

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

Affected receptors within 50m of railway and associated risks  
and mitigation (EM-001-000)

EMI

November 2013

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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.

A report prepared for High Speed Two (HS2) Limited.

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# 1 Electromagnetic interference

## 1.1 Introduction

1.1.1 This section of the report provides a summary of the likely significant impacts and route-wide effects to electrical equipment and human health resulting from the generation of electromagnetic fields as a result of the construction and operation of the Proposed Scheme.

1.1.2 Electric and magnetic fields are produced wherever electricity is used. The electric field is produced by voltage and the magnetic field by current. Electromagnetic fields (EMF) can cause three types of effect:

- Interference to electric and electronic equipment. This is called electromagnetic interference (EMI) and is the disturbance that affects an electrical system due to magnetic and electric fields, electromagnetic induction or electromagnetic radiation emitted from an external source;
- the potential to cause harmful effects in the human body through EMF; and
- the creation of induced voltages in metallic infrastructure where there is parallel running for a significant distance e.g. the route running parallel and close to overhead electric power lines or metallic fences.

1.1.3 Electromagnetic Compatibility (EMC) is the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbance to other equipment in that environment.

1.1.4 The principal source of EMF will be the traction power supply system which will power trains. Emissions from trains, signalling and communication systems and electrical and mechanical systems generally only affect the internal railway operating system and are therefore not considered further as having a wider potential effect.

## 1.2 Policy framework

1.2.1 There are no planning policies that specifically refer to EMI in any of the Local Development Frameworks; however British and European standards exist, which set safe limits for exposure. The Proposed Scheme will comply with these standards.

1.2.2 There are a number of British Standards and European Directives that are applicable to the emission and control of EMF that the Proposed Scheme will comply with:

- International Commission on Non-Ionising Radiation Protection (ICNIRP) guidelines, which sets acceptable levels for EMF exposure of the general public and workers to provide protection against known adverse health effects<sup>1</sup>;
- European Commission (EC) Recommendation 1999/519/EC, which provides levels for public exposure to EMF;

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<sup>1</sup> ICNIRP (2010), Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (1Hz to 100kHz), Health Physics, 99 (6): pp. 818-836.



- Electromagnetic Compatibility Regulations Statutory Instrument 3418:2006<sup>2</sup>. These regulations require that equipment shall be so designed and manufactured as to ensure that the electromagnetic disturbance generated does not exceed the level above which electrical and electronic equipment cannot operate as intended or allows it to operate without unacceptable degradation of its intended use; and
- BS EN 61000-6-1 and BS EN 61000-6-2, which specify the acceptable level of protection for equipment in residential and industrial environments respectively<sup>34</sup>.

1.2.3 The Proposed Scheme will be built to comply with the BS EN 50121 series of standards, Railway Applications, Electromagnetic Compatibility<sup>5</sup>.

1.2.4 The Proposed Scheme will also comply with the BS EN 50122 series of standards, Railway Applications - Fixed installations - Electrical safety, earthing and the return circuit<sup>6</sup>.

### 1.3 Assessment scope

1.3.1 A desk-top survey of the route was undertaken to identify any potentially sensitive sites within a 50m corridor either side of the centre of the nearest HS2 track, or from the proposed power equipment, e.g. overhead lines and traction substations.

1.3.2 The primary causes of EMI and EMF will come from the traction power distribution and overhead line electrification. The level of EMF diminishes rapidly with distance from the source, so the extent of any interference or harmful effects will be limited to only a short distance from the railway boundary or the boundary of any traction power substation or switching station. A 50m corridor was selected to identify all potential receptors within that area to demonstrate that the level of risk will be limited to a much shorter distance from the railway. Any receptor outside of the 50m corridor will not be affected.

1.3.3 Preliminary traction power modelling has been undertaken which has identified proposed electromagnetic emissions data throughout the route. This preliminary EMF data has formed the baseline for HS2 Ltd to identify those receptors that may be at risk. HS2 Ltd will comply with BS EN 50121<sup>7</sup>, which limits the maximum EMF at the railway boundary.

1.3.4 HS2 data for levels of traction current is based on estimated maximum power usage at typical locations along the route and has generated estimated EMF contour plots that show worst case levels of EMF.

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<sup>2</sup> *The Electromagnetic Compatibility Regulations 2006 (SI 2006/3418)* (2006), London: Her Majesty's Stationary Office.

<sup>3</sup> British Standards Institution (2007), *BS EN 61000-6-1:2007 (Electromagnetic compatibility (EMC). Part 6.1: Generic standards- immunity for residential, commercial and light industrial environments)*.

<sup>4</sup> British Standards Institution (2005), *BS EN 61000-6-2:2005 (Electromagnetic compatibility (EMC). Part 6.2: Generic standards- immunity for industrial environments)*.

<sup>5</sup> British Standards Institution (2006), *BS EN 50121:2006. Railway applications - Electromagnetic compatibility Parts 1 to 5*.

<sup>6</sup> British Standards Institution (publication date depends on the standard in the series), *BS EN 50122 series (Railway applications. Fixed installations. Electrical safety, earthing and the return circuit) Parts 1 to 3*.

<sup>7</sup> British Standards Institution (2006), *BS EN 50121-1:2006. Railway applications - Electromagnetic compatibility Part 1: General*.

- 1.3.5 Modelling traction power at this early stage is a complex process, which will undergo much iteration throughout the design of the Proposed Scheme, right up to the detailed design stage. Actual levels of EMF emitted cannot be confirmed until the Proposed Scheme is operational; however levels of emitted EMF should not exceed those used for this assessment.
- 1.3.6 Possible third party receptors to EMI and EMF were identified by mapping and analysing the route. From this information, third party receptors that fell within the 50m corridor either side of the centreline of the nearest track and also the proposed power equipment, e.g. overhead lines and traction substations, were identified.
- 1.3.7 Typical receptors identified by the study includes; residential zones, schools, hospitals, emergency services, military establishments, radio transmitters, mobile phone masts, the current National Grid infrastructure, existing railways and commercial zones.
- 1.3.8 Using the methodology detailed above the baseline data was tabulated. Once each potential receptor had been identified, an assessment was undertaken for compliance with the ICNIRP Guidelines and applicable harmonised EMC standards and to identify the level of risk and, if required, potential mitigation for each site.
- 1.3.9 Infrastructure running parallel to HS2 for any significant distance that may be susceptible to the effects of induced voltages was also identified. This included power lines and other aerial cable routes, metal fences, pipe lines and motorway telecommunication cables.

## **1.4 Baseline**

- 1.4.1 The Proposed Scheme will require demolition of a small number of commercial and residential properties that lie within the land required for construction. Of the properties that will remain, very few will be within 20m from the centre of the nearest track.
- 1.4.2 The Proposed Scheme will cross or run adjacent to existing Network Rail and London Underground railway routes.
- 1.4.3 The Proposed Scheme will run adjacent to and under existing National Grid 275kV (kilovolt) and 400kV overhead power lines.
- 1.4.4 The Proposed Scheme will cross or run adjacent to existing motorways. Motorways often have telecommunication and data cables running underneath, which may be at risk of induced voltages.

## **1.5 Comparisons with other railways**

- 1.5.1 HS1 was the first high speed railway to be built in the UK and is a 108 kilometre (km) railway between St. Pancras International station in London and the Channel Tunnel in Kent. Trains operate at speeds of up to 300kph for much of its route. HS1 has been operating for the last six years.

- 1.5.2 Although the electrification systems of both HS1 and the Proposed Scheme operate at 25kV, there are differences in system configuration. Currently around 3,500 miles of the UK railway system is electrified with 25kV overhead line electrification. EMF emissions from existing railways are not significant to cause risk to human health.

## 1.6 Emission levels

- 1.6.1 The preliminary results of the traction power modelling have identified estimated levels of EMF and EMI along the route and have been used in determining the level of risk for each receptor. The level of risk will depend on the receptor location in relation to track level, i.e. in a cutting, on an embankment or viaduct, or in a tunnel.
- 1.6.2 In any case, the Proposed Scheme will comply with BS EN 50121, which limits the maximum EMF at the railway boundary to below ICNIRP levels.
- 1.6.3 The modelling results indicate less than 10 $\mu$ T (microtesla) level of EMF at distances of between 7-10m from the centre line of the nearest track. This level is significantly lower than the 200 $\mu$ T ICNIRP recommendation for general public exposure.
- 1.6.4 Outside the boundary of land required for operation of the Proposed Scheme, the levels of radiated electric fields generated from the traction power will not exceed the 5kV/m (kilovolts per metre) threshold within the ICNIRP guidelines and will have no adverse effect on human health.
- 1.6.5 The plots indicate a 4A/m (ampere per metre) level of emissions at approximately 15m from the centre of the nearest track. This level is above the 3A/m limit for residential immunity specified in BS EN 61000-6-1 and suggests that there could be some electrical interference with susceptible electrical equipment inside this distance.
- 1.6.6 Results from the preliminary modelling estimates a maximum induced voltage per unit length of approximately 30V/km at 20m from the centre of the nearest track. Therefore, there is potential for any conductor within 20m to exceed the 60V touch threshold if it ran parallel to the Proposed Scheme for over 2km. Similarly, between 20m and 50m from the centre of the nearest track, there is risk of induced voltages of over 60V where parallel running is over 3km.
- 1.6.7 Exceeding the reference level does not necessarily mean that the prescribed basic restrictions have been exceeded. Where reference levels have been exceeded then mitigation measures will be provided.
- 1.6.8 Motorways may have telecommunication lines that could be susceptible to induced voltages, when the motorway runs parallel to the Proposed Scheme for a significant distance (typically more than 2km and up to 200m separation). For induced voltages to occur, the motorway would have to have continuous metal cable, which is considered unlikely due to the significant operational problems that are encountered with exceptionally long cable lengths.
- 1.6.9 Where the Proposed Scheme runs in tunnel, there is unlikely to be any risk from EMF or EMI due to the tunnel depth below ground level.

## 1.7 Construction

### Assessment of effects

- 1.7.1 Construction machinery and plant, and associated communications (e.g. construction radios) will comply with the applicable standards for EMF and 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.
- 1.7.2 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 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 little effect on health as the levels of EMF are very low.
- 1.7.3 All construction activities will be confined to local areas. Mitigation will be controlled by the adherence to British and European standards, which will be mandatory for all installation contractors.
- 1.7.4 It is therefore considered that there are no significant effects on a route wide basis associated with construction.

## 1.8 Operation

- 1.8.1 The primary source of EMF will be the traction power supplies generated at 25kV AC; the voltage and current generated in other railway used electrical supplies are not high enough to cause significant EMF outside of the railway boundary. The effects of EMF rapidly diminish with distance from the source, both horizontally and vertically.
- 1.8.2 The levels of EMF emitted by the traction power will vary considerably along the 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;
- 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 substation.
- 1.8.3 Preliminary traction power modelling has been undertaken by HS2 and the worst case values of predicted EMF have been used to estimate the levels of EMF at any particular location along the Proposed Scheme.
- 1.8.4 Electromagnetic emissions are controlled by compliance with the essential requirements of the Electromagnetic Compatibility Directive 2004 and implementing UK Regulations and by application of relevant EMF standards.

### Effects of EMF on human health

- 1.8.5 At even the closest of receptors, the estimated levels of EMF will be below 5% of the maximum values recommended by ICNIRP in relation to human health.

- 1.8.6 For public access where bridges pass over or under the Proposed Scheme, the level of EMF exposure may be higher than that at ground level, however 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).
- 1.8.7 ICNIRP identifies the reference level for short term exposure, which are the only guidelines set by the UK Government. There are no standards applicable to long term effects. The risk arising from long-term, low level of magnetic field exposure to children is not assessed here as although ICNIRP acknowledges research in this area, it concludes that “a causal relationship between magnetic fields and childhood leukaemia has not been established nor have any other long term effects been established.” This is supported by recent epidemiological studies of childhood cancer and EMF undertaken by The UK Childhood Cancer Study<sup>8</sup> and The Childhood Cancer Research Group<sup>9</sup>.
- 1.8.8 A few exceptional cases occur, where receptors are sufficiently close to the Proposed Scheme such that the output from the traction power modelling is inconclusive with regard to EMF risk. These receptors are included in Section 2 and they will be further assessed at detailed design stage. Specifically this affects residential dwellings that overlook the HS1 to HS2 link, however the traction load here will be considerably less than on other sections of the route and there is unlikely to be any significant effect.
- 1.8.9 It is therefore considered that there are no significant EMF effects on a route wide basis associated with operation. At even the closest of receptors, the estimated levels of EMF will be below 5% of the maximum values recommended by ICNIRP in relation to human health.

### Effects on electrical equipment due to EMI

- 1.8.10 It is possible that EMI risks may only affect some residential receptors within 20m from the centre of the nearest track or industrial receptors with very sensitive electrical or electronic equipment. This distance will depend on the localised situation, for example it will depend on whether the Proposed Scheme is on a viaduct, in a cutting or tunnel. Where identified, these receptors will be further evaluated during the detailed design stage and/or at testing and commissioning and further mitigation taken, which may be in the form of replacement of equipment with less sensitive equipment. Outside of this distance, the estimated levels of EMF at the closest receptors that remain are below the threshold for electrical interference recommended by BS EN 61000-6-1, and pose no risk.
- 1.8.11 The estimated levels of EMF at the closest receptors are below the threshold for electrical interference recommended by BS EN 61000-6-2, the threshold for industrial properties and pose no risk.
- 1.8.12 There may be residual effects for people with active medical implants, including pacemakers, where the EMC immunity performance of the active medical implant is less than the immunity performance specified in applicable harmonised standards.

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<sup>8</sup> The UK Childhood Cancer Study, [www.ukccs.org](http://www.ukccs.org); Accessed September 2013.

<sup>9</sup> The Childhood Cancer Research Group, [www.ccr.org.uk](http://www.ccr.org.uk); Accessed September 2013.

The regulatory body responsible is the Medicines and Healthcare Products Regulatory Authority, which does not consider EMF generated from power lines a significant risk to the operation of pacemakers<sup>10</sup>. Users of such equipment should seek advice from their general practitioner if in doubt.

### Other effects

- 1.8.13 Where the Proposed Scheme runs close to the existing Network Rail or London Underground Ltd (LUL) railway 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 and LUL.
- 1.8.14 Induced voltages from the HS2 overhead traction power may affect metallic infrastructure that runs parallel to the Proposed Scheme. For this have any significant effect, the infrastructure will have to run close to the Proposed Scheme and for a considerable distance, typically greater than 2km. Any effects will therefore be localised, but they can be mitigated by adopting design solutions that meet British and European standards and electrical engineering best practice.
- 1.8.15 Other effects, such as induced voltages, earthing and bonding issues associated with the interface with other railways, will be mitigated through design and construction in compliance with British, European Standards and best practice. It may be necessary for HS2 Ltd to agree and implement specific design solutions with affected third parties such as Network Rail, LUL, National Grid and the Highways Agency.

### Wildlife

- 1.8.16 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.

## 1.9 Climate change

- 1.9.1 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.

## 1.10 Receptors

- 1.10.1 A list of receptors that may be at risk from EMF and EMI is detailed in Section 2.
- 1.10.2 Receptors that have been identified as being at risk from EMF (health immunity) are those residential and commercial buildings that will remain within 10m of the centre of the nearest track.

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<sup>10</sup> Medicines and Healthcare Products Regulatory Authority, [www.mhra.gov.uk](http://www.mhra.gov.uk); Accessed September 2013.

- 1.10.3 The EMF contour plots are difficult to interpret below 10m from the centre of the nearest track and for this reason receptors below this value have been detailed within Section 2. It is unlikely that the levels of EMF will exceed the 200 $\mu$ T as the Proposed Scheme will comply with BS EN 50121-1, which limits the level of EMF at the railway boundary to below those recommended by ICNIRP. In exceptional cases where the Proposed Scheme runs over existing railway infrastructure (e.g. within CFA2), the distances between the railway and overlooking residential and commercial buildings are shorter than those on the rest of the Proposed Scheme, however along this part of the railway, the traction load is significantly less than that of the rest of the Proposed Scheme and is unlikely to pose any significant risk. A further review of these receptors will be undertaken at the detailed design stage.
- 1.10.4 Receptors at risk from EMC (equipment immunity) are those residential and commercial buildings that will remain within 20m of the centre of the nearest track.
- 1.10.5 Within 20m, the levels of EMF 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, mitigation proposals will be to reposition the equipment, or if not possible, replace with less sensitive equipment.
- 1.10.6 Receptors at risk from induced voltages are infrastructure running close to and parallel for over 2km in length and include: other railway infrastructure, metallic fences, pipelines, overhead power cables and telecommunications cables on motorways.
- 1.10.7 Where induced voltages have been highlighted as a risk, the risk will be eliminated by designing, building, operating and maintaining the Proposed Scheme to current standards. The same will be done for any other railway.
- 1.10.8 No other EMI risks have been identified.

## 2 Potentially affected receptors

### 2.1 Euston - Station and Approach (CFA1)

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

Table 1: Potentially affected receptors within CFA1 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP <sup>11</sup> 50Hz short term limit (μT)	Estimated emission level (μT)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA1-B2	1+320	10	Flats 2 to 7, 117 Parkway	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth greater than 14m).
CFA1-B3	1+345	5	Flat 1, 117 Parkway	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-B4	1+365	7	121 Parkway	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-B5	1+370	4	119 Parkway	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-B6	1+380	0	115 Parkway	Residential	EMI Technical Note (EMF	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth

<sup>11</sup> International Commission on Non-ionizing Radiation Protection.



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP <sup>11</sup> 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
					plots) and ICNIRP					greater than 25m).

## Electromagnetic compatibility assessment (equipment immunity)

Table 2: Potentially affected receptors within CFA<sub>1</sub> for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA <sub>1</sub> -A <sub>2</sub>	0+520	15	Cartmel, Hampstead Road	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme in cutting (rail depth greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA <sub>1</sub> -A <sub>3</sub>	1+310	12	1 Park Village East	Commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 13m).
CFA <sub>1</sub> -A <sub>4</sub>	1+320	10	Flats 2 to 7, 117 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 14m).

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA1-A5	1+345	5	Flat 1, 117 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-A6	1+350	13	125 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-A7	1+360	11	123 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-A8	1+365	7	121 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-A9	1+370	4	119 Parkway	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 15m).
CFA1-A10	1+380	0	115 Parkway	Commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth greater than 25m).

## Electromagnetic interference assessment (induced voltages on cables)

Table 3: Potentially affected receptors within CFA1 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA1-C1	0+000 to 1+390 (i.e. throughout the Euston - station and approach area)	Less than 200	West Coast Main Line, Watford DC Line	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122 .	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	Although the length is approximately 1.4km, the induced voltage assessment needs to consider the railways connected to it (e.g. extending into the area adjacent to the Euston - station and approach area).

## 2.2 Camden Town and HS1 Link (CFA2)

### Electromagnetic field exposure assessment (health immunity)

Table 4: Potentially affected receptors within CFA2 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA2-B1	0+450	6	Object	Assumed (worst case) residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height approximately 10m).
CFA2-B2	0+535	6	Object	Assumed (worst case) residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 8m).
CFA2-B3	0+600	6	3, 9 Cedar Way Industrial Estate	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 10m).
CFA2-B4	0+720	3	Object	Assumed (worst case) residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed scheme at ground level.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B5	0+760	10	Object	Assumed (worst case) residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme at ground level.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA2-B6	0+950	8	Caufield Court, Baynes Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct/bridge (rail height greater than 6m).
CFA2-B7	0+980	1	90-94 Baynes Street (within viaduct arch)	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B8	1+000	5	Meridian House, Baynes Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B9	1+010	0 (worst case estimate of viaduct arch location)	Unit 88 (viaduct arch), Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
										Scheme.
CFA2-B10	1+020	5	8 Nora Leverton Court, Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B11	1+035	6	Origin Housing, Office block, Nora Leverton Court, Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B12	1+045	7	Flat 1-7, Nora Leverton Court, Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height 7m).
CFA2-B13	1+050	0 (worst case estimate for north side viaduct)	Units 77-79 Randolph	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
		arch)								significantly less here than on the rest of the Proposed Scheme.
CFA2-B14	1+070	0 (in viaduct arch)	Unit 78 Randolph	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B15	1+080	2	28 Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 6m).  Traction load significantly less here than on the rest of the Proposed Scheme
CFA2-B16	1+085	6	27 Randolph Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-B17	1+090	10	26 Randolph Street	Residential	EMI Technical Note (EMF plots) and	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
					ICNIRP					6m).
CFA2-B18	1+110	9	174 Royal College Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-B19	1+115	10	176 Royal College Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-B20	1+120	5	178 Royal College Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 5m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B21	1+120	5	178a Royal College Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 5m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B22	1+130	6	Object	Residential	EMI Technical	200	Uncertain	Unlikely	Undertake further	Proposed Scheme



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
					Note (EMF plots) and ICNIRP				review at detailed design stage.	on viaduct (rail height greater than 5m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B23	1+170	3	47-49 Camden Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 5m). Radial distance approximately 6m.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B24	1+190	0	Seven commercial units, 17-19 Bonny Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detailed design stage.	Proposed Scheme on viaduct (rail height greater than 5m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B25	1+200	0	Camden Road railway	Residential	EMI Technical Note (EMF plots) and	200	Uncertain	Unlikely	Undertake further review at detailed	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
			station		ICNIRP				design stage.	5m).  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-B26	1+240	6	11 Bonny Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-B27	1+245	6	9 Bonny Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-B28	1+265	5	2, 4 Prowse Place	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height 6m).
CFA2-B29	1+280	10	3 Prowse Place	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-B30	1+325	5	158, 158A Camden Street	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B31	1+410	6	47 Kentish Town Road	Residential	EMI Technical Note (EMF	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
					plots) and ICNIRP					height greater than 7m).
CFA2-B32	1+405	4	Unit 1, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B33	1+415	4	Unit 2, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B34	1+425	5	Unit 3, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B35	1+435	6	Unit 4, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B36	1+440	7	Unit 5, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B37	1+450	8	Unit 6, 49 Kentish Town Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B38	1+460	10	Unit 7, 49 Kentish	Residential	EMI Technical Note (EMF plots) and	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
			Town Road		ICNIRP					7m).
CFA2-B39	1+445	5	1 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B40	1+455	9	2 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B41	1+465	5	3 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B42	1+470	5	4 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B43	1+475	5	5 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B44	1+480	5	6 Water Lane	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-B45	1+480	5	Leybourne Road viaduct	Residential	EMI Technical Note (EMF plots) and	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
			arches - south side units - Arch 17		ICNIRP					7m).
CFA2-B46	1+690 to 1+830	7	The Stables Market, Chalk Farm Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-B47	1+830 to 1+920	7	The Stables Market, Chalk Farm Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme at ground level (rail height approximately 0m).
CFA2-B48	1+960 to 2+140	8 to 10	54 to 78 Juniper Crescent	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in portal (rail depth approximately 0m).
CFA2-B49	2+120	10	Roundhouse Theatre, Chalk Farm Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel portal (rail depth greater than 2m).
CFA2-B54	1+400 to 1+680 (estimated)	See comments	Hawley Wharf development (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	Hawley Wharf is a future/current development.  To be assessed when further information becomes available.

## Electromagnetic compatibility assessment (equipment immunity)

Table 5: Potentially affected receptors within CFA2 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA2-A1	0+090	15	Object off York Way	Assumed (worst case) residential, commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme at ground level.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A2	0+340 to 0+480	12	Objects off Freight Lane	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height 0.7 to 10m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										here than on the rest of the Proposed Scheme.
CFA2-A3	o+390	19	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 9m).
CFA2-A4	o+450	6	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height approximately 10m).
CFA2-A5	o+535	6	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 8m).
CFA2-A6	o+580	19	5, 11 Cedar Way Industrial Estate, Cedar Way	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-A7	o+585	12	4, 10 Cedar Way Industrial Estate, Cedar Way	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A8	o+600	6	3, 9 Cedar Way Industrial Estate,	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
			Cedar Way							Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A9	0+650	14	1-2 Cedar Way Industrial Estate	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A10	0+720	3	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed scheme at ground level.  Undertake another review at detailed design and/or testing and commissioning and replace.
CFA2-A11	0+760	10	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme at ground level.  Undertake another review at detailed design and/or



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										<p>testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A12	0+775	14	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme at ground level.</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A13	0+800	15	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme at ground level.</p> <p>Undertake another review at detailed design and/or testing and commissioning and</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A14	0+910	15	Camden Garden Centre, 2-2A Barker Drive	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme at ground level.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A15	0+920	19	St Thomas Court, Wrotham Road	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme at ground level.  Undertake another review at detailed design and/or testing and commissioning and replace equipment

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A16	0+950	8	Caufield Court, Baynes Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct/bridge (rail height greater than 6m).
CFA2-A17	0+960	17	109, 111 St Pancras Way	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A18	0+980	1	90-94 Baynes Street (within viaduct arch)	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										Scheme.
CFA2-A19	0+985	18	1 Randolph Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A20	0+995	17	3 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A21	1+000	5	Meridian House, Baynes Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										<p>commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A22	1+010	0 (worst case estimate of viaduct arch location)	Unit 88 (viaduct arch), Randolph Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 6m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A23	1+020	5	8 Nora Leverton Court, Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 6m).</p> <p>Undertake another review at detailed</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A24	1+035	6	Origin Housing, Office block, Nora Leverton Court, Randolph Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA2-A25	1+045	7	Flat 1-7, Nora Leverton Court, Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A26	1+040	18	38 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-A27	1+050	0 ( worst case estimate for north side viaduct arch)	Units 77-79 Randolph	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A28	1+070	0 (in viaduct arch)	Unit 78 Randolph	Assumed (worst case) residential,	EMI Technical Note (EMI plots) and BS	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
				commercial	EN 61000-6-1				equipment.	6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A29	1+080	2	28 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA2-A30	1+085	6	27 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 6m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A31	1+090	10	26 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 6m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										of the Proposed Scheme.
CFA2-A32	1+095	12	25 Randolph Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A33	1+100	17	166 Royal College Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A34	1+105	17	168 Royal College Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A35	1+105	11	170, 172 Royal College Street	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										Scheme.
CFA2-A36	1+110	9	174 Royal College Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 5m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A37	1+115	10	176 Royal College Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 5m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										here than on the rest of the Proposed Scheme
CFA2-A38	1+120	5	178 Royal College Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A39	1+120	5	178a Royal College Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A40	1+130	6	Object	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A41	1+140	20	102-106 Camden Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A42	1+170	3	47-49 Camden Road	Commercial	EMI Technical Note (EMI plots) and BS	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					EN 61000-6-1				equipment.	5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A43	1+190	0	Seven commercial units, 17-19 Bonny Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA2-A45	1+240	6	11 Bonny Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 5m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A46	1+245	6	9 Bonny Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 5m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										of the Proposed Scheme.
CFA2-A47	1+250	11	7 Bonny Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A48	1+255	13	5 Bonny Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A49	1+260	16	3 Bonny Street	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A50	1+265	5	2, 4 Prowse Place	Commercial	EMI Technical Note (EMI plots) and BS	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive	Proposed Scheme on viaduct (rail height 6m).



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					EN 61000-6-1				equipment.	Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A51	1+280	10	3 Prowse Place	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A52	1+315	15	156 Camden Street	Commercial	EMI Technical Note (EMI	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					plots) and BS EN 61000-6-1					height greater than 7m).
CFA2-A53	1+325	5	158, 158A Camden Street	Commercial and residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A54	1+330	15	Two objects adjacent 160 Camden Street	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-A55	1+340	17	160 Camden Street	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-A56	1+410	6	47 Kentish Town Road	Commercial	EMI Technical Note (EMI plots) and BS	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive	Proposed Scheme on viaduct (rail height greater than

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					EN 61000-6-1				equipment.	7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A57	1+405	4	Unit 1, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA2-A58	1+415	4	Unit 2, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 7m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A59	1+425	5	Unit 3, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 7m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest</p>

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										of the Proposed Scheme.
CFA2-A6o	1+435	6	Unit 4, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A61	1+440	7	Unit 5, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										significantly less here than on the rest of the Proposed Scheme.
CFA2-A62	1+450	8	Unit 6, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A63	1+460	10	Unit 7, 49 Kentish Town Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 7m).
CFA2-A64	1+445	5	1 Water Lane	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m). Undertake another review at detailed design

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A65	1+455	9	2 Water Lane	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A66	1+465	5	3 Water Lane	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										<p>review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A67	1+470	5	4 Water Lane	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 7m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A68	1+475	5	5 Water Lane	Commercial	EMI Technical Note (EMI plots) and BS	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive	Proposed Scheme on viaduct (rail height greater than



Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					EN 61000-6-1				equipment.	7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A6g	1+480	5	6 Water Lane	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA2-A70	1+480	5	Leybourne Road viaduct arches - south side units - Arch 17	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 7m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A71	1+585	13	James Cameron House, 12 Castlehaven Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A72	1+610	18	4-8 Castlehaven Road	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 6m).
CFA2-A73	1+625	11	The Hawley Arms, 2 Castlehaven Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 6m).

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										<p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A74	1+625	6 to 20	Camden Lock Village (shops) on Chalk Farm Road	Assumed (worst case) residential, commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	<p>Proposed Scheme on viaduct (rail height greater than 5m).</p> <p>Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.</p> <p>Traction load significantly less here than on the rest of the Proposed Scheme.</p>
CFA2-A75	1+670	13 to 20	Camden Lock Market	Commercial	EMI Technical Note (EMI	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
					plots) and BS EN 61000-6-1					height greater than 5m).
CFA2-A76	1+660	12	10 Chalk Farm Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A77	1+670	15	11 Chalk Farm Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A78	1+670	19	12 Chalk Farm Road	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height greater than 5m).
CFA2-A79	1+690 to 1+830	7	The Stables Market, Chalk Farm Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on viaduct (rail height greater than 5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										Scheme.
CFA2-A80	1+830 to 1+920	7	The Stables Market, Chalk Farm Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme at ground level.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A81	1+960 to 2+140	8 to 20	23 to 78 Juniper Crescent	Residential	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme in portal (rail depth 0 to 2.8m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										Scheme.
CFA2-A82	2+120	10	Roundhouse Theatre, Chalk Farm Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme in tunnel portal (rail depth 0 to 3m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.  Traction load significantly less here than on the rest of the Proposed Scheme.
CFA2-A83	2+335	18	123 Regents Park Road	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Beyond the Camden and HS1 Link area boundary but included as it would otherwise be missed out. Proposed Scheme in tunnel (rail depth greater than 9m).
CFA2-A84	2+390	15	Iron Bridge House, 3 Bridge Approach	Commercial	EMI Technical Note (EMI plots) and BS EN 61000-6-1	3	Less than 3	No	N/A	Beyond the Camden and HS1 Link area boundary but included as it would otherwise be missed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										out. Proposed Scheme in tunnel (rail depth greater than 10m).
CFA2-A8g	1+400 to 1+680 (estimated)	See comments	Hawley Wharf development (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	To be determined (see comments)	Hawley Wharf is a future/current development.  To be assessed when further information becomes available.

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

Table 6: Potentially affected receptors within CFA2 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA2-C1	0+000 to 2+185	Varies along length	London Overground	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards	The Proposed Scheme runs within 200m of the London Overground for a distance of approximately 2.2km.

## 2.3 Primrose Hill to Kilburn (Camden) (CFA<sub>3</sub>)

### Electromagnetic field exposure assessment (health immunity)

Table 7: Potentially affected receptors within CFA<sub>3</sub> for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit (μT)	Estimated emission level (μT)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA <sub>3</sub> -B1	1+390 to 5+040 (i.e. whole length of the Primrose Hill to Kilburn (Camden) area)	Varies along length (see comments)	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Throughout the study area, the Proposed Scheme is in tunnel with a minimum depth of approximately 26m. Additionally, the Proposed Scheme depth is greater than 43m where the much shallower tunnels for LU Jubilee and Metropolitan Lines, WCML and Watford to Euston railway line exist in the Primrose Hill area. Therefore there is no significant EMF risk.



## Electromagnetic compatibility assessment (equipment immunity)

Table 8: Potentially affected receptors within CFA<sub>3</sub> for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA <sub>3</sub> -A <sub>1</sub>	1+390 to 5+040 (i.e. whole length of the Primrose Hill to Kilburn (Camden) area)	Varies along length (see comments)	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Throughout the study area, the Proposed Scheme is in tunnel with a minimum depth of approximately 26m. Additionally, the Proposed Scheme depth is greater than 43m where the much shallower tunnels for LU Jubilee and Metropolitan Lines, WCML and Watford to Euston railway line exist in the Primrose Hill area. Therefore there is no significant EMC risk.

## Electromagnetic interference assessment (induced voltages on cables)

Table 9: Potentially affected receptors within CFA<sub>3</sub> for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA <sub>3</sub> -C1	1+390 to 5+040 (i.e. whole length of the Primrose Hill to Kilburn (Camden) area)	Less than 200	WCML and Camden Carriage sidings (see comments)	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to WCML and Camden Carriage sidings within 200m throughout CFA <sub>3</sub> , a total length of approximately 3.7km.
CFA <sub>3</sub> -C2	1+390 to 5+040 (i.e. whole length of the Primrose Hill to Kilburn (Camden) area)	Less than 200	Euston to Watford railway line (see comments)	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the Euston to Watford railway line within 200m throughout CFA <sub>3</sub> , a total length of approximately 3.7km.

## 2.4 Kilburn (Brent) to Old Oak Common (CFA<sub>4</sub>)

### Electromagnetic field exposure assessment (health immunity)

Table 10: Potentially affected receptors within CFA<sub>4</sub> for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit (μT)	Estimated emission level (μT)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA <sub>4</sub> -B1	5+040 to 10+447 (i.e. the whole Kilburn (Brent) to Old Oak Common area)	Varies – see comments	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Throughout the Kilburn (Brent) to Old Oak Common area, the Proposed Scheme is in tunnel with a minimum depth greater than 13m. Therefore, there is no significant EMF risk.

## Electromagnetic compatibility assessment (equipment immunity)

Table 11: Potentially affected receptors within CFA4 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA4-A1	5+040 to 10+447 (i.e. the whole Kilburn (Brent) to Old Oak Common area)	Varies – see comments	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Throughout the Kilburn (Brent) to Old Oak Common area, the Proposed Scheme is in tunnel with a minimum depth greater than 13m. Therefore, there is no significant EMC risk.

## Electromagnetic interference assessment (induced voltages on cables)

Table 12: Potentially affected receptors within CFA4 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA4-C1	5+040 to 7+325	Less than 200	Watford DC Line and London Underground Bakerloo Line.	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122;	60V on Network Rail  25kV on London Underground	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	<p>The Watford DC Line and Bakerloo Line share the same line from Queens Park Station northwards and need to be assessed together.</p> <p>The Proposed Scheme runs approximately parallel to Watford DC line/Bakerloo Line within 200m from the start of the Kilburn (Brent) to Old Oak Common area at 5+040 to approximately 7+325 i.e. a total length of approximately 2.3km.</p>
CFA4-C2	5+040 to 7+380	Less than 200	West Coast Main Line	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122,	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the West Coast Main Line within 200m from approximately

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
										5+040 to 7+380 i.e. a total length of approximately 2.3km.
CFA4-C3	7+555 to 9+400 (see comments)	Varies along length	Great Western Main Line (including Old Oak Common and North Pole Depots)	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the Great Western Main Line within 200m from 7+555 (when Old Oak Common has been modified) to 9+400 i.e. a total length of approximately 1.8km. As this is close to 2km in length it is included in this assessment.

## 2.5 Northolt Corridor (CFA<sub>5</sub>)

### Electromagnetic field exposure assessment (health immunity)

Table 13: Potentially affected receptors within CFA<sub>5</sub> for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit (μT)	Estimated emission level (μT)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA <sub>5</sub> -B1	10+448 - 19+127 (i.e. whole length of Northolt Corridor area)	Varies along length	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Throughout the Northolt Corridor area, the Proposed Scheme is in tunnel with a minimum depth of approximately 23m. Therefore, there is no significant EMF risk.

### Electromagnetic compatibility assessment (equipment immunity)

Table 14: Potentially affected receptors within CFA<sub>5</sub> for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA <sub>5</sub> -A1	10+448- 19+127 (i.e. whole length of Northolt Corridor area)	Varies along length	Residential and commercial buildings	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Throughout the Northolt Corridor area, the Proposed Scheme is in tunnel with a minimum depth of approximately 23m. Therefore there is

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										no significant EMC risk.

## Electromagnetic interference assessment (induced voltages on cables)

Table 15: Potentially affected receptors within CFA5 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA5-C1	10+448 - 19+127 (i.e. whole length of Northolt Corridor area)	Less than 200	Acton and Northolt Line (see comments).	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the Acton and Northolt Line within 200m throughout the Northolt Corridor area, a total length of approximately 8.7km.
CFA5-C2	10+448 - 9+127 (i.e. whole length of Northolt Corridor area)	Less than 200	LUL Central Line (see comments)	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	25	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Schemes runs approximately parallel to the LUL Central Line within 200m throughout the Northolt Corridor area, a total length of approximately





## 2.6 South Ruislip to Ickenham (CFA6)

### Electromagnetic field exposure assessment (health immunity)

Table 16: Potentially affected receptors within CFA6 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA6-B1	23+270 to 23+385	9	West Ruislip Station, Ickenham Road	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth is greater than 18m).
CFA6-B2	23+350	0	Blenheim Care Centre, Ickenham Road	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth is greater than 18m).
CFA6-B3	23+440	1	Ruislip Golf Centre, Ickenham Road	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth is greater than 15m).

## Electromagnetic compatibility assessment (equipment immunity)

Table 17: Potentially affected receptors within CFA6 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA6-A2	23+350	0	Blenheim Care Centre, Ickenham Road	Commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth is greater than 18m).
CFA6-A3	23+440	1	Ruislip Golf Centre, Ickenham Road	Commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth is greater than 15m).
CFA6-A5	24+230	12	Object (possibly associated with Chiltern Main Line) identified on ArcGIS map, but nothing obvious on ArcGIS Aerial Imagery.	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on embankment (rail height approximately 2.5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

## Electromagnetic interference assessment (induced voltages on cables)

Table 18: Potentially affected receptors within CFA6 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA6-C1	19+127 to 23+460	Less than 200	London Underground Central Line running broadly parallel to Proposed Scheme.	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60V on Network Rail  25V on London Underground	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the London Underground Central Line within 200m from start of the South Ruislip to Ickenham area at 19+127 to the west of West Ruislip station at approximately 23+460 i.e. a total length of approximately 4.3km.
CFA6-C2	19+127 to 25+840 (i.e. whole length of South Ruislip to Ickenham area)	Less than 200	Network Rail lines (e.g. Chiltern Main Line, Acton and Northolt Line)	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the Network Rail lines (e.g. Chiltern Main Line, Acton and Northolt Line) within 200m throughout the length of whole

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
										length of the South Ruislip to Ickenham area from 19+127 to 25+840 i.e. a total length of approximately 6.7km. As the lines are joined, the assessment of induced voltages will need to be carried out together.

## 2.7 Colne Valley (CFA7)

### Electromagnetic field exposure assessment (health immunity)

2.7.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

Table 19: Potentially affected receptors within CFA7 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA7-A1	26+410	20	Hillingdon Outdoor Activity Centre building	Commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme on viaduct (rail height approximately 11m).

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

2.7.2 No induced voltage risks have been identified within this CFA.

## 2.8 The Chalfonts and Amersham (CFA8)

### Electromagnetic field exposure assessment (health immunity)

Table 20: Potentially affected receptors within CFA8 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA8-B1	31+550 - 42+740 (i.e. whole of The Chalfonts and Amersham area)	Varies - see comments	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Throughout The Chalfonts and Amersham area, the Proposed Scheme is in tunnel with a minimum depth of approximately 28m. Therefore there is no significant EMF risk.

### Electromagnetic compatibility assessment (equipment immunity)

Table 21: Potentially affected receptors within CFA8 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA8-A1	31+550 - 42+740 (i.e. whole of The Chalfonts and Amersham area)	Varies - see comments	Residential and commercial buildings	Residential and commercial (worst case)	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Throughout The Chalfonts and Amersham area, the Proposed Scheme is in tunnel with a minimum depth of approximately 28m. Therefore there is

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										no significant EMC risk.

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

2.8.1 No induced voltage risks have been identified within this CFA.



## 2.9 Central Chilterns (CFAg)

### Electromagnetic field exposure assessment (health immunity)

Table 22: Potentially affected receptors within CFAg for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFAg-B1	43+540	0	Lime Farm	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth approximately 24m).
CFAg-B3	44+040	0	Hill House	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme in tunnel (rail depth approximately 42m).

### Electromagnetic compatibility assessment (equipment immunity)

Table 23: Potentially affected receptors within CFAg for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFAg-A1	43+540	0	Lime Farm	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth approximately 22m).
CFAg-A4	44+020	12	De Fontenay	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth approximately 40m).

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA9-A5	44+040	0	Hill House	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	Proposed Scheme in tunnel (rail depth approximately 40m).

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

Table 24: Potentially affected receptors within CFA9 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA9-C1	48+855 to 55+670 (less than 200m from Proposed Scheme)	Less than 200	National Grid overhead power lines from start of the Dunsmore, Wendover and Halton area for over 80% of the length of that area.	Power lines	ITU-T Volume VI <sup>12</sup>	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs within 200m of National Grid overhead power lines for a distance of approximately 6.7km.
CFA9-C2	52+450 to 55+670	Less than 200	Marylebone to Aylesbury	Railway assets	BS EN 50121 suite of standards	60	To be determined at detailed	Yes	Design, build, operate and maintain to	The Proposed Scheme runs approximately

<sup>12</sup> ITU (2008), ITU-T Directives concerning the protection of telecommunication lines against harmful effects from electric power and electrified lines. Volume VI. Danger, damage and disturbance. ITU 2008.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
			Line		apply as does BS EN 50122.		design stage.		current standards.	parallel with the Marylebone to Aylesbury Line for a distance of approximately 3.2km.

## 2.10 Dunsmore, Wendover and Halton (CFA10)

### Electromagnetic field exposure assessment (health immunity)

2.10.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

2.10.2 No electrical equipment immunity risks have been identified within this CFA.

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

Table 25: Potentially affected receptors within CFA10 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA10-C1	48+855 to 55+670 (less than 200m from Proposed Scheme)	Less than 200	National Grid overhead power lines from start of the Dunsmore, Wendover and Halton area for over 80% of the length of that area.	Power lines	ITU-T Volume VI	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs within 200m of National Grid overhead power lines for a distance of approximately 6.7km.
CFA10-C2	52+450 to 55+670	Less than 200	Marylebone to Aylesbury Line	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel with the Marylebone to Aylesbury Line for a distance of

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
										approximately 3.2km.

## **2.11 Stoke Mandeville and Aylesbury (CFA11)**

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

2.11.1 No health immunity risks have been identified within this CFA.

### **Electromagnetic compatibility assessment (equipment immunity)**

2.11.2 No electrical equipment immunity risks have been identified within this CFA.

### **Electromagnetic interference assessment (induced voltages on cables)**

2.11.3 No induced voltage risks have been identified within this CFA.

## 2.12 Waddesdon and Quainton (CFA12)

### Electromagnetic field exposure assessment (health immunity)

2.12.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

2.12.2 No electrical equipment immunity risks have been identified within this CFA.

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

Table 26: Potentially affected receptors within CFA12 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA12-C1	72+000 to 77+445  (see comments)	Varies along length (see comments)	Aylesbury Link runs parallel.	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel with the Aylesbury Link within 200m from approximately 71+500 to the end of the Waddesdon and Quainton area at 77+445 i.e. at total distance of nearly 6km.

## 2.13 Calvert, Steeple Claydon, Twyford and Chetwode (CFA13)

### Electromagnetic field exposure assessment (health immunity)

Table 27: Potentially affected receptors within CFA13 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA13-B1	77+445 to 79+740 (typically less than 10m from Proposed Scheme)	Varies along length	Aylesbury Link	Assumed residential and commercial (worse case)	EMI Technical Note (EMF plots) and ICNIRP	200	To be determined (see comments)	Unlikely	To be determined (see comments)	The Aylesbury Link will be realigned as part of the Proposed Scheme. Separation distances along the common length with the Proposed Scheme and EMF to be assessed at detailed design.
CFA13-B2	78+755	3	Object identified on ArcGIS (approximately 300m south of the School Hill road on the east side of the Proposed Scheme), but nothing visible on ArcGIS Aerial Imagery	Assumed residential and commercial (worst case)	EMI Technical Note (EMF plots) and ICNIRP	200	N/A (see comments)	No (see comments)	See comments	Proposed Scheme in cutting (depth approximately 2m).  It is unlikely that the object exists in reality as there is nothing visible on ArcGIS Aerial Imagery. If it did exist it will be relocated as it will come within the corridor of the Proposed Scheme.



## Electromagnetic compatibility assessment (equipment immunity)

Table 28: Potentially affected receptors within CFA13 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA13-A2	78+035	15	Object (possibly small hut) on the west side of the Proposed Scheme on the opposite side to Decoypond Wood	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme in cutting (depth approximately 4.5m).  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA13-A3	78+755	3	Object identified on ArcGIS (approximately 300m south of the School Hill road on the east side of the Proposed Scheme), but nothing visible on ArcGIS Aerial Imagery	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots) and BS EN 61000-6-1	3	N/A (see comments)	N/A (see comments)	See comments	Proposed Scheme in cutting (depth approximately 2m).  It is unlikely that the object exists in reality as there is nothing visible on ArcGIS Aerial Imagery. If it did exist it will be relocated as it will come within the corridor of the Proposed Scheme.

## Electromagnetic interference assessment (induced voltages on cables)

Table 29: Potentially affected receptors within CFA13 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA13-C1	77+445 to 79+930 (less than 200m from Proposed Scheme)	Less than 200	Aylesbury Link	Railway assets	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs approximately parallel to the Aylesbury Link within 200m for approximately 2.5km.

## 2.14 Newton Purcell to Brackley (CFA14)

### Electromagnetic field exposure assessment (health immunity)

2.14.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

2.14.2 No electrical equipment immunity risks have been identified within this CFA.

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

Table 30: Potentially affected receptors within CFA14 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA14-C1	<p>Within 200m of Proposed Scheme:</p> <p>(a) from approximately 90+500 to 91+440 (i.e. approximately 1km) near Tibbets Farm;</p> <p>(b) from approximately 94+110 to 96+280 (i.e. approximately 2.2km) near Turweston.</p>	Less than 200	National Grid overhead power lines near Tibbets Farm and near Turweston.	Power lines	ITU-T Volume VI	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	The Proposed Scheme runs within 200m of National Grid overhead power lines for a distance of approximately 1km and 2.2km near Tibbets Farm and Turweston respectively. As these are the same power lines, the total distances are added i.e. a total distance of approximately 3.2km.

## 2.15 Greatworth to Lower Boddington (CFA15)

### Electromagnetic field exposure assessment (health immunity)

Table 31: Potentially affected receptors within CFA15 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA15-B1	105+240	8	Small building near Lower Thorpe Farm.	Residential and commercial (worse case)	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on embankment (rail height approximately 9m).
CFA15-B2	114+820	10	Silo near Fir Tree House, Lower Boddington	Residential and commercial (worse case)	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme on embankment (rail height approximately 4m).

### Electromagnetic compatibility assessment (equipment immunity)

Table 32: Potentially affected receptors within CFA15 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA15-A1	105+240	8	Small building near Lower Thorpe Farm.	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on embankment (rail height approximately 9m).  Undertake another review at detailed

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
										design and/or testing and commissioning and replace equipment only then.
CFA15-A2	114+820	10	Silo near Fir Tree House, Lower Boddington	Assumed (worst case) residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Proposed Scheme on embankment (rail height approximately 4m).  It is assumed (worst case) that the silo has electrical/equipment e.g., for monitoring and control.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

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

2.15.1 No induced voltage risks have been identified within this CFA.

## 2.16 Ladbroke and Southam (CFA16)

### Electromagnetic field exposure assessment (health immunity)

Table 33: Potentially affected receptors within CFA16 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA16-A2	124+510	7	The Bungalow, Banbury Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detail design.	HS2 in cutting.
CFA16-A3	127+820	10	Welland House, Bascote Heath	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	HS2 in tunnel.

### Electromagnetic compatibility assessment (equipment immunity)

Table 34: Potentially affected receptors within CFA16 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA16-A2	124+510	7	The Bungalow, Banbury Road	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA16-A3	127+820	10	Welland House, Bascote Heatth	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	HS2 in tunnel.

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

2.16.1 No induced voltage risks have been identified within this CFA.

## **2.17 Offchurch and Cubbington (CFA17)**

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

2.17.1 No health immunity risk receptors have been identified within this CFA.

### **Electromagnetic compatibility assessment (equipment immunity)**

2.17.2 No electrical equipment immunity risks have been identified within this CFA.

### **Electromagnetic interference assessment (induced voltages on cables)**

2.17.3 No induced voltage risks have been identified within this CFA.



## 2.18 Stoneleigh, Kenilworth and Burton Green (CFA18)

### Electromagnetic field exposure assessment (health immunity)

Table 35: Potentially affected receptors within CFA18 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA18-A2	138+660	7	2 East Gate, National Agricultural Centre	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake a further review at the detailed design stage.	HS2 in cutting.
CFA18-A5	138+660	7	Home Farm, National Agricultural Centre	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake a further review at the detailed design stage.	HS2 in cutting.
CFA18-A8	139+460	5	303 Cromwell Lane, Burton Green	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	less than 200	No	N/A	HS2 in tunnel.
CFA18-A9	140+980	13	404 Cromwell Lane, Burton Green	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	less than 200	No	N/A	HS2 in tunnel.

## Electromagnetic compatibility assessment (equipment immunity)

Table 36: Potentially affected receptors within CFA18 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA18-A1	138+650	15	1 East Gate, National Agricultural Centre	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA18-A2	138+660	7	2 East Gate, National Agricultural Centre	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA18-A4	139+280	15	Avenue A, National Agricultural Centre	Residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

CFA18-A5	138+660	7	Home Farm, National Agricultural Centre	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting. Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA18-A6	139+280	15	Studio, New Kingswood Farm, Dalehouse Lane	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting. Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA18-A7	139+280	15	New Kingswood Farm, Dalehouse Lane	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 in cutting. Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA18-A8	139+460	5	303 Cromwell Lane, Burton Green	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	N	N/A	HS2 in tunnel.

CFA18-A9	140+980	13	404 Cromwell Lane, Burton Green	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	HS2 in tunnel.
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### Electromagnetic interference assessment (induced voltages on cables)

2.18.2 No induced voltage risks have been identified within this CFA.

## 2.19 Coleshill Junction (CFA19)

### Electromagnetic field exposure assessment (health immunity)

Table 37: Potentially affected receptors within CFA19 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA19-A1	161+390	7	Coleshill Farm	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake a further review at the detailed design stage.	HS2 on embankment.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

## Electromagnetic compatibility assessment (equipment immunity)

Table 38: Potentially affected receptors within CFA19 for exposure to traction power frequency electromagnetic fields (electromagnetic immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA19-A1	161+390	7	Coleshill Farm	Residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on embankment.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

## Electromagnetic field (induced voltage)

2.19.2 No induced voltage risks have been identified within this CFA.

## 2.20 Curdworth to Middleton (CFA20)

### Electromagnetic field exposure assessment (health immunity)

2.20.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

Table 39: Potentially affected receptors within CFA20 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA20-A1	168+120	11	Cocksparrow Farmhouse, Kingsbury Road	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on embankment.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

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

2.20.2 No induced voltage risks have been identified within this CFA.

## **2.21 Drayton Bassett, Hints and Weeford (CFA21)**

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

2.21.1 No health immunity risk receptors have been identified within this CFA.

### **Electromagnetic compatibility assessment (equipment immunity)**

2.21.2 No electrical equipment immunity risks have been identified within this CFA.

### **Electromagnetic interference assessment (induced voltages on cables)**

2.21.3 No induced voltage risks have been identified within this CFA.



## 2.22 Whittington to Handsacre (CFA22)

### Electromagnetic field exposure assessment (health immunity)

Table 40: Potentially affected receptors within CFA22 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu$ T)	Estimated emission level ( $\mu$ T)	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA22-A1	185+140	4	Streethay Cottage, Burton Road	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Uncertain	Unlikely	Undertake further review at detail design.	HS2 on viaduct.
CFA22-A5	185+190	9	Shaw Lane Farm	Residential	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	HS2 on embankment.

### Electromagnetic compatibility assessment (equipment immunity)

Table 41: Potentially affected receptors within CFA22 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA22-A1	185+140	4	Streethay Cottage, Burton Road	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on viaduct.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

CFA22-A2	185+190	13	Elverceter, Burton Road	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on embankment.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA22-A3	190+970	11	Hanch Wood House, Shaw Lane	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on embankment.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA22-A4	190+970	17	Shaw House, Shaw Lane	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	
CFA22-A5	191+700	9	Shaw Lane Farm	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.

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

2.22.1 No induced voltage risks have been identified within this CFA.

## 2.23 Balsall Common and Hampton-in-Arden (CFA23)

### Electromagnetic fields exposure assessment (health immunity)

2.23.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

2.23.2 No electrical equipment immunity risks have been identified within this CFA.

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

Table 42: Potentially affected receptors within CFA23 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA23-V5	151+200 to 153+000	50 to 250m	Buried high pressure gas pipe	Metal pipe	Potential induced voltages	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	

## **2.24 Birmingham Interchange and Chelmsley Wood (CFA24)**

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

2.24.1 No health immunity risks have been identified within this CFA.

### **Electromagnetic compatibility assessment (equipment immunity)**

2.24.2 No electrical equipment immunity risks have been identified within this CFA.

### **Electromagnetic interference assessment (induced voltages on cables)**

2.24.3 No induced voltage risks have been identified within this CFA.

## 2.25 Castle Bromwich and Bromford (CFA25)

### Electromagnetic field exposure assessment (health immunity)

Table 43: Potentially affected receptors within CFA25 for exposure to electromagnetic fields (health immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	ICNIRP 50Hz short term limit ( $\mu\text{T}$ )	Estimated emission level ( $\mu\text{T}$ )	Is there any credible EMF risk? (Y/N)	Mitigation measures	Comments
CFA25-H3	167+800 – 170+600	Varies, see comments.	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots) and ICNIRP	200	Less than 200	No	N/A	Proposed Scheme runs in a tunnel to a depth of 28m below the surface.  Therefore there is no significant EMF risk.

### Electromagnetic compatibility assessment (equipment immunity)

Table 44: Potentially affected receptors within CFA25 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA25-E3	167+800 – 170+600	Varies, see comments.	Residential and commercial buildings	Residential and commercial	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	3	No	N/A	Proposed Scheme runs in a tunnel to a depth of 28m below the surface.  Therefore there is no significant EMC risk.

## Electromagnetic interference assessment (induced voltages on cables)

Table 45: Potentially affected receptors within CFA25 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA25-V3	164+900 - 166+900	20 to 50m	Esso gas pipeline	Gas pipeline	Potential induced voltages	60	To be determined at detailed design stage	Yes	Design, build, operate and maintain to current standards.	
CFA25-V5	166+500 - 169+860	5	HS2 runs parallel to existing Network Rail Birmingham to Derby line	Railway	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	
CFA25-V11	167+500 - 171+300	50 to 250m	M6 motorway telecommunication cables	Telecommunication cables	ITU-T Volume VI	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	

## 2.26 Washwood Heath to Curzon Street (CFA26)

### Electromagnetic fields assessment (health immunity)

2.26.1 No health immunity risks have been identified within this CFA.

### Electromagnetic compatibility assessment (equipment immunity)

Table 46: Potentially affected receptors within CFA26 for electromagnetic compatibility assessment (equipment immunity)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Immunity limit (A/m)	Estimated emission level (A/m)	Is there any credible EMC risk? (Y/N)	Mitigation measures	Comments
CFA26-E14	174+150	10	Museum Collection Centre  Birmingham City Council 80 Dollman Street	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	HS2 on 15m viaduct.
CFA26-E17	174+330	10	The Midland Tavern public house	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Less than 3	No	N/A	HS2 on 15m viaduct.

CFA26-E21	174+600	Less than 10	West Midlands Fire Service headquarters	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on 15m viaduct, already adjoining existing 25kV electrified railway.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.
CFA26-E25	175+360	0 (underneath Curzon Street Station)	Eagle and Tun public house  New Canal Street	Residential	EMI Technical Note (EMF plots), BS EN 61000-6-1	3	Greater than 3	Yes	Reposition sensitive equipment or replace with less sensitive equipment.	HS2 on 8m viaduct, already adjoining existing 25kV electrified railway.  Undertake another review at detailed design and/or testing and commissioning and replace equipment only then.



## Electromagnetic interference assessment (induced voltages on cables)

Table 47: Potentially affected receptors within CFA26 for electromagnetic interference assessment (induced voltages on cables)

Identifier	Approximate railway chainage km + m	Distance from route centreline (m)	Sensitive installation	Receptor	Reference	Touch voltage limit (V)	Estimated level (V)	Is there any credible EMI risk? (Y/N)	Mitigation measures	Comments
CFA26-V2	170+000 to 173+500	5	HS2 runs parallel to existing Network Rail Birmingham to Derby line	Railway	BS EN 50121 suite of standards apply as does BS EN 50122.	60	To be determined at detailed design stage.	Yes	Design, build, operate and maintain to current standards.	

### 3 References

BS EN 61000-6-1 (2007), *Electromagnetic compatibility Part 6.1: Generic standards- immunity for residential, commercial and light industrial environments.*

BS EN 61000-6-2 (2005), *Electromagnetic compatibility Part 6.2: Generic standards- immunity for industrial environments.*

BS EN 50499 (2008), *Procedure for the assessment of the exposure of workers to electromagnetic fields.*

BS EN 50121 series of standards, Railway Applications, Electromagnetic Compatibility, which contains the following parts;

- BS EN 50121-1:2006 Part 1: General
- BS EN 50121-2:2006 Part 2: Emissions of the whole railway system to the outside world
- BS EN 50121-3-1:2006 Part 3-1: Rolling stock - train and complete vehicle
- BS EN 50121-3-2:2006 Part 3-2: Rolling stock - apparatus
- BS EN 50121-4:2006 Part 4: Emissions and immunity of the signalling and telecommunications apparatus
- BS EN 50121-5:2006 Part 5: Emissions and immunity of fixed power supply installations and apparatus

BS EN 50122 series of standards, Railway Applications - Fixed installations - Electrical safety, earthing and the return circuit, which consists of;

- BS EN 50122-1:2011 Part 1: Protective provisions against electric shock
- BS EN 50122-2:2010 Part 2: Provisions against the effects of stray currents caused by d.c. traction systems
- BS EN 50122-3:2010 Part 3: Mutual Interaction of a.c. and d.c. traction systems.

European Commission (1999), *EC Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz).*

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