

CITY OF EDINBURGH COUNCIL

Post Settlement Agreement Budget

Budget Report

19<sup>th</sup> August 2011



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## 1.0 INTRODUCTION

- 1.1 Faithful+Gould was asked to carry out a review of the Budget for the delivery of the Edinburgh Trams project following the Settlement Agreement.
- 1.2 The review would consider the robustness of the financial assessment as presented to the City of Edinburgh Council on the 30<sup>th</sup> June 2011. It would challenge the figures as presented and the assumptions made at arriving at those figures. Based on the findings a revised budget would be presented to the City of Edinburgh Council for its consideration.
- 1.3 Due to the time constraints (effectively 3 weeks) the review relied on previously quantified items and project data. This was then challenged, to assess its reliability and relevance. A risk workshop was also held to explore all areas of the project to ensure that all avenues of risk, that may have a financial impact of this project going forward, were considered.
- 1.4 Faithful+Gould did not review or analyse the contractual basis of the project, but did query certain aspects of the draft MOV5 (Settlement Agreement Memorandum of Understanding) and in particular took into account the 'exclusions' (see Appendix D) when evaluating the risk profile.
- 1.5 The report is written with the assumption that those reading it have a detailed knowledge of the project and the parties involved.

## 2.0 EXECUTIVE SUMMARY

- 2.1 Based on the analysis of base costs, review of associated risks and discrete risks Faithful+Gould would recommend the following budget level. This figure is made up of various budgets from various sources and Faithful+Gould are relying on these budgets being correct as time does not permit the final checking of these budgets.

**Post Settlement Agreement Budget** **£742.92M**

- 2.2 This value represents the 80<sup>th</sup> percentile – the 80% confidence level – for project funding or budget purposes.

- 2.3 The base costs values with regard to Infraco are all at an advanced stage and due to the tight timescales leaves very little negotiating room. This has been highlighted by the responses from the Contractor in the On-Street Works Section.

### 2.4 **Budget**

The budget has been arrived at by consultation with various parties and covers all costs associated with the completion of the Tram Project – see Appendix A

### 2.5 **Delay by Utilities**

The Re-routing of the utilities is still causing concern and is a high risk to the project in in cost and time, monies have been set aside to cover any delays but costs from this work is very much a floating cost. The work involved with the utilities must have good management on the client side to try and minimise any delays.

### 2.6 **Interface Risk**

The current costs presented for the on-street works for Siemens are extremely high and not value for money, as its well in excess of the original costs for the works. Unfortunately all the materials are on site and paid for by the client. To complete the works any change of contractor on this element of works probably creates a very high risk due to any fault with the existing materials and any warranty for the works.

### 2.7 **On-Street Works**

We are of the opinion that the on street work costs are grossly inflated by INFRACO both for the civil work and the Siemens works. The Siemens position is explained in paragraph 2.6 above. Siemens hold a “golden key” due to the materials being on site and already paid in full. With regards to the civil works the cost is also grossly inflated and the contractor has allowed for the very worst case scenario for all works. If this was a competitive tender then we would expect some of the risk to be taken by the contractor to secure the works. We have highlighted areas that we think are overpriced.

- Traffic Management Works
- Indirect Cost
- Capping Layer in Excavations
- Paving Slabs – all priced as new
- Seimens Package



2.8 **Recommendations**

Due to the circumstances and contractual agreement presently in place for this project it is almost impossible to change contractors. The grossly inflated prices from INFRACO for the on street works indicate that it would almost be more cost effective to carry out this section of works on a cost plus basis. If this was an option it would require more management from the clients side to closely monitor all the works being undertaken, to make sure the correct labour was on site and the contractor was working efficiently. If managed properly this can be quite successful but can lead to disputes on efficiency of labour etc. This should be considered, and would also nullify any costs that INFRANCO have built into their costs for carrying out the remedial works on Princess Street which is possibly part of the issue why their costs are grossly inflated (which should be INFRACO cost).

### 3.0 METHODOLOGY

- 3.1 The project falls into six main elements (listed below). Five of these elements relate to specified work areas with their own associated risks. The sixth element being for discrete risks that are either general risks or risks that affect the whole of the project.
- Off-Street Works (Lump Sum)
  - On-Street Works
  - Utilities
  - CAF
  - Project Management Costs
  - Risk Allocation
- 3.2 Overarching these elements is the MOV5 or Settlement Agreement Memorandum of Understanding between the Client organisation tie Ltd and the Contractor organisation Infraco. Although, Faithful+Gould's scope of work did not cover a review of the revised contract in MOV5, Faithful+Gould was made aware of proposed 'exclusions' to that agreement and took those into consideration when evaluating the risk profile of the project.
- 3.3 The Off-Street Works (Lump Sum) relate to all costs and works prior to the MOV5 date of 1<sup>st</sup> September 2011 and a lump sum agreement to complete the works from Edinburgh Airport to Haymarket Station. These have been the focus of extensive mediation between the parties and as such it was felt that, in the available time, Faithful+Gould should concentrate on the risks associated with the agreed lump sum, insofar as future expenditure and specified risks that could effect this element of work.
- 3.4 The On-Street Works relates to works between Haymarket Station and York Place. At the time of this report the budget for this element of the works had not been agreed between the Client and Infraco. This allowed Faithful+Gould to carry out a more in-depth review of the figures being proposed by the contractor.
- This review took the format of a 'tender review' where we considered the breakdown of the contractor's submission and were able to review sub-contract prices. We also compared the prices with the previously noted budget.
- 3.5 The Utilities element covered all areas of the project and by its nature could have a major effect on the project. A significant amount of work was ongoing to identify anticipated utility risks. This ongoing work was used as a basis for informed analysis of the risks in this area.
- 3.6 The CAF costs had been agreed and so the review of this element of the works was limited to associated risks that may occur.
- 3.7 The Project Management Costs relate to expenditure to date and future expenditure by the Client to all other parties excluding Infraco. Here the values of cost were provided by the Client. Faithful+Gould's role was to challenge these costs to ensure that consideration had been given to all aspects of this element and look for duplication of risk items.
- 3.8 Risk Allocation was the final element and covered two areas of work. Firstly 'Discrete Risks' were reviewed and assessed. Then finally all costs were modelled to achieve a risk profile for the project.

A Risk Workshop was then held on the 11<sup>th</sup> August 2011, to allow key individuals involved in the project (see Appendix A) an opportunity to challenge existing risks and

explore new risks. The workshop also allowed individuals attending to bring any new risks to the table.

As part of the Risk Allocation section, all items in all work elements were then risk profiled to give a probability of cost and to derive an anticipated budget for the Edinburgh Trams Project.



## 4.0 ELEMENTS OF WORK

### 4.1 Off Street Works

The value of the Base Costs for the On-Street Works, have been agreed at £362.5M. This has been achieved through extensive mediation (not part of the Faithful+Gould scope). Of this total value £194.99M has been committed in assessments with a further £19.68M committed as part of the ongoing 'Prioritised Works'. This leaves a total of £147.83M of works to be completed.

A saving against Forth Ports is anticipated and has been factored in to the risk profile.

### 4.2 On Street Works

#### 4.2.1 Budget Price

4.2.1.1 The budget was compiled by tie Ltd, using the difference between the valuation of work carried out to the end of March 2011 and the estimated cost to complete from the contract sum. Following the submission of prices by the contractor the budget had to be revised so that a more like for like comparison could be carried out. These revisions are listed under the heading Revised Budget. The table below details both the original and the revised budget values:

Section	Original Budget (ob)	Revised Budget (rb)	Notes
Bilfinger Berger BoQ	£9,274,383	£9,274,383	A
Siemens	£3,974,427	£3,974,427	B
Risk allowance	£1,391,156	£2,517,000	C
Adjustments	£1,125,453	£6,810,000	D(ob) D(rb)
Traffic Lights		£1,700,000	E
Changes		£2,000,000	F
Prelims – BB	£2,550,455	£2,550,455	
Prelims - Siemens	£894,246	£894,246	
Deduct Siemens Materials		-£1,629,000	G
Sub total	£19,210,120		
Adjustments	£3,289,880		H
<b>Total</b>	<b>£22,500,000</b>	<b>£28,091,511</b>	

Notes:

- A BB price was arrived at by pricing a contemporary BOQ to reflect the IFC drawings updated at that time using Contract Rates.
- B Siemens value was derived pro rata from the Siemens contract Price analysis submitted at contract award stage.
- C The risk allowance of £2,517,000 is a consolidation of risk plus adjustments from the original budget (£1,391,156 + £1,258,844).

- D(ob) Allowance for risk on formation 10% of civils plus risk of downtime disruption etc of 5%
- D(rb) Revised Adjustment includes original budget price plus additional to cover capping layer to roads areas to cover poor ground conditions and new kerbing in lieu of re-use of existing.  
 It should be noted that the adjustment has been revised to reflect additional capping layer added by BB as worst case scenario. However, there is no evidence that should the worst case scenario not materialise, adjustment would be made to the remuneration value. It is our view that the additional cost of capping layer be treated as contingency and the actual requirement be based on re-measurement of the work carried out based on ground bearing capacity.  
 The kerbing allowance included in the revised adjustment figure is based on information that new kerbing has been included in the tender submission by BB. However, in the event that the existing kerbing is re-instated, there appears to be no mechanism to adjust remuneration to cover reuse. Again as with the capping layer, it is our view that remuneration is based on actual work done.
- E Traffic lights are a Provisional Sum in the Contract. Provisional Sums for site wide works (as this work is) were included in the Off Street tie assessment. Now the scope is split this may well have been overlooked in the separate price for on street and has therefore been added to the revised budget.
- F Includes work associated with turnback at St Andrews Square/ York Place and for a floating slab.
- G Materials associated with Siemens contract have already been certified. The Siemens tender therefore covers labour and preliminaries costs.
- H This was added by tie for budget purposes and partly reflects the adjustment to the slightly higher figure that Cyril Sweett arrived at.

#### 4.2.2 Civils, Systems and Trackwork

4.2.2.1 The summary produced details the value of the Civil Works (Bilfinger Berger civil UK Ltd) together with the Systems and Trackwork (Siemens plc) is as follows:

Item	Description	Detailed Description	Amount
1	Bilfinger Berger civil UK Limited	Civils Work	£33,322,586
2	Siemens plc	Systems and Trackwork	£20,160,679
<b>Grand total</b>			<b>£53,483,265</b>



4.2.2.2 Tenders for the on-street civil works were received from the following contracting companies:

- Lagan
- Crummock
- RJ McLeod
- Land Engineering
- Mackenzie

Contractor	Value
Lagan	£15,649,862
Crummock	£15,683,274
Land Engineering	£17,626,025
Mackenzie	£17,881,893
RJ McLeod	£20,462,868
Average of above	£17,460,784

The values noted are compiled from the tender values received together with the contractor qualifications on omissions, clarifications and exclusions.

The value used in compilation of the £33,322,586 total is the average of the tenders received, namely £17,460,784. From the table above, the lowest tender was received from Lagan in the amount of £15,649,862. The difference between the average and lowest tender is £1,810,922. With the addition of Overheads and Profit at 10%, the value is £1,992,014

Using the average in the summary gives a false picture. It is recommended that the lowest tender value be used in the compilation of the summary of all costs with the £1,992,014 noted as contingency.

An Enquiry Clarification (EC Nr 1) and covering the pavement types was issued by Bilfinger Berger to their Civil Works tendering sub contractors informing them that the bills of quantities were produced to the worst case scenario with a capping layer of 700mm over the roads areas. This clarification is not carried into the BB Civil Works proposal Pricing Assumptions therefore the actual depths shown on the contract drawings will be deemed to be the BB allowance. This could lead to BB pursuing variations for extra over costs should actual depth requirements be greater than indicated on the drawings despite the worst case scenario being included in the bills of quantities.

It is our view that this element of the works be treated as provisional and subject to adjustment with the actual value to be certified based on actual work carried out.

Enquiry clarification (EC Nr 8) and covering Kerbs, Setts & Paving was issued by Bilfinger Berger to their Civil Works tendering sub contractors informing them that the Bilfinger Berger measurement upon which the tender is based contains approximately 1500m of new kerbing and 2000m<sup>2</sup> additional pavement over and above that measured by tie. The discrepancy requires more in depth investigation. However, it is our view that in order to reach some common ground to enable agreement, these works are also considered as provisional and subject to re-measurement.

4.2.2.3 The Civil Work value of £33,322,568 as contained in the report entitled 'Edinburgh Tram Network On Street Works Civil Price' and dated 20 June 2011 is compiled as follows:

Item	Description	Detailed Description	Amount	Observations
1	Main Subcontract Works	Sub-total	£15,668,623	A
2	Subcontract qualifications	Omissions	£735,255	A
		Clarifications	£487,082	A
		Exclusions	£569,824	A
		Resource Reconciliation	£769,903	B
		Late Changes	£632,456	C
		Sub-total	£3,221,521	
3	Other Subcontractors	Site Investigation Works	£400,000	D
		Logistics	£899,169	E
		Street lighting	£559,979	F
		Princes St. outstanding wks	£345,000	G
		Traffic & Pedestrian Management	£4,173,615	H
		Sub-total	£6,377,763	
		Total for direct costs (1-3)	£25,267,906	
4	In-direct costs (BBUK)	Total for in-direct costs (4)	£5,025,354	I
5	Risk, Overheads & Profit	Risk – Reer Schedule X Pricing Assumptions	£-	
		Overheads at 7%	£2,120,528	J
		Profit at 3%	£908,798	J
		Total for Risk Overheads & Profit	£3,029,326	
<b>Grand Total</b>			<b>£33,322,586</b>	

Observations:

- A: Values taken as an average of the five tenders received.
- B: Value added to cover the difference between the Bilfinger Berger estimate of the works and the average of the tenders received. This value should be deleted.
- C: The late changes are detailed in the report with the majority of the value associated with programme creep. For example section 1C is 5 weeks longer £208,820, 1D 3 weeks longer £125,292 and traffic management longer duration £280,000. The balance of the works in this section is associated with the Canning Street Traffic Light Junction. The rates for which are reasonable.
- D: The value seems high considering the extent of works to complete the project. Further investigation required.
- E: Logistical Support is based on 45 weeks duration for Princes Street works and 105 weeks duration for Haymarket/Shandwick/St Andrew/York Place.
- F: Original rates used with uplift of 15%. The uplift % is high when viewed against current indices. A figure in the region of 5% would be more appropriate.
- G: Represents works that were postponed on instruction and is a fair reflection of the value expected.
- H: The value quoted is excessive bearing in mind the works scope. During the Princes Street works, the cost reimbursable element was £330,000. This covered approximately 1km of route and being on a cost reimbursable basis is likely to be higher than at fixed price. On a pro rata basis if that rate is applied to the whole on street works of 2.6km, including the remaining Princes Street works, the value would be in the region of £858,000. An additional £280,000 is included in the 'Late Changes' section for Traffic Management. It is our observation that an amount in the region of £1,000,000 would be more realistic for the Traffic & Pedestrian Management with a reduction on the quoted value of £4,173,615 of £3,173,615. With overheads and profit at 10%, the reduction would be £3,490,098
- I: See item 4.2.2.4 below
- J: The total for overheads and profit, although high in the current economic climate, reflect the values contained in the original project

4.2.2.4 The in-direct costs at £5,025,356 are as follows:

Item	Description	Target Price	Observations
1	Site Office at Haymarket	£763,341	
2	Consortium Office	£234,834	
3	Staff	£2,595,582	
4	Finance	£706,300	
5	Consultants	£706,300	
	<b>In-direct costs Total</b>	<b>£5,025,356</b>	<b>A</b>



Observations:

A: The value appears excessive when viewed against the programme timescales. In addition, although we do not have a breakdown of the off-street works agreed lump sum, it is conceivable that an element of in-direct cost is built into the lump sum.

4.2.2.5 Supplementary tenders for section 1D H chainage 130,818 – 131,247 West Maitland Street – Haymarket were received on 22 July as follows:

<b>Contractor</b>	<b>Value</b>
Lagan	£3,433,628
Crummock	£4,545,737
Mackenzie	£5,050,426

The lowest submission by Lagan in the amount of £3,433,628 should be added to the summary as noted in 4.2.2.3 above. The resultant total is therefore:

<b>Section</b>	<b>Value</b>
From 2.03	£33,322,586
From 2.05	£3,433,628
<b>Total</b>	<b>£36,756,214</b>

**4.2.3 Systems and Trackwork**

4.2.3.1 The Siemens costs exclude materials as these have already been certified.

The budget for the Siemens element of the project as prepared by tie was on a pro rata basis from the Siemens contract sum analysis provided at award stage. No programme was available and consequently a value based percentage was added to cover prelims (estimated at £894,246)

In meetings with Siemens, tie has established that Siemens have priced the preliminaries at full resource level for the current programme duration. Whilst it is accepted by tie that the programme is of a longer duration than anticipated by tie and that that would attract additional preliminary costs, original target price of £20,160,348.19 has been reviewed following observations made by tie. The target price has been adjusted to £14,480,150.03 following observations made by tie and is compiled as follows:

Activity / Contractor	Value	Notes
Overall project management	£1,493,375.86	
Track work – sub-system extended PM	£286,232.45	
BAM	£4,266,656.57	A
Core HVLV	£157,950.00	B
Infrastructure	£316,119.90	
Insurance, bonds, guarantees	£22,931.03	
Risk (extended warranty)	£345,881.38	
Risk (implementation risk)	£907,684.91	C
Sub-contracts:		
Rail Automation UK	£565,536.31	
Electrification UK	£1,464,671.50	
Traffic Solutions UK	£453,045.19	
Siemens AG (Germany)	£2,731,057.46	
Changes	£2,006,650.00	D
<b>Total</b>	<b>£14,480,150.03</b>	

Notes:

- A: Siemens have intimated that they expect to negotiate with BAM. They have highlighted that the programme has extended by 8 weeks since BAM submitted their quotation and that would add 8 weeks prelims at a cost of £71,000 per week (£568,000). However, the £4,266,656.57 amount is for the laying only (materials are paid separately) of 1.6km of track. In comparison, the original 18.5km route length which amounted to approximately £11,000,000 (again for lay only) equates to a cost per kilometre of approximately £600,000. Based on this, the value for the track element included in the works to complete, would be £960,000. BAM have included in the £4.26m an amount for EOT which should be an internal matter between Siemens and BAM, their sub contractor. The BAM element should be reduced by approximately £3,306,000.
- B: No breakdown has been provided for this element. However Siemens have advised that the current quotation amounted to £35,000 with the remainder comprising a contingency of £100,000 and mark up.
- C: Siemens have advised that this represents 5% of the original quotation. This is excessive. Siemens have been requested by tie to review the sum and highlight the risks that they require to cover.
- D: The changes have been itemised by Siemens and include £961,612 for the York Place New Tumbback Strategy and £597,120 for Floating Slab.

General observations are that there is an excessive resource provision quoted for what is 1.5km of track. In addition, Siemens have included project functions in Germany which require clarification. Included in the Siemens costs is an amount of £247,000 for material storage costs. Again this seems excessive and requires further investigation and clarification.

In our view, a further reduction in the region of £1m - £1.5m could be realised following completion of the negotiations.



#### 4.2.4 Summary

4.2.4.1 There are a number of areas where savings can be introduced from the £53,483,265 total value of Bilfinger Berger and Siemens element. The table below details the tender totals and areas of adjustment:

Description	Adjustments	Tender
Civil work value (from report dated 20 June 2011)		£33,332,586
Civil work value (Tender received 22 July 2011)		£3,433,628
Siemens		£20,160,679
Total		£56,916,893
Adjustments:		
Use value for lowest tender for civil works in lieu of average	-£1,922,014	
Resource reconciliation	-£769,903	
Street lighting uplift reduction (15% to 5%)	-£26,077	
Reduction to Traffic & Pedestrian Management	-£3,490,098	
Siemens revised target price saving	-£5,680,198	
Siemens further reduction	-£3,306,000	
Total	-£15,194,290	-£15,194,290
<b>Revised On Street works total</b>		<b>£41,722,603</b>

4.2.4.2 Further to the adjustments noted above, there remain a number of sections where further adjustments may be realised. These are as follows:

Description	Comment
2.03 Site investigation Works (£400,000)	Further investigation required
2.03 Indirect costs, (£5,025,356)	Further investigation required

4.2.4.3 In addition to the revisions noted above, the works associated with the additional capping layer, kerbing and paving should be considered as provisional and subject to remeasurement based upon actual works carried out and valued at the rates contained in the bills of quantities received in competition.

4.2.4.4 In conclusion we are of the opinion that the Contractor has priced for the worst case scenario and that certain items are overpriced.

- The use of the Contractor of reporting an average price from his sub-contractors is unusual and immediately adds nearly £2.0M to the project.
- His response with regard to the capping layer, "to remove the item and have the council take the risk as another Pricing Assumption" is hardly in the spirit of the project going forward. In fact, this hard negotiating stance reflects the very tight timescale that the CEC has set to agree this works.
- When comparing various elements of work with previous items of work the prices submitted appear to be extremely inflated. In fact the resourcing by Siemens would suggest that they have priced the works on the assumption that it will be a contentious contract to run (6nr Surveyors on the On-Street Works). If this is the case savings may be achieved by changing certain personnel within the organisations both on the Contracting side and the Clients side. This may not be an insignificant sum.

#### **4.3 Utilities**

##### **4.3.1 Utilities**

- 4.3.1.1 The Utilities have had a significant effect on the project, both in terms of programme delay and direct costs. Our initial review of this area was to consider what had occurred in the past and to see if these same difficulties may arise in the future.
- 4.3.1.2 Known and identified clashes between the tram structure and utilities were identified and quantified in the base cost.

##### **4.3.2 Contractual Issues**

- 4.3.2.1 The first thing noted was the separation of the Utilities contract (MUDFA) from the Edinburgh Tram delivery contract. With no apparent linkage between these two contracts, neither contract had the ability to influence the other. The effect was that with a prolongation of the utilities work the tram delivery project went into delay with the inevitable cost implications.
- 4.3.2.2 Faithful+Gould consider this as one of the fundamental risks to the project. Ideally both contracts would be carried out by the same contractor under one contract. This would have the effect of passing the responsibility of the delivery of the utilities to that Contractor and so minimise the risk of delay, to the Client.
- 4.3.2.3 Other considerations discussed, were the ability to hand over the On-Street Works in sections as and when they became available, with no right to possession on a certain date. This would again minimise the opportunity of the delivery contractor to claim delay in relation to the ongoing utilities works.

##### **4.3.3 Design**

- 4.3.3.1 A number of design areas were discussed, in particular the bases for the overhead lines. These were considered to be extensive and a piled solution was suggested. Faithful+Gould were then informed that this area had been explored but the Contractor's designers were unwilling to change their design and would not accept design liability should the base design be altered.
- 4.3.3.2 Therefore a risk allowance has been included to cover for clashes between utilities and the bases.

##### **4.3.4 Delay**

- 4.3.4.1 The most significant risk from the utilities remains the delay to the On-Street works that could arise. This has been assessed and is included in the risk profile.

#### **4.4 CAF**

- 4.4.1 The CAF Base cost had been agreed at £62.4M prior to the Faithful+Gould review. This value represented circa £58M from the original contract plus a further £4.4M as an agreed settlement for variations and delay to the contract.
- 4.4.2 This agreed sum is a 100% confirmed and so sits quite firmly as a Base Cost
- 4.4.3 The agreed sum also included for the separation of CAF from the Infraco contract. The interface risk resulting from this is seen as a 'black flag' risk in terms of interface between the parties. See section 5.3.3. for explanation.

**4.5 Project Management Costs**

- 4.5.1 The Project Management costs have been provided by the City of Edinburgh Council directly from their project data source. There is a high degree of clarity in the figures which relies on actual expenditure and residual monies left in those individual budgets. Here again these values have been reviewed and adjusted accordingly.
- 4.5.2 As this element represents a significant number of individual items, it was reviewed in detail to check for duplicated items
- 4.5.3 Other risks that have been identified during the process have been highlighted and evaluated.

**4.6 Discrete Risks**

- 4.6.1 Risks for each of the areas of Base Costs had risks identified individually and listed against those areas (see Appendix C Risk model). Discrete Risks i.e. risks of either a general nature or those that affected the whole of the project, were also listed but in a separate section at the end of the model spread sheet. The method of how the risk items were handled is contained in the next section (Section 5.0).



## **5.0 RISK ALLOCATION**

### **5.1 General**

5.1.1 A workshop was held on Wednesday 3<sup>rd</sup> August 2011, involving key personnel from both City of Edinburgh Council and tie Ltd to identify, quantify and record potential risks to the project and provide the base information for the budget review and the subsequent risk analysis. The workshop drew upon previous risk work undertaken by the project team including the ETN risk register.

5.1.2 Following the workshop, a new budget summary was created and this incorporated the discrete risks identified and was also used to build the risk model (see Appendix B). The model addressed both estimate (forecast) uncertainty and discrete risks generally using a 3 point methodology.

### **5.2 Risk Analysis Methodology**

5.2.1 The objective of the workshop and subsequent meetings / correspondence with CEC and tie Ltd was to identify risks associated with the project at this stage, and assess those risks in terms of impact on the project. The information captured during the workshop provided the data for subsequent analysis.

The workshop incorporated the following sessions:

- High level review of budget
- Settlement Agreement
- Main Body of Workshop
  - On Street Works - Haymarket to York Place
    - Haymarket to West End
    - Princes Street
    - St Andrews Square
    - York Place
  - Utilities
  - Lump Sum / Off Street Works – Airport to Haymarket
    - Works to date (including Prioritised Works / Works to the North)
    - Works to go
    - Depot
  - CAF works
  - Non BSC Costs to go
  - Non BSC Costs to date
  - Contingency & Specified Risks

### 5.3 Quantative Cost Risk Analysis

#### 5.3.1 Developing the QRA model

The layout of the risk model follows the arrangement of the cost forecast / budget. Faithful+Gould's due diligence team examined the basis of the forecast and developed three point estimates (optimistic, most likely and pessimistic) ranges against each line item in the forecast estimate. These line items were then incorporated into a risk model to represent the view of uncertainty and confidence.

Against each line item in the risk model the most appropriate input distribution has been selected. A triangular distribution has been selected to represent the distribution of the uncertainty for each of the forecast line items.

A common cause of risk estimating bias is the default use of the project plan forecast to anchor the centre point. Faithful+Gould's approach avoids this by structuring our questions as follows: "What is the maximum practical cost impact? What is the minimum practical cost impact? What is the expected cost impact?"

#### 5.3.2 Method for developing cost ranges for the QRA

The cost risk models for the project are developed in accordance with best practice. The modelling process itself commenced with receipt of the cost plan or base estimate forecast from the City of Edinburgh Council.

Individual risks were identified from the existing risk register and from the workshop held 3<sup>rd</sup> August 2011. The results of the workshop combined with the assessment of the existing risk register were ratified at a review meeting with Alan Coyle on 9<sup>th</sup> August 2011 and again with representatives of CEC on 11<sup>th</sup> August 2011. During these meetings the validity of the risks were reviewed and a range of possible outcomes in terms of value and a probability of occurrence were assigned. The project team also considered the implications of the settlement agreement as drafted and the specific exclusions identified. These are set out in the budget / model in Appendix XX.

#### 5.3.3 Interpreting the results from the cost analysis

The cumulative frequency distribution allows you to determine the probability of obtaining an outturn cost below a chosen value. It also allows the team to determine the probability of the project cost falling within a specified range. Often, clients will choose the 50% confidence level as the project management contingency sum, and the 80% confidence level as the project funding level.

Given the uncertainties as to whether risks will occur or not, it is impossible to predict the out-turn cost with absolute certainty. So a graph which shows confidence limits of a cost not being exceeded is produced. For example reading across the graph at 50% confidence limit, identifies the cost which has a 50% chance of being exceeded (and in this situation a 50% chance of not being exceeded). The 50th percentile is the point at which many clients decide to identify the contingency sum for project management purposes.

Nevertheless, the 50/50 chance of completing a project for a particular sum is not a very practical confidence level with respect to the provision of overall project funding. Clients may therefore decide to use the 80th percentile – the 80% confidence level – for project funding or budget purposes.

It should be noted that the following risks have specifically been excluded from the analysis as they are considered 'Black Flag' items. Should they occur, then the entire project would require re-baselining.

1. CAF breaking away from the Infraco consortium:
  - It is considered that it is imperative that the contractual interface between the parties, BB, Siemens and CAF, is maintained and that the redrafting of the contracts will need to be tight enough to nullify any risk to the Client.
  - The quantum of this risk is considerable and would skew the risk profile unnaturally. But the Parties consulted, agree that the likelihood of it happening is relatively small. Therefore it is considered as a 'black flag' item.
2. The following Agreements
  - Tram Supply Agreement
  - Interface Agreement
  - Maintenance Agreement

In summary the separation of CAF from the Infraco contract and the other agreements listed represent the contractual 'interface' between the delivery parties. Should these integrate liabilities, for the delivery of the scheme, become decoupled from one another, there is a severe risk that one party to the original contract would fail to deliver its element of work, thus putting the whole project at risk

#### **5.4 Results from the Quantitative cost risk analysis**

##### **5.4.1 Cost forecast uncertainty ranges**

The review of the forecast budget resulted in the following cost ranges being applied to the base forecast.

See Appendix A for supporting information to these amounts.



## 6.0 APPENDICIES

The following appendices are included in the report.

- Appendix A - Budget Summary & Risk Model
- Appendix B - QRA Summary
- Appendix C - Risk Graph

**Appendix A**  
**Budget Summary & Risk Model**



CITY OF EDINBURGH COUNCIL  
 EDINBURGH TRAMS  
 POST SETTLEMENT AGREEMENT BUDGET

Level 1	Level 2	COWD	TO GO	BUDGET	Notes
		EM	EM	EM	
Off Street Works Airport to Haymarket (Infraco)	<b>Base Cost</b>				
	Payments to App 43 + Hg Certs 1, 2 & 3a	£ 178.93			
	Apps 44 & 45 + Hg Certs 3b & 3c	£ 16.06			
	Prioritised Works	£ 19.68			
	Costs 'to go' to BBS		£ 147.83		
	Deduction for Forth Ports		-£ 2.44		Colin Smith
	<b>Base Cost Total</b>	£ 214.67	£ 145.39	£ 360.06	
	<b>Risks</b>				
	R041 Approval of plans for Gogar interchange Retaining wall (treatment of unstable wall or special construction measures)				Price given at Workshop AC confirmed estimate from previous meeting now in R041 Allowance
	FG Risk 35 Edinburgh Gateway - Power Cable				
	FG Risk 36 Scottish Rugby Union appeasement costs				
	FG Risk 47 Blockades and possessions not included in Lump sum				
	FG Risk 49				
	<b>Risk Cost Total</b>	£ -	£ -	£ -	
	<b>Sub Total</b>	£ 214.67	£ 145.39	£ 360.06	

Risk Model Data				
Probability %	Optimistic Cost <small>Assume only 5% chance it will be lower than this</small>	Most Likely	Pessimistic <small>Assume only 5% chance it will be higher than this</small>	
100%	£ 178,930,000.00	£ 178,930,000.00	£ 178,930,000.00	
100%	£ 16,060,000.00	£ 16,060,000.00	£ 16,060,000.00	
100%	£ 19,680,000.00	£ 19,680,000.00	£ 19,680,000.00	
100%	£ 147,830,000.00	£ 147,830,000.00	£ 147,830,000.00	
100%	-£ 3,600,000.00	-£ 2,443,000.00	-£ 1,000,000.00	
50%	£ 150,000.00	£ 350,000.00	£ 500,000.00	
60%	£ 50,000.00	£ 100,000.00	£ 200,000.00	
90%	£ 350,000.00	£ 400,000.00	£ 400,000.00	
50%	£ 125,000.00	£ 250,000.00	£ 250,000.00	

Level 1	Level 2	COWD	TO GO	BUDGET	Notes
		EM	EM	EM	
On Street Works Haymarket to York Place (Infraco)	<b>Base Cost</b>				
	On-street contract price - Bilfinger Berger		£ 36.76		Discussion on Pricing : CS to go back to Contractor; view to be taken on holding contingency As above
	On-street contract price - Siemens		£ 12.50		
	<b>Base Cost Total</b>	£ -	£ 49.26	£ 49.26	
	<b>Risks</b>				
	Pricing Assumptions				Advised at Zero Cost Andy Conway 09-08-11 Steps - Advised at £75k Cost Andy Conway 09-08-11  base costs in budget - street scape uplift separate budget - therefore risk allowance zero
	6.4.2.1 Floating Track Slab				
	6.4.2.3 York Place Terminal Point				
	6.4.2.4 Cathedral Lane Substation				
	6.4.2.5 Elder Street				
	6.4.2.6 Dublin Street				
	6.4.2.7 Cycleway at Mound				
	6.4.2.8 St Andrews Square		OUT		
	R049 Additional land required to allow construction				figure supplied by Third party manager NOT a Risk
	R057 Unknown or abandoned chambers', cellars, voids etc.				
	FG Risk 8 Sub-suppliers warranties expire during the maintenance period and Siemens may have legitimate claim due to delays				Colin Smith - see e-mail 11/8/11
	FG Risk 15 Multiple road closures proposed / agreed may not work with traffic despite being acceptable in principle (via the model results)				Shouldn't be our issue
	FG Risk 17 OLE may not work - design costs to determine a solution and the consequential costs (Design, Construction, Quant's and delay)				discussion with CS This will not happen
	FG Risk 23 Demolition of building could impact on Infraco		OUT		
	<b>Risk Cost Total</b>	£ -	£ -	£ -	
	<b>Sub Total</b>	£ -	£ 49.26	£ 49.26	

Probability	Optimistic Cost	Most Likely	Pessimistic	
100%	£ 29,000,000.00	£ 31,548,122.00	£ 33,000,000.00	
100%	£ 11,875,000.00	£ 12,500,000.00	£ 12,000,000.00	
100%	£ 800,000.00	£ 1,000,000.00	£ 1,200,000.00	
100%	£ 800,000.00	£ 1,000,000.00	£ 1,200,000.00	
100%	£ 800,000.00	£ 1,000,000.00	£ 1,200,000.00	
100%	£ -	£ -	£ -	
100%	£ 60,000.00	£ 75,000.00	£ 90,000.00	
100%	£ 800,000.00	£ 1,000,000.00	£ 1,200,000.00	
90%	£ 130,000.00	£ 150,000.00	£ 180,000.00	
50%	£ -	£ 250,000.00	£ 300,000.00	
80%	£ 180,000.00	£ 200,000.00	£ 250,000.00	
90%	£ 850,000.00	£ 1,000,000.00	£ 1,500,000.00	

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CITY OF EDINBURGH COUNCIL  
 EDINBURGH TRAMS  
 POST SETTLEMENT AGREEMENT BUDGET

Level 1	Level 2	COWD EM	TO GO EM	BUDGET EM	Notes	Probability	Optimistic Cost	Most Likely	Pessimistic	
Utilities	<b>Base Cost</b>				Master schedule showing £1.253M; See Contingency and Specified risks. Steven Bell to confirm; 700nr now the figure of conflicts £1.25M was on 550nr; say ave. cost of £20k ea x 200nr problems					
	Identifiable items on Register									
	Trial Holes (140nr x £3k)		£ 1.25				100%	£ 400,000.00	£ 1,250,000.00	£ 2,000,000.00
	Leith Walk Utilities		£ 0.42				100%	£ 399,000.00	£ 420,000.00	£ 504,000.00
	<b>Base Cost Total</b>	£ -	£ 2.77	£ 2.77						
	<b>Risks</b>				Discussion with CS; designer cost £5k; delay 1 on programme £5 days £10/ec all in £110k/ea x 200nr  Opex cost for council Allowance OK Relates to South St Andrews Sq; York Place; Shandwick Place; Michael Blake - CS pursue this; Delay included in overall delay costs Included in £300k/week					
	R004 Damage to Utility Apparatus		OUT							
	R032 Utilities works, failure of MUDFA to deliver against programme		OUT							
	R038 Utility Consents		OUT							
	FG Risk 1 Utilities Risk - Utility diversions, clashes, design solutions, delay, construction						90%	£ 250,000.00	£ 1,800,000.00	£ 2,200,000.00
	FG Risk 5 Mitigation costs to avoid known and onerous utility clashes in the track formation - derogation for track formation levels to avoid utilities		OUT							
	FG Risk 29 Drainage connections (20% of above FG Risk 28)						80%	£ 100,000.00	£ 200,000.00	£ 300,000.00
	FG Risk 31 Road level lowering and utility issues as a result						90%	£ 2,000,000.00	£ 3,000,000.00	£ 5,000,000.00
	FG Risk 59 Delay to delivery of items on the Identified Utilities Register		OUT					£ -	£ -	£ -
	FG Risk 60 Loss and Expense Claims as a result of any delay		OUT					£ -	£ -	£ -
	<b>Risk Cost Total</b>	£ -	£ -	£ -						
	<b>Sub Total</b>	£ -	£ 2.77	£ 2.77						
CAF	<b>Base Cost</b>	£ 48.00	£ 14.40			100%	£ 48,000,000.00	£ 48,000,000.00	£ 48,000,000.00	
	<b>Base Cost Total</b>	£ 48.00	£ 14.40	£ 62.40		100%	£ 14,400,000.00	£ 14,400,000.00	£ 14,400,000.00	
	<b>Risks</b>				Discussed at meeting 11-08-11; considered not a risk  From Sept 2013 9months Allowance only £1000/per tram SHOW stopper can not be quantified; It is a contractual issue					
	R024 Power not available to re-commission first tram		OUT							
	FG Risk 39 Test track - single or 2 lines?		OUT					£ -	£ -	£ -
	FG Risk 50 £62.4m is up to Sept 2013 - £170k per month. Delay to Jan 14 anticipated - Risk that it could be beyond Jan 14						95%	£ 900,000.00	£ 1,350,000.00	£ 1,800,000.00
	<b>Risk Cost Total</b>	£ -	£ -	£ -						
	<b>Sub Total</b>	£ 48.00	£ 14.40	£ 62.40						

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CITY OF EDINBURGH COUNCIL  
EDINBURGH TRAMS  
POST SETTLEMENT AGREEMENT BUDGET

Level 1	Level 2	COWD	TO GO	BUDGET	Notes	Probability	Optimistic Cost	Most Likely	Pessimistic
		£M	£M	£M					
Project Management	<b>Base Cost</b>								
	To Date	£ 248.50				100%	£ 248,500,000.00	£ 248,500,000.00	£ 248,500,000.00
	Project Management Costs		£ 20.50			100%	£ 18,450,000.00	£ 20,500,000.00	£ 22,550,000.00
	Third Party					100%	£ 1,235,000.00	£ 1,300,000.00	£ 1,365,000.00
	CAAD - CALA			£ 1.30		100%	£ 95,000.00	£ 100,000.00	£ 105,000.00
	CAAD - Tesco			£ 0.10		100%	£ 1,000,000.00	£ 1,250,000.00	£ 1,700,000.00
	Network Rail - APA			£ 1.70	Pessimistic view	100%	£ 95,000.00	£ 100,000.00	£ 105,000.00
	Network Rail - Bridge & Operating Agreements			£ 0.10		100%	£ 760,000.00	£ 800,000.00	£ 840,000.00
	Edinburgh Airport Ltd			£ 0.80		100%	£ 712,500.00	£ 750,000.00	£ 787,500.00
	New Ingliston Ltd			£ 0.75		100%	£ 950,000.00	£ 1,000,000.00	£ 1,050,000.00
	Forth ports			£ 1.00	Reinstatement view	100%	£ -	£ -	£ -
	Accommodation			OUT	Covered by PM Costs Line	100%	£ -	£ -	£ -
	Preparing for Operations			OUT	Covered by PM Costs Line	100%	£ -	£ -	£ -
	Insurance & Extensions			OUT	Covered by PM Costs Line	100%	£ -	£ -	£ -
	Warranty Extensions			OUT	Included in Risk 8	100%	£ -	£ -	£ -
	Legal			£ 1.30	Provided by McGrigors	100%	£ 1,235,000.00	£ 1,300,000.00	£ 1,560,000.00
	Land & property			OUT	Included in Risk R049	100%	£ -	£ -	£ -
	Traffic Modelling Costs			£ 0.10	provided by AC	100%	£ 95,000.00	£ 100,000.00	£ 105,000.00
	Comms and Marketing			£ 1.10		100%	£ 1,045,000.00	£ 1,100,000.00	£ 1,155,000.00
	Comms Link to CEC			OUT	Covered by ER	100%	£ -	£ -	£ -
	Reinstatement of Public Art			£ 0.30		100%	£ 285,000.00	£ 300,000.00	£ 315,000.00
	Materials Storage Cost			£ 1.50		100%	£ 1,425,000.00	£ 1,500,000.00	£ 1,575,000.00
	Design Completion	Register of Design Disputes		OUT	Balance of Design issues to be included in General Design Risk Item at end	100%	£ -	£ -	£ -
	<b>Base Cost Total</b>	£ 248.50	£ 30.55	£ 279.05					
	<b>Risks</b>								
	Event Delay Risk				Moved from Base to Risk	100%	£ 1,000,000.00	£ 1,600,000.00	£ 2,000,000.00
	FG Risk 11				Figure derived from 'Open for Business' yearly cost of £210k/yr	90%	£ 105,000.00	£ 160,000.00	£ 210,000.00
	FG Risk 53				Inc. in Pm costs above		£ -	£ -	£ -
	<b>Risk Cost Total</b>	£ -	£ -	£ -					
	<b>Sub Total</b>	£ 248.50	£ 30.55	£ 279.05					

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CITY OF EDINBURGH COUNCIL  
 EDINBURGH TRAMS  
 POST SETTLEMENT AGREEMENT BUDGET

Level 1	Level 2	COWD EM	TO GO EM	BUDGET EM	Notes	Probability	Optimistic Cost	Most Likely	Pessimistic
Discrete Risks									
	<b>Base Cost Total</b>	£ -	£ -	£ -					
	<b>Risks</b>								
	<b>Settlement Agreement</b>								
	Colin Smiths Key areas								
	Impact on tram Supply Agreement		OUT		All these are to do with legal's and are musts ; if wrong these are black flags				
	Impact on Interface Agreement		OUT						
	Impact on maintenance Agreement		OUT						
	Warranties		OUT			As previous	£ -	£ -	£ -
	tram inspection Agreement		OUT			tied into interface items	£ -	£ -	£ -
	Traffic Modelling		OUT			OUT in PM above	£ -	£ -	£ -
	milestone payments		OUT			OUT	£ -	£ -	£ -
	LD's Capped		OUT			not a risk	£ -	£ -	£ -
	Delay to Off Street Works caused by On Street Works delay		OUT			in FG Risk 12	£ -	£ -	£ -
	Running Off Street Works only; maintenance liabilities		OUT			This is now not an option	£ -	£ -	£ -
	21 day notification - Major Risk - contract move to cost reimbursable				only effects Civils; Rates are to be ; probability is 20% of the £33M worst case	90%	£ 2,200,000.00	£ 3,300,000.00	£ 6,600,000.00
	<b>Pricing Assumptions</b>								
	FG Risk 40a 6.4.1 - Approval body		OUT		No Value				
	FG Risk 40b 6.4.2 - Design Approvals 8nr		OUT		see On Street Pricing Assumptions				
	FG Risk 40c 6.4.3 - Urban Traffic Controls		OUT		No Value				
	FG Risk 40d 6.4.4 - Excavation limits		OUT		Contractors Risk				
	FG Risk 40e Temporary works by tie		OUT		Contractors Risk				
	FG Risk 40f 6.4.5 - Utility free construction		OUT		Covered by Utility Items				
	FG Risk 40g 6.4.6 - Unexploded ordinance		OUT		OUT in PM above				
	FG Risk 40h Contaminated material		OUT		Covered by Utility Items				
	FG Risk 40j 6.4.7 - Routine maintenance					50%	£ 100,000.00	£ 500,000.00	£ 600,000.00
	FG Risk 40k 6.4.8 - Relaxation of time constraints					50%	£ 100,000.00	£ 300,000.00	£ 400,000.00
	FG Risk 40m 6.4.9 - Protection of trees		OUT		No Value				
	FG Risk 40n 6.4.10 - Archaeological Finds					50%	£ 10,000.00	£ 250,000.00	£ 500,000.00
	FG Risk 40p 6.4.11 - Programme Narrative		OUT		Covered by other risks				
	FG Risk 40q 6.4.12 - 20 Non controversial issues no risk		OUT		No Value				
	FG Risk 40r 6.4.21 - Vandalism		OUT		Contractors Risk				
	FG Risk 40s 6.2.22 - Material Free Issue				Ticket machines	50%	£ 225,000.00	£ 250,000.00	£ 275,000.00
	FG Risk 40t 6.4.24 - Clause too broad		OUT		No value				
	<b>Other Risks</b>								
	R002 Death, injury or damage to third parties (people or property) during construction		OUT		Covered by Insurance Costs / Contractors Insurance				
	R011 Failure of Contractors / Sub-Contractors to self-certify completion, close out of NCRs and deliver construction quality					15%	£ 20,000.00	£ 40,000.00	£ 60,000.00
	R018 Security Incident					5%	£ 10,000.00	£ 50,000.00	£ 100,000.00
	R019 Archaeological or Human Remains		OUT		Covered in PM costs				
	R020 Exceptional adverse weather					5%	£ 120,000.00	£ 300,000.00	£ 420,000.00
	FG Risk 3 Road Maintenance adoption costs burden on project due to on-going works and delay of hand-back		OUT		Considered to be in FG Risk 040j				
	FG Risk 12 OVERALL time delay impact (assessment of cumulative effect of identified risks on this register)				Delay considered to be £300k/week;	90%	£ 7,800,000.00	£ 11,610,000.00	£ 15,600,000.00
	General Design Risk				This will be the balance figure of £10M on design items above	100%	£ 4,443,750.00	£ 5,925,000.00	£ 6,221,250.00
	<b>Risk Cost Total</b>	£ -	£ -	£ -					
	<b>Sub Total</b>	£ -	£ -	£ -					
	<b>GRAND TOTAL</b>			£ 753.54 M					

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**Appendix B**  
**QRA Summary**



# ETN Infrastructure QRA Summary

Model Date:

12 August 2011

Modelling output is based upon the Monte Carlo Analysis, with 10,000 iterations.

## PROJECT STATISTICS

Percentile	Project Cost Estimate (including risk contingency, £)
pmean	£781,027,412
P0	£761,829,696
P50	£781,834,816
P80	£784,614,144
P90	£785,956,288
P100	£792,537,856

CEC Contingency (based on P50):	£31,314,816
CEC Contingency (based on P80):	£34,094,144

## WORKSTREAM STATISTICS

	BASE ESTIMATE
Off Street Works Airport to Haymarket	£360,500,000
On Street Works Haymarket to York Place	£45,800,000
Utilities	£2,770,000
CAF	£62,400,000
Project Management	£279,050,000
Discrete Risks	£0
<b>Total Base Estimate</b>	<b>£750,520,000</b>

RISK	pmean	Total
Base Uncertainty Discrete Risk	£360,166,700 £685,528	£360,852,228
Base Uncertainty Discrete Risk	£43,158,330 £5,477,518	£48,635,848
Base Uncertainty Discrete Risk	£2,757,666 £4,434,468	£7,192,134
Base Uncertainty Discrete Risk	£62,400,000 £1,282,404	£63,682,404
Base Uncertainty Discrete Risk	£278,731,700 £1,675,749	£280,407,449
Base Uncertainty Discrete Risk	£0 £20,257,410	£20,257,410

Project Base Uncertainty	£747,214,396
Project Discrete Risk	£33,813,077

Project Base Estimate including pmean QRA Risk	£ 781,027,473
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Percentage Risk/Base Estimate	4.1%
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**Appendix C**  
**Risk Graph**

**City of Edinburgh Council  
ETN Infrastructure  
August 2011**



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**CONSTRUCTIVE EXPERTISE**

**FGOULD.COM**