Hugh Porter
Track Alliance

4000 word project report

Prepared by

……..
Hugh Porter
Candidate

Reviewed by

……..
Ernie G Boardman
Lead Sponsor

Prepared for Chartered Professional Review (2001)
Institution of Civil Engineers
Candidate's membership no 46852552

Issued 03/10/2001 Status Final

Report Summary - Track Alliance

I became Cost and Value Manager for Carillion's Track Alliance Contract with London Underground Limited in April 1998; I am now responsible for all commercial issues for three contractors. This role includes estimating and negotiation of Target Prices under the Option C Engineering and Construction Contract. Carillion has so far profitably undertaken £28m of track renewal works using this contract.

I maintained a commitment to Safety in the implementation phase through regular Planned General Inspections of worksites and through the facilitation of a number of Safety Forum.

I learnt with the client how to administer the contract effectively by developing;

- an early warning procedure and a system of filenotes to record agreement and not problems,
- a bespoke estimating procedure with my Estimating Manager that gives the client auditability of cost and comparability of cost build up with the programme.

I have developed and implemented strategies to reduce cost and mitigate risk

- optimising labour levels that increase productivity and use critical resources efficiently
- by incentivising subcontractors to achieve specific objectives
- through a new Shift Report design; this records shift output targets, records the causes of variance in output and tracks actions taken to prevent their reoccurrence
- through the design of a Health and Safety / Completion file. I have devised a format with a pre-determined structure that has a contents list that is signed off as information is placed in the file. This significantly reduces wasted effort and time taken and ensures everyone involved is aware of the specification requirements at the outset.

I have used independent judgement in assessing risk and opportunity in the settlement of complex events and issues.

Negotiation
I finalised the negotiation of a Deed of Variation in August 1999. This enabled the client to overcome short term budgetary issues, capping future costs, whilst Carillion gained from clear delivery objectives, the ability to release 90% of staff with immediate effect and allowed us the option to return at a later date.

In June 2000 I put together a proposal, based upon Carillion's experience with Railtrack, for a multi-party Alliance with a robust basis for collaboration and pooling of expertise. The client and the other contractors involved accepted this. We are still working on this basis.

Development
A key client objective has been to reduce the cost of track renewals. I studied previous reports and using my own knowledge and experience created a cost model that generates probable time and cost data from the outline project scope information. This is a significant improvement over the pre-existing rule of thumb approach for the assessment of new works.

Commitment
I have provided individual and general training on Commercial, Safety and Quality matters. Within the company I have worked on a cross-departmental working party to clarify how Actual Costs for Staff are derived and how they can be demonstrated to clients. As editor of the Business Group's newsletter I am encouraging people to develop themselves and to contribute to other people's development.

Outside of work I have been involved with the ALGS committee since 1999 and have assisted a school in Gravesend by developing their web site and supporting a 'Walking Bus' initiative.

Contents

Table of Figures

1 The Project

1.1 Background

In 1998 London Underground Limited (LUL) let separate Design and Build contracts to four companies to provide track replacement across their network. Contracts were to be for 3 years with the option of 2 years extension, had minimum annual values of £6.5m and were based on the Engineering and Construction Contract (ECC) Option C. This option is a Target contract with activity schedule; the activities in this case being short sections of the Employer's asset that require replacement.

The types of activity included the full replacement in both deep tube and open sections of concrete and ballasted track forms and points and crossings. A typical activity has a value of £1m, length 300m and duration 25 weeks, and in the first 18 months of our contract Carillion delivered £18m of work, referred to as the workbank. Due to the operational constraints of the working railway, most of the work is undertaken six nights a week between 00.30 and 04.30 when the current is routinely switched off.

LUL's procurement strategy, known as the Corporate Track Alliance Programme (CTAP), was designed to reduce costs and increase the productivity of replacement work. Contractors were given the incentive to manage risks by being entitled to a pre-determined share with the client of the difference between pre-agreed Target Prices and the Actual Cost of Providing the Works. This form of contract encourages innovation and collaboration and quickly provides resolutions to problems that cause delay and disruption. Previous contracts had been typified by initially low prices supplemented by further costs as contractors' entitlement to the consequences of scope and delivery changes were claimed. The uncertainty of the value and timing of final settlements disrupted the use of works budgets that are tied to government spending years.

1.2 Tender expectation

At the tender stage few of our team were familiar or experienced with the ECC Option C and the approach necessary to make it work. We also had little experience of LUL and were keen to build up credible reputation and experience.

Prior to this contract, I had been involved in tender teams for Option C contracts for the Stage 1 Channel Tunnel Rail Link work. I researched published reports and discussed with other people in Carillion the most important aspects of the contract. I briefed our bid team and put together our strategy that relied heavily on the work of the Reading Construction Forum. It was clear from Reading's own words the attributes that characterised successful alliances,

"One Team working openly together, with One Programme and One Budget, making the most of strengths of its constituent parts, to achieve clearly defined common goals in a spirit of mutual trust and co-operation".

1.3 Reality

This report is explains my role in making the contract a success.

It is a success as it came through stronger from a series of difficult times. There have been changes in the structure and ownership of the Employer, twice the Project Management team have changed and there has been funding challenges associated with ongoing delay to the Public Private Partnership (PPP) and the final costs of the Jubilee Line Extension project. At each stage in these challenges I have paid a pivotal role developing a solution.

Although well designed for producing engineering led solutions, the original contract did not fully recognise the over-riding importance to the Employer of predictable cash flow. Secondary issues were not dealt with such as how the effects of uncertainty in the Employer's budget and how areas over which the Contractor would have no real control, due to internal trading constraints, were to be resolved.

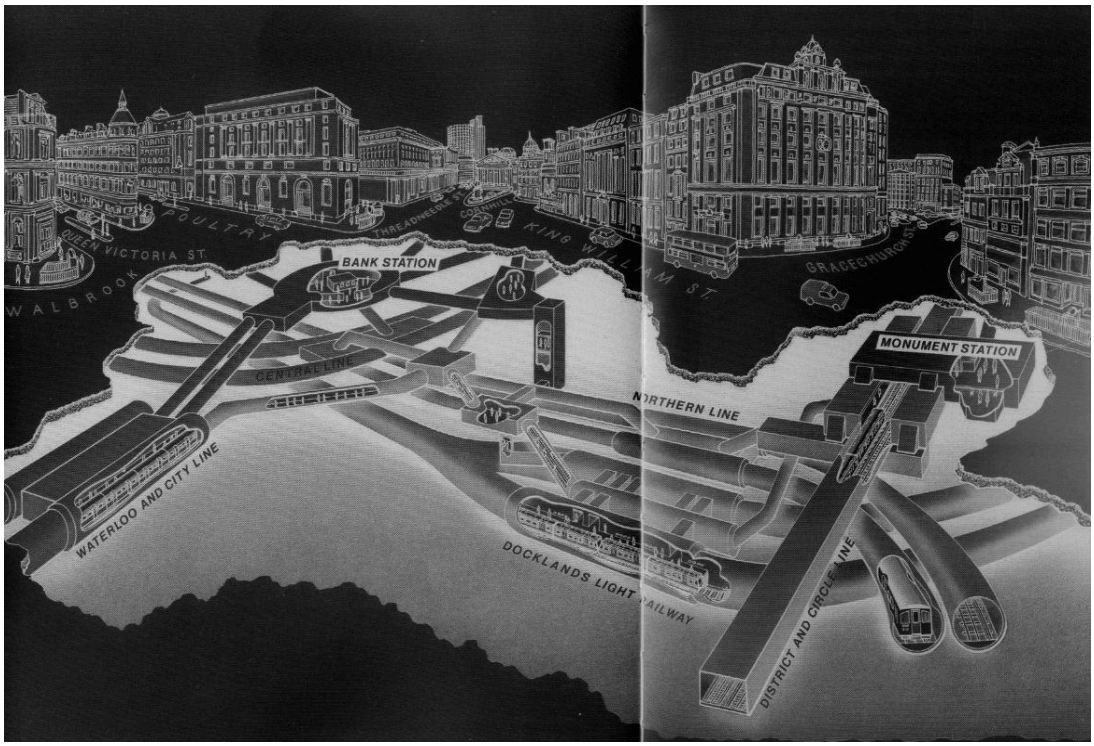


Figure 1 tunnel complex at Monument / Bank Station

It is easy to look at these issues with the benefit of hindsight to say they should have been considered and addressed more proactively. However, the issues are complex and ongoing. The challenges of making the system work together will form a major part of the move to renew London Underground's network over the next few years.

Post-Hatfield and in an environment with less focus on budget spending and more focus on step by step engineering analysis, risk mitigation and long-term planning, the lessons we have learned will be put to beneficial use.

2 Stage 1 – CTAP

Initially termed ‘Commercial’ Manager for Carillion within our bid team by the time of our tender presentation I had changed this to ‘Cost and Value’ Manager to reflect more clearly the role being undertaken.
I had reporting directly to me an Estimating Manager, two Construction Economists (aka Senior Quantity Surveyors) and a Graduate QS. In addition to managing the subcontract orders and monitoring costs of works done, my responsibilities included the on site preparation and negotiation of Target Prices for individual activities as they were notified to us. I in turn reported to the Managing QS for Carillion Rail based in Wolverhampton.

2.1 One team

Other companies awarded new contracts were incumbent contractors; with hindsight there were considerable drawbacks running in parallel old contracts, with the same 80 people ‘man marking’ each other, and new contracts promoting collaboration, openness and mutual understanding.

As part of the senior Carillion management team in a position to address these issues, I failed to recognise the effect this would have on morale within our team in our first few months. Early in 1999 I presented plans to the Alliance Management Team (AMT), formed of the Project Managers of each of the contract parties, to integrate teams and reduce our staff. Shortly afterwards we co-located - which was great for collaboration - but it only reduced some of the Client’s costs as each Contractor maintained most of their own staff thus duplicating roles.

2.2 Finite resources

It became apparent there were shortages of signalling resources and engineering train sets. This had a major impact on the way we were to approach the works, from a technical point of view and our tender assumptions, and in the capacity of the Contractors to plan a forward programme of works without the certainty of resource availability.

An early suggestion of mine was that we should have an integrated programme made available to the parties from which we could jointly, as a track delivery team, review and optimise limited resources, including track access. Regular and constructive Integrated Planning meetings took place. This produced one programme although a major weakness was that it was not always live as so many parties were involved in the production, it did not have contingency and risk details and it had little or no visibility of the activities of others on the network.

2.3 Knowing objectives

The Alliance Board, which had directors from each company and to whom the AMT reported, created an Alliance Charter to set out the aims and principles under which we intended to work. The merit of this was there were Directors' signatures showing the clear commitment of individual companies.

It was important that this message was clearly understood by all members of the team particularly on the nightshift. I arranged a Safety Forum to discuss the Charter and how we could make improvements in general. We produced project objectives as follows: -

we should provide the works together as one team

- Safely, with no unplanned disruption to the public
- working to programme as far as possible
- complete to the correct quality
- do more for less money
- no surprises – always be alert to issues and resolve them early

CORPORATE TRACK ALLIANCE PROGRAMME

PROGRAMME CHARTER

This programme will be underpinned by the spirit of alliance, with all parties working together to the ultimate benefit of London Underground Ltd customers, our stakeholder, and our people by adhering to the following principles and values:

Success derived from positive participation

Individual talent leads to team development

Relationship built on trust and communication

Timely and considered decision making a cornerstone of success

A positive approach to opportunities and problem solving

A Programme of continuous improvement

- Safety
- Quality
- Environment
- Technical excellence
- Process development
- Cost efficiency

We the undersigned, members of the CTAP Alliance Board and Project Managers, confirm our commitment to establishing these principles and values as the basis for the Corporate Track Alliance Programme.

Tarmac

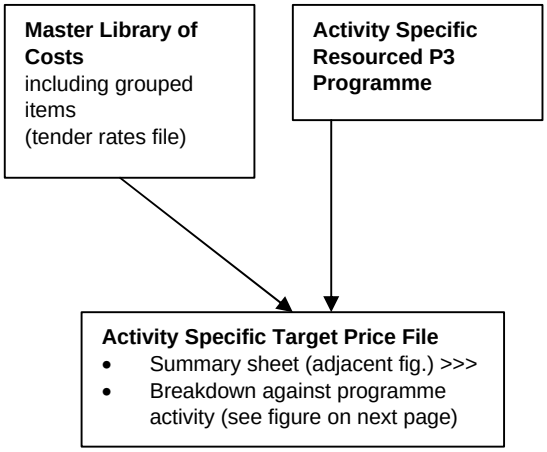
Andie Harper, Head of PMS
Alan Filby, Programme Director
Nick Van den Hurk, Programme Director
Rowan Sharples, Programme Director
Ed Wells, General Manager - Specialist Contractor
Mark Syrett, Programme Mgr.
Carl Ford, Project Manager
Mike Austin, Project Manager
Jim Boaden, Project Manager
David Smith, Project Manager
Peter McMahon, Passenger Services

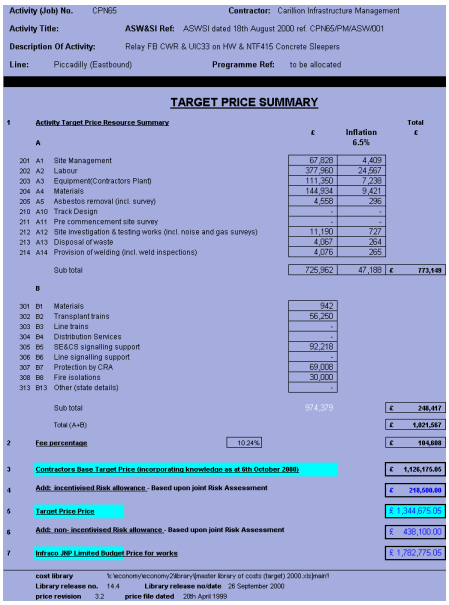
Figure 2 CTAP Alliance Charter

3 Approach and Deployment

3.1 Activity estimates

Our tendered resource rates, adjusted each year by our tender's inflation factor, were used to create activity Target Prices over the full three year contract period. In order to ensure consistency and clarity in our method of pricing I, together with my Estimating Manager, devised and created an estimating package in Excel that addressed fully the client's requirements under the contract. It tracked the origin and basis of rates and directly tied the price breakdown for each activity to its programme. It allows analysis of individual and groups of cost components against different scenarios for the consideration of value and risk.





Activity (Job) No. CPN65 Contractor: Carillion Infrastructure Management
Activity Title: ASW&SI Ref: ASWSI dated 18th August 2000 ref. CPN65/PM/ASW/001
Description Of Activity: Relay FB CWR & UIC33 on HW & NTF415 Concrete Sleepers
Line: Piccadilly (Eastbound) Programme Ref: to be allocated

TARGET PRICE SUMMARY

		Activity Target Price Resource Summary	£	Inflation 6.5%	Total £
	A				
201	A1	Site Management	67,828	4,409	
202	A2	Labour	377,960	24,567	
203	A3	Equipment(Contractors Plant)	111,350	7,238	
204	A4	Materials	144,934	9,421	
205	A5	Asbestos removal (incl. survey)	4,558	296	
210	A10	Track Design	-	-	
211	A11	Pre commencement site survey	-	-	
212	A12	Site investigation & testing works (incl. noise and gas surveys)	11,190	727	
213	A13	Disposal of waste	4,067	264	
214	A14	Provision of welding (incl. weld inspections)	4,076	265	
		Sub total	725,962	47,188	£ 773,149
	B				
301	B1	Materials	942		
302	B2	Transplant trains	56,250		
303	B3	Line trains	-		
304	B4	Distribution Services	-		
305	B5	SE&CS signalling support	92,218		
306	B6	Line signalling support	-		
307	B7	Protection by CRA	69,006		
308	B8	Fire isolations	30,000		
313	B13	Other (state details)	-		
		Sub total	974,379		£ 248,417
		Total (A+B)			£ 1,021,567
2		Fee percentage 10.24%			£ 104,608
3		Contractors Base Target Price (incorporating knowledge as at 6th October 2000)			£ 1,126,175.00
4		Add: incentivised Risk allowance - Based upon joint Risk Assessment			£ 218,500.00
5		Target Price Price			£ 1,344,675.00
6		Add: non- incentivised Risk allowance - Based upon joint Risk Assessment			£ 438,100.00
7		Infraco JNP Limited Budget Price for works			£ 1,782,775.00

cost library %:\economy\economy2\library\[master library of costs (target) 2000.xls]main1
Library release no. 14.4 Library release no/date 26 September 2000
price revision 3.2 price file dated 20th April 1999

Figure 3 a) Estimating files b) Target Price Summary Sheet

We were able as a result to quickly assess and adjust our plans for delivering works on the latest information available. Changes made to price and programme were transparent to all those involved.

340 Rerail & realign

Ref.	Code	SOP ref.	Description	Unit Cost	Waste %	No.	Shifts	Unit/ shift	Unit	Extension
341 Equipment										
54	psr	A03	PSR Rail Lifting Frame	£ 21.00	-	4	23	0.2	week	£ 386.40
40	iman	A03	Iron Man Lifting Frame	£ 22.05	-	4	23	0.2	week	£ 405.72
31	clamp	A03	Robel Clamp	£ 5.00	-	4	23	0.2	week	£ 92.00
57	rroller	A03	Steel Rail roller	£ 5.00	-	20	23	0.2	week	£ 460.00
420	cycloconv	A03	HF cycloconvertor (runs 2No tools max.)	£ 52.50	-	3	23	0.2	week	£ 724.50
419	bandsaw	A03	HF rail saw (band)	£ 59.50	-	2	23	0.2	week	£ 547.40
381	rotabroachdrill	A03	HF Rail Drill : Rotabroach	£ 47.25	-	2	23	0.2	week	£ 434.70
422	hfddu	A03	Diesel generator for HF tools, incl. fuel	£ 78.77	-	1	23	0.2	week	£ 362.35
373	RatchetJack10	A03	Duff Norton 10t Ratchet jack (516)	£ 18.75	-	8	23	0.2	week	£ 690.00
64	trolley	A03	Rail Trolley	£ 42.50	-	2	23	0.2	week	£ 391.00
508	u69drill	A03	HF Rail Drill : U69 check rail	£ 45.50	-	2	23	0.2	week	£ 418.60
679	kanary	A03	Kanary triple gas detector	£ 100.00	-	3	23	0.2	week	£ 1,380.00
421	hfcable	A03	HF extension lead	£ 4.55	-	20	23	0.2	shift	£ 418.60
342 Trains & personnel - see items 201 & 350										
343 Materials - rail										
621	FBRAIL3	B01	113A FB Rail BS11 Grade A [PMI LU3002/006]	£ 25.41	1.25%	1	1	37	m	£ 941.63
97	FTR1	A04	Trans Rail & fits, Str.	£ 943.00	-	2	1	1	each	£ 1,886.00
622	uic332	B01	UIC33 Check Rail [PMI LU3002/006] (already on site)	£ 30.42	1.25%	1	1	0	m	£ -
469	uic33_f	A04	UIC33 check rail - flared end	£ 232.10	1.25%	2	1	1	nr	£ 470.00
344 Materials - Baseplates & pads										
137	clip401a	A04	PR401A Rail Clip 906P1 (Temp use (clip & unclip))	£ 1.50	5.00%	1	1	864	nr	£ 1,360.80
427	VLASS_A	A04	Vic Line Baseplate Assembly (lett L0111)	£ 83.75	-	1	1	12	nr	£ 1,005.02
428	SCASS_A	A04	Schwihag baseplate assembly (lett L0111)	£ 77.05	-	1	1	256	nr	£ 19,724.80
345 Materials other										
193	tsfb	B05	S&E Cost: FB Train Stop (installed)	£ 3,015.00	-	1	1	0	nr	£ -
103	BJFB	A04	Benkler Block Joint, FB	£ 322.26	3.00%	1	1	7	nr	£ 2,323.49
413	BJuic33	A04	Benkler Block Joint, UIC33 rail, Tenconi	£ 192.00	3.00%	1	1	4	nr	£ 791.04
105	fpbhfb	A04	Fishplate BH/113AFB	£ 33.00	2.00%	1	1	2	pair	£ 67.32
468	fpuic33	A04	Fishplate UIC33 check rail (part no. 279P416)	£ 89.27	2.00%	1	1	6	set	£ 546.33
134	ckbolt	A04	Check Rail Bolt	£ 5.00	5.00%	1	1	12	nr	£ 63.00
346 Labour support										
176	pf_h	A02	Fitter	£ 20.43	-	1	23	8	hr	£ 3,759.12
347 Disposal										
92	ds033rl	A13	Dispose of rail (assumed 40% to be removed)	£ -	-	1	40%	22.52	t	£ -

350 Recover Scrap Rail

Ref.	Code	SOP ref.	Description	Unit Cost	Waste %	No.	Shifts	Unit/ shift	Unit	Extension
182	prmas_s1	B07	Protection Master (<10 hours)	£ 164.00	-	2	2	1	shift	£ 656.00
190	trmas_s2	B07	Train Master (10-12 hours)	£ 254.00	-	2	2	1	shift	£ 1,016.00
191	tos_s	B07	Technical officer (CRA)	£ 384.00	-	1	2	1	shift	£ 768.00
205	wtrain4	B02	Train, general purpose (type A)	£ 1,850.00	-	1	2	1	shift	£ 3,700.00
771	spic_s1	A02	SPIC 8 hour shift	£ 183.00	-	1	2	1	shift	£ 366.00
187	tg_h	A02	Leading Platelayer (Track Ganger)	£ 15.71	-	2	2	8	hr	£ 502.72
171	l1a_h	A02	Skilled operative /Concrete Finisher	£ 14.40	-	20	2	8	hr	£ 4,608.00
40	iman	A03	Iron Man Lifting Frame	£ 22.05	-	8	1	1	week	£ 176.40

4 Engineering Hours - Full Breakout/recondition

400 Break out screed and remove shingle

Ref.	Code	SOP ref.	Description	Unit Cost	Waste %	No.	Shifts	Unit/ shift	Unit	Extension
401 Main Sub-contract labour										
182	prmas_s1	B07	Protection Master (<10 hours) (10 shingle; 10 screed)	£ 164.00	-	2	20	1	shift	£ 6,560.00
771	spic_s1	A02	SPIC 8 hour shift	£ 183.00	-	1	20	1	shift	£ 3,660.00
187	tg_h	A02	Leading Platelayer (Track Ganger)	£ 15.71	-	2	20	8	hr	£ 5,027.20
171	l1a_h	A02	Skilled operative /Concrete Finisher	£ 14.40	-	10	20	8	hr	£ 23,040.00
301	fi	B08	Fire isolation - Piccadilly Line	£ 250.00	-	1	20	1	nr	£ 5,000.00
679	asmon	A05	Air monitoring: asbestos shift: RACU	£ 240.00	-	1	20	0.10	shift	£ 480.00
402 Trains & personnel										
364	note	A01	NB: (included in 412)	£ -	-	1	4	1	note	£ -
403 Disposal										
290	mdrain4_d	A13	Disposal for drain in '4ft', Tube	£ 14.42	-	1	1	196	m (track)	£ 2,826.32

410 Break out sleepers, exchange, formwork and concrete (incl. Con rail fettling)

Ref.	Code	SOP ref.	Description	Unit Cost	Waste %	No.	Shifts	Unit/ shift	Unit	Extension
411 Main Sub-contract labour										
182	prmas_s1	B07	Protection Master (<10 hours)	£ 164.00	-	2	65	1	shift	£ 21,320.00
771	spic_s1	A02	SPIC 8 hour shift	£ 183.00	-	1	65	1	shift	£ 11,895.00
187	tg_h	A02	Leading Platelayer (Track Ganger)	£ 15.71	-	4	65	8	hr	£ 32,676.80
171	l1a_h	A02	Skilled operative /Concrete Finisher	£ 14.40	-	24	65	8	hr	£ 179,712.00
301	fi	B08	Fire isolation - Piccadilly Line	£ 250.00	-	1	65	1	nr	£ 16,250.00
679	asmon	A05	Air monitoring: asbestos shift: RACU	£ 240.00	-	1	65	0.10	shift	£ 1,560.00
412 Trains & personnel										
202	wtrain1	B02	Train, remove spoil (type D)	£ 4,700.00	-	1	8	1	shift	£ 37,600.00
202	wtrain1	B02	Train, remove spoil (type D) (1 contingency)	£ 4,700.00	-	1	2	1	shift	£ 9,400.00
190	trmas_s2	B07	Train Master (10-12 hours)	£ 254.00	-	2	10	1	shift	£ 5,080.00
182	prmas_s1	B07	Protection Master (<10 hours)	£ 164.00	-	2	10	1	shift	£ 3,280.00
191	tos_s	B07	Technical officer (CRA)	£ 384.00	-	1	10	1	shift	£ 3,840.00

Figure 4 b) Target Price breakdown against programme items

3.2 Programme delivery

I played a significant part in delivering the main programme of works within ‘budget’ and on time.

3.2.1 Supply chain

The following table shows the projected spend and price risk for key components of our anticipated cost.

Item	% spend	Price Risk of unforeseen increase over 3 years
LUL Internal Services	25%	None – Actual Rates used as instructed
Labour Subcontract	35%	High – if resource costs not fixed
Domestic Subcontract	15%	High – if resource costs not fixed
Staff Costs	10%	Low – as under our direct control
Material	9%	Low – actual LUL supplier cost falling
Equipment	7%	Low – many suppliers, could buy own

Figure 5 Cost source and risk of change over three years of contract

A 10% increase in labour cost above our inflation figure could offset any profit we might earn. To reduce our price risk we signed up three year fixed price agreements with key subcontractors. I also wanted to include incentives into these orders such that we focused subcontractors' efforts into achieving the overall project objectives; as achieving these would be beneficial to everyone.

None of the sub-contractors, with whom we discussed incentives with initially, were willing to take on board the risk that they could lose some of their profit if they failed to meet targets ('pain') although they were more willing to accept the 'gain' principle where they exceeded targets.

I subsequently developed the labour supply subcontract order to provide a reward of 10% of our saving share if that subcontractor achieve three basic quality thresholds; these were on accident frequency, availability of skilled resource on demand and achieving pre-determined milestones. We calculated that solely by achieving the thresholds the scheme would be self-financing.

3.2.2 Subcontracting activities

In order to deliver the peaks of our workbank without over stretching our own resources, we identified two activities where we were able to subcontract the whole delivery operation to a dedicated team.

In one case at Morden, which involved the replacement of four points and a crossing (otherwise known as P&C), over the Easter Bank holiday weekend, our wholly owned subsidiary company Centrac were willing to undertake the work and had the necessary expertise to do so.

We had already agreed a Target Price with the client for undertaking the works at Morden. Centrac were asked to quote a price for managing and delivering the same scope of works. Their lump sum price for the labour and equipment element, minus a profit margin, matched our own Target. Centrac's need to earn a fair profit and our need to incentivise Centrac to reduce the overall activity price meant that we had an opportunity to agree terms that were beneficial to all parties.

Figure 6 Removal of track slab at Morden activity – Easter weekend 1999

Thus was my opportunity to introduce incentives in the supply chain. I offered 75% of the Carillion share of savings on the whole activity to Centrac, as a means by which they could earn their profit, with a counterbalance that they would pay 25% of our share of any excess cost. To share a proportion of our fee with Centrac would not have been enough encouragement for Centrac or sufficient reward for us. The client was not disadvantaged and there was a greater probability of savings.

From Carillion's point of view we were able to undertake an additional £1m worth of work over one weekend without compromising our other work in hand. The end

result was a very successful delivery of a complex activity to the satisfaction of all parties.

3.2.3 "Super-sites"

Using knowledge which we built up showing where unplanned costs and delays to works occurred, we formulated strategies to reduce our reliance on critical resources.

At Earl's Court Station we had been allocated three adjacent activities. The delays as a result of cancelled or unavailable engineering trains were not as marked there as at our other sites. On comparing our Actual Costs against the Target Price I noted we were more productive and flexible when we increased labour on a site and reduced our reliance on Engineering Trains. The cost per metre of completed track was thereby reduced and this was the origin of "Super-sites". As output per night increased, the activity duration decreased along with demand for some critical resources.

The determining factor is not just whether we saved money and time by using labour in place of a mechanised train; waste material was carried manually via station lifts to be transported away by road in pick-ups. The overall manual handling was reduced as a number of lifting operations was eliminated. Another advantage of the Super-sites was that operational management and logistics co-ordination could be improved by having fewer and more concentrated places of work where it was safe to do so. They had the added benefit of enabling better intervention and risk control into an otherwise fairly loose night-time organisation.

3.3 Change control

The Engineering and Construction Contract introduces a form of contract change procedure triggered by defined events known as Compensation Events and compels both parties to raise early warnings and resolve issues quickly that may affect cost, time or quality - whatever may have been the cause. This should include those issues normally picked up as part of the Quality Assurance system.

I recognised that as a team we all need to have a thorough understanding of our contractual obligations and what they are intended to achieve. Furthermore, I also wished to ensure that we should use this to enable a quick response and resolution without unnecessary bureaucracy.

To achieve this understanding, I arranged for an expert to give a presentation on the contract after which I presented tutorials explaining our site procedures, using a flow chart to highlight individual responsibilities.

A key principle was that we should record clearly not just the problem but also the agreements reached. In the case of meetings attendees are instructed to draft out filenotes recording agreements made and to circulate them appropriately. Technical Query sheets are draw-up after discussion with a client's representative and where possible, the responses completed at that time.

Early Warning
I arranged that a formal Early Warning meeting should take place every Friday. A couple of days before this, we passed over our early warning file to allow for it to be studied and any clarification or further substantiation requested prior to the meeting. This speeded up the process making meetings more productive.

I did not want us to focus just on Compensation Events but also to record our own deviations from planned work as required in our quality system's non-conformance procedure. These are both changes from the original plan and as such, lend themselves to be monitored in an integral fashion.

Figure 7 Bank Branch – shows use of motorised trolleys (a first for LUL) and precast concrete units prior to placing reinforcement and pumping concrete

Diary sheet based on planned, actual and variance analysis.
It is necessary for everyone to be familiar with the programme of works. This is not just the main programme outline such as 'two platelayers gangs will realign 200m of track in 10 shifts'. In order to meet the programme the more specific shift target, that 'two platelayer gangs in this particular four hours will realign track on 50 baseplates (i.e. 25m of track)', must be known and relayed to the people on the ground.

I devised a new diary sheet to achieve this. This was used for our Bank Branch Improvement works; this 9 week closure of a section of the Northern Line involved working 24 hours a day in 3 shifts – at its peak, we employed 250 men a day.

The diary sheet was structured to ensure the Supervisor in charge

1. determined and recorded what they planned to achieve
2. recorded what they actually achieved
3. recorded any unplanned work or events
4. recorded the causes of variance and what action was taken to prevent reoccurrence

These sheets worked well and we now have a clear record of what it was achieved, how it was done and any lessons learnt.

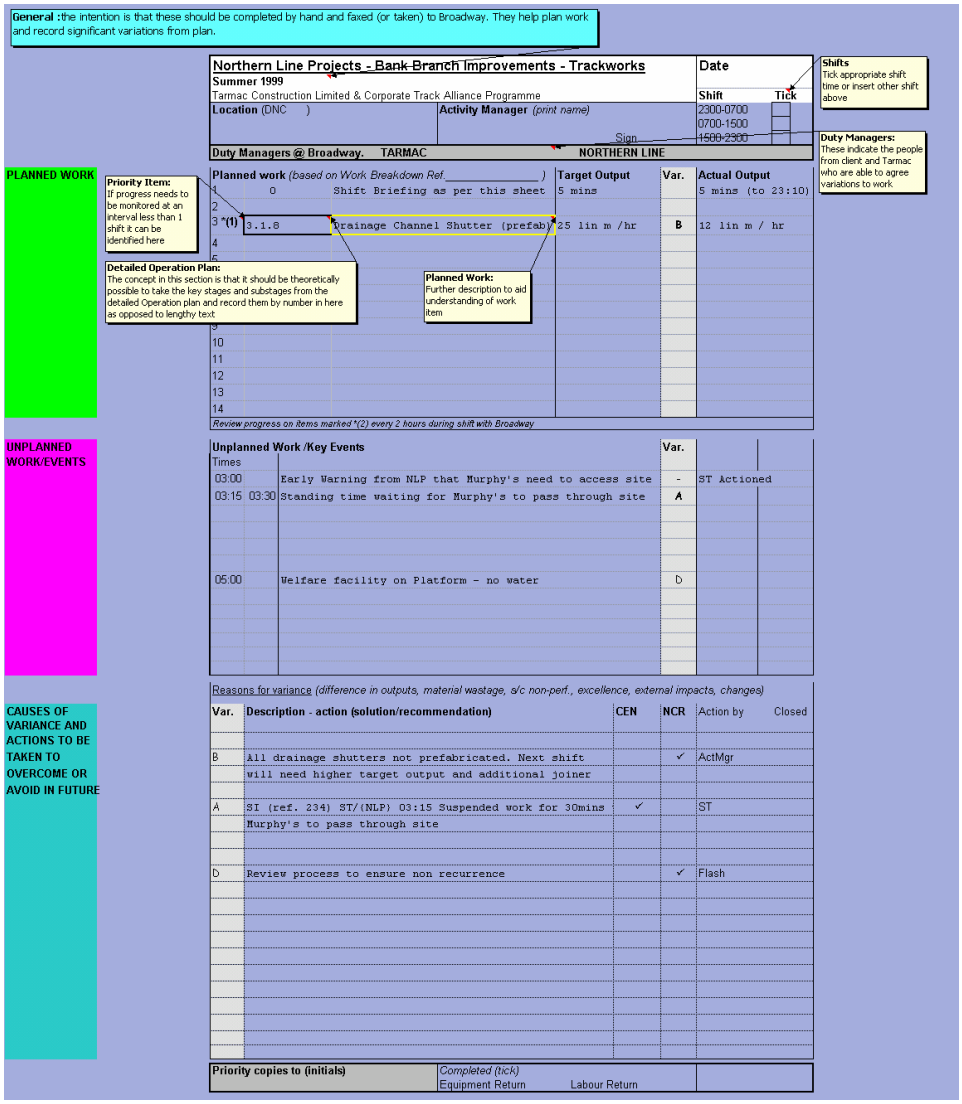


Figure 8 New format diary sheet, annotated with guidance notes

3.4 Activity completion handover files

My previous experience with Carillion on the Jubilee Line Extension had taught me that it was important that the output requirements were determined at an early stage and that all evidence of compliance to these requirements must be collated in a systematic manner.

List of Contents

Section	Contents	Items Outstanding	Action
	Revision History		
1.0.	Design Statement		
2.0.	General Description of Works		
3.0.	F10 Catalogue & Approvals		
4.0.	Design/ Modification Criteria of Structure/Location		
5.0.	Details of Principal Materials & Components		
6.0.	COSHH Information		
7.0.	Work Undertaken/Construction Methods		
8.0.	Demolition Considerations		
9.0.	Operation & Maintenance		
10.0.	As Built Information - Construction Drawing Register	Mark as built	
11.0.	As Built Information - Other Drawings	Mark as built	
12.0.	QA Documentation		
13.0.	Emergency Fire Fighting Equipment		
14.0.	Other Services		
15.0.	Appendix A :		
16.0.	Appendix B :		
17.0.	Appendix C :		
18.0.	Appendix D :		
19.0.	Appendix E :		
20.0.	Appendix F : On Site Weld Reports Weld Location Diagram I&T Reports		

Figure 9 Part of handover file list of contents (Health and Safety file data)

The Design Manager and I agreed and prepared a process and format for the handover files which was agreed prior to work commencing on each activity.

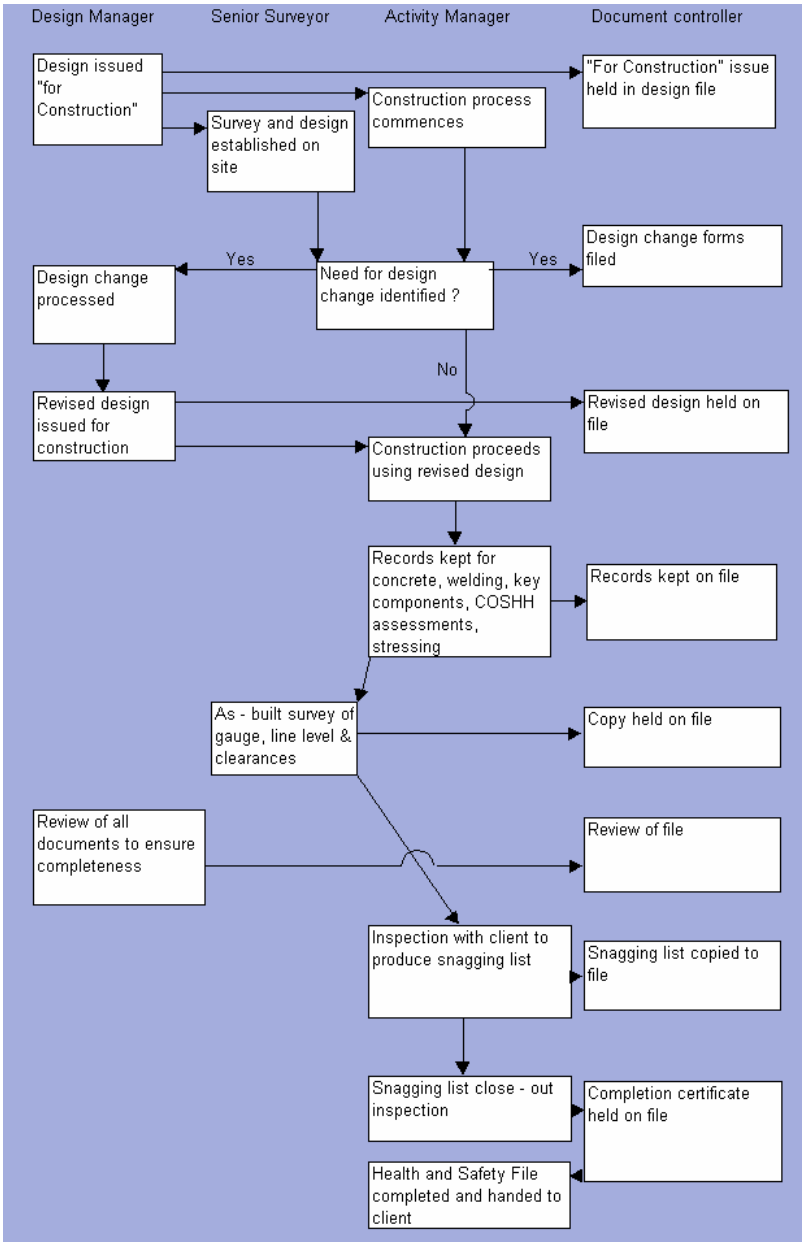


Figure 10 Schematic of process for Health and Safety file data collation

The main list of contents highlights whether information is outstanding in any section. The section contents list identifies precisely what information is required. The Activity Manager initials this detailed list when each data item is inserted in the file. The effect of this is to enable anybody picking up the file to known its status immediately obviating further time consuming checks and error.

4 Understanding Cost and Value

The Engineering and Construction contract defines a number of terms related to cost and value. It is in order that these are understood in the context of the next section that I have summarised the main terms: -

1. The price, or value, of an activity is equal to the agreed Target Price adjusted by the value of Implemented Compensation Events.
2. Actual Cost is the '*amount of payments due to subcontractors…. and the cost of components in the Schedule of Cost Components for work which is not subcontracted, less any Disallowed Cost*'.
3. The amount paid to the Contractor is the '*Actual Cost… plus the Fee*'.
4. Disallowed Cost is straightforward and relates to cost that is :-
    - not used to Provide the Works,
    - unjustified by records or are not in accordance with subcontract orders,
    - for correction of defects after completion,
    - unreasonable wastage of materials and plant
    - as a result of not giving an Early Warning which could have been given.

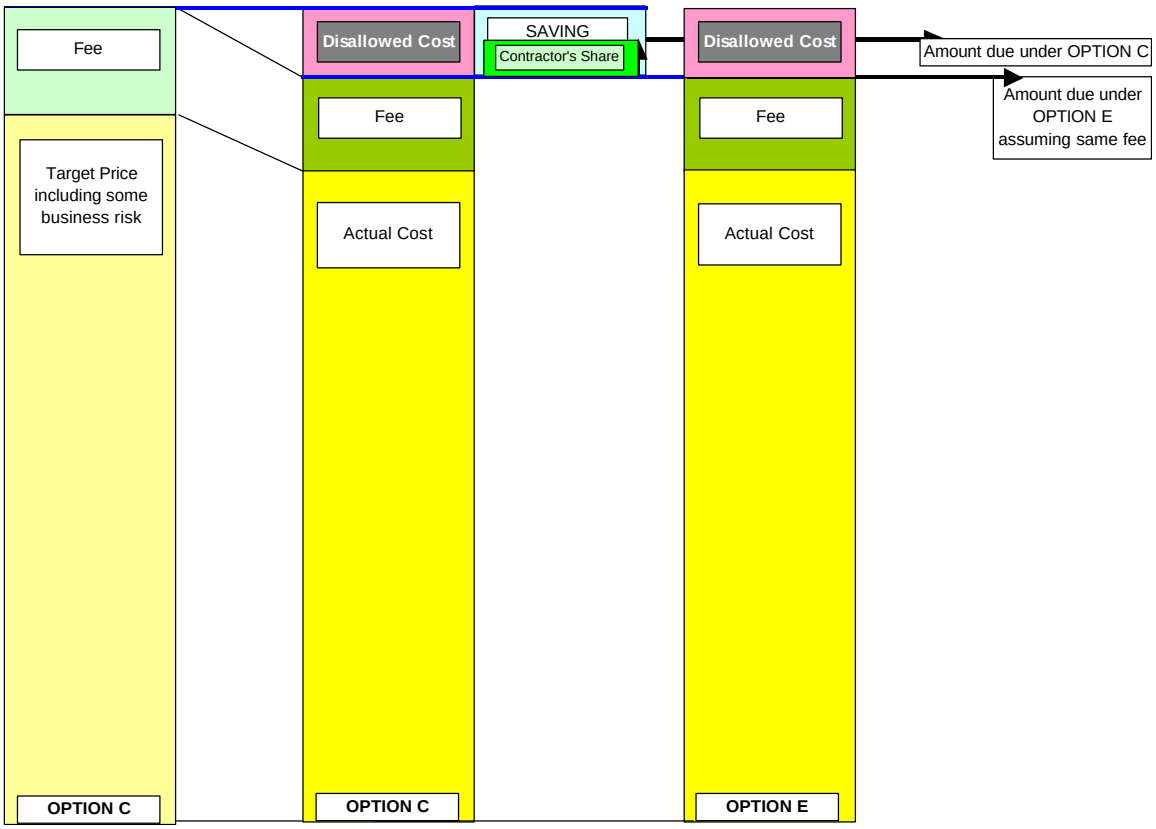


Figure 11 Option C Target Price -value (left-hand column) compared against amount paid to contractor under Options C and E (middle and right columns respectively). Note: There may be no Disallowed Cost.

I made Actual Cost straightforward to determine; through subcontracting work as far as possible and ensuring materials and equipment were purchased or hired externally and through the use of purchasing cards.

Monitoring of **subcontract** costs was done with spreadsheets tracking Target allowances against planned and actual used resources up-dated daily against the live Accepted Programme for the contract. This gave an early indication of any deviation from the Target Price in time to take remedial action.

Figure 12 Bank Branch - photograph showing section of track completed with concrete pump still in place in use on another section

Example – Bank Branch

The graph, on the next page, shows the position of actual labour expenditure against the baseline price on the Bank Branch activity mid way through the closure period. We made a paper saving of £50,000 on the labour component of the Target Price by negotiating reduced rates with our subcontractor for these works. I was concerned that there was a high risk to the project if, for any reason, we were unable to maintain the commitment of the workforce for the full 8 weeks. I, together with our Construction Manager, devised an attendance bonus to be paid out to those people who worked all the shifts required of them. The details of this were agreed in advance with the client and the subcontractor order was modified accordingly. We had therefore put into place a risk mitigation measure at no addition cost to the client. The activity at the final account produced a net saving to both parties.

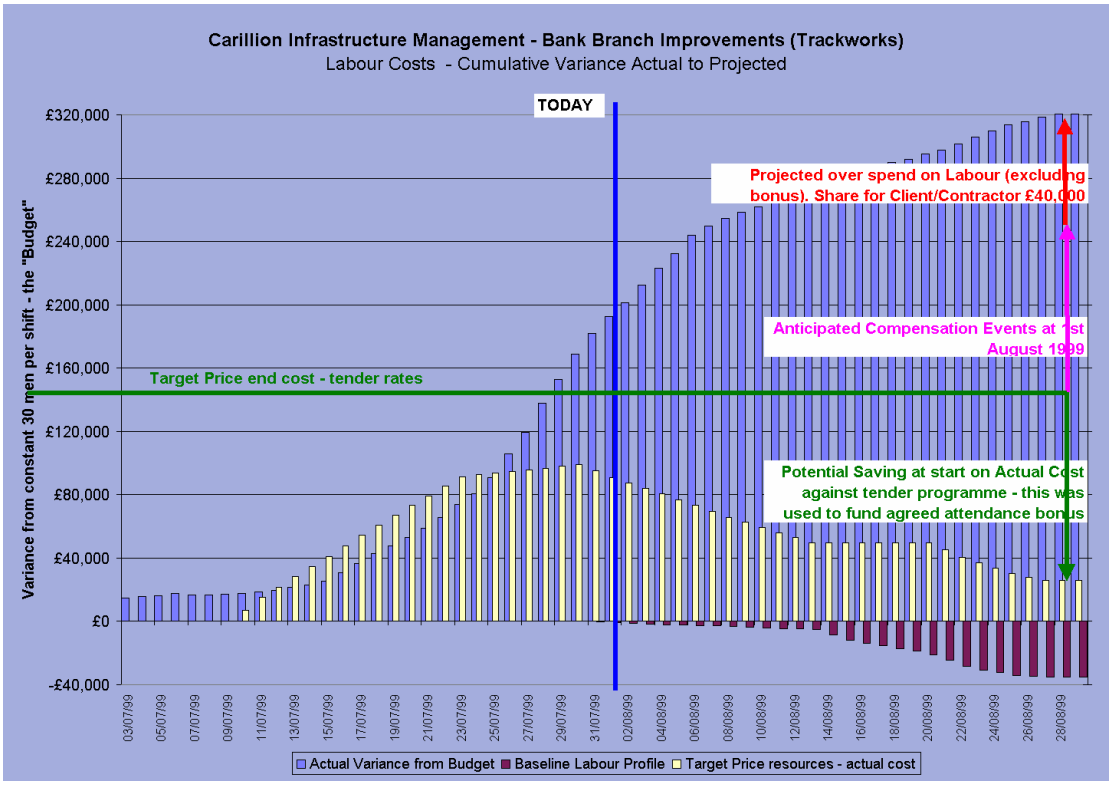


Figure 13 Bank Branch monitor of actual and projected cumulative labour costs' variance from budget and Target Price data

Monitoring of **material** cost was done firstly by checking quantities and prices of orders directly against the Target Price breakdown and then later on site against the tender wastage allowances.

Equipment use, and therefore cost, was reasonably static and manageable. The main risk of having an unrecoverable cost results from excessive loss or damage to equipment. These are events for which the contract requires the Contractor to carry insurance and are therefore deducted from Actual Cost.

Remaining issues are Actual Cost for **staff** and **establishment** and **Disallowed Cost**. The recovery of staff (or 'People') cost using the Schedule of Cost Components did not directly equate to the cost of staff defined by Carillion's head office ("Site Cost"). It became clear that it was necessary for staff cost constituents to be understood at every stage of a contract to ensure that: -

- a robust and straightforward 'open book' approach is possible
- there are no misunderstanding or surprises between client, head office and the project team
- full recovery of real cost, overhead and profit is possible whether this is in the fee or Actual Cost
- the site team can track the real value of the works to their company

To understand and monitor performance of the cost constituents it necessary to know

- the whole cost of employing staff
- which costs will be charged for staff by Head Office
- which costs are chargeable to the client
- how the fee is constructed in the tender
- what are the risks of only partial recovery of cost elements that are deemed to be in the fee
- how staff cost and value should be monitored and reported.

Furthermore it is necessary to assess the impact on company profit and loss as a result of changes in the law or adjustments in internal costing or remuneration processes. Option T of the Engineering and Construction Contract allows for a Compensation Event where there are changes in the law (e.g. the implementation of the Working Time Directive in 1998).

The above data in Carillion were not readily accessible, as the form of cost derivation was radically different from recent company practice. I became involved in a group of four people providing a wholesale reappraisal, and proposing changes, to the process by which we report and charge costs within the company.

Fee Percentage and Monitor

Description				Assumed Net Cost		Tender Fee make-up	Actual Net Cost	Work group code	Value - actual/ assumed	Monitor against tender sum
				£18,000,000			£12,000,000			
Standard Definition										
Overhead (including HO people outside WA)						4.50%		n/a	£540,000	£0
Profit						3.50%		n/a	£420,000	£0
Other Non Reimburseable Items/cost	**base value**	**@**	**yes/no**							
Cost of events contract requires to be insured			no	£70,000	0.39%			p7	£45,000	£1,667
Other sums recovered from insurers (GR equiv)			no	£10,000	0.06%			p7	£3,000	£3,667
Legal fees			no	£0	0.00%			p7	£5,000	-£5,000
Insurance Premium - ELI on s/c labour	£5,580,000	4.75%	no	£265,050	1.47%		£3,960,000	p6	£188,100	-£11,400
Insurance Premium - CAR	£18,000,000	0.70%	no	£126,000	0.70%			p6	£66,000	£18,000
Liquidated Damages anticipated	£18,000,000	0.30%	no	£54,000	0.30%		£12,000	p5	*£12,000*	£24,000
Pain/Gain assumed at tender	£18,000,000	-1.00%	no	-£180,000	-1.00%		£60,000	p5	*£60,000*	-£180,000
Abnormal Defects Pre Completion			no	£10,000	0.06%			p5	*£8,000*	-£1,333
Defects after Completion			no	£25,000	0.14%			p5	*£10,000*	£6,667
Unrecovered People costs (not cost)	£1,800,000	2.30%	no	£41,400	0.23%			p4	£29,040	-£1,440
Unrecovered People costs (as WAO recovery)	£1,800,000	11.81%	no	£212,500	1.18%		£152,267	p3	£152,267	-£10,600
Working Area Overhead recovery in cost	£1,800,000	11.81%	-	-£212,500	- 1.18%		£1,320,000	p1*WAO	-£155,833	£14,167
Labour only S/C Fee	£5,580,000	11.00%	yes	£613,800	0.00%	2.34%		p2	£0	£0
Total Fee						**10.34%**				£1,240,967
						Difference recovered fee to actual cost in fee				**-£141,607**
									change in profit	**- 1.18%**

Figure 14 Table indicating what allowances may be considered for inclusion in fee and therefore require to be monitored

The understanding of what is in a fee is particularly important. Our fee is intended to recover the following:

profit + overheads + disallowed & unrecoverable costs

The figure provides an example of the types of cost that are not reimbursable in Actual Cost and therefore form part of the fee. The whole site team needs to be aware of the consequence of any decision that they make. The client, and his auditors, expects there to be clarity in cost. I therefore allocated a 'Work Group' code for every element of cost on the goods received ledger, whether recoverable under the contract or forming part of the fee, to provide that clarity.

The systems I have devised for tracking and understanding these issues are now being used elsewhere in the company.

5 Stage 2 – Infraco JNP Limited Track Alliance

The Corporate Track Alliance Programme has now become the Infraco JNP Limited Track Alliance as a result of changes brought about through the government's Public Private Partnership strategy.

I was involved in the process of creating a new Alliance of three companies and Infraco JNP Limited that allows the potential pain or gain arising out of the individual works contracts to be pooled together and shared equally. The net result is that there is incentive to work together within an integrated management team to achieve results.

I am currently coming to the end of a process of negotiating terms to enable the contracts to be extended for a further year. This has brought with it new opportunities to further improve the way we work and to address issues that have arisen as a result of the reshaping of London Underground Limited.

5.1 Value benchmark

As part of the process of integrating the teams we now have amassed a wealth of information and expertise on undertaking track renewals. I have used this information to develop model that will provide an estimate of the cost and time of undertaking bespoke solutions.

Core Site Data		Core Paramters	
Length of running rail	200	Av shift rate	£128
Recon length	176	rail m per train	200
Spacing of NTF415 (m)	1.015	if check minus	25%
% NTF415 at this spacing	50%	rerail m per shift	65
Spacing of NTF415 (m)	0.505	SE&CS trainstop visits	3
% NTF415 at this spacing	50%	m pipeline/shift	200
Number of NTF415s	263	Fire isolation cost	£150
Check rail (Yes/No)	1	Compressor Survey	£15,000
% in check rail	50%	Site Service/shift	£1,000
greaser	1	Fee	9.89%
FTR	1	FBO per shift	2.75
Trainstops	2	inflation	8%
Compressor	1	concrete waste	20%
Meters of Compressor pipe	1400	unit price adebof	£600
Design severity	1	Vsection sleeper	0.04
x-section drainage	0.36	FBO depth	0.50
m3 drainage ballast	72	PBO depth	0.25
thermit welds	8		
shifts	144		
% con rail fettle	10%		
Fire isolations	1		
Fire isolations shifts	80		
Protection Masters required per shift	1		
FBO	1		
Compressor survey required	1		
start	18/09/2000		

Outputs		
Price per metre	£5,103	incl fee
Shifts per metre	1.4	
Cost (,000)	£985	ex fee
Weeks	24	
end	*04/03/2001*	
Cost (,000) FEE	£1,083	incl fee

Figure 15 Input variables and parameters for tube renewals cost and time model

The model also allows the team to assess the benefits and risks associated with alternate strategies in a systematic manner. One particularly useful output are figures that can be used in an assessment of the cost benefit of a fully compliant design against a sub-optimal, but otherwise satisfactory, design solution.

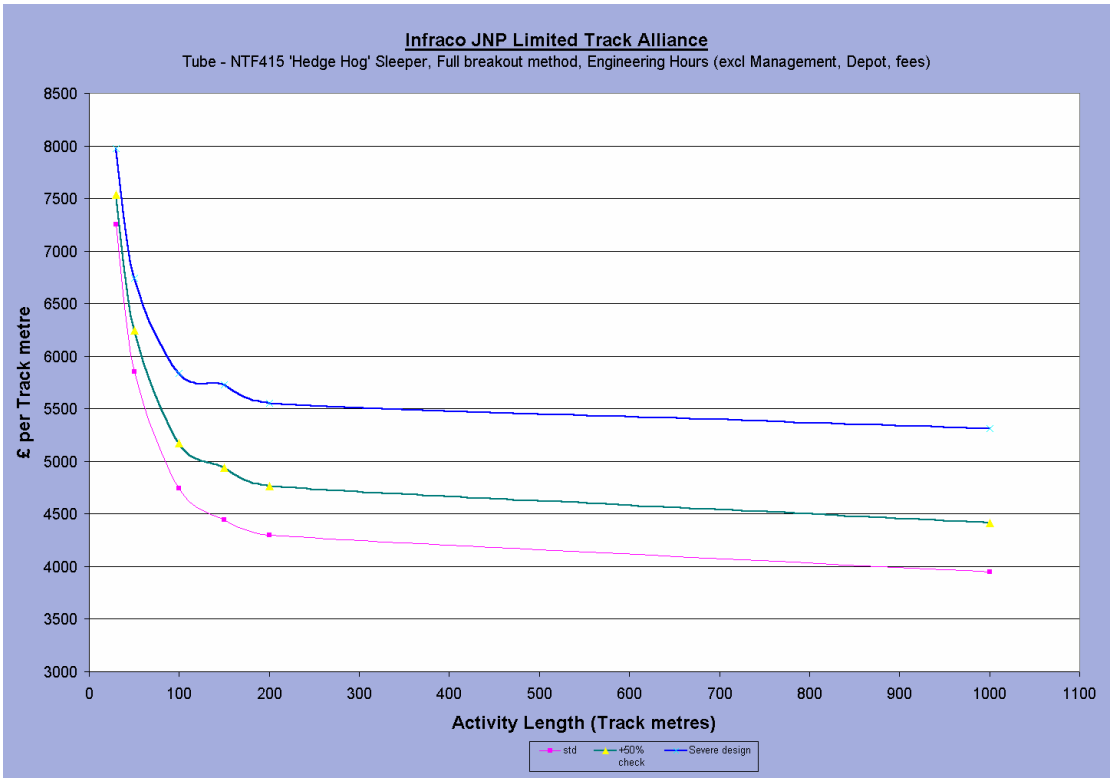


Figure 16 Output of estimating model indicating relative costs of solutions

6 Professional and personal development

I have maintained a commitment to my ongoing professional and personal development whilst being involved with London Underground Limited's Track Alliance programmes.

Since 1999 I have been involved organising evening meetings, courses, events and visits as part of the Institution of Civil Engineer's Association of London Graduates and Students committee. I have gained considerably from this in my contact with the London Association, contact at Presidential visits in discussing the structure and challenges of the industry.

I have also helped promote civil engineering, sustainability projects such as the Walking Bus initiative and Internet communication through my support of an infant school in Gravesend. This has provided me with an insight into the difficulty in achieving short-term sustainable success in the uptake of simple and practical solutions.

(3990 words)