

**Edinburgh Tram (Line One) Bill****Response to letter of 26 October in relation to the review of the Preliminary Financial Case by ArupScotland and the additional submissions from the objectors****EXECUTIVE SUMMARY**

- 1 **tie** welcomes the opportunity to respond to the detailed matters set out in Arup's report on the Line 1 Preliminary Financial Case ("PFC"). This executive summary provides an overview of tie's response on the matters where clarification was requested by Arup. Each of the sections in the report provides a brief digest of the main points, followed by more detailed technical material.
- 2 We are pleased to note Arup's conclusion that the Preliminary Financial Case is reasonable and robust for a project at this stage of procurement. The following extracts from the Executive Summary of the Arup report also provide a useful flavour of the standing of the PFC :
  - i) "The process leading up to key decisions which have been taken to date, are clearly set out and reasonable alternatives have been considered and assessed."
  - ii) "Relevant guidance for assessing projects, including Green Book, has been considered and applied."
  - iii) "The risk analysis and risk management appears to be well developed"
  - iv) Although the overall estimate of both the capital and operating costs would appear to have been correctly prepared and applied we consider that further clarification is required on a number of points" [the clarifications are provided in this response].
  - v) "On the whole the overall modelling framework appears sound"
- 3 **tie** recognises that the application of a robust approach to developing the PFC does not of itself resolve the challenges faced in delivering a complex and long-term project such as this. However, **tie** believes we are moving forward from a solid platform.
- 4 A summary of **tie**'s response to issues raised in the principal areas addressed in the Arup report is set out below.

**Risk of under-estimation of capital costs**

- 5 **tie** notes that Arups have concluded that "the overall estimate of the capital cost seems to have been rigorously and thoroughly prepared using a database of costs and comparison to other UK Light Rail Schemes, and is a sound basis for the build-up of capital cost".

- 6 The report does however suggest that an additional contingency should be applied. **tie** does not agree with the basis for increasing the contingency element in these estimates. Firstly, the cost base used by **tie** already reflects a significant contingency. In addition, **tie** has allowed fully for lifecycle refurbishment costs in assessing net cash flow surpluses, although Arups may not have been aware of the treatment of this. Finally, the additional contingency applied in the report to reflect revenue risk transfer does not apply because this risk is not being transferred to the private sector construction consortium.
- 7 It is also relevant to point out that certain newspaper reports of a “£220m funding shortfall”, allegedly arising from the Arups report, reflect the full amount of the additional contingency which **tie** does not believe is required for the reasons set out above. The sum quoted of £220m also double-counts over £50m of cost attaching to the section of tram route which will be shared by both lines 1 and 2. When these factors are excluded, the figures previously reported by **tie** remain the best estimate of the likely future costs and there is no additional “£220m shortfall”.
- 8 Finally, it is very important to recall that the final capital costs will be determined only after a competitive market tender. In the event that bids were unacceptably large compared to the current estimates, there is no commitment by the Council or the Scottish Executive to proceed with the project. The contract structure will prevent any open-ended commitment of funding, as has been a problem on other public projects such as the Holyrood building.

#### **Risk of over-estimation of tram farebox revenue**

- 9 We agree with Arups view that this area has been a major problem on other UK tram schemes. There is inherent uncertainty in forecasting up to 30 years ahead on any project, but **tie** has done a number of things to mitigate these risks. **tie** has engaged modelling and transport demand experts to develop the demand models. The model used by **tie**'s advisors has been confirmed by Arups as sound. The model used has evolved over a long period of time, with constant validation and refreshment of the information database.
- 10 Accordingly, although some source information was established some time ago, the level of updating means this is regarded as up to date and fully fit for purpose. The process of refreshing the data will continue as the business case is developed. **tie** has also sought to learn from the estimation errors encountered in other schemes and avoid a repetition.
- 11 The relatively high demand and growth rates demonstrated by the Edinburgh model relates to a number of factors, including the relatively high public transport usage already demonstrated in the Edinburgh area, the expected growth in the patronage to major locations such as the airport, Royal Bank of Scotland site, Edinburgh Park and (specifically in relation to Line 1) the North Edinburgh waterfront area which is one of the largest urban development sites in Scotland.

- 12 We also agree fully with the importance which the report attaches to bus service integration, without which there is a considerable risk to the tram revenues as has been demonstrated in other UK schemes. For this reason, tie has developed an innovative structure to bring together the transport operators and to seek a comprehensive approach to integration, for the benefit of travellers using all modes in Edinburgh and South East Scotland. This work is at an early stage but is one of the critical workstreams over the months and years ahead.

### **Dependence on North Edinburgh development**

- 13 One of the main reasons for the tram project is to link the developing waterfront area with the rest of the city. It is therefore no surprise that the Line 1 revenue projections contain a high volume of patronage to and from this part of the City. The underlying model has assumed that only those plans which already have consent have been reflected in the demand modelling, which should prove to be a conservative assumption. For example, there is no allowance for demand from the recent plans announced for the East Leith Docks area, where up to 18,000 new homes are being planned.
- 14 In addition, this area – particularly towards the West - is regarded as one of the most socially deprived in the City. A principal purpose of the tram project is to improve social inclusion and this will have a particularly strong impact on this area.

### **Risk of a funding shortfall**

- 15 The PFC sets out the avenues being followed by tie and the Council to support the funding of the project. It is not possible to quantify most of these at this early stage in a definitive way but the opportunities include :

Property Development : Council Owned land development, Developer Contributions, Specific Large Scale Development and small scale (tram stop and interchange) development.

Commercial Income : Advertising and other additional revenues from the tram business.

- 16 More details are provided in the PFC and quantification will be established in mid-2005 when an Outline Business Case will be submitted in support of the tram procurement process.
- 17 It should be noted that the Executive grant will fully cover costs in a scenario where only Line 1 was constructed.

### **Risk that PFI may be too prudently assessed**

- 18 tie considers its approach on the modelling of the PFI and Hybrid financial models to be appropriate at this point in the project. It should be stressed that

at this stage, **tie** has not carried out a Value for Money Assessment of the alternative funding options. This would involve a number of adjustments to the models to reflect the risk premium and risk transfer costs and this will be addressed as part of the Outline Business Case.

## **Conclusions**

- 19 **tie** has noted the positive comments made in the Arups report about the robustness of the Preliminary Financial Case and has taken careful note of the specific areas of concern highlighted. There is no complacency on **tie**'s part about the key areas. **tie** recognises fully the need to ensure that capital costs are monitored and presented fairly as the more detailed design stages of the project develop. In financial terms, the risk of capital cost overrun is mitigated by the fact that no commitment will be made to construction until robust contractual arrangements are in place and the affordability of the project is agreed. The specific points on revenue forecasting have been addressed in this report and work will continue on refining these forecasts, in particular to develop the beneficial effect of bus and tram service integration.

## DETAILED RESPONSE

- 1 The following areas are addressed in the order presented in the Arups Report for ease of cross-reference :
  - **Patronage and Revenue Model Development**
  - **Overview of Passenger and Revenue Forecasts**
  - **Economic evaluation**
  - **Sensitivity testing**
  - **Operating and capital costs**
  - **Financial modelling and funding mechanisms**
  - **Risk analysis**
  
- 2 **Patronage and Revenue Model Development**
  - The model is highly complex but has been refreshed regularly with the latest and best available data and has been regularly validated by independent consultants to confirm robustness
  
- 3 The City of Edinburgh Land Use Transport Model Interaction (LUTI) was developed using procedures that conform to current best practice and conforms to guidance set out in the Highway Agency's Design Manual for Roads and Bridges (DMRB).
  
- 4 The hierarchical model consists of 3 components: a land use model (DELTA); a traffic restraint analysis model (TRAM); and a detailed assignment model (DAM). Each model consists of a number of sub-models which were each calibrated and validated prior to the entire model being serially validated.
  
- 5 The initial model development was based on the validated and calibrated 2001 Central Scotland Transport Model 3 (current version is CSTM3A) which has been regularly updated and audited by consultants, on behalf of the Scottish Executive. The CSTM model was originally developed on the basis of an extensive dataset that included data that was up to 15 years old. However, the model has subsequently been rebased and revalidated using more recent data on a number of occasions, leading to the increased level of detail, disaggregation and geographical area.
  
- 6 The functionality of the LUTI model is significantly greater than that of the CSTM model in order to forecast factors influencing mode choice and trip making within Edinburgh. The model is highly segmented to enable the detailed simulation of changes in travel demand in response to network and service changes, changes in the price and supply of car parking, congestion charging etc.
  
- 7 The LUTI (TRAM and DELTA) model was calibrated and validated to 2001 by MVA and David Simmonds Consultancy. It was based on new survey data (traffic, public transport and household) as well as the most up-to-date

information available elsewhere, including Scottish Household survey data base, traffic and public transport survey data, inner and outer cordon and screenline crossing data, etc. The 2001 census was not used as the information was not available at the time of the development of the model. At the strategic level, the model forecasts have been controlled by economic factors, car ownership and planning data (all within the DELTA model). The forecasts were audited in 2002 by independent consultants against the Highways Agency national databases and forecasts (such as NTEM and TEMPRO) and the model deemed satisfactory.

- 8 A more recent review of the model undertaken by Professor Roger Vickerman in 2003 concluded that the model development had followed current practice and may provide slightly conservative forecasts in some areas.
- 9 Local planning data based on approved Local Structure Plans have also been taken into account within the LUTI model. The location of the development within designated areas is controlled by changes within the model forecasts. For Line 1 major mixed use developments are planned at Granton and Leith Docks. The model takes account of existing plans for these areas in a prudent manner.
- 10 The Arup report highlighted some concern on the bus reorganising required as part of the modelling assumption. The bus network restructuring is described as limited within the PFC as services associated with a small number of bus routes along one corridor are modified. The modified bus services run in parallel to the proposed alignment of Line 1.
- 11 The high number of buses along Leith Walk is proposed to reduce from 49 to 27 as the provision of Line 1 will provide a significant increase in overall public transport capacity.
- 12 A new Council-owned company, Transport Edinburgh Limited, has been established to promote service integration. It is anticipated that this will lead to effective co-operation resulting in integration between bus and tram operations and improved services for the travelling public.
- 13 The capacity issues on Leith Walk are being addressed as part of the Transport Edinburgh Limited remit. The detail of the final solution is some time away, it is however recognised by all parties that the demand through this corridor cannot be met long term by feeding in more buses.
- 14 During the build up of the model a Modelling and Appraisal Working Group for the tramline appraisal was drawn from the tram line consultant modelling teams, **tie** Limited, MVA, the Council and David Simmond's Consultancy. The purpose of the group was to collectively review on a consistent basis all modelling issues relating to the tram line assessment that were identified during the evaluation and preparation of the STAG and PFC reports. The Line 1 forecasts were not compromised by resolution of any of the issues identified by MAWG.

- 15 The use of the term 'LUTI model' is a collective one that refers to the component DELTA and TRAM models. On some occasions the terms has been used ambiguously to refer to the full hierarchical modelling suite including the DELTA, TRAM and the DAM models. As a consequence, in Section 2.7 of the Arup report it was indicated that there was some confusion as to which of two statements was correct. The skim matrices used in the TUBA analysis are derived from the DAM model.
- 16 The 2001 census data was unavailable for use during the period of the development of the Council LUTI model in 2001/2 and therefore was not used.
- 17 In order to robustly forecast the complex journey choices within Edinburgh, the model has been developed with extensive market segmentation, which includes, in addition to normal model segmentation, the following functionality:
- **Journey purpose.** The segmentation included within the LUTI TRAM model was: home-based travel to/from work; home-based travel to/from shopping; home-based travel for other purposes (excluding employer's business); non-home-based trips, made up of all employer's business trips and all other non-home-based trips. Home-based demand was further segmented into three household categories, based on car ownership (0, 1 or 2+ cars available to the household).
  - **Goods vehicles.** Modelled as a separate demand matrix.
  - **Time Periods.** In total, nine time periods were modelled, 3 separate peak hours in the morning and evening (6 in total), two off-peak inter-peak periods and overnight.
  - **Parking Activity.** Parking was modelled in zones 1-30 for eight types of parking space.
  - **Trip Linking.** Home-based trips are linked together as simple chains of out and return trips, referred to as 'tours'.
  - **Mode Choice.** The modes and sub-modes available were: car to destination zone; car to parking zone + walk (city centre parking zones only); car to parking zone + PT (city centre parking zones only); existing PT (bus and/or rail) + walk; new PT mode; walk/cycle.
- 18 The crowding function was not used for the public transport detailed assignment model. However, the TRAM model strategic network definition incorporates capacity restrictions at the 88 zone level and as demand by mode increases, the modal choice changes.
- 19 The link capacities within the Highway DAM model were reduced to reflect the shared and segregated running sections. In the case of segregated running one lane of capacity was removed. In the case shared running the capacities were reduced by 20%. The junction layouts were coded to reflect the

proposals developed through the design process in consultation with key stakeholders. Junction coding files could be provided but at this point none have been requested.

- 20 Statements in the main body of the STAG report are the final position taken. The technical notes recorded deliberations on the issue and were included in the STAG document to simply emphasise the degree of consideration given to the various issues.
- 21 It was not possible to code a mode constant within the model software so a mode factor was applied to the tram in-vehicle time. The figure was based on a review of values used within other PT and tram modelling studies. Mode constant values of 10-15 minutes have often been used to represent tram systems in other transport models in the UK. Mode factors are less commonly used but given that average journey times by tram are relatively short and therefore mode constants of 10-15 minutes would equate to much smaller factors, a factor of 0.8 was considered to be representative of the mode preference for trams.
- 22 No formal validation was undertaken on either the highway or public transport models. In general, it is considered that the 1997 validation of the CSTM3 model from which they were derived provides a sufficiently robust basis for the development of the case for Edinburgh Tram. This has been supplemented by using the best information available to update the matrices and networks to a 2001 base, which, given the marginal changes involved, are not considered to have a material impact on the 1997 validation .
- 23 Given the importance of public transport demand forecasting for the case for tram, a set of validation checks were made on the public transport model using bus count data collected in Spring 2003. This concluded that in general the model was under forecasting bus demand, in part due to growth between 2001 and 2003, and this was the basis for the 10% uplift employed in Line 1 for public transport demand.
- 24 **Overview of Passenger and Revenue Forecasts**
- Growth in tram patronage is driven by a model in which the assumptions have been scrutinised in detail
  - The overall shape of the projections is consistent with known or reasonably predictable economic factors
  - There are good reasons to anticipate a higher level of demand for the tram Line 1 service relative to the average of other UK tram systems
  - Tie recognises critical importance of revenue forecasting and continues to devote considerable effort toward assessing the projections
  - Bus and tram service integration is recognised as critical and this will be a main workstream as the business case is further developed
- 25 Analysis of the model outputs reveals that the growth in Line 1 demand is 45% (9.44m riders pa in 2011 to 13.69m pa in 2026). Of this, the growth in



public transport demand in the Line 1 corridor accounts for upwards of 10% of this, with mode shift from car to Line 1 bringing this market growth up to around 15%.

- 26 The remainder of growth in Line 1 demand is being driven by increasing levels of congestion having an adverse impact on bus operations, thus increasing the share of public transport demand taken by Line 1 compared to bus. For example, the bus journey time between Leith and Haymarket increases by around 5mins between 2011 and 2026, whereas tram times remain largely unchanged due to the level of segregation and priority provided to the tramline.
- 27 The benchmarking exercise carried out considered a range of indicators on the demand levels for tram systems across the UK and compared these to the demand forecasts for Line 1. Whilst results were presented for the forecast 2011 and 2026 loadings, comparison can only realistically be done at best against the 2011 forecasts since the comparison is with actual demand on existing systems; we obviously have no firm information on 2011 or 2026 demand.
- 28 This exercise indicated that the 2011 forecasts for Line 1 were, on all indicators, within the range of existing systems. In general, Croydon has the highest demand levels across all the indicators, with Manchester demand being comparable to Line 1 with some indicators higher and some lower.. Sheffield and Midland Metro are consistently in the lower end of the ranges. On this basis, the Line 1 demand forecasts are considered realistic and plausible.
- 29 Reasons for the promoters confidence in these figures include Edinburgh's urban bus use being amongst the highest per person in Britain, a legacy of an extensive and well developed system, traditionally low bus fares and concentration of jobs and services in the City Centre. The provision of the tram lines provides a frequent high quality service between the city centre and major residential areas of the city, giving rise to a step change in the quality and attractiveness of public transport and a commensurate modal shift from car.
- 30 At the time of the design freeze no commitment was made to the CETM scheme. Therefore the modelling assumptions underpinning the scheme appraisal permits westbound traffic on Princes Street. However in developing the more detailed junction configurations within Princes Street the working assumption was that westbound traffic would be prohibited.
- 31 Consideration of congestion charging in the context of Line 1 indicates that the impact on forecast patronage level is most likely to be neutral. Congestion charging will give rise to a reduction in the level of congestion and journey times within the inner cordon. Between the inner and outer cordon, the congestion charging study indicated that there will be a very small reduction in traffic speeds, resulting from a combination of a reduction in radial traffic flows in the direction of peak flows and local increases in traffic

movements for other movements elsewhere as traffic diverts to avoid crossing the inner cordon. Overall there will be a net increase in public transport patronage. Where there is an increase in bus speeds relative to the tram, there may be some abstraction of forecast tram patronage. This will be balanced by an overall increase in public transport patronage, including tram patronage, for orbital movements along the alignment of Line 1.

## 32 **Economic Evaluation**

- Strong economic case for Line 1 and ability to meet a range of local and governmental planning objectives.
- Significant benefits to serving Granton and other development areas.

33 A BCR above 1.0 indicates that the economic benefits of the scheme exceed the economic costs of the scheme. Much sensitivity testing has been undertaken to ensure that the scheme will fulfil its objectives and produce an economic surplus, with no test resulting in a BCR of less than 1.0.

34 Furthermore, the scheme is designed to fulfil a range of objectives, in line with the local and governmental planning objectives, not just economic. Line 1 has a positive impact across all the local planning objectives, improving accessibility, promoting sustainability and reducing environmental damage, reducing traffic levels, improving transport safety and promoting social benefits. Of the governmental objectives, it reduces harmful emissions, promotes economic regeneration and growth, integrates with a range of other policy objectives, notably land use transport integration through serving the redevelopment areas of Granton and Leith, and promotes accessibility and social inclusion.

35 Line 1 provides a step change in the level and quality of public transport to the areas of Drylaw, Pilton and Granton, giving much faster journey times to the city centre than can be made by bus. Furthermore, Line 1 better serves the West End and Haymarket, with the local road network constraining buses to operate via Princes Street. The result of this is a relatively high level of benefit for passengers to and from these areas.

36 Serving Granton was a prime factor in the development of Line 1, with the area currently undergoing major redevelopment. From the outset, great efforts have been made to secure a segregated right of way through the area to ensure a fast and attractive transport link and which has been integrated with the developing land uses.

37 The modelling process explicitly includes trip generation and hence such demand is included in the forecasts; no other allowance is made for such trips. (The discussion presented in the technical notes refers to the fact that generated trips are typically not explicitly modelled and DfT guidance does allow off-peak demand to be increased by 15% to account for this.)

38 A review was undertaken of the level of Line 1 demand which is new public transport trips (from car and generated) and this demonstrated that these

were in the range of 16%-20% in 2011 and slightly higher in 2026. This is consistent with the empirical evidence from existing systems.

- 39 All transport models are subject to model noise because as the model approaches convergence, trips tend to change route in response to small changes in overall journey costs along parallel routes. The model convergence criteria were selected appropriately and are documented in the Model Development Report. Nevertheless, benefits can be forecast in some areas remote from the area of influence of the scheme and these have been eliminated to increase the level of confidence in the forecasts.
- 40 The external-external car trips that have not been removed benefit from the reduction in congestion delays within the network as the result of modal transfer to public transport. These benefits are secondary non-user time and distance saving benefits that the scheme provides to other trips within the network. A restricted area multi-modal model was developed for the purpose of the tram evaluation rather than a corridor model in order that the change in modal split and trip reassignment could be taken into account during the design and evaluation.
- 41 Overall demand levels on the respective highway and public transport networks are derived from the strategic TRAM model. This takes projected changes in land use and socio economic drivers to forecast travel demand by mode into the future. The model reflects a whole range of behavioural responses to changing travel costs, including whether to make the trip or not. On this basis, the forecast demand reflects how congestion levels affect the propensity to travel and hence the demand forecast by the model for 2026 is reflective of this. Beyond 2026, travel demand and costs have assumed to remain static.
- 42 Non-user benefits (highway benefits) were deleted (adjusted) in remote areas where the likely benefits of the scheme to travellers were considered to be small. Model noise may contribute to the scale of these non-user benefits, leading to the forecast of apparently large overall levels of benefit, particularly where a very large number of trips are each forecast to receive a small benefit. The review indicated that it would be prudent to remove forecast benefits in some areas in order that the overall resulting forecast benefits were robust. Some £109m worth of non-user benefits were deducted from those forecast from the demand model.
- 43 The benefits were deducted on the basis set out above and the overall benefit adjusted prior to presentation within the report. This led to confusion referred to within the Arup report. Further reduction of the figures within the report would result in the adjustment being applied twice.

### **Sensitivity Testing**

- 44 As part of the detailed work to arrive at the PFC, **tie** performed several financial sensitivity tests covering Interest Rates and Inflation. The STAG report similarly reflected sensitivity testing of a number of key variables.

It has been highlighted as part of the NAO report and various other sources that a negative bus response to the introduction has been the major reason for schemes struggling to be commercially viable. **tie** has long recognised that this area is a critical success factor in the Edinburgh scheme. This is at an early stage but is being addressed as part of Transport Edinburgh Limited initiative.

45 The proposals for Line 1 do not include the use of a 'Quality Contract' at present. **tie** is currently involved with the bus operators and in discussion on the best way ahead to maximise the global use of public transport to ensure the continued economic growth of the city.

#### 46 **Operating and Capital Costs**

- There are good justifications for the inclusion or exclusion of certain costs in the capital cost base questioned by Arups and **tie** believes its approach is justified.
- **Tie** does not agree that additional contingency – both related to the HM Treasury Optimism Bias concept and to more general factors – is justified over and above the contingencies already reflected

47 Arup's have suggested certain additional costs should be added to the capital cost base :

CETM - The tram routing requires the alteration to several junctions and traffic flows that also form part of CETM. There is therefore likely to be an element of overlap between tram and CETM costs. The Tram has no additional cost allowance for the wider effect of CETM.

The alignment in Granton and Leith has been fully costed and there is no requirement to increase the cost base.

Where a scheme is uncommitted there is no recognition in cost terms of the impact, in this case the example quoted of Haymarket Station Development is not allowed for in the costs, as the scope, viability or timeframe is not yet confirmed.

48 In addition to the above additional items suggested by Arup there was also reference to the inclusion of additional sums to cover Renewals, Revenue Risk Premium and Replacement Trams.

49 Taking the three suggested additional costs in turn:

- i) **Renewals** - this cost is fully provided for in the modelling based on the assessment of the technical advisors.
- ii) **Revenue Risk Premium** - the revenue forecasts have been rigorously assessed and benchmarked to provide confidence that they are deliverable. Additionally the early involvement of

Transdev will further improve the accuracy of these estimates. The independent setting of revenue targets and the joint delivery of the target revenue and gain/pain share should ensure that there are proper incentives to maximise revenue in the context of an integrated service environment with appropriate risk transfer. More fundamentally, the revenue risk is not being passed to the private sector construction consortium under the contract structure being planned by tie. Accordingly, the revenue risk is unlikely to affect capital cost.

- iii) **Replacement Trams** - the lifecycle costs allow for substantial mid life refurbishment and maintenance of the tram fleet. It is not expected that any of the fleet will require to be replaced mid life.

50 It was also highlighted that no specific mention was made of enhanced paving costs. **tie** can confirm that the cost of complying with the Council's aesthetic requirements as detailed in the design manual has been allowed for within the tram costing for the track and related infrastructure including stops.

51 Arup requested information as to why an additional £400k was included in the PFI and Hybrid modelling. The sum was included based on an estimated overhead cost associated with the special purpose company that would be set up to oversee the additional processing, reporting and administration activities that are likely to be required to oversee the PFI and Hybrid approaches.

52 The inclusion of such a cost reflects best practice, but the figure of £400k is by necessity an estimate at this stage.

### 53 **Financial Modelling and Funding Mechanisms**

- There is evidence that additional funding sources needed are deliverable.
- The approach to financial modelling of PFI and Hybrid is conservative.
- HM Treasury Guidance applied consistently.

54 The PFC sets out the avenues being followed by **tie** and the Council to support the funding of the project. It is not possible to quantify most of these at this early stage in a definitive way but the opportunities include :

Property Development : Council Owned land development, Developer Contributions, Specific Large Scale Development and small scale (tram stop and interchange) development.

Commercial Income : Advertising and other additional revenues from the tram business.

55 More details are provided in the PFC and quantification will be established in mid-2005 when an Outline Business Case will be submitted in support of the tram procurement process.

56 The work carried out to date highlights that there is good evidence that such sums are realistically deliverable based on the advice of relevant professional advisors and the experience of Transdev. As the project progresses **tie** will continue to address new opportunities as they arise.

57 **tie** considers its approach on the modelling of the PFI and Hybrid to be appropriate at this point in the project. It should be stressed that at this stage, **tie** has not carried out a Value for Money Assessment of the alternative funding options. This would involve a number of adjustments to the models to reflect the risk premium and risk transfer costs and this will be fully addressed as part of the Outline Business Case.

58 As part of the report Arup has re-run the cost estimates through an alternative model and arrived at a different answer. It is difficult to assess the alternative approach without substantial further discussions with Operis. The PFI approach that **tie** used in the PFC is a simple affordability and shadow bid model (which has been tested against a more detailed model). The **tie** model does reflect current market assumptions with a degree of “buffer” to allow for fluctuations in rates. A more complex shadow bid model will be developed as part of the Outline Business Case should PFI or a Hybrid continue to be an option. This decision will be based on a full Value for Money assessment, to be carried out in conjunction with the Scottish Executive

59 The indexation approach used by Operis, full indexation, is a perfectly viable option and should have the effect suggested. However **tie** has opted for a more conservative assumption of 1% at this stage as it is more likely to arrive at a larger fixed element with a smaller indexation given the nature of the scheme and past funder issues. The scenario modelled reflects a market position which would be sustainable and deliverable.

## 60 **Risk Analysis**

- HM Treasury Guidance has been correctly applied as appropriate in the estimation of Optimism Bias within the economic analysis as required by the Scottish Executive.
- The current scope of the risk matrix is robust and has the potential to expand to cover additional areas.
- The **tie** approach to risk management is appropriate.
- **Tie's** approach to risk prioritisation is effective.

61 In several areas **tie's** treatment of Optimism Bias was discussed, **tie** can confirm that they are fully aware of the recent report “Procedures for Dealing with Optimism Bias in Transport Planning”, published in July 2004, reporting on studies by Bent Flyvbjerg in association with COWI on behalf of the Department for Transport.

- 62 **tie** and their advisor's recommend caution in adopting higher Optimism Bias values (as potentially inferred by the **Arup** study) as a matter of course and have considered Optimism Bias in association with the base costs.
- 63 **tie** have discussed the approach to estimation of Optimism Bias, including the recent Bent Flyvbjerg report, with the Scottish Executive and confirmed that HM Treasury guidance is to be applied.
- 64 The calculation of Optimism Bias is a necessary judgement based on an assessment of a number of a range of factors. On a large scale complex infrastructure project it has to be recognised that there are major risks associated with capital cost estimates. **tie** continue to follow best practice in assessing and monitoring all risks.
- 65 **tie** agree with **Arup**'s suggestion that the risk register could be further 'disaggregated' and potentially extended to include wider funding and interface management risks. **tie** anticipated undertaking these further development during the next stages of project evolution and recognise that there will be a need for ongoing maintenance of the risk register. In development of **tie**'s procurement strategy, risk has been a primary consideration including **tie**'s and other abilities to manage interface risk.
- 66 **tie** have and will continue to examine emerging risks through the infrastructure procurement strategy in development for those risks retained, shared or transferred to the private sector. This will include review of the role of the System Integrator.
- 67 **tie** continue to develop the overall funding case for the scheme and will examine these issues as part of the developing Outline Business Case for the scheme.
- 68 In addition to emerging issues, **tie** and their advisors have accounted for lessons learnt and reported within the National Audit Office (NAO) report "**Improving public transport in England through light rail**", published in April 2004. CEC and **tie**'s comments on this report can be found on the Parliamentary Bill website as follows:-
- <http://www.scottish.parliament.uk/business/committees/tram-one-bill/documents.htm>
- 69 **tie** has reviewed the Audit Scotland (AS) report "**Management of the Holyrood building project**" published in June 2004. This report highlighted a number of observations, features and lessons that are appropriate to all major capital schemes, in its key findings. **tie** has summarised the report observations and recommended lessons for **tie** and appended it to this response.
- 70 **tie** consider that appropriate scrutiny has been and will be given to the areas suggested by **Arup** during the ongoing development of the scheme. Inputs to the risk register have been provided by **tie**'s advisors including Transdev and

will be extended and further disaggregated as further development takes place. In the meantime, **tie** is continuing to develop the funding case for the scheme.

- 71 **tie**'s advisors have developed robust cost estimates that account for the risks associated with interface issues pertaining to the scheme.
- 72 The Arup report sought more detail as to why **tie** had not performed a Quantitative Risk Assessment. Some risk management plans focus on qualitative analysis, some on quantitative analysis, and some use both. We argue for both, with use varying at different stages in the project lifecycle. What is important for present purposes is that an effective approach is adopted to ensure that 'identifying and structuring' process is adopted through qualitative techniques. **tie**'s current motive is to ensure key corporate learning is achieved. It is planned that this is supplemented at later stages with a more quantitative 'choosing and evaluating' process at the next stage of the project development in consideration with procurement issues regarding risk allocation.
- 73 **tie** recognise that a Monte Carlo simulation can be one of a number of useful techniques to support the risk management process and for combining probability distributions where a quantitative risk analysis is required.
- 74 Whilst primarily used in investigating the sensitivity of risk models there were a number of factors that **tie** and their advisors have considered in not undertaking this type of assessment, as follows.
- Not a mandatory part of STAG analysis and therefore not required as an output at this stage;
  - Needs resolution of detailed design issues (to ensure accurate input data) to allow a detailed consideration of disaggregated capital cost contingencies;
  - As outlined above, **tie**'s strategy is to use this technique in the scheme development in conjunction with evolving scheme Outline Business Case to assist financial modelling (being built into the financial and technical advisor remits for the next wave of implementation procurements);
  - Risk of incorrectly detracting from Optimism Bias estimate if the source data is insufficiently developed due to early stage of scheme development and incorrect assumptions;
  - Benchmarking of costs has supported overall robustness of approach; and
  - Technique is potentially subject to sampling error (particularly with relatively small data sets) that if reduced can bias results (due to insufficient design development).
- 75 At the early phases of the project **tie** developed processes and structures to control the identified issues. **tie** captured this thinking within a Risk Management Policy and Risk Management Plan for the scheme. Our Plan identified our prime objectives in risk management, as follows.



- All identified risks mitigated to a 'medium' significance or less;
- All identified risks passed to the best parties capable of managing the risk;
- A culture of risk awareness (not risk averse) and management is created;
- Schemes are delivered within budget and on time;
- Schemes provide a fully functioning operational service; and
- Schemes are supported by all key stakeholders.

- 76 As stated above, we clearly set a 'tolerance' level for risks that impact the projects in terms of their significance. This tolerance level establishes a boundary for those risks that are acceptable and unacceptable to **tie** (risks above this tolerance are shown RED). **tie**'s approach effectively allows **tie** to prioritise mitigations over three grades, in accordance with industry best practice. In addition, it is noted that summarised graphically to five grades of severity (very low to very high) as defined on the risk register.
- 77 **tie** prioritise response plans to identified risks according to risk severity (taking into account effects and secondary issues) in accordance with industry best practice. It is recognised that further refinement to adopt a five-colour system as proposed by **Arup** may be of some assistance. Our risk categorisation allows further prioritisation in a number of ways including degree of likelihood and scope, timing and severity of impact to the scheme.
- 78 **tie** and their advisors regularly update and amend priorities of risks taking into account progress in stakeholder management. The outcomes of this process are reflected in monthly risk report to **tie** Board to ensure key risks are discussed. The Board are also informed of progress with stakeholders to determine appropriate prioritisation.
- 79 **tie** accept **Arup**'s assertion that there could be benefits in further disaggregation of risks to allow a more refined prioritisation of individual stakeholders. In the course, of further development of the scheme and risk register **tie** propose to further disaggregate risk associated with stakeholders.
- 80 It is noted that the risk register does not represent the full extent of stakeholder management underway or planned. **tie** recognise that the perception of and predisposition to risk varies between each stakeholder. A system is in place to manage stakeholder relationships which has the following objectives
- Promote understanding of the Tram Proposals;
  - Counter misinformation;
  - Maximise support for the Tram;
  - Minimise the amount of opposition/objections;
  - Minimise potential risks; and
  - Promote proactive and interactive flow of information;

- 81 All stakeholders who have objected to the Bills have the right to be treated equally and consistently. In recognition of this, a system has been established for governing negotiations with objectors which ensures fair treatment.
- 82 As a general principle, **tie** is concentrating first on parties who have actually lodged an objection to the Bill. However, there are exceptions to this which are reviewed on a case by case basis.
- 83 **tie** and their advisors consider that their response planning for stakeholders is appropriately tailored and understood.
- 84 In the report Arup discuss the impact of procurement risk and how this impacts on the capital cost, **tie** and their advisors have identified a total of 10 procurement related risks that could lead to a capital cost (and 23 risks that could delay the programme) including the following two specific risks identified in [Section 8.10] which could lead to dispute and claims with consequential cost and programme impacts.

Ref.	Risk Description
71	DPOFA Procurement delayed due to consequence of termination
115	Force majeure event, as defined in the contract

- 85 **tie** considers that each of the risks identified could lead to Optimism Bias on the anticipated costs and that suitable mitigations are required to minimise or obviate the likelihood and impact of all risks occurring. **tie**'s philosophy is to identify, analyse and mitigate all risks that could lead to a cost or programme impact (and other impacts as shown) for the following Optimism Bias areas in relation to procurement. These risk areas have also been considered in the development of **tie**'s emerging procurement strategy.
- Complexity of Contract;
  - Late Contractor Involvement Design;
  - Poor Contractor Capabilities;
  - Government Guidelines;
  - Dispute & Claims Occurred;
  - Information Management; and
  - Other Procurement Areas.
- 86 In this sense, **tie** and their advisors have adopted a robust approach and not constrained their analysis of Optimism Bias to a limited number of areas, in order to determine a low Optimism Bias estimate. In addition, **tie** have not ignored 'known' risks that are recognised as having a contribution to Optimism Bias (contrary to guidance that shows these risks have not previously led to additional cost or programme delays for the sample projects reviewed).
- 87 **tie** and their advisors therefore do not accept Arup's assertion that the Optimism Bias uplifts have been underestimated. The soundness of **tie**'s approach has been reflected in the relative higher cost estimates of the

Edinburgh system compared with other previous and planned schemes in the UK.

- 88 For all risks **tie** and their advisors guard against drawing unnecessary and subjective judgements and uncertain assumptions (leading to greater risk exposure) into the process. This is reinforced in terms of the approach taken in the determination of Optimism Bias (reasons for which are well documented) that has established the reasons for not doing a risk-by-risk bottom up analysis to evaluate likely risk impact and also apply to the evaluation of the mitigation cost.
- 89 This approximately £2m allowance is probably best understood in terms of 'global' viewpoint, as equates to an approximately 10% increase in Project Costs and represents 200 to 250 man months of input. To place this allowance into further context, it is noted that it would also equate to approximately half of the development costs for the scheme to date.
- 90 **tie** and their advisors consider that the 1% allowance for the cost of mitigation is pragmatic and reasonable.
- 91 The Arup review highlighted the possibility of some confusion over the numbering of risks in different document versions, by way of explanation **tie** have employed a revision control system during the development of the risk register for the scheme to ensure that an audit trail of risks identified has been maintained. **tie** have periodically re-numbered risks in order to assist in sorting and prioritising risks due to changes in severity. **tie** agree with Arup's suggestion that the a sequential numbering of risks (that is maintained for the duration of the project) would assist in further traceability.

## **Appendix A**

### **Lessons from the Management of the Holyrood Building Project**

Ref.	Audit Scotland Observation	Lesson for tie
1.	The complexity difficulties encountered have resulted in substantial cost and programme over-runs.	Identify areas of potential design complexity and ensure original estimates are robust and adequate contingencies (capital expenditure and programme) are made.
2.	The 'construction management' procurement strategy is the primary reason for problems encountered, where the majority of risks are retained by the public sector.	Ensure an appropriate procurement strategy is adopted that transfers and shares the appropriate risks with the private sector
3.	The management and control processes have been undertaken by a number of organisations, groups and bodies.	<p>Ensure clear roles and responsibilities are defined for all parties.</p> <p>Ensure a single point of control and leadership, with explicit authority and responsibility given to the person in charge.</p>
4.	The design team included a partnership arrangement between Edinburgh and Barcelona based architects.	Ensure definition of requirements is provided to all advisors and clear roles and responsibilities are defined for each member of the design team and especially those embarking on partnership or Joint Venture basis.
5.	<p>The main cause of 20-month delay to the project since September 2000 was the following.</p> <ul style="list-style-type: none"> <li>• Production of detailed design variations; and</li> <li>• Late supply of information during construction process.</li> </ul>	<p>Ensure that detailed design is initiated at the earliest opportunity to avoid variations.</p> <p>Ensure clear lines of communication are adopted with programme indicating dates for supply of information to each party.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' to InfraCo.</p> <p>Ensure adequate allowance is given to time spent at the planning stage to address the following.</p> <ul style="list-style-type: none"> <li>• Clear definition of Client's requirements</li> <li>• Sequence of construction</li> <li>• Assessing and managing project risks</li> <li>• Using value management</li> </ul>
6.	Difficulties encountered in very	Ensure construction programme

Ref.	Audit Scotland Observation	Lesson for tie
	complex, densely developed non-standard building against very tight deadlines.	<p>allows 'early' and 'adequate' construction period for areas of complex construction.</p> <p>Ensure construction work is undertaken in a 'phased manner' to avoid density issues coming to the fore.</p> <p>Ensure agreed project budget is established and a set of key performance indicators established to measure during the life of the project</p>
7.	In some cases trade contractors were responsible for design in addition to the design team.	Ensure that a clear 'single point' of focus is kept on design responsibility through lead designers.
8.	Both the architects and some trade contractors did not deliver on time some critical elements of the design work.	<p>Identify the critical elements of the design work within a detailed design programme.</p> <p>Select a procurement strategy that allows the ability to seek Liquidated Damages at key milestones.</p> <p>Select designer on ability and resources to meet the programme.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' to InfraCo.</p>
9.	Project management required a very demanding timetable for completion and was realistically 'unachievable'.	<p>Ensure expectations are managed for delivery of the project.</p> <p>Ensure the development and maintenance of the project delivery programme. Seek independent experience on ability to deliver the scheme.</p> <p>Ensure that forecast to completion of project is maintained during design and construction phases.</p>
10	Project management should have 'done more' to address the 'root causes' of problems.	Ensure that the project team communicate issues and problems to achieving the delivery dates and a 'partnering' relationship is fostered to ensure individuals feel free to express reservations.

Ref.	Audit Scotland Observation	Lesson for tie
11	<p>The construction programme was predicated and flawed due to the following.</p> <ul style="list-style-type: none"> <li>• Inappropriate assumptions; and</li> <li>• Unachievable commitments by the design team and contractors</li> </ul>	<p>Examine the basis of all critical project assumptions that could delay the scheme.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p> <p>Ensure that the project team and InfraCo communicate issues and problems to achieving the delivery dates and a 'partnering' relationship is fostered to ensure individuals feel free to express reservations.</p>
12	<p>Under the construction management contract the public sector ultimately bears the majority of 'construction risk'.</p>	<p>Select a procurement strategy that optimises the transfer of 'construction risk' to InfraCo.</p>
13	<p>Project management did not test the designers, construction manager or trade supply contractors' commitment or ability to resource to meet revised programmes.</p>	<p>Develop a realistic design and construction programme.</p> <p>Ensure that resource availability is tested for all parties contracted including sub-consultants and sub-contractors.</p> <p>Ensure that the commitment of parties is there to meet revised programmes (which may include acceleration).</p>
14	<p>Project management was unable to manage risks associated with programme delays effectively.</p>	<p>Ensure that all parties contribute to a consistent framework for risk management including ability to contribute to definition of mitigation to overcome programme delays.</p>
15	<p>The cost of the scheme increased after 2000 (post significant design freeze) due to ongoing design development and construction delays.</p>	<p>Ensure that detailed design is initiated at the earliest opportunity to avoid variations.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>
16	<p>Cost increases due to design development related entirely to the following.</p> <ul style="list-style-type: none"> <li>• Realising the detail design;</li> <li>• Defining the quality of finish; and</li> </ul>	<p>Ensure that detailed design is initiated at the earliest opportunity to avoid variations.</p> <p>Develop clear specification requirements for the scheme including clear indicators of quality and material</p>

Ref.	Audit Scotland Observation	Lesson for tie
	<ul style="list-style-type: none"> <li>• Selecting the palette of materials.</li> </ul>	<p>selection prior to going to market to minimise design development e.g. through development of Design Manual.</p> <p>Monitor detail design progress.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>
17	Construction costs rose from £140M to £311m (an increase of 220%).	Identify areas of potential design complexity and ensure original estimates are robust and adequate contingencies (capital expenditure and programme) are made.
18	<p>Construction management involved a significant amount of design development to continue over the following stages, resulting in an increase of £80m to the scheme.</p> <ul style="list-style-type: none"> <li>• Tendering of contractors</li> <li>• Appointment of contractors</li> <li>• Commencement of building work</li> </ul>	<p>Ensure that detailed design is initiated at the earliest opportunity to avoid variations.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>
19	Design development carries a risk of cost increases that should have adequate allowance in the scheme cost plan.	<p>Ensure that detailed design is initiated at the earliest opportunity to avoid variations and make adequate contingency to account for design development risk.</p> <p>Ensure that the Client retains management responsibility for design development appropriate to the form of contract.</p>
20	Risks associated with design development should be managed.	<p>Develop a governance model that ensures responsibility for scheme costs and emerging design development.</p> <p>Ensure that the all parties contribute to a consistent framework for risk management including ability to contribute to definition of mitigation to overcome design development cost impacts.</p> <p>Review the ability to absorb cost</p>



Ref.	Audit Scotland Observation	Lesson for tie
		increases or alternative solutions to accommodate design development.
21	Design development became a process for costing approval as opposed to delivery within cost limit.	<p>Ensure that design development is challenged throughout and clear understanding of project affordability is understood.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>
22	<p>Uncertainty regarding the scope of work for packages led to the following.</p> <ul style="list-style-type: none"> <li>• Difficulty to achieve good (interest and price) competition (13No. out of 20No. main contracts had three or fewer tenderers);</li> <li>• Deliver Value for Money (11No. out of 20No. main contracts had uncertain VfM); and</li> <li>• Increased negotiation from normal requirements</li> </ul>	<p>Maintain market interest in scheme through promotion of the scheme to ensure tenderers interest in scheme.</p> <p>Ensure clear scope of works are defined for all works proposed Contracts and clear value for money tests are established prior to placement.</p> <p>Ensure that negotiators with suitable experience are engaged.</p>
23	<p>Decisions to award contracts with a large degree of uncertainty due to programme constraints resulted in the following.</p> <ul style="list-style-type: none"> <li>• Weaker negotiating position for subsequent claims for extra time related costs; and</li> <li>• Little opportunity to attribute blame due to poor performance.</li> </ul>	<p>Ensure that decision to award contracts is taken following clear understanding of elements remaining to be clarified and clear obligations.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>
24	<p>Uncompetitive process resulted in contractors claims to £86m to construction costs due to the following with no improvement to the scheme.</p> <ul style="list-style-type: none"> <li>• Prologation</li> <li>• Disruption</li> <li>• Delay</li> </ul>	<p>Ensure that the construction works are fully pre-planned with clear programmes, methodologies, constraints and dependencies known at the outset.</p> <p>Establish clear grounds for claim through the Contract with a procurement strategy that allows the ability to transfer 'design risk' and 'construction risk' to InfraCo.</p>

Ref.	Audit Scotland Observation	Lesson for tie
		Define and monitor claims under contract with appropriate governance requirements
25	The same quality objectives could have been achieved for less cost if the whole design and construction process had been better executed.	Ensure adequate consideration of the procurement options available and select the preferred option on basis of ability to deliver quality, cost and programme objectives.
26	Those delivering the project have had clear quality and programme objectives but unclear cost objectives.	Ensure that all those responsible for the delivery of the scheme have a clear understanding with regard to the project objectives of quality, cost and programme.
27	<p>The Holyrood project lacked a single point of leadership and control where appropriate decisions could be made resulting in the following.</p> <ul style="list-style-type: none"> <li>• No focus to decision making;</li> <li>• Lack of accountability;</li> <li>• Unclear allocation of responsibility for time, cost and quality; and</li> <li>• Leadership and control was not clearly established.</li> </ul>	Ensure that governance model empowers single point of leadership and support to Project Director.
28	The parties involved did not agree a cost plan resulting in costs being 'indicative' rather than 'reliable'	<p>Ensure that a cost plan is developed for the scheme that has sign-off from all parties and a sound basis for proceeding between key milestones.</p> <p>Ensure monthly updates are prepared including 3-month forecasts for all advisors, suppliers and contractors.</p>
29	Project management did not use 'normal' budgetary control procedures.	Ensure that appropriate budgetary control measures are in place.
30	Project management did not have clear definition of overall budget or approved cost ceiling at every stage of the project lifecycle resulting in focus on only given to quality and time objectives.	<p>Ensure that a clear definition of anticipated outturn cost is made and all parties work toward delivering the scheme within this ceiling.</p> <p>Ensure that the governance model provides sign-off responsibilities for 'approved cost ceiling' and appropriate change control procedures.</p>

Ref.	Audit Scotland Observation	Lesson for tie
		<p>Ensure that measures of quality, cost and time are regularly reviewed during project lifecycle.</p> <p>Consider the use of project reviews to provide assurance that it may move to the next stage of development.</p>
31	There was a need for better cost reporting and financial control.	Ensure adequate resources and appropriate financial control systems are adopted by all parties.
32	The cost reporting and financial control was not always comprehensive or systematic.	Ensure regular 'comprehensive' reporting of current spend and forecasts are provided on a 'systematic' basis.
33	Risk management for the Holyrood project was not good practice.	<p>Ensure that clear risk management procedures are adopted and all parties are engaged in the process.</p> <p>Ensure that mitigation strategies are developed for each risk.</p>
34	Accounting for risk was insufficient.	Ensure adequate contingencies are made for expected programme delays and cost increases that may influence the project.
35	Contrary to good practice, there was no quantified allowance for the major risks facing the project.	Ensure adequate contingencies are made for expected programme delays and cost increases that may influence the project, for all 'major' risks
36	Project management introduced risk management to quantify risks and conducted risk reviews late in the process.	Ensure that clear risk management procedures are adopted and all parties are engaged in the process throughout the project lifecycle.
37	Culture adopted acceptance of cost increases as risk materialised.	<p>Ensure that an appropriate culture to challenge cost increases is adopted by the delivery team with clear definition of anticipated outturn cost is made and all parties work toward delivering the scheme within this ceiling.</p> <p>Ensure that the governance model provides sign-off responsibilities for 'approved cost ceiling' and appropriate change control procedures.</p>
38	Overspend on consultants to £50m (comprising 19% of the approved construction costs).	Ensure a tight rein is placed on expenditure on consultants.
39	Project management did not explore, prior to appointment, alternative fee arrangements	Ensure that the procurement routes examine alternative fee arrangements to ensure value for money.

Ref.	Audit Scotland Observation	Lesson for tie
	including financial incentives to deliver value for money.	Ensure care is taken in development of the payment regime to incentivise contractors against performance against clear quality, time and cost targets.
40	Percentage fees do not align with the Client's cost objectives.	Ensure that incentives adopted do not include scaleable fees related to the capital expenditure of the scheme
41	Corporate Body did not place cap on spend on consultants until very late in the programme and did not provide a timely incentive to consultants to control costs and programme	<p>Ensure a limit to exposure of consultant fees in known at the outset.</p> <p>Ensure a tight rein is placed on expenditure on consultants.</p> <p>Select a procurement strategy that allows the ability to transfer 'design risk' to InfraCo.</p>
42	Project management did not seek to convert it's construction managers fee to a fixed lump sum until late in the process and missed earlier opportunities to do this.	<p>Review options to cap, fix and agree fees for construction management at the earliest appropriate opportunity.</p> <p>Select a procurement strategy that allows the ability to transfer 'construction management' to InfraCo.</p>
43	Project management did not apply a systematic method of assessing the performance of consultants.	Ensure the application of performance measurement of all consultants.
44	Project management did not use the opportunity of performance measurement to demonstrate areas of 'underperformance' or examine areas whereby additional costs could be recovered.	<p>Ensure the application of performance measurement of all consultants.</p> <p>Establish criteria for unacceptable performance and ability to recover additional costs for poor performance</p>
45	The construction management method of procurement is 'unusual' and has not been used before in Scotland.	<p>Ensure that procurement method is appropriate for the complexity of the scheme.</p> <p>Ensure that care is taken in the choice of form of contract to be employed with a sound understanding of the risks and benefits of each option.</p>
46	There was inadequate experience of the construction management method of procurement at the early stages of the scheme within the Client	<p>Ensure adequate and experienced resources are employed in the project delivery team.</p> <p>Engage professionals who are</p>

Ref.	Audit Scotland Observation	Lesson for tie
	team and project management team.	experienced in the construction methods to be employed.

## **Glossary**

AS	Audit Scotland
BCR	Benefit Cost Ratio
CETM	Central Edinburgh Traffic Management
CSTM	2001 Central Scotland Transport Model
DAM	Detailed Assignment Model
DPOFA	Development Partner Operating Franchise Agreement
DBRM	Highway Agency's Design Manual for Roads and Bridges
DELTA	Delta Land Use Model
DfT	Department for Transport
ECCS	Edinburgh Congestion Charging Scheme
LUTI	Land Use Transport Model
MAWG	Modelling and Appraisal Working Group
NAO	National Audit Office
PFC	Preliminary Financial Case
PFI	Private Finance Initiative
PT	Public Transport
STAG	Scottish Transport Appraisal Guidance
TRAM	Traffic Restraint Analysis Model
TUBA	Transport User Benefits Appraisal