

A382 – MRN Carbon Negative Project

Part of the Live Labs 2 Corridor & Place-Based Consortium

OUTLINE BUSINESS CASE Devon County Council

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Elevator Pitch

Devon County Council's Live Labs bid is a bold proposal to radically accelerate the reduction of carbon emissions associated with the construction and maintenance of UK highways. It aims to demonstrate that by combining current and developing initiatives, carbon negative highways are possible. The project will test new innovations, processes, materials and standards on a proposed highways scheme in order to demonstrate the carbon savings that are feasible on a project which is typical of highways projects nationwide. The A382 project provides a unique 'Live Laboratory' opportunity to drive carbon changes to the design, construction and maintenance. The scheme is currently in the detailed design stage under the stewardship of a partnership between Devon County Council (DCC) and Milestone Infrastructure Ltd.

Building on the significant work that DCC has already undertaken with the University of Exeter on measuring and evaluating carbon and working closely with other Live Labs the project will devise a route that delivers the A382 scheme as carbon negative over the whole life cycle of the project. The variety of infrastructure in the project mean that there will be learning that can be quickly applied to a broad spectrum of UK highways projects. The Live Labs proposal is to fund initiatives that come at an additional cost, to ensure nothing is cost prohibitive and to develop the blueprint for future projects to follow.

Project Overview

Using an existing highway project as a basis, the A382 Live Labs bid aims to use the unique opportunity of a major project in the detailed design stage, with Early Contractor Involvement to trial a number of carbon reducing interventions.

In March 2019, the Peninsula Transport Shadow Sub-National Transport Body agreed to submit an Outline Business Case (OBC) for improvements to the A382 Major Road Network (MRN) to the Department for Transport (DfT) through the recent Major Road Network Fund. The project received programme entry in May 2021

The scheme identified was the A382 between Drumbridges and Newton Abbot illustrated in figures 1 and 2 of the strategic case **Error! Reference source not found.** It comprises a combination of road widening, including structures, junction improvements and new non-motorised provision to support the large amount of housing and employment on the A382 corridor allocated in the Teignbridge Local Plan.

We intend to engage existing industry experts, leverage local skills and where appropriate offer seed funding to innovators in the early stages of developing products or processes so that innovations can be accelerated and included within the project. In so doing we will nurture the next generation of low carbon innovations so that they are ready to scale nationally and internationally. The scope of this Live Labs project will include all the materials, products and processes involved with the construction and maintenance of a highway improvement scheme. The carbon focus is well underway with the carbon impacts already influencing decision making throughout the A382 project. The project proposes to use the Live Labs funding to cover the extra over cost associated with using new and emerging technologies on this live construction project. The Live Labs project will not seek to consider the carbon impact of increased vehicular demand on the A382 although it is noted that the construction project once completed will provide significant active travel benefits

The construction of new highways, highway improvements and the ongoing maintenance of those assets continues to be a key activity for local highway authorities. It is proposed that the outcomes of this trial will be directly applicable to the majority of highways projects in the UK. DCC are set to deliver approximately £111m of capital highways projects in the next two years, in addition to approximately £59m spent annually on capital structural highway maintenance. We believe there is scope to significantly decrease this figure by rolling out the results of this Live Labs project. Scaling that to a national level, according to the UKRLG report 'The Case for Investing in Highways

Maintenance’ in 2021/22 in the past 10 years the value of maintenance expenditure stood at £2bn¹ per annum.

This proposal aims to address the fact that these activities are a major contributor to carbon emissions and that any meaningful carbon reduction initiatives can immediately be implemented nationally. Devon County Council declared a Climate Emergency in 2019. It has targeted becoming net-zero as an authority by 2030 and recently was a key partner in publishing the Devon Carbon Plan; the roadmap for the county to become net-zero by 2050. Addressing the problem of how to reduce emissions from highway activities is essential in achieving those goals. One of the overriding challenges is achieving the carbon targets in a sustainable way that avoids ‘green washing’.

A significant part of the A382 Live Labs project will be working with the University of Exeter and Milestone to enhance the existing Devon County Council Carbon Calculator with a view to making the resulting tool free to use for the wider industry. We will use DCC’s existing carbon capture tool to measure carbon resulting from the A382 project and provide monitoring and evaluation at a Project level.

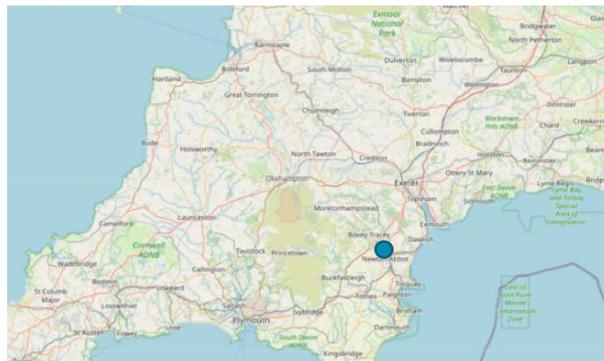


Figure 1



Figure 2

¹ https://ukrlg.ciht.org.uk/media/15247/the-case-for-investing-in-highway-maintenance_final.pdf

The Strategic Case

Project Context

The A382 project hosting the Live Labs trial has been chosen because it reflects a significant number of similar projects not only in the current MRN funding, but capital projects carried out nationwide.

The A382 MRN project is a high profile project, strategically important in Devon. Whilst the area is strategically well placed with the potential for good transport connectivity by rail and road, the A382 itself as the road link between the A38 and Newton Abbot is of poor quality. The proposed major upgrade gives a number of facets in which to test carbon reducing interventions;

A382 Project Element	Pre Live Labs	Live Labs Opportunities
Most of the A382 route is of a rural layout, comprising a low standard single carriageway with poor alignment (minimum width 5.5 metres) and no verges. There is no pedestrian provision and the narrow road is dangerous for non-motorised users. The route is approaching capacity and therefore delivers a reduced level of service; the section into Newton Abbot town centre is slow moving at peak times.	Horizontal and vertical realignment	<p>Earthworks: Recycling existing material</p> <p>Drainage: SUDS and incorporation of biochar in landscaping</p> <p>Pavements: In-situ carriageway recycling, with biogenic binders</p> <p>Alternative concretes: Cement options, clinker free, biochar, graphene</p>
The collision rate for the A382 MRN route is 245 collisions per billion vehicle kilometres, higher than both the national and DCC 5-year rural A roads average. Moreover, at Whitehill Cross lies one of 4 collision cluster sites on DCC’s MRN network described as a ‘live site under ongoing investigation’.	New roundabouts at Trago Mills, Forches Cross and Whitehills	<p>Geometric Standards: Relaxations</p> <p>Lighting Illuminous and/or reflective road markings Alternative anti-skid surfacing</p> <p>Drainage</p>

		Reduction in formal drainage, above ground solutions prioritised.
Teignbridge District Council’s Local Plan Policy HT1 (c) strongly supports “realignment of the A382 Bovey Tracey road between Newton Abbot and Drumbridges roundabout at the A38 and separate cycle lanes” in order to improve connectivity and accessibility within the Heart of Teignbridge. It also states that “the realignment of the A382 between Newton Abbot and Drumbridges is considered necessary to improve the capacity of the existing lanes to ensure that the road can accommodate the future growth and to provide opportunities for new cycle links.”	Inclusion of a shared footway/cycleway to link Newton Abbot and the existing paths towards Dartmoor.	<p>Materials: Alternative bound and unbound materials trials; graphene, biogenic binders, carbon sinks, carbon negative aggregates.</p> <p>Energy: Renewable energy incorporated into street furniture</p>
A382 – Jetty Marsh Link road, a new 400m road and junction linking to the A382. Providing resilience to the existing narrow A382 at that location		<p>Energy: Utilising the road as a heat exchanger, using heat generated and reducing the need for treatments in winter</p> <p>Lighting: Solar generated lighting sources for pedestrian and cycle route</p>

A series of consultations have been held over the gestation of the scheme, all of which have found that the improvement proposals are generally acceptable to the public. DCC has also received many letters of support from key stakeholders and businesses, with which DCC will continue to engage as the Scheme progresses. The addition of the Live Labs trial will provide additional interest and to date is already creating conversations locally.

Live Labs Principles

“Through deployments at demonstrable scale, we will achieve a step change in the normalisation and uptake of zero-carbon techniques, solutions and materials in the local roads realm to meet the needs of today and prepare us for an uncertain tomorrow”

This Live Labs proposal has identified that the construction of new highways, highway improvements and the ongoing maintenance of those assets continues to be a key activity for local highways authorities. The problem that this proposal aims to address is that each of these activities is a major contributor to carbon emissions. We plan to use the £44M A382 improvements project to radically accelerate the reduction of emissions associated with these works, providing a Live Lab for solutions on a demonstrable scale that can be picked up by the wider industry thus **addressing a problem which is commonplace** across the sector.

A business-as-usual approach in the industry will result in the emission of high levels of carbon during construction, production of raw materials, methods of construction and maintenance. The challenges facing the A382 project team, as on any project, are the delivery of a safe design to a required standard whilst minimising the ongoing liabilities to the Highway Authority and working alongside the existing standards. The focus of this Live Labs will be the development of a low carbon mindset. For designers this may be questioning the standards or approaching the design from a ‘do minimum’ angle. For the construction team a shift in mindset to embrace new ways of working or using different materials. In both cases engagement with local stakeholders will be needed to explain the reasons for new ways of working.

Prior to the Live Labs 2 bid the A382 project team had been looking at a number of carbon reducing options for design and construction. The success of the bid has facilitated a greater **focus on net zero outcomes** by funding innovations that would previously have been discounted on the basis of cost.

The design work undertaken on the scheme to date has already resulted in **demonstrable savings** in carbon through actions such as reducing surfacing and kerbing. Any innovations to be included will have had its carbon credential scrutinised by Exeter University prior to inclusion so that the project team is satisfied that a saving will be achieved. In addition to Devon and the University of Exeter’s work on the carbon calculator we have also developed, a carbon capture tool which we plan to use to determine the actual carbon generated by the scheme and thereby demonstrate **measurable savings** in carbon.

Our calculation tool includes the full life carbon costs of the works we undertake, including the maintenance regimes. Through design we are looking to minimise the assets that will require maintenance and through material choice and working practices we will look to extend the maintenance life of those assets, for example constructing surfacing with a longer life span. Consideration of long-term maintenance will be an important factor in the decision making process on the selection of initiatives thereby delivering **improvements to maintenance regimes and, as a result, revenue cost savings.**

The prominence of maintenance in the considerations of design and innovation decisions should result in multiple benefits. As well as the improved maintenance regimes and resultant cost savings an **improved customer experience** is anticipated through resultant **improvements in the performance, reliability and resilience** of the A382.

The project team are already finding that the decisions made to reduce carbon are also delivering **reduced capital costs as well as a reduction in the infrastructure/asset costs** for the scheme.

These are being seen in a variety of ways including through reduced materials and reduced construction programmes. Innovations under consideration, if implemented, would result in a legacy that future schemes will benefit from thereby delivering future capital cost reductions. Whilst the infrastructure/asset costs may reduce we also aim to improve the value of the alternatives. For example, the use of hedgebanks instead of VRS reduces the value of the highways asset but its value as a feature that can absorb carbon and enhance biodiversity needs to be acknowledged.

A key benefit of the A382 project is that the scale of improvements means that there will be little of the existing road remaining and as such **ageing assets will necessarily be replaced or supplemented by sustainable alternatives.** Where possible the re-use or recycling of existing features and material will be considered.

Prior to the Live Labs bid DCC had entered into an Early Contractor Involvement arrangement with Milestone Infrastructure. As well as input to progressing the design, Milestone have adopted the same focus on carbon reduction as the rest of the project team and are **actively collaborating** in seeking out innovations and different ways of working. As a large organisation who also deliver Devon's Term Maintenance Contract, Milestone have drawn on their wider contacts to provide input.

Historically Devon has worked closely with Dr Lash of Exeter University in the creation of our calculation and capture tools. The A382 project team is extending that relationship with Dr Lash working closely with the Live Labs project team to scrutinise the carbon credentials of the innovations as well as checking that our measurement process is fit for purpose.

With a project that is so broad we have taken the approach of wide engagement including with the other Live Labs. With this open approach, sharing knowledge and learning widely we are already starting to find that it generates new thoughts, sparks ideas and creates an innovation ecosystem. The A382 project itself encapsulates many different aspects of highway schemes from new road construction to widening, the construction of footway/cycleway to junction improvements,

installation and modification of bridges and culverts, along with the ongoing maintenance of the assets all of which will be included in this process. With the project covering not only a part of the major roads network but also urban highway and tie-ins to the rural network we envisage a **potential for scalability** with the outcomes being scaled up to encompass DCC's network and wider. Working with both the remainder of the consortium as well as with Milestone, as our term maintenance contractor, gives the opportunity to understand the use of the innovations on smaller scale projects as well as the potential to **deliver wider benefits within and outside the UK local roads sector**.

Drivers for Change

Decarbonisation is the process of decoupling economic growth and energy supply from greenhouse gas emissions. Drivers for decarbonisation exist at national and global levels. Globally the impact of carbon emissions on Climate Change has been proven, the expected impacts of ongoing climate warming will include sea level rises, increased food scarcity, mass population displacement and the collapse of ecosystems.

Rising temperatures directly correlate to a number of viral and insect borne diseases which currently have no cure. Nationally, the impacts on food and water security are already clear to see as is the impact on civic resilience in the increasing number of severe weather events.

A greater understanding of the accumulated risk of these threats is starting to influence policies and strategies locally and nationally. All sectors will have their part to play in what is rapidly becoming an urgent situation.

Devon County Council, as with a number of other Local Highway Authorities in the UK, have declared a climate emergency. A key contributor to emissions is the activities associated with highway operations, whether that be construction or maintenance. The construction of new highways, highway improvements and the ongoing maintenance of those assets continues to be a significant activity for local highways authorities. This proposal aims to address the fact that each of these activities is a major contributor to carbon emissions.

With the potential for carbon budgeting to be imposed in the future local authorities will need ways of reducing the carbon impact of their essential works so that their budget can be used on the unavoidable carbon producing activities. Additionally, the possibility of a requirement to purchase carbon credits to offset works raises the risk of further constraints on finances and the driver to reduce carbon impacts as much as possible.

Policies & Strategies

As mentioned above, in preparing a business case for such a project such as the A382 the focus of the project team tends towards the requirements of local strategies such as those for growth,

safety or the promotion of active transport. The preparation of the Final Business Case for the A382 has identified how the project fulfils the requirements of the relevant strategies.

As part of this business case for the Live Lab we have considered, in addition, the various policies and strategies pertaining to carbon reduction as follows:

The UK Government has committed to the delivery of the United Nations Sustainable Development Goals. This includes ending the UK contribution to global warming by 2050 and reducing emissions in 2030 by at least 68% compared to 1990 levels through the UK's latest Nationally Determined Contribution.

The DfT Decarbonising Transport outlines the direction of travel towards net zero, it provides direction to the government's ambition.

"The UK will play a leading role in this modern-day industrial revolution consolidating our position as an internationally recognised leader in green technology, science, and research."

Devon County Council's strategic plan also focusses on the need to take action to combat climate change.

"Climate change poses a serious threat to quality of life now and for future generations. It will damage biodiversity, disrupt food production, damage infrastructure, threaten jobs, and harm human health.

Disadvantaged and less affluent groups are likely to be most negatively affected by climate change, and the effects of climate change may make disadvantage worse. As a community leader, the County Council has an important role to help tackle the climate emergency and enable communities to adapt to climate change."

Over the period 2021-2025 we will:

- **Support a green recovery from COVID-19** which means we will support a low carbon economy and rebuild in a way that is sustainable for the future and reduces climate risks
- **Ensure resources are used more efficiently** by waste reduction, re-use and recycling
- **Prioritise sustainable travel and transport** with more opportunities for cycling and walking
- **Help people adapt to climate change** by providing helpful resources and guidance
- **Help wildlife and landscapes to recover**
- **Encourage sustainable lifestyles** by engagement, awareness-raising and supporting low carbon initiatives

- **Support the transition to low emission vehicles** whilst realising that this shift may not be achievable for large parts of rural Devon
- **Continue to reduce carbon emissions across all our services** including the use of innovative low carbon materials in our highways, low energy streetlighting and supporting remote working and other practical measures to address climate change

DCC has targeted becoming net-zero as an authority by 2030 and recently was a key partner in publishing the Devon Carbon Plan, the roadmap for the county to become net-zero by 2050. Following this declaration Devon County Council have been working closely with the University of Exeter, Future Highways Research Group and their Term Maintenance contractor, Milestone Infrastructure, to develop an accurate carbon calculation and accountancy business model. This model is now in use and is being used to inform decisions and forms the foundation of Highways Infrastructure Development directorate's carbon reduction plan.

Peninsula Transport, the shadow sub-national transport body in the area cites one of its five goals for future to

*"Improve connections between people, businesses, and places"*²

It recognises that by investing in transport options, inequalities in society can be reduced and that this can be done in a way that is sensitive to the environment. The proposed Live Labs project aligns perfectly with this ethos, whilst the overall project will improve connections, the carbon focus will do this in a sustainable and resilient manner.

In addition to the above this bid also aligns well with the South West Infrastructure Partnership's South West Vision 2050³, addressing and building on the areas for action:

- *People & nature-based decision making - Better identify and meet user needs, with infrastructure underpinned by values and equity;*
- *Addressing behaviours, skills, literacy & communication - Act with ambition and urgency to make best use of our technology, skills and knowledge - work collaboratively and responsibly for the benefit of society as a whole.*
- *Connectivity & collaboration - Adopt whole systems thinking to remove barriers and enable investment, working more collaboratively across sectors and engaging with all stakeholders.*

² [Our vision | Peninsula Transport](#)

³ [SWIP-South-West-Vision-2050-2.pdf \(southwestinfrastructurepartnership.co.uk\)](#)

- *Resource access & efficiency - Make better use of existing resources, whether it is funding, data, waste (materials, energy and effort) and instilling a sense of urgency.*

Future Challenges

Whilst Devon County Council is committed to a target of Net Zero by 2030 and the early work with Exeter University on carbon measurement has demonstrated a commitment to meet that target, we recognise that there are a number of barriers to overcome in order to reach our goal. Significant pressure on both capital and revenue budgets, compounded by inflationary pressure, has by necessity reduced the appetite for taking financial risks. This has put pressure on decarbonisation as a whole. Taking some risks, setting new priorities, testing cutting edge and innovative new products and ways of working is essential to make progress.

As such the early efforts to reduce carbon on the A382 project necessarily focussed on the solutions which were either neutral or reduced cost. Whilst the Live Labs funding will provide the ability to use innovations that previously would have been cost prohibitive. Part of the challenge of the programme is to enable the uptake of those to become more widespread and hence more commercially acceptable.

An additional challenge is to bring all available (and future) technology, innovation, and expertise together in one place to meet a pre-determined project programme. It is recognised that some of newly proposed solutions will need scrutiny and robust assessment before inclusion in the scheme and that this may take time. With the support of Live Labs we will be able to incorporate the latest technologies and products to deliver our targeted outcome of a carbon negative whole life highways scheme.

The challenge of designing and constructing a carbon negative major highway scheme through its lifecycle will require the input of many different organisations including suppliers, academic specialists, and operational experts. Combining the collective knowledge of this multi-organisation team, we have identified from our diverse experience many carbon saving initiatives and solutions that will be applied to this project. Whilst these will form the basis of our proposals to reduce carbon, to achieve our goal a change in mindset across the whole team from 'business as usual' will be required.

Instrumental to the maintenance of the legacy arising from live labs will be changes to the planning and delivery of the future pipeline of projects and renewals and we are already discussing long term changes with our asset teams. The outcomes of this scheme have the potential to impact DCC's extensive TMC contract as well as projects arising from funding bids such as the Bus Service Improvement Programme, Active Travel Fund, and the Major Road Network fund, Devon County

Councils forward programme of Capital highway projects over the next two years is valued at approximately £111m.

External Partners

Following declaration of Climate Emergency in 2019, Devon County Council have been working closely with the University of Exeter and our engineering framework contractors for a number of years to develop an accurate carbon calculation and accountancy business model. Building on this the partners currently involved in this Live Labs project are detailed below. This list is likely to be expanded as the project progresses.

	<p>Organisation: University of Exeter Name: Dr Dan Lash Role: Senior Research Fellow</p>
<p>Role in programme: Dr. Lash will ensure that the approach and calculations undertaken in this Live Labs project will be compatible with what is being developed through the FHRG (that he is jointly authoring and is discussed elsewhere in this document). Dr. Lash has been commissioned through the project to provide critical input initially at the design stage, but also through construction/verification. This will include ensuring the carbon calculations are being undertaken in ways that are consistent with the current and emerging standards and guidance, including harmonising the initial two models (Milestone and Devon) and to develop them into a project specific model that includes both the upfront and lifecycle emissions for the baseline scheme, and all proposed interventions and innovations.</p>	
	<p>Organisation: Milestone Infrastructure Name: Phil Ramsden Role: Regional Director</p>
<p>Role in programme: Milestone Infrastructure will be supporting Devon CC with identification and assessment of carbon reduction and carbon negative opportunities. Utilising their construction and maintenance experience in the highways sector, alongside input specifically from their Sustainability Team, Milestone will provide practical support to the LiveLabs programme during the ECI and construction phase of the project.</p>	
	<p>Organisation: Future Highways Research Group (FHRG) Name: Simon Wilson Role: Carbon Measurement</p>

Role in programme: As a result of Devon’s ongoing work with FHRG, a light touch approach to M&E will be provided by FHRG. This will comprise creating experimental carbon profiles and independently reviewing and certifying the profiles for accuracy and completeness.

Location

The scheme is located in South Devon near to Newton Abbot and falls into two parts, the A382 between the Drumbridges junction with the A38 and Forches Cross 2 km further along the road (see figures 1 & 2 in the project overview). The second part is a new section of road, Jetty Marsh Link Road, on the outskirts of Newton Abbot that joins the A382 with a new roundabout at Whitehills Cross.

The project includes sections of road widening, realignment and new construction as well as construction of a shared use path alongside the route. There will be areas of new street lighting, culverts, extensive earthworks and landscaping to create biodiversity net gain.

Theory of Change

The ‘golden threads’ emerging from the theory of change (see Appendix A) are set out in the following table:

Inputs and Background	Outputs	Outcomes	Impacts
Inputs across the wider Highways and Infrastructure Development directorate	Change to traditional ways of working, bringing about new ways of working and bringing maintenance to the fore in design	Change to a more collaborative way of working across the organisation	Change in BAU for designers, planners and maintenance. Learning improvements across the sector
Early Contractor Involvement creating collaborative working with Milestone. Input from University of Exeter	Early input to effect design changes and construction efficiencies. Detailed assessment of options in relation to carbon	Behaviour change in approach to ECI. Shared learning	Reduced capital costs, reduced carbon impact

Measuring impacts and links with M&E activities

Carbon measurement will be undertaken on site using Devon’s carbon capture tool. This will provide feedback on the theoretical figures produced during the calculation process.

The tool has been developed as part of the work with the University of Exeter to capture the actual carbon generated by works. It takes raw data from the contractors such as fuel, mileage, plant and material data to determine the actual carbon used in the process. Using the live data, calculated data and cost information we will be able to demonstrate in theory and in practice the impacts on carbon of the solutions chosen along with the cost associated with that saving. These will also feed into the activities of ADEPT's M&E supplier. We will work with the M&E supplier to provide information in the format and quantity required

Whilst carbon measurement will be the prime focus of the project we are also interested to understand how the change in working practices is perceived by road users and residents and also whether the works will increase the interest of the local population in carbon reduction. We propose to have a scheme specific webpage for the project and will investigate the use of website monitoring tools to monitor traffic to the scheme webpage as well as instigating a means to gather feedback to the project team via the webpage. Since large scale schemes such as this always generate complaints the volume and content of these will also be monitored and evaluated and where possible compared against similar historic schemes to identify and variations from typical works.

A cycle route parallel to the scheme will remain open throughout the duration of the project and highlighted as a means of avoiding closures or potential disruption. Use of the cycle routes will be monitored to see whether there is any uptake and behaviour change.

As part of the wider carbon reduction programme Devon County Highways are working with EDG on a Decarbonisation Strategy which will include changes to business as usual at all levels from client, through designers and onto contractors. We will provide further feedback to Live Labs as this strategy evolves.

The Economic Case

Benefit Cost Ratio

In line with the Live Labs guidance, consideration of the Economic Case will be undertaken under the umbrella of the Department for Transport (DfT) Value for Money (VfM) Framework. However, it is recognised that Live Labs is not a traditional transport scheme, and the Economic Case will acknowledge the wider objectives of the proposals including the learning and evidence gained that can be used elsewhere nationally and internationally.

As previously described, the Live Labs project sits within the existing A382 MRN project, so whilst it is not realistic to undertake a detailed economic appraisal of all the proposed trials and provide a final Benefit Cost Ratio, we will look to make an assessment on the effect the trials might have on the BCR already calculated for the A382 project. In conversations with ADEPT it has been agreed that this high level approach suits the development stage of the Live Labs work.

The Department for Transport VfM Framework states that a VfM assessment should be formed of three elements:

- Option development
- Consideration of costs and benefits
- Consideration of risks and uncertainties

We have therefore also considered these three factors and demonstrate how VfM will be driven by each element. In line with Treasury’s appraisal requirements, the impacts considered in this project are not limited to those directly impacting on the measured economy, nor to those which can be monetised. The economic, environmental, social and distributional impacts of the proposals have all been examined for the A382 project, using qualitative, quantitative and monetised information. In assessing value for money, all of these have been consolidated to determine the extent to which a proposal’s benefits outweigh its costs.

OBC Benefits	OBC costs
Present Value Benefits (£000s)	89,949
Present Value Costs (£000s)	24,281
BCR	3.70

The Benefit to Cost Ratio (BCR) calculated at Outline Business case stage of the scheme falls into the **High Value for Money** category with a BCR between 2 and 4.

There are expected to be additional social benefits such as an increase in physical activity brought about by the new off-road pedestrian and cycle path, and improved journey reliability, journey quality and accessibility.

The adversity of the environmental impacts, such as impacts on landscape, biodiversity and historic environment (for which mitigation is being sought) are considered to be wholly outweighed by the positive economic impacts which include easing congestion, unlocking economic opportunities and enabling the delivery of new housing development. If land value uplift is considered, even taking moderate probability, it is likely that the BCR would increase to the Very High VfM Category.

Non monetised benefits

The following non monetised benefits were considered as part of the A382’s OBC

- Reliability impact on Business users
- Reliability impact on Commuting and Other users
- Landscape

- Townscape
- Historic Environment
- Biodiversity
- Water Environment
- Physical activity
- Journey quality
- Security
- Access to services
- Severance

Option Development

A scheme cannot demonstrate value for money if it does not deliver against objectives at a local, regional or national level. The A382 Live Labs objectives and their alignment to the Live Labs vision and principles and local, regional and national policies is shown in the Strategic Case.

The initial stage of the A382 Live Labs proposal comprises option development where potential trials will be considered on their whole life cost and whole life carbon. The use of a matrix and a decision making board will ensure understanding and management of the positive and negative impacts from a range of perspectives. This aligns with the Green Book process of considering all impacts across a multi-criteria spectrum.

The specific measures that will be implemented within the A382 project have not yet been identified and therefore assessing their impacts in detail is not feasible at this stage. The potential scale of the interventions can be demonstrated by both an academic approach and by examples of what has already been delivered on the ground. For example,

Devon County Council – Street Lighting Renewal

Devon County Council have invested £8.7m in the installation of LED street lighting and part night lighting. Once complete DCC will have reduced the carbon emissions generated by its street lighting by 80%, reducing carbon emissions by 15,000 tonnes each year. This is the equivalent of taking 8,000 cars off the road.

Live Labs Added Value

The addition of the Live Labs project will deliver all the originally proposed benefits and in addition will deliver the following:

- Sharing of learning to the wider industry, the savings associated with highway authorities not having to ‘reinvent the wheel’ by following the experiences of Live Labs 2.
- The value associated with the scaling up of successful interventions
- Possible reduction in air quality associated with new fuel types used in plant and highways vehicles.
- Reduced maintenance liabilities.
- Reduction of construction and maintenance stage carbon

- Interventions could result in journey time savings and improvements to reliability due to innovative solutions requiring less maintenance, for example single layer surfacing solutions would reduce the disruption caused during works and the frequency of works
- There would also be economic benefits associated with targeting local supply chains as part of reducing carbon from transportation.

At this stage the costs for the A382 project, pre–Live Labs, are known. Taking this figure and applying the additional £3m likely to be spent on interventions allows us to start to consider what an A382+ Live Labs BCR could look like. Taking into account a small number of likely interventions such as (see table 1 below);

- Low carbon surfacing materials
- Reduced kerbing
- Recycling the existing road

It is possible to calculate the value of saved carbon, and to update the BCR’s. Of course, this is only a coarse approximation based on a small number of the possible interventions and the true values associated with further carbon reduction and other benefits will be realised in time.

OBC Benefits	OBC costs	OBC costs + £3m Live Labs
PVB (£000s)	89,949	89,949
PVC (£000s)	24,281	25,937
BCR	3.70	3.47

The A382 BCR shows a small decline with the additional Live Labs costs but remains firmly within the **high value for money** category. With the benefit of further carbon saving interventions, the BCR will increase further.

Key to the process of delivering a successful outcome to the Live Lab is the consideration of value for money in the decision making process. The options under consideration will go before a board comprising relevant Asset Managers, the project team and department heads for decision. The options will be considered against local, regional and national level objectives to demonstrate value for money with the board being provided with the full picture of the options considered.

As an example the information presented for the removal of the footbridge and replacement with an at grade crossing comprised the cost saving, carbon saving, input from road safety, lifetime maintenance cost and carbon savings, ecology implications, risks and input from the walking, cycling, horse-riding assessment team. Separate input was sought from local members on the political considerations and local reaction.

This process provides the ability to consider both monetised and non-monetised elements to reach decision on overall value to the project, DCC and the industry.

Whilst this decision was more straight-forward with few unknowns, the benefit of having the full picture in making that decision was acknowledged and this process will be enhanced for the consideration of future innovations.

Risks and uncertainties in relation to value for money

The greatest risk to value for money is the uncertainty of impacts due to the novel interventions being considered. Case studies and research can demonstrate to a point that the proposals will deliver sound benefits, however as with any new technology in some cases there may be limited testing and evidence to give full confidence in their outputs.

The impact of inflation on the A382 project has been anticipated since the submission of the OBC and the designers had already begun to look into potential changes to the scheme to reduce the impact on carbon and to combat the anticipated inflationary pressures, these included reducing the highway width.

Some degree of descoping will be required to bring the cost of the scheme to within the existing funding envelope. The descoping process considered various elements of the scheme to see whether it was possible to remove, replace or amend them. Any element considered was assessed against the following criteria to inform the decision:

- Potential cost saving
- Potential cost avoidance
- Impact on Design Programme
- Impact on Objectives
- Impact on Construction Programme
- Potential Carbon Saving
- Pros, Cons and Implications

No change is expected to the objectives of the scheme stated in the A382 OBC and the Value for Money category is likely to be unchanged.

The impact of the Live Labs cost on the BCR is currently negative. At the early stage of innovation costs are high and can be expected to fall as uptake is increased. Assuming that the costs fall by half the BCR is 3.58, reducing the negative impact. This suggests that the value associated with carbon saving is not prioritised in the current calculation framework. This is something further the Live Labs project will comment on.

DCC has previously had success in bringing a new product from new innovation to BAU. Warm asphalt is now used as standard on contracts within the county, whilst clearly a saving in carbon terms, in analysing its implementation it raises the point that a one sized fits all approach will not work. The rural nature of the county means that the transportation of material from the quarry plays a significant part in the remaining carbon. This project seeks to trial products based on their carbon saving potential with the assumption that future scaling will offer value for money.

[REDACTED]

Item	Quantity	Carbon tCO2e*	Carbon maintenance tCO2e*	Cost estimate*	Notes	Monetised Carbon saving from construction (£, 2010 prices)**	Monetised carbon saving Future maintenance (£, 2010 prices)**	Total Carbon saving (£, 2010 prices)**	
Surfacing	Traditional	40748 m2 x 0.28 m	2237	2943	[REDACTED]	Based on typical construction			
	Carbon reducing (reduced thickness)	40748 m2 x 0.075 m	1031	1734	[REDACTED]	Thinner construction 75 mm total bound, 15% more expensive from previous job	£145,845	£84,488	£230,344
Existing Road	Disposal (traditional)	27149 m2 x 0.3 m	719.5	486	[REDACTED]	Typical construction with tar bound materials and appropriate disposal			
	Recycling	27149 m2 x 0.3 m	406	406	[REDACTED]	Recycling plant located near to site, recycling of all existing road	£37,913	£5,591	£43,503

* Figures from carbon calculator; ** Figures provided by Jacobs

Table 1

The Commercial Case

Proposed activities

Project Management: governance, carbon Support, and overseeing communications. This area of activity ensures effective delivery on the ground, coordination, progress reporting and information dissemination. The role will be undertaken by Devon County Council.

Additional Local Authority Resources: where necessary, legal, procurement, environmental support will be utilised.

Design: Carbon Baselineing, Assessment, and Review

This will be undertaken by the project team with using the combined Devon and Milestone tools and following the principles of the Carbon Calculation and Accounting Standards (CCAS) which Devon and the University of Exeter have been authoring with FHRG. The team will scrutinise the existing available data and factors, amending where appropriate. With new innovations to account for the project team will collate data from suppliers, subjecting it to detailed scrutiny before inclusion in the project.

Proving Services have agreed a support package which comprises preparing carbon profiles and independently reviewing and certifying the profiles for accuracy and completeness.

Design: Decision-making

A robust decision making process will be put in place (as detailed in the Management Case) to ensure that the best innovations are chosen to be trialled on this high profile project.

Communications: Content creation, press and monitoring

In part, this will be carried out by the DCC press office who have significant contacts in the South West media. The role of content creation and sharing will capture the behind the scenes view for wider sharing. This task will be carried out by a bespoke appointment via the University of Exeter's graduate network and supported by Milestone.

Monitoring & Evaluation: Collation and analysis of data, preparation of reports.

Data collection will be undertaken by the site team with analysis provided by the University of Exeter. Reporting and evaluation of results by the project team led by Devon County Council.

Construction: Delivery trials on the A382 Project.

As previously discussed, this project is well advanced with an ECI contractor already appointed and working on the project. It is intended that Milestone Infrastructure would be the contractor delivering the works on site. As a partner in the Live Labs bid they are fully engaged with the process.

Procurement strategy

The clear and pressing need to combat climate change means that innovation is required in all areas of delivering highway works, this includes the approach to procurement.

The National Procurement Strategy for Local Government in England 2022 says;

“The new procurement rules are expected to move the winning bidder test from ‘most economically advantageous tender’ (MEAT) to ‘most advantageous tender’ (MAT), and this change will help councils to focus on value in its broader sense beyond economic value.”

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It also gives Local Authorities a clear steer towards procuring works and services in a way that combats climate change.

The Procurement team at DCC are engaged and are keen to make use of the Live Labs project as a testbed for future Procurement. Whilst the details will evolve as the project progresses the following premises have been agreed.

- The need to give fair chance to all qualified bidders remains, it is accepted that in areas of innovation there may only be a single supplier.
- Together the Procurement and Live Labs teams will work together to develop a strategy to assess and rank bids in terms of carbon.
- Where the trial element falls within the normal remit of a highway improvement project, the element will be procured via the tendered Stage 2 NEC contract.

Where possible, **an outcome-based specification** will be used in the A382 contract to maintain flexibility and leaving open the opportunity to insert innovations into the project. Where changes to the specification are required, this will be dealt with via the usual NEC compensation event process. It will be made clear to the contractor that due to the project programme, there will inevitably be a degree of change to make the Live Labs element of the project a success, their buy-in will be essential.

DCC’s procurement strategy described to date herein has been informed by the following factors:

- Compliance with regulations, government guidance and DCC’s constitution.
- A focus on innovating, to bring carbon budgeting into the procurement process.
- DCC’s appetite for risk and the lessons learnt from other recent schemes delivered by DCC;
- The composition of the proposed Scheme (i.e. road widening and alignment improvements, the new Jetty Marsh link road, and the high-quality footway/cycle way);
- DCC’s demonstrable competence in preparing and managing both design and build and traditional contracts.

A number of procurement options for the A382 project were considered, taking into account issues such as: value for money, timing, risk, cost certainty and outcomes. Design and Build (D&B) options

were considered but disregarded due to the size of the scheme and the environmental risks which could lead to potentially longer and more costly tender periods.

DCC favours use of the New Engineering Contract (NEC) - Engineering and Construction Contract (ECC) Contract. It is endorsed for public sector use in the UK government’s Construction Strategy and by the Construction Clients’ Board, the Crown Commercial Service and the Association of Project Managers. This contract is well known to DCC and its use is widely supported in the industry. Six options are available, each of which has been considered. DCC favoured Option A (Priced with Activity Schedule) for the works, in particular a two-stage procurement with a contractor involved during the design stage.

Further work will be undertaken to assess the risk allocation, the secondary risk options and any additional clauses that DCC might wish to include during the construction phase.

Potential suppliers were given the chance to find out about the scheme at a supplier event held via the Hampshire County Council Gen 4 framework in late 2021. Two tenders were received in 2022 and Milestone Infrastructure appointed as the successful contractor the Stage one ECI period.

The Live Labs project sits alongside the A382 highway improvement project which sets out to improve the alignment of the A382, construct walking and cycling links and build a new 1000m link road. This is an NEC 4 project of approximate £45m value, it was decided in 2021 that the procurement method would be a two stage NEC arrangement where stage 1 comprises Early Contractor Involvement (ECI). Stage 1 was tendered in early 2022 and Milestone Infrastructure appointed as successful contractor. The tender for Stage 2, the construction phase, is programmed for spring 2023. Following that, and the expected confirmation of funding in winter 2024, stage 2 will be awarded.

Whilst currently in Stage 1, the evolving Live Labs project team are already working with Milestone to leverage their industry contacts for innovations to test.

Procurement Plan

Task	Method	Date
Initial scoping options A382	A range of procurement options and contractual arrangements were discussed at Project Board level and a decision was made to pursue a two stage Early Contractor Involvement using the Hampshire Gen 4 framework	Autumn 2021 - Complete
A382 Tender – Stage 1	Two stage contract tendered and contract awarded to Milestone Infrastructure.	January 2022 - Complete

Live Labs Bid	Together with the University of Exeter, Milestone DCC applied for Live Labs 2 and were successful at the Dragons Den.	October 2022 - complete
A382 Stage 2 submission	On receipt of the finalised design Milestone Infrastructure will provide a priced submission containing a developed activity schedule, and programme.	June 2023
A382 Stage 2 due diligence	The priced submission will be assessed by an independent third party to ensure value for money. Devon County Council Cabinet approval to award Stage 2 to be obtained	
Submission of MRN Full Business Case	Anticipated submission	September 2023
Anticipated MRN funding decision		December 2023
A382 Contract Award		January 2023
A382 commence works on site		March 2023

Complying with Procurement, Subsidy Control and State Aid Regimes

Procurement:

Activity	Supplier	Compliance with procurement regulations
Design/ Project Management	Engineering Design Group, Devon County Council	Design department internal to DCC
Carbon Input	University of Exeter	Procured using a procurement exemption on the basis of ongoing and previous work with Devon County Council providing specialist insight.
Carbon Input	Proving Services	Procured using a procurement exemption on the basis of ongoing and previous work with Devon County Council on carbon accounting standards and unique supplier.
Construction	Milestone Infrastructure Ltd	Already procured via the Gen 4-3 framework in accordance with procurement regulations.

Section 151 Officer Declaration

As Section 151 Officer for the Council, I declare that the financial information in this business case is accurate to the best of my knowledge and that the Council:

- has allocated sufficient budget to deliver the programme on the basis of its proposed funding contribution
- accepts responsibility for meeting any costs of delivering the programme over and above the DfT contribution requested, including potential cost overruns, and the underwriting of any third-party contributions
- accepts that no further increase in DfT funding will be considered beyond the maximum contribution requested
- No Subsidy Control issues identified

Devon County Council
Name: Angie Sinclair

Signed:



The Financial Case

The A382 project has been successful in the Major Road Network funding allocation, pending the submission of the Full Business Case in Autumn 2023. Whilst low, there remains a risk that the full business case fails to get secure DfT funding. To mitigate this risk further we are in constant dialogue with the DfT, providing draft documents for their review as progress is made.

In the worst case of MRN funding not being secured, Devon County Council accept that they are responsible for the delivery of the Live Labs project and would anticipate that, with Adept’s approval, the Live Labs funding would be applicable to another project, or series of projects from Devon County Council’s heathy capital programme.

As the responsible budget holder for the A382 MRN project I am pleased to support the A382 Live Labs bid. The additional funding will allow meaningful low carbon trials to take place in situ. As the results become clearer I expect that the successes will be scaled up and applied across Devon County Council’s wider infrastructure programmes. The project provides an excellent learning opportunity for our teams and strengthens our efforts to work towards our organisation’s net zero carbon goals.

Jamie Hlland – Deputy Director Planning

Proposed Funding

	Pre Live labs	Including Live Labs
Funding:		Additional £3.7m to cover the additional costs of trialling carbon reduction initiatives
Spend profile:	21/22 – 2% 22/23 – 6% 23/24 – 4% 24/25 – 15% 25/26 – 33% 26/27 – 30% 27/28 – 10%	Additional Live Labs funding 22/23 – 1% 23/24 – 9% 24/25 - 45% 25/26 – 45% Whilst this balance of costs does not align perfectly with the 40/30/30 cost profile proposed by ADEPT, we consider there to be a strong justification for this approach given the existing A382 programme.

- **Year 1** – due to the constraints of the existing construction programme year 1 will focus on both mobilising and working with industry to locate innovations to include in the project. Establishing a solid foundation of understanding, collaboration and research. With the carbon base line already in place the project is a strong place to start from.
- **Years 2 & 3** – will see the trials put into place, monitoring and evaluation work carried out throughout and significant input from our partners.
- **Legacy tail** – the Live Lab project will close, and the follow-up legacy activity over a 5-year tail will be undertaken by ADEPT, and therefore has not been detailed in the Business Case.

Accessing external funding streams:

Where possible we will add to our existing funding streams, possibilities include:

- **Academic grants/funding:** The University of Exeter has access to funding from the Engineering and Physical Sciences Research Council including the ‘Impact Co-Creation Award’, ‘Knowledge Exchange Fellowship’ and ‘Impact Visionary Award’. Funding of up to £35,000 is available in each grant, which we would use to support knowledge transfer activities.
- **S106/CIL contributions:** We have already secured local developer contributions towards the existing A382 project
- **Future government capital grants:** We will explore applications for funding from future government capital grants over the three-year project duration
- **Future Industry Grants:** for example UK Research and Innovation funding
- **In-kind contributions from partners:** The project has already benefited from significant pro-bono time from the local authorities and contractor partners. This is expected to continue across many functions/activities once the project is established.

Long Term Financial Viability

The development of the Live Lab has considered the need to continue the benefits, impact and work beyond Year 3. The proposed A382 Live Labs project relates to long term infrastructure, the trials that will be undertaken will form part of the DCC highway asset and will continue to provide value to that asset for their respective design lives.

In all cases, rapid translation of learnings will be communicated within Devon County Council and beyond with a view to replicating successes and adding to the value already created.

Proposed trial	Expected design life
Earth retaining	120 years
Surfacing materials	30 years
Street lighting	50 years

Kerbs	20 years
Culverts	120 years
Vehicle Restraint System	10 years

Hence the value of the Live Labs investment will far exceed the three year programme. Working with our asset colleagues and TMC we are starting to identify legacies. That will not only feature in the highway asset but by the thinking differently about sourcing or disposing of materials, to the local community too.

Live Labs Targets	Ensuring benefits endure beyond 2026 without further funding
<p>Reduced impact on climate through decarbonised highways network, with all maintenance activities focused on measured decarbonisation</p>	<p>The efficiency and carbon savings, projected over the local and UK network, and achieved through both the work on the A382 and future application of the developed methodology and toolkits will continue.</p> <p>Local policies and processes amended during the Live Lab as part of transition to BAU, will continue after the project. Maintenance activities represent a significant sum for local authorities. [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED] Of the proposals considered for inclusion on the A382 are drainage plans that significantly reduce the need for gullies, enhanced asphalts that would extend the life of surfacing and thereby the intervals for A road maintenance and alternatives to vehicle barriers that have a longer life or remove the requirement for replacement after collisions. Devon is responsible for the longest road network of any authority in England so expanding the benefits from the A382 across Devon alone would have a significant impact on the annual maintenance budget.</p>
<p>Far reaching impact on decarbonisation across the sector/neighbouring sectors through use of developed methodology, scaled up to learning, toolkits and guidance</p>	<p>The sharing and collaborative working undertaken throughout the project will build an enduring network that can continue without additional funding. The dissemination of toolkits and methodology will support this.</p> <p>The scalability of the successes of the Live Lab will mean they are replicable across the wider network without requiring further funding.</p>

<p>Connecting strategy, planning, funding, specification and delivery in a whole lifecycle approach</p>	<p>Evaluation of proposals would consider the same cost or less for reduced carbon, and only where we think costs will reduce in the long term employ more expensive methods, materials for carbon reduction</p>
<p>Transformed BAU approach to roads and service delivery, carbon budgeting and M&E</p>	<p>The Live Lab will develop new BAU in these areas and therefore won't need explicit funding as it will become routine work</p>
<p>UK an international exemplar for decarbonised local roads and pioneer in Net Zero</p>	<p>The comms activities undertaken by ADEPT, supported by those of the Live Lab, will position the work of the Live Lab on the UK and international stages. The reputation as an exemplar of decarbonised roads will continue without further funding as the successes are scaled up and replicated across the UK's network.</p>
<p>Behavioural changes across the industry and public acceptance of decarbonisation activities</p>	<p>Over the 3 years of the Live Lab the comms activities, coupled with the development of green skills within the authority and partners, will develop behavioural changes and acceptance of decarbonisation work.</p>

Supporting the transition to Business as Usual (BAU)

The project has taken into account the need to rapidly transition any successful new ways of working into BAU so that resulting carbon savings can be maximised.

- Continuous refinement of the Carbon Calculator with the University of Exeter considered at every stage of design and delivery.
- Providing Devon County Council with the technical backing to change specifications and procurement methodologies.
- Providing carbon literacy training, mentoring and career support to shift mindsets across staff and contractors to actively embed a culture and ambition to collaborate, change and decarbonise roads
- Ensuring that new ways of working in a decarbonised approach are continuously maintained to encourage challenge of conventional wisdom. By engaging and stimulating the public, we are increasing awareness, engaging the community and building momentum establishing a new BAU and progress towards net zero.

The Management Case

DCC has set up the project structure to ensure that key partners are fully involved, and that decision making is streamlined, the structure is shown below and also includes communication routes with external partners (Figure 3)

The University of Exeter has been heavily involved in the development of DCC’s existing Carbon Calculation and Accountancy business model since 2019. This model considers the cost and carbon impact of road construction projects for materials use, upstream transport, site works, and waste across the lifecycle of the project. It is currently forming the basis of the development of industry-wide standards for Scope 3 carbon reporting, in partnership with the Future Highways Research Group. The University’s role will be to monitor the accuracy of the calculations for the scheme and further develop the ability to capture carbon data during construction and maintenance. In addition, the University’s role would be to develop the calculator further to record savings through innovations thereby allowing the calculator to keep pace with developments. The ability to accurately account and prove that a carbon negative scheme is possible is fundamental to the success of this Live Lab proposal.

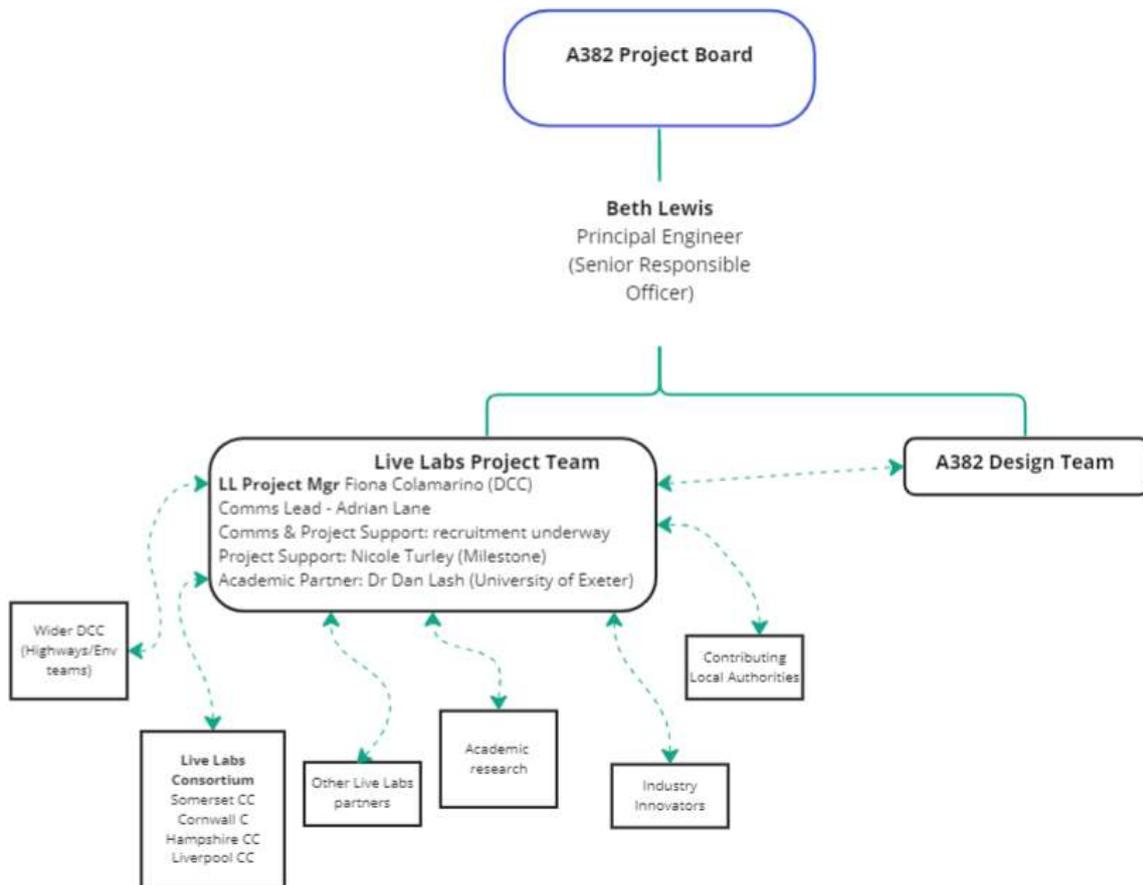


Figure 3

Key Roles and Responsibilities

Live Labs Senior Responsible Officer: Overall responsibility for the delivery of the Live Lab project including ADEPT deliverables and budget management. Setting strategic direction, liaison with wider consortium at board level and management of any reporting needed by Adept. Devon County Council position – Beth Lewis.

Live Labs Project manager: Day to day responsibility for the progress of the project. Devon County Council position – Fiona Colamarino.

- Set up processes to gather innovations (from DCC contacts and from industry)
- Manage the assessment of innovations for suitability
- Set up monitoring processes for innovations to be taken forwards
- Arrange for communications during the project (using comms team)
- Manage ongoing carbon analysis with Exeter Uni
- Share learning from other LL via the consortium

Lives Labs Project support: Day to day responsibility for supporting the progress of the project. Milestone Infrastructure position – Nicole Turley.

- Supporting the development of a process to identify and integrate carbon reduction and carbon negative innovations
- Provide a link between the Live Labs team and the ECI/Construction Milestone Team; assessing buildability and methods of working
- Review and critically assess innovations
- Assess and monitor carbon baselines throughout the Design, ECI and Construction phases
- Support with communications
- Assist with reporting requirements

Live Labs communications and project support: Intern position from the University of Exeter, recruitment currently underway. In this role the graduate will work closely with the project team on things such as sharing learning, monitoring and evaluation, communications and reporting. They will support the Senior Responsible Officer, Project Manager and Communications Lead with communications and social media publications as well as supporting the project team within work on collating and sorting innovations where necessary.

The project itself will operate on the following premise (Figure 4) with options appraisals carried out by the Live Labs team before proposals being ratified at the Live Labs Board and implemented by the A382 design team.

Data collation has already commenced and reporting arrangements will be confirmed once the programme M&E supplier is appointed in order to align with their proposals.



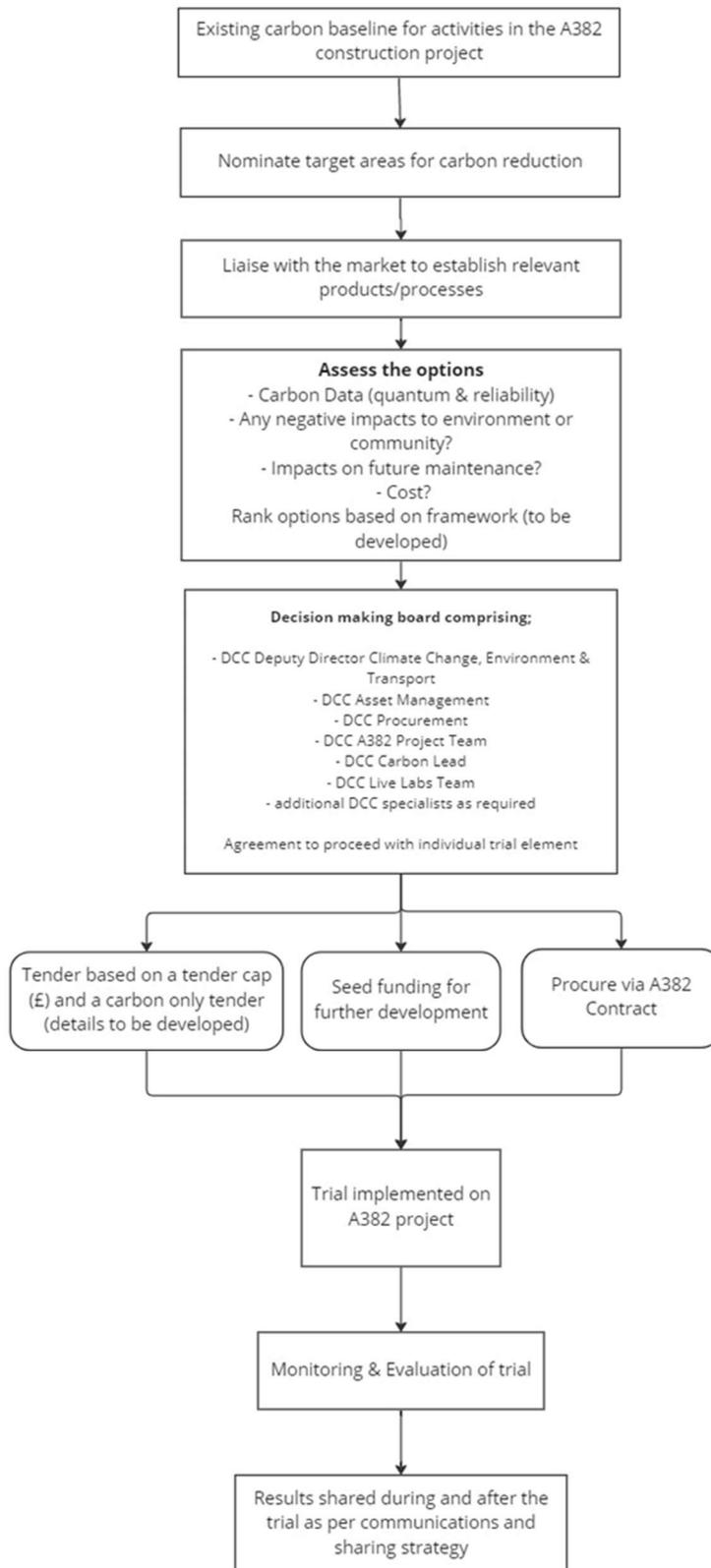


Figure 4

Statements of Support

Both Milestone and the University of Exeter are key partners in this project.

Milestone have been an integral part of the part of the A382 construction team since April 2022. Their industry connections and willingness to facilitate alternative solutions make them a crucial part of the Live Labs project as it moves towards construction.

Statement of Support – Milestone Infrastructure

Milestone Infrastructure are proud to be supporting Devon CC on the LiveLabs2 project for the A382. Accelerating carbon reduction and carbon negative initiatives into this scheme will provide valuable learning for the industry as a whole, as well as providing the opportunity for Devon CC, Exeter University, and Milestone Infrastructure to showcase the green skills and capability in the South West of England. The project complements Milestone’s ambitions for safer, greener highways, and provides the opportunity to aim beyond net zero and target carbon negative status; an industry first. Nicole Turley, Sustainability Manager at Milestone, has been involved in the A382 project from the tender stage and has supported throughout the ECI period. She will continue to support the Devon CC Project Lead and Project Manager throughout the Live Labs process to collaborate on new innovations, ways of working, and to draw on Milestone’s wider sector expertise for the benefit of all partners.

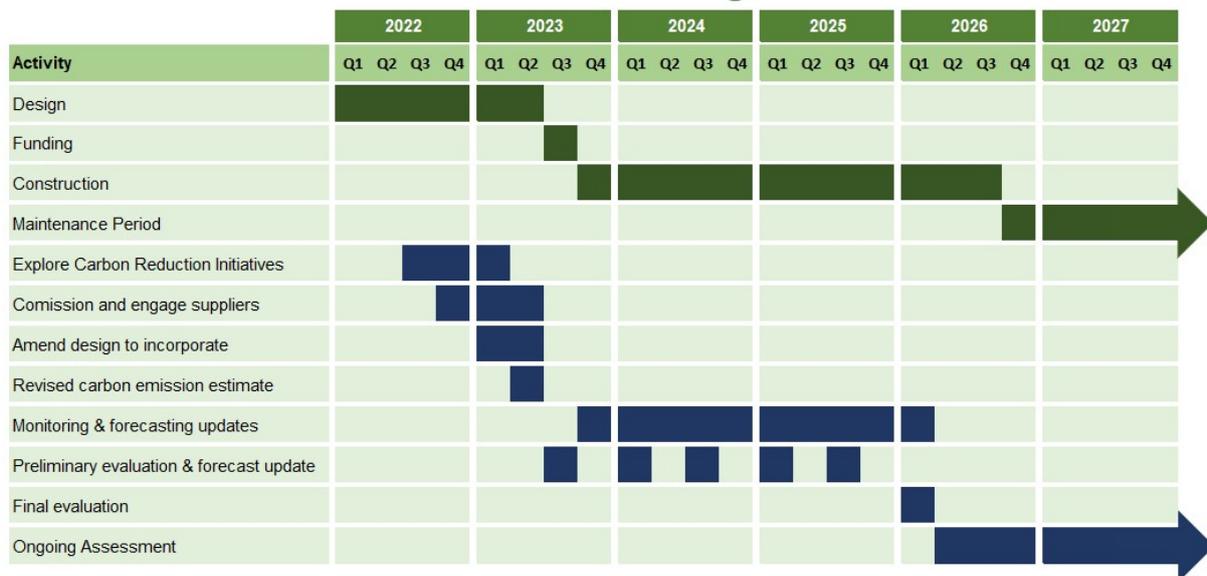
Statement of Support – University of Exeter

Dr. Dan Lash at the Centre for Energy and the Environment, University of Exeter (UoE), has been working with Devon County Council (DCC) on highways infrastructure projects for a number of years. This has included quantifying greenhouse gas (GHG) emissions from new capital schemes, developing tools for DCC to use in-house to improve design and decision making around capital and maintenance projects, and working more widely with the sector to produce guidance aimed at harmonising approaches to GHG quantification. Through this, it has become apparent where the current limitations both in quantifying emissions, and the opportunity to drive those emissions down through the design and construction process are. The UoE are happy to be supporting DCC on this Live Labs project at the A382, as it will place GHG impacts ‘front and centre’ in the decision making process for the project. This has the potential to both deliver a very low impact scheme, and for the lessons learned to be applied more widely within the sector.

Project Plan

Date	Project Milestone
Set up Live Labs team	Complete
Initial Calculation of Carbon Baseline	Complete
Refinement of baseline and calculator	Present – May 2023
Gather innovations from industry/academia	Present – Jul 2023
Assess carbon impact of innovations and if appropriate add to A382 project	Present – Dec 2023
Implement innovations	Spring 2024 - 2026
Monitoring and Evaluation	Spring 2024 – 2026 (and subsequent 5 year period)
New Business as usual	2026 – 2031

A382 Live Labs Outline Programme



Draft Risk Register

To maintain momentum, DCC is continuing with development of the Live Labs project at risk whilst this OBC is considered. Upon approval, DCC will take forward the further development of the project through to appointing team members and committing innovations into the A382 project procurement, tender and the Full Business Case.

The most significant risk to the A382 scheme is construction inflation, this risk is being actively managed by the designers and contractors.

By its very nature the Live Labs project is a trial and is inherently full of uncertainty. The risks fall into two categories; the trial elements and the delivery of the Live Labs project itself.

The risk associated with the success of the proposed innovations will be monitored and controlled by the innovation selection process, an early draft is show in the Management Case. Part of the project will be to work with academic experts to determine the best way to quantify the impacts of the trial. Significant risk will remain, the challenge will be determining the appropriate level.

See active **risk register** in Appendix B

The Carbon Case

Carbon Baseline Estimation and Reduction Target

The Department for Transport have included a requirement to develop a robust and comprehensive carbon management case as part of the Full Business Case (FBC) for the A382 scheme. In order to fulfil these requirements Devon have prepared a draft case which includes a carbon management plan in accordance with the DfT guidelines. This process required the setting of a baseline and also a target for carbon reduction across the life of the project for which 25% was chosen. That target was chosen as detailed design commenced and before Milestone were engaged and was deemed to be achievable whilst challenging at that point of the project. However, with the design progressing and the input of Milestone as well as the potential opportunities afforded by the Live Labs funding a new target of carbon negative has been chosen. This target is significantly more ambitious but the opportunity presented both by the project circumstances and additional funding provided the ideal scenario to push the target as far as possible.

The baseline of the A382 project both for Live Labs and the FBC is set at the point where planning consent was granted for both parts of the scheme. This is a point at which the site extents were set, the preliminary design completed and the point at which the original business case for the scheme was prepared. In relation to PAS2080 it marks the point where the project transitioned from planning to design and it is from this point that both the current design team and Milestone have come to the project.

The design at this point, whilst preliminary, had set the horizontal alignment, land ownership, basic drainage principles and earthworks as well as including the structures and street lighting. In preparing a baseline from this point both DCC and Milestone have worked on the basis that the scheme would be built as a traditional scheme in the same way as the previously constructed adjoining phases. Reasonable assumptions were made for items like gullies, manholes and structural foundations.

Using both the DCC and Milestone tools we have calculated a preliminary baseline for the project of circa 10,000 tCO₂e which covers the construction and maintenance. Further work will be undertaken to provide a more accurate baseline.

Approach to Carbon Measurement Across the Lifecycle

In order to provide measurement across the lifecycle we first of all need to determine what the lifecycle is. In initial considerations we looked at using 2050 as a deadline since that is the year by which achievement of net zero is targeted. However, this deadline risks missing some of the key maintenance activities associated with a highway scheme.

As such we have provisionally chosen a figure of 40 years post construction since this should include all of the main maintenance activities such as barrier replacement and surface reconstruction. This figure is based on an initial review of the academic literature on Life Cycle Assessment (LCA) by the University of Exeter. In this, there does not appear to be an accepted LCA period in the LCA of roads, though 40 years was the most commonly used value identified in one literature review. Therefore, our work here will use that as a starting point, though we may also undertake the analysis with an undefined/infinite time series, which would enable us to then explore a range of periods including the impact of choosing different values. It also enables us to potentially use other target periods e.g., 2050 to align with national decarbonisation targets. We will raise this issue with the other Live Labs with a view to having a consistent approach to lifecycle across the programme.

Devon's approach to carbon measurement has been developed through a 2 year research project, working closely with Exeter University. The project objective was to produce a standard method of carbon reporting and calculation. In 2020/21, Devon worked closely with its supply chains and Exeter University to produce a series of carbon baselines per works activities and unit measures e.g. 1m of patching or replacement of 1 street light column. This data was used to produce a designer's impact assessment tool, allowing modelling of various technical solutions against the carbon impacts. This tool considered in scheme carbon emissions, carbon cost and the whole life cost of carbon throughout an asset's lifecycle. Further progression was undertaken to digitise the standardization of the raw carbon data collation through an on-line webform and development of cloud based data lakes/algorithms.

The FHRG undertook a review of Local Authority progress on quantifying GHG emissions from road projects, and identified that Devon was the most advanced. The Devon approach has been used as the basis of a 7-authority led trial in 2022, which tested the readiness of the industry and achievability of the model. Following positive feedback, DCC and the UoE have been working with FHRG to author the Carbon Calculation and Accounting Standards (CCAS), a practitioner led document that offers standardised guidance on how to collate, calculate and report on carbon emissions for the highway construction industry. This guidance will align the scope and calculations for the sector with those set out in EN ISO 14064-1 and the Greenhouse Gas Protocol for organisational footprinting. That guidance currently only covers upfront emissions, so the proposed work on the A382 will add important learning around the application of LCA principles on a real capital project. To support this guidance, a Carbon Profiler (a piece of calculation software) has been developed, following the rules of the CCAS document. All CCAS work has been undertaken in conjunction with the Future Highways Research Group as a research project. The work of this Live Lab will continue to build on the CCAS work and is the basis of our continuing work the FHRG.

As mentioned above, both Milestone and Devon have prepared a baseline of the project using their respective calculation tools. Whilst the figures are fairly close there are differences and as such an exercise is currently underway to compare the 2 baselines, identify where the differences arise and any information that is currently missing. Once these are identified and understood a merged version of the two tools will be prepared, bringing the strengths of both together. The merged version will then be developed to track project changes and allow for the inclusion and calculation of innovations.

For a given task, such as resurfacing, the calculator includes carbon data for the material used, the plant that was used, transport for the plant, operatives and materials and transport and disposal of any waste arising. For the whole life cost the calculator will also factor in any maintenance operations associated with the asset over a stated period.

Since the baseline is based on preliminary stage drawings we have made reasonable assumptions on items such as drainage and bridge piles. As the design progresses we are able to refine the figures, as such it is anticipated that some will go up as more detail is available.

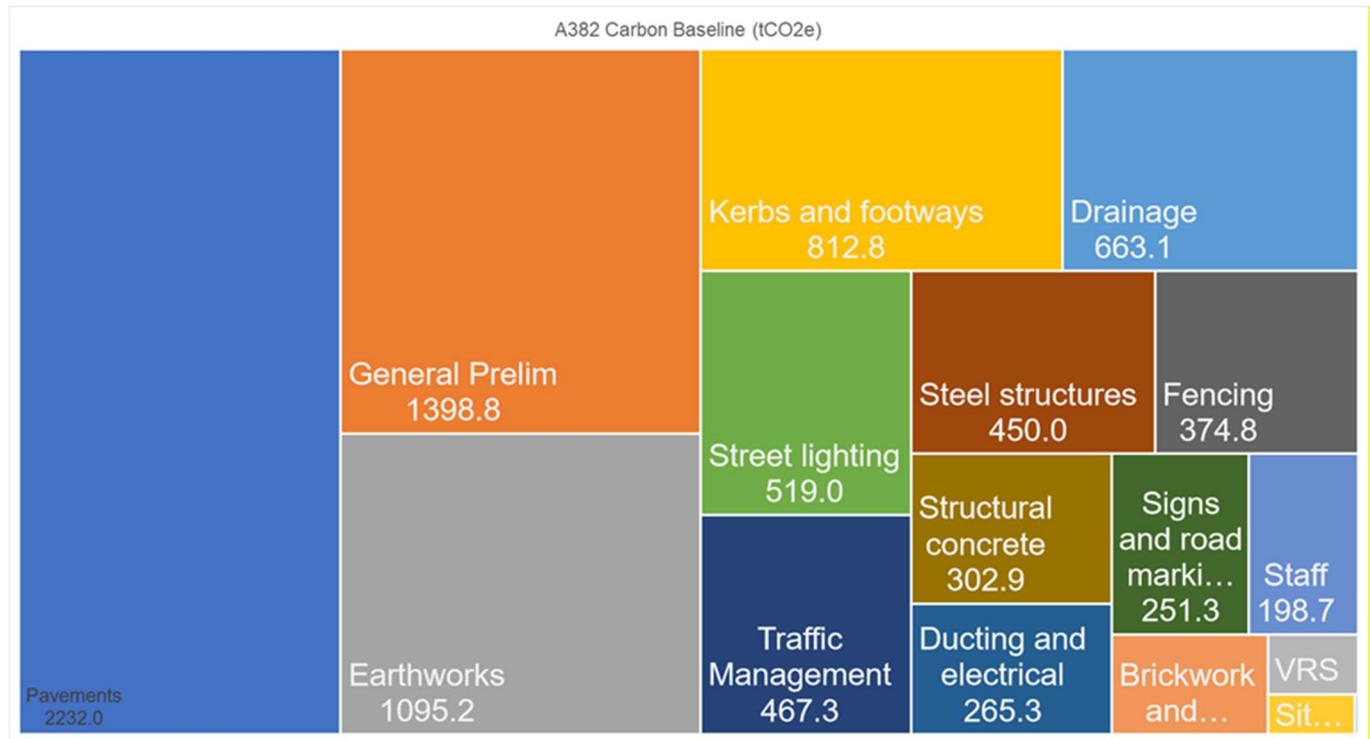
There are a number of items which are not easy to quantify and as such we have consider how best address those. These items include the release of carbon stored in the soil as a result of earthworks activities and the removal of vegetation and resulting loss of sequestration. In both cases a number of variables affect the amount of carbon such as age and condition of tree or shrub and soil type and use. Measuring items such as these accurately is a project in itself but rather than ignore their impact we intend to acknowledge the effect of these activities and consider existing research to determine how best to address their impact. Taking earthworks as example we will be able to quantify with confidence the carbon associated with the plant use, material transport and disposal but we will look at research undertaken into carbon storage in soil to provide an educated estimate of the carbon released through those processes.

Now that both the design and works planning are progressing it is the intention of the team to undertake a calculation refresh to provide a record of the pre-Live Labs savings. These are design or construction changes that come at no additional cost to the project and are therefore an early learning opportunity for other projects on what carbon savings can be achieved at no cost. Items that fall under this category include things like the removal of kerbs, reducing the road width and replacing the bridge with an at-grade crossing.

Following the work that was undertaken on the calculation tool, Devon County Council has created a carbon capture tool. The tool takes raw data collected by the contractor during the works and calculates the carbon impact of the tasks. This tool will also be refined to allow the inclusion of innovations.

Description of Expected Carbon Reductions by Intervention Type

The figure below provides a breakdown of the various series of the scheme and their calculated carbon impact.



Whilst the figures will be updated through the process of the calculation review these give a good indication of the baseline and it's contributing factors.

Taking these in turn we will interrogate a breakdown of each element to identify where reductions can be made. In order to track the various options, their benefits, costs and progress on then we have developed a spreadsheet, an indicative copy of which is included in Appendix D, this will be updated with accurate data as the project progresses.

Description of Approach to the Quantification of Residual Emissions

There are instances, such as where site constraints force the use of more carbon intense solutions where we will review the options that would have been available to us in an ideal scenario and provide a theoretical carbon saving. One such instance is earthworks where the site extents do not provide sufficient space for earthworks to stand at their natural angle and reinforcement or retaining is required. For the purposes of future schemes and understanding the impacts of early decisions we would determine the design and construction had sufficient space been available. The same process will be applied to other instances where emissions are unavoidable so that the data can be used by others.

Details of Academic and Industrial Partners

The project is being supported by Dr. Dan Lash at the University of Exeter. Dr. Lash has been working closely with DCC for a number of years on the decarbonisation of its highways projects.

This has included the design for a number of schemes using WebTAG (A382/3, A361, Cullompton Relief Road) and from this the development of an in-house carbon calculator for the quantification of emissions from a range of capital and maintenance projects. From this, a contractor data capture tool is in development, which will enable live data to be input and calculated. A review of carbon calculation and readiness of local highways authorities by the FHRG demonstrated that the work of DCC and the University of Exeter was considered best practice for the sector. Dr. Lash is currently jointly writing revised guidance with the FHRG and DCC for calculating greenhouse gas emissions including Scopes 1, 2 and 3. This guidance will align the scope and calculations for the sector with those set out in EN ISO 14064-1 and the Greenhouse Gas Protocol for organisational footprinting. Dr. Lash will ensure that the approach and calculations undertaken in this Live Labs project will be compatible with what is being developed through the FHRG. That guidance currently only covers upfront emissions, so the proposed work on the A382 will add important learning around the application of LCA principles on a real capital project. Dr. Lash has been commissioned through the project to provide critical input the design stage and also a check and challenge function through construction and monitoring. This will include ensuring the carbon calculations are being undertaken in ways that are consistent with the current and emerging standards and guidance, including harmonising the initial two models (Milestone and Devon) and to develop them into a project specific model that includes both the upfront and lifecycle emissions for the baseline scheme, and all proposed interventions and innovations.

Milestone are our main industrial partners in this project, providing collaboration not only on carbon reduction options but also the approach to and calculation of carbon. Nicole Turley, Sustainability Manager, has been an environmental professional in the highways and construction sector for 8 years and notably worked on the development of an in-house carbon calculator with Chief Estimator, Jason Hanney. Nicole has tested and trialed the Milestone calculator on several projects and worked on the baseline assessment for the A382. Using this baseline Nicole has coordinated carbon reduction workshops with key stakeholders and has worked with Beth Lewis and Dr. Dan Lash to compare the logic and outputs of both the Milestone and Devon carbon assessment tools. Nicole will provide a link between the LiveLabs team and operational Milestone team who are, in parallel, working on the Early Contractor Involvement (ECI) stage of the project in order to keep carbon at the forefront of decision making and supply chain engagement. Nicole will also support Devon CC to research innovations and upcoming technologies, reaching out to start-ups, SMEs, and industry leaders, both within and external to the highways sector.

Monitoring & Evaluation

Tactical M&E Activities

Progress on the project will be monitored and evaluated using well established procedures, risk registers, lessons learnt and monthly reporting to both the A382 Project Board and the wider Live Labs programme. These will be in addition to the programme level M&E set out below.

Carbon analyses will form part of determining the success of trial elements, but the project will seek to look wider, to assess the practicalities of implementation, the wider sustainability impacts, impacts on social value, the economy, our landscape and our communities. The expressed target of a carbon negative construction project will not be pursued at all costs. As the monitoring and evaluation framework is developed this wider consideration will be quantified and brought into the decision-making process. A copy of the proposed decision record spreadsheet for the project is included in Appendix E and a version already used to present design decisions to project board is included in Appendix C.

Whilst carbon measurement will be the prime focus of the project we are also interested to understand how the change in working practices is perceived by road users and residents and also whether the works will increase the interest of the local population in carbon reduction. We propose to have a scheme specific webpage for the wider A382 project which will include a section on Live Labs 2. We will investigate the use of website monitoring tools to monitor traffic to the scheme webpage as well as instigating a means to gather feedback to the project team via the webpage. We anticipate monitoring what parts of the website are visited, whether communications affect the traffic and also what the interest in carbon is from those visiting the site and whether we can influence that interest. Since large scale schemes such as this always generate complaints the volume and content of these will also be monitored and evaluated and where possible compared against similar historic schemes to identify and variations from typical works.

A cycle route parallel to the scheme will remain open throughout the duration of the project and highlighted as a means of avoiding closures or potential disruption. Use of the cycle routes will be monitored to see whether there is any uptake and behaviour change.

As part of the wider carbon reduction programme Devon County Highways, working with the Engineering Design Group are developing a Decarbonisation Strategy which will include changes to business as usual at all levels from client, through designers and onto contractors. We will provide further feedback to Live Labs as this strategy evolves.

Programme Level M&E

From the ADEPT supplied documents it is understood that the supplier of the programme level M&E will undertake the following activities:

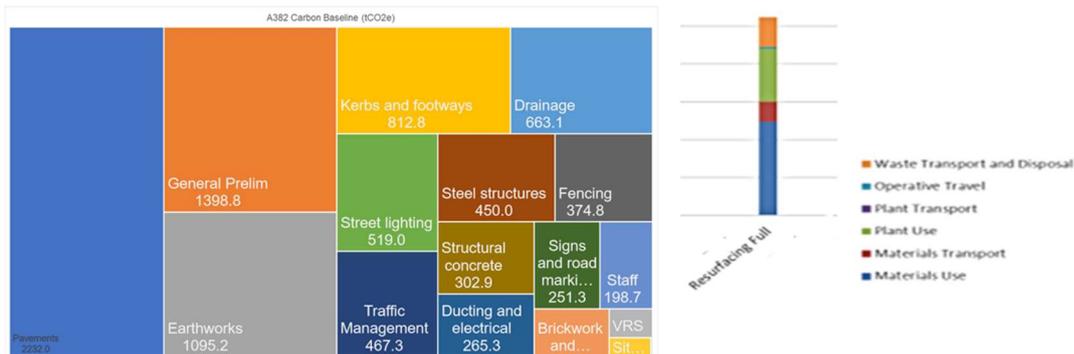
- Speak with each of the 7 Live Labs and the ADEPT team to prepare a detailed programme of timings for the programme of works;
- Collaborate with each Live Lab to scope their evaluation activities and design an evaluation framework;
- Provide a dashboard that is updated on a regular basis to summarise the delivery of the benefits for each Live Lab and across the programme;
- Organise regular sharing seminars for the Live Labs to provide updates to each other, provide cross-project critique and problem solving;
- Annual report to provide a transparent summary of the progress being made in delivering the benefits of each Live Lab and any innovations or lessons learnt;
- Report summarising the outputs produced by each Live Lab, the outcomes delivered as a consequence, and initial conclusions as to the overall Impact and Value for Money of the programme;
- Two annual legacy reports to provide a transparent summary of the legacy benefits that continue to be delivered by each Live Lab, and any recommended actions that should be undertaken to ensure any good innovations become Business as Usual
- Final report that summarises the outcomes of all the Live Labs projects and makes an objective assessment of the success of the programme in terms of its short-, medium- and long-term impact; and the overall Value for Money.

Devon will collaborate with the M&E supplier to ensure a full understanding of the programme and evaluation on the project. Devon is well advanced in the calculation and recording of the carbon reduction work and will be able to share early findings with the M&E supplier.

Supply of Outputs

Depending on the audience the main information that will be of use from the project will be responses to; what did we do, how much carbon did we save, what did it cost and is it suitable for future schemes.

We propose that the outputs from the project will be presented simply so that they can be communicate the information on these points to as wide an audience as possible, whether that be the public wanting to know how the money was spend or the industry wanting to know the details of how it was done. From the presentations given to date we have already realised the communication benefits of providing not only a graphic breakdown of the carbon contributors to the project but also the further breakdown for each contributor as per the example below:



Feedback is that the graphics show clearly where the carbon build up lies and through that it is easier to communicate the logic of various options. We would propose to continue using similar graphics to clearly demonstrate where carbon reductions have occurred and the impact they have had on the overall picture.

The table provided in Appendix D can form the basis of more detailed analysis of the work done providing comparison between the carbon and monetary value of a traditional approach versus a carbon reducing option. This can be expanded to include the maintenance carbon and costs and details on the actual results of the carbon captured on site.

Devon’s carbon capture tool uses power BI to present similar graphics and provide a dashboard of information on the data provided by the contractor, which we also intend to use both during construction and for ongoing maintenance.

In addition to the outputs set out above some other key information we are keen to monitor is how the project is perceived by local residents and road users and how well we are communicating the work we are doing. Large schemes close to urban areas usually generate significant feedback from the public which we’ll monitor both via our customer service team and Milestone’s public relations team. Lessons learned on both what worked well and what didn’t can then be picked up by future schemes.

A further item for monitoring is the impact of new ways of working in procurement and their effect on the industry. We would trial new procurement methods and monitor how well they work and seek feedback from organisations like CECA on how these changes are perceived.

Details of Methodologies and Tools

As mentioned above, in collaboration between Devon, Milestone and the University of Exeter, we will create an enhanced calculation tool that allows the capture and calculation of proposed innovations as well as carbon data for typical activities. The enhanced tool will allow the inclusion of maintenance activities and costs so that both the full life carbon picture can be captured but also so that value for money can be attributed to the options available. This will be useful feedback for our colleagues, other live labs and the wider industry.

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In moving into the construction phase we will use Devon's carbon capture tool to collect the raw data from the site activities which can then be used to calculate the actual carbon impact of the activities. This tool will also require enhancement to cope with the inclusion of innovation on the project for which we will commission the company originally involved with building the tool.

Equality Impact Assessment

As part of the main A382 scheme an Equality Impact Assessment was undertaken. The EIA focussed on the overall scheme and determined that there were no adverse impacts on protected characteristics and that the scheme would provide benefits to many through provision of shared use facilities. A further EIA has been undertaken for the Live Labs element of the project which has also identified no adverse impacts.

The main project has been through a planning application through which all environmental impacts have been considered and addressed, as a result environmental impacts were discounted from the EIA in both the A382 and Live Labs EIA.

Devon County Council are committed to equality, diversity and inclusion (EDI), with policies and/or strategies in place to ensure our workforces are representative of the communities in which they work. This will ensure each stage of the project (from strategy through to delivery of works on the ground) benefits from a wide set of insights, perspectives and experiences.

Community and Stakeholder Engagement

Through early community engagement we will be inclusive of the views of the communities impacted by the scheme, to ensure any changes we make are positive for everyone. We will focus on the needs of the community with the aim that the main contract for the works includes the provision for social benefits. One area identified which would benefit from help are care leavers and we will be working with Milestone as part of their social value work to determine how best to address the needs of this group.

We will engage and inform stakeholders affected by the scheme to ensure awareness of the Live Lab and how the proposals will affect them. Work on this has already started with stakeholders identified and contact made via the project team.

Implications for people with protected characteristics have been considered through the attached Equality Impact Assessment and no adverse impacts have been identified. Work to ensure we consider implications for people with protected characteristic will continue beyond the completion of the EIA. Recent guidance received from Guide Dogs, 'Making the Built Environment Inclusive' is being reviewed against the current design.

With a hospital directly adjacent to the works consideration of their specific needs will be considered throughout the works.

Since a number of the innovations under consideration relate to material choices it is not anticipated that these will have any impacts on stakeholders but they will be kept informed and engaged about them nonetheless.

If any of the proposed innovations are likely to impact on a protected characteristic, we intend to engage with the relevant community as part of the early stage assessment of the proposal. If the trial is later implemented the impact on the community will be monitored.

Engagement with such stakeholders throughout the project will enable us to collect and monitor feedback on the project.

Our intended communications are detailed in the following section, it is envisaged that engagement and sharing will be a significant deliverable for the project and the methods used will be tailored to the local demographic.

Sharing, dissemination and working

Communications and content

We view the sharing and dissemination work to be formed of two strands. A public facing communications element which publishes updates to the general public at important milestones, generates stories to raise the local profile and responds to queries, this element will be undertaken by the DCC press office with support from Milestone and a project content creator. The second strand is more industry facing and relates to content creation and sharing in more granular detail the successes and failures, the step by step progress and technical learning. The audience for this element will predominantly be the highways and construction industry and the methods of dissemination will need to be matched to openness of the sharing. This work will coordinate with the work undertaken by the M&E supplier.

Sharing, dissemination and working with other local highways authorities

- Existing contacts with other local authorities we will communicate our findings with ‘Lunch and Learns’ and in person events already in the calendar.
- We will work with ADEPT to facilitate sharing knowledge through blogs, articles and white papers, media and social media content, webinars, magazines and videos/images.
- We will also support the preparation and submission of papers that ADEPT require for conferences and exhibitions.
- We have contacts within a variety of professional bodies within which we will also communicate our learnings.

Sharing, dissemination and working with the wider highways sector

- From the information provided to date we anticipate the majority of this work being undertaken by ADEPT however we will provide input and support as required.

Sharing, dissemination and working with the UK public sector beyond roads

- Local authorities cut across multiple sectors, and so project outcomes will be shared with other departments, outside the Highways functions there will be relevance for Environment and Economy teams including construction.
- DCC have regular meetings with organisations such as the NHS, South West Water and Environment Agency to exchange learning on carbon in their respective sectors.
- Our academic partners already work across multiple sectors to share knowledge, our University of Exeter colleague Dr Dan Lash from the Centre for Energy and the Environment works with multiple clients across industries.

- We will share knowledge with Innovate UK, who run a Net Zero Places Innovation Network that includes decarbonisation case studies.

To date Devon County Council has delivered three presentations on the Live Labs programme to internal and external audiences.

Statement of Collaboration

The A382 project is a typical highways project, many which are delivered across the country each year, the results of the various Live Labs trials hosted within it will be shared widely across the industry, both successes and failures. Interventions which are successful in carbon terms and practical to employ will be immediately applicable to projects nationwide with the evidence of success in use required to challenge established standards where needed.

Work alongside our consortium partners and existing geographical alliances has already begun, and the positive impacts are already clear to see. Adopting an entirely transparent working relationship with partners allows lessons to be shared and mutual connections to be leveraged. In the few weeks to date Devon County Council has already connected its Street Lighting department with a peer's Live Lab project. The potential is clear to see, and the enthusiasm has already spread. The project will address behaviour change at all levels, there is a considerable enthusiasm from technical practitioners up to Director level. This support is equalled by the support of the Cabinet Portfolio Holder for Climate Change Environment and Transport, Cllr Andrea Davis. The team is looking forward to engaging with colleagues and challenging the status quo particularly in relation to the local authority/supplier relationship and providing a test bed for a new approach to procurement.

The A382 Live Labs project will succeed or fail on its relationships with others, the proposal has been clear from its inception that the core of the project is finding, testing, implementing, and sharing innovation. The Live Labs project will be built on the foundations of the existing A382 project relationship with Milestone who are engaged on an early contract engagement basis. We anticipate leveraging the industry contacts within our private sector partners, consortium partners, peer authorities, establish suppliers and innovators in the highways industry and other allied fields. We will support ADEPT's strategic programme-level communications by openly sharing knowledge both inside and outside the highways sector. We will develop a bespoke Communications Plan that meshes ADEPT's activity with local communications and engagement activity, and the work of our partners

APPENDIX A – Theory of Change

