



Cork Line Level Crossing Options Report

Multi-Criteria Analysis

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Irish Rail



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1. Introduction

Jacobs are engaged to provide consultancy services to Iarnród Éireann (IE) for the removal of 7no. manned level crossings on the Dublin to Cork Line, between Limerick Junction and Mallow Stations. The crossings are located within a 15 mile/24 km section of the line between 122 miles 0808 yards and 137 miles 0315 yards which straddles the Cork/Limerick county boundary.

The level crossings are located midway between the stations, such that the trains are travelling at speed. The scheduled trains which pass through these crossings each day must lower their speed, increasing travel time for passengers. Eliminating the level crossings is paramount in reducing the safety risks associated with the interface between rail and road traffic and lowering the potential for accident, injury or loss of life.

In 2010/2011, concept stage designs were developed for overbridge schemes to eliminate each of the level crossings. None of the schemes were progressed due to a lack of funding.

In 2018, Iarnród Éireann undertook a feasibility study to investigate and appraise the options for the elimination/de-manning of the level crossings. The options considered for the elimination/de-manning of the level crossings included closure (extinguishment of the public right of way across the level crossing), provision of alternative access through the construction of an access road and/or overbridge and the upgrade to a CCTV level crossing.

To determine the emerging preferred option at each of the level crossing points Jacobs have undertaken an option selection analysis at each location. This work took into account the work undertaken previously as detailed above and was supplemented with additional options as identified during site visits. The emerging preferred option at each location was determined following a comparative Multi Criteria Analysis (MCA) utilising key criteria of all the feasible options that were identified at each location. Further to the identification of each Emerging Preferred option these will be taken forward for further development and Preliminary Design.

1.1 Objective

The purpose of this report is to undertake a comparative assessment of the feasible options at each level crossing location to determine the Emerging Preferred Option at each of the applicable locations.

1.2 Report Structure

The following outlines each chapter of the report:

- Chapter 2: outlines the feasibility study done in March 2018;
- Chapter 3: provides a description of the methodology adopted in this assessment;
- Chapter 4: describes the level crossing locations and options developed;
- Chapter 5: undertakes a comparative assessment of the options and outlines the preferred option for each level crossing.

2. Feasibility Study

Following a culmination of previous work undertaken in 2018, Iarnród Éireann published a Feasibility Report in February 2019 identifying the feasibility options to eliminate/de-man the seven manned crossing as summarised below.

- **XC187 Fantstown:** elimination/de-manning of the level crossing through the extinguishment of the public right of way across the level crossing and the possible upgrade of the existing alternative access provision of alternative access route.
- **XC201 Thomastown:** elimination/de-manning of the level crossing through provision of alternative access across the railway line via a new overbridge.
- **XC209 Ballyhay:** elimination/de-manning of the level crossing through provision of alternative access across the railway line via a new overbridge, or, elimination/de-manning of the level crossing through the upgrade of the level crossing to a 4-barrier CCTV controlled level crossing.
- **XC211 Newtown:** elimination/de-manning of the level crossing through provision of a new link road to the west of the railway corridor to connect the local road at the west site of level crossing XC211 with Beechwood Grove and on to the proposed new overbridge at level crossing X212.
- **XC212 Ballycoskery:** elimination/de-manning of the level crossing through provision of alternative access across the railway line via a new overbridge.
- **XC215 Shinanagh:** elimination/de-manning of the level crossing through provision of alternative access across the railway line via a new overbridge.
- **XC219 Buttevant:** elimination/de-manning of the level crossing through provision of alternative access across the railway line via a new overbridge.

3. Methodology

3.1 Introduction

This chapter sets out the methodology followed in undertaking the options assessment study and the selection of the preferred option for each level crossing. The appraisal is based on the criteria identified in the Common Appraisal Framework for Transport Projects and Programmes (DTTS, 2016).

3.2 Methodology

For the comparative assessment of the level crossing options, a qualitative assessment of the criteria outlined for Stage 2 and 3 is proposed. To identify the emerging preferred option at each location, an MCA was undertaken based on criteria in the Common Appraisal framework for Public Transport Projects and Programmes. This comparative assessment is qualitative, high level, and is based only on key criteria that would offer differentiation between the different options. As such, it was assumed that there is no relevant differentiation between the route options regarding the following criteria:

- Accessibility & Social Inclusion;
- Integration; and,
- Physical Activity

Table 3-1 outlines the criteria and sub-criteria utilised for the assessment.

Table 3-1 Criteria and sub-criteria

Criteria	Sub-criteria	Description
Economy	Cost	Comparison of options with regards to comparative capital cost
	Land Take	Comparative qualitative assessment of land requirements for each option
	Reliability / Journey Time	Comparative assessment of journey time for each option
Engineering	Geotech	Comparison of options with regards to the assumed ground conditions based upon a desktop assessment
	Structures	Comparison of options with regards to number and complexity of bridges/structures required within each option
	Geometry	Comparison of options with regards to compliance to design criteria and ability for options to gain required design speeds
Environment	Ecology	Qualitative appraisal of potential effects of proposed option on internationally and nationally important designated sites and associated flora and fauna
	Water/Flood Risk	Qualitative appraisal of potential impacts of proposed options on existing surface water bodies and aquifers.

Criteria	Sub-criteria	Description
	Landscape	Qualitative assessment of potential impacts on the landscape and amenity
	Noise	Qualitative assessment of sensitive receptors within the vicinity of the different options
	Cultural Heritage	Qualitative assessment of potential impacts of proposed options on legally protected sites.

3.3 Scoring Procedure

For each of the criterion, the options will be compared against each other based on the primary and sub criteria utilising a five point scale, ranging from having significant advantages over other options, to having significant disadvantages over other options. This five-point scale is colour coded as presented in Table 3-2, shown below.

Table 3-2 Options Appraisal Colour Coding System

Score/Colour	Description
	Significant advantages over other options
	Some advantages over other options
	Comparable to other options
	Some disadvantages over other options
	Significant disadvantages over other options

4. Level Crossing and Route Options

4.1 Introduction

There are 7 manned public road level crossings in operation on the Dublin to Cork line between Limerick Junction and Mallow stations. The crossings are located within a 15 mile/24 km section of the line between 122 miles 808 yards and 137 miles 315 yards, which straddles the Cork/Limerick county boundary.

Details of the level crossings are provided in Table 4-1.

Table 4-1 Level crossing details

Level Crossing	Mileage	Crossing Type	Road Type	Local Authority
XC187 – Fantstown	122mi 808yds	C – Type	Local	Limerick City & County
XC201 – Thomastown	127mi 70yds	C – Type	Local	Limerick City & County
XC209 – Ballyhay	130mi 878yds	CD – Type	Local	Cork County Council
XC211 – Newtown	131mi 1385yds	CD – Type	Local	Cork County Council
XC212 – Ballycoskery	131mi 1759yds	CD – Type*	Local	Cork County Council
XC215 – Shinanagh	134mi 260yds	CD – Type*	Local	Cork County Council
XC219 – Buttevant	137mi 315yds	CX - Type	Regional	Cork County Council

* Operated on a 24-hour basis as a CX – Type level crossing.

The Iarnród Éireann designations for Gated Manned Level Crossing are as follows:

- C Type – Gates normally CLOSED to road traffic;
- CX Type – Gates normally OPEN to road traffic;
- CD Type – Gates normally OPEN to road traffic by DAY and normally closed at other times;
- CN Type – Gates normally OPEN to road traffic by NIGHT and normally closed at other times.

The following section describes the seven level crossings and provides details of alternative options developed for each of them.

4.2 Level Crossing Locations and Proposed Options

4.2.1 XC187 – Fantstown

Level Crossing XC187, Fantstown is a 'C-Type' manually operated gated level crossing located at 122 miles 808 yards on the Dublin to Cork. The level crossing is located on local road LS 8514, 3km to the east of Kilmallock in the townland of Fantstown in County Limerick.



Figure 4-1 XC187 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC187 is a straight closure and diversion of traffic along existing roads. For this reason, no alternative options were considered at Preliminary Stage.

4.2.2 XC201 – Thomastown

XC201, located in the townland of Thomastown, Co. Limerick, is a “C-type” manually operated gated level crossing on a local road. The gates are manually opened by a gatekeeper from 07.30 – 23.30hrs and closed to road traffic outside of these hours. There are also pedestrian wicket gates at the crossing, which the gatekeeper does not control.



Figure 4-2 XC201 Scheme Location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC201 is closure and alternative route via new road alignment and new road-over-rail bridge. Four alternative options were developed for the closure of this crossing as shown in Figure 4-3 and described below.

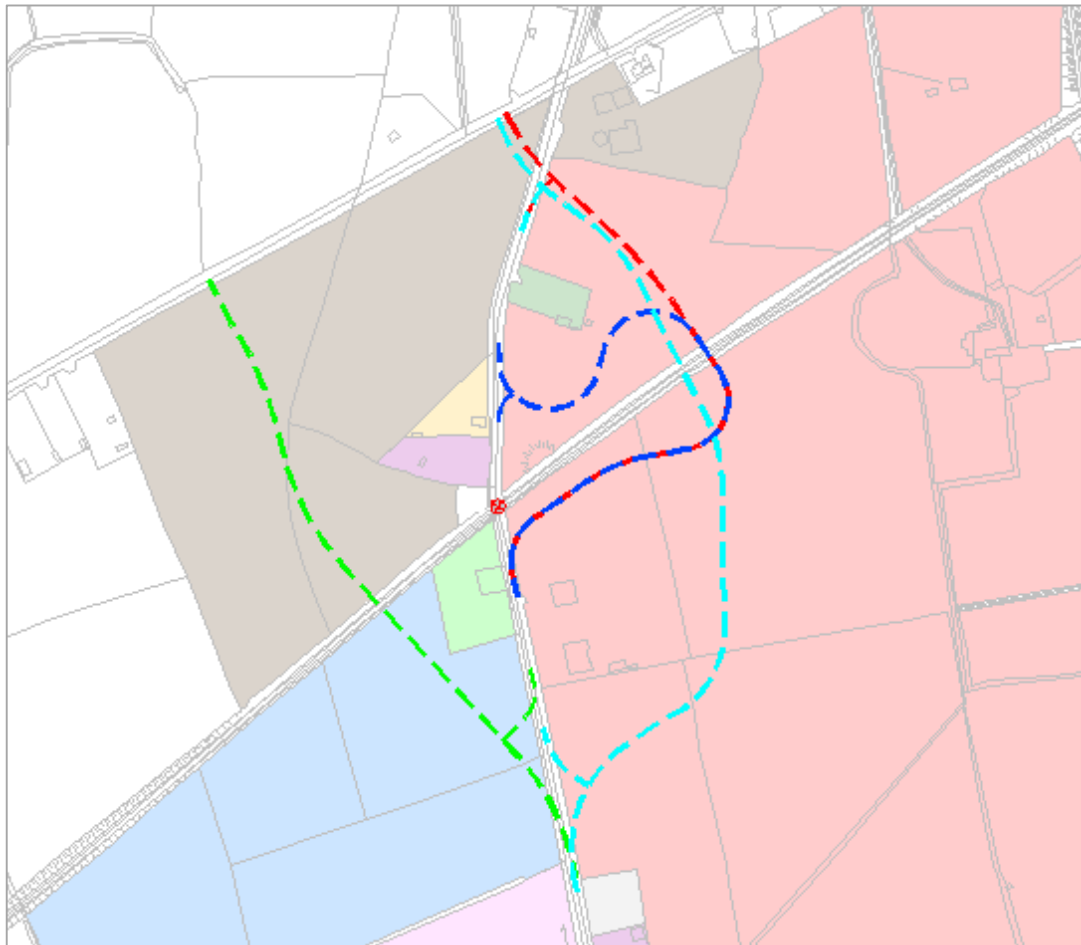


Figure 4-3 XC201 Alternative Options

- **Green option:** This alignment proposes a new road-over-rail bridge to the south west of the closed level crossing, and a new junction onto the Regional Road R515, to the west of the existing junction. New junctions would be required to the south of the level crossing.

The remaining sections of the existing local road pavement to the north and south of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- **Red option:** This alignment proposes a new road-over-rail bridge to the north west of the closed level crossing, and the implementation of a staggered junction on the Regional Road R515. New junctions would be required to the south of the level crossing.

The remaining sections of the existing local road pavement to the north and south of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- **Blue option:** This alignment proposes a new road-over-rail bridge to the north west of the closed level crossing, with tie-ins to the existing road to the north and south of the level crossing.

The remaining sections of the existing local road pavement to the north and south of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- **Cyan option:** This alignment proposes a new road-over-rail bridge to the north west of the closed level crossing, and the implementation of a staggered junction on the Regional Road R515. New junctions would be required to the south of the level crossing.

The remaining sections of the existing local road pavement to the north and south of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.2.3 XC209 – Ballyhay

Level Crossing XC209, located in Ballyhay, Co. Cork, is a “CD-type” manually operated level crossing on a local road. The gates are manually opened by a gatekeeper from 07.30 – 23.30hrs and closed to road traffic outside of these hours. There are also pedestrian wicket gates at the crossing, which the gatekeeper does not control.



Figure 4-4 XC209 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC209 is to either convert to CCTV level crossing or closure or the crossing and alternative route via new road alignment and new road-over-rail bridge.

For the level crossing closure, a number of alternative options were developed through the combination of alternative mainline options (green, blue and cyan) and link options (red, pink and orange). The mainline and link options are show in Figure 4-5.

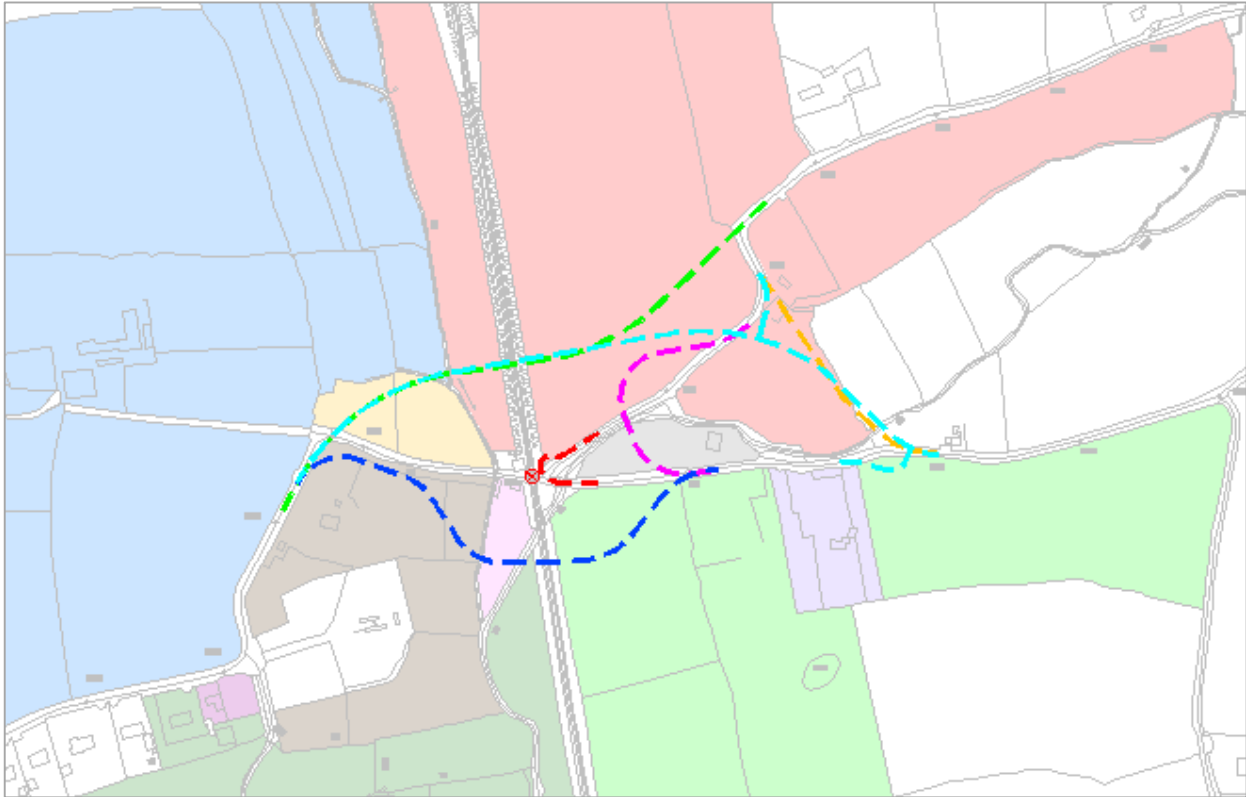


Figure 4-5 XC209 Alternative Options

The combined alternative options are described below:

- **Green-Red option:** This alignment proposes a new road-over-rail bridge to the north of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the north east of the crossing. Improvements would be made to the existing highway alignment to the east of the level crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- **Green-Pink option:** This alignment proposes a new road-over-rail bridge to the north of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the north east of the crossing. An additional new road alignment and river bridge is proposed to link the two existing local roads to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- **Green-Orange option:** This alignment proposes a new road-over-rail bridge to the north of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the north east of the crossing. An additional new road alignment and river bridge is proposed to link the two existing local roads to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- **Blue-Red option:** This alignment proposes a new road-over-rail bridge to the south of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing. Improvements would be made to the existing highway alignment to the east of the level crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- **Blue-Pink option:** This alignment proposes a new road-over-rail bridge to the south of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing. An additional new road alignment and river bridge is proposed to link the two existing local roads to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- **Blue-Orange option:** This alignment proposes a new road-over-rail bridge to the south of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing. An additional new road alignment and river bridge is proposed to link the two existing local roads to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- **Cyan option:** This alignment proposes a new road-over-rail bridge to the north of the closed level crossing, linking the existing local road to the west of the crossing with the existing local road to the north east of the crossing. An additional new road alignment and river bridge is proposed to link the proposed alignment with the existing local road to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.2.4 XC211 – Newtown

Level Crossing XC211, located in the townland of Newtown, Co. Cork, is a “CD-type” manually operated level crossing on a local road, 0.5km to the north of Ballyhea village. The gates are manually opened by a gatekeeper from 07.30 – 23.30hrs and closed to road traffic outside of these hours. There are also pedestrian wicket gates at the crossing, which the gatekeeper does not control.



Figure 4-6 XC211 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC211 is closure and alternative diversion route via new road alignment. Two alternative options were developed for the closure of this crossing as shown in Figure 4-7.

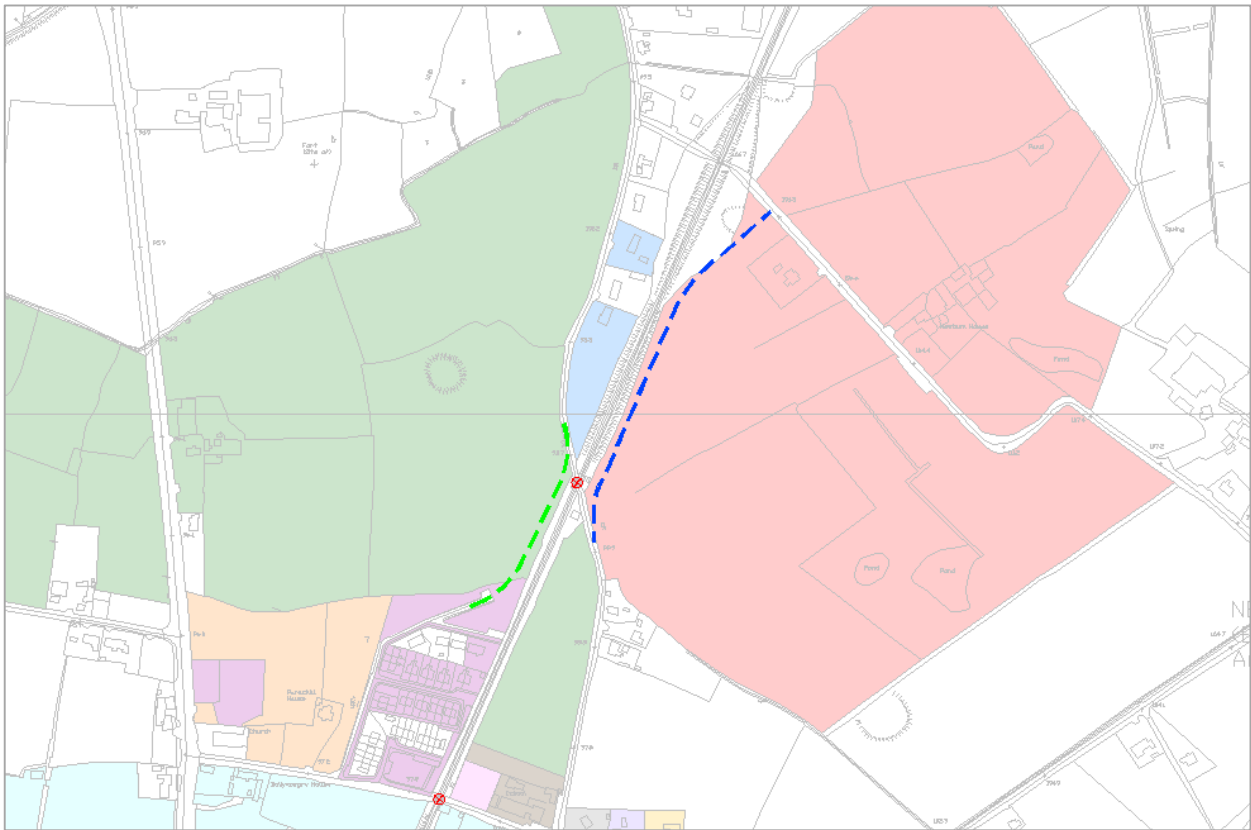


Figure 4-7 XC211 Alternative options

The alternative options are described below:

- Green option:** This alignment proposes to realign the local road to connect into the back of Beechwood Grove housing estate to the South (which is immediately West of the XC212 level crossing). The proposed realignment will not require any structures.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- Blue option:** This alignment proposes to realign the local road, from Dooley's Cross Road, to connect into the local road to the north east of the level crossing. The proposed realignment will not require any structures.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.2.5 XC212 – Ballycoskery

Level Crossing XC212, located in Ballycoskery, Co. Cork, is a “CD-type” manually operated level crossing on the local road, L1533. Although it is designated as a CD-type crossing, it is operated as a CX-type and is manned on a 24-hour basis. The gates are manually closed by a gatekeeper to allow the rail traffic to pass through and the pedestrian wicket gates are permanently locked.



Figure 4-8 XC212 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC212 is closure and alternative route via new road alignment and new rail bridge. Three alternative options were developed for the closure of this crossing as shown in Figure 4-9.

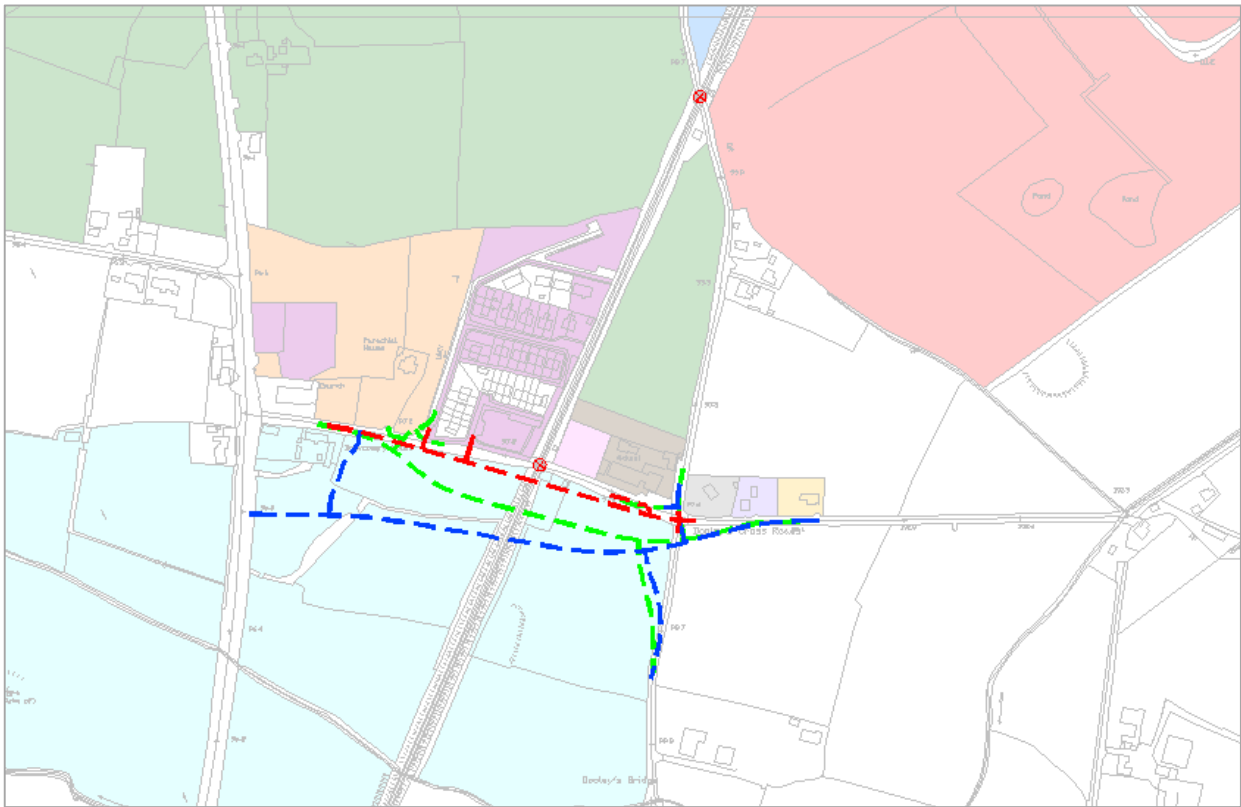


Figure 4-9 XC212 Alternative options

The alternative options are described below:

- Green option:** This alignment proposes a new road-over-rail bridge to the south of the level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing.

The existing road to the east of the level crossing would be replaced with a car park which would be developed in association with the local school. The remaining sections of the existing local road pavement to the west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- Red option:** This alignment proposes a new rail-over-road bridge to the south of the level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- Blue option:** This alignment proposes a new road-over-rail bridge to the south of the level crossing, linking the existing local road to the east of the crossing with the existing N20 via a new junction.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.2.6 XC215 – Shinanagh

Level Crossing XC215, located in the townland of Imphrick, Co. Cork, is a “CD-type” manually operated level crossing on the local road, L1320. Although it is designated as a CD-type crossing, it has been operated as a CX-type for 25 years and is manned on a 24-hour basis. The gates are manually closed by a gatekeeper to allow the rail traffic to pass through and the pedestrian wicket gates are permanently locked.

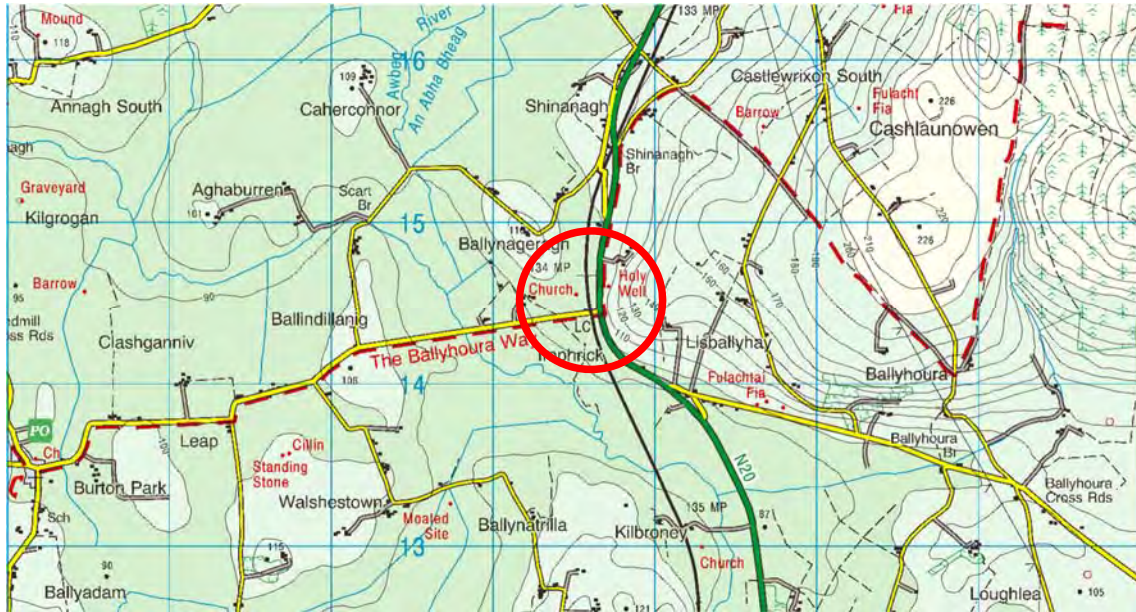


Figure 4-10 XC215 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC215 is closure and alternative route via new road alignment and new/existing road-over-rail bridge. A number of alternative options were developed through the combination of alternative mainline options (green, red and blue) and link options (orange and pink). The mainline and link options are shown in Figure 4-11.

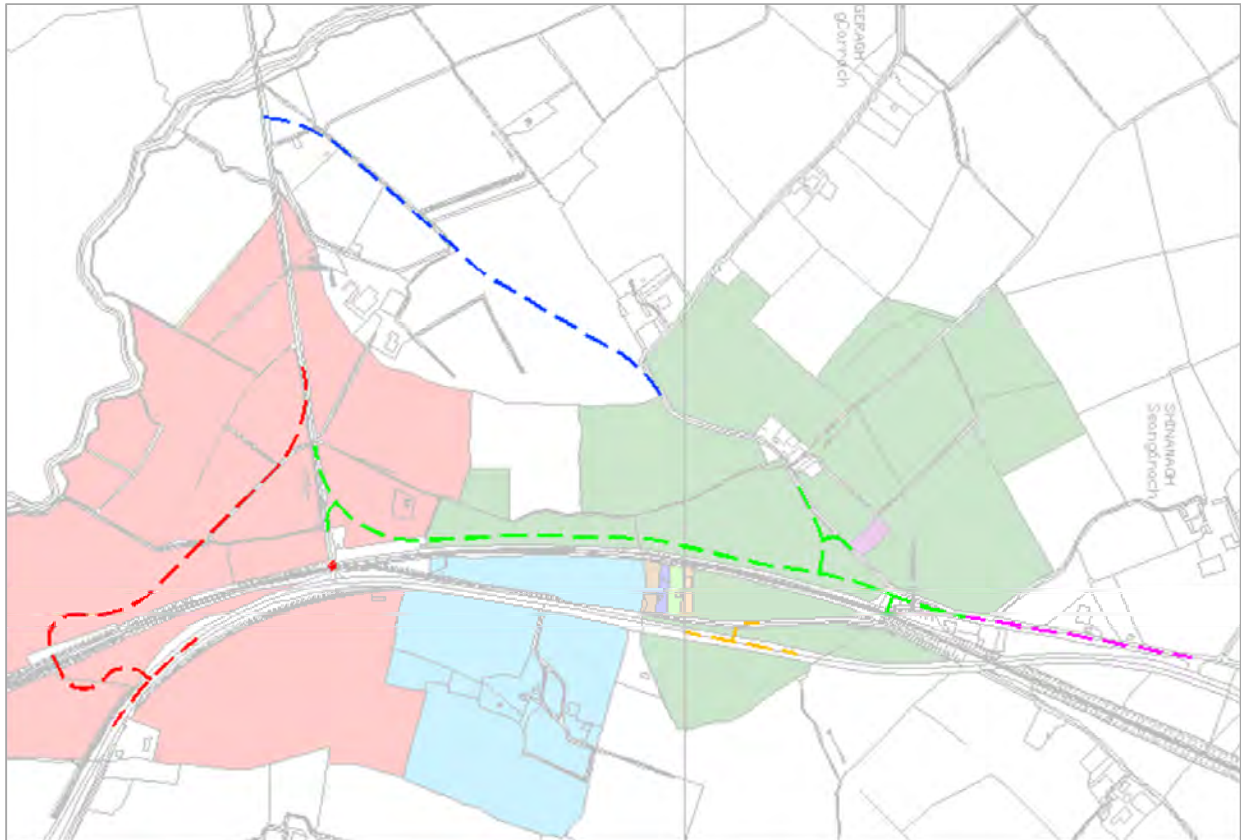


Figure 4-11 XC215 Alternative options

The alternative options are described below:

- Green-Orange option:** This alignment proposes a new section of local road and tie-in to an existing road-over-rail bridge to the north of the level crossing. The existing tie-in to this bridge will be improved, and it is also proposed to upgrade the existing junction onto N20 national road at this location, to accommodate the increase in traffic numbers.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- Green-Pink option:** This alignment proposes a new section of local road and tie-in to an existing road-over-rail bridge to the north of the level crossing. The existing tie-in to this bridge will be improved, and it is also proposed to tie-in with the local road to the north of the bridge.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- Blue-Orange option:** This alignment proposes a new section of local road and tie-in to an existing road to the north-west of the level crossing. It is also proposed to upgrade the existing junction onto N20 national road at this location, to accommodate the increase in traffic numbers.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- Blue-Pink option:** This alignment proposes a new section of local road and tie-in to an existing road to the north-west of the level crossing. It is also proposed to tie-in with the local road to the north of the bridge.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

- **Red option:** This alignment proposes a new road-over-rail bridge to the south of the level crossing, linking the existing local road to the N20 national road.

The remaining sections of the existing local road pavement to the west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.2.7 XC219 – Buttevant

Level Crossing XC219, located in the townland of Greggane, Co. Cork is a “CX-type” manually operated level crossing on the regional road, R522. The crossing is manned on a 24-hour basis, with the gates being manually closed by a gatekeeper to allow the rail traffic to pass through.

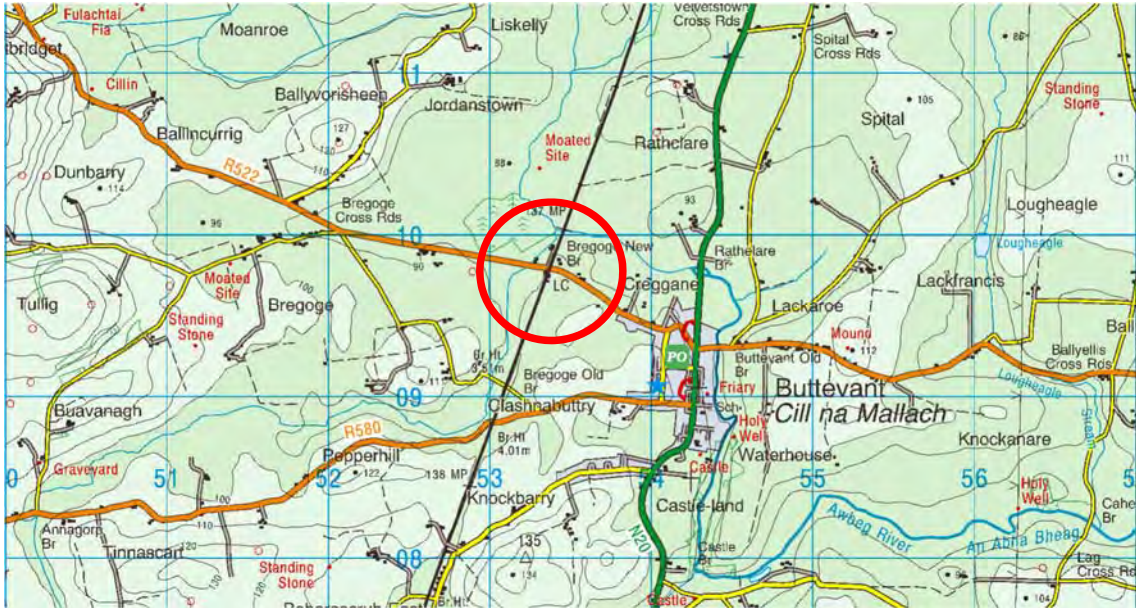


Figure 4-12 XC219 Scheme location

As per Feasibility Study Options Appraisal, the preferred solution for Level Crossing XC219 is closure and alternative route via new road alignment and new road-over-rail bridge. Three alternative options were developed for the closure of this crossing as shown in Figure 4-13.

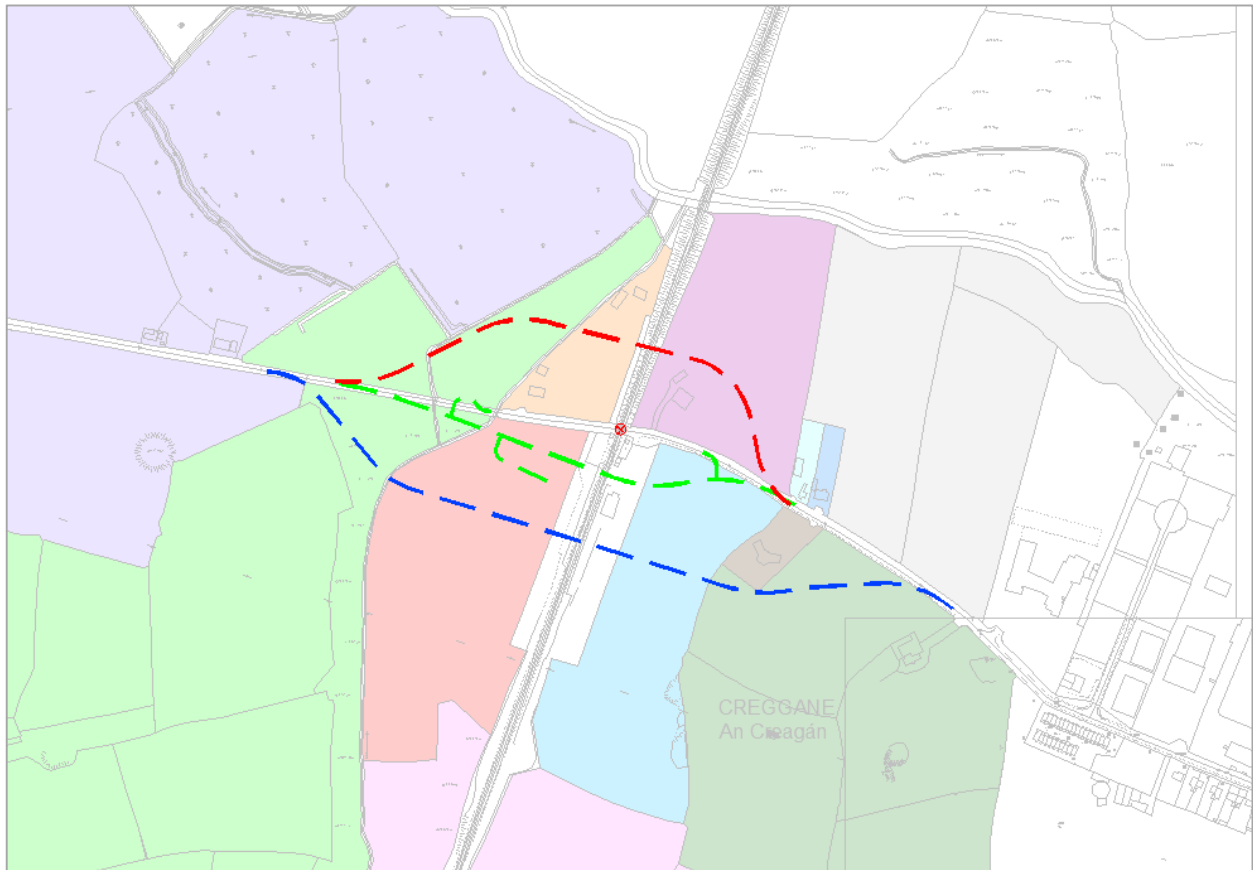


Figure 4-13 XC219 Alternative options

The alternative options are described below:

- Green option:** This alignment proposes a new road-over-rail bridge to the south of the level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- Red option:** This alignment proposes a new road-over-rail bridge to the north of the level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.
- Blue option:** This alignment proposes a new road-over-rail bridge to the south of the level crossing, linking the existing local road to the west of the crossing with the existing local road to the east of the crossing.

The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required.

4.3 Summary

Table 4-2 summarises the feasible options developed for each of the level crossing locations described in the previous section.

Table 4-2 Summary of the level crossings and alternative options

Level Crossing	Option Number	Option Colour	Description
XC187 – Fantstown	None	n/a	Based on the outcomes from the Feasibility Report, no review of route options required
XC201 – Thomastown	Option 1	Green	New road-over-rail bridge to SW of level crossing. New junction on R515.
	Option 2	Red	New road-over-rail bridge to NE to level crossing. Upgrade existing junction on R515.
	Option 3	Blue	New road-over-rail bridge to NE of level crossing.
	Option 4	Cyan	New road-over-rail bridge to NE to level crossing. Upgrade existing junction on R515.
XC209 – Ballyhay	Option 1	Green-Red	New road-over-rail bridge to North of level crossing. Widen existing junction.
	Option 2	Green-Pink	New road-over-rail bridge to North of level crossing. New road alignment with river bridge.
	Option 3	Green-Orange	New road-over-rail bridge to North of level crossing. New road alignment with river bridge.
	Option 4	Blue-Red	New road-over-rail bridge to South of level crossing. Widen existing junction.
	Option 5	Blue-Pink	New road-over-rail bridge to South of level crossing. New road alignment with river bridge.
	Option 6	Blue-Orange	New road-over-rail bridge to South of level crossing. New road alignment with river bridge
	Option 7	Cyan	New road-over-rail bridge to North of level crossing.
XC211 – Newtown	Option 1	Green	New road alignment to west of level crossing.
	Option 2	Blue	New road alignment to east of level crossing.
XC212 – Ballycoskery	Option 1	Green	New road-over-rail bridge to South of level crossing.
	Option 2	Red	New rail-over-road bridge to South of level crossing.
	Option 3	Blue	New road-over-rail bridge to South of level crossing. New junction on the N20.
XC215 – Shinanagh	Option 1	Green-Orange	New road alignment to East of level crossing. Upgrade existing junction on N20.
	Option 2	Green-Pink	New road alignment to East of level crossing. Extend diversion to existing junction on N20 with some traffic restrictions required at existing bridge junction.
	Option 3	Blue-Orange	New road alignment to North of level crossing. Upgrade existing junction on N20.

Level Crossing	Option Number	Option Colour	Description
	Option 4	Blue-Pink	New road alignment to North of level crossing. Extend diversion to existing junction on N20 with some traffic restrictions required at existing bridge junction.
	Option 5	Red	New road-over-rail bridge to West to level crossing. New junction on N20.
XC219 - Buttevant	Option 1	Green	New road-over-rail bridge to South of level crossing.
	Option 2	Red	New road-over-rail bridge to North to level crossing.
	Option 3	Blue	New road-over-rail bridge to South to level crossing.

5. Multi Criteria-Analysis

5.1 Introduction

A multi-criteria analysis was undertaken to evaluate the performance of the options developed for each one of the level crossing locations described in chapter 4, against the criteria outlined in Chapter 3.

5.2 Multi-Criteria Analysis

The following section of the chapter outline the assessment of feasible option alternatives for each one of the level crossing locations described in chapter 4. Further details surrounding the assessment of each option can be found in Appendix A: Options Appraisal.

5.2.1 XC201 Thomastown

- Due to safety concerns with sub-standard alignment and reduced sightlines, Option Red, Option Blue and Option Cyan were sifted out of further assessment;
- Therefore, as the safest option, the only feasible option is the Green option.

5.2.2 XC209 Ballyhay

The comparative assessment of the options for XC209 Ballyhay level crossing location is summarised below and shown in Table 5-1.

- With regard to the link road options, the Red option is ruled out immediately due to geometry constraints as HGVs cannot manoeuvre the curve;
- The Green options are the cheapest for the link roads as it requires less land and construction;
- Considering the mainline options, the Green options are significantly less curved than the Blue which would lessen its construction, environmental impacts and safety concerns;
- Due their curvature, the Blue options would require more land take and would also split some plots;
- The Blue options cross the Awbeg river which would cause some environmental issues but would also require the construction of a two-span bridge;
- The secondary Green-Orange option would require the shortest diversion for travelling to the north east but would cause a long diversion if the Green mainline option was implemented;
- Although the secondary Blue-Pink option is the easiest for crossing the Awbeg river, it has the most onerous construction and land take.

Table 5-1 Comparative assessment - XC209 Ballyhay

Primary Criteria	Secondary Criteria	Route Option				
		Green-Pink	Green-Orange	Blue-Pink	Blue-Orange	Cyan
Economy	Cost	Green	Green	Red	Red	Green
	Land Take	Green	Yellow	Red	Yellow	Yellow
	Reliability / Journey Time	Yellow	Yellow	Yellow	Yellow	Light Green
	Aggregated score	Green	Light Green	Red	Yellow	Light Green
Engineering	Geotech	Light Green	Light Green	Yellow	Yellow	Yellow
	Structures	Light Green	Light Green	Light Green	Light Green	Light Green
	Geometry	Light Green	Green	Red	Yellow	Light Green
	Aggregated score	Light Green	Green	Red	Yellow	Yellow
Environment	Ecology	Green	Green	Red	Red	Light Green
	Water/Flood Risk	Light Green	Light Green	Yellow	Yellow	Red
	Landscape	Light Green	Light Green	Yellow	Yellow	Light Green
	Noise	Light Green	Light Green	Light Green	Light Green	Light Green
	Cultural Heritage	Light Green	Light Green	Yellow	Light Green	Yellow
	Aggregated score	Green	Green	Red	Yellow	Light Green

Based on the outcomes of the above comparative assessment, the preferred option is the Green-Pink Option. The Green-Pink Option presents significant economic, engineering and environmental advantages, rendering the Blue Options to be of a significant disadvantage. The Green-Pink option has significant advantages over the Green-Orange option in terms of land take which is a key criterion and therefore is the preferred option. Whilst there are some disadvantages within the Green Options, there are considerably more disadvantages associated with the Blue Options.

5.2.3 XC211 Newtown

The comparative assessment of the options for XC211 Newtown level crossing location is summarised below and shown in Table 5-2.

- Due to its length the Blue option is the more expensive option being considered;
- Despite the difficulties with the housing estate, the Green option would be preferable for its lower cost and ease of construction;
- Although the Green option is the shortest, it will bring a lot of extra traffic through a housing estate. This would cause a lot of problems for the residents and make the housing estate more dangerous. It is also the more environmentally friendly option of the two;
- There are no significant differences between the Green and Blue options regarding reliability/journey time, Geotech and structures criteria;
- The Blue option would lead to a greater loss of vegetation, including an area of scrub located to the north of the scheme;

- In the water/flood risk criterion, the Blue option has some disadvantages over the red option due to increase run off particularly to the east of the railway;
- The Green option has some advantages over the Blue option in the landscape criteria due to potential visual impacts from dwelling on the western side of the railway line.

Table 5-2 Comparative assessment - XC211 Newtown

Primary Criteria	Secondary Criteria	Route Option	
		Green	Blue
Economy	Cost	Green	Red
	Land Take	Green	Red
	Reliability / Journey Time	Light Green	Yellow
	Aggregated score	Green	Red
Engineering	Geotech	Yellow	Yellow
	Structures	Yellow	Yellow
	Geometry	Yellow	Light Green
	Aggregated score	Yellow	Light Green
Environment	Ecology	Light Green	Yellow
	Water/Flood Risk	Light Green	Yellow
	Landscape	Light Green	Yellow
	Noise	Yellow	Yellow
	Cultural Heritage	Yellow	Yellow
	Aggregated score	Light Green	Yellow

Based on the outcomes of the above comparative assessment, the preferred option is the Green Option, which has significant advantages over the Blue option in the economy criterion. Whilst the Blue option presents some advantages over the Green Option in the engineering criterion, the Green option has some advantages over the Blue option regarding the environment criterion, giving an overall more advantageous assessment.

5.2.4 XC212 Ballycoskery

The comparative assessment of the options for XC212 Ballycoskery level crossing location is summarised below and shown in Table 5-3.

- The Green option is the least expensive option as the construction of an underbridge is not required, in comparison with the Red option which is considered the most expensive;
- The construction of an underbridge with the Red option produces safety concerns, increased land take, and disruption during construction;
- The Blue option moves road traffic the furthest away from receptors, making it the best option for noise.

Table 5-3 Comparative assessment - XC212 Ballycoskery

Primary Criteria	Secondary Criteria	Route Option		
		Green	Red	Blue
Economy	Cost	Green	Red	Light Green
	Land Take	Light Green	Yellow	Red
	Reliability / Journey Time	Yellow	Yellow	Yellow
	Aggregated score	Green	Red	Yellow
Engineering	Geotech	Light Green	Red	Green
	Structures	Green	Red	Green
	Geometry	Yellow	Yellow	Yellow
	Aggregated score	Light Green	Red	Green
Environment	Ecology	Yellow	Light Green	Yellow
	Water/Flood Risk	Light Green	Yellow	Yellow
	Landscape	Light Green	Light Green	Yellow
	Noise	Yellow	Light Green	Green
	Cultural Heritage	Yellow	Yellow	Yellow
	Aggregated score	Light Green	Light Green	Yellow

Based on the outcomes of the above comparative assessment, the preferred option is the Green Option. Whilst the Green option is not the best option regarding the engineering criterion, its overall score in the economic and environment criteria presents it as the best option when compared to the others.

5.2.5 XC215 Shinanagh

As mentioned in section 5.2, the Red option was sifted out in the preliminary analysis due to safety concerns with sub-standard geometry and reduced sightlines. The remaining options were assessed as summarised below and shown in Table 5-4

- The Green options are the longest and require construction adjacent to the railway. A potential heritage site would be impacted in the proposed solution. These constraints would require extra consideration and well-thought mitigation measures.
- The Blue options are shorter than the Green alternatives and therefore would require less construction and land take. However, the Blue option might split many plots of land, which would require careful stakeholder engagement.
- The Green options would have high costs due to their length.
- The cost of the Blue options are expected to be quite low and would therefore be preferable.

Table 5-4 Comparative assessment - XC215 Shinanagh

Primary Criteria	Secondary Criteria	Route Option			
		Green-Orange	Green-Pink	Blue-Orange	Blue-Pink
Economy	Cost	Orange	Green	Green	Green
	Land Take	Green	Green	Orange	Orange
	Reliability / Journey Time	Yellow	Yellow	Yellow	Yellow
	Aggregated score	Green	Green	Orange	Green
Engineering	Geotech	Green	Green	Orange	Orange
	Structures	Yellow	Yellow	Yellow	Yellow
	Geometry	Yellow	Yellow	Yellow	Yellow
	Aggregated score	Green	Green	Orange	Orange
Environment	Ecology	Green	Orange	Orange	Green
	Water/Flood Risk	Green	Green	Orange	Green
	Landscape	Green	Green	Orange	Orange
	Noise	Green	Orange	Green	Green
	Cultural Heritage	Yellow	Yellow	Yellow	Yellow
	Aggregated score	Green	Orange	Red	Green

Based on the outcomes of the above comparative assessment, the Green-Orange option is the preferred option. Whilst the Green-Orange is not the best option regarding the economy criterion, its overall score in the environment and engineering criteria presents it as the best option when compared to the others.

5.2.6 XC219 Buttevant

The comparative assessment of the options for XC219 Buttevant level crossing location is summarised below and shown in Table 5-5.

- The Green option has advantages over the Red and Blue options. The cost of the Green option would be significantly lower due to its shorter length and lower land take. The short length of the Green option would also enhance journey time when comparable to the other two alternatives;
- The Red option has the most onerous alignment, however there is no structural preference between the options;
- The Red option has some advantages over the other options such as no direct impact on Buttevant Station or Bregoge Bridge, minor interruptions of hedgerows and mature tree lines and low potential increase in pluvial flood risk.
- The Green option presents significant advantages over the other options in both the economic and engineering criterion.

Table 5-5 Comparative assessment - XC219 Buttevant

Primary Criteria	Secondary Criteria	Route Option		
		Green	Red	Blue
Economy	Cost	Green	Red	Yellow
	Land Take	Light Green	Yellow	Yellow
	Reliability / Journey Time	Light Green	Yellow	Yellow
	Aggregated score	Green	Red	Yellow
Engineering	Geotech	Red	Light Green	Yellow
	Structures	Yellow	Yellow	Yellow
	Geometry	Green	Yellow	Yellow
	Aggregated score	Light Green	Yellow	Yellow
Environment	Ecology	Red	Light Green	Yellow
	Water/Flood Risk	Light Green	Yellow	Yellow
	Landscape	Light Green	Light Green	Yellow
	Noise	Red	Light Green	Green
	Cultural Heritage	Yellow	Light Green	Yellow
	Aggregated score	Yellow	Light Green	Yellow

Based on the outcomes of the above comparative assessment, the preferred option is the Green Option. Whilst the Green option does present significant disadvantages in the geotech, ecology and noise criteria, however there is a higher aggregate of advantages overall with the Green option compared to the Red and Blue options.

5.3 Summary

Following a comparative assessment of the various options utilising an MCA at each level crossing location, the emerging preferred option for each of the locations is the Green Option.

At XC201 Thomastown, due to safety concerns with sub-standard alignment and reduced sightlines, Options Red, Option Blue and Option Cyan were ruled out of further assessment. Therefore, the Green Option is the safest and uniquely feasible option.

At XC209 Ballyhay, the Green-Pink Option presents significant economic, engineering and environmental advantages over the other options, making it the preferred option at this location also. The Green-Pink Option is the least expensive as it requires less land and construction, as well as being considerably less curved than the other options, reducing construction, environmental and safety concerns.

At XC211 Newtown, the Green Option is the preferred option as it presents significant advantages over the Blue Option in the economy criterion. Whilst the Blue Option presents some advantages over the Green Option in the engineering criterion, the Green Option has some advantages over the Blue Option regarding the environment criterion, giving an overall preferred option.

At XC212 Ballycoskery, the Green Option is the preferred option when compared to the others. Whilst the Green Option is not the best option regarding the engineering criterion, it is the least expensive option as there is no requirement for the construction of an underbridge, which also presents engineering advantages.

At XC215 Shinanagh, the Green-Orange Option is the preferred option as it presents significant advantages over the other options in each criterion. Whilst the Green-Orange option does prove more expensive, it does present advantages over the Green-Pink option in terms of the environment criterion and has significant advantages over the blue options.

At XC219 Buttevant, the preferred option is the Green Option as it has a higher aggregate of advantages overall when compared to the other options.

Consequently, the assessment presents the Green Option as the preferred option at each location and therefore has an advantage over all of the alternative options presented.

Appendix A. Options Appraisal

A.1 Level Crossing XC 201 Thomastown

Primary Criteria	Secondary Criteria	XC 201 Route Option			
		Green	Red	Blue	Cyan
Economy	Cost	Considered to be similar capital cost to other schemes.	Considered to be similar capital cost to other schemes.	Considered to be similar capital cost to other schemes.	Considered the most expensive in terms of capital cost.
	Land Take	Land take required from 2no. landowners.	Land take required from 1no. landowner.	Land take required from 1no. landowner.	Considered the most onerous in terms of land take (area and number of landowners).
	Reliability / Journey Time	Shorter journey time when compared to the other options.	Journey time would be increase due to the route alignment when compared to other options.	Journey time similar to the Red Option.	Route length would increase the journey time when compared to the Green Option.
Engineering	Geotech	No significant differences in ground conditions between options.	No significant differences in ground conditions between options.	No significant differences in ground conditions between options.	No significant differences in ground conditions between options.
	Structure	No preference with regards to structures as bridge will be same for all	No preference with regards to structures as bridge will be same for all	No preference with regards to structures as bridge will be same for all	No preference with regards to structures as bridge will be same for all
	Geometry	Best alignment in terms of safety and driver comfort. New junction required on Regional Road. Works may impact existing groundwater well/spring to south west of level crossing.	Safety concerns with sub-standard alignment and reduced sightlines. New junction required on Regional Road. New junction to Reg Road is also in close proximity to existing NIAH (National Inventory of Architectural Heritage) site – cost/time implications.	No tie-in with Regional Road required. Safety concerns with sub-standard alignment and reduced sightlines. Works within pluvial flood risk area – drainage and structural implications. Works within SMR (Sites & Monuments Record) zone of	Safety concerns with sub-standard alignment and reduced sightlines. New junction required on Regional Road. New junction to Reg Road is also in close proximity to existing NIAH (National Inventory of Architectural

Primary Criteria	Secondary Criteria	XC 201 Route Option			
		Green	Red	Blue	Cyan
			<p>Works within pluvial flood risk area – drainage and structural implications.</p> <p>Works within SMR (sites & monuments record) zone of existing archaeological monument – cost/time implications.</p>	<p>existing archaeological monument – cost/time implications.</p>	<p>Heritage) site – cost/time implications.</p> <p>Works within pluvial flood risk area – drainage and structural implications.</p> <p>Works within SMR (sites & monuments record) zone of existing archaeological monument – cost/time implications.</p>
Environment	Ecology	Very limited loss of hedgerow. Crossing of watercourses.	Loss of hedgerow sections and loss of mature trees to north of scheme.	Limited loss of hedgerow.	Loss of hedgerow sections to the south and loss of hedgerows/mature trees to north of scheme.
	Water/Flood Risk	Low potential increase in pluvial flood risk locally due to increased runoff.	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to south of railway (see PFRA).	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to south of railway (see PFRA).	Crosses access lane to the immediate east of farm buildings. Severance issues associated with this. Appears to be an OHL (possibly telephone lines) at the southern section along the road leading to the existing crossing as well as OHL to running parallel and to the east of the farm buildings which may need to be diverted.
	Landscape	Considerable visual extent of development Interrupts several hedgerows	Development will be over-looked by a dwelling whose upper floor views are oriented in the direction of the development – any ground floor views are likely to be	Development will be over-looked by a dwelling whose upper floor views are oriented in the direction of the development – any ground floor views are likely to be	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to south of railway (see PFRA).

Primary Criteria	Secondary Criteria	XC 201 Route Option			
		Green	Red	Blue	Cyan
		Visual impacts at proposed intersection at R515	screened by a large mature coniferous hedgerow to rear of dwelling. Visual impacts at proposed intersection at R515 Interrupts several hedgerows	screened by a large mature coniferous hedgerow to rear of dwelling. Interrupts several hedgerows	Potential for road to intersect with surface water flows and cause localised flooding.
	Cultural Heritage	Potential for unrecorded archaeology to be encountered in greenfield areas. Possible indirect impacts on setting of thatched dwelling (RPS No. 38/NIAH 21904709).	Traverses RMP constraints area for enclosure LI047-045 with potential for associated archaeological remains to be impacted. Potential for further unrecorded archaeology to be encountered in greenfield areas. Indirect impacts on setting of enclosure LI047-045 and mound LI047-046. Increased risk of traffic impact (collision) on water pump (NIAH 21904708).	Traverses RMP constraints area for enclosure LI047-045 with potential for associated archaeological remains to be impacted. Potential for further unrecorded archaeology to be encountered in greenfield areas. Indirect impacts on setting of enclosure LI047-045 and mound LI047-046.	Potential for unrecorded archaeology to be encountered in greenfield areas. Indirect impacts on setting of enclosure LI047-045 and mound LI047-046. Increased risk of traffic impact (collision) on water pump (NIAH 21904708).
	Noise	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.

A.2 Level Crossing XC 209 Ballyhay

Primary Criteria	Secondary Criteria	XC 209 Route Option		
		Green-Red*	Green-Pink	Green-Orange
Economy	Cost	Considered to be the least expensive of all options based on capital cost. This is based on the Green option having a higher capital cost than the Blue option due to the structural requirements of the Blue option. The Red link option is considered to have a lower capital cost than the Pink and Orange options.	Considered to be preferable to other routes based on the Green option having a higher capital cost than the Blue option due to the structural requirements of the Blue option. The Pink route requires a river bridge and more road works than the Red option. This route is considered to be similar capital cost to the Green-Orange and Cyan options.	Considered to be preferable to other routes based on the Green route having a higher capital cost than the Blue route due to the structural requirements of the Blue route. The Orange route requires a river bridge and more road works than the Red route. This route is considered to be similar capital cost to the Green-Pink and Cyan routes.
	Land Take	Considered to be preferable due to minimal land take required for the link road. Green option preferable to blue option due to area and number of landowners.	Considered neutral in comparison to others. Pink option affects more landowners than Orange option, and splits land more onerously. Green option preferable to Blue route due to area and number of landowners.	Considered preferable to some others as land take is close to land borders. Green option preferable to Blue option due to area and number of landowners.
	Reliability / Journey Time	No significant differences between the options in terms of journey time.	No significant differences between the options in terms of journey time.	No significant differences between the options in terms of journey time.
Engineering	Geotech	Green option has no additional structures. Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement). Red option has no impact to the river, significantly reduced ground investigation, foundation and earthworks requirements.	Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement). Pink route crosses river, which will require additional bridge and scour protection, environmental issues with working in close to the river.	Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement). Orange option crosses river, which will require additional bridge and scour protection, environmental issues with working in close to the river.

Primary Criteria	Secondary Criteria	XC 209 Route Option		
		Green-Red*	Green-Pink	Green-Orange
	Structure	No bridge required to this option.	Option has cross watercourse close to the road.	Option has cross watercourse close to the road.
	Geometry	Green option has the best alignment in terms of safety and driver comfort, and required works are outside flood risk area. Red option cannot accommodate swept path of tractor-trailer vehicle while retaining existing river bridge. Works within fluvial flood risk area – drainage and structural implications.	Green option has the best alignment in terms of safety and driver comfort, and required works are outside flood risk area. Pink option works within SMR zone – cost/time implications. Works within indicative and extreme fluvial flood risk area – drainage and structural implications.	Green option has the best alignment in terms of safety and driver comfort. Orange option has the best alignment in terms of safety and driver comfort. It works very close to existing SMR site and within SMR zone – cost/time implications. Works within fluvial flood risk area – drainage and structural implications.
Environment	Ecology	Loss of low ecological value habitat. Green route crosses area of marsh habitat with potential to support species of conservation interest (plants). Red option has limited impacts to watercourse and limited loss of aquatic habitat from bridge widening.	Loss of low ecological value habitat in the green section and loss of mainly low ecological value terrestrial habitat in the pink section. Green option crosses area of marsh habitat with potential to support species of conservation interest (plants). Pink option has one crossing of watercourse tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC. Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter (less disturbed area as away from dwelling)).	Loss of low ecological value habitat in the green section and loss of mainly low ecological value terrestrial habitat in the orange section. Green option crosses area of marsh habitat with potential to support species of conservation interest (plants). Orange option has one crossing of watercourse tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC. Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter).
	Water/Flood Risk	Green option has low potential increase in pluvial flood risk locally due to increased runoff. New road alignment for red option may intrude on fluvial floodplain to the east of the railway (low/moderate impact envisaged).	Green option has low potential increase in pluvial flood risk locally due to increased runoff. Pink option has potential to remove existing bridge immediately to east of railway (if railway crossing is closed),	Green option has low potential increase in pluvial flood risk locally due to increased runoff. Orange option has potential to remove existing bridge immediately to east of railway (if railway crossing is closed), however may

Primary Criteria	Secondary Criteria	XC 209 Route Option		
		Green-Red*	Green-Pink	Green-Orange
		New river crossing required immediately to east of railway. Stage 3 FRA (including modelling required). Red option avoids the need for a new bridge/river crossing (compared to the pink and orange link road options)	however may need to be retained due to landscape character / architectural significance.	need to be retained due to landscape character / architectural significance.
	Landscape	Green option has greater separation distances from nearby dwelling in comparison to blue option – reduced visual impacts. It interrupts several hedgerows and has potential minor loss of immature conifer woodland. Red option has minor vegetation loss, low visual impacts and small loss of hedgerow vegetation.	Green option has greater separation distances from nearby dwelling in comparison to blue option – reduced visual impacts. It interrupts several hedgerows and has potential minor loss of immature conifer woodland. Pink option has low visual impacts due to intervening screening. It interrupts several hedgerows and tree lines, create awkward field patterns and has loss of riparian vegetation (river crossing).	Green option has greater separation distances from nearby dwelling in comparison to blue option – reduced visual impacts. It interrupts several hedgerows and has potential minor loss of immature conifer woodland. Orange option has limited visual impacts due to intervening screening. It interrupts several hedgerows and areas of scrubby vegetation and has loss of riparian vegetation (river crossing).
	Cultural Heritage	No direct impact on any recorded cultural heritage sites and lower potential to impact unrecorded archaeology in the red link road. Green option has potential for unrecorded archaeology to be encountered in greenfield/marshy areas. Possible indirect impacts on setting of mill (CO008-059), church (CO008-001002) and graveyard (CO008-001001). Red option has potential minor impact on heritage values of crossing/railway line (if any) and bridge over Awbeg River.	No direct impact on any recorded cultural heritage sites. Green option has potential for unrecorded archaeology to be encountered in greenfield/marshy areas. Possible indirect impacts on setting of mill (CO008-059), church (CO008-001002) and graveyard (CO008-001001). Pink option has potential for unrecorded archaeology to be encountered in greenfield/marshy areas and at crossing of Awbeg River. Potential impact on setting of any heritage values near	Green option has no direct impact on any recorded cultural heritage sites. Potential for unrecorded archaeology to be encountered in greenfield/marshy areas. Possible indirect impacts on setting of mill (CO008-059), church (CO008-001002) and graveyard (CO008-001001). Orange option is potentially the least impact on setting of church (CO008-001002) and graveyard (CO008-001001). It has potential impact on mill (CO008-059). Potential for unrecorded archaeology to be encountered

Primary Criteria	Secondary Criteria	XC 209 Route Option		
		Green-Red*	Green-Pink	Green-Orange
			crossing/railway line (e.g. bridge over Awbeg River).	in greenfield/marshy areas and at crossing of Awbeg River.
	Noise	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.

Level Crossing XC 209 Ballyhay Continued

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
Economy	Cost	Considered to be the least expensive of the Blue option options due to no requirement for structural works for the link road. However, the Blue option is considered more onerous than the Green option from a structural perspective due to the bridge requirement at the south of the level crossing.	Considered to be the most expensive of all options in terms of capital cost, along with the Blue-Orange option. This is due to having the most structural requirements of all routes (with the exception of the Blue-Orange option).	Considered to be the most expensive of all options in terms of capital cost, along with the Blue-Orange option. This is due to having the most structural requirements of all routes (with the exception of the Blue-Pink option).	Considered to be similar capital cost to the Green-Pink option and Green-Orange option.
	Land Take	Considered preferable in comparison to other blue options. Green option is preferable to Blue option due to area and number of landowners.	Pink option affects more landowners than Orange route, and splits land more onerously. Green option preferable to Blue option due to area and number of landowners.	Considered preferable to some others as land requirement is close to land borders. Green option preferable to Blue route due to area and number of landowners.	Considered preferable to all options except the Green-Red option as this option splits land less onerously.

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
	Reliability / Journey Time	No significant differences between the options.	No significant differences between the options.	No significant differences between the options.	Route alignment would reduce the journey time when compared to the other options.
Engineering	Geotech	<p>Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement).</p> <p>Blue option crossing river will require additional bridge and scour protection, environmental issues with working in close to the river.</p> <p>In closer proximity to residences and church graveyard.</p> <p>Red option has no impact to the river, significantly reduced ground investigation, foundation and earthworks requirements.</p>	<p>Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement).</p> <p>Blue option crossing river will require additional bridge and scour protection, environmental issues with working in close to the river.</p> <p>In closer proximity to residences and church graveyard.</p> <p>Pink option crosses river, which will require additional bridge and scour protection, environmental issues with working in close to the river.</p>	<p>Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement).</p> <p>Blue option crossing river will require additional bridge and scour protection, environmental issues with working in close to the river.</p> <p>In closer proximity to residences and church graveyard.</p> <p>Orange option crosses river, which will require additional bridge and scour protection, environmental issues with working in close to the river.</p>	<p>Alluvial deposits shown to be present across the site. Marsh land with standing water shown in areas. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace, piling or ground improvement).</p> <p>Option crosses river, which will require additional bridge and scour protection, environmental issues with working in close to the river.</p>
	Structure	<p>Blue option has cross rail and watercourse in close proximity. Additional river bridge/possibly combined structure required.</p>	<p>Blue option has cross rail and watercourse in close proximity.</p>	<p>Blue option has cross rail and watercourse in close proximity.</p>	<p>Cyan option has cross rail and watercourse in close proximity.</p>

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
	Geometry	<p>Blue option works within fluvial flood risk area – drainage and structural implications. Additional river bridge/possibly combined structure required.</p> <p>Red option cannot accommodate swept path of tractor-trailer vehicle while retaining existing river bridge.</p>	<p>Blue option works within fluvial flood risk area – drainage and structural implications. Additional river bridge/possibly combined structure required.</p> <p>Pink option works within SMR zone – cost/time implications. Works within indicative and extreme fluvial flood risk area – drainage and structural implications.</p>	<p>Blue option works within fluvial flood risk area – drainage and structural implications. Additional river bridge/possibly combined structure required.</p> <p>Orange option has the best alignment in terms of safety and driver comfort.</p> <p>It works very close to existing SMR site and within SMR zone – cost/time implications. Works within fluvial flood risk area – drainage and structural implications.</p>	<p>The cyan option provides a single connection to both link roads. The geometry is favourable and is similar to the green route.</p> <p>The option accommodates the greater flow of traffic which travels west rather than the north west.</p>
Environment	Ecology	<p>Loss of mainly low ecological value terrestrial habitat.</p> <p>One crossing of watercourse tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC.</p> <p>Crossing tributary of the Awbeg River.</p> <p>Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter).</p> <p>Potential for loss of kingfisher habitat.</p> <p>Red option has limited impact to water course and limited loss</p>	<p>Loss of mainly low ecological value terrestrial habitat.</p> <p>One crossing of watercourse tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC.</p> <p>Crossing tributary of the Awbeg River.</p> <p>Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter).</p> <p>Potential for loss of kingfisher habitat.</p> <p>Pink option has one crossing of watercourse tributary</p>	<p>Loss of mainly low ecological value terrestrial habitat.</p> <p>One crossing of watercourse tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC.</p> <p>Crossing tributary of the Awbeg River.</p> <p>Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter).</p> <p>Potential for loss of kingfisher habitat.</p> <p>Orange option has one crossing of watercourse</p>	<p>Similar to green-orange option including river crossing and loss of hedgerows/mature trees in places. Cyan option deviates from Green-orange option by crossing field instead of connecting directly with existing access; this would lead to a slightly greater effect on habitats, however habitat here is mainly low ecological value.</p> <p>Loss of mature trees and hedgerows alongside river.</p>

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
		of aquatic habitat from bridge widening.	(Awbeg River) of the Blackwater River (Cork/Waterford) SAC. Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter (less disturbed area as away from dwelling)).	tributary (Awbeg River) of the Blackwater River (Cork/Waterford) SAC. Loss of supporting habitat for aquatic species (fish, crayfish, plants, otter).	
	Water/Flood Risk	New road likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged). New river crossing required immediately to west of railway. Stage 3 FRA (including modelling required). Low potential increase in pluvial flood risk locally due to increased runoff. Red option avoids the need for a new bridge/river crossing (compared to the pink and orange link road options)	New road likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged). New river crossing required immediately to west of railway. Stage 3 FRA (including modelling required). Low potential increase in pluvial flood risk locally due to increased runoff. Pink option has potential to remove existing bridge immediately to east of railway (if railway crossing is closed), however may need to be retained due to landscape character / architectural significance.	New road likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged). New river crossing required immediately to west of railway. Stage 3 FRA (including modelling required). Low potential increase in pluvial flood risk locally due to increased runoff. Orange option has potential to remove existing bridge immediately to east of railway (if railway crossing is closed), however may need to be retained due to landscape character / architectural significance.	Cyan option requires crossing of Buttevant (East)_020. New bridge would be required. As for orange route option. Hydrological connection to Blackwater/Cork SAC. Option crosses fluvial flood plain; depending on design, has potential to bisect flood plain and cause flooding upstream.
	Landscape	Blue option has loss of riparian vegetation, visual impacts at	Blue option has loss of riparian vegetation, visual	Blue option has loss of riparian vegetation, visual impacts at	Impacts would be similar to those for orange, pink and part

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
		graveyard and loss of small area of woodland. The development will benefit from mature tree line/hedgerow screening to the east of the proposed alignment. Red option has minor vegetation loss, low visual impacts and small loss of hedgerow vegetation.	impacts at graveyard and loss of small area of woodland. The development will benefit from mature tree line/hedgerow screening to the east of the proposed alignment. Pink option has low visual impacts due to intervening screening. It interrupts several hedgerows and tree lines, create awkward field patterns and has loss of riparian vegetation (river crossing).	graveyard and loss of small area of woodland. The development will benefit from mature tree line/hedgerow screening to the east of the proposed alignment. Orange option has limited visual impacts due to intervening screening. It interrupts several hedgerows and areas of scrubby vegetation and has loss of riparian vegetation (river crossing).	of green option (bridge section). Suggests limited visual impacts and lower than for blue option.
	Cultural Heritage	No direct impact on any recorded cultural heritage sites and lower potential to impact unrecorded archaeology in the red link road. Blue option has potential for unrecorded archaeology to be encountered in greenfield areas. Possible indirect impacts on setting of church (CO008-001002) and graveyard (CO008-001001) and house listed on NIAH (Reg. No. 20900801). Red option has potential minor impact on heritage values of	No direct impact on any recorded cultural heritage sites and lower potential to impact unrecorded archaeology in the red link road. Blue option has potential for unrecorded archaeology to be encountered in greenfield areas. Possible indirect impacts on setting of church (CO008-001002) and graveyard (CO008-001001) and house listed on NIAH (Reg. No. 20900801).	No direct impact on any recorded cultural heritage sites and lower potential to impact unrecorded archaeology in the red link road. Blue option has potential for unrecorded archaeology to be encountered in greenfield areas. Possible indirect impacts on setting of church (CO008-001002) and graveyard (CO008-001001) and house listed on NIAH (Reg. No. 20900801). Orange option is potentially the least impact on setting of	Eastern section of the Cyan option is similar to the Orange route. It has potential impact on mill (CO008-059). Potential for unrecorded archaeology to be encountered in greenfield/marshy areas and at crossing of Awbeg River. Possible indirect impacts on setting of church (CO008-001002) and graveyard (CO008-001001).

Primary Criteria	Secondary Criteria	XC 209 Route Option			
		Blue-Red*	Blue-Pink	Blue-Orange	Cyan
		crossing/railway line (if any) and bridge over Awbeg River.	Pink option has potential for unrecorded archaeology to be encountered in greenfield/marshy areas and at crossing of Awbeg River. Potential impact on setting of any heritage values near crossing/railway line (e.g. bridge over Awbeg River).	church (CO008-001002) and graveyard (CO008-001001). It has potential impact on mill (CO008-059). Potential for unrecorded archaeology to be encountered in greenfield/marshy areas and at crossing of Awbeg River.	
	Noise	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.	Potential construction noise impacts. Operational noise impacts unlikely.

A.3 Level Crossing XC 211 Newtown

Primary Criteria	Secondary Criteria	XC 211 Route Option	
		Green	Blue
Economy	Cost	Significantly cheaper option compared to Blue option in terms of capital cost.	Significantly more expensive option compared to Green option in terms of capital cost.
	Land Take	Significantly less land take required compared to the Blue option.	Significantly more land take required compared to the Green route.
	Reliability / Journey Time	Journey time would be shorter when comparable to the Blue option.	Route length would lead to a longer journey time when comparable to the Green option.
Engineering	Geotech	No significant differences in ground conditions between options.	No significant differences in ground conditions between options.
	Structure	No structures.	No structures.
	Geometry	No significant differences between the alignments. The green option is the shortest, but it will bring a lot of extra traffic through a housing estate. This would cause a lot of problems for the residents and make the housing estate more dangerous	No significant differences between the alignments. The blue is preferable as it avoids routing traffic through the housing estate.
Environment	Ecology	Loss of low ecological value habitat and small area of hedge row.	Loss of mainly low ecological value habitat. Greater loss of vegetation including area of scrub to north of scheme.
	Water/Flood Risk	Low potential increase in pluvial flood risk locally due to increased runoff.	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to east of railway (see PFRA).
	Landscape	Minor loss of vegetation. Potential visual impacts at archaeological feature to the west. Loss of section of mature hedgerow.	Minor loss of vegetation. Road runs along a locally elevated section of terrain Potential visual impacts from dwellings on western side of railway line.

Primary Criteria	Secondary Criteria	XC 211 Route Option	
		Green	Blue
	Cultural Heritage	<p>No direct impact on any recorded cultural heritage sites. Shorter option may represent lower potential to impact unrecorded archaeology.</p> <p>Potential for unrecorded archaeology to be encountered in greenfield areas. Potential minor indirect impact on setting of ringfort CO008-034.</p>	<p>No apparent advantages when compared with Green option.</p> <p>Potential direct impact on ringfort CO008-040 and associated archaeological remains. Potential for unrecorded archaeology to be encountered in greenfield areas.</p>
	Noise	<p>Potential operational impact unlikely to lead to significant effect.</p> <p>Potential construction noise impacts</p> <p>Potential operational impacts depending on expected traffic changes</p>	<p>Potential operational impact unlikely to lead to significant effect.</p> <p>Potential construction noise impacts</p> <p>Potential operational impacts depending on expected traffic changes</p>

A.4 Level Crossing XC 212 Ballycoskery

Primary Criteria	Secondary Criteria	XC 212 Route Option		
		Green	Red	Blue
Economy	Cost	Considered to be the least expensive in terms of capital cost. When compared to the Red option, the requirement for an underbridge makes the Green option less expensive. The tie-in to the national road and more extensive road works make the Blue option more expensive than this option.	Considered the most expensive due to requirement of constructing an underbridge.	Considered slightly more expensive than Green option in terms of capital cost.
	Land Take	Less onerous land take than the Blue option. More land take required than the Red option.	Considered the least onerous in terms of land area, however risk of requiring school land makes this option less preferable.	Considered the most onerous of the options.
	Reliability / Journey Time	No significant differences between the options.	No significant differences between the options.	No significant differences between the options.
Engineering	Geotech	Proximity to school requiring reinforced earth solution to reduce land take.	Proposed underbridge option. Potential increased impact to the railway through settlement of the track caused by the underbridge. Groundwater control required for cutting and underbridge. Potential increased land take or retainment required depending on ground conditions	Potential to reduce reinforced earth length compared to green option. Greater land-take required if go for embankments for approach.
	Structure	Square span. Simpler construction compared to red option. Safest operationally.	Underbridge provides potential for graffiti and social issues Underbridge close to school is less safe Disruption to railway during construction	Similar to green option.
	Geometry	The green option has constraints due to the tie in locations which results is less than desirable geometry which will	The red option maintains the existing line of road. The geometry is relatively simple. The construction of the option would cause	The blue option is similar to the green option but requires a new junction with the N20. The existing junction with the

Primary Criteria	Secondary Criteria	XC 212 Route Option		
		Green	Red	Blue
		need to be mitigated. A lower than desirable headroom over the railway is required to tie into the existing carriageway at both tie in points.	significant disruption to existing traffic and the railway.	N20 would have to be closed to facilitate this.
Environment	Ecology	<p>Loss of moderate ecological value terrestrial habitat.</p> <p>Loss of building with high bat roost potential.</p> <p>Loss of some mature trees. Low impact.</p> <p>Larger area of wet meadow loss to mainly to west and some in east of scheme.</p>	<p>Little to no loss of mainly moderate ecological value habitat.</p> <p>Loss of building with high bat roost potential.</p> <p>Loss of some mature trees. Low impact.</p>	<p>Retention of building with high bat roost potential.</p> <p>Loss of mainly low ecological value terrestrial habitat.</p> <p>Loss of some area of wet meadow.</p> <p>Loss of some mature trees. Moderate impact.</p>
	Water/Flood Risk	Low potential increase in pluvial flood risk locally due to increased runoff.	Moderate potential increase in pluvial and groundwater flood risk locally due to new underbridge at railway.	<p>New road alignment may intrude on fluvial floodplain to the west of the railway (low impact envisaged).</p> <p>Potential requirement for Stage 3 FRA (including modelling required).</p> <p>Low potential increase in pluvial flood risk locally due to increased runoff.</p>
	Landscape	<p>Road alignment benefits from layer of hedgerow screening on southern verge of L1533 west of railway line.</p> <p>Nearest above ground alignment to Beechwood residential estate to north – potential for visual impacts</p> <p>Potential visual impacts along Kilmallock Cycle Hub Route 1</p> <p>Interrupts several hedgerows and mature tree lines.</p>	<p>Road alignment benefits from layer of hedgerow screening on southern verge of L1533 west of railway line.</p> <p>Underground route will have less visual exposure – low visual impacts.</p> <p>Potential visual impacts along Kilmallock Cycle Hub Route 1</p> <p>Interrupts several hedgerows and mature tree lines.</p>	<p>Largest offsets from surrounding dwellings</p> <p>Benefits from additional layer of hedgerow screening from residential estate to north.</p> <p>Potential visual impacts at proposed new intersection with N20</p> <p>Largest visual extent of development</p>

Primary Criteria	Secondary Criteria	XC 212 Route Option		
		Green	Red	Blue
		Alignment passes south of dwelling immediately east of railway line. Visual impacts at school and dwellings to east of railway line	Visual impacts at school and dwellings to east of railway line.	Interrupts several hedgerows and mature tree lines. Potential visual impacts along Kilmallock Cycle Hub Route 1.
	Cultural Heritage	No direct impact on architectural heritage sites. Enters RMP constraints area for church CO008-069 with potential impacts on subsurface archaeology and setting. Potential for unrecorded archaeology to be encountered in greenfield areas, particularly in the vicinity of moated site CO008-035.	Lower potential to impact unrecorded archaeology. Enters RMP constraints area for church CO008-069 with potential impacts on subsurface archaeology and setting. Potential for direct impact on possible station house which may be of architectural heritage interest.	No direct impact on any recorded cultural heritage sites. Mostly avoids RMP constraints area for church CO008-069. Potential for unrecorded archaeology to be encountered in greenfield areas, particularly in the vicinity of moated site CO008-035. Potential indirect impact on setting of church (CO008-069) and moated site (CO008-035).
	Noise	Least preferred option for noise compared to the red and blue options but still moves traffic away from receptors compared to the existing road. Potential construction noise impacts	Second best option for operational noise. Potential construction noise impacts	Best option for operational noise as moves road traffic furthest from receptors. Potential construction noise impacts

A.5 Level Crossing XC 215 Shinanagh

Primary Criteria	Secondary Criteria	XC 215 Route Option				
		Green - Orange	Green-Pink	Blue-Orange	Blue-Pink	Red
Economy	Cost	Considered to be more expensive than other routes in terms of capital cost, due to extent of road works and working on the N20.	Considered to be less expensive than the Green-Orange option as this option does not require works to the N20. More expensive than other options in terms of capital cost.	Considered to be more expensive than the Blue-Pink option as this option requires works to the N20. Less expensive than other options in terms of capital cost.	Considered to be the least expensive of the options in terms of capital cost, based on extent of road works.	Considered to be the most expensive option in terms of capital cost due to the need for a bridge construction and significant work to the N20.
	Land Take	Considered preferable to Blue options as fewer land owners and less split of land would be required. No preference between Orange and Pink options.	Considered preferable to Blue options as fewer land owners and less split of land would be required. No preference between Orange and Pink options.	Considered more onerous than Green options as more land owners and more split of land required. No preference between Orange and Pink options.	Considered more onerous than Green route options as more land owners and more split of land required. No preference between Orange and Pink options.	Considered to be onerous in terms of land take due to number of landowners and construction either side of the railway.
	Reliability / Journey Time	No significant differences between the options.	No significant differences between the options.	No significant differences between the options.	No significant differences between the options.	No significant differences between the options.
Engineering	Geotechnical	Reduced geotechnical investigation and design as no structures (overbridge) required on this alignment. Alignment expected to be underlain by glacial till. Ground/surface obstructions due to proximity to the historic church and graveyard to	Reduced geotechnical investigation and design as no structures (overbridge) required on this alignment. Alignment expected to be underlain by glacial till. Ground/surface obstructions due to proximity to the historic church and graveyard to the west and the railway to the east.	Located further from karst feature (found to the north of level crossing, between railway and N20). Significantly reduced ground investigation, foundation and earthworks requirements compared to overbridge solution to the south, and marginally reduced	Located further from karst feature (found to the north of level crossing, between railway and N20). Significantly reduced ground investigation, foundation and earthworks requirements compared to overbridge solution to the south, and marginally reduced compared to green option.	Located away from Imphrick Church and graveyard. It is also further from karst feature (found to the north of level crossing, between railway and N20). Alluvial deposits shown to be present at the bridge crossings. Potential soft ground conditions, issues associated with foundation solution

Primary Criteria	Secondary Criteria	XC 215 Route Option				
		Green - Orange	Green-Pink	Blue-Orange	Blue-Pink	Red
		<p>the west and the railway to the east.</p> <p>Karst feature shown in close proximity to the route.</p>	<p>Karst feature shown in close proximity to the route.</p> <p>Pink section is an existing road, no geotechnical investigation required.</p>	<p>compared to green option.</p> <p>Option falls within wayleave of the Gas Transmission pipeline.</p> <p>Alluvial deposits shown to be present along half of the route. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace or ground improvement).</p>	<p>Option falls within wayleave of the Gas Transmission pipeline.</p> <p>Alluvial deposits shown to be present along half of the route. Potential soft ground conditions, issues associated with foundation solution (requirement for dig out and replace or ground improvement).</p> <p>Pink section is an existing road, no geotechnical investigation required.</p>	<p>(requirement for dig out and replace, piling or ground improvement).</p> <p>Increased geotechnical investigation and design as structure (overbridge) required on this alignment.</p>
	Structure	Some works required to existing overbridge.	Some works required to existing overbridge.	Some works required to existing overbridge.	Some works required to existing overbridge.	Most onerous due to requirement for new bridge.
	Geometry	<p>No significant differences between the options.</p> <p>The upgrade of the existing N20 junction (orange link) is less favorable as it would require significant upgrade to the existing N20 and the approach to the junction on the local road.</p>	<p>The upgrade of the existing N20 junction (orange link) is less favorable as it would require significant upgrade to the existing N20 and the approach to the junction on the local road.</p>	<p>No significant differences between the options.</p> <p>The upgrade of the existing N20 junction (orange link) is less favorable as it would require significant upgrade to the existing N20 and the approach to the junction on the local road.</p>	<p>The upgrade of the existing N20 junction (orange link) is less favorable as it would require significant upgrade to the existing N20 and the approach to the junction on the local road.</p>	<p>Safety concerns with sub-standard alignment and reduced sightlines.</p> <p>The red option is the least favorable option as the geometry is significantly below standard and requires a new junction on the N20. The N20 is also on a curve at this location as had an existing junction in close proximity.</p>

Primary Criteria	Secondary Criteria	XC 215 Route Option				
		Green - Orange	Green-Pink	Blue-Orange	Blue-Pink	Red
Environment	Ecology	No impact on Blackwater River (Cork/Waterford) SAC. Loss of low ecological value habitat. Loss of mature trees in one location.	Loss of low ecological value habitat. Moderate potential for impact to Blackwater River (Cork/Waterford) SAC given distance to watercourse.	Loss of low ecological value habitat. High potential for impact to Blackwater River (Cork/Waterford) SAC given close proximity at southern end.	No impact on Blackwater River (Cork/Waterford) SAC and using existing road results in no loss of vegetation for birds and bats.	Loss of low ecological value habitat. Moderate potential for impact to Blackwater River (Cork/Waterford) SAC given distance to watercourse.
	Water/Flood Risk	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to west of existing N20 junction of railway (see PFRA).	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to south of existing N20 junction of railway (see PFRA).	New road alignment may intrude on fluvial floodplain to the west of the railway (low impact envisaged). Potential requirement for Stage 3 FRA (including modelling required). Low potential increase in pluvial flood risk locally due to increased runoff.	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to west of existing N20 junction of railway (see PFRA).	Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to south of existing N20 junction of railway (see PFRA).
	Landscape	Road alignment primarily follows alignment of railway line – minor loss of vegetation and minimal disruption to field pattern Road alignment benefits from screening of mature tree line hedgerows to west and to east along railway line boundary.	Minor loss of vegetation through use of existing farm tracks. Visual impacts from proposed N20 junction Visual impacts from dwellings east of N20.	Minor loss of vegetation through use of existing farm tracks. Visual impacts along Ballyhoura way national waymarked trail Road alignment situated on locally elevated terrain – potential increase in visual exposure.	Road alignment primarily follows alignment of railway line – minor loss of vegetation and minimal disruption to field pattern Road alignment benefits from screening of mature tree line hedgerows to west and to east along railway line boundary	Minor loss of vegetation through use of existing farm tracks. Visual impacts from proposed N20 junction Visual impacts from dwellings east of N20 Largest visual exposure due to elevated nature of proposed overbridge

Primary Criteria	Secondary Criteria	XC 215 Route Option				
		Green - Orange	Green-Pink	Blue-Orange	Blue-Pink	Red
		<p>Visual impacts along Ballyhoura way national waymarked trail</p> <p>Vegetation loss at N20 junction</p> <p>Visual impacts at dwellings at north-western end of alignment.</p> <p>Visual impacts at archaeological feature – graveyard</p> <p>Potential loss of mature vegetation at proposed new intersection west of existing railway overbridge</p>	<p>Largest visual exposure due to elevated nature of proposed overbridge.</p>	<p>Potential visual impacts at dwelling to north-west of alignment</p> <p>Very minor amount of existing vegetative screening</p>	<p>No vegetation lost at N20 junction.</p> <p>Visual impacts along Ballyhoura way national waymarked trail</p> <p>Visual impacts at dwellings at north-western end of alignment.</p> <p>Visual impacts at archaeological feature – graveyard</p> <p>Potential loss of mature vegetation at proposed new intersection west of existing railway overbridge</p>	
	Cultural Heritage	<p>Increased appreciation of church and graveyard (CO007-120001 and CO007-120002) and Shinanagh Bridge from greater visibility.</p> <p>Enters RMP constraints area for church and graveyard (CO007-120001 and CO007-120002) with potential impacts on associated archaeology and setting.</p>	<p>No direct impact on any recorded cultural heritage sites. Avoids RMP constraints area for church and graveyard (CO007-120001 and CO007-120002). Also avoids Shinanagh Bridge.</p> <p>Potential for unrecorded archaeology to be encountered in greenfield areas.</p> <p>Traverses RMP constraints area for castle CO007-119001</p>	<p>Avoids RMP constraints area for church and graveyard (CO007-120001 and CO007-120002). Also avoids Shinanagh Bridge.</p>	<p>Pink Option would take less traffic over Shinanagh Bridge than a new N20 junction.</p> <p>Option has no additional disadvantages to those already identified above for the Green Option.</p>	<p>No direct impact on any recorded cultural heritage sites. Avoids RMP constraints area for church and graveyard (CO007-120001 and CO007-120002). Also avoids Shinanagh Bridge.</p> <p>Potential for unrecorded archaeology to be encountered in greenfield areas.</p>

Primary Criteria	Secondary Criteria	XC 215 Route Option				
		Green - Orange	Green-Pink	Blue-Orange	Blue-Pink	Red
		Potential for unrecorded archaeology to be encountered in greenfield areas, particularly in the vicinity of the church and graveyard and holy well (CO007-121). Possible direct impact on Shinanagh Bridge. Possible slight negative impact on townland boundaries.	with potential for impacts on subsurface archaeology. Occupation site (CO007-119002) previously excavated in this area. Potential for unrecorded archaeology to be encountered in remaining greenfield areas.			
	Noise	Green option has potential operational impact unlikely to lead to significant effect. Potential construction noise impacts and potential operational impacts depending on expected traffic changes.	Green option has potential operational impact unlikely to lead to significant effect. Potential construction noise impacts and potential operational impacts depending on expected traffic changes. The pink option has potential operational impact unlikely to lead to significant effect.	No construction or operational impacts likely.	No construction or operational impacts likely. The pink option has potential operational impact unlikely to lead to significant effect.	Potential operational impact unlikely to lead to significant effect. Potential construction noise impacts Potential operational impacts depending on expected traffic changes.

A.6 Level Crossing XC 219 Buttevant

Primary Criteria	Secondary Criteria	XC 219 Route Option		
		Green	Red	Blue
Economy	Cost	This option is considered to be the cheapest option based on extent of road works, based on capital cost.	This option is considered to be the most expensive due to extra structural requirements compared to the other routes, based on capital cost.	This option is more expensive than the Green option but less expensive than the Red option in terms of capital cost, based on the extent of road works required,
	Land Take	This option is considered the most preferable based on the total area and number of land owners affected.	This option is considered preferable to the Blue option based on the total area and number of land owners affected.	This option is considered the least preferable based on the total area and number of land owners affected.
	Reliability / Journey Time	Shorter route length would reduce the journey time when compared to the other options.	Journey time would be greater than the Green option.	Due to route alignment, the journey time would be similar to the Red option.
Engineering	Geotech	Ground investigation and construction would be required in close proximity to disused station, which may cause disruption and also presents increased potential for made ground/contamination/surface obstructions. Crosses two watercourses.	Avoids issues relating to working close to disused station during ground investigation and construction. Alignment in proximity to residences to the northeast and northwest, ground investigation/construction may cause disruption. Alignment crosses overhead lines.	Reduces issues relating to working close to disused station during ground investigation and construction. Increased linear length impacting cost and land take.
	Structure	No preference with regards to bridges as implications are similar for all.	No preference with regards to bridges as implications are similar for all.	No preference with regards to bridges as implications are similar for all.
	Geometry	No significant differences between the options. The green option is seen as the most favourable option as it closer to the existing alignment.	No significant differences between the options.	No significant differences between the options.

Primary Criteria	Secondary Criteria	XC 219 Route Option		
		Green	Red	Blue
Environment	Ecology	<p>Most terrestrial habitat comprises low ecological value pasture fields.</p> <p>One crossing of watercourse tributary of the Blackwater River (Cork/Waterford) SAC.</p> <p>Moderate potential for impact to Blackwater River (Cork/Waterford) SAC.</p> <p>Loss of very high rare meadow habitat. May not be mitigatable.</p> <p>In close proximity to two buildings with high roosting potential for bats.</p> <p>Crosses marsh area with potential for aquatic plant species of conservation interest and may change hydrological regime.</p> <p>Otter recorded under existing bridge potential for disturbance and loss of supporting habitat.</p>	<p>Most terrestrial habitat comprises low ecological value pasture fields.</p> <p>Two crossings of watercourse tributaries of the Blackwater River (Cork/Waterford) SAC.</p> <p>Higher potential for impact to Blackwater River (Cork/Waterford) SAC given closer proximity to the watercourse.</p> <p>Loss of supporting habitat for aquatic species and otter.</p>	<p>Most terrestrial habitat comprises low ecological value pasture fields.</p> <p>Area less suitable for otter holting habitat.</p> <p>One crossing of watercourse tributary of the Blackwater River (Cork/Waterford) SAC.</p> <p>Lower potential for impact to Blackwater River (Cork/Waterford) SAC.</p> <p>In close proximity to one building with high roosting potential for bats.</p> <p>Loss of very high rare meadow habitat (area more scrub-like in comparison to Green Option). May not be mitigatable.</p> <p>In close proximity to two buildings with high roosting potential for bats.</p>
	Water/Flood Risk	<p>Potential to remove existing culverted river crossings associated with the existing R522 alignment (to partially offset new river crossing required, see cons).</p> <p>Potential to enhance existing ditch capacity and habitat diversity to west of main river at location of works.</p> <p>New embankment likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged).</p> <p>New river crossing required immediately to west of railway (may be partially offset by removal of existing river crossings).</p>	<p>Potential to enhance existing ditch capacity and habitat diversity to west of main river at location of works.</p> <p>New embankment likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged).</p> <p>New river crossing required immediately to west of railway.</p> <p>Potential requirement for Stage 3 FRA (including modelling required).</p> <p>Low potential increase in pluvial flood risk locally due to increased runoff.</p>	<p>Potential to enhance existing ditch capacity and habitat diversity to west of main river at location of works.</p> <p>New embankment likely to intrude on fluvial floodplain to the west of the railway (moderate/high impact envisaged).</p> <p>New river crossing required immediately to west of railway.</p> <p>Potential requirement for Stage 3 FRA (including modelling required).</p> <p>Moderate potential increase in pluvial flood risk locally due to increased runoff, particularly to east of railway (see PFRA).</p>

Primary Criteria	Secondary Criteria	XC 219 Route Option		
		Green	Red	Blue
		Potential requirement for Stage 3 FRA (including modelling required). Low potential increase in pluvial flood risk locally due to increased runoff.		
	Landscape	Smallest visual extent of development. Visual impacts at dwelling west of railway line – dwelling affords some degree of screening from hedgerow along the southern verge of R522. Visual impacts along R522 regional road	Minor interruption of hedgerows and mature tree lines Alignment makes use of existing agricultural entrances east of railway tracks – reducing amount of hedgerow vegetation to be removed. Visual impacts at dwelling west of railway line, however high degree of screening occurs to the rear of this dwelling. Visual impacts along R522 regional road	Good separation distances from majority of dwellings aside from dwelling on eastern side of railway which benefits from a high degree of mature screening in the surrounds of the dwelling. Largest visual extent of development Interrupts several hedgerows and mature tree lines. Visual impacts at dwelling west of railway line. Visual impacts along R522 regional road.
	Cultural Heritage	There are no apparent benefits to this option for cultural heritage. Potential direct impacts on historic buildings and features associated with Buttevant Station, including the railway store/warehouse (NIAH 20803040). Also, potential impact on Bregoge Bridge. Potential for unrecorded archaeology to be encountered in greenfield areas.	No direct impact on Buttevant Station or Bregoge Bridge. Potential for unrecorded archaeology to be encountered in greenfield areas.	Avoids Bregoge Bridge. Potential direct impacts on historic elements of Buttevant Station. Potential indirect impact on Protected Structure RPS No. 988 (farmhouse). Potential for unrecorded archaeology to be encountered in greenfield areas.
	Noise	Least preferred option for noise compared to the red and blue options	Second best option for operational noise. Potential construction noise impacts	Best option for operational noise as moves road traffic furthest from receptors.

Primary Criteria	Secondary Criteria	XC 219 Route Option		
		Green	Red	Blue
		but still moves traffic away from receptors compared to the existing road. Potential construction noise impacts.		Potential construction noise impacts

