

Translink

Re-Signalling Coleraine - Londonderry

Outline Project Specification

A013730-SN-SG-RP-0004

April 2010



Revision Schedule

Outline Project Specification

April 2010

| Rev | Date | Details | Prepared by | Reviewed by | Approved by |
|-----|---------------|--|---|---|---|
| 01 | August 2009 | First issue | Ben Morris Assistant Engineer | Adam Allen Principal Engineer | John Keepin Signalling Consultancy Manager |
| 02 | October 2009 | Updated to EDR Comments | Ben Morris Assistant Engineer | Adam Allen Principal Engineer | John Keepin Signalling Consultancy Manager |
| 03 | February 2010 | Updated with scope changes | David Lowrie Senior Engineer | Adam Allen Principal Engineer | Tim Tumber Associate |
| 04 | April 2010 | Updated with GB Email comments 30-03-2010 | David Lowrie Senior Engineer | Adam Allen Principal Engineer | John Flippance Principal Engineer |

This document has been prepared in accordance with the scope of Scott Wilson's appointment with its client and is subject to the terms of that appointment. It is addressed to and for the sole and confidential use and reliance of Scott Wilson's client. Scott Wilson accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of the Company Secretary of Scott Wilson Ltd. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole. The contents of this document do not provide legal or tax advice or opinion.

© Scott Wilson Ltd. 2010

Scott Wilson
Tri Centre 3
Newbridge Square
Swindon
SN1 1BY

Tel 01793 508500
Fax 01793 508501

www.scottwilson.com

Table of Contents

| | | |
|------|---|----|
| 1 | General | 1 |
| 1.1 | Brief Description of Project Background | 1 |
| 1.2 | Notional Timescale for Project | 2 |
| 1.3 | Resources / Competences Required..... | 3 |
| 1.4 | Nominated Project Manager / Engineer | 3 |
| 1.5 | Other Engineers Involved..... | 4 |
| 2 | Overall Design Concept | 5 |
| 2.1 | Design Parameters and Assumptions | 6 |
| 2.2 | Acceptability of Risk from Proposed Track Layout and Mitigation | 7 |
| 2.3 | Draft Staging and Testing Strategy | 7 |
| 2.4 | Application Standards Declared | 7 |
| 2.5 | Anticipated Non-Compliance with Current Standards..... | 8 |
| 2.6 | Train Operating Requirements..... | 8 |
| 2.7 | Dependability (RAMS) Requirements..... | 8 |
| 2.8 | Operational and Maintenance Requirements | 8 |
| 2.9 | Vandalism Protection | 9 |
| 2.10 | Safety Assurance Required | 9 |
| 2.11 | Scheme Approvals Required | 9 |
| 2.12 | Product Acceptance Required | 9 |
| 2.13 | Other Items | 9 |
| 3 | New Systems / Equipment..... | 10 |
| 3.1 | Type of Interlocking..... | 10 |
| 3.2 | Control and Indication Systems..... | 10 |
| 3.3 | Remote Control Systems | 11 |
| 3.4 | Interlocking Interface..... | 11 |
| 3.5 | Data Preparation..... | 11 |
| 3.6 | Signals, AWS, TPWS, ATP, etc. | 11 |
| 3.7 | Train Detection | 12 |
| 3.8 | Point Operation and Detection | 13 |
| 3.9 | Hot Axle Box Detectors..... | 13 |
| 3.10 | Fringe Box Interfaces..... | 13 |
| 3.11 | Level Crossings | 13 |
| 3.12 | Type of Relays..... | 14 |
| 3.13 | Signalling Power Supplies..... | 14 |

| | | |
|------|---|----|
| 3.14 | Data Transmission..... | 14 |
| 3.15 | Cable Routes..... | 14 |
| 3.16 | Ground Frames..... | 15 |
| 3.17 | Reversible Working / Block Circuits | 15 |
| 3.18 | Staff Warning Systems | 15 |
| 3.19 | Train Operated Warning System (TOWS)..... | 15 |
| 3.20 | Other Systems..... | 15 |
| 3.21 | System Interfaces / Interfaces with Existing | 16 |
| 3.22 | Equipment Housing..... | 16 |
| 3.23 | Operational Buildings..... | 16 |
| 3.24 | Operational Telecommunications..... | 17 |
| 3.25 | Changes in Electrification..... | 17 |
| 3.26 | Changes in Permanent Way | 17 |
| 3.27 | Changes in Civil Engineering | 18 |
| 3.28 | Changes in Power Supplies (Other than Signalling..... | 18 |
| 3.29 | Changes in Rolling Stock..... | 18 |
| 4 | Existing Systems / Equipment | 19 |
| 4.1 | Hazards from Mixing old and New Technologies | 19 |
| 4.2 | Sufficient Space / Power / Heat Dissipation for Additional Equipment..... | 19 |
| 4.3 | Correlation Required..... | 19 |
| 4.4 | Condition of Existing Infrastructure | 19 |
| 4.5 | Cable and Wire Insulation | 19 |
| 4.6 | Renewals Avoided / to be Carried Out At the Same Time..... | 19 |
| 4.7 | Recoveries / Systems to be Decommissioned | 20 |
| 4.8 | Published Restrictions | 20 |
| 5 | Implementation / Hazards | 21 |
| 5.1 | Interfaces with Other Projects | 21 |
| 5.2 | Occupational Safety Hazards..... | 21 |
| 5.3 | Environmental Factors | 21 |
| 5.4 | Electromagnetic Interfaces Strategy / Report Required..... | 22 |
| 5.5 | Site Surveys / Signal Sighting Required..... | 22 |
| 5.6 | Installation and Testing Staff Logistics | 23 |
| 5.7 | Site Accommodation (During Works) | 23 |
| 5.8 | Possessions, Red Zone Working | 23 |
| 5.9 | Testing Requirements..... | 23 |
| 5.10 | Training Requirements (Operational and Maintenance) | 24 |
| 5.11 | Long Lead Equipment..... | 24 |

| | | |
|------|--|----|
| 5.12 | Spares Requirements | 25 |
| 5.13 | OPS Change Control | 25 |
| 5.14 | Other Items | 25 |
| | appendix 1 – Check list for ops contents | 26 |
| | appendix 2 – Remote control sketch | 29 |

1 General

1.1 Brief Description of Project Background

Under the Coleraine to Londonderry re-signalling project several options are being considered to help modernize the route, reduce journey times and increase line capacity.

These options centre on a number of sites; particularly Londonderry, Eglinton, Castlerock and Coleraine. Each site is being developed as a separate site to aid option selection. The intention being that any site combination can be chosen by Translink in order to meet their ambitions financially and operationally.

The main changes that are proposed under this scheme are:

- To transfer control from Castlerock and Londonderry to a new PC based VDU system at Coleraine, making Londonderry and Castlerock signal boxes redundant.
- To provide train detection between Coleraine and Londonderry.
- To remove the passing loop and associated mechanical signalling at Castlerock and provide a new CCTV MCB and protecting signals.
- To signal Eglinton for an additional passing loop.
- Renewal of Londonderry interlocking area while future proofing the relocation of the station.
- Renewal of the Bann Bridge controls and transfer to the new PC based VDU system at Coleraine (funded separately).
- To recover the mechanical signalling on the Portrush branch and signal the line for "one train working".
- To convert McConaghy's UWG to an AHBC (funded separately).
- To provide MSLs at 11 UWC's which have been selected because of their frequency of use.
- To provide telephones at the other 34 UWC and additional signalling to protect them. (funded separately).
- To modify existing level crossing striking in points and signal spacing for the new line speeds.
- To provide T.O.W.S at Downhill and Castlerock tunnels and Bann River Bridge.

This Outline Project Specification describes the signaling works necessary for the re-signalling of Coleraine to Londonderry. This is a feasibility report and is dependant on the options taken forward; there may be sections and comments that will no longer be applicable.

1.2 Notional Timescale for Project

The commissioning date is intended to be 2012/2013.

1.3 Resources / Competences Required

| | |
|--|-------------------|
| Client | Translink |
| CDM Co-ordinator | Translink |
| Principal Installation Contractor | TBA |
| Signalling Design | Scott Wilson Ltd. |
| Signalling Installation | TBA |
| Permanent Way Design | TBA |
| Permanent Way Installation | TBA |
| Civils and Structural Design | TBA |
| Civils and Structural Construction | TBA |
| Electrical and Mechanical Design | TBA |
| Electrical and Mechanical installation | TBA |
| Telecommunications Design | Scott Wilson Ltd. |
| Telecommunications Installation | TBA |

Scott Wilson Ltd. is contracted for feasibility work only.

Contractors shall comply with the requirements of Network Rail Company Standard NR/GN/TEL/10117 - Competence Management Systems for Work on Control and Communications Systems, Issue 2 February 2006 and NR/SP/CTM/012 – Competence & training in Signal Engineering, Issue 1 December 2006.

Project Management for all the interfaces, design, installation, testing and commissioning to be controlled by the Principal Contractor.

1.4 Nominated Project Manager / Engineer

| | | |
|---------------------------------------|---------------|-------------------|
| Sponsor/Development Manager (Overall) | Ruairi Savage | Translink |
| Translink Project Manager | Geoff Brown | Translink |
| Designated Project Engineer | Geoff Brown | Translink |
| Contractor's Engineering Manager | TBA | Scott Wilson Ltd. |
| Design Contractor's Project Manager | Ivan Wheaton | Scott Wilson Ltd. |

1.5 Other Engineers Involved

| | | |
|--|---------------|------------------|
| Signalling Design | Adam Allen | Scott Wilson Ltd |
| Signalling Installation | TBA | TBA |
| Permanent Way Design | TBA | TBA |
| Permanent Way Installation | TBA | TBA |
| Civils and Structural Design | TBA | TBA |
| Civils and Structural Construction | TBA | TBA |
| Electrical and Mechanical Design | TBA | TBA |
| Electrical and Mechanical installation | TBA | TBA |
| Telecommunications Design | Jeremy Phelps | Scott Wilson Ltd |
| Telecommunications Installation | TBA | TBA |

Scott Wilson names above are only relevant for feasibility work.

2 Overall Design Concept

Brief outline of site options.

Londonderry:

- Platform starting signals positioned to allow passive provision for Station reconstruction.
- Transfer of controls from Londonderry signal box to Coleraine.
- Upgrade of existing relay based interlocking and interfaced with new cabling and fixed telecoms network at Eglinton.
- Full train detection.

Eglinton:

- New passing loop to be provided and signalled - to include passive provision for future Park & Ride station.
- Relay interlocking controlled by Coleraine and interfaced to Londonderry.
- Full train detection.

City of Derry Airport:

- Relay interlocking to be re-controlled from Coleraine.
- Westinghouse S2 TDM system to Londonderry redirected to Coleraine.
- Full train detection.

Ballykelly

- Recovery of existing redundant signalling and wiring.
- Recovery of redundant equipment housings.

McConaaghy's:

- Convert existing UWG Crossing to an AHB Crossing (funded separately).
- Full train detection.

Bellarena:

- To be the location of a future passing loop and passive provision only is to be considered at this stage.

Magilligan:

- Relay interlocking to be re-controlled from Coleraine and interfaced with Bellarena.

- Westinghouse S3 TDM system to Castlerock redirected to Coleraine.
- Full train detection.

Castlerock:

- Transfer of controls from Castlerock signal box to Coleraine.
- Existing loop to be removed.
- Recovery of lever frame and mechanical interlocking.
- Level crossing to be converted to MCB with CCTV to Coleraine.
- Upgrade of existing relay based interlocking to provide for level crossing controls to be controlled from Coleraine signal box.
- Full train detection.

Bann River Bridge (*Related Project not directly part of this scope of work*).

- Recovery of manned Control Box.
- Upgrade of existing relay interlocking to include the replacement of mechanical control arrangement.
- CCTV and Phone system to Coleraine may be necessary.
- Transfer controls to the new PC based VDU system at Coleraine.

Coleraine:

- Recovery of N-X panel.
- New PC based VDU system.
- Remote control of the Bann River Bridge outstanding – potential hazards to be resolved.

Portrush:

- Recovery of the mechanical signalling.
- Re-signalling for “one train working”.

2.1 Design Parameters and Assumptions

The arrangements for the project are depicted on a series of Signalling Scheme Sketches C0363-LY-CE-DG-0001 – 0010 Rev02. Signalling and Operational Telecommunications systems Network Rail company code of practice NR/GN/SIG/11600 (formerly RT/E/C/11600) outlines retrospective safety work that should be considered when undertaking alterations to the existing infrastructure. No non safety retrospective work should be undertaken unless explicitly specified by Translink.

2.2 Acceptability of Risk from Proposed Track Layout and Mitigation

New track layouts between Coleraine and Londonderry are subject to a Risk Assessment in accordance with GI/RT7006 and GI/GN7606 “Prevention and Mitigation of Overruns” along with the requirements of NR/L2/SIG/14201 “Prevention and Mitigation of Overruns - Risk Assessment of Signals” and NR/GN/SIG/14202 “Guidance on Prevention & Mitigation of Overruns – Risk Assessment of Signals”.

2.3 Draft Staging and Testing Strategy

The project requires alterations to the Coleraine signal box, substantial alterations of TDM remote control systems, several upgraded relay interlockings, alterations to existing infrastructure, and the provision of new lineside infrastructure. The testing strategy will include testing “Off Line” as far as reasonably practicable to minimise the disruption to the working railway.

Testing shall be conducted in accordance with NR/GN/SIG/11730 “Signalling Works Testing” and GK/RT0209 “Testing and Commissioning of Signalling and Operational Telecommunications Systems”. A testing strategy will be submitted as part of the concept design documentation.

Construction and implementation stagework strategies will be developed in liaison with the design implementation Contractor as the project proceeds. Any proposed enabling stagework should be fully justified on the grounds of a reduction in commissioning time or project risk. Implementation of these works shall take into account the possessions available within Rules of the Route, and any other works planned to be delivered in the area.

A Test Plan for the works will be provided by the implementation Contractor and shall be submitted to Translink for approval. The Test Plan will be prepared and all testing activities conducted with reference to the Testing Strategy and Network Rail Signalling Works Testing suite of standards, as well as the manufacturer’s documentation for any specific equipment to be used. Testing Strategies/Testing and Commissioning Plans must be approved for use by Translink at least 10 days prior to commencement of any testing.

The use of SMTH procedures and/or generic design may be proposed for staging or temporary works where such use can be shown to be robust, appropriate and cost effective.

2.4 Application Standards Declared

All works on this scheme will be compliant with national, European, UK, CDM and Health and safety Regulations, as well as ORR Railway Principles and Guidance, Railway Group and Network Rail Company Standards.

Railway Group Standards Issue 1, February 2010 and Network Rail Company Standards Issue 74, 5th December 2009 – 5th March 2010. New/revised standards issued after this date will be reviewed and, where required, implemented (following agreement through change control with Translink) or a TNC/derogation will be sought in accordance with NR/SP/SIG/11201.

All design shall take into account any other local instructions and procedures supplied by Translink.

2.5 Anticipated Non-Compliance with Current Standards

The designated Responsible Engineer for each discipline shall be responsible for specifying and ensuring that appropriate standards are complied with. Any non-compliance will be actioned in accordance with NR/SP/SIG/10071 and recorded in a register created for this purpose.

Every effort shall be made to ensure that the number of non-compliances raised is kept as low as possible. At this stage, no non-compliances are anticipated.

2.6 Train Operating Requirements

The Class of trains operating on the Belfast to Portrush/Londonderry line are:

- CAF3000 (typical 3-car but 2 x 3-car do operate within the area)
- Class 450 (typical 3-car units)
- New Trains Two

No alteration to the type of rolling stock is planned under this scheme. It is the aspiration of this project to reduce journey time and eventually to increase service to 2 trains an hour.

2.7 Dependability (RAMS) Requirements

The alterations to the system will be designed in accordance with guidance contained in BS EN 50126 and Group and Company Standards. The proposed design shall not introduce a level of reliability less than that of comparable equipment on Translink's Infrastructure.

Every opportunity for RAMS improvement will be taken including but not limited to the use of LED signals, plug couplers for points, and disconnection boxes for track circuits. In other cases designers shall endeavour to use the equipment types already in use in the area wherever practical, hence reducing the need for additional spares and for training of the maintainer.

2.8 Operational and Maintenance Requirements

CDM Regulations are applicable to this project and designers shall consider the 'maintainability' & operational requirements in the event of failure of all systems/equipment installed. The scheme plan will be subject to Operational Review.

Specific operational and maintenance aspects are to be considered in the design of the project in particular those relating to Staff Safety:

- Safe Cess Walkways.
- Provision of Driver's Walkways to SPTs.
- Safe Cess access routes to all operational equipment.
- Positioning of location cases to permit access without being "on or near the line"
- Taking "touch potential" into account.

- Provision of REBs such that Foot and Vehicular access is available without being “on or near the line” wherever possible.

For all engineering disciplines the equipment and materials installed as part of this project will be of types already in use on this part of the Network. Only type-approved equipment will be used. The additional equipment will increase the maintainer’s workload.

2.9 Vandalism Protection

Translink shall determine the level of vandalism protection to be provided as part of these works. As a minimum all signalling equipment shall be positioned on the railway side of the boundary railings and fencing. Padlocks shall be fitted to all lineside signalling equipment and housings. The Signal Sighting Committee is to recommend any additional vandalism protection measures to be adopted for fixed signals and associated equipment.

Any loose equipment left on the lineside in association with the construction activities on this project shall be secured to protect against vandalism and damage to the operational railway. All redundant or scrap materials shall be removed from the site in a planned and expedient manner. A safe environment shall be provided at all times.

2.10 Safety Assurance Required

The Principal Contractor and, where required, the Designer, shall undertake all works associated with this project in accordance with European and UK legislation (including the requirements of the Transport and Works Act 1992), Network Rail standards and safety policies and conditions of contract. Railways and other Guided Vehicles (Safety) Regulation 2006, HSE Railway Inspectorate (RI) Railway Safety Principles and Guidance and Railway Group and Network Rail Company standards, rules, procedures and instructions, EN and BS standards shall apply to the project.

2.11 Scheme Approvals Required

All Scheme Approvals required for this project shall be obtained in accordance with Network Rail Company Standard Specification NR/SP/SIG/11201 (formerly RT/E/S/11201). Under the terms of this standard, Translink is responsible for obtaining statutory approvals.

2.12 Product Acceptance Required

It is currently envisaged that only type-approved equipment shall be used for this project. Any requirement to adopt non-type approved equipment shall remain under continuous review during the life of the project.

2.13 Other Items

Not Applicable

3 New Systems / Equipment

3.1 Type of Interlocking

The single line between Coleraine and Londonderry is served by 2 main free-wired relay interlockings situated at Londonderry and Coleraine, with additional free-wired relay interlockings at Magilligan and Castlerock for the manually controlled level crossings, and also a small relay interlocking for the City of Derry Airport.

Londonderry Relay Room is the oldest relay interlocking having been built in the mid 70's. The other Relay Rooms date from 1989 to around 1993. All interlockings appear to be well-maintained and can accommodate minimal alterations however large changes, particularly involving additional cable and wiring, may be difficult to accommodate.

It is proposed that the existing RRI is maintained and where necessary upgraded to meet the operational and functional requirements of present relay interlocking standards. This will see an upgrade to the relay interlocking at Castlerock for the level crossing controls, at and at Londonderry to replace the ageing relay room. Coleraine existing relay interlocking will remain unchanged as an interface at Eglinton. These upgraded RRI interlockings will be compatible with the existing Westinghouse TDM systems.

At Londonderry a new location will be provided to accommodate any additional controls and wiring. This will be positioned near the proposed passing loop with cables being taken back to the existing platforms to serve the remaining signals and for train detection.

The relay interlocking at the City of Derry Airport is relatively new and will remain. Control will be transferred to Coleraine. There is no requirement to interface this interlocking with adjacent interlockings as its principle of operation is based on that of a level crossing.

3.2 Control and Indication Systems

There are significant alterations to the control and indication systems associated with this project. Londonderry and Castlerock signal boxes are to be recovered with their controls and indications being relocated to Coleraine.

Currently Coleraine is centred around a combined NX Panel however in order to facilitate the removal of the signal boxes at Londonderry and Castlerock a PC based VDU system shall be installed. This change will see Coleraine becoming the central point of control and communication for the lines to Londonderry and Portrush – covering most of the North West of Northern Ireland.

The Train Descriptor will be included as part of the new VDU system, currently a Westinghouse S3 TDM system carries the Train descriptor information, this will become redundant. A separate system will be provided for the CCTV. The various level crossings which are affected under this scheme will be catered for at Coleraine Signal Box with separate systems that will not be part of the VDU system.

Controls and indications for Coleraine Interlocking are hard wired to the NX Panel. The VDU system will need to be interfaced with the existing interlocking at Coleraine, Interfacing the VDU system to the other proposed Interlockings under this scheme should not require separate

interfacing. With the large 'dog-leg' panel removed there will be ample space necessary for the new VDU system.

3.3 Remote Control Systems

A Siemens Simatic PLC serves as a panel processor at Coleraine the controls and indications between Coleraine Signal Box and Ballymoney, Killigan, Ballymena, and Coleraine interlocking are carried by Westinghouse S2 TDM systems. A Westinghouse S2 TDM system is also in place between Londonderry Relay Room and The City of Derry Airport. A Westinghouse S3 TDM system serves between Magilligan MCB and Castlerock Signal Box. A range of Siemens Simatic products carry the controls and indications to Coleraine.

From the new VDU system at Coleraine information will be transmitted over new optical fibres to the various sites. The existing Westinghouse S3 TDM between Magilligan and Castlerock will be redeployed between Magilligan and Coleraine; it is likely that it will be transmitted over a new fibre optics cable.

Please see Appendix 2 for a sketch of the alterations to the remote control systems.

The new separate interlockings are to be networked using the interlockings vital and non-vital serial communications modules which will carry the controls and indications between the various interlockings and Coleraine. The existing TDM systems will need to be assessed and modified accordingly for the additional controls and indications provided as a result of this work.

3.4 Interlocking Interface

There will be a requirement for new interfacing between the proposed new site layouts at Eglinton and existing relay interlockings. Any new logic controllers should easily be able to interface with traditional relay based interlockings.

This interface unit will also work as the interface between Coleraine Relay Interlocking to the new VDU control and indication system at Coleraine.

3.5 Data Preparation

Data preparation will be required for:

- Control and Indication system, including the Train Describer
- see section 3.2 & 3.20
- Customer information system

3.6 Signals, AWS, TPWS, ATP, etc.

Main signals are to be mainly two and three aspect single-aperture Dorman LED type

The new and altered signals will be assessed for TPWS to comply with NR/GN/SIG/00028 (General Guidelines on Train Protection & the Provision of Signalling). Indication of TPWS failures shall be provided under the new VDU system at Coleraine where possible.

New signal structures shall be designed in accordance with current Health and Safety legislation and standard drawings. This shall permit safe cleaning of all front lenses and plates.

Straight post structures shall be used where practicable. Network Rail's Civil Engineering processes will be followed for all structure design and construction approval.

Where specifically identified by Translink, ladders to new signal structures shall be provided with lockable access to prevent use by unauthorised persons. New permissible speed indicator signs shall be provided where this scheme calls for a change in the running line speed. The signs are all subject to agreement by the Signal Sighting Committee.

The proposed signalling arrangements are depicted on the signalling scheme sketches C0363-LY-CE-DG-0001 r02 sheets 1-10.

3.7 Train Detection

3.7.1 Method of Train Detection

With the removal of Londonderry and Castlerock signal boxes, electronic token block working is not possible. New train detection shall be achieved by either axle counters or DC track circuits.

At present the line is operated through a mixture of signal box controlling station areas and block working supported by Track Circuiting. Where track circuits exist today at Level crossings and in station areas these shall remain and be indicated to the signaller at Coleraine. Additional DC track circuits will operate between these existing sites of track circuiting. In addition, DC track circuits shall be provided for the Non-Block signalling.

New or altered track circuit connections shall be provided with disconnection boxes and duplicated track circuit leads.

A report has been compiled presenting the differences and benefits of both types of train detection. Details can be found in Report A013730-SN-SG-RP-0003 'Train detection in Coastal Areas'.

It is envisaged that due to the benefits of both types of train detection, axle counters shall be installed where appropriate and this shall be the subject of a separate review.

3.7.2 Bonding

Alteration to existing track circuits bonding shall be in accordance with Group and Company standards. Where problems are discovered with the existing track circuit bonding configuration, Translink shall be informed.

3.7.3 Track Circuit Interrupters

It is not currently proposed to provide Track Circuit Interrupters at any of the sites affected under this scheme.

3.7.4 Stainless Steel Strip

It is not currently proposed to provide stainless steel strips at any of the sites affected under this scheme.

3.8 Point Operation and Detection

The new points operating mechanisms shall be HW1000 machines. Independent detection relays for each end shall be provided at the controlling location.

Cable connections to the points machines shall use standard plug coupler style connections.

Points numbering will fit within the existing numbering sequence in the locality. For multiple ended points, the end furthest in the Down direction shall be the A end, with further ends identified alphabetically in the Up direction. This will maintain consistency with other multiple ended points in the locality.

Trap points shall be installed where full signal overlaps cannot be achieved within a loop. However, the sketches show arrangements that do provide such overlaps.

Refer to section 3.26 for details of the power supply for points heaters.

3.9 Hot Axle Box Detectors

Not applicable.

3.10 Fringe Box Interfaces

Coleraine signal box interfaces to the south with Antrim, controlled from Belfast signal box. There is no change to this interface as a result of this work.

3.11 Level Crossings

There are around 43 User Worked Crossings which are affected by this scheme and due to proposed increase in line speed and existing deficiencies it is proposed that 11 of these, generally the more frequently accessed, are to be upgraded to Miniature Stop Lights and will use Level Crossing Predictor Technology where possible. [Whilst the remainder are to be protected with additional non block signals and telephones connected to Coleraine Signal box.](#)

Magilligan MCB Crossing will no longer be controlled from Castlerock and will be taken in under the new system at Coleraine. This will require a minor alteration at Magilligan to cater for this, this alteration should be small enough to be done using BR930 relays rather than a separate modern interlocking addition. Magilligan CCTV transmission system will have to be upgraded. The current Philips system is no longer supported.

The MCB level crossing at Castlerock is currently controlled from the signal box and relay interlocking and in future this will be controlled from Coleraine. The crossing will require a CCTV system to Coleraine.

All AHB strike in points will need to be re-calculated and altered for the increase in line speed under this project. It is the aspiration of Northern Ireland Railways to modify all Automatic Half Barrier Crossings to interface with Coleraine VDU control system.

The existing McConaghy's UWG Crossing is to be replaced with an AHB Crossing and will interface to the existing relay base interlocking.

3.12 Type of Relays

All new relays shall be BR930 series where required for small alterations to existing relay interlockings.

3.13 Signalling Power Supplies

New Distribution Network Operator (DNO) supply points for signalling power supplies are to be provided at key locations and distributed along the railway at 650v. Signalling supplies will be guaranteed by means of battery and generator backup, or other dedicated Uninterruptible Power Supply. It is believed that Existing sites of signalling equipment have suitable power supply arrangements and sufficient capacity to cater for any new work.

Existing power supply arrangements must be appropriately assessed as to their compliance with current standards and its capacity to cope with the proposed alterations.

3.14 Data Transmission

The RRI system must be capable of data transmission for a number of different applications. This will include vital Parallel Outputs and Inputs to provide interfaces to signalling equipment. Vital serial communications to provide serial interfaces to other interlocking and vital systems, such as existing Westinghouse S3 TDM systems. Non-vital serial communications should be possible to provide a means of linking to the new PC based VDU system at Coleraine Signal Box.

Vital and non-vital serial communications will operate over a new fibre optic SDH transmission network as proposed within Telecommunications Project Design Specification A013730-SN-SG-RP-0005. It is proposed that the SDH transmission network shall have a diverse route back to Coleraine Signal Box via a Public Telecommunications Operator (PTO) link. In addition to the resilience offered by the physical and geographical routing of data circuits, another level of resilience is offered by the SDH transmission network due its protection switching capability, inherent in the SDH hardware.

Existing TDM systems are required to be assessed and modified accordingly, to allow re-control from Coleraine Signal Box and for the additional controls and indications provided as a result of this work.

3.15 Cable Routes

New buried cable route ducting will be provided along the entire length of the Railway between Coleraine and Londonderry. This shall have at least 30% spare capacity. No surface concrete troughing shall be provided. This buried ducting will carry all new lineside cables required; this is likely to be a mixture of Power, Fibre Optics, and a small amount of multicore cable.

Alterations at Magilligan and Coleraine relay interlockings may be difficult because of the minimal amount of capacity available for additional wiring and cables.

It is proposed to use available spare conductors in existing multicore cables where a minimum of 10% spare conductors will remain. Prior to use, existing spare conductors will be tested to ensure compliance with relevant cable standards. Any cables that are found to fail the test shall be replaced.

All new cables routes shall be in accordance with NIR specification I-SG-IMP-SPEC-001 Issue 2. No new orange pipes shall be used on this scheme. Axle Counter or Track Circuit connection leads may be fastened to the sleepers. All new signalling and power cables used for this project shall conform to the requirements contained within Network Rail Product Specification NR/PS/SIG/00005 and the PADS approved cables list. In addition all power cables shall be to NIR specification I-SG-IMP-SPEC-002 Issue 1.

3.16 Ground Frames

Not applicable.

3.17 Reversible Working / Block Circuits

At present the line is operated through a mixture of signal box controlling local station areas and electric token block working between these signal boxes. The aspirations of this scheme are to provide train detection along the single line between Coleraine and Londonderry. Axle counters are likely to be employed as an additional method of train detection. Providing track circuit block working will make the Tablet machines between Coleraine, Castlerock, and Londonderry redundant.

3.18 Staff Warning Systems

Translink shall provide information to Design and Construction contractors concerning existing Staff Warning systems.

With the removal of Bann bridge control box it is recommended that a form of an automatic staff warning system be put in place in addition to any CCTV coverage.

3.19 Train Operated Warning System (TOWS)

A TOWS shall be installed at the locations of Downhill and Castlerock Tunnels and at Bann River Bridge. They shall be permanently installed systems with fixed warning units and control switches at each end. The TOWS and its installation shall be compliant with GK/RT0029.

3.20 Other Systems

3.20.1 Remote Monitoring

The upgrade RRI should be capable of supporting interfacing to new and existing condition monitoring systems. It should be possible to remote monitor this information from Coleraine.

Passive provision shall be made for the remote monitoring of point heating equipment.

3.20.2 Customer Information Systems

Alterations to customer information systems may be necessary to cater for new stations, altered platforming and changes to services.

3.21 System Interfaces / Interfaces with Existing

Systems that need to interface to the proposed PC based signalling system may require alteration. This may include the existing relay based interlockings which are to remain under this scheme.

A small existing interlocking will be required at Coleraine in order to act as an interface with Eglinton. This serves as a TDM system prevents multicore cable being necessary between interlockings.

3.22 Equipment Housing

New lineside signalling equipment shall be housed in new standard location cases or REBs. A site survey is required for positioning, siting and access arrangements.

Enabling works may be necessary prior to work starting. This may include several data transmission alterations.

New REBs shall be provided where more than three new location cases would otherwise be required in a suite, subject to space, ground conditions and access. There is insufficient space available for new relay racks, extra cable rows and additional fusing in many of the existing REBs. Consequently new REBs shall be provided wherever required; namely, Londonderry, Eglinton, Castlerock, and Coleraine.

Where new location cases are required, these will be of stainless steel construction and shall be fitted with heaters and internal lighting. A clear plastic wallet, opening sideways, shall be attached to the inside of one door for the storage of test record cards. A drawing holder shall be provided, fixed within the case, unless alternative arrangements are agreed with Translink.

Where possible, any new location cabinets shall be sited at least 3 metres from the nearest running rail, with individual cases arranged in "toast rack" style and shall be marked with a description of their contents on both ends, in accordance with the requirements of NR/GN/SIG/11821 "Siting Requirements for Lineside Apparatus Housings" Issue 1, August 2000, and NR/GN/SIG/11210 "Signalling Installation" Issue 1, August 2000.

If there is no earth provided for an existing location and a new case is to be provided for new equipment, then this shall be positioned a minimum of 2.5 metres away from existing cases to allow for the provision of an earth cable direct from the nearest DNO earth, if a satisfactory local earth cannot be achieved.

See section 4.3 for correlation requirements.

3.23 Operational Buildings

Coleraine Signal Box is situated on the Up side of the Antrim to Londonderry and Coleraine to Portrush lines and is of brick and wood construction. The control is via a combined control and indication NX panel. There is sufficient room within the signalbox for the installation of pc based control and indication system. The light from the large amount of glass in the signalbox may have to be reduced by shading / shielding to provide the appropriate light conditions to view the pc screens.

Coleraine signal box will be upgraded from an NX Panel to a PC based VDU system.

Castlerock Signal Box is situated on the Coleraine to Londonderry Line adjacent to the Sea Road MCB crossing and is of brick and wood construction. Its function is to safely control train movements in the local area and the single lines to Coleraine and Londonderry. The signalbox also monitors the AHB crossings at Carrowreagh, Bellarena, Duncrum East & West, Clooney, Umbra and Barmouth.

The box is extremely cramped with equipment sited on a “wherever possible” basis. A wall mounted colour CCTV monitor has been added to allow the Signalman to have sight of a blind spot on the crossing. A Train Describer monitor is mounted alongside on the wall. The Controls and monitors for Magilligan CCTV controlled crossing are on a table in the corner. The local MCB controls are located on the side of a cabinet alongside a window.

Castlerock signal box will be made redundant and recovered under this scheme.

Londonderry Signal Box is located on platform 1 at Londonderry Station. Its function is to safely control train movements in the local area and to and from the single line to Castlerock.

In addition to the signalling control panel there is a secondary panel mounted alongside. This separate control and indication panel has been added to the signalbox to interface with the City of Derry Airport.

Londonderry Signal Box will also be made redundant the level of recovery is still to be confirmed, it is likely that the building itself will remain.

In addition to the 3 working signal boxes, there is also the Bann River Bridge Control Box which is located on the line between Coleraine and Londonderry, approximately 800 metres north of Coleraine Signal Box. Its function is to control the movement of the Bann River Swing Bridge. It has very limited accommodation but is well lit.

Under a separate but related project the Bann River Bridge Control Box will be made redundant and recovered.

3.24 Operational Telecommunications

New SPTs to Coleraine Signal Box shall be provided for all new signals.

Points zone telephones are to be provided where appropriate.

Platform and Level Crossing telephones to Coleraine shall be provided where necessary.

Further details on the Telecommunications requirements for Coleraine – Londonderry re-signalling can be found in the Project Design Specification A013730-SN-SG-RP-0005.

3.25 Changes in Electrification

Not applicable.

3.26 Changes in Permanent Way

The Permanent Way engineer will develop the track design specifications centred around works including, but not limited to:

- New Loop at Eglinton
- Recovered Loop at Castlerock
- New track layout at Londonderry

3.27 Changes in Civil Engineering

The following civil engineering works will need to be designed and implemented by the project:

- Cable Routes
- Signal Structures including bases
- Location case and REB bases
- Walkways
- Drainage systems
- Stations including Platforms alterations

3.28 Changes in Power Supplies (Other than Signalling)

The Electrical & Plant engineer will develop general power supply requirements including, but not limited to:

- Building supplies
- Station lighting
- Operational supplies (points heating, buffer stop lamps)
- All interfaces with DNO supplies

For signalling supplies, refer to section 3.13.

3.29 Changes in Rolling Stock

The New Trains Two fleet will begin operating on the line. These will be the next set of trains to be procured by Translink.

4 Existing Systems / Equipment

4.1 Hazards from Mixing old and New Technologies

All alterations and additions will use technology consistent with that in currently in existence. Specifically PVC insulated wire must not be intermixed with rubber insulated wiring within interlocking and location case equipment housing.

4.2 Sufficient Space / Power / Heat Dissipation for Additional Equipment

New location cases will be provided where there is insufficient space to accommodate equipment in existing cases – to be verified during wiring correlation. It is not anticipated that the changes will present problems with heat dissipation. Further assessments shall be undertaken during the detailed design stage.

4.3 Correlation Required

A correlation assessment shall be carried out at the detailed design stage, of all existing wiring and circuits in accordance with NR/GN/SIG/11115 (formerly) RT/E/C/11115.

Further to the correlation assessment onsite, a written correlation report shall be produced by the design contractor, and shall be submitted to Translink before design alterations take place.

4.4 Condition of Existing Infrastructure

A preliminary Asset Condition Report A013730-SN-SG-RP-0002 has been produced by Scott Wilson Ltd. this gives an initial assessment on the key sites of the existing infrastructure.

A condition assessment survey in accordance with NR/GN/SIG/11116 (formerly RT/E/C/11116) shall be carried out, at the detailed design stage, to further determine the condition of the existing signalling infrastructure.

4.5 Cable and Wire Insulation

Wire condition is satisfactory and there appears to be no issues with wire degradation.

For further details please see Asset Condition Report A013730-SN-SG-RP-0002.

4.6 Renewals Avoided / to be Carried Out At the Same Time

Not applicable.

4.7 Recoveries / Systems to be Decommissioned

There are a number of recoveries to be undertaken as part of this scheme.

It has already been stated that Londonderry & Castlerock Signal Boxes will be recovered. It is likely that the signal box at Londonderry will remain while Castlerock signal box will be taken down.

Another area of extensive recoveries will take place at Portrush. Portrush signal box is no longer used with the 'one train working' arrangements operating from Platform 1. The extent of the recoveries will be specified by Translink but it is likely to include the recovery of the signal box and all redundant track work, semaphore signals, and point rodding. This is only an initial assessment and much of the work done will depend on Translink's future plans for the development of Portrush.

Prior to completion of signalling works, all signalling equipment, cables and wiring made redundant by the works will be fully recovered from site (subject to risk assessment). Redundant materials awaiting disposal from site shall be stored in a suitable area so as not to disrupt work on site, cause problems with fire access routes or cause a hazard to the public or railway staff. Materials must be stored to ensure they are not accessible to vandals.

Redundant cables must be removed from the cable duct where practicable, in particular from UTXs. Any cables that are not to be recovered shall have their ends permanently capped and sealed.

Due to the age of the buildings, a risk assessment will need to be carried out to assess whether there is a risk of asbestos being present at any signal boxes which are to be demolished. Any such material should be handled and disposed of in accordance with government regulations.

The contractor shall submit to the Principal Renewals and Enhancements Engineer a schedule of reusable equipment belonging to Translink, and shall ensure that these items are returned to Translink or other organisation designated by the Principal Renewals and Enhancements Engineer.

Special control measures governing the installation and recovery of new and redundant wiring shall be recorded in the Testing Plan where this is found to be necessary following a survey of the asset condition.

4.8 Published Restrictions

The Principal Contractor will be informed by Translink of any prohibition notices that are in force in the area affected by this project. In addition the Principle Contractor shall refer to any available Hazard directories.

The sectional appendix will require to be updated to show the changes in permanent way layout and the alterations will need to be published in the appropriate notices.

5 Implementation / Hazards

5.1 Interfaces with Other Projects

5.1.1 Overview

It is not believed that potential conflicts with signalling records will arise from any projects in the area.

Should conflicting works overlap with this project, the methods of control to mitigate hazards arising shall be identified and recorded in the Signalling Design Specification for this project.

5.2 Occupational Safety Hazards

The Management of Health and Safety at Work Regulations 1992 and CDM Regulations 2007 shall apply to this scheme. The principal CDM positions are as follows:

| | |
|-----------------------|----------------|
| Client: | Translink |
| Principal Contractor: | TBA |
| Designer: | TBA |
| CDM Co-ordinator: | Mott Macdonald |

A Health & Safety plan and Method Statement as appropriate will be required for all signalling and telecomms correlation, construction and testing activities to be undertaken on site. Special precautions to satisfy COSHH regulations will be detailed in the H&S plan.

This scheme will involve work on or near high voltage equipment; the Electricity at Work Regulations 1989 shall apply.

Anticipated scheme hazards include moving plant and equipment, buried services and rail traffic.

Detailed design will take into account any options and arrangements to facilitate the safe operation and maintenance of the infrastructure.

All hazardous substances are to be handled and disposed of in accordance with Railway Group and Network Rail Company Standards, COSHH regulations, Environmental Protection Act 1990 and any other applicable regulations or codes.

5.3 Environmental Factors

All waste systems arising from this project will be removed from site and disposed of at a licensed facility in accordance with the Environmental Act 1990 and Translink Environmental Policy. Waste management documentation will be retained by the main contractor and will be made available to Translink on request.

If there are PCBs in the work site, Translink shall be notified and all project site personnel shall be informed using project safety management procedures.

The project team shall familiarise themselves with the requirements from the Noxious Weeds Act 1959 and Wildlife & Countryside Act 1981, and they shall report to Translink any instances where such vegetation exists.

The Principal Contractor shall ensure that in particular buildings, structures and equipment shall not be positioned close to private residences beside the line. The Principal Contractor shall advise Translink of any sites where it is considered that this is not achievable.

The Principal Contractor shall comply with the project's Environmental Management Plan and with Network Rail Company Standard NR/SP/ENV/015.

5.4 Electromagnetic Interfaces Strategy / Report Required

All equipment installed by this scheme shall comply with the Electromagnetic Compatibility Regulations 1992 and EU Directive 89/336/EEC (as amended).

The works associated with this project will not introduce new electrical interfaces, and therefore EMC is assured and an EMC report will not be necessary for these works.

5.5 Site Surveys / Signal Sighting Required

5.5.1 Site Surveys

The following surveys shall be carried out as part of this scheme:

- correlation and asset condition of affected infrastructure
- correlation of signalling and location plans
- signal sighting survey
- cable route survey

Other surveys to be developed as required

5.5.2 Signal Sighting Required

Signal Sighting activity (including representatives of Translink Ops/TOCs/FOCs) will be required for all new and modified:

- Signals.
- Speed Signage.
- Signal Post telephones.
- Point Zone telephones.

The Chairperson will also need to be consulted on sighting forms for all new location cases.

The Principal Contractor shall undertake a Track/site safety audit, Translink shall specify site access.

5.6 Installation and Testing Staff Logistics

All works shall be tested in accordance with NR/GN/SIG/11730, Signal Works Testing or, where appropriate, NR/GN/SIG/11740, Signal Maintenance Testing, where such use (e.g. for staging or temporary works) can be shown to be robust and cost-effective.

For Signal Works Testing, the requirements of NR/SP/SIG/14001 (formerly NR/SP/SIG/14002, NR/SP/SIG/14003 and NR/SP/SIG/14004 shall also be complied with.

5.7 Site Accommodation (During Works)

Facilities will be provided in accordance with the Construction and Welfare Regulations 1996 and NR/L3/INI/CP0036.

5.8 Possessions, Red Zone Working

The Principal Contractor shall produce a stagework strategy which will give details of blockages required for all stagework prior to the commissioning. Possession requirements will be progressed and developed when the stagework strategy has been finalised.

The main Signalling commissioning and signalling support of Civil Engineering activities will be outside Rules of the Route possessions. The possessions required for the works will be submitted to Translink in advance.

Where possible the works shall be arranged so that required possessions are within the NIR Rulebook constraints using a safeguarded Green Zone as the preferred method of working. Where this is impractical working arrangements subject to RIMINI planning procedures will be used.

5.9 Testing Requirements

Testing activities will include:

Factory acceptance testing of the VDU system

Alteration to the TDM remote control system (in no-train periods)

Pre-testing interlocking and lineside infrastructure

Stagework to install track work

Principles testing of the altered signalling system and commissioning. Multiple commissioning are envisioned using controlled “break ins”.

Testing shall be conducted in accordance with NR/GN/SIG/11730 ‘Signalling Works Testing’ and GK/RT0209 ‘Testing and Commissioning of Signalling and Operational Telecommunications Systems’. A testing strategy will be submitted as part of the concept design documentation.

Construction and implementation stagework strategies will be developed in liaison with the design implementation Contractor as the project proceeds. Any proposed enabling stagework should be fully justified on the grounds of a reduction in commissioning time or project risk.

Implementation of these works shall take into account the possessions available within NIR Rulebook, and any other works planned to be delivered in the area.

A Test Plan for the works will be provided by the implementation Contractor and shall be submitted to Translink for approval. The Test Plan will be prepared and all testing activities conducted with reference to the Testing Strategy and Network Rail Signalling Works Testing suite of standards, as well as the manufacturer's documentation for any specific equipment to be used. Testing Strategies/Testing and Commissioning Plans must be approved for use by Translink at least 10 days prior to commencement of any testing.

A Tester in Charge (TIC) shall be nominated for these works and shall be subject to acceptance by Translink's Designated Project Engineer.

The use of SMTH procedures and/or generic design may be proposed for staging or temporary works where such use can be shown to be robust, appropriate and cost effective.

5.10 Training Requirements (Operational and Maintenance)

Translink staff will be given training by the Principal Contractor, identifying infrastructure changes and new equipment where appropriate.

The project shall be responsible for the provision of information necessary for the introduction and safe operation of trains into and out of the new platforms, in conjunction with Translink Production.

5.11 Long Lead Equipment

The signalling contractor shall identify items that are expected to be long lead. These shall be procured sufficiently early to ensure availability for the construction and testing phase of the works. Items that should be considered for advance procurement are:

- TDM equipment
- Signal heads and route indicators
- Signal structures
- Signalling relays
- Signalling cables
- Axle counter equipment (if specified)
- Location cases / REBs
- TPWS equipment
- TOWS

5.12 Spares Requirements

The project in conjunction with Translink shall identify any additional spares requirements. The works involved with the project do not significantly add to the quantities of existing equipment in this area.

After the final commissioning, a minimum of 10% spare cores shall exist in cables affected by this scheme. A minimum of 20% spare cores shall exist in any new cables provided by this scheme. Should this not be possible, the Designated Project Engineer is to be informed of the cables involved and the revised spare capacity and their agreement to this sought prior to final design. This requirement shall not apply to cables renewed due to the provision of a new UTX.

5.13 OPS Change Control

This OPS will be fully version controlled in the format “x.y”. This will be incremented with each issue, where “x” indicates the version submitted for approval and “y” any minor amendments (typographical errors, update to comments, etc.) not requiring re-submission.

Should any changes to the project be identified following formal approval of this OPS by Translink, a revised OPS will be distributed, in line with NR/GN/SIG/11110 “Outline Project Specifications (OPS) for Signalling Schemes”, Section 6. All alterations shall be highlighted by sidebars.

5.14 Other Items

5.14.1 Source Records

All design will be produced in accordance with GK/RT0207 “Signalling Design” and NR/GN/SIG/11710 “Signalling Design Handbook”. The methodology used will be fully compliant with NR/GN/SIG/11701 “Signalling Design: Production Guidance”.

Source records will be updated or redrawn from correlation as appropriate. New sheets will be A3 size, CAD generated, in Bentley Microstation (.dgn) format, using standard cell libraries and to current design principles. The two-drawing method shall generally be adopted for the production of alterations. In line with NR/GN/SIG/11701 Part D Section 3.1, the one-drawing method may be used for index sheets where appropriate.

Source and master records shall be returned to the records custodian within six weeks of final commissioning, once they have been updated to testing comments, and maintenance copies of affected locations and affected sheets of relay rooms issued.

APPENDIX 1 – CHECK LIST FOR OPS CONTENTS

| | | Included | Not Applicable |
|----------|---|----------|----------------|
| 1 | General | | |
| 01 | Brief Description of Project and Background | √ | |
| 02 | Notional Timescale for Project | √ | |
| 03 | Resources / Competences Required | √ | |
| 04 | Nominated Project Manager / Engineer | √ | |
| 05 | Other Engineers involved | √ | |
| 2 | Overall Design Concept | | |
| 01 | Design Parameters and Assumptions | √ | |
| 02 | Acceptability of Risk from Proposed Track Layout and Mitigation | √ | |
| 03 | Draft Staging and Testing Strategy | √ | |
| 04 | Application Standards Declared | √ | |
| 05 | Anticipated Non-Compliance with Current Standards | √ | |
| 06 | Train Operating Requirements | √ | |
| 07 | Dependability (RAMS) Requirements | √ | |
| 08 | Operational and Maintenance Requirements | √ | |
| 09 | Vandalism Protection | √ | |
| 10 | Safety Assurance Required | √ | |
| 11 | Scheme Approvals Required | √ | |
| 12 | Product Acceptance Required | √ | |
| 3 | New Systems / Equipment | | |
| 01 | Type of Interlocking | √ | |
| 02 | Control and Indication Systems | √ | |
| 03 | Remote Control Systems | √ | |
| 04 | Interlocking Interface | √ | |
| 05 | Data Preparation Required | √ | |
| 06 | Signals, AWS, TPWS, ATP, etc | √ | |
| 07 | Train Detection | √ | |
| 08 | Point Operation and Detection | √ | |
| 09 | Hot Axle Box Detectors | | √ |
| 10 | Fringe Boxes, Interfaces, etc | √ | |
| 11 | Level Crossings | √ | |
| 12 | Types of Relays | √ | |
| 13 | Signalling Power Supplies | √ | |
| 14 | Data Transmission | √ | |
| 15 | Cable Routes | √ | |
| 16 | Ground Frames | | √ |
| 17 | Reversible Working / Block Systems | √ | |
| 18 | Staff Warning Systems | √ | |
| 19 | Train Operated Warning System (TOWS) | √ | |
| 20 | Other Systems | √ | |
| 21 | Systems Interfaces / Interfaces with Existing | √ | |

| | | | |
|----------|--|---|---|
| 22 | Equipment Housing | √ | |
| 23 | Operational Buildings | √ | |
| 24 | Operational Telecommunications | √ | |
| 25 | Changes in Electrification | | √ |
| 26 | Changes in Permanent Way | √ | |
| 27 | Changes in Civil Engineering | √ | |
| 28 | Changes in Power Systems | √ | |
| 29 | Changes in Rolling Stock | √ | |
| 4 | Existing Systems / Equipment | | |
| 01 | Hazards from Mixing Old and New Technologies | √ | |
| 02 | Sufficient Space / Power / Heat Dissipation for Additional Equipment | √ | |
| 03 | Correlation Required | √ | |
| 04 | Condition of Existing Infrastructure | √ | |
| 05 | Cable & Wire Insulation Condition | √ | |
| 06 | Renewals avoided/to be carried out at the same time | √ | |
| 07 | Recoveries / Systems to be Decommissioned | √ | |
| 08 | Published Restrictions | √ | |
| 5 | Implementation / Hazards | | |
| 01 | Interfaces with other Projects | √ | |
| 02 | Occupational Safety Hazards | √ | |
| 03 | Environmental Factors | √ | |
| 04 | Electromagnetic Interference Strategy / Report Required | √ | |
| 05 | Site Surveys / Signal Sighting Required | √ | |
| 06 | Installation and Testing Staff Logistics | √ | |
| 07 | Site Accommodation (during works) | √ | |
| 08 | Possessions, Red Zone Working | √ | |
| 09 | Testing Requirements | √ | |
| 10 | Training Requirements (operational and maintenance) | √ | |
| 11 | Long Lead Equipment | √ | |
| 12 | Spares Requirements | √ | |
| 13 | OPS Change Control | √ | |
| 14 | Other Items | √ | |

APPENDIX 2 – REMOTE CONTROL SKETCH

RRI – Route Relay Interlocking

