

<b>Committee(s):</b>	<b>Date(s):</b>
Planning and Transportation Committee Project Sub Committee Finance Committee	14 <sup>th</sup> May 2013 16 <sup>th</sup> May 2013 24 <sup>th</sup> May 2013
<b>Subject:</b> St Paul's Cathedral External Lighting - Outline Options Appraisal	Public
<b>Report of:</b> Director of the Built Environment	For Decision

### Summary

#### Dashboard

Project Status : Green

Timeline indicating the stage at which the project is: Gateway 3

Total Estimated Cost : between £425,000 and £1,105,000

Spend to Date : £50,000 for evaluation

Overall project risk : Green

#### Context

This report seeks approval of a new scheme for St Paul's Cathedral external lighting which is approaching the end of its 25 year life span. The scheme is to be fully funded by external sponsorship and a total contribution of £100,000 from the City Finance Contingency Committee. The scheme is to be managed by the City on behalf of the Cathedral which will be the recipient of the external sponsorship funding.

St Paul's Cathedral is of international, religious, architectural and cultural significance and is arguably England's most important classical building. It is one of the most recognised landmarks on the London skyline. The Cathedral is grade I listed and is located in St Paul's Cathedral Conservation Area.

Since 1966, the City of London has taken responsibility for the installation and maintenance of the external lighting of the Cathedral as well as all associated running costs. This is specified in the "St Paul's Cathedral New Floodlighting" report that was approved in 1989 by the Finance Committee and the Coal, Corn and Rate Finance Committee (renamed Finance Committee in 1992).

The current lighting scheme, which uses large energy consuming flood lights on and off the Cathedral, was installed in 1989 and is now approaching the end of its 25 year life span. The current system is inflexible and fails to highlight the architectural features of the Cathedral. It also uses High Intensity Discharge (HID) technology that is currently in poor condition and likely to be out dated in 10 years time and is being superseded by new energy efficient technology.

As one of the City's most iconic buildings, the floodlighting of St Paul's is intended to make it stand out when viewed from across London. Increasingly the Cathedral is viewed in the context of ever taller illuminated towers in the City. In order to

ensure that the Cathedral maintains its preeminent position and to address the sustainability issues of its current out of date lighting, the proposal seeks to illuminate the Cathedral in an architecturally sophisticated manner using modern technology.

In order to progress the project for relighting the Cathedral, Members approved a feasibility study in 2008, which was led by the Dean and Chapter of St Paul's Cathedral. In September 2010, Members of the Planning and Transportation Committee approved a budget of £50,000 from the City of London Strategic Project Funding for evaluation.

The evaluation was carried out with a strong input from the Dean and Chapter of St Paul's using their lighting consultants Speirs & Major. They were the consultants responsible for the successful illumination of the interior of the Cathedral as part of its 300 years restoration. The evaluation key objectives were:

- Replace the current lighting equipment which is approaching the end of its life;
- Create a flexible lighting scheme that highlights the architecture of the building;
- Deliver annual savings of approximately 50% of running costs (electrical and maintenance);
- Reduce light pollution and energy use in line with the Corporation's commitment to sustainability;
- Improve the quality of the evening environment in this area and therefore, London as a whole;
- Identify an external funding strategy for the implementation of the project.

A number of options have now been evaluated and are presented in this report.

#### Brief description of project

3 options were evaluated in detail, these are:

- Replacing the current scheme like for like;
- Implementing a new design using High Intensity Discharge (HID) lighting;
- Implementing a new design using Light-Emitting Diodes (LED) technology (preferred option see Appendix 1 for illustrations).

The current lighting scheme installed in 1989 provides intense light into the whole building, using strong HID fittings that are located in St Paul's Cathedral and Carter Lane gardens, on buildings and posts in St Paul's Churchyard, and on the Cathedral itself. The intended effect of the design is to mimic the Cathedral illuminated by moon light, however the scheme is currently incomplete and does not allow for any flexibility in the lighting of the building at different times of the year, on different days, etc. The existing HID fittings do not light the Cathedral to the best effect, when compared to new LED technology that allows a much more subtle approach to lighting. It should also be noted that the current rapid

development of modern LED technology will likely make it difficult to source HID lighting elements in 10 years time and therefore to maintain the lighting equipment.

The recommended option (Option 3) is to replace the current lighting scheme using the latest LED technology that will better highlight the buildings architectural features. The new design would continually adapt to the level of lighting needed (i.e. for special events, at different times of the night...) delivering considerable energy savings and reducing City maintenance costs by approximately 68%. The current cost to run and maintain the lighting is £32,700 per year, and could be reduced to £10,600 (see figures in Appendix 3). The project would also assist in achieving a reduction in light pollution and the City's carbon footprint in line with the Corporation's commitment to sustainability.

The design of the proposed scheme was developed with the Cathedral and it is welcomed and supported by their Fabric Advisory Committee, which assesses all proposals for architecture alterations to the building. However their preferred option for the lighting units to implement this design is for the more efficient LED technology.

The new design will involve new fittings to be installed. Some will be in existing locations but many new locations on the building itself are proposed that will make maintenance and access easier. Planning application and listed building consent will be required and any resultant issues or requirement will be investigated and reported at Gateway 4 (detailed options appraisal).

In order to fund the project it was originally envisaged that the project would fund about 50% of the required expenditure through "spend to save" initiative due to the efficiency of modern lighting, with the balance being met from sponsorship channelled through the Cathedral from external parties. However on 24 May 2012, new project funding guidelines were approved by the Resource Allocation Sub-Committee specifying that "spend to save" funded projects have a pay-back period of no more than 5 years rather than 25 years originally proposed for this project. Given the changes to "spend to save" calculations for projects, but taking into account the significant savings that can be made through the use of modern technology, it is recommended that the City funds the progression of the project to the stage where partnership/sponsorship can be effectively secured, and the sponsorship approach reduces the City contribution enabling the 5 year payback requirement to be met. In order to progress the scheme it is proposed that a contribution of £100,000 be provided from the Finance Committee Contingency Budget. This funding to be utilised to develop a clear sponsorship plan and implement sponsorship activities, as well as to prepare the detailed design (Gateway 4). It is anticipated that the implementation phase of the project will be fully funded by external sponsorship.

To achieve a successful sponsorship that is tailored for the Cathedral and the City, it is proposed to hire a sponsorship specialist to prepare and promote a clear Sponsorship Package and to create and manage solid sponsorship relationships. The Cathedral will oversee the work of this specialist, with input from the City Public Relations office in:

- Identifying the Cathedral and the City sponsorship objectives;
- Preparing the sponsorship programme;
- Checking National and European regulations regarding sponsorships;
- Identifying potential City businesses and international companies that would be interested in the sponsorship;
- Approaching City businesses and international companies;
- Preparing and organising high level presentations using high quality materials (i.e. high quality prints to show the lighting design, 3d model, etc.);
- Organising lighting trials and mock-ups in liaison with lighting designers;
- Developing and negotiating the sponsorship agreements;
- Preparing the implementation plan.

It is anticipated that the Cathedral will be the direct recipient of the sponsorship funding and will therefore have a central role in the approach and choice of the sponsorship. The sponsorship consultant and sponsorship funding will then have to follow the Cathedral's procurement rules. It should be noted that the Cathedral and the City have already been approached by the sponsors of the Olympic re-lighting scheme for Tower Bridge who are showing a keen interest in the St Paul's Lighting project.

To complete the Sponsorship Package and prepare the Gateway 4 (detailed design option), it is recommended that £25,000 is allocated from the Finance Committee Contingency Budget (see detailed finance table in Appendix 2).

### Options

Description	Option 1 Like for Like	Option 2 New Design: HID	Option 3 New Design : LED
Total Estimated Cost	£425,000	£915,000	£1,105,000
Tolerance +/-	5%	5%	5%
Likely Funding Strategy	City funding – to be identified	External sponsorship, and a £100,000 from the Finance Committee Contingency Budge	External sponsorship, and a £100,000 from the Finance Committee Contingency Budge

NB Full details of all of the options are available in paragraph 23 of the Main report.

### Recommendations

Option(s) recommended to develop to next Gateway

**It is recommended that :**

**Planning & Transportation Committee and Project Sub Committee approve the following:**

- 1) Option 3 to relight St Paul's Cathedral with a new LED lighting scheme at an estimated total cost of £1,105,000 funded by external sponsorship and £100,000 from the City Finance Committee Contingency Budget;**
- 2) A sponsorship specialist be engaged to support the City and the Cathedral in developing a clear plan to identify sponsorship opportunities and prepare a Sponsorship Package;**
- 3) This project proceed to Gateway 4 (detailed options appraisal) funded by £25,000 from the £100,000 City Finance Committee Contingency Budget. This project proceed to Gateway 4 (detailed options appraisal) funded by £25,000 from the £100,000 City Finance Committee Contingency Budget.**

**Finance Committee approve the following:**

- 4) A total contribution of £100,000 from the City Finance Committee Contingency Budget be allocated to St Paul's lighting project to meet the cost of preparing the Sponsorship Package and securing external funding for the implementation of the project, including developing the project to the next Gateways.**

#### Next Steps

The City, in partnership with the Cathedral, to prepare and agree the sponsorship strategy and appoint an expert with strong experience to develop and promote the Sponsorship Package. This is to be done with the input of the City Public Relations office. Thereafter, the next step will be to approach and contact key City corporate businesses and major international companies to seek funding. High quality marketing materials and lighting trials and mock-ups will be prepared to help to promote the project and to secure the sponsorship. Detailed design and costing are also to be prepared after Gateway 4.

#### Resource requirements to reach next Gateway and source of funding

£25,000 from within the proposed £100,000 contribution from the Finance Committee Contingency Budget.

#### Financial assessment/Investment Appraisal to be provided in the detailed options Appraisal report

To be provided at the next Gateway.

#### Plans for consultation prior to the next Gateway report

It is proposed to continue to consult and work with St Paul's Cathedral. Other relevant parties will also be consulted including:

- Externals: English Heritage, the GLA, City businesses, international companies;
- Internals: The Public Relation Office, the City Surveyor, the Built Environment and the Open Spaces Departments, the Access Team, and the Bridge House Estates.

### Tolerances

Project costs have been provided by chartered quantity surveyors in January 2013 and analysts are forecasting reductions in the price of LED fittings of 15%, year on year through to 2015. Therefore the prices set out in this report reflect a 15% reduction since an initial evaluation in March 2012, and we are pro-actively monitoring the market to ensure the best value options are explored. Further cost reductions are therefore expected by the time the project is implemented.

It should be noted that there is a low risk of the existing main distribution equipment not being in good condition and needing to be replaced. The main distribution equipment has been investigated as far as possible at this stage and conclusion shows that it is in good condition. Further investigated are to be carried out and confirmed in the Gateway 4 report.

## **Main Report**

### **Overview**

<p><b>1. Evidence of Need</b></p>	<p>The current lighting scheme is approaching the end of its 25 years life span and is now in need of replacement. A feasibility study was undertaken for the Dean and Chapter of St Paul's Cathedral in May 2008 which identified a preliminary proposal for a future project, pending options.</p>
<p><b>2. Success Criteria</b></p>	<ul style="list-style-type: none"> <li>• Reduced energy consumption</li> <li>• Reduced maintenance costs</li> <li>• Reduced CO2 emissions</li> <li>• Enhanced lighting design</li> <li>• Safer and more pleasant evening environment in the area</li> <li>• More attractive nightscape for the City, within London</li> </ul>
<p><b>3. Project Scope and Exclusions</b></p>	<p>At this stage, this project does not include the replacement of the main distribution equipment, which should be of sufficient quality to be retained. This will be further investigated at the next stage of design development.</p>
<p><b>4. Link to Strategic Aims</b></p>	<p>To support and promote the City as the world leader in</p>

	<p>international finance and business services.</p> <p>To provide modern, efficient and high quality local services and policing within the Square Mile for workers, residents and visitors with a view to delivering sustainable outcomes.</p> <p>This proposal will improve the evening environment of one of the most popular City destinations for residents, tourists and visitors.</p>
<b>5. Within which category does the project fit</b>	Improvements in efficiency.
<b>6. What is the priority of the project?</b>	Advisable.
<b>7. Governance arrangements</b>	Partnership with St Paul's Cathedral.
<b>8. Resources Expended To Date</b>	£50,000 on evaluation (£35,000 Fees and £15,000 Staff Costs).
<b>9. Results of stakeholder consultation to date</b>	The City Lighting Team and St Paul's Cathedral have evidenced a need for the external lighting to be replaced and upgraded. The City lighting team and the Fabric Advisory Committee of St Paul's Cathedral are both supportive of LED technology (Option 3) that provides high performance to emphasise the architecture of this high profile monument.
<b>10. Consequences if project not approved</b>	The current lighting for the Cathedral is approaching the end of its 25 years life span and needs replacing. The City of London is responsible for maintaining and running the external lighting of St Paul's Cathedral. If the project is not approved, and sponsorship obtained, City funds are likely to be needed to replace deficient lighting or the St Paul's lighting may fail. City lighting engineers have advised that the current lighting equipment is in poor condition and its future useful life cannot be guaranteed. Therefore, there is a serious risk for the current lighting to fail if a new scheme is not implemented.

### Outline Options Appraisal

<b>11. Commentary on the options considered</b>	The recommended option (Option 3) is the most expensive to install, however it is considered that it has the most benefits in terms of reduction in light pollution and the City's carbon footprint and reduces City running costs by 68%. The likely evolution of the LED
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	technology over the next 25 years outweighs its cost. It should also be noted that seeking sponsorship for a new LED technology scheme is likely to be more successful than seeking sponsorship for an ageing technology like HID that provides less marketable benefits.
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### **Information Common to All Options**

<b>12. Key benefits</b>	The benefit of the three options is the replacement of lighting fittings that are currently in poor condition for the continued lighting of an important heritage building.
<b>13. Estimated programme and key dates</b>	It is anticipated that the Gateway 4 report will be submitted to Committee in the first quarter of 2014 and that the implementation stage could start in 2015.
<b>14. Potential risk implications</b>	See risk implications for each option in paragraph 25.
<b>15. Anticipated stakeholders and consultees</b>	It is proposed to continue to consult and work with St Paul's Cathedral. Other relevant parties will also be consulted including: <ul style="list-style-type: none"> <li>• External: English Heritage, the GLA, The Bridge House Estates, City Businesses, International Lighting Companies</li> <li>• Internal: The City Surveyor, the Built Environment and the Open Spaces Departments, the Access Team, the City Public Relation Office.</li> </ul>
<b>16. Legal implications</b>	<ul style="list-style-type: none"> <li>• A license between the City and St Paul's Cathedral will be needed;</li> <li>• Planning permission and listed building consent will be needed to fix the new fittings on buildings;</li> </ul>
<b>17. HR implications</b>	N/A
<b>18. Anticipated source(s) of funding – capital and revenue</b>	External sponsorship is to be investigated, (i.e. Corporation businesses as well as technical sponsorship from lighting/electrical companies, Bridge House Estate's funding...) including a £100,000 contribution from the City Finance Committee Contingency Budget.



<p><b>19. Affordability</b></p>	<p>Options 1 and 2 are cheaper in terms of the capital cost, however the running costs are much higher and HID technology is likely to be superseded by LED technology over the next 10 to 15 years.</p> <p>The capital cost for option 3 is the highest but this option proposes a more energy efficient technology that requires less maintenance and will significantly reduce running costs, thereby saving the City money approximately £22,100 per year as estimated by quantity surveyors.</p> <p>The recommended sponsorship approach minimises the City's contribution to a total of £150,000 (£50K expended to Gateway 3 and a further £100,000 proposed) to achieve some £1,000,000 in sponsorship funding to enable the proposed scheme to go ahead.</p>
<p><b>20. Next steps</b></p>	<p>A sponsorship specialist to start developing the Sponsorship Package in partnership with the Cathedral, and identify potential sponsors. The next step will be to approach key City corporate businesses and major international companies to seek funding. High quality marketing materials and a lighting trials and mock-ups will be prepared to help to promote the project and to secure the sponsorship. Detailed design and costing are also to be prepared.</p>

**Outline Options Appraisal Matrix**

See attached.

**Appendices**

<b>Appendix 1</b>	Visuals
<b>Appendix 2 &amp; 3</b>	Finance tables
<b>Appendix 4</b>	HID and LED technologies

**Contact**

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	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>
<b>21. Brief description</b>	<p><b>Replacement of the current scheme like for like</b></p> <ul style="list-style-type: none"> <li>• keep the existing lighting design</li> <li>• replace all the light fittings like for like using the same technology (HID lighting)</li> <li>• reuse the existing control equipment</li> </ul>	<p><b>New Scheme using HID technology</b></p> <ul style="list-style-type: none"> <li>• New scheme design in line with the Cathedral's lighting strategy</li> <li>• New light fittings using HID technology</li> <li>• New control equipment</li> </ul>	<p><b>New Scheme using LED technology</b></p> <ul style="list-style-type: none"> <li>• New scheme design in line with the Cathedral's lighting strategy</li> <li>• New light fittings using the latest LED technology</li> <li>• New control equipment</li> </ul>
<b>22. Scope and Exclusions (where different to section 3)</b>	N/A	N/A	N/A
<b>23. Key benefits (where different to section 12)</b>	<p>The main benefits of this option are as follows:</p> <ul style="list-style-type: none"> <li>• replacement of lighting fittings</li> <li>• no benefits in term of lighting quality nor long-term reduction of energy and maintenance costs</li> </ul>	<p>The main benefits of this option are as follows:</p> <ul style="list-style-type: none"> <li>• replacement of lighting fittings</li> <li>• <b>Running cost savings (energy and maintenance) of approximately 45%</b></li> <li>• Reduced CO2 emissions</li> <li>• Improved lighting and evening environment</li> </ul>	<p>The main benefits of this option are as follows:</p> <ul style="list-style-type: none"> <li>• replacement of lighting fittings</li> <li>• <b>Running cost savings (energy and maintenance) of approximately 68%</b></li> <li>• Greatly reduced CO2 emissions</li> <li>• Best lighting and evening environment</li> </ul>

	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>
			<ul style="list-style-type: none"> <li>• Best control options</li> <li>• Most recent technology that is likely to last longer</li> </ul>
<b>24. Estimated Programme (where different to section 13)</b>	N/A	N/A	N/A
<b>25. Potential risk implications</b>	<p>This option presents the risk of eventual redundancy of HID technology that might become superseded by LED technology over the next 10 to 15 years. This would result in much higher maintenance costs or worse, an obsolete scheme.</p> <p>This option would not allow the controls of the lighting to be modified. The existing controls are dated and require the City to enter various buildings to access the control gear, which is not the most efficient solution.</p> <p>There is also a risk of the existing distribution equipment not being in good condition and needing to be</p>	<p>This option presents the risk of eventual redundancy of HID technology that might become superseded by LED technology over the next 10 to 15 years. This would result in much higher maintenance costs or worse, in an obsolete scheme.</p> <p>There is a risk of external sponsorship funding not being sufficient to cover the cost of the project due to the use of outdated HID technology.</p> <p>There is a risk for the sponsorship requirements not being agreed between the City, the Cathedral and the external sponsorship, and consents not being obtained from building owners and the City</p>	<p>There is a risk of external sponsorship funding not being sufficient to cover the cost of the project. It should be noted that, the City has already been approached by potential sponsors interested in the project and the LED technology.</p> <p>There is also a risk for the sponsorship requirements not being agreed between the City, the Cathedral and the external sponsorship, and consents not being obtained from building owners and the City Planning Department.</p> <p>There is also a risk of the existing distribution equipment not being in good condition and needing to be</p>

	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>
	replaced.	Planning Department. There is also a risk of the existing distribution equipment not being in good condition and needing to be replaced.	replaced.
<b>26. Anticipated stakeholders and consultees (where different to section 15)</b>	N/A	N/A	N/A
<b>27. Legal implications (where different to section 16)</b>	N/A	N/A	N/A
<b>28. HR implications (where different to section 17)</b>	N/A	N/A	N/A

<b><u>Financial Implications</u></b>	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>
<b>29. Total Estimated cost (£)</b>	The total estimated cost for this option is £425,000. This is made up of pre-implementation costs of £100,000 and implementation costs of £325,000 funded by the City.	The total estimated cost for this option is £915,000. This is made up of pre-implementation costs of £100,000 funded from the Finance Committee Contingency Budget and implementation costs of £815,000 funded from external	The total estimated cost for this option is £1,105,000. This is made up of pre-implementation costs of £100,000 funded from the Finance Committee Contingency Budget and implementation costs of £1,005,000 funded from external

		<p>contributions/sponsorship.</p> <p>Project costs have been provided by Chartered Quantity surveyors in January 2013 and approved by City Lighting engineers. See Appendix 3 for detailed cost estimate and running costs estimate</p>	<p>contributions/sponsorship.</p> <p>Project costs have been provided by Chartered Quantity surveyors in January 2013 and approved by City Lighting engineers. See Appendix 3 for detailed cost estimate and running costs estimate.</p> <p>Several analysts are forecasting reductions in the price of LED fittings of 15% year on year through to 2015. Further cost reductions are therefore expected by the time the project is implemented.</p>
<b>30. Anticipated source of project funding (where different to section 18)</b>	<ul style="list-style-type: none"> <li>City of London funding</li> </ul>	<ul style="list-style-type: none"> <li>External funding contributions</li> <li>£100,000 from the Finance Committee Contingency Budget</li> </ul>	<ul style="list-style-type: none"> <li>External funding contributions</li> <li>£100,000 from the Finance Committee Contingency Budget</li> </ul>
<b>31. Estimated capital value/return (£)</b>	N/A	N/A	N/A
<b>32. Fund/budget to be credited with capital return</b>	N/A	N/A	N/A
<b>33. Estimated ongoing revenue implications</b>	The running costs for this option	The running costs for this option	This is the most efficient option in

(£)	<p>have been estimated at a total of £32,700 over 1 year (£22,600 of electricity costs and £10,100 of maintenance cost).</p> <p>This option would not result in any revenue savings for the City.</p>	<p>have been estimated at a total of £18,000 over 1 year (£12,200 of electricity costs and £5,800 of maintenance cost).</p> <p>This option would result in revenue savings of 45% for the City.</p>	<p>terms of running costs (see all cost details in Appendix 3) The running costs for this option have been estimated at a total of £10,600 over 1 year (£6,700 of electricity costs and £3,900 for maintenance).</p> <p>This option would result in revenue savings of 68% for the City.</p>
<b>34. Anticipated source of ongoing revenue funding (where different to section 18)</b>	N/A	N/A	N/A
<b>35. Fund/budget to be credited with income/savings</b>	N/A	N/A	N/A
<b>36. Affordability (where different to section 19)</b>	N/A	N/A	N/A

<b>37. Recommendation</b>	Not recommended	Not recommended	Recommended
<b>38. Reasons</b>	<p>It is not recommended to implement this option as the current lighting design and the associated technology result in high running costs to the City.</p>	<p>It is not recommended to implement this option as the HID technology results in relatively high running costs to the City.</p> <p>It should also be noted that HID</p>	<p>It is recommended to implement this option as it would reduce the City of London's running costs by 68% in line with the Corporation's commitment to sustainability. This</p>

	<p>In addition, this option does not promote the architecture of the cathedral and does not provide any adaptability to the level of lighting throughout the night.</p> <p>It should also be noted that HID technology is likely to become obsolete over the next 10/15 years.</p>	<p>technology is likely to become obsolete over the next 10/15 years and external funding will be difficult to obtain for out of date technology.</p>	<p>option is also considered the most flexible and future proof as lighting technology is rapidly evolving and options 1 and 2 could become costly and difficult to maintain in 10 years time.</p> <p>This option is also supported by the Fabric Advisory Committee of St Paul's Cathedral and the City Lighting Team.</p>
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Appendix 1 – Visuals



Proposal - South elevation





**Proposal - West Elevations with Lantern & Bell Towers internally illuminated /non illuminated**

## Appendix 2 – Finance Committee Contingency Funding table

Tasks	(£)
<b>To proceed to Gateway 4 – Detailed Option Appraisal</b>	
Sponsorship consultant specialist to prepare Sponsorship Package	11,000
Lighting consultant to provide technical assistance and test the main distribution system	4,000
Marketing and publicity package (design)	3,000
Built Environment Department Staff Cost	7,000
<b>Sub Total Fees and Staff Costs</b>	<b>25,000</b>
<b>To proceed to Gateway 5 – Authority to Start Work</b>	
Sponsorship consultant specialist to secure sponsorship	12,000
Marketing and Publicity package (prints & materials, 3D model)	8,000
Lighting consultant to develop detailed design and prepare lighting trials and mock-ups to test lights and assist sponsorship	18,000
Legal fees to prepare sponsorship agreement	5,000
Consultants	7,000
City Staff Cost	25,000
<b>Sub Total Fees and Staff Costs</b>	<b>75,000</b>
<b>TOTAL</b>	<b>100,000</b>

### Appendix 3 – Comparative table

Comparative Cost in use over full 25 years life if LED brightness increases by 15% and electricity prices increase by 15% over the next two years			
OPTIONS	OPTION 1 Like for like using HID (£)	OPTION 2 New scheme using HID (£)	OPTION 3 New scheme using LED (£)
<b>IMPLEMENTATION COSTS</b>			
Capital cost (excluding fees and staff costs)	190,000	680,000	870,000
Fees and staff costs	135,000	135,000	135,000
<b>Implementation costs sub total</b>	<b>325,000</b>	<b>815,000</b>	<b>1,005,000</b>
<b>CITY RUNNING COSTS</b>			
Power consumption over 1 year	22,600	12,200	6,700
Maintenance over 1 year	10,100	5,800	3,900
<b>Running costs sub total over 1 year</b>	<b>32,700</b>	<b>18,000</b>	<b>10,600</b>
<b>Running costs sub total over 25 years</b>	<b>817,500</b>	<b>450,000</b>	<b>265,000</b>
<b>Total implementation and 25 years running costs</b>	<b>1,142,500</b>	<b>1,265,000</b>	<b>1,270,000</b>

## Appendix 4 – HID and LED technologies

**High-intensity discharge lamps (HID lamps)** are a type of electrical gas-discharge lamp which produces light by means of an electric arc between tungsten electrodes housed inside a translucent or transparent fused quartz or fused alumina arc tube. HID lamps are typically used when high levels of light over large areas are required.

High-intensity discharge lamps make more visible light per unit of electric power consumed than fluorescent and incandescent lamps since a greater proportion of their radiation is visible light in contrast to heat. Most HID lamps produce significant UV radiation, and require UV-blocking filters to prevent UV-induced degradation of lamp fixture components and fading of dyed items illuminated by the lamp.

**An LED lamp** is a solid-state lamp that uses light-emitting diodes (LEDs) as the source of light. LED lamps offer long service life and high energy efficiency (the same light for less electricity) than most other lighting. LED sources are compact, which gives flexibility in designing lighting fixtures and good control over the distribution of light with small reflectors or lenses. Because of the small size of LEDs, control of the spatial distribution of illumination is extremely flexible, and the light output and spatial distribution of a LED array can be controlled with no efficiency loss. However, initial costs are higher than those of fluorescent and incandescent lamps.

The main difference to other light sources is the directed light that requires less Lumen compared to light sources which would need reflectors or lenses to do the same. Compared to fluorescent bulbs, advantages claimed for LED light bulbs are that they contain no mercury, that they turn on instantly, and that lifetime is unaffected by cycling on and off. LED light bulbs are also mechanically robust when most other artificial light sources are fragile.

Efficiency of LED devices continues to improve and the efficiency of conversion from electric power to light is generally higher than for incandescent lamps. LED lighting is recommended worldwide as it reduces energy consumption.