

Financial Management and Planning (ACPA7002)

Assignment 2

The Replacement of Tunnel Civil Engineering's Current Head Office Stores Yard at Silverton House with Separate Plant Yard

Capital Project Appraisal



Simon Shuker - July 2023

University of Wales – Trinity St David

Supervisor: Howard Davies



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1. Introduction and Overview of the New Yard Project.

Introduction.

It has long been recognized that Tunnel Civil Engs organic growth has exceeded the capacity of the existing premises at Silverton House. In order to make better use of the existing premises, and to allow greater operational effectiveness, allow for future growth, and to base the newly sanctioned 'Tunnel Plant' division, we are proposing a second Operating Centre to be developed, built, and operated by Tunnel CE. The proposed Project has evolved through discussion at Directors, Shareholders, Operational Board, Health and Safety Board, and Workforce Consultancy Committee level, comprising the following:

The purchase of new land opposite the existing Silverton House entrance, adjacent to the A38, for the development of a logistics and materials yard, and operating yard, for the new Tunnel Plant and servicing operation.

As the proposing team for the Project, led by myself, we recognize that this Project will :

- bring a range of innovative changes to the way Tunnel Civil Engineering works and operates,
- add considerable value to our Client offering with the realization of a self-operating fleet of transport, operational and specialist vehicles currently hired by us, or leased and at the end of their current leases. This move is (at least) cost-neutral to Tunnel
- raise productivity considerably by allowing more efficient operating space and organization
- potentially allow Tunnel to become the best performing operational team within the Devon Council workstream
- Represent an broad intervention by Tunnel which will successfully remove the restrictions to growth, diversification and innovation within all of Tunnels activities.

Rationale of General Assessment for the Project.

In general we have followed a strong and wide rationale of study to get to this point, select this project over others under consideration, and then examine this project in more detail to satisfy ourselves, as the proposing team, that this proposal to the Board is the correct one.

Following the lead of Samset (Ref 1), who notes: *"Experience suggests that our possibility to make major amendments is at its highest in the earliest stages of a project while at the same time the cost of making the right decisions is low"*, the basic content of the scheme has been carefully limited to only include elements of high confidence and low risk in our study. Although this is not an exhaustive list of what was studied, the general rationale we have followed has included the following considerations:

- Are we confident that the claims of the engineers, designers, consultants or architects are valid?
- Is the project feasible technically? – and are there any remaining technical risks?
- Is the Project Work the financial returns are based on secure in nature and likely to provide (at least) the returns and profits noted in our cost analysis (see Appendices)
- Are there any environmental implications – especially any that might contradict the interests of, or our commitment to, one of our largest Client, the Environment Agency?
- What are there any implications for Tunnel staff?
- How confident can Tunnel be that the self-delivered access and development can be achieved to the timescale proposed?
- How confident are the Proposing Team on the costings show real costs?
- For the machinery and process plant hire, are the expected operating costs accurate?

- Is the project pricing strategy the optimum one ?
- Are there commercial risks, to internal sources of funding of other calls on the company?
- Is the return on our internal investment going to be adequate?
- Have the intangible benefits been evaluated fully, as well as the tangible benefits?
- Would any feasibility studies from external experts give higher confidence in any areas?

(Ref 2).

We are aware of the common problem of early-stage underestimation of project costs and risk (Ref 4). Combined with the over-estimation of opportunity and an incomplete assessment of available skills, this can allow serious errors at the front-end of project planning and assessment. We have ratified the estimation of costs (Appendices 2 and 3) and the programme has been confidently built and checked. This team will retain ownership of the scheme throughout the development stages.

The overall conclusion made by the Project Team is that the New Yard proposal should proceed to proposal to the Board for adoption.

Operational Considerations for Tunnel Civil Engineering.

With all projects such as the New Yard, there is a high potential for disruption to operational work, management time and administration resource that will be taken up, or at least partially distracted, by any project chosen to proceed. The other options no longer under consideration have been dropped as they offer considerably more disruption to our operations or lower overall - not just financial-benefit.

It is vital also to consider the following reasoning in the project/s proceeding, or not.

- The scheme involves a change and improvement to the way Tunnel will operate - we will be further consulting all sections of our workforce on the working changes, travelling times, logistics of equipment, the delivery of operational supplies and materials, and the dispatch of operating Tunnel teams from the proposed new premise choices.
- Considering complete business continuity, during construction, and once in place.
- We will consider the impact of the schemes on our neighboring businesses
- We will be considering the Health and Safety changes to ourselves, and with others

Financial Assessment of the New Yard Project.

The financial assessment is covered in the Board presentation – the results of the modelling are noted in the conclusion of this report.

The Established financial models – critical analysis.

Payback period.

The Payback method is simply the length of time the project incomes pay back the cash outflow for the initial investment. The decision rule is for a business simply to set a maximum payback term, inside which the original investment is repaid. Effectively, the shorter the payback, the more desirable the project to the business. This is a simple method, it offers insights into liquidity in the business, and is important to establish this so that further projects can be planned. However, the method has its limitations:

- The method does not recognise inflows after the payback date
- The timing of the cashflow is ignored, as is other relevant information
- Easy to understand but offers less insight than NPV, discussed later.
- There is no accounting of the risk levels of volume of investment at similar Payback periods
- No relation to shareholders wealth, only indicating initial investment IS paid back, and when
- The time value of money isn't considered, nor is the profitability involved.

Generally, Payback is a useful tool to a quick assessment on the impacts of projects on the business, and inside 2 or 3 years. It is important that payback isn't used as the only tool, but it is useful for a quick and preliminary screening of a project's suitability. Its important to look further into other tools such as PI, IRR, NPV for a more complete assessment.

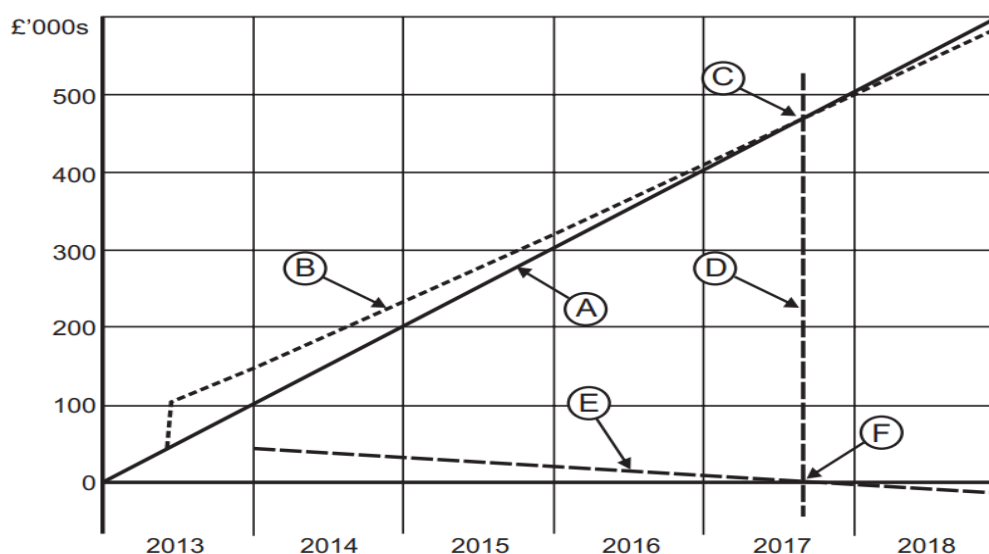
An example of payback shows graphically where a boiler replacement is assessed (Ref 2). Here taking into account savings in maintenance and fuel, new and old are combined. The payback of the new is demonstrated on the Figure 6.2, Curves A and B cross at point C, where the investments are outweighed by the savings, shown by line D. The cumulative cashflow, change from neg to positive, shows at point F—the same point.

Year	2013	2014	2015	2016	2017	2018
Existing system:						
Fuel	90	90	90	90	90	90
Maintenance	10	10	10	10	10	10
Annual cash outflows	100	100	100	100	100	100
New proposal:						
Capital cost	60					
Fuel	85	80	80	80	80	80
Maintenance		6	8	10	10	10
Annual cash outflows	145	86	88	90	90	90
Saving (loss) if the new plant starts up on 1 July 2013						
Annual cash saving (loss)	(45)	14	12	10	10	10
Cumulative cash saving (loss)	(45)	(31)	(19)	(9)	1	11

Note: All figures are £'000s

This tabulation of simple cash flows predicts break-even during 2017. In other words the payback period is between four and five years.

Ref 2



There are two different methods combined on these axes. Both predict the payback date more precisely than the tabulation in [Figure 6.2](#).

Ref 2

Net Present Value/Discounted Cash Flow.

Net present value is the addition of the discounted values of the net cashflows from the scheme. This method recognises the 'time value of money', and the importance of the timing of investment on returns. A positive NPV shows an enhancement to the business' wealth, and the higher the NPV, the more attractive the scheme. The NPV is easy to use and provides clear signals. The NPV is either applied using a 'discount table' using a chosen discount rate, – see Appendix 1 – or there is an 'Excel' function equivalent, which both converge on a generally similar value for NPV.

Year	Cash inflows (savings) £	Cash outflows £	Net annual cash flows £	Discount factor at 10% rate	Net annual discounted cash flows £	Net present value (NPV) £
0 (2013)		45 000	(45 000)	1.000	(45 000)	(45 000)
1 (2014)	14 000		14 000	0.909	12 726	(32 274)
2 (2015)	12 000		12 000	0.826	9 912	(22 362)
3 (2016)	10 000		10 000	0.751	7 510	(14 853)
4 (2017)	10 000		10 000	0.683	6 830	(8 022)
5 (2018)	10 000		10 000	0.621	6 210	(1 812)
6 (2019)	10 000		10 000	0.565	5 650	3 838

An annual discounting rate of 10 per cent has been used in this example. The cash inflow data before discounting come from the table in Figure 6.2 and the discounting factors were taken from Figure 6.4.

Ref 2

Internal Rate of Return, IRR.

The project Internal Rate of Return, or IRR, the discount rate that shows the NPV at zero. An IRR greater than the discount rate is acceptable, and the higher the IRR, the more acceptable is the project. The IRR is calculated by trial and error, homing in by guesses to show the NPV at zero. The IRR is a good indicator of liquidity, but is weak on dealing with different scale of schemes and does not relate to shareholders wealth. It is inferior to NPV, but does take into account the timing of cashflows, and the 'time value of money'. Excel makes the calculation easier with a specific function for IRR, as in NPV. The graph below illustrates the relationship between IRR and NPV, IRR is at the NPV = 0.

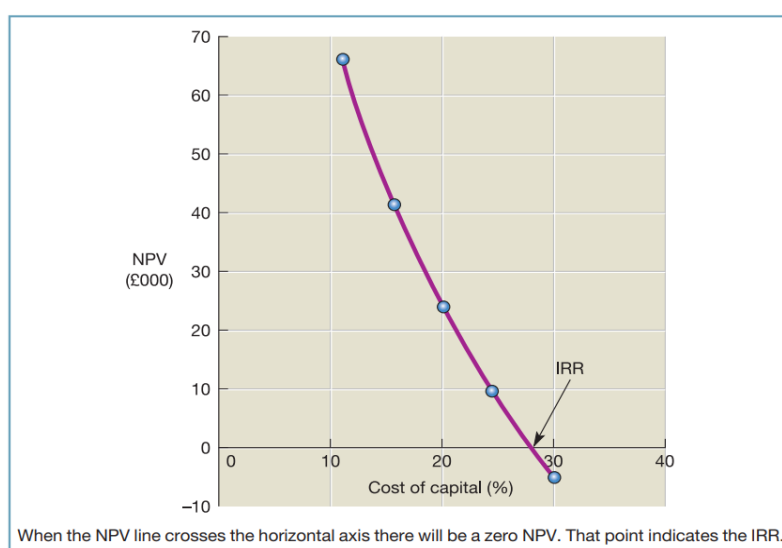


Figure 10.3 The relationship between the NPV and IRR methods

Ref. 3. Attrill & McLaney

Profitability Index (PI.) and Benefit/Cost Ratio (BCR)

The PI represents the potential profit of the proposed project, and a PI greater than 1 indicates a project should proceed, less than 1 indicates not. The PI uses the 'Gross present value' – the future value of the cashflows but excluding the initial investment, divided by the initial investment. As a variation of the NPV rule it does recognise the time value of money, is simple to apply, and takes into account the liquidity of the project, but ignores the size of the project.

Related to PI is the 'Benefit/Cost Ratio' – which is calculated by NPV/Initial Outlay, where the initial investment is included, as it is within the calculation of NPV. Both ratios measure the profitability per unit of funding value invested. The use of each is personal choice, but they are not completely interchangeable, as the selection of optimum schemes will give differing ranking of suitability for the same schemes, assessed by PI and BCR.

Accounting Rate of Return (ARR).

This relatively simple method takes the average accounting operating profit generated by the Project, and relates it as a percentage of the average investment made over the life of the project. The calculation of the average investment includes the initial investment, but also the possible disposal value, which can only be conjectured, so in itself this measure is open to error and misinterpretation. The method also uses the average profit after depreciation, which depends upon the policy of depreciation followed by the company's accounting policy – straight line or time-loaded. As NPV is affected by earlier profit bias in an income stream, the IRR may be affected by incorrect depreciation methods in the profit calculation.

Any Project must exceed an accepted target IRR, and if there are multiple projects, then the higher ARR should, of course, be favoured. ARR, however, ignores the time factor of projects, so that projects of equal IRR – the same operating profit and average investment, will have the same IRR but will not be of equal value to the business. (Ref 3, P376).

The decision choice of a target ARR is open to interpretation across managers, and the target ARR will therefore be at large between the consideration of successive projects in the same business. In addition, the relative size of project investments cannot be represented within ARR.

2. Capital project funding options

Here we will present a description and analysis of the main theories of corporate finance and apply their strengths and weaknesses to financing decisions. A finance source affects the discounted cash flow of the income the company generates, based on the discount rate within the company. As the value of the company is therefore affected by the businesses overall cost of capital, minimising the discount rate therefore maximises the value of the business (Ref 3).

Importantly, we can separate funding into internal and external finance – internal finance requires only the ratification of its Directors and may involve retained cash and support from existing Director shareholders. External finance will include issue of new shares to other shareholders, but also covers external funding bodies such as banks and investment houses. Also, we can separate funding into either short, or long-term. Short term generally refers to the need for funding under a year, long term finance would be needed for more than a year.

A summary of internal and external funding sources available to business is as follows:

- Use of retained earnings/ cash reserves – profit not invested or passed to shareholders. This is the most important source of new long-term finance for businesses across the UK. There will be costs of finance as shareholders will require returns as if there had been share issue for the funding.
- Loans are a very common source of funding, if adequate security exists in the company's asset-bank. Loans may be term loans, mortgages, or convertible loan notes, which offer the right to convert to ordinary shares and a certain date and price (Ref 3).
- Bank overdrafts are a source – the interest rates are acceptable, but repayment can be on-demand.
- Asset disposal is a source of funding, as is sale-and-leaseback may well provide funding on assets with adequate remaining lifetime and value sufficient to secure the finance.
- There may well be opportunity for short-term finance resulting from control of trade receivables and invoice collection, reducing inventories held, and delaying trade payables. All of these options rely on strong trade relationships that might become tested under changing business conditions, and workloads.
- Some contractors or interested parties may consider assisting with finance as an 'interested party' – indeed the formation of a 'joint venture' (JV) or 'special purpose vehicle' (SPV) to address a project or proposal would be a catalyst for sourcing funding from either party or from a third party attracted by a lower risk of the JV/SPV (Ref 2)
- Reclaim of Research & Development expenditure, as a tax refund or cash. This can be used for loan security, but is now far less certain to be paid than in previous years.
- Other direct Government Grants may be available, depending on local conditions and geography, and often focussed on low-carbon projects or disadvantaged area status.
- The issue of debentures, or loan stock.

3. Conclusions

From the financial information we have available, we can demonstrate the acceptability of the Project in the terms of accepted financial appraisal models. These will be summarised below alongside Tunnels' usual acceptable thresholds. We are satisfied that the rationale followed has been robust, and we note the following in our choice of assessment criteria:

- Payback has been used as a simple screening tool.
- We have used a suite of usually accepted financial measures, not just a simple Payback Period.
- NPV and IRR have been considered, as have PI and BCR, and the ARR, as noted below.
- Only NPV offers a wholly logical approach, truly addressing the 'time value of money'. There are limitations to the ARR, Payback, and IRR, but in general all these methods are widely used by businesses. (Ref 3, p 370)

The output of the usually accepted financial models studied is as follows:

Payback Period (PP) - 2.57 years. Outside Tunnels' usual 2-year limit, but within 3-year limit for specially considered schemes.

Net present value (NPV) - £230,688.97 – positive, and acceptable to Tunnel, even using the minimum profit levels expected and 9% WACC. If other projects considered, the highest NPV should proceed.

Internal rate of return (IRR) - 20.35% - above Tunnel's accepted level of 20%, using a WACC of 9%. Projects with IRR above the WACC are acceptable, and the greater the IRR, the more acceptable the project.

Profitability Index (PI) - 1.512, Benefit/Cost Ratio (BCR) - 0.512.

Annual Rate of Return = 48.20%. Acceptable to Tunnel at this level. The greater the IRR, the greater the attractiveness of the considered Project.

4. Recommendations

The recommendations of myself and the Project Team are that the Project should proceed as soon as practicable. This is an exceptional opportunity for Tunnel to capitalize on a ready supply of work, available reserves and shareholders' funds, and a site location that allows and funds operational expansion and financial performance.

5. References.

Ref 1. Samset, Knut. (2010) Early project appraisal: making the initial choices. Palgrave Macmillan.

Ref 2. Dennis Lock (2013). Project Management. Project management (10th edition.). Gower.

Ref 3. Attrill & McLaney (2017). Accounting and Finance for Non-Specialists. (Tenth Edition) Pearson.

Ref 4. Andersen, Samset, Welde , (2016), "Low estimates – high stakes: underestimation of costs at the front-end of projects", International Journal of Managing Projects in Business, Vol. 9. Iss 1 pp. 171 – 193.

6. Appendices.

Appendix 1: Present Value Table.

Appendix 2: Tunnel Civil Engineering – New Yard: Detailed Project Costing.

Appendix 3: Tunnel Civil Engineering - New Yard: Costs, profits expected, initial funding

Appendix 4: Project costing models: Payback, NPV, and IRR for New Yard Project

Appendix 5: Project costing models : ARR, PI and BCR for New Yard Project.

Appendix 1 – Present Value Table.

PRESENT VALUE TABLE

Present value of \$1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Appendix 2 - Tunnel Civil Engineering – New Yard: Detailed Project Costing

Purchase adjacent land and develop – main cost build-up.

TUNNEL CIVIL ENGINEERING					
A. Field Purchase & Conversion Cost					
	Unit	Quantity	Rate	Value	Total
Materials					
Terram 9000m2 (1 roll 100mx4.2m = 420m2)	roll	21.4286	150.00	3,214.29	
geogrid 9000m2 (1 roll 75mx3.7m = 278m2)	roll	32.3741	670.00	21,690.65	
100mm duct	m	400	1.90	760.00	
150mm hardcore 9000m2	t	2700	9.00		
100mm subbase 9000m2	t	1800	11.00		
Sand 400x0.3x0.3	t	72	20.00	1,440.00	
Tarmac 8x25x0.15	t	70.5882	85.00	6,000.00	
Concrete	m3	20	100.00	2,000.00	
Kerbs	No.	80	3.50	280.00	
					35384.93
Labour					
2 Man gang	day	30	425.00	12750.00	
3 Man gang	day		650.00	0.00	
					12750.00
Plant					
13t Excavator (9000*0.25)*2t = 4500t/16t = 280 lorries out & in	wk	8	500.00		
9t Dumper	wk	8	150.00		
8t Excavator	wk	6	350.00	2100.00	
6t Dumper	wk	6	130.00	780.00	
Pecker	wk		150.00	0.00	
Wacker	wk		35.00	0.00	
Disk cutter	wk		25.00	0.00	
Breaker	wk		30.00	0.00	
Small tools	wk	6	50.00	300.00	
TM pedestrian & signage	sum		100.00	0.00	
Spoil Disposal 6yrd skip (Leeses)	No		218.00	0.00	
Spoil Disposal 16t/5.5m3 Grab Lorry	No		240.00	0.00	
Spoil Disposal 16t 6.5m3 Lorry Normal	No		260.00	0.00	
Spoil Disposal 16t 6.5m3 Lorry Mixed roots/grassy/vegetation	No.		320.00	0.00	
Road Saw	wk		75.00	0.00	
				0.00	
Deliveries plant	Item,	1	100.00	100.00	
Fuel	Litres	1500	1.10	1650.00	
					4930.00
Subcontract					
Land purchase 2.2 acres (as per purchase opposite)	Acres	0	42857.00	0.00	
Land purchase 2.2 acres (proposed offer)	Acres	2.2	34090.91	75000.00	
CCTV & Alarm	Sum	1	10500.00	10500.00	
Palisade Fencing	m	400	83.00	33200.00	
Electric Gates	Sum	1	3000.00	3000.00	
Topsoil	m3	2400	17.00		
Full earthworks subcontract -BT Jenkins	Sum	1	161500.00	161500.00	
Electrician	sum	1	1000.00	1000.00	
Aquatech Design for Planning etc	Sum	1	1000.00	1000.00	
Planning	Sum	1	500.00	500.00	
Stamp Duty - £0 under £150k	Sum	1	0.00	0.00	
Community Infrastructure Levy	Sum	1	0.00	0.00	
Solicitors	Sum	1	2000.00	2000.00	
Electric Supply	Sum	1	1500.00	1500.00	
Water Supply	Sum	1	1000.00	1000.00	
					290200.00
Prelims					
Transport (Transit)	wk	6	150.00	900.00	
H&S PPE	wk	6	50.00	300.00	
Contract Management	wk		750.00	0.00	
TM/Heras	wk		50.00	0.00	
Insurance	%	2.5		0.00	
Store	wk		75.00	0.00	
Store Transport	No.		100.00	0.00	
Portaloo	wk		25.00	0.00	
Portaloo delivery	No.		25.00	0.00	
Welfare hog unit	wk	14	180.00	2520.00	
Welfare Transport	No.		60.00	0.00	
					3720.00
				Sub Total	346984.93

Appendix 3: Tunnel Civil Engineering - New Yard: Costs, profits expected, initial funding

Purchase adjacent land and develop – costs, profits expected, initial funding required.

New land	Adjacent field and Head Office partial sublet						
Headline costs	£350,000	Purchase/Basic conversion costs - rounded :	-£346,984				
	£100,000	Office Extension & solar panels					
Proposed Funding	£150,000	Deposit from capital reserve					
	£300,000	Shareholders funds					
	£450,000	Total immediate investment needed					
New land		1	2	3	4	5	Total
Project Cost and Benefit							
Initial costs	£450,000						
Net yearly profit		£175,000	£175,000	£175,000	£175,000	£175,000	£875,000
Resale 6th year ?							£275,000
New land	Value/Benefit per year						
Annual Profit for Project							
	£12,000	New solar power from roof - offset of current power needs					
	£22,500	Head office sublet rent - consultant					
	£140,500	Devon Contract - base level minimum profit expected from framework					
Total	£175,000						

Appendix 4: Project costing models: Payback, NPV, and IRR for New Yard Project

Payback, NPV, and IRR for New Yard Project.

Payback Calculation.								
Payback.	Initial	Yearly return						
	-£450,000	£175,000		450000/175000 = 2.57				
				Payback = in 2.57 years.				
Net Present Value Calculation.								
NPV Calculation			0	1	2	3	4	5
		Project spend:	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000
	WACC		9.00%					
	Net present value		£230,688.97					
Internal Rate of Return - trending from positive to zero								
IRR calculation	Positive Result		0	1	2	3	4	5
		Project spend:	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000
	WACC	which brings	20.00%					
	IRR	IRR tends to zero	£3,028.55					
Internal Rate of Return - trending from negative to zero								
IRR calculation	Negative Result		0	1	2	3	4	5
		Project spend:	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000
	WACC	which brings	21.00%					
	IRR	IRR tends to zero	-£5,422.82					
Internal Rate of Return - approximation to zero.								
IRR calculation	Exact 'guess'		0	1	2	3	4	5
		Project spend:	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000
	WACC	which brings	20.35474%					
	IRR	IRR tends to zero						
Note* - reliability of cashflow accuracy makes this IRR/WACC figure approximate only.								
Net Present Value Calculation - NPV Tables and Excel Comparison.								
Project - New field		Year						
		Investment, Year 0	1	2	3	4	5	
	Present Value	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000	
	Payback	2.57	Manual Calc					
	Discount Rate (WACC)	9%	From Table					
	NPV table Denominator	1	0.917	0.842	0.772	0.708	0.65	
	Future Value	-£450,000	£160,475	£147,350	£135,100	£123,900	£113,750	
	NPV	£230,575						
	NPV (Excel)	£230,689						

Appendix 5. Project costing models : ARR, PI and BCR for New Yard Project.

ARR, PI and BCR for New Yard Project.

Annual Rate of Return (ARR)								
Project - New field		Year						
	Investment, Year 0	1	2	3	4	5	Residual	
	Annual Net Profits #	-£450,000	£175,000	£175,000	£175,000	£175,000	£175,000	£275,000
	Residual Value- approx	£275,000						
	Average Annual Profits	£175,000	as above					
	Average Investment	Initial	£450,000					
		Residual	£275,000					
	Average Investment	(450000/275000)/2 = £362,500						
	Annual Rate of Return =	Average Annual Profits	=	£175,000	=	48.20%		
		Average Investment		£362,500				
# Net profits are stated, so no need to depreciate.								
Profitability Index and Benefit/Cost Ratio								
Project - New field		Year						
	Investment, Year 0	1	2	3	4	5		
	GROSS Present Value	£0	£175,000	£175,000	£175,000	£175,000	£175,000	
	Payback	2.57	Manual Calc					
	Discount Rate (WACC)	9%						
	Denominator	1	0.917	0.842	0.772	0.708	0.65	
	Future Value	0	£160,475	£147,350	£135,100	£123,900	£113,750	
	Gross PV	£680,575.00						
	GROSS PV (Excel)	£680,688.97						
	Profitability Index =	GROSS Present Value	=	£680,575	=	1.512		
		Initial Outlay		£450,000				
	Benefit/Cost Ratio =	NET Present Value	=	£230,575	=	0.512		
		Initial Outlay		£450,000				