

5. DEVELOPMENT OF EDINBURGH TRAM DURING THE PARLIAMENTARY PROCESS

This Chapter sets out the development of Edinburgh Tram during and following the Parliamentary process for Lines 1 and 2. The key developments set out are those that relate to the proposed phased implementation, recognising current affordability constraints, and the creation of Transport Edinburgh Limited, a new company set up by CEC to oversee the integrated operations of Lothian Buses and Edinburgh Tram.

Project Phasing

- 5.1 The final STAG reports for Lines 1 and 2 were produced in September 2004 and contained relatively minor updates and revisions from the first version issued in November 2003, with the promoted schemes remaining essentially unchanged.
- 5.2 During 2005 the key funding and affordability issues were addressed in the context of a fixed SE grant of £375m, a substantial contribution from CEC and the financial risks which will have to be borne by either CEC or SE. The conclusion reached was that although Tram Line 1 only or Tram Line 2 only had a high degree of deliverability within the constraint of a fixed SE grant of £375m, a network of Lines 1 and 2, with or without the Newbridge Shuttle, was unlikely to be affordable in one phase of construction and that a phased approach to procurement and delivery would be implemented.
- 5.3 Taking a prudent view on capital cost estimates and funding sources, an examination was undertaken by a number of parties — the CEC, TEL (see below), Lothian Buses, Transdev (the tram operator) — to assess optimum construction phasing. This work was validated by the SE. The parties determined through reasoned argument and professional judgement which phases within the totality of lines 1 and 2 would be the best to proceed with, assuming that Royal Assent was granted for both Bills.
- 5.4 Consideration has been given to a range of options for first phase network construction and to the pattern of construction of subsequent phases. This work indicates that the line from Newhaven to Edinburgh Airport (phase 1a), via Haymarket and Princes Street, gives the best balance of costs and benefits and presents a high probability of being financially viable when integrated with Lothian Buses services. This first phase of the tram development could be extended to include the section of Line 1 from Roseburn to Granton Square (phase 1b).
- 5.5 Phase 1a would provide the core support for the city economy and would directly link the major growth centres at the Airport/Gogarburn/West Edinburgh and Leith Waterfront with the city centre. It would provide access to the major housing and commercial developments under construction and planned and would underpin the role of these developments in sustaining the Edinburgh's role as a growing successful capital city.
- 5.6 The link to Leith will serve two thirds of the waterfront development contained in the

area that runs across the Leith waterfront between Newhaven and the eastern end of the Victoria Dock in Leith. Two thirds of the totality—approaching 20,000 houses plus shops and offices—is within that arc. The tram will serve that area extremely well. Figures have changed during the consideration of the Bill and Forth Ports has made revised proposals for Leith Docks. Under the latest proposals, a community the size of Bathgate will be built in Leith Docks.

5.7 The advantages to CEC in achieving its vision for the city and in securing transport infrastructure stemming from this proposed first phase of the tram are:

- The tram would be a world class gateway to the city for visitors arriving at the Airport, providing access to all modes of transport;
- Direct access to the major shopping destinations of the Gyle, Ocean Terminal and the city centre and to the Royal Bank of Scotland's new international headquarters at Gogarburn;
- Access for existing communities to employment, leisure, shopping and other opportunities;
- The line would link with existing transport hubs at Edinburgh Park, Haymarket and Waverley Railway Stations and at the Bus Station in St Andrew Square to give first class interchange for local and long distance trips;
- The line would serve an expanded 'Park and Ride' at Ingliston increasing the catchment area of the tram and further reducing the demand for car travel in the city;
- The Roseburn Street tram stop would serve Murrayfield and Tynecastle stadia, giving access to international and national sporting and other events;
- This first phase would provide the core infrastructure on which expansion of the network would be built and could include in the future the proposed Line 3 linking the city centre with the new Royal Infirmary and the key development areas in South Edinburgh.

5.8 The development of this core section of Lines 1 and 2, as a first phase, is fully supported by TEL and Transdev, the tram operator.

5.9 The resulting first phase (Phase 1a) represents a good "fit" with the Structure and Local Plans. This is also the case with Phase 1b, which CEC wishes to construct at the same time as Phase 1a. Here the key 'driver' is the need to link the Granton Waterfront with the rest of the network and the rest of the city-region. Granton is linked to the network at Haymarket via the Roseburn corridor, which also serves the new Telford College, the Western General Hospital, Craighleith retail park and other key destinations.

Transport Edinburgh Limited

5.10 It has always been a critical element of the planning for the tram system that the operations of bus and tram (and other modes) should be as fully integrated as possible. Edinburgh is in an almost unique position, in that the main bus operator in the city is majority owned by the public sector. Recognising the unique opportunity this presented, CEC decided to establish Transport Edinburgh Limited ("TEL"), to take on the responsibility for coordinating the services of Lothian Buses and the tram.

- 5.11 TEL is the single economic entity within which both the tram and Lothian Buses will operate. As a result of the common ownership of both Lothian Buses and the Edinburgh Tram, TEL will ensure complete integration of bus and tram services in a single network, avoiding unnecessary duplication and at the same time maximising passenger benefits through a fully integrated ticketing regime and marketing of the integrated network. TEL will take full advantage of the continuing engagement of Transdev, the tram operator, whose experience of tram and other public transport operation complements the expertise available in Lothian Buses.
- 5.12 TEL has played a leading role in the work carried out to date in assessing the economic and financial viability of the Phase 1a tram integrated with bus services and is assisting the Joint Revenue Committee contractor to define the parameters and inputs to the patronage and revenue modelling process to inform the optimal tram and bus network. TEL has also been engaging in consultation with third party bus operators.
- 5.13 TEL is committed to the implementation of integrated ticketing between the tram and Lothian Buses with fare parity between the two systems.

6. CONSULTATION

Participation and consultation is central to the ethos of STAG. A well planned and well executed participation and consultation strategy will lead to better proposals and greater support for their implementation.

Extensive consultation was undertaken during the development of Lines 1 and 2 and this is summarised below. This continued through the Parliamentary process, notably the management of and negotiation with objectors to the Bill. A separate strand during this time and subsequently has been the creation of Community Liaison Groups to inform further development of the scheme.

Objectives and consultation process

- 6.1 Extensive consultation has been undertaken in respect of the Edinburgh Tram network. We appointed a specialist advisor, Weber Shandwick, to develop and implement an overall strategy for public relations and communications, for both Lines 1 and 2.
- 6.2 The main objectives of the consultations were to inform stakeholders about the proposals, and to allow stakeholders to express their views on the proposals and therefore contribute to the assessment and preparation of final route designs. The consultation process also aimed to raise awareness and understanding of, and interest in, the proposals amongst stakeholders, and to build support where possible. In addition, the consultation process was intended to enable misconceptions and negative perceptions amongst stakeholders and the wider public to be addressed.
- 6.3 The consultation process involved three main groups and many methods of consultation. This is summarised in Table 6.1.

TABLE 6.1 CONSULTATION TO DATE

Groups	Methods	Who involved?	
Clients	Steering group meetings	tie	
	Monthly progress meetings	CEC Transport and Planning division	
	Small meetings	Scottish Executive	
Stakeholder	Letters	Environmental (e.g. Murrayfield Flood Defence)	
	Telephone conversations	Statutory	
	Meetings		Heritage (e.g. Historic Scotland)
			Transport (e.g. Network Rail)
			Community (e.g. Scottish Rugby Union)
			Business (e.g. Royal Bank of Scotland)
			Public Utility (e.g. British Telecom)
	Emergency services		
	Disability		
	Technical (e.g. Traffic Interface Group)		
Public	Media launch	General public	
	Leaflets		
	Website		
	Freefone number		
	Consultation with Political Representatives & Community Organisations		
	Exhibitions		
	Public meetings		

Results of the consultation for Line 1

6.4 The main findings were that 84% supported the concept of the tram in Edinburgh. The key points raised by the Line 1 consultation are summarised below.

Route-alignment concerns:

- Princes Street/George Street – Princes Street was supported by 66% of respondents.
- Telford Road/Former railway solum – Responses from the public within the zone of influence of the route options favoured the former railway solum along the Roseburn corridor. When taking into account all parties, the picture switched in favour of Telford Road, particularly because of cycle groups, who were concerned that there might be an adverse effect on the cycleway if the former railway solum were used for the tram route.
- With regard to proposed stops on Line 1, 83% of the respondents considered them to be well placed and convenient.
- There was concern about existing traffic problems and the plan for road realignment for Lower Granton Road. A desire was expressed to relocate the tram from this section.
- Trinity Crescent and Starbank Road also emerged as sections causing concern about width of carriageway, conflict with traffic and loss of parking.
- On Leith Walk and Constitution Street concerns were expressed about impact of

- 6.10 The consultation did result in changes to the then proposed routes. The highlights of these are listed below:
- At Ingliston, proposals now terminate the main tram route at the Airport Terminal building, with any service to Newbridge being provided by a shuttle service from Ingliston.
 - At Gogar, Option B, which avoids Gogar roundabout and is the most popular option, has been recommended as the final proposal.
 - For Roseburn/Carrick Knowe, tie is proposing Option B (north of the railway line), in line with the response to the public consultation.
 - For the Airport alignment, the preferred route is a principal service terminating at the airport, connecting at Ingliston Park & Ride with a shuttle service to Newbridge.
- 6.11 There was further technical work undertaken which, together with the consultation outcomes, influenced the Final Route proposals.

Parliamentary Process

Edinburgh Tram (Line 1) Bill (introduced by City of Edinburgh Council)

- 6.12 The Edinburgh Tram (Line 1) Bill was promoted in the Parliament on 29 January 2004 by CEC. Following its introduction, there was a 60 day period for objections, which ended on 29 March 2004. This resulted in 206 admissible objections.
- 6.13 The Edinburgh Tram (Line 1) Bill Committee was established and met for the first time on 30 June 2004. The Committee published its Preliminary Stage Report on 16 February 2005, which was debated by the Parliament on 2 March 2005. At the debate of 2 March 2005, Parliament agreed the general principles of the Bill, and that the Bill should proceed as a Private Bill⁴⁷. On 3 March 2005 the Parliament passed a financial resolution on the Bill.
- 6.14 The Committee then commenced the Consideration Stage of the Bill. This stage involved the consideration of objections and the detail of the Bill⁴⁸. At the start of Consideration Stage, the Committee grouped those objections which, in its opinion, were the same or similar. The result of this process was that of the 192 outstanding objections that remained following the conclusion of Preliminary Stage, 47 groups were subsequently agreed by the Committee.

⁴⁷ Private Bill Process Flowchart: <http://www.scottish.parliament.uk/business/committees/tram-one-tram-two/papers-04/tram-line-guidance.pdf>

⁴⁸ Consideration Stage initially a 10 stage process. 1. Objections Grouped; 2. Lead Objectors Identified; 3. Promoter and Lead Objectors submit a list of topics, a witness list, a witness summary and details of any amendments; 4. Committee selects witnesses; 5. Timetable for Evidence Set; 6. Promotor and Lead Objector submit Witness Statement; 7. Witness statements passed to other parties; 8. Revised Witness Statements submitted; 9. Committee Consideration commences; 10. Committee reports

- 6.15 Following informal discussions between the clerks and objectors, the Committee also agreed the 'lead objectors' for each group, to have responsibility for coordinating that group's provision of evidence. Where an objection was not or could not be grouped, the original objector automatically became the lead objector for that "group". The Committee had to arbitrate between the interests of the promoter and the interests of each of the remaining objectors and report on each outstanding objection⁴⁹.
- 6.16 The Consideration Stage Report was published on 1 March 2006, and in this report, the Committee gave its decision as to whether to uphold or dismiss each objection. Several objections were withdrawn before and during this first phase of Consideration Stage, as a result of negotiations between the promoter and objectors.
- 6.17 After the Committee had commenced Consideration Stage, it received a request from the promoter for it to consider a proposal to change the alignment of the tram route at two points – in the Haymarket Yards area and the Ocean Terminal area – which would take it outwith the limits of deviation. The Committee agreed that both these proposals merited consideration, meaning that it had to be made aware of any relevant arguments and objections in relation to each altered route. The promoter advertised the proposed route changes, notified affected parties and produced revised and supplementary accompanying documents explaining what the proposed amendments would involve. A new objection period was established and 5 objections were received.
- 6.18 During the course of the Consideration Stage, these objections were withdrawn and accordingly the Committee agreed in its Consideration Stage Report published on 1 March 2006 that these proposed route changes should be made to the Bill
- 6.19 At Final Phase, there was a final consideration of the Private Bill and a decision whether to pass or reject it was taken at a meeting of the whole Parliament. The Bill was passed following the Final Phase debate held on 29 March 2006.
- 6.20 The Bill received Royal Assent on 8th May 2006.
- Edinburgh Tram (Line Two) Bill (Introduced by City of Edinburgh Council)***
- 6.21 **The Edinburgh Tram (Line Two) Bill was promoted in the Parliament on 29 January 2004 by CEC.** Following its introduction, there was a 60 day period for objections ended on 29 March 2004. This resulted in 85 admissible objections.
- 6.22 The Edinburgh Tram (Line 2) Bill Committee was established and met for the first time on 29 June 2004. The Committee published its Preliminary Stage Report on 9 February 2005, which was debated by the Parliament on 23 February 2005. At this debate of the 23 February 2005, Parliament agreed the general principles of the Bill,

⁴⁹ The Committee held meetings in the Scottish Parliament on 21 and 27 June, 5, 13, 19, 27, 28 September, 3 and 25 October, 7, 8, 14 and 29 November and 5 December 2005, at which it took oral evidence from the promoter, objectors and their witnesses. The Committee also took oral evidence at joint meetings with the Edinburgh Tram (Line 2) Bill Committee on 14 June and 1 November 2005. These meetings were limited to consideration of objections identical to both Bills

and that the Bill should proceed as a Private Bill.

- 6.23 The Committee then commenced the Consideration Stage of the Bill. At the start of Consideration Stage, the Committee grouped those objections which, in its opinion, were the same or similar. The result of this process was that of the 77 outstanding objections that remained following the conclusion of Preliminary Stage, 57 groups were subsequently formed by the Committee. The Committee also agreed "lead objectors" for each group, to have responsibility for coordinating that group's provision of evidence.
- 6.24 Several objections were withdrawn before and during this first phase of Consideration Stage, as a result of negotiations between the promoter and objectors.
- 6.25 After the Committee had commenced Consideration Stage, it received a request from the promoter for it to consider a proposal to change the alignment of the tram route at two points - in the Haymarket Yards area and the Gyle area - which would take it outwith the limits of deviation. Such changes, if agreed by the Committee, would necessitate amendments to the Bill.
- 6.26 A new objection period was established and seven objections were received. The Committee subsequently agreed that the notification carried out by the promoter and the revised documents it produced were adequate, and that all the new objections should progress to Consideration Stage.
- 6.27 All of the objections in respect of the amendment at the Gyle were subsequently withdrawn and although not all of the objections in relation to the route change at Haymarket were withdrawn, the Committee agreed in its Consideration Stage Report published on 21 December 2005 that the route be amended as sought.
- 6.28 The Committee noticed that the essence of many objections to Line 2 related to the compulsory acquisition of the objectors' land and rights in land, and the adverse local environmental impacts that objectors consider they will suffer. Having regard to all of the evidence, the Committee was satisfied that the benefits of the scheme outweighed the disbenefits and that an appropriate balance has been struck between the rights of those adversely affected by the scheme and its benefits to the wider community.
- 6.29 On 3 March 2005 the Parliament passed a financial resolution on the Bill. The Consideration Stage Report was published on 21 December 2005 and the Bill was passed following the Final Phase debate held on 22 March 2006.
- 6.30 The Bill received Royal Assent on 27 April 2006.

Objection Management

- 6.31 Not all objections were resolved during the parliamentary process. **tie** made extensive efforts to negotiate with objectors to try and reach agreement. As a result of these negotiations many objections were withdrawn. **tie** sent the objector a letter in comfort giving assurances to that individual/business that what had been agreed in the negotiation process would be put in place. Where negotiation was unsuccessful and **tie** and the objector reached a point where there was no further discussion, **tie** issued a

letter of closure, to indicate that everything possible had been done to negotiate with the objector and that no agreement was able to be reached. Where negotiations had come to a standstill tie issued a position statement, informing the objector what had been done so far, and inviting them to continue negotiations. A summary of this is set out in Table 6.3.

TABLE 6.3 OBJECTION MANAGEMENT

	Number of objections	Objections withdrawn	Agreement made	Letters of Comfort	Letters of Closure
Line 1	192	33	21	5	3
Line 2	77	49	36	5	11

- 6.32 For those whose objections were not resolved by agreement, or withdrawn, there is ongoing stakeholder consultation. Essentially the consultation exercise provides these remaining residents and businesses that still have issues with the opportunity to attend meetings and have input into the various stages of the design process.

Side Agreements

- 6.33 As a result of the objection management process, side agreements have been put in place with a number of objectors. These are managed by tie's land and property team.

Update on consultation – recent developments

- 6.34 In late 2003, as the Private Bills for Tram Lines 1 and 2 were prepared for introduction to Parliament, a number of Community Liaison Groups (CLGs) were set up in key areas along the proposed routes⁵⁰.
- 6.35 tie and CEC recognise the importance of effective community liaison during the design process, and through to implementation of the tram network. As such, tie and partners are working with residents, businesses and others along the route to develop the best possible opportunities for consultation, discussion and explanation. In November 2005, a questionnaire was sent out to all those who attended the existing CLG meetings, asking for detailed feedback on the meetings, and asking for ideas on how meetings could be arranged in the future.
- 6.36 This feedback lead to a change in approach, following Royal Assent. This new approach has been put in place to ensure that those frontagers directly impacted by trams are dealt with on an individual basis so their specific thoughts and concerns can be fed into the design process. The wider public will also be consulted through larger meetings and exhibitions.
- 6.37 A Business Liaison Group has been set up for traders on Leith Walk and Constitution

⁵⁰ The CLG areas are Ratho Station, Baird Drive, West End, Leith Walk/Constitution Street, Trinity/Starbank, Lower Granton Road and Craighleith.

7. DESCRIPTION OF PROPOSED SCHEME

This Chapter sets out a high level description of the proposed scheme for a number of areas, providing the basis for the appraisal set out in the next Chapter:

- Route alignment - noting stop locations, elements of major infrastructure and integration with the road network;
- Infrastructure – detailing key elements of infrastructure associated with the tramway;
- Tram vehicle specification;
- Tram operations;
- Capital and operating costs; and
- Bus network integration – setting out the proposals for the integration of Lothian Buses with Edinburgh tram.

Introduction

- 7.1 The proposed scheme now comprises a combination of elements of the former Line 1 and Line 2 proposals. These are described below.

Route Alignment

Phase 1a

Newhaven to Constitution Street

- 7.2 From Newhaven Stop on Lindsay Road to Ocean Terminal the tram will run segregated parallel to the street then on-street for a short section. A new retaining wall structure, approximately on the line of the existing pedestrian ramp, will provide access from the Lindsay Road to Dock Road. The alignment runs parallel to the existing road, segregated running to the tramstop at Ocean Terminal, where a turnback facility is provided.
- 7.3 From Ocean Terminal, the tramline runs on-street along Ocean Drive, over the existing bridge at the Victoria Dock entrance and the existing Tower Place bridge, both of which will be modified to accommodate the tramway. A tramstop will be provided off-street on Ocean Drive near the new casino and proposed residential developments, from where the alignment runs off-street as far as Tower Street.

- 7.4 From Tower Street to Foot of the Walk, the tramway runs on-street, a mixture of segregated and non-segregated. Platform stops are provided between Bernard and Queen Charlotte Streets.

Foot of The Walk to York Place

- 7.5 The tramlines will run on-street (centre running) for the length of Leith Walk from Foot of The Walk to Picardy Place.
- 7.6 Platform stops, located centrally between tram lanes, are proposed at Foot of The

retaining structures will be required to accommodate the required widening.

- 7.37 Where the railway corridor passes under narrow and low arched bridges, the track bed will be lowered to allow the tram tracks to be offset from the bridge centre-line and thus allow room for a narrower cycleway/footpath.
- 7.38 The safety clearances required for the Overhead Line Equipment (OLE), combined with the increased width of track, mean that extensive tree clearance will be required, opening up the current enclosed nature of the railway corridor. The disturbed slopes will be landscaped and removed vegetation replaced with suitable trees and shrubs.
- 7.39 The cycleway and footpath will be surfaced in a fine grade blacktop as existing, while the tram track, with the exception of crossings, incorporating a grass finish.
- 7.40 The stops at Telford Road, Craigleith, Ravelston Dykes and Roseburn are entirely within the railway corridor and will be designed as well-detailed low platforms, with the shelters, seating, signage and other equipment designed as an integrated whole. The level differences between the stops and the adjacent cycleway and accesses will be dealt with by the incorporation of ramps and steps with commensurate lighting and security measures. The Telford Road stop will facilitate access to the nearby hospital while the stop at Craigleith will be positioned to fit with the surrounding access paths to the residential areas and Retail Park. The Roseburn stop will be located close to the A8 serving local residents and properties in the vicinity of the main road.

Tram Infrastructure

Rails, trackslab and surfacing

- 7.41 The nature of tramline surfacing (track, swept path, affected roads and footpaths) is dependent upon its environment. On street, trackslab construction (reinforced concrete) must provide strength to support the traffic / tram loads (including risk of voids beneath) together with appropriate stray current protection. Steel rails precoated with a resilient material are fixed within the trackslab. The trackslab may also be designed for specific circumstances to mitigate ground borne vibrations and noise. Off-street the rails may be fixed within "grasstrack" (usually a "lawned" type slab or unit construction) or traditional ballast and sleeper type arrangement.
- 7.42 The extent of surfacing works assumed is based on the following reinstatement criteria:
- typically the tramline width will be a minimum of around 3.5m per lane within streetrunning sections;
 - increased lane width and centre line separation will be required on bends;
 - increased centre line to accommodate centre poles where necessary;
 - carriageway and footpath width provision should include for the necessary street furniture including signage & signalling, poles, barriers, etc;
 - where no existing pavement offers space or access for specific maintenance purposes, additional surfaced pavement may be required; and
 - footpaths will generally not be less than 2.0m wide.

Specific Technical Requirements

- 7.63 The Tram body will be a nominal width of 2.65m externally and the total Tram length will be a nominal value of 40m.
- 7.64 The following loading conditions apply in the Specification:
- AW0 = Tram tare weight (empty car)
 - • AW1 = AW0 + full load of seated passengers
 - • AW2 = AW1 + weight of standing passengers at 4 persons/m²
 - • AW3 = AW1 + weight of standing passengers at 5 persons/m²
 - • AW4 = AW1 + weight of standing passengers at 6 persons/m²
 - • AW5 = AW1 + weight of standing passengers at 8 persons/m²

where the mean passenger weight is taken to be 70.5kg.

- 7.65 The passenger capacity of the tram will be at least 230 persons, of which a minimum of 80 will be seated, on fixed seats. There will in addition be provision for wheelchairs in accordance with Rail Vehicle Accessibility Regulations. There will also be provision for luggage racks.
- 7.66 At least 70% of the floor area will be low-floor, with have a height above rail level between 300mm and 400mm. High floor areas will be minimised and all doorways will allow for level boarding access at a height between 300-350mm above the top of the rail.
- 7.67 The Tram will have a maximum operating speed of up to 80km/h.

Noise and Vibration

- 7.68 The Tram will be compliant with the Noise and Vibration Policy of the Edinburgh Tram Project and it is important that the proposed Tram should be as quiet as is reasonably possible. This is likely to mean that the proposed design will incorporate wheel damping, side skirts with sound-deadening linings and resilient mounting of electrical equipment likely to generate noise.
- 7.69 In meeting these requirements, it is a requirement of the tram supplier to carry out noise tests in Edinburgh to determine the frequency peaks generated, in particular by the wheels. The results of these tests will be used to determine the type and extent of any tuned vibration dampers that should subsequently be fitted to the wheels.

Interior

- 7.70 Care and attention will be given to provide a safe passenger environment within the tram vehicles. In regard to this, passenger movement within the Tram will be made as safe as practicable, and able-bodied passengers will be able to move along the entire length of the passenger saloon of the Tram.
- 7.71 The free and safe movement and loading of passengers will be facilitated by the incorporation of handrails, grab-poles and an interior free of tripping hazards and

impacts.

- 8.144 The tram vehicles themselves will also have an impact in areas not currently trafficked, such as the railway corridor.
- 8.145 Construction activities for the tram will appear as an ordinary construction site of the sort common in urban areas, except that the sites will generally be long and linear, and will partially fill what are normally spaces within the fabric of the city. Many activities, such as the erection of the OLE supports and the equipping of the line will be of such short duration that their effect on the townscape is negligible. The location and disposition of the major construction compounds is unknown at the time of writing and cannot therefore be specifically assessed.
- 8.146 The tram will be a new element in the city, clearly visible to all and its impact will be dependent on the design of the system. There is substantial potential for mitigation through ensuring that the various new and altered elements are appropriately designed and integrated into the fabric of the city.
- 8.147 A Design Manual has been prepared, and this sets out the principles of urban design and detailing to be followed in the final design. This will provide specimen designs for key areas, including the whole of the World Heritage Site. Contract requirements will ensure that the final design complies with the Design Manual.
- 8.148 General mitigation commitments arising from the Design Manual include:
- Improvements to the pedestrian realm affected by the tram, including comprehensive wall to wall repaving of key areas;
 - Careful design of the OLE to simplify the layout, balancing conductor wire and support cable sizes against support spacing so as to minimise the size of the wiring;
 - Detailing and design of wire supports and their arrangement to suit the form of the street, particularly at junctions;
 - Use of visually appropriate methods of OLE support, including designing a simple and elegant support column, attractive in its own right;
 - Integrating the OLE supports with other vertical elements in the street (lighting and signing poles) as far as possible, and coordinating the spacing of new and existing poles, replacing existing lighting columns where appropriate;
 - Simple alignment of the tram track to avoid as far as reasonably possible the need for complex OLE support structures or wiring, including straight alignments along the principal city centre streets to respect the formality of urban design of the New Town;
 - Use of surfacing and kerb materials appropriate to the location, in accordance with CEC public realm guidelines;
 - Coordinated and visually integrated design of tram stops, creating high quality pedestrian spaces, with the shelters, seating, signage and other equipment designed as an integrated whole, visually light and transparent.
- 8.149 A summary of the impacts on each townscape zone around the city centre is given in the table below. The section of the route in Phase 1a which extends from Haymarket to Edinburgh Airport has been assessed in a slightly different way, and is described

TABLE 8.21 SUMMARY OF LANDSCAPE IMPACTS (PHASE 1A)

Location	Description	Importance	Impact
Haymarket	Potentially complex OLE support. Road alterations and demolitions weaken enclosure of junction area. Tram stop will improve Haymarket Terrace.	World Heritage Site New Town Conservation Area (CA)	West of Haymarket Terrace: minor adverse to minor beneficial. East of Haymarket Terrace: major adverse. The tram stop: small area major beneficial.
West End	OLE in designed vista. Road widened into gardens.	World Heritage Site New Town CA West End CA	Major adverse.
Princes Street	OLE in designed vista and iconic tourist views. Footway widening.	World Heritage Site New Town CA	Overall major adverse, primarily arising from the OLE. Footway widening beneficial
St Andrew Sq	OLE in designed vista and iconic tourist views.	World Heritage Site New Town CA	Major adverse impact.
Queen St to Picardy Pl	OLE in designed vista. Road widened and awkward level changes.	World Heritage Site New Town CA	Major adverse impact. Particular impact on National Portrait Gallery.
Leith Walk	Road widening and loss of enclosure, but also improvement opportunity at top of Walk. OLE particularly visible in long views. Loss of street trees at north end.	World Heritage Site (part) New Town CA (part) Leith CA (part)	Overall major adverse impact.
Leith	Distinctive small-scale local character, highly sensitive to change.	Leith CA	Major adverse impact
Port of Leith	Tram a minor additional element in industrial parts, part of a much wider change elsewhere.	Leith CA (part)	Generally, minor impact, moderate in limited areas.

8.150 The section of route from Gogar roundabout to the Airport runs to the north of an Area of Great Landscape Value (AGLV) at Gogar. There is a Designed Landscape (Millburn Tower) to the south west of this stretch of corridor route, but this would be entirely unaffected by the tram proposals as there would be little intervisibility between the landscapes and the proposed tram route. The section of tram corridor from Gogar roundabout to the Airport falls within Green Belt designated land of which the local landscape character, under local plan policy is to be protected, maintained and enhanced. The tram corridor would also run adjacent to various areas of open space identified and protected under local plan policy.

8.151 Localised minor positive landscape impacts would arise particularly for the housing areas bounding Broomhouse and Stenhouse Drives due to the proposed mitigation planting along the tram corridor and the mixed woodland screen planting between the railway and tram corridors.

8.152 The area around Edinburgh Park comprises large business related developments

locations.

8.164 A summary of the visual amenity impacts is presented in Table 8.23.

TABLE 8.23 VISUAL AMENITY IMPACTS (PHASE 1a)

Location and Impact	Importance	Significance of Impact
<p>Haymarket</p> <p>OLE generally seen against backdrop of buildings in short views across Haymarket Terrace and junction, longer views across station car park and railway. Tops of columns seen against sky in some places.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>New Town: West End</p> <p>OLE generally seen against backdrop of buildings in short views across the road, longer glimpses from side streets.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p> <p>West End Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>New Town: Princes Street</p> <p>OLE generally seen against backdrop of Castle and the Old Town in open views across gardens. Backdrop of sky from parts of north side footway. Stops interrupt views locally.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>First New Town - designed vistas from cross streets and George Street. OLE will be just discernible against a backdrop of trees.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p>	Neutral (to be confirmed)
<p>Edinburgh Castle</p> <p>Tram discernible but not significant in panoramic views from Castle</p>	<p>World Heritage Site</p> <p>Old Town Conservation Area</p> <p>Listed building</p>	Neutral
<p>New Town: St Andrew Square</p> <p>OLE generally seen against backdrop of buildings and trees in short views across the road, longer glimpses from side streets.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>New Town: Queen St to Picardy Place:</p> <p>OLE generally seen against backdrop of buildings and trees in short views across the road, longer glimpses from side streets.</p>	<p>World Heritage Site</p> <p>New Town Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>Leith Walk</p> <p>OLE generally seen against backdrop of buildings and trees in short views across the road, longer glimpses from side streets.</p>	<p>World Heritage Site (part)</p> <p>New Town Conservation Area (part)</p> <p>Leith Conservation Area (part)</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse
<p>Leith</p> <p>OLE generally seen against backdrop of buildings and trees in short views across the road, longer glimpses from side streets.</p>	<p>Leith Conservation Area</p> <p>See Cultural Heritage for listed buildings</p>	Major to minor adverse

cleaners and domestic helps, pet sitters, child minders and so on. These impacts would be less easy to track but can be important in revitalising an area by pumping in extra income which is recycled through local service providers such as shops and pubs.

8.278 Finally, these impacts are very difficult to quantify as outcomes depend on a range of unpredictable factors, including

- How Granton regeneration area residents respond to having a wider range of employment opportunities available through the tram
- The precise nature of the jobs that are generated in developing areas, the skill and other requirements and how the employers seeking staff respond to potential new recruits
- How residents of other areas, including other regeneration areas within the Edinburgh travel to work area, respond to accessibility changes.

8.279 It is noted that Granton Waterfront development, for example, is also likely to more accessible from other regeneration areas in the city, but also from other non-regeneration areas, where there are also people who would enter the labour market if transport barriers are removed. The mix between regeneration and non-regeneration area residents is important here, for only the former is normally regarded as a distributional gain.

Integration

8.280 The Scottish Executive views integration as one of its five key objectives for transport, as reflected by STAG. The 2004 Scottish Transport White Paper, Scotland's Transport Future⁶⁴, contains five objectives for transport, one of which is as follows:

"Improve integration by making journey planning and ticketing easier and working to ensure smooth connection between different forms of transport"

8.281 These objectives are also reflected in the Draft National Transport Strategy, published by the Scottish Executive in 2006⁶⁵.

8.282 Within this chapter, this section therefore deals with the following specific issues:

- transport integration – the degree to which a proposal fits with other transport infrastructure and services;
- transport-land-use integration – the fit between the proposal and established land-use plans and land-use/transport planning guidance; and
- policy integration – the appropriateness of the proposal in light of wider policies both of central and local Government.

Transport integration

⁶⁴ Scottish Transport White Paper, Scotland's Transport Future, 2004
<http://www.scotland.gov.uk/library5/transport/stfwp-00.asp>

⁶⁵ Scotland's National Transport Strategy: A Consultation, April 2006,
<http://www.scotland.gov.uk/Publications/2006/04/20084756/0>

Changes in travel time	Population	Households	Households No Car	Population	Households	Households No Car
5 to 10 min	20,970	10,443	5,111	44	21	5
1 to 5 min	76,598	35,473	13,989	58,920	24,663	7,300
No effect	433,482	186,045	63,275	444,627	186,164	58,590
-1 to -5 min	164,744	72,248	24,081	106,514	47,806	16,914
-5 to -10 Min	50,840	22,378	7,025	42,783	20,482	9,206
>-10 Min	29,202	12,727	4,035	125,433	61,535	26,323
<i>Total disbenefit</i>	<i>100,081</i>	<i>47,283</i>	<i>19,922</i>	<i>58,992</i>	<i>24,695</i>	<i>7,305</i>
<i>Total benefit</i>	<i>244,786</i>	<i>107,354</i>	<i>35,142</i>	<i>274,730</i>	<i>129,823</i>	<i>52,443</i>
Edinburgh Park			Gyle Centre			
>10 min	529	241	77	-	-	-
5 to 10 min	3,896	1,794	572	12,907	5,443	1,762
1 to 5 min	82,300	36,893	13,393	9,313	4,169	1,456
No effect	416,541	175,136	56,240	366,129	154,111	48,718
-1 to -5 min	171,716	76,663	26,106	137,621	58,609	20,842
-5 to -10 Min	61,128	29,515	13,014	87,185	40,260	16,460
>-10 Min	42,240	20,439	8,937	165,194	78,090	29,100
<i>Total disbenefit</i>	<i>86,724</i>	<i>38,929</i>	<i>14,042</i>	<i>22,220</i>	<i>9,612</i>	<i>3,218</i>
<i>Total benefit</i>	<i>275,084</i>	<i>126,618</i>	<i>48,057</i>	<i>390,000</i>	<i>176,959</i>	<i>66,403</i>
Edinburgh Airport						
>10 min	99,479	41,643	12,834			
5 to 10 min	60,486	24,637	7,145			
1 to 5 min	95,856	43,655	15,727			
No effect	334,234	142,846	45,288			
-1 to -5 min	118,741	52,423	20,362			
-5 to -10 Min	27,866	12,944	5,068			
>-10 Min	41,686	22,535	11,916			
<i>Total disbenefit</i>	<i>255,821</i>	<i>109,935</i>	<i>35,705</i>			
<i>Total benefit</i>	<i>188,294</i>	<i>87,901</i>	<i>37,346</i>			
Total Impacts						
Population		Benefit	2,767,202			
		Disbenefit	1,456,017	1.90		
Households		Benefit	1,242,232			
		Disbenefit	635,934	1.95		
Households with no car		Benefit	456,802			
		Disbenefit	215,748	2.12		



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TABLE 8.40 PHASE 1A COST TO GOVERNMENT

Cost to Public Sector				
	STAG Code	Total	Public Transport	Road Users
Local Government				
Public Sector Investment Costs	PV9	£0		
Public Sector Operating & Maintenance Costs	PV10	£0		
Grant/ subsidy payments	PV11	£0		
(Developer Contribution)		£0		
Revenues	PV12	£0		
Taxation impacts	PV13	£0		
Central Government				
Public Sector Investment Costs	PV9	£0		
Public Sector Operating & Maintenance Costs	PV10	-£154,291	-£154,291	
Grant/ subsidy payments	PV11	-£460,335	-£460,335	
(Developer Contribution)		£0	£0	
Revenues	PV12	£241,647	£241,647	
Taxation impacts	PV13	-£63,097	-£39,146	-£23,951
Total PVC to Government		-£436,077		costs appear as negative
Monetised Summary				
Present Value of Transport Benefits (PV1-8)				
Accidents, PV1		-£11,897		
Transport Economic Efficiency		£714,222		
Total PVB (PV1-PV8)		£702,325		
Present Value of Cost to Government (PV9-13)		£436,077		
Net Present Value		£278,145		
Benefit-Cost to Government Ratio		1.61		

8.345 Total net revenues to TEL are £241m PV, which includes both new revenue to tram of £720m PV and a revenue loss to bus £479m PV. TEL net operating, maintenance and renewal costs are -£154m PV, with tram costing £480m PV partially offset by bus operating cost savings of £324m PV. This shows that the overall operational financial for TEL is positive, and that the trams revenues would also more than cover its operating costs.

8.346 The £480m grant/ subsidy requirement is equivalent to investment costs of the scheme. In addition to the grant funding requirement from the Executive, an additional net £63m is incurred as a loss to the Treasury.

Economic Appraisal Summary

8.347 Table 8.41 summarises the key results of the economic appraisal for both Scheme 1a only and Scheme 1a + 1b.

TABLE 8.41 SUMMARY ECONOMIC RESULTS OVER 60 YEARS

	Scheme 1a only - Economic impacts (£m PV, 2002 prices)	Scheme 1a + 1b - Economic impacts (£m PV, 2002 prices)
User Benefits (consumer)	301	529

User benefits (business)	129	200
Private sector provider impacts	-44	-15
Present Value of Scheme Benefits (£ m.)	385	714
Accident benefits	-5	-12
Present Value of Scheme Benefits incl. Accidents (£ m.)	380	702
Present Value of Scheme Costs (£ m.)	340	436
Net Present Value (£ m)	41	278
Benefit : Cost Ratio	1.12	1.61

- 8.348 The economic case for Edinburgh Tram demonstrates that both the 1a and 1a + 1b options provides positive NPVs and therefore would provide overall value for money.
- 8.349 The 1a scheme would deliver a net present value of £41m and a BCR of 1.12 : 1, representing value for money in economic terms. The 1a + 1b scheme would therefore deliver a net present value of £278m and a BCR of 1.61 : 1, representing good value for money in economic terms.
- 8.350 **The 1a scheme would deliver 54% of the 1a + 1b scheme benefits, but would incur costs equivalent to 78% of the 1a + 1b scheme.**
- 8.351 A comparison of the 1a appraisal with that of 1a + 1b enables the incremental benefit of the 1b scheme component to be identified. The incremental case for 1b is very strong, with 1b delivering an additional 85% of scheme benefits (£322m) over 1a but at an incremental cost £97m PV, a 28% addition. The incremental NPV of the 1b scheme is £226m with a BCR of 3.34 : 1.
- 8.352 This sensitivity therefore demonstrates that the 1a scheme would deliver an inferior, but still positive, economic return than the Central Case, but that the case for the 1b scheme is very strong and helps underpin the robustness of the scheme as a whole.

STAG2 Appraisal Summary Tables

- 8.353 Table 8.42 and Table 8.43 provide a STAG Part 2 appraisal summary of Edinburgh Tram Phase 1a and Phase 1a+1b respectively.

TABLE 8.42 EDINBURGH TRAM PHASE 1A STAG PART 2 APPRAISAL

Proposal Details			
Name and address of authority or organisation promoting the proposal		City of Edinburgh Council	
Proposal Name:	Edinburgh Tram	Name of Planner:	
Proposal Description:	Introduction of a tram route serving the Leith development area, the two main railway stations, the city centre, Edinburgh Park and Edinburgh Airport	Total Public Sector Funding Requirement:	Capital costs/grant (undiscounted) £495m (2006 prices) Annual revenue support: £0 PVC to Govt.: £340m
Funding Source From:	Transport Scotland	Amount of Application:	
Background Information			
Geographic Context:	The proposal will directly serve the corridor from Leith via the City Centre to Edinburgh Airport, including the communities of Newhaven, Leith, Pilrig, Dalry, Saughton, Broomhouse and Edinburgh Park. The route will serve a mixture of commercial, residential and airport related land uses, and the major regeneration areas within Leith. The route will be largely segregated and, through careful design, minimise interaction with the built environment.		
Social Context:	There are a number of (former) Social Inclusion Partnerships along the tram corridor, including geographical-focused initiatives operating in Broomhouse as well as thematic initiatives operating in Sighthill and Stenhouse. The 2004 based Indices of Deprivation indicate that some deprived wards lie within or adjoining the tram route. Car ownership along much of the route is less than 50% of households.		
Economic Context:	The economic performance of the tram corridor is influenced by the economic dynamics of the City of Edinburgh and its wider conurbation, and in particular Central and West Edinburgh. Edinburgh is the seat of administrative power for Scotland with the presence of the Scottish Parliament. The City and its city-region is also at the heart of the country's financial, business, legal, medical/healthcare and insurance markets, and therefore remains very strong in these key industries and sectors. The scheme will serve the commercial core of the city-centre, the major growth area at Edinburgh Park, Gyle Shopping Centre, the RBoS HQ and Edinburgh airport, and the major regeneration areas at Leith.		
Planning objectives:			
Objective:		Performance against planning objective	
To support the local economy by improving accessibility: <ul style="list-style-type: none"> Improved access to the public transport network; and Improved access to employment opportunities. To promote sustainability and reduce environmental damage caused by traffic: <ul style="list-style-type: none"> Increasing proportion of journeys made by public transport, cycling and walking; and Reducing local and global emissions. To reduce traffic congestion: <ul style="list-style-type: none"> Reducing number of trips by car; and Reducing traffic volume on key routes. To make the transport system safer and more secure: <ul style="list-style-type: none"> Reducing traffic accidents. To promote social benefits:		Edinburgh Tram will improve accessibility to employment opportunities, education, shopping and leisure destinations, contributing to improve the local economy. In particular, the tram will serve the regeneration area of Leith and Western Harbour. The scheme will contribute to sustainable travel (zero emissions produced at source by the tram, reduced noise and urban realm improvements) and provide enhanced opportunity for transfer from car to public transport. The tram system will provide a safe and secure means for travel The tram will provide social benefits in terms of enhanced liveability on streets and accessibility to mobility impaired and deprived segments of the population.	

<ul style="list-style-type: none"> Improving liveability of streets, maximising their role as the focal point of local communities; and Reducing social exclusion, by improving the ability of people with low incomes, no access to car, the elderly or those with mobility impairments to use the transport system. 			
Rationale for Selection or Rejection of Proposal:	Lines 1 and 2 were developed within the STAG framework and demonstrated the best fit with planning objectives and the overarching five governmental objectives relating to Environment, Safety, Economy, Integration and Accessibility. The current proposal, comprising elements of Lines 1 and 2, reflects current affordability constraints and the need to maximise the benefits from Edinburgh Tram within this constraint.		
Implementability Appraisal			
Technical:	The proposed alignment is technically feasible, employing tried and tested tram technology. Urban design issues are acceptable and the tram system is integrated with the local bus network.		
Operational:	Run times are minimised through good alignment design and integration with the highway network.		
Financial:	Capital funding is provided by Transport Scotland, with on-going operating cost covered by farebox revenue.		
Public:	Extensive consultation took place in 2003, with high levels of support shown for tram in Edinburgh. Legal powers to construct the tram have been obtained through the Parliamentary Private Bill process, which weighed the overall merits of the scheme with specific objections. Mitigation strategies and policies have been developed to minimise the adverse impacts and hence acceptability of the tram.		
Environment			
Mitigation Options included: (Costs & Benefits)	Various documents have been developed (the Design Manual, Code of Construction Practice and the Noise and Vibration Policy) which set out how any potential adverse impacts of the tram will be mitigated.		
Sub-objective	Qualitative Information	Quantitative Information	Significance of Impact
Noise and vibration			
Air Quality – Overall			
CO2 – Global			
PM10 – Local			
NO2 – Local			
Water Quality, Drainage and Flood Defence	<p>Water Quality may be affected by run-off from construction sites, and during the operation of the route. Where overbridging or culverting is required at the Water of Leith and Gogar Burn plus minor tributaries, there may also be water quality impacts. Groundwater may be affected by penetration of contaminated run-off to aquifers.</p> <p>Comprehensive mitigation programmes render impact on areas at risk of flooding</p>	<p>Water courses likely to be affected & quality (SEPA classification); Gogar Burn (fair to poor) Water of Leith (good to fair)</p>	<p>Water Quality: Minor negative Groundwater: Neutral Flood Defence: Neutral</p>

	neutral.		
Geology	No impacts on designated geological sites. Mineral reserves will not be affected. Waste management issues relating to disposal of potentially contaminated waste during construction and operation may occur.	Designated Geological Sites: SSSIs: Calton Hill (13ha) Castle Rock (Edinburgh Castle) RIGs: No RIGs	Geological Sites: Neutral Mineral Reserves: Neutral Waste Management: Minor negative
Biodiversity	Several areas of habitat will be lost including sections of the wildlife corridor adjacent to the main Glasgow/Edinburgh railway line. The Gogar Burn Site of Interest for Nature Conservation (SINC) and Water of Leith Urban Wildlife Site (UWS) will be affected by the construction of bridges. Badgers at Gogar area in particular will be affected during construction and operation.		Slight adverse
Visual Amenity	Varying range of visual impacts all along the route. The World Heritage Site would be directly impacted by the proposals, as well as wider landscapes including sections of the open Greenbelt landscape. Design of tram system will need to fit to scene. Positive impacts would occur over localised areas due to the proposed mitigation by associated planting.	World Heritage Site and Conservation Areas	Minor adverse. (However, major negative impacts would occur for views from No. 4 Ingliston Rd, Princes St and St Andrew Sq.)
Agriculture and Soils	Agriculture - There would be a Minor Negative impact for individual farming plots, because the area of land take is small in terms of the scale of the farming operations. Contaminated Land - Areas of contaminated land may be disturbed by the construction of the tram.	Agriculture :The extent of agricultural land take will be quantified in the Book of Reference as part of the parliamentary bill submission. Contaminated land (2 sites possibly affected): Disused railway land around Baird Drive and Haymarket, Former landfill believed to have been used for demolition material close to Gogar Burn & Castle	Agriculture: Neutral to Moderate Negative Contaminated Land: Minor to Negative Soils: Neutral

		Gogar	
Cultural Heritage	The tram will pass through the World Heritage Site of the City Centre. Additionally, to make way for the tram, three sites have been identified to be demolished or relocated, including two Listed Buildings.	World Heritage Site: Edinburgh City Centre Listed Buildings to be demolished: The Caledonian Alehouse The Heart of Midlothian War Memorial (at Haymarket)	Moderate negative
Landscape	The World Heritage Site would be directly impacted by the proposals. The proposals would also impact on the character of sensitive townscape areas and wider landscapes including sections of the open Greenbelt landscape. Some positive impacts would occur over localised areas due to the proposed mitigation by associated planting.	World Heritage Site and Conservation Areas	Major Negative (However minor negative for the occasional localised character areas)
Safety			
Sub-objective	Item	Qualitative Information	Quantitative Information
Accidents	Change in Annual Personal Injury Accidents	Standard rates and methodology from NESA	Change in annual accidents: +75.3 in 2011 and +75.4 in 2031
	Change in Balance of Severity	Split by damage only, slight, serious and fatal	Annual changes (2011): damage only 70.1, slight 4.6, serious 0.5, fatal 0.1
	Total Discounted Savings		£5.2m (PV)
Security		CCTV system at all stops and on vehicles. Positive design and access integrated with urban form. High use of inspectors on vehicles. Lighting and help points at all stops.	Moderate beneficial
Economy (Transport Economic Efficiency)			
Sub-objective	Item	Qualitative Information	Quantitative Information (£000's)
User Benefits	Travel Time	Significant public transport journey time savings: Leith Docks – Haymarket 10+ minutes, tram corridor west of Haymarket to Leith Docks improved by 10+ minutes, access time to Edinburgh Park/Gyle improved by 10+ minutes for much of eastern	£403,135 (PV)

		Edinburgh	
	User Charges		£0
	Vehicle Operating Costs		£26,435 (PV)
	Quality / Reliability Benefits	The higher quality afforded by Edinburgh Tram compared to the alternative public transport modes has been encapsulated in the demand modelling and appraisal through the use of differential in-vehicle time factors.	Included in travel time benefits
Private Sector Operator Impacts	Investment Costs	Scheme capital cost	-£389,880 (PV)
	Operating & Maintenance Costs		£0
	Revenues	Change in revenue to rail operators and non-TEL bus operations	-£44,115 (PV)
	Grant / Subsidy payments	Grant for capital costs	£389,880 (PV)
Economy (Economic Activity and Location Impacts)			
Sub-objective	Item	Qualitative Information	Quantitative Information
Economic Activity and Location Impacts	Local Economic Impacts	The commercial and residential property markets will benefit from the tram, leading to additional employment in the retail, office, commercial and leisure sectors. North Edinburgh (Western Harbour - Newhaven and Leith Docks) will benefit as will Edinburgh Gate, Newbridge North and Ratho Park. Small additional employment due to cost savings (eg taxi/parking costs): central/north Edinburgh.	1,450 local additional jobs (present value) assuming that displacement takes place outside of Edinburgh TTWA.
	National Economic Impacts	A proportion of the local employment generated will be retained at the national level. Potential for further national impacts through additional labour supply, people moving to more productive jobs and agglomeration effects (not quantified).	640 additional jobs (present value) at the Scotland level, allowing for displacement .
	Distributional Impacts		
Integration			

Sub-objective	Item	Qualitative Information	Quantitative Information
Transport Interchanges	Services & Ticketing	Phase 1A will enhance the opportunity for through ticketing/joint ticketing arrangements.	Slight beneficial
	Infrastructure & Information	Scheme will enhance existing transport interchange facilities and also provide new transport interchange opportunities. Information provision at the interchange facilities will be of the highest quality and will include real time information provision.	Moderate beneficial
Land-use Transport Integration		Scheme integrates well with national, regional, and local land-use policy and development proposals.	Moderate beneficial
Policy Integration		The scheme is consistent with national policies beyond transport.	Slight beneficial
Accessibility & Social Inclusion			
Sub-objective	Item	Qualitative Information	Quantitative Information
Community Accessibility	Public Transport Network Coverage	Accessibility is significantly improved for travel from most zones to all the selected destinations, with the exception of travel from the south-west of Edinburgh to Leith.	
	Access to Other Local Services	The tram provides increased opportunities for walking and cycling as access modes, but it has limitations to promote further non-motorised trips to access local services.	
Comparative Accessibility	Distribution / Spatial Impacts by Social Group	Significant accessibility benefits can be realised across all population groups.	In general, around twice as many benefit from the scheme as disbenefit, with the ratio being highest for non-car owning households.
	Distribution / Spatial Impacts by Area	For George Street, mostly neutral impact but there is a modest surplus of beneficiaries across the three segments For Haymarket, 180,000 net population benefiting from Edinburgh Tram For the Foot of Leith Walk,	No. of households without a car that benefit (disbenefit) George St: 8,480 (4,204) Haymarket: 41,338 (8,551) Foot of Leith Walk: 36,508 (42,634) Crewe Toll: 44,163 (9,572)

		<p>the impacts are large, but broadly neutral overall, with equally large numbers benefiting and disbenefitting</p> <p>For Crewe Toll, Ocean Terminal, Napier University, Sighthill Industrial Estate, Edinburgh Park and Gyle Centre there are large net benefits across all the segments</p> <p>For Granton and Edinburgh Airport, there are overall disbenefits in accessibility</p>	<p>Ocean Terminal: 59,396 (25,604)</p> <p>Granton: 27,528 (44,990)</p> <p>Napier University: 35,142 (19,922)</p> <p>Sighthill Industrial Estate: 52,443 (7,305)</p> <p>Edinburgh Park: 48,057 (14,042)</p> <p>Gyle Centre: 66,403 (3,218)</p> <p>Edinburgh Airport: 37,346 (35,705)</p>
Strategic Environmental Assessment (SEA)			
Summary of SEA outcome where appropriate	Not applicable		
Cost to Public Sector			
Item	Qualitative information	Quantitative Information (£000's)	
Public Sector Investment Costs		£0	
Public Sector Operating & Maintenance Costs	Net change in TEL operating and maintenance costs	-£120,008 (PV)	
Grant / Subsidy Payments	Grant to the private sector to cover the capital cost	-£389,880 (PV)	
Revenues	Revenue to TEL for tram and bus operations	£219,817 (PV)	
Taxation Impacts	Reduction in tax receipts arising from	-£49,486 (PV)	
Monetised Summary			
Present Values of Transport Benefits		£380,231	
Present Value of Cost to Government		£339,557	
Net Present Value		£45,889	
Benefit-Cost to Government Ratio		1.12	

TABLE 8.43 EDINBURGH TRAM PHASE 1A+1B STAG PART 2 APPRAISAL

Proposal Details			
Name and address of authority or organisation promoting the proposal		City of Edinburgh Council	
Proposal Name:	Edinburgh Tram	Name of Planner:	
Proposal Description:	Introduction of a tram route serving the Leith development area, the two main railway stations, the city centre, Edinburgh Park and Edinburgh Airport	Total Public Sector Funding Requirement:	Capital costs/grant (undiscounted): £580m Annual revenue support: £0 PVC to Govt.: £436
Funding Source From:	Transport Scotland	Amount of Application:	
Background Information			
Geographic Context:	The proposal will directly serve the corridor from Leith via the City Centre to Edinburgh Airport, including the communities of Newhaven, Leith, Pilrig, Dalry, Saughton, Broomhouse and Edinburgh Park. The route will serve a mixture of commercial, residential and airport related land uses, and the major regeneration areas within Leith. The route will be largely segregated and, through careful design, minimise interaction with the built environment.		
Social Context:	There are a number of (former) Social Inclusion Partnerships along the tram corridor, including geographical-focused initiatives operating in North Edinburgh and Broomhouse as well as thematic initiatives operating in Sighthill and Stenhouse. The 2004 based Indices of Deprivation indicate that some deprived wards lie within or adjoining the tram route. Car ownership along much of the route is less than 50% of households.		
Economic Context:	The economic performance of the tram corridor is influenced by the economic dynamics of the City of Edinburgh and its wider conurbation, and in particular Central and West Edinburgh. Edinburgh is the seat of administrative power for Scotland with the presence of the Scottish Parliament. The City and its city-region is also at the heart of the country's financial, business, legal, medical/healthcare and insurance markets, and therefore remains very strong in these key industries and sectors. The scheme will serve the commercial core of the city-centre, the major growth area at Edinburgh Park, Gyle Shopping Centre, the RBoS HQ and Edinburgh airport, and the major regeneration areas at Leith.		
Planning objectives:			
Objective:		Performance against planning objective	
<p>To support the local economy by improving accessibility:</p> <ul style="list-style-type: none"> Improved access to the public transport network; and Improved access to employment opportunities. <p>To promote sustainability and reduce environmental damage caused by traffic:</p> <ul style="list-style-type: none"> Increasing proportion of journeys made by public transport, cycling and walking; and Reducing local and global emissions. <p>To reduce traffic congestion:</p> <ul style="list-style-type: none"> Reducing number of trips by car; and Reducing traffic volume on key routes. <p>To make the transport system safer and more secure:</p> <ul style="list-style-type: none"> Reducing traffic accidents. 		<p>Edinburgh Tram will improve accessibility to employment opportunities, education, shopping and leisure destinations, contributing to improve the local economy. In particular, the tram will serve the regeneration area of Granton, Leith and Western Harbour.</p> <p>The scheme will contribute to sustainable travel (zero emissions produced at source by the tram, reduced noise and urban realm improvements) and provide enhanced opportunity for transfer from car to public transport.</p> <p>The tram system will provide a safe and secure means for travel</p> <p>The tram will provide social benefits in terms of enhanced liveability on streets and accessibility to mobility impaired and deprived segments of the population.</p>	

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<p>To promote social benefits:</p> <ul style="list-style-type: none"> Improving liveability of streets, maximising their role as the focal point of local communities; and Reducing social exclusion, by improving the ability of people with low incomes, no access to car, the elderly or those with mobility impairments to use the transport system. 			
<p>Rationale for Selection or Rejection of Proposal:</p>		<p>Lines 1 and 2 were developed within the STAG framework and demonstrated the best fit with planning objectives and the overarching five governmental objectives relating to Environment, Safety, Economy, Integration and Accessibility. The current proposal, comprising elements of Lines 1 and 2, reflects current affordability constraints and the need to maximise the benefits from Edinburgh Tram within this constraint.</p>	
<p>Implementability Appraisal</p>			
<p>Technical:</p>		<p>The proposed alignment is technically feasible, employing tried and tested tram technology. Urban design issues are acceptable and the tram system is integrated with the local bus network.</p>	
<p>Operational:</p>		<p>Run times are minimised through good alignment design and integration with the highway network.</p>	
<p>Financial:</p>		<p>Capital funding is provided by Transport Scotland, with on-going operating cost covered by farebox revenue.</p>	
<p>Public:</p>		<p>Extensive consultation took place in 2003, with high levels of support shown for tram in Edinburgh. Legal powers to construct the tram have been obtained through the Parliamentary Private Bill process, which weighed the overall merits of the scheme with specific objections. Mitigation strategies and policies have been developed to minimise the adverse impacts and hence acceptability of the tram.</p>	
<p>Environment</p>			
<p>Mitigation Options included: (Costs & Benefits)</p>		<p>Various documents have been developed (the Design Manual, Code of Construction Practice and the Noise and Vibration Policy) which set out how any potential adverse impacts of the tram will be mitigated.</p>	
<p>Sub-objective</p>		<p>Qualitative Information</p>	<p>Quantitative Information</p>
<p>Noise and vibration</p>			
<p>Air Quality – Overall</p>			
<p>CO2 – Global</p>			
<p>PM10 – Local</p>			
<p>NO2 – Local</p>			
<p>Water Quality, Drainage and Flood Defence</p>		<p>Water Quality may be affected by run-off from construction sites, and during the operation of the route. Where overbridging or culverting is required at the Water of Leith and Gogar Burn plus minor tributaries, there may also be water quality impacts. Groundwater may be affected by penetration of contaminated run-off to aquifers.</p> <p>Comprehensive mitigation</p>	<p>Water courses likely to be affected & quality (SEPA classification);</p> <p>Gogar Burn (fair to poor)</p> <p>Water of Leith (good to poor)</p> <p>Water Quality: Minor negative</p> <p>Groundwater: Neutral</p> <p>Flood Defence: Neutral</p>

	programmes render impact on areas at risk of flooding neutral.		
Geology	No impacts on designated geological sites. Mineral reserves will not be affected. Waste management issues relating to disposal of potentially contaminated waste during construction and operation may occur.	Designated Geological Sites: SSSIs: Calton Hill (13ha) Castle Rock (Edinburgh Castle) RIGs: Craigleith Quarry	Geological Sites: Neutral Mineral Reserves: Neutral Waste Management: Minor negative
Biodiversity	Several areas of habitat will be lost including sections of the wildlife corridor adjacent to the main Glasgow/Edinburgh railway line. Roseburn Railway Corridor, which contains significant woodland & grassland habitats, will suffer significant impacts. Protected badger species will also be affected at this site and at Gogar Burn.	Affected sites: Gogar Burn Site of Interest for Nature Conservation (SINC) Water of Leith Urban Wildlife Site (UWS) Roseburn Railway Urban Wildlife Corridor Protected species potentially affected: Badgers, pipistrelle bats.	Moderate adverse
Visual Amenity	Varying range of visual impacts all along the route. The World Heritage Site would be directly impacted by the proposals, as well as wider landscapes including sections of the open Greenbelt landscape. Design of tram system will need to fit to scene. Views into railway corridor from surrounding houses substantially opened up. Positive impacts would occur over localised areas due to the proposed mitigation by associated planting.	World Heritage Site and Conservation Areas (i.e. Coltbridge and Wester Coates Conservation Area - part)	Minor adverse. (Major negative impacts would occur for views from No. 4 Ingliston Rd, Princes St and St Andrew Square. Also along the railway corridor at Roseburn, although mitigation is planned.)
Agriculture and Soils	Agriculture - There would be a Minor Negative impact for individual farming plots, because the area of land take is small in terms of the scale of the farming operations. However, land segregation would result from Tram Line 2 alignment and this is a Moderate Negative impact because of the combined effect of Class 2	Agriculture :The extent of agricultural land take will be quantified in the Book of Reference as part of the parliamentary bill submission. Contaminated land (2 sites possibly affected): Disused railway land around Roseburn, Baird Drive and Haymarket, Former landfill believed to	Agriculture: Neutral to Moderate Negative Contaminated Land: Minor to Negative Soils: Neutral

Sub-objective	Item	Qualitative Information	Quantitative Information
Community Accessibility	Public Transport Network Coverage	Accessibility is significantly improved for travel from most zones to all the selected destinations, with the exception of travel from the south-west of Edinburgh to Leith.	
	Access to Other Local Services	The tram provides increased opportunities for walking and cycling as access modes, but it has limitations to promote further non-motorised trips to access local services.	
Comparative Accessibility	Distribution / Spatial Impacts by Social Group		
	Distribution / Spatial Impacts by Area	<p>For George Street, mostly neutral impact but there is a modest surplus of beneficiaries across the three segments</p> <p>For Haymarket, 216,000 net population benefiting from Edinburgh Tram</p> <p>For the Foot of Leith Walk, the impacts are large, but broadly neutral overall, with equally large numbers benefiting and disbenefiting</p> <p>For Crewe Toll, Granton, Ocean Terminal, Napier University, Sighthill Industrial Estate, Edinburgh Park and Gyle Centre there are large net benefits across all the segments</p> <p>For Edinburgh Airport, there are marginal disbenefits in accessibility, although no-car households have a small benefit.</p>	<p>No. of households without a car that benefit (disbenefit)</p> <p>George St: 8,480 (4,204)</p> <p>Haymarket: 46,412 (7,370)</p> <p>Foot of Leith Walk: 37,957 (41,646)</p> <p>Crewe Toll: 56,712 (11,581)</p> <p>Ocean Terminal: 58,663 (22,584)</p> <p>Granton: 49,826 (26,917)</p> <p>Napier University: 36,209 (18,887)</p> <p>Sighthill Industrial Estate: 51,976 (7,753)</p> <p>Edinburgh Park: 48,096 (14,005)</p> <p>Gyle Centre: 66,966 (7,517)</p> <p>Edinburgh Airport: 38,940 (34,059)</p>
Strategic Environmental Assessment (SEA)			
Summary of SEA outcome where appropriate	Not applicable		
Cost to Public Sector			
Item	Qualitative Information	Quantitative Information	
Public Sector Investment Costs		£0	

		productive jobs and agglomeration effects (not quantified).	
	Distributional Impacts	North Edinburgh regeneration area residents would have access to a broader range of jobs. Some would move from unemployment to employment; some who are already in employment may find a better job because of the tram (A GVA impact rather than an employment one); and, others who are not employed and not in receipt of JSA, but who are enabled to enter the workforce because of better accessibility.	Better access to 27,000 additional jobs for North Edinburgh regeneration area residents.
Integration			
Sub-objective	Item	Qualitative Information	Quantitative Information
Transport Interchanges	Services & Ticketing	Scheme will enhance the opportunity for through ticketing/joint ticketing arrangements.	Slight beneficial
	Infrastructure & Information	Scheme will enhance existing transport interchange facilities and also provide new transport interchange opportunities – Phase 1b will enhance interchange opportunities at Crewe Toll (particularly with regards access to the Western General Hospital). Information provision at the interchange facilities will be of the highest quality and will include real time information provision.	Moderate beneficial
Land-use Transport Integration		Scheme integrates well with national, regional, and local land-use policy and development proposals. In particular Phase 1B will help enhance the integration of the development in the Granton area.	Large beneficial
Policy Integration		Scheme is consistent with national policies beyond transport.	Slight beneficial
Accessibility & Social Inclusion			

		tram corridor west of Haymarket to Leith Docks improved by 10+ minutes, access time to Edinburgh Park/Gyle improved by 10+ minutes for much of eastern Edinburgh	
	User Charges		£0
	Vehicle Operating Costs		£33,691 (PV)
	Quality / Reliability Benefits	The higher quality afforded by Edinburgh Tram compared to the alternative public transport modes has been encapsulated in the demand modelling and appraisal through the use of differential in-vehicle time factors.	Included in travel time benefits
Private Sector Operator Impacts	Investment Costs	Scheme capital cost	£460,335 (PV)
	Operating & Maintenance Costs		£0
	Revenues	Change in revenue to rail operators and non-TEL bus operations	-£14,735 (PV)
	Grant / Subsidy payments	Grant for capital costs	£460,335 (PV)
Economy (Economic Activity and Location Impacts)			
Sub-objective	Item	Qualitative Information	Quantitative Information
Economic Activity and Location Impacts	Local Economic Impacts	The commercial and residential property markets will benefit from the tram, leading to additional employment in the retail, office, commercial and leisure sectors. North Edinburgh (Granton Waterfront, Western Harbour - Newhaven and Leith Docks) will benefit as will Edinburgh Gate, Newbridge North and Ratho Park. Small additional employment due to cost savings (eg taxi/parking costs): central/north Edinburgh.	3,200 local additional jobs (present value) assuming that displacement takes place outside of Edinburgh TTWA.
	National Economic Impacts	A proportion of the local employment generated will be retained at the national level. Potential for further national impacts through additional labour supply, people moving to more	980 additional jobs (present value) at the Scotland level, allowing for displacement.

	Agricultural land take. Contaminated Land - Areas of contaminated land may be disturbed by the construction of the tram.	have been used for demolition material close to Gogar Burn & Castle Gogar	
Cultural Heritage	The tram will pass through the World Heritage Site of the City Centre. Additionally, to make way for the tram, three sites have been identified to be demolished or relocated, including two Listed Buildings.	World Heritage Site: Edinburgh City Centre Listed Buildings to be demolished: The Caledonian Alehouse The Heart of Midlothian War Memorial (at Haymarket)	Moderate Negative
Landscape	The World Heritage Site would be directly impacted by the proposals. The proposals would also impact on the character of sensitive townscape areas and wider landscapes including sections of the open Greenbelt landscape. Significant vegetation removal along the railway corridor. Some positive impacts would occur over localised areas due to the proposed mitigation by associated planting.	World Heritage Site and Conservation Areas (Coltbridge and Wester Coates Conservation Area – part.) Caroline Park – designated Landscape	Major Negative (However minor negative for the occasional localised character areas)
Safety			
Sub-objective	Item	Qualitative Information	Quantitative Information
Accidents	Change in Annual Personal Injury Accidents	Standard rates and methodology from NESA	Change in annual accidents: +58.2 in 2011 and +21.3 in 2031
	Change in Balance of Severity	Split by damage only, slight, serious and fatal	Annual changes (2011): damage only 54.1, slight 3.6, serious 0.4, fatal 0.0
	Total Discounted Savings		-£11.9m (PV)
Security		CCTV system at all stops and on vehicles. Positive design and access integrated with urban form. High use of inspectors on vehicles. Lighting and help points at all stops.	Moderate beneficial
Economy (Transport Economic Efficiency)			
Sub-objective	Item	Qualitative Information	Quantitative Information
User Benefits	Travel Time	Significant public transport journey time savings: Leith Docks and Granton to Haymarket 10+ minutes,	£695,266 (PV)

Stag 2

Public Sector Operating & Maintenance Costs	Net change in TEL operating and maintenance costs	-£154,291 (PV)
Grant / Subsidy Payments	Grant to the private sector to cover the capital cost	-£460,335 (PV)
Revenues	Revenue to TEL for tram and bus operations	£241,647 (PV)
Taxation Impacts	Reduction in tax receipts arising from	-£63,097 (PV)
Monetised Summary		
Present Values of Transport Benefits		£702,325
Present Value of Cost to Government		£436,077
Net Present Value		£278,145
Benefit-Cost to Government Ratio		1.61

9. RISK AND UNCERTAINTY

In scheme development and appraisal, there is always likely to be some difference between what is expected and what eventually happens, due to biases in the appraisal, and risks and uncertainties that exist. The main aim of taking account of such risks is to ensure the on-going deliverability of the project and to obtain the best estimate of costs and benefits.

tie has implemented a rigorous approach to risk management across all elements affecting the delivery of Edinburgh Tram. This is set out in this Chapter as follows:

- The general risk management process;
- Derivation of costs and revenues;
- Optimism bias;
- Current risk status;
- Economic case sensitivity analysis; and
- On-going risk management process.

Introduction

- 9.1 One of the critical success factors for the Edinburgh Tram Network (ETN) project is the identification and management of the risks and opportunities inherent in a project of this nature. The aim is to successfully manage all risks to and opportunities for the project thus ensuring that a supported and fully functioning operational service is delivered within budget and on time. Key drivers are as follows:
- integrate risk awareness and management, and not risk aversion, into the project culture;
 - decrease risk exposure to acceptable levels;
 - capitalise on opportunities;
 - transfer ownership of risks to the party best able to manage them; and
 - provide clear and useful information to managers and stakeholders.
- 9.2 In order to manage risk in a structured manner, tie's Risk Manager oversees and co-ordinates risk across a number of transport initiatives including ETN. Additionally, tie has appointed a full time Project Risk Adviser to apply a framework of risk analysis and evaluation to assist in decision making.
- 9.3 The project has also made allowance for Optimism Bias as required by HM Treasury's "The Green Book". A risk in itself, OB is the systematic tendency for appraisers to be over-optimistic and evidence from other projects worldwide, as well as tram projects in the UK, shows that it has been a major issue.

Risk Management Process

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Early Strategic Appraisal

- 9.4 During 2002, tie and CEC gave early consideration to the overall strategic risks associated with the introduction of a tram network in Edinburgh. Previous experience with the proposed City of Edinburgh Rapid Transit (CERT) suggested that a major risk was that associated with the integration of public transport services following introduction of the trams.
- 9.5 CEC commissioned a report by Turner & Townsend to review the development of the Edinburgh Tram Line 1 and the appropriateness of potential procurement routes, funding sources, best practice in scheme delivery and issues and pitfalls on other schemes. Papers were written as a means of briefing both CEC Elected Members and Officers on the nature of strategic risks related to the proposed tram system and other Integrated Transport Initiative (ITI) proposals. Identified risks were recorded as a preliminary risk matrix used as a basis for discussion at a workshop involving CEC Officers, the tie Board and several key advisors during January 2003. The matrix and discussion upon it assisted tie in the formulation of an overall Risk Management Plan.

Phase Specific Activities

- 9.6 During early work on the tram, all advisers, appointed by tie to provide services, were required within their appointment briefs to advise tie on risks associated with their particular element of work. This was generally line specific and risk registers were compiled for each line.
- 9.7 tie recognised the economies of scale to be brought to the project by considering it as a phased network. Therefore, a single risk register has been compiled with detailed information on the likelihood and potential impact of each identified risk. However, in order to allow for analysis of different phases of the project, risk impacts have been allocated to each phase where applicable.

tie Risk Management Plan

- 9.8 Throughout the development of the tram and other ITI proposals, tie has initiated and continued to develop a plan for the management of risk. The principal components are:
- appointment of experience advisers covering legal, financial, technical, operational, environmental, PR and communications, project management and implementation issues;
 - engagement of Partnerships UK for specialist procurement advice;
 - consultation with relevant authorities, such as the Office for Fair Trading and Scottish Executive, to obtain advice on competition issues and on the funding and development of similar schemes;
 - involvement of an Operator at an early stage in scheme development;
 - periodic briefing and updating of CEC to advise progress and development of risk management process;
 - benchmarking with other schemes;
 - constitution of a multi-disciplinary Risk Management Working Group to facilitate preparation of a consolidated risk register and to monitor the management of risk;

- appointment of a full time Risk Manager to oversee and co-ordinate the complete risk process for all transport initiatives by tie;
- appointment of a full time Project Risk Adviser to undertake project specific risk management tasks on behalf of tie; and
- implementation of a multiple user/register risk management system – Active Risk Manager – which will enable the Risk Manager and Risk Owners to monitor risk progress on a “live” basis.

Technical Feasibility and Risks

9.9 The proposed alignment and options are feasible, based on a number of key assumptions:

- the design is based upon vehicle parameters (as described in Section 7). No new or untried technology is proposed, but new traction technologies will be reassessed prior to implementation;
- adequate tram priority is achieved in order that run times can be maintained as required. Agreement with CEC has been reached on junction and traffic management designs. The practical and feasible alignment and junction designs demonstrate that the required level of tram priority can be achieved. The designs have varied during development in order to optimise runtime.
- the tram is prioritised over the wide area model effects.
- acceptability of urban design issues. This has been addressed through the development of a detailed design manual in conjunction with CEC Planning.
- integration with other modes of transport, in particular bus. The design provides for maximum tram-bus integration and mitigates potential adverse impacts on bus. A degree of modal transfer is assumed. The risk of changes in bus routes, competition and predatory bus pricing is significant and has proved to be problematic on other schemes. This has been largely mitigated through the creation of Transport Edinburgh Limited who will operate an integrated tram and bus network as a single economic entity and through detailed design development aimed at tram-bus integration.

Consultation

9.10 In order to reduce strategic risk, tie has taken steps to consult with key organisations such as Scottish Executive, CEC and bus operators in the Edinburgh area.

9.11 To gain and maintain overall knowledge of the progress of the scheme development, the Scottish Executive has an observer on the board of tie. Additionally there were a number of specific consultations:-

- tie’s Risk Manager has held meetings concerned with scheme economics and risk;
- tie’s Financial Adviser, Grant Thornton, has consulted the Financial Partnerships Unit in order to...TBC
- There have been meetings between tie, tie’s technical advisers and the Scottish Executive on the structure and coverage of the STAG report; and
- The Private Bills Unit was consulted by tie’s legal adviser, Bircham Dyson Bell, and the land referencing teams.

9.12 CEC provides a number of tie Board Members and is thus directly involved in the

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decision-making process related to tram scheme development. At the technical level, there has also been regular and close involvement, with Council Officers engaged in some of the Topic Working Groups established by tie, notably the Planning and Environment Working Groups. These have been involved in detailed work with development of the Design Manual and with the evolution of streetscape designs in critical areas of the city, with the aim of ensuring that the scheme meets CEC's aspirations for the tram network. In addition, a senior officer from CEC Transport is a member of tie's Steering Group which convenes monthly to discuss the tram project.

9.13 Recognising the importance of a properly integrated public transport network to the viability of the tram scheme, tie has been in discussion with major bus operators in the Edinburgh region. In addition to regular liaison at Chief Executive Officer level through the Operator Liaison Group, there have been specific discussions related to the appointment of the tram operator, Transdev Edinburgh Trams Ltd, under the Development Partnering and Operating Franchise (DPOF) process (see Section 9.18).

9.14 Additionally, tie have been undertaking various public consultation exercises (see Chapter 6) throughout the development and design process and this has produced information that has been fed back into the design and risk register where applicable.

9.15 tie also recognises that Funders are exposed to strategic risk which the project cannot control. This includes exposure to fluctuations in inflation rates, changes of law and external events impacting on works. In order to aid Funder understanding of potential strategic risks that may affect out-turn cost, tie and their advisers have taken part in meetings between CEC and Transport Scotland convened with a view to reach agreement over the funding of such risk.

Risk Transfer Through Procurement

9.16 Optimal risk transfer dictates that risk is allocated to the party best able to manage that risk. This in turn requires the terms of any contract to be negotiated in order to achieve the optimal risk spread amongst the participants in the project.

9.17 Through the procurement process, tie has sought to enhance the delivery of the ETN by combining best practice with lessons learned from other related projects in the UK and abroad. The outcome of this work led to the shaping of the procurement route with a balanced approach to risk transfer, and active treatment of specific areas that have proven problematic in other projects. tie established a Procurement Working Group, comprising representatives from legal, financial and technical advisers, at the end of 2002. Issues covered included mode integration, legal and financial and the major strategic risks anticipated by the group were:

- integration of the trams network with other transport modes;
- delivery of the tram network within an affordable and certain capital cost;
- delivery within an acceptable timescale; and
- minimisation of the impact of tram costs on the finances of CEC.

9.18 The Working Group recognised that one key weakness of typical tram scheme procurement was that tram schemes were being constructed and implemented with minimal reference to the operations and long term sustainability of the system. tie's belief is that this can be solved by involving the intended operator in the initial and

development phases of the procurement of the main infrastructure contractor. To this end the early appointment of an operator as an additional specialist adviser was considered advantageous and a Development Partnering and Operating Franchise Agreement (DPOFA) was established with Transdev in May 2004.

- 9.19 Another key strand of the procurement strategy was the early involvement of the design contractor. This allowed tie to advance design work for sensitive sections of the tram route, thereby reducing the planning and estimating risks to which bidders for the infrastructure contract are exposed. The Systems Design Services (SDS) contract was awarded to Parsons Brinckerhoff in September 2005.
- 9.20 A significant benefit arising from having undertaken early design work is that tie is able to procure the necessary utility diversions prior to commencement of the system construction. This provides very significant construction programme benefits and therefore cost benefits, due to reduced risk exposure of the infrastructure provider, creating the best opportunity to minimise disruption and maximise construction productivity. Tender returns from the Multi Utilities Diversion Framework Agreement (MUDFA) are currently being evaluated and the preferred bidder for this contract is expected to be announced at the end of September 2006.
- 9.21 The separation of the day-to-day operation of the tram network from the initial construction of the tram system is a further characteristic or consequence of early operator involvement. It allows those parties responsible for providing vehicles and infrastructure to concentrate on their respective strengths.
- 9.22 The 'Enhanced' Conventional Procurement Strategy that was developed, addresses both the issues experienced on other light rail procurements in the UK and the specific circumstances affecting Edinburgh. The resultant structure is a series of contracts which, managed as a group, will transfer risk effectively to the private sector, advance the scheme as quickly as possible and deliver strong value for money solution to tie, CEC and Transport Scotland.
- 9.23 tie does however, recognise the benefits delivered by a consortium structure which would normally be achieved through a single integrated procurement process and aims to retain as many of these benefits as possible by re-aggregating the structure within the infrastructure contract (Infraco). It is intended to achieve this by novating the design (SDS) and vehicle supply and maintenance contracts (Tramco) to the infrastructure contract.
- 9.24 tie and CEC will retain certain risks either where they are the best party to own them or where retention commercially offers value for money. For example, it has been commercially attractive for tie to retain the land acquisition role and consequently ownership of the risks associated with this.
- 9.25 As part of the process of co-ordination and integration of buses and tram, a Joint Revenue Committee (JRC) was established with the objective of the development, testing and commissioning of a modelling suite to test the viability of the Tram Business Case and ongoing revenue forecasting for TEL. The JRC contract was awarded to a joint team of Steer Davies Gleave and Sir Colin Buchanan & Partners and is due to provide the modelling suite to tie in August 2006.

- 9.26 To support tie in the facilitation of design and project management and allow for continuity post novation of SDS to the infrastructure contract, a Technical Support Services (TSS) provider has been contracted. These resources will also be critical for testing, quality, safety and environmental management.

Derivation of Costs and Revenues

- 9.27 The technical teams engaged to advise upon the estimation of costs have extensive experience in the development of tram schemes in the UK and abroad and are thus cognisant of the likely factors and risks that will impact upon out-turn costs. Details of the derivation of costs and project revenues for the scheme can be found elsewhere in this report.

Capital Costs Base Data

- 9.28 Initial capital cost estimates were prepared using a combination of benchmarking, previous experience and engineering judgement to define the works elements and to obtain and refine implementation costs.
- 9.29 With the procuring of the SDS Provider in September 2005, base cost estimation has developed in parallel with the design. tie's technical advisers, TSS, have provided assurance on estimates produced by SDS and a further cost study is being conducted by Cyril Sweett in order to provide an independent check on costs.
- 9.30 A key benefit in developing the tram system as a network, is that gained by economies of scale.

Operating Costs Base Data

- 9.31 Operating costs have been built up from detailed estimates of likely staffing levels, power requirements, maintenance costs and other related costs such as insurance and policing (see Chapter 7 for further details). These in turn are based upon an assumed operation service pattern and frequency.
- 9.32 The DPOF process has informed the benchmarking exercise and operating assumptions made taking into account advice from Transdev.

Demand and Revenue Benchmarking

- 9.33 As part of the process to ensure robust and credible demand and revenue forecasts for Edinburgh Tram, comparable data for other UK systems have been compiled (using DfT statistics) and a benchmarking exercise undertaken. The results are set out in Table 9.1. Demand for Edinburgh Tram is that forecast for 2011; data is presented for both the ramp-up forecast and the 'full' forecast, excluding any ramp-up effects. The latter provides a more meaningful comparison with existing systems, all of which, with the exception of Nottingham, will have reached maturity.
- 9.34 Looking at revenue per trip, Edinburgh Tram is at the low end of the range, with only Nottingham having a lower average fare. In demand terms, the boardings per stop for Edinburgh Tram equal or exceed any of the existing systems. A similar story exists for the boardings per route-km, where Edinburgh Tram is exceeded only by Croydon. For passenger-kms by route-km, Edinburgh Tram is comparable to Croydon, with

- cost escalations in utilities diversion budgets have been recognised by tie;
- the potential advantage to be gained from full co-operation of bus and tram operators has not always been forthcoming on other projects. tie has progressed the DPOFA with Transdev to facilitate this with TEL; and
- tie continues to liaise with other promoters to obtain maximum benefit from their experiences.

Risk Allowance

Process

- 9.36 Significant effort has been placed in the management of risk to the Edinburgh Tram Network. However, it is recognised that there will be a need for risk allowances set aside to deliver the scheme. These allowances to be set aside are split between those necessary for the Delivery Agent (tie) and those necessary for the Principal Funder (Transport Scotland). The terminology used for these risk allowances are recognised to comprise those emerging from Specified Contingencies and Optimism Bias, respectively.
- 9.37 These are estimated using two recognised industry techniques of Quantitative Risk Analysis (Monte Carlo simulation) and HM Treasury guidelines (as documented in Mott MacDonald’s study on behalf of HM Treasury). Separate estimation is adopted due to two fundamentally different approaches being used, namely a ‘bottom up’ (QRA) and ‘top down’ (OB) estimations. This also avoids the risk of potential double counting of necessary contingencies.
- 9.38 tie has been consistent in the approach to the estimation of potential outturn costs and applied allowances to base cost estimates and sought specified contingencies for the delivery of scheme within the potential OB allowance to provide a degree of certainty to estimates.
- 9.39 The QRA techniques employed allow a statistical assessment to be carried that allows stakeholders to choose the level of confidence necessary for delivery, This is exemplified where on ‘individual’ schemes funders may seek a higher degree of confidence compared with a lesser level of certainty on each project where it fits within a portfolio approach. This degree of confidence (probability) is illustrated in Table 9.2.

TABLE 9.2 CONFIDENCE PROBABILITIES

0-30%	30-70%	70-100%
Low Confidence	Reasonable Confidence	High Confidence

- 9.40 Prior to the advent of OB, it has been practice that projects are delivered with the schemes funded to a 50% confidence level (e.g. 50 out of 100 projects will be delivered within this allowance) and funders maintaining a reserve to 90% very high confidence level.
- 9.41 tie will conduct an updated QRA exercise following completion of capital cost estimates.
- 9.42 Optimism Bias on capital cost estimates reduce with management effort in mitigation

of documented principal contributing risk areas related to procurement, the Project, the Client, the environment and external influences.

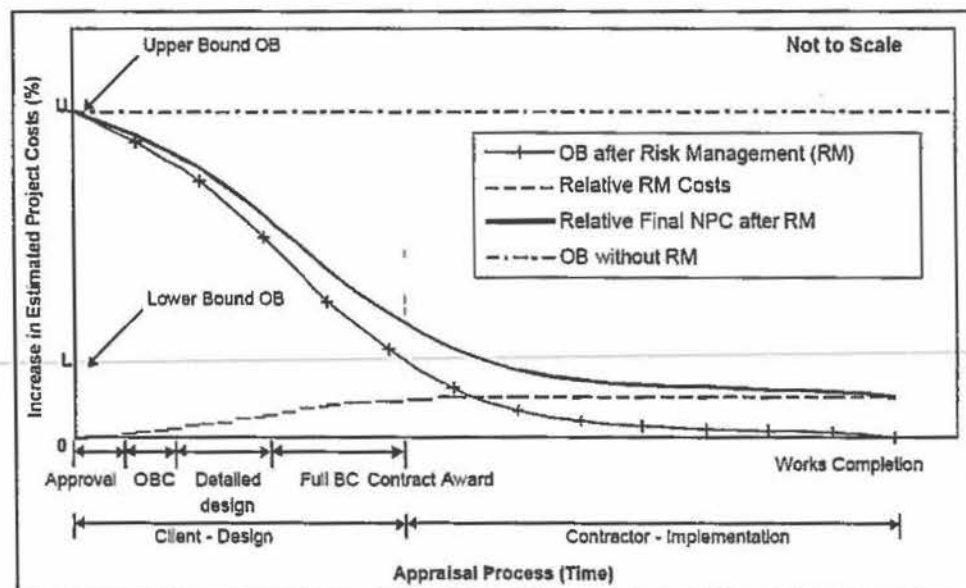
9.43 The Mott MacDonald study that forms the extant guidance recommended by the Scottish Executive confirmed the need for OB allowances across all types of projects at Outline Business Case. The study determined 'upper bound' and 'lower bound' OB values that represent starting values and the levels to aim for in projects with effective risk management by the time of contract award, respectively. The study also recognised that lower bound values can be reduced below suggested values. Our scheme has been classified as a 'standard civil engineering' project with upper bound starting value increase to base estimates of 44% and reported lower bound value of 3%.

9.44 It should be recognised that these values are based upon quantitative data review of the following key differences:

- Capital expenditure as planned at Outline Business Case and Contract Award
- Actual capital expenditure

9.45 As discussed above, this reduction is due to concerted project and risk management effort, and is best shown diagrammatically in Figure 9.1 (extract from Mott MacDonald study) with the lower bound value representing the optimism bias level to expect with effective risk management by the time of Contract Award. In this way, it can be concluded with effective risk management that the level of OB could reduce to at least 3%.

FIGURE 9.1 OPTIMISM BIAS



9.46 At the Outline Business Case, the estimated a reduction in OB to 24% with specified risk allowances of c10%. This reduction was partly due to the extensive development work undertaken during the gestation period of preparing and delivering the scheme through the Private Bill process.

9.47 In conjunction with Parsons Brinckerhoff, our System Design Services Provider, we have placed significant effort in preliminary design and scheme functional specification development that clarify stakeholders' requirements. In addition, our procurement strategy has included for early operator involvement that has helped to mollify potential project delivery risks.

9.48 However, the Mott MacDonald study showed conclusively that the single most important contributing factor to optimism bias was the inadequacy of the initial business case. There has therefore been an industry need for significant improved effort in developing the business case, identifying and, obtaining confirmation of the requirements, analysing risks when evaluating options. Our Outline Business Case has addressed project risk areas with the assessment of risk allowances for the total cost of managing residual risks. We have carried out a review of project estimates accounting for the major changes to scope to confirm that project estimates are still relevant.

Current Risk Status

Risk Identification

9.49 The and its advisers have identified project risks through workshops, strategic reviews, experience of other UK tram schemes and recording of risks throughout the development process. To aid the identification process, methodologies and checklists contained in the following guidance were used:-

- The Institution of Civil Engineers and the Faculty and Institute of Actuaries (2002 Revised) RAMP Risk Analysis and Management for Projects, Thomas Telford, UK.
- Mott MacDonald (July 2002) Review of Large Public Procurement in the UK, Report prepared for HM Treasury.
- Association for Project Management (2004) PRAM Project Risk Analysis and Management Guide, APM Publishing, UK.
- CIRIA – reference TBC.

9.50 New risks are identified through subject specific workshops and as part of the general project processes. These are analysed for duplication or overlap with risks already identified within the project risk register and added or discarded accordingly. Through the analysis process, and as the project progresses, the nature and magnitude of risks changes and the register is adjusted as required.

Risk Matrix

9.51 A consolidated risk register has been prepared for the tram network. For each risk identified, the register shows:-

- the stage of the scheme development at which the risk might materialise;
- the underlying nature of the risk (procedural, specification, external influence)

- etc);
- elements impacted by the risk (capital expenditure, operating expenditure, revenue, programme, quality);
 - likelihood of realisation;
 - magnitude of impact;
 - treatment strategy;
 - responsibility for treatment;
 - mitigation factor achieved;
 - status of risk; and
 - dates for action.
- 9.52 In order to review timing, the risks have been categorised in order to identify the risk level of each of the following five stages of the project and to ensure risks are reviewed and treated for each stage of the project.
- Planning – STAG2 appraisal and business case preparation;
 - Application for Powers – Private Bill preparation;
 - Procurement – Operator, Vehicle and Infrastructure contracts;
 - Construction; and
 - Operation.
- 9.53 tie, their advisers and service providers have identified risks. These risks have been categorised into the following groups in accordance with HM Treasury guidance:
- Procurement;
 - Project specific;
 - Client specific;
 - Environment; and
 - External influences.
- 9.54 Each of the project risks has been assessed against the following principal impacts:
- Capital costs;
 - Operating costs;
 - Revenue;
 - Programme;
 - Quality;
 - Functionality; and
 - Approvability.
- 9.55 Of these areas, capital costs and works duration (programme) have been shown to lie within Optimism Bias considerations. Two strategies have been adopted to quantify the impact of risk, in accordance with HM Treasury Green Book guidance. The first has been to calculate Optimism Bias to be applied to capital costs and works duration. The second has been to appraise the risks associated with operating costs and revenue through sensitivity analysis.

9.56 The significance of each risk is classified by means of an impact-probability matrix and this allows risk action to be prioritised. This matrix is shown in Table 9.3.

TABLE 9.3 RISK SIGNIFICANCE MATRIX

				Probability					
				1	2	3	4	5	6
				NIL	0-10% (Remote)	10-25% (Unusual)	25-50% (Possible)	50-75% (Probable)	75-100% (Expected)
Level	Impact	Capex £/Opex/Rev £pa	Programme (Weeks)						
1	NIL	0	0	1	2	3	4	5	6
2	Insignificant	0-25k	0-1	2	4	6	8	10	12
3	Minor	25-100k	1-2	3	6	9	12	15	18
4	Moderate	100-500k	2-4	4	8	12	16	20	24
5	Significant	500k-1m	4-12	5	10	15	20	25	30
6	Major	>1m	>12	6	12	18	24	30	36

9.57 Table 9.4 shows the ranges of risk significance that have been adopted.

TABLE 9.4 SIGNIFICANCE OF RISK

Significance	Range	Colour
Negligible Risk	0-4	
Low Risk	4-8	
Medium Risk	8-12	
High Risk	12-16	
Very High Risk	16+	

Key Risks

9.58 tie has developed clear and active processes to prevent and mitigate project risks in accordance with industry best practice. Through this management, a number of risks have been identified.

9.59 A number of lessons have also been learnt from the previous UK tram schemes. The following key risks that occurred on other UK tram schemes have been recognised and duly mitigated through tie’s procurement strategy, consultations and design and cost assumptions:

- Revenue – reduction in tram capacity, negative PR, bus competition (fares and coverage) and overestimated revenues;
- Capital Costs – underestimated costs due to utility diversions, compliance with planning, traffic management and bid costs;
- Approvability – planning issues and negative PR; and

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- Operating Costs – lack of tram priority and reduced operational performance.
- 9.60 Utilising the ranking process identified above, the principal risks arising from this exercise can be summarised as follows:
- Funding availability is less than tie requires to proceed – a key element of the Business Case is to demonstrate the requirement for a minimum amount of funding to enable the project to proceed;
 - Passenger numbers are lower than forecast – tie and their technical advisers have established a credible base model and reviewed the factors affecting revenue, assumptions and sensitivities. Further comfort has been gained through the early involvement of Transdev;
 - Delay and cost increases due to CEC Planning requirements – tie have significantly mitigated this risk through the development of the Design Manual and proposals to account for World Heritage Site status. Additionally, there is ongoing liaison with CEC Planning during design development in order that approvals requirements can be incorporated into the design.
 - Capital costs, associated with land purchase, contractor's area and compensation, Network Rail, unforeseen ground conditions, vehicle costs, CEC/tie instructed changes and utility diversion costs exceed current forecasts, breach the contingency level included within the Model. This should be mitigated through the level of work undertaken to date by the technical advisers and designers, and will also be accounted for by the inclusion of Optimism Bias within financial reporting.
 - Operating costs exceed current projections due to lack of priority to the tram at junctions. Transdev have been involved in identifying cost issues and it is recognised that this has been influenced by specification issues, such as staffing levels.
- 9.61 The risks listed above represent those considered as most serious to the success of the project more or less on an ongoing basis. Tie will use the risk treatment summary as a means to undertake this process through regular reviews and updates of the risk documentation and proactive management of risks.

Treatment of Contingency

- 9.62 Traditionally, it is customary to include a certain element of contingency within base cost estimates as an allowance against possible increases in capital costs. However, reporting methods for this do not always allow transparency of contingency allocation. Therefore, tie has required estimators to exclude contingency from base costs.
- 9.63 In order to gain the required transparency, contingency has been treated as risk with specific quantities applied against identified risks. Each risk has a likelihood of occurrence and minimum, most likely and maximum cost impacts noted. This allows a full Quantitative Risk Analysis (QRA) to be undertaken using Monte Carlo simulation – a random statistical analysis that combines the impact range and probability of all the risks to produce details of an expected outcome.

Sensitivity Analysis

Sensitivity Tests

9.64 We have undertaken a range of sensitivity tests to understand the robustness of the appraisal. These are:

- In-vehicle time / mode constant sensitivity
- No change to bus network
- Lower interchange penalty

9.65 A summary of the sensitivity test results is presented in Table 9.5. Each sensitivity is then discussed.

TABLE 9.5 SENSITIVITY TESTS

Economic impacts (£m PV, 2002 prices)	Mode Constant	DM Bus	Interchange Penalty	Exclusion of EARL
User Benefits (consumer)	391	594	569	
User benefits (business)	117	237	197	
Private sector provider impacts	-8	-9	-14	
Accident benefits	-2	-14	-10	
Present Value of Scheme Benefits (£ m.)	498	808	742	
Present Value of Scheme Costs (£ m.)	453	755	433	
Net Present Value (£ m)	45	54	308	
Benefit : Cost Ratio	1.10	1.07	1.71	

Mode Constant Test / In-Vehicle Time

9.66 The central case includes an in-vehicle time weight for tram of 0.77, reflecting the higher quality and perception that tram has over bus.

9.67 A sensitivity test has been undertaken with a weight of 0.86, which gauges the sensitivity of the appraisal case to the assumed 'quality' benefit that tram would deliver. The 0.86 weighting was based on an interpretation of the stated preference results which reflected the impact of those respondents who stated a clear objection to the concept of the Edinburgh Tram and hence would be biased against it.

9.68 The sensitivity test shows the overall scheme benefits decline from £702m PV to £498m PV, while costs to the public sector increase slightly to £453m due to a lower public transport revenues than in the Central Case.

9.69 The NPV under this scenario reduces to £45m and the BCR falls to 1.10 : 1. This sensitivity shows that the case for the tram is sensitive to the improved 'quality' associated with tram, but also that, even under this pessimistic scenario the overall economic case remains positive.

9.70 This scenario also represents a proxy for an increase tram journey time of around 12% (the ratio of 0.86 to 0.77). Again, this suggests that the economic case would remain positive if tram journey times were to increase by 12%, but that the case is sensitive to the delivery of attractive tram journey times.

Do Minimum Bus Network Scenario

- 9.71 This test examines the economic case for the scheme assuming that the Do Minimum bus network remains in place.
- 9.72 The key impact of this scenario is that scheme costs increase significantly by £318m to £754m as the bus operating and renewal cost savings that accrue in the central case are eliminated. By contrast, overall scheme benefits only increase from £702m to £808m PV, and increase of £106m.
- 9.73 The net effect is that the overall NPV falls to £54m and the BCR falls to 1.07 : 1. The implication of this is that the benefits 'lost' from removing parallel bus services and rationalisation are significantly out-weighted by the operating cost savings this would bring, thereby delivering a much more efficient transport system.
- 9.74 The result provides a strong validation of the assumed bus network configurations, which would deliver significant cost savings while not impacting too greatly on passengers.

Interchange Test

- 9.75 The Central Case includes an interchange 'penalty' of 12.5 minutes, which is at the higher end of typical interchange penalty value range. The effect of this is to penalise those who have a 'forced' interchange, particularly at Leith Walk.
- 9.76 A sensitivity has been undertaken assuming a lower interchange penalty of 8 minutes, applied in both the Do Minimum and the Do Something. The effect of a lower interchange penalty is to improve the scheme benefits from £702m to £741m, and the overall NPV by a similar amount. The BCR would increase to 1.71 : 1.
- 9.77 The sensitivity test shows that the case is not particularly sensitive to this assumption but that, were a more 'typical' interchange value employed the economic case for the scheme would improve.

Exclusion of EARL

- 9.78 EARL is assumed to be in the Do-Minimum for appraisal purposes. Should it be excluded, this would have a material impact on the case for Edinburgh Tram, given that both serve Edinburgh Airport.
- 9.79 TBC

Ongoing Risk Management Process

- 9.80 Ultimately responsibility for risk is taken by the tie Board, with responsibility delegated to the Project Director. He has appointed advisors covering technical, legal and financial issues, together with tie's appointed Risk Manager. He is responsible for executing or overseeing actions necessary to treat risk on the tram scheme.

10. MONITORING AND EVALUATION

STAG guidance requires that a new project be subject to planned evaluation and monitoring, in addition to regular revalidation of the project throughout its development.

STAG defines Monitoring as “an on-going process of watching over the performance of a project identifying problems as these arise and taking appropriate action”, while Evaluation is used for “specific, post-implementation events, designed to assess the project performance against established objectives and to provide in-depth diagnosis of successes as well as deficiencies”. Therefore, by gathering and interpreting information, monitoring and evaluation will demonstrate how the project performs against its objectives, identify any deficiencies and allow adjustments to be made.

Soon after implementation, the performance of the project should be assessed against the specified objectives – the process evaluation. Recognising that certain projects, including public transport projects, require time before the full benefits can be realised, a further evaluation – the outcome evaluation – is required some time after implementation.

In addition, regular monitoring of the project is essential against specified Key Performance Indicators (KPIs) to assess the ongoing effectiveness of the scheme.

This chapter describes the measures put in place by tie to meet the requirements of the STAG guidance with respect to evaluation and monitoring.

Introduction

- 10.1 There are five phases of the project which require consideration during the monitoring and evaluation process, namely:
- Scheme development;
 - Infrastructure procurement;
 - Construction;
 - Testing and commissioning; and
 - Operations.
- 10.2 The STAG requirements for monitoring and evaluation are principally associated with the operational phase, following scheme implementation. However, it is also necessary to assess and re-appraise the project during phases prior to implementation. Actions to be undertaken by tie during scheme development, procurement and construction to assess impacts on programme, costs and potential revenues are also described below.

Objectives

- 10.3 The objectives for this scheme are described in Chapter 3 of this report. The specific project objectives are derived from a range of national, regional and local objectives reflecting transport and more diverse government and local authority strategies.

Project Objectives

10.4 Project objectives have been set out as a more measurable and specific account of the planning objectives (as described in Chapter 3), and can be seen as scheme performance indicators:

- Local economy and accessibility:
 - Increased number of people with access to the public transport network; and
 - Increased number of people with access to employment opportunities at Granton, Leith, Muirhouse, Pilton and Newhaven.
- Sustainability and environment:
 - Increased share of travel on public transport and non-motorised modes; and
 - Reduced global emissions and control local air quality in order to comply with air quality standards.
- Traffic congestion:
 - Reduced number of trips made by car; and
 - Reduced road traffic volume (veh-km) on key urban routes.
- Safety:
 - Reduce the number of road traffic accidents and casualties in Edinburgh.
- Social benefits:
 - Improve liveability of streets; and
 - Improve access to transport system by people with low incomes, no access to car, the elderly or mobility impairments.

Project Stage Influences

10.5 All development work undertaken to date has been done with the above objectives in mind. The choice of alignment and development of the design and specification has been directed towards meeting or aiding these objectives. The following are amongst the factors taken into account during scheme development to date:

- The introduction of the tram will improve travel mode choice for Edinburgh, providing a fast, clean and efficient service as an attractive alternative to the private car which should help reduction of congestion both on public transport and in general traffic;
- Design proposals have considered the interface between trams, buses and other transport modes, with the objective of favouring public transport, thereby encouraging an increase in the use of public transport and reducing the need for car travel;
- In turn, it is anticipated that the reduction will lead to improvements in road traffic accidents and in some environmental criteria such as air quality;
- The proposals to accommodate the tram on Princes Street have also been developed with the intention of improving the pedestrian environment in this well-used area of the city;
- A Design Manual has been developed for the tram and its immediate environment;
- Route options considered have been chosen to serve population centres in socially disadvantaged areas, thereby increasing access for low income groups; and
- Specifications for infrastructure and equipment are being developed to cater for

the mobility impaired.

- 10.6 During future scheme development, the scheme objectives will continue to be under review and re-appraisal where appropriate. The following can be cited as examples:
- Operating patterns will be reviewed in conjunction with Transdev (the Operator appointed through the Development, Partnering and Operating Franchise – DPOF – Agreement) to establish the optimum service pattern and frequencies;
 - The Service Integration Plan will be finalised through TEL to encourage optimum use of public transport;
 - Junction operation will be reviewed with TEL and CEC to optimise priorities for public transport modes and minimise congestion;
 - Operating plans will be developed with Transdev covering all aspects of operational safety;
 - Specifications for infrastructure and equipment will be developed in conjunction with Transdev to obtain benefits with respect to safety, passenger security, system accessibility, etc all leading to improved public perception and system attractiveness; and
 - Proposals will be agreed with CEC and TEL for future fares policies.

Base Case

- 10.7 STAG guidance recognises the problems associated with establishing a valid Base Case against which the performance of the scheme may be judged. In the case of the tram scheme, there is an additional difficulty introduced by the length of the lead time prior to implementation of tram operations, which is unlikely to be before 2010.
- 10.8 Under these circumstances it is premature to be prescriptive in terms of the establishment of the collection and organisation of the data that will provide the Base Case. It is anticipated that this will be developed and agreed by the with CEC and the Scottish Executive for execution during the period immediately prior to initial operation on any part of the tram network. In the case of environmental base data, it will also be necessary to consult with other heritage and conservation bodies to ensure that any changes in the environment since production of the Environmental Statement can be accommodated.
- 10.9 It is likely that the baseline data will include but will not necessarily be limited to:
- Data on noise, water quality, air quality, ecology, tree surveys and the like;
 - Passenger usage on public transport, particularly buses and heavy rail services upon which patronage may be affected by the introduction of the tram;
 - Junction performance, queue lengths, etc at critical locations;
 - Mode choice survey; and
 - Safety records.
- 10.10 It will be important to establish through discussions with other organisations (e.g. CEC, train and bus operators) what information is available as part of their regular data gathering functions at that time, to avoid incurring additional cost and to limit the collection of new information to that which is strictly necessary to establish performance against scheme objectives.

- 10.11 It is also noted that it may be necessary to obtain some base line data prior to start of construction to be certain that construction activities do not adversely impact the validity of any changes measured.

Project Development, Procurement and Construction

Project Validation

- 10.12 There is currently around 4 years required for final scheme development, approval and construction. It is possible that circumstances may change within that time, which could affect the assumptions made regarding the scheme. For example, CEC and/or tie will likely be implementing various transport projects during that period and it will be necessary to keep under review the tram objectives, taking into account any changes in the underlying transport situation resulting from these and other measures.
- 10.13 Future changes in planning and transportation strategies as proposed or implemented by CEC will also result in a re-assessment of the tram proposals. Such changes might influence phasing of the network, detailed design or planned service pattern and frequency, which will be assessed by tie and its advisors.

Cost and Revenue Review

Early Operator Involvement

- 10.14 A key strand of the Procurement Strategy was the decision to select the operator for the system in advance of completing the Parliamentary process which is a pre-requisite to the letting of contracts for the fabric of the system. The principal reasons for introducing early involvement of the operator were that it allows tie to use the operator's knowledge and experience during the Parliamentary process, business case development, planning, design, and commissioning phases, to ensure that the system will be capable of being operated effectively, facilitates input from an experienced tram operator on issues such as fares and ticketing policy and facilitates planning of the integration of the tram into the combined TEL network of trams and buses, taking account of other operators. Following a competitive tendering process, Transdev were duly appointed as operators under the Development Partnering and Operating Franchise Agreement (DPOFA) in May 2004.
- 10.15 DPOFA also recognises that there may be subsequent changes to infrastructure and/or operating plans which could lead to changes in agreed costs and revenues, both before and after the start of operations. The DPOFA Agreement includes a mechanism for adjustment of target costs and incentivises the Operator to achieve these targets through a pain/gain sharing formula during operations.

Joint Revenue Committee

- 10.16 As part of the process of coordination and integration of buses and tram, a Joint Revenue Committee (JRC) was established with the objective of the development, testing and successful commissioning of a Modelling Suite to support the viability of the Tram Business Case and ongoing revenue forecasting for TEL.
- 10.17 A Modelling Revenue Stakeholder Group ("MRSG") has been established to assist JRC to define the parameters and inputs which allows them to deliver the scope of

services under their contract. The members of this group will be required to source any information which their organisation has and which is required to inform the model building process to ensure it is robust. This group will report back to their respective organisations on progress and ultimately on the output from the modelling.

Early Designer Involvement

- 10.18 Another key strand of the Procurement strategy was the early involvement of the design contractor. The System Design Services (SDS) contract was awarded in September 2005 to Parsons Brinkerhoff. This contract allows tie to advance design work for sensitive sections of the tram route, thereby reducing the planning and estimating risks to which bidders for the infrastructure contract are exposed. It also facilitates the opportunity to procure advanced works on utility diversions and identify at an earlier stage the land requirements and traffic regulation requirements, both temporary and permanent, of the identified network scope.

Advanced works

- 10.19 A significant benefit arising from having undertaken early design work is that tie is able to procure the necessary utility diversions prior to commencement of the system construction. This provides very significant construction programme benefits and therefore cost benefits, due to reduced risk exposure of the infrastructure provider, creating the best opportunity to minimise disruption and maximise construction productivity.

Summary

- 10.20 Given the above, operating costs and revenues will be under continual review throughout the project development and operating phases.
- 10.21 In addition, tie will be able to continually review costs associated with infrastructure and equipment during the development, procurement, construction and commissioning phases to confirm the ongoing validity of estimates and underlying assumptions.

Programme Monitoring

- 10.22 tie will lead a project management team comprising various advisors throughout scheme development and construction. In addition to monitoring changes in capital and operating costs and revenues, the same team will also regularly review progress against the assumed project programme, thereby evaluating any potential for changes in project costs and associated risks.

Operations

Process Evaluation

- 10.23 Evaluations are specific post-implementation events designed to identify whether:
- A project has performed as intended (or under or beyond expectations);
 - Established objectives have been achieved (fully or partially, and the reasons for any failures); and
 - The project continues to represent value for money (also considering actual cost

budget).

- 10.24 The Process Evaluation is conducted straight after the implementation. It will draw lessons for on-going implementation and for the design, management and implementation of future projects.
- 10.25 For the reasons given above with respect to Base Case data, it is not possible at this stage to be specific about the nature of the process evaluation. It seems likely at this stage that there will be a need to provide data which will measure changes in the baseline parameters mentioned above such as various environmental parameters, public transport passenger counts, mode choice surveys and junction performance. Particularly in the case of the last of these, it would be prudent to ensure that junction performance is optimised to benefit the public transport modes without excessive inconvenience to general traffic. The introduction of additional minor traffic control measures to assist this process might be desirable and a process evaluation soon after implementation would provide information to justify any such action.
- 10.26 Evaluation can be conducted straight after the implementation and/or after the full benefits can be capitalised. It will draw lessons for on-going implementation and for the design, management and implementation of future projects. The proposed evaluation performance indicators related to project implementation are summarised in Table 10.1

TABLE 10.1 EVALUATION PERFORMANCE INDICATORS

Objective	Performance Indicator/measure	Performance target	Source of indicator	Monitoring method and frequency
Costs	Proportion of actual costs over budget	X% of budget exceedance	Project costs	Budget and cost comparison – after implementation
	Proportion of budget allocated to the CEC which was actually spent within timescale	X% budget spent by completion	Project costs by time	Project costs by time – after implementation
Views	The extent to which (stakeholder, public) consultation influenced outcomes	Significant number of views taken into account	Consultation process	Qualitative examination of consultation, by group
	Stakeholder's views on how well the project was designed and implemented	Overall positive views	Stakeholder interviews	Qualitative survey results by group – after implementation
Transport	The extent to which public transport model results reflect reality	Travel time Patronage N. bus services withdrawn or modified	PT model, TIMS, bus operator timetable and after surveys	Comparison between modelled and actual – after implementation and again one year later
	The extent to which road model results reflect reality	Traffic diversion Congestion Delays	Highway model and traffic surveys	Comparison between modelled and actual – after implementation and again one year later
Local economy	Actual impact on economic activity	Employment Commerce Tourism	Before and after surveys	Comparison between before and one year after implementation, by location and activity

- Customer satisfaction – to indicate a measure of good performance in public perception.
- 10.33 These KPIs have been selected as being the aspects of service most likely to influence the attractiveness of the system to users, which in turn will assist achievement of the objectives set down for the tram.
- 10.34 The Vision Achievement Bonus is also payable dependent upon a consistent performance against these KPIs over time, promoting continued high quality service.
- 10.35 It is recognised that monitoring of these KPIs will not address all the expectations of the STAG guidance in assessing the performance against the scheme objectives and additional monitoring will be required for this purpose. It is proposed that the details of such performance indicators be developed in conjunction with interested parties closer to the date of service introduction. Nonetheless, a set of performance indicators have been set out earlier in this chapter based on the project objectives.
- 10.36 A monitoring survey framework is proposed, which will encompass the collection, analysis and interpretation of data generated by:
- Traffic count surveys (e.g. cordon and screen line, but first checking the availability of any on-going traffic surveys by CEC or any national data sources);
 - Data collection from Ticketing Information Management System (TIMS);
 - Air quality monitoring equipment (first verify whether any air quality monitoring is already in place);
 - Safety records from the Police; and
 - Household and employee monitoring survey (first verify whether employee and school travel plans already exist).
- 10.37 The KPIs and monitoring programme are summarised in Table 10.2.

Outcome Evaluation

- 10.27 It is recognised that the full potential of a new transport mode will only be realised some time (perhaps 2 to 3 years) after its introduction. It is for this reason that the DPOF contract proposes a review and possible revision of Target Costs after such a period. The outcome evaluation will probably be undertaken as part of the process to be followed prior to agreeing any change of the targets and will be based on similar data to that collected for the baseline survey and process evaluation mentioned above.

Monitoring

- 10.28 A monitoring programme will need to be developed within the development and implementation stages of the project, in order to ensure the gathering of relevant information on performance indicators. The monitoring programme will measure the progress towards meeting the objectives through an assessment against target indicators, in particular whether the project is providing Best Value.
- 10.29 The payment mechanism within the DPOF contract for the tram project includes four discrete elements related to payment during the Operations phase:
- Operating costs and profit element;
 - Performance regime;
 - Pain/gain share mechanism; and
 - Vision achievement bonus.
- 10.30 The evaluation of payments due will require a degree of monitoring to be undertaken as a regular function of operations. The pain/gain share payment will be dependent upon the financial performance of the tram and will offer the Operator and tie the opportunity to share in savings on operating costs below the agreed Target Operating Cost.
- 10.31 In addition, a significant proportion of payment is linked to the Performance Regime and the Vision Achievement Bonus. The Performance Regime is the day-to-day mechanism through which the will monitor and incentivise the Operator to deliver a high quality and attractive tram scheme which will satisfy the primary scheme objectives, by increasing public transport use and reducing car use. Deductions will be applied to payments in the event of unsatisfactory performance against 7 Key Performance Indicators.
- 10.32 The KPIs against which the service will be measured are:
- Timetable Adherence – measuring performance against scheduled service intervals;
 - First and last tram – punctuality of first and last services (included within Timetable Adherence but weighted as 5 times a regular departure);
 - Cleanliness of tram interiors and stops fulfilment of maintenance obligations;
 - Security – to gauge personal security, equipment and incident responses;
 - Information and signage – currency and coverage of service information;
 - Revenue generation and protection – availability of ticket sales points and minimisation of fare evasion; and

TABLE 10.2 MONITORING PERFORMANCE INDICATORS

Objective	Performance Indicator	Definition of Indicator	Performance target	Source of indicator/target	Monitoring method and frequency
Accessibility	Access to transport network	Number of people (non-car available in particular) within 400 metres walk distance from a public transport stop/service Public transport use	X% by 2015 (5 years after opening) X million per year by 2015	Population distribution, car availability (from Census/ Scottish Registry Office), PT routes TIMS	Yearly population and distribution updates by ward Continuous monitoring of bus and tram ticketing
	Access to employment opportunities	Number of people with access to employment in Granton, Leith, Muirhouse, Pilton and Newhaven	X% employees at key locations being able to access jobs by public transport by 2015	Population distribution, car availability, PT routes. Employee survey	Annual population and distribution. Annual survey with employees from key employment locations.
Sustainability and Environment	Use of sustainable transport modes	Increased modal share on public transport, cycle and walk.	X% increase on PT by 2015 Y% reduction on cars by 2015	Household survey	Citywide household survey every 5 years
	Air quality - pollutant concentrations	Various pollutant concentration targets	Meet NAQS targets for all pollutants	UK National Air Quality Strategy (NAQS)	Changes in air quality with monitoring equipment, allowing for seasonal variations
	Global emissions	Reduction in CO ₂ emissions	X% reduction in CO ₂ emissions.	Emission modelling	Modelling of before and after emissions.
Traffic Congestion	Car trips	Reduction in car trips	X% reduction in car trips	Traffic monitoring, household survey	Traffic monitoring programme. Citywide household survey every 5 years
	Traffic volumes - key routes	Average AM/PM, daily, weekly, monthly and annual traffic volumes on urban key routes (veh-km) Growth in car traffic	Road Traffic Reduction Act (RTRA) local targets Car traffic growth not to exceed X% in 2015	Road Traffic Reduction Act UK Government's 1 st Report	Permanent/temporary site automatic/manual traffic count programme
Safety	Road traffic accidents and casualties	Total number of people killed or injured in road traffic accidents in Edinburgh	X% reduction by 2015	Tomorrow's roads: safer for everyone (UK Road Safety Strategy)	Road traffic accident database. Annual records from local Police and local authorities
Social Benefits	Liveability of streets	Number of people using the streets for leisure	% increase in street activities	On-street surveys	Annual survey
	Access by deprived and impaired	Number of deprived / impaired people using the system	% of users that are deprived or impaired	On-board surveys	Annual survey

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- 10.38 Before the monitoring programme is agreed upon, consideration must be given to the actual availability of the data, practicalities from collecting new data, its format, whether it will properly reflect the indicators proposed and cost from obtaining it. Indicators and targets should be subject to regular reviews to ensure that they continue to properly reflect the performance of the project against its objectives, throughout the monitoring period.
- 10.39 Emphasis has been placed in the DPOF contract on the need for electronic data gathering to be employed as the preferred method wherever possible. This will also apply to data gathered outside the DPOF contract for monitoring purposes.

Conclusion

- 10.40 The paragraphs above demonstrate that tie has been, is and will continue to take steps to validate and evaluate the scheme (both before and after implementation) and to monitor its performance in the operational phase.
- 10.41 The project objectives are set out together with actions to be taken during the various phases from scheme development throughout operations. A key factor in this process is the appointment of the Operator using the DPOF procedure, the creation of the JRC and the early designer appointment. These actions alone will contribute significantly to minimisation of risk and regular review of the project.