The Cambridge South East Transport Order

Transport And Works Act 1992

Transport And Works (Applications And Objections Procedure) (England And Wales) Rules 2006

Economic Dimension Addendum

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1. Economic Dimension Addendum

1.1. Introduction

1.1.1. Purpose of the Economic Dimension

The Economic Dimension is one of the five cases that form the Department for Transport's (DfT) Transport Business Case process. It assesses options and identifies the economic, environmental, social and distribution impacts that the Cambridge South East Transport Phase 2 (CSET2) scheme is expected to deliver. It also calculates the value for money (VfM) to fulfil Treasury's requirements for appraisal and demonstrating VfM in the use of taxpayer's money.

1.1.2. Scope of the Economic Dimension Addendum

For the purpose of this stage of the programme, we have assumed that a full refresh of the business case (OBC 2020) (CSET-20-00) is not required. Instead, this Economic Dimension Addendum presents the economic analysis of the impacts of changes in the CSET2 scheme design. The scope and assumptions underpinning this Economic Dimension Addendum are presented below in Table 1-1. As the majority of the benefits accrue in the form of time savings, we propose to take a proportionate approach and assess the impact of design changes on time savings only. This analysis will focus on Level 1 benefits only and will therefore present the updated initial Benefit Cost Ratio (BCR). From this analysis, a reasonable judgement will be made on whether the design changes have improved the initial BCR and the value for money of the CSET2 scheme.

Table 1-1 - Scope and Assumptions of the revised economic analysis for CSET2 scheme

Scope	Assumptions
Updated Transport User Benefits Assessment (TUBA) runs for preferred option	On the basis of updated traffic modelling as a result of the option refinement process, we have re-run TUBA in order to determine the journey time savings from the scheme as a result of design changes.
Updated VfM assessment of preferred option	In addition to the updated TUBA assessment, we will also examine the impact of the design changes on decongestion benefits and provide a VfM assessment for the updated scheme.
Input into options report	We have used the analysis from the above two inputs to help draft the options report.
Risks and exclusions	The updated analysis is only for the purpose of the options assessment note. It is to inform decision-making around the most appropriate option to be pursued as part of the CSET2 scheme. We intend to run a single TUBA for a preferred option. Any sensitivity testing, or variants (e.g., more than one run) required in order to compare options has not been included in our scope. Updated costs have been provided and are applied to a Present Value Cost (PVC) calculator. Time savings and decongestion benefits will be considered. Other impacts will not be included in this exercise, the purpose of which is to assess the merits of a revised scheme design in relation to the scheme design considered in the previous business case iteration.

1.1.3. Overview of the Economic Dimension

The key elements of the Economic Dimension are listed in Appendix C, which reference the relevant section(s) in respective documents.

1.1.4. Context of the scheme

This Economic Dimension Addendum focuses on the preferred option which was previously identified as the **best performing option in terms of both route alignment and travel hub site** by **Mott MacDonald** in the Options Appraisal Report[1] presented in the Appendix A of OBC 2020. The preferred route takes a direct alignment across fields towards the A11, which includes a second crossing of the River Granta. It ends at travel hub Site B, located to the south west of the junction between the A1307 and A11. General traffic would access it from the A1307 via a new junction whilst the site itself would have a linear arrangement in order to accommodate it between a high-pressure gas main, over which development is restricted, and the A11. The site can provide parking for up to 2,800 cars.

1.2. Level 1 Impacts: Transport Impacts

The Level 1 benefits for the CSET2 scheme have been updated in line with DfT guidance to inform the initial VfM assessments and the initial BCR. The appraisal focused on the monetised transport user benefits to produce the initial BCR, as shown in Table 1-2 below.

Table 1-2 - Level 1 Benefits Informing Core VfM Statement

Benefit	Description
Transport User Benefits (TAG A5-4)	• The appraisal of the economic elements associated with the scheme has been undertaken in accordance with TAG unit A1-1 Cost-Benefit Analysis. • Transport Economic Efficiency – evaluated using TUBA version 1.9.17.2, Economic parameter file 1.9.18).
Safety (TAG A5-4)	• As with the transport user benefits, this has followed the marginal external costs method from TAG unit A5-4.
Air Quality (TAG A5-4)	• As with the transport user benefits, this has followed the marginal external costs method from TAG unit A5-4.
Noise (TAG A5-4)	• As with the transport user benefits, this has followed the marginal external costs method from TAG unit A5-4.
Greenhouse Gases (TAG A5-4)	• As with the transport user benefits, this has followed the marginal external costs method from TAG unit A5-4.

Source: AtkinsRéalis

1.3. Transport Modelling Framework

The Cambridge Sub Regional Model F-Series (CSRM2) has been used as the basis of the assessment of the preferred option. This has been enhanced with additional local refinements to its highway model and the latest form of the Public Transport and Sustainable Modes model to ensure the full impact of the preferred option is being considered.

The following reports explain the CSRM2 base year model, demand model set-up and forecasting approach:

- CSRM2 F-Series Highway Local Model Validation Report (v5.1, May 2022)[2];
- CSRM2 F-Series Transport Demand and Public Transport Model Development and Validation Report (v5.2, May 2022)[3]; and
- CSRM2 F-Series Model Forecasting Report (v5.1, May 2022)[4].

These provide details of the survey data used to build the base year traffic model and the network and planning assumptions used to produce the forecast assignments.

[1] https://www.greatercambridge.org.uk/asset-library/Sustainable-Transport/Public-Transport/Cambridge-South-East-Transport/Outline-Business-Case-2020/CSET-OBC-Appendix-A-Options-Appraisal-Report403394-MMD-BCA-00-RP-BC-0024-Rev-D.pdf
[2] CSRM2 F-Series Highway Local Model Validation Report, Transport Demand and Public Transport Model Development and Validation Report and Model Forecasting Report produced by AtkinsRéalis.
[3] CSRM2 F-Series Transport Demand and Public Transport Model Development and Validation Report produced by AtkinsRéalis.
[4] CSRM2 F-Series Model Forecasting Report produced by AtkinsRéalis.

1.3.1. Base Year Modelling

1.3.1.1. 2015/2019 Base Year Highway Model

The base year CSRM2 SATURN highway model structure and demand patterns were initially reviewed along the A1307 and A1301 corridors.

The modelled flows at various points along the A1307 corridor were compared to the observed data available to ensure the model was accurately reflecting current base year (2015) flows and the subsequent 2019 Present Year Validation.

1.3.1.2. 2015 Base Year Public Transport Model

Public transport supply and demand data was sourced from CSRM2 which uses MEPLAN software.

Journey times for transit services are based on the congested times modelled in the CSRM2 highway module, which are added to the timetabled running times in the MEPLAN model.

The public transport modelled passenger flows were compared to the observed boarding data available to ensure the model was accurately reflecting base year (2015) flows with a subsequent present year validation (2019) also conducted. The observed data for the present year validation examined differing sections of the CSET2 corridor.

Daily modelled bus flows along the CSET1 and CSET2 corridors can be shown to be within 10% of observed values for movements outside Cambridge City and when examined for smaller sub-sections can be shown to be within 10% when examined across a 12-hour day.

1.3.2. Forecast Years Modelling

F-series Baseline CSRM2 demand model runs for the Do Minimum scenario and the preferred scheme option was produced for the AM peak period (07:00-10:00), Interpeak period (10:00– 16:00) and PM peak period (16:00-19:00) for the forecast years of 2026 and 2041.

The baseline case represents a scenario which is consistent with the adopted Local Plans for the four Local Authority Districts represented in CSRM2 (Cambridge City, South Cambridgeshire, Huntingdonshire and East Cambridgeshire). This includes local assumptions on housing, employment and other developments, along with transport schemes which are either committed or expected to be required to support development[5].

Any changes made to the base year highway networks were similarly applied to the forecast year highway networks. Separate networks were then created for the Do Minimum and Do Something preferred option. In addition to the network changes, new High Quality Public Transport services between Haverhill, Granta Park, the new travel hub site and Cambridge city centre were included in line with the CSET Phase 2 Public Transport Network Strategy Report[6] presented in the Appendix D of OBC 2020. CSRM2 uses reduced waiting and travel time weightings for high quality bus services compared to ordinary bus services. These reduced waiting and travel time weightings have been applied to the new services along the CSET2 scheme corridor.

For forecast year scenarios, Park & Ride matrices for each site modelled are provided from CSRM2 using a composite path of both the public transport and highway legs of the trip for the full origin to destination movement. This ensures the most accurate generalised costs are available for TUBA and other appraisal purposes.

1.4. Transport Economic Appraisal

1.4.1. Benefit Cost Ratio and Value for Money Appraisal

In the calculation of the BCR and subsequent VfM calculation several assumptions have been made and these are outlined below.

[5] Note that the model does not include the latest data from the emerging Local Plan (2023).
[6] https://www.greatercambridge.org.uk/asset-library/Sustainable-Transport/Public-Transport/Cambridge-South-East-Transport/Outline-Business-Case-2020/CSET-OBC-Appendix-D-Public-Transport-Network-Strategy-403394-MMD-BCA-00-RP-BC-0370-Rev-B.pdf

1.4.2. Assumptions

1.4.2.1. General Costs

In line with the TAG guidance Unit A1.2 on cost the following assumptions have been applied to generate a PVC in 2010 prices, discounted to 2010:

- Spend Profile – It has been assumed that all costs are expended over the period 2027 to 2029 inclusive (see Table 1-3);
- Inflation has been applied to Q2 2022 costs as per BCIS TPI indices;
- Risk contingency (informed by Quantitative Cost Risk Assessment) has been applied to costs;
- Costs have been uplifted by a Market Price Factor of 1.19;
- Costs have then been rebased from 2022 prices to 2010 prices using the GDP deflator index; and
- Finally, costs have been discounted to 2010 prices to arrive at a figure for the PVC.

Table 1-3 – Annual Spend Profile

Costs (£)	2026	2027	2028
Proportion of scheme cost	33%	50%	17%

It should be noted that project costs to date (i.e. all historic project cost including design, project management, etc. from 2015 to 2022 exclusive of risk spent by WSP and Mott MacDonald) are excluded in the economic appraisal. This is in accordance with TAG Unit A1.2 which states that 'Only the costs which will be incurred subsequent to the economic appraisal and the decision to go ahead should be considered. 'Sunk' costs, which represent expenditure incurred prior to the scheme appraisal and which cannot be retrieved, should not be included'.

1.4.2.2. Marginal External Costs (MECs)

Certain benefits that are not captured under TUBA assessments which includes accident savings, local air quality, noise and greenhouse gases were calculated using the DfT's Tag Unit A5.4 MECs. A bespoke spreadsheet model which is in line with the TAG guidance is used to capture these benefits. Further explanations of the assumptions used for the MECs are provided in the Scheme Cost Review (CSET-21-14).

1.4.2.3. Opening Year

The opening year for the CSET2 scheme was assumed to be 2028. Modelling was undertaken for 2041 and has been discounted to 2010.

1.4.2.4. Appraisal Period

A 60-year appraisal period has been used, with a horizon year of 2086.

1.4.2.5. Revenue, Operational, maintenance and renewal costs (currently excluded)

At present the assessment excludes the contribution of additional revenue, operational costs (OPEX), as well as maintenance and renewal costs. It is likely that due to the volume of new users, the potential revenue generation would be a significant contributing factor, however, careful consideration is required as to who will benefit from this revenue.

1.4.3. Transport Benefits

User benefits of the CSET2 scheme relating to highway improvements is derived using TUBA and MECs for a 60-year appraisal period in line with the design life of these investments. TUBA input parameters are detailed in the Economic Appraisal Technical Note (CSET-21-13).

The transport user benefits for the economic appraisal of the core scenario were assessed using:

- TUBA which includes:
    - Travel time benefits
    - Vehicle operating cost benefits
    - Indirect taxation revenues

- MEC benefits which includes:
    - Accident
    - Local Air Quality
    - Noise
    - Greenhouse Gases

This section discusses the results of the economics assessment of the CSET2 scheme. Results are presented from TUBA and MEC.

1.4.3.1. Monetised Transport Benefits

All benefits and costs were calculated in monetary terms and expressed as present values (PV) discounted to 2010 values and converted to market prices,. This enables direct economic comparison with other schemes which may have very different timescales.

The CSET2 scheme is forecast to produce benefits calculated through TUBA of £95.64m (PV) over the 60-year appraisal period. These benefits are generated by:

I. travel time savings of £98.83m;
II. vehicle operating cost benefits of £5.94m due to the CSET2 scheme generating reductions in congestion which requires less fuel to be consumed per trip; and
III. an indirect tax revenue of -£9.13m.

User benefits of the CSET2 scheme relating to highway improvements are derived using TUBA and MECs for a 60-year appraisal period in line with the design life of these investments.

Table 1-4 represents the outputs described above.

Table 1-4 - TUBA Benefits

Impact	Benefits (£m)
Travel Time savings	£98.83
VOC benefits	£5.94
Indirect Taxation Revenues	-£9.13
Total	**£95.64**

All entries are £m in 2010 prices and values. Positive values indicate additional revenue.

1.4.3.2. Distribution of benefits sector wise and geographically

The benefits by geographical sector over the two forecast year appraisal periods are shown in Table 1-5 while Table 1-6 shows the proportion of benefits by sector. **Figure 1-1** shows the location of the sectors which were defined as part of the model development process.

Figure 1-1 - Sector Map

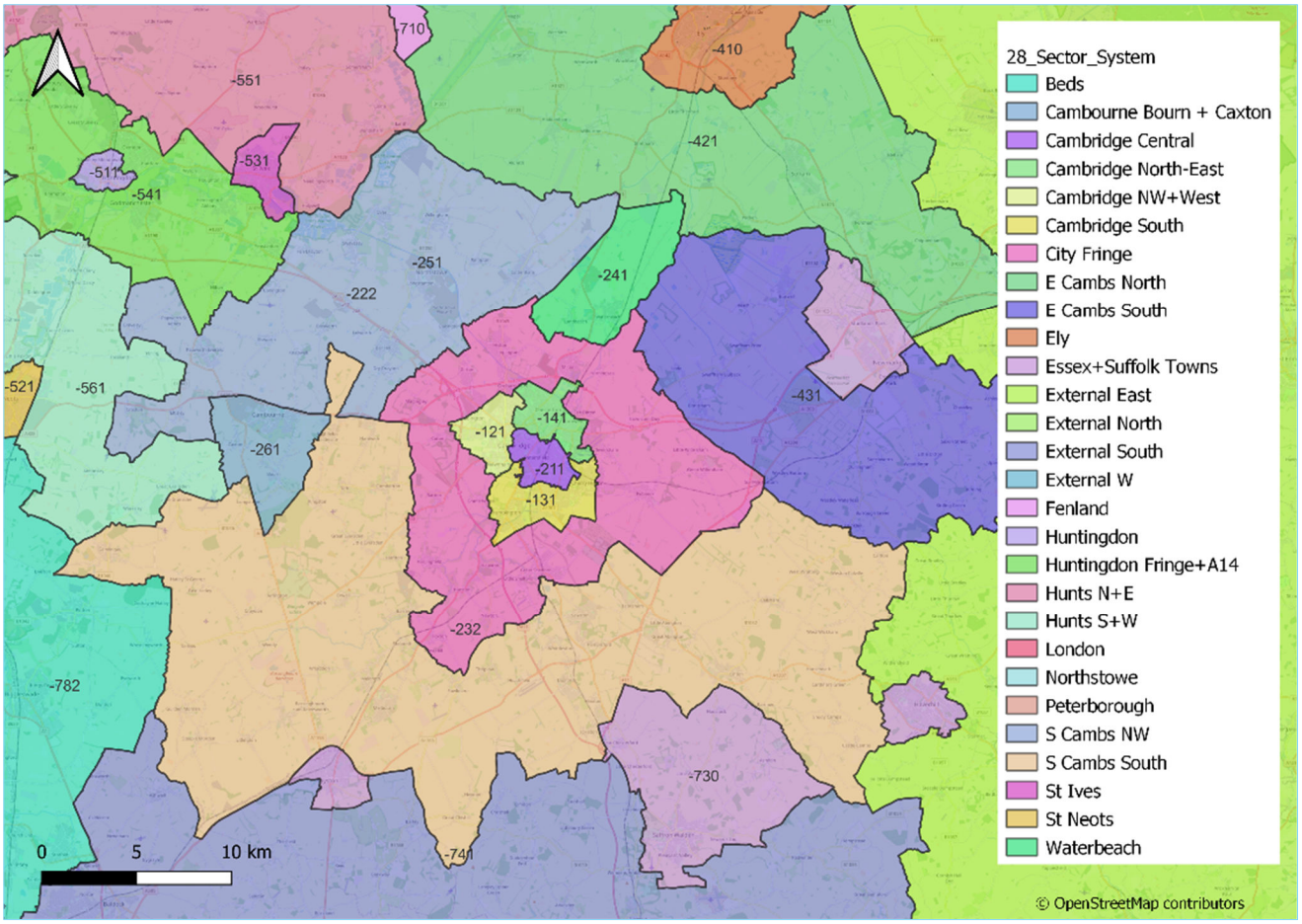


Table 1-5 - Benefits by Sector over 2 years (2026 & 2041 in 2010 Prices)

			Benefits (Sector Origin)				
SI#	Sector #	Location	Time	Fuel VOC	Non-Fuel VOC	Indirect Tax	Total
1	-110	Cambridge Central	£772,943	£673,348	£20,431	-£46,556	£1,420,166
2	-121	Cambridge NW+West	£171,061	£154,963	£4,017	-£8,984	£321,057
3	-131	Cambridge South	£265,330	£252,823	£14,336	-£22,385	£510,104
4	-141	Cambridge North-East	£147,182	£143,491	£3,189	-£8,380	£285,482
5	-211	City Fringe	£454,831	£369,699	£34,749	-£51,169	£808,110
6	-222	S Cambs NW	£83,032	£69,450	£10,153	-£10,692	£151,943
7	-232	S Cambs South	£2,245,538	£1,482,436	£139,816	-£248,775	£3,619,016
8	-241	Waterbeach	£43,632	£35,819	£2,155	-£3,313	£78,293
9	-251	Northstowe	£24,101	£19,929	£700	-£1,349	£43,380
10	-261	Cambourne Bourn + Caxton	£65,171	£52,058	£2,385	-£4,314	£115,300
11	-410	Ely	£18,017	£31,148	£4,572	-£3,818	£49,919
12	-421	E Cambs North	£102,758	£87,284	£9,641	-£12,122	£187,562
13	-431	E Cambs South	£95,177	£74,413	£7,947	-£10,255	£167,282
14	-511	Huntingdon	-£39,924	-£35,157	£384	£650	-£74,046
15	-521	St Neots	£16,131	£18,975	£140	-£142	£35,103
16	-531	St Ives	£44,426	£36,708	£1,413	-£2,287	£80,260
17	-541	Huntingdon Fringe+A14	£5,583	£4,375	£2,908	-£2,634	£10,232
18	-551	Hunts N+E	£46,659	£41,689	£3,968	-£4,292	£88,023
19	-561	Hunts S+W	£6,721	£7,651	£909	-£667	£14,614
20	-710	Fenland	£17,672	£14,772	£1,251	-£1,474	£32,221
21	-720	Peterborough	£8,232	£3,566	£1,440	-£1,487	£11,750
22	-730	Essex+Suffolk Towns	£904,386	£700,649	£47,057	-£78,668	£1,573,424
23	-741	External South	£85,644	£76,053	£11,642	-£16,084	£157,255
24	-751	External East	£138,226	£103,383	£28,862	-£28,025	£242,446
25	-761	External North	£15,350	£10,659	£2,984	-£1,558	£27,435
26	-772	External W	£18,512	£14,875	£2,821	-£2,344	£33,864
27	-782	Beds	£16,722	£14,102	£2,112	-£2,063	£30,874
28	-790	London	£146,602	£129,591	£5,519	-£14,531	£267,181

Table 1-6 - Proportion of Benefits by Sector

			Benefits (Sector Origin)				
SI#	Sector #	Location	Time	Fuel VOC	Non-Fuel VOC	Indirect Tax	Total
1	-110	Cambridge Central	13%	15%	6%	8%	14%
2	-121	Cambridge NW+West	3%	3%	1%	2%	3%
3	-131	Cambridge South	4%	6%	4%	4%	5%
4	-141	Cambridge North-East	2%	3%	1%	1%	3%
5	-211	City Fringe	8%	8%	9%	9%	8%
6	-222	S Cambs NW	1%	2%	3%	2%	1%
7	-232	S Cambs South	38%	32%	38%	42%	35%
8	-241	Waterbeach	1%	1%	1%	1%	1%
9	-251	Northstowe	0%	0%	0%	0%	0%
10	-261	Cambourne Bourn + Caxton	1%	1%	1%	1%	1%
11	-410	Ely	0%	1%	1%	1%	0%
12	-421	E Cambs North	2%	2%	3%	2%	2%
13	-431	E Cambs South	2%	2%	2%	2%	2%
14	-511	Huntingdon	-1%	-1%	0%	0%	-1%
15	-521	St Neots	0%	0%	0%	0%	0%
16	-531	St Ives	1%	1%	0%	0%	1%
17	-541	Huntingdon Fringe+A14	0%	0%	1%	0%	0%
18	-551	Hunts N+E	1%	1%	1%	1%	1%
19	-561	Hunts S+W	0%	0%	0%	0%	0%
20	-710	Fenland	0%	0%	0%	0%	0%
21	-720	Peterborough	0%	0%	0%	0%	0%
22	-730	Essex+Suffolk Towns	15%	15%	13%	13%	15%
23	-741	External South	1%	2%	3%	3%	2%
24	-751	External East	2%	2%	8%	5%	2%
25	-761	External North	0%	0%	1%	0%	0%
26	-772	External W	0%	0%	1%	0%	0%
27	-782	Beds	0%	0%	1%	0%	0%
28	-790	London	2%	3%	2%	2%	3%

The highest contribution of benefits is obtained from sector S Cambs South (35%) followed by Essex+Suffolk Towns (15%). The new public transport route from the A11 via Sawston and Shelford to the Cambridge Biomedical Campus and a new travel hub near the A11/A1307 junction falls within the sectors with high benefits which is envisioned to have road user benefits to the users.

1.4.3.3. MEC Benefits

The MEC approach is designed to capture the secondary benefits of the proposed monetised benefit for the change in distance travelled by car (pcu-km).

Certain benefits that are not captured under TUBA assessments include accident savings, local air quality, noise and greenhouse gases. These were calculated using the DfT's Tag Unit A5.4 MECs. A bespoke spreadsheet model which is in line with the TAG guidance is used to capture these benefits.

The method is based on the application of DfT defined costs (pence per kilometre) for a range of pre-defined factors, as presented in Table 1-7 below. DfT has defined assumptions regarding the increase in these costs over time as indicated by the noticeable increase in congestion. For the assessment of the change on travel along the corridor, the values are calculated for the 60-year appraisal period by interpolation of the provided DfT costs up to 2035, after which they are held constant for the remainder of the appraisal period.

The use of road vehicles incurs both private costs borne by the individual traveller (such as fuel costs and personal travel time) and external costs borne by others. These external costs include congestion, local and global air pollution, noise, infrastructure and accident costs. The MEC method is based on the change in these external costs arising from an additional (or removed) vehicle (or vehicle km) on the network. These costs have been estimated from the Department's National Transport Model and Surface Transport Costs and Charges: Great Britain 1998 For this appraisal, the benefits from accidents, local air quality, noise and greenhouse gases were assessed using MEC, on distance saved by road users.

User benefits of the CSET2 scheme relating to highway improvements is derived using MECs for a 60-year appraisal period in line with the design life of these investments.

Unless otherwise specified, monetised values throughout this report are presented in units of prices discounted to 2010 and adjusted to 2010 market prices. These units are used consistently for scheme benefits and costs.

Table 1-7 - Monetised MEC Benefits

Analysis of Monetised Costs and Benefits (in £000)	
Congestion	£6,306.56
Infrastructure	£52.57
Accident	£952.74
Local Air Quality	£118.36
Noise	£62.98
Greenhouse Gases	£919.08
Indirect Taxation	-£732.42
Total MEC	£7,679.86
Total MEC (excluding infrastructure, congestion and indirect taxation)	**£2,053.15**

Source: AtkinsRéalis

The total marginal costs benefits are £2.05m which excludes the congestion, infrastructure benefits and indirect taxation to avoid double counting. The excluded benefits are assessed from TUBA.

1.4.3.4. Benefits Summary

The quantitative assessments of impacts made have been summarised in the appraisal tables – Transport Economic Efficiency (TEE) Table (Table 1-8), Public Account Table and Monetised Costs (Table 1-10) and Benefits (AMCB) Table (Table 1-11) below.

1.5. Transport Economic Efficiency (TEE) Table

The TEE table brings together the benefits to transport users and providers derived from the TUBA runs, and the cost to business of any developer contributions. The TEE table is a key component in the reporting of the economic assessment. The TEE is presented in Table 1-8 below:

Table 1-8 - Transport Economic Efficiency (TEE) table for core scenario (in £000s)

Attribute	Present Value of Benefits, 2010 prices and values
Non-Business: Commuting	
Travel Time	£ 54,675
Vehicle Operating Costs	£ 3,794
User Charges	-£2,612
During Construction & Maintenance	-
Net Non-Business Benefits: Commuting	£55,856
Non-Business: Other	
Travel Time	£31,139
Vehicle Operating Costs	£1,789
User Charges	-£1823
During Construction & Maintenance	-
Net Non-Business Benefits: Other	£31,106
Business User Benefits	
Travel Time	£13,011
Vehicle Operating Costs	£356
User Charges	-£773
During Construction & Maintenance	-
Subtotal	£12,594
Private Sector Provider Impacts	£35,099
Subtotal	
Other Business Impacts	
Developer Contributions	-
Net Business Impact	£47,693
Total	
Present Value of Transport Economic Efficiency	**£134,655**

Notes: 1) Benefits appear as positive numbers, while costs appear as negative numbers.

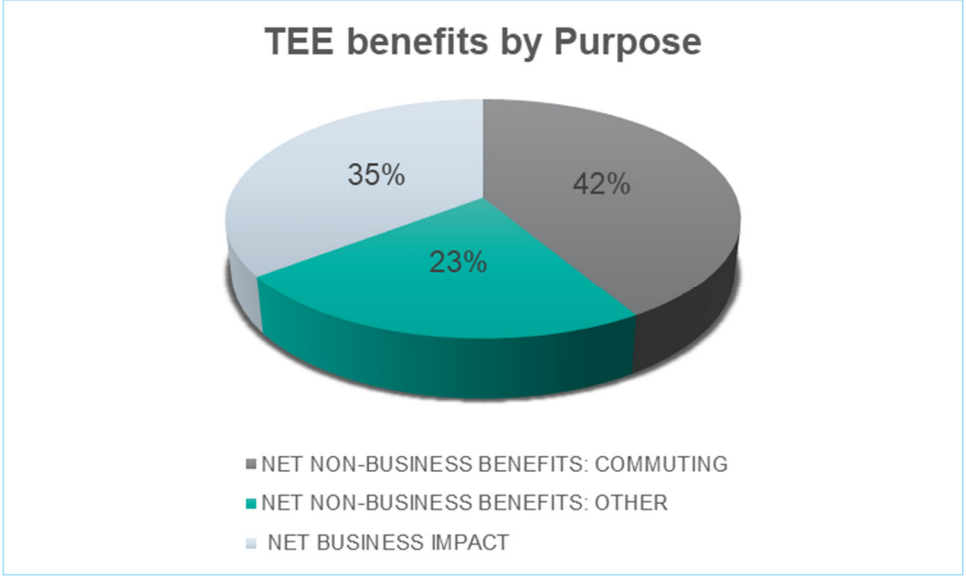
2) All monetised values are expressed as 2010 present values

The economic appraisal is carried out in compliance with TAG which evaluates the travel time savings and the vehicle operating costs (VOC) that the CSET2 scheme is forecast to produce.

The CSET2 scheme is forecast to produce net benefits for all users of £98.83m from the travel time and £5.94m from vehicle operating costs.

Figure 1-2 presents the transport economic benefits accrued from non-business commuting contributing to 42% followed by net non-business other benefits accounting for 23%, and net business users accounting for 35% of the total value of transport economic benefits.

Figure 1-2 Core Scenario Transport economic efficiency structure by travel purpose



1.6. Impact on Public Accounts

This chapter sets out the costs of the options that are captured in the appraisal and explains the costs included and how they are adapted following TAG guidance to provide Present Value of Costs (PVC). First the capital cost is presented for all options and then the whole life costs (maintenance and renewals) associated with the proposed projects. The risk allowance for each option is presented and then the inflation and optimism bias assumptions are explained. The costs are brought together, adjusted and discounted for inclusion in the cost benefit analysis.

1.6.1. Baseline Capital Costs

Cost estimates have been prepared by Faithful & Gould. The detailed breakdown of construction cost estimation is presented in the Scheme Cost Review (CSET-21-14).

The risk adjusted cost estimates are presented in Table 1-9, which mirrors Table 1-2 in the Financial Dimension Addendum. This details the costs for the preferred option, including construction, design, project management, statutory undertakers, land, risks, etc.

Table 1-9 – Outturn Costs (inclusive of risk)

	Base Costs
Project Costs to Date	£8,000,000
Construction	£74,666,623
Overheads & Profit	£7,466,662
Detailed Design and Cost Services	£8,213,328
Project Management Services	£2,710,398
Statutory Undertakings	£6,133,237
Land Cost	£11,900,000
Land Cost Risk	£2,975,000
Landfill Tax	£8,035,000

Future GCP / Consultant Costs	£1,642,666
Risks/ Contingency	£19,488,071
Inflation (as per BCIS TPI indices)	£9,758,032
TOTAL (Q42022 Prices)	**£160,989,017**

Source: AtkinsRéalis

1.6.2. Whole Life Cost Estimates

For this assessment operational and maintenance costs have been excluded from the Economic Dimension Addendum. This is based on the assumption that the revenue will offset the ongoing operating and maintenance costs of the service and infrastructure.

1.6.3. Preferred Option

Present Value Costs (PVC) based on the inclusion of the risk contingency and optimism bias, as previously outlined the defined Present Value Cost (PVC) for the CSET2 preferred option is £86,790,678.

1.6.4. Public Accounts

The Public Accounts table brings together the costs of the scheme and the revenue and tax changes which would result in the revenue and tax changes which follow from changes in traffic routes and speeds are derived from the TUBA output, while the capital and operating costs, with no developer contributions, are as described. The total impact on public accounts is estimated to be **£127.07m** (2010 prices), as shown in Table 1-10, all of which is a cost to local government. Note for the economic appraisal all funding costs and maintenance costs for the scheme were allocated to local government. No funding costs have been allocated to central government.

Table 1-10 - Public Accounts

Attribute	Present Value of Costs, 2010 prices and values
Local Government Funding	
Revenue	-
Operating Costs	
Investment Costs	
Developer Contributions	-
Grant/Subsidy Payments	-
NET IMPACT	
Central Government Funding: Transport	
Revenue	-
Operating costs	-
Investment costs	£86,790,678
Developer Contributions	
Grant/Subsidy Payments	-
NET IMPACT	£86,790,678
Central Government Funding: Non-Transport	
Indirect Tax Revenues	£9,129,361

TOTALS	
Broad Transport Budget	**£86,790,678**
Wider Public Finances	£9,129,361

1.7. Value for Money Update

The updated VfM statement for the CSET2 scheme takes into consideration all appraisal and assessment work undertaken within the updated economic analysis. This takes into account the monetised impacts versus the project costs presented as a BCR.

1.7.1. Analysis of Monetised Costs and Benefits (AMCB)

The BCR is an indication of the return on public sector investment in a project. The BCR is the ratio of the Present Value of Benefits (PVB) over the PVC and indicates how much benefit is obtained for each unit of cost. Based on an assessment of the benefits and costs of the preferred option, an initial assessment of the CSET2 scheme's VfM has been calculated and is presented in

Table 1-11, that includes an initial BCR (established monetised impacts) as appraised.

The AMCB table brings together quantified scheme costs and benefits to help determine the economic worth of the transport scheme. This table is based on those elements of the economic appraisal which are considered to produce robust monetised estimates of the impacts. It includes:

i. User benefits, such as time savings and vehicle operating cost savings, over the 60-year appraisal period;
ii. Cost to business of any developers' contributions;
iii. Changes in user charge revenues;
iv. Indirect taxation benefits;
v. Accident benefits;
vi. Monetised environment impacts; and
vii. Costs of construction and operation.

The benefits and the costs provide an initial estimate of the net benefits for the CSET2 scheme. The ratio of these benefits to costs is referred to as the Initial BCR.

In the AMCB table, four critical values are presented:

i. The PVB is the summation of the stream of discounted benefits over the appraisal period, reduced by the discounted value of the developer contribution.
ii. The PVC is the summation of the stream of discounted costs from the current year forward through the 60-year appraisal period, less the discounted value of the developer contribution, although the majority of investment costs are likely to occur before the scheme opening year. The PVC indicates the total cost of the scheme which will be considered against the benefits.
iii. The Net Present Value (NPV) is the PVB less the PVC and indicates whether there are positive or negative benefits, and their scale, from a scheme.
iv. The BCR is the ratio of the PVB to the PVC.

The BCR for a scheme provides an indicative measure for the VfM of the investment, whereby a BCR greater than 1.0 indicates that the benefits outweigh the costs. DfT has defined value for money categories, which are as follows:

i. BCR less than 1: Poor
ii. BCR between 1 and 1.5: Low
iii. BCR between 1.5 and 2: Medium
iv. BCR between 2 and 4: High
v. BCR of 4 and above: Very High

Table 1-11 below summaries the results of each component from the TUBA and MEC assessments and is presented as the AMCB for the CSET2 scheme.

Table 1-11 - Analysis of Monetised Costs and Benefits (£)

(2010 Prices, discounted)	Total Benefits	TUBA-Journey Time Benefits	MEC
Noise	£62,978	-	£62,978
Local Air Quality	£118,361	-	£118,361
Greenhouse Gases	£919,077	-	£919,077
Journey Quality	-	-	-
Physical Activity	-	-	-
Accidents	£952,735	-	£952,735
Economic Efficiency: Consumer Users	£55,857,000	£55,857,000	-
Economic Efficiency: Consumer Users (Other)	£31,105,000	£31,105,000	-
Economic Efficiency: Business Users and Providers	£47,693,000	£47,693,000	-
Wider Public Finances (Indirect Taxation	-£9,129,361	-£9,129,361	-
Present Value of Benefits (PVB)	**£127,578,790**	**£125,525,639**	**£2,053,151**
Broad Transport Budget	£86,790,678	-	-
Present Value of Costs (PVC)	**£86,790,678**[7]		
OVERALL IMPACTS			
Net Present Value (NPV)	**£43,490,711**	NPV=PVB-PVC	
Benefit to Cost Ratio (BCR)	**1.47**	BCR=PVB/PVC	

Source: AtkinsRéalis

Note: 1) All monetised values are expressed as 2010 present values

2) This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

[7] Process and assumptions of PVC calculation are detailed in section 1.4.2.1.

Table 1-12 - DfT VfM Categories

VfM Category	Implied by…
Very High	BCR greater than or equal to 4
High	BCR between 2 and 4
Medium	BCR between 1.5 and 2
Low	BCR between 1 and 1.5
Poor	BCR between 0 and 1
Very Poor	BCR less than or equal to 0

The new analysis yields a higher BCR improving from 0.81 to 1.47, and a higher VfM from poor to low, as compared to OBC 2020. Table 1-13 below compares the PVB, PVC, BCR and VfM values between OBC 2020 and this Economic Dimension Addendum. This change is a result of a larger increase in PVB (an 83% increase) than the increase in PVC (a 14% increase), with more monetised benefits coming from local air quality (increased by £37,000), economic efficiency for consumer users (increased by £37,541,000) and, business users and providers (increased by £40,522,000). This can be attributed to the different methodologies used in the economic appraisal approach. OBC 2020 assessed economic efficiency using journey time benefits (calculated by the multiplication of the time savings based on a defined Value of Time (VoT) per user purpose split) and MEC methods. The Economic Dimension Addendum did so through TUBA, which aligns with DfT guidance TAG unit A1-1 Cost-Benefit Analysis.

The latest BCR of 1.47 gives a project value for money category as Low VfM. Achieving so requires an increase in BCR by 0.3, which can be facilitated by an increase in PVB by £2,607,227, or a decrease in PVC by £1,738,151.

Table 1-13 - Summary of PVB, PVC, BCR and VfM of OBC 2020 and MEC calculations

	OBC 2020 Calculations	MEC calculations
PVB	£69,762,000	£127,578,790
PVC	£85,652,000	£86,790,678
BCR	0.81	1.47
VfM	Poor	Low

1.8. Active Mode Appraisal

1.8.1. Background

As part of reviewing the methodology used in the Economic Analysis, additional work has been undertaken using the Active Mode Appraisal Toolkit (AMAT). This section provides updates to the economic analysis presented in the Economic Dimension Addendum that was produced to demonstrate the Value for Money for the CSET2 scheme.

Previously, the economic appraisal included benefits based on the MEC approach that captures the benefit to highway users associated with a general reduction in congestion on the highway network across the study area due to a reduction in vehicles on the road, following mode shift to walking, cycling and public transport.

However, the MEC approach does not capture journey quality and health impacts and thus, the Department for Transport's (DfT) Active Mode Appraisal Toolkit (AMAT) has been used. MEC impacts were excluded from the updated PVB due to double counting of benefits while TUBA benefits were retained supplemented with AMAT benefits to people walking and cycling. AMAT allows users to undertake the economic appraisal of cycling and walking interventions in line with TAG Unit A5-1.

1.8.2. General parameters and assumptions

The general appraisal assumptions and parameters adopted for quantifying the active mode benefits are summarised in Table 1-14. Application of these assumptions is documented in the following subsection.

The key parameters are:

- The Reference Case and Do Something (DS) active travel demand;
- Walking and cycling journey characteristics (i.e. typical trip distances and speed); and
- Quality of walking and cycling infrastructure before and after the proposed interventions.

Table 1-14 – Assumptions for the treatment of active mode benefits

Parameters	Assumptions	Source
Active Mode Appraisal Toolkit version	AMAT v2.11 May 2024	DfT
Appraisal period	40-year period	As per Active Travel England for high quality schemes, compliant with Manual for Streets and LTN 1/20 design standards
Opening year	2029	As per scope
Discounting rate and year	2010 base year, discounted 3.5% p.a.	TAG Table A1.1.1
Marginal External Costs	"Other Urban" local area type for the study area in Cambridgeshire	Area Lookup table in AMAT
Reference Case demand	503 pedestrian trips 1021 cycling trips	Propensity to Cycle Tool (PCT)
Demand uplift	5% uplift for walking trips 17% uplift for cycling trips	Propensity to Cycle Tool (PCT) – Government Equity scenario
Return journeys	90% of people making return trips	Default value in AMAT; assumption to convert between people and total trips
Number of days for which intervention is applicable per year	303 days	The intervention is expected to yield benefits both during the weekdays and on Saturday due to the strategic location of the scheme

1.8.3. Active travel impacts

Impacts on existing and new cycling and walking users as well as the decongestion impact on users of other modes and the wider network as a result of mode shift are quantified using the DfT's AMAT which considers three broad categories of impacts, as summarised in Table 1-15.

Table 1-15 – Impacts from increased use of active travel and mode shift

Impact categories	Sub-category	Description
Physical activity	Reduced mortality risk	Health benefits of increased physical activity
	Absenteeism	Marginal impact on overall productivity of the workforce due to reduced absenteeism, arising from improved health

Journey quality	Cycling and walking ambience and perceptions	Cyclists and pedestrians experience benefits based on 'willingness to pay' values of improved infrastructure
Marginal external costs	Road decongestion (user element)	Marginal changes in road user travel times due to changes in road congestion
	Other infrastructure investment	Reductions (or increases) in local or central government expenditure on highways maintenance, due to reduced (or increased) wear and tear on highways, due to reductions (or increases) in vehicle kilometres travelled
	Accidents	Marginal changes in the frequency of road collisions due to changes in vehicle kilometres travelled
	Local air quality, Noise, Greenhouse gases	Marginal changes in air quality, noise and greenhouse gas emissions due to changes in vehicle kilometres travelled
	Indirect tax	Marginal reductions in indirect tax attributed to reduced highways congestion due to mode shift from road to active modes, i.e. reduced fuel consumption by those who switch to active modes and slightly lower fuel costs to those continuing to travel by road as a result of decongestion

1.8.4. Cycling infrastructure

For the purposes of this appraisal, the cycling infrastructure is "On-road non-segregated cycle track" in the Reference Case and "Off-road segregated cycle track" in the Do Something scenario. This is determined on the basis that along Francis Crick Avenue there is currently an on-road non-segregated cycle track and the provision after the CSET2 scheme would offer an off-road segregated route, as the cycleway will be separated for a small distance from the highway traffic .The off-road segregated cycle route is justified due to the safety concerns resulting from increased bus movements and proposed street works along Francis Crick Avenue as part of the TWAO.

1.8.5. Walking infrastructure

Table 1-16 outlines the assumed changes in the pedestrian environment along Francis Crick Avenue between the Reference Case and Do Something scenario based on the best interpretation of the design. Specifically, the CSET2 scheme will enhance the kerb level provision, crowding and directional signage.

Table 1-16 – Pedestrian infrastructure along Francis Crick Avenue

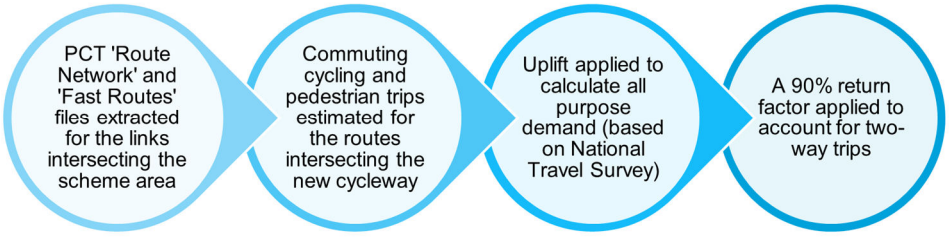
Infrastructure categories	Baseline conditions along Francis Crick Avenue (Reference Case)	Conditions along Francis Crick Avenue with scheme (Do Something)
Street lighting	Yes	Yes
Kerb level	No	Yes
Crowding	No	Yes
Pavement evenness	Yes	Yes
Information panels	No	No
Benches	No	No
Directional signage	No	Yes

1.8.6. Active travel demand

1.8.6.1. Reference Case demand

In the absence of sufficient local count data to accurately estimate baseline demand, the PCT has been used to forecast baseline cycle and pedestrian demand in the area. Key steps involved in the estimation of baseline travel demand from PCT data are summarised in Figure 1-3.

Figure 1-3 - Approach to estimating baseline travel demand from the Propensity to Cycle Tool



The PCT 'Route Network' file is built from all between-zone Lower Layer Super Output Areas (LSOA) fast routes (including any that start or end in Cambridgeshire). The PCT 'Fast Routes' file captures commuting origin-destination flows for the fastest legally cyclable routes under 20km for a selected link. The data is based on 2011 Census records and only contains connections where the minimum number of commuters (by any mode, in either direction) is 5. As such it is acknowledged that the data may not include all trips. Figure 1-4 shows the fast routes selected to estimate the baseline demand for Francis Crick Avenue as extracted from PCT.

Figure 1-4 – Baseline cycling demand along the proposed cycleway in Francis Crick Avenue

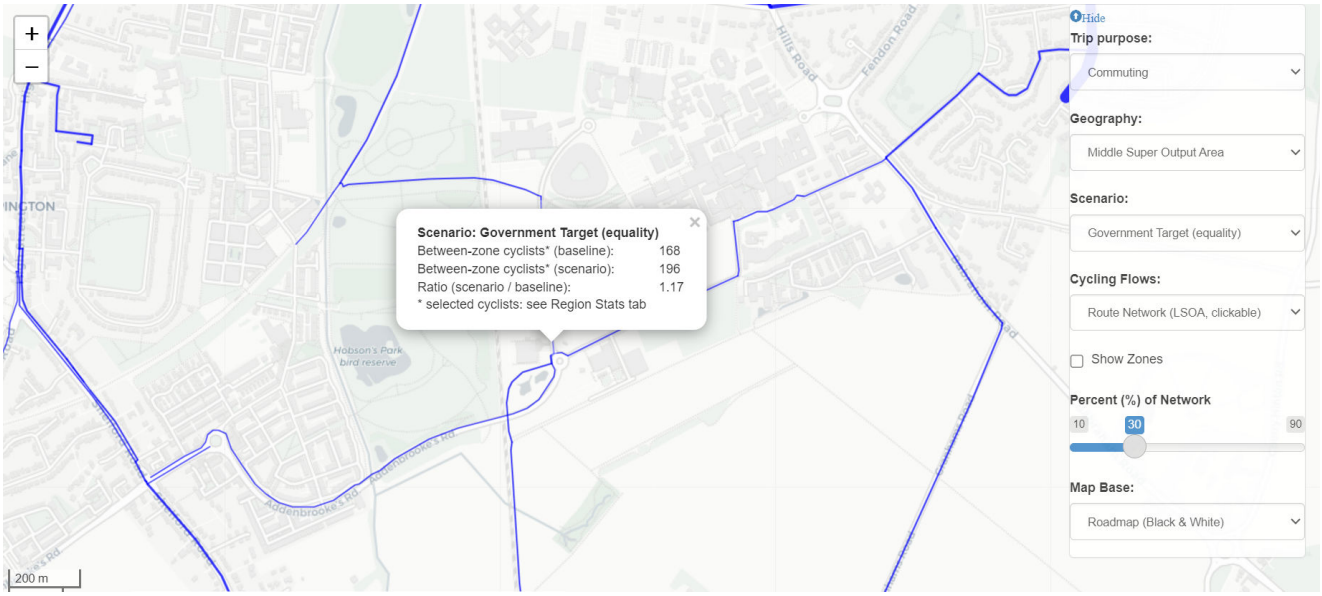


Figure 1-4 demonstrates that, using Census 2011 data, PCT estimates a baseline cycle commuting demand of 168 users and pedestrian commuting demand of 18 users when selecting the 'Fast Route' for the links intersecting with the proposed cycleway. As previously mentioned, the PCT includes Origin to Destination trips based on Census 2011 Journey to Work data between LSOA. In order to extrapolate the total number of cyclists in the area to account for all trip purposes, 2019 National Travel Survey (NTS) data has been used as

sourced from the DfT[8]. According to Table NTS0409a, 31% of cycling trips and 7% of walking trips were for commuting purposes, leading to a Reference Case demand of 265 pedestrians and 538 cyclists per day.

A 90% return trip factor was then applied to the total demand to encompass two-way all-purpose trips, as recommended in TAG Unit A5.1. This led to the Reference Case demand presented in Table 1-17.

Table 1-17 – Reference Case pedestrian and cycling demand

Demand	Walking trips	Cycling trips
Reference Case	503	1021

1.8.6.2. Analysis of current uptake and potential for growth with the Propensity to Cycle Tool

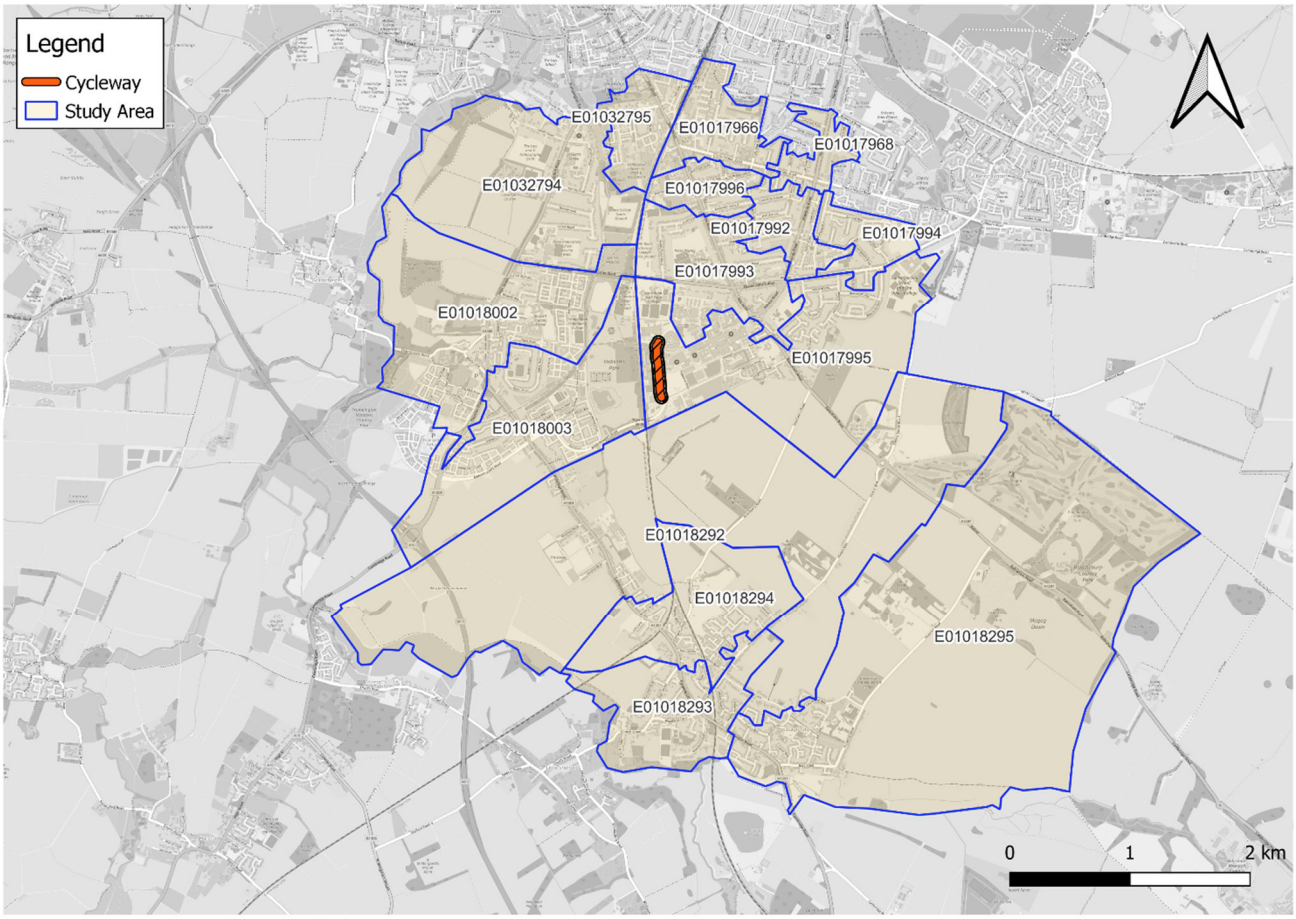
The PCT provides an evidence base and future projections of what walking and cycling uptake could be achieved in England and Wales given various policy scenarios in line with the Government's target to double cycling nationally by 2026[9]. Data from the PCT is available as Origin to Destination trips based on Census 2011 Journey to Work data between Lower Layer Super Output Areas (LSOA). The PCT then estimates for each Origin-Destination (OD) trip the potential pedestrian and cycle mode share for each of the different policy scenario profiles given the characteristics of the Origin-Destination trip. Four policy scenario profiles were used in the PCT, namely Government Target (Equity), Government Target (Near Market), Go Dutch and E-bike, representing varying levels of growth in cycling demand in the future.

The PCT 'Route Network' file for the Government Target (Equity) scenario indicated a 17% cycling uplift along Francis Crick Avenue as presented in Figure 1-4. Alongside this, a bespoke group of LSOAs was selected for the PCT analysis as shown in Figure 1-5 to identify the travel to work patterns within the study area. The Origin-Destination travel to work data was extracted and summarised, by distance band, for trips within the study area.

[8] National Travel Survey, DfT, Table NTS0409a: Average number of trips (trip rates) by purpose and main mode: England, from 2002 to 2020

[9] Cycling Delivery Plan (GOV.UK, 2014)

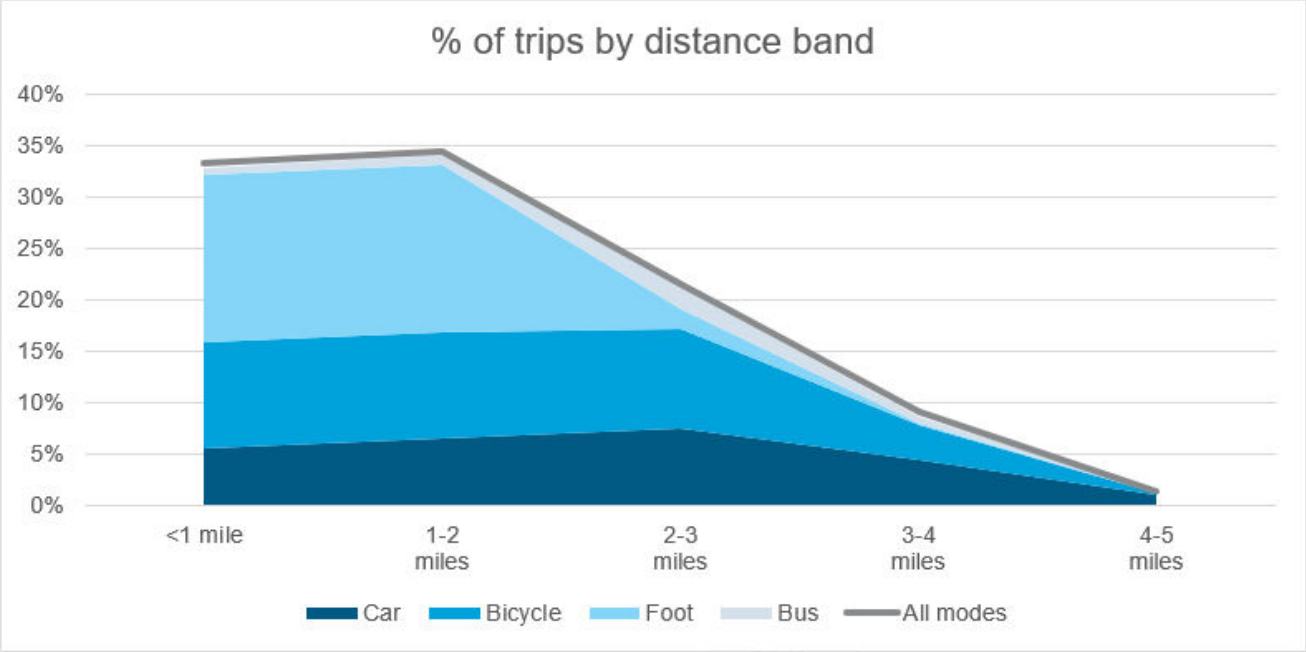
Figure 1-5 – Propensity to Cycle Tool - Study area



Trips under five miles can be manageable by bicycle for most people, and shorter distance trips would also be suitable for walking[10]. 27% and 33% of short trips (less than 5 miles) around Francis Crick Avenue were made by car and by bicycle respectively, as shown in Figure 1-6, while 16% trips of less than 1 miles were made on foot. This suggests a potential for mode shift from car use to walking and cycling.

[10] DfT, Cycling and Walking Investment Strategy, 2017. Paragraph 1.16, available at: Cycling and Walking Investment Strategy (GOV.UK, 2017) .

Figure 1-6 – Proportion of travel-to-work trips by distance band



For the topography and route choices around Francis Crick Avenue, the PCT forecasts show that the E-bike scenario generates the highest maximum potential mode shift, suggesting a cycling uplift of 112%. Go-Dutch scenario generates cycling potential uplift of 61%.

It is important to note that these figures show the estimates of maximum potential cycling mode shares, but in reality, the shifts in travel behaviour would vary depending on the policy environment and the level of infrastructure available to support the aspired change in travel behaviour. Importantly, what this shows is that the relatively modest Government Target (Equity) scenario suggests that there is potential for material increase in cycling use from the Reference Case levels of active travel, especially for journeys shorter than five miles.

Based on the observed levels of walking and cycling in Francis Crick Avenue and the fact that the vast majority of trips within the local area are of short distance, a 17% demand uplift estimate from the PCT has been used for cyclists and a 5% uplift for pedestrians.

Consequently, the future cycling and walking demand, as presented in Table 1-18, will be used as inputs in the Active Mode Appraisal Toolkit.

Table 1-18 – Reference Case and Do Something walking and cycling trips

Demand	Walking trips	Cycling trips
Reference Case	503	1,021
Do Something	528	1,195

1.8.7. Active mode benefits

Table 1-19 outlines the monetised impacts arising from the aforementioned inputs and changes in cycling and walking infrastructure, as specified above. The majority of active mode benefits comes from the journey ambience impacts (£4.6m) that reflect the improved experience of users as a result of improved infrastructure for walking and cycling and health impacts (reduced risk of premature death and absenteeism) that reflect the impact of increased physical activity as a result of modal shift to active modes.

Table 1-19 – Active travel benefits

Category	Active Mode Appraisal benefits (’000s)
Congestion benefit	£230.21
Infrastructure maintenance	£1.12

Accident	£38.08
Local air quality	£1.16
Noise	£2.54
Greenhouse gases	£16.10
Reduced risk of premature death	£2,042.68
Absenteeism	£401.63
Journey ambience	£4,592.34
Indirect taxation	£1.46
Total	**£7,326.19**

1.9. Value for Money Update

The updated VfM statement for the CSET2 scheme takes into consideration all appraisal and assessment work undertaken within the updated economic analysis supplemented with the AMAT work. This takes into account the monetised impacts versus the project costs presented as a BCR.

1.9.1. Analysis of Monetised Costs and Benefits (AMCB)

Table 1-20 below summaries the results of each component from the TUBA and AMAT assessments and is presented as the AMCB for the CSET2 scheme.

Table 1-20 - Analysis of Monetised Costs and Benefits (£)

(2010 Prices, discounted)	Total Benefits	TUBA-Journey Time Benefits	AMAT
Congestion benefit	£230,213.08	-	£230,213.08
Infrastructure maintenance	£1,121.35	-	£1,121.35
Accident	£38,076.10	-	£38,076.10
Local air quality	£1,157.33	-	£1,157.33
Noise	£2,538.41	-	£2,538.41
Greenhouse gases	£16,097.36	-	£16,097.36
Reduced risk of premature death	£2,042,679.02	-	£2,042,679.02
Absenteeism	£401,626.74	-	£401,626.74
Journey ambience	£4,592,340.99	-	£4,592,340.99
Economic Efficiency: Consumer Users	£55,857,000	£55,857,000	-
Economic Efficiency: Consumer Users (Other)	£31,105,000	£31,105,000	-
Economic Efficiency: Business Users and Providers	£47,693,000	£47,693,000	-
Wider Public Finances (Indirect Taxation	-£9,127,896.79	-£9,129,361	£1,464.21
Present Value of Benefits (PVB)	**£132,852,953.59**	**£125,525,639**	**£7,327,314.59**
Broad Transport Budget	£86,790,678	-	-

Present Value of Costs (PVC)	**£86,790,678**[11]		
OVERALL IMPACTS			
Net Present Value (NPV)	**£46,062,276**	NPV=PVB-PVC	
Benefit to Cost Ratio (BCR)	**1.53**	BCR=PVB/PVC	

Source: AtkinsRéalis

Note: 1) All monetised values are expressed as 2010 present values

2) This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

As summarised in Table 1-20 this appraisal estimates that the CSET2 would have benefits totalling £132.8m, and costs totalling £86.8m in Present Value terms. The BCR for the scheme comes to 1.53. Therefore, according to the DfT Value for Money categorisation, the new analysis indicates a **Medium** Value for Money for CSET2.

Table 1-21 presents a summary of the BCRs including the OBC 2020, MEC and AMAT calculations.

Table 1-21 - Summary of PVB, PVC, BCR and VfM of OBC 2020 and Economic Addendum calculations

	OBC 2020 Calculations	MEC calculations	AMAT calculations
PVB	£69,762,000	£127,578,790	£132,852,954
PVC	£85,652,000	£86,900,678	£86,900,678
BCR	0.81	1.47	1.53
VfM	Poor	Low	Medium

1.9.2. COVID Sensitivity test

A COVID sensitivity test has been undertaken to assess the COVID impacts on highway and public transport assuming a 10% reduction in public transport demand. Table 1-22 presents a summary of the COVID sensitivity test outputs.

Table 1-22 – COVID sensitivity test outputs

(2010 Prices, discounted)	COVID Sensitivity Test
Economic Efficiency: Consumer Users	£47,898,000
Economic Efficiency: Consumer Users (Other)	£26,598,000
Economic Efficiency: Business Users and Providers	£43,824,000
Wider Public Finances (Indirect Taxation	-£7,373,000
Present Value of Benefits (PVB)	**£110,947,000**

1.10. Summary & Conclusion

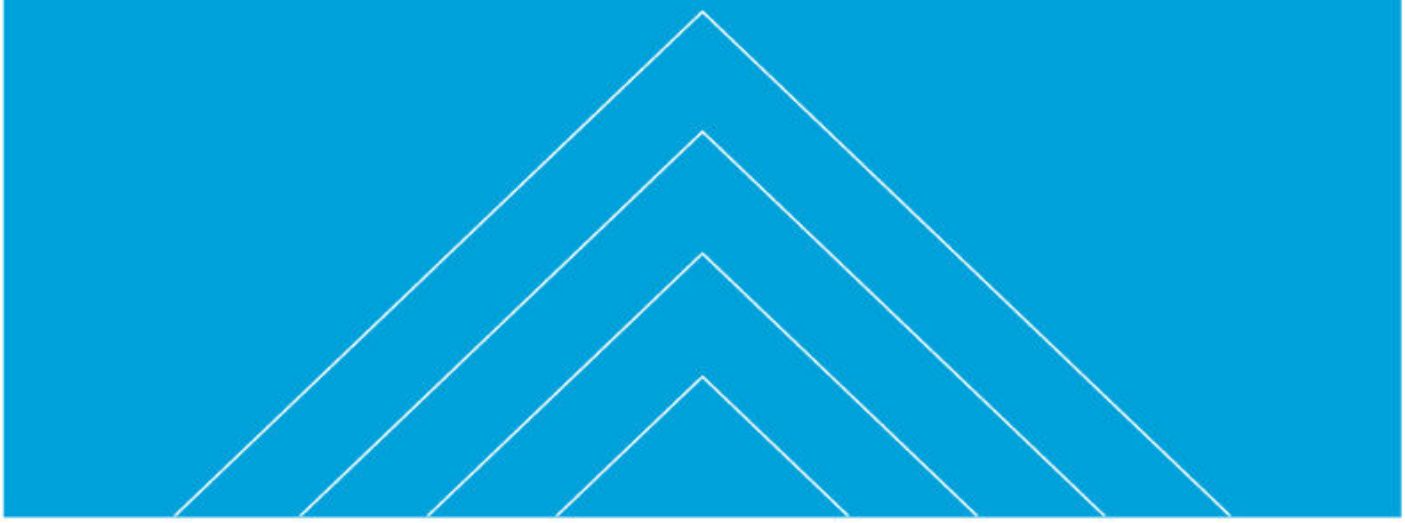
Previous work of OBC 2020 has yielded a BCR of 0.81 for the preferred option, reflecting poor VfM. While economic analysis updates including the MEC calculations produced a BCR of 1.47, reflecting an improved BCR however maintaining a low VfM, close to 1.50 which would class the project as Medium Value for Money

A revised PVB, calculated in this Economic Dimension Addendum (through an updated TUBA and AMAT benefits appraisal approach as well as construction costs) increases the PBV to **£132,852,954**. With a PVC of

[11] Process and assumptions of PVC calculation are detailed in section 1.4.2.1.

£86,790,678, this results in a new BCR of **1.53** – a **Medium** VfM. This is an improved outcome from previous economic analysis with active travel benefits being appraised with greater significance.

Appendices



Appendix A. Key Elements of the Economic Dimension

Key Economic Dimension elements addressed	OBC 2020[12]	Updated in Economic Dimension Addendum	New in Economic Dimension Addendum[13]
Options appraised	✓		
Assumptions		✓	
Sensitivity and risk profile	✓		
Appraisal Summary Table	✓		
Value for Money Statement	✓		
Level 1: Transport Impacts			✓
Level 2: Wider Economic Benefits (Fixed Land Use)	✓		
Level 3: Wider Economic Benefits (Land Use Change)	✓		
Analysis of Monetised Costs and Benefits (AMCB) Table		✓	

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[12] Outline Business Case 2020 (CSET-20-00)
[13] New section added to the OBC, or existing section in the OBC replaced by this Economic Dimension Addendum (CSET-21-02) fully revised by AtkinsRéalis

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