



GARSCUBE ESTATE EXTERNAL LIGHTING UPGRADE PROJECT

SUMMARY REPORT
NOVEMBER 2016

EXECUTIVE SUMMARY

A project was initiated in June 2016 to upgrade the external lighting at the University of Glasgow Garscube Estate. The project was to include the pole-mounted and wall-mounted light fittings, with the intention of improving lighting levels for campus users and CCTV cameras, as well as reducing energy consumption and carbon emission where practicable.

It was found that no 'As Installed' information for the existing lighting installation was available, and detailed surveys were required prior to commencing with any design work. Once the project was designed, it was determined that a payback period of less than 4 years could be obtained for the project, which provided suitable financial reasoning for commencing the project.

Through detailed design and installation, it has been possible to improve the illumination levels across the campus, and therefore increase perceived safety and coverage for the CCTV cameras that are installed across the estate.

A total of approximately £125,000 has been invested in the project, which has led to a drastic decrease in maintenance costs as well as a reduction of approximately 3400kg of carbon per annum.

Positive feedback has been obtained from relevant stakeholders, and work is progressing with illuminating a section of unlit pathway between Lady Campbell Bridge and North Lodge.

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1. INTRODUCTION

The following report details the Works that have been undertaken to improve the external lighting at the University of Glasgow Garscube Estate. The report will provide information on the following:

- Security Improvements;
- Financial Analysis;
- Carbon Savings;
- Total Funds Invested in Project;
- Feedback from End Users.

The project itself was initiated in June 2016, and has an anticipated Phase 1 completion date of November 2016, with additional Phase 2 works planned for the future.

The project was divided into two phases in order to decipher between the areas that are directly maintained by University of Glasgow Estates and Buildings staff, and those that fall outwith this area, but are still within the campus/estate boundary.

The Phase 1 Works included the building mounted and roadway/pathway lighting that is installed in the areas between the Main Gatehouse and the South Lodge, west of the River Kelvin, as well as 6no. fittings across the Lady Campbell Bridge.



Figure 1.1 Plan Drawing and Aerial Photograph Showing Area Affected by Works

The remaining Phase 2 works include the building mounted and roadway/pathway lighting that is across the Lady Campbell Bridge, east of the River Kelvin, within the Sports Complex and Kelvin Campus areas. The relevant costings and lighting designs for the Phase 2 areas have been completed, however, works have not commenced on this phase to date. Information on budget centres for these works is required prior to commencement (Garscube Estates and Buildings staff do not maintain these areas).

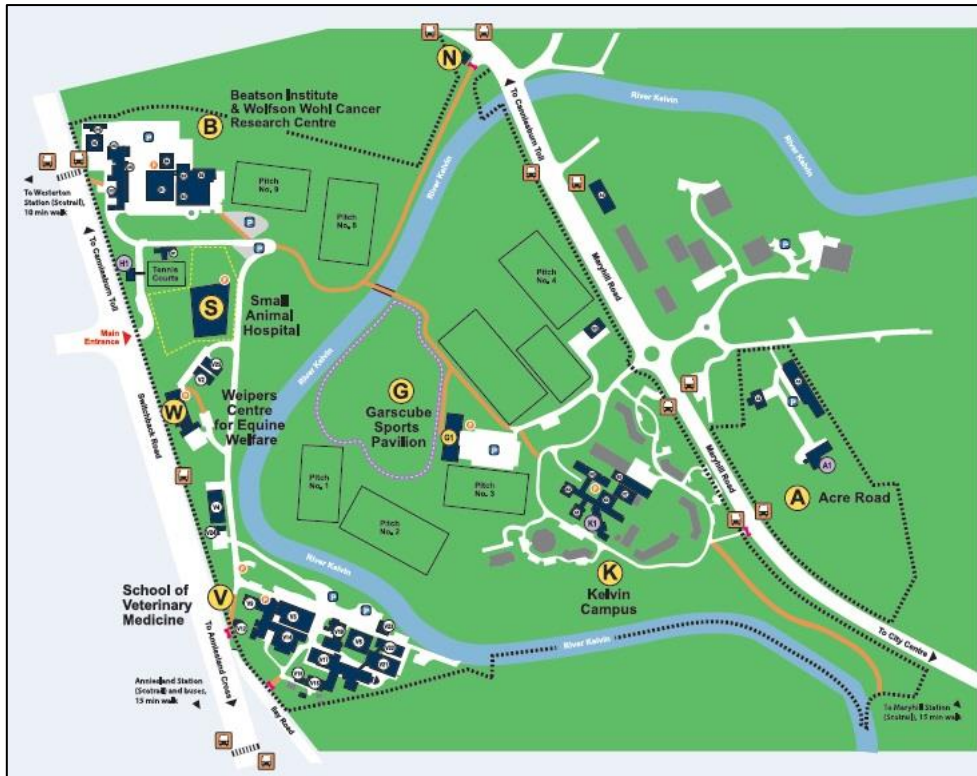


Figure 1.2, Garscube Estate Campus Map

There is also a section of pathway between the Lady Campbell Bridge and the North Lodge that is currently unlit. A previous Planning Application for this area was submitted to East Dunbartonshire Council and was subsequently denied, however, it is believed that only one resident, who is no longer living at the location, objected to the proposals. The area in question has been fully designed, and will be subject to a full Planning Application upon receipt of satisfactory cost proposals from the Electrical Contractor. University of Glasgow Grounds, Gardening and Planning staff will be consulted prior to submission of this application, at which time a tree survey may be required to ascertain the implications of the proposals on the local trees and shrubbery.

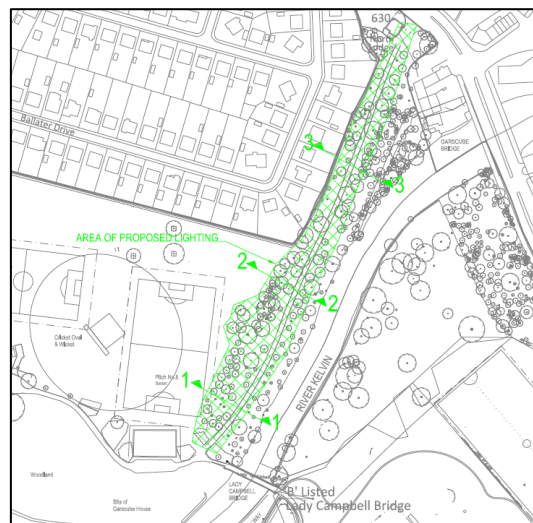


Figure 1.3, Site plan showing area of unlit pathway

2. PROJECT DETAIL

When work commenced on the Pre-Construction stages of the project, it was quickly determined that there was no As Installed information available for the project. This meant that a detailed survey of the existing lighting installations, to determine the condition, positions, etc., was required before the scope of the project could be detailed.

From the initial surveys it was found that the existing lighting installation was of varying types and conditions, with some of the light sources emitting an 'orange' light (from low pressure sodium fittings), and others utilising 'whiter' light sources. It was also found that a number of street lighting columns were in poor condition, and there were issues with time-clocks requiring regular re-setting after brownouts and blackouts.

In order to remedy the existing lighting installation, it was considered suitable to use the existing Glendale Framework Agreement to procure the goods and services required for the project. The knowledge of the site that Glendale possesses was also considered a major benefit when choosing to procure by this method.

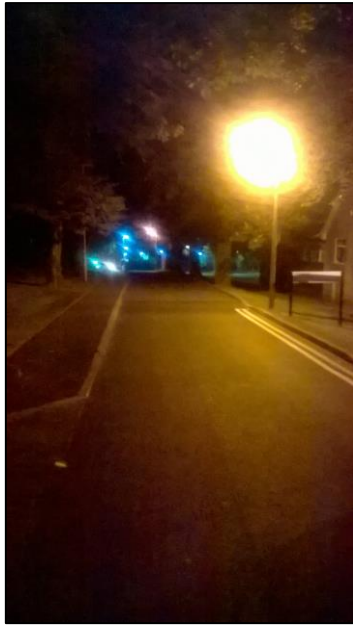
A recent project to trial LED pole-mounted fittings was completed along the roadway between the Main Entrance and the Gatehouse, and as the campus users and Central Services Team had provided positive feedback from this project, it was considered suitable to extend this project, utilising the same light sources for technical and aesthetic purposes.

2.1 Security Improvements

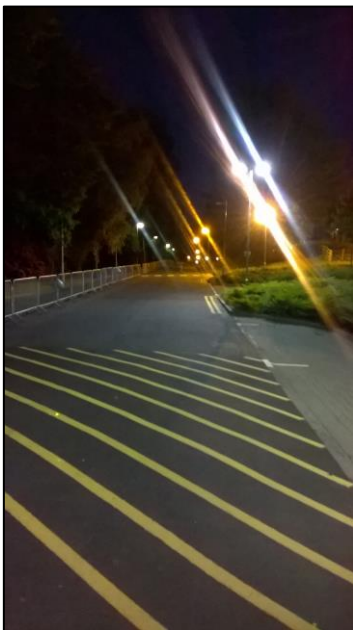
One of the primary objectives of the project was to improve the security of the campus. This was to be achieved by providing a 'whiter' light, that allowed the CCTV cameras on campus to operate in 'day' mode rather than 'night' mode, which provides better footage where required.

The feedback that has been received from the Central Services Team has all been positive to date. The cameras are now no longer switching to 'night' mode due to the increase in lux levels and improved colour temperature and colour rendering. A detailed survey of the CCTV cameras and coverage is currently being undertaken by Central Services, the results of which will be sent to the Estates and Buildings Department Once available.

The immeasurable results of perceived safety were also a focus of the project. While by nature it is difficult to ascertain whether any improvements in this area have been achieved, the improved lux levels and colour rendering of the new light sources are considered to be an improvement on the existing lighting installation, and provide those using the campus during out of hours times with a campus that is better illuminated and more closely matched to daylight lighting conditions. Please see before and after photographs of lighting at Tennis Court Pavilion and Main Drive at Small Animal Hospital.



Photograph 2.1 & 2.2, Roadway lighting looking east from Tennis Court Pavilion to Mini-Roundabout



Photograph 2.3 & 2.4, Roadway lighting looking south from Small Animal Hospital to South Lodge

2.2 Financial Analysis

As part of the financial analysis of the project, it was a requirement to provide information on the payback period of the project, and if it was to be viable before we considered implementing the project. One of the main benefits of utilising LED lighting as the light source is that the ratio of light output to energy input (luminous efficacy) is improved when utilising these sources when compared to more 'traditional' light sources. This means that energy savings can be achieved, and the overall energy consumption of the campus/estate can be reduced by implementing LED light source fittings.

Another attractive aspect of implementing LED fittings is the reduced maintenance costs that are associated with these light sources. LEDs do not require regular replacement, which is the case with

traditional lamped light sources, and therefore the costs to maintain the lighting installation are reduced. A reputable manufacturer with a 5-year guarantee was specified, which meant that maintenance costs for the fittings can almost be eliminated from future capital maintenance expenditure forecasts/budgets.

Both of these elements can be used to offset the capital cost of the proposed project. Please see table and graph below for information on Payback Period, Return on Investment and Carbon Savings for the project in question.

| | | | |
|---|-----------------------------------|------------------|----------|
| Light points | 50 | | |
| hrs/day | 12 | hours | |
| days/year | 365 | days | |
| hrs/year | 4,380 | hours | |
| Airco/months | 0 | months | |
| <hr/> | | | |
| | Sox 55W | 31W oxane | |
| Installed Power per light point | 72 | 31 | W |
| Energy Consumption/Year | 315.36 | 135.78 | Kwh/year |
| Energy costs/KWh | 0.062 | 0.062 | €/Kwh |
| Running costs/ luminaire/Year | 19.55 | 8.42 | €/year |
| <u>Airco costs per light point/Year</u> | 0.00 | 0.00 | €/year |
| Total Energy costs | 977.62 | 420.92 | €/year |
| | Difference | 556.70 | €/year |
| <hr/> | | | |
| | Sox 55w | 31W oxane | |
| Price /Lamp | 25.00 | 0.00 | € |
| Price /Luminaire | | 250.00 | € |
| Lamp Lifetime | 8,000 | 100,000 | hours |
| | 0.55 | 0.04 | |
| Lamp Costs /Year | 13.69 | 0.00 | €/year |
| Total Costs/Year | 684.38 | 0.00 | €/year |
| | Difference | 684.38 | €/year |
| <hr/> | | | |
| | Sox 55W | 31W oxane | |
| Relamping cost per Light Point | 75.00 | 0.00 | € |
| Relamping costs per Light Point/Year | 41.06 | 0.00 | €/year |
| Total cost of relamping/Year | 2053.13 | 0.00 | €/year |
| | Difference | 2,053.13 | €/year |
| <hr/> | | | |
| | Saving-Loss/year | 3,294.20 | €/year |
| | Payback Period | 3.4 | years |
| | ROI | 26% | |
| | saved CO₂ in KG | 4,759 | |

Figure 2.1, Table of Payback Period, Return on Investment and Carbon Dioxide Savings

Figure 2.1 above shows Total Cost of Ownership (TCO) information on the 50no. Pole-mounted fittings that have been installed along the main drive and in the Veterinary Hospital and School Area. The hours per day is averaged out across the year, with modest estimates for energy costs included to avoid unachievable payback figures – note: Airco/months are for internal lighting projects and are not relevant to this instance. Re-lamping costs have been estimated based on experience, and

payback figures are based on the purchase price of the light fittings only and do not include installation or wiring modification costs.

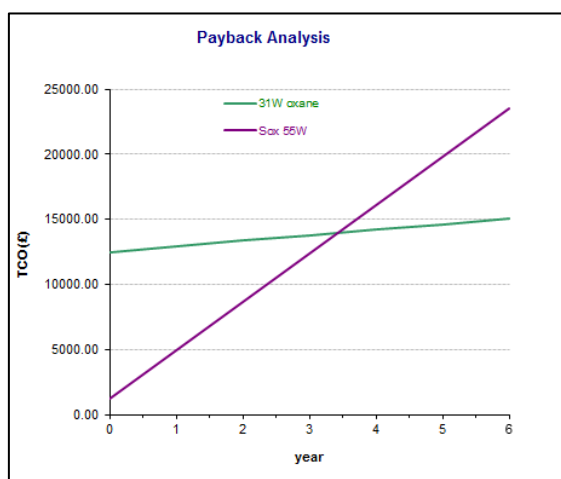


Figure 2.2, Graph of Payback Analysis

Financial analysis has not been provided for the wall-mounted fittings or bollards that are included as part of the scope of the project – pole mounted fittings only included.

2.3 Carbon Savings

As shown in Figure 2.1, the change from traditional lighting to LED results in a carbon saving of over 4000kg of CO₂ per annum. Under the CRC Energy Efficiency Scheme, this equates to approximately £64 saving on carbon per year. This is obviously additional to the monetary savings on both energy usage and maintenance costs.

2.4 Total Funds Invested in Project

To date, a total of approximately £125,000 has been invested in the project. The works to date include:

- Replacement of 46no. pole mounted fittings with modern energy efficient LED equivalent along main drive from Tennis Court Pavilion to South Lodge. Various lighting columns also replaced;
- Replacement of 4no. pole mounted fittings at Islay Road end of campus (behind Byre Building);
- Replacement of 4no. bollards at WOHL to LED equivalent;
- Replacement of wall mounted fittings at various locations including:
 - Weipers Stable Building;
 - Weipers Equine Building;
 - Indoor Riding Arena Building;
 - Estates Workshop Area;
 - McCall Building;
 - South Lodge;
 - Large Anatomy Building;
 - Byre Building;
 - McRobert and Ian Botham Building;

- Jarrett Building;
 - WSI Building;
 - Urquhart Building;
 - MRI Building;
 - Tennis Pavilion
- Upgrade of 3no. lighting control pillars at various locations throughout campus;
 - Replacement of 6no. pole mounted floodlights at Weipers Equine Roadway to LED equivalent.

2.5 Feedback from End Users

All feedback to date has been positive, with Central Services team providing informal feedback of increases in lighting levels and improvements in perceived safety. A few issues were raised that are in the process of being remedied:

- Timeclocks not coming on at the correct times;
- Some areas still to be finished;
- Some faulty fittings that do not appear to be operating.

All of these issues have been reported to the Electrical Contractor, who are in the process of addressing these minor items.

A feedback questionnaire has been sent to staff in the Central Services team, however, a response has yet to be received.

3. CONCLUSIONS & RECOMMENDATIONS

From the information that has been presented, it can be seen that a significant investment has been made in improving the external lighting across the Garscube Estate. The improvements are immediately obvious, and there will be a reduction in energy consumption across the campus as a result of the project. The Central Services team have provided some positive informal feedback, and the lighting levels and colour rendering of the external lighting has been improved due to the project.

From the financial analysis that has been conducted it was shown that a payback period of less than 4 years can be achieved for the pole-mounted fittings, based on the Total Cost of Ownership Model - which is also within the 5-year guarantee period that has been provided by the lighting manufacturer.

Further works are proposed for the Phase 2 area within the Sports Complex and Kelvin Campus. The relevant costings and lighting designs have been completed for these areas, and these areas are in the process of being commenced.

Works to illuminate the unlit pathway between the Lady Campbell Bridge and North Lodge are also being progressed with financial support from Sustrans being sought in association with the University's Travel and Transport Department.