

## 14.0 ELECTROMAGNETIC INTERFERENCE

### 14.1 ASSESSMENT METHODOLOGY

Section 39 (2) (a) (ii) of the Transport (Railway Infrastructure) Act 2001, requires that proposed developments are examined in terms of their expected emissions. Electromagnetic radiation and the potential impacts from stray current are to be considered in response to the above requirement.

The methodology adopted for this electromagnetic interference assessment is as follows:

- characterisation of the receiving environment
- characterisation of the proposed development
- evaluation of electromagnetic disturbance impacts from the proposed development
- identification of monitoring and mitigation measures required.

The supply and installation of the tram systems are governed contractually and legally by compliance with electromagnetic technical standards and guidelines.

### 14.2 RECEIVING ENVIRONMENT

The proposed Luas Line A1 is to be located mainly through undeveloped rather than densely built up areas. The potential impact is considered minimal as the separation distances are relatively large, causing low levels of electromagnetic field at adjacent potential receptors.

Section A has no development to the north and only housing to the south, which is generally 25 – 45 metres away. The Fettercairn Community Centre and Horse Project are also to the south of Section A.

Section B also has housing to the south at 25 – 45 metres away from the route alignment. However, the lands to the immediate north of the route within Citywest Business Campus are undeveloped at present with the exception of an existing ESB substation which is located north of Ard Mor and east of the proposed Citywest Campus Stop.

Section C runs along the existing Fortunestown Lane, which has a mix of residential and commercial development on its southern side, and with the exception of one residential scheme recently constructed. There are undeveloped lands to the immediate north.

The local business premises will contain electronic equipment such as main computers and personal computers, together with modern telecommunication systems. All post-1996 equipment will be in compliance with European electromagnetic compatibility regulations and should be insensitive to the electromagnetic fields from the tram system. Similarly local domestic premises will contain electrical and electronic systems, and these should be adequately immune to disturbances from the tram system.

Overall, there are no particularly sensitive receptors, which would give rise to concern from the electromagnetic fields generated by the proposed Luas Line A1.

## 14.3 CONSTRUCTION IMPACTS AND MITIGATION

Electromagnetic interference does not arise during the construction phase. No mitigation is required.

## 14.4 OPERATIONAL IMPACTS AND MITIGATION

### 14.4.1 Operational Impacts

The trams operate on 750V direct current (d.c) and this electrical power will be provided from two feeder substations, which will produce electromagnetic fields. Similarly the trams contain motors and motor control systems, and also there are associated vehicle control systems in the tram infrastructure which will contribute to the local electromagnetic fields. Therefore, the electromagnetic environment will be increased close to the tramlines when the tram operations commence due to the electromagnetic fields generated by the tram system.

Overall, the impact of the expected electromagnetic emissions from the tram system is considered unlikely to cause interference to electrical and electronic systems, and any associated exposure to passengers and local residents will be entirely acceptable.

### Electronic Equipment

The electromagnetic fields from the tram system will be present to some extent in domestic and business premises close to Line A1, but interference to electronic systems is not expected as the field levels would have to be greater than the sensitivity levels of the equipment. The equipment sensitivity levels are defined in the EMC qualification documentation of most modern items of equipment. Interference in the form of loss of data and corruption should not occur in this instance, even to closely located electronic equipment.

Switching and interruptions of electric current from the intermittent contact between the traction overhead conductor system and the tram's pantograph can cause transient fields, which could possibly reduce the quality of radio reception in nearby premises.

### Health & Safety

The magnetic fields due to electric currents in the tram overhead conductor system will occur to some extent and will be present in locations occupied by tram operational staff and passengers. However, the magnetic strengths from electrical tram operations are generally much lower than international investigation levels and human exposure is not an issue of concern. Consideration will be given to the changes in the electromagnetic fields that may occur, in order to demonstrate that there is full compliance with international exposure guidelines.

## **Sub-surface systems**

Stray current (electrical current through a path other than the intended pathway) leaking from the tram track on return to the substation and subsequently flowing in the earth has the potential to cause corrosion. This will be minimised by effective design and installation measures. The design will consider the maximum possible separation distances between the track and buried services, and the track insulation to earth, in order to control stray current impacts.

Conductors under the road surface such as buried gas pipes may also be subject to fields from the electrical power supply cables, and induced currents could be introduced. This coupling will be controlled where required by isolation or shielding to avoid corrosion of the buried metalwork and prevent damage to these systems.

### **14.4.2 Monitoring and Mitigation**

The mitigation and monitoring issues recommended below are in accordance with best practice, and will be implemented will ensure that the electromagnetic impacts of the proposed Luas Line A1 are insignificant.

#### **Electromagnetic Compatibility (EMC) Control Plan**

Any possible impact on the local environment will be addressed as part of an Electromagnetic Compatibility (EMC) Control Plan which will be prepared at the start of the project construction. The plan will set out the defined objectives and requirements for the designers, equipment suppliers and system installers to meet European legal EMC requirements, which limit the radiated emissions to levels that are acceptably low, and should not cause interference. Control will be achieved by compliance with the stated objectives and the results of all assessments will be presented in the EMC Control Plan documentation.

Measurements of emissions from the substations and trams will be made and monitored to ensure compliance with the standards. The impact of the fields generated by Luas Line A1 will be considered prior to operations and additional measurements will be made of the electromagnetic fields close to overhead conductor system for comparison with international reference levels.

#### **Compliance with the European Directives/ Standards**

All electrical products and systems associated with the proposed Luas Line A1 will be supplied and installed to comply with the European Standard EN 50121 (Parts 1-5) (which addresses railway EMC Part 2 of the standard is concerned with the interface between the railway system and the outside world and defines limits of emissions that are directed at the avoidance of interference.

The compliance of supplied equipment with the EMC limits will be independently assessed and mitigation measures will be considered as a required design change and correctly installed for any observed non-compliances. This work will be performed prior to operations. The required degree of stray current monitoring will be determined and fully implemented during the system development, tram operations, and maintenance.

Adequate verification of human exposure controls will be achieved through demonstration of safe conditions resulting from measurements and comparison with internationally accepted ICNIRP Guidelines.

### **Consultation with the System Provider**

The interaction with other telecommunication systems will be addressed through consultation with these systems owners. The electromagnetic emissions from the trams and substations that could cause interference to neighbouring electrical and electronic systems along the route will be assessed in surveys both before and after development.

### **Good engineering practices in installation**

The correct installation to good engineering practices will ensure that there is no interference to computers and information technology equipment in adjacent buildings, and will also provide protection of radio services. Studies of the electromagnetic effects of the design will identify the need for the incorporation of any required mitigation measures, and verification testing will be performed to confirm adequate performance. Good design in the form of insulated rails will be installed throughout and such measures will provide protection of buried piping and avoid corrosion.