

# **High Speed Rail (Crewe – Manchester)**

## **Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

### **Volume 5: Appendix EM-001-00000**

#### **Electromagnetic interference**

Affected receptors within 50m of railway  
and associated risks and mitigation

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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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# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
<b>2</b>	<b>Scope, methodology, data sources, assumptions and limitations</b>	<b>4</b>
<b>3</b>	<b>Assessment</b>	<b>5</b>
3.1	Assessment of effects during construction	5
3.2	Assessment of effects during operation	5
	<b>Part 1: Supplementary Environmental Statement 1</b>	<b>10</b>
<b>4</b>	<b>Introduction</b>	<b>10</b>
4.2	Extension of the 50m corridor to allow for additional tracks (revised baseline information)	10
4.3	Utilities information (revised baseline information)	10
4.4	Telecoms mast relocation	10
4.5	Removal of the HS2 West Coast Main Line connection (SES1-004-001)	11
<b>5</b>	<b>Affected receptors</b>	<b>12</b>
5.1	Hough to Walley's Green (MA01)	12
5.2	Wimboldsley to Lostock Gralam (MA02)	21
5.3	Pickmere to Agden and Hulseheath (MA03)	56
5.4	Broomedge to Glazebrook (MA04)	70
5.5	Risley to Bamfurlong (MA05)	91
	<b>Part 2: Additional Provision 1 Environmental Statement</b>	<b>133</b>
<b>6</b>	<b>Introduction</b>	<b>133</b>
<b>7</b>	<b>Affected receptors</b>	<b>134</b>
7.1	Hough to Walley's Green (MA01)	134
7.2	Wimboldsley to Lostock Gralam (MA02)	135
7.3	Pickmere to Agden and Hulseheath (MA03)	135
7.4	Broomedge to Glazebrook (MA04)	136
7.5	Risley to Bamfurlong (MA05)	136
	<b>Tables</b>	
	Table 1: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (equipment immunity)	12
	Table 2: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (induced voltages on cables and pipes)	15

## Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

### Electromagnetic interference

#### SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

#### Affected receptors within 50m of railway and associated risks and mitigation

Table 3: Potentially affected receptors within MA02 for electromagnetic compatibility assessment (equipment immunity)	21
Table 4: Potentially affected receptors within MA02 for electromagnetic compatibility assessment (induced voltages on cables and pipes)	22
Table 5: Potentially affected receptors within MA03 for electromagnetic compatibility assessment (induced voltages on cables and pipes)	57
Table 6: Potentially affected receptors within MA04 for electromagnetic compatibility assessment (induced voltages on cables and pipes)	70
Table 7: Potentially affected receptors within MA05 for electromagnetic compatibility assessment (equipment immunity)	91
Table 8: Potentially affected receptors within MA05 for electromagnetic compatibility assessment (induced voltages on cables and pipes)	92
Table 9: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (equipment immunity)	134

# 1 Introduction

- 1.1.1 This report is an appendix to the electromagnetic interference (EMI) assessment which forms part of Volume 5 of the Supplementary Environmental Statement 1 (SES1) and Additional Provision 1 Environmental Statement (AP1 ES).
- 1.1.2 This appendix provides details of changes to the EMI assessment since the production of the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES)<sup>1</sup> published in January 2022 (the main ES).
- 1.1.3 This report covers the following community areas (CA):
- Hough to Walley's Green (MA01);
  - Wimboldsley to Lostock Gralam (MA02);
  - Pickmere to Agden and Hulseheath (MA03);
  - Broomedge to Glazebrook (MA04); and
  - Risley to Bamfurlong (MA05).
- 1.1.4 This appendix should be read in conjunction with the Electromagnetic interference assessment set out in the main ES Volume 5, Appendix: EM-001-00000.
- 1.1.5 This report is structured into two parts: Part 1 – SES1 and Part 2 – AP1 ES. These parts are subdivided into community areas, and then into the relevant SES1 design changes and AP1 amendments which are of relevance to the EMI assessment. Part 1 also contains relevant updates to the EMI assessment of the original scheme as a result of updated baseline data, summarised in Section 2 and the Part 1 section.
- 1.1.6 In order to differentiate between the original proposals assessed as part of the main ES and subsequent changes, the following terms are used:
- 'the original scheme' – the Bill scheme submitted to Parliament in January 2022, which was assessed in the main ES;
  - 'the SES1 scheme' – the original scheme with any changes described in the SES1 that are within the existing powers of the bill; and
  - 'the AP1 revised scheme' – the original scheme as amended by the SES1 changes and AP1 amendments.

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<sup>1</sup> High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

## 2 Scope, methodology, data sources, assumptions and limitations

- 2.1.1 The assessment scope, key assumptions and limitations are as set out in the main ES Environmental Impact Assessment Scope and Methodology Report (SMR)<sup>2</sup> (see main ES Volume 5, Appendix: CT-001-00001).
- 2.1.2 This report considers the electromagnetic interference impact of the SES1 changes and AP1 amendments to the original scheme, together with an updated assessment of the original scheme based on revised baseline data – specifically associated with the following aspects:
- utilities assets as potential receptors of EMI; and
  - areas of the route where the 50m corridor defined with respect to the main running lines does not encompass proposed additional tracks, such as those associated with rolling stock maintenance facilities.

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<sup>2</sup> High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report*, Volume 5, Appendix: CT-001-00001. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

## 3 Assessment

### 3.1 Assessment of effects during construction

- 3.1.1 Construction machinery and plant, and associated communications (e.g. construction radios) will comply with the applicable standards for electromagnetic fields (EMF) and electromagnetic compatibility (EMC). Therefore, when installed, operated and maintained correctly, the risk of this apparatus producing EMF that exceeds published limits for workers and the public or causing EMI is considered to be low.
- 3.1.2 Power supplies used for construction are generally not sufficient to cause a major EMI risk. Specialist tunnel boring machines will be used for the construction of bored tunnel sections; these will typically require a high voltage electrical supply, normally at 11kV. This will come from the local Distribution Network Operator to a purpose-built sub-station within the work area. Such supplies will have no significant risk to health as the levels of EMF are very low for credible separation distances between such cables and the general public (expected to be greater than 250mm).
- 3.1.3 All construction activities will be confined to local areas. Mitigation will be controlled by adherence to British and European standards, which will be mandatory for all installation contractors. In addition, as set out in the draft Code of Construction Practice (CoCP)<sup>3</sup>, the nominated undertaker and its contractors will consider the impacts of EMI on wireless telecommunication systems during construction of the AP1 revised scheme. This will include site-specific impacts from the demolition of buildings and the installation of tower cranes, and where appropriate will employ best practice technology to ensure that levels of radio frequency interference associated with the AP1 revised scheme are low and at acceptable levels.
- 3.1.4 It is therefore considered that there are no significant effects on a route-wide basis associated with construction.

### 3.2 Assessment of effects during operation

- 3.2.1 The primary source of EMF will be the traction power supplies generated at 25kV alternating current (AC); the voltage and current generated in other railway used electrical supplies are not high enough to cause significant EMF outside the railway boundary.
- 3.2.2 The levels of EMF emitted by the traction power system will vary considerably along the HS2 route and the maximum values will last only for a few seconds at a time. The levels at any particular location depend on a number of variables, for example:

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<sup>3</sup> High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Draft Code of Construction Practice*, Volume 5, Appendix: CT-002-00000. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.



- individual train performance at any particular instant i.e. whether it is accelerating, at constant velocity, braking or at rest;
- the number of individual trains in any one electrical section; and
- proximity to a traction feeder sub-station.

3.2.3 The effects of EMF rapidly diminish with distance from the source, both horizontally and vertically.

3.2.4 Preliminary traction power modelling has been undertaken by HS2 Ltd<sup>4</sup> and the worst-case values of predicted EMF have been used to estimate the levels of EMF at any particular location along the AP1 revised scheme<sup>5</sup>.

## Effects of EMF on human health

3.2.5 The AP1 revised scheme will comply with BS EN 50121 series of EMC standards<sup>6</sup> for railway applications, which places limits on the maximum emission at the railway boundary. These limits are below the International Commission on Non-Ionising Radiation Protection (ICNIRP)<sup>7</sup> guidelines, which define acceptable levels for EMF exposure of the general public and workers to provide protection against known adverse health effects.

3.2.6 At distances of between 7m and 10m from the track centreline of AP1 revised scheme the estimated levels of EMF are below 10% of the maximum values of 100µT recommended by ICNIRP (1998) in relation to human health for magnetic field exposure at 50Hz. For electric field exposure, the estimated levels from the AP1 revised scheme are approximately 20% of the limits.

3.2.7 Where bridges will pass over or under the AP1 revised scheme, the level of EMF exposure may be higher than that at ground level, however it is unlikely to reach maximum threshold. The level of exposure is also likely to be of a transient and short-term nature (e.g. crossing a bridge in a vehicle or on foot).

3.2.8 It is therefore considered that there are no significant EMF effects on a route-wide basis associated with operation.

## Effects on electrical equipment due to EMI

3.2.9 It is possible that EMI risks may affect some residential receptors within 20m from the centre of the nearest track or industrial receptors with very sensitive electrical or electronic

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<sup>4</sup> EMC Strategy (2013), *C240-PBR-DS-STR-000-000001, Appendix A2*, pp.43-58.

<sup>5</sup> The traction power modelling which underpins the EMF contour plots used in this assessment was for the Phase One section of route on which a higher service level (18TPH) is proposed compared to that for the Phase 2b section (between 4 and 10TPH). Hence this should add a further level of conservatism into the assessment

<sup>6</sup> British Standards Institution (2017), *Railway applications – Electromagnetic Compatibility*, BS EN 50121 series.

<sup>7</sup> International Commission on non-ionizing radiation protection (2010), *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (1Hz to 100 kHz)*.

equipment. This distance will depend on the localised situation, for example it will depend on whether the AP1 revised scheme is on a viaduct, in a cutting or tunnel. Where an EMI risk is identified, these receptors will be further evaluated during the detailed design stage and/or at testing and commissioning. Mitigation may be applied, for example in the form of replacement with less sensitive equipment or relocation of equipment where practicable.

- 3.2.10 Beyond 20m from the AP1 revised scheme, the estimated levels of EMI are below the threshold for electrical interference for residential, commercial and light-industrial receptors (specified in BS EN 61000-6-1<sup>8</sup>) and no risk has been identified.
- 3.2.11 The estimated levels of EMI are below the threshold for electrical interference for industrial receptors (specified in BS EN 61000-6-2<sup>9</sup>), and no risk to these receptors has been identified.
- 3.2.12 In accordance with guidance from the Medicines and Healthcare Products Regulatory Authority, EMF generated from power lines is not considered to pose a significant risk to people with active medical implants including pacemakers. Therefore, no potential significant impact on the operation of active medical implants is anticipated, provided the immunity performance is in line with the requirement of the applicable harmonised standards.

## Other receptors

- 3.2.13 Where the AP1 revised scheme will run close to an existing conventional rail route, any effects of EMC, EMI or EMF will be mitigated by complying with the BS EN 50121 and BS EN 50122 suite of standards. It may be necessary for HS2 Ltd to agree and implement specific design solutions with Network Rail to mitigate or eliminate the risk of EMI to the conventional rail network.
- 3.2.14 Induced voltages from the AP1 revised scheme's overhead traction power could affect metallic infrastructure that runs parallel to the AP1 revised scheme. For this to have a significant risk of interference, the infrastructure would have to run close to the AP1 revised scheme (e.g. 10m to 20m separation distance) and for a considerable distance, typically of the order of 1km or more. Any potential interference risk identified at this stage will be considered further in the detailed design stage. It is anticipated that the interference risks would be localised.
- 3.2.15 Other effects, such as induced voltages and earthing and bonding issues associated with the interface with other railways and third parties such as utilities, will be mitigated through design and construction in compliance with British, European and industry standards and best practice. Where required, HS2 Ltd will agree design solutions with affected third parties

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<sup>8</sup> British Standards Institution (2019), BS EN 61000-6-1, *Electromagnetic compatibility (EMC), Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*, BS EN 61000 Series.

<sup>9</sup> British Standards Institution (2019), BS EN 61000-6-2, *Electromagnetic compatibility (EMC), Part 6-2: Generic standards – Immunity for industrial environments*, BS EN 61000 Series.

such as Network Rail, Transport for Greater Manchester, National Grid and National Highways, where reasonably practicable.

- 3.2.16 Cathodic protection (CP) systems as used installed on neighbouring buried utilities such as some metallic pipelines could be affected by the AP1 revised scheme. These risks will be considered further in the detailed design stage, and it is anticipated that the risk would be mitigated through application of British, European and industry standards and best practice.

## Wildlife

- 3.2.17 The limited number of published studies addressing the risk of EMF to wildlife shows little or no evidence of a significant environmental impact. From current information, the exposure limits in the ICNIRP guidelines for protection of human health are also protective of wildlife.

## Climate change

- 3.2.18 The levels of generated EMF and EMI are dependent on the traction power, which has been calculated for a worst case scenario based on the maximum trains running per hour. Any change in climate is unlikely to affect the output from the traction power and cause any significant increase in EMF or EMI.

## Conclusions

- 3.2.19 The receptors that may be at risk due to revised baseline information, SES1 changes and AP1 amendments to the original scheme are included Parts 1 and 2 of this document. The receptors listed here are supplementary to those listed in the main ES Electromagnetic interference assessment technical appendix (see main ES Volume 5, Appendix: EM-001-00000).
- 3.2.20 The SES1 changes and revised baseline data are not considered to result in any new or different likely significant route-wide effects from those presented in Volume 3 of the main ES.
- 3.2.21 The AP1 amendments are not considered to result in any new or different likely significant route-wide effects from those presented in Volume 3, Route-wide effects of the main ES.
- 3.2.22 Receptors at potential risk from EMI (equipment immunity) are those residential and commercial buildings that will remain within 20m of the centre of the nearest track.
- 3.2.23 Within 20m, the levels of EMI emitted may cause some interference to sensitive electrical equipment. A further review will be undertaken at detailed design and/or testing and commissioning. Where electrical equipment is found to be adversely affected, initial mitigation would be to reposition the assets at the receptors locations, or if not possible, replace with less sensitive equipment.
- 3.2.24 Receptors at potential risk from induced voltages are infrastructure running close (within 50m) to and parallel for over 0.5km in length and include: other railway infrastructure,

## Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

### Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

#### Affected receptors within 50m of railway and associated risks and mitigation

metallic fences, pipelines, overhead power cables and telecommunications cables on motorways.

- 3.2.25 Where induced voltages have been highlighted as a risk, the risk will be mitigated by designing, building, operating and maintaining the AP1 revised scheme to British, European and industry standards and best practice.

# Part 1: Supplementary Environmental Statement 1

## 4 Introduction

4.1.1 In the following sections the EMI risk associated with the SES1 changes and revised baseline data is documented with updated lists of affected receptors. The original list of affected receptors was included in the main ES Electromagnetic interference assessment technical appendix (see main ES Volume 5, Appendix: EM-001-00000). The changes relevant to the updated EMI assessment for the SES1 scheme are summarised below.

### 4.2 Extension of the 50m corridor to allow for additional tracks (revised baseline information)

4.2.1 The original list of affected receptors reported in the main ES Electromagnetic interference assessment technical appendix was generated based on consideration of a 50m corridor from the centre line of the nearest HS2 track. A review was conducted to identify whether any additional receptors needed to be considered within the EMI assessment as a result of additional tracks associated with HS2 railway infrastructure structures, such as those associated with rolling stock depots. For example, this review identified that an expanded assessment area needed to be considered for the Wimboldsley to Lostock Gralam area (MA02), based on applying a 50m corridor from the tracks at the edges of the area to be occupied by HS2 infrastructure. There was one additional receptor that was identified, which is listed in Table 2.

### 4.3 Utilities information (revised baseline information)

4.3.1 The utility information used for the EMI assessment was updated for all community areas (MA01 to MA05). The updated list of EMI affected utility receptors is documented in the following sections.

### 4.4 Telecoms mast relocation

4.4.1 The removal of specific telecommunications mast relocations from the original scheme has changed the affected telecoms listed in the main ES Volume 5, Appendix: EM-001-00000. This has impacted the Hough to Walley's Green (MA01) and Wimboldsley to Lostock Gralam (MA02) areas, as detailed in Table 1 and Table 3 respectively.

## **4.5 Removal of the HS2 West Coast Main Line connection (SES1-004-001)**

- 4.5.1 The removal of the HS2 West Coast Main Line (WCML) connection has an impact on the EMI assessment described in the main ES Volume 5, Appendix: EM-001-00000 within community areas Pickmere to Agden and Hulseheath (MA03), Broomedge to Glazebrook (MA04), and Risley to Bamfurlong (MA05).
- 4.5.2 For the Pickmere to Agden and Hulseheath (MA03) area the following receptors which were listed in Table 5 in the main ES Volume 5, Appendix: EM-001-00000 are no longer affected by the SES1 scheme:
- MA03-FT-0027;
  - MA03-FT-0026;
  - MA03-GN-0012;
  - MA03-CW-0029; and
  - MA03-FT-0016.
- 4.5.3 The receptors within community areas Broomedge to Glazebrook (MA04) and Risley to Bamfurlong (MA05) are no longer affected by the scheme i.e. the possible EMI impacts do not arise. This includes the utilities listed in Table 6 and Table 8, which are included in the SES1 assessment to update the baseline presented in the main ES. However, these receptors will not be affected due to removal of the HS2 WCML connection.

## 5 Affected receptors

### 5.1 Hough to Walley's Green (MA01)

#### Electromagnetic field exposure assessment (health immunity)

5.1.1 No health immunity risks have been identified within this community area.

#### Electromagnetic compatibility assessment (equipment immunity)

5.1.2 The telecommunication mast information in Table 1 of the main ES Volume 5, Appendix: EM-001-00000 is superseded by the telecommunication mast information listed in Table 1 below.

5.1.3 Table 1 below also identifies a receptor due to updated information about committed developments. All remaining receptors in Table 1 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Table 1: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (equipment immunity)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA01-CD-001	ML 248+800	22.2	Office / Work studio / Storage	Commercial	BS EN 61000-6-1	3	<3	N	To be determined at design stage	This receptor is a committed development [MA01/457A]. Allocated for business; industrial; and storage and distribution uses:

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Weston Interchange, Crewe. Specific immunity of equipment to be determined to confirm whether the risk identified is significant once further details of the proposed development are available. The receptor is located where the HS2 scheme runs in a tunnel with a depth of >30m.
MA01-MT-0007	ML 253+082	23	Telecommunications Mast  Asset owner: Unknown	Commercial	BS EN 61000-6-1	3	<3	N	To be determined at design stage	Receptor is located where HS2 scheme runs in a portal area. Mast requires relocation regardless of any EMI effects. Assessment to be updated once new location is determined.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA01-MT-0008	ML 254+300	Not available	Telecommunications Mast  Asset owner: Unknown	Commercial	BS EN 61000-6-1	3	Not available	Y	To be determined at design stage	Mast requires relocation regardless of any EMI effects. Assessment to be updated once new location is determined.

## Electromagnetic interference assessment (induced voltages on cables and pipes)

5.1.4 The utilities information in Table 2 of the main ES Volume 5, Appendix: EM-001-00000 is superseded by the information listed in Table 2. All remaining receptors in Table 2 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

**Table 2: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (induced voltages on cables and pipes)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA01-FT-0012	ML 252+420 to ML 253+091	8.31	Utility  Asset owner: Level 3  Material (where known): Fibre Optic cable (assume metallic sheath/armour)	Below ground telecoms cable	CCITT part VI <sup>10</sup>	25 normal 430 fault	To be determined at design stage	Y	To be determined at design stage	A section of existing below ground telecoms route is to be replaced by a below ground cable diversion. Proposed cable route crosses the alignment with a crossover angle of 90°. Proposed cable route runs parallel to the alignment for approximately 780m with a minimum separation distance of 8m.
MA01-EN-0009	ML 253+445 (crossover point)	0	Utility  Asset owner: Scottish Power	33kV Overhead Electrical Line	BS EN 50522 <sup>11</sup>	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of existing overhead electrical line is to be removed with a proposed overhead cable diversion. The

<sup>10</sup> The International Telegraph and Telephone Consultative Committee (CCITT) (1966), Blue Book Volume VI, *Telephone signalling and switching*, International Telecommunication Union.

<sup>11</sup> British Standards Institution (2010), *Earthing of power installations exceeding 1 kV a.c.*, BS EN 50522 Series.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA01-EN-0008	ML 253+603 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of existing overhead electrical line is to be removed with a proposed overhead cable diversion. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA01-EN-0003	ML 254+787 (crossover point) ML 254+296 to ML 254+787	70	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of existing below ground electrical line is to be removed with a proposed below ground cable diversion. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for

## Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

### Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										approximately 491m with a minimum separation distance of 70m.  Note: cable runs parallel to WCML involving two third parties i.e. NR and SP.
MA01-EN-0005	ML 254+683 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of existing overhead electrical line is to be removed with a proposed overhead/below ground cable diversion. The proposed below ground cables cross the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA01-GN-0001	ML 254+732 (crossover point)	0	Utility  Asset Owner: National Grid	High Pressure Gas Main	BS EN 50443 <sup>12</sup>	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing gas pipeline is to be abandoned / removed with a proposed pipeline

<sup>12</sup> British Standards Institution (2011), *Effects of electromagnetic interference on pipelines caused by high voltage a.c. electric traction systems and/or high voltage a.c. power supply systems*, BS EN 50443 Series.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							diversion at ML 254+732 as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA01-EN-0002	ML 255+198 (crossover point)	38	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried electrical cable route is to be abandoned / removed with a proposed cable diversion. Proposed route crosses the alignment with a crossover angle of 90°. Short run of parallelism approximately 143m with a minimum separation distance of 38m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA01-EN-0020	ML 255+378 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA01-CW-0003	ML 255+683 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed pipeline diversion. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA01-FT-0001	ML 256+083 to ML 256+191	23	Utility  Asset Owner: British Telecom	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead telecoms cable route is to be removed with a proposed buried telecoms cable diversion. Proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							route moves telecoms cable section from 6.5m to 23m away from the alignment. Cable parallelism is approximately 82m.
MA01-CW-0004	ML 256+572 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	600mm DI twin Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed pipeline diversion. Proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.

## 5.2 Wimboldsley to Lostock Gralam (MA02)

### Electromagnetic field exposure assessment (health immunity)

5.2.1 No health immunity risks have been identified within this community area.

### Electromagnetic compatibility assessment (equipment immunity)

5.2.2 Previous telecommunication masts identified in Table 3 of the main ES Volume 5, Appendix: EM-001-00000 are no longer relevant to the assessment as a result of telecoms mast relocation. One telecommunication mast is identified as a result of the updated EMI assessment as listed in Table 3 below.

5.2.3 All remaining receptors in Table 3 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Table 3: Potentially affected receptors within MA02 for electromagnetic compatibility assessment (equipment immunity)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-MT-0001	ML 257+289	25.8	Telecommunications Mast  Asset owner: Unknown	Commercial	BS EN 61000-6-1	3	<3	N	N/A	Distance measured from the Crewe North Rolling Stock Depot. Specific immunity of equipment to be determined to confirm whether the risk identified is significant. Mast requires relocation regardless of any EMI effects.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Assessment to be updated once new location is determined.

## Electromagnetic interference assessment (induced voltages on cables and pipes)

5.2.4 The utilities information in Table 4 of the main ES Volume 5, Appendix: EM-001-00000 is superseded by the information listed in Table 4. All remaining receptors in Table 4 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Table 4: Potentially affected receptors within MA02 for electromagnetic compatibility assessment (induced voltages on cables and pipes)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-EN-0001	ML 256+145 (crossing point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-FT-0044	ML 256+942	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead telecoms route which previously crossed the alignment has been replaced by a proposed below ground route that diverts the cabling away, with a separation distance of >50m. Parallelism is less than the threshold value.
MA02-CW-0003	ML 256+942	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water pipeline route which previously crossed the alignment has been replaced by a proposed water mains route that diverts the piping away, with a separation distance of >50m. Parallelism is less than the threshold value.
MA02-EN-0002	ML 256+942	0	Utility	11kV Overhead	BS EN 50522	52 normal 320 fault	To be determined	N	To be determined	A section of the existing 11kV overhead electrical line route

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: Scottish Power  Material (where known): Not available	Electrical Line			at design stage		at design stage	which previously crossed the alignment has been replaced by a proposed below ground route that diverts the cabling away, with a separation distance of >50m. Parallelism is less than the threshold value.
MA02-CW-0008	ML 257+133 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water mains pipeline crosses the alignment with crossover angle 60°. It should be noted that this receptor also crosses the WCML.
MA02-EN-0010	ML 257+925 to ML 258+095	>25	Utility  Asset Owner: Scottish Power  Material (where known): Not available	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	Overhead electrical line route which previously crossed the alignment has been replaced by a below ground cable route that runs parallel to WCML. The proposed route runs parallel for approximately 200m with a separation distance of 25m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-FT-0042	ML 258+177 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried telecoms cable is to be removed with a proposed buried telecoms cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-GN-0028	ML 259+372 (crossover point)	0	Utility  Asset Owner: National Grid  Material (where known): Not available	High Pressure Gas Pipeline	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing gas pipeline route is to be removed with a proposed gas pipeline diversion as the replacement. Proposed route crosses the Crewe North Rolling Stock depot and HS2 alignment at ML 259+372, with a crossover angle of 80° and 85° respectively. Parallelism is less than the threshold value.  The asset may be equipped with a cathodic protection

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										system which may be vulnerable to interference from the HS2 traction system.
MA02-EN-0013	ML 259+616 (crossover point)  ML 259+451 to ML 259+690	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the Crewe North Rolling Stock depot and HS2 with a crossover angle of 90°. The proposed route runs parallel for approximately 1,177m with a separation distance ranging from 30m to 90m.
MA02-FT-0040	ML 259+260 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Overhead telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead telecoms cable crosses the Crewe North Rolling Stock depot at ML 259+230 and HS2 alignment at ML 259+260 with crossover angles of 75° and 70° respectively.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-EN-0015	ML 259+616 (crossover point)  ML 259+456 to ML 259+690	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the Crewe North Rolling Stock depot and HS2 alignment at ML 259+616 with a crossover angle of 90°. The proposed route runs parallel for approximately 240m with a separation distance ranging from 30m to 90m.
MA02-FT-0048	ML 259+616 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the Crewe North Rolling Stock depot and HS2

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										alignment at ML 259+616 with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-FT-0038	ML 259+745 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the Crewe North Rolling Stock depot and HS2 alignment with a crossover angle 70°. Parallelism is less than the threshold value.
MA02-EN-0018	ML 259+959 (crossover point) ML 260+007 to ML 260+153	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route

## Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

### Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										runs parallel for approximately 140m with a separation distance of 30m.
MA02-CW-0019	ML 259+611 (crossover point)  ML 259+030 to ML 259+611	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 581m with a separation distance of 75m.
MA02-EN-0020	ML 260+368 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 70°.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-CW-0046	ML 261+544 (crossover point)  ML 261+367 to ML 261+509	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 140m with a separation distance of 75m.
MA02-EN-0022	ML 261+114 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-CW-0047	ML 261+544 (crossover point) ML 261+367 to ML 261+509	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Trunk Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 140m with a separation distance of 75m.
MA02-FT-0051	ML 261+544 (crossover point) ML 261+367 to ML 261+509	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 140m with a separation distance of 75m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-GN-0027	ML 261+540 (crossover point) ML 261+367 to ML 261+509	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas route is to be removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 140m with a separation distance of 75m.
MA02-EN-0025	ML 261+936 (crossover point) and ML 262+012 (crossover point)  ML 261+936 to ML 262+013	0	Utility  Asset Owner: INEOS  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90° and 85° respectively. The proposed route runs parallel to the alignment in two instances, for approximately 20m and

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										24m with a separation distance of 15m and 37m respectively.
MA02-EN-0026	ML 261+933 (crossover angle)  ML 261+934 to ML 262+009	0	Utility  Asset Owner: TATA Chemicals Europe  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 74m with a separation distance 37m.
MA02-EN-0027	ML 261+984 to ML 262+202	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route runs parallel for approximately 220m with a minimum

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										separation distance of 30m.
MA02-EN-0029	ML 264+586 to ML 264+748	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route runs parallel for approximately 160m with a minimum separation distance of 35m.
MA02-GN-0026	ML 264+984 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Medium pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of existing medium pressure gas route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA02-FT-0027	ML 264+973 (crossover point)	0	Utility  Asset Owner: British Telecom	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of existing telecoms cable route crosses the alignment with a crossover angle 70°. Parallelism is less

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							than the threshold value.
MA02-CW-0001	ML 266+410	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline at is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-EN-0031	ML 266+898 (crossover point) ML 267+128 to ML 267+520	0	Utility  Asset Owner: INEOS  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed overhead cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 45°. The proposed route runs parallel for approximately 388m with a minimum

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										separation distance of 35m.
MA02-FT-0025	ML 266+178 to ML 266+240	11	Utility  Asset Owner: British Telecom  Material (where known): Not available	Overhead Telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	Existing telecoms cable route does not cross the alignment. The existing cable runs parallel for approximately 70m at a minimum separation distance of 73m.
MA02-EN-0032	ML 266+272 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 80°. The proposed route runs parallel for approximately 36m with a minimum separation distance of 40m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-EN-0035	ML 266+785 (crossover point) and ML 266+895 (crossover point)  ML 267+130 to ML 267+518	0	Utility  Asset Owner: INEOS  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be abandoned with proposed below ground cable diversions as the replacement. Proposed route crosses the alignment at ML 266+785 and at ML 266+895 with crossover angles of 90° and 45° respectively. The proposed route runs parallel for approximately 383m with a minimum separation distance of 37m.
MA02-EN-0033	ML 266+270 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 80°.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-CW-0057	ML 266+268 (crossover point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	An existing water main pipeline at is to be crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-FT-0023	ML 266+270 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	Existing telecoms cable route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA02-GN-0019	ML 266+751 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	150mm diameter pipeline  High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing high pressure gas main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA02-GN-0024	ML 266+912 (crossover point) and ML 267+150 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Medium pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing medium pressure gas main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with crossover angles of 50° and 75° respectively. Parallelism is less than the threshold value.
MA02-FT-0022	ML 266+912 (crossover point)	0	Utility  Asset Owner: British Telecom	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	Existing telecoms cable route crosses the alignment with a crossover angle of 45°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							
MA02-EN-0108	ML 267+188 to ML 267+454	>49	Utility  Asset Owner: TATA Chemicals Europe  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route maintains a minimum separation distance of 54m and runs parallel to the alignment for approximately 266m.
MA02-EN-0039	ML 267+185 to ML 267+456	>49	Utility  Asset Owner: TATA Chemicals Europe  Material (where known): Not available	HV Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route maintains a minimum separation distance of 49m and runs parallel to the alignment for approximately 271m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-EN-0034	ML 267+145 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.
MA02-EN-0042	ML 267+145 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA02-GN-0020	ML 268+149 (crossover point)	0	Utility  Asset Owner: Cadent Gas	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing low pressure gas main pipeline is to be abandoned with a proposed as pipeline

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							diversion the replacement. Proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA02-GN-0010	ML 268+423 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing low pressure gas main pipeline is to be abandoned with a proposed as pipeline diversion the replacement. Proposed route crosses the alignment with a crossover angle of 85°. The proposed route runs parallel to the alignment for approximately 653m with a minimum separation distance of 35m.
MA02-EN-0067	ML 268+370 (crossover point)	0	Utility  Asset Owner: Scottish Power	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed double overhead/below ground

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	ML 268+170 to ML 268+365 and ML 268+389 to ML 268+569		Material (where known): Not available							cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. The proposed route runs parallel to the alignment in two instances, for approximately 195m and 180m with a minimum separation distance of 64m and 90m respectively.
MA02-CW-0110	ML 267+583 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-GN-0003	ML 267+671 (crossover point)	0	Utility  Asset Owner: Cadent Gas	300mm diameter	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	Proposed high pressure gas main pipeline route crosses the alignment with a crossover angle of 90°. Parallelism is less

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available	High pressure gas main						than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA02-PC-0045	ML 268+427 (crossover point)	0	Utility  Asset Owner: SABIC  Material (where known): Not available	250mm diameter  Aviation fuel pipeline (7 No.)	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing oil pipeline route is to be abandoned with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 170m with a minimum separation distance of 89m.  The asset may be equipped with a cathodic protection system which may be vulnerable to

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										interference from the HS2 traction system.
MA02-CW-0013	ML 269+258 (crossing point) ML 269+381 (crossing point) ML 269+550 (crossing point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	Various sections of the existing water main pipelines are to be abandoned with two proposed pipeline diversion routes. Proposed routes cross the alignment with crossover angles of 70°, 85° and 90° respectively. Parallelism is less than the threshold value.
MA02-EN-0107	ML 268+376 to ML 268+502	>60	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be abandoned or removed with a proposed below ground cable diversion as the replacement. Proposed route maintains a minimum separation distance of 60m. Parallelism is less than the threshold value.
MA02-FT-0004	ML 268+226 to ML	>87	Utility	Below ground	CCITT part VI	25 normal 430 fault	To be determined	N	To be determined	A section of the existing below ground telecoms



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	268+541 (crossing point)		Asset Owner: INEOS  Material (where known): Not available	telecoms cable			at design stage		at design stage	cable route is to be removed with a proposed buried telecoms cable diversion. Proposed route crosses the alignment with a crossover angle of 90° and runs parallel back to ML 268+ 226. Proposed route maintains a minimum separation distance of 87m and runs parallel to the alignment for approximately 167m.
MA02-CW-0051	ML 269+542 (crossing point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	Various sections of the existing water main pipelines are to be abandoned with proposed pipeline diversions as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-CW-0094	ML 267+767 to ML 269+744	>47	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is abandoned / removed with a proposed pipeline diversion as the replacement. Proposed route runs parallel to the alignment for approximately 2,100m at a minimum separation distance of 40m.
MA02-EN-0083	ML 268+376 to ML 268+502	60 minimum	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. Proposed route runs parallel for approximately 170m with a minimum separation distance of 60m.
MA02-FT-0008	ML 269+356 (crossing point)	0	Utility	Below ground	CCITT part VI	25 normal 430 fault	To be determined	N	To be determined	A section of the existing below ground telecoms cable route is to be

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: INEOS  Material (where known): Not available	telecoms cable			at design stage		at design stage	abandoned with a proposed buried telecoms cable diversion. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-CW-0111	ML 269+730 (crossing point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	Various sections of the existing water main pipelines are to be abandoned with proposed pipeline diversions as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-FT-0009	ML 269+530 (crossing point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned with a proposed buried telecoms cable diversion. Proposed route crosses the alignment with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										crossover angle of 85°. Parallelism is less than the threshold value.
MA02-EN-0086	ML 268+798	13.9 minimum	Utility  Asset Owner: Unknown  Material (where known): Not available	Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	Existing route maintains a minimum separation distance of 13.9m. Parallelism is less than the threshold value.
MA02-FT-0007	ML 268+798 (crossing point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	Existing route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.
MA02-CW-0101	ML 268+778 (crossing point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-WW-0004	ML 268+231 to ML 268+833	59m minimum	Utility  Asset Owner: United Utilities  Material (where known): Not available	Gravity Wastewater Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be removed with a proposed pipeline diversion as the replacement. Existing route crosses the alignment at ML 268+798 with a crossover angle of 70°. Proposed route branches off and runs parallel to the alignment for 322m with a minimum separation of 40m. Parallelism is less than the threshold value.
MA02-EN-0084	ML 268+798 (crossing point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	Low voltage Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	Existing route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-CW-0116	ML 269+730 (crossing point)	0	Utility  Asset Owner: INEOS  Material (where known): Not available	Potable Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	Various sections of the existing water main pipelines are to be abandoned with proposed pipeline diversions as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA02-EN-0096	ML 269+350 (crossing point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA02-EN-0092	ML 269+350 (crossing point)	0	Utility  Asset Owner: Scottish Power	33kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA02-EN-0094	ML 269+350 (crossing point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	11kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA02-FT-0001	ML 269+769 (crossing point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	Existing telecoms cable route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA02-GN-0004	ML 270+258	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	300mm diameter  High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing high-pressure gas main route is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA02-GN-0002	ML 270+583	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing low pressure gas main route is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 60°.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.
MA02-PC-0001 MA02-PC-0002 MA2-PC-0043 MA02-PC-0044 MA02-PC-0046 MA02-PC-0047 MA02-PC-0048	ML 270+457	0	Utility  Asset Owner: CLH  Material (where known): Not available	250mm diameter  Aviation fuel pipeline (7 No.)	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing fuel pipeline route is to be abandoned with two of the pipelines being diverted as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The assets may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA02-GN-0005	ML 270+281	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing high pressure gas main route is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route crosses the alignment with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA02-GN-0013	ML 271+000 to ML 273+000	125m minimum	Utility  Asset Owner: National Grid  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing high pressure gas main route is to be abandoned with a proposed pipeline diversion as the replacement. Proposed route maintains a minimum separation distance of 125m and runs parallel to the alignment for approximately 1,109m. The asset may be equipped with a cathodic protection system which may be vulnerable to

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										interference from the HS2 traction system.

### 5.3 Pickmere to Agden and Hulseheath (MA03)

#### Electromagnetic field exposure assessment (health immunity)

5.3.1 No health immunity risks have been identified within this community area.

#### Electromagnetic compatibility assessment (equipment immunity)

5.3.2 No identified telecommunication masts within this community area. Previous telecommunication masts identified in Table 5 of the main ES Volume 5, Appendix: EM-001-00000 are no longer relevant to the assessment. All remaining receptors in Table 5 and Table 6 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

#### Electromagnetic interference assessment (induced voltages on cables and pipes)

5.3.3 The utilities information in Table 7 of the main ES Volume 5, Appendix: EM-001-00000 is superseded by the information listed in Table 5 below. All remaining receptors in Table 7 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

**Table 5: Potentially affected receptors within MA03 for electromagnetic compatibility assessment (induced voltages on cables and pipes)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA03-FT-0034	ML 272+024 (crossover point)	0	Utility  Asset Owner: Level 3  Material (where known): Fibre Optic cable (assume metallic sheath / armour)	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried telecoms cable route is to be abandoned and replaced with a proposed cable diversion. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA03-FT-0001	ML 273+428 to ML 273+711	46	Utility  Asset Owner: BT  Material (where known): Unknown whether copper or fibre with metallic sheath / armour)	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried telecoms cable route is to be abandoned and replaced with a proposed cable diversion. Proposed route runs parallel to the alignment for approximately 283m with a minimum separation of 46m.
MA03-GN-0015	ML 273+261 (crossover point)	0	Utility	High Pressure	BS EN 50443	60 normal 1000 fault	To be determined	Y	To be determined	A section of the existing buried pipeline is to be abandoned and

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: TATA Chemicals Europe.  Material (where known): Unknown	Gas pipeline			at design stage		at design stage	replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA03-CW-0001	ML 273+705 (crossover point)	0	Utility United Utilities Infrastructure	Below ground water main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried pipeline is to be abandoned and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 45°. Parallelism is less than the threshold value.
MA03-FT-0030	ML 273+705 (crossover point)	0	Utility  Asset Owner: BT Openreach	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried telecoms cable route is to be abandoned and

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known)							replaced with a proposed cable diversion. Proposed route crosses the alignment with a crossover angle of approximately 45°. Parallelism is less than the threshold value.
MA03-EN-0009	ML 274+508 (crossover point)  ML 274+514 to ML 274+683	0	Utility  Asset Owner: Scottish Power  Material (where known)	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be abandoned and replaced with a proposed cable diversion. Proposed route crosses the alignment with a crossover angle of approximately 45°. Proposed route runs parallel to the alignment for approximately 169m with a minimum separation of 50m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA03-EN-0013	ML 275+383 (crossover point)  ML 275+396 to ML 275+602	0	Utility  Asset Owner: Scottish Power  Material (where known)	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be abandoned and replaced with a proposed cable diversion. Proposed route crosses the alignment with a crossover angle of approximately 90°. Proposed route runs parallel to the alignment for approximately 205m with a minimum separation of 80m.
MA03-FT-0008	ML 275+382 (crossover point)	0	Utility  Asset Owner: BT Openreach  Material (where known)	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be removed and replaced with a proposed cable diversion. Proposed cable diversion identified which crosses the alignment at 90°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA03-EN-0001	ML 276+ML 275 (crossover point)  ML 276+648 to ML 279+399	0	Utility  Asset Owner: National Grid  Material (where known):	400 kV Overhead transmission line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead 400kV transmission line is to be removed and replaced with a proposed diversion which crosses the alignment at an angle of 60°. The proposed route runs parallel to the alignment for approximately 2,750m with a minimum separation of 60m. There is a short parallel stretch with a separation of 60m, the route then diverges, the bulk of this interface has a separation of around 200m.
MA03-FT-0010	ML 278+167 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-EN-0015	ML 276+202 to ML 277+723	45	Utility  Asset Owner: Scottish Power  Material (where known): Unknown	132kV Below Ground Electrical Cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route runs parallel to the alignment for approximately 1,000m with a minimum separation of 45m.
MA03-EN-0016	ML 278+167 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below ground electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-FT-0009	ML 277+411 to 278+205	80	Utility  Asset Owner: BT	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Unknown (e.g. fibre or copper).							diversion. Proposed route runs parallel to the alignment for approximately 420m with a minimum separation of 80m.
MA03-CW-0019	ML 277+300 to ML 277+723	48	Utility United Utilities Infrastructure  Material (where known): Unknown	Below ground water main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing route is to be removed and replaced with a proposed diversion. Proposed route runs parallel to the alignment for approximately 800m with a minimum separation of 48m.
MA03-CW-0026	ML 278+167 (crossover point)	0	Utility United Utilities Infrastructure  Material (where known): Unknown	Below ground water main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA03-FT-0016	ML 279+500 (crossover point)	0	Utility  Asset Owner: BT Openreach  Material (where known): Unknown (e.g. fibre or copper).	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground cable is to be removed and replaced with a proposed diversion. Proposed cable diversion crosses the alignment at 90°. Parallelism is less than the threshold value.
MA03-CW-0029	ML 279+500 (crossover point)	0	Utility United Utilities Infrastructure  Material (where known): Unknown	Below ground water main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing buried pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the Manchester Spur alignment with a crossover angle of approximately 90°. Parallelism is less than the threshold value.
MA03-GN-0012	ML 281+299 (crossover point)	0	Utility Cadent Gas	High Pressure Gas Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Unknown							alignment with a crossover angle of approximately 85°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA03-FT-0023	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-EN-0017	ML 278+170 (crossover point)	0	Utility Unknown	Overhead Electricity Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electricity cable route is to be removed and replaced with a proposed diversion. Proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Unknown							route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-FT-0031	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below Ground Telecoms Cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-FT-0024	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below Ground Telecoms Cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA03-FT-0025	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Below Ground Telecoms Cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-CW-0020	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-GN-0001	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Medium Pressure Gas Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-EN-0020	ML 278+170 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Overhead Electricity Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electricity cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 75°. Parallelism is less than the threshold value.
MA03-FT-0026	ML 279+553 (crossover point)  MS 279+548 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 90°. Parallelism is less than the threshold value. Proposed route also crosses the Manchester

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										spur alignment with a crossover angle of approximately 50°.
MA03-FT-0027	ML 279+553 (crossover point) MS 279+548 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 90°. Parallelism is less than the threshold value. Proposed route also crosses the Manchester spur alignment with a crossover angle of approximately 50°.



## 5.4 Broomedge to Glazebrook (MA04)

### Electromagnetic field exposure assessment (health immunity)

5.4.1 No health immunity risks have been identified within this community area.

### Electromagnetic compatibility assessment (equipment immunity)

5.4.2 No equipment immunity risks have been identified within this community area.

### Electromagnetic interference assessment (induced voltages on cables and pipes)

5.4.3 The information in Table 6 below is provided as an update to the baseline information presented in the main ES. However, as a result of the removal of the HS2 WCML connection (SES1-004-001), these receptors will not be affected by the HS2 scheme.

**Table 6: Potentially affected receptors within MA04 for electromagnetic compatibility assessment (induced voltages on cables and pipes)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA04-CW-0001	ML 281+866 (crossover point)	0	Utility  Asset Owner: United Utilities	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							
MA04-EN-0001	ML 282+102 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 45°. Parallelism is less than the threshold value.
MA04-GN-0011	ML 282+393 (crossover point)  ML 282+210 to 282+358	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas route is to be removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel for approximately 148m

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										with a separation distance of 114m. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-FT-0002	ML 282+739 (crossover point)  ML 282+736 to ML 283+013  ML 282+917 to 283+307	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead telecoms cable route is to be removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 75°. The proposed route is split into two parallel runs for approximately 277m with a minimum separation distance of 43m and 390m with a minimum separation distance of 67m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA04-CW-0008	ML 282+739 (crossover point)  ML 282+736 to ML 283+013 and ML 282+916 to ML 283+306	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 75°. The proposed route runs parallel to the alignment in two instances, for approximately 277m and 390m with a minimum separation distance of 43m and 67m respectively.
MA04-PC-0001 to MA04-PC-0006	ML 283+243 (crossover point)	0	Utility  Asset Owner: ESSAR  Material (where known): Not available	250mm diameter  Aviation fuel pipeline (7 No.)	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing fuel pipeline route is to be abandoned with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The asset may be equipped with a cathodic protection

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										system which may be vulnerable to interference from the HS2 traction system.
MA04-EN-0004	ML 282+473 to ML 283+274	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	LV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route runs parallel to the alignment for approximately 800m with a maximum separation of 155m, decreasing to 8m with an approach angle of approximately 30°. No crossover with alignment.
MA04-EN-0005	ML 283+327 (crossover point)  ML 283+323 to ML 283+960	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed overhead/below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										alignment for approximately 637m with a minimum separation distance of 124m.
MA04-CW-0013	ML 283+699	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA04-GN-0009	ML 284+437	0	Utility  Asset Owner: National Grid  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas route is to be abandoned / removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

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										cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-GN-0010	ML 284+112 (crossover point)	0	Utility  Asset Owner: National Grid  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas route is to be abandoned / removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-EN-0006	ML 284+348 (crossover point)	0	Utility  Asset Owner: Scottish Power	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be abandoned / removed with a proposed below ground cable diversion

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	ML 284+374 to ML 284+483		Material (where known): Not available							as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 111m with a minimum separation distance of 38m.
MA04-CW-0014	ML 284+940 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 85°. Parallelism is less than the threshold value.
MA04-GN-0008	ML 284+940 (crossover point)	0	Utility  Asset Owner: Cadent Gas	Medium pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas route is to be removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							crossover angle of 90°. Parallelism is less than the threshold value.
MA04-GN-0007	ML 285+119 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas route is to be removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-EN-0009	ML 286+141 (crossover point)	0	Utility  Asset Owner: Scottish Power  Material (where known): Not available	132kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

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										the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA04-GN-0006	ML 286+245 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas route is to be removed with a proposed below ground diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-WW-0003	ML 286+418 (crossover point)	0	Utility  Asset Owner: United Utilities	Gravity Wastewater Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be removed with a proposed pipeline diversion as the replacement. The proposed route crosses

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA04-WW-0006	ML 286+599 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Gravity Wastewater Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA04-FT-0020	ML 286+586 crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of existing below ground telecoms cable route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA04-FT-0010	ML 286+576 (crossover point)	0	Utility  Asset Owner: British Telecom	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be removed with a proposed below ground cable diversion as the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA04-GN-0005	ML 286+835 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-FT-0022	ML 286+844 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-CW-0020	ML 286+840 (crossover point)	0	Utility  Asset Owner: United Utilities	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-FT-0014	ML 287+280 to ML 287+920	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Overhead / below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead / below ground cable route does not cross the alignment, the closest point being 156m from the alignment with an approach angle of approximately 30° to the alignment. Parallelism is less than the threshold value.
MA04-FT-0017	ML 287+399 (crossover point)  ML 287+414 to ML 287+525 and ML 287+408 to ML 287+498	0	Utility  Asset Owner: Level3  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										alignment in two instances, for approximately 114m and 88m with a minimum separation distance of 46m and 58m respectively.
MA04-FT-0018	ML 287+401 (crossover point)  ML 287+414 to ML 287+526 and ML 287+409 to ML 287+494	0	Utility  Asset Owner: Level3  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment in two instances, for approximately 112m and 85m with a minimum separation distance of 44m and 55m respectively.
MA04-EN-0015	ML 288+167 (crossover point)	0	Utility	Low Voltage Below Ground	BS EN 50522	52 normal 320 fault	To be determined	N	To be determined	A section of the existing below ground electrical cable route is to be removed with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	and ML 288+215 (crossover point)		Asset Owner: Electricity Northwest  Material (where known): Not available	Electrical Line			at design stage		at design stage	proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Additionally, a temporary cable route is proposed. The temporary route crosses the alignment with a crossover angle of 60°. No parallelism.
MA04-CW-0025	ML 288+073 (crossover point) and ML 288+082 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed water main pipeline as a replacement. The proposed route splits and crosses the alignment at two points with a crossover angles of 90°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA04-FT-0019	ML 288+187 (crossover point)	0	Utility  Asset Owner: Level 3  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value. It should be noted that this receptor runs parallel with the Liverpool to Manchester Line for approximately 571m with a minimum separation distance of >5m.
MA04-GN-0003	ML 288+700 (crossover point)  ML 288+441 to ML 288+701	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of below ground gas route is removed / abandoned with a below ground diversion proposed. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 260m with a minimum



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										separation distance of 71m. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-GN-0004	ML 288+735 (crossover point)  ML 288+450 to ML 288+722	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of below ground gas route is to be proposed. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 272m with a minimum separation distance of 87m.  The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA04-GN-0012	ML 288+755 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of below ground gas route is to be proposed. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA04-GN-0001	ML 287+083 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing gas pipeline crosses the alignment with a crossover angle of 80°. Existing and proposed route runs parallel to the alignment for approximately 800m with a minimum separation of 30m. The asset may be equipped with a cathodic protection system which may be vulnerable to

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										interference from the HS2 traction system.
MA04-FT-0023	ML 286+785 (crossover point)	0	Utility  Asset Owner: Vodaphone  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-EN-0010	ML 286+785 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-EN-0011	ML 286+785 (crossover point)	0	Utility	Below ground 11 kV cable	BS EN 50522	52 normal 320 fault	To be determined	N	To be determined	A section of the existing below ground electrical cable route is to be

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: Electricity Northwest  Material (where known): Not available				at design stage		at design stage	abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-EN-0012	ML 286+838 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Below ground cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.
MA04-EN-0013	ML 286+838 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Below ground cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.
MA04-FT-0021	ML 286+785 (crossover point)	0	Utility	Below ground	CCITT part VI	25 normal 430 fault	To be determined	N	To be determined	A section of the existing below ground telecoms cable route is to be

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: BSkyB  Material (where known): Not available	telecoms cable			at design stage		at design stage	abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-WW-0007	ML 286+794 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Foul Water Rising Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA04-WW-0009	ML 286+794 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Gravity Surface Water Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 80°.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										Parallelism is less than the threshold value.

## 5.5 Risley to Bamfurlong (MA05)

### Electromagnetic field exposure assessment (health immunity)

5.5.1 No health immunity risks have been identified within this community area.

### Electromagnetic compatibility assessment (equipment immunity)

5.5.2 The telecommunication mast information in Table 7 below is provided as an update to the baseline information presented in the main ES and supersedes the telecommunication mast information in Table 8 of the main ES Volume 5, Appendix: EM-001-00000. All remaining receptors in Table 8 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged. However, as a result of the removal of the HS2 WCML connection (SES1-004-001), these receptors will not be affected by the HS2 scheme.

**Table 7: Potentially affected receptors within MA05 for electromagnetic compatibility assessment (equipment immunity)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-FT-0050	ML 293+259	23.5	Telecommunications Mast	Commercial	BS EN 61000-6-1	3	<3	N	N/A	Specific immunity of equipment to be determined to confirm whether the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset owner: Unknown							risk identified is significant.
MA05-FT-0048	ML 296+410	23.5	Telecommunications Mast  Asset owner: Unknown	Commercial	BS EN 61000-6-1	3	<3	N	N/A	Specific immunity of equipment to be determined to confirm whether the risk identified is significant.

## Electromagnetic interference assessment (induced voltages on cables and pipes)

5.5.3 The information in Table 8 below is provided as an update to the baseline information presented in the main ES and supersedes the information in Table 9 of the main ES Volume 5, Appendix: EM-001-00000. However, as a result of the removal of the HS2 WCML connection (SES1-004-001), these receptors will not be affected by the HS2 scheme.

**Table 8: Potentially affected receptors within MA05 for electromagnetic compatibility assessment (induced voltages on cables and pipes)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-GN-0001	ML 290+715 (crossover point)	0	Utility  Asset Owner: National Grid	High pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of below ground gas route is to be proposed. The proposed route

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA05-EN-0050	ML 292+408 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-EN-0052	ML 292+404 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	11kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA05-CW-0008	ML 292+404 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angles of 70°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-CW-0003	ML 292+404 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA05-CW-0002	ML 292+404 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angles of 70°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-FT-0068	ML 292+407 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.
MA05-GN-0005	ML 292+407 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 70°. Parallelism is less than the threshold value.

## Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

### Electromagnetic interference

#### SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

#### Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-CW-0013	ML 293+450 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angles of 90°. Parallelism is less than the threshold value.
MA05-FT-0033	ML 293+450 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-EN-0062	ML 293+454 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	11Kv Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. Parallelism is less than the threshold value.
MA05-FT-0036	ML 293+299 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route crosses the alignment with a crossover angle of 75°. Parallelism is less than the threshold value.
MA05-CW-0020	ML 293+675 (crossover point)	0	Utility	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	ML 293+673 to ML 296+360		Asset Owner: United Utilities  Material (where known): Not available							water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angles of 90°. The proposed and existing route runs parallel to the alignment for approximately 2,687m with a minimum separation distance of 40m. It should be noted that the separation distance exceeds 40m for the majority of the parallel area.
MA05-EN-0064	ML 294+019 (crossover point)  ML 294+019 to ML 294+198	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	33kV Overhead Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing overhead electrical cable route is to be removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										route runs parallel to the alignment for approximately 181m with a minimum separation distance of 31m.
MA05-CW-0023	ML 295+356 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angles of 90°. Parallelism is less than the threshold value.
MA05-CW-0022	ML 295+356 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							angles of 90°. Parallelism is less than the threshold value.
MA05-CW-0028	ML 295+809 (crossover point) and ML 295+831 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Potable Water Distribution Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route splits and crosses the alignment twice, with a crossover angles of 90°. Parallelism is less than the threshold value.
MA05-EN-0065	ML 294+966 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	LV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										of 80°. Parallelism is less than the threshold value.
MA05-EN-0066	ML 294+967 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	33kV Below Ground Electrical Line	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground electrical cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA05-FT-0051	ML 294+967 (crossover point)	0	Utility  Asset Owner: British Telecom  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										of 80°. Parallelism is less than the threshold value.
MA05-FT-0024	ML 294+967 (crossover point)	0	Utility  Asset Owner: BSkyB  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground telecoms cable route is to be abandoned / removed with a proposed below ground cable diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA05-GN-0008	ML 294+965 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 80°. Parallelism is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-WW-0043	ML 296+584 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Combined Water Rising Main	BS EN 50443	60 normal 1,000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be abandoned / removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 50°. The proposed route runs parallel with the alignment for approximately 336m with a minimum separation distance of 72m.
MA05-WW-0026	ML 297+079 (crossover point)  ML 296+443 to ML 297+079	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Combined Water Rising Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be abandoned / removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 80°. The proposed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										and existing route runs parallel with the alignment for approximately 636m with a minimum separation distance of 75m.
MA05-GN-0015	ML 296+584 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Medium pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-GN-0014	ML 296+584 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-CW-0040	ML 297+094 (crossover point) and ML 297+108 (crossover point)  ML 296+650 to ML 297+096	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route is to be abandoned / removed with a proposed pipeline diversion as the replacement. The proposed route crosses the alignment twice with a crossover angle of 85°. The proposed and existing route runs parallel with the alignment for approximately 400m with a minimum separation distance of 59m, with an average separation distance of approximately 70m.
MA05-WW-0054	ML 297+227 (crossover point)	0	Utility	Gravity Surface Water Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline is to be abandoned / removed with a proposed pipeline as

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: United Utilities  Material (where known): Not available							a replacement. The proposed route crosses the alignment with a crossover angle of 90°.
MA05-CW-0043	ML 297+390 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA05-FT-0047	ML 297+748 (crossover point)	0	Utility  Asset Owner: Instalcom  Material (where	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be abandoned / removed with a proposed below ground cable route diversion as the replacement. The

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA05-FT-0041	ML 297+748 (crossover point)	0	Utility  Asset Owner: BT  Material (where known): Not available	Overhead telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be abandoned / removed with a proposed below ground cable route diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 80°. Parallelism is less than the threshold value.
MA05-EN-0100	ML 298+315 (crossover point)  ML 298+315 to ML 298+481	0	Utility  Asset Owner: Electricity Northwest  Material (where	11kV Below Ground Electrical Cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground cable route is to be abandoned / removed with a proposed cable route diversion as a replacement. The proposed route crosses the alignment with a crossover angle

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							of 90°. The proposed route runs parallel to the alignment for approximately 170m with a minimum separation distance of 15m.
MA05-CW-0065	ML 298+315 (crossover point)  ML 298+315 to ML 298+720	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 409m with a minimum separation distance of 15m.
MA05-CW-0066	ML 298+315 (crossover point)	0	Utility  Asset Owner: United Utilities	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	ML 298+315 to ML 298+720		Material (where known): Not available							as a replacement. The proposed route crosses the alignment with a crossover angle of 90°. The proposed route runs parallel to the alignment for approximately 409m with a minimum separation distance of 15m.
MA05-FT-0043	ML 300+597 (crossover point)  ML 299+680 to ML 300+010	0	Utility  Asset Owner: BT  Material (where known): Not available	Overhead Telecoms Cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be abandoned / removed with a proposed cable route diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 45°. The proposed route runs parallel with the alignment for approximately 330m with a minimum separation distance of 42m. The proposed route also runs parallel to the WCML

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										for approximately 870m with a minimum separation distance of 30m.
MA05-EN-0102	ML 300+597 (crossover point)  ML 299+680 to ML 300+010	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	11kV Below Ground Electrical Cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route is to be abandoned / removed with a proposed cable route diversion as the replacement. The proposed route crosses the alignment with a crossover angle of 45°. The proposed route runs parallel with the alignment for approximately 330m with a minimum separation distance of 42m. The proposed route also runs parallel to the WCML for approximately 870m with a minimum separation distance of 30m.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-EN-0104	ML 299+825 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	LV Below Ground Electrical Cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing cable route crosses the alignment with a crossover angle of 30°. Parallelism is less than the threshold value.
MA05-GN-0024	ML 300+139 (crossover point) and ML 300+141 (crossover point) ML 297+585 to ML 300+138	0	Utility  Asset Owner: National Grid  Material (where known): Not available	High Pressure Gas Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	Y	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 90°. The proposed route also crosses the WCML alignment with a crossover angle of 80°. The proposed route runs parallel at varying separation distances from the

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										alignment. It runs parallel for approximately 2.5km with a continuous separation of 115m over a length of 520m. The asset may be equipped with a cathodic protection system which may be vulnerable to interference from the HS2 traction system.
MA05-CW-0069	ML 300+597 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing water main pipeline is to be abandoned / removed with a proposed water main pipeline as a replacement. The proposed route crosses the alignment with a crossover angle of 55°. Parallelism is less than the threshold value.
MA05-EN-0116	ML 301+738 (crossover point)	0	Utility  Asset Owner:	11 kV Overhead	BS EN 50522	52 normal 320 fault	To be determined	N	To be determined	A section of the existing overhead cable route crosses the alignment with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	and ML 301+998 (crossover point)		Electricity Northwest  Material (where known): Not available	Electrical Cable			at design stage		at design stage	crossover angle of 85°. A proposed below ground cable route is to be added which crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-WW-0058	ML 301+746 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Gravity Combined Water Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 65°. Parallelism is less than the threshold value.
MA05-CW-0071	ML 301+998 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							
MA05-EN-0119	ML 301+998 (crossover point)	0	Utility  Asset Owner: Unknown Material (where known): Not available	Unknown	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-GN-0023	ML 301+998 (crossover point)	0	Utility  Asset Owner: Cadent Gas  Material (where known): Not available	Low pressure gas main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-FT-0067	ML 301+998 (crossover point)	0	Utility  Asset Owner: BT  Material (where	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							
MA05-FT-0046		0	Utility  Asset Owner: BSkyB  Material (where known): Not available	Below ground telecoms cable	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-EN-0120	ML 301+998 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Unknown	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-EN-0121	ML 301+998 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Unknown	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							
MA05-EN-0122	ML 301+998 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Unknown	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline route crosses the alignment with a crossover angle of 60°. Parallelism is less than the threshold value.
MA05-FT-0030	ML 292+407 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.
MA05-FT-0031	ML 292+407 (crossover point)	0	Utility Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Unknown							replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.
MA05-FT-0026	ML 292+407 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.
MA05-FT-0029	ML 292+407 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										with a crossover angle of approximately 60°. Parallelism is less than the threshold value.
MA05-EN-0053	ML 292+407 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.
MA05-EN-0055	ML 292+550 to ML 293+160	34	Utility Unknown  Material (where known): Unknown	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be removed and replaced with a proposed diversion. Proposed route runs parallel to the alignment for approximately 610m with a minimum

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										separation distance of 34m.
MA05-EN-0056	ML 292+550 to ML 293+160	34	Utility Unknown  Material (where known): Unknown	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be removed and replaced with a proposed diversion. Proposed route runs parallel to the alignment for approximately 610m with a minimum separation distance of 34m.
MA05-EN-0060	ML 292+407 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 60°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA05-FT-0035	ML 293+450 (crossover point)	0	Utility Unknown  Material (where known): Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 80°. Parallelism is less than the threshold value.
MA05-WW-0014	ML 293+450 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Unknown	Combined Water Rising Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline is to be removed and replaced with a proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 80°. Parallelism is less than the threshold value.
MA05-WW-0037	ML 296+584 (crossover point)	0	Utility	Gravity Combined Water Sewer	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing pipeline is to be removed and replaced with a

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
	ML 296+385 to ML 296+521		Asset Owner: United Utilities  Material (where known): Unknown							proposed diversion. Proposed route crosses the alignment with a crossover angle of approximately 50°. The proposed route runs parallel with the alignment for approximately 200m with a minimum separation distance of 80m.
MA05-CW-0033	ML 296+584 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0010	ML 296+584 (crossover point)	0	Utility	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined	N	To be determined	A section of the existing telecoms cable route is to be abandoned / removed

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Asset Owner: Unknown  Material (where known): Not available				at design stage		at design stage	with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-EN-0077	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0016	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			Material (where known): Not available							diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0017	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0053	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
			known): Not available							Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0056	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0057	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment



**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0015	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-EN-0080	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-GN-0012	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Low Pressure Gas Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground gas pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0055	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-FT-0009	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-EN-0079	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown Material (where known): Not available	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-WW-0040	ML 296+584 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Waste-water	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-CW-0034	ML 296+584 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-EN-0078	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-FT-0003	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Telecoms Line	CCITT part VI	25 normal 430 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing telecoms cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-EN-0092	ML 296+584 (crossover point)	0	Utility  Asset Owner: Unknown  Material (where known): Not available	Electricity cable	BS EN 50522	52 normal 320 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing electrical cable route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 50°. Parallelism is less than the threshold value.
MA05-CW-0053	ML 297+737 (crossover point)	0	Utility  Asset Owner: United Utilities  Material (where known): Not available	Water Main	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with a crossover angle of 85°. Parallelism is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (V)	Estimated emission level (V)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
										less than the threshold value.
MA05-EN-0094	ML 297+737 (crossover point)	0	Utility  Asset Owner: Electricity Northwest  Material (where known): Not available	Below ground 11kV cable	BS EN 50443	60 normal 1000 fault	To be determined at design stage	N	To be determined at design stage	A section of the existing below ground pipeline route is to be abandoned / removed with a proposed below ground diversion as the replacement. Proposed route crosses the alignment with angle of 85°. Parallelism is less than the threshold value.

# Part 2: Additional Provision 1 Environmental Statement

## 6 Introduction

- 6.1.1 There is one change between the original scheme and the AP1 revised scheme which has EMI significance. This is the additional land permanently required for the realignment and extension of Crewe tunnel (AP1-001-001). The impact of this change is limited to the Hough to Walley's Green area (MA01), and the changes to the affected EMI receptors listed in the main ES Volume 5, Appendix: EM-001-00000 is detailed in the following tables.



## 7 Affected receptors

### 7.1 Hough to Walley's Green (MA01)

#### Electromagnetic field exposure assessment (health immunity)

7.1.1 No health immunity risks have been identified within this community area.

#### Electromagnetic compatibility assessment (equipment immunity)

7.1.2 The receptor information in Table 1 of the main ES Volume 5, Appendix: EM-001-00000 is supplemented by the information listed in Table 9. All remaining receptors in Table 1 of the main ES Volume 5, Appendix: EM-001-00000 remain unchanged.

**Table 9: Potentially affected receptors within MA01 for electromagnetic compatibility assessment (equipment immunity)**

Identifier	Approximate railway chainage (km + m)	Horizontal distance from route centre line (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there potential EMC risk? (Y/N)	Mitigation measures	Comments
MA01-339 (GIS)	ML 252+000 to ML 253+000	30.8	Dwelling	Residential	BS EN 61000-6-1	3	<3	N	N/A	
MA01-929 (GIS)	ML 252+000 to ML 253+000	23.5	Farm storage	Residential	BS EN 61000-6-1	3	<3	N	N/A	
MA01-930 (GIS)	ML 252+000 to ML 253+000	28.14	Farm storage	Commercial	BS EN 61000-6-1	3	<3	N	N/A	
MA01-931 (GIS) to MA01-940 (GIS) and MA01-949 and	ML 252+000 to ML 253+000	0 – 20	Kennels	Commercial	BS EN 61000-6-1	3	>3	Y	None required	Note: A small exceedance of the 50Hz magnetic field immunity limit is

**Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement**

Electromagnetic interference

SES1 and AP1 ES Volume 5, Appendix: EM-001-00000

Affected receptors within 50m of railway and associated risks and mitigation

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MA01-973 to MA01-995										unlikely to be significant for equipment found in an animal care facility. Depth of tunnel at this point ranges from 11.4 to 34.8m.

## Electromagnetic interference assessment (induced voltages on cables and pipes)

7.1.3 No additional or altered EMI risks have been identified within this community area.

### 7.2 Wimboldsley to Lostock Gralam (MA02)

7.2.1 This change has no EMI impact within this community area.

### 7.3 Pickmere to Agden and Hulseheath (MA03)

7.3.1 This change has no EMI impact within this community area.

## **7.4 Broomedge to Glazebrook (MA04)**

7.4.1 This change has no EMI impact within this community area.

## **7.5 Risley to Bamfurlong (MA05)**

7.5.1 This change has no EMI impact within this community area.

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