

# A2 Ballykelly Bypass Stage 1 SAR Addendum



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A2 Ballykelly Bypass  
Stage 1 SAR Addendum

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## **Introduction**

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# 1 Introduction

## 1.1 Scheme Background

AECOM was commissioned by the Department for Regional Development (DRD) Roads Service to develop route options for a bypass around the village of Ballykelly.

The scheme is located on the A2 between Coleraine and Londonderry at Ballykelly and proposes a bypass road around the village. The A2 is part of the Northern Key Transport Corridor formed by the M2/A26/A37/A2 roads that links the Belfast Metropolitan Area to Antrim, Ballymena, Ballymoney, Coleraine, Limavady and Londonderry. The existing corridor is a mixture of motorway, dual and single carriageway.

Ballykelly is located 4km west of Limavady on the shores of Lough Foyle. It originated as a Plantation settlement and the development of a nearby Second World War airfield greatly enhanced the size and significance of the village. There has been considerable expansion throughout the post-war period, particularly since the 1990's, with a series of private residential developments west of the historic core along Clooney Road.

The village lies adjacent to the existing A2 which circumvents the north and east coast of Northern Ireland between Belfast and Londonderry and passes through other local and important commercial centres such as Limavady and Coleraine.

Ballykelly currently suffers from traffic congestion during peak hours, and the bisection of the village by the A2 causes severance within the village centre. In addition there are associated environmental impacts, including vehicular emissions, related to through traffic in excess of 15,000 vehicles per day within the village.

The removal of through traffic would help reduce the risk of accidents within Ballykelly and, depending on the extent of the bypass option to be selected, provide considerable benefits in journey time savings for A2 traffic between the commercial centres to the east and west, such as Londonderry and Coleraine.

## 1.2 Strategic Nature of Scheme

DRD has developed a 10 year Regional Transportation Strategy (RTS) for Northern Ireland. Northern Ireland's dispersed population is served by an extensive road network of almost 25,000km, of which some 1,200km are trunk roads – Key Strategic Transport Corridors and Link Corridors – linking the major towns. Within this strategic trunk road network, high capacity roads such as dual carriageways and motorways carry the heaviest traffic volumes. There are a number of "bottlenecks" on the road network where the capacity of a particular stretch of road is insufficient. Traffic congestion and delays occur during peak periods on weekdays and at other times throughout the week. The RTS, amongst other things, identified parts of the Key Strategic Transport Corridors and Link Corridors where improvements were required.

The Regional Strategic Transport Network Transport Plan 2015 (RSTN TP) includes a programme for the implementation of Strategic Road Improvements (SRI's) to remove bottlenecks on the key network where lack of capacity is causing serious congestion, and to improve the environment by providing bypasses to towns situated on the RSTN, thus relieving the effects of heavy through traffic.

Although not originally part of the RSTN TP, the A2 Ballykelly Bypass scheme is contained in the recently published Investment Delivery Plan (IDP) for Roads, which is part of Investment Strategy for Northern Ireland (ISNI) 2008, and is one of a number of schemes included in the Roads Service 10 Year Forward Planning Schedule.

The decision by the Ministry of Defence (MOD) to close Shackleton Barracks, which lies to the north of the village, and subsequently dispose of the land hastened the scheme assessment process, to allow DRD Roads Service to identify if any of the existing Barracks land would be required for the scheme prior to sale by MOD.

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### 1.3 Scheme Assessment

Scheme Assessment is undertaken in accordance with TD37/93 Scheme Assessment Reporting, contained in Volume 5, Section 1 of the Design Manual for Roads and Bridges (DMRB).

TD37/93 describes the objectives of the Stage 1 Scheme Assessment as follows:

*“Identify the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with broadly defined improvement strategies.”*

### 1.4 Stage 1 Scheme Assessment

A Stage 1 Scheme Assessment was undertaken, its purpose being to identify the Preferred Corridor for the scheme.

As part of the study, two broadly defined potential corridors were identified to assist in defining the preferred route corridor for a future bypass of Ballykelly. These wider corridors are as follows:

- Northern Corridor Options; and
- Southern Corridor Options.

In order to carry out a broad assessment of the environmental, engineering and traffic issues associated with the Northern and Southern Corridors, a number of distinct route options for each corridor were produced to determine the Preferred Corridor. Three-dimensional outline designs for the options being considered have been developed using a proprietary highway design software package.

Two carriageway standards were examined during the Stage 1 Assessment; wide single 2+1 (WS2+1) carriageway and dual (D2) carriageway. However the object of the Stage 1 Assessment was to identify the Preferred Corridor, and did not attempt to recommend an appropriate carriageway standard as it was at the time considered that the most appropriate carriageway standard would be chosen during Stage 2.

The routes considered during Stage 1 were not exhaustive but were prepared to allow a comparative assessment of the issues related to both corridors.

The assessment concluded with the publication of a Stage 1 Scheme Assessment Report in October 2008, and a subsequent Ministerial Announcement that the Southern Corridor would be taken forward to Stage 2 as the Preferred Corridor.

### 1.5 Purpose of this Report

This report has been prepared to re-examine the findings of the Stage 1 Scheme Assessment Report and to confirm or refute the conclusion that the Southern Corridor should be taken forward as the Preferred Corridor. The reasons for this are outlined briefly below.

As schemes progress through the various stages of the Scheme Assessment process, studies are undertaken in more depth as more information becomes available. At early stages of the process, available information is at its lowest level and therefore it is essential that some assumptions are made.

During the Stage 2 Assessment, further work was undertaken and information gathered to assist in the choice of Preferred Route. Towards the end of the Stage 2 process, DRD Roads Service informed AECOM that it considered that the additional information gathered and work undertaken should be used to re-analyse the findings of the Stage 1 Assessment to ensure that the conclusions of the Stage 1 Assessment were correct, and that any corrections required due to assumptions made during Stage 1 did not invalidate the conclusion.

## **Summary of the Stage 1 Scheme Assessment Report**

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## 2 Summary of the Stage 1 Scheme Assessment Report

### 2.1 Context

The preliminary assessment completed as part of this study took the form of three distinct assessments:

- Engineering Assessment;
- Traffic and Economic Assessment;
- Environmental Assessment.

The assessments were carried out independently. The findings of the assessments are summarised below.

### 2.2 Engineering Assessment

The Stage 1 Engineering Assessment noted the increased flood risk of routes within the Northern Corridor, due to the flatter topography, tidal influence and larger volumes of water found within the Northern Corridor.

It also noted that all routes within the Northern Corridor have a large earthworks imbalance, caused by the combination of the requirement of routes to be elevated above potential flood levels coupled with the flat, low-lying topography within the Corridor. Routes within the Northern Corridor would therefore require the import of large quantities of material to form the embankments as there is little potential for site-won material. Not only was this seen as being a major disbenefit in terms of the impact of large volumes of heavy earthworks-moving plant accessing and egressing the area, this imbalance had a significant effect on the cost of schemes within the Northern Corridor and this was reflected in the cost estimates produced during Stage 1.

### 2.3 Traffic and Economic Assessment

The traffic assessment concluded that there could be a considerable transfer of traffic onto the bypass, which in turn would generate significant benefits for business and consumer travellers as well as wider benefits for the residents of Ballykelly village. However it was demonstrated that this would be the case whether the Northern or Southern Corridors was selected as the Preferred Corridor. Therefore no corridor outperformed the other in traffic terms.

In economic terms, it was found that the Southern Corridor outperformed the Northern Corridor due to the higher construction costs associated with routes within the Northern Corridor. It was therefore concluded that the Southern Corridor was preferred.

### 2.4 Environmental Assessment

The Northern Corridor was preferred for Cultural Heritage; Land Use; Traffic, Noise and Vibration; and Pedestrians, Cyclists, Equestrians and Community Effects; whereas, the Southern Corridor was preferred for Ecology and Nature Conservation; Water Quality; Geology; and Policies and Plans. For many of the study headings, there is a return of 'no preference'. These study headings were: Air Quality; Disruption Due to Construction; Landscape Effects; and Vehicle Travellers.

Overall, the Stage 1 Environmental Assessment concluded that there was no preferred corridor. It did however note that there were some risks associated with the Northern Corridor; these were increased flood risk (both tidal and fluvial), potential non-compliance with Planning Policy Statement PPS 15 'Planning and Flood Risk' and possible impact on Whooper swan gathering grounds.

### 2.5 Recommendations

It was recommended that the Southern Corridor be taken forward to Stage 2 as the Preferred Corridor.

This recommendation was accepted by DRD Roads Service, and was confirmed by a Ministerial Announcement in February 2009.

## **Description of Routes**

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## 3 Description of Routes

### 3.1 Comparison of Routes

Assessment work has been undertaken during Stage 2 on a number of routes within the Southern Corridor. To allow a comparison to be made between the Northern and Southern Corridor, a comparable route within the Northern Corridor was prepared and assessed. This route was prepared to be as similar as possible with regard to length and tie-in points to the existing A2 to the Southern Route to ensure that a like-for-like assessment could be undertaken. A brief description of the routes is included in the sections below.

The alignments chosen for the purposes of the assessment are shown in Figure 1, at the rear of this report.

### 3.2 Southern Route Option

As the Stage 2 Assessment neared completion, one route combination began to emerge as the route likely to be taken forward and recommended as the Preferred Route. This was a combination of the Grey Route within the western section of the study area and the Orange Route within the eastern section. For the purposes of this report, this route shall be referred to as the Southern Route.

The individual route elements considered during the Stage 2 Assessment are covered in more detail in the Stage 2 Scheme Assessment report.

The Southern Route deviates from the existing A2 via a proposed at-grade roundabout, approximately 1.9km west of Ballykelly village centre. The route heads in a south-westerly direction through Ballykelly Forest and emerges on the eastern edge of the forest. It then heads east, crossing Loughermore Road, Plantation Road, Glenhead Road and Ballykelly River. A compact grade-separated junction would be provided at Loughermore Road. The route continues east until it begins to head north-east, crossing Tully Road north of the cricket ground, where it meets the existing A2 at the site of another proposed at-grade roundabout.

### 3.3 Northern Route Option

The route developed within the Northern Corridor has been designed to be as similar as possible to the Southern Route to allow a like-for-like comparative assessment.

The route within the Northern Corridor deviates from the existing A2 approximately 300m west of the position where the Southern Route deviates. It was not possible to produce an alignment within the Northern Corridor which tied into the existing A2 at exactly the same location as the Southern Route without it affecting the existing MOD housing stock; however such a small deviation does not devalue the comparative assessment.

The route passes through the section of Ballykelly Forest to the north of the existing A2, passing to the north of the existing MOD housing stock. It then heads eastwards, crossing Station Road and the adjacent Ballykelly River. To allow a direct comparison with the Southern Route and to provide a connection to the local road network, it has been assumed that a compact grade-separated junction would be provided at this location. The route continues eastwards before turning to the south to connect to the existing A2 at an at-grade roundabout at the same location as the Southern Route.

### 3.4 Design Standards

Both routes have been designed to comply with TD9/93 to all-purpose dual carriageway standards. The Design Speed of the road in accordance with TD9/93 is 120kph. Both routes have been designed to be Departure-free, and therefore both routes are of a similar standard.

## **Cost Estimates**

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## 4 Cost Estimates

### 4.1 Cost Estimate Assumption

The basic construction cost estimate for the scheme route options was developed using a combination of SPON'S Civil Engineering and Highway Works 2010 Price Book and experience gained on recently tendered projects.

The following is a summary of assumptions used in the estimate:

- Contractor's preliminaries assumed at 15% based on previous project cost comparisons,
- It has been assumed that the tie in roundabouts at each end of the scheme will be lit,
- Traffic signs and road markings assumed to be 1% based on previous project costs,
- Motorway Communications have not been included,
- Landscape and ecology assumed to be 1% based on previous project costs, except where specific mitigation measures have been identified as essential. These measures, where required, have been added to the cost of the individual routes.

### 4.2 Land Costs

Land costs for routes within the Southern Corridor were established through discussions with Land and Property Services (LPS), who provided the following rates:

- Agricultural land - £18,500/acre or £37,000/ha good quality;
- Agricultural land - £9,250/acre or £18,500/ha poor quality;
- Woodland - £9,250/acre or £18,500/ha.

The meeting held with LPS did not include consideration of land costs for any route within the Northern Corridor, as this was not required as part of the Stage 2 Assessment. However for the purposes of this report land costs for the Northern Route have been assumed to be identical to that identified for the Southern Route.

It is considered that this approach may underestimate the land cost associated with the Northern Route as it assumes Agricultural value for the land within the Barracks area. As the price paid to MOD for any land purchased would be at market value, there is the possibility that Commercial or Industrial rates would be applicable at the time of purchase, depending on the planned land use at that time.

It is important that the cost of the Northern Route is not perceived to be artificially inflated. As the future land use of the Barracks land cannot be determined at this time and in the interests of allowing a fair comparison between the options the land had been valued at a similar rate to the Southern Corridor.

### 4.3 Risk

A Risk and Value Engineering Workshop was undertaken on 12th August 2009. The minimum, most likely and maximum costs and probability of the residue risks identified at the workshop have been assessed and results input into the Highways Agency's Risk Management System (HARMS). HARMS then carries out a Monte Carlo risk assessment (a computational algorithm that relies on repeated random samplings to compute its result) of all the residue risks. The Risk Register has been updated since the Risk Workshop to reflect the additional risk reduction measures undertaken since the Workshop, and the HARMS analysis re-run to reflect this revised register.

It should be noted that the Risk and Value Engineering Workshop did not examine any routes within the Northern Corridor, as it focused on the proposed routes within the Southern Corridor and it was not envisaged at that time that a route within the Northern Corridor would be examined. For the purposes of this assessment, the value of Risk used in the cost estimate for the route within the Northern Corridor has been assumed to be equal to that of the Southern Route to the south. It is likely that the value of Risk for the Northern Corridor route would be higher than that of the Southern Route, as factors such as fluvial and tidal flood risk, risk associated with the potential non-maintenance of sea defences and MOD pumps and environmental factors such

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as effects on potential Whooper swan gathering grounds would all contribute to a high level of Risk. However without a full Risk and Value Engineering Workshop to identify and quantify those risks, it is considered appropriate that the Risk value be taken as identical to that of the Southern Route and that this is the best method of ensuring fair comparison between the routes.

#### 4.4 Preparation & Supervision

Preparation costs have been taken as 9% of construction and land cost. Supervision costs were taken as 5%. These percentages are in accordance with defaults assumed within the COBA software used to evaluate the economic benefits of the scheme.

#### 4.5 Optimism Bias

The purpose of Optimism Bias is described in HM Treasury "Green Book" dated 2003, and is used to counter the differences between the inherent unwitting optimism of the expected outcome and the actual outcome when considering cost estimates. The Optimism Bias calculation was found to be 20.3% for both construction and land using the recommendations from the "Supplementary Green Book Guidance". However the Highways Agency method of calculating Optimism Bias as described in "MP Director's Instruction 06/07" resulted in an Optimism Bias of 15.8%. The average of these values was taken; therefore the Optimism Bias used for the scheme was 18.0%. This topic is covered in more detail in the Stage 2 Scheme Assessment Report.

#### 4.6 Cost Estimates

Table 1 below shows the cost estimate for the two routes.

**Table 1: Cost Estimate Summary**

Routes	Roads (£m)	Structures (£m)	Risk (£m)	Land (£m)	Prep & Super (£m)	Opt Bias (£m)	Total (£m)
Southern Corridor	17.972	4.787	3.049	1.600	3.410	5.547	36.365
Northern Corridor	29.758	2.800	3.049	1.600	4.782	7.558	49.547

##### **Notes**

- 1) Price base date is Q3 2009.
- 2) Estimates do not include VAT.
- 3) Preparation costs are 9% and Supervision costs are 5% (COBA defaults).
- 4) Optimism Bias is 18%.

As expected, the cost of the structures on the Northern Route is significantly less than that on the Southern Route, with almost £2.0 million saved before the addition of Preparation & Supervision and Optimism Bias. Including these elements in the total results in a bottom line saving of approximately £2.5 million.

The reduced structures cost for the Northern Route is more than outweighed by the significantly larger costs associated with the Roadworks elements. The reasons behind this are discussed in more detail in the Engineering Assessment Chapter (Chapter 5), of this report, but it is wholly due to the lack of earthworks balance and the costly requirement to bring in huge quantities of imported material to form the necessary embankments. Bulk earthworks quantities provided following a volumetric analysis using the Bentley MX suite of software indicates a fill requirement in excess of 1.4 million cubic metres and an excavation requirement of only 30 thousand cubic metres. In comparison, a similar exercise carried out for the Southern Route revealed a bulk import requirement of around 250 thousand cubic metres of material.

# **Engineering Assessment**

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## 5 Engineering Assessment

### 5.1 Comparative Assessment

This section has been prepared to identify the engineering aspects that would influence the route choice.

### 5.2 Junctions and Side Roads

Access onto both routes would be severely restricted due to the standard of dual carriageway proposed, with access to existing properties and land holdings being via the existing side road network. Due to the length of both the Northern and Southern Routes, a central junction was included to allow U-turn manoeuvres and access to the local road network, as a length of bypass without such a facility would be out of keeping with the remainder of the existing A2.

It was concluded following traffic modelling work undertaken during the Stage 2 Assessment that the most appropriate location for this junction on the Southern Route was at Loughermore Road. No such traffic modelling was undertaken for the Northern Route; however Station Road would appear to be the most suitable location.

In both circumstances, it is envisaged that the main routes for traffic in and out of Ballykelly would be via the at-grade roundabouts at either end of the village. Both Station Road and Loughermore Road would disbenefit from a large increase in traffic volumes, and the existing A2 between the proposed roundabouts and the village would be more than able to cater for the expected traffic volumes, given that they currently cater for much higher volumes.

As both routes have similar connectivity to the local road network, it is considered that this is not a determining factor in route choice.

### 5.3 Land Use

Land use at the western end of both potential routes is similar, in that they both traverse a section of Ballykelly Forest. Therefore this is not a determining factor in route choice.

Further eastwards, however, the land use patterns differ. The Southern Route passes through farmland, much if not all of which would be classed as good quality. This potential loss of farmland would have a detrimental effect on many of the holdings to the south of the village, and although the Southern Route does result in loss of farmland, one of the reasons for its choice as Preferred Route was that it resulted in the loss of a substantially lower quantity of farmland than most other routes examined during Stage 2. This fact however, is indeed one of the disadvantages of a route within the Southern Corridor.

The effect on land use on the Northern Route is difficult to assess in the long term. Since the closure of Shackleton Barracks in 2008, the land has remained largely unused, with the exception of a one-off motorcycle rally on the site of the airfield. In that respect, the majority of land required to construct the Northern Route is currently unused and consequently would not be heavily affected. It is impossible to predict what the long-term use of the land would be. There has in the past been consideration given to development for the purposes of housing, waste management facilities and the use of the airfield as a commercial maintenance facility, but there appears to be no firm commitment given to any of these options or in fact any other use. There has been no indication to date from MOD that the land will be disposed of any time soon, however it should be noted that any discussions could be commercially sensitive and therefore may not yet be in the public domain.

Therefore, in the absence of information regarding future land use within the Northern Corridor, it is considered that there would be a benefit in routing the bypass within the Northern Corridor due to loss of a smaller quantity of farmland than within the Southern Corridor.

### 5.4 Hydrology & Drainage

There are significant differences in drainage and flooding aspects between potential northern and southern routes. This was considered to be an important issue during the Stage 1 Assessment and has been discussed in detail in the previously published

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Stage 1 Scheme Assessment Report. It was concluded that there was a significantly higher flood risk associated with routes within the Northern Corridor than with routes within the Southern Corridor. No further information has come to light during the Stage 2 Assessment that changes that conclusion.

The concerns regarding the potential for both tidal and fluvial (river) flooding associated with any route within the Northern Corridor (not only the route considered within this report for the purposes of the comparative assessment), has had a significant knock-on effect on the Northern Route in that it contributes to the large earthworks imbalance associated with the Northern Route. This is covered in more detail in the sections below.

The Stage 1 conclusion that there would be a disbenefit from a hydrology and drainage perspective of constructing the Northern Route as a pose to the Southern Route remains valid.

### **5.5 Topography and Effects on Alignments**

The topography within the Southern Corridor is of an upland agricultural landscape. The land undulates along the line of the route, and there are a number of areas of cut required, mainly at both the eastern and western ends. The material excavated from these areas provides a large percentage of the fill material required to construct the embankments, and hence the alignment achieves a reasonable cut/fill balance.

The land within the Northern Corridor, on the other hand, is largely flat and low-lying alluvial terrain. As the potential for both fluvial and tidal flooding are high within this area, the alignment must be elevated above the existing ground to protect against potential flooding problems. This results in an alignment which is on embankment for almost the whole of its length and a considerable earthworks imbalance between fill requirements and available cut material.

### **5.6 Construction**

The most problematic issue from a construction viewpoint relates to the importation of a very large quantity of fill material required to construct the Northern Route. As stated in Chapter 4 of this report, the earthworks imbalance for this route is in the order of 1.4 million cubic metres, which adds significantly to the cost of the scheme. In addition to the high cost of this activity, sourcing such a large quantity of material from the local area would prove problematic and it is likely that much of the material would have to be brought in from a considerable distance for the site. This will result in impacts on the environment of settlements along the A2 and the associated earthworks vehicle movements will put additional pressure on the road infrastructure.

Furthermore, it must be noted that earthworks is a seasonal activity and can generally only be undertaken efficiently during the late spring, summer and early autumn periods. Transporting, depositing and compacting such huge amounts of material during the relatively short earthmoving period would effectively render this route impractical from a construction viewpoint by increasing the construction period.

In comparison, the imbalance of approximately 250 thousand cubic metres of material for the Southern Route is significantly less problematic in term of sourcing material and construction time.

### **5.7 Conclusion**

Although it is considered that the Northern Corridor would likely provide a benefit in terms of land use, engineering considerations associated with flooding and resulting earthworks imbalance result in the conclusion that the recommendation of the Stage 1 Scheme Assessment that the Southern Corridor be taken forward as the Preferred Corridor is unaltered.

## **Environmental Assessment**

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## 6 Environmental Assessment

### 6.1 Introduction

AECOM completed a Stage 1 Environmental Assessment Report (EAR) for the proposed A2 Ballykelly Bypass in July 2008. The Stage 1 environmental assessment was completed in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment Stage 1 reporting guidelines.

The purpose of the Stage 1 environmental assessment was to assist with the identification of a corridor (Northern or Southern) where the construction of the road improvement is least environmentally damaging. Following assessment of twelve environmental categories, the outcome of the Stage 1 EAR concluded that there was no preferred corridor for the Ballykelly Bypass and that there was no indication of significant impacts which could not be adequately mitigated for any of the environmental aspect considered at Stage 1. It was also noted that there were various impacts associated with both the northern and southern corridors.

The purpose of this addendum to the Stage 1 SAR is to revisit the conclusions to the Stage 1 EAR and look at the constraints associated with an 'example' Northern Corridor Route Option.

It must be noted that much of the Environmental work undertaken to produce the Stage 2 Assessment of the Southern Corridor has not been replicated on the route within the Northern Corridor, and this section has been undertaken as a desk study only. This is mainly due to seasonal constraints, which did not allow the range of surveys undertaken within the Southern Corridor to be duplicated within the Northern Corridor.

### 6.2 Summary of Stage 1 EAR Conclusions

The Stage 1 environmental assessment included twelve environmental categories. For each category, a preference for either the Northern or Southern Corridor was given, if possible. In the case of Air Quality, Disruption Due to Construction, Landscape Effects and Vehicle Travellers however, it was concluded that there was no preferred option. These categories are discussed below followed by those categories where a preference for the northern category was stipulated and subsequently those where the southern category was preferred.

#### 6.2.1 Air Quality

The Stage 1 EAR concluded that for Air Quality, beneficial impacts are expected for receptors along the existing route, as a result of a reduction in road traffic on the existing route. Likewise, detrimental impacts are expected at residential receptors near to any proposed new route. This was the case for both corridor options.

It was concluded that there was no preferred option. Although the Stage 1 preferred corridor bypass to the south of Ballykelly meant that potential negative impacts to the Lough Foyle Special Protection Area (SPA), Area of Special Scientific Interest (ASSI) and Ramsar site can be avoided.

#### 6.2.2 Disruption Due to Construction

The Stage 1 EAR concluded that overall there was no preferred option for Disruption Due to Construction.

It was noted in the Stage 1 EAR that the greater range of significant features present that may be adversely affected by construction activities to the north of the existing A2 would require a detailed impact assessment should the Northern Corridor proceed to Stage 2. These included areas used by the designation features (fields used by whooper swan) of the Lough Foyle SPA. A bypass located to the south of Ballykelly would reduce potential negative impacts to the swans by increasing the distance between the proposal and the areas the swans have used in the past.

#### 6.2.3 Landscape Effects

The Stage 1 EAR concluded that there was no preferred option for Landscape Effects. There were some differences between the corridor options, such as greater landtake and the requirement to cross Ballykelly Glen Local Landscape Policy Area (LLPA) for the Southern Corridor option and the need for avoidance of more landscape features for the Northern Corridor. However, both corridor options were considered capable of accommodating a bypass.

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The Stage 1 SAR decision to locate the bypass to the south of the Village will avoid a potential adverse impact to Walworth Bawn LLPA. Furthermore, it will avoid the difficulties associated with providing mitigation for any adverse effects in the low lying elevations to the north.

#### 6.2.4 Vehicle Travellers

For Vehicle Travellers, there was no preferred option at Stage 1. Both corridor options are expected to open up views and to reduce driver stress.

#### 6.2.5 Cultural Heritage

The Stage 1 EAR concluded that the Northern Corridor was preferred in terms of Cultural Heritage, despite the presence of more recorded sites in the Northern corridor (including two Scheduled Monuments). The main reason for this decision is that there is more potential for previously unrecorded archaeological sites to be discovered in the southern study area due to the nature of the landscape.

The Stage 1 SAR decision to locate the bypass to the south of Ballykelly means that potential impacts to the Scheduled Monuments and other recorded sites to the north can be avoided or reduced.

#### 6.2.6 Land Use

Both the Northern and Southern Corridors have the potential to impact upon Ballykelly Forest and LLPA's. Within the Northern Corridor Walworth Bawn LLPA could be directly or indirectly impacted and within the Southern Corridor Ballykelly Glen LLPA will be directly impacted. The distinguishing feature is the greater loss of Best Most Versatile (BMV) land associated with the Southern Corridor which led to the preference in terms of Land Use within the Stage 1 EAR for a route to the North.

#### 6.2.7 Traffic Noise and Vibration

For Traffic Noise and Vibration, the Northern Corridor was preferred at Stage 1. This decision was based on the premise that construction of the bypass to the north is likely to result in a more significant reduction in population affected by road traffic noise than for the Southern Corridor (as Ballykelly is more densely populated south of the A2 carriageway).

However, it should be noted that given the distance separating the bypass alignment from the residential dwellings, it is highly unlikely that traffic flow in either corridor would be high enough to generate compensation claims under the Noise Insulation Regulations (amended 1988).

#### 6.2.8 Pedestrians, Cyclists, Equestrians and Community Effects

The Northern Corridor was preferred at Stage 1 for this environmental category. Either option was expected to reduce traffic within the Village, resulting in better air quality and improvement of pedestrian safety. However, the Northern Corridor was preferred because there are a number of community facilities, and possible undesignated cycle ways and bridleways located south of the Southern Corridor study area that may be affected by severance.

#### 6.2.9 Ecology and Nature Conservation

The Stage 1 EAR concluded that the Southern Corridor was preferred in terms of Ecology and Nature Conservation. Although both corridor study areas contain areas of potential nature conservation interest, it was recommended that the Northern Corridor be avoided due to the potential negative impacts to the Lough Foyle SPA (a protected site under the EU Birds Directive).

It was noted in the Stage 1 EAR that this area is clearly a very important staging area for swans moving into Ireland and Britain from Iceland. Although the Northern Corridor is outside the SPA, birds from the SPA use the fields to the south of the railway line as feeding grounds. As there is no guarantee that in the future any particular configuration of fields will provide suitable feeding grounds for swans (due to such factors as changes in agricultural policy, movements of world commodity prices, and changes of land ownership), the precautionary principle suggests that the greatest area of potentially suitable ground should be left undeveloped, to allow this highly mobile species to find adequate feeding opportunities upon arrival at this traditional stopover site. Sterilising a swathe of land with a new road therefore has the potential to adversely affect this key designation feature of the SPA. As a result, it was concluded that this area should be left undeveloped given that an alternative corridor was possible.

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#### 6.2.10 Water Quality

The Southern Corridor was preferred in terms of Water Quality at Stage 1. Although there are potential surface water impacts for both corridors, the Northern Corridor contains greater known areas of potentially contaminated land uses and more sensitive aquifers. Furthermore, the risk of impacts arising from flooding is higher for the Northern Corridor than for the Southern Corridor. The Q100 flood plain extends throughout the Northern Corridor, such that there is no option for a bypass within this corridor that avoids the floodplain.

#### 6.2.11 Geology

The Southern Corridor was preferred at Stage 1 for Geology. Both corridor options have the potential to cause slight adverse effects, with the main effect being the loss of soil of agricultural value. There is a higher proportion of high quality agricultural land within the Southern Corridor.

The main issue with the Northern Corridor is the potential to disrupt the setting and integrity of an important raised beach sequence and therefore the geomorphology of the area. Overall, the Southern Corridor was preferred due to lesser impacts on the local geomorphology.

#### 6.2.12 Policies and Plans

The Northern Corridor was preferred for Policies and Plans at Stage 1 as it is more compliant. There were three more non-compliances for the Northern corridor compared to the Southern Corridor. Two of these were at the Regional level and one at the Local level.

Locating the bypass to the south of Ballykelly avoids the greater potential for impacts to the Fruitfield Delta Area of Constraint on Mineral Development (Policy MIN 3 Areas of Constraint, A Planning Strategy for Rural Northern Ireland) and Site of Local Conservation Interest (Policy ENV 3 Sites of Local Conservation Interest, Draft Northern Area Local Plan). It would also avoid non-compliance of PPS15 Planning and Flood Risk, which discourages development in floodplains. Both corridors have the potential to impact on Local Landscape Policy Areas (Draft Northern Area Local Plan), although the impact of the northern corridor could be avoided.

#### 6.2.13 Summary

In summary, there are two key impacts associated with the Northern Corridor. These are the greater flood risk potential and the potential impacts to the neighbouring Lough Foyle SPA/ASSI/Ramsar site.

### 6.3 Desktop Scoping of the Northern Corridor Route Option

The remainder of this Chapter looks at the 'example' Northern Corridor Route Option (the Northern Route Option) assessed as part of this Stage 1 Addendum, as shown in Figure 1. It should be noted that AECOM has not undertaken a Stage 2 environmental assessment of the Northern Route Option. This Route Option is being used as an example for the purposes of this addendum, to give an indication of what potential environmental impacts may arise as a result of this "example" northern option.

Below is a summary of potential environmental impacts associated with the Northern Route Option:

#### Air Quality

- Negative impacts to Lough Foyle SPA/ASSI/Ramsar site and Fruitfield Delta SLNCL.

#### Cultural Heritage

- Visual impacts on the setting of four listed buildings: Aircraft hangar at Shackleton Barracks, Tamlaught Finlagan Rectory (the Old Rectory), a 17<sup>th</sup> century Bawn and Church Hill House.

#### Disruption Due to Construction

- Potential for negative impacts through disruption of populations of bird species that are designation features of the Lough Foyle SPA.

#### Ecology and Nature Conservation

- Potential negative impacts to fields used by whooper swan (designation features of the Lough Foyle SPA) as feeding grounds.

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- Direct impacts to Fruitfield Delta SLNCl.
- Direct negative impacts to Ballykelly Forest, which is designated as a Planted Ancient Woodland Site (PAWS) and provides habitat for protected species such as badgers and bats.
- Direct negative impacts to an area of private forest, which may contain priority species (breeding birds and badgers).
- Potential impacts to parkland and treelines at the Old Rectory.
- Potential impacts to hedgerows and hedgerow trees.
- Crossing of the Ballykelly River, which is designated under the EC Freshwater Fish Directive (78/659/EEC) as Salmonid.
- Potential negative impacts to protected mammals such as badger, bats and otter.

#### Landscape Effects

- Direct negative impacts to Ballykelly Forest.
- Impacts to high quality views of the Old Rectory (Grade B2 listed).
- Impact of embankment on landscape and views likely to be significant
- Difficulties associated with providing mitigation for any adverse landscape effects in the low lying elevations to the north.

#### Land Use

- Impact to land used by the community at Ballykelly Forest.
- Impact to Greenbelt land.

#### Traffic Noise and Vibration

- Less opportunity for reduction of noise and vibration impacts through topographical screening effects, due to low lying elevations to the north.

#### Pedestrians, Cyclists, Equestrians and Community Effects

- Impacts to Ballykelly Forest northern area, which is popular with walkers, dog walkers and runners.

#### Vehicle Travellers

- No impacts determined at Stage 1 that are unique to the Northern Route Option.

#### Water Quality

- Four watercourse crossings; rivers are wider north of Ballykelly and therefore crossings could be more complex and dangerous.
- Greater exposure of Lough Foyle SPA/ASSI/Ramsar site to pollution incidents; as crossings are further downstream.
- Higher risk of flooding.
- Risk of contamination of superficial aquifer located to the north of Ballykelly.

#### Geology

- Potential to disrupt the geomorphology of the area, including the setting and integrity of an important raised beach sequence.
- Direct impacts to the Fruitfield Delta ESCR (Earth Science Conservation Review) site.
- Loss of soil of agricultural value.

#### Policies and Plans

- Non-compliance with PPS15 Planning and Flood Risk (Regional).
- Non-compliance with Policy MIN 3 Areas of Constraint, A Planning Strategy for Rural Northern Ireland (Regional).
- Non-compliance with Northern Ireland Biodiversity Strategy (2000)
- Non-compliance with Policy ENV 1 Biodiversity.
- Non-compliance with Policy ENV 3 Sites of Local Conservation Interest (Local).
- Non-compliance with Policy ENV 4 Trees of the draft Northern Area Plan 2016.

#### 6.3.1 Summary

There are a number of potential negative impacts associated with the Northern Route Option. The main impacts are greater risk of flooding and potential impacts to the neighbouring Lough Foyle SPA/ASSI/Ramsar site. Other key impacts include impacts to Ballykelly Forest, the grounds/setting of the Old Rectory and to Fruitfield Delta SLNCl, Area of Constraint on Mineral Development and ESCR site.

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#### **6.4 Overall Conclusions**

The Stage 1 EAR concluded that there were impacts associated with both the Northern and Southern Corridors, but that these may be addressed by design or mitigation. This conclusion remains valid.

An example Northern Corridor route was considered in this Addendum. Studies have not revealed any findings to refute the conclusions drawn from previous reviews. Therefore the outcome of this assessment reinforced the issues associated with the Northern Corridor identified in the Stage 1 EAR.

The Northern Corridor generally would result in a number of environmental impacts. Key among these would be the potential impact to the Whooper Swan breeding areas and the impact to the flood plain. These issues, while potentially mitigateable, are of concern and should be avoided if possible. Whooper Swans are protected under EC Directive 79/409/EEC (on the Conservation of Wild Birds) and the precautionary principle would dictate that if there is an option to avoid these impacts, this should be done. Similarly the Q100 flood plain extends throughout the Northern Corridor, such that there is no option for a bypass within this corridor that avoids the floodplain. A road in the flood plain, while technically achievable, would result in impacts to water quality. Any new road in this corridor would also be at risk of flooding, given the uncertainty about flood levels and climate change. Thus as an option exists to avoid these impacts, this option should be pursued.

## **Traffic and Economic Assessment**

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## 7 Traffic and Economic Assessment

### 7.1 Introduction

This section summarises the traffic operational performance of the two bypass options considered in this report, together with an estimate of accident and economic benefits in accordance with DMRB Volume 13. The topics covered in this Chapter are covered in more detail in Chapter 7 of the Stage 2 Scheme Assessment Report, however the basis of the economic assessment and subsequent results of the comparison of the Northern and Southern Routes are discussed in this chapter.

### 7.2 Summary of Stage 1 Traffic & Economic Conclusions

The Stage 1 Scheme Assessment Report concluded that routes within the Southern Corridor outperformed routes within the Northern Corridor in terms of economic efficiency. This was one of the primary reasons for the Southern Corridor being taken forward as the Preferred Corridor.

### 7.3 Basis of the Assessment

For the purposes of the assessment, it has been assumed that Opening Year for the scheme is 2018. This date has been chosen as it is currently anticipated that the Ballykelly Bypass scheme will be implemented towards the end of the current ten year ISNI period to 2017/18 as described in the IDP.

### 7.4 Baseline Conditions

This topic is covered in detail in the Stage 2 Scheme Assessment Report; however an overview is included below.

#### 7.4.1 Traffic Flows

On the basis of the surveys undertaken, the equivalent annual average 2008 24-hour, 7-day (i.e. weekday) daily flows (AADT's) on the A2 are:

- A2 west of Ballykelly, between Carnamuff Rd and Glasvey Drive junctions: 13,845 vehicles
- A2 east of Ballykelly, just east of Tully Rd junction: 14,972 vehicles.

It should be noted that these flows were recorded in November 2008, after the closure of the army base. The equivalent figures recorded in February 2008 prior to the closure were 14,838 vehicles west of the village and 19,109 east of the village. The assessment undertaken for this report, as is the case for the Stage 2 Scheme Assessment, uses the most up-to-date figures available, i.e. post-Barracks closure.

#### 7.4.2 Journey Times

Table 2 shows a summary of the observed journey time information recorded in 2008, with total eastbound times shown between the James O'Hara Car Dealership on the west and Farlow Road on the east (vice versa for westbound).

**Table 2: Summary of Journey Times (2008)**

Peak	Journey Time	Eastbound	Westbound
AM	Minimum	05:23	05:02
	Average	05:58	05:53
	Maximum	07:04	07:12
OFF	Minimum	05:17	04:58
	Average	05:57	06:28
	Maximum	06:32	10:42

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Peak	Journey Time	Eastbound	Westbound
PM	Minimum	05:50	05:21
	Average	06:26	06:07
	Maximum	07:40	07:15

#### 7.4.3 Collision Information

Police records detailing personal injury collisions at junctions and links were examined for the five-year period 2004-2008. Analysis of the junction collisions reveals a total of 23 occurrences; consisting of 17 slight and 6 serious collisions recorded at the fourteen junctions. Analysis of the links between junctions reveals a total of 49 collisions; 36 slight, 11 serious and 2 fatal collisions. The greatest number of collisions on links occurred on the A2 between Tully Road and Spallan Road east of the village (7 incidents), four of which were serious collisions, two being slight and one that was fatal. The other fatal collision also occurred east of the village, between Spallan Road and Brighter Road, and there were also an additional three slight collisions at this location.

The accident rate on the A2 itself (i.e. not including the accidents on the side road links) can be divided into three sections; the national speed limit section west of the village, the 30mph limited section through the village and the national speed limit section east of the village.

To the west, the calculated accident rate over the period 2004-2008 is 0.179 personal injury accidents per million vehicle kilometres (pia/mvkm) on the links and at the junctions within this section of the A2. As this section of the A2 is of 'Wide Single Carriageway' (WS2) standard, the calculated rate is therefore higher than the national average (DMRB Vol. 13 Part 2 rate is 0.171 pia/mvkm for this type/speed of road).

Within the village itself, the calculated accident rate is again much higher than the national average over the same five-year period, with a rate of 1.211 pia/mvkm calculated compared to the equivalent DMRB figure of 0.844 pia/mvkm for this type/ speed of road (i.e. Single Carriageway or 'S2').

To the east, the calculated accident rate is lower than the national average, with a calculated rate of 0.243 pia/mvkm compared to the DMRB figure of 0.381 pia/mvkm for this type/speed of road (again 'S2' carriageway).

Therefore, on two of the three sections of the A2 the accident rate is higher than the national average. There is also a low perceived safety for pedestrians and other road users in the village area.

#### 7.5 Traffic Assessment

This topic is covered in more detail in the Stage 2 Scheme Assessment Report.

The approach for this project involved the assimilation of current traffic volumes and turning movements by way of traffic surveys. The results of the surveys were used to develop a spreadsheet model for the study area. AM and PM Peak hour base models were developed using 2008 traffic flow data obtained from the surveys.

Forecast year models were developed for 2018 and 2033, in line with the predicted year of opening of the bypass and design year for the scheme. In terms of 24hr 7 day Annual Average Daily Traffic (AADT) flows, the calibrated 2008 peak hour flows were growthed using derived conversion factors from the ATC surveys. It was established that the use of a blanket factor may result in AADT flows that were either too low or too high at certain locations, therefore to ensure robust AADT flows were produced, conversion factors were then established for each direction at each ATC location.

To establish the traffic assignment for each by-pass route, journey time surveys were carried out in June 2009 during off peak periods i.e. 10:00-12:00, as these would likely simulate peak hour traffic volumes through the village when the bypass is in

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operation through the general reduction in traffic. These journey times were then compared to the estimated journey times of the proposed by-pass routes.

The predicted AADT on the existing A2 in 2018 is 19,535 to the west of Ballykelly and 18,483 to the east, of which 11,786 has been assigned to the by-pass based on origin-destination survey information and the re-assignment of all through traffic onto the by-pass.

The Northern and Southern Routes examined for the purposes of this report are of similar length therefore it has been assumed that each route will attract similar levels of traffic, and therefore the projected flows on both routes have been taken to be equal. Projected Do-Minimum and Do Something (Bypass) flows at year of opening are shown in Table 3 below.

**Table 3: Flows for Respective Routes**

Route Option	Bypass Flow (2018 7 Day 24hr AADT)	Two-Way Flow At Centre Of Ballykelly Village (2018 7 Day 24hr AADT)
Do Minimum	0	22,043
Northern Route	11,786	10,257
Southern Route	11,786	10,257

## 7.6 COBA Analysis

The COBA (COst Benefit Analysis) program compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and accidents), and expresses the results in terms of a monetary valuation. The COBA Version 11 Revision 7 was used for the assessment. The essence of COBA is that the travel cost for each component (link and junction) of the network is calculated separately according to the flows and turning movements assigned to it. The individual link and junction costs that are time, vehicle operating costs and accidents are summarised to yield the total costs over the network.

The Net Present Value (NPV) of any scheme can be calculated by subtracting the Present Value of Costs (PVC) from the Present Value of Benefits (PVB). This figure is expressed as a 2002 price discounted from the current year to 2002. A positive NPV indicates that the benefit of the proposed scheme outweighs the costs indicating that a scheme is potentially economically viable. The assessment period was 2018 to 2077. 2018 is assumed to be the year of opening, while 2077 is assumed to be the final assessment year. These assumptions result in a 60-year assessment period, in accordance with current Government guidance (TAG).

## 7.7 COBA Results

A summary of the Present Value of Benefits and Costs (PVB and PVC), Net Present Values (NPV) and Benefit to Cost Ratios (BCR) for each of the routes are given in Table 4 overleaf.

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**Table 4: COBA results**

<b>TEE Benefits</b>	<b>Northern Route</b>	<b>Southern Route</b>
<b>(D) Consumer User Benefits</b>	46.899	45,485
<b>(E) Business Benefits</b>	59.388	57,650
<b>(F) Private Sector Provider Benefits</b>	65	62
<b>(G) Accident Benefits</b>	1.325	671
<b>(H) Emission Benefits</b>	-214	-189
<b>Present Value of Benefits (D+E+F+G+H = PVB)</b>	107.462	103,680
<b>Present Value of Costs (PVC)</b>	33.856	24,796
<b>Net Present Value (NPV)</b>	73.606	78,883
<b>Benefit to Cost Ratio (BCR)</b>	<b>3.174</b>	<b>4.181</b>

It can be seen from the above table that the PVB for the two routes are similar however the PVC of the Northern Route is significantly higher than that for the Southern Route. This results in the Northern Route having a lower BCR than the Southern Route. The Southern Route therefore represents the best value for money, and hence the Southern Corridor results in better value for money than the Northern Corridor.

### 7.8 Affordability

Although the Affordability of a scheme does not strictly form part of the Economic Assessment process, it must be noted that there is only a finite sum of money available from the Public purse to construct infrastructure projects of this nature and Affordability must therefore be considered.

Although the Ballykelly Bypass scheme was not included in the RSTN TP, it was included in the Expanding the Strategic Road Improvement Programme 2015 (ESRIP) consultation document at a cost of £30 million, and was subsequently included in the IDP although no budget cost was indicated.

The cost estimates for the scheme were included in Table 1, Chapter 4, and whereas the cost estimate of £36.4 million for the Southern Corridor is higher than the £30 million indicated in ESRIP, it is considerably closer to the budget figure than the cost estimate for the Northern Route, which at £49.6 million is almost £20 million in excess of the ESRIP budget. Such a large discrepancy must call into question the Affordability of the Northern Route, albeit that it still provides acceptable levels of Economic benefit.

It should however be noted that at the time of the publication of ESRIP the scheme was indicated as a wide single 2+1 (WS2+1) carriageway standard whereas it has subsequently been deemed that dual carriageway standard is appropriate.

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## **7.9 Conclusion**

It is clear that the Southern Route provides a clear benefit over the Northern Route in terms of Economic return, and has the additional benefit of being more affordable.

It is therefore concluded that the results of the Stage 2 SAR Traffic and Economic assessment remain valid, and confirms that the Southern Corridor should be the Preferred Corridor.

## **Conclusions**

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## 8 Conclusions

### 8.1 Summary

This section summarises the findings of the report.

### 8.2 Engineering Assessment

The engineering problems associated with flooding of any route within the Northern Corridor, most notably the inherent lack of earthworks balance and the subsequent requirement to import large quantities of material, result in the conclusion that the choice of the Southern Corridor as the Preferred Corridor is the correct one.

### 8.3 Environmental Assessment

The Stage 1 Environmental Assessment concluded that there was 'no preference' between the Northern and Southern Corridors. Whereas routes within the Southern Corridor have subsequently been subjected to a full Stage 2 level Environmental Assessment and the Northern Route described in this report has not, no evidence has come to light since the publication of the Stage 1 Environmental Assessment that would result in any significant alteration to those conclusions.

In addition, there remain a number of outstanding risks with the Northern Corridor in relation to flooding/water quality issues and impact upon potential Whooper Swan gathering grounds which could possibly prove to be highly detrimental, and thus the Environmental Assessment concludes that if a suitable option exists that avoids these potential issues then that option should be pursued. Such an option does exist, this option being to route the bypass within the Southern Corridor.

### 8.4 Traffic & Economic Assessment

From a Traffic perspective, the routes perform almost identically. Both connect to the existing A2 at similar locations by the proviso of at-grade roundabouts, and both have a compact grade-separated junction at their approximate mid-point to provide access to the local road network.

From an Economics perspective, the Southern Route outperforms the Northern Route. It should be noted that this is simply a result of the Southern Route being cheaper than the Northern. The Northern Route results in similar benefits to the Southern Route but at a considerably inflated cost, it is not due to any inherent economic benefit associated with the Southern Corridor. Notwithstanding that fact, this is a considerable benefit of the Southern Route and was the main reason for the choice of Southern Corridor as the Preferred Corridor at Stage 1. This conclusion remains valid.

In addition, Affordability is a factor when it comes to the construction of infrastructure projects. Although the Northern Route is still shown to provide healthy economic benefits, there is a finite amount of money available to construct projects of this nature and therefore as the Southern Route is cheaper it is considered the most beneficial option.

### 8.5 Conclusion

No information has come to light during the Stage 2 Scheme Assessment which invalidates the major assumptions made during Stage 1.

Following a review of the comparative assessments undertaken between the Southern Route and the Northern Route produced for the purposes of this report, it is considered that the conclusions of the Stage 1 Assessments (i.e. the Engineering, Environmental and the Traffic & Economic Assessments) remain unchanged.

It is therefore concluded that the outcome of the Stage 1 Scheme Assessment that the Southern Corridor be recommended as the Preferred Corridor remains valid.

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## Figure 1