## *Appendix 1 – In-Depth Checks*

The following appendix sets out the In-Depth Checks undertaken by the Department for the 2016 Quality Assurance Report. The three projects/programmes selected for review are:

- **Luas Cross City (pp. 14-27)**

- **N5 Westport to Bohola (pp. 28-46)**

- **Grow Dublin (pp. 47-61)**

The In-Depth Checks were conducted by SRAD in accordance with a specific methodology developed in line with the guidance set out in the Public Spending Code.

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Strategic Research and Analysis Division

## Quality Assurance – In Depth Check

### Section A: Introduction

This introductory section details the headline information on the programme or project in question.

| Programme or Project Information | |
|---|---|
| **Name** | Luas Broombridge (Cross City line) |
| **Detail** | Capital investment project in Dublin City to extend the Luas Green Line to Broombridge, connect the Luas Green Line with the Luas Red Line in the process |
| **Responsible Body** | Transport Infrastructure Ireland (TII) is delivering the project with funding being provided by the National Transport Authority (NTA) |
| **Current Status** | Expenditure Being Incurred |
| **Start Date** | First Proposed in 2005 as part of Government's 10-year investment strategy for transport, *Transport 21* |
| **End Date** | Currently in Construction, expected to open in late 2017 |
| **Overall Cost** | €368 million (excl. VAT) |

**Project Description**

This project refers to the construction of a light rail line as part of Dublin City's Luas tram network. This project will extend the existing Green Line from St. Stephen's Green to the Iarnrod Éireann train station in Broombridge. This extension northwards through Dublin City will also connect the previously separate Luas Green and Red lines.

Based on the early success of both the Luas Red and Green lines in Dublin City, a transport case was put forward by the Rail Procurement Agency (RPA) in 2004 to link the two existing lines and so develop the city's light rail lines into an inter-connected network. This case concluded that the proposal was fully in keeping with the relevant transport and land use policies. In 2005 the Government's 10-year investment strategy for transport to 2015, *Transport 21*, incorporated plans to implement seven new Luas lines for Dublin along with two new Metro lines. This proposal included a proposal to extend the Luas Green line through the city centre to Broombridge Iarnród Éireann station on the Maynooth railway line. In November 2011 a Government plan for infrastructure and capital investment for the period from 2012 to 2016 was published, conducted in the context of tight fiscal constraints. The review concluded that among the main priorities for economic infrastructure over the medium term was the development of the cross city Luas line: Luas Broombridge, also known as Luas Cross-City.

This project was determined to represent the 'missing link' in the creation of a Luas network for Dublin with trips between the Luas Red and Green Lines (and their extensions) now made possible through intersecting lines in the city centre. A map of the proposed line can be found at the end of this report in Appendix 1. The preferred route of Luas Broombridge was selected following detailed assessment including Multi-Criteria Analysis (MCA) and Cost Benefit Analysis (CBA) together with the consideration of the views of the public and interested parties during the public consultation process. The preferred route is 5.6km long and comprises thirteen new stops, not including the pre-existing St. Stephens Green Luas stop.

The Infrastructure Works contract for the project was awarded by the RPA to Sisk Steconfer Joint Venture Utilities Limited (SSJV). This comprises of John Sisk & Son, an international construction company headquartered in Ireland, and Steconfer, a Portuguese construction company specialising in railway and overhead catenary works.

## Section B - Step 1: Logic Model Mapping

As part of this In-Depth Check, SRAD has completed a Programme Logic Model (PLM) for the Luas Broombridge. A PLM is a standard evaluation tool and further information on their nature is available in the Public Spending Code.

| Objectives | Inputs | Activities | Outputs | Outcomes |
|---|---|---|---|---|
| Promote Economic Growth<br><br>Reduce Traffic Congestion<br><br>Integrate the Public Transport Network<br><br>Increase the Commercial Success of the Luas<br><br>Facilitate Sustainable Development and Regeneration<br><br>Enhance the 'Public Realm' | €368m in Capital Funding<br><br>Associated staff and administration costs<br><br>Assessment of Alternative Mode of Transport (Bus Rapid Transport System) by AECOM and Goodbody Consultants<br><br>Detailed economic analysis and profiling of the Luas Cross City catchment area by Future Analytics Consulting Ltd. | Transport Planning and Modelling (incl. demand forecasting)<br><br>Risk Analysis<br><br>Capital Costing<br><br>Cost Benefit Analysis<br><br>Assessment of Alternative Mode of Transport (Bus Rapid Transport System)<br><br>Appraisal of Route Options<br><br>Development of Procurement Strategy<br><br>Assessment of Alternative Mode of Transport (Bus Rapid Transport System<br><br>Construction of 5.6km of new tram lines and associated construction of supporting infrastructure such as 13 new tram stops, power connections, | Creation of 'missing link' in Luas network<br><br>Extension of Luas system to the north of Dublin city centre<br><br>Increased public transport share (up to 10.5 million additional Luas journeys p.a. in base case)<br><br>Increased Luas operating revenues and enhanced commercial performance, meaning continued avoidance of subvention<br><br>Greater integration of Luas, Rail and bus services in Dublin<br><br>Reduced city centre congestion<br><br>Increased economic benefits of enhanced mobility, as measured in the cost benefit analysis<br><br>Reduced CO2 and other greenhouse emissions and costs thereof as measured in the CBA | New Luas line, extending the existing Green Line from St. Stephen's Green to Broombridge station, allowing for connection with the Luas Red Line at O'Connell Street (in north direction) and Abbey Street (in south direction)<br><br>400,000 fewer car trips per annum as per transport modelling. Estimated emission savings of €23.4 million for period 2018 – 2037<br><br>Reduction in road accidents quantified as a benefit of €246,000 over period 2018 – 2037<br><br>Estimated travel time of 21 minutes by tram from Cabra to St. Stephens Green |

| | | | | |
|---|---|---|---|---|
| | | communications systems and overhead line equipment.<br><br>Replacement of Liam Whelan Bridge at Fassaugh Road, Cabra, Dublin 7.<br><br>Construction of Rosie Hackett Bridge (facilitating pedestrians, buses and the Luas) over the Liffey linking Marlborough Street and Hawkins Street.<br><br>Safety testing of line. | Enhanced image of Dublin as a shopping, tourist and business destination<br><br>Enhancement of city centre realm and improved quality of life for Dubliners and visitors to the city<br><br>Creation of 60 direct and indirect sustainable jobs to operate and maintain the system<br><br>Catalyst for regeneration of city centre areas and sustainable new development of vacant city centre sites | |

**Description of Programme Logic Model**

*Objectives:*

The objectives of the Luas Broombridge project are as follows:

1. **Promote economic growth** in the Dublin economy (and by extension, the Irish economy) by improving the quality of life, sustainability, attractiveness and connectivity of Dublin. The project seeks to enhance Dublin's competitive edge in attracting "internationally mobile human capital and investment" and will capture further added value from the monies previously invested in the existing Luas line.

2. **Reduce traffic congestion** by offering a "fast, frequent and reliable alternative to the private car for travelling to the city centre along the corridor to Broombridge and more importantly along the corridors served by the existing Luas Red and Green Lines".

3. **Further integration of the public transport network** by creating a "genuine" light rail network, thereby increasing benefits in the areas already served by providing additional connectivity through more destinations available via the light rail network. Luas Broombridge will integrate with existing transport services such as the Luas Red and Green Lines, rail services from Maynooth and Dunboyne and the majority of existing Quality Bus schemes which enter or cross Dublin City Centre. Luas Broombridge can also interchange with proposed future projects such as Metro North, DART Underground and Luas extensions to Lucan.

4. **Increasing the future commercial success of the Luas** by extending the catchment area of the Luas system. New Luas passengers are expected to come not only from the corridor of the route, but also from the corridor of the existing Luas lines and of the other transport lines with which it interchanges. Luas Broombridge is forecast to substantially increase passengers on the Luas system and other public transport modes. As with the existing Luas lines, it is expected that Luas Broombridge will operate at a profit and will not require an operating subvention from Government.

5. **Facilitate sustainable development and regeneration** by serving both existing and new housing developments as well as contributing to the regeneration of neglected areas in north inner city Dublin. The redevelopment will provide key social and economic benefits to the region and Luas Broombridge will help facilitate this in a way that is less reliant on the private car and will thus be environmentally and economically sustainable. Luas Broombridge will also serve the proposed consolidated campus for DIT at Grangegorman.

6. The project seeks to **"enhance the public realm"** by improving the streetscape along its route, particularly in areas which have experienced decline in recent years. The enhancement of the city centre realm will help to increase Dublin as a tourist, shopping and cultural destination.

*Inputs:*

The primary input to this project will be the estimated €368 million in direct and indirect capital costs (excl. VAT) to develop and construct the Luas Broombridge project.

Other inputs include administration and staffing costs as well as the cost of hiring consultants to carry out economic appraisal of the project and assess alternative modes of transport.

*Activities:*

There were a number of key activities carried out through the project including:

1. **Assessment of an alternative mode** to Luas Broombridge, namely a Bus Rapid Transit system. The conclusion was that Light Rail is superior to BRT on most evaluation criteria.

2. **Transport Modelling**: Demand analysis undertaken to project the demand for the light rail system based on different population growth and land use scenarios.

3. **Capital costing** including quantitative cost risk analysis.

4. **Risk analysis** included the application of risk and value management methodology to identify and mitigate risks to the project.

5. **Financial and Economic Appraisal**: Cashflow projections and Cost-Benefit Analysis was undertaken for several different cost and growth scenarios.

6. **Route option**: The preferred route of Luas Broombridge was selected following detailed assessment including multi-criteria analysis and the consideration of views expressed by members of the public and interested parties during the public consultation process.

7. **Development of Procurement Strategy**: The RPA reviewed a number of options for procuring the project.

8. **Construction**: Construction of 5.6km of new tram lines and supporting infrastructure, including 13 new tram stops, power connections, communications systems and overhead line equipment. The construction also includes the replacement of Liam Whelan Bridge in Cabra and the construction of a new public transport bridge by Dublin City Council over the river Liffey between Marlborough Street and Hawkins Street.

9. **Safety testing**: Inspection of new line and trials of trams running the line to identify any potential safety or engineering issues.

*Outputs:*

Having carried out the identified activities using the inputs, the outputs of the project are the extension of the Luas system to the north of Dublin city centre with increased public transport share, increased Luas operating revenues, greater integration of Luas, rail and bus services in Dublin and reduced city centre congestion. Furthermore, the implementation of this project is expected to bring economic benefits through enhanced mobility, reduce CO2 and other greenhouse emissions, enhance the image of Dublin as a shopping, tourist and business destination, and create an estimated 60 direct and indirect sustainable jobs to operate and maintain the system.

*Outcomes:*

The main envisaged outcome of the project is the new Luas line, extending the existing Green Line northwards through Dublin City, allowing for a connection with the Luas Red line. However, other expected outcomes related to this include 400,000 fewer car trips annually, emission savings worth approximately €23.4 million for the period 2018 – 2037, reduced road accidents (quantified as a benefit of €246,000 over period 2018 – 2037), and an estimated travel time of 21 minutes by tram from Cabra to St. Stephen's Green.

## Section B - Step 2: Summary Timeline of Project/Programme

The following section tracks the Luas Broombridge Project from inception to conclusion in terms of major project/programme milestones

| | |
|---|---|
| 2004 | Transport case put forward by the RPA in 2004 to link the two existing Luas lines. |
| 2005 | Government's 10-year investment strategy for transport, incorporated plans to develop 7 new Luas lines for Dublin |
| Nov 2011 | Government review of infrastructure and capital investment policy concluded that Luas Broombridge was among its main priorities. |
| Nov 2012 | Updated Business Case submitted by NTA to DTTaS and DPER |
| Nov 2012 | Government decision received to progress with Luas Broombridge project. |
| March 2013 | DTTaS issues formal approval for Luas Broombridge |
| 2014 | NTA engage with EIB on loan process. |
| 2014 | NTA and DTTaS engage on procurement for main contract. |
| Late 2014/2015 | DTTaS approve contract signing. |
| 2015 | Construction commences |
| Mid 2017 | Trials of new tram line carried out |
| Late 2017 | Construction expected to end and tram line to open for use |

## Section B - Step 3: Analysis of Key Documents

The following section reviews the key documentation relating to appraisal, analysis and evaluation for the Luas Broombridge Project.

| Project/Programme Key Documents | |
|---|---|
| **Title** | **Details** |
| Original Business Case | An Ex-Ante Appraisal of the Luas Broombridge Project from June 2009 |
| Updated Business Case | Updated Ex-Ante Appraisal from November 2012 |
| Assessment of Potential Use of Bus Rapid Transit | Report assessing an alternative mode of transport along the proposed Luas Broombridge line. |
| Report on Constructing Luas Broombridge in advance of Metro North Project | Report assessing options available for constructing Luas Broombridge in a manner that does not impede the deliverance of Metro North |
| Bi-Monthly Management Reports | On-Going Project Management Reports for the Luas Broombridge Project |

**Key Document 1: Original Business Case**

The 2009 Business Case document provides a comprehensive overview of the numerous appraisals and pieces of analysis carried out for the Luas Broombridge project as it was in 2009. The Business Case comprised of the following sections: Project Definition; Transport Planning (demand forecasting); Capital Costing; Risk Assessment; Cost Benefit Analysis; Finance and Cashflow Projections; Procurement Strategy; and Programme and Way Forward (implementation plan). The CBA undertaken found that even in the most pessimistic of scenarios a Benefit Cost Ratio (BCR) of 1.26 was projected.

While this document was produced prior to the introduction of the Public Spending Code it does represent a generally satisfactory level of appraisal. However, it would benefit from the inclusion of (i) more clarity concerning the rationale for the project and (ii) a preliminary appraisal of alternative options to the Luas Broombridge. In the economic appraisal undertaken, the appraisal is subject to sensitivity analysis, a do-minimum alternative, and a scenario in which population and employment levels remain at 2006 levels. The inclusion of options such as: alternative modes of transport, an alternative light rail line, or a traffic management solution, even at a preliminary appraisal stage, would make the overall document more comprehensive. It must be noted however, that alternative route options

for the Luas Broombridge line were evaluated using a Multi Criteria Analysis (MCA). Details of the results from this analysis are not provided in the document.

**Key Document 2: Updated Business Case**

The Updated Business Case document has the same sections in it as the earlier iteration but it has been updated to take into account the guidelines of the PSC and Common Appraisal Framework, particularly in terms of the economic appraisal whereby parameter values and shadow prices have been updated and/or included. A Project Appraisal Balance sheet has also been developed as part of the appraisal process. Details of the MCA process, including the scoring for the alternative routes is included in this document.

Furthermore, this document notes that an alternative mode (BRT) was assessed as a comparative to the light rail option. However details of this analysis were not included.

**Key Document 3: Assessment of Potential Use of Bus Rapid Transit**

This document is a 2009 report carried out by Goodbody Economic Consultants to assess a specific alternative mode of transport to service the proposed Luas Broombridge line. It included details of the bus-based service, its costs, the demand forecast for it and a CBA comparing it to the light rail option. The report also included a "wider evaluation of the light rail and BRT options" which outlined some of the qualitative aspects of both options under elements such as Economy, Transport Efficiency and Effectiveness, Safety, Environment, Accessibility & Social Inclusion, and Integration (incl. with future transport network).

This analysis was carried out prior to the introduction of the PSC but it is an appropriate and satisfactory appraisal. However, the full calculations for the CBA are not included as part of the main document and would need to be included as an appendix or a supporting document for assessment purposes.

**Key Document 4: Report on Constructing Luas Broombridge in Advance of Metro North Project**

This document from 2011 set out to ensure the construction of the Luas Broombridge project would accommodate and integrate with the proposed Metro North project. This report outlined a number of options that would allow for the construction of the Luas Broombridge line and would allow for its continued operation during the subsequent construction of the proposed Metro North. From this it was possible to set out the potential outcomes under different scenarios of construction for Luas Broombridge, including Do-Minimum and Do-Maximum scenarios. This analysis allows for the sifting of potential

options for level of construction undertaken for the Luas Broombridge project while also identifying potential upgrades that will be required at a later stage to accommodate Metro North without impacting upon the operation of Luas Broombridge.

**Key Document 5: Bi-Monthly Management Reports**

Minutes from the bi-monthly management meetings were provided as part of the In-Depth Check of the Luas Broombridge project. These documents provide details of the oversight and ongoing monitoring of the project by the NTA. These documents all appear to show a satisfactory level of monitoring and oversight for the project.

## Section B - Step 4: Data Audit

The following section details the data audit that was carried out for the Luas Broombridge Project. It evaluates whether appropriate data is available for the future evaluation of the project/programme.

| Data Required | Use | Availability |
|---|---|---|
| Average Annual Daily Traffic figures along proposed Luas Broombridge Line | To assess number of cars currently travelling along route and make projections based on growth and demand scenarios. | Assume held by NTA, referenced in Business Cases |
| Modal split for people travelling along proposed Luas Broombridge line | To assess how many people are currently availing of Public Transport modes, active modes, cars or other modes along route | Assume held by NTA, referenced in Business Cases |
| Capacity of new Luas line | To determine whether new line can meet projected demand and adequately provide service at peak times | Assume held by NTA, referenced in Business Cases |
| Construction and Maintenance costs for project | Required for cashflow and economic appraisal | Yes, detailed in monthly management meetings but not in any standalone document received by SRAD |
| Road collision data along proposed Luas Broombridge line | Required for quantifying potential road safety benefits from project. | Assume held by NTA, referenced in Business Cases |

**Data Availability and Proposed Next Steps**

The majority of data identified as required for this project is not currently available to the SRAD. However, the use of this data in appraising the project is well described within the two Business Cases (2009 & 2012) as this data is required to run the models used in the appraisals. Therefore, it would appear very likely that the data is available and held by the NTA. However, to ensure that this is the case the SRAD will seek specific documents such as CBA and modelling reports to clarify that the identified data is available.

## Section B - Step 5: Key Evaluation Questions

The following section looks at the key evaluation questions for the Luas Broombridge Project based on the findings from the previous sections of this report.

**Does the delivery of the project/programme comply with the standards set out in the Public Spending Code? (Appraisal Stage, Implementation Stage and Post-Implementation Stage)**

The overall assessment of this project's compliance with the relevant and applicable standards, as set out in the Public Spending Code, is that it generally adheres to the guidelines. However, as noted above, the two Business Case documents would benefit from a more detailed rationale for the project and by including several more alternatives to the preferred option in a preliminary appraisal. However, we do note that a detailed assessment of a BRT alternative has been undertaken as part of the overall appraisal.

The implementation stage meets PSC guidelines and the provision of the bi-monthly management meeting notes has provided a good insight into the monitoring and management of the project that has been undertaken. The identified milestones for this project are appraised as part of the implementation stage to assess whether they have been met, or if they are likely to be met within the project timeframe.

**Is the necessary data and information available such that the project/programme can be subjected to a full evaluation at a later date?**

Some data referenced in the Business Case documents relating to demand forecasting and conducting a CBA has not been provided to the SRAD. A separate report providing a more detailed account of the CBA and demand forecasting would be required to ensure that these had been carried out correctly. However the details provided within the Business Case documents would indicate that the data has been collected and analysed correctly, and is available from the NTA.

**What improvements are recommended such that future processes and management are enhanced?**

Given the project began prior to the introduction of the Public Spending Code it is inevitable that certain elements of the project's appraisal and evaluation process may not adhere to the structure outlined by the PSC's guidelines. Therefore, there is potential for some improvements to the appraisal stage of the project, specifically in terms of identifying the need for the project and carrying out a preliminary appraisal of a large number of alternatives. For the purposes of quality assurance it must be confirmed that the data relating to demand forecasting and the CBA is readily available.

## Section: In-Depth Check Summary

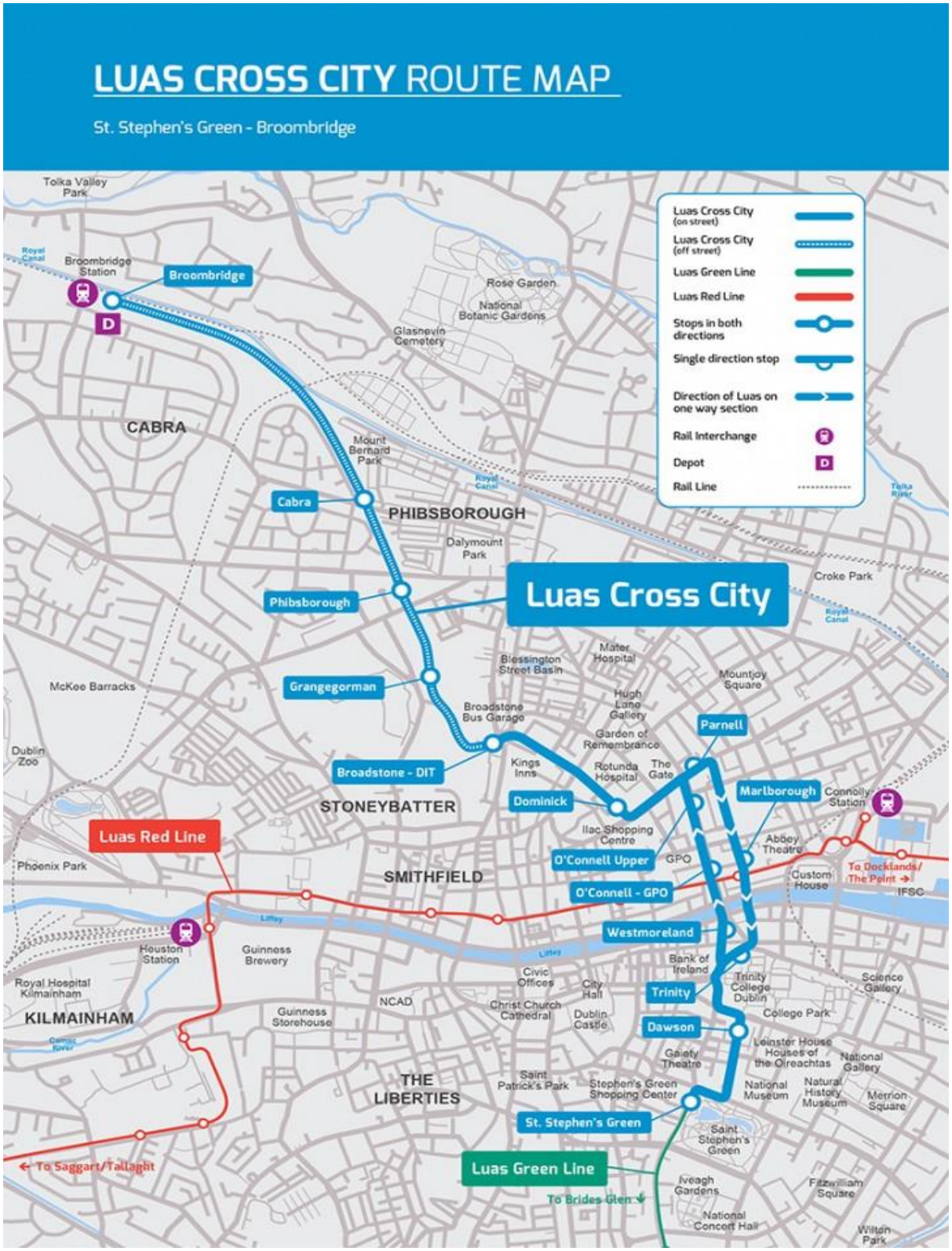
The following section presents a summary of the findings of this In-Depth Check on the Luas Broombridge Project.

**Summary of In-Depth Check**

This project refers to the construction of a light rail line as part of Dublin City's Luas tram network. This project extends the existing Luas Green Line from St. Stephen's Green to the Iarnrod Éireann train station in Broombridge. This extension northwards through Dublin City will also connect the previously separate Luas Green and Red lines. This project was first identified in 2004 following the early success of the Luas Green and Red Lines. Government approval was gained in 2012 and construction began in 2015.

The overall assessment of the Luas Broombridge project in terms of the Quality Assurance Process is that generally the project complies with the relevant and applicable guidelines of the Public Spending Code (PSC). The In-Depth Check notes that the project was initiated prior to the introduction of the PSC in 2013 and that certain elements, particularly relating to the appraisal of the project, could not be expected to fully adhere to these guidelines. There are two particular areas in the appraisal of this project that would benefit from the guidelines provided by the PSC: defining the rationale for the project, and undertaking a preliminary appraisal of a larger number of alternative options.

**APPENDIX 1A – Map of Luas Broombridge route**



An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Strategic Evaluation and Analysis Division

## Quality Assurance – In Depth Check

### Section A: Introduction

This introductory section details the headline information on the programme or project in question.

| Programme or Project Information | |
|---|---|
| **Name** | N5 Westport to Bohola/Turlough |
| **Detail** | Proposed upgrade of the N5 between Westport and Bohola (subsequently Turlough) |
| **Responsible Body** | Transport Infrastructure Ireland, Mayo County Council |
| **Current Status** | Phase 5 – Advance Works/Tendering |
| **Start Date** | January 2008 in its original form as an upgrade to the N5 between Westport and Bohola<br>Construction now expected to begin in 2021 |
| **End Date** | To be determined |
| **Overall Cost** | Total Scheme Budget (incl. VAT): €169.58 million<br>Total Scheme Budget (excl. VAT): €152.55 million |

**Project Description**

The initial road project covered the N5 from Westport to Bohola. One of the objectives of the project was to complement the N26 Ballina to Bohola, Phase 2 Road Scheme which addressed the development of N26 and N58 corridors from Ballina in order to support the National Spatial Strategy for Castlebar and Ballina. On 23 February 2010 a decision to refuse planning for the N26 Ballina to Bohola Stage 2 Road Scheme was reached by An Bord Pleanála. On foot of that decision it was decided to terminate the N5 Westport to Bohola Road Project east of Turlough Village. The models were revised accordingly.

The N5 Westport to Bohola Project considers the redevelopment of 3 existing sections of National Road Network: the road from Westport to Castlebar, the road through Castlebar, and the road from Castlebar to Turlough. The existing route carries a diverse mix of traffic travelling at different speeds, including commuters in cars, commercial vehicles, public transport vehicles, a dozen or more school bus routes, agricultural vehicles and cyclists.

A summary of the existing conditions on these three sections of road is as follows:

- The existing N5 Westport to Castlebar is a single carriageway. The lane widths vary between 2.6 and 3.5 metres and the hard shoulder widths vary from 0 to 3 metres. The existing road markings prohibit overtaking along approximately 50% of the route between Westport and Castlebar. In addition, current design standards require better alignment along this stretch of road. The two-way traffic volumes of 11,400 average annual daily traffic (AADT) as of the Base Year 2013 exceed the recommended design capacity for a Type 1 Single Carriageway. In addition, there is the equivalent of 27 junctions per kilometre. Nine junctions per kilometre is considered “High” by TII design standards. There are issues with the condition of paving conditions and there is no designated cycling or pedestrian facilities along this length of the existing N5.

- The existing N5 through Castlebar provides limited opportunities for overtaking. This can give rise to significant delays.

- The traffic levels on the existing N5 Castlebar to Turlough road as of the Base Year 2013 exceed the recommended design capacity for a Type 1 Single Carriageway. While the alignment is good, the level of traffic reduces the opportunities for overtaking.

The new route aims to alleviate congestion, increase safety, facilitate economic activity, improve journey times, support regional development and provide for further integration with existing and proposed road schemes.

The project is now at Phase 5 in the 7-stage project lifecycle described by TII, which involves advance works and tendering. The original opening year was 2014 with a corresponding scheme design year of 2029. Following the base year calibration and

validation process, these dates have advanced by four years so that the scheme opening year is now 2018 and the scheme design year 2033.

TII have advised that future milestone dates are yet to be determined as they are dependent on the availability of Exchequer funding to allow the project to proceed. The current funding profile under the Government's Capital Investment Plan does not make provision for a construction start until Q1 2021.

The route chosen following the route selection process will involve the construction of 19.7km of dual carriageway and 3.1km of single carriageway[2]. The scheme will require the construction of 2 grade separated junctions, 7 at-grade junctions and 11 bridges.

The scheme also aims to improve road-based public transport at a local, regional and national level by removing congestion along this section of the corridor.

The proposed road project supports Government's Smarter Travel policy, which aims to integrate walking, cycling and public transport. In respect of this policy, the N5 Westport to Turlough project will support existing and proposed cycling and walking routes while providing new links where needs have been identified.

[2] The original N5 Westport to Bohola proposal would have comprised 23.7km of dual carriageway and 2.1km of single carriageway. This plan was rejected by An Bord Pleanála.

## Section B - Step 1: Logic Model Mapping

As part of this In-Depth Check, SRAD has completed a Programme Logic Model (PLM) for the N5 Westport to Turlough Road Project. A PLM is a standard evaluation tool and further information on their nature is available in the Public Spending Code.

| Objectives | Inputs | Activities | Outputs | Outcomes |
|---|---|---|---|---|
| Improve the economic efficiency of the transport network by reducing journey times, improving journey time reliability and increasing road capacity.<br><br>Reduce the frequency of collisions and the severity of accidents.<br><br>As a result of the removal of peak hour traffic delays, minimise fuel wastage and emissions.<br><br>Improve accessibility between key urban centres in the regions.<br><br>Improve public transport journey times and reliability. | Total Scheme Budget of €169.58m capital funding (incl. VAT).<br><br>Associated staff and administration costs.<br><br>AECOM together with Roughan & O'Donovan – Faber Maunsell Alliance Consultancy for traffic modelling and tender assessment. | Project Brief Report.<br><br>Assessment of Constraints.<br><br>Traffic Modelling.<br><br>Cost-Benefit Analysis.<br><br>Road Safety Audit.<br><br>Appraisal of Route Options.<br><br>Public Consultation.<br><br>Selection of Preferred route.<br><br>Route Design.<br><br>Environmental Impact Assessment and Statement.<br><br>Tendering.<br><br>Construction. | Feasibility and Constraints Studies.<br><br>Preliminary Appraisal of Options.<br><br>Route Selection Report.<br><br>Appraisal of Feasible Options and Selection of Preferred Option.<br><br>Design of Selected Route.<br><br>Environmental Impact Assessment and Statutory Process.<br><br>Application to An Bord Pleanála.<br><br>Detailed Design and Land Acquisition.<br><br>Tender contracts.<br><br>Construction of N5 Westport to Turlough. | Improved journey times and journey reliability<br><br>Reduced frequency and severity of road traffic collisions.<br><br>Improved access at a local and national level to the region for all road-based traffic.<br><br>Connectivity to existing national and regional roads.<br><br>Strengthened infrastructure base at a regional and national level through the delivery of key strategic roads. |

**Description of Programme Logic Model**

*Objectives:*

The objectives of the N5 Westport to Turlough Road project are categorised under the five criteria set out for Multi Criteria Analysis in the 2009 edition of DTTaS's Common Appraisal Framework: Economy, Safety, Environment, Accessibility & Social Inclusion, and Integration.

The project's objectives link in with the broader objectives of the National Spatial Strategy and the National and Regional Development Plans.

The specific objectives for this section of the N5 as set out in the October 2013 Business Plan are summarised below:

Economy

- Reduce journey times along the section of road from Westport to Turlough.
- Improve journey time reliability.

Safety

- Reduce frequency of road traffic collisions.
- Reduce severity of accidents along proposed section of the N5.

Environment

- Reduce CO2 and particulate emissions in urban areas through reduction of traffic.
- Reduce noise associated with turbulent traffic flow.

Accessibility & Social Inclusion

- Improve accessibility between Westport, Castlebar and Ballina.
- Improve road-based public transport journey time and reliability.
- Complement national and local planning policy.

Integration

- Integrate with proposed N59 Westport to Mulranny Road project.

*Inputs:*

The primary input to the project is the estimated Total Scheme Budget of €169.58 million (incl. VAT) capital funding necessary to develop, construct and manage the upgraded section of the N5 from Westport to Turlough.

Other inputs include engineering consultancy services from Roughan & O'Donovan, Faber Maunsell and AECOM covering constraint studies, route selection, detailed design, preparation and submission of planning applications and associated reports, and assistance with the tendering process.

*Activities:*

The project is at Phase 5 of the project lifecycle (advanced works and tendering). A number of key activities have already been carried out for the project, including: Constraints Study, Appraisal of Route Options, Selection of Preferred Route, Traffic Modelling, Road Safety Audit, Environmental Impact Assessment, Cost-Benefit Analysis (which has been updated due to the route revision), planning, design and tendering processes.

The next Phase of the project will involve the construction and upgrade of the N5 between Westport and Turlough.

*Outputs:*

The outputs for Phases 1 to 4 have been achieved. The project is at the advance works and tendering phase and the process of tendering has begun.

Previously four road projects had been independently developed by Mayo National Road Design Office. Following an NRA peer review it was decided that these four projects would be developed collectively from N59 Newport Road in the townland of Deerpark East, Westport to N5 Dublin Road, east of Bohola in the townland of Clooneen and to revise the road status from single carriageway to dual carriageway. An initial business case was made on this basis for a road project from Westport to Bohola in 2009.

Following the decision to refuse planning permission to the N26 Ballina to Bohola Stage 2 Road Scheme, a separate study was undertaken to check the validity of the connection point of the N26 to the N5. The decision was made to terminate the scheme at Turlough, pending future consideration of the N26/N58 corridor. A cost-benefit analysis was then carried out for the shortened scheme. The traffic model was updated based on the route selection process previously carried out. The Business Case was revised in 2013, including an updated CBA. The Environmental Impact Statement was produced in August 2013 and was approved in July 2014.

Phase 5 commenced in 2015 with the initiation of work in the following areas: detailed ground investigation, archaeological investigation, and fencing and hedge clearance. All of the advance works were either complete or nearing completion in mid-2017. Currently, the Archaeology Testing Contract is complete on the ground, though the archaeological contractor is continuing with post-excavation analysis and reporting off-site. The Fencing

and Hedgerow Clearance Contract is complete on the ground except for minor snagging works and the final account has yet to be agreed. The diversion of overhead ESB lines is not yet complete and it is expected that ESB will complete this advance work by the end of 2017.

Following a tendering process, Mayo County Council has awarded a contract to Roughan & O'Donovan in August 2017 to act as engineering consultants for Phases 5, 6 and 7 of the project.

The main construction contract tender documents are due to be completed by Q1 2018. The tender competition for the main construction contract will commence when funding becomes available.

*Outcomes:*

The key outcomes of the project include: improved access at a regional and national level for work, education and other activities; improved journey times and journey reliability; reduced frequency and severity of road traffic collisions; and, additional road provision for walking and cycling.

## Section B - Step 2: Summary Timeline of Project/Programme

The following section tracks the N5 Westport to Turlough/Bohola Project from inception to conclusion in terms of major project/programme milestones.

| | |
|---|---|
| Prior to 2008 | Four road projects independently developed by Mayo National Roads Design Office. |
| 2008 | Constraints Study |
| 2009 | Project Brief |
| 2009 | Scheme Cost Estimate Methodology Report |
| 2009 | Route Selection Report |
| 2009 | N5 Westport to Bohola Phase 3 CBA report |
| Feb 2010 | Decision to refuse planning for the N26 Ballina to Bohola Stage 2 Road Scheme was reached by An Bord Pleanála. Route changes to terminate at Turlough. |
| 2010 | Project Brief Phase 3 |
| 2011 | N5 Westport to Turlough Total Scheme Budget |
| 2011 | N5 Westport to Turlough Business Case |
| 2012 | N5 Design Report Volume 1 and 2 |
| 2012 | Environmental Impact Statement |
| 2013 | N5 Westport to Turlough Total Scheme Budget - revised |
| 2014 | An Bord Pleanála Direction |
| 2015 | NRA Approval for Archaeological Consultancy |

| | |
|---|---|
| 2015 | Detailed GI Tender Assessment Report |
| 2015 | TII Signed Tender Award Recommendation |
| 2016 | Advance Fencing Contract – Tender Assessment Report |
| 2016 | TII Signed Tender Award Recommendation (Advance Fencing Contract) |
| Mid 2017 | Advance works either complete or nearing completion (see "Outputs" section above) |
| August 2017 | Engineering Consultancy Services Contract awarded for Phases 5, 6 & 7 of the project. |
| Q1 2018 | Main construction contract tender documents due to be completed. |
| 2021 | Competition for the main construction contract projected to take place in Q1 2021. |

## Section B - Step 3: Analysis of Key Documents

The following section reviews the key documentation relating to appraisal, analysis and evaluation for the N5 Westport to Turlough Project.

| **Project/Programme Key Documents** | |
|---|---|
| **Title** | **Details** |
| Constraints Study Report (October 2008) | Data collection focused on determining constraints to development. Also includes a public consultation undertaken during April 2008. |
| Project Brief (April 2009) | Details the need for the scheme, strategic fit, scope, constraints and objectives. |
| Scheme Cost Methodology (January 2009) | Paper outlines the process of deriving cost estimates for each potential route, including the emerging preferred route. |

| | |
|---|---|
| Route Selection Report<br>(March 2009) | Detailed description of routes initially examined and recommendation of preferred route. |
| Westport to Bohola Cost Benefit Analysis<br>(June 2009) | Cost Benefit Analysis comparing five potential schemes and do-minimum scenario. |
| Project Brief<br>(March 2010) | Project Brief updated to reflect route change, with the scheme now terminating at Turlough rather than Bohola following An Bord Pleanála determination. |
| Business Case (Preliminary)<br>(August 2011) | Detailed overview of design, costing and appraisal of preferred route. Includes project balance sheet, summary of risk assessment and approach to procurement. |
| Design Report<br>(August 2012) | Comprehensive report on the development of the preferred scheme, including engineering requirements, environmental impacts and 30-year project appraisal. |
| Environmental Impact Statement<br>(August 2012) | Required due to length and width of preferred scheme. |
| Business Case (Final)<br>(August 2013) | Updates base year for traffic models from 2010 to 2013. Updates Opening Year and Scheme Design year from 2014 and 2029 to 2018 and 2033 respectively. |
| Traffic Modelling Report<br>(August 2013) | Background to traffic modelling for the project. |
| Cost Benefit Analysis<br>(October 2013) | Update to the Cost Benefit Analysis reflecting developments such as the change to the opening year and more recent accident data. |
| Project Appraisal Balance Sheet<br>(October 2013) | Summary appraisal of project impacts based on outputs of various assessments carried out during the planning and design stages of project development. |

**Key Document 1: Constraints Study Report (October 2008)**

The study area for the proposed N5 Westport to Bohola Road Project is described in detail in this report. Data collection is focused on determining the physical, environmental and engineering constraints that exist which could affect the scheme.

The scheme has been divided into five sections and the study caters for any future fast-tracking of sections of the overall scheme, if required.

The report states that the two principal centres in the study area are Westport and Castlebar and the surrounding rural areas. The total population of the study area was 47,063 in 2006.

The report points out that the study area of the proposed N5 Westport to Bohola Road Project passes through lowland and hilly ground with a feature of the study region being the large number of areas of poor to average quality land such as bogs. Land parcels are much smaller than the national average, with the consequence that the number of landowners therefore that will be affected by the scheme will be higher than for most other national road schemes throughout the country. The summary states that this will be mitigated by the fact that a number of these will be part-time farmers, and significant areas of land are not in agricultural use.

**Key Document 2: Phase 1 - Project Brief (April 2009)**

The main areas of focus in this report were: project history, the need for the scheme, the scheme's strategic fit, the scope and constraints of the project and the project objectives.

Objectives are identified under the 5 headings of Economy, Safety, Environment, Accessibility and Integration.

The objectives identified are quite general. The latest version of DTTaS's Common Appraisal Framework published in 2016 seeks to address this issue by specifying that objectives should be Specific, Measureable, Accurate, Realistic and Timely (SMART).

**Key Document 3: Scheme Cost Methodology - N5 Westport to Bohola (January 2009)**

For the route selection phase of the scheme a point cost estimate is required for each of the route options and parts thereof in accordance with the NRA Cost Management Manual. The point estimate requires that costs be assigned under seven heading: Planning & Design, Land & Property, Archaeology, Advance Works and Other Contracts, Main Contract Construction, Main Contract Supervision, Residual Network.

The sum of these seven elements gives the total for each length being considered in the route selection and cumulatively gives the cost of the overall scheme. Under the NRA Cost Management Manual, this is known as the Option Comparison Estimate (OCE). This estimate type is required to undertake and complete the Cost Benefit Analysis (CBA). All final costs for each of the points and the final estimate are inclusive of VAT.

For the N5 Westport to Bohola, the overall cost of the Emerging Preferred Route as of 2009 was estimated to be €274.5m including VAT but excluding allowances for inflation and contingencies.

**Key Document 4: Phase 3 - Route Selection Report (March 2009)**

This report describes the process that was carried out to arrive at the preferred route. Chapter 4 refers to the previous constraints study. Chapter 5 sets out the engineering parameters and Chapter 6 details the route corridors. Two public consultations took place as part of the route selection process: after the initial assessment of route corridors and again after the detailed assessment of Alternative Routes (Chapter 10) and the traffic predictions and the economic assessment of road safety (Chapter 11). Chapter 10 examines 21 decisions in detail under a variety of headings. The concluding chapters cover the development of the preferred route (Chapter 13) and recommendations (Chapter 14).

**Key Document 5: Phase 3 - Route Selection - Westport to Bohola - Appraisal (June 2009)**

The COBA program compares the "Do-Minimum" scenario (i.e., not to progress with the scheme) with the "Do-Something" scenario (i.e., to progress with the scheme) and determines whether benefits resulting from the provision of the scheme will outweigh the costs of construction and future maintenance. The route selection process identified five alternative schemes, all commencing at the existing N59 at Creggaunnahorna, north of Westport, and ending at the existing N5 east of Bohola.

For comparison purposes, each scheme was decomposed under the following headings: Reduced Single Carriageway, Type 2 Dual Carriageway, Standard Single Carriageway, Side Road and Junctions.

The COBA network is defined as the area within which significant journey time saving and reassignment effects would be expected as a result of the scheme. The COBA network used in this assessment extended east-west from Swinford to Westport and north-south from Foxford to Ballinrobe. The network includes several national primary, secondary and regional roads.

All general parameters were taken from the NRA National Parameters Value Sheets in the NRA Project Appraisal Guidelines.

A number of junctions were chosen for inclusion in the modelling which would allow the delay experienced through junctions to form part of the estimation of journey time savings. Only the most relevant junctions in terms of operational capacity and/or delay were selected for coding into the input deck. This effectively included those nodes where queuing was common during the do-minimum scenario, or where strategic routes intersect.

The COBA model was validated by using surveys to assess journey times. The difference between modelled and observed was found to be 2% with observed times being slightly higher than modelled times. Each scheme was assessed under High and Low Growth scenarios. The costs in this report are represented as 2002 prices, exclusive of VAT.

The assessment resulted in a cost benefit ratio ranging between 1.980 and 1.396 for the high traffic growth scenario and between 1.851 and 1.303 for the low growth scenario over a 30-year design horizon. The results show that all proposed Schemes for the N5 Westport to Bohola Road Project are economically viable with Scheme C returning the highest cost-benefit ratio.

**Key Document 6: Phase 3 - Project Brief - Westport to Turlough (March 2010)**

This document is similar in content to the April 2009 Project Brief at Phase 1. The main addition is the inclusion the proposed road network following the route selection process.

Other updates include: an extended summary, an extended project history, details on proposed alignment, revising the base year from 2007 to 2010 and the revising the scheme opening year from 2014 to 2015. Some detail is provided on modelled base year traffic flows. The section on Strategic Fit is updated to include of a reference to the Smarter Travel policy framework. More detail is provided on the sections of road to be developed.

**Key Documents 7 and 11: Phase 3 - Business Case (Draft and Final) - Westport to Turlough (August 2011 and August 2013)**

The draft Business Case was completed in August 2011. It was finalised in August 2013 following the Design Report and the Environmental Impact Statement.

The Business Case sets out the project context, analysis tools, consideration of options, preferred route, costings, appraisal of the preferred route, risk assessment and procurement.

It was noted that the route selection process was carried out between Westport to Bohola. Following An Bord Pleanála's decision to refused planning permission for the N26 Ballina to Bohola scheme; it was found that schemes B and E were identical once the Turlough to Bohola subsection of road was removed. Potential schemes are assessed by Cost Benefit and Multi Criteria Analyses and from these the amalgamation of schemes B and E emerges as the preferred route.

Routes were judged against five criteria: Environment, Safety, Economy, Accessibility and Integration. In order to determine the ranking of alternative routes their expected impact

was scored against each criterion ranging from highly positive (+3) to highly negative (-3). A Project Appraisal Balance sheet is included and key impacts are summarised.

The monetised value change over 30 years for commuting and business was calculated at €93m and €42.7m respectively.

The Final Business Case refers to a Scheme Opening Year of 2018 and a Scheme Design Year of 2033. However, correspondence of July 2017 indicates that construction is scheduled for Q1 2021 with the Scheme Opening Year being revised to 2024.

**Key Documents 8 and 9: Phases 3 and 4 - Design Report, Environmental Impact Statement and the Statutory Process Selection (August 2012)**

This report represents the final planning phase for a National Road Project. It is during this stage that the characteristics of the route are identified, including horizontal and vertical alignment, structures, drainage and earthworks.

The Design Report, along with the identification of land requirements, production of an Environmental Impact Statement (EIS) and any mitigation measures and commitments agreed at a possible future oral hearing will form the basis of Mayo County Council's requirements for the Design and Build Contract.

A large section of the report is dedicated to the description of the development of the scheme with details of the traffic modelling undertaken, design standards adopted and resulting alignments, drainage, earthworks, pavements, structures, environmental mitigation and all other associated features of the proposed scheme. The report also includes an Economic Analysis of the proposed scheme, an Incremental Analysis to confirm the performance of the proposed scheme relative to alternatives and consideration of the Construction Phase and Road Safety Audit.

**Key Document 12: Phase 3 - Business Case - Appendix B - Traffic Modelling Report (Revision 5) – Westport to Bohola and Westport to Turlough (August 2013)**

The purpose of the Traffic Modelling Report (TMR) is to describe the traffic forecasting that has been undertaken. The report outlines the development of the base year traffic model, the methodology for forecasting demand in future years and the testing of scheme options.

In Revision 5 the models were re-based to account for 2013 traffic levels. In order to establish an understanding of traffic patterns and volumes in the study area in 2013 a number of additional traffic surveys were carried out. These included, Manual Count Surveys, Automatic Traffic Count Surveys, and Journey Time Surveys. Journey time survey

information was used to validate the data in the base models. Journey time surveys were undertaken between several key nodes within the study area.

The Opening year used was 2018 and the Design Year 2033.

**Key Document 13: Phase 3 – Cost Benefit Analysis, Revision 4 (July 2013)**

Revision 4 of the CBA was written following the deferment to the Opening Year to 2018. As a result of the change in the Opening Year the scheme was altered, with revised traffic flows estimated for the Do Minimum scenario impacting upon the Do Something flows. Cost and accident datasets were updated. Further journey time surveys were carried out. Accident rates were determined using the RSA Personal Injury Accident. As junction delay was noted to be a key driver of journey times along the existing N5 through Castlebar, detailed junction models were carried out to ensure that all proposed junctions have sufficient capacity to account for forecast peak traffic flows.

There was a variance of 4% between the modelled and observed journey times with the modelled times being slightly higher than observed times.

The Total Scheme Budget remained at €169.58m for the preferred route. No shadow pricing or Relative Price Factor was used in the determination of costs.

The Total Scheme Budget CBA summary is presented for high, medium and low growth scenarios under the following headings: Consumer User Benefits, Business User Benefits, Private Sector Provider Impacts, Accident Benefits, Emission Benefits, Indirect Tax Revenues, Residual Value, Present Value of Benefits, Present Value of Costs, Net Present Value and Benefit Cost Ratio.

The Benefit Cost Ratio of the preferred route for High, Medium and Low Growth was 2.439, 1.967 and 1.941 respectively. The net present value for each of these scenarios was calculated at €206.3 million, €138.6 million and €134.3 million respectively.

The report notes that travel time savings represent 75% of the scheme benefits and that accident benefits account for approximately 22% of the benefits.

**Key Document 14: Phase 3 - Project Appraisal Balance Sheet - Westport to Turlough (October 2013).**

The Project Appraisal Balance Sheet (PABS) is based on qualitative and quantitative evaluation of criteria and other elements set out in the Department of Transport, Tourism and Sport's Common Appraisal Framework (2009). The project is evaluated under five headings: Economy, Safety, Environment, Accessibility and Social Inclusion, and Integration. The total benefits to the economy are calculated at €243.4m over 30 years.

## Section B - Step 4: Data Audit

The following section details the data audit that was carried out for the N5 Westport to Bohola/Turlough Project. It evaluates whether appropriate data is available for the future evaluation of the project/programme.

| Data Required | Use | Availability |
|---|---|---|
| Average Annual Daily Traffic figures | Traffic modelling (e.g., forecasting future demand versus capacity) | Yes. Conversion rates were developed that allowed AM and PM peak hour traffic flows to be extrapolated to annual average daily traffic, Traffic surveys were carried out in 2007, 2008, 2010 and 2013. |
| Journey time data | To assess the need for intervention to alleviate congestion | Yes. Journey time surveys were carried out at key points during the project lifecycle. The most recent surveys were undertaken during 2013 and the results documented in the Traffic Modelling Report. |
| Junction capacity | To assess the need for intervention to alleviate congestion and develop traffic demand forecasts | Yes. Volume-to-capacity ratios at important junctions were calculated through surveying and traffic modelling. |
| Road collision data along the proposed route | To assess the need for intervention from a safety standpoint, assuming some collisions are attributable to congestion and the lack of opportunity for overtaking | Yes. Collision data sourced from the Road Safety Authority. Additionally, a Road Safety Audit was carried out during the Design Phase. |

**Data Availability and Proposed Next Steps**

To date the project has involved a substantial amount of data analysis to explore the need for the route, to model future demand and capacity, to assess the feasibility of different options and to appraise feasible options in a more detailed manner. This data is well presented in the key documentation.

Traffic surveys were carried out in 2007, 2008, 2010 and 2013. The 2013 surveys updated the base year to 2013 and the opening year to 2018. The Traffic Modelling Report of August

2013 summarises previous survey work and details the different types of surveys that were carried out to assess traffic patterns and volumes.

Twelve manual count surveys were undertaken from 7am to 7pm on 7 March 2013 at a number of important junctions to establish traffic volumes and turning movements. Flows were subdivided into 15 minute intervals and broken down by vehicle type. This data was used to calibrate and validate base year models to ensure a reliable representation of the existing patterns of demand in the study area.

Six automatic traffic count surveys were also undertaken between 5 March 2013 and 11 March 2013 at a number of important link locations, with flows then broken down into one hour intervals. The six stretches of road covered by the surveys were the N59 North of Westport, N5 East of Westport, N59 South of Westport, R311 West of Castlebar, N84 South of Castlebar and N60 Southeast of Castlebar. Supplementary data from the 2012 surveys and from the NRA Traffic Monitoring Units was also used.

Journey time surveys have been carried out to ensure that the travel time on existing roads is properly reflected in the base models. In 2013, additional surveys were undertaken between several key nodes within the study area.

Calibration and validation of the 2013 N5 Base Year Local Area Model (LAM) was also carried out to assist with the forecasting of traffic levels.

Given that Transport Infrastructure Ireland has advised that construction will not begin until 2021 due to budgetary constraints, future survey work will be required to update costs and benefits. Once the new route is in operation data will be required as part of the Post Project Review exercise. Relevant data will be required to assess what impact the new route has had, for example, in the areas of journey time, journey time reliability, volume-to-capacity ratios at junctions and the frequency and cause of collisions. Data on the impact of the new route on modal shift (e.g., changes in the number of people using public transport) will also need to be collected.

## Section B - Step 5: Key Evaluation Questions

The following section looks at the key evaluation questions for the N5 Westport to Turlough based on the findings from the previous sections of this report.

**Does the delivery of the project/programme comply with the standards set out in the Public Spending Code? (Appraisal Stage, Implementation Stage and Post-Implementation Stage)**

This assessment of the N5 Westport to Turlough project is that it does broadly comply with the standards set out in the Public Spending Code, though it should be noted that the project had progressed to Phase 3 prior to the Code's introduction. The project has gone

through the prescribed stages of appraisal by setting out the rationale for intervention and listing the project's objectives; exploring a number of options; carrying out a preliminary appraisal to identify feasible options; and, undertaking detailed appraisal to select a preferred option. The appraisal has also included constraint studies, including a public consultation process, and risk analysis.

With regard to objectives, the 2016 version of DTTaS's Common Appraisal Framework (CAF) requires that they be Specific, Measureable, Accurate, Realistic and Timely (SMART). Developing SMART objectives would have assisted in the future assessment of the project. It would also have been helpful if the objectives were ranked in order of priority.

Additionally, the CAF states that project promoters should avoid referring to any mode specific solutions at the initial stage, which was not the case in this instance.

While it is recognised that delays occur due to budgetary constraints, it would be beneficial to have a summary of expected project milestones and to track how these have deviated from the original timeline over time.

It is noted that a discount rate of 4% was applied and 2009 prices were used. The current CAF requires that a 5% discount rate be used, applying shadow pricing where necessary, and that costs and benefits are presented in 2011 prices.

Reference could have been made to rail services operating within the study area. Currently there are rail lines running from Dublin to Westport via Castlebar and from Dublin to Ballina. The impact of the upgraded stretch of N5 on other modes of transport could have been included in the CBA.

**Is the necessary data and information available such that the project/programme can be subjected to a full evaluation at a later date?**

There is a substantial amount of data and information provided within the main documents for the appraisal and design of this project.

In order to carry out the Post Project Review additional data will have to be collected in the future looking at journey times, collisions, costs, etc. Data may also be required on the effects on other modes of transport such a cycling and rail transport. Finally, given the high volume of tourist traffic in the area, the data needs of the tourism sector should also be considered.

**What improvements are recommended such that future processes and management are enhanced?**

There is scope for improvement in the pre-appraisal and appraisal phases of the project, in line with the 2016 edition of the CAF. For example, the pre-appraisal phase should take into account all modes of transport used within the study area. The CAF provides guidance for agencies when carrying out an appraisal where a modal option lies outside of its remit.

The objectives for the project could have been set out in a more specific and quantifiable manner. By developing SMART objectives for the project, future reviews and assessments could be more detailed and meaningful.

If a further CBA is required, current guidelines from the Department of Public Expenditure and Reform and the Department of Transport, Tourism and Sport should be used, which would help to address the above comments.

Carefully tracking scope, schedule and budget is essential to any major project. Changes under any of these headings from the original plan should be documented. For example the original opening date for the project was 2014, before subsequently changing to 2018 and then 2021. The implications of these delays, financial and otherwise, need to be documented.

It is also noted that the nature of the project changed from a route from Westport to Bohola to a shortened route terminating at Turlough. The lessons learned from this change should be recorded to assist with the planning of future projects.

## Section: In-Depth Check Summary

The following section presents a summary of the findings of this In-Depth Check on the N5 Westport to Bohola/Turlough Project

**Summary of In-Depth Check**

This project refers to the upgrading of a section of the N5, first between Westport and Bohola and subsequently between Westport and Turlough following a planning determination made by An Bord Pleanála. The project arises from the amalgamation of four separate roads projects in County Mayo initiated prior to 2008 while the route revision was made in 2011. The original opening year for the scheme was 2014 and this was subsequently put back to 2018. Due to further delays related to budgetary constraints, it is now expected that construction will commence in 2021.

The project was at Phase 3 when the Public Spending Code was introduced in 2013. Nevertheless, the overall appraisal process and documentation for the project is generally consistent with the Public Spending Code and the latest edition of DTTaS's Common Appraisal Framework. The current guidelines might have enhanced analysis in the pre-appraisal and appraisal phases, ensuring that the impact of the project on alternative transport modes within the study area, such as rail, are considered and that objectives are SMART. In the event that another cost-benefit analysis of the project is required before construction starts, the opportunity should be taken to implement the updated guidelines.

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Strategic Research and Analysis Division

## Quality Assurance – In Depth Check

### Section A: Introduction

This introductory section details the headline information on the programme or project in question.

| Programme or Project Information | |
|---|---|
| **Name** | Grow Dublin |
| **Detail** | International marketing campaigns to grow visitor numbers and spend in Dublin in line with Grow Dublin Taskforce Strategy to 2020 |
| **Responsible Body** | National Tourism Development Authority, Fáilte Ireland |
| **Current Status** | Campaigns complete for 2015 and 2016; 2017 will commence in Autumn this year |
| **Start Date** | First proposed in 2014. Campaigns took place in 2015 and 2016 with a further campaign planned for 2017 |
| **End Date** | 2017 |
| **Overall Cost** | **2015**: €1,030,000<br>**2016**: €1,399,984<br>**Total**: €2,429,984 |

**Project Description**

From 2007 to 2012 tourist numbers in the Dublin region fell by 18% and tourism revenue by 12.6%. The Grow Dublin Taskforce was established in 2012 with the aim of identifying how to bring renewed growth to tourism in Dublin in the period to 2020. A key action proposed by the Taskforce was the delivery of an overseas marketing campaign for Dublin. The purpose of this overseas marketing campaign is to drive awareness and consideration of Dublin as a 'must see, must go' destination for specified target markets.

The first overseas campaign for Dublin ran in 2015 with a budget of €1.03m generated through public-private partnership. The campaign ran for the month of October and consisted of outdoor advertising, audio visual, social media and public relations components. In 2016, €1.4m was spent on a campaign targeted at British holidaymakers encouraging them to take short breaks in Dublin during the off-season (November to February).

Fáilte Ireland developed and managed the overseas campaigns under the governance of the Grow Dublin Advisory Board chaired by Michael Carey. Paul Reid, CEO of Fingal County Council, represents the four Dublin local authorities at Board level.

In terms of financing the programme, Fáilte Ireland contributed €450k in 2015 and €500k in 2016, the four Dublin Local Authorities contributed €300k in 2015 and €501k in 2016, and the private sector contributed €280k in 2015 and €406k in 2016.

## Section B - Step 1: Logic Model Mapping

As part of this In-Depth Check, SRAD has completed a Programme Logic Model (PLM) for the Grow Dublin international marketing campaigns. A PLM is a standard evaluation tool and further information on their nature is available in the Public Spending Code.

| Objectives | Inputs | Activities | Outputs | Outcomes |
|---|---|---|---|---|
| **2015** | | | | |
| To raise awareness of a new destination brand for Dublin among key market segments (Social Energisers and Culturally Curious)<br><br>**KPIs**<br>*Awareness*<br>Outdoor Advertising – International Reach 5m.<br>Impressions across Social Channels - 2m.<br>Earned Media mentions - 100k.<br><br>*Considerations*<br>Video Views – 1m views.<br>Website – increase daily visitors by 25% over the course of the campaign.<br>50% increase in people talking about Dublin as a travel destination. | €1.03m in campaign funding, comprising €450k from Fáilte Ireland, €300k from the four Dublin local authorities and €280k from the private sector. | Marketing campaign consisting of advertising, social media and PR components. The 4-week campaign was both domestic and international; with the international elements mainly targeted at the UK market with some digital activity in France and Germany. | **1. Advertising (International and Domestic)**<br><br>*1.1. International*<br>4-week UK outdoor campaign (London Underground, rail and key road traffic sites). Large digital formats displayed across key sites around London.<br><br>*1.2. Domestic*<br>2-week domestic outdoor campaign (Dart, Luas, City Metropoles, bus and key advertising points in Dublin Airport)<br><br>**2. Digital Campaign**<br>Digital activity launched in tandem with outdoor advertising and focused around a number of video executions | **1. Advertising (International and Domestic)**<br><br>*1.1. International*<br>10m reach with the target audience seeing the brand an average of 16 times each.<br><br>*1.2. Domestic*<br>2m reach with the target audience seeing the brand an average of 8 times each.<br><br>**2. Digital Campaign**<br>1.1m international video views<br><br>4m impressions across Twitter and Facebook, of which 1.5m were organic (not paid for).<br><br>93% increase in Facebook impressions over course of |

| | | | | |
|---|---|---|---|---|
| Increase the usage of #lovedublin by 20%. | | | which brought the brand to life. Activity was both domestic and overseas – mainly GB but with some content translated for French and German markets where the focus was purely digital. Three new videos and creative assets were created.<br><br>**3. Public Relations**<br>Secondary campaign complementing the outdoor and digital elements. It targeted key Irish media, opinion formers and media influencers both online and offline. | campaign.<br><br>80% increase in mentions of the Dublin brand.<br><br>80% increase in people talking about Dublin as a travel destination.<br><br>41% increase in #loveDublin usage.<br><br>Increase in daily website visits from 4,500 during first week of campaign to 11,000 during second.<br><br>**3. Public Relations**<br>Audience reach of 805,000.<br><br>PR valued at €160k.<br><br>National print coverage valued at €13k. |

| Objectives | Inputs | Activities | Outputs | Outcomes |
|---|---|---|---|---|
| **2016** | | | | |
| Drive awareness and understanding of *Dublin: A Breath of Fresh Air* proposition and build sustainable brand value.<br><br>Encourage GB holiday makers to take short breaks in Dublin during the 'shoulder season' in Dublin (Nov-Feb), thereby growing visitor numbers and revenue.<br><br>Build Dublin in a distinctive way, encapsulating what to see and do.<br><br>Disperse visitor traffic across the geography of the city. | €1.4m in campaign funding, comprising €500k from Fáilte Ireland, €501k from the four Dublin local authorities and €406k from the private sector. | Creation of UK National Print advertising.<br><br>Creation of UK national radio advertising.<br><br>Creation of out-of-home advertising in 5 UK cities.<br><br>Creation of digital content and social media activity.<br><br>International publicity campaign. | **UK National Print**<br>8 pages of advertorial content, 18 print display adverts, 7 pieces of digital content on a bespoke Visit Dublin hub. Reach: 6.3m<br><br>**UK National Radio**<br>Weekend show sponsorship, live reads, branded spots, feature discussions, co-branded spots, and an off-air digital hub with a competition page to win a trip for two to Dublin. Reach: 6.1m; 5,000 competition entries.<br><br>**Out-of-Home Advertising**<br>654 advertising panels deployed across Glasgow, Birmingham, Edinburgh, Manchester and Liverpool. Reach: 2.9m.<br><br>**Digital Media**<br>Advertising on high affinity websites to drive traffic to visitdublin.com. GB visits to site up 95% and page views up 56%. 9.5m impressions delivered. 84,776 clicks delivered by paid | GB visitors to visitdublin.com increased by 95%.<br><br>Campaign activity drove 176,124 clicks to visitdublin.com<br><br>Over 60% of Culturally Curious market segment exposed to campaign said it positively influenced their likelihood of visiting Dublin in the future, with Dublin moving from fifth to first in terms of its appeal as a city break destination among competitors.<br><br>Almost half of the Culturally Curious market segment was aware of being exposed to at least one element of the campaign. |

| | | | | |
|---|---|---|---|---|
| | | | search over campaign, accounting for 30% of all visits to visitdublin.com. Reach: 5.1m.<br><br>Social media Facebook campaign delivered 19m impressions, 4m video views and 38,000 clicks through to visitdublin.com.<br><br>**International Publicity**<br>By pitching story ideas, Fáilte Ireland and Tourism Ireland attracted a number of UK journalists to visit Dublin during the campaign.<br><br>Fáilte Ireland also partnered with Dublin Airport to develop a 'Welcome to Dublin' message that was displayed throughout the airport complex. | |

**Description of Programme Logic Model**

*Objectives:*

The objectives of the Grow Dublin overseas marketing programme are as follows[3]:

1. **Build a distinctive new brand proposition** for Dublin, encapsulating what the city has to offer, so as to distinguish it from its competitor set of rival city destinations.
2. **Raise awareness and understanding of a new destination brand for Dublin** among key market segments and thus drive reappraisal of Dublin as a destination.
3. **Promote economic growth** in the Dublin economy by attracting greater numbers of tourists to visit Dublin and generating increased revenue from those tourist visits.
4. **Disperse visitor traffic across the geography of the city**.

*Inputs:*

The primary input to this project is the estimated €2.4 million spent on developing and implementing marketing campaigns for Dublin in targeted overseas markets.

*Activities:*

The key activities carried out in each year of the programme involved the creation and distribution of the material for the marketing campaigns.

*Outputs:*

The outputs of the programme formed the content of the marketing campaigns across multiple forms of media, both at city locations in Great Britain and online.

*Outcomes:*

The main outcomes of the programme were:

- **2015**: Substantial international reach (the target audience seeing the brand), substantial impact in terms of video views, website visits and impressions across online platforms as well as audience reach and earned PR.

- **2016**: substantial increase in website visits and positive attitude towards Dublin as a potential destination among key target market segment (Culturally Curious).

[3] Given that there is some discrepancy between the objectives from year to year and that no definitive set of objectives was set out in advance for the programme as a whole, these objectives are based on those for the 2016 campaign which encompass the general objective for 2015 along with further new objectives.

## Section B - Step 2: Summary Timeline of Project/Programme

The following section tracks the Grow Dublin overseas marketing programme from inception to conclusion in terms of major programme and campaign milestones.

| | |
|---|---|
| 2012 | Grow Dublin Taskforce established by Fáilte Ireland |
| Jan 2014 | Launch of *Destination Dublin: A Collective Strategy for Tourism Growth to Dublin*, which included the action to 'Deliver a Powerful Marketing Communications Strategy' |
| Nov 2014 | Grow Dublin Tourism Alliance established with responsibility for implementing strategy |
| Feb 2015 | Grow Dublin Tourism Alliance was reconfigured to the Grow Dublin Advisory Board which was established with responsibility for implementing strategy. Additional members were invited onto the board. |
| Oct 2015 | *Dublin, A Breath of Fresh Air* brand and marketing campaign launched in the UK and, to a lesser extent, other European markets |
| Oct 2016 | *Dublin is what happens in between* campaign launched targeting the Culturally Curious in five UK cities with the aim of inspiring this cohort to visit Dublin during the shoulder season |

## Section B - Step 3: Analysis of Key Documents

The following section reviews the key documentation relating to appraisal, analysis and evaluation for the Grow Dublin international marketing campaigns.

| Project/Programme Key Documents | |
|---|---|
| **Title** | **Details** |
| Destination Dublin, A Collective Strategy for Tourism Growth to 2020 | Strategy to maximise tourism numbers and value in order to grow economy of Dublin |
| Grow Dublin Tourism Alliance Progress and Action Plan | Action plan identifying key priorities for implementation of Dublin tourism strategy |
| Campaign Briefs, 2015 and 2016 | Description of campaigns required and results expected for 2015 and 2016 |
| Media Plans, 2015 and 2016 | Media Buy details for 2015 and 2016 campaigns |
| Pre- and Post-Campaign Research, 2016 | Research on awareness of Dublin before and after UK campaign, conducted in 2016 and Q1 2017 |
| Dublin International Campaign Results, 2015 and 2016 | Objectives, activities and results for 2016 campaign; results achieved for 2015 campaign |

**Key Document 1: Destination Dublin, A Collective Strategy for Tourism Growth to 2020**

The strategy document refers to research undertaken by the Grow Dublin Taskforce to assess tourism demand in foreign markets, and the decision to target market segments with the greatest potential for growth. Three possible growth scenarios are set out (including the current level of growth) and the Taskforce agreed the most ambitious scenario should be pursued, which required additional private funding and a repurposing of overseas marketing of Dublin to project the new destination brand. The general objective of the strategy is to achieve economic growth in Dublin through maximising tourism numbers and spend. The Action Plan includes development of a powerful marketing communications strategy to target low awareness among potential visitors. KPIs (e.g. visitor numbers) are set out but specific targets for each KPI are left to 'relevant… organisations'.

**Key Document 2: Grow Dublin Tourism Alliance Progress and Action Plan**

The action plan establishes specific priorities for business sectors in order to implement the overall strategy. The broad objective for the strategy is to get Dublin into the consideration set of priority international visitor segments, while growing visitor numbers and optimising the economic impact of visitors to Dublin and surrounding areas are also mentioned. The rationale for intervention is established, which is due to both the need for coordination across multiple actors and sectors to ensure cohesive brand presentation and the need to advance Dublin's future growth prospects. A distinct experience brand for Dublin and subsequent communications campaigns are identified as essential to delivering the targeted growth – this effectively rules out a do-nothing option as insufficient to meet the key objective. Measurement of progress in order to understand the effectiveness of the expenditure and the nature of the economic impact is also identified as an integral enabler of achievement of the strategy, with key KPIs listed. The tasks of identifying the funding arrangements and operational details of the marketing campaign were delegated to specified subgroups within the GDTA. Action plans are set out for each subgroup, to be completed either by end-2016 or over a three-year campaign. Finalising and agreeing a 3-year brand campaign, subject to funding, is one action laid out for the Branding subgroup. Separately, a Funding subgroup was tasked with finding a viable funding structure for 3 years, and with ensuring measurement of expenditure.

**Key Document 3: Campaign Briefing Documents, 2015 and 2016**

*2015:* A media brief for the UK (awarded to Carat) and content creation brief for Ireland (awarded to Huskies). The Carat brief explains the course of action decided upon by GDTA and GDTA request a 'detailed proposed plan' for how the budget will be spent. The Huskies brief sets out goals for marketing of changing perception and increasing awareness. The objectives set out in these briefs are specific for marketing content creators, rather than objectives for the programme generally.

*2016*: A communications brief for Rothco setting out business and communications objectives as well as stipulating 'mandatories' to be followed in creating the campaign material. Relevant statistics, previous research and brand development work is included in the appendices.

**Key Document 4: Media Plans, 2015 and 2016**

*2015*: An interim report from Carat Dublin which gives details of media purchases in the UK, including prices for online promotional activity to the value of £54,449.

*2016*: A media plan in the form of a Gantt chart detailing when each form of promotional activity (e.g. radio/print advertising) will take place. Planned KPIs are also included.

**Key Document 5: Pre- and Post-Campaign Research, 2016**

Two PowerPoint presentations on market research undertaken by RedC in targeted UK cities before and after the 2016 campaign. The first survey involved a sample of 1,053 respondents with entry restrictions and quotas imposed to ensure only potential holidaymakers were surveyed and a spread of responses across cities, age groups, socio-economic status and market segments. The second survey focused on a smaller sample of 224 exclusively from the Culturally Curious market segment and subject to the same entry criteria as the pre-campaign survey but without demographic quotas. The results show success in meeting the objectives of raising awareness and consideration of Dublin's brand proposition among the Culturally Curious market segment.

**Key Document 6: Campaign Review Document, 2015 and 2016**

*2015*: A report on the objectives, KPIs and results achieved for 2015 campaign. It specifies Social Energisers and Culturally Curious as key market segments at which the campaign was targeted. Also included are PowerPoint slides detailing results of 2015 campaign.

*2016*: A brochure detailing objectives, activities and results of the 2016 campaign.

## Section B - Step 4: Data Audit

The following section details the data audit that was carried out for the Grow Dublin international marketing campaigns in 2015 and 2016. It evaluates whether appropriate data is available for the future evaluation of the programme.

| Data Required | Use | Availability |
|---|---|---|
| Number of visitors to Visit Dublin website and social media channels in 2015 and 2016 | Assess difference in number of visitors to visitdublin.com and social media channels in 2015 and 2016 | Yes, Held by National Tourism Development Authority |
| Tourist visitor numbers to Dublin (broken down by market segment, and geographically within Dublin) | Assess growth in visits to Dublin region generally, growth in each target market segment, growth from markets in target countries, tourism growth for Dublin relative to competitor cities, and spatial dispersion of tourist activity across Dublin | Partial – UK holidays to Dublin region (overall and percentage during shoulder season) available from Fáilte Ireland. |
| Revenue from tourist visits to Dublin (broken down by market segment, and geographically within Dublin) | Assess growth in tourism revenue in Dublin region generally, growth from each target market segment, growth from markets in target countries, spatial dispersion of tourist activity across Dublin region. | Partial – revenue from UK tourists in Dublin region available from Fáilte Ireland. |
| Survey data on attitudes among target market segments in target market countries to Dublin as a potential tourism destination, including relative to competitor cities. | Assess effectiveness of marketing campaign in increasing awareness of Dublin's tourism offerings among target markets and relative to competitors. | Partial – data available for 2016 from pre- and post-campaign surveys. |
| Cost data for equivalent marketing campaigns in previous years or as undertaken by comparable destination marketing organisations. | Assess efficiency of the programme (i.e., were outputs produced for the lowest cost?) | Data on marketing budget, overall budget and publicly funded % of budget available for DMOs in competitor cities |

**Data Availability and Proposed Next Steps**

The NTDA holds figures on how many visitors the Visit Dublin website receives while Fáilte Ireland publishes estimated aggregate figures on tourist numbers and revenue for the Dublin region. In combination this data can allow for the effectiveness of the advertising campaigns to be judged in terms of increasing awareness of Dublin as a destination and also to what extent this increased awareness translates into actual visitor numbers.

The conducting of surveys pre- and post-campaign in 2016 is an encouraging step and one which should be repeated in 2017. Extending the survey and analysis of the results to multiple target market segments rather than just the Culturally Curious would be useful, if possible, in order to control for factors that could affect attitudes across many or all market segments. Data from these surveys provide additional material for evaluating the effectiveness of the campaign.

It is unclear at present if data is currently available that would help to determine whether the campaigns have achieved their objective of increasing revenue from tourist visits in the Dublin region specifically during the shoulder season, or the objective of spreading tourist activity spatially across Dublin. In the absence of this data it is impossible to measure campaign outcomes. As such, data in these areas should be collected for the 2017 campaign in order to enable a comprehensive evaluation of the programme.

## Section B - Step 5: Key Evaluation Questions

**Does the delivery of the project/programme comply with the standards set out in the Public Spending Code? (Appraisal Stage, Implementation Stage and Post-Implementation Stage)**

The programme was generally appraised in accordance with Public Spending Code guidance, despite the absence of a distinct, specific appraisal document for the marketing campaign programme. The overall objectives and rationale for the programme are set out in the GDTA Action Plan, which discusses these in the wider context of cross-sectoral actions to implement the collective strategy for tourism growth in Dublin. Appraisal of multiple options is not explicitly discussed, although it is made clear that a do-nothing option would not meet the objectives. Objectives and KPIs for 2015 were also set out in an overview document which discussed the results of the campaign. Objectives and KPIs for 2016 were set out clearly, and in advance of the expenditure, in a briefing document to the chosen marketing agency. However, given the data available, it does not appear possible to evaluate progress on the objectives of increasing visitor spend or dispersing visitor traffic across the city.

The GDTA Action Plan recognises the importance of monitoring and evaluation to ensure successful programme delivery, and several indicators are available so that the overall effectiveness of the programme can be monitored. Media plans have been provided for the 2015 and 2016 campaigns, with planned spending established in detail for 2016 through supporting documentation. Further information on marketing outputs, results in terms of promotional activity (e.g. number of clicks), and impacts in terms of attitudes towards Dublin were collected. The 2015 objectives specified two target market segments (Social Energisers and Culturally Curious), though the evaluation looked only at general results. The evaluation for 2016 improved on this by looking specifically at impacts in the Culturally Curious market segment, clearly linking the evaluation to the programme objectives.

**Is the necessary data and information available such that the project/programme can be subjected to a full evaluation at a later date?**

High-level data necessary to measure effectiveness (tourist visitor numbers to Dublin in the shoulder season, tourist revenue to Dublin from British visitors) is collected by Fáilte Ireland. Data is also available to assess the cost of the marketing initiative relative to marketing spend in competitor cities. However, in order to comprehensively evaluate the impact of the programme, data on visitor spending and the geographic spread of tourism activity across the greater Dublin region needs to be collected and made available.

**What improvements are recommended such that future processes and management are enhanced?**

Carrying out of a single appraisal for the programme as a whole, to include rationale, objectives, appraisal of multiple options and plans for monitoring and evaluation, in advance of drawing down of expenditure. Most of these Business Case elements were present in the various Key Documents submitted by Fáilte Ireland for the campaigns in 2015 and 2016, mainly in the GDTA Action Plan published before the 2015 campaign. SRAD also accepts that the appraisal process in this instance took place within the particular prevailing circumstances of the Grow Dublin programme and under considerable time pressure.

## Section: In-Depth Check Summary

**Summary of In-Depth Check**

Spending on the Grow Dublin tourism programme varies depending on how the projects under its umbrella are categorised and this creates some confusion around the Public Spending Code requirements. Treating the overseas marketing campaign as one current expenditure programme taking place over three years (2015-2017) and costing €2.43m for the first two (€1.75m of public funds), a small single appraisal should have been carried out within Fáilte Ireland and documented. Broadly speaking, the work carried out by Fáilte Ireland in appraising the programme, establishing a plan for monitoring and evaluation, and following up on those plans, meets this requirement. The project is unusual in that appraisal and expenditure took place almost in parallel in the first year. That said, it is also clear that, despite the complex governance structure which emerged in the wake of the Grow Dublin tourism strategy, Fáilte Ireland and the other relevant bodies always endeavoured to implement the programme effectively and kept DTTaS and other stakeholders up to date on a regular basis.

The preparatory work for the 2016 campaign demonstrates an improvement from that of the 2015 campaign. The 2016 brief sets out specific objectives and KPIs with a view to achieving impacts (increased visitor numbers and spend by certain tourists in Dublin at certain times), and data collection and analysis follows up on these, though some data gaps related to the fulfilment of objectives remain. Going into the 2017 run of the Grow Dublin campaign this autumn and based on the findings of this In-Depth Check, Fáilte Ireland should aim to continue the good progress made in 2016 to ensure that the programme is fully compliant with the Public Spending Code.