers each. All platforms would be constructed at the level of the existing rail platforms. The HS2 platforms would be a consistent 14m width and straight along their whole length. The 14m width is required to accommodate vertical access cores and the necessary clearance to platform edge. Escalators and stairs would be located central to a combined concourse towards the end of the platforms to aid an efficient dispersal of passengers and encourage intuitive wayfinding. The station roof would cover the full length of the HS2 platforms and be approximately 15m high.

Concourse (See Figure 3.31)

The existing Salford Central station concourse would be removed. A new combined HS2 and rail concourse facility **(2)** would be located at ground level beneath the elevated platforms and to the east of Trinity Way. The route between concourse and platforms would be via stairs, escalators and lifts through the platforms. Temporary concourse facilities would be required for Salford Central station in the intervening time between demolition of the existing concourse and completion of the new concourse, resulting in disruption to passengers during this period.

Forecourt and Carpark (See Figure 3.30 & 3.32)

A new combined rail and HS2 forecourt **(3)** is proposed within the triangular Gore Street site to the northern side of the viaduct. A new MSCP would be located underneath the platforms to the east side of Trinity Way and would accommodate 1,500 cars. The route between the concourse and the carpark across Trinity Way would be facilitated by means of a new pedestrian footbridge and associated passenger lifts.

Servicing and Operations (See Figure 3.33)

Areas directly opposite the MSCP have been identified as zones for servicing and operational support **(4)** to platforms and concourse areas. Locating the servicing to the west end of the station would avoid conflict with passenger movements towards the concourse.

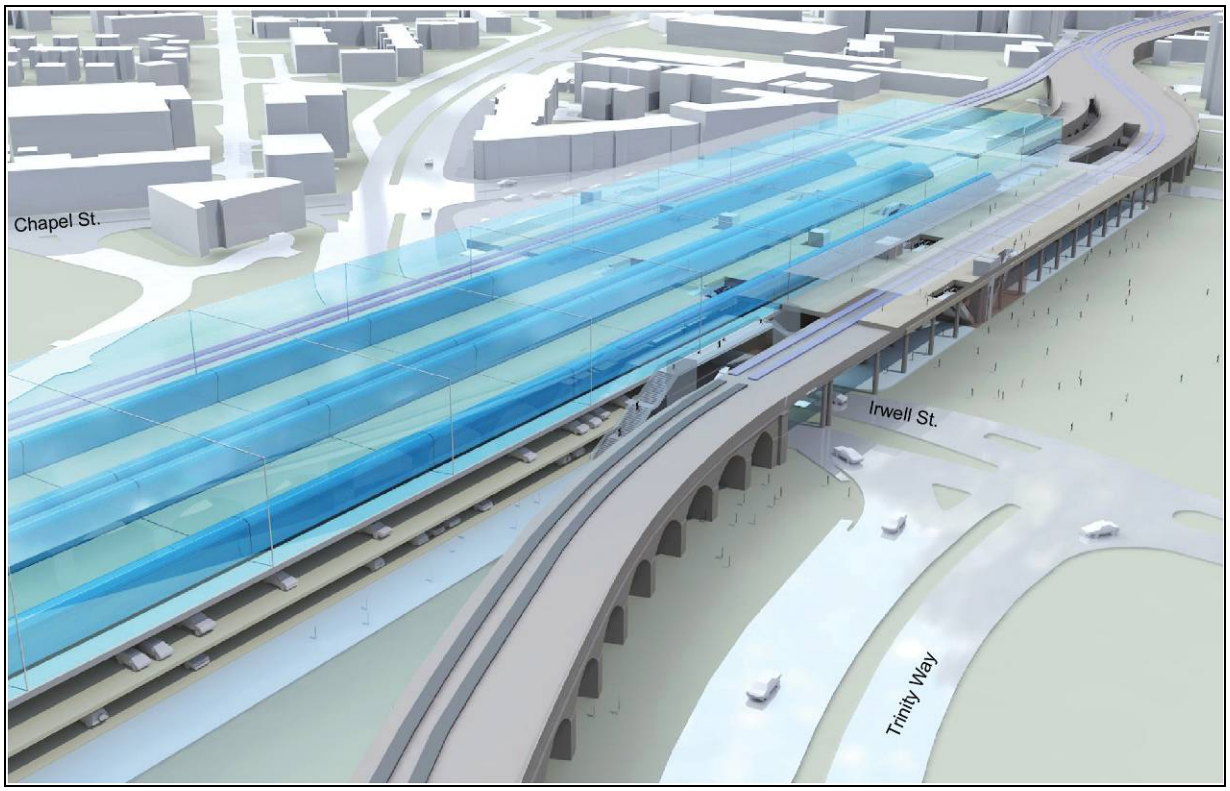


Figure 3.29: Option 19 - Visualisation Of Proposed Station Arrangements

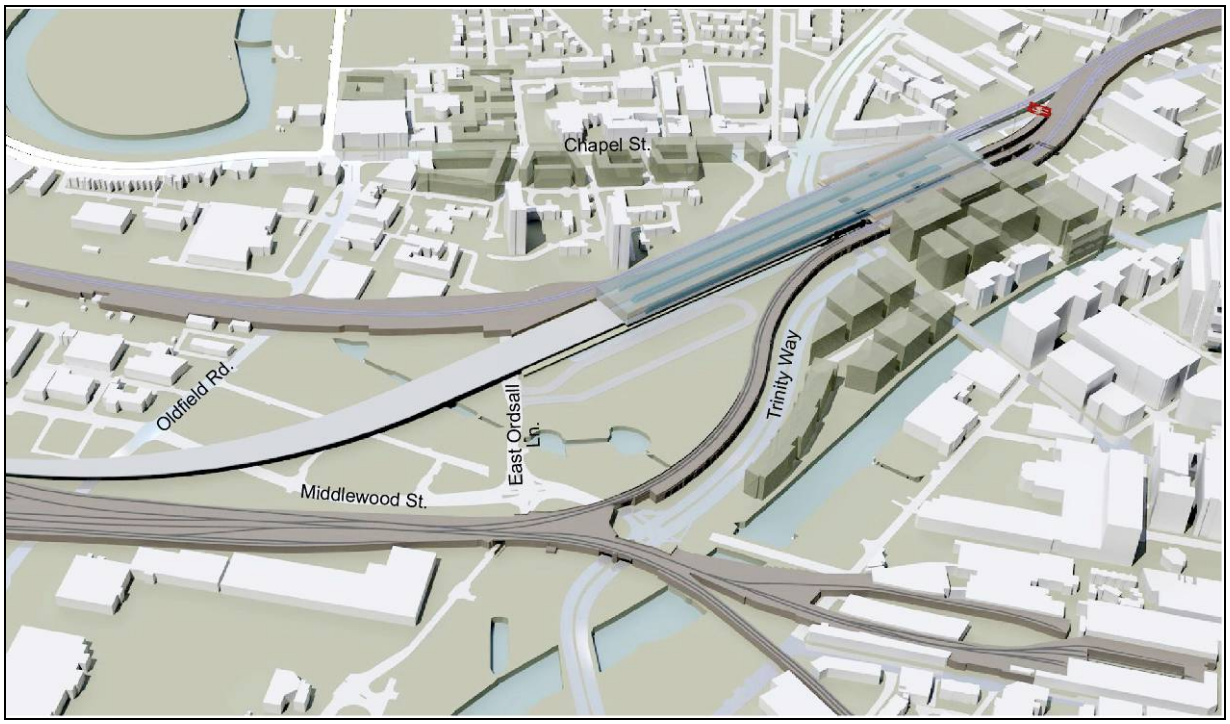


Figure 3.30: Option 19 - Birds Eye View Of Proposed Station

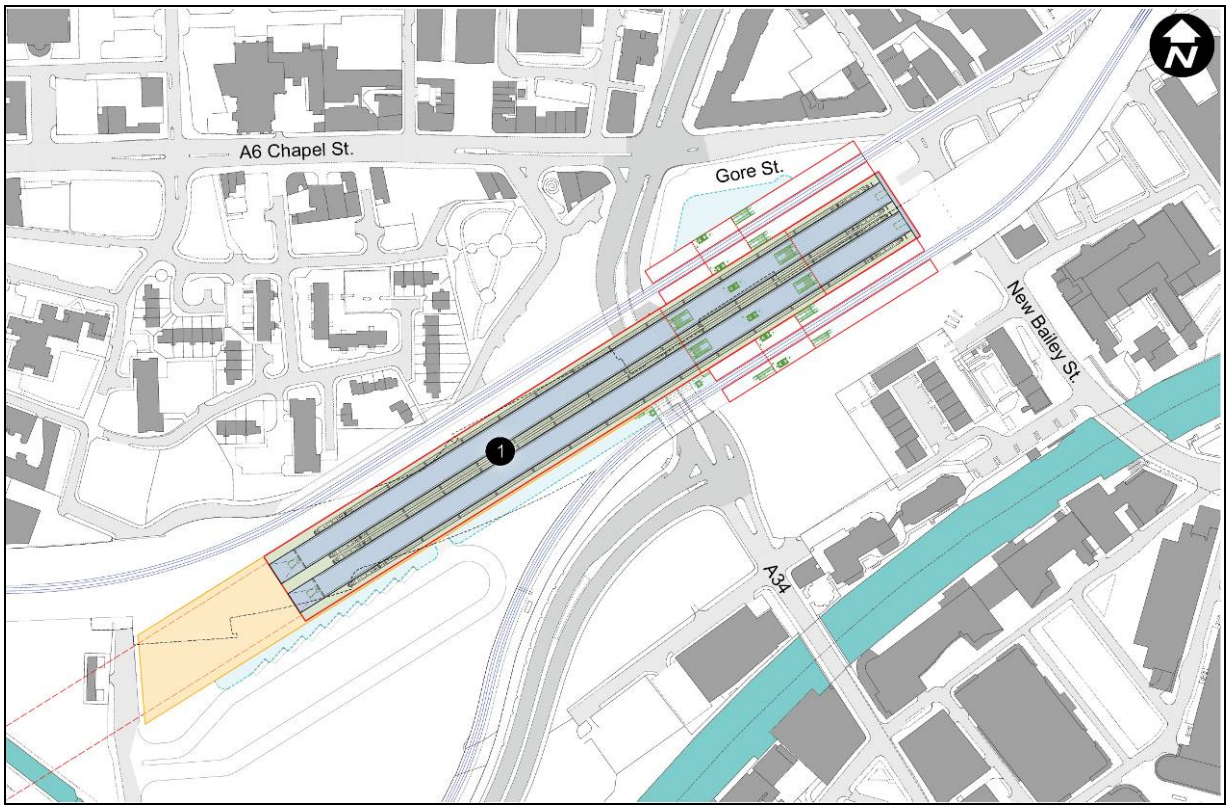


Figure 3.31: Option 19 - Proposed Platform Level Plan

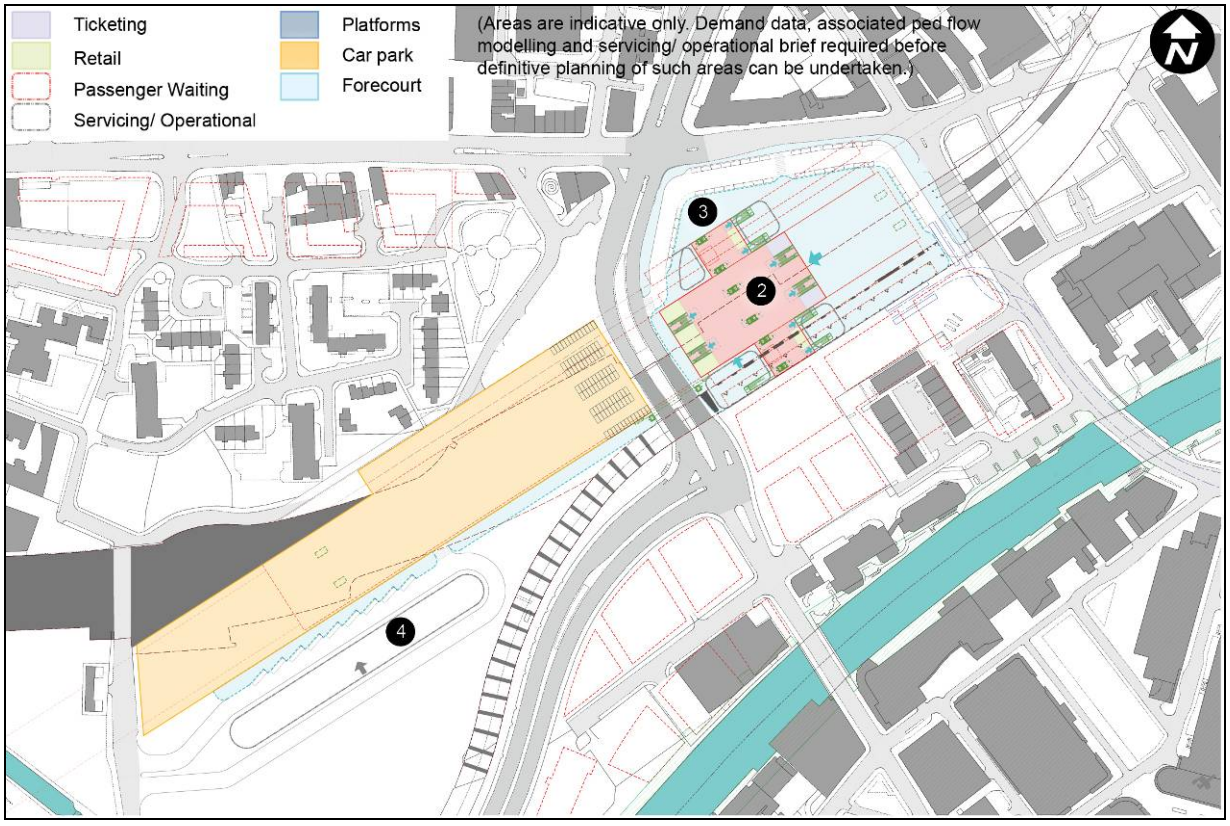


Figure 3.32: Option 19 - Proposed Concourse Level Plan

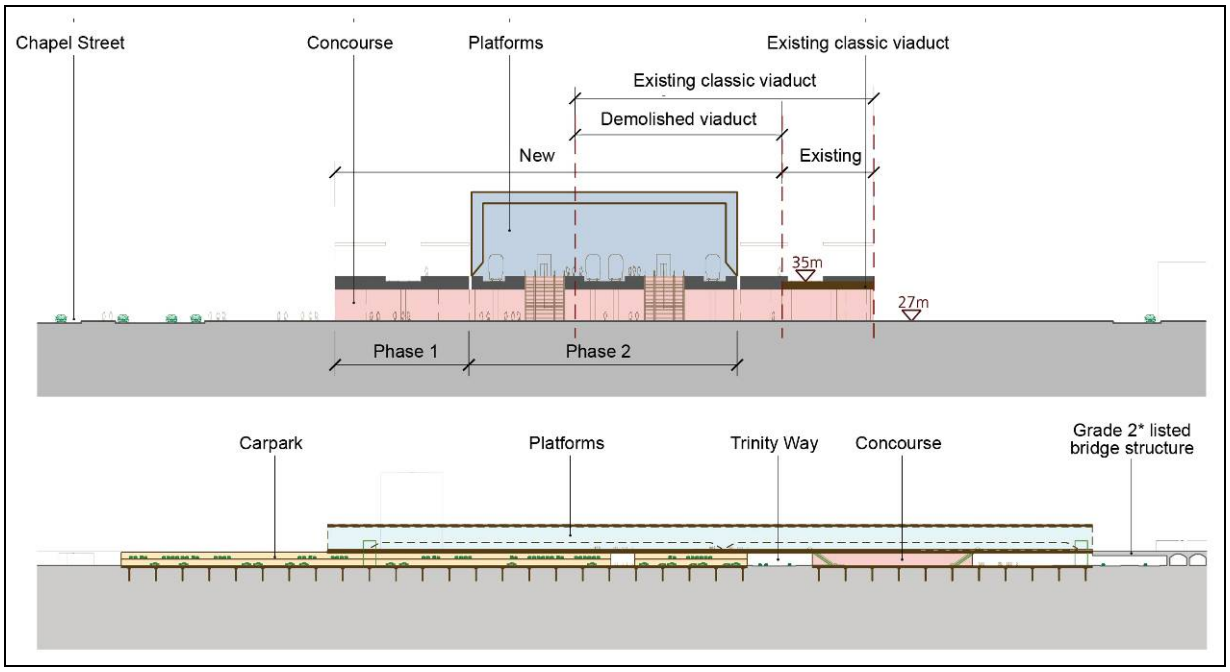


Figure 3.33: Option 19 – Cross And Long Sectional Views of Proposed Station

Site Specific Constraints

Planned future developments and existing structures to the south and east of Salford Central station have set the parameters within which the HS2 station could be planned and constructed (See Figure 3.35).

The land directly south of Salford Central station, currently used as car parking, is subject to a detailed developed masterplan **(1)**.
In order to avoid impacting these future developments the footprint of the HS2 station was set within the footprint of the existing viaduct. In order to minimise disruption to existing rail services running along lines on the southern edge of the viaduct the HS2 station is set north of these **(2)**.
The grade II listed railed bridge structures, which span above Salford Central station and across New Bailey Street, have limited how far east the HS2 station could be placed. The proposed station is set back from the listed structures in order to protect their setting **(3)**.

Accessibility (See Figure 3.32)

The proposed combined rail and HS2 concourse facility would be accessible for pedestrians from all sides with primary access off New Bailey Street. Onward pedestrian travel from the concourse to the city centre would be along New Bailey Street which offers a direct route into the city centre.

The station and its associated MSCP are located on either side of the IRR. The existing Salford Central station access will be modified to provide the station forecourt, drop off parking and taxi ranks served by a one way system, entering from New Bailey Street, along the station frontage to exit onto the eastbound carriageway of the IRR. Highway access to the station from the strategic roads network will be principally from the A6 Chapel Street at the existing junction with New Bailey Street. Highway access to the proposed MSCP will be via a network of new access roads connecting the MSCP with the A5066 Oldfield Road, for access to or from the A6 Ordsall Lane, for access to the A34/IRR, A57 and M602.

Intermodal Interchange (See Figure 3.34)

The site benefits from good connections to major highways and local bus services. Metrolink services do not currently extend as far as Salford. The nearest Metrolink stop is Deansgate which would be approximately 15 minutes walk. There are frequent bus services along Chapel Street directly north of the station **(1)**.

Passengers transferring between the HS2 and rail services would do so through the combined at grade concourse **(2)**.

A new forecourt within the Gore Street site to the north side of the station would support drop off and pick up and taxi facilities. Car parking would be located in a MSCP within the Middlewood site **(3)**.

The connection between the car park and concourse would be achieved by means of a new pedestrian footbridge across Trinity Way **(4)**.

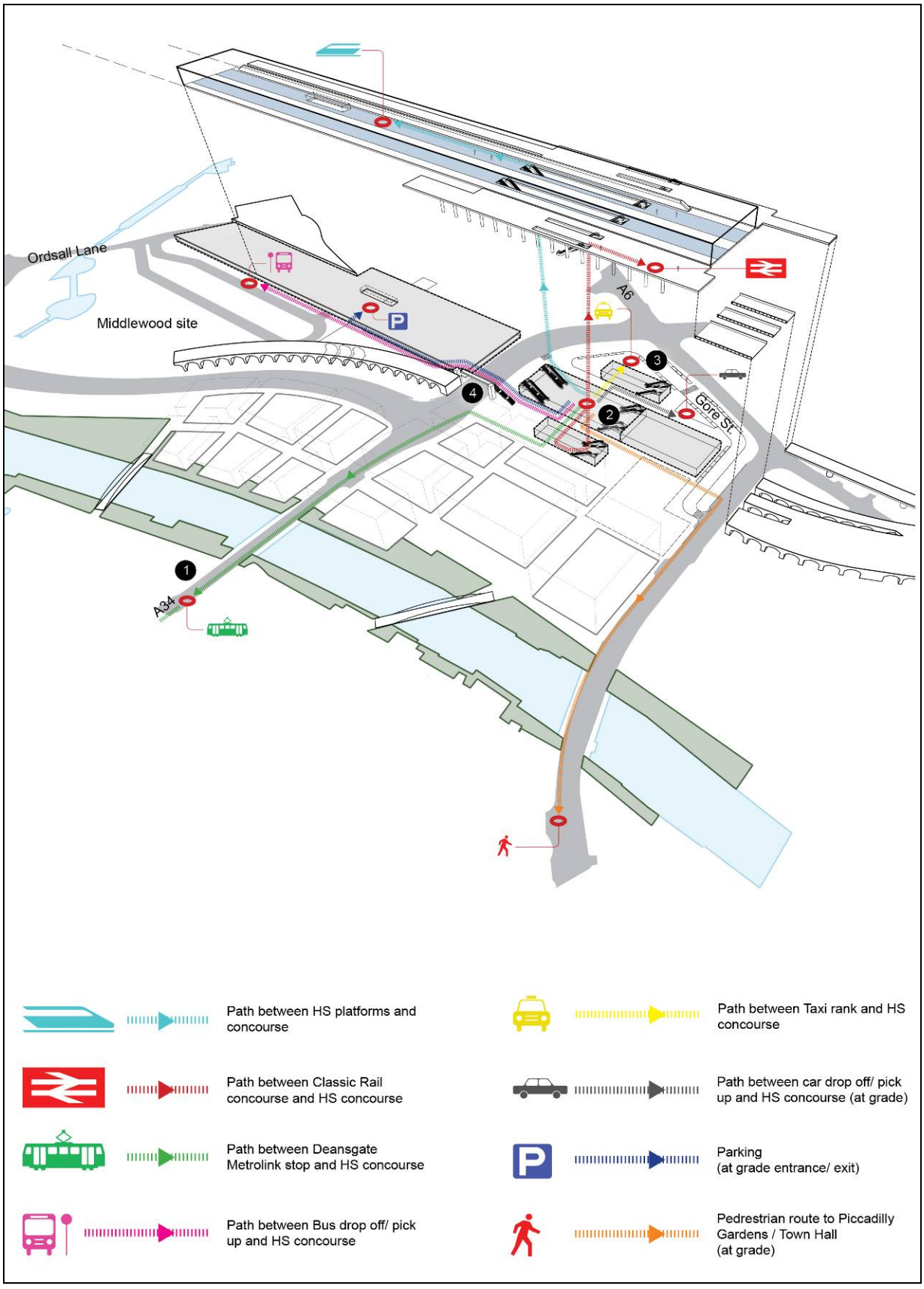


Figure 3.34: Option 19 - Intermodal Interchange

Constructability

The work would be carried out in 3 main stages. Initial Studies were carried out to identify methods of constructing the station with the primary objectives of:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure
- Minimising the land take associated with the station development

The works would be carried out in 3 main stages. The overall schedule will be four and half to five years as there is opportunity to overlap the stages. The proposals involve a much greater level of construction complexity than that of options 1A and 9B. This adds a significant level of risk and cost to a station in this location. The construction would involve working in close proximity to two sets of live railway lines and would require extensive demolitions and realignment of existing rail viaducts. Deal Street Junction would be remodelled. There would be extensive disruption to the operation of the existing station. Access for piling and construction would generally be restricted. The construction would pose the risk of settlement of adjacent structures.

Stage 1 (21 months - See Figure 3.35)

- Clear the construction areas north of the existing Salford lines and station.
- Clear the main construction area and set-up site camp.
- Rationalise existing railway junction east of station to approximate new layout.
- Construct new Salford Lines viaduct with railway on top including new section of concourse and roof with passenger access escalator routes to new platforms.
- Commence foundations and support structure for main deck beyond existing arch structure.
- Construct new bridge connection at end of new Salford Lines and divert railway on to new route.

Stage 2 (30 months - See Figure 3.36)

- Complete concourse and platform areas including escalator access to Chat Moss Lines (if platforms have previously been reinstated by Network Rail).
- Construct support structure including car park and HS2 extended platforms over carpark.
- Demolish block of flats on Middlewood Street.
- Construct approach viaduct.

Stage 3 (18 months - See Figure 3.37)

- Construct station roof.
- Construct new station facilities including commercial.
- Complete platform fit-out and install HS2 escalators to concourse.
- Complete parking areas.
- Construct access roads, taxi and bus ranks and car drop-off points.

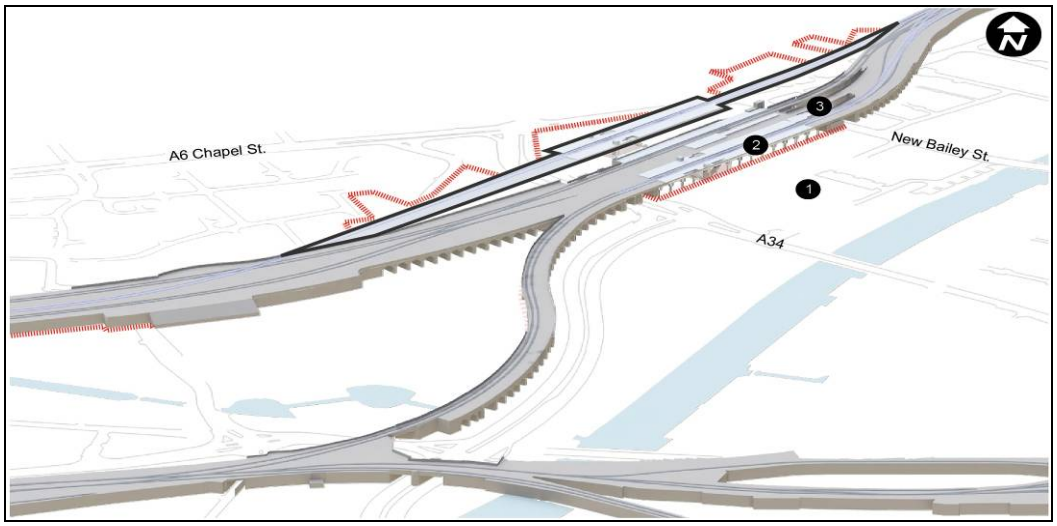


Figure 3.35: Option 19 - Construction Sequence Stage 1

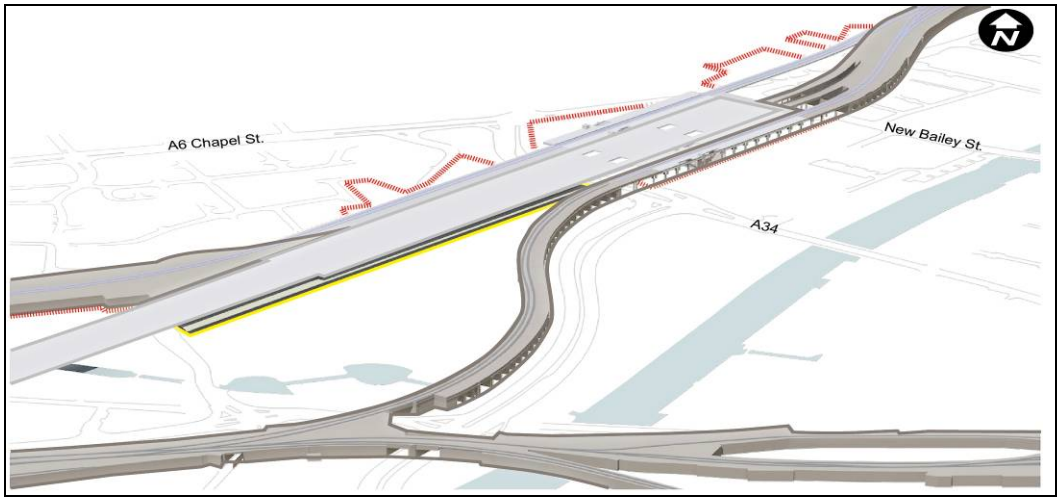


Figure 3.36: Option 19 - Construction Sequence Stage 2

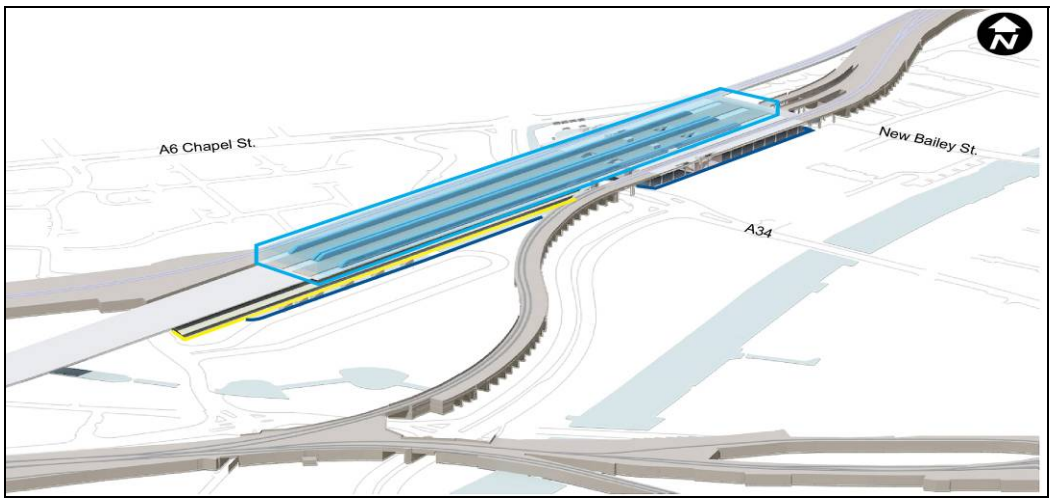


Figure 3.37: Option 19 - Construction Sequence Stage 3

3.2 Intermediate Stations

Development of intermediate station options followed the same four stage process as city centre stations:

1. the long listing stage;
2. the short listing stage;
3. the short listing stage; and
4. the development and finalisation stage.

During the long listing stage all but one of the options were parked, with option 1, M6 selected as the final option to be developed in more detail. The location of this option is shown in Figure 3.38. Details of historic options are included in section 8.2.

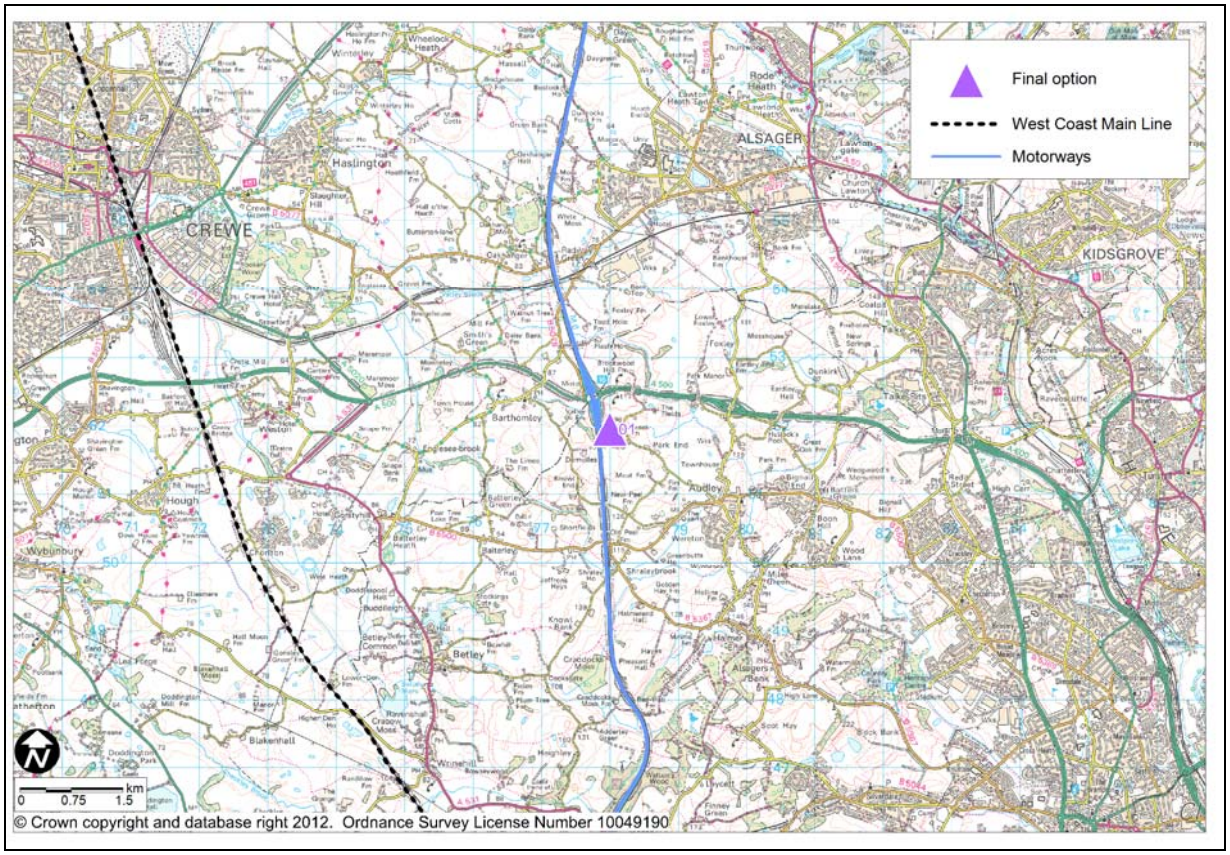


Figure 3.38: Finalised Option for Intermediate Station

3.2.1 M6 Intermediate Option

Route Layout

The platforms for the M6 intermediate station option would be located immediately south of the A500 highway, adjacent to its junction with the M6 motorway. The stopping lines which serve the platforms would diverge from the through route at a junction approximately 800m south of the centre of the station, and re-join at a junction approximately 800m north of the station. These lines would run at a similar level and to the outside of the through route tracks. See also Section 2.14, HSM14 for further line of route details.

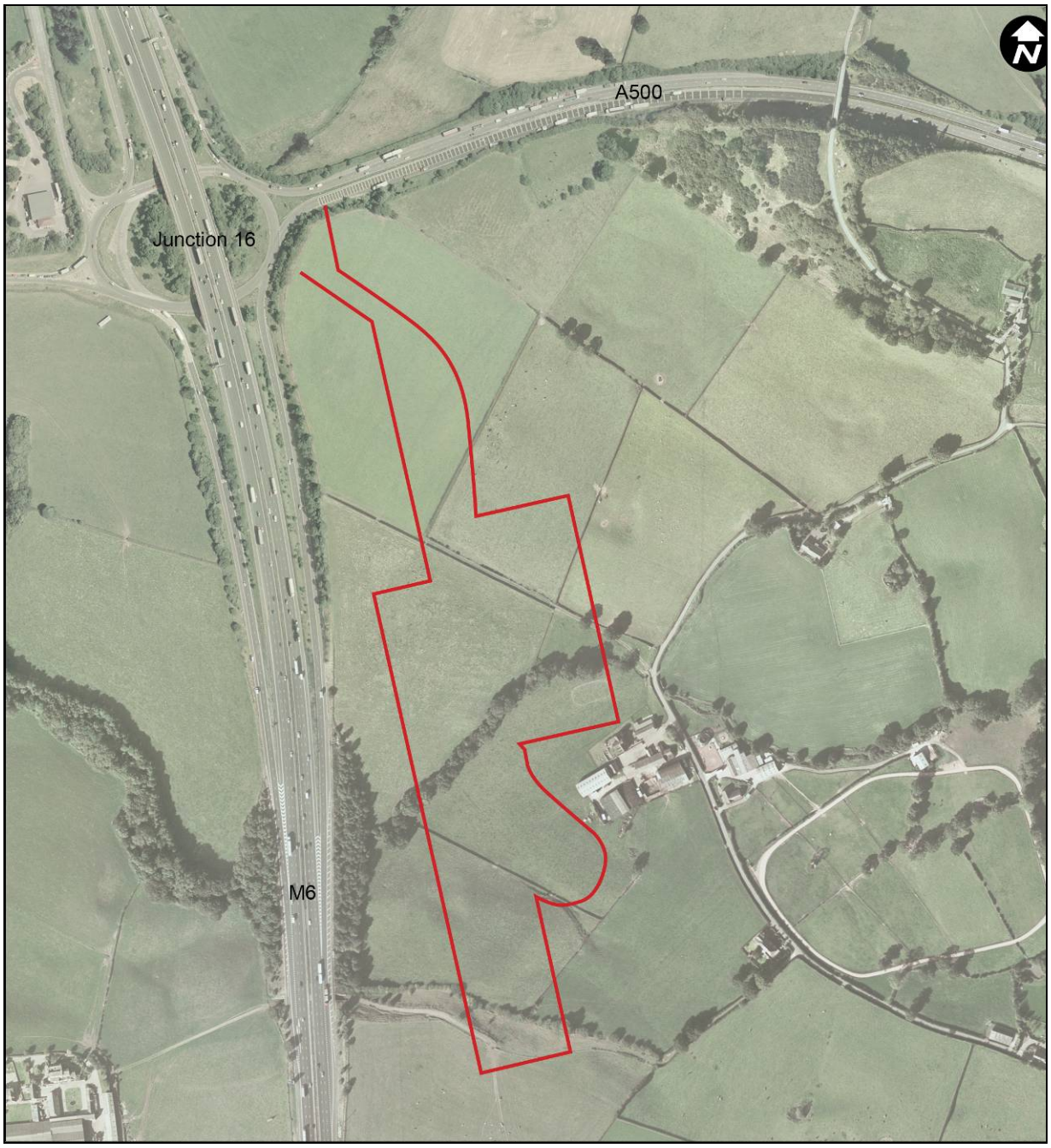


Figure 3.39: Intermediate Option - M6 - Proposed Station Footprint

Station Description

It would be located to the east of the M6 and to the south of the A500 highway that links Crewe and Stoke-on-Trent. It would lie parallel with the M6 and approximately 600m southeast of junction 16 which connects the motorway with the A500. The station footprint would be 415m long by 46.4m wide (excluding the car park) with platforms elevated approximately 10m above existing ground level.

Platforms (See Figure 3.40)

The two central through lines would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platforms would be 10.5m wide each (See Figure 3.40).

Concourse (See Figure 3.41)

HS2 concourse facilities would be located at grade below the elevated platforms. The main entrance to the concourse would be located on the eastern side of the concourse. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse (See Figure 3.41).

Forecourt and Carpark

A linear forecourt arrangement would run along the full length of the eastern side of the station. The station multi storey car park would be located to the east of the station and would accommodate 1,500 cars.

Servicing and Operations

Areas under the platforms and directly adjacent to the concourse have been identified as zones for servicing and operational support to platforms and concourse areas.

Accessibility (See Figure 3.42 & 3.43)

Vehicular access to the site from the M6 would be achieved by modifying the gyratory junction of the existing junction 16 and adding an additional approach arm to the junction at the roundabout. This would allow the station to be accessed directly from both the M6 and A500 however it would also generate significant additional HS2 and construction traffic volumes at an already congested part of the strategic road network.

The M6 forms a major link to and from the north and south of the UK and junction 16 forms a major interchange with the A500, linking Stoke-on-Trent and Crewe, Nantwich with the M6. It is understood that this interchange is subject to high traffic and that congestion on the M6 at this location is a common occurrence. It is also understood that congestion on the A500 in the direction of Stoke-on-Trent is also common.

Intermodal Interchange

The unconstrained nature of the site would facilitate an efficient station arrangement and interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off/pick up facilities would be located next to the main entrance to the concourse. The car parking facilities would be offset slightly from the concourse in order to avoid impacting existing residential and farm buildings along Park Lane. There are no existing bus services therefore interchange would be car only.

Figure 3.40: Intermediate Option - M6 - Platform Level Plan

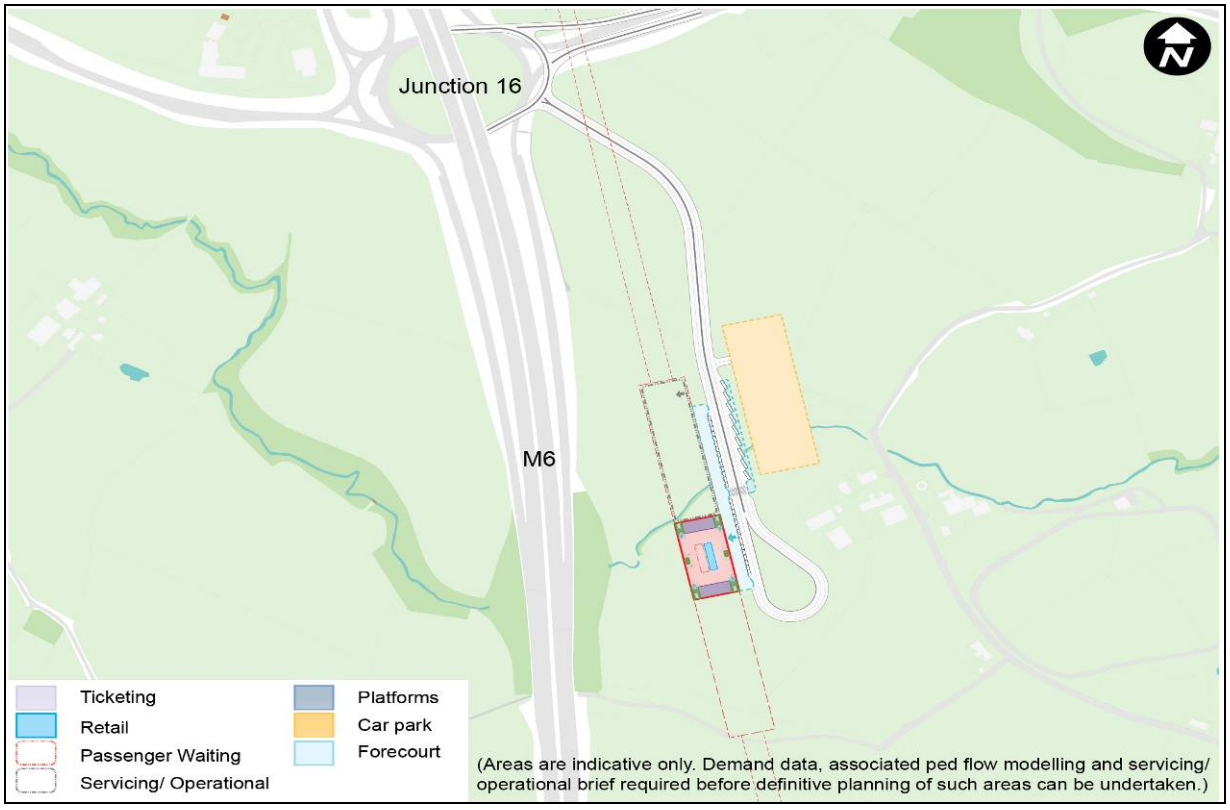


Figure 3.41: Intermediate Option - M6 - Concourse Level Plan

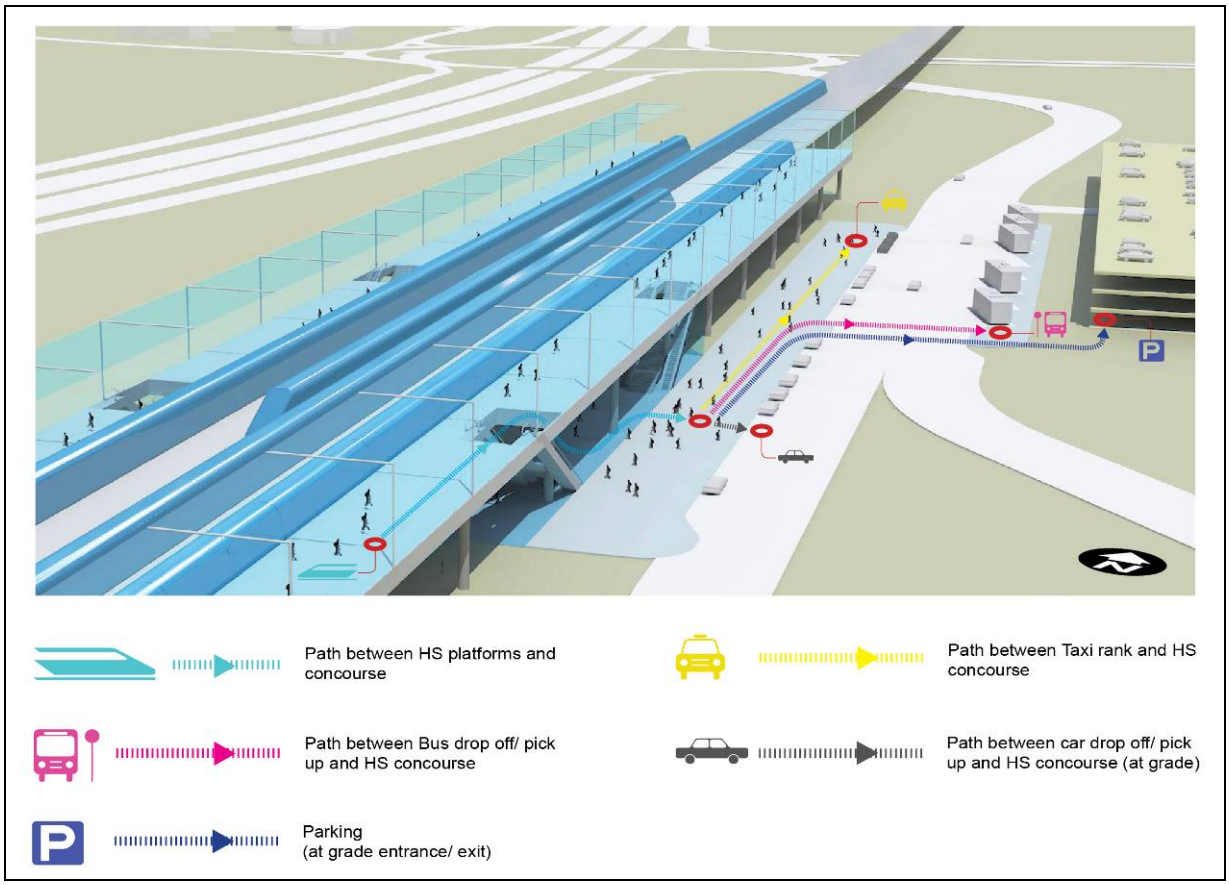


Figure 3.42: Intermediate Option - M6 - Intermodal Interchange Diagram

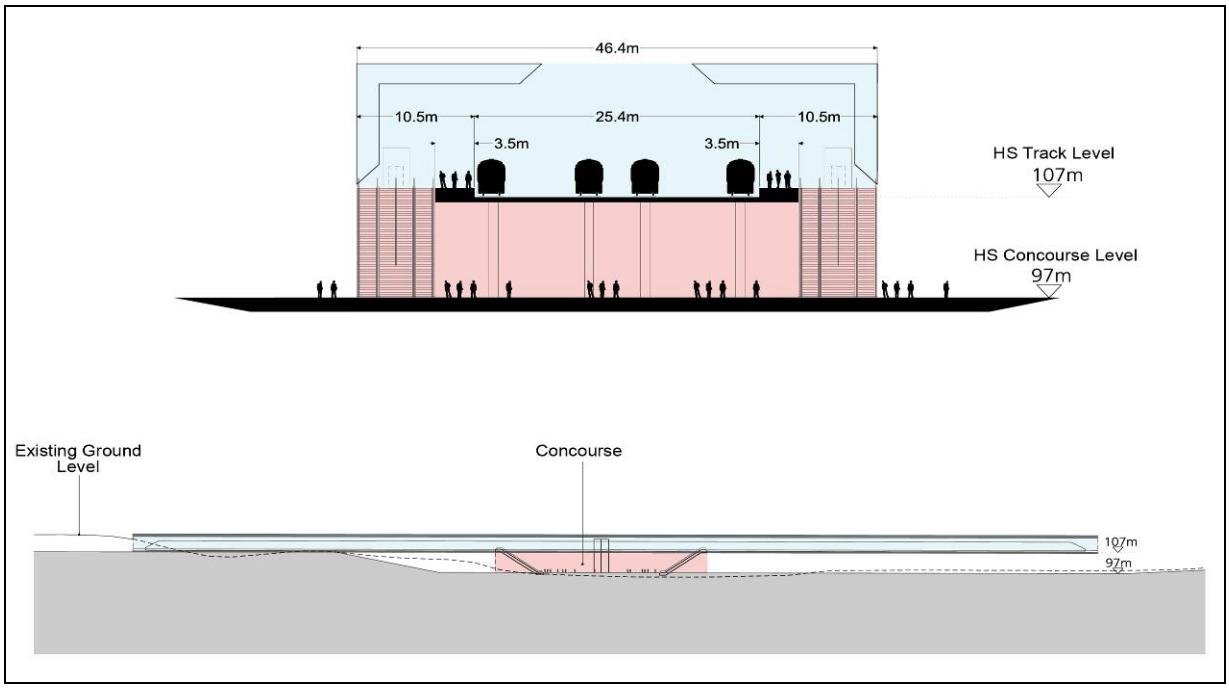


Figure 3.43: Intermediate Option - M6 – Cross And Long Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage1 (14 months)

- Clear the construction area and set-up site compound.
- Construct temporary access road from the A500 west bound carriageway.
- Construct new A500 roundabout and slip road arrangement at M6 junction 16.
- Construct foundations and piers for station structure and approach HS2 viaducts from the north and south.

Stage 2 (18 months)

- Construct deck structures and platforms.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (18 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new multi-storey car park.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc.

3.3 Interchange Stations

The interchange station options were developed in four distinct stages:

1. the long listing stage;
2. the short listing stage;
3. the selection of options for further development stage; and
4. the development and finalisation stage.

During each stage, a sifting process parked some of the options based on established criteria and selected others to be developed in more details until the final stage, details of historic options are included in section 8.3.

During the development and finalisation of the options, two new options 4e (Manchester airport north/south) and 5a (Knutsford) were developed to accommodate line of route progress.

The sifting process selected the following options to be developed and finalised:

- 4c – Manchester airport north/south
- 4e – Manchester airport north/south
- 4d – Manchester airport east/west (variant 1 in previous stage)
- 5 – Knutsford
- 5a – Knutsford
- 30 – Preston M55

The location of these options is shown on Figure 3.45.

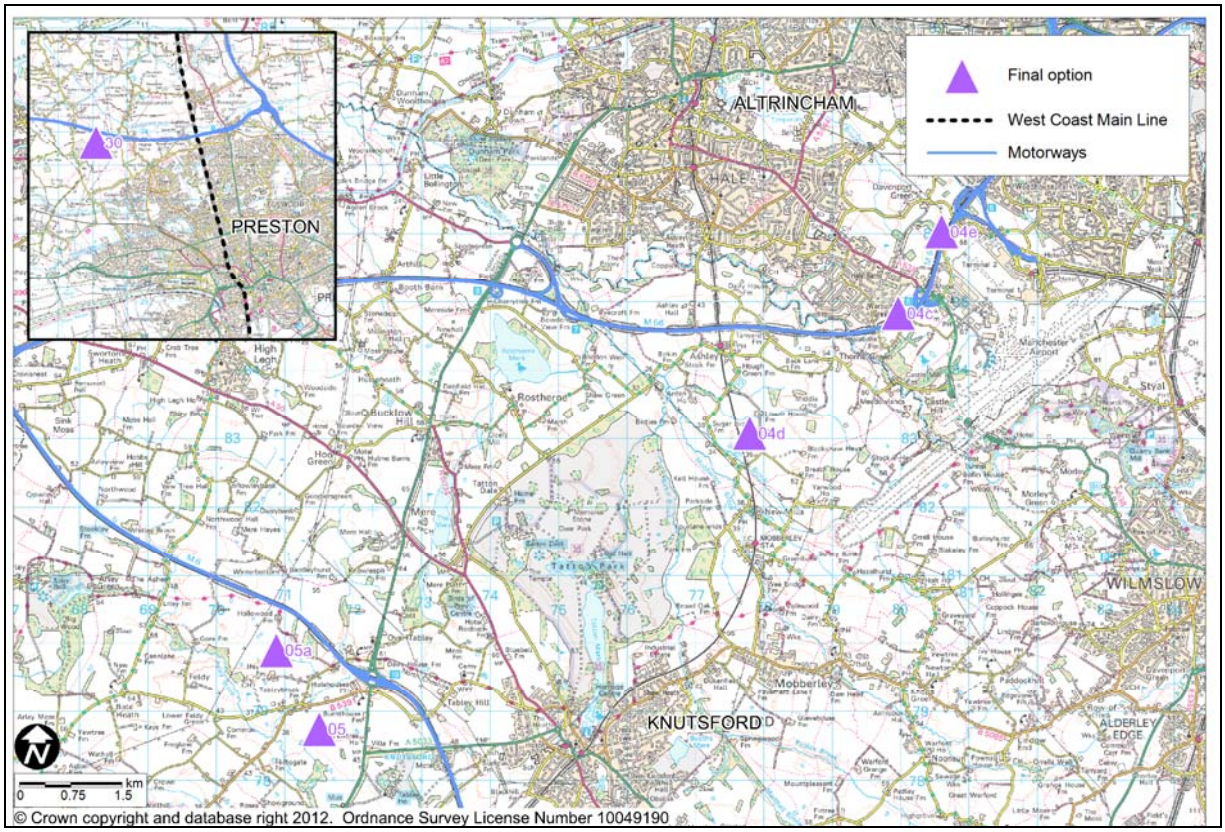


Figure 3.44: Finalised Options For Interchange Stations

3.3.1 Option 4c Manchester Airport Interchange (North/South)

Route Layout (See Figure 3.45)

The platforms for station option 4c would be located adjacent to the existing Altrinch am to Chester railway. The stopping lines which serve the platforms would diverge from the route at a junction approximately 3.7km to the south of the centre of the station, and re-join at a junction 3.2km to the north. These lines would run at a similar level and to the outside of the spur route tracks. See also Section 2.26, HSM25 for further line of route detail.

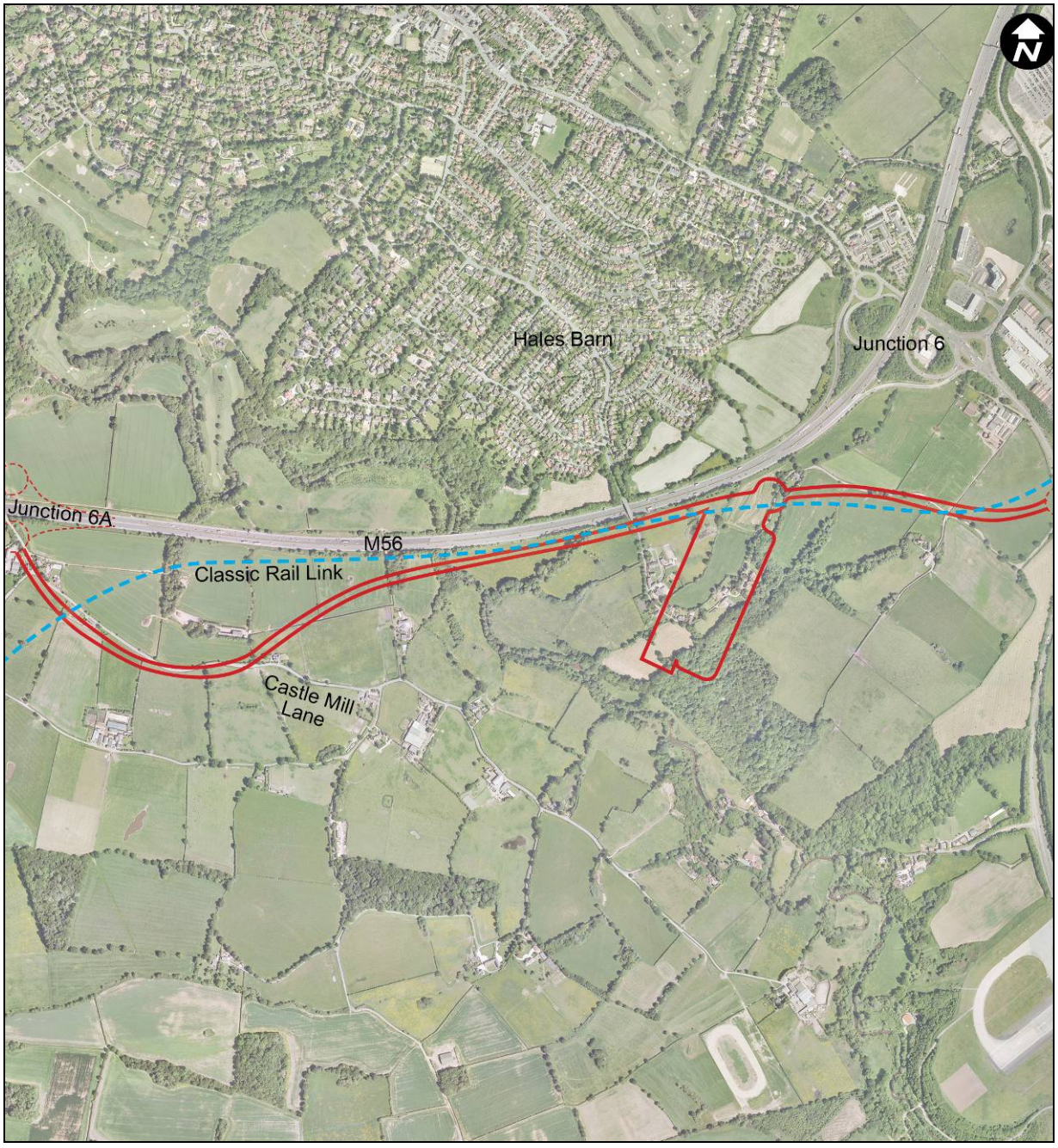


Figure 3.45: Interchange Option 4c - Proposed Station Footprint

Station Description

The station would be located 2.2km south west of Manchester Airport. It would be on a site directly south of the M56. The station footprint would be 415m long by 45.2m wide (excluding the car park) with platforms in cutting approximately 10m below existing ground level.

Platforms (See Figure 3.46)

The two through lines on the spur to Manchester Piccadilly would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platforms would be 10.5m wide each.

Concourse (See Figure 3.47)

HS2 concourse facilities would be located at grade above the platforms. The main entrance to the concourse would be located on the eastern side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt and Carpark

A linear forecourt arrangement would run along the full length of the eastern side of the station. The station multi-storey car park would be located to the east of the station and would accommodate 3,000 cars.

Servicing and Operations

Areas directly adjacent to the concourse have been identified as zones for servicing and operational support to platforms and concourse. Areas directly adjacent to the multi storey car park (MSCP) have been identified for servicing needs which would not be directly connected to platform and concourse.

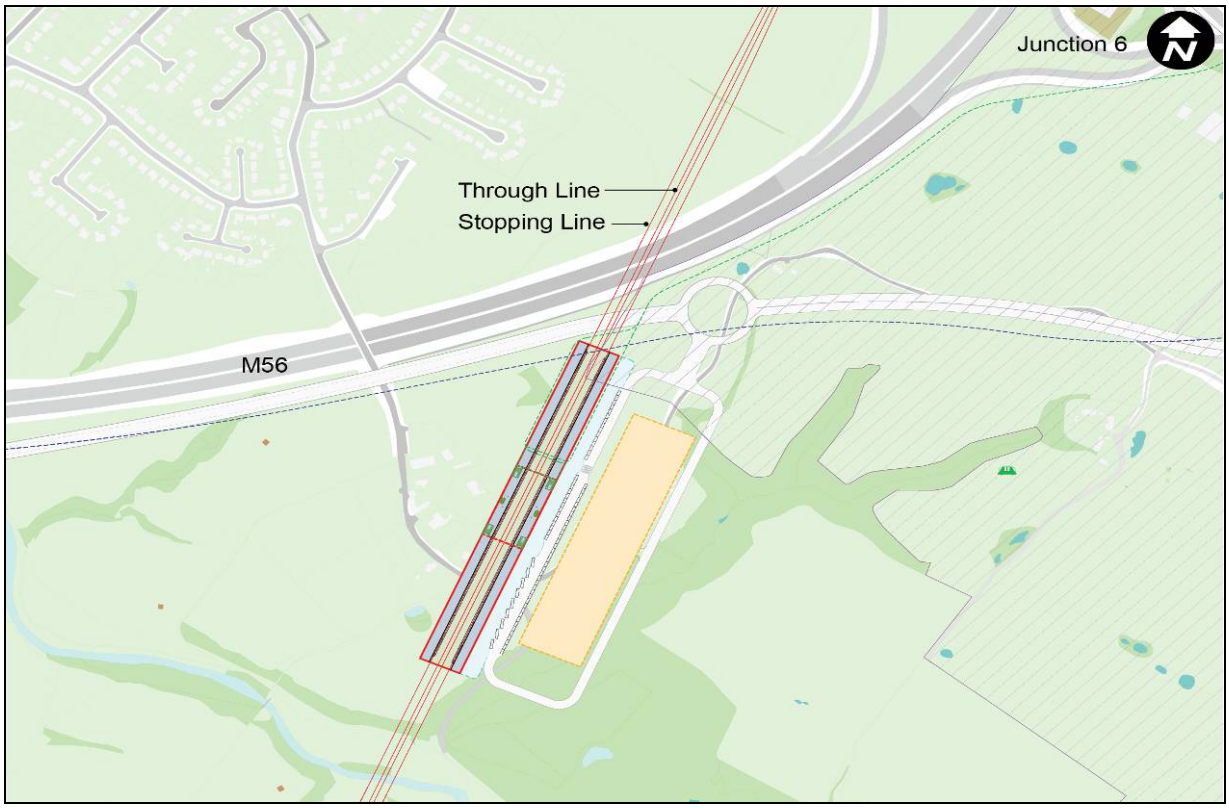


Figure 3.46: Interchange Option 4c - Platform Level Plan

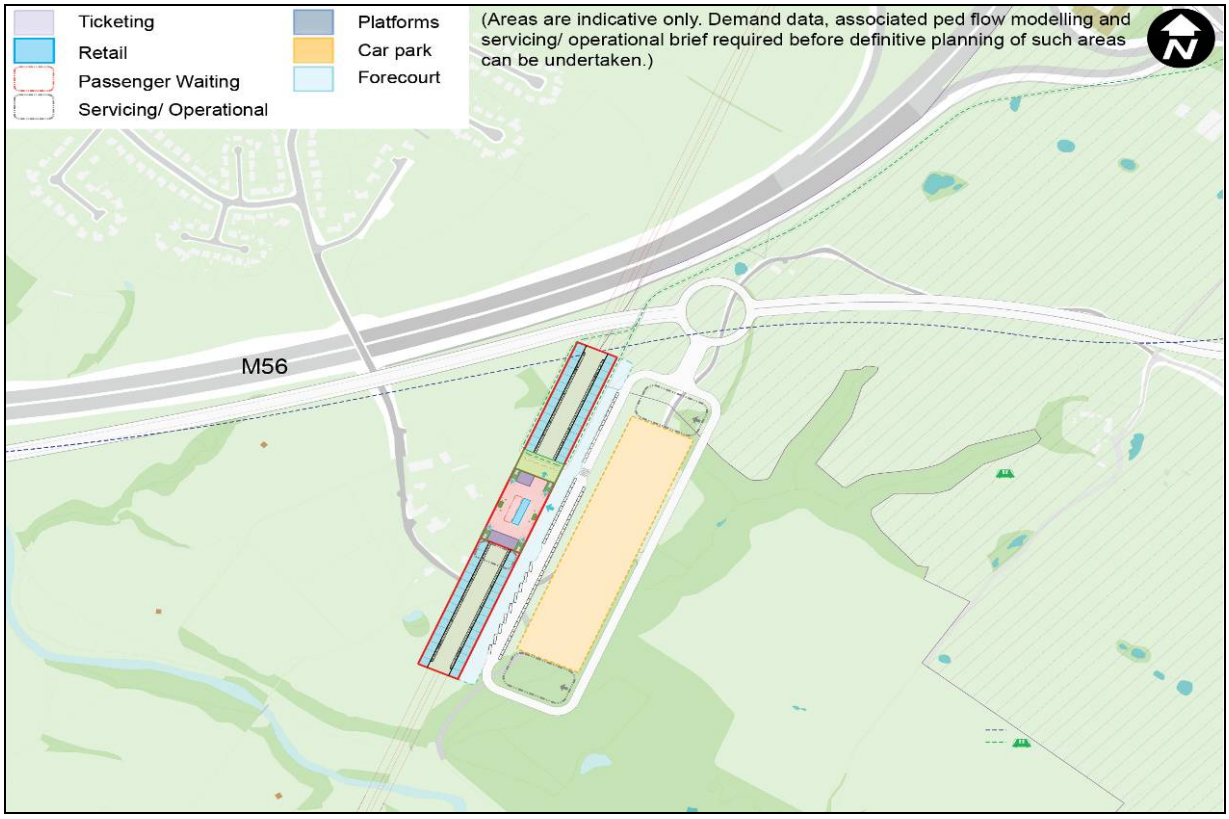


Figure 3.47: Interchange Option 4c - Concourse Level Plan

Accessibility

The primary pedestrian entrance to the HS2 concourse would be from the eastern, airport facing, side of the station. As the concourse box would sit unconstrained on the site of an entrance from western, Hales Barn/ M56 facing, side would also be possible which would aid cross site connectivity and station accessibility.

Vehicular access to the site from the M56 would be via a new grade-separated dumbbell junction, 6a, at a point approximately midway between the existing junctions 6 and 7 at Ashley, with a new section of link road, approximately 1.4 miles long constructed to connect the new junction with the proposed Airport Interchange station. Furthermore, a short section of carriageway would be constructed to link the motorway junction with local roads at a new junction with Castle Mill Lane/Ashley Road.

At this location the new M56 junction would remove HS2 traffic from the M56 junction 6/A538 junction and Wilmslow Road, negating the need for junction remodelling. Construction impacts of the junction would be limited as the M56 would be the only highway affected and could remain open for the majority of time required to construct the grade-separated junction.

The airport could be accessed by road from the interchange station via the new link road, M56 and junction 5 (Ringway Road West) and/or junction 6 (A538 Wilmslow Road) or by a separate Personal Rapid Transport system (PRT).

A separate link road would be constructed between the HS2 interchange and a new at grade roundabout on the A538 Wilmslow Road immediately to the east of the M56 junction 6. The A538 Wilmslow Road is currently subject to high traffic demand particularly at peak times, therefore, the traffic between the HS2 interchange and the airport via this route would be restricted to public transport, taxies and service vehicles only.

Intermodal Interchange (See Figure 3.48 & 3.49)

The unconstrained nature of the site would facilitate an efficient station arrangement and interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off and pick up facilities would be located next to the station entrance.

Passengers transferring to the Airport would use a PRT system. The proposed arrangement of the PRT interchange area is as an extension north of the main HS2 concourse facilities. The distance from the HS2 station to Terminal 1 of Manchester Airport via PRT would be 3.5km, with a journey time of approximately 7 minutes.

There are two bus routes along the A538 Hale Road/Wilmslow Road; Route 18 services connect the airport with Hale and Altrincham via the A538 to the Cargo Centre, main terminal complex and Trafford centre, and services along Route 19 during the early morning, connect the cargo centre with the main airport complex, Wythenshawe and Altrincham. A slight modification to these routes would enable them to serve this interchange station.

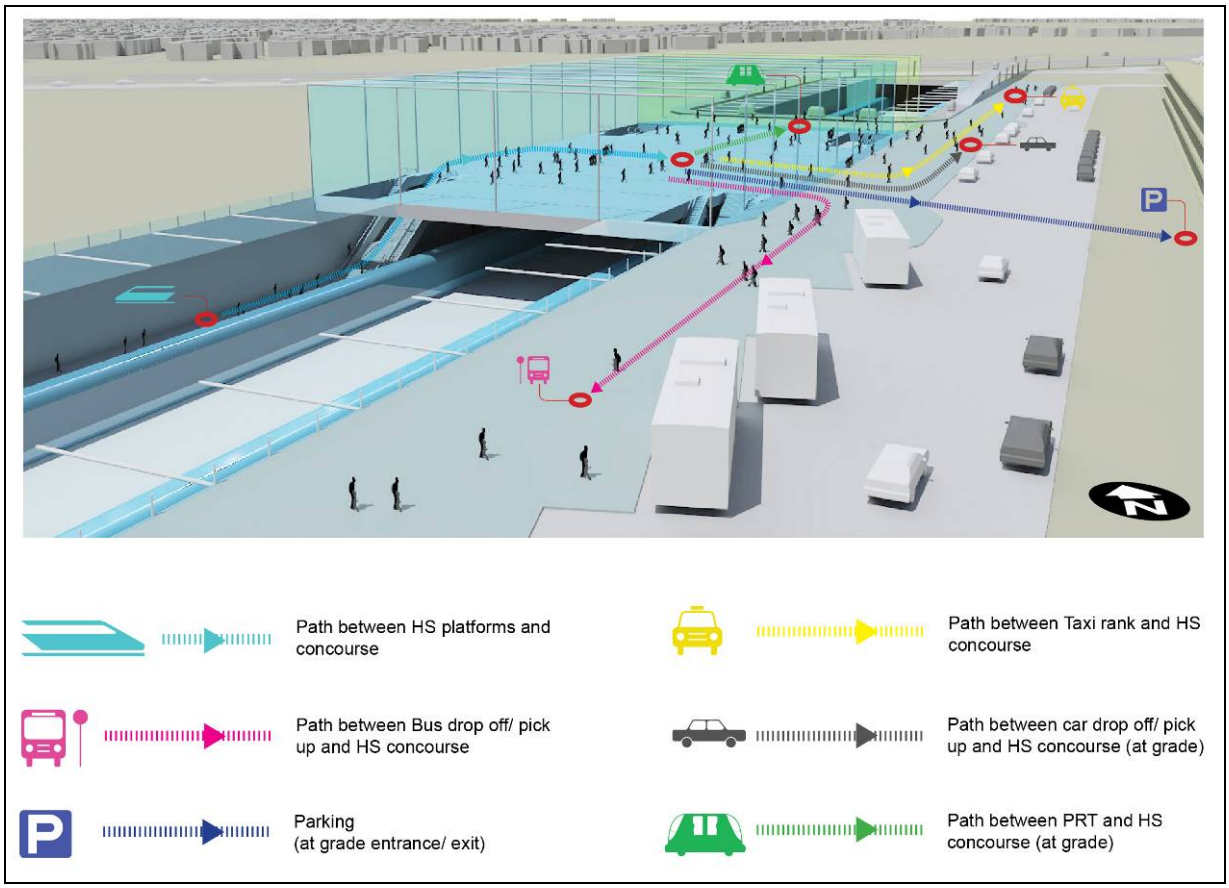


Figure 3.48: Interchange Option 4c - Intermodal Interchange Diagram

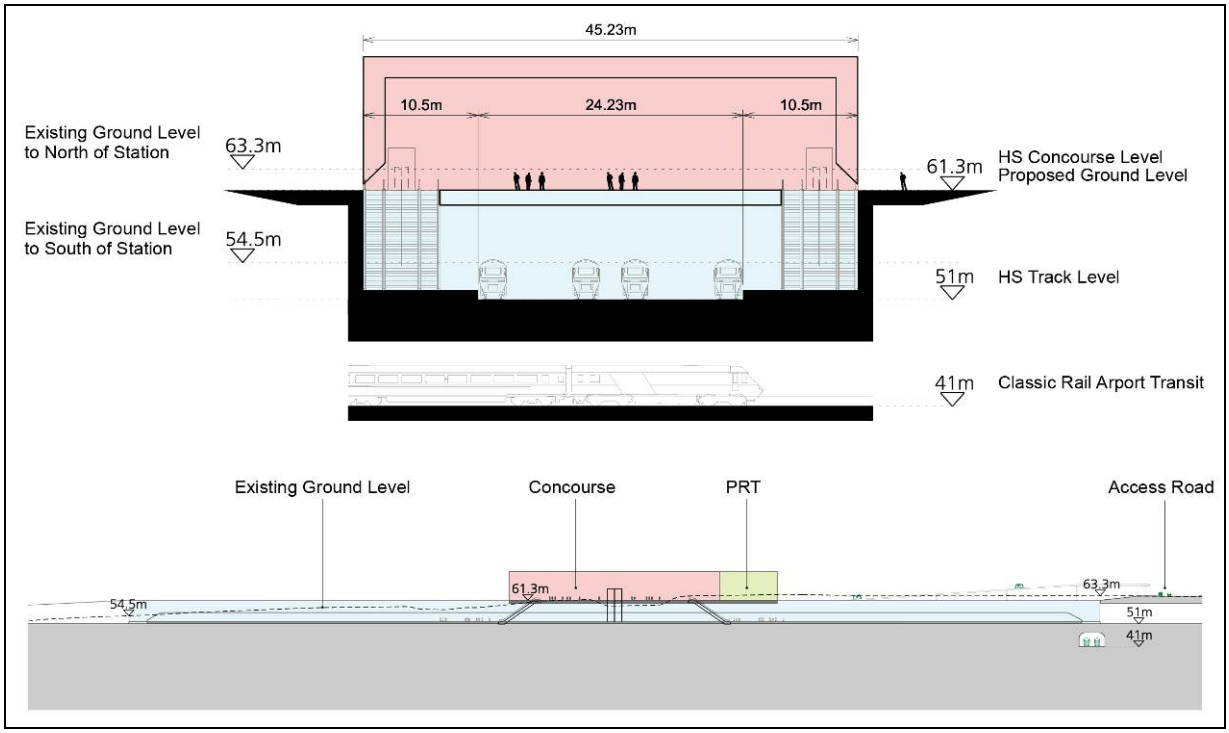


Figure 3.49: Interchange Option 4c – Cross And Long Sectional Views Of Proposed Station

Constructability

Constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage 1 (26 months)

- Clear the construction area and set-up site compound using temporary access from Warburton Green.
- Construct new roundabout and road connection to spur from Airport Tunnel road.
- Excavate and construct foundations and concrete box for the existing railway station structure.
- Excavate and construct foundations and construct HS2 open concrete box structure.

Stage 2 (12 months)

- Construct platforms.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (17 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new multi-storey car park.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc

3.3.2 Option 4d Manchester Airport Interchange (East/West)

Route Layout (See Figure 3.50)

The platforms for station option 4d would be located adjacent to the existing Altrincham to Chester railway. The stopping lines which serve the platforms would diverge from the route at a junction approximately 3.7km to the south of the centre of the station, and re-join at a junction 3.2km to the north. These lines would run at a similar level and to the outside of the through route tracks. See also Section 2.19, HSM19 for further line of route detail.

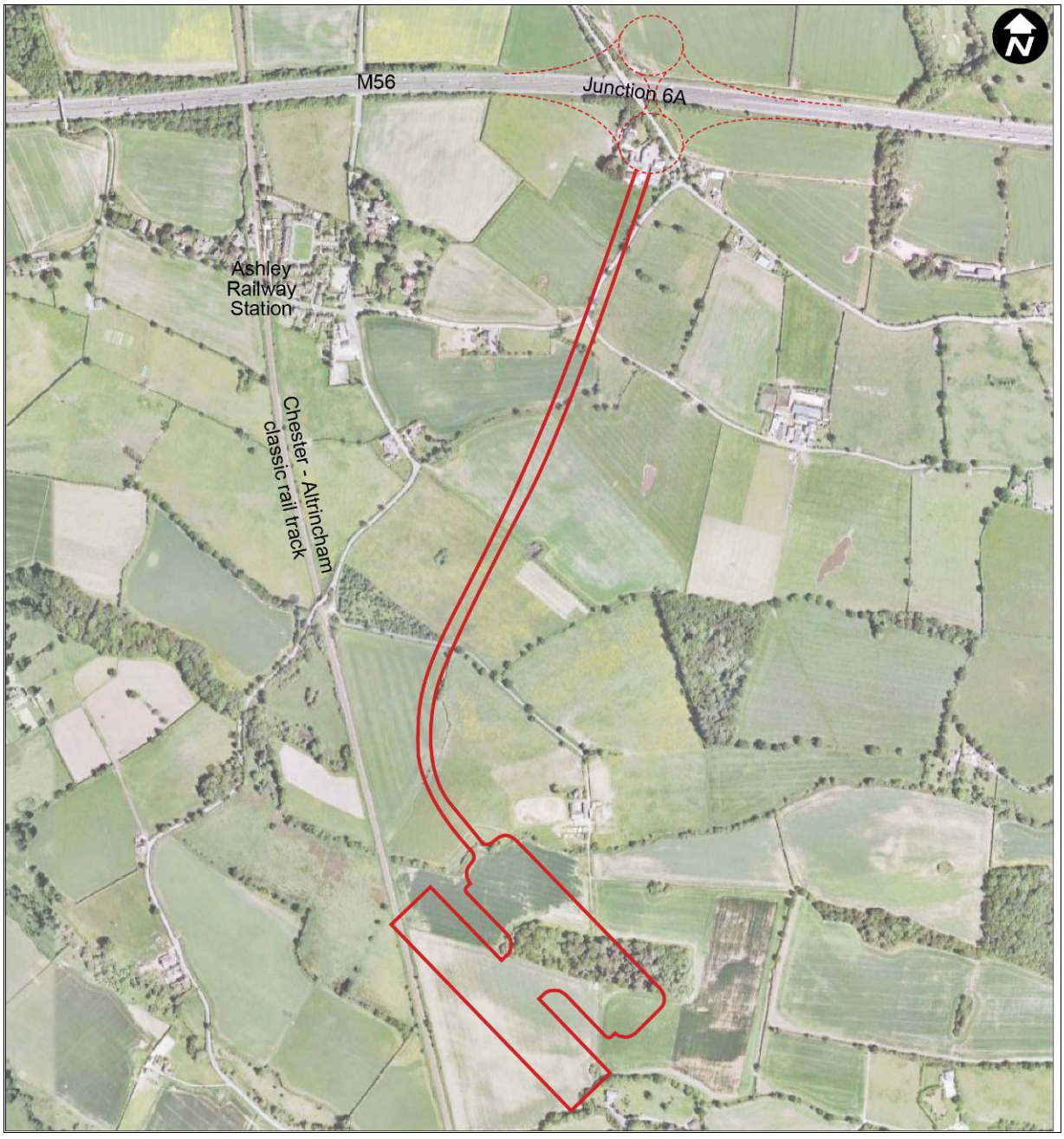


Figure 3.50: Interchange Option 4d - Proposed Station Footprint

Station Description

The station would be located on a green field site approximately 4.0km south west of Manchester Airport and immediately adjacent to the existing Chester - Altrincham railway. It would be approximately 1.5km south of the M56. The station footprint would be 415m long by 55.8m wide (excluding the car park) with platforms elevated approximately 3.5m above existing ground level.

Platforms (See Figure 3.51)

The two through lines would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platforms would be 10.5m wide each.

Concourse (See Figure 3.52)

HS2 concourse facilities would be split between the entrance at ground level and an elevated concourse deck over the tracks. The main entrance to the concourse would be located on the north eastern side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt/ Car park

A linear forecourt arrangement would run along the north eastern side of the station. The station multi-storey car park would be located to the east of the station and would accommodate 3,000 cars.

Servicing/Operations

Areas directly adjacent to the MSCP have been identified as zones for servicing/operational support to platforms/concourse.

Figure 3.51: Interchange Option 4d - Platform Level Plan

Figure 3.52: Interchange Option 4d- Concourse Level Plan

Accessibility (See Figure 3.50)

The primary pedestrian entrance to the HS2 concourse would be from the north eastern, airport facing, side of the station.

Vehicular access to the site from the M56 would be via a new grade-separated dumbbell junction, 6a, which would be constructed at a point approximately midway between the existing junctions 6 and 7 at Ashley, with a new section of link road approximately 1.4km long constructed to connect the new junction with the proposed airport interchange station.

In order to accommodate peak flows to and from the M56, as well as the interchange station park and ride, it is anticipated that the link road would be dual two lane carriageways. Furthermore it is anticipated that the increased traffic flows on the M56 would mean that the capacity, in both directions would need to be increased. This could be achieved by widening or the introduction of hard shoulder running.

The airport could be accessed by road from the interchange station via the new link road, M56 and junction 5 (Ringway Road West) and junction 6 (A538 Wilmslow Road), or by a separate PRT system.

Intermodal Interchange (See Figure 3.53 & 3.54)

The unconstrained nature of the site would facilitate the planning of an efficient station arrangement and interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off/pick up facilities would be located next to the station entrance.

Passengers transferring to the airport would use a PRT system. The proposed location of the PRT interchange area would be adjacent to the HS2 concourse. The distance from the HS2 station to terminal 1 of Manchester Airport via PRT would be 7km, with a journey time of approximately 14 minutes. There are no bus routes along the M56

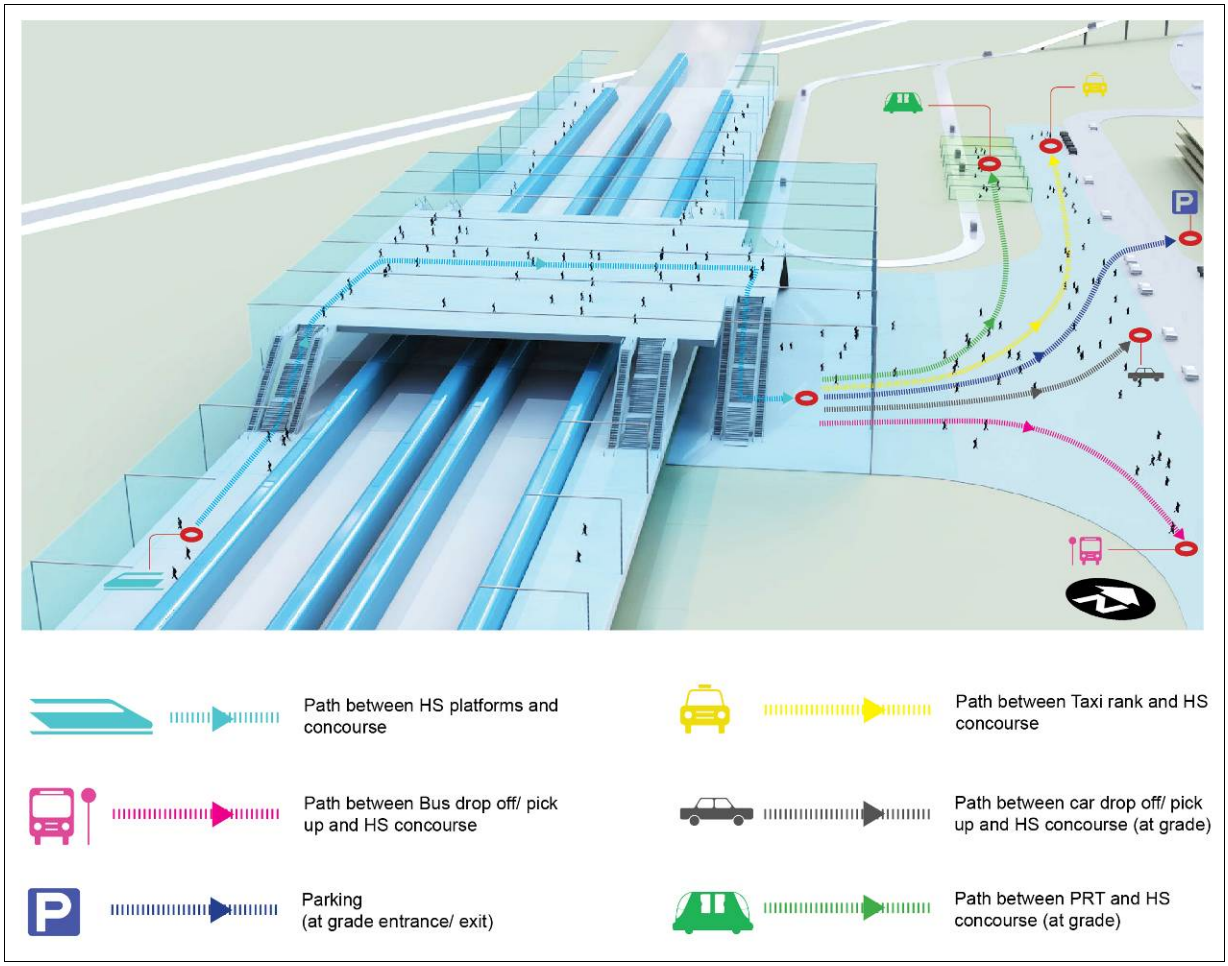


Figure 3.53: Interchange Option 4d - Intermodal Interchange Diagram

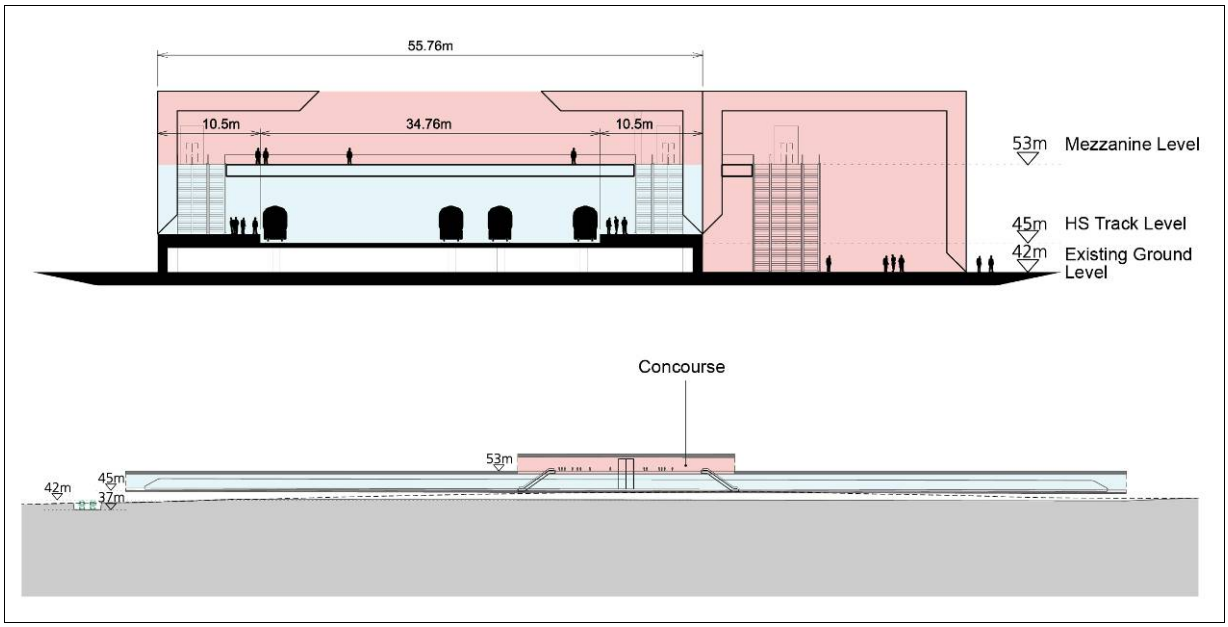


Figure 3.54: Interchange Option 4d – Cross And Long Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage 1 (14 months)

- Clear the construction area and set-up site compound using temporary access from Mobberley Road/Breach House Lane.
- Construct new M56 interchange and link road.
- Construct foundations and piers for station structure and approach HS2 viaducts from the north and south.

Stage 2 (21 months)

- Construct deck structures and platforms.
- Construct mezzanine deck.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (18 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new multi-storey car park.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc

3.3.3 Option 4e Manchester Airport Interchange (North/South)

Route Layout (See Figure 3.55)

The platforms for station option 4e would be located west of the M56 between junctions 5 and 6. The stopping lines which serve the platforms would diverge from the route to Manchester Piccadilly at a junction approximately 600m south of the centre of the station, and re-join at a junction approximately 600m north immediately prior to the route descending into tunnel. The through lines at the station location would diverge from each other to provide sufficient separation for the twin bore tunnels immediately to the north; the stopping lines would diverge into the centre rather than the outside to utilise this additional width. See also Section 2.30, HSM28B for further line of route details.

Figure 3.55: Interchange Option 4e - Proposed Station Footprint

Station Description

It would be located less than one km west of Manchester Airport. The site lies immediately west of the M56. The distance by road to junction 5 would be 2.5km and 1.2km to junction 6. The station footprint would be 415m long by 37.6m wide (excluding the car park) with platforms in cutting approximately 8.5m below existing ground level.

Platforms (See Figure 3.56)

The two outer through lines on the spur to Manchester Piccadilly would enable HS2 trains to run at maximum speed whilst the two inner stopping lines would enable trains to stop and serve the station via an island platform. The platform would be 14m wide.

Concourse (See Figure 3.57)

HS2 concourse facilities would be located at grade above the platforms. The main entrance to the concourse would be located on the eastern, airport facing, side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt and Carpark

A linear forecourt arrangement would run along the full length of the eastern side of the station. The station multi-storey car park would be located to the west of the station and would accommodate 3,000 cars.

Servicing and Operations

Areas directly adjacent to the concourse have been identified as zones for servicing and operational support to platforms and concourse areas.

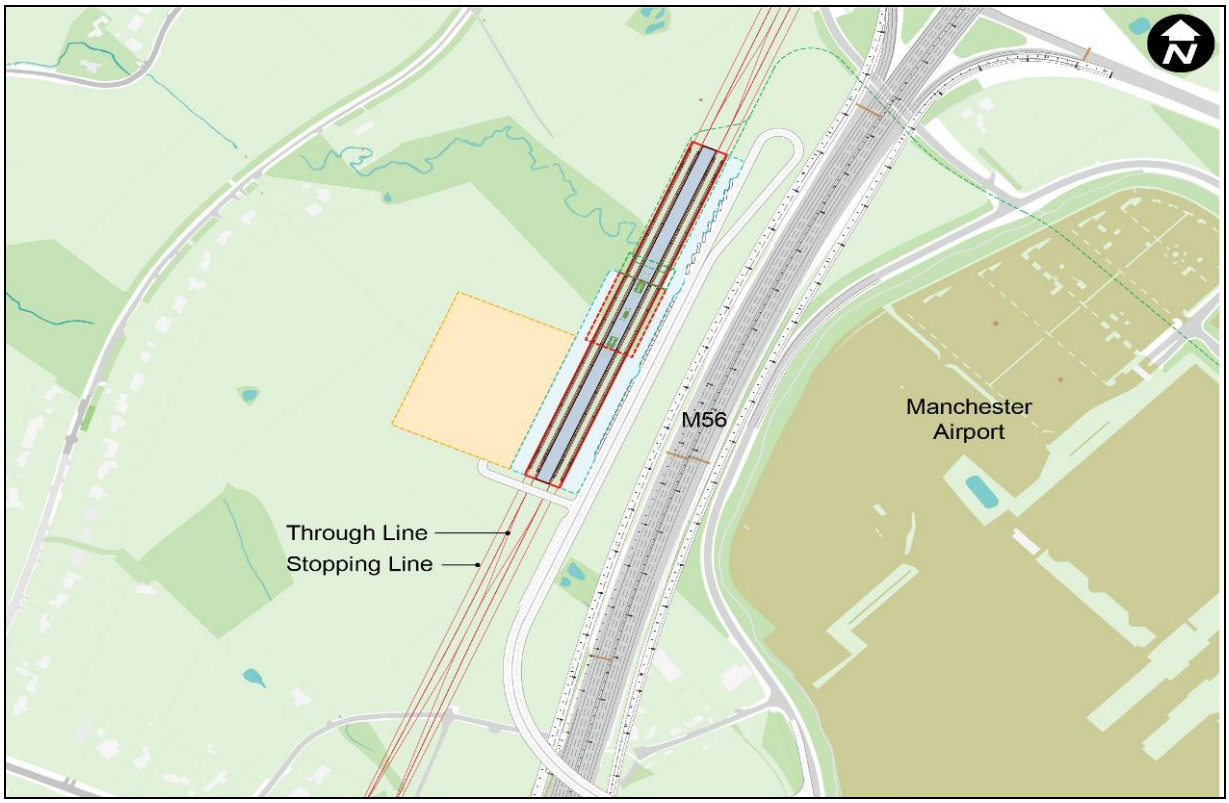


Figure 3.56: Interchange Option 4e - Platform Level Plan

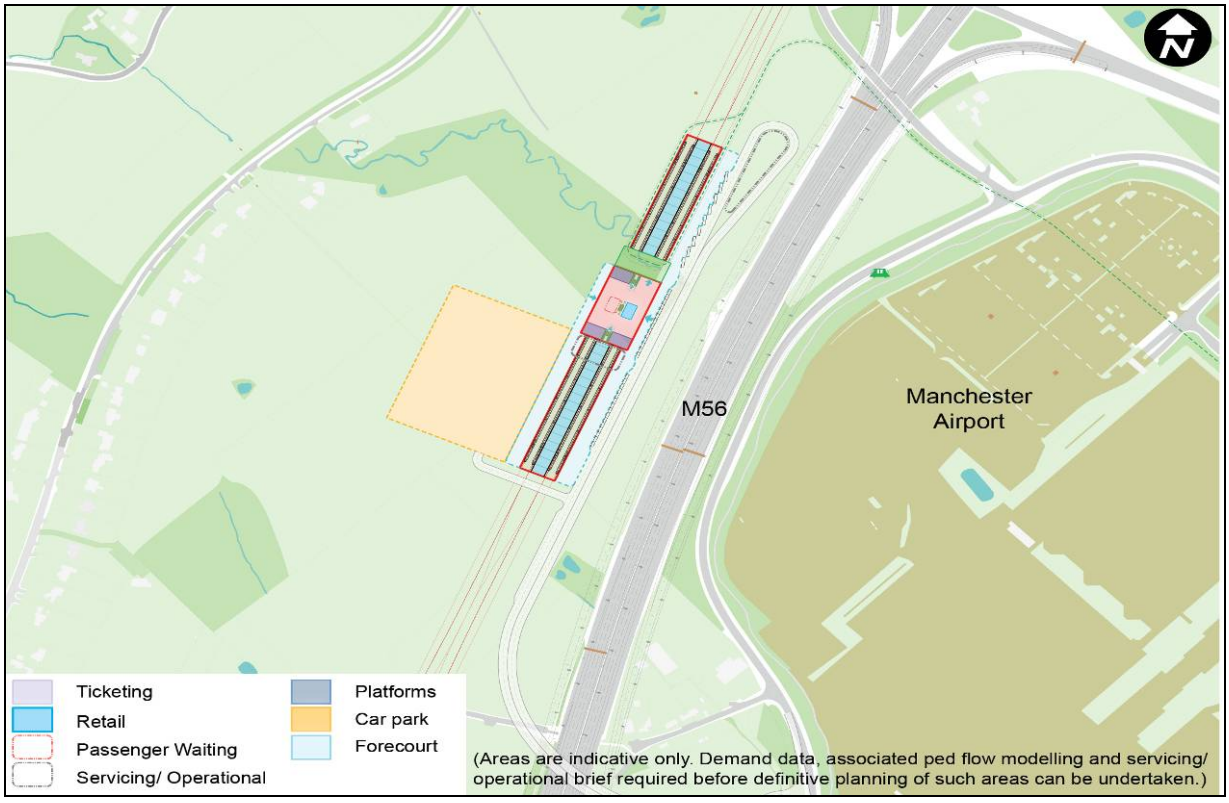


Figure 3.57: Interchange Option 4e - Concourse Level Plan

Accessibility (See Figure 3.55)

Vehicular access to the site from the M56 would be via an improved junction 6. Junction capacity issues have been identified with the existing M56 Junction 6. This junction comprises of a grade-separated 'compact' half-cloverleaf dumb-bell junction. It is understood that congestion and queuing issues are associated with both roundabouts and the section of 2-lane A538 dual-carriageway connecting the two roundabouts under the M56 carriageway.

As such, to provide sufficient capacity for the motorway network, local highway network and access to the proposed HS2 Station, the existing junction 6 must be improved. These improvements may include the construction of a large gyratory roundabout (which would be signalised and provide the required storage for queuing) and new slip roads (linking junction 6 and 5).

Eastbound traffic from the A556/M6 could leave the M56 at the improved junction 6 to access the interchange station. Eastbound traffic from the interchange would join the M56 as normal at junction 6. Traffic from the interchange and eastbound traffic heading to Manchester International Airport Terminal complex would exit the M56 at junction 6, and follow the link roads that connect to junction 5 and merge onto Ringway Road West.

Westbound traffic from the M60 heading to the airport would leave the M56 at junction 5 and onto Ringway Road West. Westbound traffic leaving the airport would diverge from Ringway Road West onto the new link road connecting junction 5 and junction 6 of the M56, continue onto the roundabout at junction 6 then onto the Westbound Merge Slip and merge onto the M56. Traffic from the airport to the interchange station would follow the same route but exit off the roundabout onto Runger Lane heading east.

Westbound traffic from the M60 heading to the interchange station would exit the M56 at junction 6 (Westbound Diverge Slip Road) and at the roundabout take the first exit onto the Runger Lane.
Runger Lane would be improved from junction 6 to a new roundabout on Runger Lane between the airport access and Hasty Lane, from which the interchange station link road would connect into.

Intermodal Interchange (See Figure 3.58 & 3.59)

The unconstrained nature of the site would facilitate an efficient planning of station arrangement and a resultant short interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off and pick up facilities would be located next to the station entrance.

Passengers transferring to Manchester Airport would use a PRT system. The proposed arrangement of the PRT interchange area would be as an extension north of the main HS2 concourse facilities. The distance from the HS2 station to Terminal 1 of Manchester Airport via PRT would be 2.1km, with a journey time of approximately 5 minutes.

There are two bus routes along the A538 Hale Road/Wilmslow Road; Route 18 services connect the airport with Hale and Altrincham via the A538 to the Cargo Centre, main terminal complex and Trafford Centre, and services along Route 19 during the early morning, connect the cargo centre with the main airport complex, Wythenshawe and Altrincham. A slight modification to these routes would enable them to serve the interchange station.

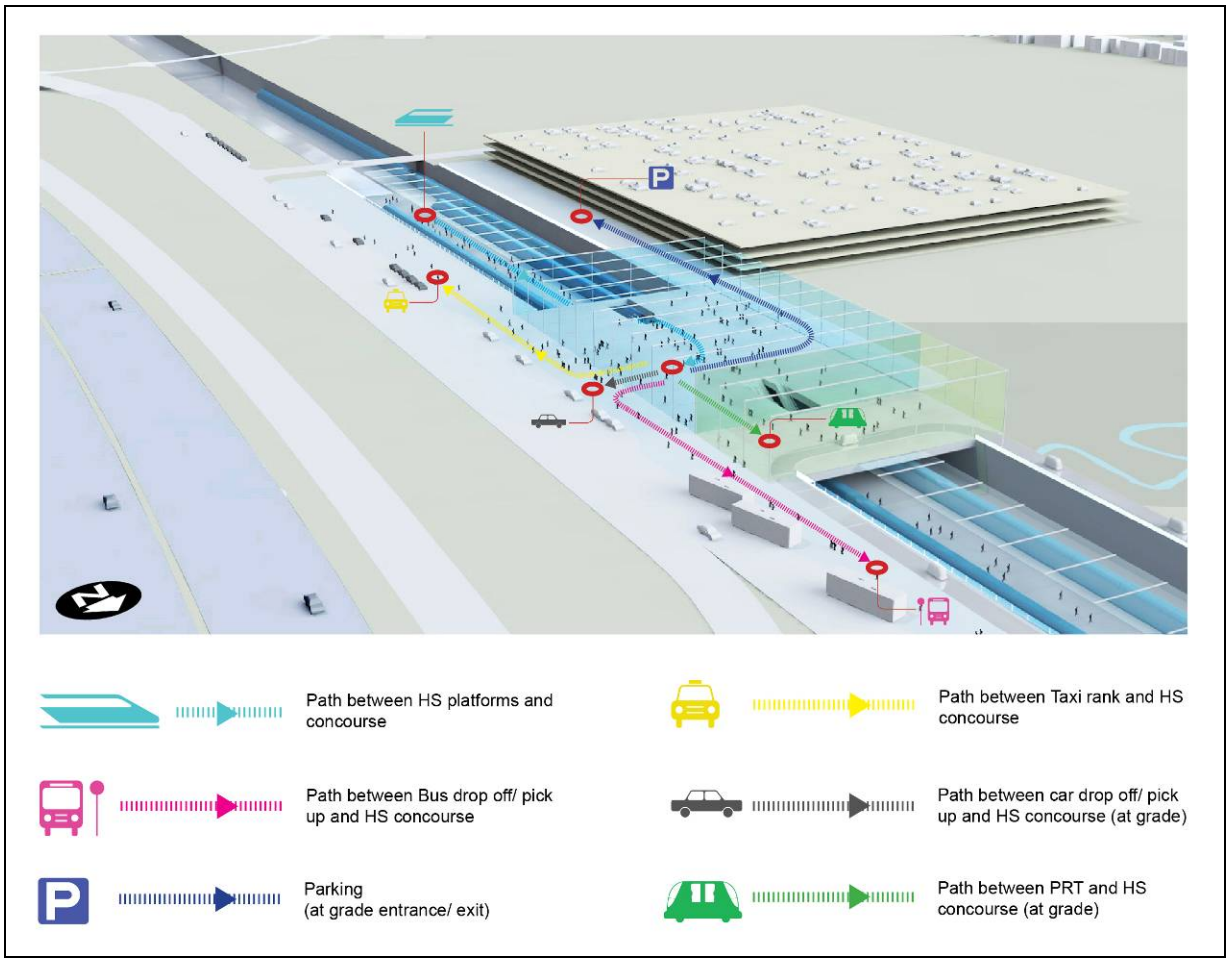


Figure 3.58: Interchange Option 4e - Intermodal Interchange Diagram

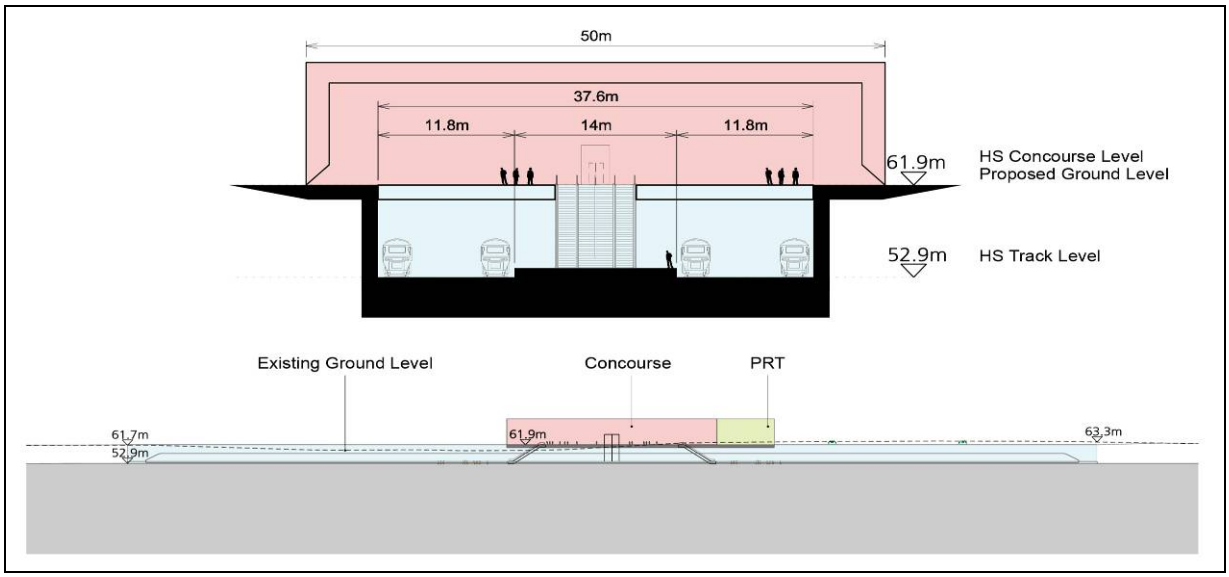


Figure 3.59: Interchange Option 4e - Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage 1 (26 months)

- Clear the construction area and set-up site compound using temporary access from Hasty Lane.
- Construct new roundabout and road connection to airport M56 link.
- Excavate and build and concrete box.

Stage 2 (12 months)

- Construct platforms.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (17 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new MSCP.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc

3.3.4 Option 5 Knutsford Interchange

Route Layout (See Figure 3.60)

The stopping lines which serve the platforms for station option 5 would diverge from the thro ugh route at a junction approximately 800m so uth of the cent re of the station, and rejoin at a junction approximately 800m north of the stati on. These lines would run at a similar level and to the outsid e of the through route. See also Section 2.15, HSM15 for further line of route details.

Figure 3.60: Interchange Option 5 - Proposed Station Footprint

Station Description

The station would be located on a green field site running parallel to the A556 and perpendicular to the M6 with junction 19 connecting the two routes 1km north of the station. The site would be approximately 3.5km to the west of Knutsford town centre. The station footprint would be 415m long by 46.3m wide (excluding the car park) with platforms elevated approximately 4.0m above existing ground level.

Platforms (See Figure 3.61)

The two central through lines would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platforms would be 10.5m wide.

Concourse (See Figure 3.62)

HS2 concourse facilities would be split between the entrance at ground level and an elevated concourse deck over the tracks. The main entrance to the concourse would be located on eastern side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt and Car park

A linear forecourt arrangement would run along the full length of the eastern side of the station. The station multi storey car park would be located to the east of the station and would accommodate 3,000 cars.

Servicing and Operations

Areas directly adjacent to the concourse have been identified as zones for servicing and operational support to the platforms and concourse areas.

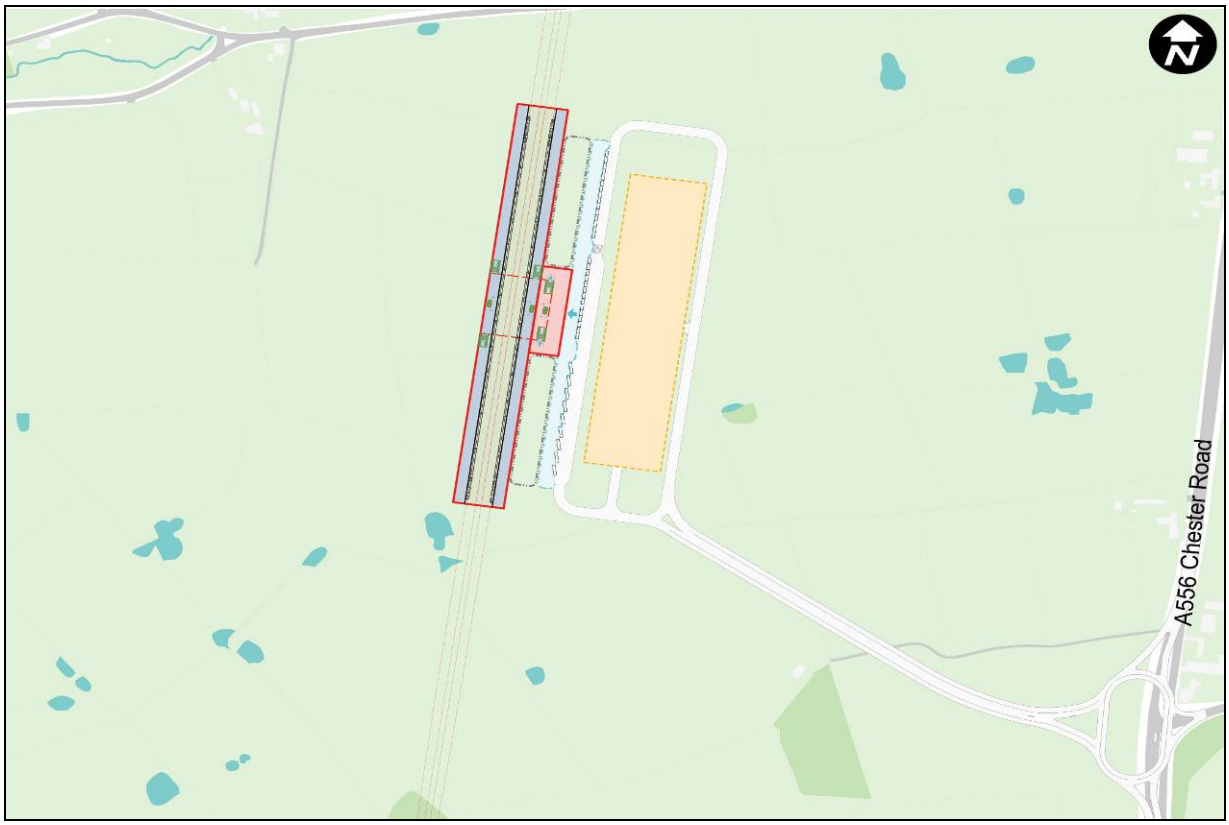


Figure 3.61: Interchange Option 5 - Platform Level Plan

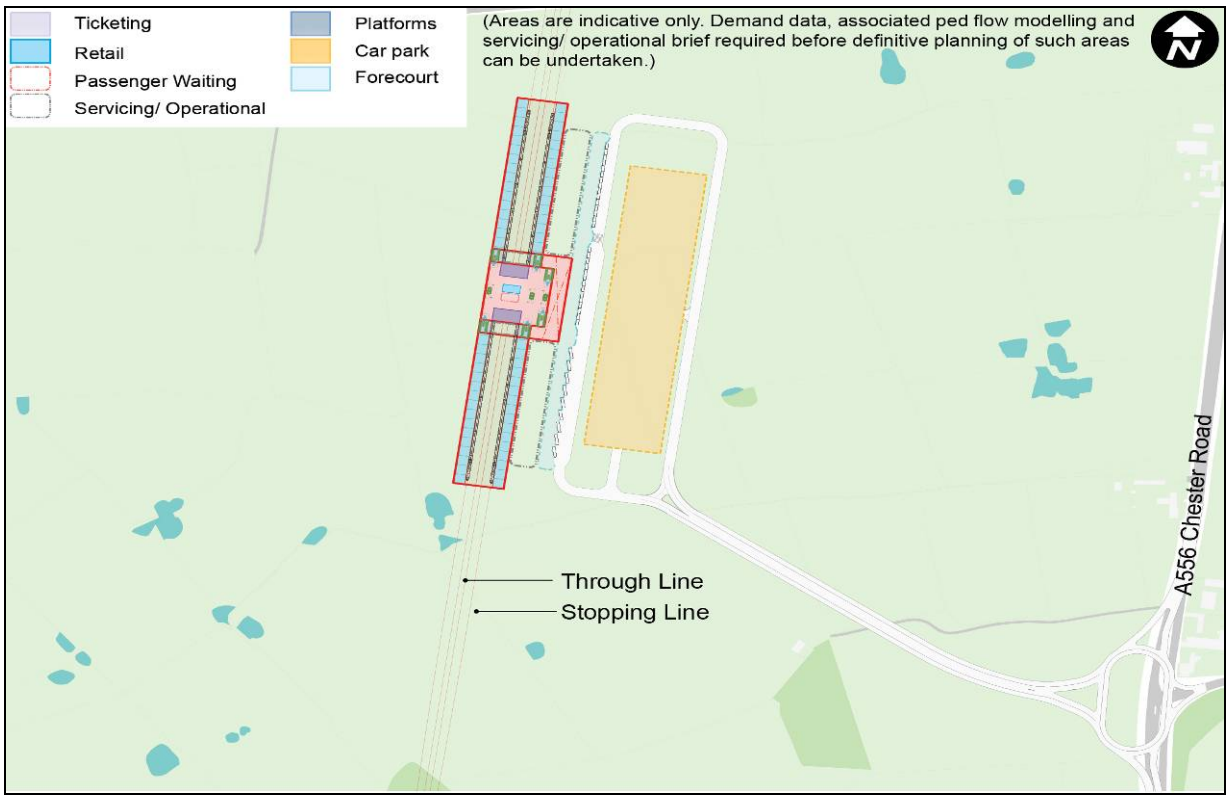


Figure 3.62: Interchange Option 5 - Concourse Level Plan

Accessibility (See Figure 3.60)

The primary pedestrian entrance to the HS2 concourse would be from the eastern side of the station. Vehicular access to the station site would be via a dual carriageway link road connected to a four armed roundabout junction constructed on the A 556 at the location of the existing A5033 signal controlled T junction. This junction would be approximately 1km south of the M6 junction 19.

Intermodal Interchange (See Figure 3.63 & 3.64)

The unconstrained nature of the site would facilitate an efficient planning of station arrangement and result in a short interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off and pick up facilities would be located next to the station entrance.

It is understood that there is currently one bus service (289) which passes the proposed location via the A556 and A5033. At present the service operates Monday to Saturday on a 30-minute frequency commencing at 08:45 and finishing at 23:02.

The site is not accessible by public transport links from Manchester Airport, requiring a new bus service to connect the HS2 station with this important regional transport hub.

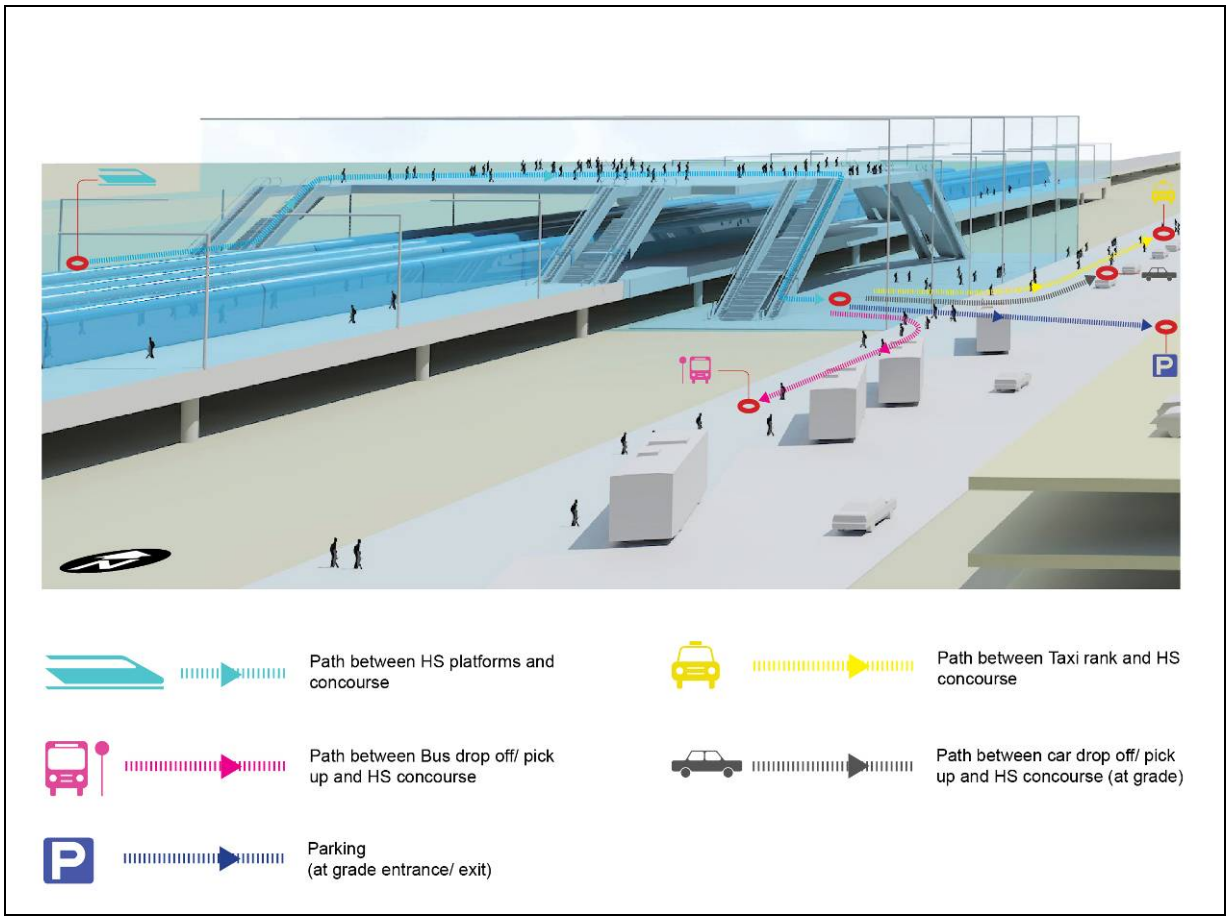


Figure 3.63: Interchange Option 5 - Intermodal Interchange Diagram

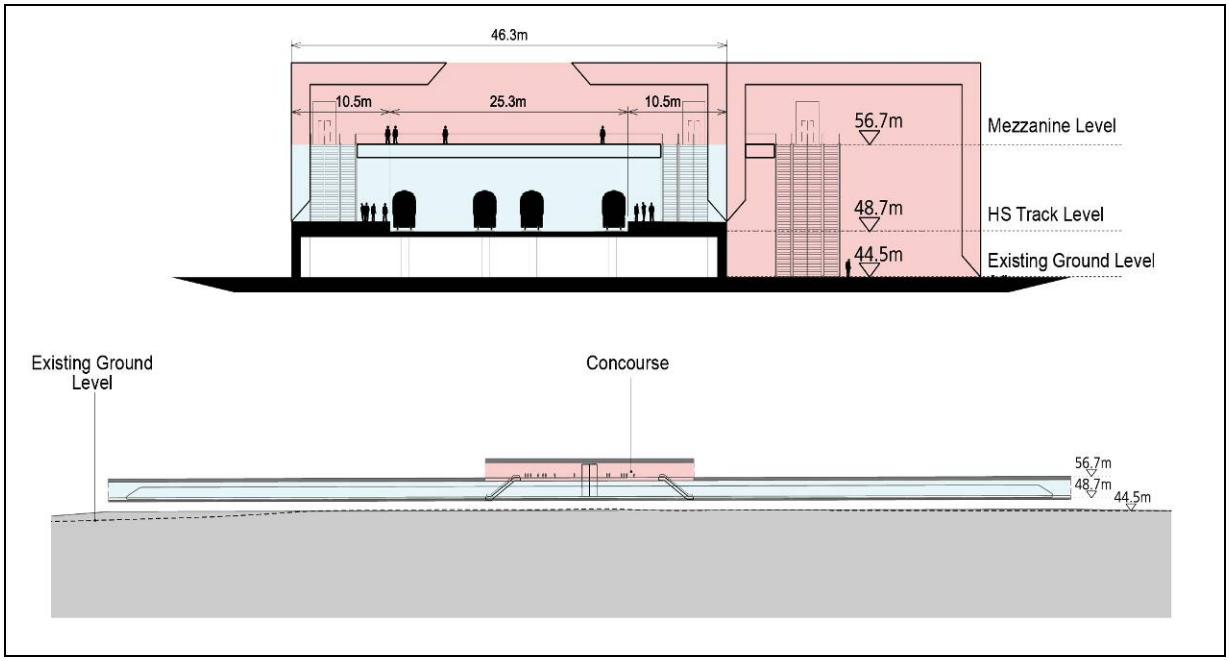


Figure 3.64: Interchange Option 5 – Cross And Long Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage1 (14 months)

- Clear the construction area and set-up site compound.
- Construct new A556 roundabout and access road.
- Construct foundations and piers for station structure and approach HS2 viaducts from the north and south.

Stage 2 (18 months)

- Construct deck structures and platforms.
- Construct mezzanine level.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (18 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new MSCP.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc.

3.3.5 Option 5a Knutsford Interchange

Route Layout (See Figure 3.65)

The stopping lines which serve the platforms for station option 5a would diverge from the through route at a junction approximately 800m south of the centre of the station, and re-join approximately 800m north of the station. These lines would run at a similar level and to the outside of the through route. See also Section 2.11, HSM11 for further line of route details.

Figure 3.65: Interchange Option 5a - Proposed Station Footprint

Station Description

The station would be located on a green field site running parallel to the A556 and perpendicular to the M6 with junction 19 connecting the two routes 1.4km east of the station. These highways form the main access routes towards Manchester and the airport from the south. The site would be approximately 4.6km to the west of Knutsford town centre. The station footprint would be 415m long by 46.3m wide (excluding the car park) with platforms elevated approximately 4.0m above existing ground level.

Platforms (See Figure 3.66)

The two through lines would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platform would be 10.5m wide.

Concourse (See Figure 3.67)

HS2 concourse facilities would be split between the entrance at ground level and an elevated concourse deck over the tracks. The main entrance to the concourse would be located on the eastern side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt and Car Park

A linear forecourt arrangement would run along the full length of the eastern side of the station. The station multi-storey car park would be located to the east of the station and would accommodate 3,000 cars.

Servicing and Operations

Areas directly adjacent to the concourse have been identified as zones for servicing and operational support to platforms and the concourse areas.

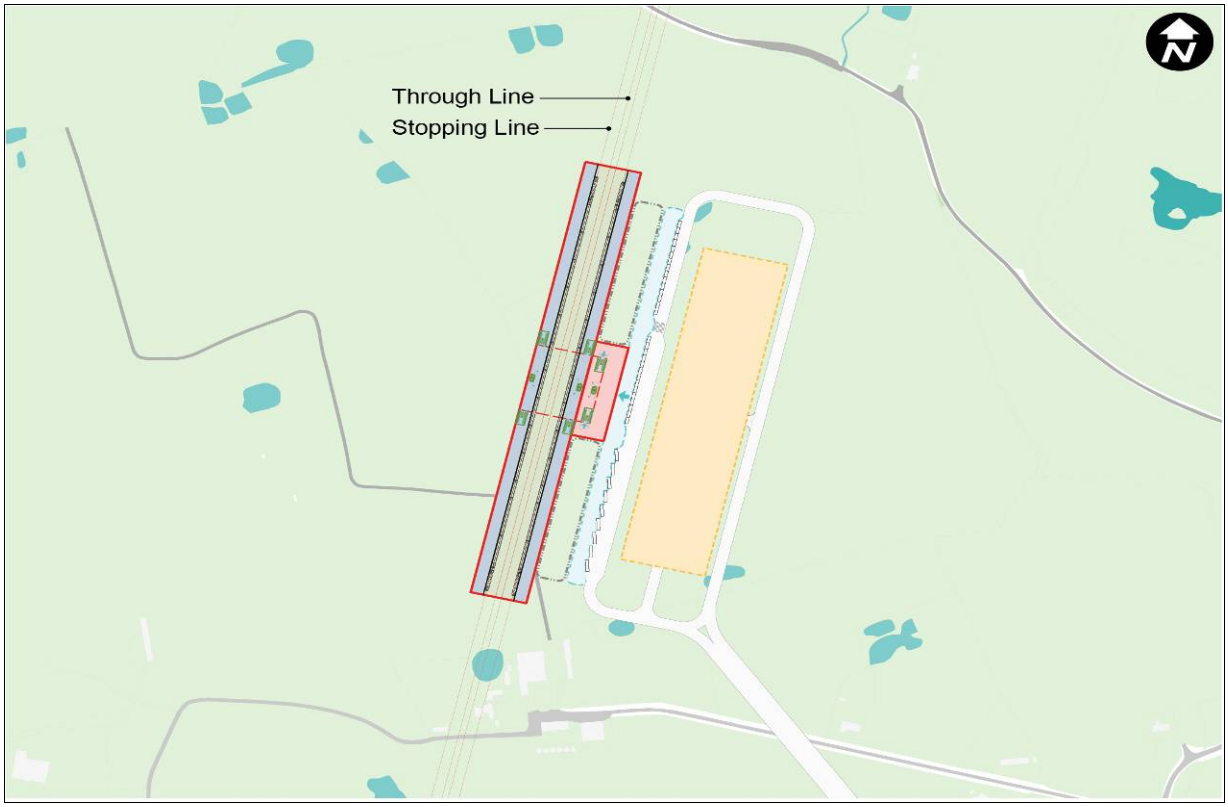


Figure 3.66: Interchange Option 5a - Platform Level Plan

Figure 3.67: Interchange Option 5a - Concourse Level Plan

Accessibility (See Figure 3.65)

Vehicular access to the station site would be via a dual carriageway link road connected to a four armed roundabout junction constructed on the A 556 at the location of the existing A5033 signal controlled T Junction. This Junction would be approximately 1.1km south of the M6 Junction19. The station would be a further 1.4km west of the A5033 junction with the A556 Trunk road.

The A55/A556 forms a major link to and from Wales to the M6 North & South, Manchester Airport and the Greater Manchester conurbation. As a consequence the M6 junction is subject to congestion during peak periods and already has dedicated left and right turn lanes to the M6 north and south bound slip roads with access to the gyratory roundabout being signalised. As it is also proposed to incorporate a 3000 space park-and-ride facility at this interchange station it is not considered feasible access to the interchange station from this junction.

Intermodal Interchange (See Figure 3.68 & 3.69)

The unconstrained nature of the site would facilitate an efficient planning of the station arrangement and result in a short interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off/pick up facilities would be located next to the station entrance.

It is understood that there is currently one bus service (289) which passes the proposed location via the A556 and A5033. At present the service operates Monday to Saturday on a 30-minute frequency commencing at 08:45 and finishing at 23:02.

The site is not accessible by public transport links from Manchester Airport, requiring a new bus service to connect the HS2 station with this important regional transport hub.

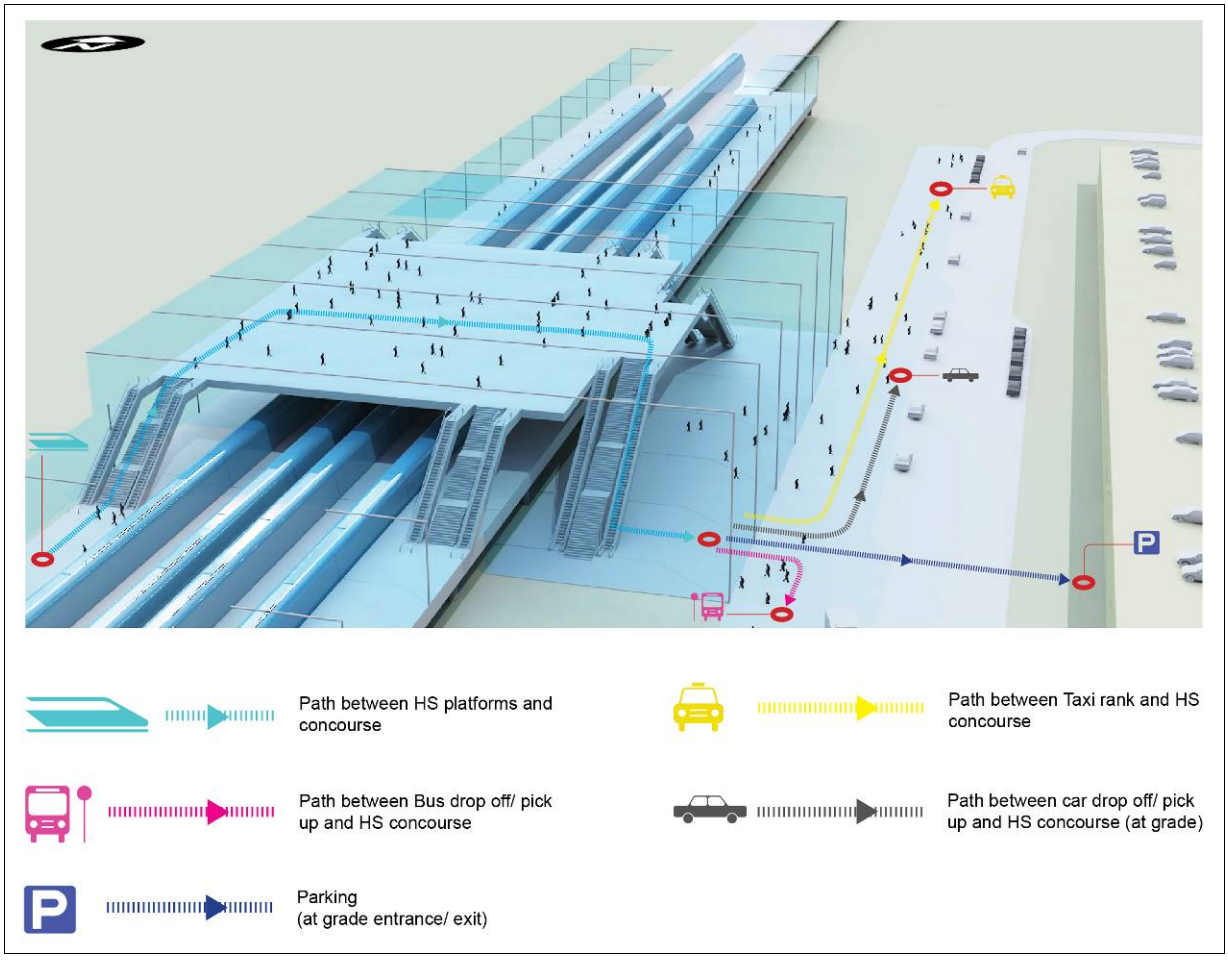


Figure 3.68: Interchange Option 5a - Intermodal Interchange Diagram

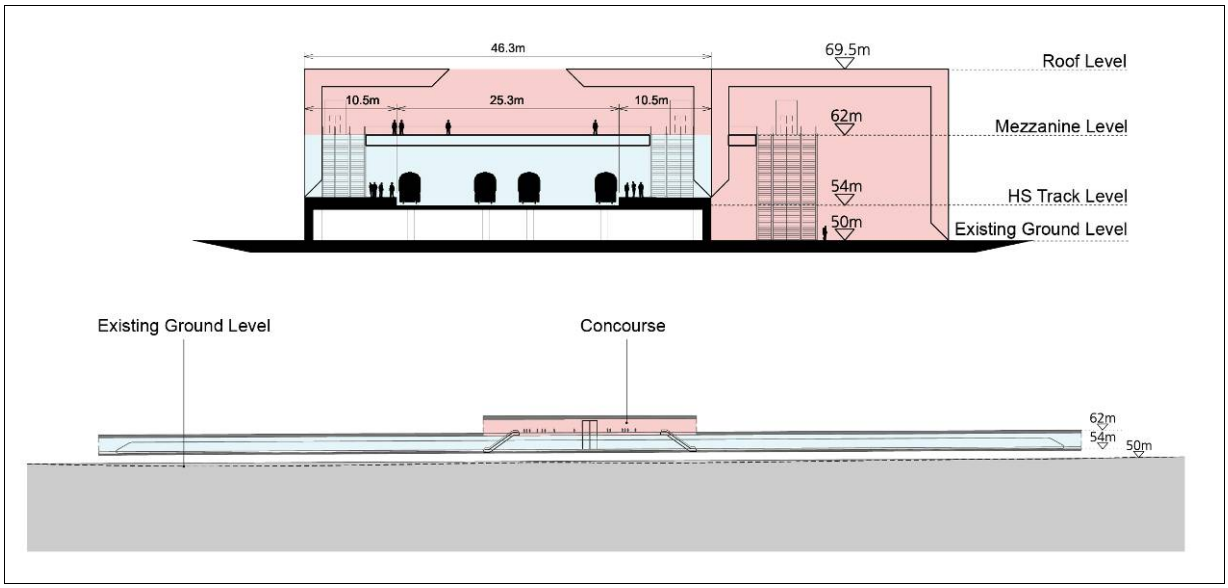


Figure 3.69: Interchange Option 5a - Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage1 (14 months)

- Clear the construction area and set-up site compound.
- Construct new A556 roundabout and access road.
- Construct foundations and piers for station structure and approach HS2 viaducts from the north and south.

Stage 2 (18 months)

- Construct deck structures and platforms.
- Construct mezzanine level.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (18 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new MSCP.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc.

3.3.6 Option 30 M55 Interchange

Route Layout (See Figure 3.70)

The platforms for station option 30 would be located immediately south of the M55 motorway. The stopping lines which serve the platforms would diverge from the through route at a junction approximately 2.2km south of the centre of station option 30, and rejoin at a junction approximately 1.1km north of the station. These lines would run at a similar level and to the outside of the through route tracks. See also Section 2.24, HSM24 for further line of route details.

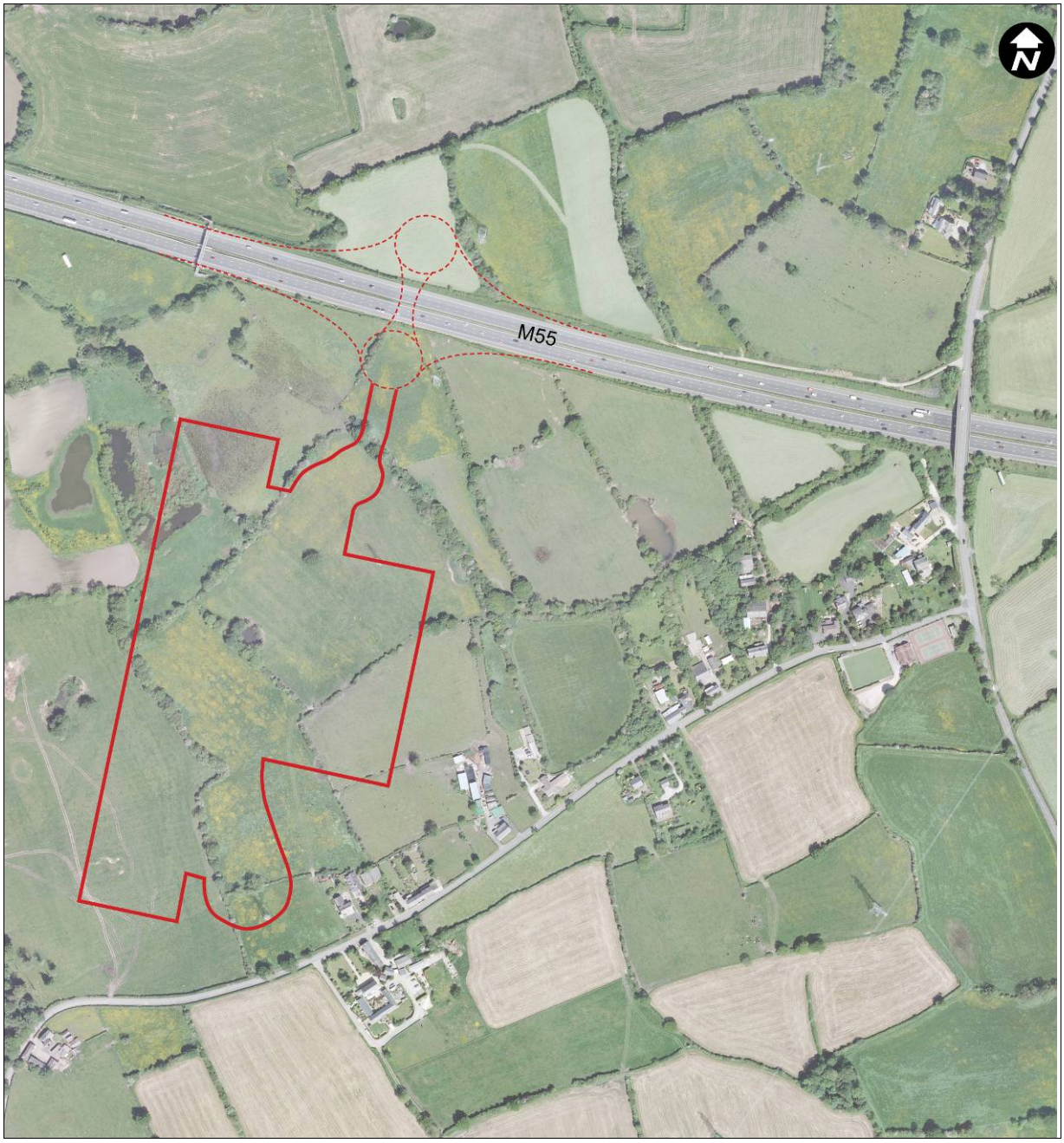


Figure 3.70: Interchange Option 30 - Proposed Station Footprint

Station Description

The station would be located on a green field site adjacent to the M55, north west of Preston town centre and west of the existing West Coast Mainline. The site would be approximately 6.5km north-west of Preston and 16km east of Blackpool. The station footprint would be 415m long by 52.0m wide (excluding the car park) with platforms elevated approximately 4.7m above existing ground level.

Platforms (See Figure 3.71)

The two through lines would enable HS2 trains to run at maximum speed whilst the two stopping lines would enable trains to stop and serve the station via two side platforms. The platform would be 10.5m wide.

Concourse (See Figure 3.72)

HS2 concourse facilities would be split between the entrance at ground level and an elevated concourse deck over the tracks. The main entrance to the concourse would be located on the eastern side of the station. The route between concourse and platforms would be via stairs, escalators and lifts through the concourse.

Forecourt and Car park

A linear forecourt arrangement runs along the full length of the eastern side of the station. The multi-storey car park would be located to the east of the station and would accommodate 3,000 cars. The car park is offset slightly from the concourse in order to avoid impacting residential properties along Bartle Lane.

Servicing and Operations

Areas directly adjacent to the concourse have been identified as zones for servicing and operational support to the platforms and concourse areas.

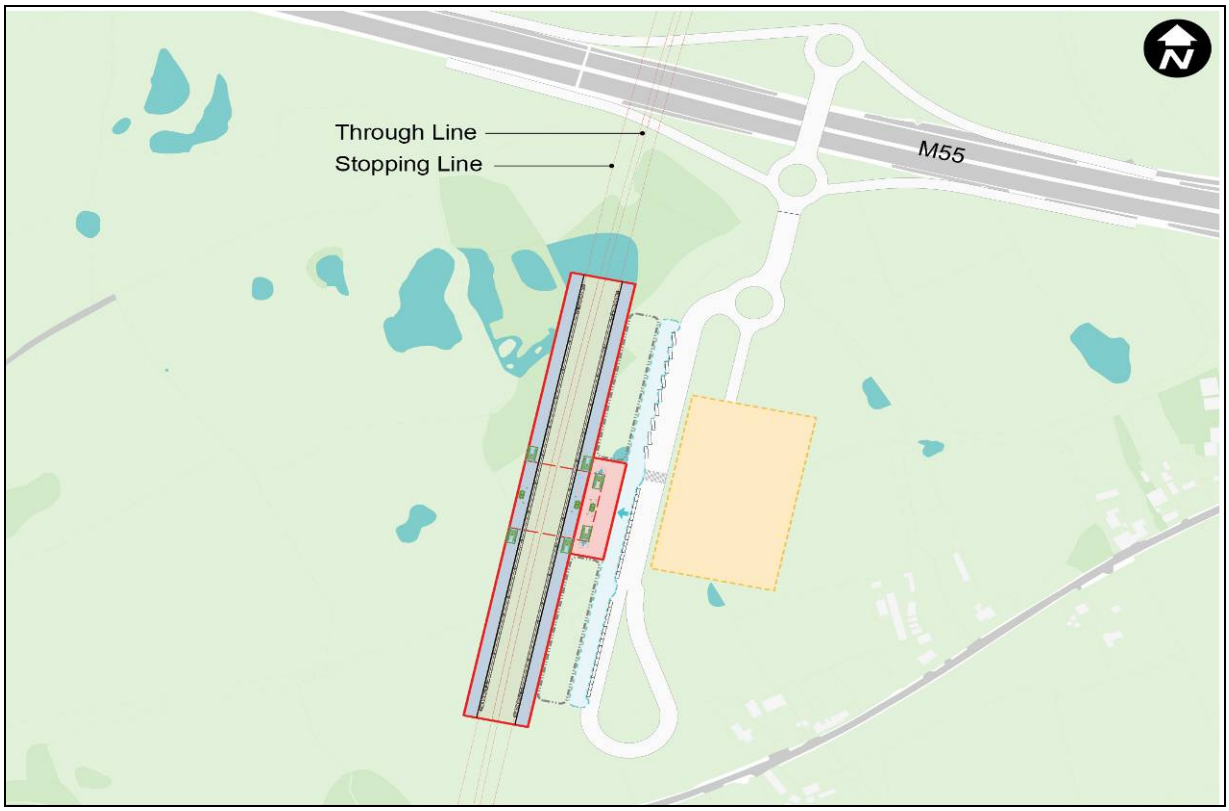


Figure 3.71: Interchange Option 30 - Platform Level Plan

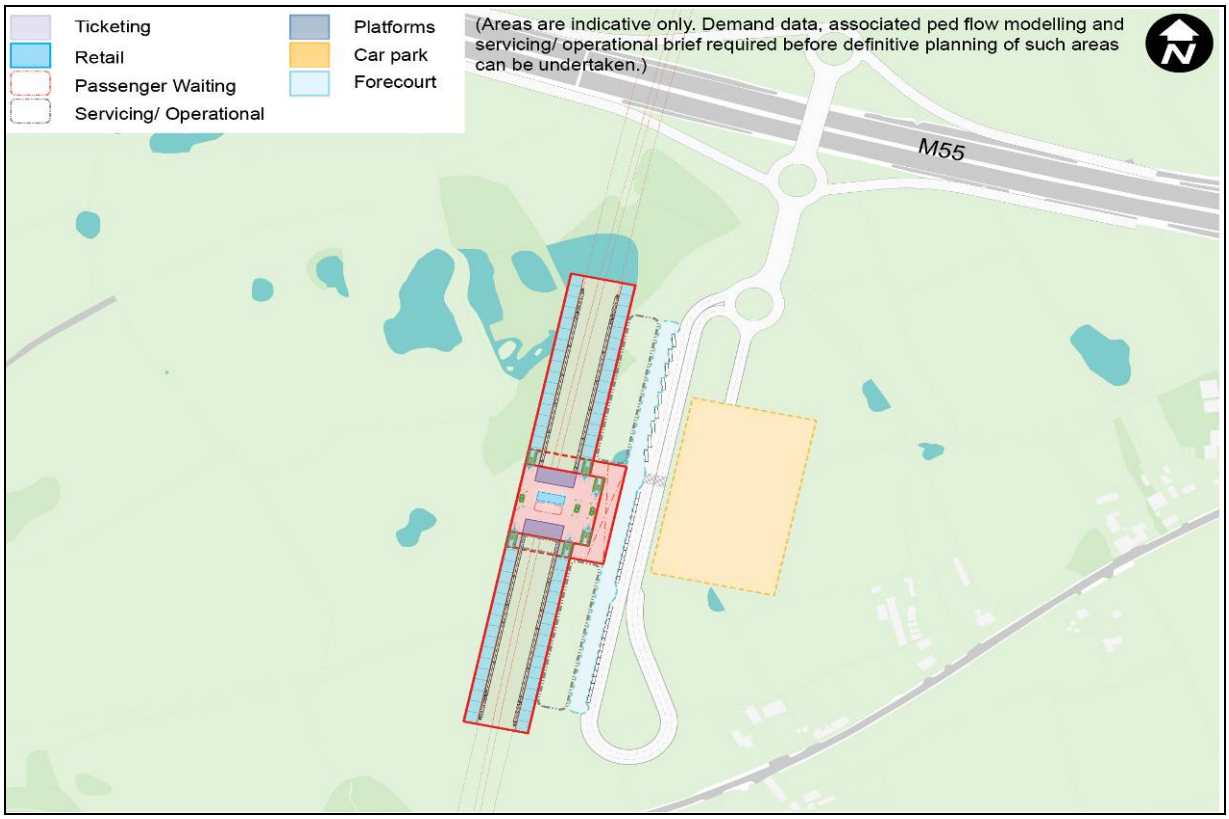


Figure 3.72: Interchange Option 30 - Concourse Level Plan

Accessibility (See Figure 3.70)

Vehicular access to the site from the M55 would be via a new grade-separated dumbbell junction, 3, which would be constructed at a point approximately 4km west of the existing junction 1 and 7.6km east of the existing junction 3, with a new section of link road approximately 200m long constructed to connect the new junction with the proposed interchange station.

The M55 forms a major link to and from Blackpool to the M6 north and south, Preston and Lancashire. This section of motorway does not suffer from excessive congestion as such the existing motorway would not require any additional widening or similar improvements.

Intermodal Interchange (See Figure 3.73 & 3.74)

The unconstrained nature of the site would facilitate an efficient station arrangement and as a result a short interchange from platform to concourse to forecourt facilities. Taxi and private vehicle drop off and pick up facilities would be located next to the main entrance to the concourse. There are no existing bus services therefore interchange would be car only.

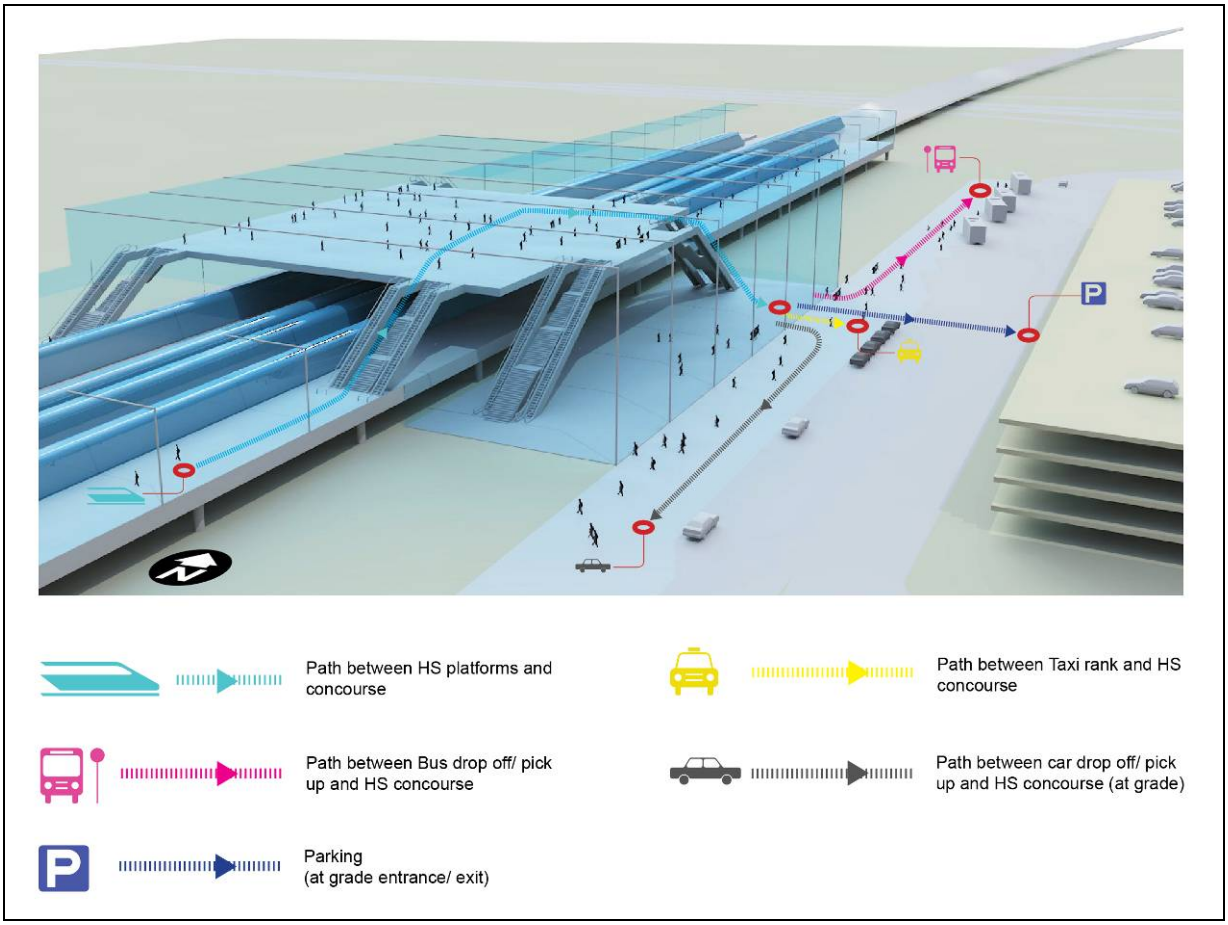


Figure 3.73: Interchange Option 30 - Intermodal Interchange Diagram

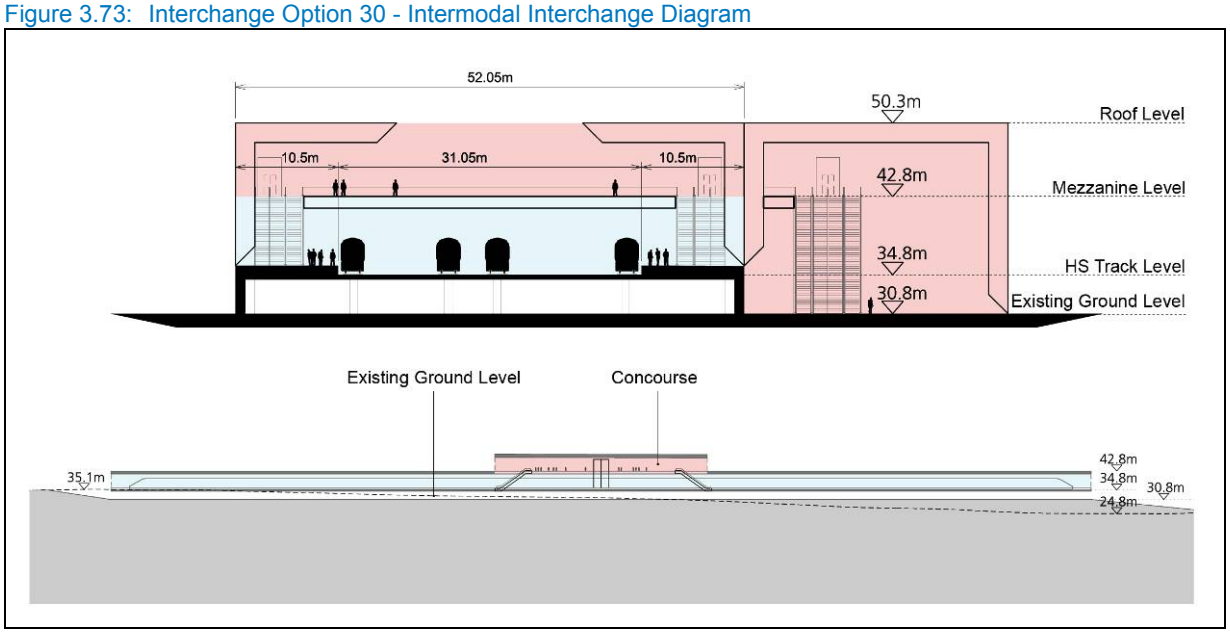


Figure 3.74: Interchange Option 30 - Sectional Views Of Proposed Station

Constructability

The constructability of the station has been assessed with the following objectives:

- Identifying any major risks associated with the site.
- Minimising the number of demolitions and extent of disruption to existing infrastructure

The works would be carried out in 3 main stages. The overall schedule would be 3 years as there would be opportunity to overlap the stages.

Stage 1 (20 months)

- Clear the construction area and set-up site compound with temporary access from Bartle Lane.
- Construct new M55 junction and access road.
- Construct foundations and piers for station structure and approach HS2 viaducts from the north and south.

Stage 2 (18 months)

- Construct deck structures and platforms.
- Construct mezzanine level.
- Construct ground level concourse.
- Level area for car park.

Stage 3 (18 months)

- Construct station roof.
- Complete platform fit-out and install HS2 escalators to concourse.
- Construct new station facilities including commercial.
- Construct new MSCP.
- Construct access roads, taxi and bus ranks and car drop-off points.
- Completion works including constructing footpaths, landscaping, etc.

4. Depots

Introduction

Two depots would be required for the operation of the West Midlands to Manchester leg. One would be an Infrastructure Maintenance Depot (IN) as a base from which to carry out engineering activities to inspect, maintain and renew the infrastructure. The second would be a Rolling Stock Depot (RS) at which the trains would be stabled overnight, for cleaning and maintenance.

To support the route and station options described in Sections 2 and 3 of this report two infrastructure depot options and six rolling stock depot options were selected through the standard sifting process. Details of historic options can be found in Section 9.

Infrastructure maintenance depot options:

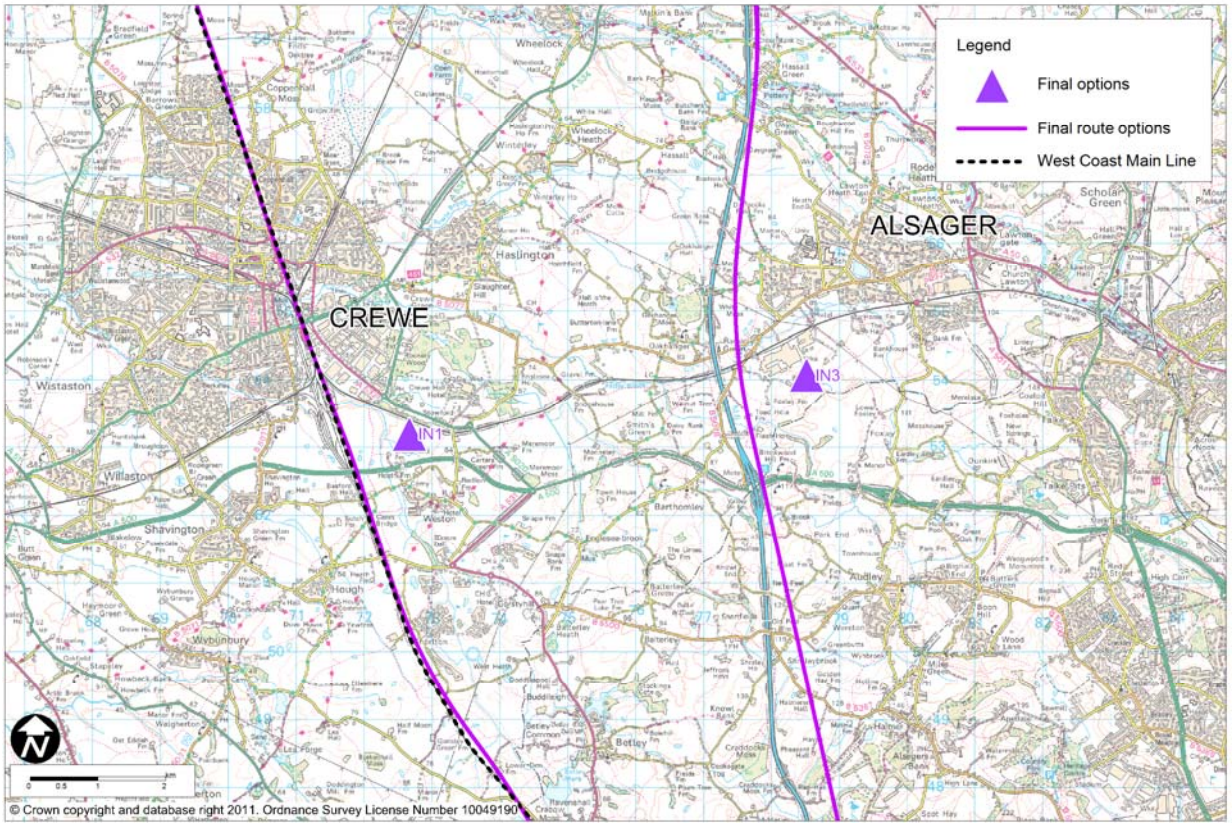
- IN1 Crewe
- IN3 West Alsager

Rolling stock maintenance depot options:

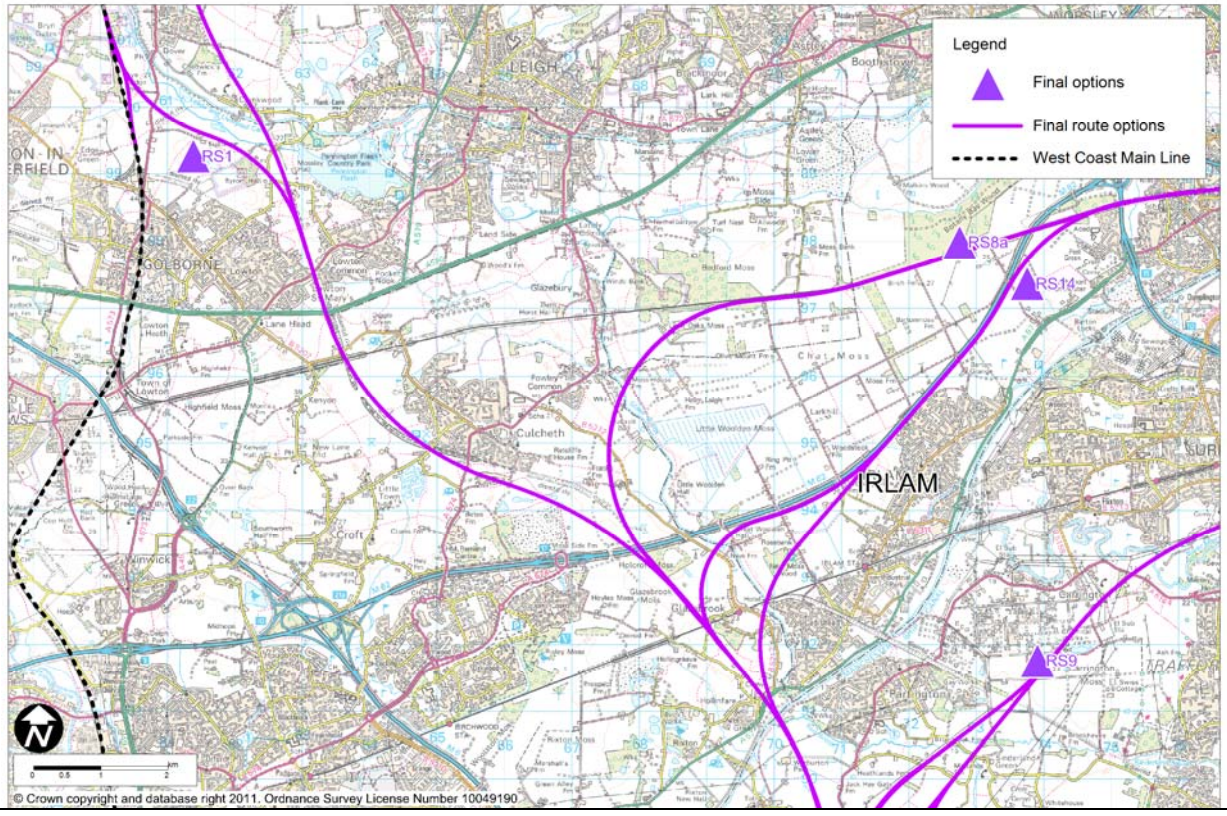
- RS1 - Golborne
- RS8 – Eccles
- RS9 – Carrington
- RS14 – Barton

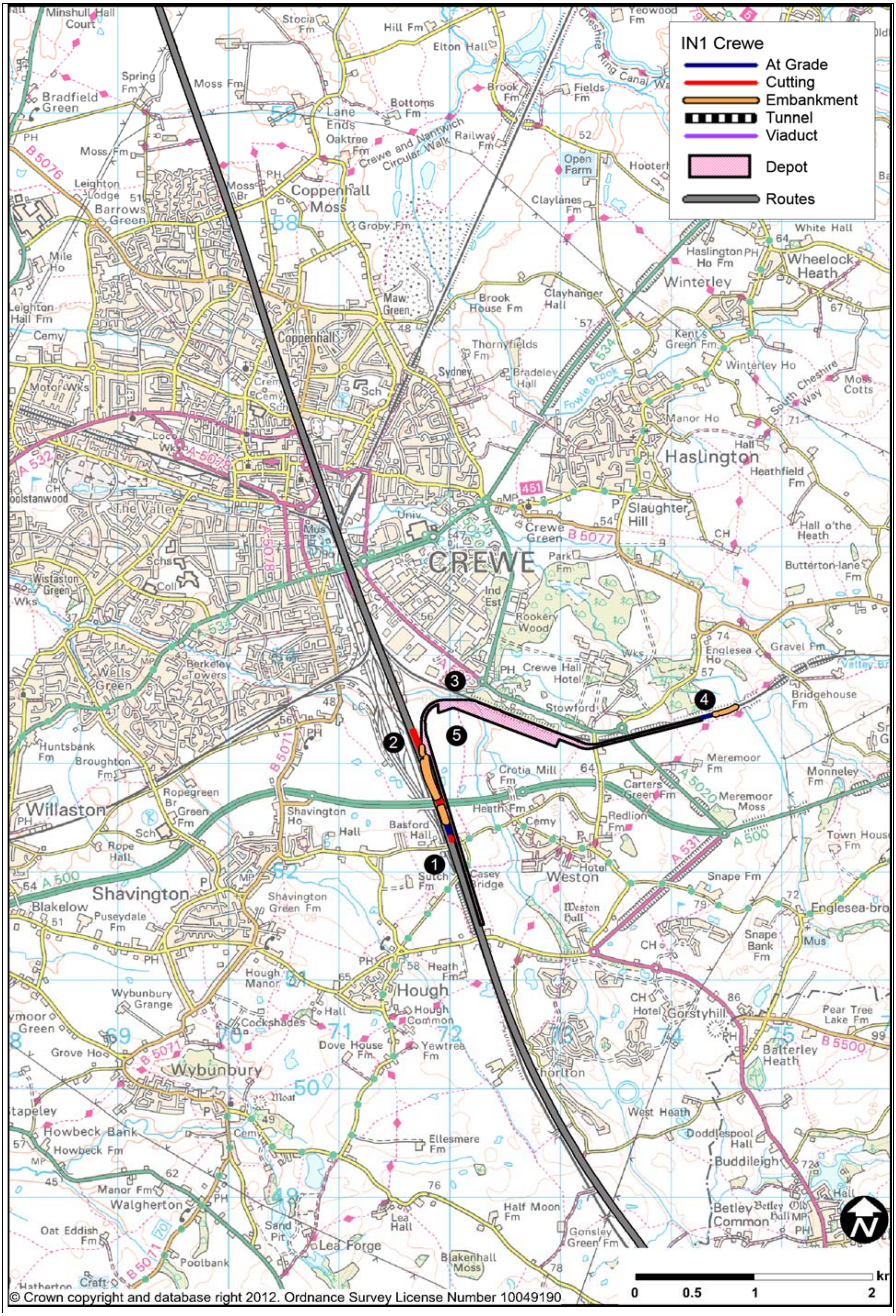
The locations of the depot options relative to the routes is shown opposite. The remainder of this section provides location maps and a brief description of each depot.

Infrastructure Maintenance Depots



Rolling Stock Maintenance Depots




IN1 Crewe
At Grade
Cutting
Embankment
Tunnel
Viaduct
Depot
Routes
1
2
3
4
5
CREWE
0
0.5
1
2
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4.1 Infrastructure Maintenance Depots

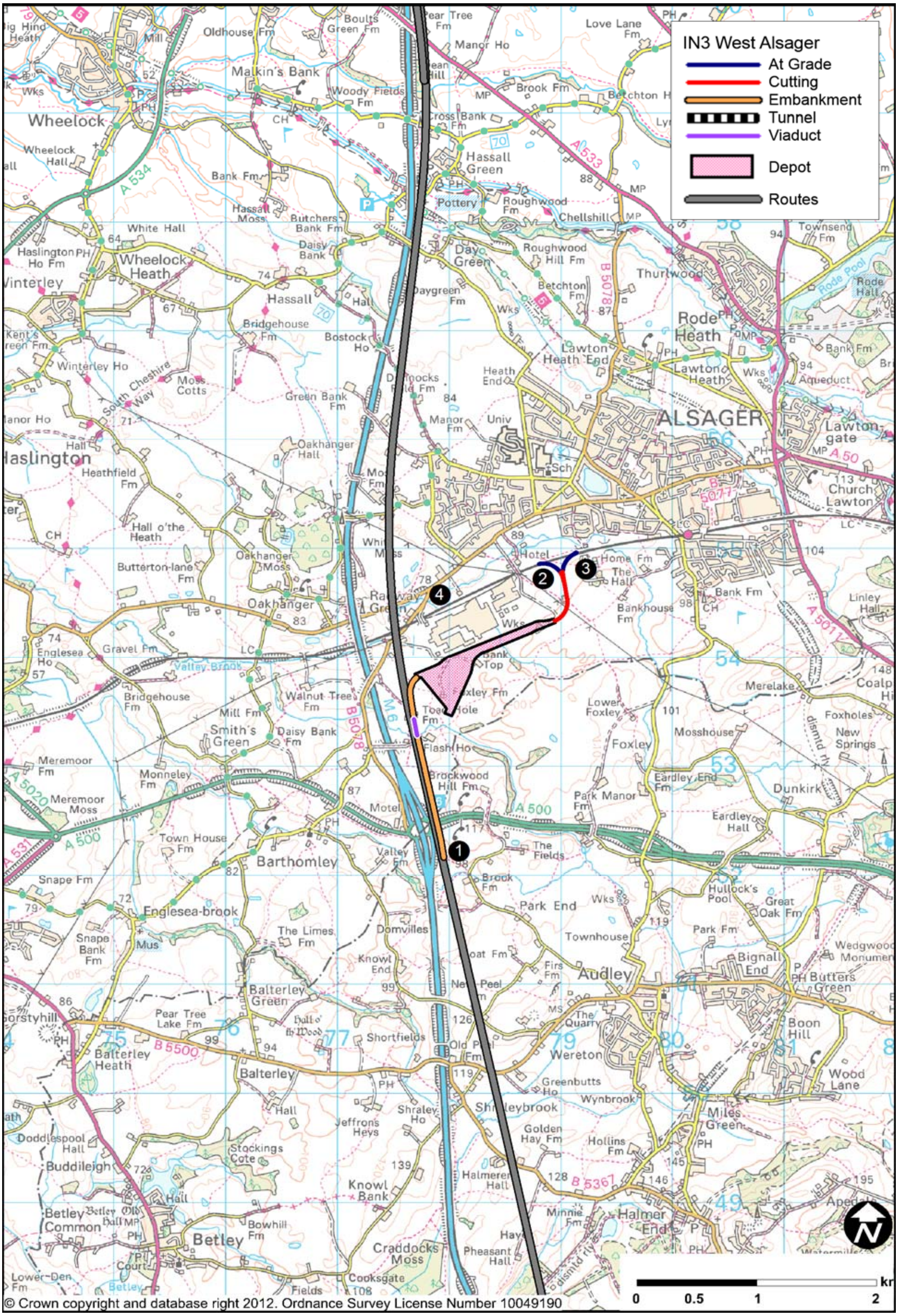
4.1.1 IN1 Crewe

The depot would be located just north of the mid point of the western route to Manchester 1.5km south east of Crewe and east of the WCML. It would be connected to route section HSM09. The depot would be situated on relatively level farmland that is allocated for rail connected industrial development and alongside the Crewe to Kidsgrove railway. A section of the depot would cross Basford Brook and its flood plain.

The depot would have rail access at both ends and comply fully with the HS2 design criteria and specifications.

The depot would have good access to the electrified WCML and Crewe to Kidsgrove line. Access would be provided from the south from the WCML connection route (HSM09) just north of Weston Lane **(1)** and from the north at a point opposite the freight sidings **(2)** using flat junctions. In addition access to the Crewe to Kidsgrove railway would be provided at both ends of the depot **(3** and **4)**. A new highway access to the depot would be constructed from the development area **(5)**.

Construction of the depot in this location would use standard methods. The A500 over the WCML would be impacted by both the HS2 route and the connection to the depot, and would be diverted onto a new bridge.


IN3 West Alsager
At Grade
Cutting
Embankment
Tunnel
Viaduct
Depot
Routes
0
0.5
1
2
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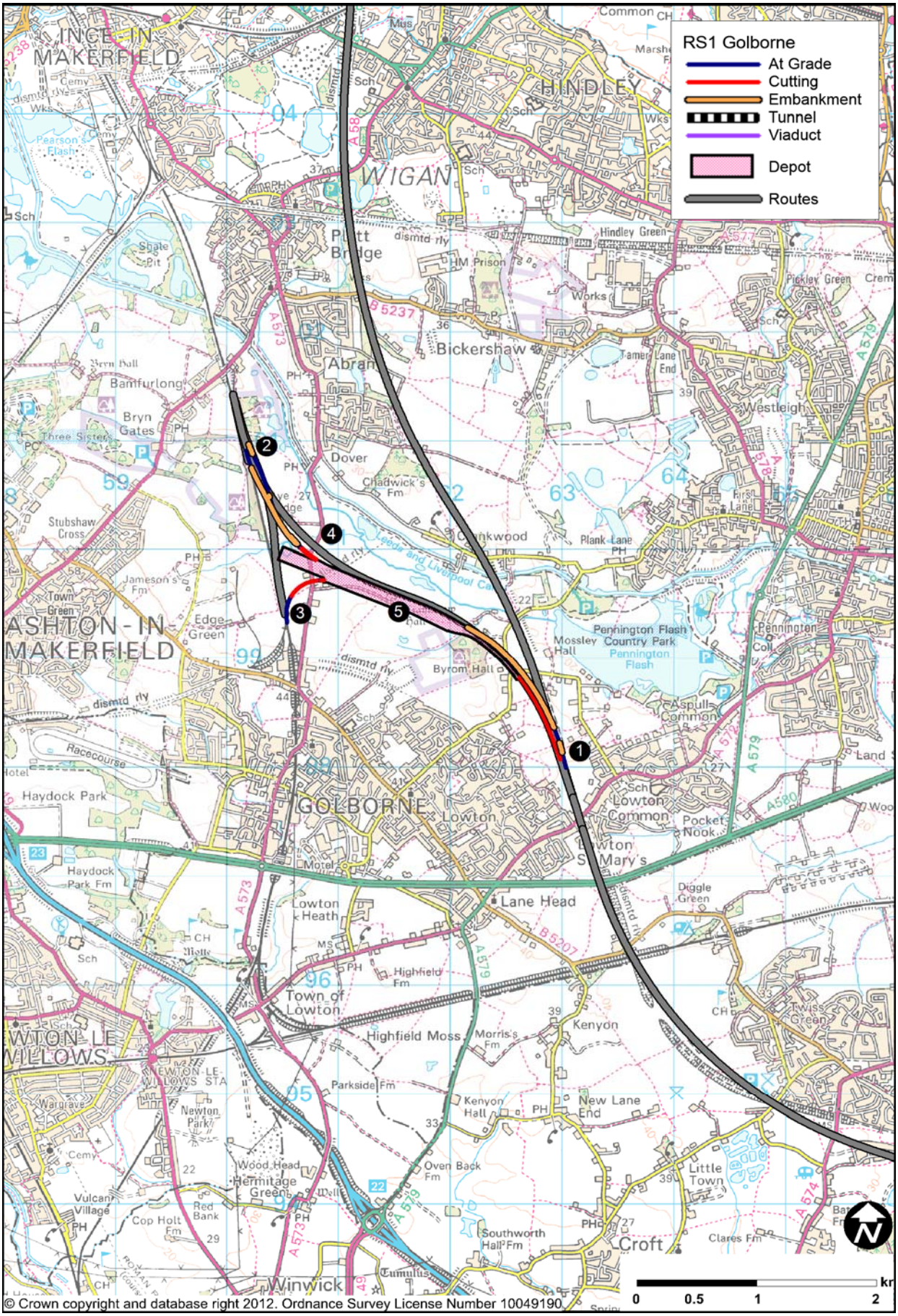
4.1.2 IN3 West Alsager

The depot would be located just north of the mid point of the eastern route to Manchester and would be connected to HSM13 and HSM17. The depot would be situated 2km south west of Alsager and immediately south of BAE Systems premises at Radway Green, in farmland with some variability in level.

The depot would have rail access at both ends and be perpendicular to the high speed route. It would comply fully with the HS2 design criteria and specification. The depot would be double ended and perpendicular to the high speed route.

Access would be provided to HS2 (HSM13 and HSM17) at a junction **(1)** 250m south of the M6 junction 16. An approach line 1.7km long would descend alongside the through route before heading east into the depot. From the eastern end of the depot an approach route 700m long would run in a cutting to connect to the Crewe to Kidsgrove railway in both directions (**2** and **3**). Highway access to the depot would be through the Business Park off the B5077 **(4)**.

Construction of the depot in this location would use standard methods.



4.2 Rolling Stock Depots

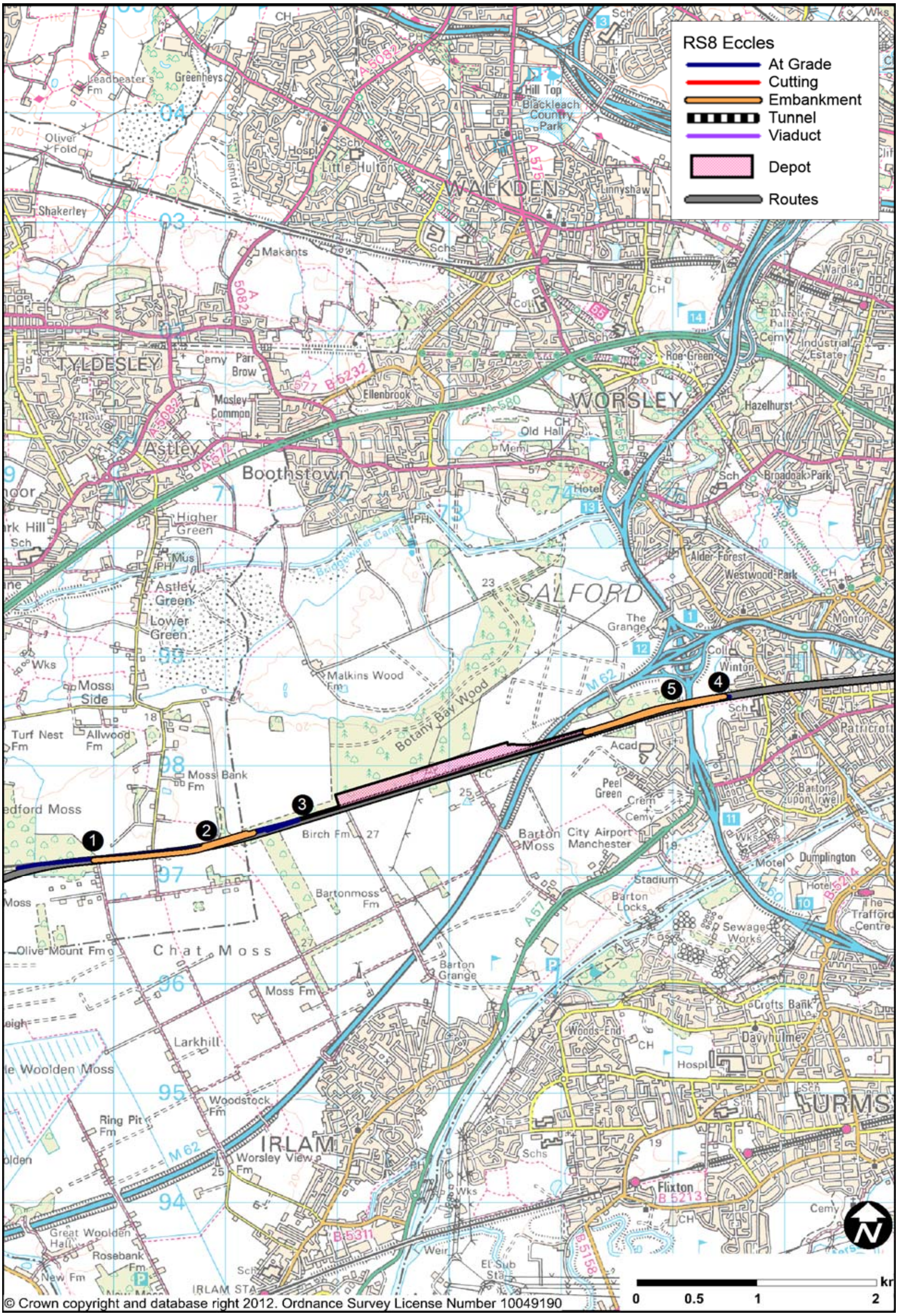
4.2.1 RS1 Golborne

This depot would be situated on relatively level farmland between the WCML north of Golborne and the HS2 connecting route to the WCML (HSM22). The site would be strategically located to serve Manchester, Liverpool and Preston. It would be suitable for all Manchester city centre station options.

The depot would meet all HS2 design criteria and specifications. It would have rail access at both ends.

Access from HS2 would be provided from the south using a grade separated junction from the connecting route (HSM22) to the WCML. This would allow trains to run south to Manchester. One line on each side of the connecting route would be provided from a junction **(1)** east of Lowton to the depot. The eastern line, which would be 1.5km long, would cross over the connecting route to run into the depot. At the north end of the depot, additional lines 1.2km long would be provided to connect to the WCML at a grade separated junction **(2)**. This junction would enable classic compatible trains from the depot to serve Preston. In addition, also at the north end of the depot a line 0.7km long would connect at a flat junction **(3)** to the WCML to provide access for classic compatible trains to Liverpool. The A573 **(4)** would be diverted to cross the site. Access to the site during operations would be from the A573 **(4)** which would need to be diverted to cross the site.

The depot would be designed to avoid the demolition of Lightshaw Hall **(5)** in the centre of the site. Construction of the depot in this location would use standard methods.Connecting to the WCML would require reconfiguration of the WCML and the junctions at Bamfurlong, Golborne and Lowton and cause some disruption to services.


RS8 Eccles
At Grade
Cutting
Embankment
Tunnel
Viaduct
Depot
Routes
1
2
3
4
5
TYLDESLEY
WALKDEN
WORSLEY
Astley
Boothstown
SALFORD
IRLAM
Chat Moss
Little Hulton
Barton Moss
City Airport Manchester
Botany Bay Wood
Malkins Wood
Davyhulme
Flixton
M 62
0
0.5
1
2
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4.2.2 RS8 Eccles

This depot would be situated on a level area of farmland and woodland to the west of the M60/M62 interchange at Winton and adjacent to the Liverpool to Manchester Railway. It would be suitable for the two Salford city centre station options, but not an option near Manchester Piccadilly.

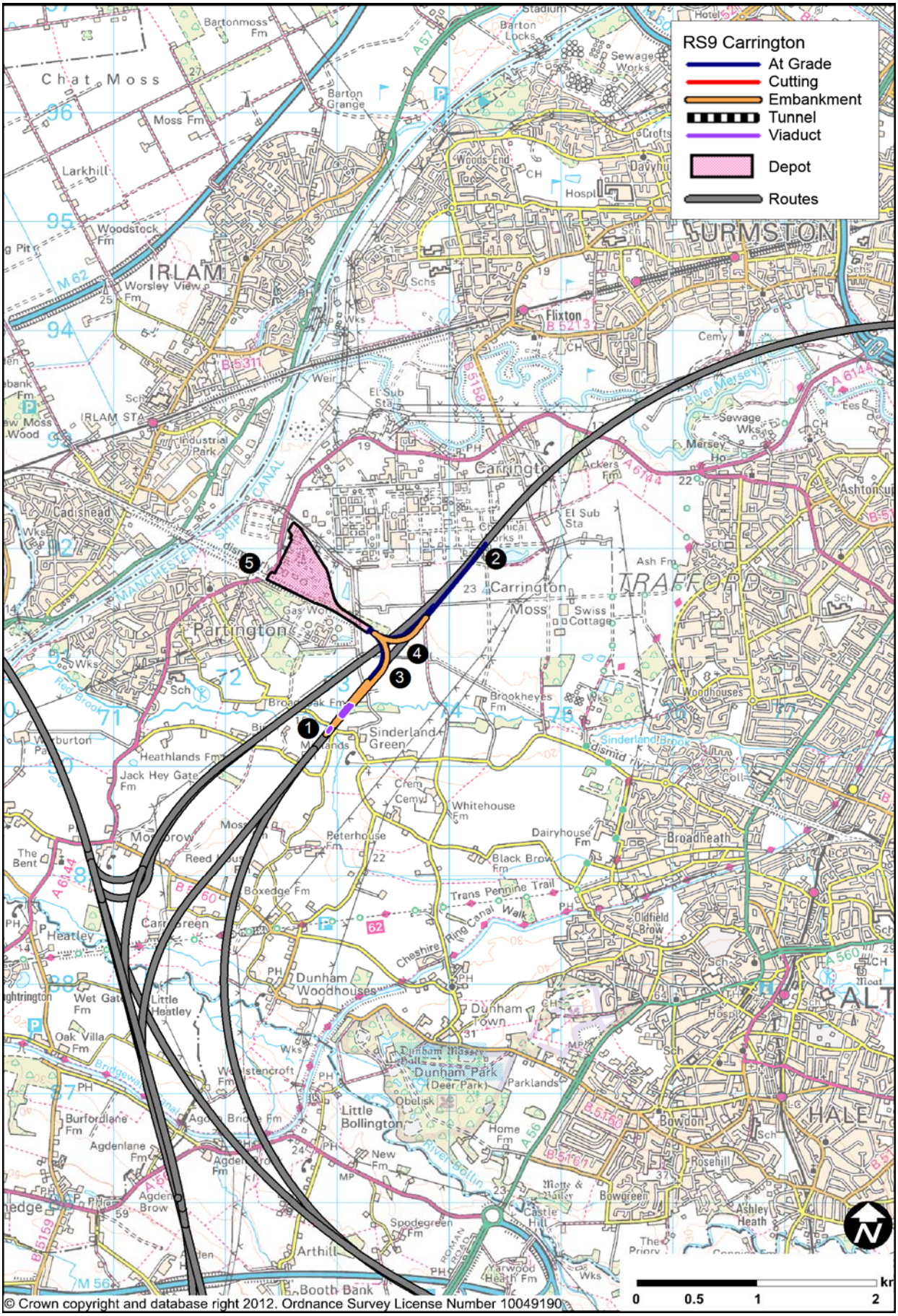
The depot would have rail access at both ends and would comply fully with the HS2 design criteria and specifications.

Access would be provided in both directions to the HS2 spur to Manchester (HSM40) and to the west on the Liverpool to Manchester railway which would have been electrified. All connections to the Liverpool to Manchester railway and HS2 would be grade separated. The Liverpool to Manchester railway connection would enable classic compatible trains from the depot to serve Liverpool and Preston.

For the eastern access a grade separated junction **(1)** would be provided from the HS2 spur with the southern depot line crossing over the spur and the Liverpool to Manchester railway **(2)**. The northern depot line would leave the spur route after it had passed under the existing railway (see HSM40 for details). The lines, with a total length of 1.3km, would then run on the north side **(3)** of the existing railway into the depot. For the western access a grade separated junction would be provided **(4)** with the one of the two lines from the depot crossing over the spur route west of the M60 **(5)**. The lines would be 2.2km long and a bridge over the M62 would be required to connect into the HS2 spur.

A new depot access road would be required for 3km from the north.

Construction of the depot in this location would use standard methods once the new highway access had been provided. The Liverpool to Manchester railway would require realignment at the junctions with the depot lines. Part of the depot would also be on an area of peat which would require ground stabilisation works prior to construction.


RS9 Carrington
At Grade
Cutting
Embankment
Tunnel
Viaduct
Depot
Routes
1
2
3
4
5
Chat Moss
IRLAM
SURMSTON
TRAFFORD
Partington
Carrington
Carrington Moss
Flixton
Sinderland Green
Dunham Woodhouses
Dunham Park (Deer Park)
Little Bollington
Broadheath
Bowdon
HALE
Ashley Heath
Rosehill
Bowgreen
Castle Hill
Arthill
Booth Bank
Irlam Sta
Trans Pennine Trail
Ring Canal Walk
Cheshire Ring Canal
Manchester Ship Canal
River Mersey
River Bollin
0
0.5
1
2
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4.2.3 RS9 Carrington

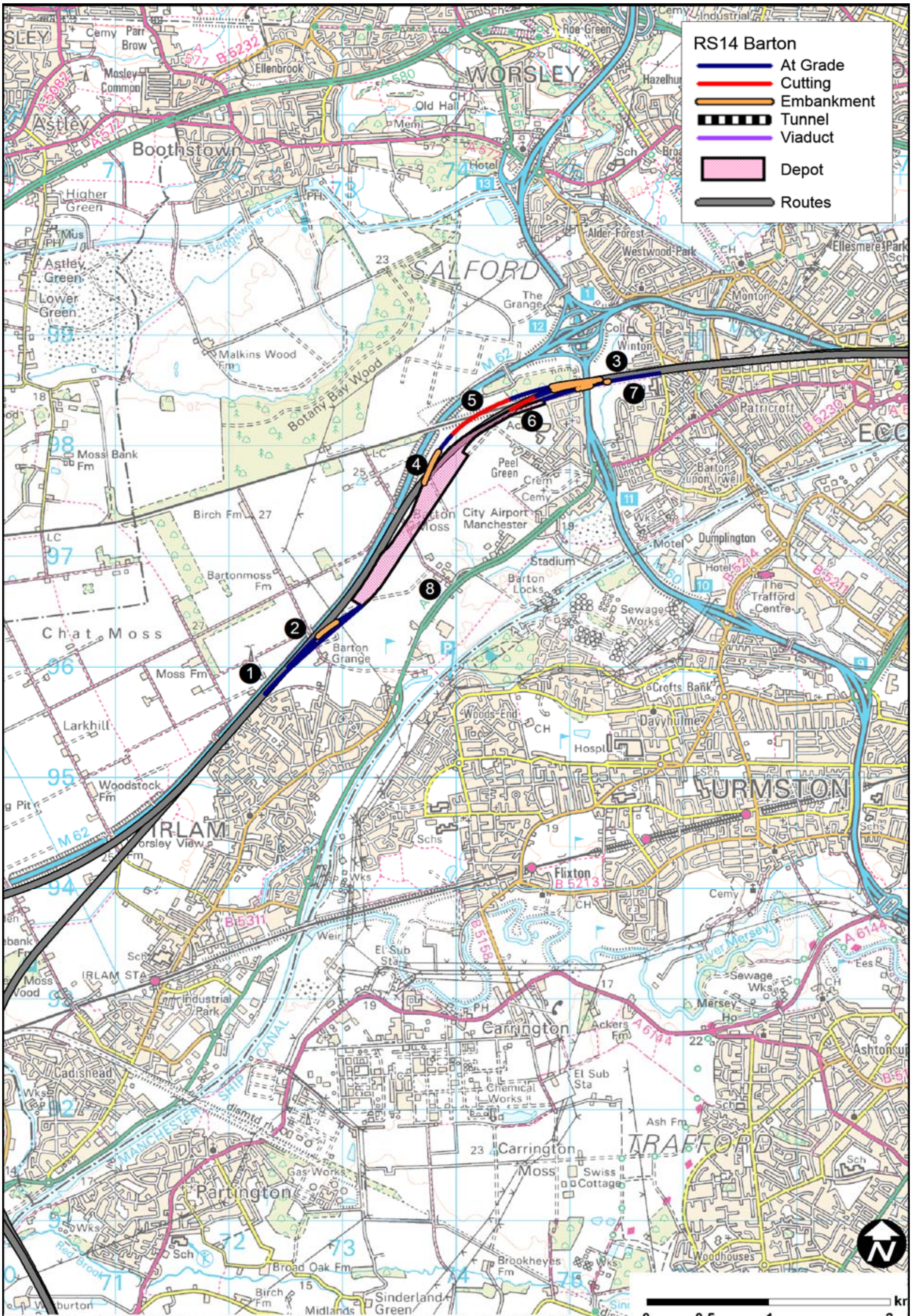
This depot would be situated on a level brownfield site, within the Carrington Industrial estate. Although parts of this Estate are subject to development, adjacent sites would also be suitable to accommodate the depot footprint. A depot at this l ocation would be suitable for the Manchester Piccadilly city centre station option, but not the Salford station options.

The depot would not com ply fully with the HS2 design criteria and specifications as it would have rail access only at one end.

Access would be provided using grade separated junctions **(1** and **2**) in both directions to the HS2 spur (HSM31) along the M ersey valley to wards the Manchester Piccadilly station option. Bot h junctions would use 700m long depot lines,. At both junctions the most easterly line would rise onto embankment to cross over the spur route **(3** and **4)**.

There would be no access to the existing rail network from this depot option and Liverpool and Preston would be served by connecting to the WCML at Golborne. Highway access would be direct from the A6144 **(5)**.

Construction of the depot in this location would use standard methods.



4.2.4 RS14 Barton

This depot would be situated on level farmland and part of the Barton aerodrome adjacent to the M62. It would be suitable for the two Salford city centre station options, but not Manchester Piccadilly.

The depot would have rail access at both ends and would comply fully with the HS2 design criteria and specifications..

Access would be provided in both directions to the HS2 spurs (HSM35 and HSM39) that follow the M62 corridor to the Salford station options. The junctions connecting to the HS 2 spurs would be grade separated. The junction from the south the **(1)** would be located north east of Irlam with the most western line to the depot (1.1km in length) crossing over the spur route **(2)** near Barton Grange. The junction to the east of the depot would be located west of Winton **(3)** with the northern line to the depot (2.0km in length) crossing over the M60 and the spur route **(4)**. Both lines from the junction would pass under the Liverpool to Manchester railway **(5** and **6)**.

Access would also be provided in the Manchester direction to the Liverpool to Manchester railway. Depot lines 1.3km long would be provided from the east end of the depot, crossing over the M60 and Worsley Brook to a junction at Winton **(7)**. Liverpool and Preston would be served by classic compatible trains using this connection.

Highway access would be direct from the A6144 **(8)** via a new access road.

Construction of the depot in this location would use standard methods. The Liverpool to Manchester railway would be realigned at the junction with the depot line. Part of the depot would also be on an area of peat which would require ground stabilisation works prior to construction.

5. Classic Compatible

Classic compatible trains would run from HS2 routes onto existing rail lines, operated by Network Rail, to complete their journeys. Three options for connections from HS2 routes to the West Coast Main Line (WCML) have been developed at Crewe, Bamfurlong (13km north of Warrington) and Brock (12km north of Preston).

5.1 Connection at Crewe to WCML

The connection to the WCML south of Crewe station would allow classic compatible trains to serve Crewe, Runcorn, Liverpool and North Wales.The connecting route (HSM09) from the HS2 through route to the WCML is described in section 2.9 of this report. It would join the WCML at node F, 900m south of Crewe station. Figure 5.1 shows the connection in relation to the existing rail lines and the HS2 through lines to Manchester.

It has been assumed that the HS2 services to Manchester and Scotland would be carried on the dedicated HS2 infrastructure and would use the proposed tunnel under Crewe. None of these services would be required to stop at, or pass through, Crewe station. At Crewe station 400m long trains from the south would split to form 200m long trains for onward travel to the north. Similarly 200m long trains from the north would be required to join to form 400m long trains for onward travel to the south.The two centre tracks through the station would be removed to accommodate the infrastructure alterations required to allow the stopping, splitting and joining of these classic compatible trains.

Currently only platforms 6 and 12 in the northbound direction and platform 12 in a southbound direction can accommodate 400m long trains, which require a platform length of 415m. By reconfiguring junctions at the north and south ends of the platforms, in association with the removal of the through lines, the length of platform 6 available would be extended to 415m for southbound trains. An 83m extension to Platform 5 would also be constructed to the south to provide the required 415m useable platform length. These alterations would provide 3 platforms which would be suitable for HS2 trains. Figure 5.2 shows the alterations.

Signalling and overhead electrification alterations would be required for the reconfigured track layout.

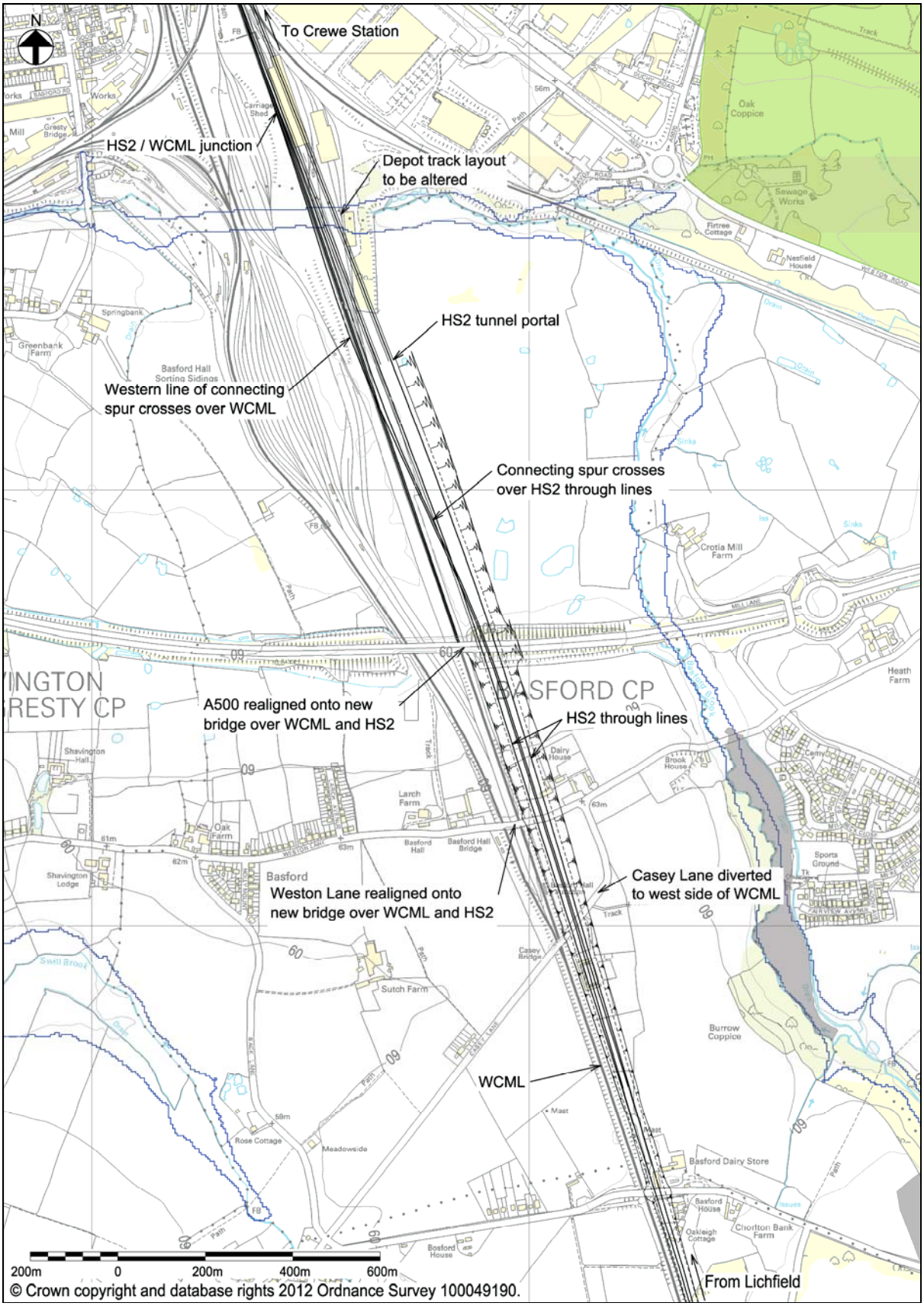


Figure 5.1: Connection at Crewe to WCML

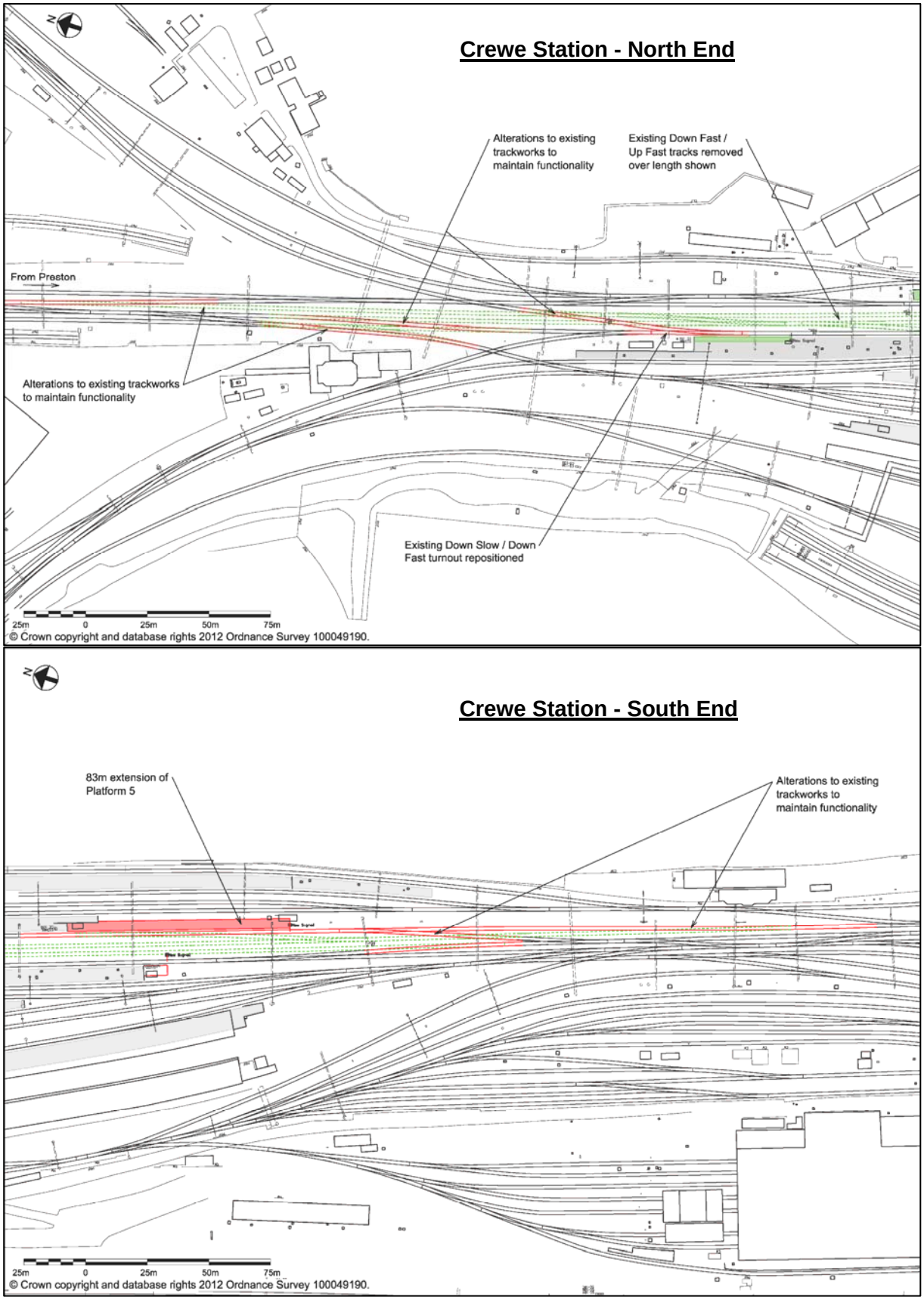


Figure 5.2: Crewe Station Reconfigured Track Layout

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5.2 Connection at Bamfurlong to WCML

The connection to the WCML at Bamfurlong, some 13km north of Warrington, would allow classic compatible trains to serve Preston, Lancaster, Carlisle and Scoltand. The connecting route (HSM22) is described in section 2.22 of this report.

A grade separated junction would be provided at Bamfurlong. The HS2 lines would connect to the fast lines of the WCML which are the most easterly lines of the four. At the junction HS2 would adopt the straight route and the WCML would become the diverging route. To accommodate this connection the existing most easterly line of the WCML would be diverted to the east a maximum distance of 100m this would give HS2 adequate clearance to pass over it. The diversion would be 2km long with a new embankment and bridge over Coffin Lane Brook. The western of the two fast lines would be also need to be realigned but only along a 600m length. The two most westerly lines of the WCML, the slow lines, would not be affected. Figure 5.3 shows the HS2 route connection and associated WCML diversion.

Signalling and overhead electrification alterations would be required for the reconfigured track layout.

To provide the necessary operational functionality it may be necessary for the existing network infrastructure at Golborne Junction and Lowton Junction (5km to the south), and the tracks between them and the HS2 junction, to be reconfigured. Network Rail has undertaken an evaluation with HS2 Ltd of these works as well as those required to provide additional capacity between Golborne and Preston.

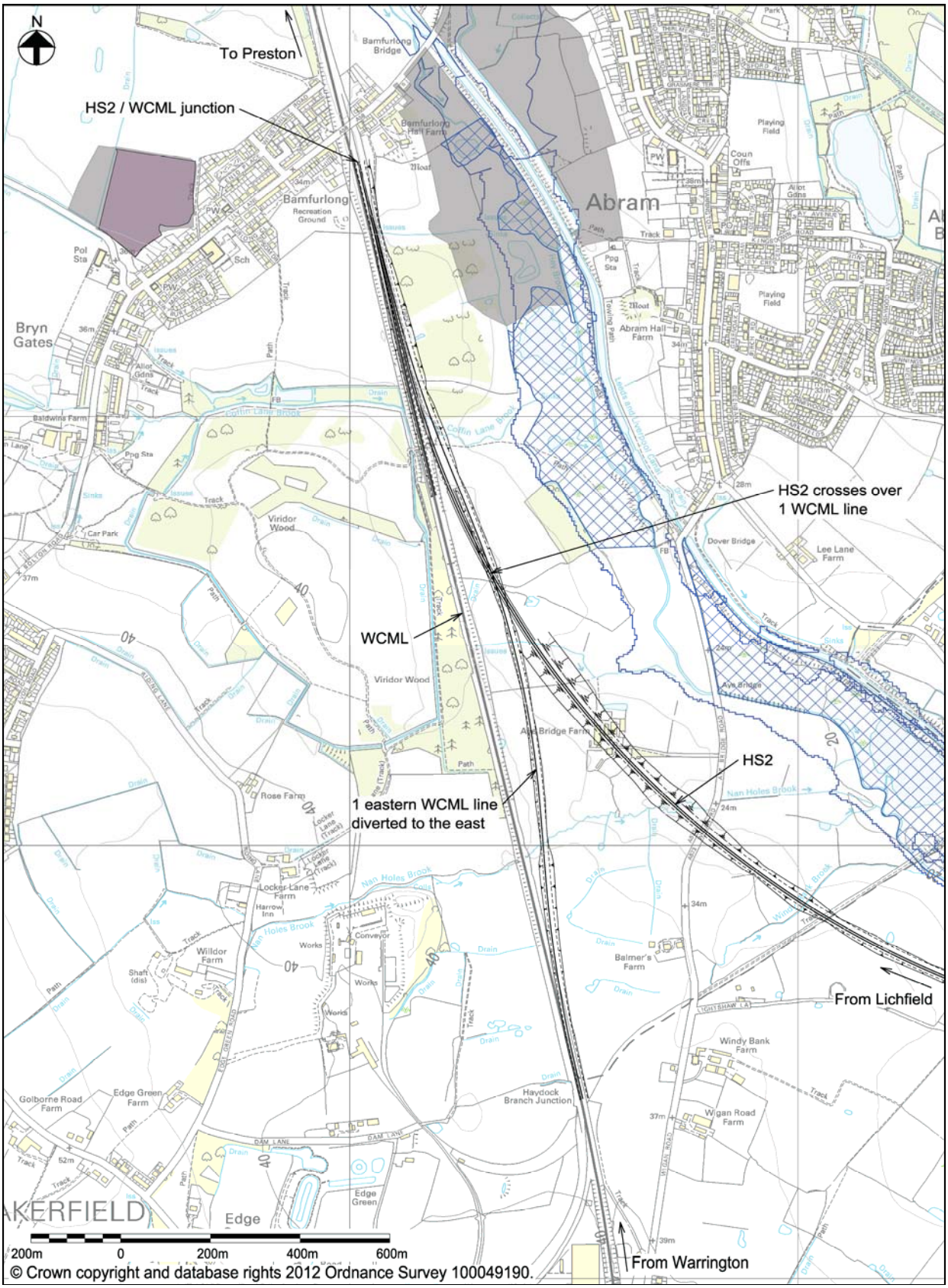


Figure 5.3: Connection at Bamfurlong to WCML

5.3 Connection at Brock to WCML

The connection to the WCML at Brock, some 12km north of Preston, would allow classic compatible trains to serve Lancaster, Carlisle and Scotland. The HS2 route that joins the WCML at Brock (HSM23) is described in section 2.23 of this report.

A grade separated junction would be provided at Brock. At the junction HS2 would adopt the straight route and the WCML would be diverted. The existing most easterly line of the two WCML lines would be diverted to the east a maximum distance of 50m. This would require 1km of diversion with a new embankment and bridge over the River Brock. The easterly HS2 line would cross over the westerly WCML line and descend in the area created by the diversion to join the WCML. The two WCML lines would be realigned over a total length of 4km. Figure 5.4 shows the connection.

Signalling and overhead electrification alterations would be required for the reconfigured track layout. Network Rail has undertaken an evaluation with HS2 Ltd of capacity and speed improvements that would be required on the WCML north of Brock to Scotland to facilitate HS2 services.

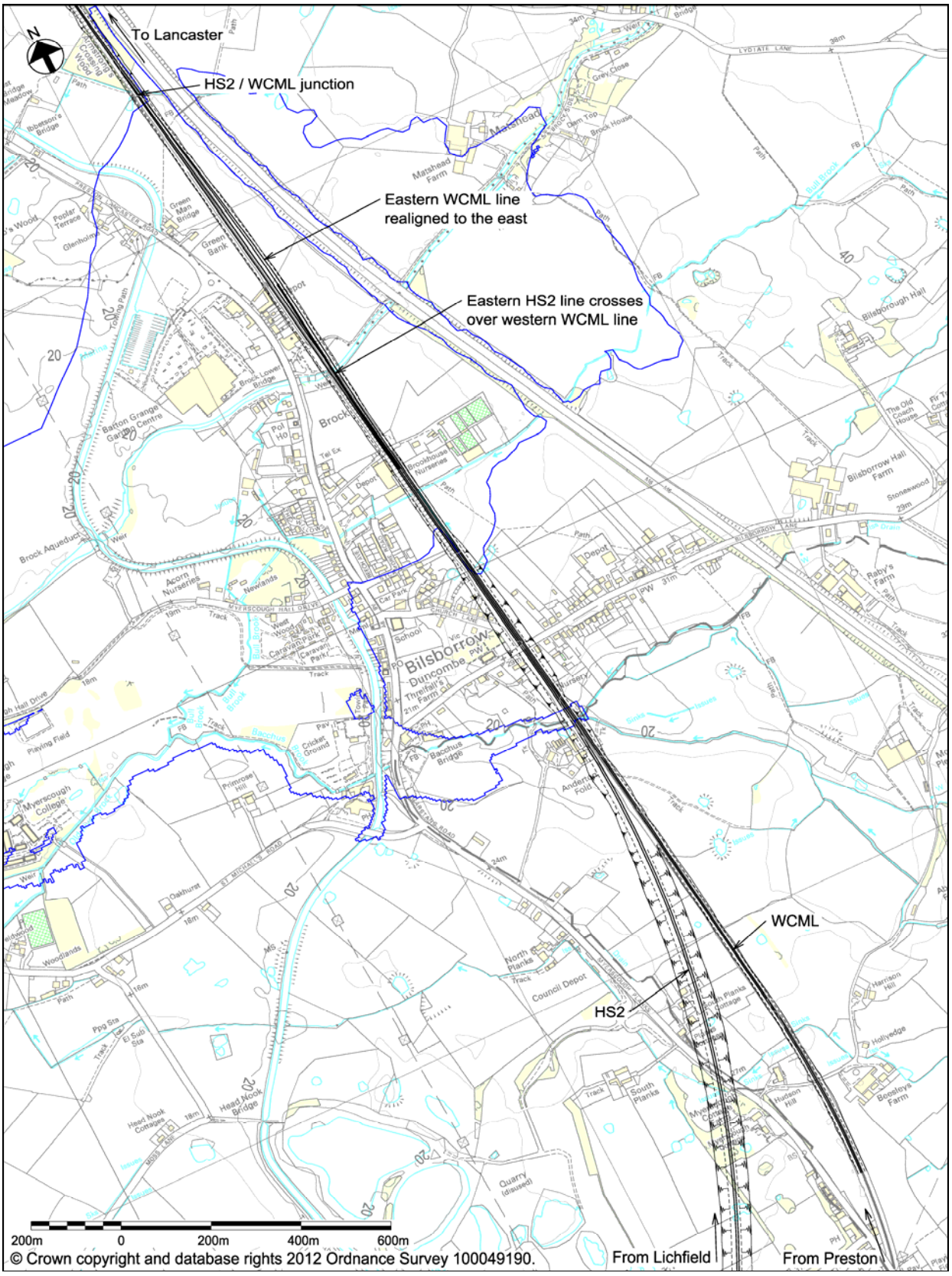


Figure 5.4: Connection at Brock to WCML

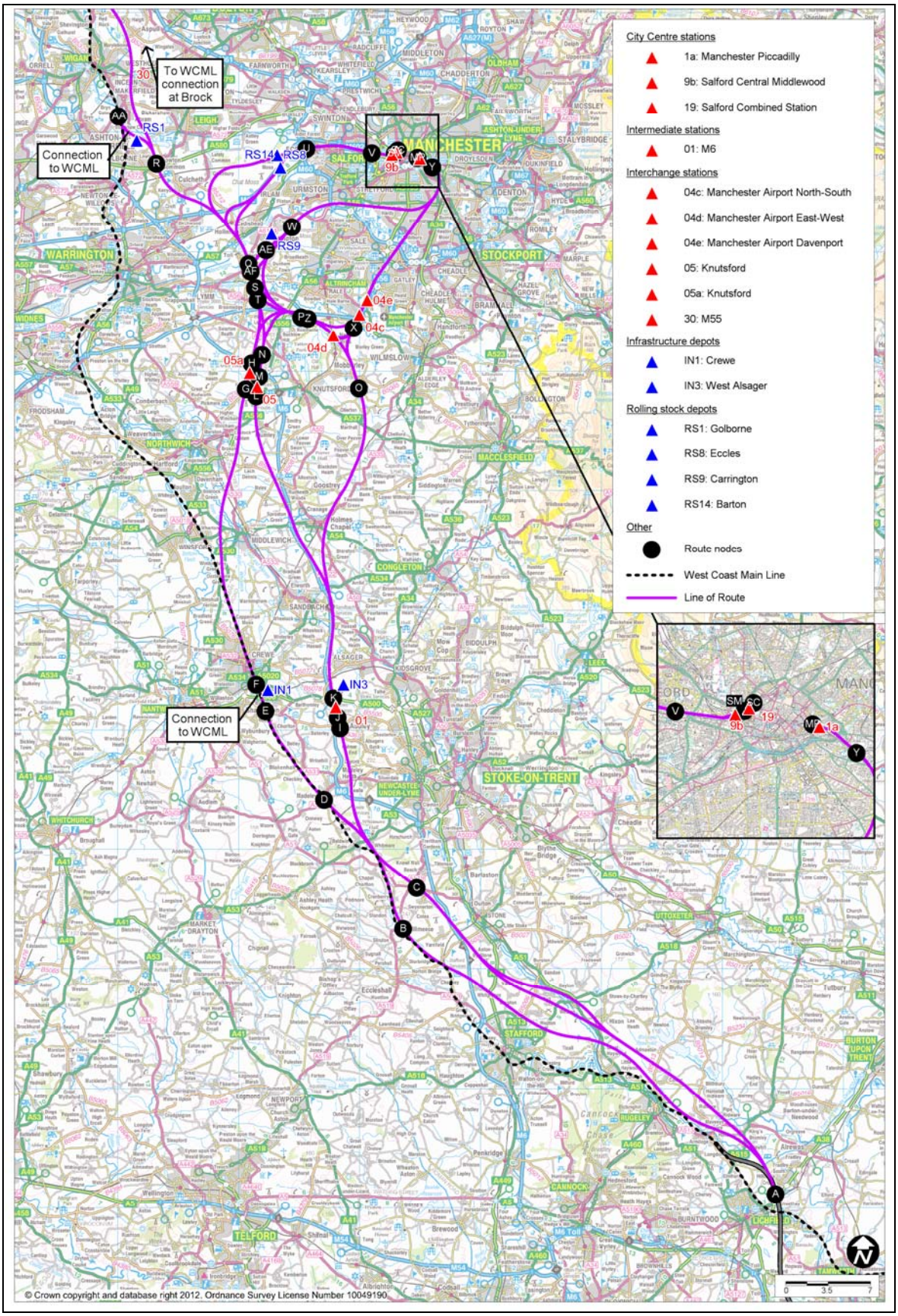


Figure 6.1: Key Plan

6. Whole Route Options

6.1 Combining the Building Blocks

The building blocks described in the preceding sections of this report can be combined in a number of ways to give whole route options to Manchester and the WCML.

These building blocks comprise:

- 40 sections of route HSM01 to HSM40 (Section 2)
- Three city centre stations: Manchester Piccadilly, Salford Middle wood, Salford Central (Sections 3.1 – 3.3)
- One intermediate station: M6 (Section 3.4)
- Six interchange stations: 2 at Knutsford, 3 at the Airport and 1 at the M55 (Sections 3.5 to 3.10)
- Connections to the WCML at Crewe, Golborne and Brock (Section 5)
- Two infrastructure maintenance depots (Section 4.1)
- Four rolling stock depots (Section 4.2)

A key plan showing all routes, nodes, stations, WCML connections and depots is shown in Figure 6.1.

6.2 Summary of Whole Route Options

The routes from Lichfield to Manchester and the WCML can be best described as 12 examples. These are made up of three routes from Lichfield to the Manchester outskirts, each with four spur options to city centre stations in Manchester and a single route north to the WCML. These routes and spurs are shown in Figure 6.2.

The three routes from Lichfield to Manchester are:

- Lichfield to Newcastle-under-Lyme northern option to the south of Weston, followed by Newcastle-under-Lyme to Crewe western route and **Crewe to Golborne western route** (red route)
- Lichfield to Newcastle-under-Lyme northern option to the south of Weston, followed by the **Sandbach to Golborne airport route** (dark blue route)
- Lichfield to Newcastle-under-Lyme northern option to the south of Weston, followed by **Sandbach to Golborne M6 route** (green route)

The four spurs to the city centre stations are:

- Airport and south Manchester tunnel (light blue spur)
- Mersey and tunnel (orange spur)
- M62 (yellow spur)
- Chat Moss corridor (green spur)

Route sections that are not used in the 12 examples are identified as ‘other routes’ (purple routes) in Figure 6.2. These route sections perform in a very similar way to those used in the examples, however where they result in a different journey time, this is set out below.

1. Only one of the three options south of Newcastle-under-Lyme has been used in the 12 examples; Lichfield to Newcastle-under-Lyme northern option with south of Weston variant. If the alternative

route options are chosen there is an additional journey time of two seconds for the northern option to the north of Weston and eight seconds for the southern option.
2. There are two spurs to Salford that follow the M62 corridor. The one that has been used in the examples is the western option. If the other option is used the journey time is reduced by 37 seconds.
3. All of the 12 route options can also include the route section to join the WCML north of Preston.

6.3 Performance of Whole Route Options

Table 6.1 shows the 12 route options, indicating the combination of routes and spurs.

The following information is provided in the table, allowing the routes to be compared:

- City centre station served by the option
- Journey time from London Euston to Manchester city centre station
- The journey times from London Euston to the WCML connections
- Intermediate station served by the option
- Interchange station served by the option
- Which infrastructure maintenance depot would be required
- Which rolling stock maintenance depots would be suitable
- The route length to Manchester
- Key features

Journey times were calculated using the methodology described in HS2 Ltd's report to Government.

The HS2 Ltd report "Options for phase two of the high speed rail network" identifies that at this stage of the design process the best performing combination is:

- the northern route between Lichfield and Newcastle-under-Lyme (which has the option of the variant), from there to Crewe and on to Golborne (the red route)
- a city centre station at Manchester Piccadilly (MP)
- the Mersey and tunnel spur (the orange spur)

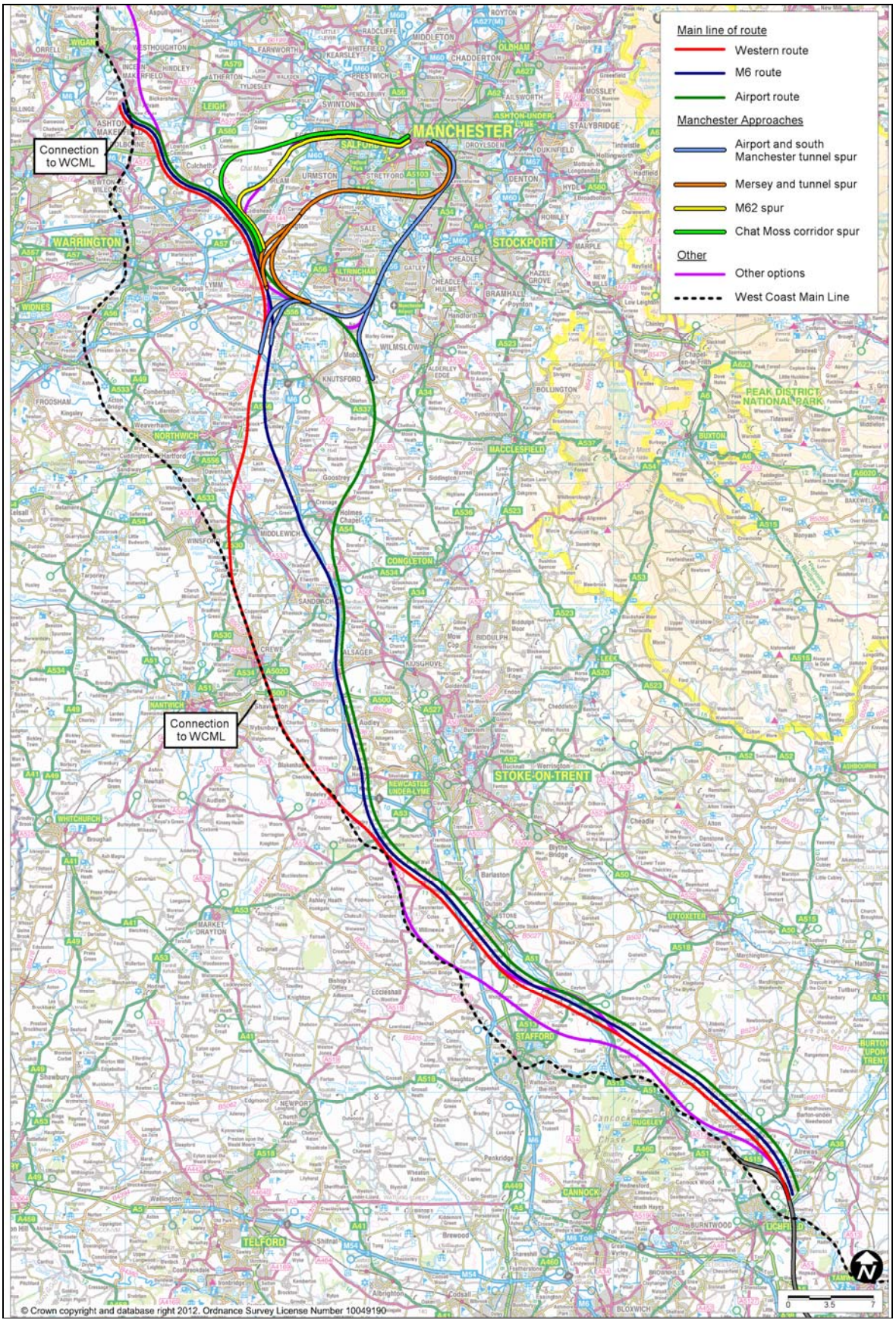


Figure 6.2: Whole Route Options. This is an illustration of 12 examples route options. The actual position of routes shall be taken from Section 2.

Line of Route Name	Spur Name	City Centre Station	Journey Time to City Centre Station	Intermediate Station	Interchange Station	Infrastructure Maintenance Depot	Rolling Stock Maintenance Depot	Route Length to Manchester (km)	Journey Time to City Centre Station with stop at intermediate station	Time increment	Journey Time to WCML Connection	
											Crewe	Golborne
Lichfield to Newcastle-under-Lyme northern option with south of Weston variant Crewe to Golborne western route Newcastle-under-Lyme to Crewe western route	Mersey and tunnel (Base Proposition)	Piccadilly	01:08:35	-	Knutsford 5A	IN1 - Crewe	RS9 - Carrington or RS1 - Golborne	119.72	01:13:34	00:04:59	00:11:55	01:04:58
	M62	Salford Central	01:08:37	-	Knutsford 5A	IN1 - Crewe	RS14 - Barton or RS1 - Golborne	119.57	01:13:37	00:05:00	00:11:55	01:04:58
	Chat Moss corridor	Salford Central	01:08:47	-	Knutsford 5A	IN1 - Crewe	RS8 - Eccles or RS1 - Golborne	122.37	01:13:47	00:05:00	00:11:55	01:04:58
	Airport and south Manchester tunnel	Piccadilly	01:08:38	-	N/S Airport Dav Green*	IN1 - Crewe	RS1 - Golborne	118.04	01:13:38	00:05:00	00:11:55	01:04:58
Lichfield to Newcastle-under-Lyme northern option with south of Weston variant Sandbach to Golborne airport route	Mersey and tunnel	Piccadilly	01:09:00	M6 HS2	E/W Airport	IN3 - West Alsager	RS9 - Carrington or RS1 - Golborne	120.11	01:13:58	00:04:58	-	01:05:14
	M62	Salford Central	01:08:52	M6 HS2	E/W Airport	IN3 - West Alsager	RS14 - Barton or RS1 - Golborne	121	01:13:51	00:04:59	-	01:05:14
	Chat Moss corridor	Salford Central	01:09:02	M6 HS2	E/W Airport	IN3 - West Alsager	RS8 - Eccles or RS1 - Golborne	123.8	01:14:00	00:04:58	-	01:05:14
	Airport and south Manchester tunnel	Piccadilly	01:06:15	M6 HS2	N/S Airport	IN3 - West Alsager	RS1 - Golborne	107.54	01:11:17	00:05:02	-	01:05:14
Lichfield to Newcastle-under-Lyme northern option with south of Weston variant Sandbach to Golborne M6 route	Mersey and tunnel	Piccadilly	01:08:12	M6 HS2	Knutsford 5	IN3 - West Alsager	RS9 - Carrington or RS1 - Golborne	117.18	01:13:12	00:05:00	-	01:04:37
	M62	Salford Central	01:08:13	M6 HS2	Knutsford 5	IN3 - West Alsager	RS14 - Barton or RS1 - Golborne	117.38	01:13:13	00:05:00	-	01:04:37
	Chat Moss corridor	Salford Central	01:08:23	M6 HS2	Knutsford 5	IN3 - West Alsager	RS8 - Eccles or RS1 - Golborne	120.15	01:13:23	00:05:00	-	01:04:37
	Airport and south Manchester tunnel	Piccadilly	01:09:00	M6 HS2	N/S Airport Dav Green*	IN3 - West Alsager	RS1 - Golborne	115.2	01:14:00	00:05:00	-	01:04:37

Table 6.1: Performance of Whole Route Options

(* Davenport Green Interchange Station)

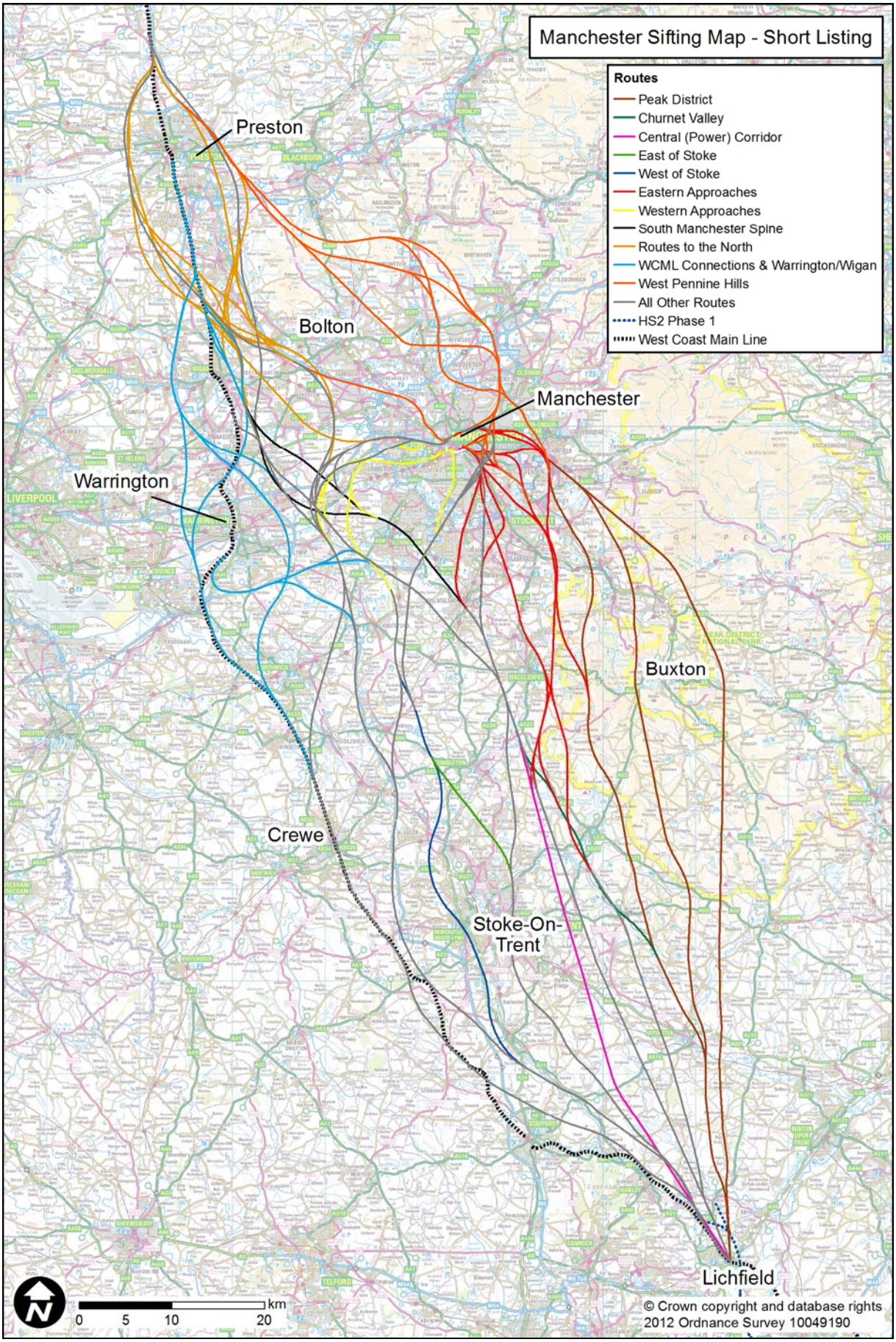
7. History of Line of Route Options Studied

This section describes the history of line of route options studied and identifies those routes or groups of routes that were identified and parked at the following sifting stages:

- long list of options (see Section 7.1)
- short list of options (see Section 7.2)
- selecting of options for refinement (see Section 7.3)
- alternative options not progressed to final options stage (see Section 7.5)

7.1 Long List of Options

Route options that had been identified by HS2 Ltd were provided to MSG. These were reviewed and additional options were identified to generate the long list. All route options identified at long listing are shown overleaf on the short listing map. No sifting was undertaken at this stage, with all routes progressing to the short list and further development.


Manchester Sifting Map - Short Listing
Routes
Peak District
Churnet Valley
Central (Power) Corridor
East of Stoke
West of Stoke
Eastern Approaches
Western Approaches
South Manchester Spine
Routes to the North
WCML Connections & Warrington/Wigan
West Pennine Hills
All Other Routes
HS2 Phase 1
West Coast Main Line
Preston
Bolton
Manchester
Warrington
Buxton
Crewe
Stoke-On-Trent
Lichfield
0 5 10 20 km
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7.2 Short List of Options

7.2.1 Peak District group

The group would have formed three routes at the most easterly part of the route corridors connecting Lichfield with Dukinfield, southeast of Manchester.

The southern end of this group of routes would generally run on low embankments and cuttings, passing through relatively flat land. Further north, the routes would require a mixture of high embankments and deep cuttings, high viaducts of up to 75 metres in height, and lengths of tunnel totalling between approximately 16km and 20km. The routes would run through areas of hard rock which could present difficulties for tunnelling construction, and unstable slopes. Some sections of the routes would run through river valleys/corridors and flood plains, including for the River Dove, River Churnet, River Goyt and River Tame.

7.2.2 Churnet Valley group

The group would have connected east of Cheadle with Macclesfield.

This route would run on high embankments, deep cuttings, and in approximately 7km of tunnel. The route would pass through areas of hard rock which could present difficulties for tunnelling construction, areas of unstable slopes, and lengths of viaduct along the River Churnet valley.

7.2.3 Central (Power) Corridor group

The group would have connected northwest from Lichfield with south of Macclesfield.

At the south end of this route approximately 20km would generally run on low embankments and cuttings, passing through relatively flat land. For the subsequent 35km the route would require a mixture of high embankments and cuttings, some lengths of high viaduct, and several sections of tunnel. The route would run through areas of hard rock which could present difficulties for tunnelling construction, and unstable slopes. Several flood plain and river crossings would be required.

7.2.4 East of Stoke group

The group would have been formed of a short route connecting the northeast of Stoke-On-Trent with Brereton Heath, just west of Congleton.

This route would run generally on high embankments and cuttings, and in tunnel for approximately 3km. The route would pass through areas of hard rock which could present difficulties for tunnelling construction, and areas of unstable slopes. Further difficulties may be encountered due to potential instability associated with mining in the area.

7.2.5 West of Stoke group

The group would have formed a single route connecting north of Stone with Over Peover, passing partly in tunnel through the west of Stoke-On-Trent.

This route would run on high embankments and deep cuttings, and in tunnel for approximately 10km underneath Newcastle under Lyme. In part, the route would follow the River Trent. The section of the route near to Newcastle under Lyme has complex geotechnical issues, including mining and associated subsidence, and hard rock.

7.2.6 Eastern Approaches group

The group would have formed a number of approaches connecting core route options from Macclesfield with stations in the east of Manchester. Some of the approaches would have split at their northern extent to connect into multiple city-centre station options.

Many of the route options within this group would follow alongside existing transport and river corridors for much of their length. These routes would run through mostly urban built-up areas, requiring substantial lengths of structures and the closure or realignment of urban roads, and resulting in disruption to existing infrastructure in some locations. Sections of tunnels would be required for some of the route options.

7.2.7 Western Approaches group

The group would have formed five approaches connecting core line of route options with stations in the west of Manchester. The two western-most of these approaches would have run eastwards from Glazebury into Salford. The other three approaches would have extended northwards, connecting either Altrincham or north east of Holmes Chapel, with St. George's on the south side of Manchester city centre.

For most of their length these route options would follow one of three main infrastructure corridors into Manchester. They would run at existing ground level or be elevated on viaduct alongside the Manchester Ship Canal, an existing major sewer corridor, or the A5103 Princess Parkway. The most northerly option following the Manchester Ship Canal corridor would require a short length of tunnel underneath the Canal. All options would run through existing built up urban areas, and substantial lengths of structure and viaduct would be required to cross existing infrastructure.

7.2.8 South Manchester Spine group

The group would have connected Wilmslow with Wigan, connecting routes from Birmingham to Manchester and the WCML.

The eastern part of these two route options would run in a tunnel for approximately 14km passing underneath Altrincham. Emerging from tunnel the options would rise onto viaduct for much of the remaining length, crossing over Manchester Ship Canal and several roads including the M62 and A580 East Lancs Road. The routes would pass through areas of peat and areas where there has been extensive coal mining. The northern route option would also require a major new viaduct structure across Pennington Flash.

7.2.9 WCML Connections and Warrington/ Wigan group

The group would have formed connections to Warrington, Wigan and the WCML from the core Birmingham to Manchester routes. The group spanned from Northwich at its southern extent, and Altrincham and Knutsford at its south-eastern extent, northwards to Preston.

The southern parts of these route options would run through generally flat terrain and through built up urban areas. Most of the options follow alongside the M6 or the West Coast Main Line corridors for large parts of their length. Major new crossings of the River Mersey and Manchester Ship Canal would be required in addition to the closure or realignment of several roads. Some route options would take an indirect route to connect to the WCML south of Warrington. At this point there would be less operational capability on the classic network to accommodate the HS2 services.

7.2.10 West Pennine Hills group

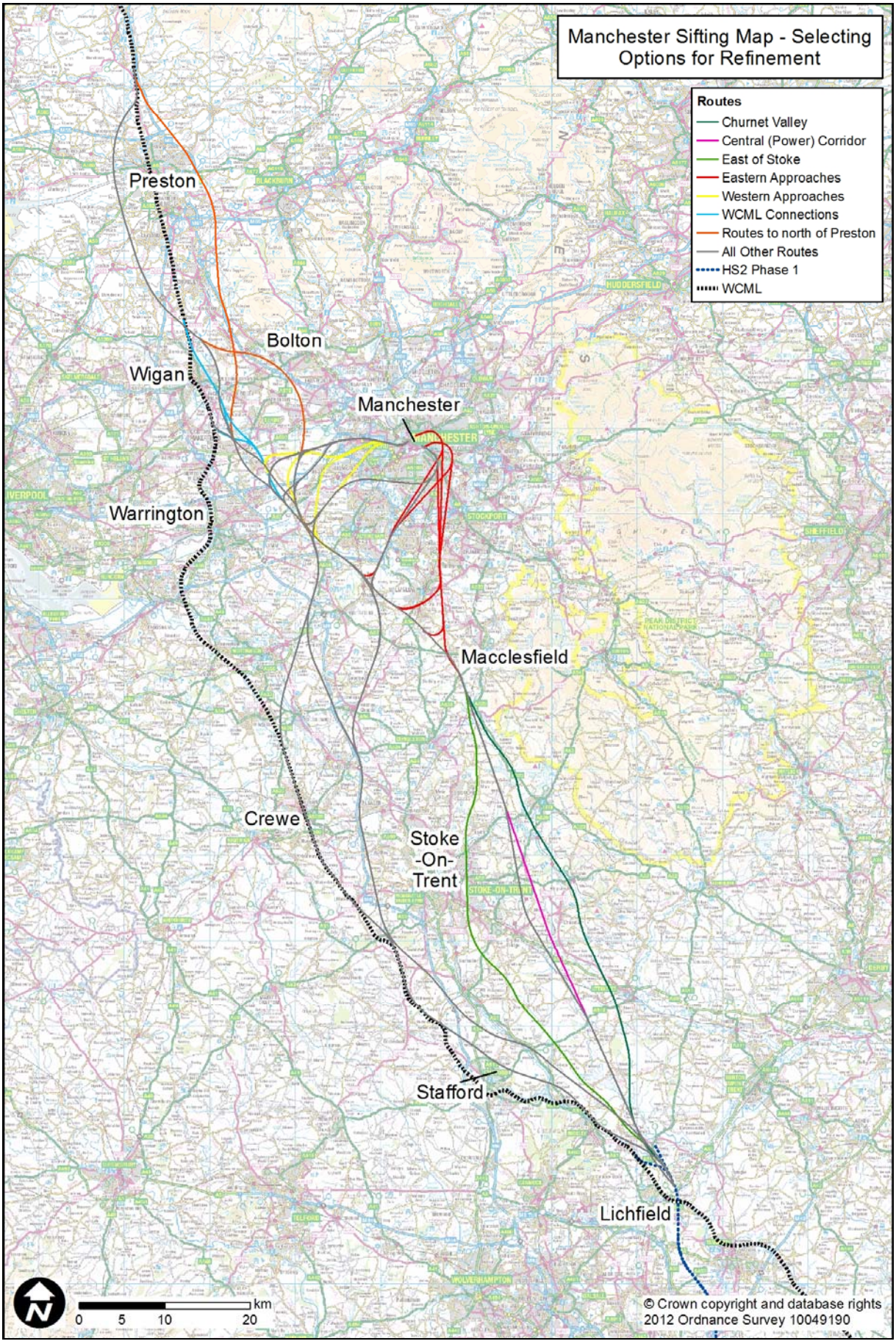
The group would have formed several alignments connecting Manchester to the north and north west of Manchester. Most alignments in this group extended to the northeast of Preston partially in tunnel, with the exception of one alignment which followed the M61 corridor to Westhougton.

All route options would require some lengths of tunnel, in one case approximately 19km in length. Through the upland areas north of Manchester, the options require high embankments and long lengths of high viaduct, with some lengths of deep cutting.

7.2.11 Routes to north of Preston group

This group would have formed several alignments from the west of Manchester running northwest to connect onto the WCML, including connections to the north of Preston. The group includes a variety of routes taking different corridors past a number of urban areas including Hindley, Coppull and Eccleston.

In general, to the south of Preston the more eastern routes would pass through hillier terrain and would require more deep cuttings and high embankments with some sections of viaduct. The more westerly routes are generally through flatter terrain. All routes within this group would cross areas of coal mining. Some tunnelling would be required for some of the routes where they would go under urban areas, including under Hindley and Coppull.


Manchester Sifting Map - Selecting Options for Refinement
Routes
Churnet Valley
Central (Power) Corridor
East of Stoke
Eastern Approaches
Western Approaches
WCML Connections
Routes to north of Preston
All Other Routes
HS2 Phase 1
WCML
Preston
Bolton
Wigan
Manchester
Warrington
Macclesfield
Crewe
Stoke -On- Trent
Stafford
Lichfield
0 5 10 20 km
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7.3 Selecting Options for Refinement

7.3.1 Churnet Valley group

The remaining Churnet Valley route would connect Lichfield with Macclesfield passing to the west of Leek.

The southern 30km of this route option would require generally low embankments and shallow cuttings across open countryside. Further north the route would pass close to the edge of the Pennines and would require high embankments and deep cuttings, together with several lengths of viaduct (including over Churnet Valley) and several short lengths of tunnel.

The routes would run through areas of hard rock which could present difficulties for tunnelling construction, and unstable slopes particularly at Churnet Valley

7.3.2 Central (Power) Corridor group

This route would form part of the route taking the most direct path between Lichfield and south of Macclesfield. This section would run from south-west of Uttoxeter to west of Leek.

The route would run on generally medium to high embankments and medium to deep cuttings. It includes some lengths of viaduct, many individual bridge structures, and with several short lengths of tunnel totalling approximately 3km.

7.3.3 East of Stoke group

The remaining East of Stoke route would connect Lichfield with Macclesfield, passing in tunnel through the east side of Stoke-on-Trent.

The southern 39km of this route option would cross undulating open country generally on low to medium embankments and cuttings. There would be a 700m viaduct to the south west of King's Bromley, together with other viaducts over flood plains. Further north the route would climb towards Hilderstone with some lengths of high viaducts and short tunnels, before descending into a 15km tunnel beneath Stoke on Trent. Continuing north there would be a short length of tunnel under the eastern side of The Cloud near Woodhouse Common and some lengths of viaduct over the River Dane and Macclesfield Canal

This route would involve some significant engineering complexities. In particular, it would involve a long section of tunnel through the ex-mining area of the Potteries Coalfield. The complexities of this would be unprecedented for UK tunnelling experience due to the tunnel depth required to get below the voids left by mining. Other coal mining related risks would also need to be managed during construction such as methane pockets, ground movements and ground water influx.

7.3.4 Eastern Approaches group

The group comprised six approaches into the eastern side of Manchester. All approaches would have diverged from a core route option between Macclesfield and Altrincham, to enter the east of Manchester partly in tunnel and terminate at one of three city-centre station options.

All route options within this group would involve lengths of tunnel under the Manchester urban area. This would vary in length from approximately 12km to 17km for the more westerly group of 3 options, and 14km to 18km for the more easterly group. On the immediate approach to the city centre stations,

all options would involve a similar range of issues including crossing and realignment of city centre roads and existing railways.

7.3.5 Western Approaches group

The Western Approaches comprised six approaches to terminus station options located in the west of Manchester. These routes would have diverged from the main line of route at one of three locations: near the M6 crossover (west of Tatton Park); southwest of Altrincham (north of Rostherne Mere); or to the northeast of Lymm.

All route options within this group would involve lengths of tunnel on the immediate approach to Manchester city centre. The most easterly of the route options would include an approximately 9km long tunnel under Urmston residential area; the other options would include approximately 4km to 6km long tunnels. All options would cross areas with up to 5 metres depth of peat which would require removal or construction of special engineering foundations, with the greatest depth occurring on the most westerly option.

7.3.6 WCML connections group

The remaining route would run from east of Warrington to south of Coppull, connecting to the WCML.

From the southern end of this option, the route would initially run on generally medium height embankments with some discrete bridge crossings. At Pennington Flash (a 70 hectare lake caused by mine collapse), the route would require a technically complex 800m long structure. Further to the north, the route would pass under the eastern edge of Wigan in a tunnel approximately 3km long and then connect with the existing WCML south of Preston

7.3.7 Routes to north of Preston (orange routes)

This group comprises of two routes from west of Manchester heading north towards connections to the WCML. One route would pass to the immediate southwest of Bolton; one route would continue northward passing to the east of Preston and connecting to the WCML north of Preston.

The routes would pass through areas of peat and areas where there has been extensive coal mining. Some tunnelling would be required for the route continuing to the north of Preston, including a 3km tunnel under Hindley.

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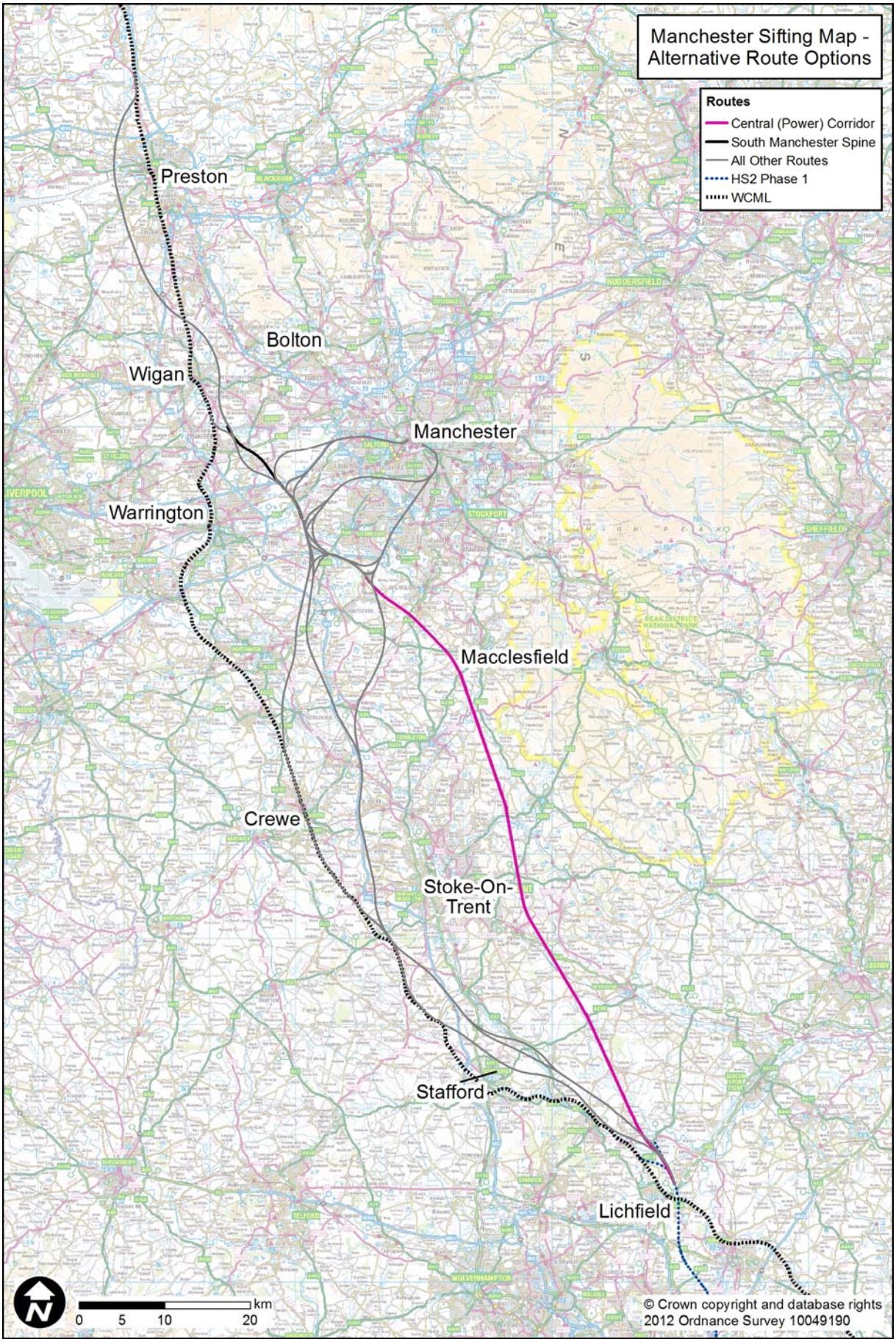
Manchester Sifting Map - Alternative Route Options
Routes
Central (Power) Corridor
South Manchester Spine
All Other Routes
HS2 Phase 1
WCML
Preston
Bolton
Wigan
Manchester
Warrington
Macclesfield
Crewe
Stoke-On-Trent
Stafford
Lichfield
0 5 10 20 km
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7.4 Alternative options not progressed to final options stage

At the stage of selecting options for refinement two route options were retained to illustrate the alternatives to the routes included in the final options stage. These options are described below. Although they were not sifted out, no further work was undertaken on these route options due to the notably better performance of the final options.

7.4.1 Central (Power) Corridor

This route would run from Lichfield to south of Manchester in the vicinity of Manchester Airport following the route of overhead power lines to the south of Macclesfield.

The southern 18km of this route would generally run on low embankments and cuttings, passing through relatively flat land. Continuing further to the north, the route would require a mixture of high embankments and deep cuttings, lengths of high viaduct, and several short lengths of tunnel. The route would run through areas of hard rock which could present difficulties for tunnelling construction, and unstable slopes. Several flood plain crossings would be required.

7.4.2 South Manchester Spine

This option provided a route from southwest of Manchester to connect with routes either linking with the WCML at Golborne or continuing northward towards Preston.

This route would pass through areas of peat, and would require a tunnel underneath Lowton in an area of coal mining.

8. History of Station Options Studied

This section describes the history of city centre, intermediate and interchange station options studied. For each category of station those that were parked at the following stages are identified:

- long list of options (see Sections 8.1.1, 8.2.1 and 8.3.1)
- short list of options (see Sections 8.1.2, 8.2.2 and 8.3.2)
- selecting options for refinement (see Sections 8.1.3, 8.2.3 and 8.3.3)

8.1 City Centre Sections

8.1.1 Long List of Options

City Centre Stations Sifting Process

The 30 longlisted stations were evaluated against assessment criteria which were defined in the form of subject headings. These took the form of the following 8 key headings:

- Dispersal
- Proximity to commercial centre
- Impact on existing rail infrastructure
- Complexity of construction
- Sustainability - impact on communities
- Sustainability - impact on environment and heritage
- Cost
- Compatibility with Northern Hub

Each of these headings covered key considerations for the identification of an appropriate station site in Manchester. In order for them to be used as a filter, the headings were used to generate a single question which could then be asked of each station site option. This question was pre-answered by up to three graded statements. The assessment process was undertaken by asking each of the questions to each of the station options and in turn applying the most appropriate statement in answer to each. The options "answers" were then recorded in an assessment matrix but in the associated colours. This gave each option a RAG (Red, Amber, Green) rating which revealed its overall response to the key considerations. The colours were representative of the statements intent i.e. Green represents a favourable response, Red a less favourable response.

The next stage of assessment involved grouping options into 'families' relative to their geographic location in the city. From this, the strongest performing options in each family were identified to ensure an appropriate range of options. The options which did not have a real discernible difference to similar adjacent options were parked in favour of the strongest option. Analysing the options against these criteria helped inform the assessment and the decision of which options to ultimately recommend for continuing to the next gate stage.

A similar assessment process was undertaken at short listing and finalised option stages however the assessment of sustainability and cost was removed and contained within separate reports. The level of assessment was incrementally increased with each stage in the form of sub-headings to the original key subject headings. This resulted in further questions being asked of each option and ensured an appropriately thorough analysis at each stage.

This process represented an 'inward' assessment of the station options based purely on architectural, capacity, construction, and operational issues. It did not take into account the 'outward' assessment of line routes or costs associated with the stations. The station options could not be looked at in isolation of line, route and cost. Therefore, a combined and separate assessment of 'inward' and 'outward' strands would be required before recommending a preferred station option.

The final options report was supplementary to the assessment of the station options carried out the previous options development stage. At this stage a more detailed consideration of circulation and site permeability was considered alongside the criteria considered at previous stages. The final options report did not undertake a final evaluation of each option but rather aimed to further test the options with a view to identifying the key issues and opportunities associated with each.

The following sections outline the station options considered at each stage and provide a brief summary of the options which were parked.

	OPTION NUMBER	OPTION CODE	OPTION NAME	APPLICABLE STATION TYPES	DISPERSAL	PROXIMITY TO COMMERCIAL CENTRE	IMPACT ON EXISTING RAIL INFRA STRUCTURE	COMPLEXITY OF CONSTRUCTION	SUSTAINABILITY - IMPACT ON COMMUNITIES ***	SUSTAINABILITY - IMPACT ON ENVIRONMENT AND HERITAGE ***	COST	COMPATABILITY WITH NORTHERN HUB **	OPTION CARRIED FORWARD by HS2	VIABLE OPTIONS IDENTIFIED by MSG (See pages 99-144)	REASONS FOR PARKING/ CONTINUING
PICCADILLY	1A	MP1	Manchester Piccadilly by Platform 1	A,B,C,D,E,F									Yes	Yes	Proximity to Piccadilly/City Centre. Space to construct
	1B	MPB	Manchester Piccadilly Baird Street	A,B,C,D,E,F									Yes	Yes	Proximity to Piccadilly/City Centre. Space to construct
	1C	MPS	Manchester Piccadilly Store Street	A,B,C,D,E,F									No	No	Buildability Issues
	1D	MPU	Manchester Piccadilly Undercroft	A,B,C,D,E,F									No	No	Complexity of construction relative to other Piccadilly options
	1E	MPM	Manchester Piccadilly Mayfield	A,B,C,D,E,F									Yes	Yes	Through Station Possibilities
	1F	MPL	Manchester Piccadilly London Road	A,B,C,D,E,F									Yes	No	Not a distinct enough difference between this option and UNI
	3	UNI	University	A,B,C,D,E,F									Yes	Yes	Central Location, good connections
EAST	2	ANC	Ancoats	A,B,C,D,E,F									No	No	MPB is effectively this option with better dispersal
	4	SPC	Sport City	A,B,C,D,E,F									No	No	Aproach impacts on Phillips Park cemetery
VICTORIA	5	TFS	Thomson Street Fire Station	A,B,C,D,E,F									No	No	Poor Links
	6	GSB	Green Street Quarter / Bromley Street	A,B,C,D,E,F									Yes	Yes	Availability of land, Proximity to Manchester Victoria
	7A	MVT	Manchester Victoria Through	A,B,C,D,E,F									No	No	Too much impact on existing infrastructure
	7B	MVG	Manchester Victoria Greengate	A,B,C,D,E,F									Yes	Yes	Availability of land, Proximity to Manchester Victoria
	17	UNG	Underground	A,B,C,D,E,F									No	No	Prohibitively expensive and complex to construct
	18	MEN	MEN (New MSG Option)	A,B,C,D,E,F									Yes	Yes	Good through route possibilities and commercial
NORTH	8A	CII	Cambridge Industrial Estate Irwell Bank	A,B,C,D,E,F									No	No	Poor relationship to city centre and classic network
	8B	CIW	Cambridge Industrial Estate Wilfred St	A,B,C,D,E,F									No	No	Poor relationship to city centre and classic network
SALFORD	9A	SCW	Salford Central West Platforms	A,B,C,D,E,F									Yes	No	Complexity/Impact of build.Option 9a to investigate further
	9B	SCM	Salford Central Middlewood	A,B,C,D,E,F									Yes	Yes	Open Site, Ease of Construction, proximity to Salford Central
	9C	HST	Hope Street	A,B,C,D,E,F									No	No	Poor location relative to existing infrastructure
	10	LST	Liverpool Street	A,B,C,D,E,F									No	Yes	Central site between CBD and Salford Quays
	16	TVC	Television Centre	A,B,C,D,E,F									No	No	Cuts across 'Ordsall Chord' works of Northern Hub proposals
QUAYS	11A	SQE	Salford Quays Eire Basin	A,B,C,D,E,F									No	No	Poor links to city centre. Complex to construct
	11B	SQT	Salford Quays BDF Terminal	A,B,C,D,E,F									Yes	Yes	Located next to future 'Media City'. Ease of Construction.
	11C	SQB	Salford Quays Trafford Bank	A,B,C,D,E,F									No	No	Poor location. Potential conflict with adjacent petroleum refinery
	15	POD	Pomona Dock	A,B,C,D,E,F									Yes	No	Location is too far from CBD and Quays
GMEX	12	KMI	Knott Mill	A,B,C,D,E,F									No	No	KMI option is similar to FST which is being carried forward
	13	FST	First Street	A,B,C,D,E,F									Yes	Yes	Central location with transport links and space to construct
	14A	GMX	GMex	A,B,C,D,E,F									No	No	GMEX crosses streets, classic rail, metro lines and Deansgate Station
	14B	GMS	GMex South	A,B,C,D,E,F									No	No	Complex to build and impacts on existing infrastructure

Figure 8.1: Example Of Assessment Matrix Table

Summary of Options Parked Following Longlisting Stage

OPTION 1a* (MP1) Manchester Piccadilly by Platform 1
OPTION 1b* (MPB) Manchester Piccadilly Baird St
OPTION 1c (MPS) Manchester Piccadilly Store St
OPTION 1d (MPU) Manchester Piccadilly Undercroft
OPTION 1e* (MPM) Manchester Piccadilly Mayfield
OPTION 1f* (MPL) Manchester Piccadilly London Road
OPTION 2 (ANC) Ancoats
OPTION 3* (UNI) University
OPTION 4 (SPC) Sport City
OPTION 5 (TFS) Thomson St Fire Station
OPTION 6* (GSB) Green Street Quarter/Bromley Street
OPTION 7a (MVT) Manchester Victoria Through
OPTION 7b* (MVG) Manchester Victoria Greengate
OPTION 8a (CII) Cambridge Industrial Estate Irwell Bank
OPTION 8b (CIW) Cambridge Industrial Estate Wilfred St
OPTION 9a* (SCW) Salford Central West Platforms
OPTION 9b* (SCM) Salford Central Middlewood
OPTION 9c (HST) Hope Street
OPTION 10* (LST) Liverpool St
OPTION 11a (SQE) Salford Quays Erie Basin
OPTION 11b* (SQT) Salford Quays DBF Terminal
OPTION 11c (SQB) Salford Quays Trafford Bank
OPTION 12 (KMI) Knott Mill
OPTION 13* (FST) First Street
OPTION 14a (GMX) GMex
OPTION 14b (GMS) GMex South
OPTION 15* (POM) Pomona Docks
OPTION 16 (TVC) Television Centre
OPTION 17 (UNG) Underground
OPTION 18* (MEN) Manchester Evening News

(* Option carried forward to next stage)

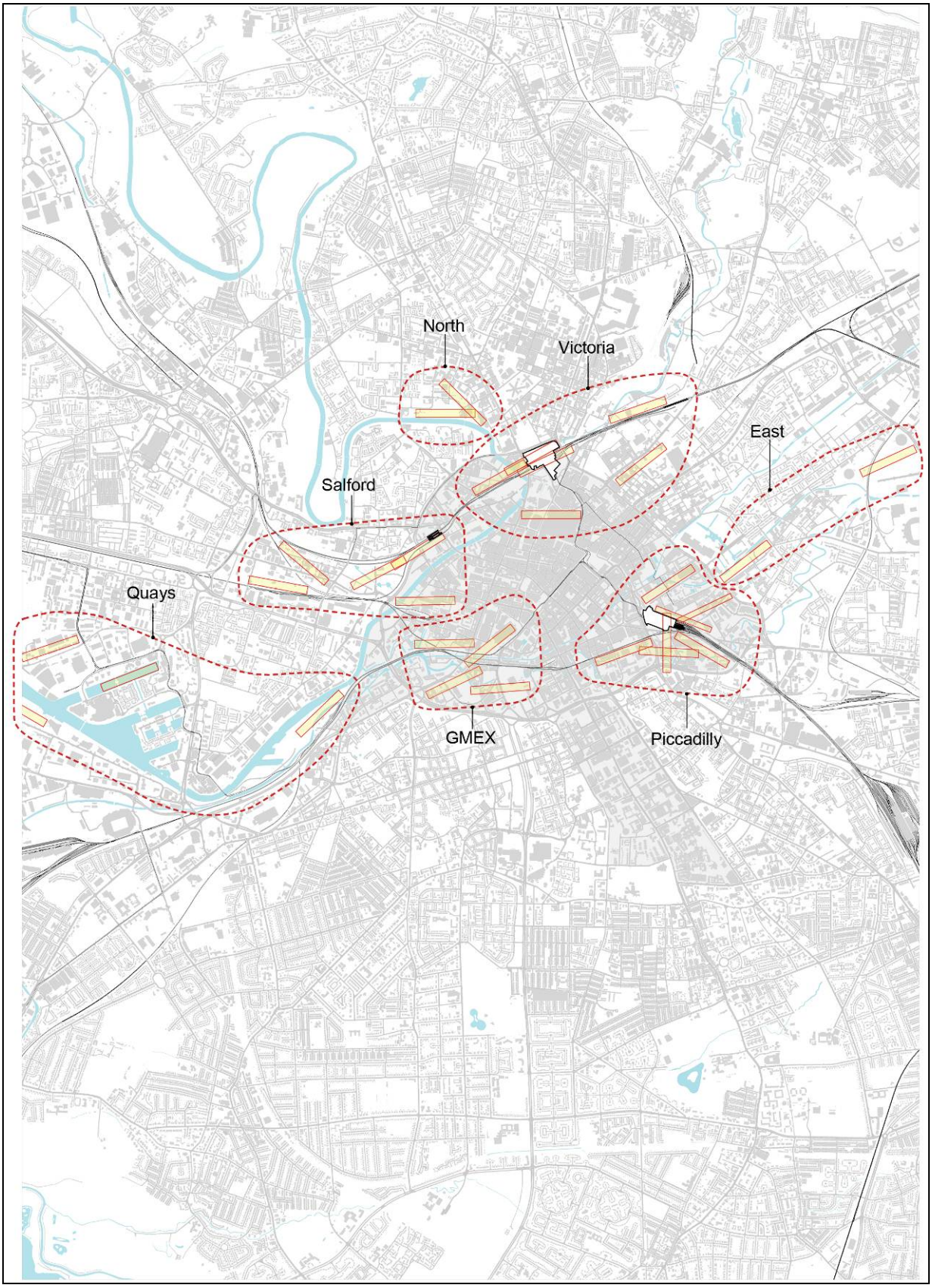

Figure 8.2: Manchester City Centre Station Longlisted Options

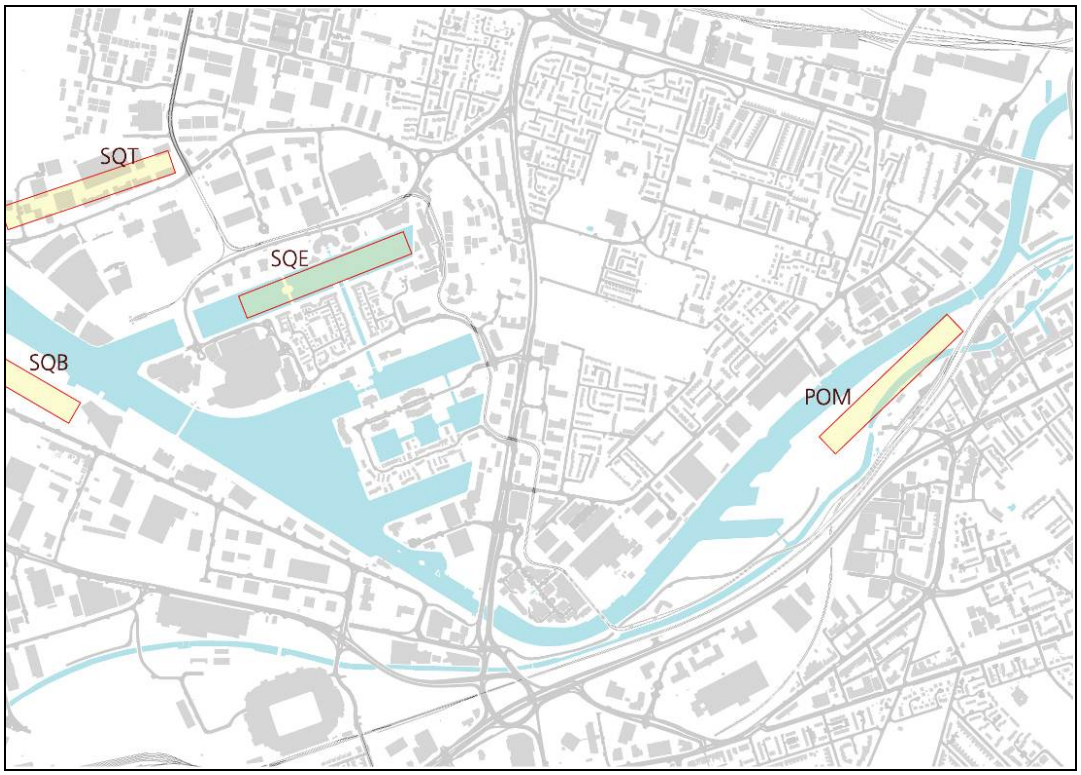

Figure 8.3: Quays Area Longlisted Station Options

Option 11a SQE Salford Quays Erie Basins

Elevated terminal station within an existing canal basin in Salford Quays. The station would be over 2km from the city centre (defined as the area within the inner ring road). Onward dispersal by public transport would not be not well supported as the station is not close to any existing rail and is 2km from the inner ring road. The option would present a complicated construction due to contaminated land below the immediate surface of the basin. The station would detract from the amenity of the water which characterises the Salford Quays area and would alter the nature of the historical Manchester Ship Canal. A planned expansion of the local Media City site may impact on the availability of sites for a HS2 station in this area. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option. The approach to the station would be elevated to cross the canal.

Option 11c SQB Salford Quays Trafford Bank

At grade terminal station adjacent to the Manchester Ship Canal at Salford Quays. The station would be over 2km from the city centre (defined as the area within the inner ring road). Onward dispersal by public transport would not be not well supported as the station would not be close to any existing rail and would be 2km from the inner ring road. The option would present a complicated construction due to a conflict with main feeder supplies to the adjacent petroleum refinery. Three shipping docks would be required to be filled or bridged. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

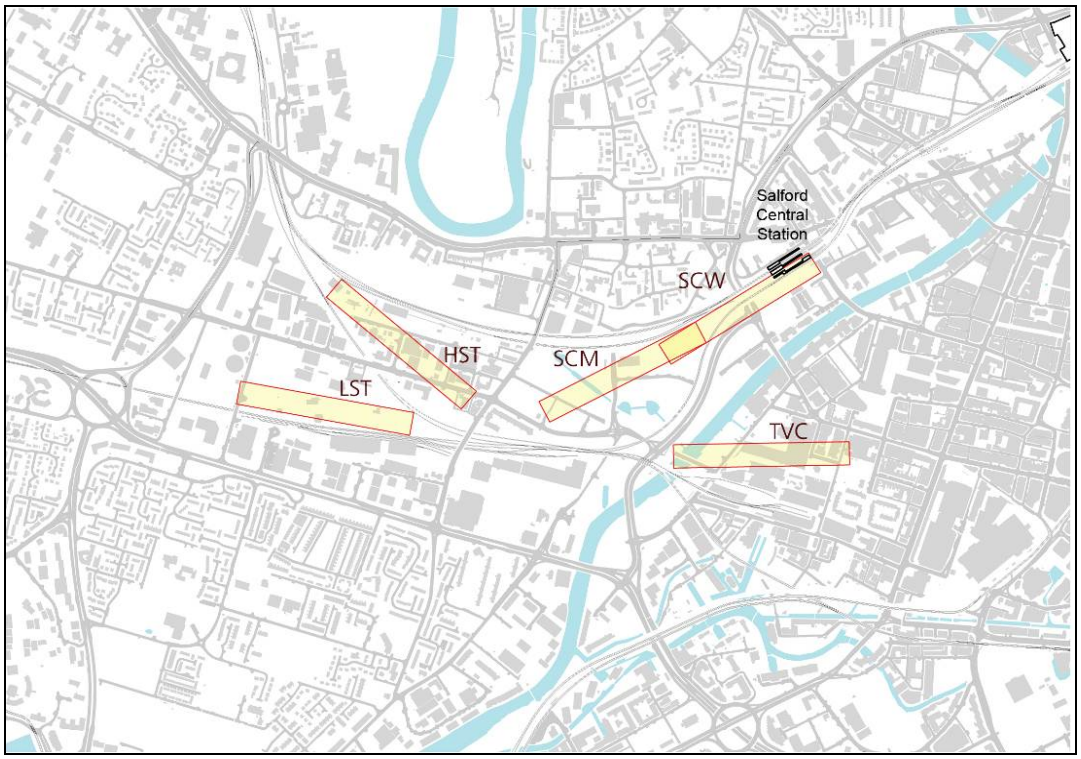

Figure 8.4: Salford Area Longlisted Station Options

Option 9c HST Hope Street

Elevated terminal station on a vacant site west of Salford Central station. The station would be under 1km from the city centre (defined as the area within the inner ring road) and over 500m from Salford Central station. Pedestrian connectivity to the city centre would be poor as the site is con strained by existing rail and roa d infrastructure. Onward dispersal by public transport would not be not well supported as the station is not close to any existing rail or Metrolink services. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 16 TVC Television Centre

Elevated terminal station on the former site of Granada Studios. The station would be within the inner ring road however onward dispersal would not be well supported as there is no access to any mass transit public transport.
The option would impact greatly on a key element of the Northern Hub works; the Ordsall Line Chord.

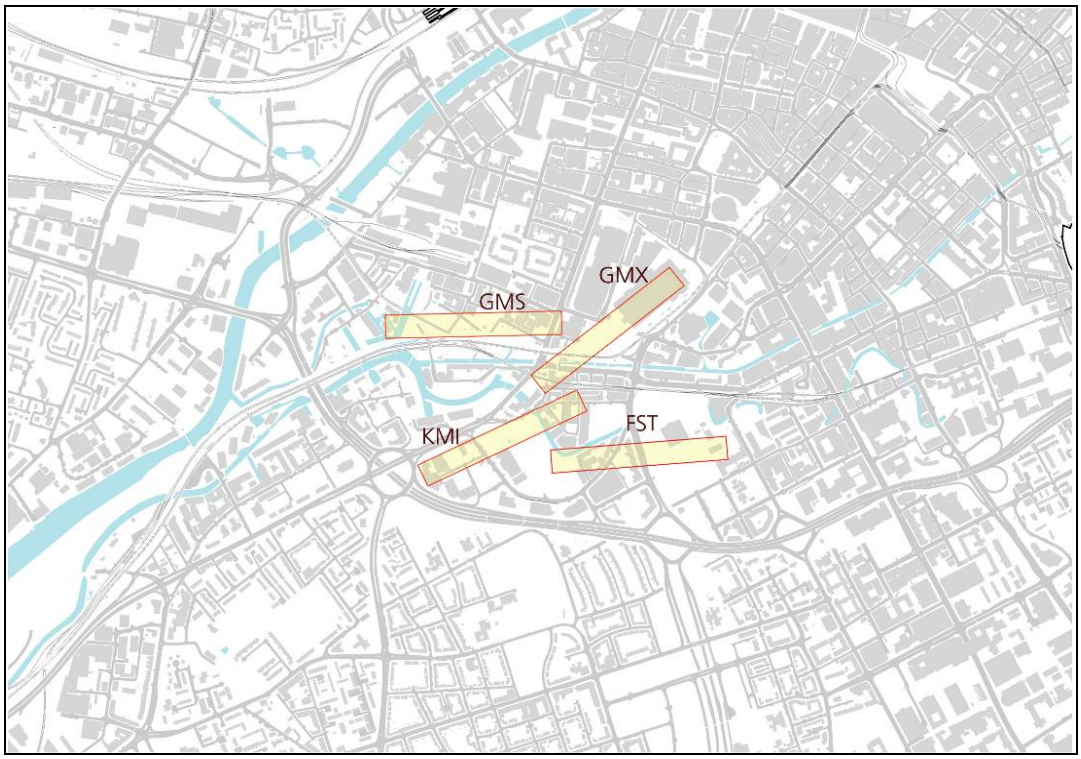

Figure 8.5: GMEX Area Longlisted Station Options

Option 12 KMI Knott Mill

At grade terminal station parallel to Chester road and south of Deansgate station. The station would be within the inner ring road however onward dispersal would not be well supported as Deansgate station has only 2 tracks therefore any stopping services to pick up HS2 passengers would significantly impact on capacity of the existing station. This route through Deansgate is key to Northern Hub plans. The site is constrained by Mancunian Way and the existing rail viaducts. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 14a GMX GMex

At grade terminal station accommodated in part within GMeX. The existing trainshed of GMex would not be long enough to accommodate the 400m long platforms of a HS2 station. The station would be within the inner ring road however onward dispersal would not be well supported as Oxford Road station has poor throughput while Deansgate station has only 2 tracks therefore any stopping services to pick up HS2 passengers would significantly impact on capacity of the existing station. The option presents a complicated construction due to the need to rebuild sections of the Metrolink and the added complexities and risks associated with constructing next to Bridgewater Hall and the Beetham Tower. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option. The approach to the station would crossunder the railway, metro canal and highways and would be expensive and disruptive.

Option 14b GMS GMex South

Elevated terminal station to the west of GMex and north of Deansgate station. The station would be within the inner ring road however onward dispersal would not be well supported as Oxford Road station has poor throughput while Deansgate station has only 2 tracks therefore any stopping services to pick up HS2 passengers would significantly impact on the capacity of the existing station. The option presents a complicated construction due to the added complexities and risks associated with constructing next to the Beetham Tower. The approach to the station would be elevated above the already elevated Manchunian Way.

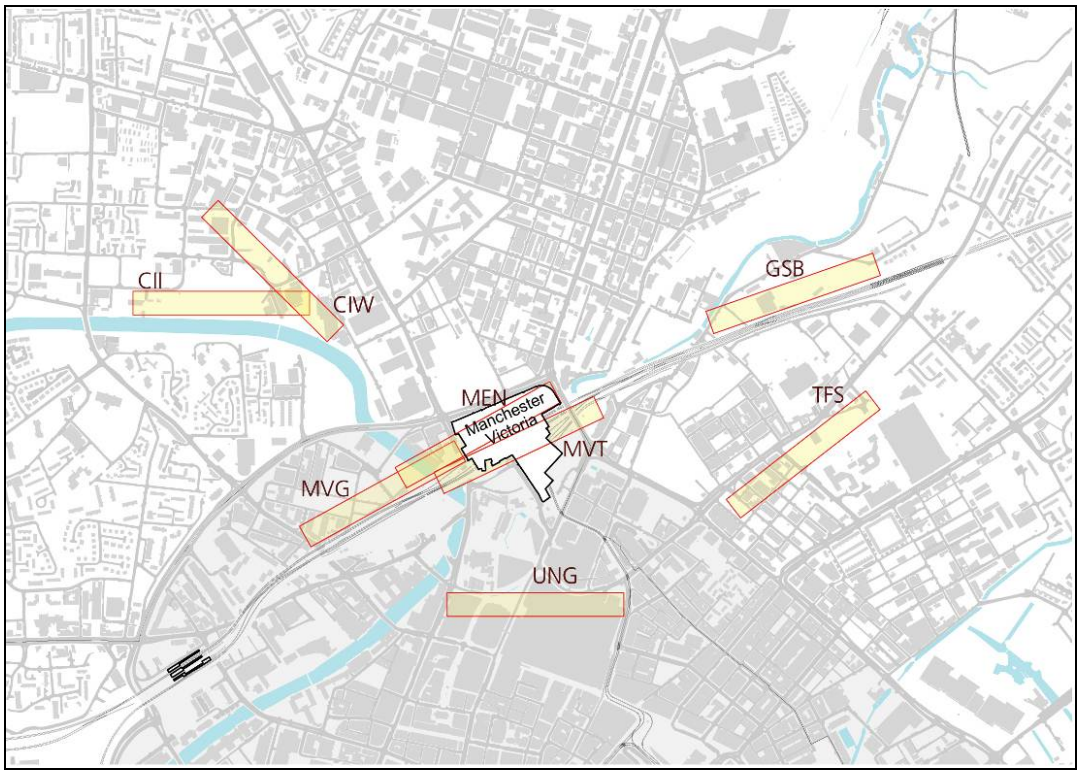

Figure 8.6: Victoria and North Areas Longlisted Station Options

Option 5 TFS Thompson Street Fire Station

At grade terminal station located south east of Victoria Station and immediately east of the inner ring road. The station would be within 1km of the city centre (defined as the area within the inner ring road). Its proximity to Swan Street would facilitate good connectivity with the inner ring road but would reduce ease of pedestrian connectivity with the city centre. Onward dispersal by public transport would not be not well supported. Rail services at Manchester Victoria station would be approximately 600m away. Shudehill Metrolink stop is approximately 300m away. The Thompson street fire station which would be impacted by the HS2 station and require it to be relocated to an alternative site in advance of the construction of the HS2 station. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 7a MVT Manchester Victoria Through

At grade through station on the footprint of existing Manchester Victoria station. The station would be within 1km of the city centre (defined as the area within the inner ring road). Onward dispersal would be well supported via existing rail and Metrolink services at Manchester Victoria. A station at this location would severely impact the proposed Northern Hub works to Manchester Victoria station, the planned improvements to east/west connections and existing approaches into the station. Existing rail services would need to be relocated. Extensive remodeling of the Victoria station approaches would be required in order to build the 400m long platforms. The current concourse area is also constrained and would require extensive modifications to support the predicted additional demand of the HS2 station. The predicted cost of the station would be approximately double of the least expensive station option on the assumption that a similar 6 platform station would need to be constructed to relocate existing rail services onto. Construction would require dignificant disruption to rail and metro services.

Option 8a CII Cambridge Industrial Estate Irwell Bank

At grade terminal station built parallel to the North bank of the River Irwell. The station would be under 1km from the city centre (defined as the area within the inner ring road) and over 500m from Manchester Victoria station. Pedestrian connectivity would be poor as the station would be on the opposite side of the River Irwell to the city centre. Onward dispersal by public transport would not be well supported as the station would be isolated from any existing rail/metro/transport corridor. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 8b CIW Cambridge Industrial Estate Wilfred St

Elevated terminal station built parallel to the North bank of the River Irwell. The station would be under 1km from the city centre (defined as the area within the inner ring road) and over 500m from Manchester Victoria station. Pedestrian connectivity would be poor as the station would be on the opposite side of the river Irwell to the city centre. Onward dispersal by public transport would not be not well supported as the station would not be isolated from any existing rail/metro/transport corridor. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

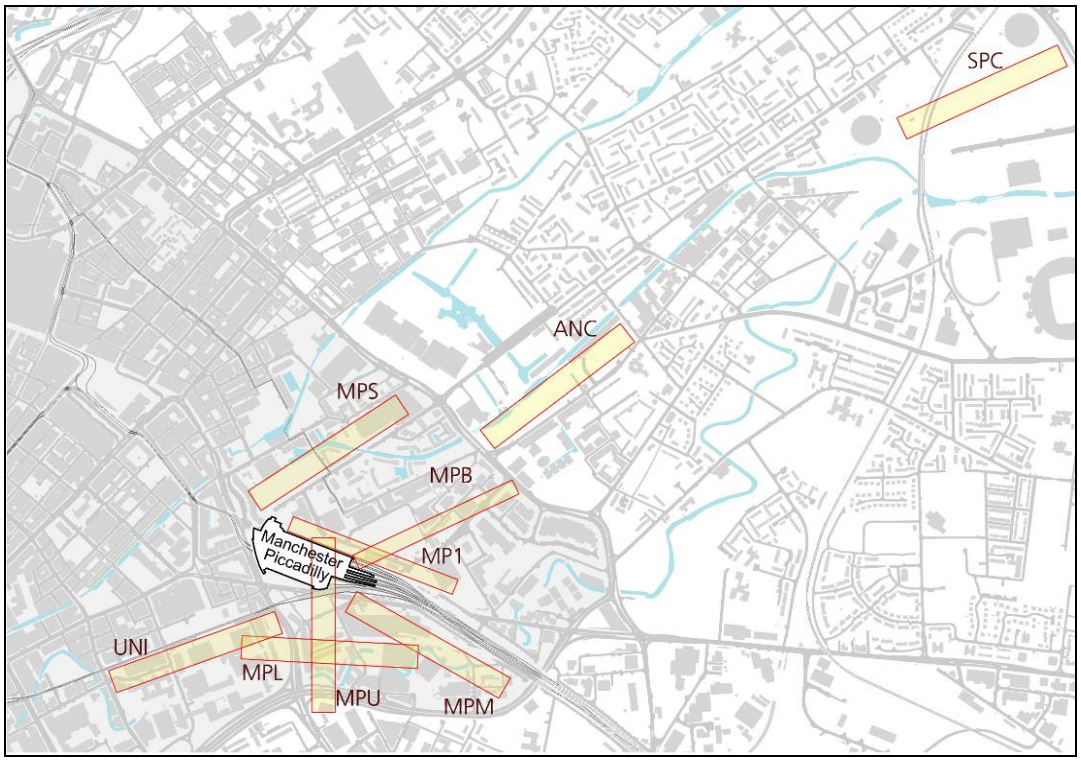

Figure 8.7: Piccadilly and East Areas Longlisted Station Options

Option 1c MPS Manchester Piccadilly Store St

Elevated terminal and through station option adjacent to the concourse of Manchester Piccadilly station. The new station would be within the inner ring road and onward dispersal by public transport would be well supported via existing rail and Metrolink services at Manchester Piccadilly station. The station would present a more difficult construction to that of nearby option 1A and 1B due to the demolition of several commercial and residential buildings and the need to bridge over the Ashton canal. The station would provide good connectivity with the city centre but a more complex interchange with Manchester Piccadilly station than Option 1A. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option. The approach to the station would bridge over the Manchunian Way.

Option 1d MPU Manchester Piccadilly Undercroft

Underground structure, built partially within the undercroft of Manchester Piccadilly station. The station would be within the inner ring road and onward dispersal by public transport would be well supported via existing rail and Metrolink services at Manchester Piccadilly station. It would however prove complex and expensive to construct with a potentially significant impact on existing operations within Manchester Piccadilly station, the metro and proposed Northern Hub works of new platforms 15 and 16. The predicted cost of the station would be approximately 20% more expensive than the adjacent options 1A and 1B.

Option 2 ANC Ancoats

At grade terminal station located approximately 800m to the east of Manchester Piccadilly station. The station would be within 1km of the city centre and immediately east of the inner ring road. Onward dispersal by public transport would not be well supported. Rail and Metrolink services at Manchester

Piccadilly station would be approximately 10mins walk. The East Manchester Metrolink extension which will open in 2012 from Piccadilly to Droylsden in Tameside includes a new stop directly south of the proposed HS2 station site. Its alignment however may also increase complexity of construction due to the additional constraint it places on the site. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 4 SPC Sports City

Elevated terminal station adjacent to Manchester Sports City. The station would be over 2km from the city centre and over 1km from the inner ring road. Onward dispersal by public transport would not be well supported. Bus services operate in the vicinity of the site however there are currently no rail or Metrolink services within walking distance of the proposed station. The East Manchester Metrolink extension which will open in 2012 from Piccadilly to Droylsden in Tameside includes a new stop approximately 200m south of the proposed HS2 station site. The option would also present difficulties in achieving a viable route to connect into it. The predicted cost of the station would be approximately 20% more expensive than the least expensive station option.

Option 17 UNG Underground

Underground station located within the city centre.

The above ground options proved more viable alternatives. The build issues associated with an underground station would prove this to be a very complex and difficult option. The predicted cost of an underground station would be approximately 400% more expensive than the least expensive station option.

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8.1.2 Short List of Options

Summary of Options Parked Following Shortlisting Stage

OPTION 1a* (MP1) Manchester Piccadilly by Platform 1
OPTION 1b* (MPB) Manchester Piccadilly Baird Street
OPTION 1e (MPM) Manchester Piccadilly Mayfield
OPTION 1f (MPL) Manchester Piccadilly London Road
OPTION 3 (UNI) University
OPTION 6 (GSB) Green Street Quarter / Bromley Street
OPTION 6b (GSB) Green Street Quarter / Bromley Street**
OPTION 6c* (GSB) Green Street Quarter / Bromley Street**
OPTION 7b (MVG) Manchester Victoria Greengate
OPTION 9a* (SCW) Salford Central West Platforms
OPTION 9b* (SCM) Salford Central Middlewood
OPTION 10 (LST) Liverpool Street
OPTION 11b (SQT) Salford Quays BDF Terminal
OPTION 13 (FST) First Street
OPTION 13a (FSA) First Street A**
OPTION 15 (POM) Pomona Dock
OPTION 18 (MEN) Manchester Evening News

* Option carried forward to next stage
** Addendum Option

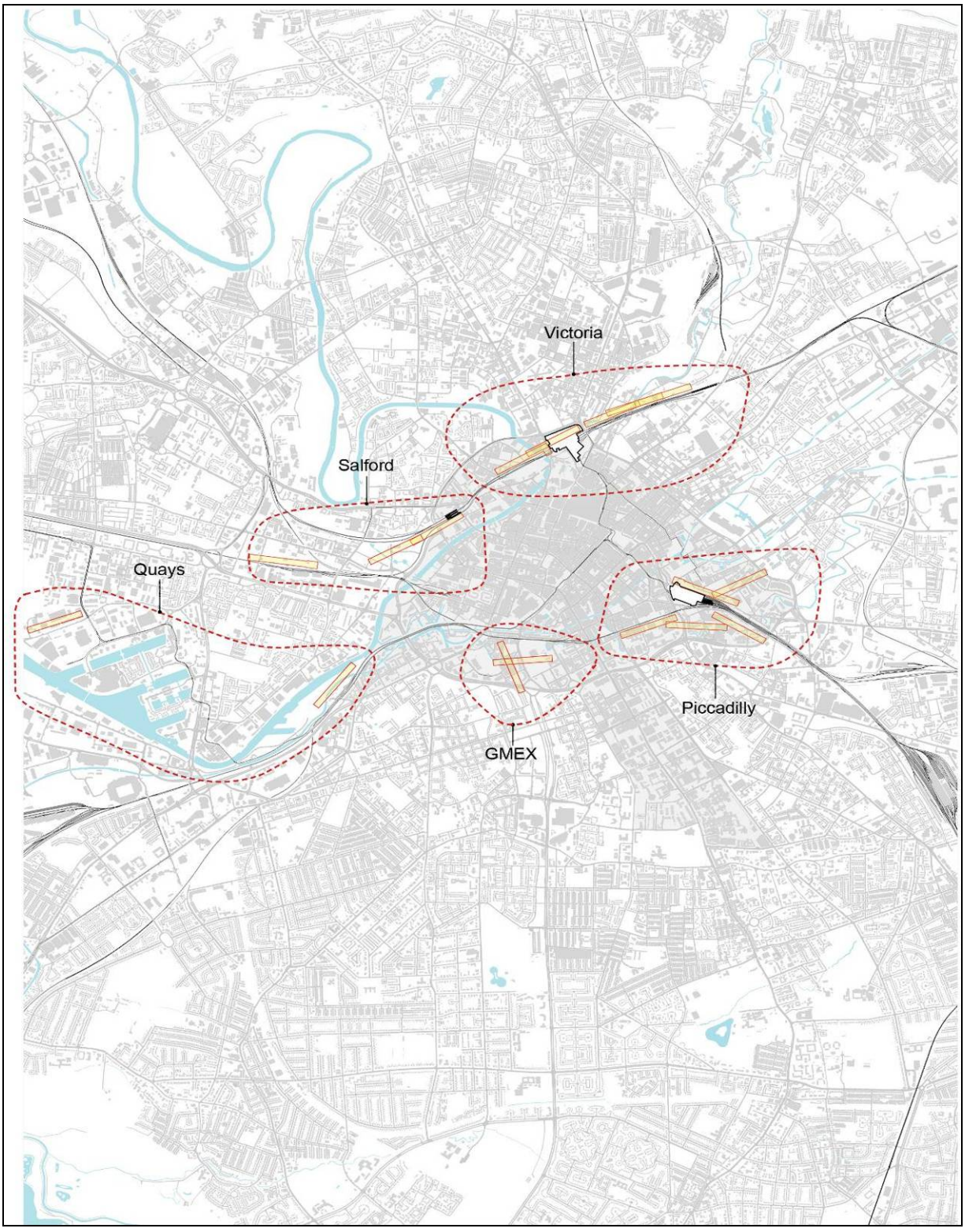

Figure 8.8: Manchester City Centre Shortlisted Station Options

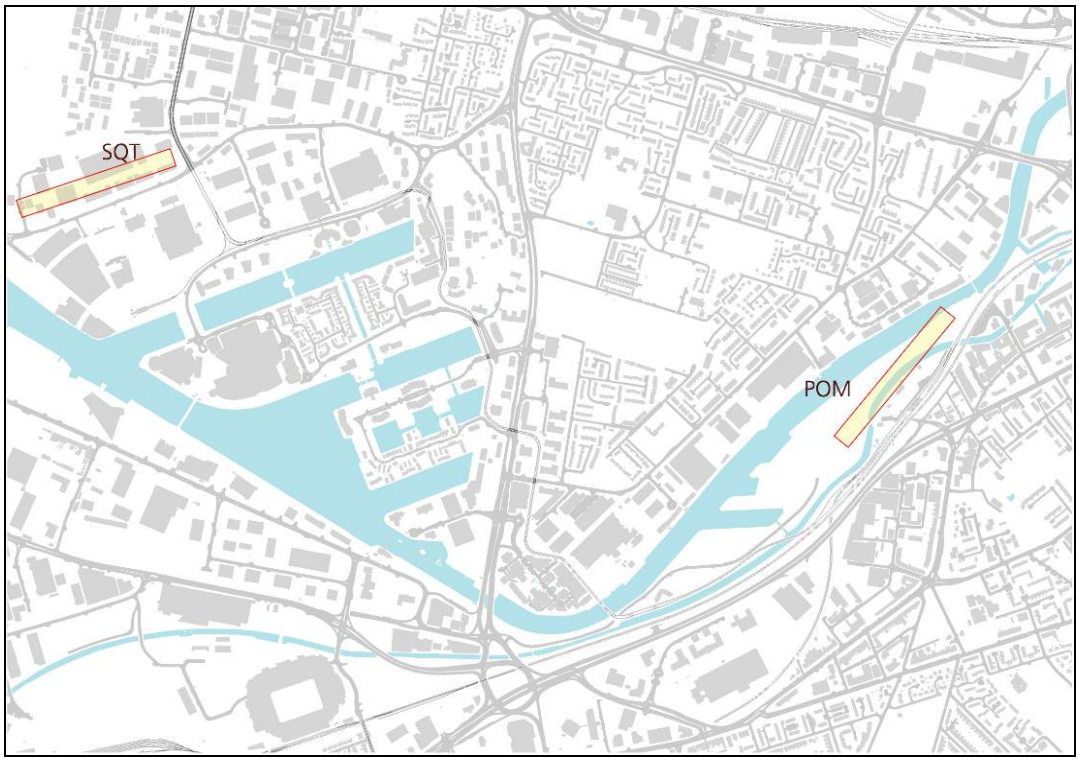

Figure 8.9: Quays Area Shortlisted Station Options

Option 15 POM Pomona Dock

Elevated terminal station located in a greenfield site between the Manchester Ship Canal and rail lines leading into Oxford Road and Manchester Piccadilly stations. The site is adjacent to the Cornbrook Metrolink stop. The station would suffer from poor proximity to, and onward dispersal towards, the city centre.

Passenger orientation would be complicated by the isolated location of the station behind existing rail viaducts and busy local roads. Construction would be complicated by poor site access and the watercourses which run alongside and through the site.

The approach to the station from the west would include a long elevated section to cross the metro and highways.

Option 11b SQT Salford Quays BDF Terminal

Elevated terminal station located within Salford Quays. The site would suffer from very poor passenger dispersal and connectivity with the city centre. It is the most distant option from the city centre of all the shortlisted station options. The Metrolink passes in front of the station site however the travel time to the city centre via the Metrolink would be 15-18minutes. There are no existing rail links close by. The station platforms would need to be elevated approximately 18.5m above adjacent ground level in order that the approach would provide sufficient navigational clearance over the Manchester Ship Canal. A station of this height would be visually intrusive and expensive to construct.

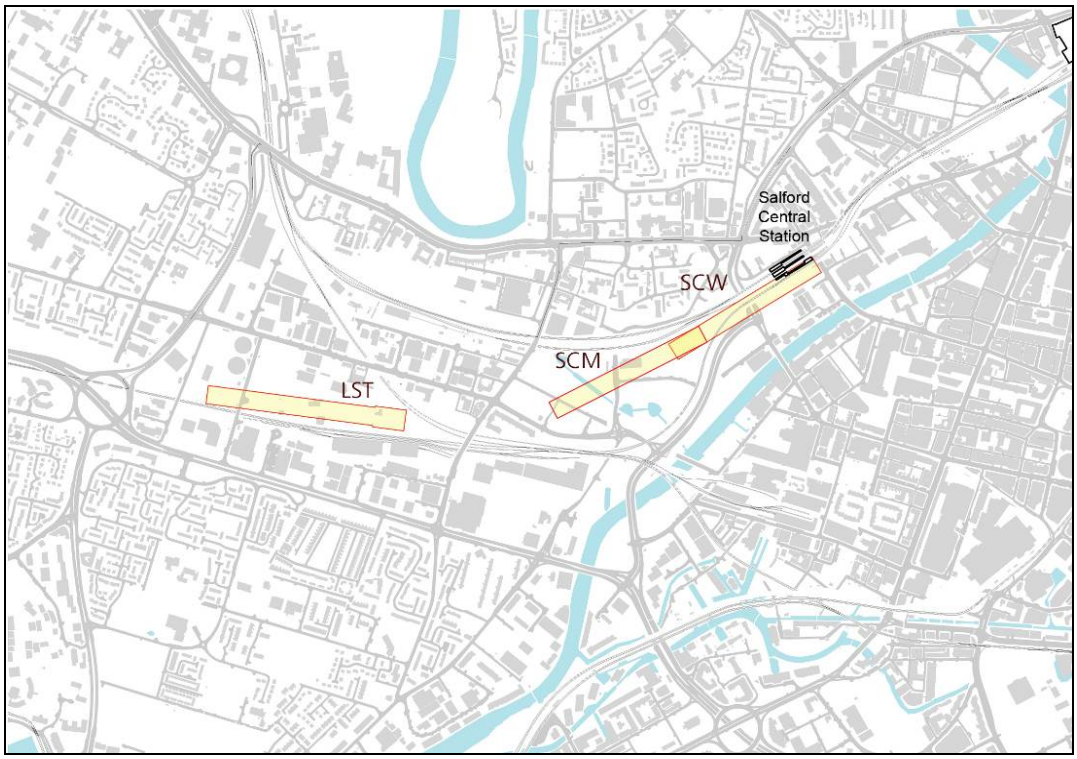

Figure 8.10: Salford Area Shortlisted Station Options

Option 10 LST Liverpool Street

At grade terminal station located in a brownfield site approximately 1.3km west of Salford Central station and adjacent to the Chat Moss rail line. The station would suffer from poor proximity to the city centre. The location would lack access to any existing rail, bus or Metrolink services and suffer from difficult site accessibility. The approach to the station would impact highways into Manchester and Salford.

Figure 8.11: GMex Area Shortlisted Station Options

Option 13 FST First Street

Elevated terminal station in an east west orientation located immediately south of Deansgate and Oxford Road stations. The station would bridge across Medlock street. The proposal would suffer from poor onward dispersal as Oxford Road station has poor throughput while Deansgate station has only 2 tracks. Any stopping services to pick up HS2 passengers would significantly impact on the capacity of Deansgate station and the Northern Hub plans for services between Piccadilly and Victoria stations. The station location intersects with the River Medlock. Passenger orientation and onward dispersal to the city centre would be complicated by the station's location behind existing rail viaducts and busy local roads. The western approach to the station would be complicated with a long, elevated approach crossing the Manchunian Way.

Option 13a FSA First Street

Elevated terminal station in a north south orientation and located immediately south of Deansgate station. The station would bridge across Mancunian Way which forms part of the Manchester inner ring road. The proposal would suffer from poor onward dispersal as Oxford Road station has poor throughput while Deansgate station has only 2 tracks and therefore any stopping services to pick up HS2 passengers would significantly impact on the capacity of Deansgate station and the Northern Hub plans for services between Piccadilly and Victoria stations. The station location intersects with the River Medlock. Passenger orientation and onward dispersal to the city centre would be complicated by the location of the station behind existing rail viaducts and busy local roads. The approach to the station would be complicated and require a large elevated structure through Moss Side.

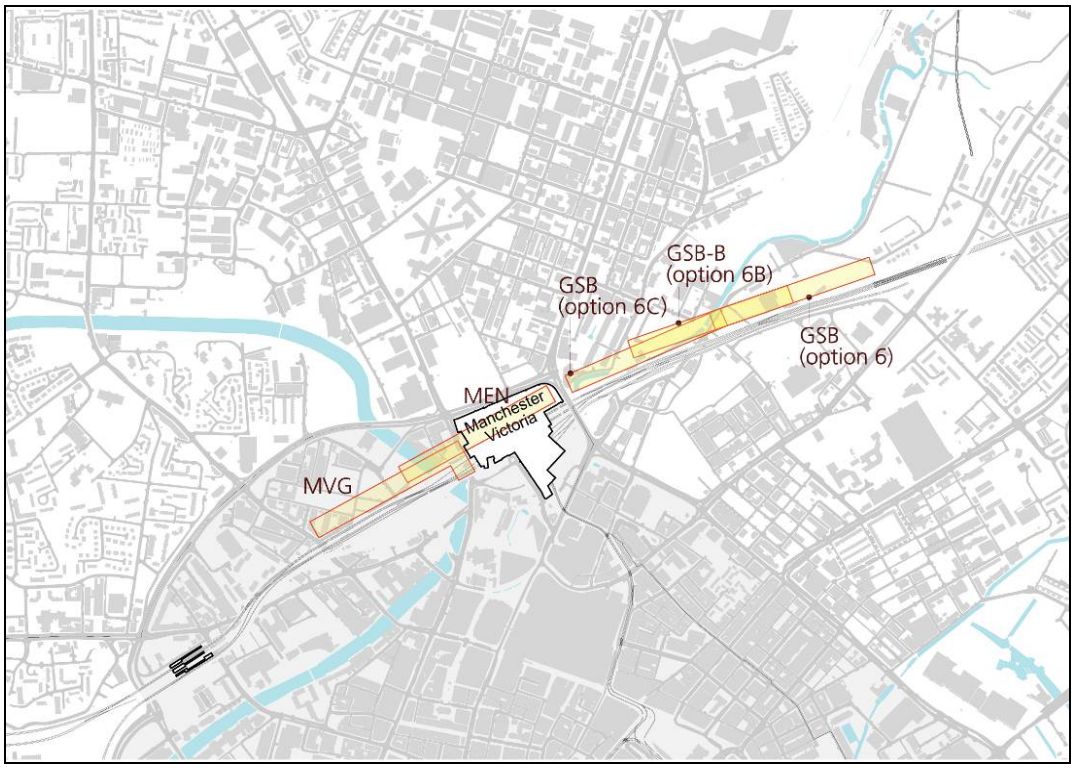

Figure 8.12: Victoria Area Shortlisted Station Options

Option 6 GSB Green Street Quarter / Bromley Street

Elevated terminal station located parallel with and to the north of the eastern approach to Manchester Victoria station. The option suffers from poor connectivity with Manchester Victoria station and the city centre. A derivative option, 6B, was introduced as an addendum to overcome the shortfalls of option 6. It would be located closer to Victoria station with a view to improving intermodal connectivity and access to the city centre. As a result option 6 was replaced by option 6B.

Option 6b GSB Green Street Quarter / Bromley Street

Elevated terminal station located parallel with and to the north of the eastern approach to Manchester Victoria station. An additional addendum option '6C' was introduced and located closer again to Manchester Victoria station with a view to further improving intermodal connectivity and access to the city centre. As a result option 6B was replaced by option 6C.

Option 7b MVG Manchester Victoria Greengate

Elevated terminal station located immediately west of Manchester Victoria station and to the north side of the existing rail viaduct. The station would be conveniently located for onward dispersal of passengers towards the city centre and Manchester Victoria station. The concourse is elevated and at the end of the platforms as a result of the lack of space beneath the platforms to accommodate a concourse. This end loaded concourse arrangement would offer a less efficient dispersal of passengers than a centrally loaded concourse. Connectivity between the HS2 station and existing rail, bus and Metrolink services at Manchester Victoria station would be complicated by the MEN arena which is located between the two stations. It would prevent a physical connection between the two concourses. The proposed station would conflict with Northern Hub plans for Manchester Victoria station. The approach to the station would be complicated and would affect existing rail services.

Option 18 MEN

At grade terminal or through station option parallel to the rail platforms of Manchester Victoria station and occupying the footprint of the Manchester Evening News Arena. The proposal would create an intermodal transport interchange connecting HS2 with existing rail and Metrolink services at Manchester Victoria Station and providing good connectivity with the city Centre. The proposal would however require the demolition and rebuilding of the MEN arena. This would add significantly to the cost of the development. A temporary location for the arena would be required should it be permanently rehoused over the HS2 station. The approach to the station from either the east or west would also prove complicated and would require significant disruption to existing rail services during construction.

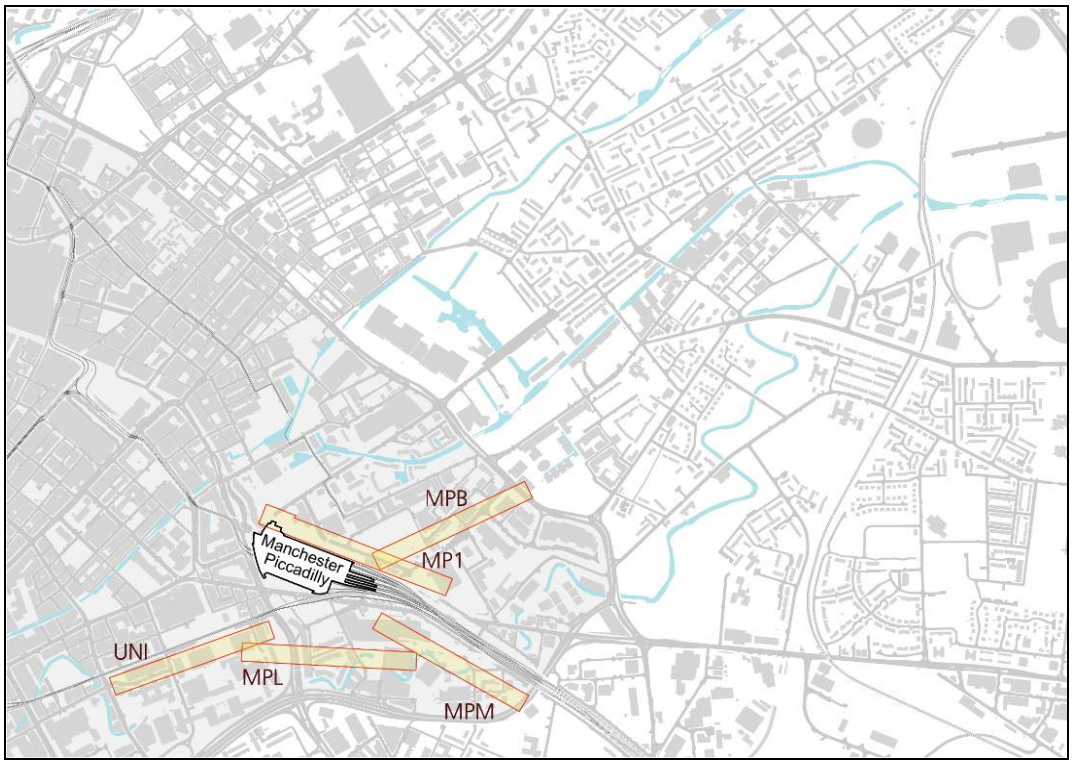

Figure 8.13: Piccadilly Area Shortlisted Station Options

Option 1e MPM Manchester Piccadilly Mayfield

Elevated terminal station located within the Mayfield site southeast of Manchester Piccadilly station. The site has been identified within Manchester's UDP for major regeneration and had been subject to detailed planning investigation under the title of Mayfield campus, also know as the Whitehall of the North. The HS2 station proposals would conflict with regeneration plans for the area. Passengers would be required to walk approximately 650m to access existing rail and Metrolink services at Manchester Piccadilly station. An elevated raised link bridge would be required to connect the HS2 and existing rail station. The interchange between the two stations would require several changes in level. Passenger orientation and onward dispersal to the city centre would be complicated by the station's location behind existing rail viaducts and busy local roads. Northern Hub works to Manchester Piccadilly station involve new platforms 15 and 16 directly north of the proposed HS2 station location.

Option 1f MPL Manchester Piccadilly London Road

Elevated terminal station located south of Manchester Piccadilly station and bridging across London Road. The western end of the site has been identified within Manchester's UDP for major regeneration. The proposed station would conflict with regeneration plans for the area. The eastern end of the site is occupied by buildings up to 18 stories high which form part of the Manchester University Campus, and the 10 storey MacDonald Manchester Hotel, a series of apartment blocks ranging from 7 to 19 stories in height and industrial warehouses. The station location intersects with the River Medlock. Access to existing rail, bus and Metrolink services at Manchester Piccadilly station would be approximately 500m away. Passenger orientation and onward dispersal to the city centre would be complicated by the station's location behind existing rail viaducts and busy local roads. The approach to the station would be complex with potential to impact on the WCML and the station approach of Manchester Piccadilly station

8.1.3 Selecting Options for Refinement

Summary of Options Parked Following Refinement Stage

OPTION 1a* (MP1) Manchester Piccadilly by Platform 1
OPTION 1b (MPB) Manchester Piccadilly Baird Street
OPTION 6C (GSB) Victoria Station - Green St Quarter/ Bromley St
OPTION 9a (SCW) Salford Central West Platforms
OPTION 9b * (SCM) Salford Central Middlewood
OPTION 19* (SCS) Salford Combined Station**

* Option carried forward to next stage
** Addendum Option

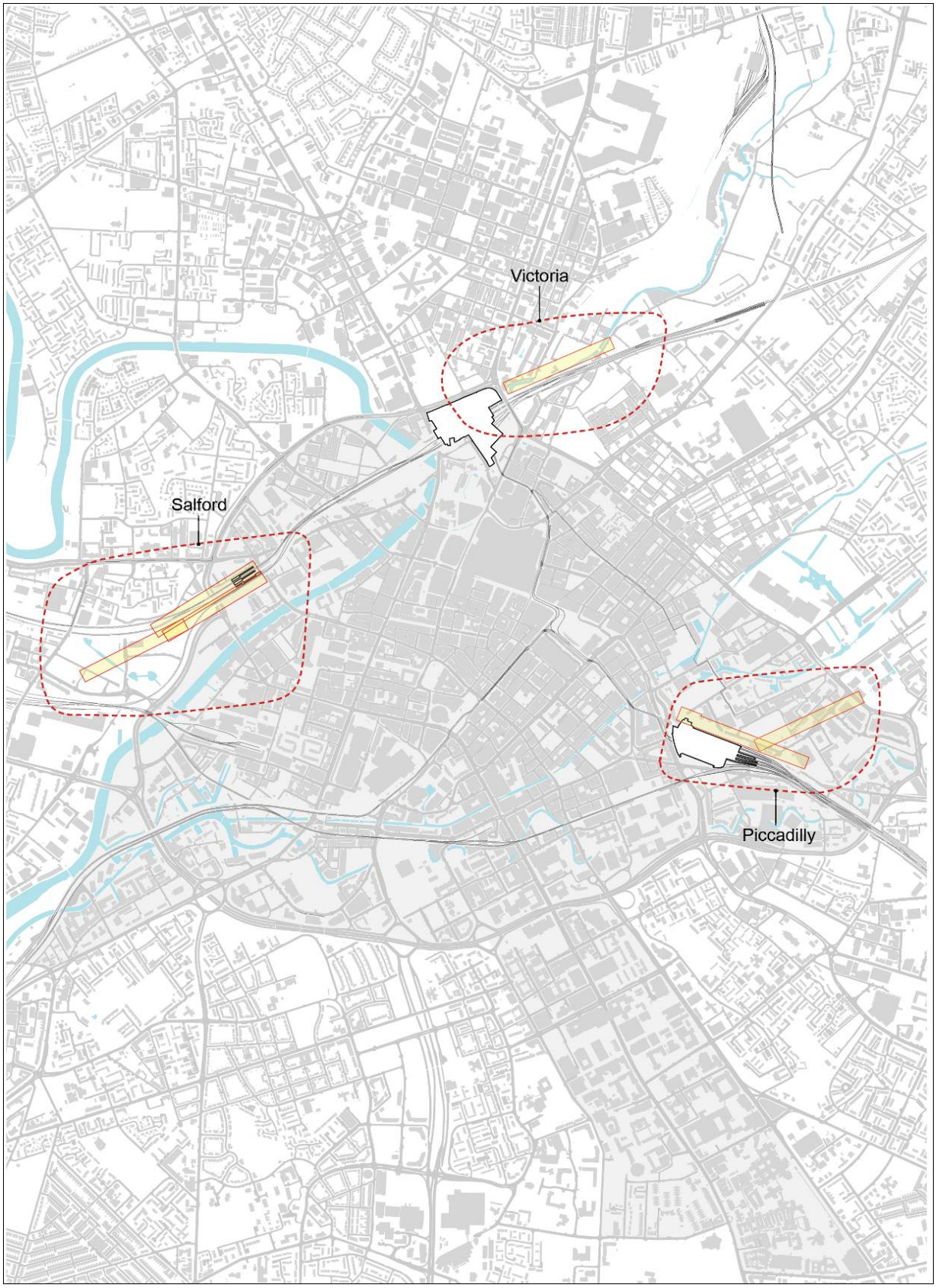

Figure 8.14: Manchester City Centre Station Options Selected for Further Development

Option 1b MPB Manchester Piccadilly Baird Street

The proposed station consists of sub-surface platforms in open cutting with a concourse at grade immediately east of Piccadilly station. The site contains a cross fall from east to west of 7.5m. The station would abut the north side of Piccadilly Station at angle of approximately 45 degrees.

Strengths of Option:

1. Good connectivity with Manchester Piccadilly station rail and Metrolink services, however the walking distance from the end of the HS2 platform to existing rail or Metrolink services would be much longer than that of option 1A.
2. Opportunity to improve cross site connectivity by opening up Piccadilly station undercroft.

Weaknesses of Option:

1. A more difficult connection to the WCML than western station options.
2. More complex construction than option 1A involving a bridge over the Manchester inner ring road and substantial retaining walls.
3. Disruption to highways operations.
4. Poor passenger experience owing to platforms being set within cuttings and concourse located primarily in the undercroft of Manchester Piccadilly station.
5. Considerable severance issues as a result of cutting across site at grade.
6. Dispersal onto inner ring road not as efficient as option 1A.

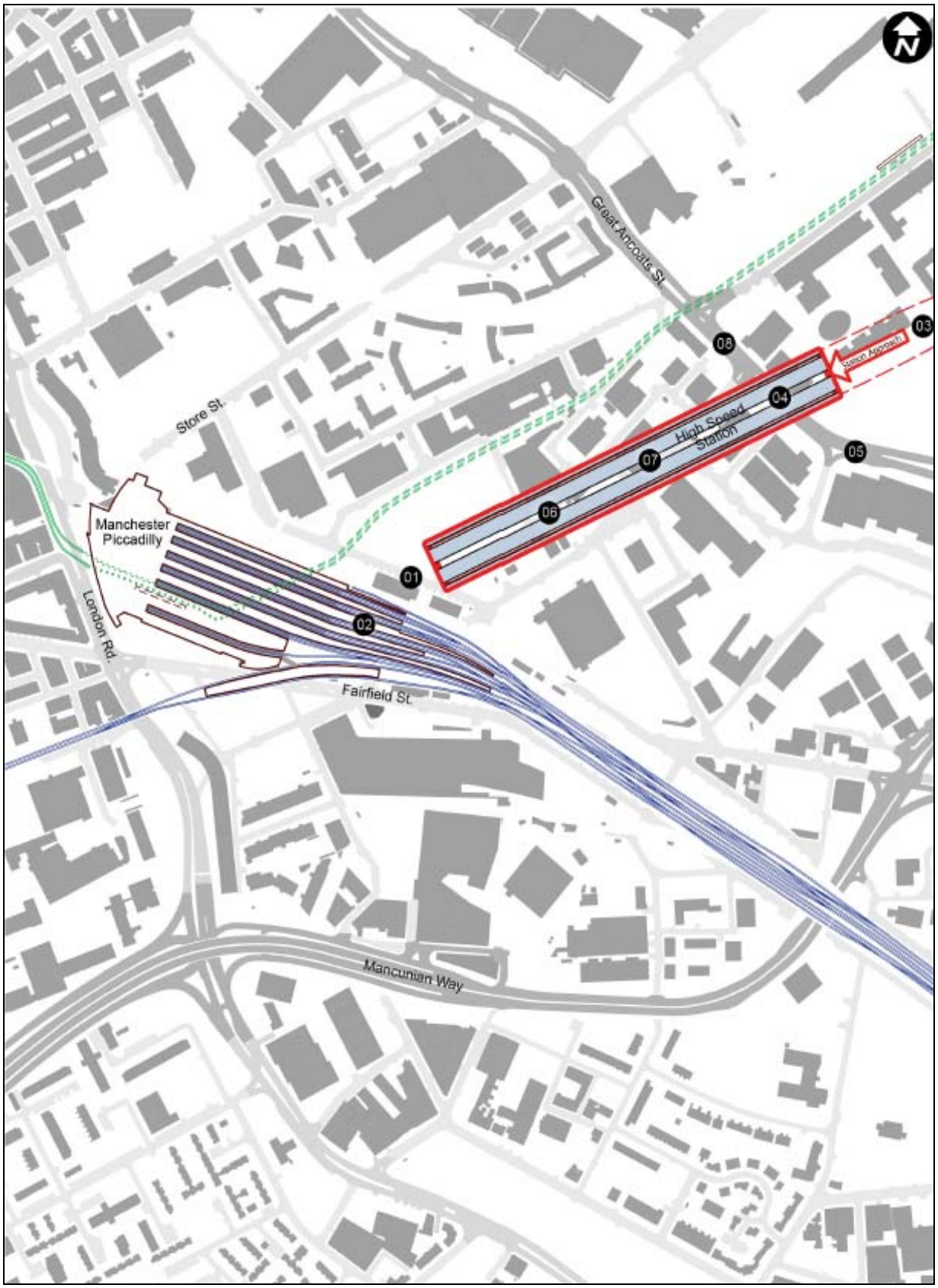

Figure 8.15: Option 1b - Proposed Station Configuration

Option 6c GSB Victoria Station - Green St Quarter/ Bromley St

The proposed station would consist of platforms and concourse parallel with and to the n orth of the eastern approach into Manc hester Victoria station. The platfo rms would pass under Cheetham Hill Road bridge. The station would be partially elevated and partially at grade.

Strengths of Option:

1. Good connectivity with Manchester Victoria station rail and Metrolink services.
2. Central location with a short pedestrian connection to the city centre.

Weaknesses of Option:

1. A more difficult connection to the WCML than western station options.
2. Poor fit with existing urban fabric. Substantial demolitions of new high density office and residential towers required.
3. Severe disruption to inner ring road to facilitate rebuilding of Cheetham Hill Road in conjunction with accommodating new HS2 platforms. No viable diversion was identified.
4. Cheetham Hill Road would divide the HS2 stat ion roof structure reducing the potential 'brand' image that one continuous grand train shed would offer.
5. Poor forecourt/concourse relationship. Improvement to this would require reconfiguration of the inner ring road.
6. The approach to the station would be in tunnel up to 3km longer than for option 1a.

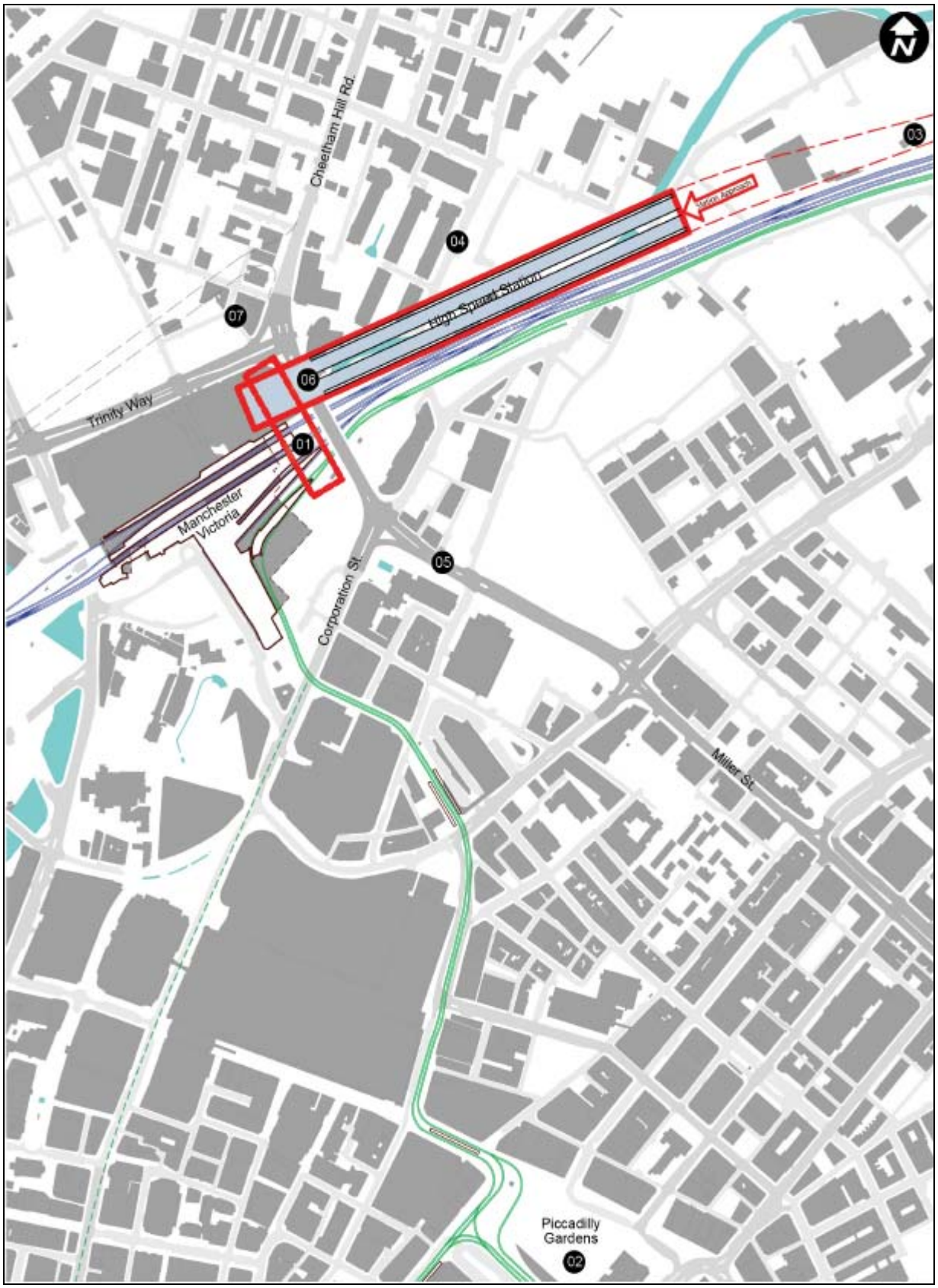

Figure 8.16: Option 6c - Proposed Station Configuration

Option 9a SCW Salford Central West Platforms

The proposed station would consist of platforms elevated 16m above adjacent ground level and directly above the platforms of Salford Central station. The concourse would be at grade.

Strengths of Option:

1. Good proximity to Salford Central station.
2. The development would offer opportunities to improve cross site connectivity by opening up the undercroft of Salford Central station.
3. Potential to act as catalyst for other developments on adjacent sites.
4. Easier connection to WCML than eastern station options.

Weaknesses of Option:

1. Highly complex construction and structure. The proposals would involve a much greater level of construction complexity than the alternative Salford area options. It would involve a very complex double height arrangement with massive transfer structure to suit existing configuration of masonry arches. The transfer arrangement would be particularly difficult at the transitions between existing railway lines below. Piling access would be severely restricted and construction access would generally be very poor. Construction would take place over a highly used road system.
2. This would all add a significant level of risk and cost to a station in this location.
3. Construction would be highly disruptive to services using Salford Central station.
4. Platforms would be 16m above ground level. A structure of this height would have considerable visual impact.
5. Platforms would be 16m above ground level. A structure of this height would present considerable overshadowing issues to properties north of the viaduct.
6. It would not fit with proposed Northern Hub works.
7. Lack of Metrolink in the Salford area.

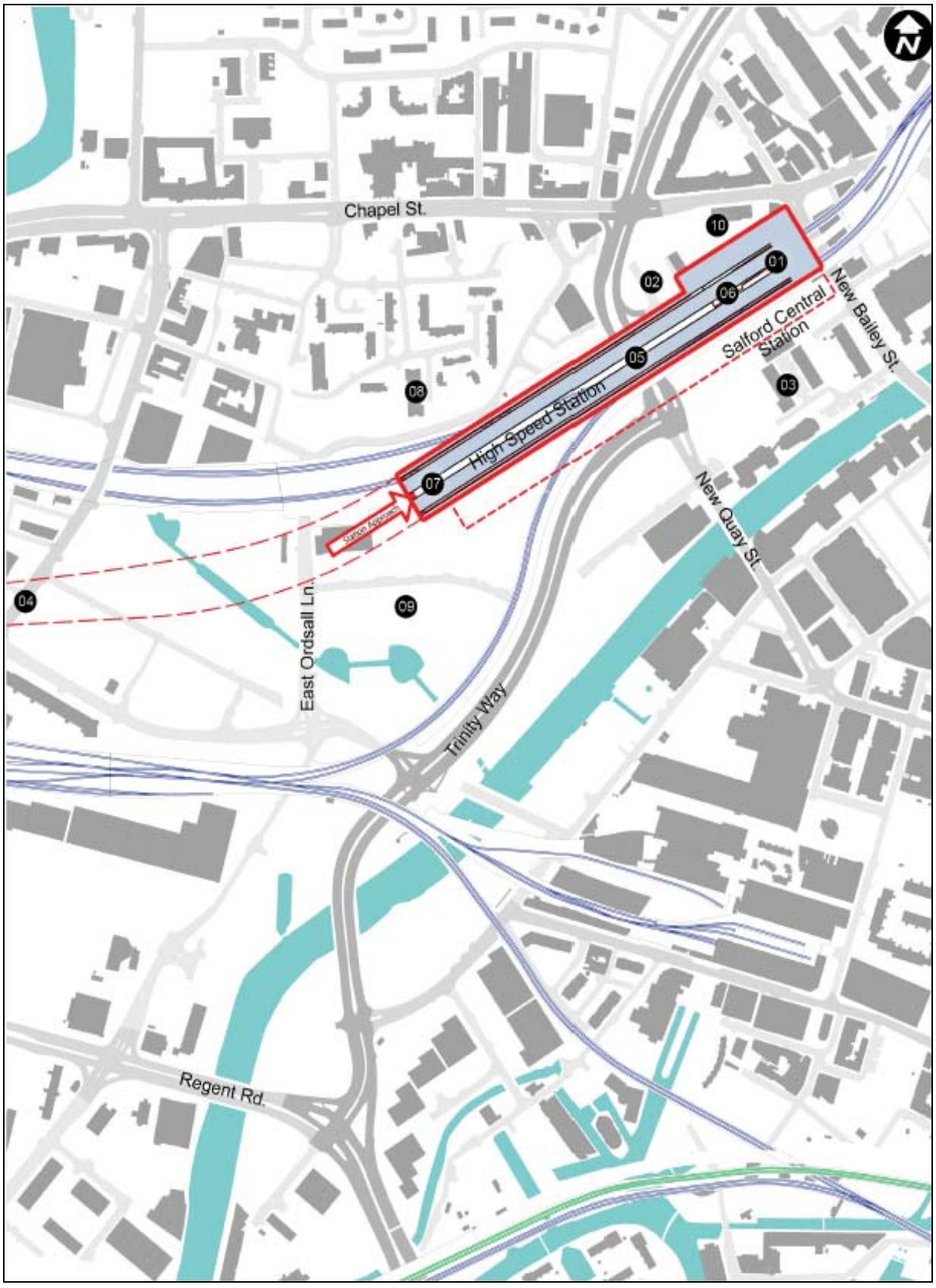

Figure 8.17: Option 9a - Proposed Station Configuration

8.2 Intermediate Stations

8.2.1 Long List of Options

Summary of Options Parked Following Longlisting Stage

Eight options were proposed by HS2 in discussion with the stakeholders (see figure 8.18).
During a sifting process, seven of the options were parked with option 1, M6 selected for further development. The parked options were:

- Option 2 – Stoke-on-Trent South parked due to insufficient demand for a station at this location
- Option 3 – Stoke-on-Trent North parked due to insufficient demand for a station at this location
- Option 4 – Crewe South parked due to the line of route would be underground at this location
- Option 5 – Crewe Central parked due to the line of route would be underground at this location
- Option 6 – Stoke-on-Trent South East (1) parked due to the line of route would be underground in a deep tunnel at this location. Insufficient demand for a station in this location
- Option 7 – Stoke on Trent South East (2) parked due to insufficient demand for a station at this location
- Option 8 – Uttoxeter parked due to insufficient demand for a station at this location

8.2.2 Short List of Options

At the short listing stage, option 1 M6 was still considered to be the only viable option selected for further development.

8.2.3 Selecting Options for Refinement

Option 1 M6 was renamed as option M6 and developed further as the final intermediate station option.

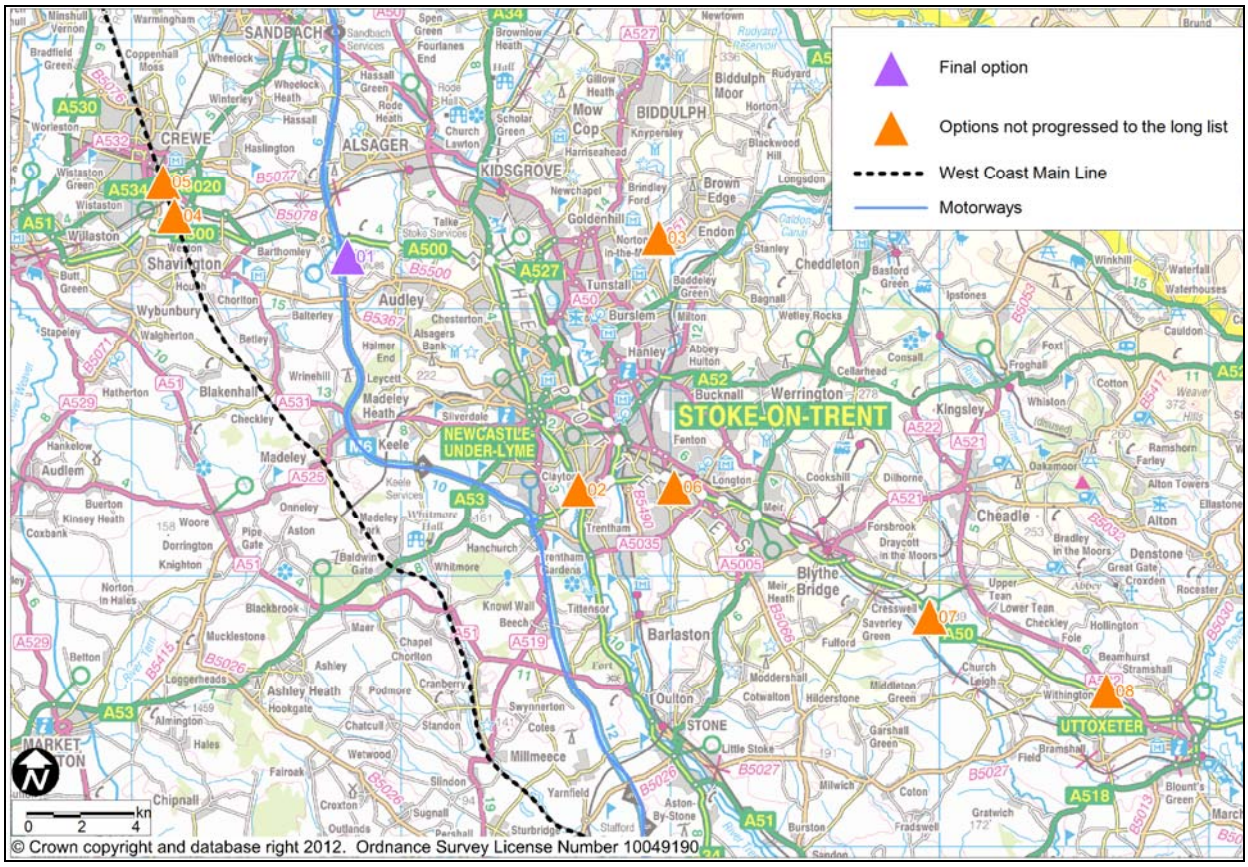

Figure 8.18: Manchester Intermediate Station Longlisted Options

8.3 Interchange Stations

8.3.1 Long List of Options

Summary of Options Parked Following Longlisting Stage

36 options were generated by HS2 in discussion with the stakeholders. The choice of these location s was driven by good connectivity to highways and/or rail and also potential development sites. They are shown on Figure 8.19.

During a sifting process, 16 options were long listed. These options were:

Option 2 – Denton
Option 4C – Manchester airport north/south
Option 4D – Manchester airport east/west
Option 5 – Knutsford
Option 10 – Barton
Option 10A – Port Salford
Option 12 – Wigan East
Option 13 – Horwich
Option 14 – Euxton
Option 15 – Preston M61
Option 18 – Altrincham South
Option 22 – Cutacre
Option 24 – Samlesbury
Option 25 – Cuerdon
Option 28 - Whittingham
Option 29 – Risley (replaced option 7 – Thelwall)

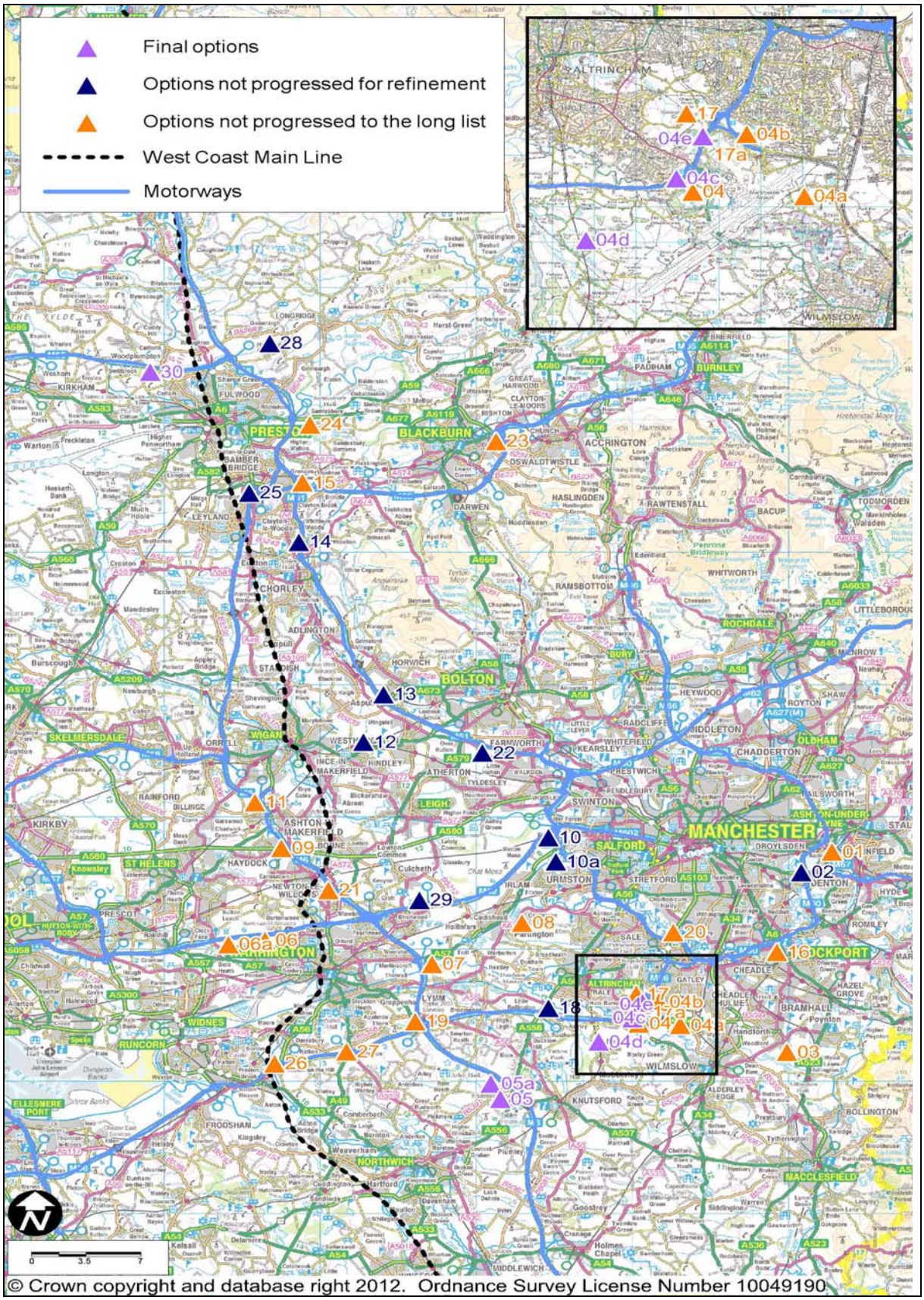

Figure 8.19: Manchester Interchange Station Longlisted Options

The station options parked are summarised in the table below:

Option number	Station name	Issues
1	Guide Bridge	The station would be in a deep cavern underground.
3	Woodford	The station would be located more than 5km from nearest LoR.
4	Manchester Airport west	Optimised as option 4c and 4d
4A	Manchester Airport south east	Optimised as option 4c and 4d
4B	Manchester Airport north east	Optimised as option 4c and 4d
6	Omega	Station would be located more than 5km from nearest LoR.
6A	M62 junction 7	Station would be located more than 5km from nearest LoR.
7	Thelwall	Station would be located more than 1km from nearest LoR.
8	Carrington	The station would have poor connections.
9	Ashton in Makerfield	The station would be more than 5km from the nearest LoR.
11	Wigan junction 25	The station would be more than 4km from the nearest LoR.
16	M60 Gateway	The station would be 3km from the nearest LoR.
17	Davenport Green	Optimised as option 4c and 4d
17A	Davenport Green south	Optimised as option 4c and 4d
19	Lymm	The station would be more than 5km from the nearest LoR.
20	Sale	The station would be in a deep cavern underground.
21	Parkside	The station would be more than 3km from the nearest LoR.
23	Whitebirk	The station would be more than 5km from the nearest LoR.
26	Daresbury	The station would be more than 5km from the nearest LoR.
27	Stretton	The station would be more than 5km from the nearest LoR.

8.3.2 Short List of Options

At the short listing stage all options were developed to the next level of design detail. Following the appraisal all options were considered to be viable and were progressed to the next stage of development.

8.3.3 Selecting Options for Refinement

During the process to select options for further development, a new option 30 (Preston M55) and a variant of option 4D (Manchester airport east/west) were also identified. Throughout the process some of the long listed options were also parked. The following eight options were selected for further development:

- Option 4c – Manchester airport north/south
- Option 4d – Manchester airport east/west runway avoidance
- Option 4d – Manchester airport east/west runway tunnel
- Option 5 – Knutsford
- Option 15 – Preston M61
- Option 18 – Altrincham South
- Option 24 – Samlesbury
- Option 30 – Preston M55

The options that were parked are summarised in the table below:

Option number	Station name	Issues
2	Denton	The station would be more than 5km from the nearest LoR.
10	Barton	The station would be more than 5km from the nearest LoR.
10a	Port Salford	Station would be located about 23m above ground to cross over the Manchester Ship canal and avoid the M60.
12	Wigan East	The nearest LoR to the station would be in tunnel.
13	Horwich	The station would be more than 5km from the nearest LoR.
14	Euxton	The station would be more than 5km from the nearest LoR.
22	Cutacre	The station would be more than 5km from the nearest LoR.
25	Cuerdon	The station would be more than 5km from the nearest LoR.
28	Whittingham	The station would be more than 5km from the nearest LoR.
29	Risley	Station would be located on a landfill site.

During the option refinement stage additional design information was developed to enable further sifting of options.

The final interchange station options selected for reporting are:

- Option 4c – Manchester airport north/south
- Option 4e – Manchester airport north/south
- Option 4d – Manchester airport east/west runway avoidance
- Option 5 – Knutsford
- Option 5a – Knutsford
- Option 30 – Preston M55

The options parked during this stage are summarised in the table below:

Option number	Station name	Issues
4d	Manchester Airport east west runway tunnel variant	The station alignment would be in tunnel to avoid Manchester airport runway.
18	Altrincham south	The station would be close to Rostherne Mere an environmentally sensitive area. Option 4d would provide more benefits.
15	Preston M61	The station would be more than 5km from the nearest LoR.
24	Samlesbury	The station would be more than 5km from the nearest LoR.

9. History of Depot Options Studied

This section describes the history of infrastructure and rolling stock maintenance depot options studied and identified those that were parked at the following sifting stages:

- long list of options (see Section 9.1)
- short list of options (see Section 9.2)
- selection of options for refinement (see Section 9.3)

9.1 Long List of Options

9.1.1 Infrastructure Maintenance Depots

A long list of options for infrastructure maintenance depots was generated following a sifting exercise of all the potential options identified by HS2 and discussion with stakeholders. 15 infrastructure maintenance depot locations were identified and are shown in Figure 9.1.

Table 9.1 lists the options and the outcome of sifting. The sifting exercise resulted in the parking of those options that would not meet one or more of the criteria or where there were clearly better performing comparative options.

Infrastructure Depot Option	Issues
IN1 Crewe	Selected for further development.
IN2 East Alsager	This location would not be adjacent to an HS2 route.
IN3 West Alsager	Selected for further development.
IN4 Baldwin's Gate	This location would involve major excavation into a hillside.
IN5 Stone	This location was considered to be too far south.
IN6 Leigh	The HS2 route option which would have been adjacent to this location had been parked.
IN7 Congleton	The HS2 route option which would have been adjacent to this location had been parked.
IN8 Middlewich	This option would require crossing over the WCML to connect to the HS2 route.
IN9 Kidsgrove	This location would not be adjacent to an HS2 route.
IN10 Hixon	This location was considered to be too far south.
IN11 Etruria	This location would not be adjacent to an HS2 route.
IN12 Blythe Bridge	The HS2 route option which would have been adjacent to this location had been parked.
IN13 Barlaston	This location would not be adjacent to an HS2 route.
IN14 Mill Meece	This location was considered to be too far south.
IN15 Rugeley	This location was considered to be too far south.

Table 9.1: Infrastructure Depots

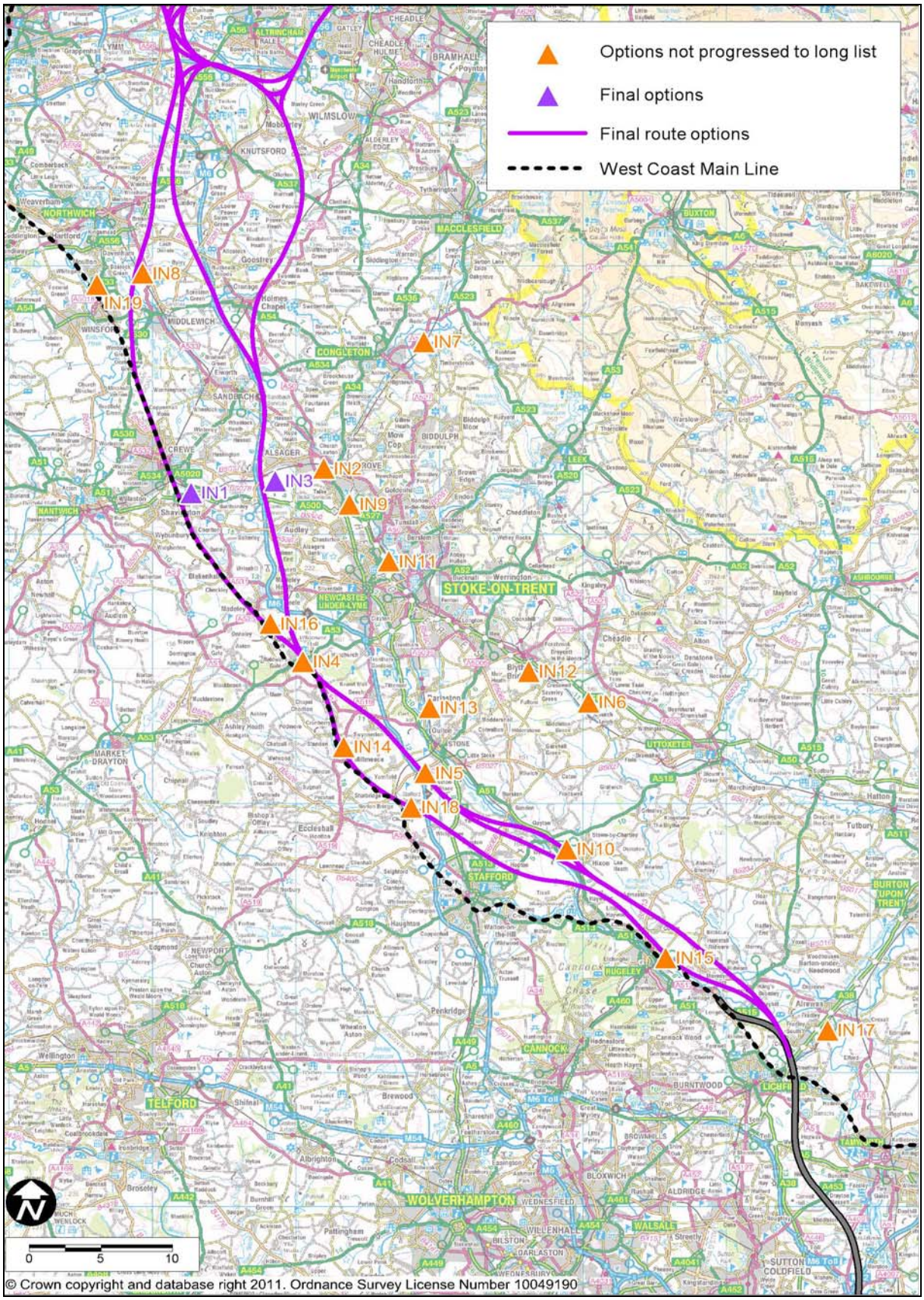

Figure 9.1 Infrastructure Maintenance Depots

9.1.2 Rolling Stock Depots

A long list of options for rolling stock maintenance depots was generated following a sifting exercise of all the potential options identified by HS2 in discussion with stakeholders. 24 rolling stock maintenance depot locations were identified and are shown in Figure 9.2.

Table 9.2 lists the options and the outcome of sifting. The sifting exercise resulted in the parking of those options that would not meet one or more of the criteria or where there were clearly better performing comparative options.

Rolling Stock Depot Option	Issues
RS1 Golborne	Selected for further development.
RS2 Leyland, Preston South	This option would require the route to the north of Preston to be built. It would not be close to the existing railway network and would require major works to the highway network.
RS3 Preston North	This option was considered to be too far north of Manchester to be of practicable use.
RS4a Manchester South	Selected for further development.
RS4b Manchester South	Selected for further development.
RS5 Crewe	This option was considered to be too far south of Manchester to be of practicable use.
RS6 Parkside Colliery	This option would not be located adjacent to any proposed line of route for HS2. It would require the existing Liverpool to Manchester railway to be gauge cleared for HS2 trains. In addition, it was considered that there may be insufficient capacity on the existing railway for HS2 services.
RS7 Macclesfield	The HS2 route option which would have been adjacent to this location had been parked. The nearest route to the depot would be too far for the location to be suitable.
RS8 a, b and c Eccles	Option 8a selected for further development. The other 2 options were parked at this stage as they would be less well positioned to connect to the HS 2 lines of route and the existing railway.
RS9 Carrington	Selected for further development.
RS10 Ince-in-Makerfield	This option would require the route to the north of Preston to be built. Highway access and removal of contaminated material from a disused tip were identified as high cost items.
RS11 Middlewich	This option was considered to be too far south of the preferred triangle and too far from the terminal station.
RS12 Horwich	The HS2 route option which would have been adjacent to this location had been parked. The nearest route to the depot would be too far for the location to be suitable.
RS13 Atherton	This location would not be connected to the existing rail network nor adjacent to an HS2 route.
RS14 Barton	Selected for further development.
RS15 Winsford	This location was considered to be too far south of the preferred triangle and would not be adjacent to an HS2 route.
RS16 Farington	This location would not be adjacent to an HS2 route.
RS17 Leyland	This location would not be adjacent to an HS2 route.
RS18 Samlesbury	This option would require the route to the north of Preston to be built.
RS19 Red Scar	This location is would not be adjacent to an HS2 route
RS20 Daresbury	This location is would not be adjacent to an HS2 route
RS21 Birchwood	This location is would not be adjacent to an HS2 route

Table 9.2: Rolling Stock Depots

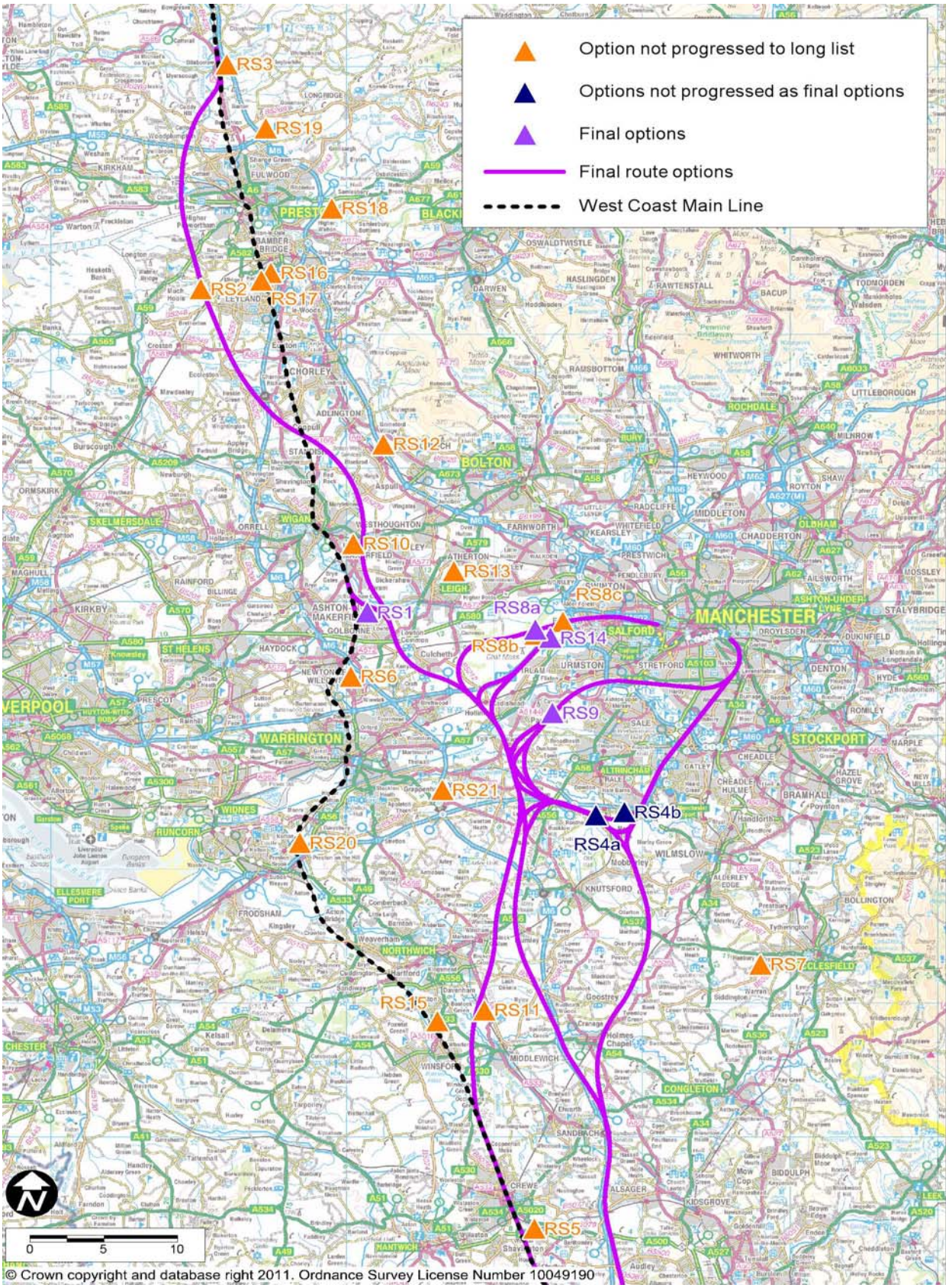

Figure 9.2 Rolling Stock Depots

9.2 Short List of Options

At this stage all the selected options were considered to still be viable and were selected to be developed further.

9.3 Selection of Options For Refinement

9.3.1 Infrastructure Maintenance Depots

During the sifting process two infrastructure maintenance depot locations were selected as options for further refinement. The other options were parked.

The remaining infrastructure maintenance depot options were:

- IN1 – Crewe
- IN3 – West Alsager

The layouts of options IN1 (Crewe) and IN3 (West Alsager) were developed in more detail based on the design specification developed by HS2 and are discussed in section 4.1.

9.3.2 Rolling Stock Maintenance Depots

During the sifting process six of the rolling stock maintenance depot options were selected for refinement. Two options were parked.

The remaining rolling stock maintenance depot options were:

- RS1 – Golborne
- RS4a – Manchester South
- RS4b – Manchester South
- RS8 – Eccles
- RS9 – Carrington
- RS14 – Barton

The layouts of options RS1, RS8, RS9 and RS14 were developed in more detail based on the design specification developed by HS2 and are discussed in section 4.2.

Two options, RS4a (Manchester South) and RS4b (Manchester South), were parked. More details for these options can be found overleaf.

RS4a Manchester South (Figure 9.3)

The depot would be situated on a relatively level area of farmland in the Green Belt, between Ashley and Mobberley and adjacent to Tatton Park. The depot would not comply fully with the HS2 design criteria and specification and would only have rail access at one end.

Access would be provided in both directions to the HS2 through route to the north (HSM18 or HSM19). It would not be well located for Liverpool and Preston. The depot would serve all of the city centre station options. There would be no access to the existing rail network. Highway works to provide access would be extensive, with some local roads requiring to be diverted. Construction of the depot in this location would use standard methods once the new highway access had been provided.

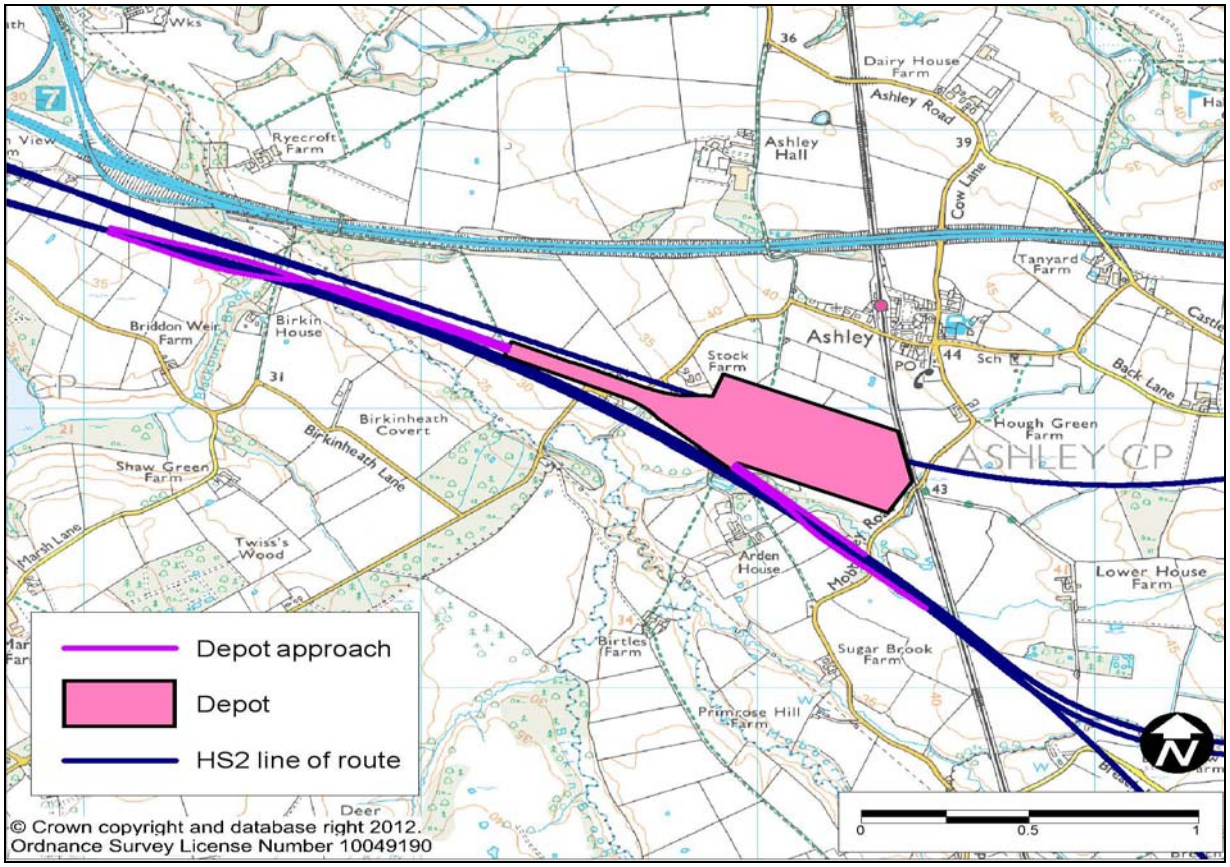

Figure 9.3 RS4a Manchester South

RS4b Manchester South (Figure 9.4)

This depot would be situated on a relatively level area of farmland in the Green Belt and would be within a triangle formed by the HS2 through route to the north (HSM18), the spur to Manchester (HSM25), and the chord providing a connection to the north from Manchester (HSM27). The depot would not fully comply with the HS2 design criteria and specification. The depot would only have rail access at one end.

Access would be provided in both directions to the HS2 spur to Manchester Piccadilly via the airport tunnel (HSM25). It would only serve the Manchester Piccadilly station option. It would not be well located for Liverpool and Preston. There would be no access to the existing rail network. Highway works to provide access would be extensive, with some local roads requiring to be diverted. Construction of the depot in this location would use standard methods once the new highway access had been provided.

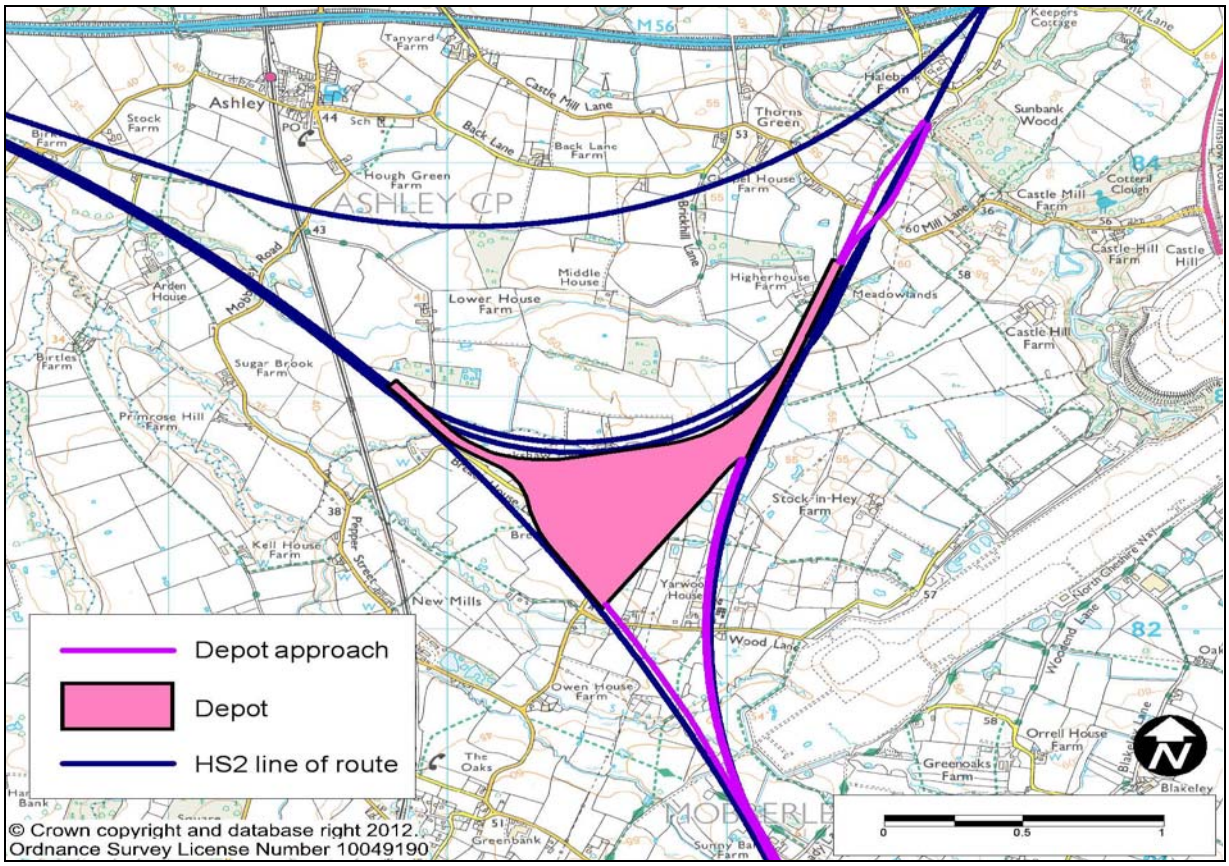

Figure 9.4 RS4b Manchester South

10. History of Classic Compatible Options Studied

This section describes the history of classic compatible options studied and those were parked at sifting stages. These options to accommodate classic compatible services can be described as follows:

- options for infrastructure enhancement between Golborne and Preston (see Section 10.1)
- options for splitting and joining of trains at Carlisle, Lockerbie and Carstairs (see Section 10.2)
- options for providing connecting chords and infrastructure changes for GC trains for services to Liverpool (see Section 10.3)

The first two items formed the basis for ongoing work being undertaken by HS2 Ltd and Network Rail. The initial work undertaken on item three is described below.

10.1 Golborne to Preston Infrastructure Options

During the development of the route options in the short listing stage a study of the existing West Coast Main Line railway (WCML) between Golborne and Preston was undertaken. This considered a number of infrastructure options for capacity enhancements and speed increases to facilitate the introduction of classic compatible trains between Golborne and Preston.

The options included:

- Remodelling and speed improvements in the Lowton/Golborne/Bamfurlong area including relocation of the ladder crossovers at Bamfurlong.
- Reconfiguration of track layout between Golborne and Spring's Branch to place the fast lines in the middle of the four tracks and the slow lines on the outside.
- Platform extensions at Wigan North Western station to accommodate 400m long trains
- Four tracking of the current two track main line between Wigan and Balshaw Lane
- Four tracking of the current two track main line railway between Standish and Balshaw Lane
- Speed increases at Euxton Junction
- Reconfiguration at Euxton Junction to minimise fast line occupation for diverging services
- Platform extensions at Preston station to accommodate 400m trains.

In addition to the connection from HS2 to the WCML at Golborne, two alternative connections were also investigated. These options are shown in Figure 10.1. The HS2 routes are shown in red and the existing WCML in black.

- At **Balshaw Lane Junction** from three of the HS2 routes. These options would have required landtake and demolitions in the urban area and in one case a long tunnel. These options were parked.
- **At Euxton Junction** from three of the HS2 routes. In all cases extensive demolitions would have been required and major skew crossings of the M6. These options were parked.

This study has informed the ongoing work being undertaken by HS2 Ltd and Network Rail on the introduction of classic compatible trains onto the WCML between Golborne and Scotland.

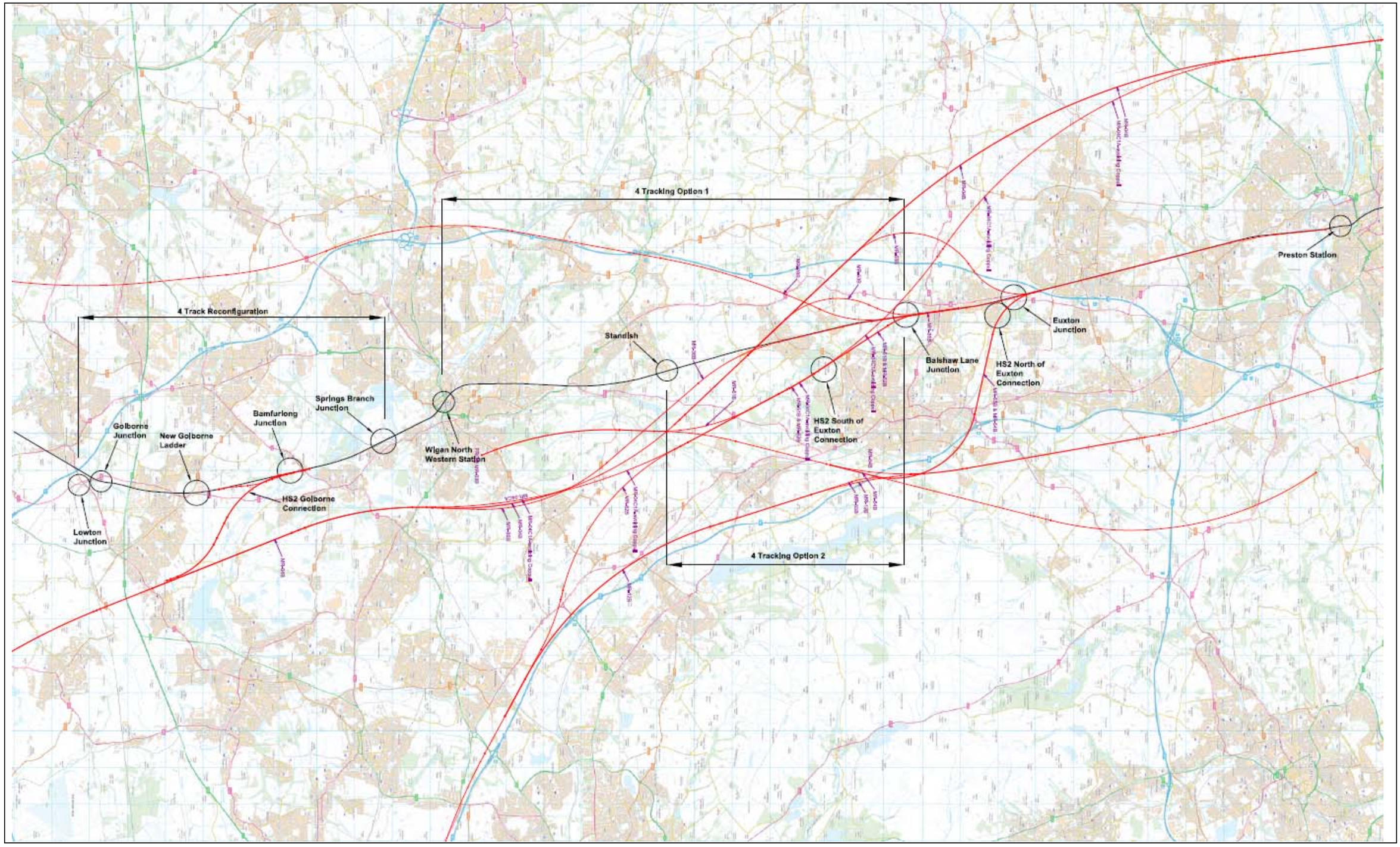

Figure 10.1 Golborne to Preston Options

10.2 Splitting and Joining Trains at Carlisle, Lockerbie and Carstairs

A study was undertaken to consider the options for splitting and joining classic compatible trains north of the HS2 connection to the WCML. This would allow 400m trains to split with one half serving Glasgow and the other half Edinburgh. The study identified platform extensions and track layout alterations that would be required at three potential locations; Carlisle, Lockerbie and Carstairs.

Carlisle

None of the existing platforms at Carlisle station can accommodate 400m trains. Trains could be split or joined without any platform extensions or major engineering works. However, only one of the two train sets making up the 400m formation would be alongside the platform face for passenger access.

To provide full platform access for 400m trains extensions to platform 1 would be required at both ends for northbound trains. For southbound trains platform 4 would require an extension of at the north end.

Lockerbie

The loop lines at Lockerbie are of sufficient length to allow the splitting and joining of trains. However, there would be either no access to platforms to allow passengers to join or alight from trains, or just access to one of the two train sets.

To provide full platform access for 400m trains both platforms would need to be extended to the north by 127m, with some remodelling of the track layout.

Carstairs

Platform length at Carstairs is currently 280m. Trains could be split and joined without the facility to allow passengers to join or alight, or with just the facility for access to one of the two train sets that make up the 400m train.

To provide full platform access for both parts of the 400m train an extension of approximately 120m would be required to the north end of the existing island platform. There would also need to be extensive remodelling of the track layout.

This study has informed the ongoing work being undertaken by HS2 Ltd and Network Rail and the selection of Carstairs as preferred location for splitting and joining classic compatible trains and forms the basis of future work and assumptions.

10.3 Liverpool Connection Chord Options and Infrastructure Changes for GC Trains to Liverpool

Two studies were undertaken to consider the provision of a chord line from HS2 routes to existing railway lines to Liverpool and the associated infrastructure changes.

The first study was completed during the development of the route options in the short list. Chord lines were identified to connect HS2 routes to the existing railway lines to Liverpool together with the infrastructure alterations that would be required to run a standard, GC compliant HS2 train to Liverpool.

A dedicated HS2 route to Liverpool was also developed to provide a comparative assessment with the gauge cleared existing network routes.

The second study was completed during the development of route options selected for refinement. Chord lines (spurs) only were identified to connect HS2 routes to the existing railway for use by classic compatible trains. This avoided the cost implications associated with gauge clearance of the existing rail network to Liverpool.

10.3.1 Development of route options in the short list – chord lines and infrastructure changes for HS2 trains to run to Liverpool

The four existing routes that give access to Liverpool from the HS2 route options are shown in Figure 10.2:

- Preston to Liverpool via St Helens (Route A on Figure 10.2)
- Manchester to Liverpool via Newton-le-Willows (Route B)
- Manchester to Liverpool via Warrington Central (Route C)
- Warrington to Liverpool via Ditton (Route D)

The existing lines are shown in hatched black, the various HS2 routes in red, green and blue, the chord lines in purple and the dedicated HS2 route in orange.

A route via Runcorn was also considered but not taken forward in detail as the 140 year old grade II listed Runcorn Viaduct over the River Mersey cannot accommodate high speed trains without very significant engineering works (possibly replacement) and disruption to the main Liverpool to London line.

A line speed enhancement exercise was undertaken to understand and estimate the journey time potential of the existing routes if enhancement works were carried out. These options were not progressed due to the capital costs of the infrastructure works and operational impacts to the existing rail network.

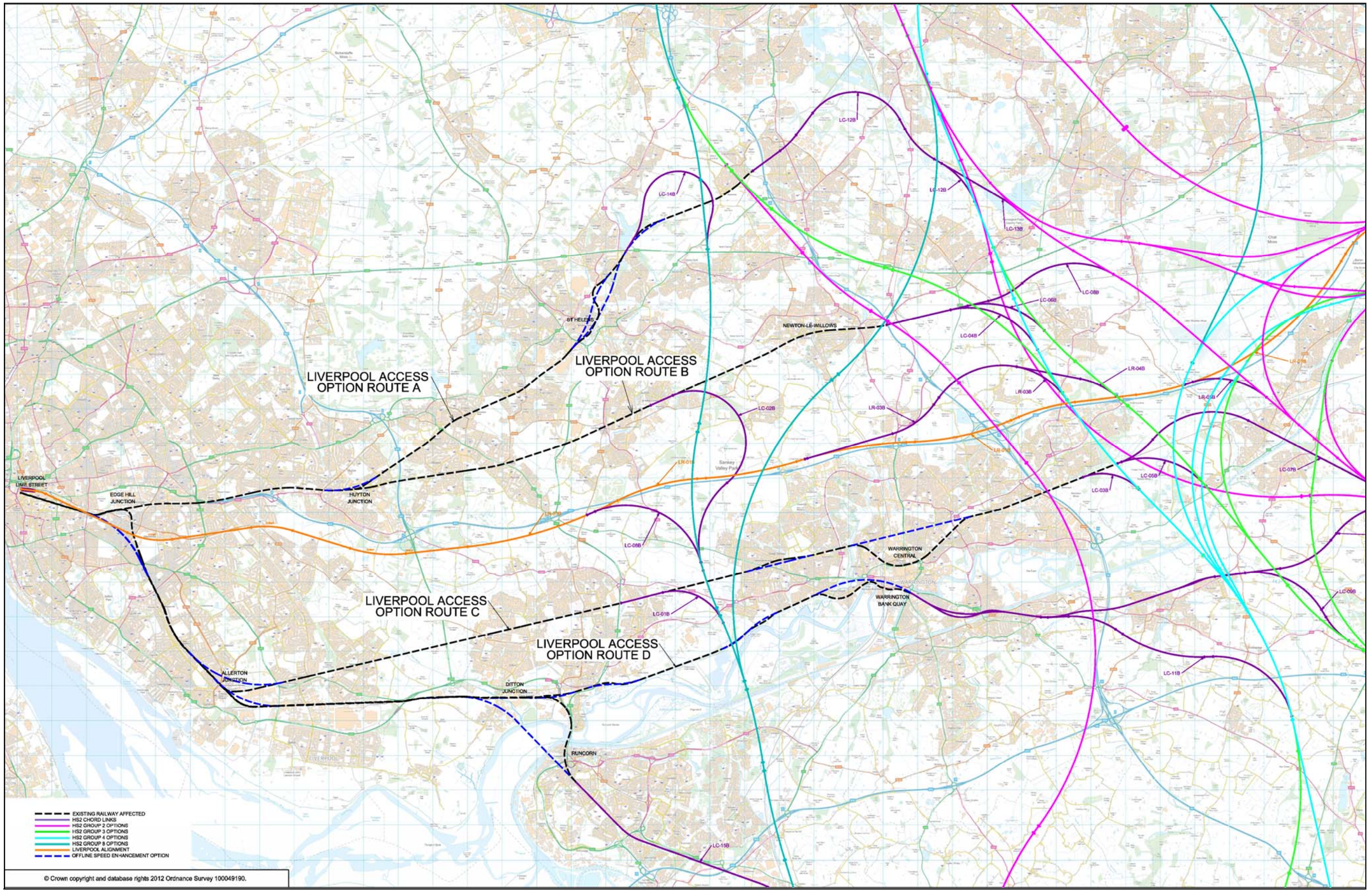

Figure 10.2 Routes to Liverpool

To accommodate the wider GC trains on the routes to Liverpool all of the options would require extensive engineering works which would include:

- Reconstruction of all stations
- Installation of loop lines at all stations to allow existing trains to continue to serve them.
- Major modifications to or reconstructions of the majority of bridge structures.
- Widening of embankments and cuttings.
- Major works to the part tunnelled section between Edge Hill and Liverpool Lime Street.
- Complete replacement of the existing signalling and telecommunications equipment.
- Installation (where overhead electrification already exists) of new high speed and conventional compatible electrification equipment
- Provision of electrification where not currently provided (the majority of the routes are not electrified.

At Liverpool Lime Street station only platforms 6 to 9 would be long enough for 200m long HS2 trains. They would require to be reconstructed for the HS2 wider trains, thus rendering them unsuitable for classic rail services and affecting the capacity of the station.

The original line between Liverpool and Manchester (via Newton-le-Willows) engineered by George Stephenson and opened on 1834 has 16 listed structures and buildings, the majority of which would be impacted by works to accommodate the wider HS2 trains.

10.3.2 Development of route options in the short list – dedicated HS2 route to Liverpool

A dedicated HS2 route was developed to provide a comparative assessment with the work required to allow HS2 trains to reach Liverpool using the existing routes.

The route would diverge from the main HS2 routes to the north, using 225kph junctions, and generally follow the M62 corridor. The route would be predominantly at ground level with a tunnelled section to access Liverpool city centre at a location adjacent to Lime Street station. This new station would likely be underground to mitigate impacts in the city centre.

This option was not progressed due to the capital costs and the difficulty of siting a station in the city centre.

10.3.3 Development of options for refinement – chord lines

During the development of HS2 route options selected for refinement chord lines were again identified to connect HS2 routes to the existing railway for use by classic compatible trains to access Liverpool. Ten chords were developed six connecting HS2 routes to the Liverpool to Manchester via Huyton line and four connecting to the Liverpool to Manchester via Hunts Cross line. These chords are shown Figure 10.3 in blue, with the HS2 routes shown in red. All of the chords would have a design speed of 160kph.

The chords connecting to the Liverpool to Manchester via Huyton line (DSE) were:

- LC-502 – a connection near Old Moss Lane south east of Glazebury. This chord would require extensive embankment works and two high skew rail brdges. Up to 2km of highway diversions would be required.
- LC-505 – a connection from an HS2 route close to junction 11 of the M62, passing south of Culcheth and joining the existing railway south of Lowton. Eight bridges would be required with embankment works and 3km of highway diversions
- LC-506 – a connection from an HS2 route that would run east of Culcheth joining the existing railway north west of Culcheth. Embankment works and 9 bridges would be required.
- LC-509 – a connection from an HS2 route south of Culcheth joining the existing railway south of Lowton. Eight bridges, 3.5km of highway alterations and extensive embankment works would be required.
- LC-510 – this connection joins the existing railway near Broseley Lane north of Culcheth from an HS2 route that runs east of Culcheth. Extensive embankment works and seventeen bridges would be required, including one over the M62, with 2km of highway diversions.
- LC-511 – a connection from an HS2 route east of Culcheth joining the existing railway near Broseley Lane north of Culcheth. Extensive embankment works and ten bridges would be required.

The chords connecting to the Liverpool to Manchester via Hunts Cross line (MAJ) were:

- LC-501 - a connection from an HS2 route east of Hollinfare joining the existing railway west of Glazebrook. Extensive embankment works, eight bridges and road diversions would be required. Two of the bridges would be 100m span structures over the A57.
- LC-504 – a connection from an HS2 route west of Hollinfare joining the existing railway west of Birchwood. Embankment works and seven bridges would be required.
- LC-507 - a connection from an HS2 route west of Hollinfare joining the existing railway west of Birchwood. Embankment works and six bridges would be required, with up to 1km of highway diversions.
- LC-508 - a connection from an HS2 route east of Hollinfare joining the existing railway west of Glazebrook. Extensive embankment works, six bridges and road diversions would be required. Two of the bridges would be 100m span structures over the A57 and a watercourse.

In all cases signalling alterations to the existing railways would be required. The Liverpool to Manchester via Huyton line is to be electrified by Network Rail. The Liverpool to Manchester via Hunts Cross line would require to be electrified from the junction with HS2.

In addition to the chord lines the following infrastructure modifications were also investigated:

- Alterations to allow electrification of the Liverpool to Manchester via Hunts Cross line.
- Reconfiguration of existing railway junctions ay Huyton, Allerton and Edge Hill to eliminate capacity constraints.

- Potential for line speed increases on the existing railways

The options for chords connecting to the Liverpool to Manchester via Huyton line were not progressed following consideration of the following:

- to the limits on operational capacity on the line following the introduction of additional traffic associated with electrification
- proposed Northern Hub works
- that the route does not provide a Warrington station
- analysis of demand
- alternative services offering preferable value for money and demand
- sustainability impacts

The options for chords connecting to the Liverpool to Manchester via Hunts Cross line were also not progressed due to the capital cost (including electrification of the part of the route) and analysis of demand. Alternative service options and sustainability impacts also influenced the decision to park these route options.

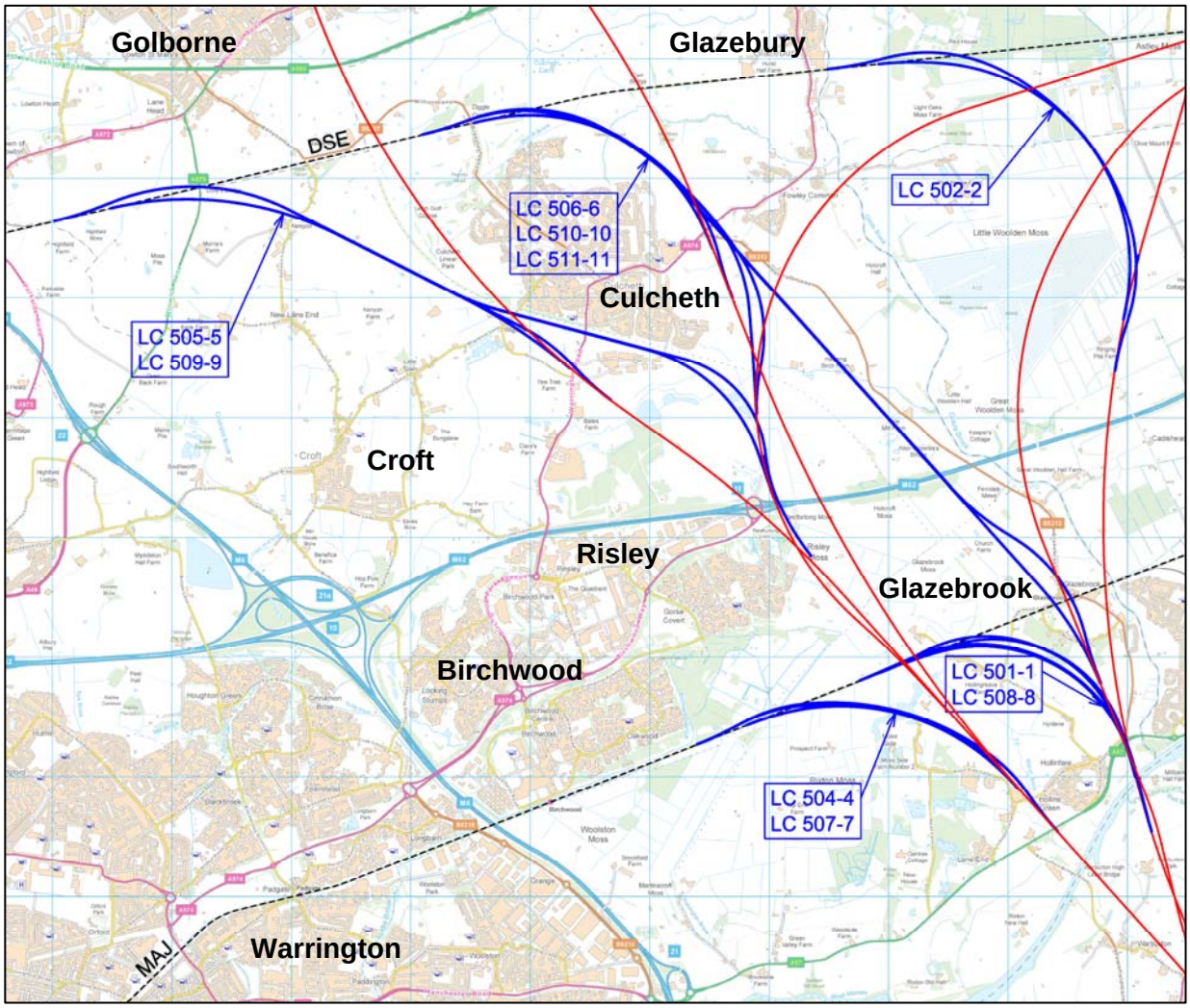

Figure 10.3 Options for Chord Lines

11. Glossary

classic compatible trains – a European high speed standard train which can also run on existing UK rail lines, also known as the “classic network”.

concrete trough – a concrete structure in which the route would cross a flood plain at a level below flood level and which would prevent water affecting the route.

conservation area – designated areas of special architectural and historic interest.

grade separated junction – a junction where one or more routes cross other routes at a different level by being raised above or below them. This could apply to either to railways or highways.

Grade I listed building – a listed building of exceptional interest, sometimes considered to be internationally important.

Grade II listed building – nationally important buildings that are of special interest.

Grade II* listed building – a listed building of particular importance, of more than special interest.

green tunnel – where earth is built-up around and over a section of the rail line to reduce its environmental impacts.

High Speed Two Limited (HS2 Ltd) – a company wholly owned by the Department for Transport responsible for developing and promoting HS2 London to West Midlands and preparing proposals for HS2 to Leeds, Manchester and Heathrow.

infrastructure maintenance depot – Base for maintenance of infrastructure associated with the proposed high speed rail line, including track, signalling equipment, cuttings and embankments.

inverted siphon – pipes that dip below an obstruction to form a “U” shaped flow path.

listed buildings - a building of special architectural and historic interest brought under the consideration of the planning system by English Heritage.

Network Rail – owner and operator who runs, maintains and develop’s Britain’s rail tracks, signalling, bridges, tunnels, level crossings, viaducts and selected rail stations. Network Rail owns and manages Birmingham New Street station, Liverpool Lime Street station and Manchester Piccadilly station.

personal rapid transit (PRT) - a system that consists of small light passenger vehicles running on elevated guide ways under computer control.

rolling stock depot – Depot used to service and maintain trains operating on the proposed route.

sifting – the process used by HS2 Ltd to develop options to meet the remit. Initial options were narrowed down through stages to the final options presented in the report.

spur –a railway line which branches off the main through route

West Coast Main Line (WCML) – Intercity railway route in the UK connecting London, Birmingham, Manchester, Liverpool and Glasgow.