



A12 Suffolk's Energy Gateway

Suffolk County Council

A12 Suffolk's Energy Gateway - Economic Case

B3553C02-JAC-XXX-00-REP-TR-0006 | P00

December 2017



A12 Suffolk's Energy Gateway

Project No: B3553C02
 Document Title: A12 Suffolk's Energy Gateway - Economic Case
 Document No.: B3553C02-JAC-XXX-00-REP-TR-0006
 Revision: P00
 Date: December 2017
 Client Name: Suffolk County Council
 Client No:
 Project Manager: Julia Johnson
 Author: Jonathan Whittaker
 File Name: I:\UNIF\Projects\B3553C02
 A12_Suffolk_Energy_Gateway\N_Delivery\1_Draft_Response\Suffolk Economic
 Case.docx

Jacobs U.K. Limited

New City Court
 20 St Thomas Street
 London SE1 9RS
 United Kingdom
 T +44 (0)20 7939 6100
 F +44 (0)20 7939 6103
 www.jacobs.com

© Copyright 2017 Jacobs U.K. Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This document has been prepared on behalf of, and for the exclusive use of Jacobs' client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this document by any third party.

Document history and status

Revision	Date	Description	By	Review	Approved
P00	21/12/17	Final	JW	AF / GD	CMcG

Contents

1.	The Economic Case	4
1.1	Suffolk’s Energy Gateway	4
1.2	Purpose of the Economic Case	5
1.3	Limitation Note	5
2.	Methodology	6
2.1	Overview	6
2.2	Assessment of Monetised Impacts and Costs (AMCB)	7
2.3	Wider economic impacts	8
2.4	Assessment of Non-Monetised Impacts	9
2.5	Assessment tools	10
2.6	Options assessed	10
2.7	Central Case, Uncertainty / Sensitivity Tests and an Alternative Scenario	11
3.	Assumptions	15
4.	Scheme Cost for Economic Assessment	20
5.	Assessment of Monetised Benefits	24
5.2	AMCB Summary	30
6.	Assessment of Non-Monetised Benefits - Environmental and Social Impacts	31
6.1	Overview	31
6.2	Environmental Impacts	31
6.3	Social Impacts	33
6.4	Appraisal Summary Table	36
7.	Assessment of Distributional Impacts	37
7.1	Purpose of the Assessment	37
7.2	Step 1 – Screening Process	37
7.3	Step 2 – Assessment and Step 3 – Appraisal	37
8.	Assessment of Wider Economic Benefits	39
8.1	Introduction	39
8.2	Induced Investments	39
8.3	Wider Impacts associated with complementary developments	40
8.4	Employment – labour supply impacts and a change in productive job impacts	41
8.5	Agglomeration	41
8.6	Regeneration	42
9.	Sensitivity Test Results	43
9.1	Introduction	43
9.2	Sensitivity Test 1 – Central Case excluding weekend benefits	43
9.3	Sensitivity Test 2 – Central Case with Sizewell C	43
9.4	Sensitivity Test 3 – Alternative Scenario with Sizewell C	44
9.5	Sensitivity Tests 4 & 5 – High and Low growth	45
9.6	Sensitivity Test 6 – Variable demand	45
9.7	Summary	47
10.	Value for Money Assessment	49

11. Conclusion	52
11.1 The Preferred Option.....	52
11.2 The Low-Cost Alternative	53
11.3 Interface with the Local Plan Review process.....	54
11.4 Summary performance versus the scheme objectives	54
11.5 Next steps.....	55

Appendix A. TEE, PA and AMCB Tables

Appendix B. Appraisal Summary Tables

Appendix C. Preparation of costs for the Financial Case and Economic Case Spreadsheet

Appendix D. Scheme Cost Pro-forma

Appendix E. Economic, Environmental and Social Appraisal Worksheets

Appendix F. Distributional Impacts Report

1. The Economic Case

1.1 Suffolk's Energy Gateway

A12 Suffolk's Energy Gateway (SEGway) comprises an improvement to the 4.5 mile (7 km) section between the B1078 at Wickham Market and the A1094 at Saxmundham in East Suffolk. It:

- Joins two sections of existing dual carriageway through a new offline alignment segregated from local roads.
- Bypasses the four communities of Marlesford, Little Glemham, Stratford St. Andrew and Farnham currently subject to all the adverse impacts of traffic.
- Incorporates upgrades to sub-standard junction layouts at both the B1078 and A1094 intersections.
- Enables an increase in local walking and cycling to essential services and the countryside.
- Starts construction in April 2021 and opens to the public in April 2023.

Option LB1d comprises a Dual Carriageway (70mph speed limit) version of the above.

Option LB2s comprises a Single Carriageway (60mph speed limit) version of the above.

Their broad location is illustrated below.

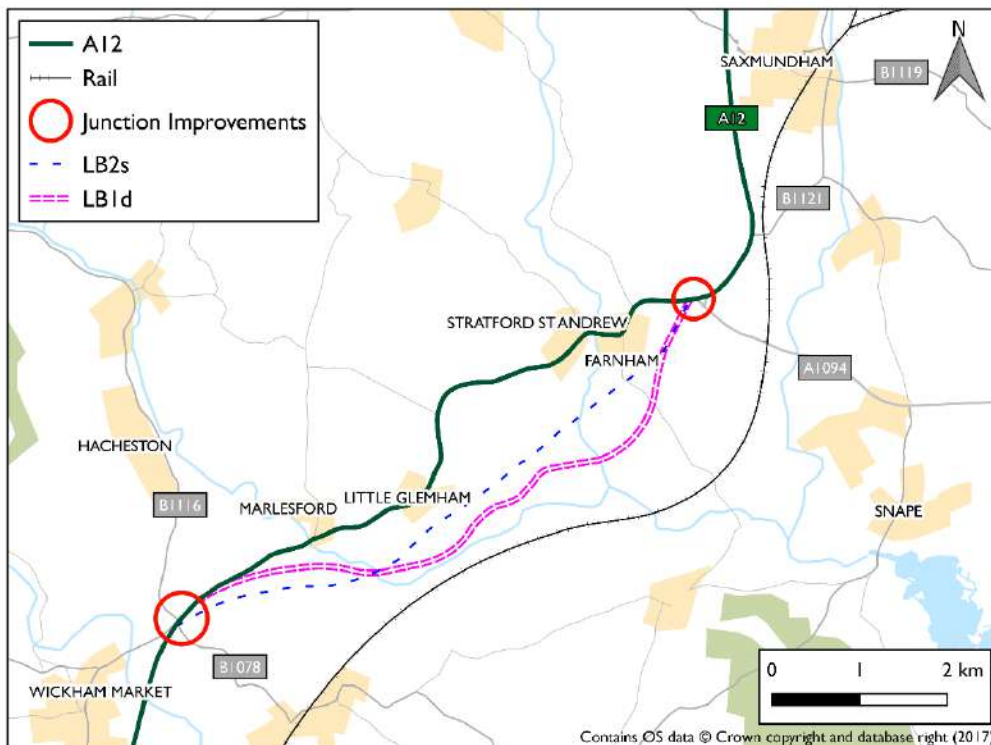


Figure 1.1 : Scheme options appraised in the Outline Business Case

1.2 Purpose of the Economic Case

The Economic Case presents the extent to which the SEGway would be beneficial to the UK economy and whether it represents value for money. The Economic Case has been prepared in accordance with DfT's WebTAG documents and the project's Appraisal Specification Report previously shared with the Department for Transport (DfT). WebTAG is the tool that is used to assess transport schemes in accordance with the requirements of HM Treasury's Green Book, which is used across government for investment decisions through identification, selection and appraisal of options.

In line with HM Treasury's appraisal requirements, the impacts considered are not limited to those directly impacting the measured economy, nor to just those which can be monetised. The economic, environmental, social and distributional impacts of a proposal are all examined, using qualitative, quantitative and monetised information. In assessing value for money, all of these are consolidated to determine the extent to which a proposal's benefits outweigh its costs.

The economic appraisal has been tailored to reflect the needs of the Outline Business Case and is discussed under the following headings:

- Methodology (Chapter 2)
- Assumptions (Chapter 3)
- Scheme Cost for Economic Assessment (Chapter 4)
- Assessment of Monetised Benefits (Chapter 5)
- Assessment of Non-Monetised Benefits - Environmental and Social (Chapter 6)
- Assessment of Distributional Impacts (Chapter 7)
- Assessment of Wider Economic Benefits (Chapter 8)
- Sensitivity Test Results (Chapter 9)
- Value for Money Assessment (Chapter 10)
- Conclusion (Chapter 11).

1.3 Limitation Note

The sole purpose of the report is to support the business case for the SEGway scheme.

The document should be read in full with no excerpts to be representative of the findings. It has been prepared exclusively for Suffolk County Council, Suffolk Coastal District Council, Waveney District Council and the Department for Transport and no liability is accepted for any use or reliance on the report by third parties.

2. Methodology

2.1 Overview

Industry-standard approaches have been used to calculate and define the relative benefits of the SEGway scheme through the use of DfT approved software packages, namely TUBA, COBALT and QUADRO, using the output from the Suffolk County Transport Model (SCTM).

The 'Value for Money' assessment is a staged process which includes appraisal of the scheme's economic, environmental, social, distributional and fiscal impacts using qualitative, quantitative and monetised information.

It starts with assessment of monetised costs and benefits and calculation of the Benefit Cost Ratio (BCR) of the Scheme. The next stage is to capture and analyse those impacts which cannot be monetised but can be presented as qualitative information. Finally, it looks at how the impacts of the scheme are distributed across different social groups - the Distributional Impacts assessment. The processes used for the Economic Assessment for the SEGway scheme are outlined in **Figure 2.1** below.

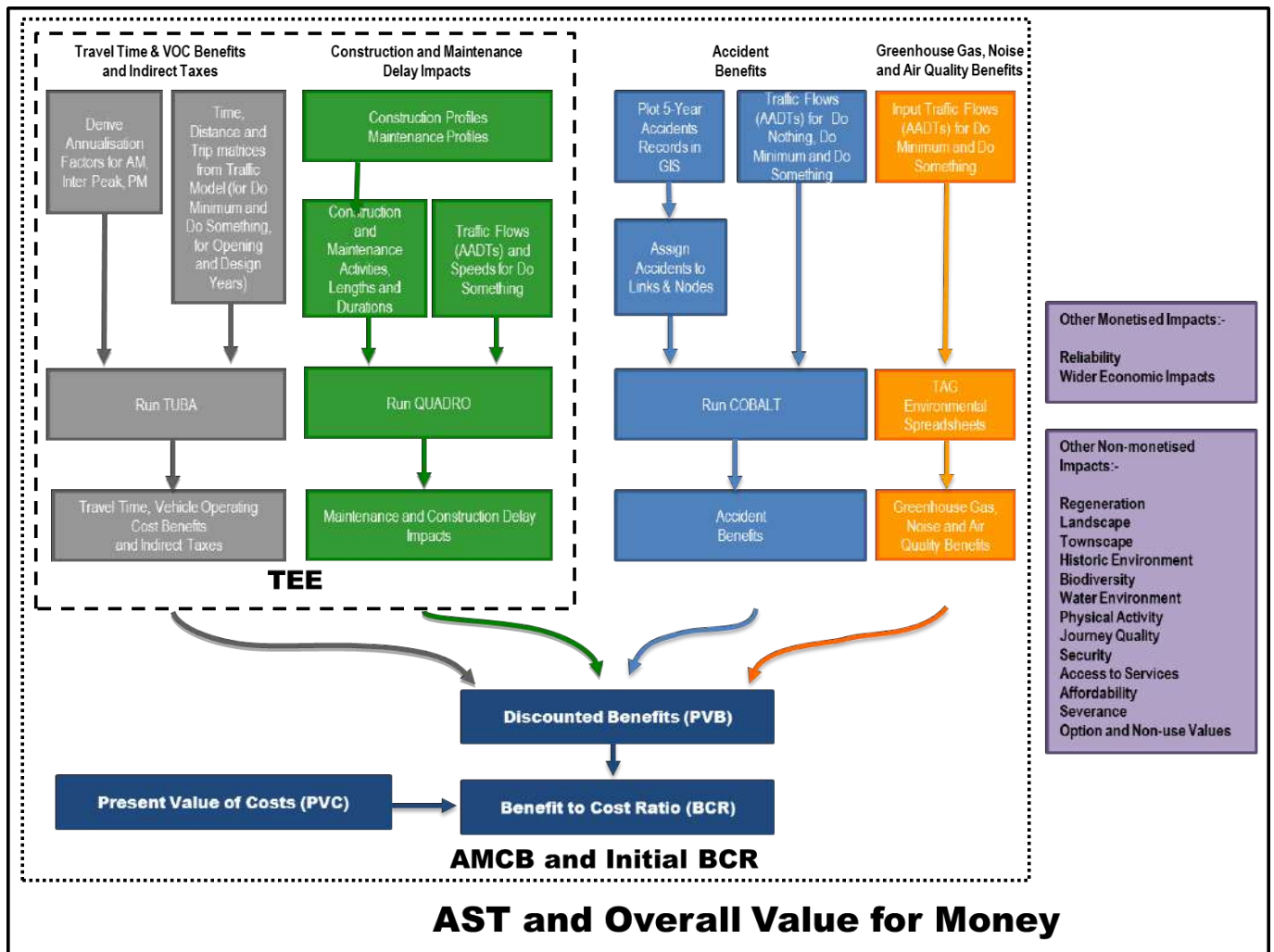


Figure 2.1 : Economic Assessment Methodology

2.2 Assessment of Monetised Impacts and Costs (AMCB)

In line with DfT guidance, Value for Money assessment starts with the calculation of those impacts that can be expressed in monetary terms. These monetised impacts are derived and summed to generate a Present Value of Benefits (PVB). The total costs are also summed to construct Present Value of Cost (PVC). These monetised benefits and scheme costs are used to calculate a Benefit Cost Ratio (Initial BCR) – that is the amount of benefit being delivered for every £1 of cost. The BCR is calculated by dividing the Present Value of Benefits (PVB) by the Present Value of Cost (PVC).

The DfT Advice Note on Value for Money Assessment for Local Transport Decision Makers (December 2013) suggests a flexible approach to economic appraisal to ensure time and resources spent on the development of a business case are proportionate to the size of the investment.

The summary of the monetised information along with the BCR is presented in the standard Assessment of Monetised Costs and Benefits (AMCB) Table, which is appended in Appendix A.

The following monetised impacts have been included in the economic assessment and are presented in the AMCB and BCR tables:

- Transport Economic Efficiency (TEE) as a result of the scheme for (1) business users and private sector transport providers; (2) consumer users (commuting); and (3) consumer users (other journey purposes) – each in terms of:
 - Travel time
 - Vehicle operating costs;
 - User charges
 - Delays during construction and maintenance
- Accidents;
- Noise (using the methods set out in WebTAG Unit A3.2);
- Air quality (using the methods set out in WebTAG Unit A3.3);
- Greenhouse gases (using the methods set out in WebTAG Unit A3.4); and
- Wider public finances (changes in indirect tax revenues);

Physical activity and journey quality have not been monetised given that the impact of the scheme on these areas is limited in relative terms.

There are also **other impacts** that can be monetised in certain instances, but the evidence relating to their appraisal is less developed and therefore there is less certainty about the robustness of their results. An example of this is the assessment of **journey time reliability** for both business users and consumers. TAG unit A1.3¹ describes the methodology for quantifying and monetising journey time reliability benefits by road type with the currently recommended measure for reliability being the standard deviation of journey time. However, the guidance identifies that “*for journeys predominately on single carriageways outside the urban area, it is not currently possible to estimate monetised reliability benefits*”. The guidance then goes on to identify *stress* as measured by the ratio of the annual average daily traffic (AADT) flow to the Congestion Reference Flow (a definition of capacity) as a reasonable proxy for reliability for rural single carriageway roads, such as the conditions which characterises the bulk of the A12 in the study area.

This method does not provide a monetised estimate of benefits but rather is used to provide a quantitative guide to a qualitative score for each option. In line with DfT guidance for journey time reliability in general and given the specific methodology used in this case, this sub-impact contributes to the qualitative summary of the scheme's VfM insofar it is included in the Appraisal Summary Table (AST). However, it is not included in the Transport Economic Efficiency (TEE) or Analysis of Monetised Costs and Benefits (AMCB) tables.

¹ Department for Transport, November 2014: TAG Unit A1.3 User and Provider Impacts

2.3 Wider economic impacts

The following analysis has been undertaken in line with the anticipated change in wider economic guidance Unit A2.1 first consulted on in 2016 (<https://www.gov.uk/government/consultations/transport-investment-understanding-and-valuing-impacts>) which is expected to be adopted shortly with minimal change. A summary of these results are presented in the Appraisal Summary Table under the Wider Impacts category.

2.3.1 Induced investments

The value of 'increased output in imperfectly competitive markets' has been estimated using a 10% uplift to Business User and Freight User Benefits. This represents the additional consumer surplus associated with increased output in imperfectly competitive markets.

2.3.2 Dependent development and complementary assessments

The scheme involves no wholly dependent development. As noted in TAG Unit A2.1, analysis of alternative scenarios can be used to determine the sensitivity of the value for money case to complementary investments by considering how likely these investments would need to be for their inclusion to change the value for money assessment.

Tourism

The *Strategic Case* has presented evidence of the role that the A12 plays in supporting the effective function of the regionally important tourist economy, with noted seasonal impacts on traffic volumes during the week and at weekends. The Economic Strategy for Norfolk and Suffolk recognises the linkages between accessibility and the prospects for tourism. Variable Demand Model (VDM) outputs from the scheme's transport model has been used to estimate a potential increase in visitors. This has been used alongside data on visitor assumptions and their spending from the 2015 Visit Suffolk Destination Research Report². This has enabled a calculation of the GVA impacts on the local economy over the appraisal period.

Tourism GVA impacts have been estimated for the proposed SEGway scheme which include potential revenue generated by additional number of visitors to Suffolk post opening of the scheme.

Sizewell C

The concept of complementary assessments has been used to understand the value generated by the potential investment in Sizewell C in the mid-2020s by EDF Energy, in terms of economic welfare benefits and GDP/GVA.

Other Employment and housing growth

An assessment has also been made of the benefits associated with employment and homes in the development planning pipeline. For employment the results are quoted in terms of GVA, whereas for housing this is reported in terms of homes.

Suffolk Coastal District Council consulted in the autumn of 2017 on Issues and Options associated with Local Plan growth, with potential housing growth beyond (up to +40%). SCDC have put forward three contrasting alternative options which include a potential shift in focus to the A12 corridor; a potential shift in focus on Ipswich and the A14 corridor, or a continuation of the existing approach (<http://www.eastsuffolk.gov.uk/planning/local-plans/suffolk-coastal-local-plan/local-plan-review/>).

The neighbouring district of Waveney has also consulted on its First Draft Local Plan, with a final draft published and then submitted for examination in late spring 2018, with adoption anticipated by the end of 2018 (<http://www.eastsuffolk.gov.uk/planning/local-plans/waveney-local-plan/new-waveney-local-plan/>).

² Visit Suffolk Market Segmentation, Destination Research Ltd, 2015, <https://www.suffolk.gov.uk/assets/planning-waste-and-environment/suffolks-countryside-and-wildlife/Visit-Suffolk-Market-Segmentation-2015-FINAL-Report.pdf> accessed 14 December 2017

At this stage of the Local Plan process, the Outline Business Case does not seek to quantify the potential complementary GVA and housing attribution benefits, except to note that the local plan timescales should allow the Full Business Case to report these results. Similarly, greater certainty with SEGway at that stage will help decision makers understand the merits (or otherwise) of increased development on the A12 corridor.

2.3.3 Employment – Labour supply impacts and productive job impacts

The welfare benefits from labour market impacts are partially captured in commuter user benefits but the tax implications are not and to estimate them it is necessary to quantify the full effects of i) labour supply impacts, and ii) the move to more or less productive jobs impacts. The relevant rate of taxation is then applied.

This is an optional component of the TAG process and has not been considered further in quantitative terms at this stage. This will be revisited if relevant at the Full Business Case stage.

2.3.4 Agglomeration

The term 'agglomeration' refers to the concentration of economic activity over an area. Transport can alter the accessibility of firms in an area to other firms and workers, thereby affecting the level of agglomeration. Agglomeration impacts arise because firms derive productivity benefits from being close to one another and from being located in large labour markets. These can occur within an industry (localisation economies) and/or across industries (urbanisation economies).

A transport scheme is more likely to have an impact on agglomeration if it increases accessibility in an area that is in close proximity to an economic centre or large employment centre. DfT has identified areas across England known as Function Urban Regions (FUR) where, if a scheme falls within the area, agglomeration impacts can be expected to be significant. Within Suffolk there are eight wards that are identified as FUR hinterland areas. Five are located in the district of Forest Heath and three are located in the district of St Edmundsbury. Both these districts are outside the area of influence of the A12 scheme.

Given the absence of FURs, the appraisal has focussed on qualitative impacts, such as impacts on Assisted Areas (parts of Lowestoft and Great Yarmouth), using knowledge gleaned from producing the economic context narrative that underpins the *Strategic Case*.

2.4 Assessment of Non-Monetised Impacts

The next stage of a Value for Money assessment builds on the initial monetised costs and benefits and considers qualitative and quantitative information on those impacts which cannot be monetised and how these contribute to the Value for Money of the scheme.

Impacts which cannot be monetised (either in all cases or for SEGway) but which have been appraised using qualitative and quantitative information and given an overall qualitative assessment score are listed below:

- Impacts on Landscape (using the methods set out in WebTAG Unit A3.6);
- Impacts on Townscape (not undertaken in this case as the route options are in a rural area);
- Impacts on Historic Environment (using the methods set out in WebTAG Unit A3.8);
- Impacts on Biodiversity (using the methods set out in WebTAG Unit A3.9);
- Impacts on the Water Environment (using the methods set out in WebTAG Unit A3.10);
- Impacts on Reliability (Business users, commuting and other users) – as this scheme affects a rural A road, monetisation of benefits is not possible in this instance.
- Impacts on Regeneration – albeit that the scheme is not in, nor does it affect a defined “regeneration area”;
- Impacts on Physical Activity; impacts on Journey Quality;
- Impacts on Security; impacts on Access to services;
- Impacts on Affordability; and impacts on Severance.

The assessment of non-monetised impacts has been undertaken in accordance with the methodology recommended within the relevant WebTAG units and the results have been summarised within the AST for both options (see Appendix B).

For the environmental non-monetised topics (Landscape, Historic Environment, Biodiversity and the Water Environment) a worst case approach is taken as set out in para 5.3.19 of WebTAG Unit A3 as follows:

“The following guidelines should be used to derive the overall assessment score for a topic from assessments on a number of separate key environmental resources. The advice here on the accumulation of environmental assessments is intended to provide a transparent and systematic basis for accumulating site or location specific results, while also allowing for the exercise of expert judgement:

Most adverse category. *The principle here is that a scheme as a whole should be assessed according to the most adverse assessment of the key environmental resources affected. For example, if a scheme affects, say, five key environmental resources, of which one is in the 'large adverse' category and the remaining four are 'slight adverse', then the overall assessment score should be 'large adverse'. The rationale for this approach is that highly adverse impacts should not be diluted or masked by less adverse impacts. It also encourages the development of alternative schemes which avoid such adverse outcomes.”*

As such, the worst individual score for all sub-topics within an assessment (e.g. Pattern, Tranquillity, Cultural, Land Cover and Character as sub-topics within the landscape assessment) has been taken to reflect the overall score for that topic regardless of the relative number of the sub-topics receiving a similarly poor score.

2.5 Assessment tools

The assessment methodology requires a use of appropriate tools and procedures in quantification and monetisation of the scheme impacts. Below is the list of appraisal tools recommended by DfT which were used to estimate the scheme benefits as part of the value for money assessment.

- **T**ransport **U**ser **B**enefit **A**ppraisal (TUBA) – the latest version 1.9.9 has been used to derive travel time benefits, VOC and indirect tax benefits of the scheme. The TUBA program takes, as its principal input, zone to zone matrices of trip numbers, times taken and distances travelled. TUBA then applies values of time and operating cost and discounts a 60-year stream of benefits to the present value year (defined by the DfT as 2010) and expresses the benefits in 2010 market prices. For the appraisal of road user costs standard values of time, operating cost and other related economic parameters for traffic appraisal were applied, using the standard 'Economics File' data available from the DfT TUBA website.
- **C**Ost and **B**enefit to **A**ccidents – **L**ight **T**ouch (COBALT) - Latest Version 2013_02 used to derive the accident benefits for the scheme (this uses cobalt-2017_1-webtag-parameters.txt file). This makes use of the past 5 years of STATS19 accident data for the defined area of impact, road link lengths, speeds and traffic flows from the Suffolk County Transport Model. COBA-LT compares scheme options with the without scheme reference case to calculate benefits over the 60-year appraisal period, with these discounted to 2010 for consistency with the other economic analyses.
- **Q**Ueues **A**nd **D**elays at **R**Oadworks (QUADRO 2017_V4R15) – This has been used to derive the cost of delay due to construction and maintenance works. This incorporates user specified data in terms of the construction phasing, maintenance regime and diversionary routes. Again this compares scheme options with the without scheme reference case to calculate benefits over the 60-year appraisal period, with these discounted to 2010 for consistency with the other economic analyses.

The use of assessment tools in economic appraisal is further discussed for each element of the assessment in the subsequent sections.

2.6 Options assessed

As part of the scheme's development various options have been identified and assessed, with a summary of this historic work included in the *Option Assessment Report* annex that accompanies the Business Case. In line with DfT guidance, the Outline Business Case has appraised two options illustrated below (**Figure 2.2**).

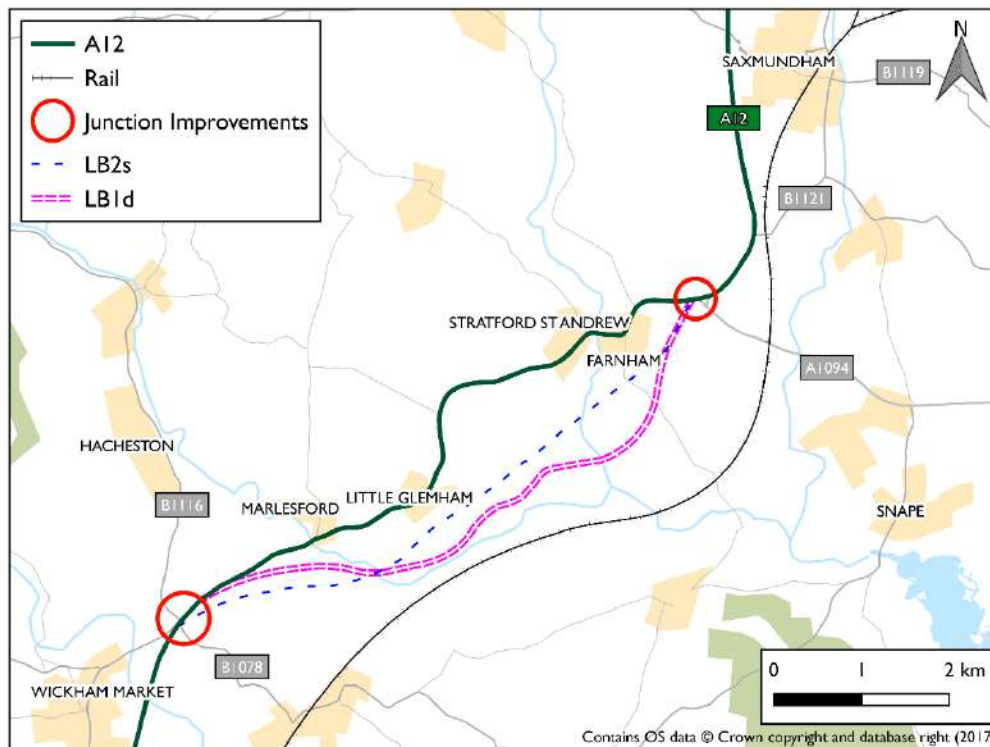


Figure 2.2 : Scheme options appraised in the Outline Business Case

2.7 Central Case, Uncertainty / Sensitivity Tests and an Alternative Scenario

2.7.1 The Central Case

The Value for Money assessment of the SEGway scheme has been based on the ‘most likely’ traffic forecast scenario known as the “Central Case.” It has been produced in line with WebTAG guidance.

The Central Case has quantified both weekday and weekend ‘welfare’ benefits associated with reductions in journey times and journey costs for road users. This has been considered a valid appraisal given that the *Strategic Case* has demonstrated the importance of the tourist economy to East Suffolk and the volume of traffic using the A12 at the weekend.

Where the Central Case for a scheme does not use a Variable Demand Model (VDM), it is important to set out the reasons why this is the case. The Suffolk County Transport Model includes a variable demand model which has been used during the model appraisal through realism tests and dedicated model runs. These initial runs show that the impacts of scheme are wider than the cordoned model area, which is unexpected. The VDM model runs for the full model show an increase in traffic on the A12 of about 20%; further analysis for option LB1d using the full SCTM assignment model highlights that 10% of this is a result of reassignment (partly from outside the cordon) with the remaining 10% is a result of the VDM. A further sensitivity has therefore been undertaken assigning the Dual A12 scheme using full SCTM; results have then been cordoned for input to TUBA. With this test, all potentially rerouting is fully captured.

As such the VDM is not considered reliable enough to be presented as the Central Case, but these results are presented as a Sensitivity Test within the Economic Case and Economic Appraisal Report to help the decision maker.

2.7.2 The purpose of Sensitivity Tests

Sensitivity tests and alternative network scenarios that seek to understand the impact of changes in cost, benefits, funding sources, demand and baseline road infrastructure; are presented alongside the Central Case

to enable the decision maker to understand the impacts of these changes on the scheme's value for money. These results are provided in Chapter 9. The following section provides brief details on these tests, including not counting weekend benefits, Sizewell C, high and low growth and variable demand.

2.7.3 Sensitivity Test 1 – Central Case without weekend benefits (TUBA only)

This test excludes benefits associated with weekend traffic to allow the reader to determine the impact that this has on the scheme's value for money. AM, PM and Interpeak benefits are the same as the core central case.

2.7.4 Sensitivity Test 2 – Central Case with Sizewell C demand and developer contribution to SEGway (TUBA, GVA and impact on public accounts)

As noted in the Strategic Case, A12 SEGway helps to facilitate the future potential delivery of a Nationally Significant Infrastructure Project on Suffolk's Energy Coast – namely Sizewell C Nuclear Power Station. EDF Energy's Sizewell C Stage 2 Pre-Application Consultation Report (2016)³ describes the scale of the infrastructure likely to be required to mitigate the impacts of the power station's construction and ongoing operation. It outlines plans to "optimise local benefits that directly arise from the construction and operation of the power station". Modelling carried out by EDF Energy concludes that additional HGVs along the A12 during the construction of Sizewell C would "increase the frequency of large vehicles meeting at Farnham bend, and so could exacerbate existing safety concerns" as well as lead to increased congestion. In addition, the consultation has sought to take into account local residents' concerns with regards to severance when assessing the three proposed options for mitigation of traffic volumes in the four villages of Farnham, Stratford St Andrew, Little Glemham and Marlesford.

A dedicated "2025 with Sizewell C construction traffic" matrix has been produced incorporating link flow data provided by EDF Energy to Suffolk County Council and Jacobs in August 2017. These flows have been added to the central case for appraisal years between 2025 and 2034.

EDF Energy's most recent consultation in 2016 noted a number of different options to mitigate some of the extra impacts associated with the Sizewell C construction without committing to one particular solution at this stage.

EDF Energy has acknowledged that it would be prepared to make a proportionate financial contribution towards the SEGway scheme, in lieu of providing an alternative highway scheme along the A12 (identified as options within EDF Energy's Sizewell C Stage 2 consultation), which would be required to enable its delivery of the Sizewell C project.

It has been accepted by Suffolk County Council that the Sizewell C project would not justify the delivery of a four village bypass as mitigation in its own right. Therefore, any contribution by EDF Energy towards the SEGway scheme would be proportionate to the level of contribution necessary to mitigate the impacts of the Sizewell C project, and is contingent on the SEGway scheme being in place to support the construction of Sizewell C.

Suffolk County Council is still in discussion with EDF Energy what a proportionate mitigation for Sizewell C would be, but believes that a two village bypass would be the minimum mitigation.

As Suffolk County Council considers that the development cannot be properly mitigated with less than a bypass scheme, Suffolk County Council estimates this would result in a contribution from EDF Energy of between £12 million and £26 million towards the scheme, which would then constitute a 9-19% private sector local contribution towards LB1d or a 13.5% to 29% private sector local contribution towards LB2s, reducing the level of Central Government funding.

For the purposes of this sensitivity test the appraisal has been confined to the:

- GVA benefits from helping to facilitate some of the new job roles associated with Sizewell C (the Strategic Case references up to 25,000 different job roles during construction and then into operation);
- assessment of TUBA benefits to include the additional demand from Sizewell C; and

³ http://sizewell.edfenergyconsultation.info/wp-content/uploads/2016/11/EDF_SZC_Stage2_SumDoc.pdf, accessed 18 June 2017

- the impact that a developer contribution could have on the scheme's value for money (as it results in a reduced public sector contribution and reduced private sector business benefits).

2.7.5 Sensitivity Test 3 – Alternative without scheme network scenario, with Sizewell C demand and developer funded mitigation on the A12 as the without scheme comparison (TUBA, GVA and impact on public accounts)

As requested by DfT in the development of the Appraisal Specification Report, this sensitivity test takes sensitivity test 2 one step further and seeks to understand if the majority of benefits of building a Four Village Bypass could be secured through a cheaper Two Village Bypass provided entirely by the developer.

To undertake this sensitivity test, an alternative *Without Scheme* network has been developed which incorporates a 2.6km single carriageway bypass of Farnham and Stratford St. Andrew – i.e. option SB5s previously appraised in the SOBC, and illustrated below in Figure 2.3. The route runs from north of the A12/Buttons Road Junction to the A12/A1094 Junction to the north of Farnham and Stratford St Andrew. It passes to the south of both villages.

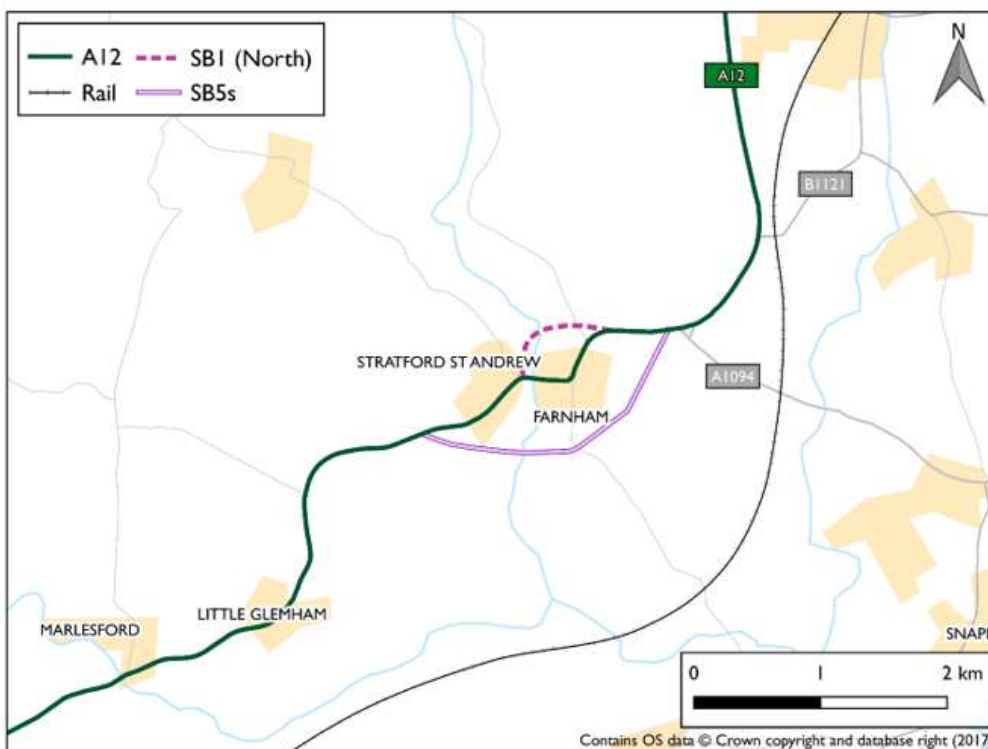


Figure 2.3 : Location of scheme option SB5s. SB1 (North) – a one village bypass is also illustrated

The SEGway long bypass options (LB1d and LB2s) have been appraised against this alternative without scheme network to calculate the net change in costs and benefits associated with the more strategic intervention (with the proviso that this Two Village Bypass is not retained in the do something – with SEGway network) if the developer contribution was instead used to part fund SEGway.

Other economic and environmental costs and benefits have not been appraised as part of this alternative scenario. It is also assumed that the scheme is acceptable and deliverable in planning terms.

As this alternative scenario involves developer contributions this assessment takes these into account in the calculation of the scheme's value for money (as it results in a reduced public sector contribution and reduced private sector business benefits).

As in Sensitivity Test 2, the GVA benefits from helping to facilitate Sizewell C employment is again valid to consider in the assessment.

2.7.6 Sensitivity Tests 4 and 5 – High and Low Growth (TUBA only)

Future traffic growth is uncertain and dependent on multiple factors. High and Low Growth forecast scenarios have been developed to take into account uncertainty regarding forecasts of population, households, employment, GDP growth and fuel price trends and their impact on future traffic growth. The High and Low Growth sensitivity tests help to investigate what effect the use of the High and Low Growth traffic forecasts would have on the BCR and the value for money.

It should be noted that the assessment of the impacts of High and Low Growth has only been undertaken in TUBA. All other assessment results (such as accidents and environmental benefits) in the calculation of the PVB and BCR figures are consistent between the Core and the sensitivity test scenarios.

2.7.7 Sensitivity Test 6 – Variable Demand (TUBA and GVA only)

This sensitivity test incorporates the results from the variable demand model run for both options to calculate the impact that induced traffic has on resulting journey times elsewhere in the network. As noted above the initial VDM runs show that the impacts of scheme are wider than the cordoned model area, which is unexpected. The VDM model runs show an increase in traffic on the A12 of about 20%; further analysis of option LB1d highlights that 10% of this is a result of reassignment (partly from outside the cordon) with the remaining 10% a result of the VDM. A further sensitivity has therefore been undertaken assigning the Dual A12 scheme using full SCTM; results have then been cordoned for input to TUBA. With this test, all potentially rerouting is fully captured.

At the same time, induced traffic in terms of the “other” journey purpose could be considered partly representative of an increase in tourism demand in East Suffolk. The Economic Strategy for Norfolk and Suffolk has recognised the link between accessibility and prospects for tourism, which is of real importance to the regional economy. The wider economic impacts analysis described in more detail in Chapter 8 has applied variable demand outputs for the “other” journey purpose to data on tourism spending to demonstrate the likely GVA increase over the appraisal period. These tourism benefits can also be considered when evaluating the value for money framework for the scheme more generally.

3. Assumptions

3.1.1 Overview

This section summarises the key assumptions supporting the Value for Money assessment. This includes the assumptions set out in WebTAG as well as further assumptions specific to the SEGway scheme and the “Central Case” (the most likely scenario) for economic appraisal.

Further details can be found in the *Economic Appraisal Report* supporting annex.

3.1.2 Traffic Model

The impacts of the proposed scheme options are based on the differences between forecasts of the Do Minimum without-scheme and Do Something with-scheme scenarios. These forecasts have been developed with the Suffolk County Transport Model (SCTM) which has been commissioned by Suffolk County Council to aid the development of modelling and appraisal for major transport schemes, local plans and major developments. The SCTM uses the SATURN suite of modelling software to replicate highway performance.

All traffic modelling supporting the scheme has been undertaken using a cordoned version of the SCTM to reflect the area of influence and impact of the SEGway scheme and avoid the capture of benefits or dis-benefits not appropriate to the scheme. This cordon is predominantly the A12(A14) corridor between the south of Ipswich (A14/A137 interchange west of the Orwell Bridge) and Lowestoft including the coastal hinterland to the east and rural hinterland to the west of the A12 (east of A140 and south of A143), as shown in Figure 3-1.

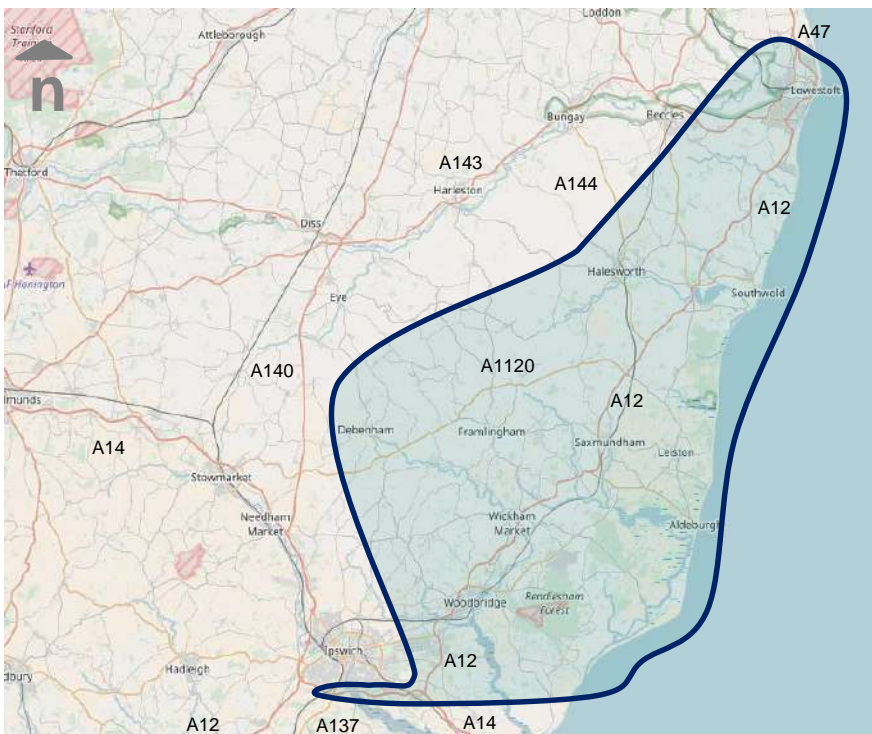


Figure 3-1: Cordoned SEGway SCTM model extent

The full countywide SCTM was initially developed by consultants WSP with this refined further by WSP for the area of influence of the SEGway scheme. The work undertaken to develop a suitably robust base year validation (base year 2016) both with the full county wide model and the subsequent SEGway local model is fully documented in the supporting Local Model Validation Reports as annexes to the Business Case:

- *Suffolk County Transport Model Local Model Validation Report (SCTM LMVR)*
- *SEGway Local Model Validation Report.*

These models have incorporated data from various sources including traffic surveys, TrafficMaster journey time data and Telefonica mobile phone data. Further information on these datasets can be found in the supporting annexes to the Business Case:

- *Traffic Data Collection Report*
- *Mobile Network Data Verification Report is enclosed as an appendix to the SCTM LMVR.*

The SCTM incorporates a demand model component. This has been run for both options to understand the scale of induced demand across journey purposes, the impact that this on travel time benefits and wider economic impacts, and whether there is a case to capture these in the Economic Case. Analysis of the demand model is presented in the supporting annex. Further commentary on sensitivity tests associated with the results is also presented in the *Economic Appraisal Report*.

- *SCTM Demand Model Report.*

Based on this information the Central Case is reported without the demand model component, although sensitivity tests to demonstrate the impact of the demand model on transport economic efficiency benefits have been produced and are reported herein. Our justification for this approach has been provided in Section 2.7.1.

3.1.3 Time Periods

The following time periods were modelled in the traffic model

- *AM 08:00-09:00*
- *Interpeak (IP) average 1hr (10:00-16:00), and*
- *PM 17:00-18:00.*

Appropriate assumptions have been made regarding the annualisation of these benefits (i.e. converting from one-hour traffic models to produce benefits for a full year) for the Transport User Benefit Analysis (TUBA).

TUBA works on the basis of standard-definition time periods as follows:

- AM Peak (weekday 07:00 to 10:00);
- PM Peak (weekday 16:00 to 19:00);
- Inter-peak (weekday 10:00 to 16:00);
- Off-Peak (weekday 19:00 to 07:00); and
- Weekend.

As noted the SCTM highway model comprises three weekday time periods; an AM peak hour, an average inter-peak hour and a PM peak hour. Expansion factors were derived through analysis of Automatic Traffic Counter (ATC) data on the A12 at Farnham. The factors calculated from the ATC data is used to expand and combine the AM, Inter, and PM peak periods to represent an average 12-hour weekday (5-days). As the inter-peak hour is an average hour period a factor of 6 was used representing the number of hours in this period.

Annualisation factors have been calculated to expand each model time period to reflect a full year of transport benefits. Weekday annualisation factors are set out in **Table 3.1** below.

Model Period	AM (08:00-09:00)	IP (Avg 1 Hour)	PM (17:00-18:00)
Expanded Model Period	AM (07:00-10:00)	IP (10:00-16:00)	PM (16:00-19:00)
Number of peak weekdays	253	253	253
ATC calculated peak hour to period expansion factor	2.86	6	2.81
Annualisation Factor	724	1518	711

Table 3.1: Weekday annualisation factors (all vehicle types)

ATC data has been used to expand 1 hour AM and PM demand to three hour values; with resulting factors of 2.86 and 2.81 respectively. The 1-hour average interpeak traffic model has been factored by 6 to reflect the full 10:00-16:00 period. The above factors represent a 12-hour period (07:00-19:00) for 253 peak weekdays in a year. Off-peak benefits (19:00-07:00) have been excluded from the economic assessment.

Weekend benefits have been derived from the inter-peak model. These represent a 12-hour period (07:00-19:00) over 104 weekend days and 8 bank holidays. Annualisation factors are summarised in **Table 3.2** below.

Model Period	IP (Average 1 Hour)		
	Weekend (07:00-19:00)	Bank Holidays (07:00-19:00)	Combined (07:00-19:00)
Expanded Model Period			
Number of days	104	8	112
Number of hours per day	12	12	12
Total Number of Hours	1248	96	1344
ATC calculated average hour factor			0.863
Annualisation Factor			1159

Table 3.2: Weekend annualisation factors (all vehicle types)

A weekday to weekend adjustment factor of 0.863 has been derived from ATC data. It is based on the average 07:00-19:00 weekend flows divided by the average weekday flows during the same period. The total number of annual weekend / bank holiday hours has been adjusted by this factor to determine the weekend annualisation factor. The *Strategic Case* has demonstrated the importance of the tourist economy to East Suffolk and a clear use of the A12 through the study area at weekends and hence why it is valid to include these benefits in the Central Case. Highest traffic flows are experienced on summer Fridays and weekends, demonstrating the vital role that the A12 plays in bringing people to the region for tourism purposes.

The calculation of the annualisation factors is given in Appendix A of the *Economic Appraisal Report*.

3.1.4 User Classes

Weekday

The economic appraisal (of user time and vehicle operating costs using TUBA) is based on seven user classes. The ten user classes which were included within the SCTM model have been reduced to seven user classes as shown in **Table 3.3** below. This involved the aggregation of relevant car user classes and disaggregation of LGVs and HGVs. Disaggregation factors were derived using WebTAG assumptions for LGV while HGV were split based on data from count points on the A12.

SATURN User Classes	TUBA User Classes
UC1: Car – Home Based Work (Inbound)	UC2: Car – Journey between home and work (“Commute”)
UC2: Car – Home Based Work (Outbound)	
UC3: Car – Home Based Employers Business (Inbound)	UC1: Car – Employers Business
UC4: Car – Home Based Employers Business (Outbound)	
UC5: Car – Non Home Based Employers Business	
UC6: Car – Home Based Other (Inbound)	UC3: Car – Other trip purposes
UC7: Car – Home Based Other (Outbound)	
UC8: Car – Non Home Based Other	
UC9: LGV (Light Goods Vehicles)	UC4: LGV (commuting and other) 12%
	UC5: LGV (Freight transport) 88%
UC10: HGV (Heavy Goods Vehicles)	UC6: HGV (OGV1) 47%
	UC7: HGV (OGV2) 53%

Table 3.3: Summary of User Classes for the Central case

Weekend

The SCTM model represents a weekday only. In order to capture weekend benefits adjustments have been made to reflect:

- the reduced level of car commuting and business trips, and
- lower LGV and HGV movements.

To ensure a conservative assessment, all weekend car trips have been assumed to be 'Other User' trips. In TUBA, Business and Commuting Trips have been combined into the Other Users demand matrix with total volumes adjusted by the average hour factor of 0.863, as given in **Table 3.2**.

Given limited survey data, LGV and HGV weekend proportions have been derived from the DfT's Road traffic statistics publication⁴, with LGV weekend volumes calculated to be 66% of the weekday and HGV weekend volumes calculated to be 35% of weekday values.

Weekend LGV trip purpose has been split 50% / 50% between personal and freight use to account for reduced on-business use at the weekend. OGV1 and OGV2 proportions of HGV traffic are assumed to be unchanged from a weekday, as outlined in **Table 3.3**.

3.1.5 Appraisal Period

In line with WebTAG guidance, the impacts of the scheme have been assessed over the 60-year period after the scheme opens.

Traffic forecasts have been developed for a scheme opening year of 2023 and a forecast year of 2038 (long term design year – fifteen years after the scheme has opened) for use in the traffic model. Traffic growth is interpolated between 2023 and 2038. The traffic forecasts from the 2038 forecast year up to the final assessment year of 2082 are assumed to remain constant.

Additional forecast years of 2025 and 2035 have also been developed to allow for the separate assessment of the Sizewell 10-year construction period, and the three years following completion of construction until the forecast year. Further information on how these forecasts have been developed including the encompassing developments and schemes in the without scheme reference case can be found in the supporting annex:

- *Forecasting Report including Appendix A – Uncertainty Log.*

3.1.6 Discounting, Units of Accounts and Inflation

Costs and benefits occur in different years throughout the assessment period, e.g. the scheme development and construction costs occur before the scheme opens, whilst the benefits occur over the DfT standard appraisal period of 60 years. Also, it is considered that benefits that accrue now are considered to be more valuable than those that accrue further into the future

Given the above, in order to compare benefits and costs it is essential that they are all converted to a common base and a common value (known as the Present Value Year). The process used is called discounting and the Present Value Year is currently 2010.

Discounting is undertaken internally within the assessment tools mentioned above, using the standard DfT discount rates of 3.5% per year for the first 30 years of appraisal and 3.0% per year thereafter.

The unit of account must also be consistent between costs and benefits in order to allow comparison between the two. There are two different units of accounts:

- Market price unit of account – this refers to the prices paid by consumers for goods and services and therefore includes indirect taxation (e.g. VAT); and

⁴ Road traffic estimates in Great Britain: 2016 tables - 'Table TRA0306 – Average traffic distribution by day of the week, Great Britain: 2016'

- Factor cost unit of account – this excludes indirect taxation. Prices paid by Government bodies are usually quoted in the factor cost unit of account as any tax paid is recovered by the Government and is therefore ignored.

While scheme benefits are calculated in market prices, scheme costs are usually quoted as factor costs.

Costs can also be in different price bases. In order to enable comparisons to be made between such costs and to take account of the effect of inflation all monetary values in the calculation of costs and benefits are adjusted so that they are all in a common price base of 2010.

The scheme costs must therefore be adjusted to market prices for economic assessment purposes. This economic appraisal reports the Present Value Cost (PVC) at a price base of 2010 discounted to 2010. The PVC includes the following adjustment factors:

- an adjustment for inflation using the Retail Price Index from 2017 to 2010
- an adjustment to market prices (gross of indirect tax)
- a discount factor based on the HM Treasury “Green Book” to adjust costs to a standard base year of 2010.

4. Scheme Cost for Economic Assessment

4.1.1 Approach

Along with the estimation of benefits, the costs are also required for the economic assessment of the scheme. Costs can be defined as the total amount of money spent on constructing and maintaining the scheme. The costs are therefore referred to as Scheme costs and Maintenance costs:

- Scheme costs represent the investment associated with construction, land, preparation (planning and designing the scheme) and supervision during the scheme construction. These are then inflated to base costs relevant to the year of expenditure, prior to the addition of risk and optimism bias.
- Maintenance costs are the cost of people, machinery and materials required to maintain the highway network. These costs are also known as the Capital Costs of Maintenance. The maintenance cost estimate has been produced using the typical maintenance profiles, costs, durations and timings for new roads as per the DfT QUADRO manual (DMRB Volume 14 Sec 1 Part 2 Chapter 4). These costs have also been inflated to base costs relevant to the planned year of the works. Optimism Bias has also been applied to the cost however risk has not been included.

“Investment costs” for construction, land / property, preparation / administration and supervision are based on the latest scheme design.

The base costs for the proposed A12 Long Dual and Long Single carriageway schemes have been estimated in current prices (2017 Quarter 4). The base costs include an allowance for inflation. This includes inflating the investment costs to the relevant year of expenditure using the BCIS General Civil Engineering Costs Index for construction-related costs and using the GDP-deflator series as published in the July 2017 TAG Data book.

Prior to using the base costs in the Economic Assessment, as per the DfT guidance TAG (Unit A1-2), these have been adjusted to account for measured risks and optimism bias. A quantified risk assessment (QRA) was completed collectively by Suffolk County Council, Suffolk Coastal District Council and Jacobs. The QRA includes all types of risk which could affect the cost of the scheme such as planning delay, political decisions, land acquisition issues, legislative delays, their likelihood and the associated financial constraints. Based on the QRA the following risk allowances have been included within the scheme costs for the two options:

- LB1d - Risk allowance of £9.56M (which equates to approximately 7% of the scheme costs, 2017 prices).
- LB2s - Risk allowance of £9.56M (which equates to approximately 11% of the scheme costs, 2017 prices).

An additional 25% Optimism Bias adjustment has been applied to the scheme costs as recommended by TAG (TAG Unit A1.2, Table 8) for Road schemes. The level of 25% is considered appropriate given the stage of scheme development and with a risk allowance of 7 to 11% of total scheme costs having been included within the scheme cost build up.

In line with TAG requirements, any ‘sunk’ costs that have already been spent have been excluded from the costs used in economic assessment.

The calculated risk and optimism bias adjusted base costs form the inputs to the DfT’s TUBA software. Costs are entered in TUBA in 2017 quarter 4 prices, along with the appropriate Gross Domestic Product (GDP) deflator to allow the software to deflate costs. The resulting costs are presented **Table 4.1** below.

Cost Element	LB1d – dual carriageway	LB2s – single carriageway
Construction	£137,548,353	£89,969,834
Land and property	£5,459,483	£5,222,829
Preparation and supervision	£13,003,678	£8,505,119
Total	£156,011,514	£103,697,782

Table 4.1 : Undiscounted, deflated, outturn scheme costs by cost element for each scheme option for Economic Appraisal

The above costs are different to those presented within the *Financial Case* as those herein include 25% optimism bias. The preparatory spreadsheet to calculate these costs for both option is enclosed as Appendix C. A copy of the resulting standalone DfT Cost Pro-forma is enclosed as Appendix D.

4.1.2 Capital Costs of Maintenance

Details of the likely maintenance costs with and without the scheme in place are provided within the *Financial Case*. The capital cost of maintenance is the cost of people, machinery and materials to maintain the new highway network. When the scheme is in place, SEGway will require additional maintenance that would not occur if the scheme was not built. This includes new surfacing materials, deeper treatments and structures inspections.

The scheme would also result in the need for less maintenance on the existing A12 as traffic flows reduce and so does the wear and tear.

The following increase in maintenance costs have initially been calculated using QUADRO for the 60-year appraisal period for each option.

Option LB1d	Option LB2s
£48,388,420	£10,950,397

Table 4.2 : Net change in capital costs of maintenance over the 60-year period compared to the without scheme reference case, 2017 prices inclusive of inflation and optimism bias

These costs have also included an allowance for inflation as outlined previously. Risk has not been applied however a higher percentage optimism bias of 44% has been applied to account for this. This is maximum recommended uplift for costs associated with road schemes.

4.1.3 Developer Contributions

For the purposes of the Central Case, it is assumed that the scheme will be funded through a combination of Large Local Majors Fund and a local contribution from Suffolk County Council. This reflects the importance of the project in terms of helping the UK to meet its clean energy and growth targets – in helping to facilitate Sizewell C, and the affordability of a local contribution for Suffolk County Council and its local partners.

However, there is the opportunity for a significantly larger local contribution once it is confirmed that the Sizewell C project goes ahead. EDF Energy supports in principle the aims and objectives of the scheme and is prepared to make a proportionate financial contribution towards the SEGway scheme, in lieu of providing an alternative highway scheme along the A12 (identified as options within EDF Energy's Sizewell C Stage consultation), which would be required to enable its delivery of the Sizewell C project. It has been accepted by Suffolk County Council that the Sizewell C project would not justify the delivery of a four village bypass as mitigation in its own right. Therefore, any contribution by EDF Energy towards the SEGway scheme would be proportionate to the level of contribution necessary to mitigate the impacts of the Sizewell C project, and is contingent on the SEGway scheme being in place to support the construction of Sizewell C. Suffolk County Council is still in discussion with EDF Energy what a proportionate mitigation for Sizewell C would be, but believes that a two village bypass would be the minimum mitigation.

As Suffolk County Council considers that the development cannot be properly mitigated with less than a bypass scheme, Suffolk County Council estimates this would result in a contribution from EDF Energy of between £12 million and £26 million towards the scheme, which would then constitute a 9-19% private sector local contribution towards LB1d or a 13.5% to 29% private sector local contribution towards LB2s, reducing the level of Central Government funding.

These costs have been calculated based on previous work undertaken by AECOM for the 2014/15 Four Villages Study, whereby an option for a short northern bypass of Farnham and a short southern bypass of Farnham and Stratford St. Andrew were costed and appraised. These have since been reviewed (see *Financial Case and its supporting appendices E and F*) and inflated to outturn costs with appropriate provision for risk for consideration in the economic appraisal.

Table 4.3 shows the resulting cost breakdown for SB5s.

Cost Element	SB5s Cost (£)
Construction	£17,509,804
Project / Design Team Fees	£3,764,608
Other Development Costs	£506,814
Inflation	£1,655,373
Risk	£2,343,660
Sub-Total	£25,780,259

Table 4.3 : Undiscounted Outturn Scheme Costs for Option SB5s (also representing the potential developer contribution), 2017 prices

As a Sensitivity Test we have used these figures to show what the impact of the developer contribution would have on the Benefit Cost Ratio for Option LB1d and LB2s in the Sizewell C alternative scenario. Optimism bias has not been added to the developer contribution.

Following the principles set out in WebTAG (Unit A1.1), the value of the developer contributions has been recorded as a negative value in both the 'Developer and Other Contributions' row of the PA table (to offset the cost recorded to the public sector provider) and the 'Developer contributions' row of the Transport Economic Efficiency (TEE) Table (to register the cost to the private sector provider/developer).

Further details of Suffolk County Council's approach to working with DfT and EDF Energy to secure these Developer Contributions is provided within the *Management Case* and *Financial Case*.

4.1.4 Present Value of Costs (PVC)

The costs used in scheme appraisal differ from the outturn costs used for funding decisions and discussed in the *Financial Case*. Costs for scheme appraisal are adjusted to the DfT standard present value year (2010) to allow direct comparison with the monetised benefits and are in calendar years.

The outturn scheme costs were entered into TUBA to be estimated over the 60-year appraisal period, converted to 2010 prices, discounted to 2010, and converted to the market price unit of account. A summary of the Present Value of Costs (PVC) output by TUBA is provided in **Table 4.4** below.

Category	Discounted Costs		
	LB1d	LB2s	SB5s
Scheme Costs (£000s)	111,506	74,308	19,751
Costs of Maintenance (£000s)	9,422	1,268	N/A
Developer Contributions	0 in Central Case The cost for SB5s is used as a sensitivity test		100%
Total PVC (£000s)	120,928	75,576	N/A

Table 4.4 : Present Value of Costs by Option (2010 prices, discounted to 2010)

Further scheme cost information is provided within the *Financial Case* supporting the scheme.

5. Assessment of Monetised Benefits

5.1.1 Introduction

As shown in **Figure 2.1** several elements of a scheme's overall benefits can be monetised. This section of the report describes and summarises each element of the monetised benefits, and derives a Benefit to Cost Ratio. Further details of the monetised economic assessment are provided in the scheme's *Economic Appraisal Report*.

5.1.2 TEE Benefits as a Result of the Scheme

The Transport Economic Efficiency (TEE) benefits consist of four key components, set out below and as summarised in **Figure 2.1**:

- Travel time savings and Vehicle Operating Costs (VOC) benefits as a result of the scheme;
- Impacts on private sector providers and other business impacts;
- Travel time and Vehicle Operating Costs (VOC) dis-benefits as a result of construction activities (considered in Section 5.1.3); and
- Travel time and Vehicle Operating Costs (VOC) dis-benefits as a result of maintenance activities (considered in Section 5.1.4).

TEE Travel time savings and VOC benefits as a result of the scheme are calculated with the use of TUBA software and normally constitute by far the largest proportion of the scheme benefits used in BCR calculation.

TUBA takes trip, time and distance matrices from the traffic forecast model for each future year, vehicle type and journey purpose (i.e. each User Class) and each time period and calculates travel time saving benefits. It does this by comparing the travel times in the Do-Minimum (without either SEGway scheme) scenario with those in the Do-Something (with either SEGway scheme) scenario. It then applies monetary values (known as Values of Time) to derive the monetary benefits of those time savings over the standard 60-year appraisal period.

TUBA also calculates Vehicle Operating Cost (VOC) changes which occur over the standard 60-year appraisal period due to changes in costs associated with such items as fuel, maintenance, and wear and tear. These occur due to changes in speed and distance when the scheme is implemented and can include both positive and negative values depending upon the scheme's impact upon traffic flows and routing.

Figure 5.1 shows the process to calculate the TUBA benefits. Further details of TUBA assessment for SEGway can be found in the *Economic Appraisal Report*.

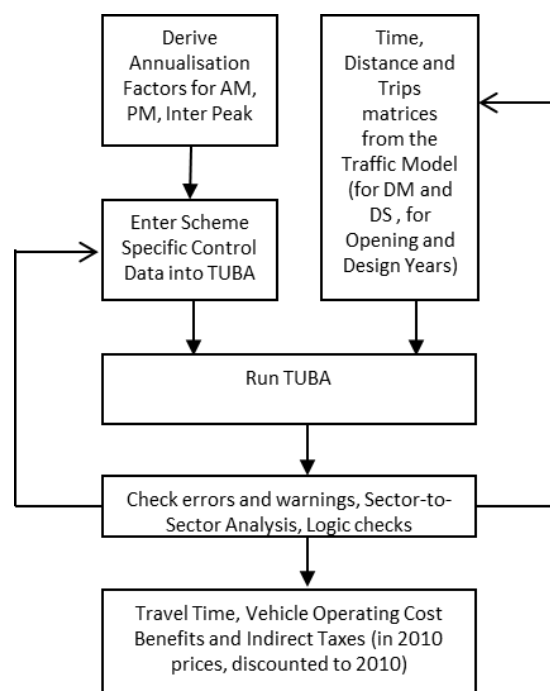


Figure 5.1 : TUBA assessment process

Results of the Central Case including weekend benefits (discounted present values in 2010 prices and values)

The results of the TUBA assessment show that SEGway will deliver benefits from journey time savings, ranging from £117.5 million (option LB2s – single carriageway) to £186.9 million (option LB1d – dual carriageway) over the 60-year appraisal period.

The scheme also produces a small net benefit of £7.4 million (option LB1d) to £10.7 million (option LB2s) from a decrease in Vehicle Operating Costs (VOC). The decrease in VOC is a logical result due to a reduction in delays as a result of the SEGway scheme.

The TUBA benefits are reported in a standard table known as the TEE table. The completed TEE table is included in Appendix A.

Assessment of the TUBA benefits by journey purpose is shown below. This reflects both the value apportioned to different journey purposes and the nature of demand on the A12 across the seven-day week, with the strong role of tourism.

Journey purpose	Option LB1d		Option LB2s	
Business	£65,368,000	33.5%	£43,921,000	34%
Commuting	£40,010,000	20.5%	£26,171,000	20.5%
Other	£88,969,000	46%	£58,077,000	45.5%
Total Benefits	£194,347,000	100%	£128,169,000	100%

Table 5.1 : Split of 60-year TUBA benefit stream (Journey Time and Vehicle Operating Cost Savings) by journey purpose and scheme option

The journey time benefit component of the TEE table has also been assessed against the level of time saved by journey purpose, as shown in **Table 5.2** and **Table 5.3** for options LB1d and LB2s respectively.

Journey purpose	0 to 2 minutes	2 to 5 minutes	More than 5 minutes
Business	£3,428,000	£49,489,000	£8,937,000
Commuting and other	£9,999,000	£112,751,000	£14,744,000
Total Benefits	£13,427,000	£162,240,000	£23,681,000

Table 5.2 : Monetised split of 60-year journey time benefit stream by size of time saving and journey purpose – option LB1d

Journey purpose	0 to 2 minutes	2 to 5 minutes	More than 5 minutes
Business	£3,643,000	£35,181,000	£6,000
Commuting and other	£11,146,000	£73,515,000	£0
Total Benefits	£14,789,000	£108,696,000	£6,000

Table 5.3 : Monetised split of 60-year journey time benefit stream by size of time saving and journey purpose – option LB2s

Travel time savings of greater than 5 minutes, account for £23.7 million of benefits which equate to 12.7% of the total travel time benefits of option LB1d. Travel time savings of 2 to 5 minutes, account for the majority of travel time benefits for option LB2s. The lower speed limit applicable to a single carriageway helps to explain the paucity of benefits associated with time savings in excess of 5 minutes.

The spatial distribution of TUBA benefits has been analysed to prove that the results are logical. This has made use of sector to sector assessment within the cordoned model to understand the spread across different geographical areas. Option LB1d provides significant benefits in the vicinity of Woodbridge, Wickham Market, Saxmundham and Aldeburgh. Elsewhere, all zones in close proximity to the A12 benefit from the scheme, although less than with the dual option. Considering option LB2s the benefits are reduced with the most significant benefits found in the vicinity of Saxmundham and Aldeburgh reflective of the less transformational nature of this scheme.

The spatial distribution of benefits and their equity and fairness are analysed further in the Distributional Impacts Report – Appendix G. TEE benefits are mapped on a sector to sector basis in the *Economic Appraisal Report*.

Key Observation

Option LB1d generates over £65m additional benefit for road users over the appraisal period compared to option LB2s. It does this by providing journey time savings of 2-5 minutes and over 5 minutes for more road users. This is a result of the higher speed possible and greater capacity available on a dual carriageway. From a journey time perspective option LB1d is the preferred option.

5.1.3 TEE Dis-benefits as a Result of Construction Activities

QUADRO is the industry-standard software used to derive the construction and maintenance delay elements of the TEE benefits of a scheme. More detail on the methodology and results of QUADRO assessment for construction delays dis-benefits can be found in the *Economic Appraisal Report*. This concludes that SEGway is not expected to create significant delays to the local road network as the scheme is largely being constructed off-line (away from the existing road). “Tie ins” to the existing network are expected to be constructed in such a way that the impact of construction is minimised.

The costs of delay to users during construction is calculated as -£412k for both options (2010 prices, discounted to 2010). This represents a very minor dis-benefit compared to the total benefits generated by the scheme.

5.1.4 TEE – Dis-benefits as a Result of Maintenance Activities

Delays will be experienced by road users during periods of maintenance in the future both with and without the scheme. Delays during road maintenance are however likely to decrease with the scheme in place as the existing A12 provides a suitable diversion route during maintenance on SEGway. Likewise, SEGway can be used as a diversionary route to local traffic to avoid maintenance activities on the old A12. Currently these options for journey resilience are not available.

The dual carriageway option results in a small increase in benefits over the single carriageway option as only one direction of the new road needs to be closed and traffic diverted at a time for maintenance activities.

The proportion of maintenance delay benefits to the total benefits of the scheme is calculated to be very small and unlikely to have impact on the value for money of the scheme.

More detail on the methodology and results of QUADRO assessment for maintenance delays dis-benefits can be found in the *Economic Appraisal Report*. This concludes that the scheme generates the following maintenance delay benefits:

- £322,430 benefits for Option LB1d (2010 prices, discounted to 2010) over the 60-year scheme appraisal
- £111,113 benefits for Option LB2s (2017 prices, discounted to 2010) over the 60-year scheme appraisal.

The results for the construction and maintenance delays combined are included within the TEE table, the AMCB table and within the Benefit Cost Ratio (BCR) for the Central Case.

5.1.5 Journey Time Reliability

The term reliability is referred as a variation in journey times that individuals are unable to predict. Such variation could come from congestion or from non-recurring events, such as accidents. It excludes predictable variation relating to varying levels of demand by time of day, day of week, and seasonal effects which travellers are assumed to be aware of.

WebTAG provides guidance for modelling and monetisation of changes in journey time reliability for motorway and urban road users. As described in the Appraisal Specification Report, the methodology outlined in *TAG Unit*

A1.3 Appendix C.5 The stress based approach to the assessment of reliability impacts of road proposals is applied to provide a broad indication of the impact of the proposals on reliability.

This approach is based on the change in 'stress' (within the range 75% to 125%) as a result of the proposal, combined with the number of vehicles affected. Stress is the ratio of measured annual average daily flow to the congestion reference flow (a definition of theoretical capacity as defined in the DMRB Volume 5, Section 1, Part 3, Annex D), expressed as a percentage. The lower the percentage, the higher the likelihood that journey time reliability is better.

To take into account the 'bottleneck' effects that occur on the A12, the analysis is carried out on a link where there is expected to be the greatest 'stress' in the Do Minimum scenario. This has been carried out on the Farnham bend. The without scheme stress has been calculated as 90% with both schemes having a stress value of 75%. These values are combined with the volume of traffic to reach an appropriate textual score, which for the two schemes are as follows:

Scheme	Assessment
LB1d	Slight Beneficial
LB2s	Slight Beneficial

A sensitivity test has been carried out to assess the impact of seasonality. The provision of a new dual carriageway bypassing stretch of the A12 (including the Farnham Bend) that both the public and tourism visitors have perceived as unreliable will provide a benefit to commuters and the visitor economy. The without scheme stress was calculated to reduce from 90% to 83% in January and increase to 101% in August. This produces a range of values, from a 'neutral' score to 'slight beneficial'.

Copies of these worksheets are enclosed in Appendix E.

5.1.6 Changes in Indirect Tax

Indirect taxes relate to the taxation levied on goods and services and therefore include excises, duties and VAT. TUBA calculates the changes in indirect taxes as a result of changes in speed and distance. These changes affect the amount of fuel being used and therefore affect the amount of taxes the Government receives.

According to the TAG guidance changes in indirect tax revenues are included as part of the Present Value of Benefits (PVB). Therefore, change in indirect taxes, as a monetary value in 2010 prices discounted to 2010, is included within the AMCB and PA tables and form part of the BCR.

The results output from TUBA for the entire study area predict the following changes in indirect tax revenues:

Scheme	Assessment
LB1d	-£1,339,000
LB2s	-£3,288,000

This decrease in revenue is applied to the benefits, as shown in the *AMCB Table* (Appendix A) and the *Economic Appraisal Report*.

5.1.7 Accident Benefits

The impact of SEGway on road accidents and casualties have been calculated according to WebTAG unit A4.1 using the DfT's COBA-LT software. This makes use of the past 5 years of STATS19 accident data for the area of impact, road link lengths, speeds and traffic flows from the Suffolk County Transport Model. COBA-LT compares scheme options with the without scheme reference case to calculate benefits over the 60-year appraisal period, with these discounted to 2010 for consistency with the other economic analyses. Further detail on the methodology and analyses undertaken is described in the *Economic Appraisal Report*.

The following tables show that both options have a positive impact on reducing accidents and casualties with LB1d providing a higher level of benefits, with the Accident Worksheets in Appendix E.

Casualty Type	Total Saved	Monetary Benefit (60 year appraisal period) discounted to 2010
Number of accidents	407.5	£27,100,800
Fatal Casualties	10.3	
Serious Casualties	90.7	
Slight Casualties	579.7	
Total Casualties	680.7	

Table 5.4 : Accident and Casualty Benefits – Scheme Option LB1d – dual carriageway

Casualty Type	Total Saved	Monetary Benefit (60 year appraisal period) discounted to 2010
Number of accidents	166.5	£9,049,600
Fatal Casualties	1.3	
Serious Casualties	32.2	
Slight Casualties	251.8	
Total Casualties	285.3	

Table 5.5 : Accident and Casualty Benefits – Scheme Option LB2s – single carriageway

A large proportion of the junction benefits (circa 80%) accrue at the A12/A1094 Friday Street junction to the north of the Scheme (15 accidents in the without scheme case across the 5-year period), and some benefits on the existing A12. The majority of the link benefits occur on the existing A12 but there are also some benefits on the parallel B1069/A1152 where SEGway is predicted to result in a decrease in traffic.

Key Observation

One of the supporting objectives of the scheme as set out in the Strategic Case is to “to reduce accidents”. The results suggest that this objective is likely to be achieved by both scheme options with the greatest benefit associated with LB1d, and for this criteria is the preferred option.

5.1.8 Environmental – Noise

Changes in traffic flows can also result in changes in noise, depending on whether properties are located adjacent to affected roads or not. The standard Noise Worksheet from WebTAG Unit A3 has been used to calculate the change in noise levels during the life of the scheme, the change in number of people ‘annoyed’ and the monetary value of those changes (PVB).

The results output from the Noise worksheet presented in Appendix E show the following benefits:

Option	Change in Noise	Monetary Value
LB1d	Households experiencing increased daytime noise in forecast year: 75 Households experiencing reduced daytime noise in forecast year: 190 Households experiencing increased night time noise in forecast year: 53 Households experiencing reduced night time noise in forecast year: 165	£3,799,562
LB2s	Households experiencing increased daytime noise in forecast year: 37 Households experiencing reduced daytime noise in forecast year: 289 Households experiencing increased night time noise in forecast year: 24 Households experiencing reduced night time noise in forecast year: 186	£4,478,734

Table 5.6 : Summary of noise impacts associated with each scheme option, over 60-year appraisal period, discounted to 2010

The greatest increases in noise levels are predicted near to the proposed bypass route (the scheme) and, conversely, the greatest decrease in noise levels are predicted near the existing A12 (around Main Road, Little Glemham and The Street, Farnham) where noise levels are predicted to decrease due to vehicles re-routing to the proposed bypass scheme.

During the night-time period, with the LB1d in place, no noise sensitive receptors are predicted to experience perceptible effects in the opening or future assessment years. For LB2s there are predicted to be four noise sensitive receptors that experience perceptible adverse effects in the future assessment year. Overall either scheme is therefore considered to have a net beneficial effect in terms of noise effects.

Key Observation

One of the supporting objectives of the scheme as set out in the Strategic Case is to “to improve air quality and reduce noise impacts for communities alongside the A12”. The results suggest that this objective is likely to be met by either option in terms of noise, when considered in terms of its net effect.

5.1.9 Environmental – Greenhouse Gases

Changes in traffic flows caused by the introduction of the scheme will result in changes in greenhouse gas emissions from vehicles due to changes in flows, speeds and distance travelled.

The standard Greenhouse Gases Spreadsheet from TAG Unit A3 has been used to calculate the changes in carbon dioxide emissions (tonnes) caused by the scheme, over the duration of the appraisal period.

The results output from the Greenhouse Gases WebTAG assessment are presented in Appendix E. The results show that the change in carbon dioxide emissions and their monetary value over the 60-year appraisal period is as follows for each scheme option, with the speed differential between the single and dual carriageway road options a determining factor in the results.

Option	Change in CO ₂ emissions	Monetary Value
LB1d	+65,692 tonnes	-£2,942,213 – i.e. net dis-benefit
LB2s	-38,749 tonnes	+£1,725,567 – i.e. net benefit

Table 5.7 : Summary of carbon dioxide impacts associated with each scheme option, over 60-year appraisal period, discounted to 2010

5.1.10 Environmental – Air Quality

The likely effects on air quality once the scheme is in place relate predominantly to the changes in traffic emissions for vehicles travelling along affected roads in the study area. The standard Air Quality Worksheet from WebTAG Unit A3 has been used to calculate the impact of the scheme on local air quality, regional air quality and the economic valuation of air pollution for the 60 years after the scheme opening.

The damage costs are based primarily on the health impacts of air quality pollutants. The damage costs for both NO_x emissions and PM₁₀ concentrations are derived from analysis by the Inter Departmental Group on Costs and Benefits (Air Quality) (IGCB(A)) (Defra, 2007) of the typical health impacts arising from changes in NO_x emissions and PM₁₀ concentrations, respectively.

The results of the air quality assessment are detailed in the Local air quality worksheet in Appendix E. In terms of local air quality there will be a mixture of increases and decreases in PM₁₀ and NO₂ concentrations as a result of the scheme.

Option	Change in PM ₁₀ concentrations	Change in NO ₂ concentrations	Monetary Value
LB1d	1008 receptors improve 318 receptors deteriorate 1 receptor with no change	938 receptors improve 386 receptors deteriorate	£9,671,877
LB2s	508 receptors improve 134 receptors deteriorate	457 receptors improve 185 receptors deteriorate	£3,572,764

Table 5.8 : Summary of local air quality impacts associated with each scheme option, over 60-year appraisal period, discounted to 2010

The improvements are generally observed at the receptors within the villages of Farnham, Little Glemham and Lower Hacheston along the existing A12, and the villages of Eyke, Rendlesham, Tunstall on the B1069. This is likely due to the bypass re-routing traffic away from these areas. Deteriorations are expected to occur along B1078, A1094 and along the new bypass, again, likely due to re-routing of traffic onto the proposed scheme bringing more traffic closer to these receptors. Overall, the dual carriageway (Option LB1d) has a greater net benefit value than the single carriageway (Option LB2s) in terms of net values for local air quality.

Key Observation

One of the supporting objectives of the scheme as set out in the Strategic Case is to “to improve air quality and reduce noise impacts for communities alongside the A12”. The results suggest that this objective is likely to be met by either scheme option in terms of air quality, with the greatest benefit provided by LB1d.

5.2 AMCB Summary

The AMCB table for both scheme options' central case is presented in Appendix A. Key headlines from this table in terms of the Present value of Benefits (PVB), Present Value of Costs (PVC), Net Present Value (NPV) and Benefit Cost Ratio (BCR) are shown below.

	LB1d – dual carriageway	LB2s – single carriageway
PVB (£000s)	£230,548	£143,407
PVC (£000s)	£120,928	£75,576
NPV = (PVB – PVC) (£000s)	£109,620	£67,831
BCR = (PVB ÷ PVC)	1.906	1.898

Table 5.9 : Summary Assessment of Monetised Costs and Benefits for Option LB1d and LB2s – Central Case with weekend benefits, 2010 prices discounted to 2010, 60-year appraisal period

6. Assessment of Non-Monetised Benefits - Environmental and Social Impacts

6.1 Overview

The following provides a summary of the WebTAG appraisal for each of the two options. More information can be found in the relevant AST, The Environmental Assessment Report (including Environmental Constraints Map) (Annex) and Appendix E. The qualitative result for each criteria and scheme option is summarised as follows:

Large Adverse
Moderate adverse
Slight adverse
Neutral
Slight Beneficial
Moderate Beneficial
Large Beneficial

6.2 Environmental Impacts

6.2.1 Environmental – Landscape

Both the single (LB2s) and dual carriageway (LB1d), associated earthworks, bridges and roundabouts, would have material adverse effects on the qualities of the landscape that make it special, such as the Special Landscape Area (SLA) with its arable small to medium scale fields, organic field boundaries, the Alde, Ore and Deben tranquil flat river valleys, surrounded by gently sloping or rolling landscape, a network of winding lanes, tall hedges and paths. The proposed highway infrastructure, traffic movement and noise, would affect the visual amenity and tranquillity experienced by high sensitivity receptors such as users of Public Rights of Way (PRoW) and parkland and local residents.

The highway scheme would be adjacent (LB1d) or within 50m (LB2s) of Foxburrow Wood Ancient Woodland. It would also encroach on other woodland areas. The scheme footprint and associated earthworks would vary between 35-65m (LB1d) or 15-60m (LB2s) wide, which would involve the loss or fragmentation of farmland, woodland, trees, hedges and hedgerows. The scheme footprint would cover approximately 39.5 hectares (LB1d) or ~31 hectares (LB2s) of land. Part of the village of Little Glemham would be within 200m of a section of the LB2s carriageway on embankment.

Acoustic barriers and dense screen planting between the proposed highway and the scheme boundary would help to mitigate the negative impact on tranquillity. However, it is likely that there would be material residual effects where landscape mitigation would not be effective within 15 or 100 years. It is unlikely that the adverse effects on views and the settings of Parks and Gardens of Historic and Landscape Interest would be fully mitigated.

The results of the WebTAG assessment show that both Options are predicted to have a Large Adverse Effect as this is the worst score assessed for any of the sub-topics. However, Option LB2s is given fewer scores of Large Adverse than Option LB1d. Overall it is considered that Option LB2s would be the preferred option in landscape terms. This is because Option LB1d is a dual carriageway and therefore larger in scale than Option LB2s, the single carriageway option.

Scheme	Assessment
LB1d	Large Adverse
LB2s	Large Adverse

6.2.2 Environmental – Historic Environment

The proposed options run through an area of rural landscape that is locally dominated by the current A12. No physical impact upon any historic buildings or designated assets is predicted, although there is the potential for adverse effects on the setting of these assets through increased noise and visual intrusion during both the construction and operational phases. This potential is highest for historic buildings located closest to the routes. For Option LB2s, 32 and 33 Hoo Lane lie within 15m of the proposed route and their setting is likely to be affected. Construction of either options would remove part of the multi-period Hacheston Settlement Site, and any potential archaeological remains associated with the former Framlingham branch railway line.

The locations of artefact scatters dating to the prehistoric and medieval periods would also be affected and indicate the potential for the presence of unknown archaeological remains which could be removed or partially removed by construction works. Construction would also remove historic landscape elements associated with Historic Landscape Types (HLTs). During operation, severance resulting from the presence of the scheme would affect the legibility of HLTs.

The overall effect of both options on the historic environment has been assessed to be Moderate Adverse.

Scheme	Assessment
LB1d	Moderate Adverse
LB2s	Moderate Adverse

6.2.3 Environmental – Biodiversity

No internationally or nationally designated sites fall within the footprint of the scheme. The Alde-Ore estuary Special Protection Area (SPA) / Ramsar and Alde-Ore Butley estuaries Special Areas of Conservation (SAC) are, however, connected to the scheme by watercourses and associated roosting / foraging birds could be indirectly affected. The site lies close to Foxburrow Wood County Wildlife Site (CWS) / ancient woodland. Foxburrow Wood CWS is not expected to be directly affected since the scheme is either adjacent to (LB1d) or within 50m (LB2s) of the wood, although there may be indirect effects e.g. through air quality changes, hydrological change, noise or visual disturbance, fragmentation, or habitat degradation. Priority habitats, such as hedgerows, would also be affected. There is the potential for impacts on legally protected or notable species of fauna, such as bats, great crested newts, reptiles, badgers and riparian mammals, where present, as a result of habitat loss / modification, fragmentation, disturbance or mortality / injury.

Overall, the effects of both Options are predicted to be Large Adverse although, due to a lower land-take and greater distance from Foxburrow Wood, LB2s would be preferred on biodiversity grounds.

Scheme	Assessment
LB1d	Large Adverse
LB2s	Large Adverse

6.2.4 Environmental – Water Environment

The construction phase would require earthworks which have the potential of mobilising material via surface water runoff to the water receptors identified (River Ore, River Alde and a drain, a tributary of the River Ore through Little Glemham and the groundwater environment) leading to potential temporary sedimentation. In addition, there is potential for accidental spillages of oils, chemicals, cement and fuels from the movement of

construction traffic across the application site. Temporary water quality issues may arise during construction and a temporary licence may be required to relocate surface water abstraction points.

During the operation of the scheme it is considered that impacts linked to sedimentation or pollution of surface water receptors will be negligible. The addition of impermeable surface areas will lead to increased rates and volumes of surface water runoff with the potential for increased surface water flood risk to downstream receptors.

However, all the above effects are readily avoided / mitigated by standard drainage and pollution controls integral to the design such that, overall, impacts for both options are considered Slight Adverse only and not significant.

Scheme	Assessment
LB1d	Slight Adverse
LB2s	Slight Adverse

6.3 Social Impacts

6.3.1 Social – Physical Activity

TAG Unit A4.1 states that “physical inactivity is a primary contributor to a broad range of chronic diseases such as coronary heart disease, stroke, diabetes and some cancers”. It is recognised that transport and the physical environment of our cities both play a major role in the amount of physical activity that people do on a day-to-day basis.

As described in TAG Unit A4.1, it is satisfactory in inter-urban road schemes where there will be relatively insignificant impacts upon physical activity such as this to provide a qualitative indicator of the impact upon physical activity.

The change in journey time for pedestrian journeys using PROW and the country lane network is anticipated to remain approximately the same. However, the number of pedestrian utility trips along the existing A12, particularly between Stratford St Andrew and Farnham, is expected to increase. There is expected to be no pedestrian use of the new scheme. Cycle trips along the existing A12 are also expected to increase, possibly with some associated increase on the country lanes connecting with the existing A12. There is expected to be low cyclist use of the new A12. There is also expected to be no change in equestrian use as a result of the scheme.

Scheme	Assessment
LB1d	Neutral
LB2s	Neutral

6.3.2 Social – Journey Quality

TAG Unit A4.1 defines journey quality as “a measure of the real and perceived physical and social environment experienced while travelling”. Journey quality addresses changes to the end to end journey experience of transport users with respect to traveller care, travellers’ views, and traveller stress.

A qualitative approach has been used to assess whether the difference between the without scheme and each scheme option will be better, worse or neutral. Both schemes have been assessed separately, but as there is no difference between the two assessments they have been described collectively in **Table 6.1** below.

Journey Quality Category	Impact Assessment
Traveller care (cleanliness, facilities, information)	The scheme will have no material impact on this aspect of journey quality.
Travellers' views	The scheme is assessed to have no significant difference in the views experienced by drivers on the new scheme. Current views which are a combination of villages and countryside will largely be replaced with countryside and stretches of floodplain.
Traveller stress (frustration, fear of accidents and route uncertainty)	<p>The reliability benefits and accident benefits of the scheme are assessed separately for this scheme. The improved certainty of journey time as evident in these assessments is likely to reduce driver frustration.</p> <p>The scheme proposals will improve the road layout with fewer bends, a higher condition of road surface and few impediments to making good progress. This will further reduce driver frustration.</p> <p>The scheme proposals will improve sight distances, create less intrusion of pedestrians and increase the road width which will reduce the fear of accidents.</p> <p>LB1d is likely to offer greater benefit over LB2s through ease of overtaking and by providing a similarly consistent type of road (i.e. dual carriageway) to the immediate sections north of south of the improvement.</p> <p>Nevertheless, LB2s still provides a benefit over existing conditions.</p>

Table 6.1: Journey Quality Impact Assessment

The overall impact assessment for each of the schemes is provided below:

Scheme	Assessment
LB1d	Large Beneficial
LB2s	Large Beneficial

A large beneficial score has been awarded for both options as both will provide a benefit for in excess of 10,000 daily users, as prescribed in TAG Unit A4.1. The relevant worksheets are enclosed in Appendix E.

6.3.3 Social – Security

Transport interventions can impact upon the personal security of transport users or other persons. The principal security impacts on road users relate to situations where they are required to leave their vehicle (e.g. car parks) or where they are forced to stop or travel at low speeds. For freight users, security impacts relate to both the security of drivers and goods carried.

The Scheme is not expected to have any material impact on security issues in the area. While road users are typically more vulnerable to crime while vehicles are standing or slow-moving, there is no evidence that there are current security issues for vehicles travelling on the A12 in the scheme study area.

Scheme	Assessment
LB1d	Neutral
LB2s	Neutral

6.3.4 Social – Access to Services

As the Scheme does not impact upon the public transport network, with the exception of a bus route whose journey times would either remain the same or be slightly quicker through the reduction of traffic on the old A12 through the Four Villages, this indicator is not assessed for this Scheme.

6.3.5 Social – Affordability

The Scheme does not propose any road-charging or change in public transport prices and as such, the only change is from vehicle operating costs. The change in vehicle operating costs is included in the Distributional Impacts assessment (Appendix F).

6.3.6 Social – Severance

Community severance is defined in TAG Unit A4.1 as “the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows.” Severance is caused where vehicle flows “significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement.”

The communities of Farnham, Stratford St Andrew, Little Glemham and Marlesford experience such severance, as a consequence of traffic on the A12 corridor. The heavy flow of traffic generally (>16,000 vehicles AADT), HGVs and LGVs (one-fifth of all traffic in 2014) only adds to community severance. Local residents have reported driving from Farnham to facilities in Stratford St Andrew due to difficulty crossing the road and feeling unsafe on the narrow footways.

Both schemes have been assessed separately, but as there is no difference between the two assessments, due to the similar reduction in traffic on the old A12, the identical provision of bridges over the new route and the similar route alignment, they have been described collectively in **Table 6.2**.

Location	Reference Case – without scheme	With Scheme
Marlesford	<p>Large Severance</p> <p>Volume of traffic and the wider road in this location acts as severance between the bulk of the village located 1/2 mile to the north of the A12 accessed by PROW and a footway alongside Bell Lane with Marlesford Farm café & shop and properties on the south side of the road.</p>	<p>Slight Severance</p> <p>Substantial reduction in existing severance in village. Traffic flows 90% less than without scheme case. Provision of minor road bridge provides some mitigation for the diverted PROW although this walking route will be longer. Conversely access to PROW to Marlesford village will be easier than now.</p>
Little Glemham	<p>Large Severance</p> <p>Volume of traffic on the A12 acts as severance between the two sides of the road. Amenities such as the Lion Inn Public House and Little Glemham Parish Rooms are on the southern side of the A12. Bus stops are on both sides of the road, with properties on both sides of the road. there are no dedicated crossing facilities, so pedestrians must cross two streams of traffic.</p>	<p>Slight Severance</p> <p>Substantial reduction in existing severance in village. Traffic flows 90% less than without scheme case. Crossing to Lion Inn, Little Glemham Parish Rooms, bus stops and neighbours will be easier. Provision of minor road bridge provides some mitigation for the diverted PROW although this walking route will be longer.</p>
Stratford St Andrew	<p>Large Severance</p> <p>The Volume of traffic (in excess of 16,000 vehicles) on the A12 results in severance between properties on the south side of the road and the shops, community facilities and bulk of the village on the north side of the road. For residents wishing to walk to nearby Farnham, there is a need to</p>	<p>No Severance</p> <p>Substantial reduction in existing severance in village. Traffic flows 90% less than without scheme case.</p> <p>Access to Riverside Centre, shop, neighbours and Farnham village will be made easier.</p> <p>Benefits for Regional Cycle Route 41. The</p>

Location	Reference Case – without scheme	With Scheme
	<p>cross the road because of a lack of a continuous footway on the northern side of the road. Traffic islands are provided at two locations at each end of the village although their necessarily flexible design to withstand HGVs does not provide pedestrians with perception of protection.</p> <p>Responses from the 2017 Public Consultation confirmed the perception of community severance in these two villages. Regional Cycle Route crosses the A12 but there is a severance impact due to the difficulty to cross the road, with few users noted in May 2017 surveys.</p>	<p>scheme also allows the route to be slightly re-routed to better serve places where cyclists would rather visit or ride through such as the villages of Farnham and Stratford St. Andrew, rather than bypass them, if desired.</p>
Farnham	<p>Large Severance</p> <p>The volume of traffic on the A12 acts as severance between the two sides of the road. Amenities such as the Farnham Industrial Estate, Mollett’s Farm and Friday Street Farm Shop & Café are severed.</p> <p>There are multiple PROW and dog-walking routes directly to the south of Farnham and the A12 causes severance impacts for access to these for residents on the north side of the A12.</p>	<p>Slight Severance</p> <p>Substantial reduction in existing severance in village and makes walking to nearby Stratford St. Andrew’s facilities now possible. Traffic flows 90% less than without scheme case.</p> <p>The new route does sever some PROW routes, however there is a bridge provided for walkers.</p>

Table 6.2: Severance classification by area

LB1d and LB2s both contribute to a “substantial relief”⁵ in community severance for the residents of the Four Villages of Marlesford, Little Glemham, Stratford St Andrew and Farnham, with traffic flows forecast to become 90% less on the old A12 than in the without scheme case. This improves access to local services such as the Riverside Centre, playing fields, churches, pub, shops, cafes, jobs and neighbours. Both SEGway options improve access to PROW located to the north of the A12. Some PROW to the south of the A12 are likely to be re-routed with bridges provided to enable safe crossing of the A12. Suffolk County Council’s Project Delivery Team will work with local stakeholders to best meet the needs of walkers, cyclists and horse riders in the detailed design of these facilities as part of the next stage of the scheme.

Despite this substantial relief for the community, the population of the Four Villages and level of walking is such that only a maximum of a slight beneficial rating can be given, with around 200 people likely to benefit. The relevant worksheets can be found in Appendix E.

Scheme	Assessment
LB1d	Slight Beneficial
LB2s	Slight Beneficial

6.4 Appraisal Summary Table

These results are summarised for each option in the standalone Appraisal Summary Table (Appendix B).

⁵ As defined by the Design Manual for Roads and Bridges, Volume 11, Section, 3, Part 8, June 1993

7. Assessment of Distributional Impacts

7.1 Purpose of the Assessment

The assessment of Distributional Impacts (DIs) is designed to help understand the impacts of transport interventions on different groups of people, including those potentially more vulnerable to the effects of transport. Consideration of the DIs of transport schemes is a mandatory requirement of WebTAG. As per TAG Unit A4.2, the DI Appraisal requires the consideration of the following eight DI Indicators:

- User Benefits (journey times and vehicle operating costs);
- Noise;
- Air Quality;
- Accidents;
- Security;
- Severance;
- Accessibility;
- Affordability.

The full appraisal process is based on a three step approach:

- Step 1 – Screening Process
- Step 2 – Assessment
- Step 3 – Appraisal of Impacts

7.2 Step 1 – Screening Process

Step 1 identifies which of the eight DI indicators should proceed to Step 2, by assessing whether their impacts are either significant or concentrated. The screening pro-forma was developed once the design of the scheme had been progressed and an understanding of the impacts had been gained. This pro-forma was shared with and signed off by the DfT in October 2017. This concluded that the following indicators would not be measured for the scheme and why:

- Security - The scheme is not considered to impact on public transport waiting facilities / interchange facilities; changes to pedestrian access; changes to provision of lighting and visibility; changes to landscaping; or changes to formal or informal surveillance.
- Accessibility - The scheme design at this stage does not specifically address public transport routes. Whilst reducing the volume of traffic on the existing A12 would improve access to local and regional centres of services such as Ipswich, Woodbridge Saxmundham and Aldeburgh through reduced and more reliable journey times for users of local bus services on route 64 as well as car users, this impact is unlikely to have a significant impact on accessibility.

7.3 Step 2 – Assessment and Step 3 – Appraisal

The DI appraisal has assessed the likely distribution of Scheme benefits among specific social group populations to determine the extent to which scheme benefits are experienced by those groups compared with the general population. The geographic distribution of the DI indicators, has been compared with the geographic distribution of concentrations of groups that may be particularly susceptible to the negative impacts. So, for example, where there is a much greater proportion of benefits for a population group (e.g. elderly residents) than the proportion of population in that group, then this is scores as a large beneficial for that group.

User benefits were assessed as neutral for the most deprived quintile, moderate beneficial for the 2nd and 3rd most deprived quintile and slight beneficial for the two least deprived quintiles for both schemes. The noise impact area only contained population from the middle income quintile, with a minor adverse score awarded for LB1d and a minor beneficial score awarded for LB2s. The air quality impact area only impacted upon two income quintiles, which were the 4th quintile (2nd least deprived) and 3rd quintile. Impacts for both NO₂ and PM₁₀ were assessed for both schemes. There were beneficial impacts for both quintiles for both particulates for LB1d and generally beneficial impacts for LB2s with exception of the 4th quintile for NO₂ which received a score of moderate adverse.

Accidents were scored as neutral for children & young people, moderate beneficial for older people, neutral for pedestrians and moderate beneficial for cyclists and motorcyclists for both schemes. For severance, both schemes were assessed to have a slight beneficial impact across all user groups.

Full details of the methodology and results for each DI impact are provided within the Distributional Impact Appraisal Report included within Appendix F. In addition, the relevant appraisal results are included in the AST in Appendix B.

8. Assessment of Wider Economic Benefits

8.1 Introduction

Wider economic benefits are of important consideration for both the *Strategic Case* and *Economic Case*, with further detail on East Suffolk's economic performance and context and the rationale for considering these assessments in the *Strategic Case* and *Economic Appraisal Report*.

This chapter provides a brief summary of the results for the following elements, with further detail on methodology contained in the *Economic Appraisal Report*.

- Induced investments
- GVA benefits associated with complementary benefits
- Employment
- Agglomeration
- Regeneration.

These wider economic benefits should be considered in tandem with the conventional TEE benefits, environmental and social impacts, and the sensitivity tests in determining the scheme's value for money banding.

The following matrix is useful for considering how the quantified wider economic impacts can be considered or seen as relevant for the central case and sensitivity tests (discussed further in Chapter 9):

Wider Economic Impact		Central Case	1: Central Case excl weekend benefits	2 & 3: Sizewell	4: High growth	5: Low growth	6: Variable Demand
Induced investments		Presented	Relevant	Presented	Relevant	Relevant	Presented
GVA growth associated with Complementary developments	Tourism	Consider			Consider		Presented
	Employment	Presented	Consider	Consider	Consider	Consider	Consider
	Sizewell C employment	Consider	Consider	Presented	Consider		Consider

Table 8.1 : Matrix of Wider Economic Impacts by Central case and Sensitivity Tests

8.2 Induced Investments

In line with TAG Unit A2.2, the additional consumer surplus which arise due to the presence of imperfect competition (the market structure distorts the efficient operation of the market), is estimated by applying a 10% uplift factor to the business and freight user benefits calculated by TUBA, as long as there is evidence that business would increase output in response to the transport investment.

The *Strategic Case* has demonstrated that the A12 in its current form has a negative impact on existing business activities and constrains prospects for growth, with key issues being unpredictable journey times, a perception that the area is unattractive for investment of business expansion and the length of business-related journey times such as deliveries and visiting clients. It is therefore considered appropriate that this additional 10% be applied in the form of an adjusted BCR.

The impact that this has on the central case for Options LB1d and LB2s is shown below in **Table 8.2**. Impacts on sensitivity tests are presented in Chapter 9.

Option	Central Case BCR	Central Case Adjusted BCR
LB1d	1.906	1.961
LB2s	1.898	1.956

Table 8.2 : Impact of Induced Investments on BCRs for each option for the Central Case

8.3 Wider Impacts associated with complementary developments

In line with WebTAG, the monetised impacts included in calculation of the core scheme BCR do not include the effect of the GVA growth unlocked by the scheme. GVA measures the total value of goods and services; i.e. economic activity. In its simplest terms, it is therefore Gross Domestic Product (GDP) at a local/regional level.

Transport acts as an enabler of growth by providing enhanced transport links and transport capacity that allows:

- additional jobs to be accommodated in a certain location
- additional people to visit an area and spend their money on services supplied by the visitor economy.

This applies especially to areas suffering from either congestion or insufficient transport links. These jobs or an increase in revenue are therefore not created by the transport scheme itself, but are supported by the increase in accessibility facilitated by the scheme. The jobs and/or spending is therefore (to varying proportions) dependent on the transport scheme – i.e. complementary. This GVA assessment aims to quantify the increase in GVA for the local economy as a result of these additional jobs or visitors.

Summary of Wider Impacts		
Sizewell C employment GVA impacts	GVA Impact (5% - 15% attribution)	£30 million - £115 million
Employment GVA impacts Carlton Park Industrial Estate	GVA Impact (10% - 20% attribution)	£9 million - 19 million
Tourism GVA impacts	GVA impacts	£42.6 million

Table 8.3 : Summary table of wider impacts, 60-year appraisal period

Greatest confidence can be given to the Sizewell C and tourism related benefits given the clear link demonstrated between transport connectivity and these sectors in the *Strategic Case*. The Carlton Park Industrial Estate is also well located to benefit from improved connectivity as a result of SEGway, being close to its northern end.

Full details of the GVA/GDP assessment for SEGway can be found in the *Economic Appraisal Report*.

At this stage, the Economic Case has not sought to quantify the potential contribution that SEGway could make to realising the distribution and scale of housing growth associated with the Local Plan Reviews currently under way in Suffolk Coastal District and Waveney District to help plan for growth to 2036. This is described in more detail as part of the *Strategic Case* including the development options and quantum possible.

Suffolk Coastal District Council consulted in the autumn of 2017 on Issues and Options associated with Local Plan growth, with potential housing growth beyond (up to +40%). SCDC have put forward three contrasting alternative options which include a potential shift in focus to the A12 corridor; a potential shift in focus on Ipswich and the A14 corridor, or a continuation of the existing approach (<http://www.eastsuffolk.gov.uk/planning/local-plans/suffolk-coastal-local-plan/local-plan-review/>).

The neighbouring district of Waveney has also consulted on its First Draft Local Plan, with a final draft published and then submitted for examination in late spring 2018, with adoption anticipated by the end of 2018 (<http://www.eastsuffolk.gov.uk/planning/local-plans/waveney-local-plan/new-waveney-local-plan/>).

At this stage of the Local Plan process, the Outline Business Case does not seek to quantify the potential complementary GVA and housing attribution benefits, except to note that the local plan timescales should allow the Full Business Case to report these results. Similarly, greater certainty with SEGway at that stage will help decision makers understand the merits (or otherwise) of increased development on the A12 corridor.

8.4 Employment – labour supply impacts and a change in productive job impacts

The welfare benefits from labour market impacts are partially captured in commuter user benefits but the tax implications are not and to estimate them it is necessary to quantify the full effects of i) labour supply impacts, and ii) the move to more or less productive jobs impacts. To formally assess these impacts it is necessary to demonstrate how the level of 'national' employment, not just 'local' employment would be affected by a transport scheme. Transport investment may induce individuals who are economically inactive to enter the labour market by affecting the effective return to labour.

The SEGway scheme may result in labour supply impacts, which is a quantifiable change in tax revenues due to higher employment levels. However, this impact has not been quantified due to proportionality. The calculations and data involved in this type of analysis are time-consuming and would not be expected to result in a very large impact, and so a qualitative impact has been presented.

The SEGway scheme is expected to improve journey times, which is a time saving for commuters, and thus reduces the cost of going to work. This can be expected to increase the amount of time spent in work, by drawing workers into the labour market or by widening labour market catchment areas to facilitate job matching. Residents of the A12 villages seem the most likely to be impacted by the road improvements. Residents of Waveney District would also benefit as Census (2011) data indicates that approximately 1,700 Waveney residents commute to Ipswich or Suffolk Coastal District.

The contribution of the scheme in terms of facilitating investment at Sizewell C nuclear power station is one example where both a regional and a national level benefit could be expected. The Government's Industrial Strategy White Paper⁶ notes that "The nuclear sector is integral to increasing productivity and driving growth across the country".

"Industry-led proposals for a Nuclear Sector Deal focus on how, working with the government, substantial cost reductions can be achieved across the UK's new build and decommissioning programmes. There are shared interests in improving productivity and the opportunities to improve the UK's competitiveness, domestic capability and export growth. The sector's proposals cover the supply chain, nuclear R&D and skills, where the aim of the deal is to help deliver the diverse workforce needed for the future, supporting a potential 100,000 jobs from Cumbria, north Wales, Somerset, Essex and Suffolk".

8.5 Agglomeration

The term 'agglomeration' refers to the concentration of economic activity over an area. Transport can alter the accessibility of firms in an area to other firms and workers, thereby affecting the level of agglomeration. Agglomeration impacts arise because firms derive productivity benefits from being close to one another and from being located in large labour markets. These can occur within an industry (localisation economies) and/or across industries (urbanisation economies).

The SEGway scheme is not expected to have quantifiable agglomeration impacts, which would be due to increasing effective density of employment. The scheme is expected to improve journey times, which does imply an increase in effective density. However, the area of the scheme does not fall within a functional urban region (FUR), meaning the density of employment is not at a threshold level where agglomeration impacts could be significant and measurable.

The impact on businesses in the area is expected to be positive. As described in the *Strategic Case*, in 2016 Suffolk County Council undertook an extensive engagement exercise with businesses in East Suffolk to understand local businesses perception of significant transport issues. This found that East Suffolk's businesses

⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf

have ranked an improvement to the A12 between Farnham and Marlesford as the most pressing for investment to help solve problems of journey time reliability, the perception of the area's suitability for inward investment and journey times to customers and for staff. The SEGway A12 scheme addresses concerns about this section of the road. By addressing local businesses' concerns, the scheme may attract investment to the local area as firms see opportunities for growth.

Private and public sector investment is ongoing in high value economic sectors such as energy, advanced agriculture, food and drink, ICT, life sciences and the visitor economy, and in conjunction with the SEGway scheme is likely to have a beneficial impact in terms of better linking clusters of similar knowledge and technology industries that already exist in Ipswich, Lowestoft and elsewhere in East Suffolk. Innovative organisations such as Cefas (headquartered) in Lowestoft already work across the marine science, technology and energy sectors. Similarly, firms located in the Great Yarmouth and Lowestoft Enterprise Zone at the centre of the east of England's 'all-energy coast' will be able to strengthen the area's status as a centre of excellence for energy production and distribution in the UK. However, all of this would not be considered additional (nationally) and thus should not be quantified as a benefit.

8.6 Regeneration

The scheme is not in, nor does it affect a defined "regeneration area", and so for the purposes of the AST, both options have been marked as not applicable. However, parts of Lowestoft and Great Yarmouth to the north of the scheme are classified as "Assisted Areas" and would benefit from improved connectivity by road and the perception of that relative improvement as a result of either scheme option.

9. Sensitivity Test Results

9.1 Introduction

The following sensitivity tests are presented in order:

1. Central case – excluding weekend benefits
2. Central case – with Sizewell C traffic and developer contribution
3. Sizewell C alternative scenario incorporating developer contribution
4. & 5. High and low growth
6. Variable demand.

The tables are limited to headline figures for the present value of benefits, present value of costs, net present value and benefit cost ratio. In addition, the impact of wider economic benefits (induced investments) by applying a 10% uplift factor to the business and freight user benefits calculated by TUBA, is shown as an adjusted BCR for each sensitivity test. Full details of the make-up of the monetised costs and benefits can be found in the *Economic Appraisal Report* and associated workbooks enclosed as part of Appendix A.

9.2 Sensitivity Test 1 – Central Case excluding weekend benefits

Table 9.1 shows the impact of not counting the weekend benefits as part of the central case appraisal, resulting in a 20% drop in benefits.

Metrics	Option LB1d (dual carriageway)		Option LB2s (single carriageway)	
	Including weekend benefits	Excluding weekend benefits	Including weekend benefits	Excluding weekend benefits
PVB (£000s)	£230,548	£185,763	£143,407	£114,594
PVC (£000s)	£120,928	£120,928	£75,576	£75,576
NPV (£000s)	£109,620	£64,835	£67,831	£39,018
BCR	1.906	1.536	1.898	1.516
Wider economic benefits (£000s)	£6,537	£5,811	£4,392	£3,901
Adjusted BCR	1.961	1.584	1.956	1.568

Table 9.1 : Sensitivity Test 1: Impact of including and excluding weekend benefits (Options LB1d and LB2s)

9.3 Sensitivity Test 2 – Central Case with Sizewell C

In this sensitivity test, forecast Sizewell traffic (provided by EDF Energy's consultants) has been included within the do-something scenario. Sizewell construction is assumed to take place over a 10-year period starting in 2026 and finishing in 2035. For this reason, six assessment years have been included in TUBA as follows:

- 2023 without Sizewell (scheme opening year)
- 2025 without Sizewell (before 1st construction year)
- 2026 with Sizewell Traffic (start of 10-year construction period)
- 2035 with Sizewell Traffic (end of 10-year construction period)
- 2036 without Sizewell Traffic (after last construction year)
- 2038 without Sizewell (scheme forecast year)

The outputs of the economic appraisal for this test are summarised in **Table 9.2** below for options LB1d and LB2s. In this scenario the TEE table records a negative impact in the 'other business impacts' section as a result of indicative developer contributions associated with Sizewell C mitigation (in lieu of providing an alternative highway scheme along the A12 – identified as options within EDF Energy's Sizewell C Stage 2 Consultation), the £26 million (2017 prices) calculated cost of a 2-village bypass is presented as the developer contribution, with this having been deflated and discounted for the appraisal. This represents the dis-benefit to the business community due to the payment of developer contributions towards the scheme. Note that this is offset by an associated reduction in the scheme costs payable by the public sector.

Metrics	LB1d		LB2s	
	Central Case	With indicative Sizewell C developer contribution	Central Case	With indicative Sizewell C developer contribution
PVB (£000s)	£230,548	£213,332	£143,407	£125,090
PVC (£000s)	£120,928	£101,177	£75,576	£55,825
NPV (£000s)	£109,620	£112,155	£67,831	£69,265
BCR = PVB ÷ PVC	1.906	2.109	1.898	2.241
Wider economic benefits (£000s)	£6,537	£4,750	£4,392	£2,536
Adjusted BCR	1.961	2.155	1.956	2.286

Table 9.2 : Sensitivity Test 2: Central Case with Sizewell C and indicative private sector developer contribution

In addition, the value for money categorisation associated with this sensitivity test should consider the £30 million to £115 million of GVA benefits that could be attributable to SEGway as a result of its contribution to facilitating new employment at Sizewell C.

9.4 Sensitivity Test 3 – Alternative Scenario with Sizewell C

The aim of this assessment is to understand the marginal change in costs and benefits associated with a full bypass compared to the without scheme case which in this scenario includes the potentially wholly developer funded short bypass of Farnham and Stratford St. Andrew (Option SB5s) if SEGway was not progressed. The results are shown below in **Table 9.3** for options LB1d and LB2s.

Metrics	LB1d		LB2s	
	Central Case	Sizewell C Alt. Scenario	Central Case	Sizewell C Alt. Scenario
PVB (£000s)	£230,548	£189,875	£143,407	£101,634
PVC (£000s)	£120,928	£101,177	£75,576	£55,825
NPV (£000s)	£109,620	£88,698	£67,831	£45,809
BCR = PVB ÷ PVC	1.906	1.877	1.898	1.821
Wider economic benefits (£000s)	£6,537	£5,326	£4,392	£3,111
Adjusted BCR	1.961	1.929	1.956	1.876

Table 9.3 : Sensitivity Test 2: Alternative Scenario with Sizewell C and private sector developer contribution (£indicative £26 million)

Again the value for money categorisation associated with this sensitivity test should also consider the £30 million to £115 million of GVA benefits that could be attributable to SEGway as a result of its contribution to facilitating new employment at Sizewell C.

9.5 Sensitivity Tests 4 & 5 – High and Low growth

Sensitivity tests have also been undertaken to investigate the effect on the scheme BCR uncertainty regarding future traffic growth associated with high and low growth. The results of the benefits are provided in **Table 9.4** and **Table 9.5** below for options LB1d and LB2s respectively, with further detail on the methodology in the *Economic Appraisal Report*.

Metrics	Low Growth	Central Case	High Growth
PVB (£000s)	£202,212	£230,548	£251,028
PVC (£000s)	£120,928	£120,928	£120,928
NPV (£000s)	£81,284	£109,620	£130,100
BCR = PVB ÷ PVC	1.672	1.906	2.076
Wider economic benefits (£000s)	£5,396	£6,537	£7,499
Adjusted BCR	1.717	1.961	2.137

Table 9.4 : Sensitivity Tests 4 and 5: High and Low Growth (Option LB1d)

Benefits decline by around 12% in the low growth scenario, and increase by around 9% in the high growth scenario for option LB1d. With low growth this option would still result in medium value for money, although with high growth being realised the scheme would move up to the “high” value for money category subject to consideration of non-monetised impacts.

Metrics	Low Growth	Central Case	High Growth
PVB (£000s)	£123,841	£143,407	£153,721
PVC (£000s)	£75,576	£75,576	£75,576
NPV (£000s)	£48,265	£67,831	£78,145
BCR = PVB ÷ PVC	1.639	1.898	2.034
Wider economic benefits (£000s)	£3,625	£4,392	£4,902
Adjusted BCR	1.687	1.956	2.099

Table 9.5 : Sensitivity Tests 4 and 5: High and Low Growth (Option LB2s)

A very similar result is found for option LB2s, with the only slight change to the previous commentary being an increase in benefits of just 7% in the high growth scenario. Nevertheless, this would still represent high value for money.

9.6 Sensitivity Test 6 – Variable demand

Lastly, the Variable Demand Model component within the SCTM has been used to understand the sensitivity of latent demand to new transport infrastructure. As previously noted the results have been interrogated to understand the realism of the induced demand, and the results presented here represent those changes within the cordoned model as well as the full model for option LB1d.

As **Table 9.6** shows, the VDM sensitivity test results in a reduction of benefits and a BCR of 1.47 as a result of an increase in demand of approximately 20% for LB1d.

Further analysis highlighted that approximately 10% of the traffic increase is a result of reassignment (partly from outside the cordon model area) with the remaining 10% a direct result of the VDM.

A further sensitivity has therefore been undertaken assigning the Dual A12 scheme using the full SCTM; results have then been cordoned for input to TUBA. With this test, all potential rerouting impacts are fully captured.

Table 9.6 presents the results of the Full SCTM assignment compared with the Central Case and VDM values, which were both assigned to the cordoned SCTM.

As expected, the BCR of 1.68 lies midway between the Central Case and VDM value.

Metrics	Option LB1d (dual carriageway)		
	Central Case	Full SCTM assignment	Variable Demand (full model)
PVB (£000s)	£230,548	£197,437	£172,843
PVC (£000s)	£120,928	£120,928	£120,928
NPV (£000s)	£109,620	£76,509	£51,915
BCR = PVB ÷ PVC	1.906	1.633	1.429
Wider economic benefits (£000s)	£6,537	£5,173	£4,482
Adjusted BCR	1.961	1.675	1.466

Table 9.6 : Sensitivity Test 6: Impact of incorporating variable demand within both the cordoned and full demand model (Option LB1d)

Table 9.7 shows the results for the VDM run for the single carriageway option. This result includes both VDM and wider redistribution impacts.

Metrics	Option LB2s (single carriageway)	
	Central Case	Variable Demand (full model)
PVB (£000s)	£143,407	101,833
PVC (£000s)	£75,576	75,576
NPV (£000s)	£67,831	26,257
BCR = PVB ÷ PVC	1.898	1.347
Wider economic benefits (£000s)	£4,392	£2,803
Adjusted BCR	1.956	1.385

Table 9.7 : Sensitivity Test 6: Impact of incorporating variable demand within the full demand model (Option LB2s)

In considering the results of this sensitivity test, the flip side of variable demand should be considered in the appraisal, namely the economic function of the additional trips that may be created as a result of a scheme. As the Wider Economic Impacts and *Strategic Case* has noted, tourism is an important part of the economy, and there is a clear link between improved accessibility and visitor journeys to East Suffolk and Norfolk's coast. The wider economic impacts analysis has calculated £42.6 million of GVA benefits associated with increased tourism.

9.7 Summary

Table 9.8 summarises the costs and benefits of each tested scenario. All tests include weekend benefits except where stated otherwise.

Scenario	Option LB1d (dual carriageway)				Option LB2s (single carriageway)			
	PVB (£000s)	PVC (£000s)	NPV (£000s)	BCR	PVB (£000s)	PVC (£000s)	NPV (£000s)	BCR
Central Case including weekend benefits	£230,548	£120,928	£109,620	1.906	£143,407	£75,576	£67,831	1.898
Central Case excluding weekend benefits	£185,763	£120,928	£64,835	1.536	£114,594	£75,576	£39,018	1.516
With Sizewell Traffic	£213,332	£101,177	£112,155	2.109	£125,090	£55,825	£69,265	2.241
Alternative with Sizewell Traffic	£189,875	£101,177	£88,698	1.877	£101,634	£55,825	£45,809	1.821
High Growth Sensitivity	£251,028	£120,928	£130,100	2.076	£153,721	£75,576	£78,145	2.034
Low Growth Sensitivity	£202,212	£120,928	£81,284	1.672	£123,841	£75,576	£48,265	1.639
VDM including weekend benefits	£172,843	£120,928	£51,915	1.429	£101,833	£75,576	£26,257	1.347
Full SCTM assignment	£197,437	£120,928	£76,509	1.633	-	-	-	-

Table 9.8: Scenario summary of benefits

At the headline BCR level there is very little to differentiate the two options. The Sizewell C options result in a slightly higher BCR for LB2s as a consequence of the lower present value of costs and the sensitivity of a ratio calculation to lower absolute numbers. Moving to the PVB column, the results demonstrate that the additional cost for LB1d is adequately rewarded in its benefit stream. LB1d's benefits are approximately 60% higher than those realised by LB2s.

Considering just the monetised costs and benefits all of the scenarios demonstrate that either scheme option offers at least "medium value for money" when just these impacts are considered. When considering sensitivity tests such as Sizewell C traffic added to the Central Case or high growth this increases to "high value for money."

Having done further analysis within the VDM to isolate dis-benefits considered most unrealistic for the scheme, the Full SCTM results for LB1d still suggest that the scheme can be categorised initially as within the medium value for money banding when just considering typically monetised benefits, albeit it at the lower level of the range. Should further consideration of the VDM test be desired, then this should also consider the purpose of the induced demand and its wider economic value in the value for money framework, with the *Strategic Case* and the wider economic impacts making a strong case for inclusion of tourism related GVA benefits.

Finally, the impact of induced investments on the “adjusted BCR” is presented in **Table 9.9** below.

Scenario	Option LB1d (dual carriageway)		Option LB2s (single carriageway)	
	Core BCR	Adjusted BCR	Core BCR	Adjusted BCR
Central Case including weekend benefits	1.906	1.961	1.898	1.956
Central Case excluding weekend benefits	1.536	1.584	1.516	1.568
With Sizewell Traffic	2.109	2.155	2.241	2.286
Alternative with Sizewell Traffic	1.877	1.929	1.821	1.876
High Growth Sensitivity	2.076	2.137	2.034	2.099
Low Growth Sensitivity	1.672	1.717	1.639	1.687
VDM including weekend benefits	1.429	1.466	1.347	1.385
Full SCTM assignment	1.633	1.675	-	-

Table 9.9: Scenario summary of benefits including adjusted BCRs associated with induced investment wider impacts

This is not enough on its own to change the value for money categorisation of either option although it pushes the Central Case to within 0.04 of a “high value for money” categorisation with an adjusted BCR of 1.96, on just this basis. The Value for Money Statement now considers the costs and benefits that could be considered in making the case for the most appropriate banding for each scheme option.

10. Value for Money Assessment

10.1.1 Appraisal Summary Tables

The AST presents evidence from the assessment that is undertaken to inform the Economic Case of an intervention. Applying the principles of HM Treasury Green Book, the AST has been designed to record all impacts - Economic, Environmental, Social, Public Accounts and Distributional - at the national level.

The ASTs for LB1d and LB2s which summarise the information contained within the Economic Case are included in Appendix B.

10.1.2 Value for Money Statement

The Value for Money assessment of the proposed SEGway scheme has been undertaken in line with the WebTAG and the Appraisal Specification Report to support the Outline Business Case of the scheme. As part of this assessment the economic, environmental, social, distributional and fiscal impacts of the proposed scheme have been appraised using qualitative, quantitative and monetised information.

A summary of monetised costs and benefits as prepared for the Economic Case is provided in **Table 10.1**.

Benefit	LB1d Value	LB2s Value
Present value of benefits (£000s)	£230,548	£143,407
Present value of costs (£000s)	£120,928	£75,576
Net Present Value (£000s)	£109,620	£67,831
BCR = PVB ÷ PVC	1.906	1.898

Table 10.1 : Assessment of Monetised Costs and Benefits Summary (all costs in 2010 prices, discounted to 2010)

Based on the DfT's Value for Money Categorisation (**Table 10.2**) both options can be initially categorised as offering medium value for money, albeit at the top of the BCR range. The majority of monetised benefits (>80%) for LB1d are associated with transport economic efficiency. Other important components for LB1d include accident and related casualty savings (11%) and local air quality (4%). The importance of transport economic efficiency is greater for LB2s with these responsible for around 90% of the monetised benefits for this option. Nonetheless accident and related casualty savings, noise and air quality all make meaningful contributions. Dis-benefits are limited to indirect taxation revenue, construction delay (albeit these are very low) and in the case of LB1d only, greenhouse gas emissions.

Value for Money Category	BCR Range
Poor VfM	Less than 1.0
Low VfM	Between 1.0 and 1.5
Medium VfM	Between 1.5 and 2.0
High VfM	Between 2.0 and 4.0
Very High VfM	Greater than 4.0

Table 10.2 : DfT's Value for Money Benefit Cost Ratio Categorisation

The above assessment relates only to the consideration of the impacts which have been monetised. As set out within this Economic Case, there are several impacts which have not been monetised or monetised but not included in the BCR (i.e. wider impacts), yet should still form part of the overall value for money assessment. These impacts and their qualitative assessment scores are summarised within **Table 10.3** and **Table 10.4**.

Impact	LB1d Assessment	LB2s Assessment
Economy - Reliability	Slight beneficial	Slight beneficial
Economy - Regeneration	N/A	N/A
Environmental - Landscape	Large adverse	Large adverse
Environmental - Townscape	N/A	N/A
Environmental - Historic Environment	Moderate adverse	Moderate adverse
Environmental - Biodiversity	Large adverse	Large adverse
Environmental - Water Environment	Slight adverse	Slight adverse
Social - Physical activity	Neutral	Neutral
Social - Journey quality	Large beneficial	Large beneficial
Social - Security	Neutral	Neutral
Social – Access to Services	N/A	N/A
Social - Affordability	N/A	N/A
Social - Severance	Slight beneficial	Slight beneficial
Social - Use and Non Use Values	N/A	N/A

Table 10.3 : Non- Monetised Assessment Summary

Impact	LB1d Assessment	LB2s Assessment
Induced Investments	£6.5 million	£4.4 million
Sizewell C employment GVA	£30 million - £115 million GVA	
Tourism GVA	£42.6 million GVA	
Carlton Park Industrial Estate employment GVA	£9 million - £19 million	
Total	£86 million - £183.1 million	

Table 10.4 : Key Wider Impacts Assessment Summary (60-year appraisal period, 2010 prices, discounted to 2010)

Both options result in adverse impacts on the environment. On the flip side both options result in benefits including substantial relief from community severance for the Four Villages and slight beneficial improvements in reliability and large beneficial improvements in journey quality for the 20,000+ daily vehicles expected to use the A12 in the opening year.

Consideration has been given to the impact on each option’s value for money categorisation if costs or benefits could be assigned to the factors that are not currently monetised in WebTAG such as landscape, or impacts such as GVA or induced investments which can be monetised but not included in the core BCR were considered. This is known in DfT’s Value for Money Framework as the concept of ‘switching values’. The required change in scheme costs or benefits required for the scheme to move to either a low or a high value for money categorisation from its initial medium value for money categorisation is shown below.

Option	Low (BCR < 1.5)		Central Case (Medium)	High (BCR > 2.0)	
LB1d	Benefits ▼ £49m (21%)	Costs ▲ £33m (27%)	1.906	Benefits ▲ £11m (5%)	Costs ▼ £5.5m (5%)
LB2s	Benefits ▼ £30m (21%)	Costs ▲ £20m (27%)	1.898	Benefits ▲ £8m (5%)	Costs ▼ £4m (5%)

Table 10.5 : Scale of change in costs or benefits to switch either scheme from its initial medium value for money categorisation to low or high value for money

These results suggest that LB1d has a greater certainty that it would offer medium value for money even with an increase in costs or decrease in benefits. Both options need a relatively modest increase in benefits or reduction in cost to be categorised as high value for money. Suffolk County Council’s current preference for a “Negotiated Route” to procurement provides one opportunity to capture innovative means to reduce cost to the scheme and try and realise that difference. Then looking at the benefits the supporting wider impacts analysis has demonstrated a range in benefits from £86 million to £183.1 million. **Taking these benefits at just the bottom of their range is sufficient to switching the "Central Case" from ‘medium’ to ‘high’ value for money.**

The sensitivity tests presented also show that with high growth or Sizewell C coming forward and the developer contributing to the scheme would enable either scheme option to offer high value for money given the reduced public sector contribution required.

The marginal impacts of a Four Village Bypass have been compared with a wholly developer funded Two Village Bypass for Sizewell C. The outcome of this is to show only a minor decrease in the BCR by 0.02 in the case of LB1d, and as such the scheme would still be considered a strong medium value for money scheme on just this criterion. Again this categorisation would need to consider the £86m to £183.1 m wider benefits facilitated, and whether a higher attribution rate for Sizewell C jobs (towards the upper end of the 5-15% range quoted) is more relevant to the scheme with the full Four Villages Bypass – **again resulting in a scheme that can be strongly considered to offer high value for money.**

At the Full Business Case stage there will be greater certainty in the quantum and location of local plan growth (which include options for growth in excess of housing need) and the timing of Sizewell C. This will allow Suffolk County Council to confirm that the scheme still offers high value for money.

11. Conclusion

11.1 The Preferred Option

This Economic Case has presented a comprehensive assessment as to the economic, environmental and social impacts of the proposed SEGway scheme. Considering the material presented in the Economic Case along with the other four main components of the Outline Business Case, the preferred option for A12 Suffolk's Energy Gateway (SEGway) is option LB1d (dual carriageway). This is based on the Project Delivery Team's consideration of multiple factors:

- Value for money – across the value for money framework and its ability to provide a present value of benefits of around 60% higher than LB2s
- Strategic fit with scheme objectives and Government policy
- Reduced travel costs for businesses, commuters and visitors through improved connectivity to other major centres and the Strategic Road Network
- Increased road safety benefits by providing safer opportunities for overtaking slow moving vehicles
- Its ability to provide a continuous high quality road as a gateway to East Suffolk's towns and villages, energy, tourist and other business assets from the south, making it an easier place to do business, visit, live and work
- Its ability to provide the headroom for East Suffolk's energy and tourism industries and settlements to grow at the pace they want, rather than be dictated by transport network constraints
- Improved reliability of travel for East Suffolk's businesses and hauliers to and from the county's ports at Felixstowe, Ipswich and Lowestoft and the Strategic Road Network (A12, A14, A47)
- Strength of support from the public, business, MPs, district, town and parish councils.

This is tempered by this option's increased cost. This will require full and further consideration as the scheme design is developed in more detail for planning, further consultation and full business case development.

LB1d helps provides all road users with a more consistent and high quality level of service (dual carriageway) for journeys between Ipswich, the A14 (and thereby London, Essex, the Southeast and Midlands) and the A1094 where travel demand splits between the A12 (Saxmundham, Southwold, Lowestoft and Great Yarmouth) and A1094 (Aldeburgh, Leiston and Sizewell).

This helps portray the A12 in a positive image as a marketable gateway to East Suffolk that is quicker and easier to do business in, live in and visit thereby:

- retaining companies and workers,
- encouraging repeat visits, and
- attracting new businesses, skilled workers, families, and visitors.

Key Observation

The Outline Business Case demonstrates that the scheme has a positive impact in terms of its ability to unlock a gross value add to the regional economy of £72 million to £157 million over 60 years, through the increase in tourism and support to the development of jobs at Sizewell C.

Taking these benefits in tandem with the appraisal of costs and benefits from improved safety, noise, air quality and journey time associated with the scheme's "Central Case" results in a scheme that can be considered as presenting "high" value for money in terms of DfT assessment criteria.

The two remaining sections of single carriageway south of the scheme (close to Woodbridge) are in Suffolk County Council's view more easily solved through lower cost, largely online improvements utilising a wide range of current and future public and private funding options.

It provides East Suffolk's only major north-south road with the resilience and capacity to cater for significant seasonal variation in travel demand caused by visitors to East Suffolk's wide range of tourist destinations and slow moving agricultural traffic. It also caters for the increase in traffic demand caused by ten years of Sizewell C construction and subsequent periodic maintenance outages of both Sizewell B and C power stations.

It suitably mitigates most of the traffic impacts of Sizewell C on the A12 (other impacts, such as those to the north of the scheme in Yoxford and along the B1122 will be dealt with through the Sizewell C Development Consent Order process) and crucially enables these to be delivered in advance of peak power station construction activities.

Suffolk County Council have put forward a local contribution as part of the scheme's cost funding package and this is detailed further in the scheme's *Financial Case* and *Management Case*. This is lower than would normally be expected, but given the interface with Sizewell C and its ability to help the UK Government realise its specific objectives associated with the Clean Growth Strategy, Industrial Strategy and Energy Policy it is considered a special case.

There is a strong opportunity to reduce Central Government contribution for the scheme and furthermore improve SEGway's value for money, with an indicative contribution in the range of £12 million to £26 million (2017 prices). However, this can only be finalised as part of Sizewell C's development consent and a positive final investment decision.

If and when Sizewell C receives its Development Consent Order and a positive Final Investment Decision, EDF Energy would then be in a firm position to commit funding. This would allow the local contribution to be substantially increased by being funded through the in-lieu payment of its mitigation requirements. However, EDF Energy would be looking to progress construction of the new nuclear power station as quickly and efficiently as possible. Crucially this would be more rapidly than the time it would then take for Suffolk County Council to be given the 'green light' to design, plan and procure the construction of SEGway to successfully mitigate all the impacts of Sizewell C's construction on this part of the A12. Thus, it will be essential to progress the scheme before the outcome of a Development Consent Order and Final Investment Decision is known.

Suffolk County Council and local partners consider this to be a once in a lifetime opportunity to forward fund the future development of SEGway through the design, consultation, planning, scheme orders and procurement phases.

11.2 The Low-Cost Alternative

Option LB2s is neither as successful in meeting the value for money criteria nor in achieving the scheme objectives. It also has less support from the public, business and political stakeholders albeit this is still positive. It would however be a more affordable option. It would still be a preferable investment to waiting for a smaller scale developer led mitigation of Sizewell C in and around Farnham and possibly Stratford St. Andrew or doing nothing.

Suffolk County Council intend to retain LB2s as a Low-Cost Alternative to LB1d to provide further checks and balances in terms of SEGway's value for money, financial affordability and ability to suitably mitigate environmental impacts as the scheme design and planning progresses. The Project Board detailed in the *Management Case* will provide guidance and support to Suffolk County Council's Project Development Team during this stage and will work closely with DfT and EDF Energy to finalise the scheme and funding package. This will be with a view to reduce central Government contribution to the scheme and in doing so this would further improve the scheme's value for money, and reinforce its categorisation as "high".

11.3 Interface with the Local Plan Review process

Suffolk Coastal District Council and Waveney District Councils are also in the process of reviewing their local plans with further work in 2018/19. Waveney District Council has a First Draft Local Plan, and Suffolk Coastal District Council have put forward three contrasting alternative options which include a potential shift in focus to the A12 corridor; a potential shift in focus on Ipswich and the A14 corridor, or a continuation of the existing approach. Again Suffolk County Council will work closely with these local partners and Government in developing the scheme's Full Business Case to understand and capture these impacts in the Value for Money Statement.

11.4 Summary performance versus the scheme objectives

It is important in developing the Economic Case to consider whether the results from the appraisal have enabled the promoter to develop a scheme that is likely to achieve the objectives it has set. The following is a summary matrix of the objectives from Chapter 5 of the *Strategic Case* and the evidence for each option, showing that both options help achieve the objectives with strongest benefit noted for LB1d:

Objective	Option LB1d	Option LB2s
1. Enhance the quality of life for local residents	This option has the strongest support of both options, with 72% of respondents who view a preference supportive of this option	This option has good support from residents with 51% of respondents who expressed a view supportive of this option
2. Reduce congestion and journey delay	PVB: £194 million	PVB: £128 million
3. Improve journey time reliability providing support for the local economy and improved productivity	The Economic Case has demonstrated a Slight Beneficial impact in line with WEBTAG, which is not especially suited to rural 'A' roads, or those with seasonality impacts	The Economic Case has demonstrated a Slight Beneficial impact in line with WEBTAG, which is not especially suited to rural 'A' roads, or those with seasonality impacts
4. Reduce community severance	The Economic Case has demonstrated a Moderate Beneficial impact in line with WEBTAG In relative terms this provides strong benefit to the majority of the residents of the Four Villages with a reduction in traffic flow of around 90% on the old A12.	The Economic Case has demonstrated a Moderate Beneficial impact in line with WEBTAG In relative terms this provides strong benefit to the majority of the residents of the Four Villages with a reduction in traffic flow of around 90% on the old A12.
5. Provide the capacity required to enable, support and deliver growth across all economic sectors, including the construction and operation of Sizewell C nuclear power station.	GVA of £30 million to £115 million associated with Sizewell C Support from EDF Energy, Associated British Ports (its preference) Support from SCDC, New Anglia LEP and MPs Aligns with Government's Industrial Strategy and Clean Growth Strategy	GVA of £30 million to £115 million associated with Sizewell C Support from EDF Energy, Associated British Ports Support from SCDC, New Anglia LEP and MPs Aligns with Government's Industrial Strategy and Clean Growth Strategy
6. Reduce accidents	PVB: £27 million PVB 681 casualties saved	PVB: £9 million 285 casualties saved
7. To improve air quality and reduce noise impacts for communities alongside the A12	Local Air Quality PVB: £9.7 million Noise PVB: £3.8 million	Local Air Quality PVB: £3.6 million Noise PVB: £4.5 million

Objective	Option LB1d	Option LB2s
8. Future proof the function of the A12 as part of Suffolk's emerging Major Road Network	This option provides the greatest consistency in type of road for users – i.e. a dual carriageway. It allows similar enhancements to be made elsewhere at a later date to help maintain the A12 as a key corridor of movement for people and goods between key economic assets in Suffolk and further afield	This option provides an improvement in level of service for road users on the A12 although may constrain future potential along the corridor

Table 11.1 : Summary matrix of performance of the Economic Case (where relevant) against the scheme objectives

11.5 Next steps

Full Business Case Update

The following tasks will need to be undertaken in order to update the Economic Case:

- The introduction should be verified and any new information included in an update, for example if the approach to assessing the value for money has been changed since the Outline Business Case.
- Confirmation that the list of options appraised is unchanged (and changes listed if any have been made).
- Confirmation of the status of Sizewell C power station and local plan growth, and any implications for wider economic impacts, travel demand and developer contributions.
- Confirmation of any further assumptions supporting the analysis.
- The AST should be revisited and updated accordingly.
- The Value for Money statement should be verified and updated, to reflect any changes made since the Outline Business Case.

Appendix A. TEE, PA and AMCB Tables

Please refer to the accompanying excel workbooks in the *Outline Business Case - Economic Case folder*.

Appendix B. Appraisal Summary Tables

Please refer to the two accompanying excel workbooks in the *Outline Business Case - Economic Case folder*.

Appendix C. Preparation of costs for the Financial Case and Economic Case Spreadsheet

Please refer to the standalone spreadsheet contained in the *Outline Business Case – Economic Case* folder

An identical version of this file is also enclosed in the *Outline Business Case – Financial Case* folder although different worksheet tabs are relevant.

Appendix D. Scheme Cost Pro-forma

Please refer to the standalone excel workbook contained in the *Outline Business Case – Economic Case* folder for both options.

Appendix E. Economic, Environmental and Social Appraisal Worksheets

Theme	Appendix	Description
Economy	Appendix E – 1	Reliability
Environment	Appendix E – 2	Greenhouse Gas
	Appendix E – 3	Noise
	Appendix E – 4	Air Quality
	Appendix E – 5	Landscape
	Appendix E – 6	Historic Environment
	Appendix E – 7	Biodiversity
	Appendix E – 8	Water Environment
Social	Appendix E – 9	Journey Quality
	Appendix E – 10	Severance

Worksheets for Townscape, Security, Affordability and Option and Non-Use Values are not applicable for this scheme. Separate distributional impact worksheets are provided for the relevant criteria in Appendix F.

Appendix F. Distributional Impacts Report

Please refer to the *Distributional Impacts Report* in the *Outline Business Case – Economic Case* folder.