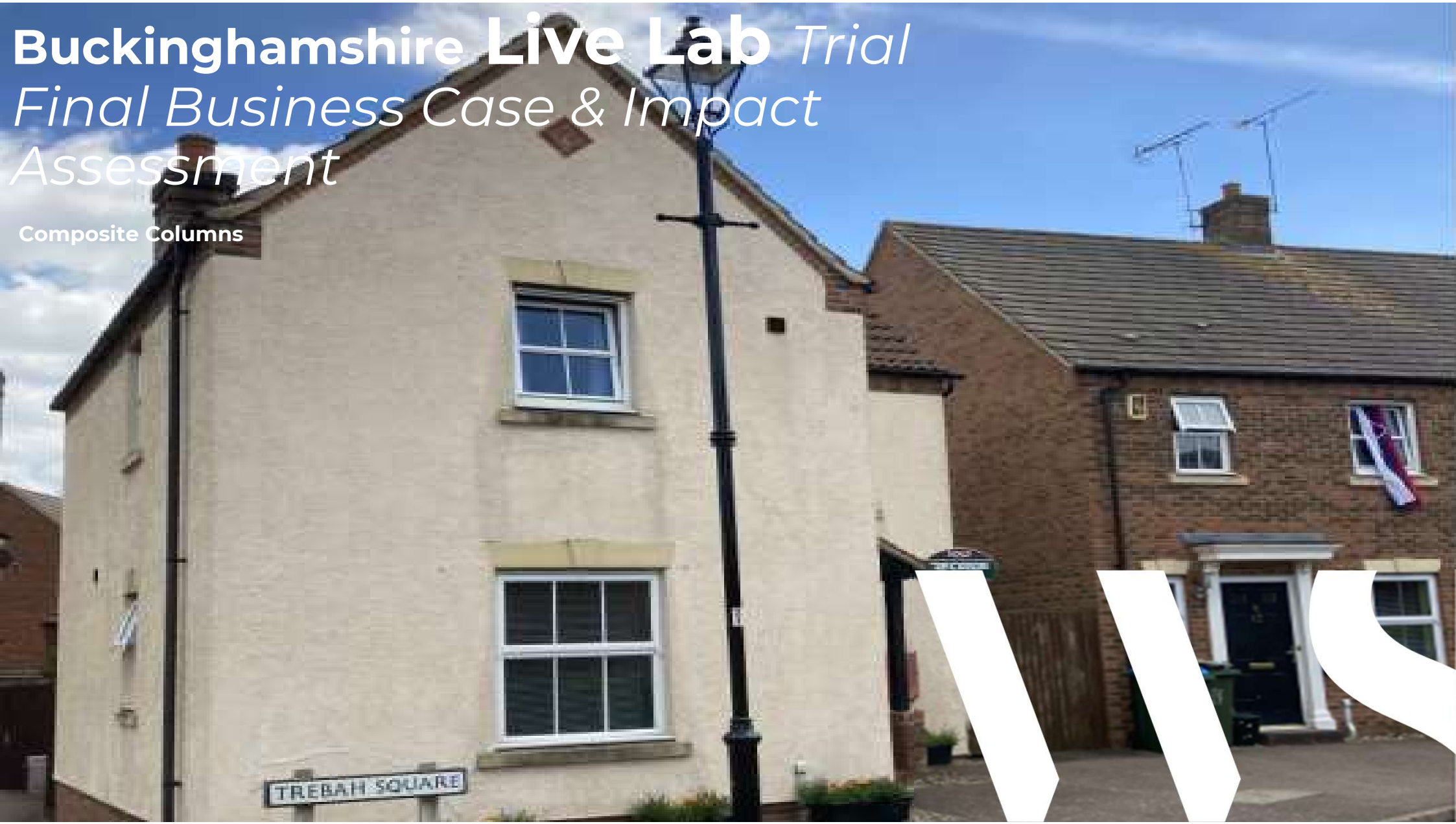
Buckinghamshire **Live Lab** *Trial*

Final Business Case & Impact Assessment

Composite Columns



Strategic Case (1)

The Strategic Case sets out why the composite street lighting column intervention is needed, how it furthers national, regional and local policy and the case for change.

National, regional and local policy fit	Lighting columns are increasingly used to support a host of smart spaces technologies, including electric vehicle (EV) charging, network communications and sensor technology. Low cost, robust and flexible solution, with a low carbon footprint, could help accelerate this process.
The case for intervention that meets those policy needs	The aim of the trial is to assess lighting columns made from recycled composite materials which may last longer, be cheaper to make and have less of an environmental impact.
The national, regional & local needs and challenges	Buckinghamshire Council is seeking to reduce capital and maintenance costs of street lighting and at the same time reduce the embedded carbon of their assets.
The wider case for the intervention	With the limited number of columns that form this trial (170) means that the like for like comparison between traditional metal (Steel and Aluminium) and composite columns supply costs could not be fully determined. However, initial indications are that the current design of the composite (fibre reinforced polymer) columns would not reduce installation or maintenance costs over traditional metal ones. Alternative designs could be more efficient but would need further assessment to determine this.

Strategic Case (2)

Social

Quicker installation times and less plant required on site. This means less disruption to the travelling public.

Financial

More durable product resulting in less maintenance and greater longevity.

Environmental

Reduction in the need for heavy goods vehicles for delivery and installation, reducing harmful emissions.

Economic

Reduction in maintenance meaning less road closures for routine maintenance.

Climate Change

Reductions in greenhouse gases for the production, installation and recycling.

Future Ready

Provide a modular platform that can support upgrading for EV charging and environmental sensors.

Strategic Case (3)

The Logic Impact model shows how the inputs and activities carried out during the trial flow through to short, medium and long term impacts. Where trials are not yet operational, anticipated impacts are provided.

Inputs	Activities	Outputs
• Installation contractor • Capital costs • Procurement and Installation time	Installation and Maintenance of composite columns	• Pedestrian footpath lighting

Planned work

Outcomes – Impact		
Short-term	**Medium-term**	**Long-term**
Reduced installation times and less plant on site.	Reduced maintenance regime	Reduced carbon emissions and reduced cost of grid electricity for lighting

Intended results

Economic Case - Costs

Capital costs – procurement, installation

Costs for the supply of the composite column are based on informed assumptions recorded on the next slide. Costs have been provided by Buckinghamshire Council for the installation works. The estimated cost for procurement and installation of 170 sites is £544k.

Annual costs - operation (including staff time), maintenance, power

As these lighting columns are replacements for existing ones it is considered that there are no additional annual costs. As there are no standards for the maintenance of composite lighting columns (currently in consideration) there is no information with regards to maintenance regimes. The supplier have composite lamppost installed in Lancashire since 1998, so has proven longevity.

Renewals

The renewal costs are not considered as part of the economic case due the replacement period being the same on both composite lighting columns and metal lighting columns.

Economic Case – Benefits realised through the trial

Monetisable: Installation of Composite Lighting columns

The costs for the composite lighting column have been assessed against both traditional lighting columns and traditional lighting column installations.

In order to compare the cost benefits we have considered four alternative material and installation combinations:

Combinations	Unit cost	Cost for 170 sites	% difference
Option 1: Composite column with Nal socket and vacuum excavation technique (as used in trial)	£3,200	£544,000	-
Option 2: Composite column with Nal socket and hand dig excavation technique	£3,008	£511,360	-6%
Option 3: Metal column with Nal socket and vacuum excavation technique	£2,350	£399,500	-27%
Option 4: Metal column, planted and hand dig excavation technique	£2,208	£375,360	-31%

Economic Case – Benefits realised through the trial

Monetisable - Installation of Composite Lighting columns (continued)

The installation method used in the trial and chosen structure is the most expensive option and therefore provides **no monetisable cost benefit** over metal lighting columns. The majority of the cost difference is down to the lighting columns, although supply costs have not been provided the supplier had communicated they are roughly three times the cost of metal equivalents.

Monetisable - Reduction in vehicles hire

For the installation of metal lighting columns there is usually a requirement for two vehicles present on site, this is typically a Hiab Lorry on which the lighting columns are transported on and the crane is used to lift the lighting columns into place. There is then a vehicle (typically van or flatbed) with an elevated platform such as a cherry picker attached which is used to undertake the works with installing the lantern and other fittings. Due to the composite columns being modular they can be transported in a van fitted with a cherry picker, therefore reducing the need for a lorry with Hiab fitted. For cost comparisons purposes the cost of hiring vehicles have been considered for the installation of 170 columns.

A typical weekly hire cost of a Hiab lorry is £350 and for a cherry picker is £475. The installation contractor has confirmed that they install 50 planted metal lighting columns in a week. With the composite lighting columns fitted in NAL sockets they will install 20 sites per week. The table below show the cost differences between installation methods based on a scheme size of 170 sites:

Economic Case – Benefits realised through the trial

Monetisable - Reduction in vehicles hire fees

Planted metal lighting column installation			
	Cost per week	Duration	Total
Hiab Lorry	£350	3.2 weeks	£2,640.00
Cherry picker	£475		
Composite Lighting Column using NAL socket			
Cherry picker	£475	8.5 weeks	£4,037.50
Counterfactual: Planted Composite Lighting Column			
Cherry picker	£475	3.2 weeks	£1,520.00

The current installation method and chosen structure is the most expensive option as can be seen from the table plant hire is initially more expensive for the installation of metal lighting columns, but due to the quicker installation times the hire period is shorter and therefore the overall cost become cheaper. and therefore provides **no monetisable cost benefit** where the NAL socket installation technique is used.

Therefore if the design was amended such that the composite lighting columns could be planted, then this should deliver a reduction in traffic management due to less equipment being present on site, in this case it would provide a **monetisable cost benefit** .

Economic Case – Benefits realised through the trial

Quantifiable not monetisable

Reduction in Traffic Management

Due to a Hiab not being required for installation of composite columns it is assumed that there will be a reduction in traffic management due to less vehicles being present on site. However due to the construction method used in the trial of vacuum excavation there is more equipment and contractors on site than using hand dig methods and therefore negated this potential benefit.

Maintenance and Longevity

It has been assumed that the time periods between maintenance and testing can be extended due to the material not being corrosive. Composite lighting column standards are under consideration at the time of writing and therefore there are no standards for testing. The current assumptions are that testing regimes could be extend as there will not be the kind of corrosion seen on standard columns. The supplier has composite lamppost installed in Lancashire since 1998, so has proven longevity.

Economic Case – Benefits realised through the trial

Qualitative

Manual Handling

The installation contractor has been consulted with to determine their experience. It was confirmed that due to the lightness of the columns they could be installed by hand without the need for a Hiab crane. This is considered a **positive qualitative benefit**

Economic Case – Benefits realised through the trial

Quantifiable not monetisable

It has also been assumed that one of the benefits of composite columns over metal ones are the increased longevity due to the lack of corrosion and metal fatigue. Traditionally metal lighting columns are designed with a life of 15–20 years, where composite columns are considered to last 30 years. However recently aluminium lighting column suppliers are now quoting a design life of 50 years. It should be noted that neither type of columns have a longevity advantage over the other and therefore has **no quantifiable benefit.**

Carbon Case – Benefits realised through the trial

The supplier undertook a carbon assessment using the EuCIA calculator, the findings of which were:

- A column made from the composite material consumes 50% less energy during its lifecycle compared to cold-formed stainless steel
- A composite column generates 70% less greenhouse gases during its lifecycle compared to the stainless steel equivalent
- The overall environmental impact (as per the EuCIA calculation) is 76% less than the stainless steel alternative

This considers the raw materials, the manufacturing process, installation and maintenance and end of life disposal.

In terms of circular economy, we note that aluminium lighting columns can however be manufactured from 95% recycled material. Once aluminium columns have reached the end of the serviceable life they can be recycled time after time. With the composite column it is understood that it can be made from 100% recycled material. It has been confirmed by the supplier that once the lighting column has reached the end of serviceable life the material cannot recycled, however it can be burnt to produce power.

Source: Adept Project Buckinghamshire Council Lighting Columns, Work package 6 final review report (J.R.Hartley)
Source: sapa Aluminium Lighting columns

Commercial Case

Implementation efficiency

The design and supply of the lighting columns was undertaken by a non-traditional lighting column supplier with expertise in composite materials. The lighting column used in the trials has a number of features that have resulted in longer installation times than traditional columns, with additional street furniture being required.

In future it is recommended that insight from a highways lighting design expert is partnered with suppliers and installation subcontractors so that additional opportunities for efficiency are identified prior to implementation.

Note: Due to a fatality onsite during construction the original installation subcontractor was removed from the scheme. This delayed installation while a new subcontractor was appointed.

Financial Case

Affordability

Currently composite lighting columns are more expensive than the metal equivalents, so savings need to be made in other areas such as installation and maintenance. Unfortunately, the design used in the trials prevents installation cost savings. If a simplified installation method was implemented then the reduction in installation costs may be realised.

Financial model

The production and installation of composite lighting columns require further research and design to make them more price competitive with metal equivalents before further interventions are considered. This should be done in conjunction with understanding future British Standards requirements for composite columns.

Funding sources

Funding for this trial was based on the ADEPT Live Labs programme.

Management Case (1)

Procurement

Much of the work was undertaken without signed final contracts, with parties collaborating together in good faith. This aided the pace of development and delivery but created additional commercial risks for both parties.

The agreed payment schedule did not take into account the local authority monthly invoicing process which led to longer delays than anticipated in payments.

Project management approach

Whilst there have been delays to delivery, the primary reasons could not have reasonably been foreseen at the outset or mitigated against.

Positive collaborative working between parties is reported by those involved. However it was noted that the changes in Council personnel at several times during the project introduced additional risk, particularly due to the unfinalised commercial agreements.

For future delivery of this form of trial or scheme it is recommended that the delivery team considers inclusion of a lighting design expertise alongside the supplier. By focusing on the design of composite lighting columns, including the installation method, with the objective of reducing the cost of installation, maintenance and the cost of carbon, the trial could have realised greater benefits.

Lesson learned

The following lesson learnt have been captured following liaison with the installation contractor:

- If the joining method for upper and lower sections was revised to an interlocking solution this would improve the stability between the two sections and this would reduce the installation time.
- If the hand dig method was used for the installation of the NAL socket then this would reduce the number of operatives onsite, and materials for reinstatement. For the current installation method approximately a 1 ton of material (concrete and aggregate is required) hand dig could reduce this by half due to a smaller excavation area. Hand dig is considered as safe as vacuum excavation as vacuum excavation can still disturb live services
- If the installation method for the composite lighting is changed as above along with modifying the design as above the design then installation times can be reduced, this would also reduce the amount of plant on site and also make the process cheaper.