

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)

Working Draft Environmental Statement

Volume 2: Community Area report

MA07: Davenport Green to Ardwick

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Department
for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES deposited in November 2013, followed by ESs deposited with Additional Provisions to that Bill in 2014 and 2015. The Phase One hybrid Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in July 2017.

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2.

Structure of the HS2 Phase 2b working draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown in Figure 1.

This working draft ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

The working draft ES comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of the following, identified at a stage in the ongoing design and environmental assessment:

- the Proposed Scheme and the reasonable alternatives studied;
- the likely significant beneficial and adverse effects of the Proposed Scheme;
- the means to avoid or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

This contains terms and abbreviations, including units of measurement, used throughout the working draft ES.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques, based on a stage in the ongoing design;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase, based on a stage in the ongoing design; and

- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied post July 2017 are reported in the relevant Volume 2: Community area reports.

Volume 2: Community area reports and map books

These cover the following community areas:

- western leg: MA01 Hough to Walley's Green; MA02 Wimboldsley to Lostock Gralam; MA03 Pickmere to Agden and Hulseheath; MA04 Broomedge to Glazebrook; MA05 Risley to Bamfurlong; MA06 Hulseheath to Manchester Airport; MA07 Davenport Green to Ardwick; MA08 Manchester Piccadilly Station; and
- eastern leg: LA01 Lea Marston to Tamworth; LA02 Birchmoor to Austrey; LA03 Appleby Parva to Ashby-de-la-Zouch; LA04 Coleorton to Kegworth; LA05 Ratcliffe-on-Soar to Long Eaton; LA06 Stapleford to Nuthall; LA07 Hucknall to Selston; LA08 Pinxton to Newton and Huthwaite; LA09 Stonebroom to Clay Cross; LA10 Tibshelf to Shuttlewood; LA11 Staveley to Aston; LA12 Ulley to Bramley; LA13 Ravenfield to Clayton; LA14 South Kirkby to Sharlston Common; LA15 Warmfield to Swillington and Woodlesford; LA16 Garforth and Church Fenton; LA17 Stourton to Hunslet; and LA18 Leeds Station.

The reports provide the following information for each area, as identified at a stage in the ongoing design and environmental assessment:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a summary of the local alternatives considered since the Government's announcement of the preferred route in July 2017;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- where possible, the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in a separate Volume 2: Community area map book. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-00, LV-02, LV-03, and LV-04, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: Community area reports), operational sound contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: Community area reports) and maps showing key surface water and groundwater features (Map Series WR-01 and WR-02, to be read in conjunction with Section 15, Water resources and flood risk of the Volume 2: Community area reports).

In addition to the community areas detailed above, reports are provided for community areas within which electrification of a section of the MML is proposed: MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station. These reports are provided at an earlier stage of the design and environmental assessment process, following the amendment of the route of the Proposed Scheme to include the electrification of a section of the MML between Clay Cross and Sheffield Midland Station. This would enable high speed trains to connect to Chesterfield and Sheffield as part of the Proposed Scheme. They include for each area:

- an overview of the area;
- a description of the proposed works within the area, based on a stage in the ongoing design;
- an outline of potential effects; and
- an overview of stakeholder engagement and consultation to be carried out as part of the EIA process.

Mitigation measures have not been identified at this stage of the design and environmental assessment process in relation to the likely effects arising from construction and operation of the Proposed Scheme for the MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station areas. Any required mitigation measures will be reported in the formal ES. In addition, any required environmental monitoring during operation of the Proposed Scheme will be reported in the formal ES.

Volume 3: Route-wide effects

This describes the effects that are likely to occur at a geographical scale greater than the community areas described in the Volume 2: Community area reports, based on a stage in the ongoing design and environmental assessment.

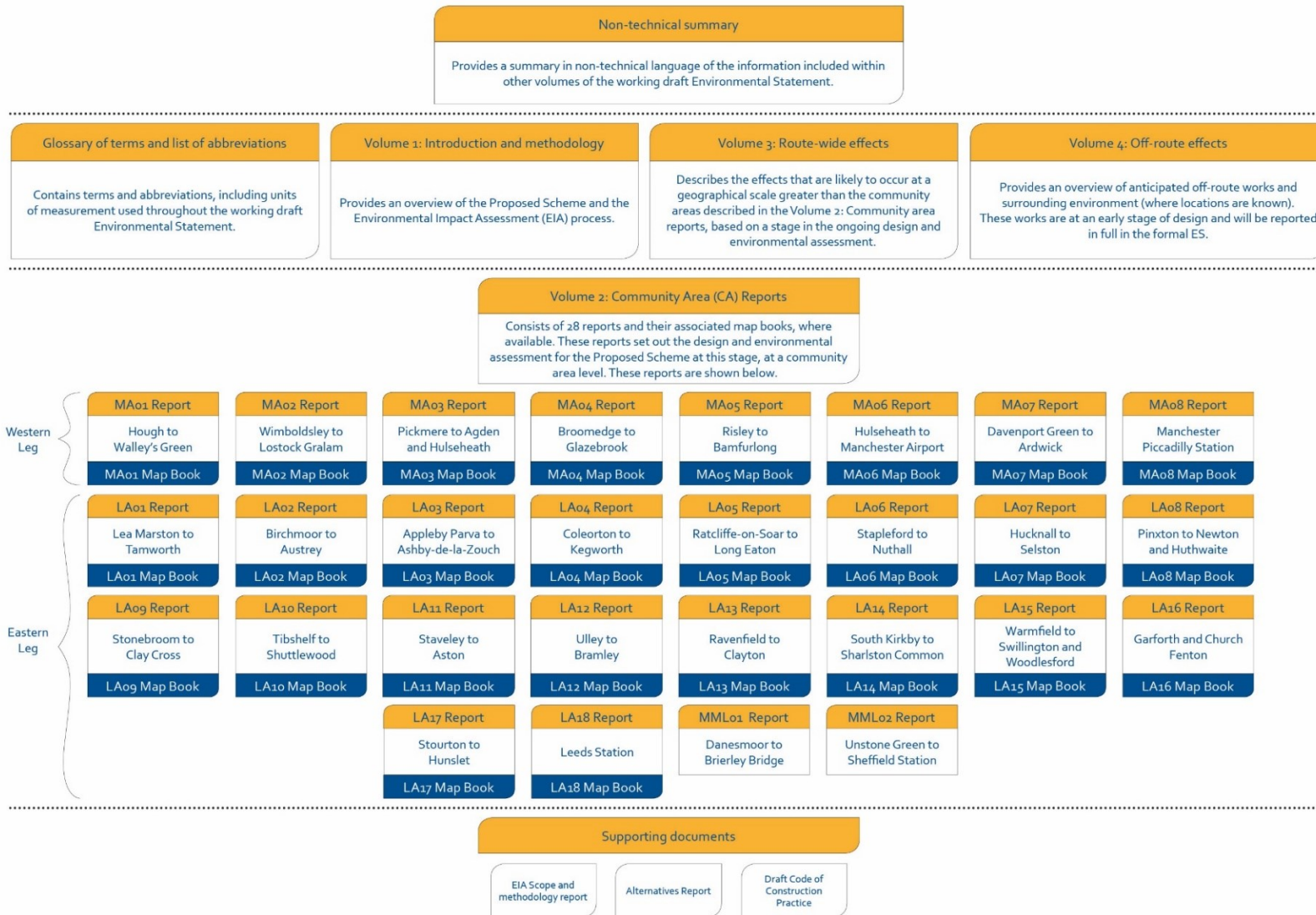
Volume 4: Off-route effects

This provides an overview of anticipated off-route works and surrounding environment (where locations are known). These works are at an early stage of design and will be reported in full in the formal ES.

Supporting documents

- EIA Scope and Methodology Report: this outlines the scope and methodology adopted for the EIA. HS2 Ltd consulted on a draft of the EIA Scope and Methodology Report (SMR) between July and September 2017. This updated version takes into consideration comments received, where appropriate, in addition to changes required as a result of updates to legislation or industry best practice guidance.
- Alternatives report: this describes the evolution of the Proposed Scheme and the reasonable alternatives considered at this stage of the design, at the strategic, route-wide, route corridor and local levels.
- Draft Code of Construction Practice (CoCP): this sets out measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Figure 1 Structure of the working draft Environmental Statement

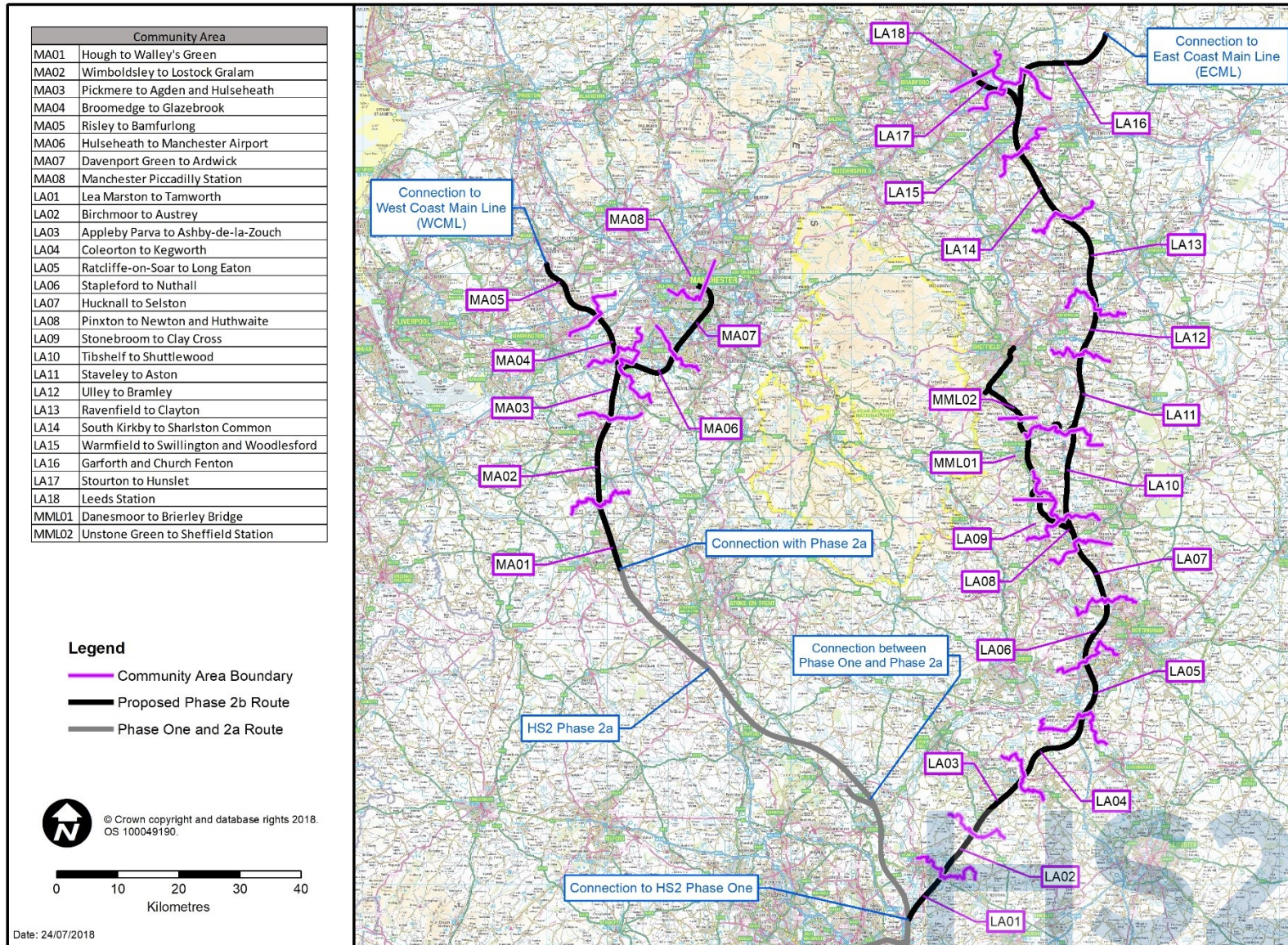


1 Introduction

1.1 Introduction to HS2

- 1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, East Midlands and South Yorkshire will be served by high speed trains running at speeds of up to 360 kilometres per hour (kph) (225 miles per hour (mph)).
- 1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London – West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.
- 1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the ‘Y network’.
- 1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands – Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.
- 1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the ‘western leg’), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as ‘the eastern leg’). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.
- 1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Davenport Green to Ardwick area (CA number MA07) which is located on the western leg of the Proposed Scheme.

Figure 2: The HS2 Phase 2b route and community areas



1.2 Purpose of this report

- 1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point in time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Davenport Green to Ardwick area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.
- 1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.
- 1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.
- 1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)^{1,2}. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.
- 1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

- 1.3.1 This report is divided into the following sections:
- Section 1: an introduction to HS2 and the purpose and structure of this report;
 - Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;

¹ Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment), House of Commons.
² House of Lords (2005), *Standing Orders of the House of Lords - Private Business*, The Stationery Office.

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- Section: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
 - agriculture, forestry and soils (Section 4);
 - air quality (Section 5);
 - community (Section 6);
 - ecology and biodiversity (Section 7);
 - health (Section 8);
 - historic environment (Section 9);
 - land quality (Section 10);
 - landscape and visual (Section 11);
 - socio-economics (Section 12);
 - sound, noise and vibration (Section 13);
 - traffic and transport (Section 14); and
 - water resources and flood risk (Section 15).

1.3.2 Each environmental topic section (Sections 4 to 15) comprises:

- an introduction to the topic;
- a description of the existing environmental baseline within the community area;
- a description of the impacts or likely significant environmental effects identified to date arising during construction and operation of the Proposed Scheme; and
- a description of any proposed mitigation and monitoring measures that have been identified to date to address any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)³.

1.3.4 The maps relevant to the Davenport Green to Ardwick area are provided in a separate corresponding document entitled Volume 2: MA07 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: MA07 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

³Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

- 1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

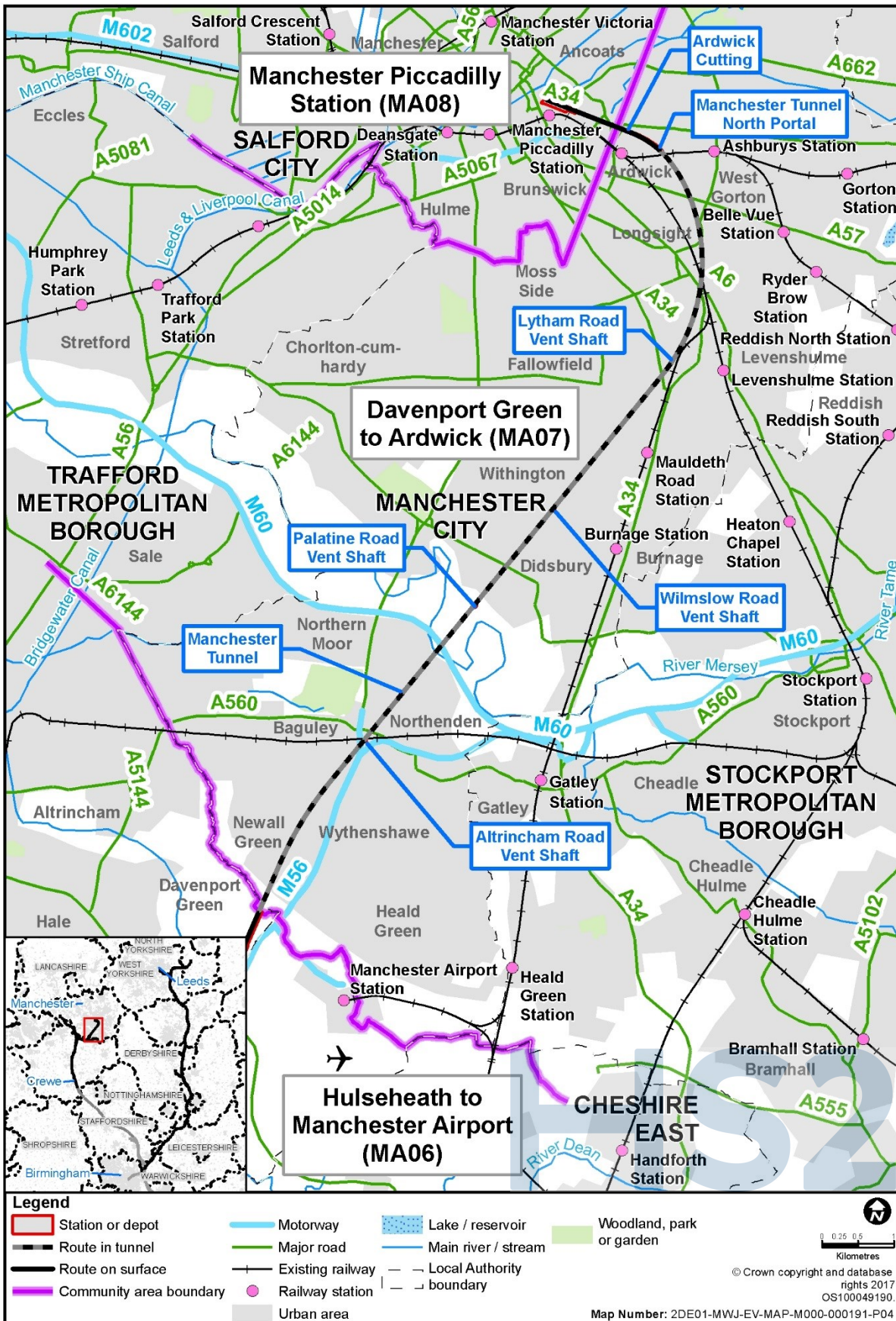
- 2.1.1 The Davenport Green to Ardwick area covers an approximately 13.4km section of the Proposed Scheme, the majority of which is in tunnel, passing under the parish of Ringway and non-civil parish areas of Wythenshawe, Northenden, Withington, Longsight and West Gorton, emerging at Ardwick, within the local authority areas of Trafford Metropolitan Borough Council (TMBC) and Manchester City Council (MCC). Fairywell Brook is located at the southern boundary of the area, adjacent to Newall Green and Woodhouse Park, at the edge of the Manchester conurbation. The northern boundary of the area is located within an area of commercial property bounded by the A665 Midland Street, the A665 Chancellor Lane and the A635 Ashton Old Road.
- 2.1.2 As shown in Figure 3, the Hulseheath to Manchester Airport area (MA06) lies to the south and west and the Manchester Piccadilly Station area (MA08) lies to the north.

Settlement, land use and topography

- 2.1.3 The area is predominantly suburban in character becoming more urban towards the north, with land use comprising dense residential development alongside recreational grounds, parkland and woodland. A number of watercourses, including the River Mersey, are found in the area.
- 2.1.4 At the southern end of the area, the route of the Proposed Scheme would pass under the settlements of Newall Green, Wythenshawe, Northenden, Didsbury, Withington, Rusholme and Longsight. An open area associated with the River Mersey lies towards the middle of the area. The northern extent of the area becomes more urban in character as it approaches Manchester city centre. There are light industrial and commercial uses through Roundthorn, Northenden, Longsight, West Gorton and Ardwick.
- 2.1.5 The area is generally flat and any minor changes in topography tend to be masked by overlying urban development. The area has its highest point at the southern end, near Newall Green, approximately 74m above Ordnance Datum (AOD). The ground falls away along the valley of the River Mersey to approximately 28m AOD at Northenden.

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Figure 3: Community area context map



Key transport infrastructure

- 2.1.6 The M56 runs through the area, with junction 5 located at the southern boundary. The route of the Proposed Scheme would pass under the M56 in a tunnel, south of junction 3a. The M60 runs in a north-west to south-east alignment through the area and would pass over the route of the Proposed Scheme east of junction 5 near Northenden.
- 2.1.7 Principal highways in this area include the A5103 Princess Parkway/Princess Road, the A560 Altrincham Road, the A5145 Barlow Moor Road, the A34 Birchfields Road/Kingsway, the A5079 Slade Lane, the A6 Stockport Road, the A6010 Kirkmanshulme Lane/Alan Turing Way, the A57 Hyde Road, the A635 Ashton Old Road and the A665 Midland Street. Other local roads in the area include the B5167 Palatine Road, the B5166 Church Road and B5093 Wilmslow Road/Moseley Road.
- 2.1.8 In this area, there is the Mid-Cheshire railway line – Manchester to Chester via Stockport (south of the M56 junction 3a), the Styal Line – Manchester to Wilmslow (adjacent to the A5079 Slade Lane), the Ashburys railway line (north of Ardwick Depot) and the Glossop Line – Manchester to Derbyshire (adjacent to the A57 Hyde Road).
- 2.1.9 Metrolink is the light rail (tram) system owned by Transport for Greater Manchester which operates throughout the Greater Manchester area. The route of the Proposed Scheme would pass under the Metrolink network 125m south-east of Martinscroft Tram Stop in Newall Green and approximately 150m north-east of West Didsbury Tram Stop.
- 2.1.10 The River Mersey runs east to west through the area, north of the M60.
- 2.1.11 The route of the Proposed Scheme would pass under several public rights of way (PRoW) including the Trans Pennine Trail, the Cheshire Ring Canal Walk and the Medlock Valley Way, in addition to a number of footpaths associated with the highways in the area. The route of the Proposed Scheme would pass under several national, regional and local cycle routes including: the Trans Pennine Trail (National Cycle Network route 62) along the River Mersey; part of the National Cycle Network route 6, known as the Fallowfield Loop, close to Lindleywood Road; and regional cycle route 85 in Wythenshawe.

Socio-economic profile

- 2.1.12 The route of the Proposed Scheme predominantly falls within the administrative areas of MCC and, to a very minor extent, TMBC.
- 2.1.13 Within the MCC area the retail sector accounted for the largest proportion of businesses (20%), with the professional, scientific and technical sector as the second largest (17%), followed by business administration and support services (8%).
- 2.1.14 According to the Annual Population Survey (2016)⁴ the employment rate⁵ within the MCC area was 63% (237,000 people). Unemployment in the MCC area was 8%.

⁴ Annual Population Survey (2016), NOMIS. Available online at <https://www.nomisweb.co.uk>

⁵ The proportion of residents aged 16-64 that is in employment.

- 2.1.15 The survey also shows that 39% of MCC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 11% of MCC residents had no qualifications.

Notable community facilities

- 2.1.16 The Davenport Green to Ardwick area is a densely populated residential area with community facilities and services located throughout. To the south and east of the route of the Proposed Scheme are the larger settlements of Gatley, Cheadle, west Stockport, Reddish and Droylsden; to the north and west are Sale and south Manchester. Higher concentrations of amenities are located closer to Manchester city centre, to the north of the M60. Smaller communities close to the route of the Proposed Scheme include Newall Green, Wythenshawe, Baguley, Northenden, Didsbury, Withington, Burnage, Fallowfield, Levenshulme, Rusholme, Longsight, West Gorton and Ardwick. In addition to being an inner city residential area, there are also several industrial estates in the area including those at Roundthorn, Northenden, Sharston and Ardwick.
- 2.1.17 Community resources typical of residential areas are found within the Davenport Green to Ardwick area. There are numerous schools and other educational establishments, places of worship, cemeteries, community centres, libraries, medical facilities, including the Christie Hospital, and care homes.

Recreation, leisure and open space

- 2.1.18 The area has a range of recreation, leisure and open space facilities which are dispersed throughout the area. Notable facilities close to the route of the Proposed Scheme include: Wythenshawe Park, which includes woodlands and recreational amenities such as an orienteering course, tennis courts, a community farm and a horticultural centre; Fletcher Moss Botanical Garden; Didsbury, Withington and Northenden golf clubs; Marie Louise Gardens; Fog Lane Park and Recreation Grounds; Ladybarn Park; Platt Fields Park; Armitage Sports Centre, which is the University of Manchester's sports centre; and Crowcroft Park.
- 2.1.19 In addition, there are allotment gardens, sports fields, clubs, stadia and multi-use pitches within the area, which offer recreational and leisure opportunities to residents.

Policy and planning context

Planning framework

- 2.1.20 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

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2.1.21 The following local policy documents have been considered and referred to where appropriate to the assessment:

- Adopted Trafford Local Plan: Core Strategy 2011-2026 (2012)⁶;
- Adopted Manchester Core Strategy 2012–2027 (2012)⁷;
- Adopted Trafford Unitary Development Plan 2002-2016 (saved policies) (2006)⁸;
- Adopted Manchester City Council Unitary Development Plan (saved policies) (1995)⁹;
- Adopted Greater Manchester Joint Waste Development Plan Document 2012-2027 (2012)¹⁰;
- Adopted Greater Manchester Joint Minerals Development Plan Document 2012-2027 (2013)¹¹; and
- Adopted Greater Manchester Transport Strategy 2040 (2017)¹².

2.1.22 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for Examination.

Committed development

2.1.23 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme.

2.1.24 Where it is likely that committed developments will have been completed by 2023, these will be identified as ‘future baseline’ schemes and taken into account in the formal ES.

2.1.25 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.26 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or

⁶ Trafford Local Plan: Core Strategy 2011-2026 (Adopted 2012). Available online at: <http://www.trafford.gov.uk/planning/strategic-planning/local-plan/core-strategy.aspx>

⁷ Manchester Core Strategy 2012-2027 (Adopted 2012). Available online at: http://www.manchester.gov.uk/downloads/download/4964/core_strategy_development_plan

⁸ Trafford Unitary Development Plan 2002-2016 (saved policies) (Adopted 2006). Available online at: <http://www.trafford.gov.uk/planning/strategic-planning/unitary-development-plan.aspx>

⁹ Manchester Unitary Development Plan (saved policies) (Adopted 1995). Available online at: http://www.manchester.gov.uk/downloads/download/4975/extant_udp_policies

¹⁰ Greater Manchester Joint Waste Development Plan Document 2012-2027 (Adopted 2012). Available online at: http://www.gmwastedpd.co.uk/doclib.html#Adopted_Waste_Plan_Documents

¹¹ Greater Manchester Joint Minerals Development Plan Document 2012-2027 (Adopted 2013). Available online at: http://www.gmmineralsplan.co.uk/docs.html#ADOPTED_MINERALS_PLAN

¹² Greater Manchester Transport Strategy 2040 (Adopted 2017). Available online at: <https://www.tfgm.com/2040>

close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

Ongoing design development

2.1.27

Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting from this will be reported in the formal ES. The main areas of design development being considered include:

- review of the design for the Manchester tunnel, portals and ventilation and intervention shafts (vent shafts)¹³;
- review of the location, layout and conventional railway interfaces at the Ardwick Depot required for the movement of materials during construction;
- relocation of the existing operational facilities within Ardwick Depot;
- review of the proposed lengths and heights of crossing structures;
- refinement of the realignment of watercourses crossing the Proposed Scheme;
- temporary and permanent utility diversions;
- refinement of the realignment of roads crossing the Proposed Scheme;
- design and location of replacement floodplain storage area required during construction and operation;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes;
- additional environmental features required to mitigate likely significant environmental effects;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station locations.

2.2 Description of the Proposed Scheme

2.2.1

The following section describes the main features of the Proposed Scheme in the Davenport Green to Ardwick area, including any proposed environmental mitigation measures that have been identified to date. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9.

2.2.2

Land required for operation of the Proposed Scheme is described in this section and is shown on Volume 2: Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: Map Series CT-05.

¹³ Shafts located at intervals along the length of a tunnel and used for ventilation and emergency access/exit.

2.2.3 In general, features are described from south to north along the route, and east to west for features that form part of the Proposed Scheme.

Overview

2.2.4 The route of the Proposed Scheme through the Davenport Green to Ardwick area would be approximately 13.4km long, the majority of which would be in tunnel. The route would extend from Davenport Green in the south, north-east towards Withington, north towards Longsight, and then north-west towards Ardwick.

2.2.5 This section of route is illustrated on maps CT-06-357b to CT-06-365a in the Volume 2: MA07 Map Book.

2.2.6 All dimensions in the sections below are approximate.

2.2.7 In the Davenport Green to Ardwick area, the route of the Proposed Scheme would be carried within or on the following features:

- tunnel for a total length of 12.8km (Manchester tunnel); and
- cutting for a total length of 573m (Ardwick cutting) in this section.

2.2.8 The Proposed Scheme is described in two separate sections below.

2.2.9 In general, features are described along the route of the Proposed Scheme from south to north and from the eastern to western sides of the route as they form part of the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: MA07 Map Book.

Manchester tunnel

2.2.10 The route of the Proposed Scheme would enter under the Davenport Green to Ardwick area as a twin-bore tunnel at the boundary with the Manchester tunnel south portal in the Hulseheath to Manchester Airport area (MA06). The tunnel would run in a northerly direction and would include four vent shafts, before emerging from the Manchester tunnel north portal at Ardwick Depot.

2.2.11 This section of route is illustrated on maps CT-06-357b to CT-06-364 in the Volume 2: MA07 Map Book.

2.2.12 Key features of this 12.8km section would include:

- a tunnel portal building and rescue area at the southern end of the Manchester tunnel. Access would be provided via a new access track from the realigned Thorley Lane, located in the Hulseheath to Manchester Airport area (MA06) (see Volume 2: Map CT-06-357b, E5 to F5);
- twin bore section of Manchester tunnel, 12.8km in length and up to 60m in depth. The top of the bored tunnel would be up to 53m below existing ground level and track level would be up to 60m below ground level. Both excavated bores would have an internal diameter of 7.5m and an external diameter of 8.5m. There would be cross passages every 350m providing access between the twin bores (see Volume 2: Map CT-06-357b, G6 to J6, to Map CT-06-364, A5 to I6);

- Altrincham Road vent shaft and headhouse¹⁴, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft would be 25m in diameter and 53.5m in depth. The headhouse would be 14.5m in height. Access would be provided from the M56 junction 3a and the A560 Altrincham Road (see Volume 2: Map CT-06-359, C6);
- Palatine Road vent shaft and headhouse, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape and a replacement floodplain storage area. The vent shaft would be 54m in diameter and 27.5m in depth. The headhouse would be 6m in height. Access would be provided from the B5167 Palatine Road (see Volume 2: Map CT-06-360, G5 and G6);
- Palatine Road vent shaft auto-transformer station, which would be 45.5m in length and 24m in width, on the western side of the route of the Proposed Scheme, immediately east of the Ashfield Lodge buildings. Access would be provided from the B5167 Palatine Road (see Volume 2: Map CT-06-360, F5 and F6);
- Wilmslow Road vent shaft and headhouse, which would be designed to help integrate into the surrounding environment. The vent shaft would be 25m in diameter and 44.5m in depth. The headhouse would be 6m in height. Access would be provided from the B5093 Wilmslow Road (see Volume 2: Map CT-06-361, F6 and G6);
- Lytham Road vent shaft and headhouse, which would be designed to help integrate into the surrounding environment. The vent shaft would be 25m in diameter and 43m in depth. The headhouse would be 6m in height. Access would be provided from Lytham Road (see Volume 2: Map CT-06-363, B6); and
- Lytham Road vent shaft auto-transformer station, which would be 45.5m in length and 24m in width, on the western side of the route of the Proposed Scheme, 29m north-east of Birchfields Primary School. Access would be provided from Lytham Road (see Volume 2: Map CT-06-363, B6).

2.2.13 There would be maintenance access routes throughout this section. There would also be utilities works within this section, which may include works to overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.14 Construction of this section would be managed from the Manchester tunnel south portal main compound located in the Hulseheath to Manchester Airport area (MA06), which is described in Section 2.3 of the Hulseheath to Manchester Airport area (MA06) report, and from the Altrincham Road vent shaft, Palatine Road vent shaft, Wilmslow Road vent shaft, Lytham Road vent shaft satellite compounds and the Manchester tunnel north portal main compound and transfer node, which are described in Section 2.3 and shown on map CT-05-357b, map CT-05-359, map CT-05-360, map CT-05-361,

¹⁴The above-ground structure that typically sits at the top of a ventilation shaft or tunnel portal. These structures can be used for housing control equipment or for providing emergency access to tunnels.

map CT-05-363, map CT-05-364 and map CT-05-365a in the Volume 2 MA07 Map Book.

Ardwick Depot

- 2.2.15 The route of the Proposed Scheme would emerge from the Manchester tunnel at the Manchester tunnel north portal in Ardwick, continuing in the Ardwick cutting north-west across Ardwick Depot towards central Manchester.
- 2.2.16 This section of route is illustrated on map CT-06-364 and map CT-06-365a in the Volume 2: MA07 Map Book.
- 2.2.17 Key features of this 573m section would include:
- a porous portal¹⁵ 50m in length at the northern end of Manchester tunnel, with a headhouse 24m long, 30m wide and 6m in height (see Volume 2: Map CT-06-364, I6);
 - a tunnel portal building¹⁶ and rescue area at the northern end of the Manchester tunnel. Access would be provided from A635 Ashton Old Road (see Volume 2: Map CT-06-364, I6);
 - the crossing of Blackbrook and Cornbrook underground rivers (see Volume 2: Map CT-06-364, I6 and I7 and Map CT-06-365, C5 and C6);
 - the Ardwick cutting, which would be a retained cutting 573m in length, 18m in width and up to 16m in depth in this section (see Volume 2: Map CT-06-364, I6 to J5 and Map CT-06-365a A5 to D6); and
 - the reconfiguration of the existing Ardwick Depot (see Volume 2: Map CT-06-364 H9 to J2 and Map CT-06-365a A6 to C3).
- 2.2.18 To accommodate the route of the Proposed Scheme, Rondin Road, Hooper Street and the A665 Midland Street would be crossed by the Ardwick cutting, requiring alteration to the existing road.
- 2.2.19 There would be maintenance access routes throughout this section. There would also be utilities works within this section, which may include works to overhead or underground lines, gas pipes, sewers and telecommunication cables.
- 2.2.20 Construction of this section would be managed from the Manchester tunnel north portal main compound and transfer node and the Piccadilly viaduct satellite compound A, which are described in Section 2.3, and shown on map CT-05-364 and map CT-05-365a in the Volume 2 MA07 Map Book.

¹⁵ Porous portals are perforated structures at tunnel portals (entrances), usually formed of concrete, designed to allow the passage of air from the tunnel. These reduce both air pressure changes and the noise generated when a high speed train enters or leaves a tunnel.

¹⁶ Tunnel portal building houses equipment, such as control equipment for the tunnel and ventilation fans for rail tunnel operations.

Demolitions

- 2.2.21 As set out in Volume 1, as the design develops, it is likely that not all the properties reported within the assessment would need to be demolished, for example where not all of the land is required for permanent works.
- 2.2.22 At this stage of the design development, it is anticipated that demolition of three existing residential properties, 28 commercial/business properties (including outbuildings) and seven other structures would be required to construct the Proposed Scheme in the Davenport Green to Ardwick area. These could be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

- 2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Davenport Green to Ardwick area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.
- 2.3.2 Land used only for construction purposes would be restored as agreed with the owner of the land and the relevant planning authority once the construction works in that area are complete.
- 2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2.
- 2.3.4 During the construction phase, public roads and PRow routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRow crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRow wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRow may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.
- 2.3.5 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

- 2.3.6 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people

and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework¹⁷ which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

- to set out how HS2 Ltd and its contractors would undertake community engagement during the construction of the project;
- to provide clarity and reassurance to HS2 Ltd's stakeholders about how community engagement activity would be managed; and
- to help HS2 Ltd be a good neighbour to local communities, including by providing accurate and timely information about construction works and offering opportunities to influence them, where appropriate.

2.3.9 A draft CoCP has been prepared and is published alongside this document, in Supporting document: Draft Code of Construction Practice. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

2.3.10 Building and preparing the Proposed Scheme for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul routes, site preparation and enabling works; main earthworks and structure works; tunnelling; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;

¹⁷ HS2 Ltd (2017) Community Engagement Framework. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625971/hs2_community_engagement_framework.pdf

- site finalisation works; and
- systems testing and commissioning.

2.3.11 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP including:

- the approach to environmental management during construction and the role of the CoCP (Section 2);
- working hours (Section 5);
- management of construction traffic (Section 14); and
- handling of construction materials (Section 15).

Advance works

2.3.12 General information about advance works can be found in Volume 1, Section 6. Advance works will be required before the main construction works commence and typically include:

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

2.3.13 Construction of the Proposed Scheme would require the following broad types of engineering works along the entire length of the route, and within land adjacent to the route:

- civil engineering works, including earthworks such as embankments and cuttings and erection of bridges and viaducts; and
- works to install, test and commission railway systems, including track, overhead line equipment, communications and signalling equipment and traction power supply.

2.3.14 The construction of track and railway systems works in open areas would include the installation of track form, rails, infill material, minor drainage works, and installation of electrification, signalling and communication equipment.

2.3.15 The construction of the Proposed Scheme would be divided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main compounds or satellite compounds. Satellite compounds are generally smaller than main compounds. Compounds would either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

- space for the storage of bulk materials;
- space for the receipt, storage and loading and unloading of excavated material;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.

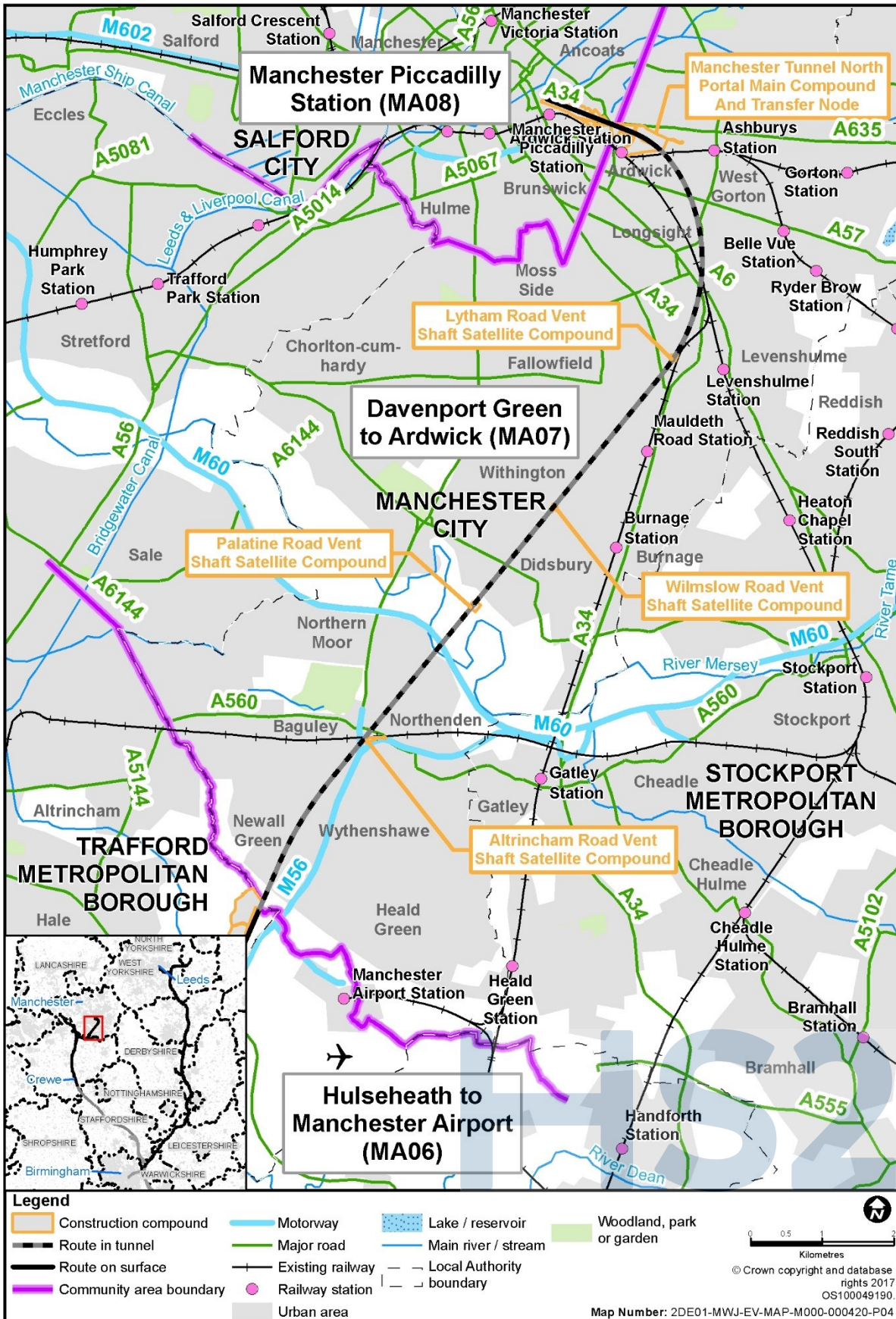
2.3.18 One main civil engineering compound, the Manchester tunnel north portal main compound and transfer node, would be located in the Davenport Green to Ardwick area. This would be used to manage the civil engineering and railway installation satellite compounds in the Davenport Green to Ardwick area.

2.3.19 Four civil engineering satellite compounds would be located in the Davenport Green to Ardwick area, all of which would continue to be used as railway installation satellite compounds following the completion of civil engineering works at those compounds.

2.3.20 The location of construction compounds in the Davenport Green to Ardwick area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA07 Map Book) show in detail the locations of the construction compounds described below.

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Figure 4: Location of construction compounds in the Davenport Green to Ardwick area



- 2.3.21 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.
- 2.3.22 In the Davenport Green to Ardwick area there would be no worker accommodation required.
- 2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil and sub soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-357b to CT-05-365a, in the Volume 2: MA07 Map Book.
- 2.3.24 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

- 2.3.25 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Where reasonably practicable, movements between the construction compounds and the working areas would be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.
- 2.3.26 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Davenport Green to Ardwick area are described in the subsequent sections of this report.
- 2.3.27 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.
- 2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Map CT-05-364 and Map CT-05-365a in the Volume 2: MA07 Map Book.

Construction compounds

- 2.3.29 This section provides a summary of the works to be managed from the construction compounds in the Davenport Green to Ardwick area, as illustrated in Figure 5 and Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

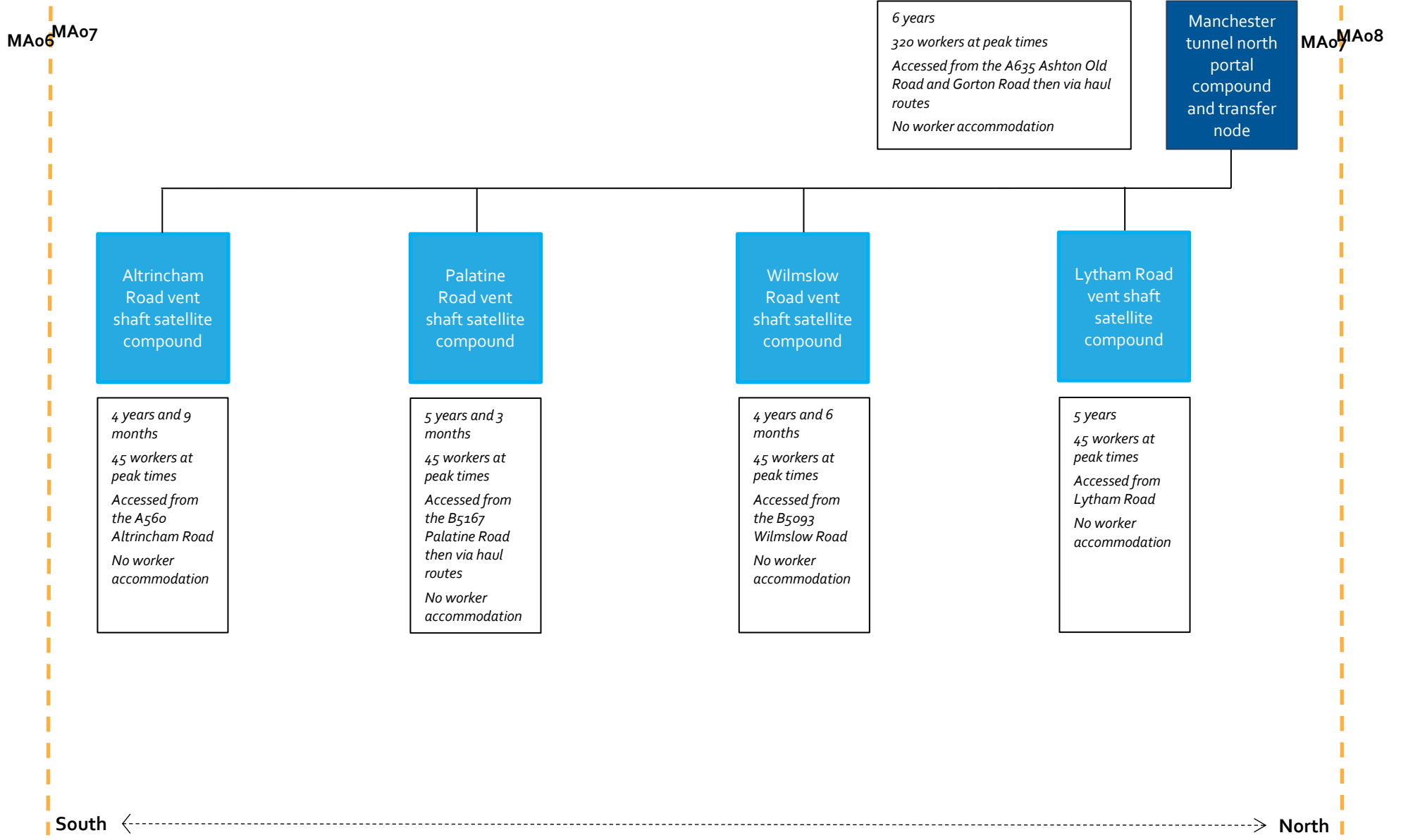
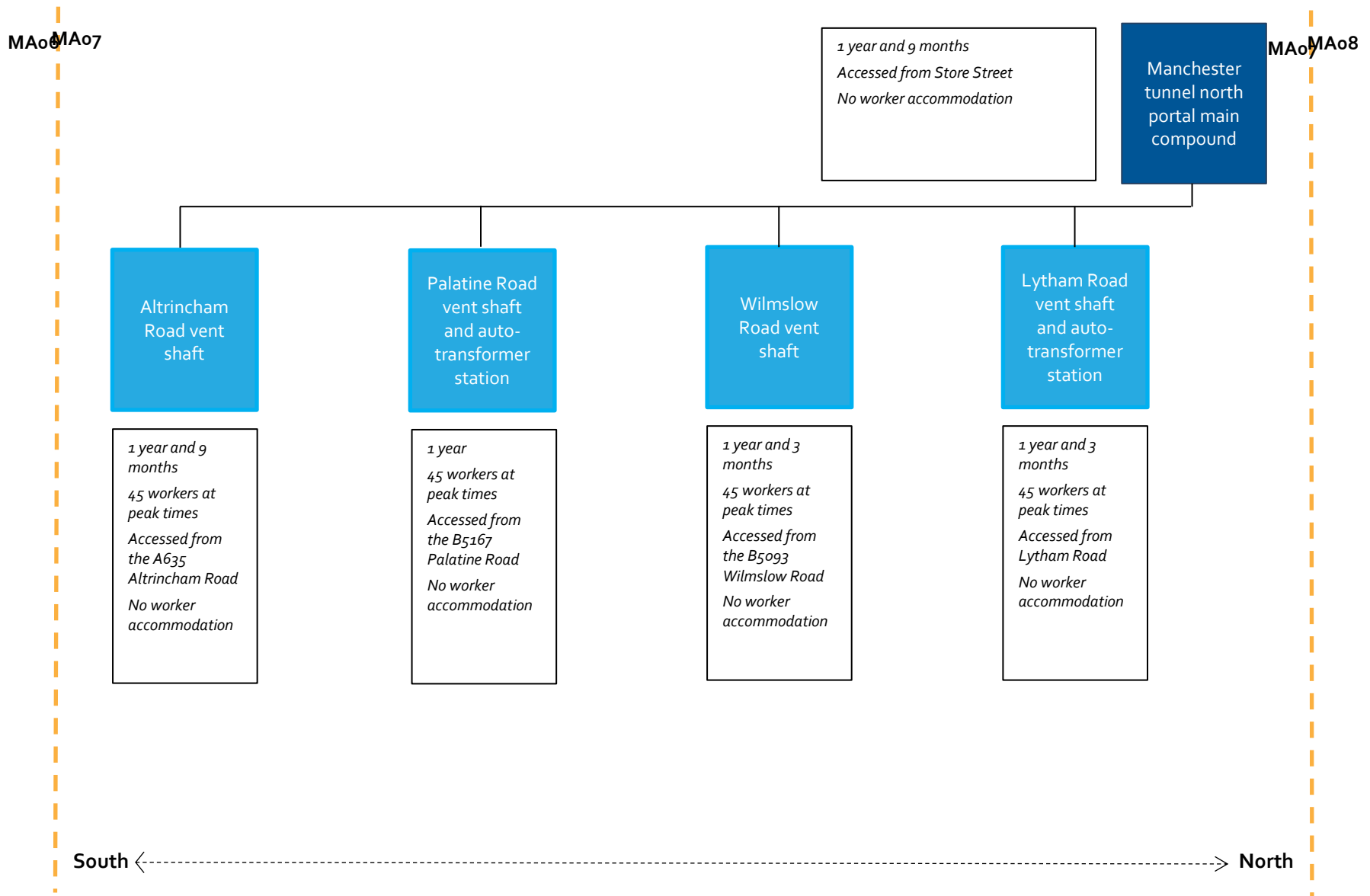


Figure 6: Construction compounds for railway systems works



Manchester tunnel south portal main compound

- 2.3.30 The Manchester tunnel south portal main compound would be located mainly in the Hulseheath to Manchester Airport area (MA06) (map CT-05-357b, D5 to H3) west of junction 5 of the M56. A small section of this compound is present in the Davenport Green to Ardwick area (map CT-05-357b, G5). It is described in Volume 2: Community area report MA06 Hulseheath to Manchester Airport.
- 2.3.31 The compound would be used to manage the construction of the tunnel portal rescue building and rescue area, which would be constructed as part of the Manchester tunnel south portal.

Altrincham Road vent shaft satellite compound

- 2.3.32 This compound (map CT-05-359, C6 to D8) would be used to manage civil engineering works in the Davenport Green to Ardwick area, as illustrated in Figure 5, for a period of four years and nine months.
- 2.3.33 On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of one year and nine months.
- 2.3.34 No demolitions would be required as a result of the works to be managed from this compound.
- 2.3.35 The compound would be used to manage the construction of the Altrincham Road vent shaft and surface headhouse structure, which would take four years and nine months to complete.
- 2.3.36 The works to be managed from this compound would require works to the A560 Altrincham Road for access.
- 2.3.37 The works to be managed from this compound would require protection works to an sub-surface culverted watercourse.
- 2.3.38 Key railway systems works to be managed from this compound would include:
- construction and installation of equipment in the vent shaft and associated headhouse; and
 - installation of the mechanical and electrical systems through the Manchester tunnel and associated tunnel portal buildings.

Palatine Road vent shaft satellite compound

- 2.3.39 This compound (map CT-05-360, F5/G5 and F6/G6) would be used to manage civil engineering works in the Davenport Green to Ardwick area, as illustrated in Figure 5, for a period of five years and three months.
- 2.3.40 On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of one year. There would be an overlap of six months between the civil engineering works and the railway systems installation works and the total duration of the works would be five years and nine months.

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- 2.3.41 No demolitions would be required as a result of the works to be managed from this compound.
- 2.3.42 The compound would be used to manage the removal of tunnel boring machines (TBMs), and the construction of the Palatine Road vent shaft and surface headhouse structure, which would take five years and three months to complete. The works to be managed from this compound would require works to the B5167 Palatine Road for access.
- 2.3.43 The works to be managed from this compound would require protection works to an unnamed watercourse.
- 2.3.44 Key railway systems works to be managed from this compound would include:
- construction and installation of equipment in the Palatine Road vent shaft, associated headhouse and auto-transformer station; and
 - installation of the mechanical and electrical systems through the Manchester tunnel and associated tunnel portal buildings.
- 2.3.45 The construction of the Palatine Road auto-transformer station foundations and building would take six months to complete. The installation of the Palatine Road auto-transformer station railway systems equipment would take one year and three months to complete. Construction works for the railway systems works would be accessed from the B5167 Palatine Road.

Wilmslow Road vent shaft satellite compound

- 2.3.46 This compound (map CT-05-361, F5/G5 and F6/G6) would be used to manage civil engineering works in the Davenport Green to Ardwick area, as illustrated in Figure 5, for a period of four years and six months.
- 2.3.47 On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of one year and three months.
- 2.3.48 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions to be managed from the Wilmslow Road vent shaft satellite compound

| Description | Location | Feature resulting in the demolition |
|--|---------------------------|---|
| Residential | | |
| Three residential properties (above commercial premises) | Wilmslow Road, Manchester | Wilmslow Road vent shaft satellite compound |
| Commercial | | |
| Three commercial properties (below residential properties commercials) | Wilmslow Road, Manchester | Wilmslow Road vent shaft satellite compound |

- 2.3.49 The compound would be used to manage the construction of the Wilmslow Road vent shaft and surface headhouse structure, which would take four years and six months to complete.

2.3.50 The works to be managed from this compound would require works to the B5093 Wilmslow Road for access.

2.3.51 Key railway systems works to be managed from this compound would include:

- construction and installation of equipment in the Wilmslow Road vent shaft and associated headhouse; and
- installation of the mechanical and electrical systems through the Manchester tunnel and associated tunnel portal buildings.

Lytham Road vent shaft satellite compound

2.3.52 This compound (map CT-05-363, B6 and C6) would be used to manage civil engineering works in the Davenport Green to Ardwick area, as illustrated in Figure 5, for a period of five years.

2.3.53 On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of one year and three months. There would be an overlap of three months between the civil engineering works and the railway systems installation works and the total duration of the works would be six years.

2.3.54 No demolitions would be required as a result of the works to be managed from this compound.

2.3.55 The compound would be used to manage the construction of the Lytham Road vent shaft and surface headhouse structure, which would take five years to complete.

2.3.56 The works to be managed from this compound would require works to Lytham Road for access.

2.3.57 Key railway systems works to be managed from this compound would include:

- construction and installation of equipment in the vent shaft, associated headhouse and auto-transformer station; and
- installation of the mechanical and electrical systems through the Manchester tunnel and associated tunnel portal buildings.

2.3.58 The construction of the Lytham Road auto-transformer station foundations and building would take six months to complete. The installation of the Lytham Road auto-transformer station railway systems equipment would take one year and three months to complete. Construction works for Lytham Road auto transformer station would be accessed from Lytham Road.

Manchester tunnel north portal main compound and transfer node

2.3.59 This compound (map CT-05-364, H9 to J2 and map CT-05-365a, A6 to C3) would be used to manage civil engineering works and provide main compound support to four satellite compounds in the Davenport Green to Ardwick area, as illustrated in Figure 5 for the civil engineering works, for a period of six years.

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2.3.60 On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of one year and nine months. There would be an overlap of three months between the civil engineering works and the railway systems installation works and the total duration of the works would be seven years and six months.

2.3.61 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions to be managed from the Manchester tunnel north portal main compound and transfer node

| Description | Location | Feature resulting in the demolition |
|--|--|--|
| Commercial | | |
| Two buildings at train maintenance depot | Ardwick Train Maintenance Depot, Rondin Road, Manchester | Manchester tunnel north portal |
| Six industrial units and containers on Rondin Road | Rondin Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Two commercial units at Rondin House | Rondin Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Vehicle pound | Rondin Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| MOT centre | Ashton Old Road, Manchester | Ardwick cutting |
| Four commercial buildings at Hooper Street Depot | Hooper Street, Manchester | Manchester tunnel north portal main compound and transfer node |
| Two commercial premises at Ashton Old Road | Ashton Old Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Service station | Ashbury Service Station, Ashton Old Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Five warehouse buildings | Midland Street, Manchester | Manchester tunnel north portal main compound and transfer node |
| Brick railway arches | Adjacent to 42-46 Ashton Old Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Other | | |
| Car wash | Ashton Old Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Fuel tank | Hooper Street, Manchester | Ardwick cutting |
| Advertising hoarding | Ashton Old Road, Manchester | Manchester tunnel north portal main compound and transfer node |
| Advertising hoarding | Junction of the A665 Midland Street and the A635 Ashton Old Road | Ardwick cutting |
| Electricity sub station | Anthony Close, Manchester | Manchester tunnel north portal main compound and transfer node |
| Electricity sub station | Glenbarry Street, Manchester | Ardwick cutting |
| Electricity sub station | Rondin Road, Manchester | Manchester tunnel north portal main compound and transfer node |

- 2.3.62 The compound would be used to manage the construction of the following tunnel and associated infrastructure:
- Manchester tunnel, which would take three years and three months to complete;
 - Manchester tunnel north portal, which would take six years to complete. The portal structure would be built in advance of the tunnelling works, with finishing works taking place following completion of the tunnel and associated infrastructure;
 - portal headhouse building, rescue area and porous portal, which would take one year to complete – after the completion of the Manchester tunnels and removal of the tunnelling plant; and
 - Ardwick cutting, which is a retained cutting and would take two years and three months to complete.
- 2.3.63 The TBMs for construction of the Manchester tunnel would be driven from this compound. The compound would also be used to manage the temporary storage and loading of tunnel excavated material.
- 2.3.64 The compound would be used to manage the reconfiguration of the existing Ardwick Depot.
- 2.3.65 Works to a number of public roads would be managed from this compound, and are subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required on the following public roads: Rondin Road, the A665 Midland Street and Hooper Street.
- 2.3.66 Works to be managed from this compound would require diversion of the Blackbrook and protection works to the Cornbrook.
- 2.3.67 Key railway systems works to be managed from this compound would include:
- track laying in the Manchester tunnel; and
 - tunnel fit out, including tunnel electrification system, tunnel vent and tunnel portal headhouse works for the Manchester tunnel.
- Piccadilly viaduct satellite compound A*
- 2.3.68 The Piccadilly viaduct satellite compound A would be located between the A665 Midland Street and the A665 Chancellor Lane, partially in the Davenport Green to Ardwick area, and partially in the Manchester Piccadilly Station area (MA08) (map CT-05-365a, C6 to D4). It is described in Volume 2: Community area report MA08 Manchester Piccadilly Station.
- 2.3.69 The compound would be used to manage the realignment of A665 Midland Street, which would take two years and nine months to complete.

Construction waste and material resources

- 2.3.70 Excavated material generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.
- 2.3.71 Forecasts of the amount of construction, demolition and excavation waste that would be produced during construction of the Proposed Scheme are reported in Volume 3: Route-wide effects.
- 2.3.72 Local excess or shortfall of excavated material within the Davenport Green to Ardwick area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

Commissioning of the railway

- 2.3.73 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It would be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

Construction programme

- 2.3.74 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

Monitoring during construction

- 2.3.75 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated undertaker and remedial action identified.
- 2.3.76 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on the monitoring procedures to be implemented prior to construction commencement.

2.4 Operation of the Proposed Scheme

Introduction

- 2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Davenport Green to Ardwick area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

- 2.4.2 It is anticipated that there would be up to six trains per hour each way passing through the Davenport Green to Ardwick area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.
- 2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

- 2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.
- 2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.
- 2.4.6 Provision for railway maintenance vehicles along the western leg of the route of the Proposed Scheme would be made at the proposed Crewe Rolling Stock Depot in the Wimboldsley to Lostock Gralam area (MA02). Further information on the depot can be found in Volume 2: Community area report MA02, Wimboldsley to Lostock Gralam.

Operational waste and material resources

- 2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste will be undertaken for the Proposed Scheme as a whole and reported in Volume 3, Route-wide effects of the formal ES.
- 2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects will also be reported in the formal ES.

Monitoring during operation

- 2.4.9 The nominated undertaker would be responsible for monitoring during operation of the Proposed Scheme. Proposed indicative area-specific monitoring measures for each environmental topic area are presented in Sections 4 to 15 of this report, based on the current level of assessment.

- 2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

Manchester tunnel vent shaft location

- 2.5.1 As part of the design development process since July 2017, further consideration has been given to the location of vent shafts required for the Manchester tunnel.
- 2.5.2 The Proposed Scheme would include vent shafts in four locations along the Manchester tunnel. Each vent shaft would include a tunnel headhouse, which would contain ventilation equipment and an associated evacuation area.
- 2.5.3 As part of the development of the design, further work is being undertaken to consider the location of the vent shafts to optimise the operation of the Proposed Scheme and to reduce environmental impacts. Four potential sites for the location of vent shafts have been identified along the Manchester tunnel near: Altrincham Road; Palatine Road; Wilmslow Road and Lytham Road. These indicative locations are subject to ongoing assessment along with other sites within their vicinity.
- 2.5.4 Further studies will be carried out to consider the locations to be included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

3 Stakeholder engagement and consultation

3.1 Introduction

- 3.1.1 HS2 Ltd's approach to stakeholder engagement and consultation on the Proposed Scheme is set out in Volume 1, Section 3.
- 3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.
- 3.1.3 A variety of mechanisms have been used to enable an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders.
- 3.1.4 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft Environmental Statement (ES) and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

- 3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016 is provided in Table 3.

Table 3: Mechanisms and timeline of stakeholder engagement since route announcement

| Engagement and consultation activity and mechanisms | Date |
|--|----------------------------------|
| Phase 2b initial preferred route announcement | 15 November 2016 |
| Phase 2b route refinement and property consultations | 15 November 2016 – 9 March 2017 |
| Phase 2b information events to support the route refinement and property consultations | January -February 2017 |
| Confirmation of Phase 2b route announcement | 17 July 2017 |
| Start date of engagement with local communities and stakeholders on the confirmed Phase 2b route | July 2017 |
| Consultation on the draft EIA and Equality Impact Assessment (EQIA) Scope and Methodology Report (SMR) to inform the EIA and EQIA and the proposed relocation of the Eastern Leg Rolling Stock Depot | 17 July 2017 – 29 September 2017 |
| Phase 2b information events to support SMR and Eastern Leg Rolling Stock Depot consultations | September 2017 |
| Phase 2b information events to provide update on design development | June – July 2018 |
| Phase 2b consultation on the working draft ES and working draft EQIA | October – December 2018 |

Draft EIA SMR consultation

- 3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

- 3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft EQIA is also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft ES and EQIA Reports which inform it.
- 3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Davenport Green to Ardwick area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

- 3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to the initial preferred route announcement in November 2016.
- 3.3.2 The main themes to emerge from stakeholder engagement in the Davenport Green to Ardwick area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:
- construction impacts near the Manchester tunnel south and north portals, particularly additional traffic on already congested roads;
 - construction related noise impacts within residential areas and increased traffic congestion on the road network around the vent shaft locations;
 - construction noise from the tunnel boring machines;
 - reduction of the operational capacity of Didsbury flood storage area around the Palatine Road vent shaft;
 - potential impact on house prices from tunnel under properties; and
 - proposed site of the Lytham Road vent shaft has been developed into the Manchester Enterprise Academy (MEA) since the original survey of vacant land undertaken by HS2 Ltd.
- 3.3.3 Stakeholder feedback will continue to be considered as part of the ongoing design of the Proposed Scheme and will be reported in the formal ES.

3.4 Engagement and consultation with stakeholder groups

Communities

- 3.4.1 Community stakeholders in the Davenport Green to Ardwick area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.
- 3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.
- 3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate EQIA being undertaken in parallel to the EIA.
- 3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the community area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.
- 3.4.5 Table 4 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design of the Proposed Scheme.

Table 4: Engagement to date with community stakeholders

| Stakeholder | Area of focus |
|---------------------------------------|---|
| Withington Golf Club | Engagement to discuss amount of land area required for the Palatine Road vent shaft and replacement floodplain storage within the golf course, as well as the ongoing viability of the golf club during and after construction. |
| Ashfield Lodge Residents' Association | Discussion on noise and visual impacts related to the construction and operation of the Palatine Road vent shaft upon those living in nearby properties and changes to Fielden Brook. |
| The Christie Hospital | Discussion on impact of removing the closest car park provision for patients, visitors and those with disabilities to the Christie Hospital at the site of the Wilmslow Road vent shaft, and the mechanism that can be used to provide alternative car parking provision before the site is acquired. |
| West Gorton Residents' Association | Meeting to discuss noise and vibration impacts associated with proximity to the Manchester tunnel north portal at West Gorton. Discussion on changing requirements for demolition in area, as the design assessed with the working draft ES no longer requires the |

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| | |
|---|--|
| | demolition of residential properties or construction works near the Armitage Church of England Primary School. |
| Levenshulme Residents' Association | Discussion on programme and timescales, and identified a number of local venues for future community based events. Their main concern was the potential impact of construction traffic. |
| Manchester Enterprise Academy (MEA) Central | Engagement on the need for relocation of the Lytham Road vent shaft away from the site of the newly developed school. |
| Afzal Khan MP for Gorton, Manchester, residents meeting | Discussion on the programme for construction of the Proposed Scheme. Engagement with residents from the Rusholme, Longsight and Levenshulme area to discuss construction traffic on the local road network and the location of the Lytham Road vent shaft. |

Local authorities and parish councils

- 3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Davenport Green to Ardwick area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.
- 3.4.7 Engagement has focused on the technical areas which inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst other topics.
- 3.4.8 Some key discussion and inputs gained from engagement local authorities and parish councils are summarised in Table 5.

Table 5: Engagement to date with local authorities and parish councils

| Stakeholder | Area of focus |
|----------------------------------|--|
| Manchester City Council | Engagement over impacts on the road network from construction traffic especially in the vicinity of the Manchester tunnel south and north portals; potential for flood storage compensation to be located on land designated for development; and the loss of businesses in Ardwick. |
| | Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration; traffic and transport, and waste. |
| Transport for Greater Manchester | Engagement over impacts on road networks from construction traffic, severance and the realignment of roads. |

- 3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways and the draft Code of Construction Practice (CoCP)¹⁸.

¹⁸ Supporting document: Draft Code of Construction Practice

Expert, technical and specialist groups

- 3.4.10 Engagement has also been undertaken with expert, technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged to date include:
- Animal and Plant Health Agency;
 - British Geological Survey;
 - Campaign to Protect Rural England;
 - Canal & River Trust;
 - Coal Authority;
 - Department of Environment, Food and Rural Affairs;
 - Environment Agency;
 - Food and Environment Research Agency;
 - Forestry Commission;
 - Highways England;
 - Historic England;
 - Inland Waterways Association;
 - National Trust;
 - Natural England;
 - Network Rail;
 - Public Health England;
 - Royal Agricultural Society;
 - Royal Society for the Protection of Birds;
 - Royal Society of Wildlife Trusts/The Wildlife Trusts;
 - the Ramblers; and
 - Woodland Trust.
- 3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.
- 3.4.12 Further information about topic-specific engagement is provided in Sections 4 to 15, where relevant.

Utilities

- 3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders to establish what infrastructure exists in the Davenport Green to Ardwick area and how it may need to be modified as part of the Proposed Scheme.
- 3.4.14 Stakeholders include: National Grid Transmission (Electricity), Electricity Northwest, United Utilities, BT Openreach, CityFibre, SSE Telecoms, Virgin Media, Sky Telecommunication Services Ltd, Gamma, Verizon, Vodafone Ltd (Below Ground Assets), Vodafone & O2 Mobile Masts, EE & 3 Mobile Masts, Cadent Gas, GeneSYS, Zayo, Instalcom, ESP Utility Group, GTC-UK, Interoute (Vtesse), CSP and Level 3.

Directly affected individuals, major asset owners and businesses

- 3.4.15 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Davenport Green to Ardwick area.
- 3.4.16 There has been no engagement with farmers and growers within Davenport Green to Ardwick due to the mainly urban land use.
- 3.4.17 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Davenport Green to Ardwick area, an information event was held at MEA Central on 7 July 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.
- 3.4.18 Engagement has been undertaken with MCC, Network Rail, Withington Golf Course, the Christie Hospital, Siemens Transportation Systems, (Ardwick Traincare Facility), Holland Hydroponics and P. McGuinness & Co Ltd.
- 3.4.19 HS2 Ltd is continuing to engage with directly affected individuals and major asset owners as the design and assessment develops.

4 **Agriculture, forestry and soils**

4.1 **Introduction**

- 4.1.1 This environmental topic has been scoped out of the assessment for the Davenport Green to Ardwick area as there are no undisturbed natural soils which would be disturbed or displaced and no agricultural or forestry activities affected by the Proposed Scheme in this urban area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality identified to date arising from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. Oxides of nitrogen (NO_x) including nitrogen dioxide (NO₂), fine particulate matter¹⁹ (PM₁₀, PM_{2.5}) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Manchester City Council (MCC), Trafford Metropolitan Borough Council (TMBC) and Cheshire East Council (CEC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)²⁰.

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur²¹:

- from construction;
- from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads;
- where road alignments have changed; or
- from the operation of combustion plant at buildings.

5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

¹⁹ PM_{2.5} and PM₁₀ describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.

²⁰ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

²¹ The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

- 5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period (2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. As both pollutant emissions from vehicle exhausts and from background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

- 5.3.1 The main sources of air pollution in the Davenport Green to Ardwick area are emissions from road vehicles. The main roads within the area are the M56 junction 3a, the M60, the A560 Altrincham Road, the A5103 Princess Parkway, the B5167 Palatine Road, the A5145 Barlow Moor Road, the B5093 Wilmslow Road, the A34 Kingsway, Birchwood Road, Lytham Road, the A57 Hyde Road, Chapman Street, the A6010 Pottery Lane, Gorton Road, the A635 Ashton Old Road and the B5093 Moseley Road.
- 5.3.2 There are 12 industrial installations (regulated by the Environment Agency) with permits for emissions to air. These are Viridor Waste (Greater Manchester) Ltd, BMI Healthcare Limited at Alexandra Hospital, United Utilities Water PLC, University of Manchester Wolfson Molecular Imaging Centre, W M Nelstrop & Co. Limited Flour Mills, United Biscuits UK Ltd, Concept Chemicals and Coatings Limited, Hovis Limited, Air Products (Chemicals) Limited, Princes Ltd (soft drink production) and Viridor Waste (Greater Manchester) Ltd. The contribution of all industrial processes and other emission sources to local air quality is included within background concentrations.
- 5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)²² for the baseline year of 2017. The data are estimated for 1km grid squares for NO_x, NO₂, PM₁₀ and PM_{2.5}. Background concentrations are within the air quality standards for all pollutants within the Davenport Green to Ardwick area.

Local monitoring data

- 5.3.4 There is currently one automatic monitoring site located within the Davenport Green to Ardwick area for monitoring NO₂ and PM₁₀ concentrations. This is located in Manchester Sharston and is classified as a suburban industrial site as part of Defra's Automatic Urban Rural Monitoring Network. Measured concentrations in 2016 were within the air quality standard for both pollutants²³.
- 5.3.5 There are currently 35 local authority diffusion tube sites for 2016 located within the Davenport Green to Ardwick area for monitoring NO₂ concentrations. Measured

²² Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps; <http://ukair.defra.gov.uk/data/laqm-background-maps?year=2013>

²³ At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

concentrations in 2016 were within the air quality standard at most sites, except at five sites in Manchester, four in Stockport and one in Tameside.

Air Quality Management Areas

- 5.3.6 There is one air quality management area (AQMA) within the Davenport Green to Ardwick area, the Greater Manchester Combined Authority (GMCA) AQMA. This AQMA covers a substantial proportion of main roads and urban centres within the Greater Manchester area and was declared in July 2001 and reviewed in May 2016. The AQMA was designated for exceedances in the annual mean NO₂ and 24-hour PM₁₀ standards.

Receptors

- 5.3.7 Several locations have been identified in the area as sensitive receptors. These are considered to be susceptible to changes in air quality, due to their proximity to dust generating activities or traffic routes during construction or operation of the Proposed Scheme.
- 5.3.8 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include Manchester Royal Infirmary, Royal Manchester Children's Hospital, Wythenshawe Hospital, University Hospital of South Manchester, the Christie Hospital and a number of primary and secondary schools.
- 5.3.9 There is one statutory designated ecological site within the Davenport Green to Ardwick area, namely the Rochdale Canal Special Area of Conservation and Site of Special Scientific Interest (SSSI). Other non-statutory sensitive ecological sites identified close to the route of the Proposed Scheme include the Wythenshawe Park Local Nature Reserve (LNR). Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

- 5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft (CoCP)²⁴ includes a range of mitigation measures that are accepted by the Institute of Air Quality Management as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.
- 5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:
- contractors' being required to manage dust, air pollution, odour and exhaust emissions during construction works;

²⁴ Supporting document: Draft Code of Construction Practice

- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

5.4.3 The draft CoCP includes the requirement for site-specific traffic management measures, such as the use of site haul routes for construction vehicles to minimise the need to use public roads.

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme might arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO₂, PM₁₀ and PM_{2.5} concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout²⁵ have been assessed for their effect on dust soiling, human health²⁶ and ecological sites. There are residential and ecological receptors located within the Davenport Green to Ardwick area.

5.4.6 For demolition, the risk of dust effects would range from negligible to high and the risk of human health effects would range from negligible to medium within this area, depending on the location of sensitive receptors and the magnitude of the construction activities. For earthworks, the risk of dust effects would range from low to high, depending on the location of sensitive receptors and the magnitude of the construction activities. There would also be a low to medium risk of human health effects from earthworks. For construction, the risk of dust effects would range from negligible to high and the risk of human health effects would range from negligible to medium within this area, depending on the location of sensitive receptors and the magnitude of the construction activities. For trackout, there would be a medium to

²⁵ Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

²⁶ Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM₁₀.

high risk of dust effects and a low to medium risk of human health effects. There would also be a low to medium risk of ecological effects from all dust generating activities. No demolition activities would affect any ecological receptors.

- 5.4.7 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities.

Construction traffic effects

- 5.4.8 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.
- 5.4.9 The A560 Altrincham Road, the A5103 Princess Parkway, the B5167 Palatine Road, the A5145 Barlow Moor Road, the B5093 Wilmslow Road, the A34 Kingsway, the A34 Birchfields Road, the A6010 Pottery Lane, the A635 Ashton Old Road and the B5093 Moseley Road would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic and temporary closures or diversions is anticipated on all of the roads listed above and the M56. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.
- 5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These would include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

- 5.4.11 No permanent effects on local air quality would be likely to arise during construction of the Proposed Scheme.

Other mitigation measures

- 5.4.12 No other mitigation measures are proposed at this stage in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

- 5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust emissions and, therefore, no significant residual effects from dust would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

- 5.5.1 No specific mitigation measures for air quality are proposed during operation of the Proposed Scheme.

Assessment of impacts and effects

- 5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic and changes in road alignment.
- 5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality and therefore no assessment is required. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

- 5.5.4 Direct and indirect effects from changes in air quality, such as those arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. Any effects will be reported in the formal ES.

Other mitigation measures

- 5.5.5 No other mitigation measures are proposed at this stage in relation to air quality in this area during the operation of the Proposed Scheme.

Summary of likely residual significant effects

- 5.5.6 Any significant residual effects for air quality from the operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

- 5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 5.5.8 Any area specific requirements for monitoring air quality effects during the operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

- 6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Davenport Green to Ardwick area.
- 6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including the Christie Hospital, the Manchester Enterprise Academy (MEA), and the Eglise En Mission Church (12-14 Midland Street). The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.
- 6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.

6.2 Scope, assumptions and limitations

- 6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)²⁷.
- 6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on community facilities and resources will be reported in the formal ES.
- 6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.
- 6.2.4 Where reasonably practicable, public footpaths and routes will be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

²⁷ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure then this will be discussed with the relevant local authority and local groups and reported in the formal ES.
- 6.2.6 The assessment in the working draft ES is based on the design information, including demolitions as set out in Section 2 available at the time of the assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.
- 6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.
- 6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, heavy goods vehicles (HGV) traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.
- 6.2.9 For the working draft ES, the full details of the construction traffic routes and geographical scope of likely in-combination (amenity) effects are yet to be determined. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.
- 6.2.10 At this stage it has not been possible to complete surveys of public open spaces in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

6.3 Environmental baseline

- 6.3.1 The Proposed Scheme through the Davenport Green to Ardwick area would be approximately 13.4km in length and lie within the Trafford Metropolitan Borough Council (TMBC) and Manchester City Council (MCC) areas. It would extend from Davenport Green in the south to Ardwick in the north.
- 6.3.2 The Davenport Green to Ardwick area is urban in nature, with a concentration of suburban residential properties. Within the Davenport Green to Ardwick area, the majority of the Proposed Scheme runs in a tunnel. Four vent shafts are exposed on the surface and are located at: the A560 Altrincham Road, Wythenshawe; the B5167 Palatine Road, West Didsbury; the B5093 Wilmslow Road, East Didsbury; and Lytham Road, Rusholme. The route resurfaces at Ardwick in the Ardwick cutting, to the south of Manchester city centre and the existing Manchester Piccadilly Station.
- 6.3.3 The majority of community facilities are located in Wythenshawe, Didsbury, Longsight and Ardwick. These include hospitals, places of worship, schools, parks and leisure centres.

A560 Altrincham Road, Wythenshawe

- 6.3.4 The area surrounding the Altrincham Road vent shaft is primarily residential. Community resources to the north of this vent shaft include a property used by the Open University and a Church of Jesus Christ of Latter Day Saints. To the south are Benchill Primary School, Benchill Community Centre, and the Jimmy Egan Boxing Club. There are also a number of open spaces, including Round Wood and Blackcarr Wood to the west, and Gib Lane Wood and Wythenshawe Park further to the north-west.

B5167 Palatine Road, West Didsbury

- 6.3.5 The Withington Golf Club covers much of the area to the south and east of the vent shaft location. To the west are the Ashfield Lodge retirement properties and Northenden Golf Course. To the north is the Nazarene Theological College and the Marie Louise Gardens. To the east there are a group of community allotment gardens and Didsbury Sports Ground. To the south lies the Didsbury Golf Course. The Trans Pennine Way follows the River Mersey which runs to the west. A smaller PRoW connects the two sections of the Trans Pennine Way locally.

B5093 Wilmslow Road, East Didsbury

- 6.3.6 The vent shaft area is currently used as a car park for the patients of the nearby Christie Hospital and Manchester Cancer Research Centre, as well as their families and visitors (including blue badge holders). The area is primarily residential, there is also a nursing home, St Cuthbert's Roman Catholic Primary School, the Manchester Muslim Preparatory School and a dental clinic. Fog Lane Park which comprises playing fields, a skate park, playground, bowling green, putting green and a pavilion is located to the south-east. To the south-west are the Northern Tennis Club and West Didsbury CE Primary School. To the north-west is the Red Lion public house.

Lytham Road, Rusholme

- 6.3.7 The vent shaft area is on the site of the MEA in Rusholme which opened in September 2017. Birchfield Primary School is located to the south. The area is largely residential with the Rushford Sport Complex to the north and the Manchester Grammar School to the west. The Manchester University Fallowfield Campus, athletic ground and sports fields are located to the south-west.

Ardwick

- 6.3.8 The area is characterised by industrial and warehousing units, with several car parks. The area includes the existing Ardwick Station, from which two services per day run in each direction. There are a small number of community resources in the area including the Eglise En Mission Church located on the A665 Midland Street in the industrial warehousing area.
- 6.3.9 To the north-west is a residential area with modern apartment blocks and lower rise housing. Ashbury Meadow Primary School and playing fields are also located to the north. The Armitage Church of England Primary School is located to the south-east of Ardwick Station. Located to the south is the Nicholls Sixth Form Campus - part of the Manchester College - which includes a community football centre.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)²⁸ includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of PRoW during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 As part of the construction of the Proposed Scheme, it would be necessary to carry out minor utility works or minor highways works within land that falls within the boundaries of residential properties. The scale of impact will be small, and the duration short (up to three months), resulting in minor adverse effects, which are not significant at a community level.

Community facilities

6.4.3 The Wilmslow Road vent shaft would require land which forms the Christie Car Park D on the B5093 Wilmslow Road. Car Park D is one of two designated patient car parks that serve the Christie Hospital, which is located approximately 250m north of the car park. Car Park D is approximately 0.5ha in area and has space for approximately 135 vehicles, including blue badge holders. The other designated patient car park – Car Park C – which has approximately 200 parking spaces, is located on the B5167 Palatine Road immediately north-west of the hospital site. There are limited alternatives

²⁸ Supporting document: Draft Code of Construction Practice

available for patients as the majority of on-street parking requires a permit and the Christie Hospital intends to increase its existing car parking capacity.

- 6.4.4 During the construction period of approximately five years and nine months, all of the 0.5ha site would be required, using all 135 of the available car parking spaces. As such, the temporary loss of car parking facilities serving the Christie Hospital due to the Proposed Scheme would result in a major adverse effect, which would be significant.
- 6.4.5 Construction of the Lytham Road vent shaft and the Lytham Road satellite compound would require the temporary use of approximately 0.5 ha of land (approximately 16% of the grounds) at the 3.2ha MEA site on Lytham Road. The construction of the Lytham Road vent shaft would take approximately six years. MEA currently has 420 pupils with capacity for 1,050 pupils in total. The school predominantly follows the English Baccalaureate system and provides opportunities and facilities for children with special educational needs (SEN). The school also offers a breakfast club and after school/extracurricular programmes, including sports, science, technology, engineering and maths (STEM), drama, and history programmes. Only a limited number of schools in the wider area offer the English Baccalaureate qualification, with another MEA site, located 2km away, being the closest. As the location and design of the Lytham Road vent shaft are still under development, the effects of the loss of this outside space at MEA, and proposed mitigation, will be assessed in the formal ES.

Recreational facilities

- 6.4.6 The construction of the Palatine Road vent shaft would require temporary use of land owned by the private members Withington Golf Club off the B5167 Palatine Road. During the construction period of approximately five years and nine months, approximately 2.5ha of land would be required from the 30ha site. The area of land required would be on the golf course itself and would affect three of the course's 18 holes, as well as associated infrastructure and landscaping such as footpaths and trees. Two of these holes would not be playable for the duration of the construction activity, which would potentially reduce the appeal of the Club to existing and prospective members. There are two alternative golf clubs adjacent to Withington – Northenden Golf Club and Didsbury Golf Club. It may be possible to re-orientate the golf course during the construction period to reduce the impact of the requirement for land on the function of the course. In the absence of confirmed mitigation, it is considered the temporary loss of land at Withington Golf Club due to the Proposed Scheme would result in a moderate adverse effect, which would be significant.

Open space and PRow

- 6.4.7 No temporary effects on open space and PRow have been identified as a result of the land required for construction of the Proposed Scheme.

Permanent effects

Residential properties

- 6.4.8 The construction of the Wilmslow Road vent shaft satellite compound would require the demolition of three residential properties on the B5093 Wilmslow Road in Didsbury to the north of Christie Car Park D. These properties would be permanently lost.

Community facilities

- 6.4.9 The Wilmslow Road vent shaft would permanently require land which forms the Christie Car Park D on the B5093 Wilmslow Road. The Proposed Scheme would permanently require approximately 0.35ha of land at the 0.5ha site – 100 of the 135 parking spaces available at Car Park D. The construction of the Proposed Scheme would temporarily require the remaining land (approximately 0.15ha and the remaining 35 of the 135 parking spaces) and this would be reinstated following the construction period of approximately five years and nine months.
- 6.4.10 The permanent requirement for land at Christie Car Park D would reduce the total car parking spaces available to patients by approximately 30%, from approximately 335 to 235 across Car Parks C and D. The loss of land at Christie Car Park D is likely to have a moderate adverse effect, which would be significant.
- 6.4.11 Construction of the Lytham Road vent shaft would permanently require land at the MEA site on Lytham Road. MEA currently has 420 pupils with capacity for 1,050 pupils in total. The Proposed Scheme would permanently require approximately 0.2ha (approximately 6%) of land at the 3.2ha site. This land is currently used as car parking and playing fields. The construction of the Proposed Scheme would also temporarily require a further approximately 0.5ha of land which would be reinstated following the construction period of approximately six years. As the location and design of the Lytham Road vent shaft are still under development, the effects of the loss of this outside space at MEA, and proposed mitigation, will be assessed in the formal ES.
- 6.4.12 The construction of the Manchester tunnel north portal main compound and transfer node would require the demolition of the Eglise En Mission Church. The church is a Francophone African Pentecostal church which holds regular services and events including four services a week and a range of other activities, such as GCSE tuition and women's bible study classes, in French and English. It has a congregation of approximately 250 with high proportions of young people, women, and Black, Asian and minority ethnic (BAME) groups. Black African women make up 60% of the entire congregation. This resource would be permanently lost and there are no comparable alternative resources in the local area. This would therefore be a major adverse effect, which would be significant.

Recreational facilities

- 6.4.13 The Palatine Road vent shaft would permanently require approximately 0.8ha of land from the Withington Golf Club. The 0.8ha required would be part of the 2.5ha required temporarily during construction of the vent shaft. The golf club buildings are not affected by the permanent requirement for land. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Open space and PRow

- 6.4.14 No permanent effects on open space and PRow have been identified as a result of the land required for construction of the Proposed Scheme.

Other mitigation measures

- 6.4.15 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in this assessment.
- 6.4.16 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

- 6.4.17 Land required for the construction of the Proposed Scheme is likely to result in temporary residual significant effects on the following community resources:
- Christie Hospital Car Park D;
 - MEA; and
 - Withington Golf Club.
- 6.4.18 Land required for the construction of the Proposed Scheme is likely to result in the following permanent residual significant adverse effects:
- loss of car parking spaces at the Christie Hospital Car Park D on the B5093 Wilmslow Road;
 - loss of land at MEA on Lytham Road; and
 - demolition of the Eglise En Mission Church on the A665 Midland Street.

Cumulative effects

- 6.4.19 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.
- 6.4.20 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

- 6.5.1 Avoidance and mitigation measures will be reported in the formal ES.

Assessment of impacts and effects

- 6.5.2 Operation of the Proposed Scheme could lead to in-combination effects on the community in this area which will be reported in the formal ES.

Other mitigation measures

- 6.5.3 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

- 6.5.4 A summary of the likely residual significant effects will be reported in the formal ES.

Cumulative effects

- 6.5.5 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.
- 6.5.6 No cumulative effects have been identified at this time. Any combined effects on a community during operation of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

Monitoring

- 6.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 6.5.8 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that would contribute to the in-combination assessments, will be described in the relevant topic sections of the formal ES.

7 Ecology and biodiversity

7.1 Introduction

- 7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Davenport Green to Ardwick area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.
- 7.1.2 Engagement with stakeholders including Natural England, Environment Agency, the Woodland Trust, Forestry Commission and Greater Manchester Ecology Unit has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.
- 7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.
- 7.1.4 All distances and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

- 7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)²⁹.
- 7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.
- 7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. In addition, the majority of this section of the route is within tunnel, and ecology surveys will therefore concentrate on the vent shaft locations and the above surface section within Ardwick. The surveys include (but are not limited to) broad habitat and detailed plant surveys, and surveys for great crested newt, birds and bats in relevant areas. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

- 7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area as known at this time.

²⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 7.3.2 The majority of the route of the Proposed Scheme in this area would be within tunnel. Above ground sections would be located at the Altrincham Road vent shaft, Palatine Road vent shaft, Wilmslow Road vent shaft, Lytham Road vent shaft and Ardwick Depot. The land required for the Proposed Scheme in the Davenport Green to Ardwick area consists mainly of urbanised habitats associated with the built environment, including bare ground, grassland, trees, hardstanding, residential and commercial properties, scrub and brownfield sites.
- 7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: MA07 Map Book.

Designated sites

- 7.3.4 There is one internationally important site of potential relevance to the assessment in the Davenport Green to Ardwick area: the Rochdale Canal Special Area of Conservation (SAC) which covers an area of 24.9ha. The SAC supports extensive colonies of the nationally scarce floating water-plantain. It is located north of Manchester Piccadilly Station 4.3km north-east of the land required for the Proposed Scheme.
- 7.3.5 There is one nationally important Site of Special Scientific Interest (SSSI) of potential relevance to the assessment in the Davenport Green to Ardwick area. For this site, the land required for the Proposed Scheme in this area is within the Impact Risk Zone³⁰ relevant to railway infrastructure as identified by Natural England. The Rochdale Canal SSSI, covering an area of 25.5ha, which has a boundary largely similar to Rochdale Canal SAC. It is designated for important habitats for submerged aquatic plants and emergent vegetation. The canal supports a rich but generally common assemblage of invertebrates, with in excess of 112 recorded species, of which 13 species are of local importance. The canal supports a number of waterside bird species including grey wagtail and kingfisher.
- 7.3.6 There are four Local Nature Reserves (LNR) of potential relevance to the assessment in the Davenport Green to Ardwick area, each of which is of district/borough value³¹. They are:
- Wythenshawe Park LNR, covering an area of 85ha, comprising an area of open parkland including woodlands, open grassland and wildflower meadows. A construction access road runs parallel immediately east of the LNR along the A5103 Princess Parkway. The LNR is located 320m north of the land required for the Proposed Scheme at the Altrincham Road vent shaft;
 - Stenner Woods and Millgate Fields LNR, covering an area of 36.5ha, comprising woodland, mature plantation coppices, grasslands, ponds and ditches, which includes a rich area of wet woodland. A construction access road runs parallel to the LNR along the A34 Kingsway, 530m to the east. The

³⁰ The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts.

³¹ Those LNRs that are also Local Wildlife Sites, specifically Stenner Woods and Millgate Fields LNR and Fletcher Moss LWS, will be assessed at its higher value e.g. LWS.

LNR is located 695m east of the land required for the Proposed Scheme at the Palatine Road vent shaft;

- Chorlton Water Park LNR, covering an area of 17.5ha, comprising a lake surrounded by grasslands and woodlands. The LNR is located 685m south-west of a construction access road and 1.4km north-west of the land required for the Proposed Scheme at the Palatine Road vent shaft; and
- Highfield Country Park LNR, covering an area of 28.5ha, comprising grasslands, woodlands and aquatic habitats. The LNR is located 1.5km east of the land required for the Proposed Scheme at the Lytham Road vent shaft.

7.3.7

There are five Local Wildlife Sites (LWS) of potential relevance to the assessment in the Davenport Green to Ardwick area, each of which is of county/metropolitan value. Citations provided by relevant organisations have been used in the descriptions below and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Blackcarr Wood and Baguley Bottoms LWS, covering an area of 5.5ha, comprising a woodland block. The LWS is located 100m south-west of a construction access road and 105m west of the land required for the Proposed Scheme, south of the Altrincham Road vent shaft;
- Gib Lane Wood LWS, covering an area of 6.5ha, comprising two woodland blocks. The LWS falls within the Wythenshawe Park LNR boundary. A construction access road runs parallel immediately east of the LWS along the A5103 Princess Parkway. The LWS is located 300m north of the land required for the Proposed Scheme, north of the Altrincham Road vent shaft;
- Round Wood LWS, covering an area of 2ha, comprising a woodland block. A construction access road runs parallel at a distance along the western and southern boundaries of the LWS, which is 90m at its closest point south of the LWS. The LWS is located 150m north of the land required for the Proposed Scheme, north of the Altrincham Road vent shaft;
- Fletcher Moss LWS, covering an area of 6ha, comprising a woodland block. The LWS falls within the Stenner Woods and Millgate Fields LNR boundary. A construction traffic route runs parallel to the LNR along the A34 Kingsway, 530m to the east. The LWS is located 720m south-east of the land required for construction of the Palatine Road vent shaft as part of the Proposed Scheme, at Withington Golf Course; and
- Wrengate Wood LWS, covering an area of 2ha, comprising a woodland block and water body. The site is within the land required for construction of the Palatine Road vent shaft as part of the Proposed Scheme, at Withington Golf Course. A construction access road runs parallel immediately west of the LWS along the B5167 Palatine Road and a construction haul route is immediately adjacent to the LWS within the Withington Golf Course.

- 7.3.8 There are no Ancient Woodland Inventory Sites relevant to the assessment in this area. A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

Habitats

- 7.3.9 The following habitat types which occur in this area are relevant to the assessment.

Watercourses

- 7.3.10 A minor watercourse flowing into the River Mersey runs through the land required for the Proposed Scheme at the Palatine Road vent shaft location, for a distance of 85m. On a precautionary basis, pending the findings of field surveys, this watercourse is considered to be of up to district/borough value.

Water bodies

- 7.3.11 There are no ponds within the land required for the Proposed Scheme, but there are 17 ponds within 500m. Four of these ponds are linked to the land required for the Proposed Scheme at the Palatine Road vent shaft location via suitable terrestrial habitat. Some may qualify as habitats of principal importance³², or local Biodiversity Action Plan³³ (BAP) habitats (e.g. if they support fauna species of high conservation importance such as great crested newts). On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Open mosaic habitat

- 7.3.12 Brownfield sites at Ardwick, which may qualify as a habitat of principal importance³⁴ (known as open mosaic habitat on previously developed land), are located within the land required for the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, these areas are considered to be of up to county/metropolitan value.

Protected and notable species

- 7.3.13 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 6.

Table 6: Species potentially relevant to the assessment within the Davenport Green to Ardwick area

| Resource/feature | Value | Rationale |
|------------------|----------------|--|
| Bats | Up to regional | <p>Nine species of bats have been recorded within Greater Manchester³⁵.</p> <p>There are 39 bat roosts within 2km of the land required for the Proposed Scheme. They include a hibernation roost for a single brown long-eared bat, four common pipistrelle maternity roosts and a single brown long-</p> |

³² Section 41 (41) of the National Environment and Rural Communities Act 2007

³³ Staffordshire Biodiversity Action Plan (BAP).

³⁴ Section 41 (41) of the National Environment and Rural Communities Act 2007

³⁵ Bats Local Biodiversity Action Plan – Greater Manchester Biodiversity Project- <http://www.gmbp.org.uk/site/images/stories/pdf/bats.pdf>

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| Resource/feature | Value | Rationale |
|--------------------|---------------------------|---|
| | | <p>leared bat maternity roost. There is a concentration of records around Withington Golf Club which is within 100m of land required for the Proposed Scheme, at the Palatine Road vent shaft location, but none are maternity roosts.</p> <p>Records confirm there are at least five species of bat throughout the area: Daubenton's bat, brown long-eared bat, common pipistrelle, soprano pipistrelle and noctule.</p> |
| Otter | Up to county/metropolitan | <p>Otters are re-colonising Greater Manchester³⁶. The rivers Irwell, Lower Mersey and Medlock were subject to survey during 2000-02, under the Fourth Otter Survey of England³⁷ and no records of otter were recorded. However, both the Lower Mersey and Medlock 2009/10 surveys identified positive sightings of otter³⁸.</p> <p>Habitat suitable for otter is present along the minor watercourse flowing into the River Mersey. The minor watercourse is located within the land required for the Proposed Scheme, at the Palatine Road vent shaft location. There are records of their presence along the River Mersey.</p> |
| Water vole | Up to county/metropolitan | <p>Water vole are widespread and locally common in Greater Manchester³⁹. However, the 2009 water vole species action plan⁴⁰ states that the populations are often fragmented and are at risk of local extinctions.</p> <p>Habitat suitable for this species is present along the minor watercourse flowing into the River Mersey, at the Palatine Road vent shaft location. There are a number of records of their presence along the River Mersey and River Medlock.</p> |
| Great crested newt | Up to county/metropolitan | <p>In Greater Manchester great crested newt is considered common but declining⁴¹.</p> <p>Habitat (aquatic and terrestrial) that is suitable for breeding great crested newt is located within 500m of land required for the construction of the Proposed Scheme. No water bodies are located within the land required for the Proposed Scheme. However, a total of four water bodies, which are linked via suitable terrestrial habitat, are located within 500m of the land</p> |

³⁶ Greater Manchester Biodiversity Newsletter: Action for Biodiversity: Spring/Summer 2009: Greater Manchester Biodiversity Project. Available online at: http://www.gmbp.org.uk/site/images/stories/gm%20biodiversity%20newsletter_spring_summer%2009.pdf; Greater Manchester Sites of Biological Importance Selection Guidelines: Greater Manchester Ecology Unit. Available online at: <https://www.tameside.gov.uk/ecologyunit/sbi/guidelines.pdf>

³⁷ Environment Agency. Fourth Otter Survey of England.

³⁸ Environment Agency (2010), Fifth otter survey of England 2009-2010. Available online at: http://www.thepredationactiongroup.co.uk/images/EA_otter_survey_oct10.pdf

³⁹ Water vole Local Biodiversity Action Plan – Cheshire Wildlife Trust. Available online at: <https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Water%20vole.pdf>

⁴⁰ Greater Manchester Biodiversity Project

⁴¹ Great Crested Newt Species Action Plan Greater Manchester Biodiversity Project, 2009. Available online at: http://www.gmbp.org.uk/site/images/stories/great%20crested%20newt%20bap_09.pdf

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| Resource/feature | Value | Rationale |
|---------------------------|---------------------------|--|
| | | <p>required for the construction of the Proposed Scheme at Palatine Road vent shaft location.</p> <p>A single record of a great crested newt is located within 2km of the Palatine Road vent shaft location. However, this record is approximately 40 years old.</p> |
| Birds | Up to county/metropolitan | <p>The brownfield sites within the Davenport Green to Ardwick area are suitable for breeding birds. Species associated with these habitats include black redstart and little ringed plover, both of which are Schedule 1 species⁴². Both species have been recorded within 2km of the land required for the Proposed Scheme.</p> <p>Peregrine falcon have been recorded within 2km of the land required for the Proposed Scheme. The woodland within the Wrengate Wood LWS and scrub is suitable for common breeding birds.</p> |
| Terrestrial invertebrates | Up to district/borough | <p>Suitable habitat for terrestrial invertebrates is present within land required for the Proposed Scheme, specifically within open mosaic habitat, which is present at Ardwick. There is a record of small square-spot moth at Levenshulme within 100m of land required for the Proposed Scheme. There are also records for small heath and wall butterflies, within 2km of the land required for the Proposed Scheme.</p> |
| Reptiles | Up to district/borough | <p>There are records of grass snake and slow worm within 2km of the land required for the Proposed Scheme, at Barlow Moor. Habitat suitable for reptiles is likely to be present within the land required for the Proposed Scheme, near Withington Golf Club at the Palatine Road vent shaft location.</p> |

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2: MA07 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigating the losses of habitat and effects on species:

- construction of a tunnel through the majority of the Davenport Green to Ardwick area would reduce the potential for impacts on otter, water vole, bats, great crested newt, birds (including black redstart), white-clawed crayfish, terrestrial invertebrates and reptiles; and

⁴² Birds listed under Schedule 1 of the Wildlife and Countryside Act (1981) for which it is an offence to intentionally or recklessly disturb at, or on near an 'active' nest

- provision of new woodland planting in the vicinity of the Palatine Road vent shaft, which would help towards compensation for losses of woodland (e.g. Wrengate Wood LWS) and enhance connectivity between remaining woodlands.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)⁴³, which includes translocation of protected species where appropriate.

7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

7.4.4 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. All assessments have been undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

Designated sites

7.4.5 Rochdale Canal SAC and SSSI is the only internationally/nationally important site within the vicinity of the land required for the Proposed Scheme. It lies 4.3km north-east of the Proposed Scheme. It is on the other side of a large conurbation and it is considered that there would be no significant effect as a result of the Proposed Scheme. It has therefore been scoped out for Habitats Regulations Assessment and from further consideration, as agreed with Natural England.

⁴³ Supporting document: Draft Code of Construction Practice

- 7.4.6 Construction of the Palatine Road vent shaft at Withington Golf Course would result in the permanent loss and severance of 0.1ha (4.5%) of Wrengate Wood LWS. On a precautionary basis it is considered that there would be a permanent adverse effect on site integrity which would be significant at the county/metropolitan level. It is considered that the woodland habitat creation area as aforementioned, would connect remaining areas of woodland and would reduce the effect on broadleaved woodland to a level that is not significant, unless the ongoing review identifies any of the woodlands as ancient in which case there would be a permanent adverse effect at up to the county/metropolitan level.

Habitats

Open mosaic habitat

- 7.4.7 On a precautionary basis, in the absence of field survey information, it is considered that construction of the Proposed Scheme would result in the permanent loss of 7.1ha of areas of open mosaic habitat. Loss of these areas would result in a permanent effect that would be significant up to county/metropolitan level.

Species

Bats

- 7.4.8 A number of buildings and structures would be removed to allow the construction of the Proposed Scheme and those adjacent are likely to be affected by noise and vibration during construction. In the absence of survey information, it is assumed that roosting bats may be present within these properties and that roosts would be lost or disturbed during construction. This could affect breeding populations of five bat species within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP. On a precautionary basis, in the absence of survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to regional level.

Birds

- 7.4.9 The Proposed Scheme would result in the loss of nesting and foraging habitats for a range of breeding and wintering birds. In the absence of survey information, it is considered that these are likely to include black redstart, little ringed plover and peregrine falcon. On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

Terrestrial invertebrates

- 7.4.10 The land required for construction of the Proposed Scheme at the Ardwick cutting would result in loss of habitat suitable for terrestrial invertebrates, specifically areas of open mosaic habitat. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

- 7.4.11 Effects on other habitats and species that would be significant at the local/parish level during construction will be reported in the formal ES.
- 7.4.12 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered where appropriate. These effects will be reported in the formal ES.

Other mitigation measures

- 7.4.13 Further measures currently being considered, but which are not yet part of the design and will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:
- options to mitigate for the loss of open mosaic habitats;
 - considering the need for inclusion of structures to reduce severance effects on bats;
 - use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
 - provision of suitable breeding and nesting habitat for Schedule 1 bird species⁴⁴, including black redstart, little ringed plover and peregrine falcon; and
 - provision of alternative roosting habitat for bats.

Summary of likely residual significant effects

- 7.4.14 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 7.

Table 7: Residual significant effects on ecological resources/features during construction

| Resource/feature | Residual effect | Level at which the effect would be significant |
|---------------------|---|--|
| Woodland | Potential for residual adverse effect on unidentified ancient woodlands | Up to county/metropolitan |
| Open mosaic habitat | Permanent adverse effect on the resource due to loss of potential open mosaic habitat | Up to county/metropolitan |
| Bats | Potential permanent adverse effect on the conservation status due to loss of roosts and foraging habitat | Up to regional |
| Birds | Potential permanent adverse effect on the conservation status due to loss of breeding, nesting and foraging habitat | Up to county/metropolitan |

⁴⁴ Birds listed under Schedule 1 of the Wildlife and Countryside Act (1981) for which it is an offence to intentionally or recklessly disturb at, or on near an 'active' nest

| | | |
|---------------------------|--|------------------------|
| Terrestrial invertebrates | Potential permanent adverse effect on the conservation status due to loss of suitable habitat to support terrestrial invertebrates | Up to district/borough |
|---------------------------|--|------------------------|

7.5 Effects arising during operation

Avoidance and mitigation measures

- 7.5.1 There are no specific measures currently identified to avoid or mitigate ecological effects during operation of the Proposed Scheme within this section of the route.

Assessment of impacts and effects

- 7.5.2 It is considered that there would be no impacts and effects on ecological features during operation of the Proposed Scheme. All assessments are based on a precautionary basis, in the absence of survey information.
- 7.5.3 Effects on other habitats and species that would be significant at the local/parish level during operation will be reported in the formal ES.

Other mitigation measures

- 7.5.4 No further additional mitigation measures are currently being considered for the Davenport Green to Ardwick area.

Summary of likely residual significant effects

- 7.5.5 Taking into account mitigation included as part of the Proposed Scheme design, there are no anticipated significant residual ecological effects during operation.

Monitoring

- 7.5.6 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 7.5.7 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

8 Health

8.1 Introduction

- 8.1.1 This section identifies the communities within the Davenport Green to Ardwick area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.
- 8.1.2 Engagement with key public health bodies is underway, including with Public Health England, Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.
- 8.1.3 This section deals specifically with impacts and effects at a local level within the Davenport Green to Ardwick area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.
- 8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.

8.2 Scope, assumptions and limitations

- 8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)⁴⁵.
- 8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.
- 8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

⁴⁵ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 8.2.4 The health determinants of relevance within the Davenport Green to Ardwick area are:
- for impacts during construction (temporary and permanent):
 - neighbourhood quality;
 - access to services, health and social care;
 - access to green space, recreation and physical activity;
 - education; and
 - social capital.
 - for impacts during operation (permanent):
 - neighbourhood quality.
- 8.2.5 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.
- 8.2.6 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a concise review of the key literature and included in the formal ES. The evidence varies in its strength; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.
- 8.2.7 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.
- 8.2.8 Potential health effects have been identified based on information that is available at this stage of the assessment. A full assessment of health effects, applying the assessment criteria set out in the SMR, will be provided in the formal ES.

8.3 Environmental baseline

Existing baseline

Description of communities in the Davenport Green to Ardwick area

- 8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below. A full description of community facilities is provided in Section 6, Community. The route of the Proposed Scheme through the Davenport Green to Ardwick area is principally in tunnel and therefore above ground infrastructure is restricted to the location of proposed vent shafts. The area is predominantly urban, comprising suburban residential development in south Manchester and industrial and mixed-use areas in the city centre. There are a range of community facilities along the section of Manchester tunnel, where impacts would be concentrated around the locations of the four vent shafts and the section emerging from the Manchester tunnel north portal in Ardwick. Within these communities, key facilities include Withington Golf Course off Palatine Road, the Christie Hospital on Wilmslow Road, the Manchester Enterprise Academy (MEA) and Birchfields Primary School at Lytham Road and the Eglise En Mission Church (12-14 Midland Street) in Ardwick.

Demographic and health profile of the Davenport Green to Ardwick area

- 8.3.2 The local communities potentially affected by the Proposed Scheme in the Davenport Green to Ardwick area have a relatively high population density, commensurate with the sub-urban and urban nature of the area.
- 8.3.3 Data provided by the Office for National Statistics⁴⁶ and the Association of Public Health Observatories⁴⁷ show that this population has a poor health status compared with the national (England) averages.
- 8.3.4 The population is more deprived than the national average with regard to the combined indices of multiple deprivation⁴⁸ and the health domain (a sub-set of the indices of multiple deprivation).
- 8.3.5 This area as a whole is considered to be less resilient than the national average, with regard to changes in the relevant health determinants, and with some vulnerabilities in terms of the health status of the population.
- 8.3.6 The available data provides detail down to ward level and enables a profile to be made of the population within the Davenport Green to Ardwick area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

⁴⁶ The Office for National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area.

⁴⁷ Public Health Observatories (PHOs) are part of Public Health England. They produce information, data and intelligence on people's health and health care for practitioners, commissioners, policy makers and the wider community. Available online at: <http://webarchive.nationalarchives.gov.uk/20170106081009/http://www.apho.org.uk/>

⁴⁸ Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015>

8.4 Effects arising during construction

Avoidance and mitigation measures

- 8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Adverse impacts on health determinants have been reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:
- reducing the loss of property and community assets, insofar as reasonably practicable;
 - reducing visual intrusion and noise, insofar as reasonably practicable; and
 - incorporating landscape design and screening into the design.
- 8.4.2 In addition, the locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable.
- 8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)⁴⁹, which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.
- 8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.
- 8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, while taking into account the specific needs of protected groups (as defined in the Equality Act 2010).
- 8.4.6 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd would include:
- improving or altering the remaining portion of the community facility;

⁴⁹ Supporting document: Draft Code of Construction Practice

- improving other existing community facilities in the area that could reduce the effect;
- improving accessibility to other community facilities; and/or
- identifying land owned by the relevant local authority that could be brought into use as a community facility with its agreement.

Assessment of impacts and effects

Neighbourhood quality

- 8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels of satisfaction with their living environment may change. In turn, this could affect mental wellbeing or behaviours such as the use of outside space.
- 8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGV). These will be assessed in the relevant sections of the formal ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the formal ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).
- 8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.
- 8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.
- 8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no significant adverse effects with respect to the effects of construction activities on dust soiling and human health within the Davenport Green to Ardwick area, taking account of mitigation measures contained in the draft CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

- 8.4.12 The construction of the Proposed Scheme would have temporary and permanent⁵⁰ impacts on neighbourhood quality in areas close to construction sites. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.
- 8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. It is currently expected that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.
- 8.4.14 Traffic and transport impacts in the Davenport Green to Ardwick area would include:
- construction vehicle movements to and from the various construction compounds and sites;
 - temporary and permanent road closures and associated diversions; and
 - temporary and permanent alternative routes for public rights of way (PRoW).
- 8.4.15 Construction traffic, including HGVs, would be present on a number of roads in this area, as listed in Section 14, Traffic and transport.
- 8.4.16 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality. This will be assessed in the formal ES.

Access to services, health and social care

- 8.4.17 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also weak to moderate evidence to suggest that transport problems are a key barrier to people's ability to access these services. There is moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.
- 8.4.18 The Wilmslow Road vent shaft would require land which forms the Christie Car Park D on the B5093 Wilmslow Road. Car Park D is one of two designated patient car parks that serve the Christie Hospital, which is located approximately 250m north of the car park. Car Park D is approximately 0.5ha in area and has space for approximately 135 vehicles, including blue badge holders. The other designated patient car park – Car Park C – which has approximately 200 parking spaces, is located on the B5167 Palatine

⁵⁰ The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months – 2 years), and long-term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

Road immediately north-west of the hospital site. There are limited alternatives available for patients as the majority of on-street parking requires a permit and the Christie Hospital intends to increase its existing car parking capacity in the future.

- 8.4.19 The Proposed Scheme would permanently require approximately 0.35ha of land at the 0.5ha site – 100 of the 135 parking spaces available at Car Park D. The construction of the Proposed Scheme would temporarily require the remaining land (approximately 0.15ha and 35 of the 135 parking spaces) and this would be reinstated following the construction period of approximately five years and nine months.
- 8.4.20 The permanent requirement for land at Christie Car Park D would reduce the total car parking spaces available to patients by approximately 30%, from approximately 335 to 235 across both car parks. The loss of land at Christie Car Park D has the potential to result in an adverse health effect.
- 8.4.21 The construction of the Ardwick cutting would require the demolition of the Eglise En Mission Church. The church is a Francophone African Pentecostal church which holds regular services and events including four services a week and a range of other activities, such as GCSE tuition and women's bible study classes, in French and English. It has a congregation of approximately 250 with high proportions of young people, women, and Black, Asian and minority ethnic (BAME) groups. Black African women make up 60% of the entire congregation. This resource would be permanently lost and there are no comparable alternative resources in the local area. The church provides a service in supporting wellbeing and therefore this demolition has the potential to result in an adverse health effect.
- 8.4.22 The Davenport Green to Ardwick area is urban in nature, with a large range of shops and services, with a broad selection, availability and capacity offering greater than average community resilience to changes in access and accessibility to such amenities and facilities during construction. The potential for health effects associated with reduced access to shops and services will be assessed in the formal ES.

Access to green space, recreation and physical activity

- 8.4.23 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.
- 8.4.24 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:
- impacts of construction traffic, including HGVs, on pedestrians and cyclists; and
 - any loss of green space or facility used for physical activity.
- 8.4.25 It is currently anticipated that the route of the Proposed Scheme may intersect a number of footways in the Davenport Green to Ardwick area. The impacts on amenity and recreational value of these footpath networks, and therefore levels of physical

activity and associated health and wellbeing benefits, will be reported in the formal ES.

- 8.4.26 Construction traffic, including HGVs, would be present on local roads. This could obstruct or deter pedestrians and cyclists from using these routes. Health effects associated with these impacts, including consideration of levels of use and available alternative routes for active travel and recreation, will be assessed in the formal ES.

Education

- 8.4.27 There is moderate evidence linking low levels of education with poor mental and physical health. The majority of evidence linking education with health outcomes looks at educational attainment in the context of broader socio-demographic status. Educational attainment influences socio-economic factors such as earnings and home ownership, as well as self-esteem and lifestyle choices.
- 8.4.28 Construction of the Proposed Scheme may impact on education through the provision of training and apprenticeship opportunities, and through impacts on educational resources along the route.
- 8.4.29 The present design for the Lytham Road vent shaft would permanently require land at the MEA on Lytham Road. MEA currently has 420 pupils with capacity for 1,050 pupils in total. The school predominantly follows the English Baccalaureate system and provides facilities for children with special educational needs (SEN). The school also offers a breakfast club and after school/extracurricular programmes, including sports, science, technology, engineering and maths (STEM), drama, and history programmes. Only a limited number of schools in the wider area offer the English Baccalaureate qualification, with another MEA site, located 2km away, being the closest. The Proposed Scheme would require land that is currently used as car parking and playing fields. Given the importance of these components of the schools and the lack of nearby alternatives, the permanent requirement for land at this location would affect the functioning of the educational institution. The location and design of the Lytham Road vent shaft are still under development and the effects of the loss of this outside space at MEA, and proposed mitigation, will be assessed in the formal ES.

Social capital

- 8.4.30 The connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. The Office for National Statistics defines social capital as follows:

'In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded

attitudes and values which are important for people to cooperate, such as tolerance or trust.⁵¹

- 8.4.31 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.
- 8.4.32 During the day, the workforce would be present on construction sites and compounds throughout the area, including main compounds and satellite compounds in the vicinity of Wythenshawe, Didsbury, Rusholme, West Gorton and Beswick. The duration of the works at each site ranges from approximately five years and nine months to approximately seven years and six months. The presence of construction workers is likely to be noticeable however the size of the temporary construction workforce is unlikely to be substantial relative to the size of these communities and therefore no health effects are expected.
- 8.4.33 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.
- 8.4.34 The Community section of the ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.
- 8.4.35 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.
- 8.4.36 Three residential properties would be demolished on the B5093 Wilmslow Road. These losses do not represent a sizable proportion of the community, and therefore,

⁵¹ Office for National Statistics- Measuring Social Capital. Available online at:
http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

no health effects are anticipated on the remaining community. Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

- 8.4.37 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities.

Other mitigation measures

- 8.4.38 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.
- 8.4.39 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.
- 8.4.40 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential adverse effects identified in this assessment. Any other mitigation measures will be described in the formal ES.

8.5 Effects arising from operation

Avoidance and mitigation measures

- 8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Davenport Green to Ardwick area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

- 8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

- 8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

- 8.5.4 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

- 9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. Consideration is given to the extent and value of heritage assets including archaeological and palaeo-environmental remains, historic buildings, the built environment and historic landscape.
- 9.1.2 Engagement has been undertaken with Historic England, Manchester City Council (MCC) and Greater Manchester Archaeological Advisory Service (GMAAS). The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.
- 9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book. Only designated heritage assets within the Davenport Green to Ardwick are shown on maps CT-10-322b to CT-10-326a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.
- 9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.
- 9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed MGM). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

- 9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁵² including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 in the SMR, respectively).
- 9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

⁵² Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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- 9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas, and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m, or and 500m study areas respectively.
- 9.2.4 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out in the vicinity of bored or mined tunnels is defined as 100m either side of the extent of tunnelling. This is referred to in the remainder of this assessment as the 100m study area.
- 9.2.5 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.
- 9.2.6 The historic environment methodology includes the consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.
- 9.2.7 Where noise is considered, this is within the context of the contribution that this makes to the heritage significance of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.
- 9.2.8 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, which will be reported in the formal ES.
- 9.2.9 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.
- 9.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

- 9.2.11 In undertaking the assessment the following limitations were identified and assumptions made:
- field surveys are ongoing, and will be subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;
 - desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
 - intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.3 Environmental baseline

Existing baseline

- 9.3.1 Baseline data was collated from a variety of sources in compiling this assessment, including:
- the NHLE (Historic England designated heritage asset data);
 - local planning authority information on conservation areas;
 - Greater Manchester HER;
 - Manchester Central Library and Trafford Local Studies Centre;
 - conservation area appraisals; and
 - historic maps and aerial photography.
- 9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

- 9.3.3 There are no designated heritage assets located partially or wholly within the land required for the Proposed Scheme.
- 9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study:
- three scheduled monuments of high value – Peel Moat (NHLE 1011674); section of an early medieval boundary ditch known as the Nico Ditch in Platt Fields 480m south-south-east of Platt Hall (NHLE 1015132); and Clayton Hall (NHLE 1197795);
 - two Grade I listed buildings of high value – Baguley Hall (NHLE 1291962) and The Edgar Wood Centre (NHLE 1197770);
 - 20 Grade II* listed buildings of high value including eight churches; seven houses and halls; Victoria Baths (NHLE 1200808) and associated wall (NHLE 1200808); two education buildings and Wythenshawe bus depot (NHLE 1389256);

- 170 Grade II listed buildings of moderate value including 78 private houses and associated structures; 32 religious buildings and associated monuments; 11 buildings and monuments associated with cemeteries; 10 assets associated with the Ashton Canal and nine leisure facilities; 14 public buildings; 10 educational buildings and associated monuments; four war memorials; one milestone and one memorial clock tower;
- 11 conservation areas of moderate value – Gatley Village Conservation Area; Northenden Conservation Area; Didsbury St James Conservation Area; Blackburn Park Conservation Area; Albert Park Conservation Area; Old Broadway Conservation Area; Mauldeth Road Conservation Area; Withington Conservation Area; Rushford Park Conservation Area; Victoria Park Conservation Area and Gore Brook Valley Conservation Area;
- two Grade II registered parks and gardens of high value – Philips Park Cemetery (NHLE 1001634) and Manchester Southern Cemetery (NHLE 1001656); and
- two Grade II registered parks and gardens of moderate value - Philips Park (NHLE 1001531) and Wythenshawe Park (NHLE 1000857).

Non-designated assets

- 9.3.5 One non-designated asset of high value lies wholly within the land required for the Proposed Scheme: site of Church of St Silas (MGM10883).
- 9.3.6 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:
- the sites of two former schools – Higher Ardwick School (MGM17378) and North Ardwick Primary School (MGM17385);
 - the site of a terraced house on Hope Street (MGM17383);
 - the site of Ancoats Branch Railway Cutting (MGM17388); and
 - the site of a brick field off Gorton Road (MGM11008).
- 9.3.7 Non-designated heritage assets located partially or wholly within 100m either side of the extent of tunnelling for the construction and operation of the Proposed Scheme include:
- two roads – the Manchester to Buxton Roman Road (MGM81) and the post-medieval Ashton Old Road (MGM11039);
 - the medieval to post-medieval settlement of Northenden (MGM2717);
 - the sites of Slade House (MGM10929), a farm (MGM11793) and garden (MGM10271); and
 - 17 industrial sites including: site of brick Kiln off Gorton Road (MGM11007), site of brick field off Ashton Old Road (MGM10882), site of Brick field off Gorton Road (MGM11008), Goods Shed (MGM10869) and site of Ancoats Branch Railway Cutting (MGM10869).

Historic environment overview

- 9.3.8 The earliest evidence for human activity within the study area comes from the Neolithic period which is the period when hunting and gathering societies moved towards a more settled farming lifestyle. Ceremonial and funerary monuments, such as burial mounds and henges, appear in the landscape and new artefacts including pottery and stone tools appear. Flint tools recorded within the study area could be representative of semi-permanent settlement at this time.
- 9.3.9 There are no recorded Bronze Age remains within the study area.
- 9.3.10 During the Iron Age the climate became cooler and wetter and the period saw an expanding population. This necessitated the intensification of agricultural practices such as the use of marginal land that resulted in large-scale clearance. There are no confirmed settlements within the study area, although Iron Age pottery was recovered in Castlefield and stone querns and figurines were recorded in Rusholme and Withington on the fringes of the study area. The closest recorded Iron Age sites to the study area are a hilltop enclosure near Stockport, a defended settlement at Rainsough and at Great Woollen Hall near Chat Moss, Salford.
- 9.3.11 The Roman fort of Mamucium (in Manchester city centre) was built in AD 78 and became an important centre with a network of roads connecting the fort with other regions. This is represented within the study area by the Manchester to Buxton Roman Road (MGM81). The modern A6 Stockport road is largely on the same alignment as the Roman road.
- 9.3.12 There is scant archaeological evidence for the early medieval period for the North West, with much of the evidence coming from documentary sources. During this period Greater Manchester was sparsely populated in comparison to other regions. The Nico Ditch (NHL1015132), a section of which runs through the study area, is attributed to this period. It is present for six miles in a roughly east-west direction between Ashton Moss and Hough Moss in Chorlton-cum-Hardy and may have been an administrative boundary ditch.
- 9.3.13 The North West in the medieval period was relatively thinly populated, compared to other parts of the country and archaeological research into both rural and urban settlement of this period has been hampered by the destruction of the evidence through 19th and 20th century urbanisation and industrialisation. A distinctive feature of the medieval period are moated sites and there are several within the study area including Clayton Hall (NHLE 1197795) and Peel Moat (NHLE 1011674). The peak period during which these were built was between approximately 1250 and 1350. The halls located within the moated sites were the centre of medieval manors set against a background landscape of open field systems, pasture meadows and large tracts of woodland. Also from this period, and within the study area, is the medieval settlement of Northenden with a weir nearby.
- 9.3.14 By the end of the medieval period and into the post-medieval period Manchester had become a regional centre for textile processing. Manchester was key to the early stages of the industrialisation and globalisation of Britain. The textile and coal industries were the driving force behind this growth and by 1664 Manchester was the

largest town in Lancashire. The rapid industrial growth saw the expansion of the rail network in Manchester, which led to railway companies investing in new sidings, stations, warehouses and goods yards which are still prominent in the landscape today. Examples of these include goods sheds (MGM10879 and MGM10869) and the site of the Ancoats railway cutting (MGM17388).

- 9.3.15 The expanding industry in the city fuelled population growth in the suburbs of Manchester. In the first half of the 19th century the population of the city grew from 88,000 to over 400,000. This resulted in the widespread expansion of terraces of workers housing, transforming the suburbs, and defining the character of areas such as Ancoats, Hulme, Moss Side, Rusholme, Miles Platting, Ardwick and Longsight. Heritage assets related to brick manufacture are prevalent and include brick field sites (MGM10882 and MGM11008), brick kilns (MGM11007) and brick works (MGM10867).
- 9.3.16 In the early 20th century industry in the region saw a phase of decline as a result of economic depression. Textile mills were frequently converted to other industries or abandoned completely. In contrast, this period saw extensive housing development, with improvements in the public transport system and roads influencing the building programme outside of the city centre.

9.4 Effects arising during construction

Avoidance and mitigation measures

- 9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.
- 9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)⁵³ sets out the measures that will be adopted, in so far as reasonably practicable, to control effects on heritage assets. These include:
- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
 - route-wide principles, standards and techniques for works affecting heritage assets; and
 - a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

- 9.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts would occur to assets both within the land required for

⁵³ Supporting document: Draft Code of Construction Practice

the Proposed Scheme and assets in the wider study area as a result of changes to their settings.

- 9.4.4 No significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets.

Permanent effects

- 9.4.5 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

- 9.4.6 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.

- 9.4.7 St Silas' Church (MGM10883) is a non-designated heritage asset of high value. The church was built in 1842 and the 1848 OS map notes the presence of a graveyard. The church was demolished in 1957 and there has been subsequent development in the area; however there is no evidence to suggest that any remains of the church or associated graveyard have been removed or truncated by later activity. The archaeological remains of the church would be physically impacted by the construction of the Manchester tunnel north portal main compound and transfer node. This would constitute a high adverse impact and result in a major adverse significant effect.

- 9.4.8 The following non-designated heritage assets date from the later post-medieval (industrial) period and illustrate the growth of Manchester. They are all of low value and although in an area which has been subsequently developed, evidence from archaeological investigations in the vicinity suggest that archaeological remains are likely to survive under modern development in this area. The archaeological remains associated with these assets would be physically impacted by the construction of Manchester tunnel north portal main compound and transfer node. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- the site of a brick field (MGM11008);
- the site of Ancoats Branch Railway Cutting (MGM17388);
- the site of North Ardwick Primary School (MGM17385);
- the site of terraced housing on Hope Street (MGM17383); and
- the site of Higher Ardwick School (MGM17378).

- 9.4.9 No significant effects are expected to occur as a result of permanent impacts on the setting of designated or non-designated heritage assets.

Other mitigation measures

- 9.4.10 No additional construction phase mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential

opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and
- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

- 9.4.11 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and would be restricted to the duration of the construction works.
- 9.4.12 As no specific mitigation measures have yet been identified in relation to heritage assets described above, the residual effects are the same as those reported under permanent effects.

9.5 Effects arising from operation

Avoidance and mitigation measures

- 9.5.1 No measures have yet been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on heritage assets within the Davenport Green to Ardwick Area.

Assessment of impacts and effects

- 9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.
- 9.5.3 During the operation of the Proposed Scheme no further ground works are anticipated, and as such there would be no further physical impacts on heritage assets arising from the operation of the Proposed Scheme.
- 9.5.4 Impacts on heritage assets due to changes in their settings arising from the physical presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would endure through the operation of the Proposed Scheme.
- 9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.
- 9.5.6 It is currently anticipated that there would be no significant effects as a result of the operation of the Proposed Scheme.

Other mitigation measures

- 9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been

identified. Potential opportunities for further mitigation have not been identified, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

- 9.5.8 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

- 9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

- 10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Davenport Green to Ardwick area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.
- 10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Manchester City Council (MCC), Greater Manchester Combined Authority (GMCA), Northwest Geodiversity Partnership, the Environment Agency, Fera Science Ltd (FSL)⁵⁴ and the Animal and Plant Health Agency (APHA). The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.
- 10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.
- 10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

- 10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁵⁵.
- 10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstraction this is increased up to 1km.
- 10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very

⁵⁴ Formerly known as the Food and Environment Research Agency.

⁵⁵ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

- 10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.
- 10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.
- 10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.
- 10.2.7 The minerals assessment is based upon the mineral resources⁵⁶ identified on published mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the Minerals Plans).
- 10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

- 10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, MCC, GMCA, Greater Manchester County Council (GMCC), GMRG, Public Health England (PHE), the Environment Agency, Natural England, Fera Science Limited (FSL), APHA records and the Oil and Gas Authority (OGA) website, as well as publicly available local geological trusts and mineral plans.

Geology

- 10.3.2 This section describes the underlying ground conditions within the Davenport Green to Ardwick area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate⁵⁷.
- 10.3.3 Table 8 provides a summary of the geology (made ground, superficial and bedrock units) underlying the land required for the Proposed Scheme and the study area.

⁵⁶ Defined in the SMR as: 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction and Development Licences (PEDLs), Shale Prospective Areas (SPAs)'.

⁵⁷ British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone*. Research Report RR/14/01. Available online at: <http://www.bgs.ac.uk/downloads/start.cfm?id=2904>.

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Table 8: Summary of the geology underlying the Proposed Scheme from Davenport Green to Ardwick

| Geology | Distribution | Formation description | Aquifer classification |
|--|--|---|------------------------|
| Made ground | | | |
| Made ground | Various locations | Artificial ground comprising variable deposits of reworked natural and man-made materials | Not classified |
| Superficial | | | |
| Alluvium | River Mersey to 25m south of Ashfield Lodge | Clay, silt, sand and gravel | Secondary A |
| River terrace deposits (Undifferentiated) | 25m south-east of Ashfield Lodge to 100m east of Ashfield Lodge | Sand and gravel | Secondary A |
| Glaciofluvial sheet deposits | Various locations | Sand and gravel | Secondary A |
| Glaciofluvial deposits | | Sand and gravel | Secondary A |
| Glacial till | | Sandy silty clay with gravel | Secondary |
| Bedrock | | | |
| Bollin Mudstone Member - Sidmouth Mudstone Formation – Mercia Mudstone Group | Davenport Green to Partridge Avenue/Blackcarr Road junction | Mudstone and siltstone | Secondary B |
| Tarporley Siltstone Formation - Mercia Mudstone Group | Partridge Avenue/Blackcarr Road junction to Joseph Johnson Mews | Siltstone, mudstone and sandstone | Secondary B |
| Helsby Sandstone Formation - Sherwood Sandstone Group | Joseph Johnson Mews to Boat Lane | Pebbly sandstone | Principal |
| Wilmslow Sandstone Formation - Sherwood Sandstone Group | Boat Lane to 50m north of Mayville Drive 20m north of Rathen Road to Delaine Road | Sandstone | Principal |

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| | | | |
|---|--|-----------------------------------|-------------|
| Chester Formation - Sherwood Sandstone Group | Various locations from Northenden to the north of the study area. | Sandstone | Principal |
| Manchester Marls Formation (Cumbrian Coast Group) | Raincliff Avenue to Campbell Road Chipping Square to Kirkmanshulme Lane Blind Lane/Viaduct Street to A665 Midland Street | Mudstone | Secondary B |
| Collyhurst Sandstone Formation - Appleby Group | Various locations | Sandstone | Principal |
| Halesowen Formation - Warwickshire Group | Birchfields Primary School to 40m west of Lindsay Avenue Redgate Lane to Rondin Road | Mudstone, siltstone and sandstone | Secondary A |
| Etruria Formation - Warwickshire Group | 40m west of Lindsay Avenue to Raincliff Avenue | Sandstone and mudstone | Secondary A |

Made ground

- 10.3.4 Made ground is a term used to denote man-made deposits such as landfill, excavated material or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled.
- 10.3.5 There is evidence of historical and current authorised landfilling within the study area, which may comprise more substantial deposits of made ground. There is also evidence of historical and existing brick pits within the study area, which may comprise more substantial deposits of made ground where backfilled.
- 10.3.6 Made ground and artificial ground is shown on BGS mapping for part of the study area. This is predominantly associated with historical and existing brick pits within the Ardwick area; embankments associated with motorway and railway construction, infilling of historical ponds, and embankments adjacent to the River Mersey. Localised deposits of made ground are likely to be present across previously developed land. Available records indicate that there are currently no authorised or historical landfills within 250m of land required for construction of the Proposed Scheme.
- 10.3.7 No known farm burial and pyre sites associated with the 1967 and 2001 outbreak of foot and mouth disease are known to be present within the Davenport Green to Ardwick area. In all cases, publicly available records (including APHA Foot and Mouth

Disease County Status Maps) do not provide an exact location for the burial or pyre sites. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

Superficial geology

- 10.3.8 Glacial till⁵⁸ (Devensian) is generally located south of M56 junction 3a to Davenport Green and north of Withington to Manchester Piccadilly Station. Glacial till, south of M56 junction 3a to Davenport Green is intermittent and some areas have no recorded superficial deposits.
- 10.3.9 Glaciofluvial deposits, glaciofluvial sheet deposits, and river terrace deposits comprising sand and gravel, are generally located centrally within the area from M56 junction 3a to Withington.
- 10.3.10 Alluvium variably comprising silty clay, silt, sand and gravel occur along the courses of streams and rivers. Alluvium is also present in the area associated with the River Mersey.

Bedrock geology

- 10.3.11 The formations and members of each bedrock stratum together with their locations along the route of the Proposed Scheme are as follows:
- mudstone with some siltstone and sandstone of the Bollin Mudstone Member and Tarporley Siltstone Formation (both of the Mercia Mudstone Member) extend from Davenport Green to Joseph Johnson Mews in the south of the study area;
 - sandstones and conglomerates of the Helsby Sandstone Formation, Wilmslow Sandstone Formation, Chester Formation (all of the Sherwood Sandstone Group) and Collyhurst Sandstone Formation (Appleby Group) extend from Joseph Johnson Mews to the A34 Birchfields Road within the central part of the study area; and
 - bedrock geology within the north of the study area from the A34 Birchfields Road to the existing Manchester Piccadilly Station, located in the Manchester Piccadilly Station area (MA08), is indicated to be more variable with sandstone of the Collyhurst Sandstone Formation (Appleby Group) and Chester Formation (Sherwood Sandstone Formation) interlinked with mudstone, siltstone and sandstone of the Manchester Marls Formation (Cumbrian Coast Group), Halesowen Formation and Etruria Formation (both of the Warwickshire Group).
- 10.3.12 Six inferred fault locations (taken from BGS digital map data) are indicated to cross the route of the Proposed Scheme. These faults are generally orientated in a south-

⁵⁸Glacial till is sometimes described as 'diamicton' in the BGS lexicon. This term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term 'glacial till' refers to diamicton of glacial origin.

south-west to north-north-east direction, and mark boundaries between the various bedrock formations as described above.

Radon

- 10.3.13 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is described in the BGS Radon Potential Dataset⁵⁹.
- 10.3.14 Two sections of the route of the Proposed Scheme lie within the following radon affected areas:
- approximately 65m to greater than 250m east of the route of the Proposed Scheme between Abergele Road and Brailsford Road near Fallowfield; and
 - approximately 170m to greater than 250m east of the route of the Proposed Scheme, within the eastern extent of the land required for construction of the Proposed Scheme at Ardwick from Sevenoaks Road to Gable Street.
- 10.3.15 In both of these areas, it is stated that between 3% and 5% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m³) for residential properties. In the remainder of the Davenport Green to Ardwick area, less than 1% of homes are indicated to be at or above the radon action level. The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200Bq/m³.

Groundwater

- 10.3.16 Four categories of aquifer have been identified within the study area, as defined by the Environment Agency:
- the Helsby Sandstone Formation, Wilmslow Sandstone Formation and Chester Formation (Sherwood Sandstone Group), and the Collyhurst Sandstone Formation (Appleby Group) are designated as Principal aquifers;
 - the alluvium, river terrace deposits (undifferentiated), glaciofluvial sheet deposits, glaciofluvial deposits and glacial till are classified as Secondary A aquifers in addition to bedrock deposits including the Halesowen Formation and Etruria Formation (Warwickshire Group);
 - the Bollin Mudstone Member and Tarporley Siltstone Formation (Mercia Mudstone Group) and the Manchester Marls Formation (Cumbrian Coast Group) are designated as Secondary B aquifers; and
 - glacial till (Devensian) is designated as a Secondary aquifer.
- 10.3.17 The Environment Agency reports that there are no groundwater abstractions for public water supply located within the study area.

⁵⁹ Available at: <http://www.bgs.ac.uk/radon/hpa-bgs.html> This dataset underpins Public Health England's Indicative Atlas of Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 978-0-85951-608-2. 29 pp, available at www.ukradon.org/information/ukmaps.

- 10.3.18 There is one private groundwater abstraction licence registered within the study area. Further detail can be found in Section 15, Water resources and flood risk.
- 10.3.19 The route of the Proposed Scheme passes through a groundwater source protection zone⁶⁰ (SPZ) 3 in proximity to the University of Manchester's Fallowfield Campus.
- 10.3.20 Details of the licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are by default provided with SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.
- 10.3.21 According to GMCC records, there are no private groundwater abstractions within 1km of the study area.
- 10.3.22 According to Environment Agency records, there are no drinking water safeguard zones⁶¹ for groundwater within 1km of the study area.
- 10.3.23 Further information on the groundwater in the Davenport Green to Ardwick area is provided in Section 15, Water resources and flood risk.

Surface water

- 10.3.24 The following watercourses would be intersected by the route of the Proposed Scheme or are on land required for construction of the Proposed Scheme:
- main rivers: The River Mersey (and a tributary of the River Mersey), Fairywell Brook, Mill Brook, Baguley Brook, Shaw Brook, a culverted section of Fallowfield Brook and Gore Brook; and
 - ordinary watercourses: Corn Brook.
- 10.3.25 A number of unnamed streams, tributaries, drains and ponds are also located within the study area.
- 10.3.26 According to Environment Agency records, there are no drinking water safeguard zones for surface water within 1km of the study area.
- 10.3.27 Surface water bodies in the Davenport Green to Ardwick area are described in more detail in Section 15, Water resources and flood risk.
- 10.3.28 There are no licensed surface water abstractions located within 250m of the Proposed Scheme.

Current and historical land use

- 10.3.29 Native land uses within the study area are shown in Table 9 and Table 10.

⁶⁰ A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

⁶¹ Environment Agency: Drinking Water Safeguard Zone Mapping. Available online at: <https://environment-agency.cloud.esri.uk.com/farmers/>

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Table 9: Current and historical mining, mineral sites and colliery spoil sites located within the study area

| Name and Area Reference | Location | Description |
|--|--|--|
| Ardwick Lime Works (MA07-196) | Located 200m north of the Proposed Scheme at Ardwick. | Historical mapping from 1848 to 1851 indicates two lime works shafts, two lime pits and associated lime kiln north of the Proposed Scheme at Ardwick. The worked deposit is recorded as the 'Ardwick Limestone'. |
| Ardwick Brick Field (MA07-198) | Within land required for construction of the Proposed Scheme from West Gorton to Ardwick. | Expansive infilled brick crofts and brick fields from West Gorton to Ardwick as shown on historical mapping from 1848 to 1908. |
| Underground Coal Workings, the A57 Hyde Road to Blind Lane/Viaduct Street (MA07-200) | Bisecting the Proposed Scheme from the A57 Hyde Road to Blind Lane/Viaduct Street and also within land required for construction of the Proposed Scheme. | Historical underground coal workings are shown to intersect with the Proposed Scheme with coal recorded between 50m and 1.2km in depth. Eight Coal Authority recorded mine entries are shown within 250m of the Proposed Scheme and land required for construction of the Proposed Scheme. Five of the mine entries are recorded as grouted/treated while three are recorded as not treated. |

Table 10: Current and historical industrial sites located within the study area

| Name and Area Reference | Location | Description |
|---|---|---|
| Tarmacadam Works (MA07-126) | East of Longsight Railway Sidings and 60m west of the Proposed Scheme | Historical tarmacadam works from 1949 to 1968 becoming a Works by 1984 |
| Galloways Boiler Works (MA07-152) | Bisecting the Proposed Scheme and within the west of land required for the Proposed Scheme at Anthony Close. | Historical Galloway's Boiler Works from 1889 to 1938 with evidence of engineering workshops and fuel storage/tanks. |
| Longsight Gas Works and gas holder (MA07-122) | Located at Longsight Railway Sidings. Gas holder is 45m west of the Proposed Scheme. Gas works is 170m west of the Proposed Scheme. | Historical gas holder shown on historical mapping from 1893 to 1934. Gas works shown on mapping from 1949 to 1960. |
| Petroleum Depot (MA07-161) | Bisecting the Proposed Scheme north of Wigley Street. | Historical, petroleum depot as shown on historical mapping from 1948 to 1968 with evidence of multiple tanks and fuel storage. Became a waste disposal works by 1971. |

- 10.3.30 Contaminants commonly associated with sites in Table 9 and Table 10 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits could also give rise to landfill gases such as methane or carbon dioxide and leachate.

Other regulatory data

- 10.3.31 There are no Control of Major Accident Hazards sites in the area.
- 10.3.32 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental

permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences).

- 10.3.33 There is a single recorded pollution incident within the study area. This relates to a Category 2 (significant) pollution incident to land from construction and demolition materials and wastes recorded in 2011 for a location west of Anthony Close, Ardwick.
- 10.3.34 There are no licensed discharge consents to groundwater within the study area.
- 10.3.35 The Environment Agency reports 29 discharge consents to surface water within 250m of the route of the Proposed Scheme, one of which is within the land required for the Proposed Scheme. Further details on groundwater and surface water in the study area can be found in Section 15, Water resources and flood risk.
- 10.3.36 There are no nationally significant ecological designations as defined in the land quality section of the SMR55 located within the study area.

Mining/mineral resources

- 10.3.37 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These could include sand, gravel, clay, stone, lime, salt, gypsum and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration and Development Licences (PEDLs).

Mineral plans

- 10.3.38 The MCC is responsible for the regulation of minerals and waste in the area. The MCC Core Strategy Development Plan Document was adopted in July 2012. Policy EN20 sets out the policies aimed at encouraging the efficient and sustainable use of mineral resources in order to enable the Council to plan for a steady and adequate supply of aggregates.
- 10.3.39 The MCC Core Strategy Development Plan Document indicates that Manchester does not have any active mineral workings.
- 10.3.40 As the Davenport Green to Ardwick area falls within Greater Manchester, also of relevance are the policies set out in the 'Greater Manchester Joint Minerals Plan', which was adopted in April 2013. The joint minerals plan outlines how the various boroughs within Greater Manchester can plan for minerals in a sustainable manner. No further revisions of the plan have been published to date.
- 10.3.41 The study area is not located in an area that may be affected by subsidence due to brine extraction (a brine compensation area).

Sand, gravel and clay deposits

- 10.3.42 The route of the Proposed Scheme does not intersect with any sand and gravel, sandstone, brick clay or coal Mineral Safeguarding Areas (MSA) as indicated by the Greater Manchester Joint Minerals Plan.

- 10.3.43 The BGS records indicate a number of historical common clay and shale open cast mineral resource sites in Ardwick associated with former brick pits and crofts within the study area.
- 10.3.44 A mining hazard area is shown to bisect the route of the Proposed Scheme from Lytham Road to Hardon Grove, Rusholme and is indicated to be associated with a 'mineral vein'.

Coal mining

Open cast coal mining

- 10.3.45 The Coal Authority records indicate eight mine entries in proximity to land required for construction of the Proposed Scheme in Ardwick. Five of the mine entries are listed as having undergone treatment in the form of grouting. Three of the mine entries are recorded as having no treatment details.
- 10.3.46 The route of the Proposed Scheme crosses a mining hazard area in Ardwick and is recorded as being associated with 'Ardwick Limestone' and 'where underground mining is known or considered likely to have occurred within or close to the area'. This information is substantiated by the occurrence of two historical lime works shafts and Ardwick Lime Works shown on historical mapping from 1848.

Deep coal mining

- 10.3.47 Deep coal, located between 50m and 1.2km in depth, and greater than 1.2km, is recorded as a resource in the study area.
- 10.3.48 Available records from the Coal Authority indicate that underground coal workings are recorded in the north of the study area from the A57 Hyde Road to Blind Lane/Viaduct Street and within Ardwick.

PEDLs/Hydrocarbons

- 10.3.49 The OGA website⁶² indicates that there is one PEDL in the study area relating to coalfields with reserves at depths of 200m to 1.5km, which have the potential for coal bed methane extraction. Currently, there are no operational coal beds within the land required for the construction of the Proposed Scheme.

Geo-conservation resources

- 10.3.50 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geo-conservation resources has been undertaken.

Receptors

- 10.3.51 The sensitive receptors that have been identified within the study area are summarised in Table 11. A definition of receptor sensitivity is given in the SMR.

⁶² Oil and Gas Authority, Onshore Interactive Maps. Available online at:
<https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa>

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Table 11: Summary of sensitive receptors

| Issue | Receptor type | Receptor description | Receptor sensitivity |
|---|--|---|----------------------|
| Land contamination | People | Residents of and visitors to nearby surrounding properties | High |
| | | Retail and business park users | Moderate |
| | | Commercial or industrial site users | Low |
| | Groundwater | Principal aquifers (Helsby Sandstone Formation/Wilmslow Sandstone Formation/Chester Formation) | High |
| | | Secondary A superficial aquifers (Alluvium/river terrace deposits/glaciofluvial sheet deposits/glaciofluvial deposits/Shirdley Hill Sand Formation) | Moderate |
| | | Secondary superficial aquifers, and Secondary B bedrock aquifers (Tarpoley Silstone Formation) | Low |
| | Surface waters | River Mersey, Mill Brook, Baguley Brook, a tributary of the River Mersey, Shaw Brook, a culverted section of Fallowfield Brook, Gore Brook, an Underground River leading from Corn Brook, unnamed tributaries, ponds and drains | Moderate |
| Built environment | Underground structures and buried services | Low | |
| Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation) | Mining/mineral sites | Areas of search for sand and gravel and PEDL | Moderate |

10.4 Effects arising during construction

Avoidance and mitigation measures

- 10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)⁶³. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

⁶³ Supporting document: Draft Code of Construction Practice

- 10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:
- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
 - methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
 - the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
 - methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
 - management of any unexpected contamination found during construction (Sections 11 and 15);
 - a post-remediation permit to work system (Section 11);
 - storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
 - traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
 - methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
 - methods to manage discovery of unknown animal burial pits (Section 6).
- 10.4.3 The draft CoCP will require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, is undertaken to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent potential harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11⁶⁴ and British Standards BS10175⁶⁵ and BS8576⁶⁶ and Construction Industry Research and Information Association (CIRIA) SP32⁶⁷.
- 10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line

⁶⁴ Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.

⁶⁵ British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.

⁶⁶ British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.

⁶⁷ CIRIA (1983) SP32 Construction over abandoned mine workings.

with the framework set out by the Sustainable Remediation Forum UK⁶⁸. The preferred option would then be developed into a remediation strategy.

- 10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

- 10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting and ground stabilisation, and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: MA07 Map Book.

Land contamination

- 10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.
- 10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:
- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
 - the vertical profile of the route;
 - the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
 - the presence of adjacent residential properties or sensitive ecological receptors.
- 10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.
- 10.4.10 A simple summary of the baseline CSM is provided in Table 12. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment.

⁶⁸ Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

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Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the potential effects of contamination has been completed by comparing the detailed CSM developed for potentially contaminated areas at baseline with construction and post-construction stages.

Table 12: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

| Area reference ⁶⁹ | Area name | Human health risk | Groundwater risk | Surface water risk | Ecosystem risk | Buildings risk |
|--|--|--------------------|------------------|--------------------|-------------------|----------------|
| On-site ⁷⁰ | | | | | | |
| MA07-165, MA07-173, MA07-182 | Depot, Hyde Road Pipe Depot, Depot and tank | Low to Moderate | Moderate | N/A ⁷¹ | N/A ⁷² | Very Low |
| MA07-175 | Public Laundry, Laundry | Very Low to Low | Low | Very Low | N/A | Very Low |
| MA07-127, MA07-66, MA07-98, MA07-183, MA07-152 | Bottling Works, Electricity Sub Station, Factory, Electrical Sub Station, Galloway's Boiler Works - disused | Low to Moderate | Moderate | Moderate | N/A | Low |
| MA07-179 | Tank | Moderate | Very Low | N/A | N/A | Moderate |
| MA07-172 | Clay/shale pits | Moderate/Low | Very Low | N/A | N/A | Low |
| MA07-184, MA07-186 | Garage | Moderate/Low | Very Low | N/A | N/A | Moderate/Low |
| MA07-168 | Gas Works | Moderate | Low | N/A | N/A | Moderate |
| MA07-176 | Brick Fields | Very Low | Moderate/Low | N/A | N/A | Very Low |
| MA07-189, MA07-174 | Victoria Brewery, Ardwick Brewery | Moderate/Low | Moderate | N/A | N/A | Moderate/Low |
| MA07-185 | Aluminium Works | Moderate | Moderate | N/A | N/A | Moderate |
| MA07-166 | Goods Shed and Yard | Moderate | Moderate/Low | N/A | N/A | Moderate/Low |

⁶⁹ Each potentially contaminated site is allocated a unique reference number.

⁷⁰ 'On-site' is within the area of land required for construction of the Proposed Scheme.

⁷¹ N/A refers to the receptor being absent.

⁷² N/A refers to the receptor being absent.

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| Area reference ⁶⁹ | Area name | Human health risk | Groundwater risk | Surface water risk | Ecosystem risk | Buildings risk |
|--|---|--------------------------|------------------|--------------------|----------------|----------------|
| MA07-194, MA07-170, MA07-180, MA07-181 | Timber Yard, Saw Mill | Moderate/Low | Moderate | N/A | N/A | Moderate/Low |
| Off-site ⁷³ | | | | | | |
| MA07-145, MA07-153, MA07-54, MA07-156 | Dalton Chemical Works, Ardwick Chemical Works, Rubber Works, Gorton Brook Chemical Works | Very Low to Moderate/Low | Low | Moderate/Low | N/A | Very Low |
| MA07-79 | Abattoir | Very low to Moderate/Low | Moderate | Low | N/A | Low |
| MA07-188 | Limestone 'shaft' | Very Low to Low | Very low | N/A | N/A | Very Low |
| MA07-169 | Works | Low to Moderate | Low | Moderate/Low | N/A | Low |
| MA07-139 | Bus Depot and Oil Tank | Very Low to Moderate/Low | Moderate | N/A | N/A | Very Low |
| MA07-141, MA07-110, MA07-109, MA07-151, MA07-159, MA07-163, MA07-191, MA07-196, MA07-197, MA07-50 | Works, Former Clothing Works, Electricity Sub Station, Industrial Estate, (Ardwick) Pulley Works, Works, Ardwick Lime Works, Lime bank Works (Engineering), Works | Low | Moderate | Moderate | N/A | Low |
| MA07-143, MA07-135, MA07-158, MA07-123, MA07-125, MA07-157, MA07-179, MA07-119, MA07-124, MA07-150, MA07-160, MA07-171, MA07-146 | Tanks – Scrap yard and Depot | Moderate | Very low | N/A | N/A | Moderate |

⁷³ 'Off-site' is beyond the land required for construction of the proposed scheme but within 250m of it.

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| Area reference ⁶⁹ | Area name | Human health risk | Groundwater risk | Surface water risk | Ecosystem risk | Buildings risk |
|---|--|-------------------|------------------|--------------------|----------------|----------------|
| MA07-190, MA07-195, MA07-199, MA07-201 | Clay/shale pits. Limestone pit | Low | Low | N/A | N/A | Very low |
| MA07-71, MA07-106 | Garage | Moderate | Low | N/A | N/A | Moderate |
| MA07-122, MA07-117 | Gas Works, Gasometer | Moderate/Low | Moderate | N/A | N/A | Moderate |
| MA07-138, MA07-149 | Iron Foundry | Low | Moderate | N/A | N/A | Low |
| MA07-198 | Ardwick Brick Field | Low | Very low | N/A | N/A | Moderate/Low |
| MA07-129, MA07-142 | Iron Works, Union Iron Works | Moderate | Low | N/A | N/A | Moderate |
| MA07-40 | Oil Depot | Low | Moderate/Low | N/A | N/A | Low |
| MA07-162, MA07-127, MA07-66, MA07-98, MA07-183, MA07-152 | Engineering Works | Low | Very Low | N/A | N/A | Low |
| MA07-148 | Sub-station | Very Low | Very Low | N/A | N/A | Very Low |
| MA07-104, MA07-97 | Co-operative Printing Works, Poster Printing Works | Low | Moderate/Low | N/A | N/A | Low |
| MA07-147 | Transport Permanent Way Depot | Moderate | Moderate | N/A | N/A | Moderate/Low |
| MA07-86 | Railway/Goods Yard, Manchester Central Station | Moderate | Moderate | N/A | N/A | Moderate |
| MA07-178 | Scrap Yard | Moderate | Low | N/A | N/A | Low |
| MA07-55, MA07-177, MA07-193 | Clothing Factory, Openshaw Dye Works | Moderate/low | Moderate | N/A | N/A | Low |
| MA07-192 | Timber Yard | Moderate/low | Moderate | N/A | N/A | Moderate/low |

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| Area reference ⁶⁹ | Area name | Human health risk | Groundwater risk | Surface water risk | Ecosystem risk | Buildings risk |
|---|---|-------------------|------------------|--------------------|----------------|----------------|
| MA07-69 | Public Laundry, Laundry | Very low to Low | Low | Very Low | N/A | Very Low |
| MA07-03 | Marsh Land | Low | Low | Low | N/A | Low |
| MA07-161 | Petroleum Depot | Low | Very low | N/A | N/A | Low |
| MA07-11, MA07-30 | Electrical Sub Station | Very low | Very low | N/A | N/A | Very low |
| MA07-41, MA07-45, MA07-118, MA07-131, MA07-64, MA07-88, MA07-167, MA07-.87, MA07-92, MA07-94 | Manchester South Junction and Altrincham Railway, | Moderate | Moderate | Moderate | N/A | Moderate |
| MA07-75 | Cotton House | Moderate/low | Moderate | N/A | N/A | Low |

Temporary effects

- 10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.
- 10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.
- 10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.
- 10.4.14 All of the sites set out in Table 12 have been assessed for the change in impact associated with the construction stage of the work. All of the sites were found to have no significant effects.
- 10.4.15 In the event that unexpected contamination is encountered during the construction of the route in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

- 10.4.16 Construction compounds located in this study area would include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials resulting in no significant effects.

Permanent effects

- 10.4.17 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.
- 10.4.18 The magnitude of the permanent effects and their significance has been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.
- 10.4.19 All of the sites set out in Table 13 have been assessed for the change in impact associated with the permanent post-construction stage. All of the site were found to have no significant effects (neutral or minor beneficial only).

Table 13: Summary of permanent (post-construction) effects

| Name and area ref | Receptor | Main baseline risk range | Main post-construction risk range | Post-construction effect |
|--------------------------------|--|--------------------------|-----------------------------------|--|
| On-site scrap yard MA07-178 | Human health (site users, uptake through direct contact, ingestion and inhalation of soil/dust and fibres) | Moderate | Low | Moderate beneficial effect (significant) |
| | Human health (off-site users, exposure to gases/vapours and dusts/fibres) | Moderate | Low | Moderate beneficial effect (significant) |

- 10.4.20 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people and property would be controlled to an acceptable level.

Mining/mineral resources

- 10.4.21 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed

Scheme or through temporary and/or permanent severance⁷⁴ or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

- 10.4.22 The land required for construction of the Proposed Scheme would not cross through any sand and gravel, sandstone, brick clay or coal MSAs.

Temporary effects

- 10.4.23 There are clay or salt resources in the study area and so no temporary effects from the construction of the Proposed Scheme on these resources would occur.

Sand, gravel and clay deposits

- 10.4.24 Temporary adverse effects may occur where construction compounds are proposed within a MSA. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

- 10.4.25 The following compounds fall within the study area:

- Altrincham Road vent shaft satellite compound;
- Palatine Road vent shaft satellite compound;
- Wilmslow Road vent shaft satellite compound;
- Lytham Road vent shaft satellite compound; and
- Manchester tunnel north portal main compound and transfer node.

PEDLs

- 10.4.26 The effect of construction of the Proposed Scheme on the identified PEDLs would be negligible as it is unlikely that construction of the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource.

Permanent effects

- 10.4.27 There are no identified open cast coal mines and deep coal mines in the study area, therefore no permanent effects from the Proposed Scheme on these resources would be present.

- 10.4.28 The majority of effects on other mining and mineral sites would be permanent.

Sand, gravel and clay deposits

- 10.4.29 The effects of construction of the Proposed Scheme on the mineral resources would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total mineral resources, this strip is less than 1% of the total, and the effect on the mineral site is

⁷⁴ In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site.

considered to be minor and therefore not significant. Mitigation measures (if any) would be discussed in advance of the works.

PEDLs

- 10.4.30 The effects of the Proposed Scheme on the identified PEDLs would be negligible as it is unlikely that construction of the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource.
- 10.4.31 Table 14 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 14: Summary of effects for mining and mineral resources

| Site name | Status | Description | Sensitivity/ value | Magnitude of impact | Effect and significance (Y/N) |
|----------------------------|------------------|--|-----------------------|------------------------|-------------------------------------|
| Mineral resources, Ardwick | Mineral resource | Multiple mineral sites in a cluster surrounding Ardwick, on land required for the Proposed Scheme. | Very low | Minor | Negligible (N) |

- 10.4.32 There would be negligible effects on mineral resources, which are not significant.

Geo-conservation sites

- 10.4.33 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

- 10.4.34 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site-specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.
- 10.4.35 Mitigation of the effects on mineral resources within the study area could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at MCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location.

Summary of likely residual significant effects

- 10.4.36 Based on the information currently available and with the application of the mitigation measures set out above, no likely significant residual effects are anticipated with respect to land quality.

10.5 Effects arising from operation

- 10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

- 10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

- 10.5.3 The Proposed Scheme within this area would include two auto-transformer stations located at the Palatine Road vent shaft and Lytham Road vent shaft locations. Auto-transformer stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.
- 10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

- 10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

- 10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

- 10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

- 11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Davenport Green to Ardwick area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.
- 11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.
- 11.1.3 Engagement with Manchester City Council (MCC) has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment. The viewpoints identified in this report are therefore provisional and will be further discussed with MCC.
- 11.1.4 The Volume 2: MA07 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06), viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).
- 11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

- 11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁷⁵.
- 11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July 2017 and winter surveys were undertaken in February 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

⁷⁵ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover and other unrecorded structures or features not captured by available data would mean the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement will be used to further refine the study area to focus on likely significant effects.
- 11.2.4 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.
- 11.2.5 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area. Tall buildings, viaducts, embankments, variations in local topography and the tight urban grain limit long-distance views across the area.
- 11.2.6 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.
- 11.2.7 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.
- 11.2.8 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.3 Environmental baseline

Existing baseline

Landscape baseline

- 11.3.1 The study area extends from the urban fringes of Manchester at Davenport Green and Manchester Airport in the south to the city centre in the north. The area is generally

flat and any minor changes in topography tend to be masked by overlying urban development. The highest area, around Newall Green, is approximately 74m above Ordnance Datum (AOD) and the ground falls away towards the shallow valley of the River Mersey at approximately 28m AOD.

- 11.3.2 The southern areas of Wythenshawe and Northenden are gently undulating and slope northwards towards the Mersey Valley. In places, particularly near the River Mersey, the natural landform is influenced by artificial elements, including man-made flood defences and the road embankments of the M60. The overriding character in the south of the study area is one of low-density suburban housing, crossed by a number of strategic east-west and north-south highways including the M60, M56 and arterial routes linking to the city centre, Manchester Airport and nearby Stockport and Altrincham. The built form generally comprises 20th century housing developed as part of a residential expansion from the city centre. Wythenshawe was planned as a garden city in the 1920's and comprises well-ordered, low density housing with generously sized private gardens, set within areas of amenity green space.
- 11.3.3 The Mersey Valley is low lying with gently sloping sides. The valley floor is largely occupied by recreational uses including golf courses, sports pitches, a number of water parks and several long-distance footpaths. The river is lined by artificial flood defences which have altered the natural landform of the floodplain. There are areas of woodland in the valley, for example around East Didsbury and stands of trees within the designed landscapes of the golf courses. These areas of woodland soften the appearance of the surrounding built form and shelter it from the intense activity associated with the major highways nearby, giving the area a feeling of tranquillity which contrasts with the more active and less tranquil adjoining built-up districts.
- 11.3.4 Between the Mersey Valley, Rusholme and Levenshulme, this suburban area, but with a relatively high building density, is crossed by arterial highways and railways. The buildings are predominantly residential and include 19th century villas in leafy suburbs, 19th century workers' terraces, planned social housing of the mid to late 20th century and later 20th century and early 21st century housing. The area is interspersed with a number of large ornamental parks and these, together with other managed open spaces such as sports facilities, contribute to the area's green, suburban character.
- 11.3.5 Neighbourhoods close to the city centre, such as Ardwick and parts of West Gorton, generally have a high density of built form, with limited green space and few street trees. Industrial and commercial development is commonplace which, along with parcels of previously developed and degraded land and transport infrastructure, gives the area its predominantly industrial character, although recent redevelopment includes new residential estates in Beswick, parts of West Gorton and Longsight. There is a strong visual connection with the city core, with views of prominent buildings, such as Beetham Tower and Piccadilly Tower, set against the skyline, particularly along the wider arterial routes leading to the centre.
- 11.3.6 LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be

refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas⁷⁶ and the Local Development Framework: Strategic Level City-Wide Urban Characterisation for Core Strategy⁷⁷. These published LCA's have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

- 11.3.7 For the purposes of this assessment, the Davenport Green to Ardwick study area has been subdivided into 28 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of these will be provided in Volume 5 of the formal ES. Twenty seven of the 28 LCAs would not be significantly affected by the Proposed Scheme because the majority of it would pass through the study area within tunnel. A summary of the remaining one LCA that would be significantly affected within the Davenport Green to Ardwick area is provided in Table 15.

⁷⁶ Natural England (2013, 2014), *National Character Area profiles*. Available online at: <https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles>

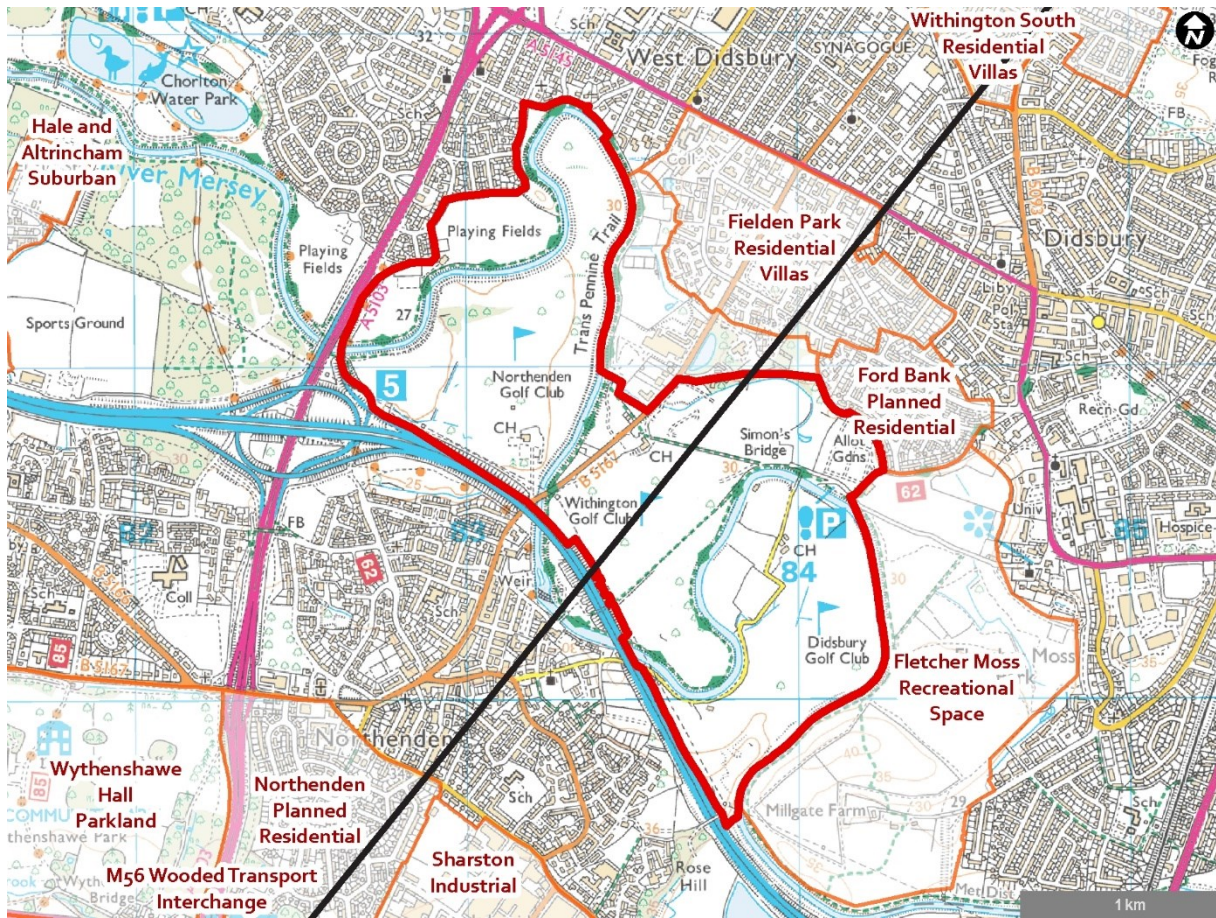
⁷⁷ Manchester City Council (2010), *strategic level city-wide urban characterisation for core strategy* Available online at: http://www.manchester.gov.uk/download/downloads/id/15520/strategic_level_city-wide_urban_characterisation_for_core_strategy.pdf

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Table 15: Summary of Significantly Affected LCAs

Mersey Valley Managed Open Space



Wide shallow landform along the River Mersey with raised flood embankment



Surrounding infrastructure screened by woodland blocks



The Mersey Valley Managed Open Space LCA occupies an area of the Mersey Valley between Northenden to the south and West Didsbury to the north. The LCA includes the flat valley bottom and its gently sloping sides. The predominant land use is recreational, with managed landscapes of golf courses and playing fields contrasting with the surrounding built form and road infrastructure. There is an extensive network of well-used public rights of way (PRoW), including the Trans Pennine Trail, which follows the course of the River Mersey. The river contributes to the scenic value of the LCA, though it is separated from its floodplain by artificial flood banks along both banks. Woodland within the golf courses, in the Didsbury St James Conservation Area, to the north-east of the LCA, and at the Stenner Woods and Millgate Fields Local Nature Reserve (LNR), to

the east of the River Mersey, provides a sense of enclosure and screening within the LCA. This woodland reduces the visual influence of built form on the northern boundary of the LCA, the effects of the M60 on its southern boundary and the influence of the B5167 Palatine Road which bisects the LCA from north to south. Overall the LCA has a feeling of tranquillity. Vegetation and footpaths are generally well-maintained. The LCA has some detracting features such as pylons. Despite the lack of built development within the LCA itself, artificial lighting in surrounding areas is typical of an urban setting.

The overall value of this LCA is medium to high based on its recreational value, woodlands, the footpath network and long distance trails adjacent to dense urban areas.

Visual baseline

- 11.3.8 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: MA07 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.xx.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational⁷⁸, 4: Transport, 5: Hotels/healthcare/education and 6: Employment.
- 11.3.9 Views experienced by occupants of residential properties are typically restricted by intervening buildings and other structures. In the city centre location, the dense urban grain tends to restrict and frame views, but from certain locations, such as on the edge of housing estates adjacent to open areas, views are more open. Established trees, mature garden vegetation and tree-lined open spaces filter views between Newhall Green, East Didsbury and Withington. Views are more open across the Mersey Valley from Didsbury and West Didsbury.
- 11.3.10 Recreational footpaths crossing the Davenport Green to Ardwick area are concentrated in the Mersey Valley, including the Trans Pennine Trail, National Cycle Routes 6, 60 and 62, MCC's promoted cycle routes and local PRow. Views from recreational routes are relatively open, particularly when looking east and west along the valley, although they are filtered by intervening vegetation in places. Elsewhere, cycle routes and PRow pass through more built up areas and views are restricted by intervening built form.
- 11.3.11 Views experienced by transport users tend to be restricted by intervening buildings, structures and vegetation.

11.4 Temporary effects arising during construction

- 11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main

⁷⁸ Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath.

construction works would take place, including the presence of compounds, main earthworks and structure works.

- 11.4.2 The effects associated with the construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the civil engineering stage in this area would be undertaken between late 2024 and the end of 2031. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.
- 11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

- 11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)⁷⁹ to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:
- design of structures to integrate as far as possible with existing skyline features and making use of a simple, clean and coherent palette of materials to help structures fit in the landscape, plus rationalisation of operation and security fencing and integration of the same with new planting, insofar as reasonably practicable;
 - avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction⁸⁰;
 - use of well-maintained hoardings and fencing;
 - prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
 - designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
 - replacement of any trees intended to be retained which may die as a consequence of nearby construction works.
- 11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

- 11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are:

⁷⁹ Supporting document: Draft Code of Construction Practice

⁸⁰ BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

the removal of existing vegetation, demolitions, earthworks and construction of the Manchester tunnel, the Ardwick cutting and the vent shafts, close to residential areas and other sensitive receptors. As a large proportion of the Proposed Scheme would be in tunnel, effects would be concentrated around the tunnel portals and vent shaft locations.

Landscape assessment

- 11.4.7 Based on the current design it is anticipated that the LCA set out in Table 16 would be significantly affected during construction of the Proposed Scheme.

Table 16: Summary description and assessment of effects on LCAs

| | |
|--|---|
| Mersey Valley Managed Open Space | High susceptibility and high sensitivity |
| <p>Susceptibility to change: The scenic quality of the Mersey Valley, its extensive woodland, visual containment, urban setting and detracting elements including powerlines and the B5167 Palatine Road impart a medium susceptibility to change arising from the Proposed Scheme.</p> <p>The Proposed Scheme including clearance of woodland, the construction of the Palatine Road vent shaft, the site access road and the satellite compound would noticeably alter landscape character, introducing uncharacteristic features into the scenic landscape of the Mersey Valley and reducing tranquillity. There would be a loss of woodland and green open space and construction traffic would introduce uncharacteristic vehicle movements into views. The construction works would be prominent in a localised area of the relatively flat valley floor, but their effects would be contained by the existing surrounding vegetation.</p> <p>There would therefore be an overall medium magnitude of change and moderate adverse effect.</p> | <p>Level of Effect:</p> <p>Moderate adverse (significant).</p> |

Visual assessment

Introduction

- 11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.
- 11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.
- 11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.
- 11.4.11 The Proposed Scheme would not give rise to significant effects at the Altrincham Road vent shaft site, as views of construction from the surrounding area would be largely screened by the Mid-Cheshire Line railway on embankment and vegetation lining the M56, which passes the shaft site on two sides. Construction activity associated with the Manchester tunnel north portal, Ardwick cutting and main compound would be largely screened from view by surrounding railway viaducts.

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Where visible, they would be seen in the context of the existing railway infrastructure and light industrial uses of the area and would be largely characteristic of the existing view. Therefore, they would not give rise to significant effects.

- 11.4.12 Table 17 identifies the locations where the construction of the Proposed Scheme would potentially result in significant effects. These are shown in Map Series LV-03 in the Volume 2: MA07 Map Book.

Table 17: Construction phase potentially significant visual effects

| | |
|--|--|
| <p>Views from PRoW 211 and Withington Golf Course (part of Trans Pennine Trail), Ashfield Lodge and Palatine Road (VPs 335.03.004 and 336.02.003) Map Number: LV-03-335 and 336</p> | <p>High and Medium-high Sensitivity Receptors</p> |
| <p>Residents of the B5167 Palatine Road and Ashfield Lodge would have filtered views, and users of the PRoW (211) and golfers would have open or filtered views of the construction works, the satellite compound and the construction site access road for the Palatine Road vent shaft. The construction works would introduce large-scale, uncharacteristic features into existing views of the wooded golf course, leading to a substantial change in the view. The removal of woodland and tree belts would open up views of construction across the golf course and from nearby housing.</p> <p>There would therefore be an overall high magnitude of change and major adverse effect.</p> | <p>Level of Effect: Major adverse (significant).</p> |
| <p>Views from Parkville Road, Ferndene Road, and Lynway Drive (VPs 336.02.009, 336.02.012 and 336.02.011) Map Number: LV-03-336</p> | <p>High Sensitivity Receptors</p> |
| <p>Residents in properties immediately adjacent to the Christie Hospital car park would have close views from upper floor windows of the construction works and the satellite compound for the B5093 Wilmslow Road vent shaft. Intervening trees in streets and gardens would partially filter views from Parkville Road and Ferndene Road. The construction works would introduce large-scale, uncharacteristic features into existing views of a car park in a suburban setting, leading to a substantial change in the view.</p> <p>There would therefore be an overall high magnitude of change and major adverse effect.</p> | <p>Level of Effect: Major adverse (significant).</p> |
| <p>Views from Handforth, Skelton, Tabley and Hardon Groves and from Manchester Enterprise Academy (MEA) and Birchfields Primary School (VPs 338.02.003 and 338.05.002) Map Number LV-03-338</p> | <p>High and Low Sensitivity Receptors</p> |
| <p>Residents (VP 338.02.003) would have close views from upper floor windows of the construction works and satellite compound for the Lytham Road vent shaft and auto transformer station. Ground floor views would be partially filtered through intervening garden vegetation. The construction works would introduce large-scale, uncharacteristic features into existing views of the school grounds in a suburban setting, leading to a substantial change in the view.</p> <p>There would therefore be an overall high magnitude of change and major adverse effect.</p> | <p>Level of Effect: Major adverse (significant).</p> |
| <p>Pupils and staff at MEA and Birchfields Primary School (VP 338.05.002) would have close and uninterrupted views of the construction works and satellite compound for the Lytham Road vent shaft and auto transformer station. Removal of mature street trees and hedging on Lytham Road would open-up currently filtered views of the MEA grounds from Birchfields Primary School. The construction works would introduce large-scale, uncharacteristic features into existing views of the school grounds, although they would be seen in the context of the railway embankment which forms the background to the view.</p> <p>There would therefore be an overall high magnitude of change and moderate adverse effect.</p> | <p>Level of Effect: Moderate adverse (significant).</p> |

Other mitigation measures

- 11.4.13 Not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. Therefore, no other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

- 11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents, users of PRoW and pupils and staff at nearby schools.
- 11.4.15 The significant effects that would remain after implementation of construction phase mitigation are summarised below:
- moderate adverse effects in relation to one LCA;
 - major adverse effects in relation to five residential viewpoint locations;
 - major adverse effects in relation to one recreational viewpoint location; and
 - moderate adverse effects in relation to one educational viewpoint location.

11.5 Permanent effects arising from operation

- 11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

- 11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2063) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:
- planting to mitigate views of ventilation shafts and the auto-transformer station; and
 - woodland planting to provide habitat connectivity and landscape/green infrastructure connectivity where reasonably practicable.

Assessment of impacts and effects

- 11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the presence of 6m high headhouses at the vent shaft locations, auto-transformer stations and associated ancillary development such as access tracks, muster areas, fencing and security lighting columns. The Proposed Scheme would be largely in tunnel and where above ground, characteristic of the urban setting for the vent shaft locations and the existing railway infrastructure and light industrial setting for the Manchester tunnel north portal.

Landscape assessment

- 11.5.4 Based on the current design, it is anticipated that the LCA described in Table 18 would be significantly affected during operation of the Proposed Scheme.

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Table 18: Operational phase significant landscape effects

| | |
|---|--|
| Mersey Valley Managed Open Space | Low to medium susceptibility and medium sensitivity |
| <p>Susceptibility to change: A landscape with a relatively high degree of visual containment creating some sense of tranquillity but in an urban setting and with existing infrastructure present results in a medium susceptibility to change arising from the Proposed Scheme.</p> <p>Year 1: The LCA would be directly affected by the introduction of the Proposed Scheme, which would include the 6m high headhouse and auto transformer station at the Palatine Road vent shaft site and associated ancillary development, such as access track, muster area, fencing and security lighting columns. The Proposed Scheme would be a prominent feature in the context of the flat landform of the Mersey valley floor, and the presence of infrastructure elements would be out of character within the open recreational green space. The loss of established trees within Withington Golf Course and adjacent to Ashfield Lodge during and presence of the Proposed Scheme, would alter the scenic quality and perception of the landscape. There would be noticeable changes to the extent of woodland belts within the LCA reducing the sense of enclosure and the presence of new structures with an industrial character in the Mersey valley would be out of character but these would be of localised occurrence in the scale of the LCA.</p> <p>There would therefore be an overall medium magnitude of change and moderate adverse effect.</p> | Level of effect: Moderate adverse (significant) |
| <p>Year 15: The mitigation planting would be established and would integrate the Proposed Scheme into the surrounding landscape.</p> <p>The overall effect would therefore reduce to non-significant.</p> | Non-significant |

Visual assessment

Introduction

- 11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.
- 11.5.6 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity would be lower than those reported.
- 11.5.7 Potential visual impacts arising from additional lighting at night during operation of the Proposed Scheme within the area may arise from continuous working and/or overnight working. Night time surveys will be undertaken to inform the assessment in the formal ES.
- 11.5.8 The Proposed Scheme would not give rise to significant effects at the Altrincham Road vent shaft site, as views of the headhouse from the surrounding area would be largely screened by the Mid-Cheshire Line railway on embankment and vegetation lining the M56. The Manchester tunnel north portal building and Ardwick cutting would be largely screened from view by surrounding railway viaducts, but where visible, they would be seen in the context of the existing railway infrastructure and would be largely characteristic of the existing view. Therefore, they would not give rise to significant effects.

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11.5.9 Table 19 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. These are shown in Map Series LV-04 in the Volume 2: MA07 Map Book.

Table 19: Operation phase potential significant visual effects

| | |
|---|--|
| <p>Views from PRoW 211 and Withington Golf Course (part of Trans Pennine Trail) and Ashfield Lodge and the B5167 Palatine Road (VPs 335.03.004 and 336.02.003) Map Number LV-03-335 and 336</p> | <p>High and medium-high sensitivity</p> |
| <p>Year 1 - Winter and summer: Residents on the B5167 Palatine Road and at Ashfield Lodge would have filtered views and users of the PRoW (211) and golfers would have open or filtered views of the 6m high headhouse at the Palatine Road vent shaft, the auto-transformer station and associated ancillary development including the paved muster area, fencing and lighting columns. The loss of vegetation would result in more open views across the golf course. The structures would be prominent and uncharacteristic new features in existing views of the wooded golf course, leading to a noticeable change in the view. Mitigation planting would not provide any visual integration at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.</p> | <p>Level of effect: Moderate adverse (significant)</p> |
| <p>Year 15 Summer: Mitigation planting would partially screen the headhouse, auto-transformer station, muster area, fencing and lighting columns from residences, but they would continue to be visible in close views from the golf course. The magnitude of change would therefore remain medium and there would be a moderate adverse effect.</p> | <p>Level of effect: Moderate adverse (significant).</p> |
| <p>Views from Handforth, Skelton, Tabley and Hardon Groves and from MEA and Birchfields Primary School (VPs 338.02.003, 338.05.002) Map Number LV-03-338</p> | <p>High and low sensitivity</p> |
| <p>Year 1 - Winter and summer: Residents (VP 338.02.003) would have close views from upper floor windows of the 6m height headhouse at the Lytham Road vent shaft, the auto transformer station and associated ancillary development including the paved muster area, fencing and lighting columns. Ground floor views would be partially filtered through intervening garden vegetation. The structures would be prominent and uncharacteristic new infrastructure features in existing views of the school grounds, though they would be seen in the context of the railway embankment which forms the background of the view. There would be a noticeable change in the view. There would therefore be an overall medium magnitude of change and moderate adverse effect.</p> | <p>Level of Effect: Moderate adverse (significant).</p> |
| <p>Year 1 - Winter and summer: Pupils and staff at MEA and Birchfields Primary School (VP 338.05.002) would have close and uninterrupted views of the 6m height headhouse at the Lytham Road vent shaft, the auto transformer station and associated ancillary development including the paved muster area, fencing and light columns. The loss of established street trees and hedge on Lytham Road would open views from the primary school. The structures would be prominent and uncharacteristic new infrastructure features in existing views of the school grounds, though they would be seen in the context of the railway embankment which forms the background of the view. There would be a noticeable change in the view. There would therefore be an overall medium magnitude of change and moderate adverse effect.</p> | <p>Level of Effect: Moderate Adverse (significant).</p> |
| <p>Year 15 - Summer: The magnitude of change would therefore remain medium and there would be moderate adverse effect</p> | <p>Level of Effect: Moderate Adverse (significant).</p> |

Other mitigation measures

- 11.5.10 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace, including use of materials, would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

- 11.5.11 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention.
- 11.5.12 No residual significant effects are anticipated following year 15 of operation for LCAs in the Davenport Green to Ardwick area. The significant effects that would remain after implementation of mitigation are summarised below:
- moderate adverse effects in relation to two residential viewpoint locations;
 - moderate adverse effects in relation to one recreational viewpoint location; and
 - moderate adverse effects in relation to one educational viewpoint location.

Monitoring

- 11.5.13 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

12 Socio-economics

12.1 Introduction

- 12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.
- 12.1.2 Engagement with Manchester City Council (MCC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.
- 12.1.3 The socio-economic effects on employment at a route-wide level will be reported in Volume 3: Route-wide effects (Section 12).
- 12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.

12.2 Scope, assumptions and limitations

- 12.2.1 The scope, assumptions and limitations for the socio-economics assessment will be set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)⁸¹.
- 12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.
- 12.2.3 Businesses may experience isolation effects as a result of the Proposed Scheme. Likely significant isolation effects will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

- 12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Davenport Green to Ardwick area. It lies within the administrative area of MCC and Trafford Metropolitan Borough Council (TMBC) within the Greater Manchester Combined Authority (GMCA) area. It also falls entirely within the Greater Manchester Local Enterprise Partnership area⁸²

⁸¹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

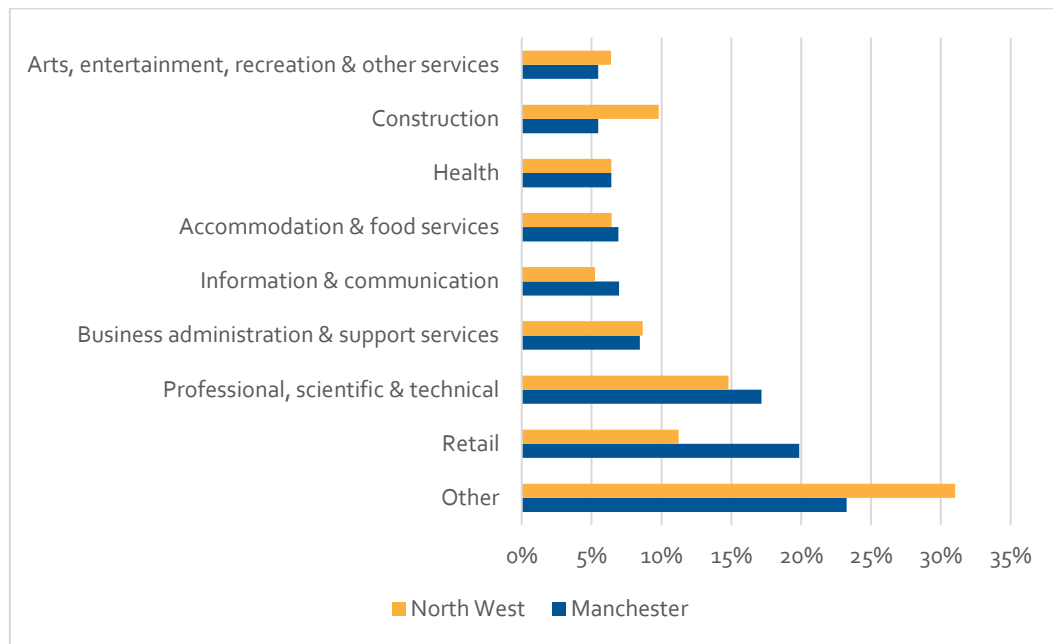
⁸² Greater Manchester Local Enterprise Partnership (2013). *Stronger Together - Greater Manchester Strategy*. GMCA.

and the North West region. Given the minor extent that the area is present within TMBC (100m), it is not included within the socio-economic baseline.

Business and labour market

12.3.2 In 2017 within the MCC area, the retail sector accounted for the largest proportion of organisations (20%). The professional, scientific and technical sector was the second largest (17%), followed by business administration and support services (8%). This is shown in Figure 8. For comparison, in the North West region, the largest sectors were professional, scientific and technical (15%), followed by retail (11%) and construction (10%)⁸³.

Figure 8: Business sector composition in MCC area and the North West^{84, 85}



12.3.3 In 2016, approximately 381,000 people worked in the MCC area⁸⁶. According to the Office for National Statistics (ONS) Business Register and Employment Survey 2016, the largest sectors in terms of share of employment in MCC were: professional, scientific and technical (13%), health, and business administration and support services (both 12%) and education (10%).

12.3.4 These compare with the largest sectors for the North West region⁸⁷, which were: health (14%), retail, and manufacturing (both 10%) and education (9%). This is shown in Figure 9.

⁸³ Office for National Statistics (2017) *UK Business Count – Local Units* <http://www.nomisweb.co.uk>; this number includes both residents and non-residents of the North-west region who work within its boundaries.

⁸⁴ Office for National Statistics (2017) *UK Business Count – Local Units* <http://www.nomisweb.co.uk>; this number includes both residents and non-residents of MCC who work within its boundaries.

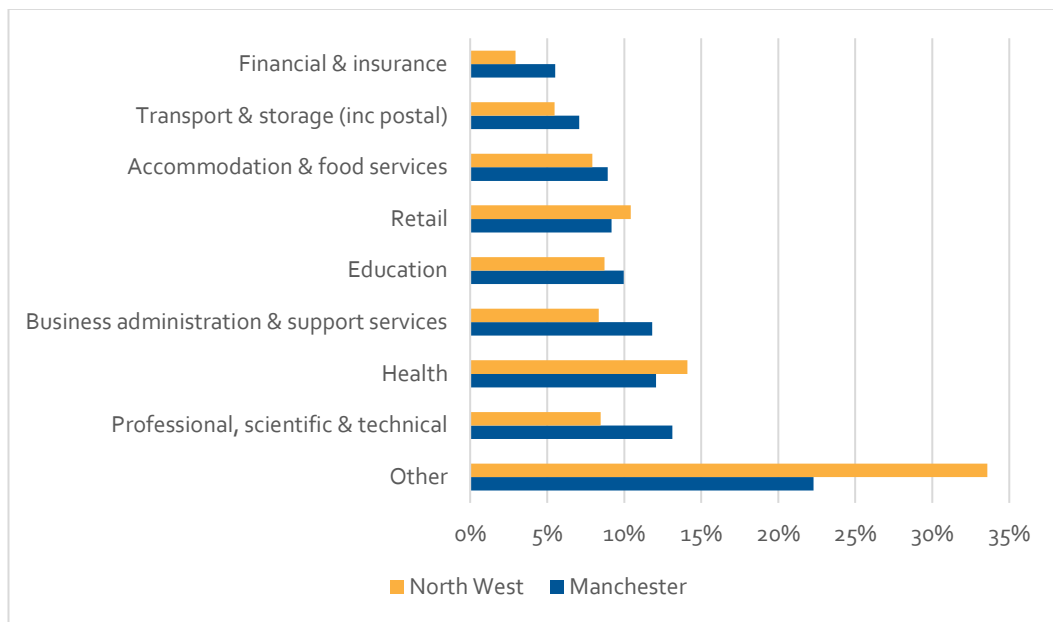
⁸⁵ 'Other' includes: Wholesale; Property; Transport and storage (inc postal); Manufacturing; Financial and insurance; Education; Motor trades; Public administration and defence; Mining, quarrying and utilities; Agriculture, forestry and fishing.

⁸⁶ Office for National Statistics (2016) *Business Register and Employment Survey* <http://www.nomisweb.co.uk>

⁸⁷ Office for National Statistics (2016) *Business Register and Employment Survey* <http://www.nomisweb.co.uk>

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Figure 9: Employment by industrial sector in the MCC area and the North West^{88 89}



12.3.5 According to the Annual Population Survey (2016)⁹⁰, the employment rate⁹¹ within the MCC area was 63% (237,000 people). This is lower than that recorded for the North West (72%) and England (74%). In 2016, unemployment in the MCC area was 8.3% which was higher than that recorded for the North West (5.3%) and England (5%).

12.3.6 The Annual Population Survey (2016) also shows that 39% of MCC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 34% in the North West and 38% in England; while 11% of residents had no qualifications, which is higher than the North West (10%) and England (8%).

Property

12.3.7 MCC estimated a shortfall of employment land to 2027 of up to 50ha, though there was thought to be low market demand in the south of Manchester⁹². The draft Greater Manchester Spatial Framework (2016)⁹³ identifies Manchester city centre as an area of disproportionate economic growth in Greater Manchester, with the priority being to protect its economic role. The importance of developing adequate employment sites is necessary for the GMCA’s strategy to support economic growth.

⁸⁸ Office for National Statistics (2016) *Business Register and Employment Survey* <http://www.nomisweb.co.uk>

⁸⁹ Percentage of employees within broad industrial groups. ‘Other’ includes: Public administration and defence; Information and communication; Manufacturing; Arts, entertainment, recreation and other services; Wholesale; Property; Construction; Motor trades; Mining, quarrying and utilities; Agriculture, forestry and fishing.

⁹⁰ NOMIS (2016), *Annual Population Survey*. Available online at <https://www.nomisweb.co.uk>

⁹¹ The proportion of residents aged 16-64 that are in employment.

⁹² Nathaniel Lichfield and Partners (2010), *Manchester Economy and Employment Space Study*. Based on upper range (includes 20% flexibility factors).

⁹³ Greater Manchester Combined Authority (2016) [online] Manchester. Available at: <https://www.greatermanchester-ca.gov.uk/GMSF>

- 12.3.8 The average vacancy rate for industrial and warehousing property in the MCC area in March 2018 has been assessed as 18% based on marketed space against known stock⁹⁴.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The draft Code of Construction Practice (CoCP)⁹⁵ includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitoring and managing flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

- 12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

⁹⁴ Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).

⁹⁵ Supporting document: Draft Code of Construction Practice

Temporary effects

Construction employment

- 12.4.3 It is currently expected that there would be one main construction compound – Manchester tunnel north portal main compound and transfer node – four satellite compounds and five railway system compounds in the Davenport Green to Ardwick area. The works undertaken at and managed from these sites would result in the creation of up to 2,200 person years of construction employment⁹⁶, which is broadly equivalent to 220 full-time jobs⁹⁷. Depending on skill levels required and the skills of local people, employment is potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).
- 12.4.4 Construction and the related direct employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from the expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).
- 12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

- 12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.
- 12.4.7 40 business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 40 units or sites, together, form 27 defined resources including:
- one business unit on Palatine Road;
 - four business units on Wilmslow Road;
 - a railway site between Ardwick Station, Blind Lane and Rondin Road (three business units);
 - eight business units on Rondin Road;
 - 17 business units on Ashton Old Road;
 - two business units on Hooper Street;

⁹⁶ Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days.

⁹⁷ Based on the convention that 10 employment years is equivalent to one full time equivalent job.

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- three business units on the A665 Midland Street;
- a secondary school on Lytham Road; and
- the Siemens Ardwick Traincare Facility.

12.4.8 Of the 27 resources identified, four businesses could potentially experience significant direct effects on business activities and employment, as set out in Table 20.

Table 20: Resources which would potentially experience significant direct effects

| Resource | Description of business activity |
|--|---|
| Secondary school on Lytham Road (car park and playing field) | Secondary school. |
| Siemens Ardwick Traincare Facility | Multiple unit maintenance depot and servicing of Siemens trains. |
| Metal supplier and management business on Rondin Road | Metal supplier and management business (scrap metal recycling). |
| Demolition and dismantling firm on Rondin Road | Family run demolition and dismantling firm with an on-site recycling plant; specialist in asbestos removal. |

12.4.9 A number of additional business resources between the A665 Midland Street and the A665 Chancellor Lane fall within both the Davenport Green to Ardwick area and the Manchester Piccadilly Station area (MA08). Potential effects on these resources are covered in Volume 2: MA08 Manchester Piccadilly Station.

Impact magnitude

12.4.10 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.11 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.12 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resulting effects would be as set out in Table 21. It should be noted that a precautionary approach has been taken in this assessment as outlined in Section 1.2 and the conclusions may change in the formal ES.

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Table 21: Significance of effects on resources

| Resource | Impact magnitude | Sensitivity | Significance of effect |
|---|------------------|-------------|------------------------|
| Secondary school on Lytham Road | High | Medium | Major adverse |
| Siemens Ardwick Traincare Facility | High | High | Major adverse |
| Metal supplier and management business on Rondin Road | Medium | Medium | Moderate adverse |
| Demolition and dismantling firm on Rondin Road | Medium | Medium | Moderate adverse |

- 12.4.13 The construction of Lytham Road vent shaft would require land that is currently used as car parking and playing fields of a secondary school on Lytham Road. These components are fundamental for the functioning of the educational institution and given the lack of alternative premises nearby, the school may need to relocate. The effect on this resource and its employees is assessed as major adverse and would therefore be significant.
- 12.4.14 The construction of Manchester tunnel north portal would require the reconfiguration of the Siemens Ardwick Traincare Facility. The business might have difficulties finding a suitable alternative location given the nature of its activities. The business requires bespoke premises that comprise office and industrial space for train maintenance works. A potential site for relocation would have to be located with good access to the TransPennine Express section of the railway network and have sufficient space to facilitate access for multiple trains as well as the space necessary to service them. The effect on this resource and its employees is assessed as major adverse and would therefore be significant.
- 12.4.15 The construction of Ardwick cutting would require the demolition of the premises occupied by a metal supplier and management business and a demolition and dismantling firm, both on Rondin Road. Both businesses might have difficulties finding suitable alternative premises and sites given the nature of the business activities. Although land is generally available in the Greater Manchester area, recycling activities onsite could constrain the ability of the firms to relocate. The effects on both of these resources and their employees are assessed as moderate adverse and both would therefore be significant.
- 12.4.16 An evangelical church providing support to start-ups is subject to direct impacts as a result of the Proposed Scheme. Significance of its effects will be assessed and reported in the formal ES.
- 12.4.17 Among all the affected resources, whether significantly or not, it is estimated that 510 jobs⁹⁸ would either be displaced or possibly lost within the Davenport Green to Ardwick area as a result of the Proposed Scheme. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to

⁹⁸ Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

residents due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the MCC area (approximately 381,000 jobs) and the scale of economic activity and opportunity in the area.

- 12.4.18 The resulting effects on employment will be reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

- 12.4.19 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.
- 12.4.20 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

- 12.4.21 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

- 12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

- 12.5.2 It is currently expected that no socio-economic resources would experience significant direct effects during the operation of the Proposed Scheme.

Operational employment

- 12.5.3 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.
- 12.5.4 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

- 12.5.5 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

- 12.5.6 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

- 12.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 12.5.8 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas⁹⁹; and
- 'non-residential receptors'¹⁰⁰ such as:
 - community facilities including schools, hospitals, places of worship and 'quiet areas'¹⁰¹; and
 - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy¹⁰², planning policy, planning practice guidance on noise (PPGN)¹⁰³ and EIA Regulations as described in the Scope and Methodology Report¹⁰⁴ (SMR).

13.1.3 Engagement has been undertaken with Manchester City Council (MCC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Davenport Green to Ardwick area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: MA07 Map Book. Map series SV-01

⁹⁹ 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.

¹⁰⁰ Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.

¹⁰¹ 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.

¹⁰² Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)

¹⁰³ Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: <https://www.gov.uk/guidance/noise--2>

¹⁰⁴ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

- 13.1.5 The assessment of noise and vibration likely significant effects on heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

- 13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1, Sections 8 and 9 and the SMR.
- 13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.
- 13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.
- 13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.
- 13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

- 13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.
- 13.3.2 The area is characterised by a mix of urban and suburban residential communities, interspersed with commercial premises and larger industrial estates. The sound environment is generally dominated by local and distant road traffic, overflying aircraft (on the flight paths of Manchester Airport), railway noise and local neighbourhood sources, with contributing natural sounds.
- 13.3.3 There are several main roads that contribute to the sound environment within the Davenport Green to Ardwick area: the M56 junctions 1-5 and M60 junctions 3-6, at the southern end of the area, and the main arterial roads into central Manchester

including the A5103 Princess Road, the A34 Kingsway/Anson Road, the A6 Stockport Road, the A57 Hyde Road and the A635 Ashton Old Road. Train services from Manchester Piccadilly Station to Chester, Birmingham and London, Sheffield and Leeds also pass through the Davenport Green to Ardwick area. Furthermore, Manchester Airport is located just outside the area, the northern approach and departure route of which overflies the residential communities in the south of the area.

- 13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.
- 13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors would not generally be adversely affected by vibration. Further information is provided in Volume 1, Section 8.
- 13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations¹⁰⁵, Roads¹⁰⁶ or Railways¹⁰⁷. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA07 Map Book) shows any noise Important Areas in the Davenport Green to Ardwick area.

13.4 Effects arising during construction

Assumptions and limitations

- 13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1, Section 8 and in the draft Code of Construction Practice (CoCP)¹⁰⁸. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.
- 13.4.2 The following assumptions have also been made in relation to the construction methods specific to the Davenport Green to Ardwick area.
- 13.4.3 At the Manchester tunnel north portal, tunnelling support activities (including erection of the tunnel boring machine (TBM), support for the TBM as it excavates, excavated material handling installation of tunnel lining and tunnel fit-out) would require 24hr working for reasons of safety, engineering practicability or to reduce the impact on existing transport.

¹⁰⁵ Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)

¹⁰⁶ Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)

¹⁰⁷ Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)

¹⁰⁸ Supporting document: Draft Code of Construction Practice

- 13.4.4 As the rotating head of the TBM 'cuts' through the ground, the TBM can give rise to ground-borne noise and vibration that is perceptible, albeit only for short periods of time (generally a matter of days as the TBM approaches and passes) at any individual receptor. The project will use modern TBMs that control vibration and ground-borne noise generation at source, as demonstrated on projects such as Crossrail. In line with the draft CoCP, there would be advanced notification to residents in relation to residual ground-borne noise or vibration effects. Taking account of this and the short duration of potential ground-borne noise or vibration effects, tunnel boring is not considered to result in likely significant effects on residential receptors. The potential effects of vibration and ground-borne noise arising from TBMs on non-residential receptors is being assessed and will be presented in the formal ES.
- 13.4.5 Materials (including tunnel lining segments) and equipment are likely to be transported from the surface to the TBM using a low speed construction railway. Other methods of moving material and equipment are available, but a construction railway is the most likely and is also the method which represents a reasonably foreseeable worst case in terms of ground-borne noise or vibration impacts; hence it has been assumed for this assessment. Excavated material would be transported to the surface by conveyor. Without mitigation, the construction railway could generate ground-borne noise and vibration in the same way as the permanent railway. HS2 will employ similar measures to those used by Crossrail (such as rolling stock suspension, management of rail joints and resilient elements between rail and tunnel). The construction railway is therefore not considered to result in likely significant effects on residential receptors. The potential effects of vibration and ground-borne noise arising from the construction railway on non-residential receptors is being assessed and will be presented in the formal ES.
- 13.4.6 There are four ventilation shafts which would involve construction works in proximity to the A560 Altrincham Road in Wythenshawe, the B5167 Palatine Road in Didsbury, the B5093 Wilmslow Road in Withington and Lytham Road in Levenshulme, respectively. The works would include construction of the piling platform, piling, pile cap construction, bulk excavation and concreting during core daytime hours and extending into the evening hours. Some activities have also been assumed to be undertaken at night-time (e.g. adit construction). This evening and night time working is for reasons of safety, engineering practicability and/or to reduce the impact on existing transport.
- 13.4.7 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

- 13.4.8 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP¹⁰⁹ (Section 13), which are:

¹⁰⁹Supporting document: Draft Code of Construction Practice

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
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- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors¹¹⁰;
- as part of BPM, mitigation measures are applied in the following order:
 - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
 - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
 - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
- contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.9 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.10 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

¹¹⁰ Including local businesses and quiet areas designated by the local authority.

Assessment of impacts and effects

13.4.11

Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: MA07 Map Book):

- Newall Green; properties on Rowarth Road, Burbage Road and Shepton Drive, arising from construction activities at the Manchester tunnel south portal (within the Hulseheath to Manchester Airport area (MA06));
- Wythenshawe; properties on Greenwood Road, the A560 Altrincham Road and Neath Avenue, arising from construction activities associated with the Altrincham Road vent shaft;
- Didsbury; properties on the B5167 Palatine Road to the west of Withington Golf Course, arising from construction activities associated with the Palatine Road vent shaft;
- Didsbury; properties on Hayescroft Gardens, Adamson Gardens, Winchester Park and Dene Park, arising from construction activities associated with the Palatine Road vent shaft;
- Withington; properties on the B5093 Wilmslow Road and side streets between Mayville Drive and Rathen Road, arising from construction activities associated with the Wilmslow Road vent shaft;
- Levenshulme; properties within the area bounded by the A34 Birchfields Road to the west, the A5079 Slade Lane to the east, the A5079 Kingsway to the south and the A6144 Old Hall Lane to the north, arising from construction activities associated with the Lytham Road vent shaft;
- West Gorton; properties on Anthony Close, Wigley Street, Hayfield Close and Bennett Street, arising from demolition works and construction activities associated with the Manchester tunnel north portal, transfer node, Ardwick cutting and the Piccadilly viaduct (within MA08 Manchester Piccadilly Station);
- Beswick; properties on Bell Crescent, Holly Street, Lloyd Wright Avenue and adjoining streets, arising from demolition works and construction activities associated with the Manchester tunnel north portal, transfer node, Ardwick cutting and the Piccadilly viaduct (within MA08 Manchester Piccadilly Station); and
- Beswick; properties on Viaduct Street, Byrcland Close, Ashlar Drive and Aden Close, arising from demolition works and construction activities associated with the tunnel transfer node, Ardwick cutting and the Piccadilly viaduct (within MA08 Manchester Piccadilly Station).

13.4.12 Map Series SV-01 (Volume 2: MA07 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, the following are likely to experience significant effects (to be confirmed in the formal ES):

- The Open University on Altrincham Road, Wythenshawe;
- The Church Of Jesus Christ Of Latter-Day Saints, on Altrincham Road, Wythenshawe;
- Britannia Country House Hotel on Palatine Road, West Didsbury;
- Nazarene Theological College on Dene Road, West Didsbury;
- Didsbury Community Church on Dene Road, West Didsbury;
- The Christie Hospital on Wilmslow Road, Withington;
- The Boundary Veterinary Clinic on Wilmslow Road, Withington;
- Birchfields Primary School on Lytham Road, Levenshulme; and
- Manchester Enterprise Academy on Lytham Road, Levenshulme.

13.4.13 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.14 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- B5167 Palatine Road between the A5103 Princess Parkway and the B5093 Wilmslow Road;
- A5145 Barlow Moor Road between the A5103 Princess Road and the B5093 Wilmslow Road;
- B5093 Wilmslow Road between School Lane and A6010 Wilbraham Road; and
- A34 Birchfields Road between the A5093 Moseley Road and Lytham Road in Levenshulme.

13.4.15 The magnitude and extent of effect will depend on the level of construction traffic using the road. Any residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.16 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

- 13.4.17 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary indirect effects from construction traffic.
- 13.4.18 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Any likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

- 13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1, Sections 4 and 8 and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1, Section 4 and as outlined below for the Davenport Green to Ardwick area.
- 13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to six trains per hour in each direction on the main lines with an operating speed of up to 230kph. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1, Section 4.

Avoidance and mitigation measures

- 13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.
- 13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1, Section 9.

Airborne noise

- 13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards¹¹¹.
- 13.5.6 Noise effects would also be reduced in other locations along the route by engineering structures (e.g. retained cuttings on the approach to tunnel portals) and landscape earthworks provided to avoid or reduce significant visual effects.

¹¹¹ Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014

- 13.5.7 As required by statute, noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where¹¹² noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe¹¹³ or the maximum noise level criteria¹¹⁴ defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.
- 13.5.8 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

- 13.5.9 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.
- 13.5.10 Specifically, in the tunnels under Manchester, a low-vibration track-form is assumed to be used to mitigate ground-borne noise and vibration from the passage of trains.

Assessment of impacts and effects

- 13.5.11 Map Series SV-01 (Volume 2: MA07 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or LpAeq,day) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or LpAeq,night) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.
- 13.5.12 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

¹¹² Following Government's National Planning Practice Guidance. Available online at: <https://www.gov.uk/government/collections/planning-practice-guidance>

¹¹³ World Health Organization (2010), *Night time Noise Guidelines for Europe*.

¹¹⁴ Dependent on the number of train passes.

- 13.5.13 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.
- 13.5.14 Likely significant airborne noise effects arising from permanent changes to existing roads, will be reported in the formal ES.

Other mitigation measures

- 13.5.15 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

- 13.5.16 The railway is largely in tunnel in this area. It is anticipated that mitigation incorporated in the Proposed Scheme, described in Volume 1 (Section 9), section 2.2 and presented in Map Series SV-01 (Volume 2: MA07 Map Book) and Map Series CT-06 (Volume 2: MA07 Map Book), would avoid likely significant effects from airborne and groundborne noise that would otherwise arise from operation of the Proposed Scheme.
- 13.5.17 Taking account of the avoidance and mitigation measures this initial assessment has identified no airborne noise effects with the potential to be considered significant on a community basis due to increased noise levels forecast to arise from the operation of the Proposed Scheme in line with the SMR.
- 13.5.18 The initial assessment indicates that the forecast noise from long-term railway operation will not exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties close to the Proposed Scheme.
- 13.5.19 Map Series SV-01 (Volume 2: MA07 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this community area as a result of operational airborne noise.
- 13.5.20 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.
- 13.5.21 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

- 13.5.22 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 13.5.23 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.
- 13.5.24 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

- 14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Davenport Green to Ardwick area.
- 14.1.2 Engagement with Highways England, Manchester City Council (MCC), Transport for Greater Manchester (TfGM) and Greater Manchester Combined Authority (GMCA) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.
- 14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book.

14.2 Scope, assumptions and limitations

- 14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)¹¹⁵.
- 14.2.2 The study area for traffic and transport includes the communities of Cheadle, Longsight, Northenden, Northern Moor, Old Trafford, Ringway, Reddish, West Gorton, Withington and Wythenshawe together with stations on the West Coast Main Line in the Davenport Green to Ardwick area, along with stations on the Metrolink tram network servicing the area. Stockport Station is located to the east, Manchester Piccadilly Station to the north-west and Manchester Airport to the south. These provide national rail services and international air services.
- 14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. The strategic roads in this area are the M56 and the M60.
- 14.2.4 The local roads in the study area include: the A34 Kingsway, the A5103 Princess Parkway, the A5145 Barlow Moor Road, the A560 Altrincham Road, the A57 Hyde Road, the A6010 Pottery Lane, the A635 Ashton Old Road, the B5093 Wilmslow Road/Moseley Road, the B5167 Palatine Road, Birchfields Road, Chapman Street, Gorton Road and Lytham Road.
- 14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.
- 14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

¹¹⁵ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

14.3 Environmental baseline

Existing baseline

- 14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, MCC, TfGM and GMCA (including provision of information on public transport, Public Rights of Way (PRoW) and accident data) and desktop analysis.

Surveys

- 14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from MCC, GMCA, TfGM and Highways England. Assessment of the data indicates that the peak hours in the area are 07:30-08:30 and 17:30-18:30. However, there are only small differences (typically less than 3%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, which are the periods when construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 periods have been used as the assessment hours representing a reasonable worst case.
- 14.3.3 Public Rights of Way (PRoW) surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

- 14.3.4 The strategic routes that pass through the area are the M56 and the M60. The strategic road network in and around the Davenport Green to Ardwick area is busy at peak times and delays can be experienced.
- 14.3.5 The local roads that could be affected by the Proposed Scheme include: the A34 Kingsway, the A5103 Princess Parkway, the A5145 Barlow Moor Road, the A560 Altrincham Road, the A57 Hyde Road, the A6010 Pottery Lane, the A635 Ashton Old Road, the B5093 Wilmslow Road/Moseley Road, the B5167 Palatine Road, Birchfields Road, Chapman Street, Gorton Road and Lytham Road. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times.
- 14.3.6 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport (DfT)¹¹⁶. Data for the three year period

¹¹⁶ STAT19 Road Safety Data 2014-2016 Department for Transport

(2014-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

- 14.3.7 No accident clusters were identified within the Davenport Green to Ardwick area.
- 14.3.8 The route of the Proposed Scheme would not cross any roads with footways within the Davenport Green to Ardwick area. The route of the Proposed Scheme is in tunnel through most of the Davenport Green to Ardwick area, emerging from the Manchester tunnel at Ardwick Depot with access required to the vent shafts locations.

Parking and loading

- 14.3.9 The parking at: the Christie Hospital, specifically Car Park D off the B5093 Wilmslow Road; the A665 Chancellors Lane; the Siemens Ardwick Traincare Facility on Rondin Road; the Manchester Enterprise Academy (MEA) on Lytham Road; and Hooper Street could be affected by the Proposed Scheme.

Public transport network

- 14.3.10 Since the route is mostly in tunnel, no bus routes would be directly affected by the route of the Proposed Scheme in the Davenport Green to Ardwick area. However, bus routes could be affected by construction traffic.
- 14.3.11 National and local rail services are accessible via Manchester Piccadilly Station, Manchester Airport and Stockport Station outside the Davenport Green to Ardwick area and local rail services are accessible via Ardwick Station and tram services on the Metrolink tram line in South Manchester. Manchester Piccadilly Station, Manchester Airport and Stockport Station provides access to national services to Birmingham and London. Ardwick Station and tram stations on the Metrolink tram line provide access to local services to stations in the Davenport Green to Ardwick area.

Non-motorised users

- 14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Cheadle, Longsight, Northenden, Northern Moor, Old Trafford, Ringway, Reddish, West Gorton, Withington and Wythenshawe. Footways vary in width and condition within these areas. Footpaths adjacent to B5093 Wilmslow Road, B5167 Palatine Road and Lytham Road, cross the proposed access routes to vent shaft locations. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.
- 14.3.13 Since the route is mostly in tunnel, no PRow within the Davenport Green to Ardwick area would be affected either temporarily or permanently due to, for example, temporary diversion of PRow during construction and permanent upgrades, including for maintenance access to the Proposed Scheme.
- 14.3.14 In the Davenport Green to Ardwick area, National Cycle Route 62, 6, 85, 86 and the Fallowfield Loop (part of the National Cycle Network) pass through the area.

Waterways and canals

- 14.3.15 There is one navigable waterway in the Davenport Green to Ardwick area; Ashton Canal which is located north of Openshaw. However, it is not expected that there

would be any effects on waterways and this topic is not considered further in this assessment.

Air transport

- 14.3.16 Manchester Airport is located south of the Davenport Green to Ardwick area. Highway access to the airport is primarily from the strategic road network via M56 junction 5 and junction 6. The Airport is also served by national rail services and Metrolink services. However, it is not expected that there would be any effects on air transport and this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

- 14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRow) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRow would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and

- on-site welfare facilities would be provided which would reduce daily travel by site workers.
- 14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)¹¹⁷ includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.
- 14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.
- 14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant
- 14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.
- 14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans¹¹⁸ to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.
- 14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:
- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
 - planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
 - programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

¹¹⁷ Supporting document: Draft Code of Construction Practice

¹¹⁸ Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

Assessment of impacts and effects

Temporary effects

- 14.4.8 The traffic and transport impacts during the construction period within the Davenport Green to Ardwick area are likely to include:
- construction vehicle movements to and from the construction compounds;
 - road closures and associated realignments and diversions; and
 - possessions on the conventional rail network and impacts on rail facilities at Ardwick Depot.
- 14.4.9 The construction assessment has also considered any impacts in the Davenport Green to Ardwick area that arise from construction of the Proposed Scheme in the adjoining community areas.
- 14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.
- 14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: MA07 Map Book.

Strategic and local highway network

- 14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:
- the M56 junction 3a;
 - the M60 junction 24;
 - the A34 Kingsway;
 - the A5103 Princess Parkway;
 - the A5145 Barlow Moor Road;
 - the A560 Altrincham Road;
 - the A57 Hyde Road;
 - the A6010 Pottery Lane;
 - the A635 Ashton Old Road;
 - the B5093 Wilmslow Road/Moseley Road.
 - the B5167 Palatine Road;

- Birchfields Road;
- Chapman Street; and
- Gorton Road.

- 14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. In the Davenport to Ardwick area, all temporary diversions are required as part of a permanent diversion.
- 14.4.14 Permanent changes to highways are reported under operation.
- 14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.
- 14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

- 14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Parking and loading

- 14.4.18 It is currently expected that the Proposed Scheme could have impacts on parking. There will be temporary impacts on parking at: the Christie Hospital, specifically Car Park D off B5093 Wilmslow Road; the A665 Chancellor Lane; the Siemens Traincare Facility at Rondin Road); the MEA at Lytham Road; and Hooper Street which would be suspended for construction of the Proposed Scheme. Some roads that could be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

- 14.4.19 There are no temporary road closures or diversions required in this area that would substantially affect bus services or stops although any increase in general traffic delays could affect bus services. Any consequent effects will be reported in the formal ES.
- 14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of and the reconfiguration of the existing Ardwick Depot and its rail facilities. The majority of the rail possessions would have little or no impact on the operation of rail services as they would be relatively minor localised works, such as work on and adjacent to track when not in use. Rail possessions would be required to undertake localised works, including construction of facilities and construction compounds/depot. This could result in disruption to operation of the conventional railway, although many of the interventions would be combined to reduce the

frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

- 14.4.21 The construction works associated with the Proposed Scheme are not currently expected to require the temporary closure or diversion/realignment of PRow and roads in this area.

Permanent effects

- 14.4.22 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

- 14.4.23 The implementation of the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.
- 14.4.24 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

- 14.4.25 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including: the M56 junction 3a; the M60 junction 24; the A34 Kingsway; the A5103 Princess Parkway; the A5145 Barlow Moor Road; the A560 Altrincham Road; the A57 Hyde Road; the A6010 Pottery Lane; the A635 Ashton Old Road; the A665 Midland Street; the B5093 Wilmslow Road/Moseley Road; the B5167 Palatine Road; Birchfields Road; Chapman Street; Gorton Road; Hooper Street; and Rondin Road. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.
- 14.4.26 Construction of the Proposed Scheme is expected to temporarily suspend parking spaces at: the Christie Hospital, specifically Car Park D at B5093 Wilmslow Road; the A665 Chancellor Lane; the Siemens Traincare Facility at Rondin Road; the MEA at Lytham Road; and Hooper Street.
- 14.4.27 Construction of the Proposed Scheme is expected to require temporary possessions in the Ardwick Depot associated with its reconfiguration.
- 14.4.28 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

- 14.5.1 The following measure has been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users: changes to the highway network to accommodate users of the Proposed Scheme.

Assessment of impacts and effects

- 14.5.2 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

- 14.5.3 The operational impacts are primarily related to the beneficial impacts of the new and improved rail services, the opportunities to improve conventional rail services and increased traffic in the area for users of Manchester Airport High Speed station and Manchester Piccadilly High Speed station which are in the Hulseheath to Manchester Airport (MA06) and Manchester Piccadilly Station (MA08) areas respectively.
- 14.5.4 The operation of the Proposed Scheme could result in impacts within this area due to increased traffic associated with users of Manchester Airport High Speed station and Manchester Piccadilly High Speed station. However, the maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

Highway network

Strategic and local highway network

- 14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include:
- the closure of A665 Midland Street;
 - the closure of Hooper Street; and
 - the closure of Rondin Road.
- 14.5.6 It is likely that traffic in the Davenport Green to Ardwick area could increase as a result of additional users of the high speed stations at Manchester Piccadilly and Manchester Airport.
- 14.5.7 The effects of these changes will be reported in the formal ES.

Accidents and safety

- 14.5.8 Changes in traffic could result in an increase in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Parking and loading

- 14.5.9 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This could include permanent loss of some parking lost during construction at: the Christie Hospital

specifically Christie Car Park D; the A665 Chancellor Lane; the Siemens Traincare Facility at Rondin Road; the MEA at Lytham Road; and Hooper Street. Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

- 14.5.10 HS2 Ltd will work with the businesses affected to identify opportunities where reasonably practicable to mitigate effects on parking.

Public transport network

- 14.5.11 The Manchester Piccadilly and Manchester Airport high speed stations lie to the north and south of the Davenport Green to Ardwick area respectively. These will benefit the Davenport Green to Ardwick area with: increased rail capacity and the opportunity for additional services on the conventional rail network; and new high speed services to the Midlands and South of England and significantly improved journey times between cities in the North, the Midlands and the South of England.
- 14.5.12 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Davenport Green to Ardwick area.

Non-motorised users

- 14.5.13 It is not currently expected that the operation of the Proposed Scheme would result in any PRoW being either permanently realigned or diverted in this area.

Other mitigation measures

- 14.5.14 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.
- 14.5.15 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

- 14.5.16 Operation of the Proposed Scheme would result in substantial benefits to users of rail services at Manchester Piccadilly station and Manchester Airport high speed station. These include increased capacity, reduced journey times and additional services including released capacity.
- 14.5.17 Operation of the Proposed Scheme would require the permanent diversion of the A665 Midland Street, Hooper Street and Rondin Road. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes.
- 14.5.18 Operation of the Proposed Scheme is expected to result in permanent loss of parking at: the Christie Hospital, specifically Car Park D; the A665 Chancellor Lane; the Siemens Traincare Facility; the MEA at Lytham Road; and Hooper Street.
- 14.5.19 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

- 14.5.20 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 14.5.21 A station travel plan would detail monitoring of travel associated with operation of the Manchester Airport and Manchester Piccadilly High Speed stations.
- 14.5.22 There are no other area-specific monitoring requirements currently proposed for traffic and transport.

15 Water resources and flood risk

15.1 Introduction

- 15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Davenport Green to Ardwick area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.
- 15.1.2 Engagement has been undertaken with the Environment Agency, Greater Manchester Combined Authority (GMCA) and Manchester City Council (MCC), which is the Lead Local Flood Authority (LLFA), and United Utilities Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.
- 15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.
- 15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:
- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
 - a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
 - route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)¹¹⁹.

15.2 Scope, assumptions and limitations

- 15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out Volume 1, Section 8 and the Scope and Methodology Report (SMR)¹²⁰.
- 15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Davenport Green to Ardwick area, the study area has been extended

¹¹⁹ National Planning Policy Framework, DCLG, 2015.

¹²⁰ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

to 1.7km for some features as there is the potential for impacts on groundwater, groundwater – surface water interactions and groundwater dependent habitats from construction of the Proposed Scheme.

- 15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.
- 15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.
- 15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of Baguley Brook and the River Mersey at the proposed location of the tunnel ventilation shaft.
- 15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.
- 15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.
- 15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

- 15.3.1 All surface water bodies in the study area fall within the Mersey Upper management catchment of the North West river basin district (RBD).
- 15.3.2 The river basin management plan¹²¹ identifies the chemical¹²² and ecological¹²³ status of surface water bodies, and the quantitative¹²⁴ and chemical¹²⁵ status of groundwater bodies within this RBD.
- 15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of

¹²¹ Environment Agency (2015), *Water for life and livelihoods Part 1: Humber river basin district: River basin management plan*.

¹²² The chemical status of surface waters reflects concentrations of priority and hazardous substances present.

¹²³ The ecological status of surface waters is determined based on the following elements:

- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in Section 7, Ecology and biodiversity;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.

¹²⁴ The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance.

¹²⁵ The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present.

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good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

- 15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.
- 15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 22. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 22: Surface water body receptors

| Water body name and location ¹²⁶ | Designation | Q95 value (m ³ /s) ¹²⁷ | Receptor value | Parent WFD water body name and identification number ¹²⁸ | Current WFD status/Objective ¹²⁹ |
|--|-------------|--|----------------|--|---|
| Fairywell Brook WR-01-309b E6 | Main river | 0.004 | Moderate | Sinderland Brook (Fairywell Brook and Baguley Brook) GB112069061270 | Moderate/Moderate by 2015 |
| Baguley Brook WR-01-309b G5 | Main river | 0.01 | High | | |
| River Mersey WR-01-309b I5 J4 | Main river | 1 | Very High | Mersey (upstream of Manchester Ship Canal) GB112069061030 | Moderate/Moderate by 2015 |
| Tributary of the River Mersey 2 WR-01-309b J5 | Main river | <0.002 | Low | | |
| Cringle Brook ¹³⁰ WR-01-309a E6 | Main river | 0.007 | Moderate | Fallowfield Brook GB112069061410 | Moderate/Good by 2027 |
| Fallowfield Brook ¹² WR-01-309a F6 | Main river | 0.003 | Moderate | | |
| Tributary of Platt Brook 1 ¹² WR-01-309a G7 | Main river | n/a ¹³¹ | Moderate | Platt Brook (Source to Fallowfield Brook) GB112069061060 | Moderate/Good by 2027 |
| Gore Brook ¹² WR-01-309a G7 | Main river | 0.01 | Moderate | | |

¹²⁶ The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA07 Map Book figure (in this case WR-01).

¹²⁷ This is the flow within the watercourse that is exceeded for 95% of the time.

¹²⁸ The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

¹²⁹ Status and objectives are based on those set out in the 2015 River basin management plan.

¹³⁰ Urban watercourses majority culverted, included due to some potential for groundwater/surface water effects from dewatering for tunnel ventilation shaft construction. Assumed Moderate value receptors.

¹³¹ Q95 is unavailable for this watercourse as it is tunnelled at this location.

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| Water body name and location ¹²⁶ | Designation | Q95 value (m ³ /s) ¹²⁷ | Receptor value | Parent WFD water body name and identification number ¹²⁸ | Current WFD status/Objective ¹²⁹ |
|---|----------------------|--|----------------|--|---|
| Corn Brook ¹²² WR-01-309a 15 16 | Ordinary watercourse | 0.06 | Moderate | Irwell/Manchester Ship Canal (Irk to confluence with Upper Mersey) GB112069061452 | Moderate/Moderate by 2015 |

Abstractions and permitted discharges (surface water)

- 15.3.6 There are no licensed surface water abstractions in the study area.
- 15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.
- 15.3.8 There are 29 consented discharges to surface waters within the study area, one of which is within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

- 15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 23. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 23 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 23: Summary of geology and hydrogeology in the study area

| Geology ¹³² | Distribution | Formation description | Aquifer classification | WFD body (ID) and current overall status ¹³³ | WFD status objective ¹³⁴ | Receptor value |
|---|---|-----------------------------|------------------------|---|-------------------------------------|----------------|
| Superficial deposits¹³⁵ | | | | | | |
| Alluvium | In the base of the valley of the River Mersey | Clay, silt, sand and gravel | Secondary A | Weaver and Dane Quaternary Sand and Gravel Aquifers | Good by 2027 | Moderate |

¹³² In recent years the BGS has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.

¹³³ As stated in the 2015 River basin management plan.

¹³⁴ As stated in the 2015 River basin management plan.

¹³⁵ Although the superficial deposits in the study area are not within the Weaver and Dane Quaternary sand and gravel aquifers WFD groundwater body catchment area, the Environment Agency have advised that all superficial deposits in this study area should be considered as part of this WFD water body.

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| | | | | | | |
|------------------------------|--|-----------------------------|------------------------------|--|--|----------|
| River terrace deposits | In the base of the valley of the River Mersey | Sand and gravel | Secondary A | (GB41202G991700) Poor ²⁷ | | Moderate |
| Glaciofluvial sheet deposits | Bands either side of the valley of the River Mersey | Sand and gravel | Secondary A | | | Moderate |
| Glaciofluvial deposits | Bands around M56 motorway junction with A5103 | Sand and Gravel | Secondary A | | | Moderate |
| Glacial till | Present on high ground across majority of study area | Clay, silt, sand and gravel | Secondary (undifferentiated) | | | Moderate |
| Shirdley Hill Sand Formation | Present in isolated areas north-east of Withington and Chorley-cum-Hardy | Sand | Secondary A | | | Moderate |

Bedrock

| | | | | | | |
|--|--|---|-------------|---|--|----------|
| Mercia Mudstone Group – Sidmouth Mudstone Formation – Bollin Mudstone Member | Underlies the route south of Wythenshawe | Mudstone and siltstone with some halite bearing units, and presence of gypsum | Secondary B | Not assessed by the Environment Agency | Not assessed by the Environment Agency | Moderate |
| Mercia Mudstone Group – Tarporley Siltstone Formation | Underlies the route between Wythenshawe and Northenden | Siltstone, mudstone and sandstone | Secondary B | Not assessed by the Environment Agency | Not assessed by the Environment Agency | Moderate |
| Sherwood Sandstone Group – Helsby Sandstone Formation | A small wedge-shaped area between Northenden and the M60 | Pebbly sandstone | Principal | Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (GB1201G101100) Poor | Good by 2021 | High |
| Sherwood Sandstone Group – Wilmslow Sandstone Formation | Present in a band between the M60 and Withington | Sandstone | Principal | | | High |
| Sherwood Sandstone Group – Chester Formation | Present between Withington, Didsbury and | Sandstone | Principal | | | High |

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| | | | | | |
|--|--|------------------------|-------------|--|----------|
| | Rusholme and Fallowfield | | | | |
| Cumbrian Coast Group – Manchester Marls Formation | Present in north-west to south-east trending bands in the Rusholme and West Gorton areas | Mudstone | Secondary B | | Moderate |
| Appleby Group - Collyhurst Sandstone Formation | | Sandstone | Principal | | High |
| Warwickshire Group - Halesowen Formation | | Sandstone | Secondary A | | Moderate |
| Warwickshire Group - Halesowen Formation – Great Mine Limestone | | Limestone | Secondary A | | Moderate |
| Warwickshire Group - Halesowen Formation – Holt Town Sandstone Bed | | Sandstone | Secondary A | | Moderate |
| Warwickshire Group - Etruria Formation | Present in a north-west to south-east trending band in the Rusholme area | Mudstone and sandstone | Secondary A | | Moderate |

Superficial deposit aquifers

- 15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 23, it outlined briefly as follows:
- 15.3.11 Alluvium, river terrace deposits, glaciofluvial sheet deposits, glaciofluvial deposits, Shirdley Hill Sand Formation and glacial till, which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow¹³⁶ to rivers. They have therefore been classified as moderate value receptors.

¹³⁶ Baseflow index defined as the proportion of a river's flow that comes from groundwater sources. Baseflow sustains a river flow in dry weather.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 23 is outlined briefly as follows:

- the Sherwood Sandstone (locally comprising sandstones of the Helsby Sandstone Formation, Wilmslow Sandstone Formation and Chester Formation) and the Collyhurst Sandstone Formation within the Appleby Appleby Group have been classified as Principal aquifers by the Environment Agency and are therefore high value receptors;
- the Mercia Mudstone Group (locally comprising the Sidmouth Mudstone Formation and Tarporley Siltstone Formation) has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are however occasionally obtainable within this rock formation and it has therefore been classified as a moderate value receptor;
- the Warwickshire Group, comprising the Halesowen Formation, including the Great Mine Limestone and Holt Town Sandstone Bed, and Etruria Formation, has been classified as a Secondary A aquifer by the Environment Agency and has therefore been classified as a moderate value receptor; and
- the Manchester Marls Formation within the Cumbria Coast Group has been classified as a Secondary B aquifer by the Environment Agency and has therefore been classified as a moderate value receptor.

WFD status of groundwater bodies

15.3.13 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated groundwater bodies in the bedrock and superficial deposits within the study area is provided in Table 23. The value attributed to each of these receptors is also indicated.

15.3.14 The bedrock Mercia Mudstone Group is not formally designated as a WFD groundwater body, although limited quantities of groundwater are occasionally obtainable from some formations within the Mercia Mudstone.

Abstraction and permitted discharges (groundwater)

15.3.15 There are no groundwater abstractions licensed for public water supply in the study area. However, the route does cross a groundwater source protection zone (SPZ) 3 for a public water supply. The public water supply is located more than 3km to the north-west of the route (very high value receptor).

15.3.16 There is one private groundwater abstraction licence registered in the study area, as shown on Map WR-02-201. This is a private commercial water supply which has been assigned a moderate value.

15.3.17 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water

supplies, unregistered private groundwater supplies may also be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.18 There are no¹³⁷ consented discharges to groundwater in the study area.

Groundwater - surface water interactions

15.3.19 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 12 features within the study area that had potential to be springs. Access was not possible to inspect any of these features at this stage.

15.3.20 The 12 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. None of these features are within the land required for the Proposed Scheme.

15.3.21 There are no ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.22 The following nature conservation sites within the study area are potentially groundwater dependent:

- Wythenshawe Park Local Nature Reserve (LNR) in Wythenshawe, Manchester, a moderate value receptor. The site may be supported by groundwater discharging from numerous springs (from the glacial till);
- Stenner Woods and Milgate Fields LNR south of Didsbury, Manchester may be supported, at least in part, by groundwater (from the alluvium and Wilmslow Sandstone Formation); and
- Wrengate Wood Local Wildlife Site (LWS) located just north of the Palatine Road vent shaft may be dependent on groundwater (from the alluvium, river terrace deposits and Wilmslow Sandstone Formation).

15.3.23 No designated nature conservation sites within the study area which are dependent on surface water flows have the potential to be affected by the Proposed Scheme.

15.3.24 Further details of the ecology of these sites, including reporting on the effects and associated other mitigation, if required, are provided in Section 7, Ecology and biodiversity.

¹³⁷ The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended, where the potential for wider pathways exists.

Existing baseline - flood risk and land drainage

- 15.3.25 The Environment Agency's Flood map for planning (rivers and sea)¹³⁸ has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).
- 15.3.26 The updated Flood map for surface water¹³⁹ has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset¹⁴⁰. The British Geological Survey (BGS) Groundwater flooding susceptibility data set¹⁴¹, has been used to assess the future risk of groundwater flooding.
- 15.3.27 The following reports were used to help determine the baseline flood risk within the study area:
- Manchester City Council Preliminary Flood Risk Assessment (2011)¹⁴²;
 - Manchester, Salford and Trafford Strategic Flood Risk Assessment (SFRA) (2011)¹⁴³; and
 - Manchester City Council Local Flood Risk Management Strategy (LFRMS) (2014)¹⁴⁴.

River flooding

- 15.3.28 The study area includes substantial areas of floodplain (Flood Zone 2 or 3) associated with Baguley Brook and the River Mersey. Although the route of the Proposed Scheme would be in bored tunnel while crossing these floodplains, two ventilation shafts would be located on the floodplain, with a potential impact on flood risk. Table 24 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 24: River flood risk sources and receptors

| Source | Location description and figure/coordinate ¹⁴⁵ | Receptor potentially affected | Receptor value/sensitivity to flooding |
|---------------|---|-------------------------------|--|
| Baguley Brook | Vent shaft | Commercial property (hotel) | Moderate |
| | WR-01-309b H5 | Gas governor | Very High |

¹³⁸ Gov.uk (2018) Flood map for planning. Available online at: <https://flood-map-for-planning.service.gov.uk/>

¹³⁹ Gov.uk (2018), Long term flood risk assessment for locations in England. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

¹⁴⁰ Gov.uk (2018), Long term flood risk assessment for locations in England. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

¹⁴¹ British Geological Survey (2017) BGS groundwater flooding. Available online at: <http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html>

¹⁴² JBA Consulting (2011), *Manchester City Council Preliminary Flood Risk Assessment (PFRA)*

¹⁴³ JBA Consulting (2011), *Manchester, Salford and Trafford Strategic Flood Risk Assessment (SFRA)*

¹⁴⁴ Manchester City Council (2014), *Manchester City Council Local Flood Risk Management Strategy (LFRMS)*

¹⁴⁵ This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA07 Map Book figure (in this case WR-01).

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| | | | |
|--------------|-----------------------------|--|-----------|
| | | Residential properties along Beechpark Avenue | High |
| | | Beechpark Avenue | Moderate |
| River Mersey | Vent shaft WR-01 310a B4 | Allotments | Low |
| | | Rugby club | Moderate |
| | | Golf course | Low |
| | | Industrial support (tank) | Moderate |
| | | Residential properties near golf course | High |
| | | Residential properties along B5167 Palatine Road | High |
| | | Commercial properties (hotels) | Moderate |
| | | Two electricity sub-stations | Very High |
| | | B5167 Palatine Road | Moderate |

Surface water flooding

- 15.3.29 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 25. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 25: Surface water flood risk sources and receptors

| Source | Location description and figure/coordinate ⁴⁴⁶ | Receptor potentially affected | Receptor value |
|---|---|-------------------------------|----------------|
| Surface water flow path along Rondin Road | Ardwick Depot WR-01 310a I5 | Two electricity sub-stations | Very High |
| | | Railway assets | Moderate |
| | | Commercial property | Moderate |
| | | Industrial facility | Moderate |

Artificial water bodies

- 15.3.30 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk to the Proposed Scheme within the study area.

⁴⁴⁶ This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA07 Map Book figure (in this case WR-01).

Groundwater flooding

- 15.3.31 Information related to historical incidents of groundwater flooding in the Davenport Green to Ardwick area is included in the Manchester, Salford and Trafford SFRA and Manchester City LFRMS²¹. Both documents state that there is no history of groundwater flooding within the area.
- 15.3.32 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the Manchester tunnel north portal due to the nature of the superficial deposits.

15.4 Effects arising during construction

Avoidance and mitigation measures

- 15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)¹⁴⁷ includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

- 15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:
- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme will avoid passing along river or stream valleys, such as that Baguley Brook and the River Mersey and their associated floodplains. Instead it would pass under them through bored tunnel;
 - avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
 - avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.
- 15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

¹⁴⁷ Supporting document: Draft Code of Construction Practice

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- 15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: MA07 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.
- 15.4.5 No watercourse realignments are proposed within the Davenport Green to Ardwick area.
- 15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.
- 15.4.7 For watercourses that are not in their natural condition, the design aim for any realignments and diversions will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.
- 15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.
- 15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:
- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
 - preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
 - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
 - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
 - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.
- 15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.
- 15.4.11 There are no permanent culverts proposed on watercourse crossings within the Davenport Green to Ardwick area.

- 15.4.12 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.
- 15.4.13 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:
- installation of cut-off¹⁴⁸ structures around excavations;
 - ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
 - promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions;
 - incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side; and
 - the Tunnel Boring Machines will be operated in a closed face mode when tunnelling within water bearing strata and the tunnel lining will be designed to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage.
- 15.4.14 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels or cutting locations.

Flood risk and land drainage

- 15.4.15 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:
- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with ventilation shafts. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with them;
 - the temporary works shown in the Volume 2: MA07 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;

¹⁴⁸ Impermeable barrier preventing water flow

- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency¹⁴⁹;
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.16 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in

¹⁴⁹ Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;

- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.17 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.18 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.19 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

15.4.20 Potential temporary impacts on baseflow in surface water receptors arising from dewatering effects are described in 'Groundwater – surface water interactions' below.

Groundwater

Aquifers

15.4.21 The Manchester tunnel would intersect the Tarporley Siltstone Formation Secondary B aquifer, the Etruria Formation and Halesowen Formation Secondary A aquifers, and the Collyhurst Sandstone Formation, Wilmslow Sandstone Formation, Chester Formation and Helsby Sandstone Formation Principal aquifers. Construction of the cross passages, vent shafts and Manchester tunnel north portal would require dewatering which would lead to moderate localised impacts on these moderate or

high value aquifers. This would result in a temporary moderate adverse effect, which is significant.

15.4.22 Dewatering of the Ardwick cutting has potential to result in localised and controlled impacts on groundwater flows and levels within the Chester Formation of the Sherwood Sandstone Principal aquifer and the glacial till Secondary Undifferentiated aquifer. However, implementation of the CoCP measures will ensure that groundwater levels are controlled with minimal losses of water from the aquifer system. Impacts are likely to be minor, resulting in no significant effects. Any potential impacts on the Chester Formation in MA08: Manchester Piccadilly Station, will be reported in the Volume 2: Community area report MA08 Manchester Piccadilly Station.

15.4.23 Where cuttings, tunnelling and associated ventilation shaft construction could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.24 Tunnelling and shaft construction in SPZ3 could impact on groundwater quality if fissures are connected to the public water supply borehole. The abstraction is located more than 3km to the north-east of the route. However, on a precautionary basis, the impact of turbidity has been assessed to be moderate, due to the high quality required to be met for potable use, resulting in a major adverse effect, which is significant.

15.4.25 The temporary open face dewatering of the Lytham Road vent shaft could also affect the public water supply. Dewatering could temporarily reduce the yield of this very high value receptor with a temporary minor impact. This would result in a temporary moderate adverse effect, which is significant.

15.4.26 There is one licensed private groundwater abstraction which has potential to be impacted by temporary open face dewatering of the Manchester tunnel vent shafts. The private groundwater abstraction is used for spray irrigation at Didsbury Golf Club golf course and has been assessed as a moderate value receptor. It has been assumed on a precautionary basis that the source of this abstraction is the bedrock aquifer. Dewatering for construction of the Palatine Road vent shaft would potentially result in a temporary moderate adverse effect to the abstraction, which is significant.

Groundwater - surface water interactions

15.4.27 There is the potential for baseflows in the River Mersey and Baguley Brook, to be impacted whilst groundwater levels are lowered in the vent shafts and tunnel portal during open face excavation. For the River Mersey and Baguley Brook (very high and high value receptors respectively) this moderate impact could result in temporary major and moderate adverse effects, which would be significant.

15.4.28 There is potential for the temporary loss of 10 spring features whilst groundwater levels are lowered in the Manchester tunnel vent shafts during excavation. There are eight potential spring features located at Wythenshawe Park, one located at Stenner Lane and one located at M56 Junction 5 north. Until the nature of these features has been confirmed by a site survey, on a precautionary basis they have been assumed to

be high value receptors. The assessment therefore identifies dewatering of the Manchester tunnel vent shafts as potentially resulting in temporary major adverse effects, which are significant.

Water dependent habitats

- 15.4.29 There is potential for temporary dewatering during construction of the Manchester tunnel vent shafts to impact groundwater flows which may support the Wythenshawe Park LNR, Stenner Woods and Milgate Fields LNR, and Wrengate Wood LWS. Dewatering would have a temporary moderate impact. The effects related to the above impacts, together with any mitigation if required, are reported in Section 7, Ecology and biodiversity.

Temporary effects - Flood risk and land drainage

- 15.4.30 It is not currently anticipated that there would be any temporary effects related to flood risk and land drainage in this study area as a result of construction of the Proposed Scheme.

Permanent effects – Water resources and WFD

- 15.4.31 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

- 15.4.32 Implementation of the avoidance and mitigation measures will ensure that there are no permanent significant effects related to the impact of the Manchester tunnel and associated construction on surface water receptors in this area.

Groundwater

Aquifers

- 15.4.33 It is currently anticipated that implementation of the avoidance and mitigation measures will ensure that there are no permanent significant effects related to the impact of the Manchester tunnel and associated construction on water levels and water quality in the aquifers intercepted by the Proposed Scheme. Where the impacts on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

- 15.4.34 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

- 15.4.35 The assessment has not identified any permanent significant effects on groundwater-surface water interactions.

Water dependent habitats

- 15.4.36 No permanent impacts on water dependent habitats are anticipated in this study area as a result of the construction of the Proposed Scheme.

Permanent effects - Flood risk and land drainage

- 15.4.37 Hydraulic modelling of Baguley Brook and the River Mersey around the Altrincham Road vent shaft and the Palatine Road vent shaft is currently being undertaken to assess potential permanent effects related to flood risk.
- 15.4.38 It is currently anticipated that the Proposed Scheme would result in minor impacts on flood levels in the case of the Altrincham Road vent shaft. This would potentially affect a gas governor and residential properties, which are very high and high value receptors respectively, resulting in moderate adverse effects, which are significant. In the case of the Palatine Road vent shaft, the Proposed Scheme would result in moderate impacts on flood levels, affecting two electrical sub-stations and residential properties, which are very high and high value receptors respectively, resulting in major adverse effects, which are significant.

Other mitigation measures

- 15.4.39 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Groundwater

- 15.4.40 The assessment of potential temporary impacts on the public water supply will be investigated further. If this investigation identifies a risk to the supply from water quality or a reduction in yield, a management strategy will be developed with United Utilities and in agreement with the Environment Agency. This strategy would be put in place temporarily to ensure supplies to customers are not affected.
- 15.4.41 The potential temporary impacts of dewatering on the private abstraction licence for Didsbury Golf Club will be investigated further. If this investigation identifies a risk of the supply being temporarily disrupted, suitable mitigation measures would be discussed with the licensee, which may include provision of a temporary alternative supply.

Groundwater - surface water interactions

- 15.4.42 A survey of the 10 potential spring features will be undertaken to determine their value and to identify whether further mitigation is required. If these are confirmed to be springs of high or moderate value, mitigation measures will be identified to reduce any adverse effects insofar as reasonably practicable.
- 15.4.43 Additional mitigation measures for the management of groundwater baseflows to the River Mersey, Baguley Brook and spring flows during excavation and dewatering of the Altrincham Road vent shaft, Palatine Road vent shaft and Wilmslow Road vent shaft may be required. If required, mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- adoption of construction techniques that avoid the need for dewatering;
- discharge of abstracted water to ground; and
- recirculation of treated water to the affected receptors.

15.4.44 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.45 Hydraulic modelling is currently being undertaken for the proposed Altrincham Road and Palatine Road and their interaction with Baguley Brook and River Mersey respectively. Any requirement for mitigation identified from the analysis will be developed in consultation with the Environment Agency.

Summary of likely residual significant effects

15.4.46 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a temporary moderate adverse effect from dewatering during construction on the Tarporley Siltstone Formation Secondary B aquifer, the Etruria Formation and Halesowen Formation Secondary A aquifer, the Collyhurst Sandstone Formation, Wilmslow Sandstone Formation, Chester Formation and Helsby Sandstone Formation Principal aquifers, which is significant;
- a temporary moderate adverse effect on the yield of one public water supply borehole, which is significant;
- a temporary moderate adverse effect on water quality of one public water supply borehole as a result of construction dewatering, which is significant;
- a temporary moderate adverse effect on one licensed private groundwater abstraction as a result of construction dewatering, which is significant;
- temporary moderate adverse effects on baseflow to the River Mersey and Baguley Brook, which is significant;
- temporary major adverse effects due to the temporary loss of 10 springs as a result of construction dewatering, which is significant;
- a permanent moderate adverse effect on flood risk on Baguley Brook, which is significant; and
- a permanent major adverse effect on flood risk on River Mersey, which is significant.

15.4.47 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

- 15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.
- 15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.
- 15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.
- 15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

- 15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

- 15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk. Summary of likely residual significant effects
- 15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

- 15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.
- 15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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