



South Essex Rapid Transit Major Scheme Business Case

Appendix 4I Risk Assessment

April 2010



A partnership project between Essex County Council, Southend-on-Sea Borough Council and Thurrock Council

sert Quantified Risk Assessment

1. In order to reflect the uncertainties in project cost estimating and the effects of other circumstances that could influence the outcomes in a project, a Quantified Risk Assessment has been conducted. This allows there to be a more realistic expression of the ultimate capital cost of the project and other threats to the project to be identified and managed/mitigated.

2. Overall process

The overall process for producing the Quantified Risk assessment is as follows.

- i) Identify risks
- ii) Agree ranges for Impact and Probability co-efficients
- iii) Assign Impact and Probability co-efficients to each risk – to give the unmitigated effect
- iv) Convert risk factors into monetary values
- v) Assign risk owners
- vi) Treatment of risks
- vii) Identify possible mitigation actions
- viii) Revalue the risk factors to reflect effect of mitigations
- ix) Impact on project cost estimate

3. Identification of Risk

Near the beginning of the project, in July 2006, a risk workshop was held, attended by key members of the promoters and the advising consultants.

Subsequent risk workshops were held in July 2008 and December 2009 and were attended by additional project professionals not previously involved in risk workshops so that the project risks could be viewed from an external perspective as well as by those more closely associated with delivery.

A large number of risks reflecting several categories were identified. At this stage, monetary values were not ascribed to the risks; rather, risk factors to reflect their relative ranking were developed so that the project team could manage the most significant risks.

Throughout the project, new risks were identified, when appropriate, through the medium of reports to the Client from the project team, and vice versa.

The risks have been identified in categories that are not surprising for a public sector project of this nature:

- Cost escalation
- Construction uncertainties

- Programme
- Funding
- Political support
- Consultation and stakeholder acceptance
- Statutory processes
- Reputation

4. Development of Risk Factors and Co-efficients

In order to rank each risk identified in the workshop, each risk had to be understood in terms of its likelihood (probability) and impact. Before each risk was so discussed, co-efficients relevant to the **sert** project were agreed between participants for both probability and impact. Both were on a scale of 1 to 5 and the product of the multiplication of the two together would generate the risk factor. The scales for each are contained in the following tables:

| P = Probability % | | | |
|-------------------|-----|-----|------|
| P | Min | Max | Med |
| 1 | 0 | 10 | 5 |
| 2 | 11 | 30 | 20.5 |
| 3 | 31 | 50 | 40.5 |
| 4 | 51 | 70 | 60.5 |
| 5 | 71 | 100 | 85.5 |

| I = Impact £m | | | |
|---------------|-----|-----|------|
| I | Min | Max | Med |
| 1 | 0 | 0.3 | 0.15 |
| 2 | 0.3 | 1 | 0.65 |
| 3 | 1 | 3 | 2 |
| 4 | 3 | 10 | 6.5 |
| 5 | 10 | 20 | 15 |

The tolerance to risk is indicated in the scale

| Risk Factor | Ranking |
|-------------|---------|
| 1 to 7 | Low |
| 8 to 14 | Medium |
| 15 to 25 | High |

Each risk was then discussed so that its origins, cause, probability and impact were as understood as they could be at this stage of the project, given that detailed design had not commenced.

The final risk register is attached. Among the information it contains are High, Low and Medium outcomes for each risk weighted by probability.

5. Conversion of Risk Factors into Monetary Values

After assigning Impact and Probability Factors to each risk, the range of outcome on each risk is derived by multiplying the lowest points on each band with each other, to derive the lowest likely outcome, weighted by probability. Equally, the highest points on each band are multiplied together to give the maximum likely outcome, weighted by probability.

For example:

A risk with an Impact co-efficient of 3 and a Probability co-efficient of 2 would give:

Lowest likely outcome: £1 million X 11% = £110,000
Maximum Likely outcome : £3 million X 30% = £900,000

e.g. see risk P4 in the risk register in Appendix where the above numbers can be identified.

6. Treatment of Risks

Conventionally, the treatment of risks can be:

- Tolerate
- Treat
- Transfer
- Terminate

In principal, risks should be owned by the parties best placed to manage or mitigate them. At this stage of **sert**, before entering into contracts for design or construction, it is not possible to transfer risks, although that will become a possibility in the future. Appropriate forms of contract will seek to transfer risk where appropriate.

Thus the risks identified are either tolerated, where low, or mitigated where the risk factor is high or medium. No opportunities for completely terminating the current risks have been identified either by changing the design or some other intervention. Some stakeholder risks, where significant opposition would have been encountered have been terminated at an earlier stage by adaptation of the design.

7. Assignment of Risk Owners and Mitigations

Each risk was then assigned an owner, responsible for managing that risk and, where appropriate, a mitigation action was identified.

Each risk was then re-considered and, where appropriate, the Impact or Probability (or both) were revised to take account of the likely effect of the mitigating action.

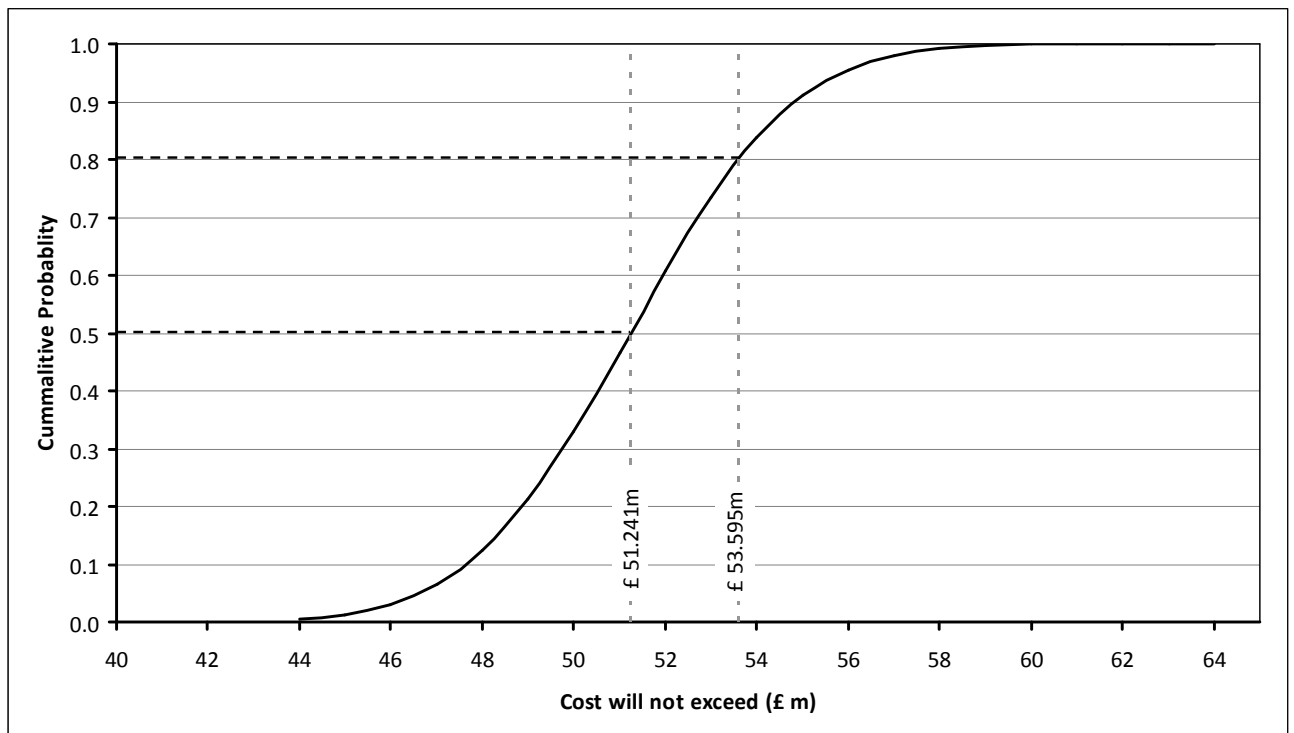
The revised risk factors and maximum and minimum outcomes were then calculated as “post-mitigation” values.

8. Impact on Project Estimate

The sums of the maximum and minimum values for each risk were then summed to give a range of the most likely impacts of risk on the project cost.

These were calculated to be from £1.98m to £13.4m. These values were then plotted against a normal distribution curve to establish the 50th and 80th percentile outcomes. See graph below.

Probability Distribution of Risk Outcomes on Project Cost



These outcomes present the likely project cost as being £51.2m (50th percentile).

9. Ongoing Revision of Risk register

The Project Team conducts regular reviews of all of the contents of the register, including adding new risks, removing those that have passed, revising values, owners and mitigations.

This process will continue throughout the life of the project and, where appropriate, management of risk will be transferred through contractual responsibility.

SERT RISK REGISTER

Risks added since Version 4

- 1 Risk C3 - Extra mitigation added re Governance
- 2 Risk P7 - New Risk added re RFA Funding

SERT ROUTE 1 COSTS

| No | Description | Mouchel Cost | Estimated Stats costs |
|----|--------------------------------------------------------|--------------|-----------------------|
| 1 | A13 Rbt - Lakeside Bus Terminus | £575,272 | £0 |
| 2 | Lakeside Bus Terminus/A126 Rbt | £868,900 | £0 |
| 3 | A126 Rbt - West thurrock Way Rbt | £123,200 | £0 |
| 4 | West Thurrock Way Rbt | £687,024 | £250,000 |
| 5 | West Thurrock Way Rbt - Sandy Lane | £820,488 | £570,000 |
| 6 | Sandy Lane - Stoneness Rd Rbt | £660,692 | £240,000 |
| 7 | Stoneness Rd Rbt - Mill Lane | £683,279 | £450,000 |
| 8 | Mill Lane Jct | £450,210 | £126,000 |
| 9 | Mill Lane Jct - Devonshire Rd | £459,868 | £150,000 |
| 10 | Devonshire Rd / Gumley Rd | £490,950 | £180,000 |
| 11 | Wouldham Rd / Askews Farm Lane | £473,317 | £0 |
| 12 | Wouldham Rd - Meesons Lane | £541,075 | £150,000 |
| 13 | Wharf Rd | £510,500 | £75,000 |
| 14 | Wharf Rd - Derby Rd | £564,921 | £41,400 |
| 15 | Crown Rd Jct | £266,300 | £30,000 |
| 16 | Crown Rd - Bedford Rd | £356,718 | £20,000 |
| 17 | Bedford Rd - Hathaway Rd | £739,641 | £85,000 |
| 18 | Hathaway Rd - Bridge Rd | £500,836 | £150,000 |
| 19 | Bridge Rd - Bradleigh Ave | £448,297 | £72,000 |
| 20 | Bradleigh Ave - Whitehall Lane | £173,880 | £0 |
| 21 | Whitehall Lane - Chadwell Rd | £416,746 | £60,000 |
| 22 | Chadwell Rd - Lodge Lane | £168,601 | £0 |
| 23 | Lodge Rd | £385,077 | £108,000 |
| 24 | Lodge Rd - Stanford Rd | £715,798 | £288,000 |
| 25 | Stanford Rd Rbt | £507,043 | £50,000 |
| 26 | Stanford Rd Rbt - King Edward Drive | £33,501 | £0 |
| 27 | King Edward Drive - Orsett Cock Rbt | £149,540 | £0 |
| 28 | Orsett Cock Rbt (with signals) | £553,840 | £0 |
| 29 | Orsett Cock Rbt - A13 - A126 | £520,380 | £0 |
| 30 | A13 - A176 | £392,382 | £0 |
| 31 | A176 Nethermayne - Basildon Hosp Rbt | £787,659 | £845,000 |
| 32 | Hospital Loop (also included in SERT 1A No 33) | £507,557 | £80,000 |
| 33 | Basildon Hospital Rbt (also included in SERT 1A No 32) | £871,878 | £30,000 |
| 34 | Hospital Rbt - Nethermayne Ashdown Way | £714,144 | £1,012,000 |
| 35 | Ashdown Way Loop | £236,236 | £170,000 |
| 36 | Nethermayne - Southernhay Rbt | £1,181,002 | £180,000 |
| 37 | Southernhay Rbt - Station Way Jct | £247,448 | £162,000 |
| 38 | Southernhay - Station Way Jct | £658,998 | £288,000 |
| 39 | Southernhay - Station Way - Clay Hill Rd | £106,636 | £140,000 |
| 40 | Southernhay - Clay Hill Rd Jct | £188,486 | £175,000 |
| 41 | Southernhay - Clay Hill Rd - Broadmayne | £577,353 | £250,000 |
| 42 | Southernhay - Broadmayne Jct | £583,979 | £255,600 |
| 43 | Ghyllgrove - Audley Way - the Grove | £139,107 | £226,800 |
| 44 | Ghyllgrove - Whitmore Way Jct | £558,526 | £405,000 |
| 45 | Ghyllgrove - Whitmore Way Jct - Festival Link | £275,946 | £930,600 |
| 46 | Festival Link - Festival Park Rbt | £171,584 | £115,000 |
| 47 | Festival Park Rbt | £151,504 | £0 |
| 48 | Festival Park Rbt - Festival Way | £244,637 | £160,000 |
| 49 | Festival Way - Gardiners Link | £851,285 | £422,000 |
| 50 | Gardiners Link - A127 Rbt | £64,200 | £0 |
| 51 | A127 Gardiners Link Rbt & Jct | £716,017 | £191,000 |
| 52 | A127 Gardiners Lane Sth - East Mayne | £335,721 | £149,400 |
| 53 | Paycockes Rd - East Mayne Jct | £126,810 | £45,000 |
| 54 | Paycockes Rd - Christopher Martin Rd | £19,394 | £0 |
| 55 | East Mayne - Christophe Martin Rd Jct | £97,437 | £0 |
| 56 | East Mayne - Gardiners Lane South | £200,339 | £0 |

£24,852,159 £9,327,800

£34,179,959

SERT ROUTE 2 COSTS

| No | Description | Mouchel Cost | Estimated Stats costs |
|----|---------------------------------------------------|--------------|-----------------------|
| 1 | Rayleigh Downs Rd | £0 | £0 |
| 2 | Rayleigh Downs Rd - Progress Rd | £0 | £0 |
| 3 | A127 Progress Rd - The Fairway | £0 | £0 |
| 4 | The Fairway - Bellhouse Rd | £788,699 | £594,000 |
| 5 | Bellhouse Rd - Bellhouse Lane | £618,878 | £423,000 |
| 6 | Bellhouse Lane - Rayleigh Rd | £1,719,025 | £1,674,000 |
| 7 | A127 Rayleigh Rd - Bridgewater Drive | £271,470 | £153,000 |
| 8 | Rayleigh Rd - Southbourne Grove | £272,522 | £63,000 |
| 9 | Southbourne Grove - Prince Ave | £232,772 | £0 |
| 10 | Prince Ave - Southbourne Grove & Westbourne Grove | £218,068 | £0 |
| 11 | Southbourne Grove - Prittlewell Chase | £211,337 | £117,000 |
| 12 | Westbourne Grove - Prittlewell Chase | £217,002 | £117,000 |
| 13 | Westbourne Grove - Hospital at Prittlewell Chase | £18,588 | £0 |
| 14 | Hospital at Prittlewell Chase - Hobblythick Lane | £26,773 | £0 |
| 15 | Hobblythick Lane - Highfield Gardens | £265,853 | £100,000 |
| 16 | Hobblythick Lane - Fairfax Drive | £349,716 | £95,000 |
| 17 | West St - East St | £318,345 | £0 |
| 18 | West St - Queensway | £41,642 | £0 |
| 19 | Chichester Rd | £368,246 | £95,000 |

£5,938,936 £3,431,000

£9,369,936

| | | | | | |
|----------------|--------------------|-------------------|--------------------|--------------------|--------------------|
| Route 1 | £24,852,159 | £9,327,800 | £34,179,959 | 50% QRA | 80% QRA |
| | | | | £40,216,209 | £42,064,019 |
| Route 2 | £5,938,936 | £3,431,000 | £9,369,936 | £11,024,686 | £11,531,236 |

| | | |
|--------------------------------|--------------------|--------------------|
| Total Construction Cost | £30,791,095 | £12,758,800 |
|--------------------------------|--------------------|--------------------|

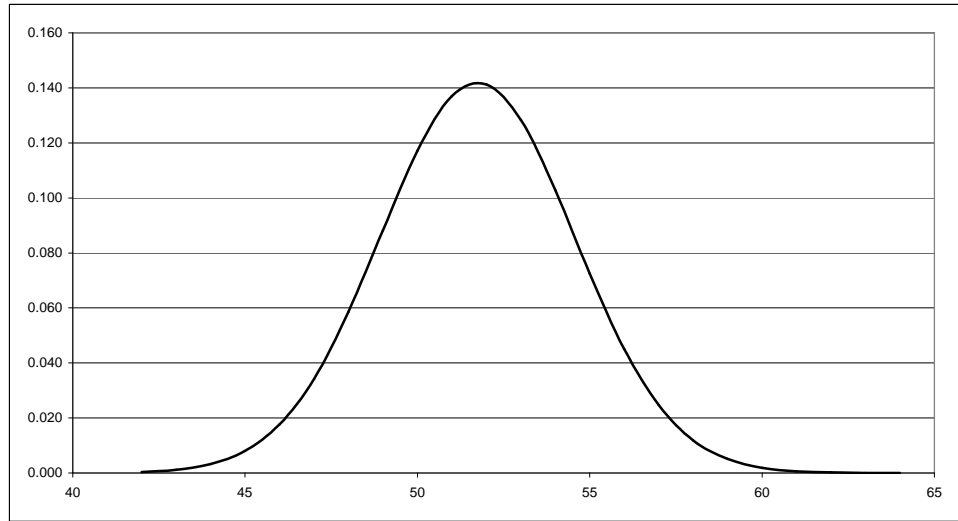
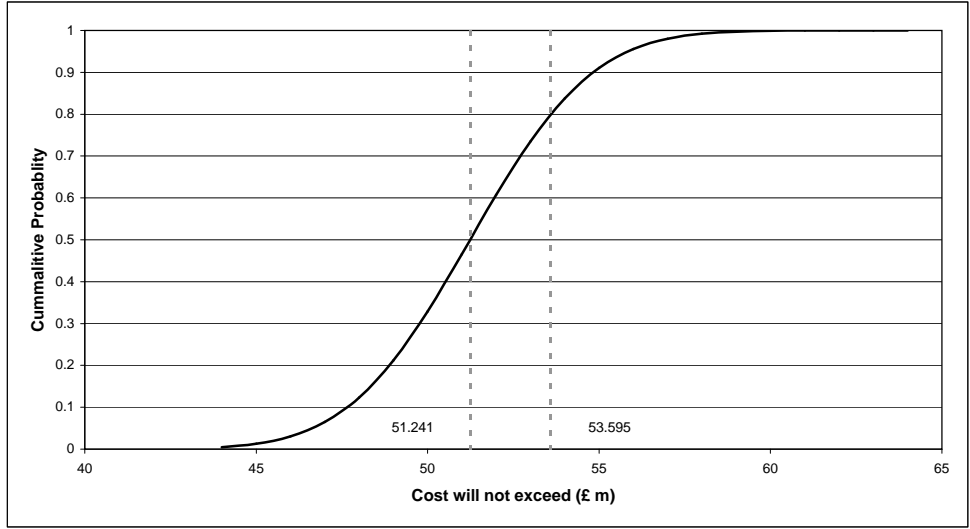
| | | | |
|-----------------------------------|--------------------|--------------------|--------------------|
| Total cost including Stats | £43,549,895 | £51,240,895 | £53,595,255 |
|-----------------------------------|--------------------|--------------------|--------------------|

| X | X+ | Mean | SD |
|---------|---------|---------|---------|
| 45.5319 | 56.9499 | 51.2409 | 2.79741 |

50.02

| Value | Probability that it won't exceed Value | Probability of being in interval |
|-------|----------------------------------------|----------------------------------|
| 41 | 0.000126 | |
| 42 | 0.000478 | 0.000352 |
| 43 | 0.00161 | 0.001132 |
| 44 | 0.004821 | 0.003211 |
| 45 | 0.012842 | 0.008021 44-45 |
| 46 | 0.030501 | 0.017659 45-46 |
| 47 | 0.064759 | 0.034258 etc |
| 48 | 0.123323 | 0.058564 |
| 49 | 0.211548 | 0.088225 |
| 50 | 0.328671 | 0.117122 |
| 51 | 0.465688 | 0.137017 |
| 52 | 0.606943 | 0.141255 |
| 53 | 0.735271 | 0.128328 |
| 54 | 0.838009 | 0.102738 |
| 55 | 0.91049 | 0.072482 |
| 56 | 0.955552 | 0.045062 |
| 57 | 0.98024 | 0.024687 |
| 58 | 0.992158 | 0.011918 |
| 59 | 0.997229 | 0.00507 |
| 60 | 0.999129 | 0.001901 |
| 61 | 0.999757 | 0.000628 |
| 62 | 0.99994 | 0.000183 |
| 63 | 0.999987 | 4.69E-05 |
| 64 | 0.999997 | 1.06E-05 |

43,549,895 Total Construction Cost
 1,982,000 QRA Low 4.6%
 13,400,000 QRA High 30.8%



| Cost | Probability |
|--------|-------------|
| 51.241 | 0.5 |
| 53.595 | 0.8 |

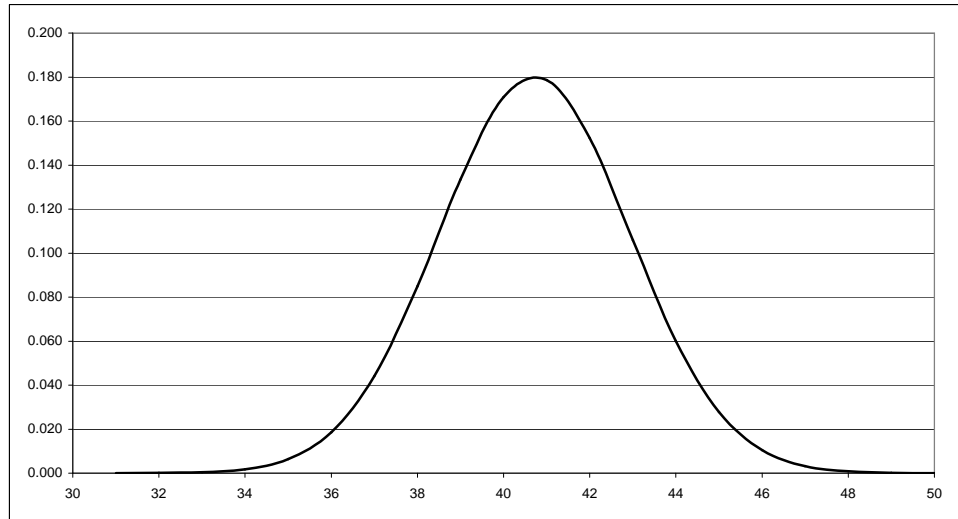
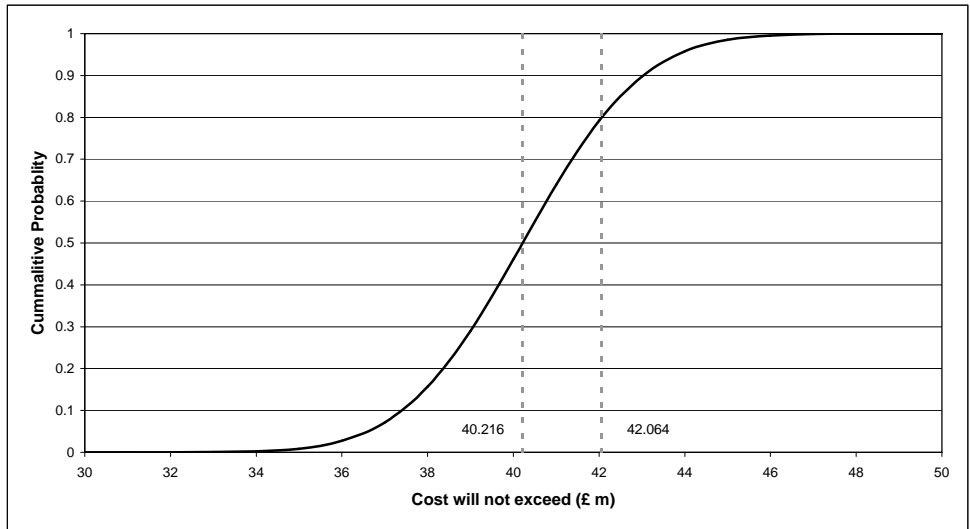
| | |
|----------|---|
| 51.2409 | 0 |
| 51.2409 | 1 |
| 53.59525 | 0 |
| 53.59525 | 1 |

| X | X+ | Mean | SD |
|----------|----------|----------|----------|
| 35.73552 | 44.69689 | 40.21621 | 2.195536 |

40.65

| Value | Probability that it won't exceed Value | Probability of being in interval |
|-------|----------------------------------------|----------------------------------|
| 30 | 1.63E-06 | |
| 31 | 1.35E-05 | 1.18E-05 |
| 32 | 9.12E-05 | 7.77E-05 |
| 33 | 0.000507 | 0.000416 |
| 34 | 0.002318 | 0.001811 |
| 35 | 0.008755 | 0.006437 |
| 36 | 0.027407 | 0.018652 |
| 37 | 0.071476 | 0.04407 |
| 38 | 0.156388 | 0.084912 |
| 39 | 0.289808 | 0.13342 |
| 40 | 0.460777 | 0.170969 |
| 41 | 0.639451 | 0.178675 |
| 42 | 0.791737 | 0.152285 |
| 43 | 0.897589 | 0.105852 |
| 44 | 0.957592 | 0.060003 |
| 45 | 0.985329 | 0.027737 |
| 46 | 0.995785 | 0.010456 |
| 47 | 0.998999 | 0.003214 |
| 48 | 0.999804 | 0.000805 |
| 49 | 0.999968 | 0.000165 |
| 50 | 0.999996 | 2.74E-05 |
| 1 | 1.17E-71 | 1.17E-71 |

34,179,959 Total Construction Cost
 1,555,565 QRA Low 4.6%
 10,516,936 QRA High 30.8%



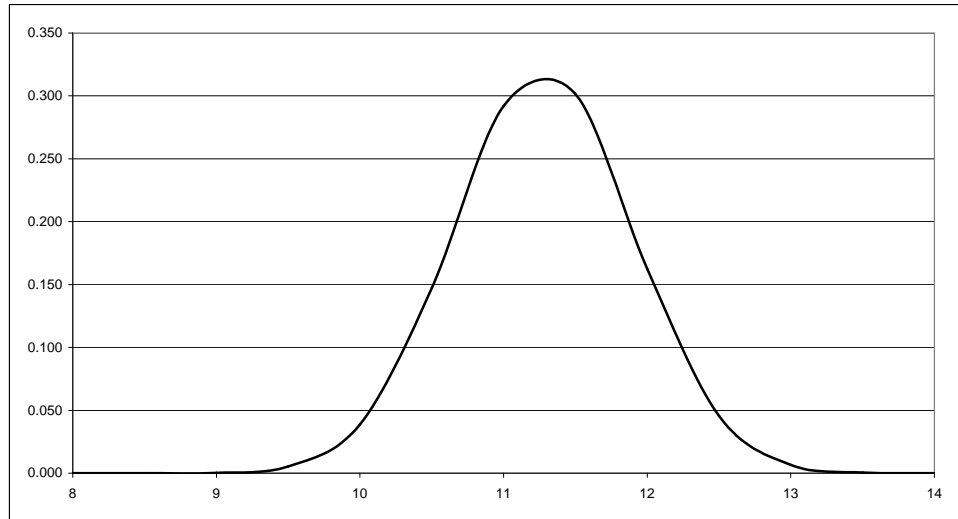
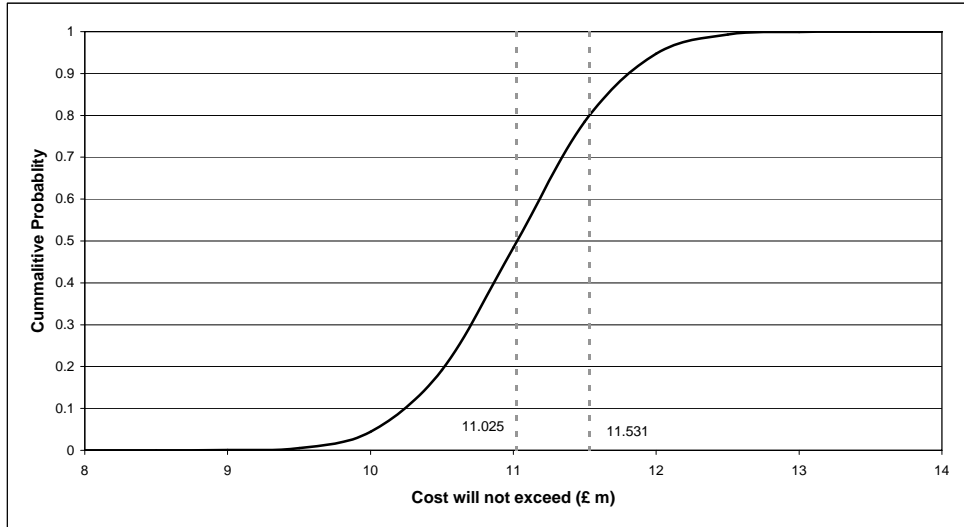
| Cost | Probability | Cost | Probability |
|--------|-------------|----------|-------------|
| 40.216 | 0.5 | 40.21621 | 0 |
| 42.064 | 0.8 | 40.21621 | 1 |
| | | 42.06402 | 0 |
| | | 42.06402 | 1 |

| X | X+ | Mean | SD |
|----------|--------|----------|----------|
| 9.796371 | 12.253 | 11.02469 | 0.601874 |

15.84

| Value | Probability that it won't exceed Value | Probability of being in interval |
|-------|----------------------------------------|----------------------------------|
| 4 | 8.93E-32 | |
| 4.5 | 1.1E-27 | 1.1E-27 |
| 5 | 6.9E-24 | 6.9E-24 |
| 5.5 | 2.17E-20 | 2.17E-20 |
| 6 | 3.46E-17 | 3.46E-17 |
| 6.5 | 2.79E-14 | 2.78E-14 |
| 7 | 1.14E-11 | 1.14E-11 |
| 7.5 | 2.37E-09 | 2.36E-09 |
| 8 | 2.51E-07 | 2.49E-07 |
| 8.5 | 1.37E-05 | 1.34E-05 |
| 9 | 0.000384 | 0.00037 |
| 9.5 | 0.005651 | 0.005267 |
| 10 | 0.044332 | 0.038681 |
| 10.5 | 0.191671 | 0.14734 |
| 11 | 0.483642 | 0.291971 |
| 11.5 | 0.785155 | 0.301513 |
| 12 | 0.947433 | 0.162278 |
| 12.5 | 0.992881 | 0.045447 |
| 13 | 0.999485 | 0.006604 |
| 13.5 | 0.99998 | 0.000496 |
| 14 | 1 | 1.92E-05 |

9,369,936 Total Construction Cost
 426,435 QRA Low 4.6%
 2,883,064 QRA High 30.8%



| Cost | Probability | | |
|--------|-------------|----------|---|
| 11.025 | 0.5 | 11.02469 | 0 |
| 11.531 | 0.8 | 11.02469 | 1 |
| | | 11.53124 | 0 |
| | | 11.53124 | 1 |

Risk Register - *sert*

The list below contains the risks relating to *sert* that carry a Risk Factor of 8 or greater in either Pre- or Post-mitigation states.

| Risk Category | Risk Ref (R) | Risk | Description of Risk | Consequence | Category | Status | Pre-Mitigation | | | | | | Risk Mitigation | Action Owner | Post-Mitigation | | | | | | Time Scale | | |
|-----------------------------------------|--------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------|----------------|---|--------|----------|--------------------------|--------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---|---|--------|----------|--------------------------|------------|--------------------------|-----------------------------------|
| | | | | | | | P | I | Factor | Priority | Max Weighted Est Cost £M | Min Weighted Est Cost £M | | | Median Weighted Estimated Cost £M | P | I | Factor | Priority | Max Weighted Est Cost £M | | Min Weighted Est Cost £M | Median Weighted Estimated Cost £M |
| Project Programme | P1 | Engineering design not providing robust cost estimates | Lack of technical resources for detailed engineering design. | Delay or cancellation, miss funding opportunity from DfT. | Project Programme | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Ensure clear identification of future workstreams and appropriate resources to deliver. | Rob Surf | 3 | 2 | 6 | Low | 0.50 | 0.09 | 0.26 | 3 |
| | P2 | Key Project Members leave | Lack of continuity in production and presentation. | Sub-optimal project. | Project Programme | On | 3 | 2 | 6 | Low | 0.50 | 0.09 | 0.26 | Ensure adequate project documentation to facilitate continuity, and retain access to knowledge of staff previously on project team where possible. | Chris Ferrary | 3 | 2 | 6 | Low | 0.50 | 0.09 | 0.26 | 2 |
| | P3 | Modelling does not fulfil DfT requirements | Lack of technical resources, complexity of modelling requirements. New projections and forecasts revealed at late stage. Conclusions drawn are wrong. | DfT rejects model. Extra cost and delay could mean inability to secure funding and missing a funding window. | Project Programme | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Ensure modelling complies with DfT standards (WebTAG, DMRB, VADMA). Maintain compliance with Mouchel Standards (NAMM). Peer review by SDG. | Rob Surf | 3 | 2 | 6 | Low | 0.50 | 0.09 | 0.26 | 4 |
| | P4 | Non-economic aspects of MSBC do not fulfil DfT requirements | Lack of technical resources, complexity of reporting requirements. New projections and forecasts revealed at late stage. Conclusions drawn are wrong. | DfT rejects business case. Extra cost and delay could mean inability to secure funding and missing a funding window. | Project Programme | On | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | Ensure that right skills and resources are available to ECC for the compilation and production of the MSBC within the scope of work and consultancy budget agreed. Ensure consistency with TAG and other Government advice. | Chris Ferrary | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |
| Consultation and Stakeholder Acceptance | C1 | Engineering design not approved by stakeholders | One or more key stakeholders do not agree with the specifics of the proposed <i>sert</i> scheme. Other local authorities do not agree on routes, priority measures or timing. | Delay or cancellation of project | Consultation and Stakeholder Acceptance | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Ensure engineering design is robust. Ensure analysis is rigorous and that conclusions flow from evidence. | Nigel Astell/ Sean Perry | 3 | 2 | 6 | Low | 0.50 | 0.09 | 0.26 | 4 |
| | C2 | Lack of buy-in from public and stakeholders | Stakeholders do not like the materials for consultation. Boroughs do not like the proposed scheme. | Rejection of business case. Insurmountable objection from bus operators. Delay or cancellation. | Consultation and Stakeholder Acceptance | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Ensure that consultation materials describe properly the objectives of scheme. Ensure local stakeholders are engaged. Ensure scheme fulfils local area demands and public aspirations. Ensure possible adverse effects are identified and adequately mitigated. | Nigel Astell/ Sean Perry | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |
| | C3 | Political approval not forthcoming at key points (milestones) in the project | Lack of commitment to objectives. Lack of approval from politicians. Failure to achieve shared ownership of the project by the three highway authorities. Refusal of access for <i>sert</i> onto highway network. Delay in submission of Business Case. Failure to reach shared agreement with partner. | Cancellation of scheme or the scheme's reputation diminishes. | Consultation and Stakeholder Acceptance | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Engage regularly with Members to ensure their continued support for the scheme. Ensure corporate governance procedures are followed strictly | Sean Perry/ Ed Vokes/ Paul Mathieson | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | 3 |
| | C4 | Operating companies not interested in new services | Lack of buy in from transit operators. Adverse response to <i>sert</i> by competitor operators. | Delay | Consultation and Stakeholder Acceptance | On | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | Ensure bus service impact study provides realistic and robust analysis of existing bus service operations. Maintain participative engagement with bus operators. Ensure equitable commercial risk and reward. | Nigel Astell | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 3 |
| Reputation | R1 | <i>sert</i> does not fulfil quality standards or meet its "concept criteria" | Scheme does not deliver the journey times, reliability or quality essential for its success. | Patronage lower than forecast. Failure to secure any funding for further tranches of routes. | Reputation | On | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | Ensure that all stages of development, design and construction are consistent with agreed specification. | Nigel Astell | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |
| | R2 | Non-deployment of suitable Automatic Vehicle Location System (AVLS) | AVLS is required for real time passenger information, bus priority and operations management. Assumption is <i>sert</i> would piggyback on replacement ECC AVLS, however there is a risk this system will not be commissioned prior to <i>sert</i> launch. Current AVLS unsuitable for <i>sert</i> . | <i>sert</i> would lack accurate and reliable real-time passenger information and operations management. These elements are key to service delivery. | Reputation | On | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | Work closely with ITS and Congestion Manager (L Saville) and Senior Area Infrastructure Co-ordinator (S Sparks) to fully understand the procurement procedure and timescales for the new AVLS. Monitor ITS and AVLS projects and ensure co-ordination with <i>sert</i> . | Nigel Astell | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |
| Finance / Funding | F1 | MSBC and implementation too expensive for other LAs to support | Other local authorities unable to resource their obligations to the MSBC process. | Additional cost and delay. | Finance/Funding | On | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | Ensure other local authorities are well informed on finance. Produce monthly project progress reports including spend and present at Project Board meetings. Ensure timely approvals if budget increases. Maintain negotiations with partners as required. | Sean Perry/ Nigel Astell | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |
| | F2 | Capital costs escalate | Detailed design work results in higher capital cost estimates than initial estimates based on concept drawings: unforeseen statutory undertakers' equipment; delay in relocation of statutory undertakers' equipment; unexpected ground conditions; unforeseen escalation of material or labour costs; adverse topographical or soil conditions. | Additional cost. Failure to secure funding. | Finance/Funding | On | 3 | 4 | 12 | Medium | 5.00 | 0.93 | 2.63 | Control "Project Creep" with robust change control and appraisal procedure. Ensure robust project estimates by reference to current market conditions and expectations. Employ independent cost reviewer. | Rob Surf | 2 | 4 | 8 | Medium | 3.00 | 0.33 | 1.33 | 4 |
| Statutory Processes | S1 | Bus Regulatory framework | <i>sert</i> proposals (esp. public sector financial contribution) conflict with competition rules and deregulation. Quality Contracts, although suggested by DfT for <i>sert</i> , are unchartered territory. | Delay | Statutory Processes | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Ensure that preferred option for procurements meets all legal and procedural requirements through employing correct technical knowledge of project team, and liaison with DfT and Essex Legal Services. | Chris Ferrary | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | 4 |

Total of Risk to be applied to **sert** project estimate

| | | |
|-------|------|------|
| 19.00 | 3.43 | 9.81 |
|-------|------|------|

| | | |
|-------|------|------|
| 13.40 | 1.98 | 6.47 |
|-------|------|------|

The list below contains the risks relating to **sert** that carry a Risk Factor of 9 in either Pre- or Post-mitigation states.

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|--------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------|----|---|---|----|--------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|---|---|-----|------|------|------|---|
| Statutory Processes | S2 | Objections / hindrance to issuing Traffic Orders | Failure to commence process at right time or project encounters unforeseen objections | Delay in progressing the site works and additional cost | Project Programme | On | 4 | 1 | 4 | Low | 0.21 | 0.00 | 0.09 | Project programme will clearly identify the date by which TOs are needed and ensure that process is begun early enough to resolve any possible objections. | Sean Perry | 3 | 1 | 3 | Low | 0.15 | 0.00 | 0.06 | 4 |
| Statutory Processes | S3 | Difficulties in acquiring land if required | Design process fails to identify land required or inability to agree compensation with land-owners | Delay in progressing the site works and additional cost | Project Programme | On | 3 | 3 | 9 | Medium | 1.50 | 0.31 | 0.81 | Project programme and design process will clearly identify the date by which all land parcels are needed and ensure that process is begun early enough to enable agreements to be reached. | Sean Perry | 2 | 2 | 4 | Low | 0.30 | 0.03 | 0.13 | 4 |
| Project Programme | P5 | Contractor failure | Contractor needs to be changed | Delay in progressing the site works and additional cost | Project Programme | On | 1 | 3 | 3 | Low | 0.30 | 0.00 | 0.10 | Procurement process will ensure that there is low risk of contractor going bust or failing to meet standards of delivery | Sean Perry | 1 | 2 | 2 | Low | 0.10 | 0.00 | 0.03 | 4 |
| Project Programme | P6 | Adverse ecological / environmental conditions | Failure to identify significant environmental issues | Delay in progressing the site works and additional cost | Project Programme | On | 2 | 2 | 4 | Low | 0.30 | 0.03 | 0.13 | Ensure appropriate surveys and assessment before site works commence | Chris Ferrary | 1 | 2 | 2 | Low | 0.10 | 0.00 | 0.03 | 4 |
| Project Programme | P7 | Regional Funding Allocation (RFA) re-profiling | Delayed availability of funding | Delay in progressing the site works and additional cost | Project Programme | On | 4 | 4 | 16 | High | 7.00 | 1.53 | 3.93 | Work closely with East of England Region at DFT through Regional Transport Forum to ensure a compelling case to maintain current funding profile for sert is presented by Essex, Southend and Thurrock councils. | Chris Stevenson | 2 | 3 | 6 | Low | 0.90 | 0.11 | 0.41 | 4 |

Risk Description – Delayed availability of funding due to Regional Funding Allocation (RFA) re-profiling

Mitigation – Ensure a compelling case to maintain current funding profile for **sert** is presented to the Regional Transport Forum by Essex, Southend and Thurrock councils.

Likelihood Guide and RAG Matrix

Risk Factors

| | | | | | | |
|-----------------|---|-------------------|----|----|----|----|
| SEVERITY | 5 | 5 | 10 | 15 | 20 | 25 |
| | 4 | 4 | 8 | 12 | 16 | 20 |
| | 3 | 3 | 6 | 9 | 12 | 15 |
| | 2 | 2 | 4 | 6 | 8 | 10 |
| | 1 | 1 | 2 | 3 | 4 | 5 |
| | | 1 | 2 | 3 | 4 | 5 |
| | | LIKELIHOOD | | | | |

- 1 Low
- 2 Low
- 3 Low
- 4 Low
- 5 Low
- 6 Low
- 7 Low
- 8 Medium
- 9 Medium
- 10 Medium
- 11 Medium
- 12 Medium
- 13 Medium
- 14 Medium
- 15 High
- 16 High
- 17 High
- 18 High
- 19 High
- 20 High
- 21 High
- 22 High
- 23 High
- 24 High
- 25 High

| P = Probability % | | | |
|-------------------|-----|-----|------|
| P | Min | Max | Med |
| 1 | 0 | 10 | 5 |
| 2 | 11 | 30 | 20.5 |
| 3 | 31 | 50 | 40.5 |
| 4 | 51 | 70 | 60.5 |
| 5 | 71 | 100 | 85.5 |

| I = Impact £m | | | |
|---------------|-----|-----|------|
| I | Min | Max | Med |
| 1 | 0 | 0.3 | 0.15 |
| 2 | 0.3 | 1 | 0.65 |
| 3 | 1 | 3 | 2 |
| 4 | 3 | 10 | 6.5 |
| 5 | 10 | 20 | 15 |

SERT ROUTE 1 LOW COST ALTERNATIVE

| No | Description | Mouchel Cost | Estimated Stats costs |
|----|--------------------------------------------------------|--------------------|-----------------------|
| 1 | A13 Rbt - Lakeside Bus Terminus | £575,272 | £0 |
| 2 | Lakeside Bus Terminus/A126 Rbt | £869,900 | £0 |
| 3 | A126 Rbt - West Thurrock Way Rbt | £123,200 | £0 |
| 4 | West Thurrock Way Rbt | £0 | £0 |
| 5 | West Thurrock Way Rbt - Sandy Lane | £820,488 | £570,000 |
| 6 | Sandy Lane - Stoneness Rd Rbt | £960,692 | £240,000 |
| 7 | Stoneness Rd Rbt - Mill Lane | £0 | £0 |
| 8 | Mill Lane Jct | £0 | £0 |
| 9 | Mill Lane Jct - Devonshire Rd | £459,968 | £150,000 |
| 10 | Devonshire Rd / Gumley Rd | £490,950 | £180,000 |
| 11 | Woultham Rd / Askews Farm Lane | £473,317 | £0 |
| 12 | Woultham Rd - Measons Lane | £0 | £0 |
| 13 | Wharf Rd | £0 | £0 |
| 14 | Wharf Rd - Derby Rd | £0 | £0 |
| 15 | Crown Rd Jct | £0 | £0 |
| 16 | Crown Rd - Bedford Rd | £356,718 | £20,000 |
| 17 | Bedford Rd - Hathaway Rd | £0 | £0 |
| 18 | Hathaway Rd - Bridge Rd | £0 | £0 |
| 19 | Bridge Rd - Bradleigh Ave | £0 | £0 |
| 20 | Bradleigh Ave - Whitehall Lane | £173,890 | £0 |
| 21 | Whitehall Lane - Chadwell Rd | £0 | £0 |
| 22 | Chadwell Rd - Lodge Lane | £0 | £0 |
| 23 | Lodge Rd | £0 | £0 |
| 24 | Lodge Rd - Stanford Rd | £0 | £0 |
| 25 | Stanford Rd Rbt | £0 | £0 |
| 26 | Stanford Rd Rbt - King Edward Drive | £33,501 | £0 |
| 27 | King Edward Drive - Orsett Cock Rbt | £149,540 | £0 |
| 28 | Orsett Cock Rbt (with signals) | £563,840 | £0 |
| 29 | Orsett Cock Rbt - A13 - A126 | £520,380 | £0 |
| 30 | A13 - A176 | £382,382 | £0 |
| 31 | A176 Nethermayne - Basildon Hosp Rbt | £197,659 | £845,000 |
| 1 | Hospital Loop (also included in SERT 1A No 33) | £0 | £0 |
| 2 | Basildon Hospital Rbt (also included in SERT 1A No 32) | £0 | £0 |
| 3 | Hospital Rd - Nethermayne Ashdown Way | £0 | £0 |
| 4 | Ashdown Way Loop | £296,296 | £170,000 |
| 5 | Nethermayne - Southernhay Rbt | £1,181,002 | £180,000 |
| 6 | Southernhay Rbt - Station Way Jct | £247,448 | £162,000 |
| 7 | Southernhay - Station Way Jct | £0 | £0 |
| 8 | Southernhay - Station Way - Clay Hill Rd | £106,636 | £140,000 |
| 9 | Southernhay - Clay Hill Rd Jct | £0 | £0 |
| 10 | Southernhay - Clay Hill Rd - Broadmayne | £577,353 | £250,000 |
| 11 | Southernhay - Broadmayne Jct | £583,979 | £255,600 |
| 12 | Ghyllgrove - Audley Way - the Grove | £139,107 | £226,800 |
| 13 | Ghyllgrove - Whitmore Way Jct | £0 | £0 |
| 14 | Ghyllgrove - Whitmore Way Jct - Festival Link | £0 | £0 |
| 15 | Festival Link - Festival Park Rbt | £171,584 | £115,000 |
| 16 | Festival Park Rbt | £151,504 | £0 |
| 17 | Festival Park Rbt - Festival Way | £244,637 | £160,000 |
| 18 | Festival Way - Gardiners Link | £851,285 | £422,000 |
| 19 | Gardiners Link - A127 Rbt | £64,200 | £0 |
| 20 | A127 Gardiners Link Rbt & Jct | £716,017 | £191,000 |
| 21 | A127 Gardiners Lane Sth - East Mayne | £335,721 | £140,400 |
| 22 | Paycocks Rd - East Mayne Jct | £126,810 | £45,000 |
| 23 | Paycocks Rd - Christopher Martin Rd | £19,394 | £0 |
| 24 | East Mayne - Christopher Martin Rd Jct | £97,437 | £0 |
| 25 | East Mayne - Gardiners Lane South | £200,539 | £0 |
| | | £13,491,276 | £4,471,800 |

SERT ROUTE 2 LOW COST ALTERNATIVE

| No | Description | Mouchel Cost | Estimated Stats costs |
|----|---------------------------------------------------|-------------------|-----------------------|
| 1 | Rayleigh Downs Rd | £0 | £0 |
| 2 | Rayleigh Downs Rd - Progress Rd | £0 | £0 |
| 3 | A127 Progress Rd - The Fairway | £0 | £0 |
| 4 | The Fairway - Bellhouse Rd | £788,699 | £594,000 |
| 5 | Bellhouse Rd - Bellhouse Lane | £818,978 | £423,000 |
| 6 | Bellhouse Lane - Rayleigh Rd | £0 | £0 |
| 7 | A127 Rayleigh Rd - Bridgewater Drive | £271,470 | £153,000 |
| 8 | Rayleigh Rd - Southbourne Grove | £272,522 | £63,000 |
| 9 | Southbourne Grove - Prince Ave | £292,772 | £0 |
| 10 | Prince Ave - Southbourne Grove & Westbourne Grove | £218,068 | £0 |
| 11 | Southbourne Grove - Prittewell Chase | £211,337 | £117,000 |
| 12 | Westbourne Grove - Prittewell Chase | £217,002 | £117,000 |
| 13 | Westbourne Grove - Hospital at Prittewell Chase | £18,588 | £0 |
| 14 | Hospital at Prittewell Chase - Hobblythick Lane | £26,773 | £0 |
| 15 | Hobblythick Lane - Highfield Gardens | £265,853 | £100,000 |
| 16 | Hobblythick Lane - Fairfax Drive | £0 | £0 |
| 17 | West St - East St | £318,345 | £0 |
| 18 | West St - Queensway | £41,642 | £0 |
| 19 | Chichester Rd | £368,246 | £95,000 |
| | | £3,870,195 | £1,662,000 |

Route 1 **£13,491,276** **£4,471,800**

Route 2 **£3,870,195** **£1,662,000**

Total Construction Cost = **£17,361,471** **£6,133,800**

Total cost including Stats = **£23,495,271**

| Cost Estimate | QRA low | QRA High | Range | | Mean | SD | Probability of not exceeding |
|---------------|----------|------------|-------------|-------------|-------------|------------|------------------------------|
| | 4.6% | 30.8% | From | To | | | 50.0% |
| £17,863,076 | £17,318 | £5,527,114 | £18,780,594 | £23,490,190 | £21,135,392 | £1,153,861 | £21,135,392 |
| | | | Range | | | | Probability of not exceeding |
| Cost Estimate | 4.6% | 30.8% | From | To | Mean | SD | 50.0% |
| £5,532,195 | £251,776 | £1,702,218 | £5,783,971 | £7,234,413 | £6,509,192 | £385,368 | £6,509,192 |

| Cost Estimate | QRA low | QRA High | Range | | Mean | SD | Probability of not exceeding |
|---------------|------------|------------|-------------|-------------|-------------|------------|------------------------------|
| | 4.6% | 30.8% | From | To | | | 50.0% |
| £23,495,271 | £1,069,294 | £7,229,332 | £24,564,565 | £30,724,603 | £27,644,584 | £1,509,209 | £27,644,584 |
| | | | | | | | Probability of not exceeding |
| | | | | | | | 50.0% |
| | | | | | | | 80.0% |
| | | | | | | | £28,914,766 |