

1.	Risk Management Checklist	Complete
2.	Summarise applicable key recommended features from Fraser Report and how reflected in procurement strategy. Include Annex for Review of NAO Light Rail Report and Audit Scotland Holyrood Report	✓
3.	Outline the extent and plans for risk workshops	✓
4.	Project Specific Matters	
5.	Outline the work undertaken to optimise risk allocation.	✓
6.	Justify Optimism Bias reduction from guidance	✓
7.	Confirm headroom for phase 1 and equivalent OB percentile. Re-write 6.4.3 to cover the phased approach and reflect the OB headroom to £375m for phase 1 (line1)	✓
8.	Justify "Standard" status of project	✓
9.	Expand perception of Flyvbjerg work	x
10.	Why not appropriate 80% percentile?	✓
11.	Expand on how we can avoid agent/principal problem	✓
12.	Clarify wording on 'pessimistic'	✓
13.	Outline the findings of the QRA	
14.	Confirm sufficiency of 10% allowance from TAs	
15.	Summarise the range of potential outturn costs	x
16.	How have we taken account of systematic tendency for revenue overestimation	✓
17.	Outline the project risks	
18.	Summarise effects on costs, programme and performance	
19.	Summarise the mitigations	
20.	Summarise who might carry them	
21.	Procurement Issues	
22.	Clarify the sub-allocation of Public Sector Risks between SE and CEC	
23.	Confirm mitigations to address Novation Risks in SDS	
24.	Clarify that risk exposure aligned to CEC capacity to bear risk	
25.	Confirm willingness to bear risk	
26.	Confirm the extent of risk in the Infracore contract	
27.	Describe planned risk-sharing and reward shares proposed	
28.	Annex 6.2	✓
29.	DPOFA Revenue	
30.	Remove reference to risk of Change of Transport Minister	✓

1 Risk Management

1.1 Introduction

The scope for risk in any project is considerable. Project risk reflects several aspects of uncertainty that can present itself throughout the project lifecycle. Risk can manifest itself in terms of uncertainty regarding objectives and priorities; design and logistics; variability and basis of estimates; and uncertainties about fundamental relationships between project parties.

Appropriate risk allocation is therefore fundamental to achieving value for money for the tram system. Risks should be allocated to the parties best placed to manage and/or bear them and can be used as the basis for an incentive to the private sector to help ensure that CEC's objectives for the project are met. This outsourcing of risk and its management would leave CEC/**tie** to concentrate on their core functions of procurement and overall project management.

The purpose of this Section of the IOBC is to address the following aspects of risk analysis.

- Types of risk that need to be considered from development to residual value for the tram system;
- Extent of identification, analysis and management of risk undertaken;
- Effect of **tie**'s procurement strategy and intended risk allocation; and
- Overall contingencies including Optimism Bias and their consideration in the Financial Model.

The risk analysis was facilitated by means of a series of meetings involving **tie** and their advisers. Although the exercise is well developed it must be borne in mind that the risk identification and analysis will continue to be updated and developed as the project evolves through design, and further innovation which the private sector will bring to the project.

tie's approach to developing the Edinburgh Tram Network has been heavily focused on the identification and management of risk. The methodology applied to the risk analysis is set out in more detail below. **tie** have maintained a full register of risks identified in respect of the project throughout its development.

tie has developed a sophisticated approach to risk management. Central to this is the appointment of an identified Risk Manager, and the establishment of a comprehensive risk management process including both a highly detailed risk matrix for the overall project, and detailed risk matrices for individual contracts within the procurement strategy.

These risk matrices have been used effectively to influence the development of the Procurement Strategy set out in **Section 5** of this IOBC.

In this section, we examine the major risks that **tie** will manage directly or share with the private sector and those that will be fully transferred to the various private sector entities with which **tie** will enter contracts.

1.2 Background

~~This section addresses~~ The background to risk analysis in terms of historical risks affecting light rail schemes has been identified in various industry reports. Risk analysis for the Edinburgh Tram scheme can be traced to the original Feasibility Study published in July 2001 and continues on the project to date. Industry publications and guidance from HM Treasury, National Audit Office, Department for Transport, ~~and~~ Audit Scotland and Holyrood Inquiry has been considered by **tie** during the development to ensure the application of risk management best practice.

Summaries of key findings and conclusions from review of the above documentation including the methodologies used to quantify the consequences and likelihood of risks are presented alongside the key project milestones to be considered have been presented in Appendix [..].

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1.3 Project Risks

The work undertaken on risk for this IOBC follows industry best practice on identifying and quantifying risks. The risks to the scheme can be allocated to the following four principal risk categories (excluding Termination Risk), using contemporary classifications.

- **Development Risk** : design and development, scheme approvals and procurement of all scheme components, and activities to be concluded prior to commencement of construction;
- **Construction Risk** : advance works including utility diversion, main infrastructure construction, project management and commissioning related risks;
- **Performance Risk** : standards and defects related risks occurring during and post-construction; and
- **Operation Risk** : repair and replacement risks impacting the scheme during Operation of the system (outwith DPOFA Operator risks).

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Building on the work initiated four years ago in the Feasibility Study and more recently reported last year in the updated Preliminary Financial Cases, **tie** has identified the following key project risk areas to the infrastructure components.

Development Risk	Construction Risk	Performance Risk	Operation Risk
Failure to acquire land	Incorrect cost estimates	Latent defects to infrastructure	Legislative/regulatory change
Delays in obtaining planning permissions	Incorrect time estimates	Performance of sub-contractors	Changes in taxation
Cost and delays due to utility diversions	Unforeseen ground / site conditions	Default by sub-contractors	Changes in VAT
Poor contractual interface with vehicle suppliers and system integrators	Unforeseen ground / site conditions under existing buildings/structures	Industrial action	Incorrect estimate of maintenance costs
Failure to design to brief	Delay in gaining access to the sites	Failure of system integration	Incorrect estimate of lifecycle costs
Continuing design development	Responsibility for maintaining on-site security	Failure to meet performance standards	Residual value reduced
Delays in advance works	Responsibility for maintaining site safety	Incorrect choice of tram vehicles	
Changes in design required by the Operator	Third party claims	Availability of tram infrastructure	
Changes in design required by CEC/ tie	Compensation events	Relief Events	
Failure to build to design	Delay events	Force Majeure	
	Force Majeure	Termination	
	Termination	Failure to upgrade to new technology resulting in obsolescence	
	Legislative/regulatory change		
	Changes in taxation		

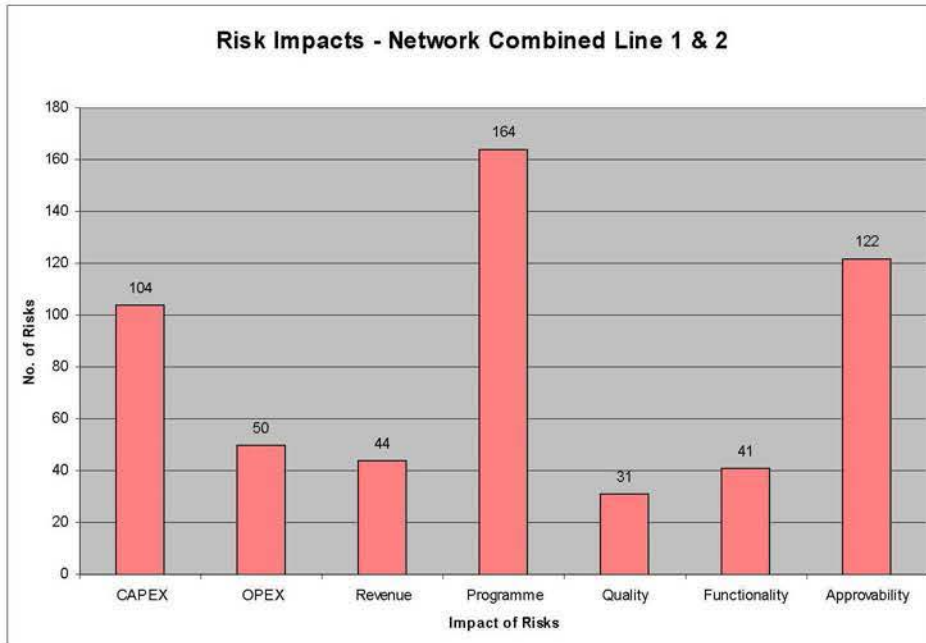
Development Risk	Construction Risk	Performance Risk	Operation Risk			
	Changes in VAT Contractor default Poor project management Contractor / Sub-contractor industrial action Protestor action Changes in inflation during construction Incorrect time and cost for commissioning new tram					
6	TERMINATION RISK	0	0	0	0	0
7	TECHNOLOGY AND OBSOLESCENCE RISK	0	0	0	0	0
8	CONTROL RISK	0	0	0	0	0
9	RESIDUAL VALUE RISK	0	0	0	0	0
10	OTHER PROJECT RISK	0	0	0	0	0

1.3.1 Impacts of Project Risks

tie have maintained a project risk register to ensure ongoing management of risk. The following impact areas are noted for the principal risk areas of development, construction, performance and operations lifecycle stages of the proposed tram system.

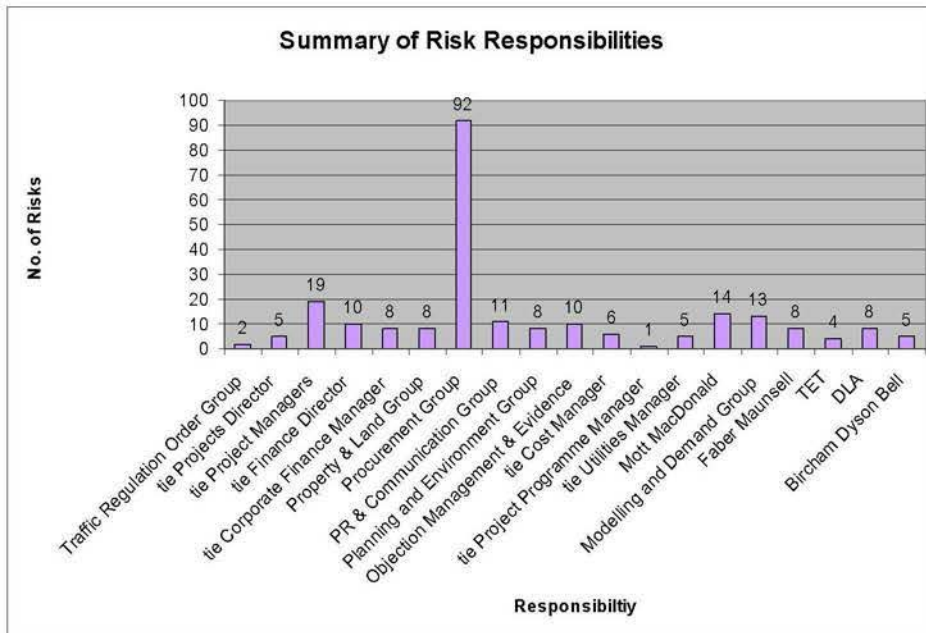
	Capital Costs	Operating Costs	Revenue	Programme	Quality	Functionality	Approvability
Development Risk	✓	✓	✓	✓	✓	✓	✓
Construction Risk	✓			✓	✓		✓
Performance Risk	✓	✓	✓	✓	✓		
Operations Risk	✓	✓		✓			

tie have assessed the multiple primary and secondary impacts of the 237 identified project risk register entries as shown below.



Although the impact of each risk is being assessed against these impact areas, it is considered that the primary potential impacts for consideration are in relation to capital expenditure, operating expenses and profit and achieving delivery programme.

Each of the identified risks have been allocated to the most appropriate team member, each of whom has the responsibility for developing and implementing a risk mitigation strategy, as summarised by responsibility below. It is noted that the current wave of planned procurements is reflected in a significant number of risks being managed by the Procurement Working Group.



1.3.2 Overall Project Risks

tie have recognised a number of overall project risks that require to be considered. These include the project affordability, approvability and market appetite, any of which could lead to suspension, curtailment or significant delays being imposed.

tie considers that the single biggest issue affecting the approvability of the tram system relates to funding, as indicated below. **tie** has mitigated this risk through development of robust cost estimates and on-going review of alternative funding options in conjunction with **tie**'s advisers. The following Development Risks will need managed.

- Limited Scottish Executive grant funding is available; and
- Delays are incurred in securing other funding sources beyond Scottish Executive grant funding.

tie considers that the submission of a robust Outline Business Case in **August-Autumn** 2005 will significantly mitigate these 'development' risks. It is anticipated that this will include a risk appraisal on each of the potential funding sources.

tie have significantly mitigated risks affecting the quality of the scheme through regular consultation with the Planning Authority on the tram system. However, delay and cost increases due to planning requirements from scheme development will need to be managed during the detailed design phase, prior to commencement of construction. **tie** have further mitigated this risk through the development of a Design Manual that identifies principles of the tram system design, provides supporting design guidance and states the design requirements for the main tram components. This Manual has subsequently been adopted by the Planning Committee. It is envisaged that the SDS Contractor will join the existing project Planning & Environment Working Group to help to de-risk planning approval delays due to design decisions. Supporting **tie** with assessment review of compliance with specifications and monitoring will be the TSS Contractor. It is considered that TSS will perform a significant risk mitigation role for **tie**.

tie has held significant pro-active consultation with the existing transport operators. An extensive portion of mitigation has been commenced with Transdev who have agreed and signed a heads of agreement with bus operators and, whose objectives include bringing about service integration with local bus operators. **tie** and their advisers have considered the influence of other transport initiatives including CETM and discussed these with the Council. The following risks will require to be managed by **tie** throughout the contract period.

- Bus/tram integration;
- Inclusion of CETM and other transport schemes;
- Ticket integration; and
- Potential future expansion of the system.

tie have identified a number of key areas where there are significant risks of delays to project programme (and consequential cost impact), as follows.

- Successful objections imposing additional requirements on Infraco;
- Parliamentary time with other Bills under consideration;
- **Change of Transport Minister;**
- Failing to reach agreement with Network Rail;
- Advance works, land and property acquisitions and PU Diversions delaying the progress of the Infraco;
- Lack of market appetite in the scheme;
- Weak communications between **tie** and the Scottish Executive;
- Delay in funding availability or affordability;
- Protracted Bidder negotiation;
- Obtaining planning permissions;

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- Development of integrated service pattern for tram and bus;
- Archaeological finds;
- Competing local and national projects cause shortage of resources; and
- Successful commissioning and obtaining HMRI consent.

As the Parliamentary consideration phase and construction of the tram takes place over the next four years of the project, the majority of the above risks that are inherent in the development and construction process occur over the first four years of the SDS/Infraco contract and will have been resolved or become actual costs by end of commissioning.

1.3.3 Risks arising from Preferred Option

1.3.3.1 Capital Costs

tie believes that the most significant capital expenditure risks are in the areas listed below because the outlier cost is largely determined by third parties, and may significantly impact the total outturn cost of the scheme. These risks have been significantly mitigated through the considerable amount of work undertaken to date by **tie**'s Technical and Land & Property Advisers to generate the robust costs and contingencies allowed.

- Finance charge costs if insufficient public sector capital;
- Utility diversion costs;
- Land costs associated with acquisition, temporary disruption during construction and compensation;
- Vehicle costs;
- Network Rail costs for interchange design, immunisation of equipment, possessions, compensation costs to train operating companies, information supply, liaison and development of agreement;
- Unforeseen ground conditions for currently accessible and inaccessible areas;
- Poor interface and integration management of the scheme;
- Compliance with Planning Authority requirements;
- Poor project, interface and integration management;
- SDS and Infraco resource shortages resulting in increased premia for staff; and
- CEC/**tie** instructed changes to the scheme specification.

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The main risks that have been analysed are those related to third parties. Of these the majority relate to Development and Construction risks. As the design, procurement of components, and construction of the tram takes place over the first four years of the project the majority of risks that are inherent in the development and construction process occur over the first four years of the SDS and Infraco contracts.

1.3.3.2 Operating Expenditure

tie believes that the most significant operating expenditure risks which will require to be managed with the support of the Council are those set out below. It is noted that these have been significantly mitigated, but not eliminated, through proceeding with a DPOF procurement process:

- Inclusion of potentially loss making sections of route;
- Greater run-times than anticipated;
- Lack of priority to schemes in rail/road network with proposed transport developments;
- Robustness and detail of modelling along tram corridor;
- Compromised routing to satisfy objectors;
- Specification issues including staffing levels;
- Variability of global market conditions impacting on insurance costs;
- Long term increases in operating costs e.g. energy;
- Maintenance and lifecycle replacement costs; and

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- CEC/**tie** instructed changes to the scheme specification.

As the Infraco contract is for hard FM services only and the agreed DPOF contract covers all the operating risks relating to soft FM, **tie** consider that these risks will be appropriately transferred to or shared with the private sector. Their timing is annual and considered every three years through DPOFA throughout the project.

The lifecycle replacement and repair costs have been estimated for the next thirty years by **tie**'s technical advisers. A private sector contractor would also have to estimate likely spend on lifecycle costs in pricing their bid. A major risk in this process is the underestimation of the risks for maintaining the tram infrastructure e.g. depot buildings. The consequences of estimating incorrectly at the start of process may mean that there is a recurring cost to the provider which renders the contract non-viable from their point of view leading to breach. This operation risk is present throughout the contract following the commissioning of a full or phased system.

Performance risk (i.e. the potential for deductions from the contract value or Unitary Charge due to poor performance) on the hard FM services is passed to the provider and impacts annually.

1.3.3.3 Revenue

Robust revenue analysis has been conducted by **tie**'s technical advisers. **tie** anticipates that further development of the revenue estimates will be necessary in the context of an integrated service network with bus operators. This development will take place through the proposed Revenue Setting Committee (RSC) Contractor who will be responsible for facilitating early decisions on ticket integration and fare strategy and developing a 'target revenue' on behalf of TEL. Revenue yield has been shown to be both underestimated and overestimated in previous light rail schemes. It is noted that these have been significantly mitigated, but not eliminated, through proceeding with a DPOF procurement process with incentivised performance and pain/gain share on performance. The following key risks are being actively managed by **tie** and their advisers.

- Inclusion of potential loss making sections of route;
- Quality control and reliability of model development;
- Slower run-times than anticipated making the system less attractive;
- Compromised routing or stop locations to satisfy objectors;
- Poor quality bus/tram integration including different revenue apportionment than expected;
- Customer attractiveness including fare strategy;
- Emerging competitive responses from bus operators;
- Loss of patronage to EARL due to competitive fare levels;
- Public response during early years (i.e. slower than planned ramp up in demand);
- Tram numbers cannot deliver patronage demands;
- Failure of ticket machines or vehicle breakdowns; and
- Unplanned long-term demographic, lifestyle or land use changes

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tie's advisors have taken account of the above risks which have previously resulted in an overestimation of tram revenues on some other light rail schemes. The DPOFA is for the provision of operator services for 15 years, with a planned annual review of 'target revenue'. The timing of the above risks is annual throughout the project.

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Performance risk (i.e. the potential for deductions due to poor performance against a number of Key Performance Indicators) is passed to the provider and impacts annually.

1.3.4 Procurement Strategy Risks

The procurement and financing strategy will have a number of features which will require close management. It is anticipated that the OBC in **August-Autumn 2005** will need to address the problems arising from partial private financing, as follows.

- Detailed programme to reach financial close (lender agreement)
- Novation of SDS and Tram Supply Contract post-Infraco appointment;
- Default, expiry or early termination;
- Partial handovers and staged commissioning;
- Indexation of Availability Payments;
- Calibration of payment mechanisms and potential retentions/compensations;
- Lease structures; and
- Change control.

1.3.5 Risks to be managed during the key phases

tie continue to hold risk management as a core value and have reflected this in the commission briefs recently for the SDS and TSS Contracts, that include obligations to provide the following risk management deliverables.

- **Project Risk Management Plan** to confirm the objectives, roles and responsibilities, definitions, risk management process and application throughout scheme development, procurement and construction phases;
- **Assumption Register** to record all capex, opex, lifecycle, revenue, programme, quality, functionality and approvability assumptions and consequent risks to the project throughout scheme development, procurement and construction phases;
- **Project Risk Register** to summarise the all capex, opex, lifecycle, revenue, programme, quality, functionality and approvability risks to the Project and proposed mitigation;
- **Design Diligence Risk Report** highlighting the those areas that do not meet our specification requirements, those that require substantial development, those that require some development but are largely satisfactory and those that meet or exceed our specification for each key system component. Report to consider commercial, safety and reliability matters;
- **Risk Progress Report** on status of risk management and mitigation indicating summary of new risks identified, new assumptions, key matters to be resolved and achievements;
- **Cost & Programme Contingency Report** indicating the recommended capital cost and programme contingency allowances to be considered;
- **Design Construction Risk Report** indicating the risks to be considered by Infraco during remaining scheme development and construction including construction sequence, construction methodologies, access, quality, approvals, security, safety, PR and compliance with Parliamentary Bill and Objector requirements; and
- **Design Operation Risk Report** indicating the risks to be considered by Opco during remaining scheme development, construction, commissioning and operational stages including maintenance, lifecycle replacement, quality, approvals including HMRI, security, safety, PR and compliance with Parliamentary Bill and Objector requirements.

tie has held a series of risk workshops and one-to-one meetings with those responsible for mitigating project risks over the past years. Regular risk management meetings and workshops are proposed during the planned development and construction phases. The allowance for this in supporting the above deliverables has been and will be included in all service provider remits.

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1.3.6 Insurable Risks

tie has developed a schedule of potentially required insurances for the main stages of the project lifecycle in conjunction with Heath Lambert Group, their insurance advisers, as follows. The final decisions on the tram insurance portfolio including scope, cover and deductible will be subject to value for money, affordability and overall risk appetite.

Development	Construction	Operational
Employer Liability Head Office insurances Professional Indemnity for Manufacture, Design & Construction	Employer Liability Head Office insurances Material Damage 3 rd Party Liability Products Liability Suppliers Extension Goods in Transit Cargo Delay in Start-Up Loading and Unloading Interface Offsite Storage CAR DSU Professional Indemnity for Design & Construct Environmental Impairment Liability Motor Contractor Plant & Equipment	Employer Liability Head Office insurances Material Damage 3 rd Party Liability Excess TP Liability Business Interruption (including Customer & Utility extensions) Motor RTA Defects Liability under CAR Continuing PI until expiry Engineering D&O Fidelity Guarantee Money in Transit Employee Benefits

The construction phase would include manufacture, supply, construction and testing.

The key decision will be **tie**'s decision whether to adopt the Owner Controlled Insurance Programme (OCIP) route. **tie** proposes to make this decision to allow this to be reflected in key contracts. A decision to use on private finance may see the Banks insist on the OCIP approach for the construction and maintenance of the system.

1.3.7 Terrorism and Security Risks

tie's advisers have recommended that the following investment in security systems is set aside as part of the overall approach to system security.

- **Stops** – Allowances are included for full CCTV coverage to evidential standards for all stop platforms, passenger emergency/help points linked to the Operations and Control Centre (OCC) together with public telephone facilities and appropriate levels of illumination via dedicated lighting;
- **Operations and Control Centre** – Allowances are included for the entire facility to be contained within a securely fenced site with barrier controlled access and manned gatehouse. All areas to have full CCTV coverage to evidential standards and appropriately illuminated by dedicated lighting. All buildings to incorporate security access and intruder alarm systems; and
- **Vehicles** – Estimated unit costs included for tram vehicles assume provision of CCTV coverage to evidential standards, passenger/driver communication facility and driver radio link to the OCC. Allowances are included within Signalling and Communication estimated costs for an automatic vehicle recognition system linked to the OCC.

tie recognise that the confidence in the security of the tram system will have a direct relationship to the overall quality of the system and therefore potential patronage. **tie** appreciate that the risk of terrorism exists both during construction and operation. However, it

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should be accepted that the tram could continue to operate, albeit in a reduced capacity, if part of the line or depot were damaged due to a terrorist event.

Currently under DPOFA, terrorism is treated as a Force Majeure event. During the original development of the contract, the procurement group discussed how **tie** would want to treat a situation in which Force Majeure had seriously impacted the operation of the system - recognising that the infrastructure provider, carrying responsibility for system availability, would be more sensitive to this issue than the Operator.

The Operator is contractually responsible for the security of system operation under DPOFA, including incident management and security management under plans which are presented to and agreed by **tie** prior to system commissioning. **tie** will define the extent of duties for the system including any requirements for anti-terrorism detection equipment or special terrorism risk reduction measures and build them in, if necessary, to the DPOFA Operating Output Specification and Transdev's operating function.

Physical measures to protect the infrastructure, vehicles, interchanges and depot(s) will be a question of the supply requirements set by the output specification for the tram vehicle and infrastructure contracts, including the responsibility of the infrastructure provider to carry out system surveillance.

tie in conjunction with Transdev are considering the merits of insuring key tram assets to provide Material Damage and Business Interruption coverage arising from the specific peril of Terrorism. However, it is recognised that these covers have a large deductible and relatively low cover relative to the premium.

1.4 Risk Contingencies

This section describes the contingencies that have been set aside for the project over and above the 'base' cost and programme allowances. It is noted that this section should be read in conjunction with **Section 8** Affordability and Funding where sensitivity analysis, switching value assessment, risk influence on NPV, payment mechanism and unitary charge are considered.

1.4.1 Specified Capital Contingencies

Capital costs of schemes vary due to the uniqueness of each scheme and this creates challenges when building up cost estimates generally and for specified contingencies in particular. Cost estimates have been built up from cost consultant inputs from **tie**'s technical advisers with contingency estimated on each element of the costs based upon perceived risk of the respective elements.

The consultant for each line has produced elemental analysis of construction costs and allowed between 10-15% contingency for each principal element of costs. Detailed analysis of individual cost items have been undertaken by the cost consultant for each Line with experienced in delivery of tram projects. Each consultant has benchmarked risk from their own cost analysis.

The level of specified contingency varies based upon the scope of each proposal and is included in this business case, as follows.

Scheme	Specified Contingency (2Q2003)	Percentage Increase to Base Costs
Line 1 Standalone (Phase 1)	£23.73m	10.82%
Line 2 Standalone	£22.84m	8.17%
Investment Enhanced Network	£42.74m	9.64%

Investment Enhanced Network excluding Newbridge	£38.36m	9.65%
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Contingency has been applied to all installation elements as noted below with no specified contingency on land values which have been included within the forecasts by Colliers CRE, **tie**'s Property & Land Adviser. The effect of this is that the contingency on each non-land element is, on average, greater than the above levels.

The degree of risk in each element of the scheme is reflected in the allowance made. The narrative below describes the levels of contingency attached to each element of the project.

Civils - Contingency for Civils is 10-12.5% of the base cost. The scope of work is more generic in nature than other tram projects costs and may be impacted by restrictions on existing ground conditions together with site operations e.g. possession times, restricted sites and traffic flow. The rates used in the build up to the Civils element should be considered as reasonably secure with the allowance for unforeseen works and site restrictions.

Utilities - Costs for Utility Diversions are considered less certain than other cost heads due to the relatively unforeseen nature of the work. Notwithstanding mitigation measures proposed by **tie**, contingency of 12.5-15% has been allowed for Utilities, depending on scope and location.

Electrical - This element of the work has a contingency level of 10-12.5% to reflect the scope of work and risk as being reasonably secure.

Network Rail - A contingency of 18.5% has been allowed for Network Rail due to the complex negotiating process to be undertaken regarding possessions, land purchase and working alongside Network Rail property.

Stops - As the scope of work of this element is less likely to change and the costs are considered to be reasonably secure a contingency level of 10-12.5% has been allocated to this element.

Track - This is the single largest value element and has been allocated a contingency of 11% which is considered appropriate at this stage of the estimating process. The procurement methodology and strategy e.g. advanced utilities work is considered as reasonable mitigation against cost risk to this element.

Trams - The procurement methodology will allow direct control of contract negotiations with **tie** to assist in quality control and promote competition and, as such, a specified tram contingency of 15% is considered appropriate.

tie are in the process of conducting a QRA validation on the risk register and will include this within the Outline Business Case in August-Autumn 2005.

It is concluded that the levels of risk allowances described together with the proposed risk and procurement strategy are considered appropriate to manage the risk challenges of the scheme.

1.4.2 Specified Programme Contingencies

The overall procurement and implementation strategy has been developed taking cognisance of the potential for delay to the project programme, as discussed in **Section 7.3.2**. To mitigate this **tie** have identified a number of critical activities such as design, approvals and consents. These activities have been scheduled at an early stage of the programme and the early appointments of the SDS and TSS will further assist in this mitigation.

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The current programme has an element of float related to key activities. This degree of flexibility will allow the rescheduling of activities to ensure that resources are deployed to maintain the critical path.

To assist in managing this process **tie** have identified a number of Project Management systems and procedures which will provide us with real time analysis of Programme activities, as follows.

- **Primavera P3e** to manage the programme and provide progress and slippage analysis, based on actual resource scheduling;
- **Primavision** will provide summaries across all critical work streams, automatically flagging any delays and slippage to planned progress; and
- **Progress Reporter** will allow up real time updating from remote site, and allows remote access to Programme information allowing timely decisions and resolution of conflict.

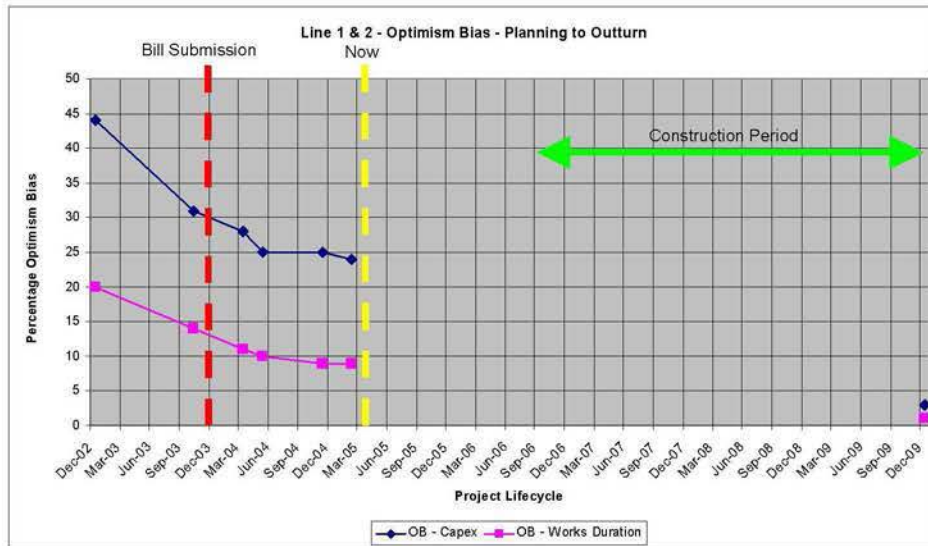
The Master Programme shall incorporate all work streams and shall identify, monitor and analyse the critical path and inherent float across all of the sub programmes.

1.4.3 Optimism Bias Contingencies

An initial step to select the 'starting values', for Optimism Bias, from the published guidance is the classification of the 'project type'. **tie** have sought the advice, regarding the project classification, from the authors of Mott MacDonald's guidance on Optimism Bias who have confirmed **tie**'s view, that it is appropriate to classify the project as a 'Standard Civil Engineering Project'. This is primarily, due to the 20-year history of delivery of tram schemes in the UK with over twelve operational schemes (totalling £2.29bn of investment costs at the time) and number of other schemes in development. tie considers that it would be inappropriate to classify the project as 'non-standard' due to the unique and complex nature of the sample projects that include the Thames Barrier and Coulport Explosive Handling Jetty projects.

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As described earlier in this section, risk management is being actively measured on the tram system for each risk and has been demonstrated through the reduction of the overall Optimism Bias level. HM Treasury recommended "starting values" of **44%** increase in Capital Expenditure and **20%** in Works Duration, in accordance with published guidance, as shown below.



Reduction in Optimism Bias has been recorded in the progress to manage each of the individual the following risks in accordance with reported 'mitigation factors' on each of the 'percentage contribution' for risk areas to Optimism Bias in accordance with HM Treasury guidance. This has not been due to the mitigation of an individual risk but rather progress in the management of all of the identified project risks.

As can be seen from the above graph, tie has shown the starting values commencing in December 2002, when the scheme technical advisers were appointed, and tracking the movement over the following 26-month period. It should be noted that the risk management process started with the publication of the Feasibility Study in 2001.

The 'current' estimated values as adopted in this IOBC for Lines 1, 2 and potential Network configurations are as follows.

Optimism Bias	February 2005
Capital Expenditure	24%
Works Duration	9%

This compares to the specified contingency to capital expenditure estimates of the full tram system of approximately 10% (specified contingencies result in an increase of approximately £42m (2Q2003) above base cost estimates for the full network) that have been recommended by tie's advisers. The following table summarises the potential overall influence of Optimism Bias on the various system configurations.

Scheme	Optimism Bias (2Q2003)	Percentage Increase in Base Costs
Line 1 Standalone	£52.64m	24%
Line 2 Standalone	£61.62m	24%
Investment Enhanced Network	£105.62m	24%
Investment Enhanced Network excluding Newbridge	£95.81m	24%

The approach to phasing is discussed in Section [..], with proposals for Phase 1 to proceed in the form of Line 1 only, with potential outturn costs (2Q2003) and committed grant availability as follows.

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Scheme	Total Available Grant	Base Cost Plus Estimated Optimism Bias	Base Cost Plus Specified Contingency	Base Cost
Phase 1	£375m	£271.96m	£243.05m	£219.32m

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It is concluded that including current estimates of Optimism Bias would increase the base costs of £441,219m (2Q2003) for Phase 1 (Line 1 Standalone) to £546,272m (effective headroom of a further £296,2m above base and contingent costs recommended by tie's advisers).

However, the comfort to funders is that the proposed £375m grant, this would result in a total 'headroom' of 70% above base costs (£155.68m above £219.32m base cost) or a total 'headroom' of 54% above base costs (£131.95m above £243.05m base cost plus specified contingency).

This allowance is clearly greater than the starting values proposed by HM Treasury guidance and provides a 'high' degree of certainty to the Scottish Executive and the Council that the overall committed grant will not be exceeded. Further, when reviewed in conjunction with Optimism Bias studies conducted on behalf of the Department for Transport that these allowances within the overall grant lies at the upper percentiles of probability (between 80-90% percentile). This confidence can be further enhanced when other funding sources are included as discussed in Section [..].

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An optimistic outturn would be the base costs of the scheme, whilst pessimistic outturn would be base costs plus Optimism Bias (from estimate recently updated) and most likely base outturn base costs plus specified contingency. Therefore, the following conclusions can be drawn on the potential outturn costs of the scheme.

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Scheme	Pessimistic	Most Likely	Optimistic
Line 1 Standalone	£271.96m	£243.05m	£219.32m
Line 2 Standalone	£318.34m	£278.90m	£256.73m
Investment Enhanced Network	£545.68m	£482.80m	£440.06m
Investment Enhanced Network ex. Newbridge	£495.00m	£438.03m	£399.20m

It is further concluded that Optimism Bias of 9% exists on the proposed 36-month construction programme and could result in delays of up to 4-months. If the full optimism bias were applied this would equate to a potential overall delay of approximately 7-months.

1.5 Risk Allocation

The selected procurement route will be realised in a series of contracts which will effectively retain, transfer or share the project risks with the private sector. It is therefore noted that the selection of an appropriate procurement route will be one of the key elements of risk mitigation for the tram system. Risk has been quantified following a detailed assessment process performed by tie and the tie's advisers in accordance with industry best practice and tie's, and their advisers, experience.

Although the intended risk allocation is not determined by funding or financing, it is recognised that PFI projects have been shown to have a more attractive long-term risk management approach (reflected in less Optimism Bias) than traditional schemes, due to the following key features as reported in HM Treasury Guidance.

- Negotiated transfer of project risks;
- Risk transfer to the best party capable of managing risk consistent with VFM and quality;

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- High level of due diligence demanded by PFI procurement;
- Clearer definition of project requirements; and
- Longer-term relationships are developed with contractors and service providers encouraging early resolution of problems.

The Risk Allocation Matrix for the proposed Infrastructure & Integrator Consortium Option for the tram infrastructure has been analysed by **tie**. This risk allocation will require to be tested with the market, has been shown to demonstrate clear benefits of risk transfer of key development and construction risks.

An opportunity will be sought through the preferred procurement option to transfer the risk of project management during construction to the private sector, holding the successful bidder responsible for the overall management of a sequence of interrelated construction projects on the critical path to implementation.

There is no standard contract for use in tram schemes which embodies responsibility for risk and its financial implications. However, there are standard forms utilised on PFI schemes that could easily be customised to meet tram requirements and the proposed risk allocation. **tie** and their advisers will use experience from previous tram schemes and the proposed risk allocation as a basis for negotiations with the private sector.

In the development of proposed contracts, **tie** and their advisers have prepared risk allocation matrices to reflect the allocation of risks to private sector, public sector and those that are effectively shared in order to construct contracts with clarity of those risks which the private sector will require to price and those risks which the public sector will need to manage. [The Risk Allocation Matrices for SDS, TSS and JRC are shown in **Appendix [..]**]

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The following sections review the optimal risk allocation during the key project phases for 'conventional' and 'PFI' options including comment on plausibility of private sector borne risks

1.5.1 Allocation during the Development Period

This section deals with the most relevant risks that **tie** will be managing or transferring to other contractors prior to entering into a contract that will deliver a completed tram system.

Set out below are the key risks that **tie** will be responsible for managing during this period.

- Parliamentary Process;
- Planning Process and Permission;
- Model development, ticketing and fare strategy;
- Tram priority in highway;
- Land Acquisition and Compensation;
- Detailed Design development;
- Network Rail Agreements;
- Public Utility diversions; and
- Programme and Cost Management.

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During this period, **tie** will actively manage these risks both directly and through a number of key contracts. These contracts include

- TSS Contract;
- SDS Contract;
- RSC Contract;
- ASW Contract; and
- Utility Single Framework Agreement for advance diversion of utilities (USFA).

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In addition, **tie** will be advised by the Operator (who has already been appointed), and **tie**'s legal team (comprising Dundas & Wilson, DLA and Bircham Dyson Bell), financial adviser

(PricewaterhouseCoopers), procurement specialists (Partnerships UK) and insurance and risk advisers (Heath Lambert Group) on issues affecting risk.

The table below sets out the general allocation of risk during this period, and this is discussed further below. Where the table indicates risk allocated to the public sector, the risk is under the management of **tie**, but with consequences of risks being experienced by a number of participants. [**tie** wishes to discuss with CEC and SE how this risk should be allocated within the public sector]

Risk Allocation During the Development Period			
Risk	Public Sector	USFA Contractor	SDS Designer
Land acquisition	✓		
Parliamentary process delays	✓		
Parliamentary process changes	✓		
Planning	✓		✓
Design Risks	✓		✓
Major Utility diversion quantity	✓		
Major Utility diversion cost	✓	✓	
Major Utility diversion delay	✓	✓	
Delays to utilities	✓		
Network rail related delays	✓		
Required approvals from HMRI	✓		
Incorrect cost estimate	✓		
Incorrect timetable assumptions	✓		

Of the above, land acquisition and progression of the parliamentary process are clearly driven by **tie** and CEC. The latter stages of the parliamentary process will benefit from the support of the SDS Contractor, but they will have no contractual responsibility for anything other than advice. **tie** has and will continue to manage these risks through the experienced in house team that it has assembled.

The initial steps towards placing planning applications will be made on behalf of **tie** and then Infracore by the SDS Contractor. Ultimately, the SDS Contractor will have responsibility for the planning application being 'fit for purpose', and there will be sanctions under the SDS Contract for poor performance. However, the fundamentals of the success of the planning application will be determined by **tie**'s (and CEC's) preferences for the system, and therefore the risk of the planning application must remain at least partially with the public sector.

Design risk covers risks of failures in the design affecting the ongoing scheme. During the development period this could manifest itself as a problem with a planning matter, a utility diversion design or the instructions to bidders for the Infrastructure Contract. This risk is partially transferred to the SDS Contractor through their contract, although it is likely that some of the consequences of a significant problem with the design failure would be borne by the public sector. **tie** will manage this directly and through the TSS.

Risk for the execution of utilities diversions will be transferred under the Utilities Framework Agreement (USFA). The quantity of work that these contracts will cover will be specified by the Designer and the risk that these are significantly greater than anticipated will be covered by the public sector. **tie** proposes to carry out detailed survey works during the period June to September 2005 to get a firmer view of the quantity of works to be required, with the support of TSS. This will provide the additional benefit of information to allow greater certainty to USFA bidders.

Should Utilities Contracts fail to complete their works in time to allow the Infrastructure Contractor on to the site, then the public sector will be responsible for works under the

contract. This risk will be minimised by the early scheduling of utilities diversion works which are anticipated to be complete by the time that the Infraco Contract is signed and staged handover of completed sections between stops.

Network Rail and HMRI will be consulted by the SDS Contractor during this period.

Cost estimates and timetable estimates will be developed further by the SDS Contractor up to the date of signing the Infrastructure Contract. The responsibility for the consequences of increases in cost and programme will be borne by the public sector. **tie** will use the TSS Contractor, the Operator and its internal resource to challenge assumptions throughout this process.

In summary, the public sector is exposed to significant risks during this period of development. The introduction of the SDS Contractor and USFA Contractor in the proposed procurement strategy reduces risk to an extent, but, as in all projects of this type, the major responsibility for identifying and managing potential risks during this period will remain with the project team and their advisers. **tie** has assembled a team with significant experience in the tram industry and, together with the TSS Contractor, the Operator, and its other advisers, believes that it has the necessary skills to manage risk during this period.

1.5.2 Allocation during the Construction Period

Risk allocation and management during this period will differ depending upon the selection of the specific procurement option for the Infraco Contract i.e. conventionally funded or privately funded.

It is worth considering how general risk transfer differs under these two different approaches.

Under a conventionally funded project, the financial risk that the Infraco Contractor is exposed to is limited to the amount of money that it has expended, less the amount it has been paid, along with any bonding requirements. Payment for construction contracts is broadly on the basis of progress against programme, and therefore there will not normally be a large exposure for the contractor based on the difference between income and expenditure on the contract.

By comparison, on a privately financed project, the risk that the Infraco Contractor is exposed to is greater, because the privately financed element of the funding for the contract does not start to be repaid until the construction is complete.

Therefore, while it is possible to contractually transfer similar risks under both types of contract, a privately financed contract will be more able to absorb the cost of a major risk arising than under the conventional approach. Therefore, it is more likely under a privately financed contract that risks will be effectively transferred than under a conventional approach, and that risk will not rebound on the public sector through non-delivery. (In addition, it is worth observing that, because of the significant risk being taken by funders under a privately financed option, the funders carry out significant due diligence on the project, which itself is another form of risk management.)

This difference in effective risk transfer applies to all risks that affect the contract, but we have picked out in the risk allocation matrix below the key areas where effective risk transfer varies between the two types of funding option.

In order to illustrate this the risk allocation matrix below sets out in the shaded boxes where the public sector would take risk under an Infraco Contract which is wholly funded by direct payments, and would not under a longer term contract that includes an element of privately raised finance.

Risk Allocation During the Construction Period				
Category	Risk	Public Sector	Infrastructure Contractor	USFA Contractor
Design	Changes in Design Requirements	✓		
	Failure of design	✓	✓	
Utilities	Major Utility diversion quantity	✓		
	Major Utility diversion cost	✓		✓
	Major Utility diversion delay	✓		✓
	Minor Utility diversion quantity		✓	
	Minor Utility diversion cost		✓	
	Minor Utility diversion delay		✓	
Construction	Force Majeure	✓	✓	
	3rd party claims		✓	
	Ground condition		✓	
	Archaeology	✓	✓	
	Site safety		✓	
	Technology risk		✓	
	Compliance with street possessions		✓	
Commissioning	System integration failure	✓	✓	
	Failure to meet standards	✓	✓	
	Inappropriate vehicle	✓	✓	
	Required approvals from HMRI	✓	✓	
Contractual/ Financial	Weaknesses in contractual interfaces	✓		
	Incorrect cost estimate	✓	✓	
	Incorrect timetable assumptions	✓	✓	

The key issues for risk management are as follows.

Design – Changes in design which are required by the public sector after the signing of the Infraco Contract will be at the risk of the public sector, under both conventional procurement and privately financed options. However, a significant failure in the design would be more effectively transferred to the Infraco Contractor under a privately financed option, because it may only become an issue during the commissioning process, when the effective risk transfer would be greater under a privately financed option (see Commissioning below).

Utilities Diversion - As discussed above, significant utilities diversion (i.e. utilities under the swept path of the tramway) will remain with the public sector. To the extent that these are unfinished at the time of the signing of the Infraco Contract (and it is expected that they will be complete in key areas), the risks on these works will be carried by the public sector. Utilities diversion under footways will be wholly the responsibility of the Infrastructure Contractor.

Construction risks – The proposed approach will transfer all of the typical risks transferred under a construction contract. We have not distinguished between the two financing approaches in the above matrix, although should a significant cost arise under construction, the public sector would be more likely to need to be involved financially under a conventional project than under a privately financed project.

Commissioning risks – These are the risks that once all of the assets have been delivered, that they do not work properly together and need to be changed. It is at this stage that difference in that amounts that the Infraco Contractor has at stake under the two funding approaches is at its greatest. Under a conventionally funded approach, if a commissioning issue emerged, the negotiating position of the public sector in any dispute would be significantly weaker than if private finance was involved.

Contractual risks – Under either approach it is imperative that **tie** ensures that the risk of problems arising at the interfaces between contracts is minimised. This risk has been significantly reduced by **tie**'s decision to novate design and vehicle contracts to the Infraco Contractor.

Financial risks - If significant cost increases emerge these will be for the Infrastructure Contractor to absorb (although a privately financed Infraco Contractor's capacity to accept cost increases will be greater than one which is conventionally funded). If construction is delayed, a privately financed Infraco Contractor would receive no availability payment for the period of delay. It may also be possible to structure a conventionally funded contract to give the Infraco Contractor a similar financial incentive to deliver on time, and this is an issue which will be raised in the Market Consultation exercise.

1.5.3 Allocation during the Operating Period

As is the case during the construction period, the effective allocation of risk will be different depending on the choice of conventional or private finance for the Infraco Contract.

At the core of this distinction is the difference between entering into a contract with an Infraco Contractor which is a special purpose vehicle which needs to earn its annual availability payment to service its debts and entering into a contract with an Infraco Contractor which is a construction company, which will be seeking to cap its ongoing liabilities for the construction project both in financial terms and in respect of warranty period.

If a conventionally funded contract was to be the procurement option, **tie** would seek to manage the infrastructure risks during the operating period using a series on contracts. However, it is unlikely that these will fully transfer the risks that a privately financed contract would. (In almost all privately financed contracts, banks have been unable to transfer significant risk on long term maintenance to a contractor.)

Therefore the table below shows in the shaded areas the risks that would be effectively transferred to the Infraco Contractor under a privately financed option, but not under a conventionally funded option. A further discussion of individual risk is given below.

Risk Allocation During the Operating Period Risks			
Risk	Public Sector	Infrastructure Contractor	Tram Operator
Revenue	✓		✓
Operating costs	✓		✓
Maintenance unit cost	✓	✓	
Maintenance quantity	✓	✓	
Latent defects	✓	✓	
Failure of warranties on subcontracts	✓	✓	
Supply chain failures	✓	✓	
Operation provision	✓	✓	✓
Failure to meet standards	✓	✓	✓
Operational safety	✓	✓	✓
Changes in tax	✓	✓	
Changes in law	✓	✓	
Inflation risk	✓		
Service running times	✓	✓	✓
Failure to provide promised tram priorities	✓		

Revenue and operating risks will be shared with the Operator under the terms of the operating contract. This will be done under the terms of the pain/gain mechanism described in **Section 5.6.2** of the Procurement Strategy.

Maintenance and latent defect risks are the key risks which will be transferred under a privately financed Infraco Contract. Allied to these are risks associated with the supply chain and failures in warranty provision (e.g. due to bankruptcy of original subcontractors).

It is also worth bearing in mind that the Infraco Contractor (if privately financed) will bear not only the costs of correcting defects but also will not earn income during the period during which the system is unavailable. (This issue is highlighted above under Operational Provision, Failure to meet standards and Operational Safety.)

A key driver for the eventual success of the system will be the delivery of the required service run-times. The DPOFA shares this risk between public and private sector. However, all other risks associated with running times would be transferred to the Infraco Contractor, to the extent that it has a long term commitment to the project.

1.5.4 Risks Retained by Public Sector

The extent of public sector retained and shared risks has been assessed by **tie** and DLA, **tie**'s procurement legal advisers. This has identified the risks that will be retained through the proposed contractual arrangements and will therefore require to be vigorously managed by the public sector. The retained risks are associated with the acquisition of land to allow construction to commence; the design development and advance utility diversion works; the completion of all necessary advance works prior to commencement of main construction works; the procedures and acceptability of potential **tie** or CEC instructed changes during design development; the care in the selection of tram vehicle supplier in achieving compatibility with infrastructure; and potential future VAT, tax and legislative changes that could influence the scheme.

In addition to the above 'development' and 'construction' related risks it is noted that the public sector will need to consider the loss of project momentum and additional costs that may be incurred through delays to the consideration and approval of the Outline Business Case; the potential cost exposure if adviser costs are exceeded or revenues underestimated; the financial governance arrangements to ensure timely and appropriate release of funds; and the potential delays incurred through indecision on the funding route.

This has identified that a proportion of the 'shared' risks will be retained by **tie** for both a full and phased system:

Risk	Proportion Retained
Development Risk	
Poor contractual interface with vehicle suppliers and system integrators	30%
Project elements become uninsurable	50%
Construction	
Delay in gaining access to the sites	30%
Delay events	50%
Force Majeure	70%
Protestor Action	70%
Performance Risk	
Relief Events	50%
Force Majeure	70%
Failure to upgrade to new technology resulting in obsolescence	50%
Termination Risk	
Termination due to uninsurable risk	50%

Risk	Proportion Retained
Termination due to force majeure	50%

The key material risk to **tie** post contract signing relates to **tie** requesting changes to the scheme that result in cost increases which the PFI provider has to pass back to **tie**. However, **tie** has significantly mitigated the risk of Operator requested change through the early involvement of Transdev. There potentially risk areas that will remain with **tie** / the Council these will be Land, Elements of Utilities, Highways work and Planning issues.

tie is confident that the scheme development work undertaken to date on tram system and the procedures it intends to adopt on design sign-off will minimise the potential for any change.

tie will continue to ensure that the appropriate **governance controls** are applied to the next stages of the development of the tram system. **tie** have identified the principles of an emerging procurement strategy with details of the consequential planning and design, procurement and construction activities that will effectively **de-risk** the main infrastructure contract.

1.6 Risk Management Strategy

The following section briefly summarises the risk management strategy in the 'short', 'medium' and 'long term' including planning engagement, co-ordination of risks, seeking market commitments and reaching financial close.

1.6.1 Key Risk Mitigation Underway

tie will continue to apply significant efforts to identify, analyse, categorise and implement the planned mitigation for each risk.

All of the risks identified have been discussed in detail between **tie** and their advisers, and are each subject to a risk mitigation strategy to minimise, where possible, their likelihood and severity of impact on project delivery and operation.

tie is seeking to substantially further mitigate risk through the ongoing involvement of Transdev (involvement commenced June 2004) and planned early involvement of the scheme designer through all the planned phases of project development.

In the 'short' term, **tie's** immediate focus will be to mitigate the risks associated with the development of the Outline Business Case to ensure funding issues do not delay scheme delivery; working to resolve issues raised by the objectors to the scheme; preparation of evidence to support the detailed considerations of Parliament; the procurement of designers to commence detailed design of the system; engaging with Network Rail and Public Utility providers; and development of integrated fare strategy with TEL.

In the 'medium' term, **tie's** focus will be the mitigation of risks associated with the potential market interest for the construction of the tram system. **tie** will be undertaking market sounding with potential Infraco consortia members; revenue model development; development of an integrated service plan with bus operators; commencing early design of critical areas of the system to achieve greater price certainty; engagement with the Planning Department; procuring advance survey works; and development of contract documentation for Utilities Single Framework Agreement.

In the 'long' term, **tie's** focus will related to the commencement of Public Utility diversions; preparation of Tram Supply and Infraco contract documentation; effecting a Contract with the

Infrastructure and Integrator Consortium; challenging the constructability of the scheme; and implementation of integration of services with bus operators.

1.7 Conclusions

The project timetable continues to be driven toward an operational system by the end of 2009, in line with the Council's published programme. The risk management approach involves expenditure prior to the date for Royal Assent to this Bill (anticipated end December 2005) for example in respect of detailed design work and Utilities diversions where synergies are available from co-ordinating work with the Utilities own works. This is necessary in order to achieve the 2009 start date but it is not intended to imply any presumption about Parliament's wishes. In the event that such expenditure is facilitated, the risk of abortive cost will be fully appraised before actual spending is committed; in the event that no, or only limited, such expenditure may be financed prior to Royal Assent, the implications for programme will require to be evaluated.

Appendix [..] – Risk Management Background

[Formatting of ~~number-of~~ section headers within this Appendix to be revised by PwC]

1.7.1 Risks Identified by the Feasibility Study

Andersen, Steer Davies Gleave and Mott MacDonald published their “*Feasibility Study for a North Edinburgh Rapid Transit Solution*” in July 2001. This report, which established the overall feasibility of a tram system in Edinburgh, identified the following areas of risk that continue to be relevant to the present day scheme. The majority of the risks identified related to scheme development and construction activities, as shown below.

Impact	Risk Area	
Capital Expenditure	Utility Diversions	On-Street Interface
	Procurement Strategy	Technical Issues – Stray Current
	Land Acquisition	Level of service: Frequency
	Planning Requirements	Depot location, scale and function
	Frontage Access/ Trade Access	Route Length - % on or off street
	Environmental Issues	Fleet Costs
	Railtrack Interface	HMRI and other Approvals
Operating Expenditure	Procurement Strategy	Maintenance/ Lifecycle Costs
	Level of service: Staffing/ Security	Depot location, scale and function
	Revenue Protection	Route Length - % on or off street
	Consultation	Ticketing
	Level of Service: Frequency	
Revenue	Patronage/ Revenue Forecasts	Revenue Protection
	Procurement Strategy	Competition – Bus
	Level of service: Staffing/ Security	
Programme	Utility Diversions	Railtrack Interface
	Land Acquisition	Consultation
	Planning Requirements	HMRI and other Approvals
	Frontager Access/ Trade Access	

tie and their advisers have considered each of the above issues in their development of the scheme.

The ongoing risks of operating the tram system will require to be monitored and managed through the life of the scheme. Particular attention and effort to address the correct commercial and contracting basis to best contain and allocate responsibility will be a key focus through the bidding and negotiating process.

1.7.2 Risks Identified by the Preliminary Financial Cases

tie's Preliminary Financial Cases for the Trams, originally published in December 2003 and updated in September 2004, reported on **tie's** structured approach to identifying, assessing and controlling risks that have emerged during the course of the design development. **tie** reported the significant efforts to ensure application of defined processes to manage risk and use of industry recognised methods to identify, classify, categorise, prioritise and measure progress.

The Preliminary Financial Cases took due cognisance of the risks previously identified during scheme development through the analysis, planning and implementation of mitigations. A further number of significant risk areas and mitigations to the scheme were reported as follows.

- **Adequacy of Scottish Executive funding** - **tie** have mitigated this risk through the review of additional funding options and commencing initial discussions with potential lenders in support of PFI routes;
- **Passenger numbers are lower than forecast** – **tie's** technical advisers have established a base model and reviewed the factors affecting revenue, assumptions and sensitivities. Further assurance and commercial focus is being gained through involvement of Transdev;
- **Delay and cost increases due to the Council Planning requirements** – **tie** have significantly mitigated this risk through convening a Planning and Environment Working Group who have met regularly with the Planning Department, sought approval of a Design Manual and discussed the proposals to account for routing through the World Heritage Site. **tie** will also control the process of targeted initial design work covering the most sensitive areas of the route. **tie** have subsequently achieved approval of the Design Manual from the Planning Department;
- **CETM influence on the Project** – **tie** and their advisers have considered the influence of CETM and discussed this with CEC;
- **Delays** due to lack of Parliamentary time due to other Bills under consideration, bus operator objections or changed priorities adopted by (or changes to) the Transport Minister – **tie** and their Parliamentary Legal Advisers continue to discuss the protocol and programme with the Parliamentary Bills Unit;
- **Capital cost** increases associated with land purchase and compensation, Network Rail, unforeseen ground conditions, vehicle costs, CEC/**tie** instructed changes, utility diversion costs in excess of current forecasts, and breaches in the contingency level included within the current risk reserve – these risks should be mitigated through the level of work undertaken to date to determine robust cost estimates by **tie's** advisers;
- **Programme overrun** due to loss of market appetite, competing projects and bidder fatigue – **tie** has taken **market soundings** on operator interest and this resulted in four strong candidates submitting DPOF bids. **tie** continues to monitor the progress of other UK light rail procurements. The preferred Infracore procurement option was also partly a reflection of recent market experience, and will be further tested through a PIN process; and
- **Operating costs** exceed current projections due to lack of tram priority at junctions – the DPOF process has provided further certainty on operating costs and will identify cost issues but not until after completion of considerable further work by the selected partner.

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1.7.3 National Audit Office - UK Light Rail Projects Risks

The Preliminary Financial Cases reported a number of lessons that have been learnt from previously constructed and currently operational UK light rail projects. The following key risks which have arisen on other UK light rail projects have been recognised by **tie** and their advisers, and duly mitigated through **tie's** procurement strategy, consultations and design and cost and programme assumptions:

- **Capital Costs** – increased capital costs due to support necessary for scheme promotion through Parliamentary process, underestimation of utility diversions, compliance with planning, increased land and compensation costs, additional traffic management measures, lack of industry product standardisation, and increased bid costs due to inefficient procurement methods;
- **Operating Costs** – increased operating costs due to lack of tram route optimisation and priority within the existing road network resulting in increased runtimes and reduced operational performance, increased market cost of insurances, and underestimation of staffing levels;
- **Revenue** – reduced revenue yield due to reduction in tram capacity due to vehicle breakdowns, negative PR, competition responses from existing and emerging bus operators (fares and coverage), overestimated revenues due to overvaluing of inherent attractiveness of tram as a 'superior' commodity over buses, and underestimation of changes in demographics and land use; and
- **Approvability** – Delays in approvability due to issues relating to achieving planning approval, doubts over the value for money of the systems, and negative PR due to inadequate performance.

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The National Audit Office (NAO) published its report "**Improving public transport in England through light rail**" in April 2004. A detailed review of this report has been conducted by **tie**. This report is a timely and comprehensive overview of the successes and failures experienced elsewhere in the UK in recent years. Although the report is mainly focussed on the role and responsibilities of the Department for Transport (DfT) it contains useful guidance for **tie** and the Council. The principal lesson learned from previous projects reported as the need to "Adopt a proactive approach to risk identification, analysis and mitigation."

NAO identified a number of barriers to the successful future development of light rail systems in the UK and highlighted the issues which need to be addressed to overcome the barriers, which included the poor financial performance of existing schemes leading to higher risk-driven cost of new schemes, and recommended:

"Better 'risk-sharing' and 'new' procurement contract structures that enhance private sector involvement"

As a consequence, the NAO made a number of specific recommendations to the Department, which included the following procurement related issues.

- **Seek better standardisation** in design of systems, vehicles and methods of construction using experience from existing systems and partnering with promoters of other new schemes;
- **Seek ways of managing risk** and reducing the costs of utility diversion including questioning the need for specific diversion; and
- **Identify the most cost-effective procurement methods** and contract structures as a means of controlling cost.

tie's procurement and risk management strategies reflect the conclusions and recommendations of the National Audit Office.

1.7.4 HM Treasury Optimism Bias Contingency

In accordance with HM Treasury (2003) Green Book: Appraisal and Evaluation in Central Government, **tie** has assessed the Optimism Bias contingency for the tram system.

"Optimism Bias is that 'percentage' by which the actual capital, operating expenditure or time of works duration exceeds (or, in the case of benefits, is less than) that expected at the business case stage."

HM Treasury guidance was supported by a Mott MacDonald study that has highlighted the **significant inadequacies** of historic government schemes getting approval on the basis of 'very poor' quality outline business cases. **tie** consider that Optimism Bias captures the following three areas of risk that will need to be managed throughout the project lifecycle.

- **Market risks** - the tender returns being at variance with our advisers' estimates;
- **Known risks** - the risks that we have identified and are managing; and
- **Unknown risks** - the issues that will emerge during scheme development and construction.

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The guidance recognises the trend that, as a project progresses, overall capital expenditure and programme risk exposure reduces as fewer unknown risks emerge and market commitment to established work packages is secured.

1.7.5 Lessons from HM Treasury Optimism Bias

tie support the need to address the issues giving rise to Optimism Bias and have identified a number of potential reasons for reducing the 'starting values' estimates of Optimism Bias compared with experience on previous schemes, as follows:

1. Previous schemes show a **historic poor government track record** where schemes were procured on a 'traditional' basis, and did not have the wealth of **OGC, 4Ps and PUK** scheme development and procurement guidance that is currently available. Historic schemes had limited experience of alternate forms of contract. HM Treasury's view of Optimism Bias therefore takes no account of emerging best practice **procurement methods**.

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tie are at the cutting edge of developing the latest industry thinking for light rail procurement. This Procurement Strategy seeks to optimise risk transfer on the basis of lessons learnt from previous tram schemes, and brings early operator involvement, in order to benefit from commercial and innovative insight. **tie** have additionally complemented their team with the involvement of **PUK** to ensure that latest industry guidance is applied.

2. There appears to have been a **lack of rigour** in the historic approach to scheme estimation (including risk portion), with estimates prepared largely based on 'unit rate' derivation with little examination of risk. Poor risk allocation in **traditional procurement** has undoubtedly contributed to Optimism Bias.

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tie's advisers have benchmarked their capital expenditure estimates against the out-turn costs of other schemes, thereby greatly improving cost certainty.

3. Mott MacDonald's study reports the methodology for estimation of **reduced Optimism Bias** from recommended 'starting values' for traditionally procured schemes. This reduction is feasible where a demonstrable appraisal of risks has been undertaken and evidence of implementation of mitigation is sought.

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4. Mott MacDonald's study has tended to report higher "**starting values**" than previous similar HM Treasury studies.

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- HM Treasury Supply Estimates study indicates a significantly **lower average Optimism Bias** on capital cost estimates for schemes in the transport sector.
- HM Treasury Central Unit of Procurement study identified a trend of significant **reduction in Optimism Bias** over the early 90s (Optimism Bias on capital costs reduced by a third and Optimism Bias on works duration reduced by a half) that is not reflected in Mott MacDonald 'starting values' (averaged over 20 years).

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tie have sought comfort in the estimates provided by advisers and undertaken benchmarking against 'previous' and 'planned' light rail schemes in the UK.

5. Mott MacDonald's recommended starting values are **potentially skewed** by the degree of innovation in some schemes which could have been considered 'leading edge' at the time.

The significant **UK and European experience** in the number in development of tram schemes over recent years shows a good **track record** for the delivery of tram schemes. At present, a total of twelve schemes have been delivered in the UK since the early 1980s with three extensions planned and a further four new schemes (including the Edinburgh tram system) being proposed.

6. It difficult to quantify the positive impact on potential Optimism Bias of certain key aspects of **tie's** approach.

- Rigour of scheme development to satisfy the Parliamentary process;
- Rigour in partner/contractor selection;
- Substantial development investment to date;
- Good understanding of industry best practice and conditions in the light rail sector;
- Experience of the **tie** project management team; and
- Significant breadth and depth of contributing adviser input including Operator.

7. The guidance notes that the recommended Optimism Bias starting values are based on sample of schemes that may '**double count**' **risk contingencies**, as in some cases information was not available.

8. The guidance supports the need for greater **early investment** as required for PFI schemes for greater scheme 'gestation', as being proposed by **tie**.

It is concluded that the 'starting values' reported in HM Treasury guidance are high estimates and can be reduced during project lifecycle with the application of procurement, project and risk management best practice.

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1.7.6 Lessons from the Management of the New Scottish Parliament Building

Audit Scotland (AS) published its report "**Management of the Holyrood building project**" in June 2004. This report highlighted a number of observations, features and lessons that are appropriate to all schemes, in its key findings. **tie** has conducted a detailed review of this report. The key recommended lessons to be implemented by **tie** are summarised as follows.

- Ensure that an **agreed project budget** is defined with a practical and robust set of key performance indicators, to be monitored during the life of the project and work towards joint responsibility for delivering the scheme on time and within budget;
- Develop and agree a 'realistic' design and construction **programme** that accounts for all critical project assumptions that could delay the scheme;
- Ensure **adequate contingencies** are made for 'expected' programme delays and cost increases that may influence the project, for all 'major' risks;
- Give adequate consideration to the available procurement options. Take appropriate care in the choice of form of contract to be employed based on a sound understanding of the risks and benefits of each option. Select a **procurement strategy** that optimises the transfer of 'design risk' and 'construction risk' to the private sector and is appropriate for the complexity of the scheme;
- Maintain **market interest** through promotion of the scheme, to ensure competitive interest from bidders;
- Engage project managers, project negotiators, consultants and contractors with **appropriate experience** in the procurement route selected. Also, seek confirmation of **resource availability** to accommodate peak loading of key resources;
- Ensure that 'detailed design' is initiated at the **earliest opportunity** to avoid variations;

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- Aim to examine options to **cap, fix and agree fees** at the earliest opportunity and ensure that the available incentives adopted **do not include scaleable fees** related to the outturn capital expenditure on the scheme;
- Develop a **governance model** that provides the appropriate controls over the project as follows.
 - Empowerment and support to 'single point' of **leadership** for the project, namely, the Project Director;
 - Ensure **clear responsibility** for an 'approved cost ceiling' and application of rigorous change control procedures including 'sign off' responsibilities for potential additional costs arising from design development;
 - Have an auditable and rigorous **change control process**; and
 - Unambiguous **lines of communication** and roles and responsibilities through all project organisations and individuals.
- Develop clear **specification requirements** for the scheme including explicit **indicators** of quality and material selection prior to going to market;
- Ensure that all parties have a shared understanding of the **quality, cost and programme objectives** for the project;
- Establish criteria for **unacceptable performance** and contractual facility to recover costs for poor performance, against a backdrop of 'comprehensive' reporting of current spend and forecasts. Ensure regular updates are provided on a 'systematic' basis within a robust framework of project financial control;
- Ensure that a **clear scope of works** are defined for all proposed Contracts and **value for money** tests are established prior to placement;
- Ensure that all parties contribute to a consistent framework for **risk management** including ability to contribute to definition of mitigation throughout the project lifecycle;
- Ensure that the project team and the private sector providers communicate issues and problems to achieving the project delivery dates and a '**partnering**' relationship is fostered to ensure individuals are free to express any reservations; and
- Consider the use of **project reviews** to provide assurance that it may move to the next stage of development.

It is recommended by Audit Scotland that these lessons and any further emerging lessons are adopted in full. **tie's** procurement strategy, project management approach and proposed payment mechanisms reflect these recommendations.

1.7.7 Department for Transport Optimism Bias Studies

Department for Transport (DfT) published its guidance "**Procedures for Dealing with Optimism Bias in Transport Planning**" in July 2004, supported by new studies by Bent Flyvbjerg in association with COWI. This guidance builds on previous studies reported by Mott MacDonald, on behalf of HM Treasury, with recommended Optimism Bias adjustments for application to full business cases.

The guidance identifies the following four categories for the causes of Optimism Bias.

- **Technical causes:** imperfect information such as unavailability of data, new or unproven technology; scope changes such as changes in relation to speed, road width, routing, safety and environmental norms; and management issues such as inappropriate calculation approach, procurement issues and risk sharing;
- **Psychological causes:** the tendency for humans and organisations to favour optimism; and appraisal of optimism;
- **Economic causes:** construction companies and consultants having interest in advancing projects; and
- **Political-institutional causes:** interests, power and institutions; and actors may deliberately lie in order to see their projects or interest realised.

The guidance highlights potential errors due to a shortage of data sources used to determine the recommended uplifts. The guidance recommends Optimism Bias increases of 40% to 57% to capital estimates for light rail schemes, depending on the desired degree of certainty

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required. The Mott MacDonald study now reflected in HM Treasury guidance (and followed by **tie**) recommends a comparable uplift of 44%. When Phase 1 (Line 1) is considered within the overall available grant funding of £375m there equates to a total of 54% allowance for Optimism Bias above base costs and specified contingencies. It is considered that this would provide a high degree of certainty for the Scottish Executive and Council for the tram as a 'standalone' project in that it would not require access to additional Grant Funding from the Scottish Executive, as discussed in Section [1.4.3].

Comment [MB6]: PwC to Check

The new guidance makes a number of recommendations for the industry, including the need for improvement in risk management and project cost controls. The guidance recognises that progressive mitigation of risk will effect a reduction in Optimism Bias. **tie** considers its risk management and method of development of scheme costs meets industry best practice and this is reflected in the benchmarking results against other tram schemes.

The guidance highlights potential pitfalls of organisations abusing Optimism Bias headroom due to a lack of incentive to bring the scheme in 'on budget'. The guidance goes on to highlight that risks are now being reflected in higher 'unit costs' and that this may result in double counting of risk.

The guidance recommends the use of 40% uplift to capital estimates based on the following.

- Where there is an acceptance that the scheme will be one of the 50 (out of 100 projects) that will be brought in within budget;
- Where a portfolio view of projects is taken;
- Where there is an above average appreciation of risk with supporting analysis and corresponding implementation of mitigation actions; and
- Where there is a desire to drive tighter cost control within projects.

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tie have applied a 'starting value' of 44% uplift to capital estimates, in accordance with the 2003 HM Treasury guidance. Through effective risk mitigation, this is now assessed at 24% and it is this level of contingency which is incorporated in the prudent case estimates. The underlying justification is set out in **Section 6.4.2**.

Comment [MB7]: PwC to check reference

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The new guidance stresses that there may be a need for an 'outside view' of schemes as it is not really appropriate for the project team to take definitive views on Optimism Bias. Accordingly, it is recommended that the Scottish Executive consider their 'portfolio' of projects and decide if additional risk reserve is required at 'funder level', with reference to this guidance. **tie** will bring an 'outside view' to mitigate the 'agent/principle' problem resulting in bias to project costs, programme and revenues through the input of Technical Support Services and supplemented with a Peer Review Group drawn from independent industry experts. **tie** may seek further comfort with the ad hoc input of specialists and audit of deliverables.

1.7.8 The Holyrood Inquiry

In September 2004, the Rt Hon Lord Fraser of Carmyllie QC published his principle conclusions and summarised his main findings on the Holyrood Inquiry. Whilst this project has many unique features and may not be considered to be directly pertinent to the Edinburgh Tram scheme, it is considered that there are many lessons to be appropriate to all planned public sector development and construction projects. **tie** has conducted a review of the lessons and summarise these below.

- A PFI procurement option should not be discounted on the basis of the potential delay to overall project delivery;
- Appropriate assessment of advantages and disadvantages of the proposed procurement route should be undertaken including clear visibility on the risks to be retained by the public sector;
- Appropriate risk allowances and contingencies should be set aside for capital costs and programme to a set brief.

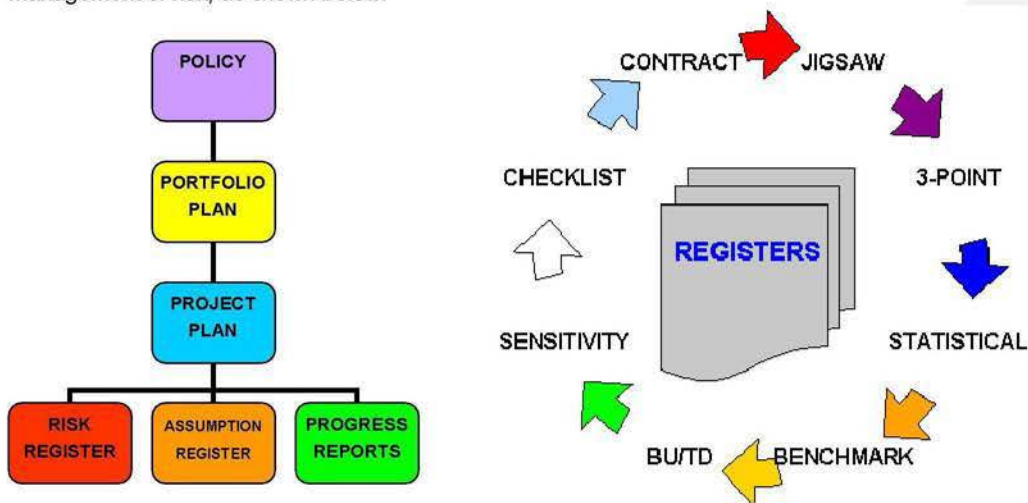
- Develop and maintain a Project Execution Plan throughout the project cycle; and
- Ensure that estimates for capital cost are accurate and reflect the complexity of scheme proposals through the advancement of earlier design;
- Ensure that where civil servants are engaged on the project, that overall governance should be made very clear;
- Identify unambiguous priorities for cost, programme and quality tensions within the scheme during development and construction phases and communicate these to all parties;
- Project change control requires full understanding of potential impacts prior to approval;
- Project completion dates and timetable for delivery should not be influenced by 'political' dates;
- Project Sponsors should be adequately experienced in the proposed procurement route and have suitable experience in the complexity of scheme proposals;
- Proper records of the conduct of the prequalification and tendering process should be kept to ensure compliance with EU procurement law;
- Rigorous due diligence should be conducted on any Joint-Venture Company tendering for services including review for need of collateral warranties and assessment of compatibility of working practices;
- Service providers should be procured with incentivised payment mechanisms; and
- Take up a Parent Company Guarantee from construction where feasible.

It is considered that that above lessons and any further emerging lessons are adopted in full. tie's proposed procurement strategy and project management approach.

1.7.81.7.9 Risk Management Framework

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tie and their advisers have identified project risks affecting the tram system through individual adviser meetings, workshops, strategic reviews and experience of other schemes and have recorded the risks identified throughout the development process. These risks have been placed on the risk register which has been further developed from checklists contained in published industry guidance. Risk management has been conducted within an organised framework utilising a range of planning and management deliverables and techniques for the management of risk, as shown below.



The risk mitigation strategy sets out an understanding of the risk identified, the actions to be taken to minimise the likelihood and impact of the risk, by whom and to an agreed timescale. Furthermore, the risks have been reviewed on an on-going basis to identify the "critical path" risks, being either fundamental in principle, or time critical to the success of the project.

These risks have been managed by **tie** to ensure they are addressed in an ongoing positive manner. It is intended that the risk register will be updated regularly as the project progresses, and will be utilised by **tie** as a 'live' management tool.

The progress in completing the actions associated with the risk management strategy for each risk has been recorded as a 'mitigation factor' (effectively the measured percentage complete for each mitigation plan). The progress to mitigate risks has been tracked and used to estimate reductions in Optimism Bias in accordance with published guidance. The extent of progress is shown below in **Section 6.4.2**.

Finally, the Optimism Bias has been supplemented with an additional 1% allowance (approximately £4.40m for the full tram system) for the cost of implementing the proposed risk management.

For additional comfort, **tie** has obtained verification of their approach to the estimation of Optimism Bias through the 'original authors' of the Mott MacDonald guidance on Optimism Bias and advice regarding project classification.

1.7.91.7.10 | Key Milestones for Risk Management

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On tram projects procured under a Full Consortium Option, the key date for transfer of risk to the private sector is the date when the single contract for the procurement of the system is signed. However, the Procurement Strategy adopted involves a staged process of risk transfer. The key project needs for risk management and the solutions proposed are summarised below.

Project Needs	Proposed Solutions
Continued Technical Support	TSS – technical reviewer, management and support to tie
Early System Design	SDS – infrastructure and system designer
Refine Revenue Projections	RSC – assessor and estimator of revenue generation from the operating tram network
Control of Infrastructure Cost Risk	ASW - Advance survey works
Reach agreement with key 3 rd parties	Ongoing objector and stakeholder management and Agreements e.g. Network Rail
De-risk the main infrastructure works	SDS/USFA Diversions - Advance design and utility single framework diversions
Select an appropriate Tram vehicle	Vehicle manufacture, design and maintenance contract novated to Infraco.
Ensure integration	Infraco – implementation company, responsible for construction, integration and maintenance of the network

A number of other potential supporting contracts and agreements will be required including Planning Supervisor, Property & Land Acquisition, Network Rail, Independent Validation & Verification, Power, Insurance and Policing. The risk profile of the project changes significantly when the commissioning of the system is complete and the operations commence.

Because the procurement strategy for this project includes a number of contracts, there will be a number of dates at which elements of risk will be transferred, as shown below.

Service Provision	Appointment
Technical Support (TSS)	May 2005
System Design (SDS)	July 2005
Revenue Setting Committee (RSC)	June 2005

Advance Surveys Works (ASW)	June 2005
Advance PU Diversion (USFA)	January 2006
Vehicle Supply (VEHCO)	December 2006
Infraco Construction & Commissioning (INFRACO)	December 2006

Of these, the most important will be the date of signing of the Infrastructure Contract. The Infrastructure Contractor's role as integrator for the system means that significant elements of the project risk will transfer to it.

Appendix [..] – Risk Allocation Matrices

[To be inserted for SDS, TSS and JRC from DLA Piper]

[Indicative allocation for Infracore/Tram from DLA Piper]