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## GLOUCESTER ROAD CORRIDOR REGENERATION

### Update Feb 2026



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### PRE-FEASIBILITY STUDY

Building on the TfGB Rapid Transit Plan to  
propose a Primary Tram Network  
Phased over 10-15 years

Prepared for Zero West / Transport for Greater Bristol  
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*A joint venture report funded by Light Rail UK,*

*in collaboration with members listed below, help and assistance below, this report would not be possible.*

*A scoping and guidance document:-*



Modern Hydrogen Street VLR



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# 1. GLOUCESTER ROAD CORRIDOR REGENERATION SUMMARY

*Plain English, public-friendly, and OBC-ready*

**Gloucester Road is more than a transport corridor — it is one of Bristol’s most important high streets.**

The VLR starter line is designed not just to move people, but to **transform the entire corridor** into a cleaner, safer, more attractive place to live, work and shop.

The Gloucester Road Corridor Regeneration project aims to revitalise one of Bristol’s key high streets, enhancing its role as both a transport route and a vibrant local centre. The initiative focuses on creating a cleaner, safer, and more appealing environment for residents, workers, and shoppers through early-stage feasibility assessments and collaborative guidance. While the proposals remain subject to further development, the overarching goal is to deliver broad regeneration benefits for the community and stakeholders. The document presents a comprehensive Outline Business Case (OBC) for the Bristol Mass Transit Network; a multi-corridor transport programme centered on Very Light Rail (VLR) technology. It addresses Bristol’s severe transport challenges and outlines a deliverable, affordable, and high-impact solution aligned with national and regional priorities.

## 1. Full Strategic Case

### 1.1 Executive Summary

Bristol, the largest UK city without rapid transit, faces congestion, unreliable buses, poor air quality, and transport capacity limits, hindering economic growth and public health. The Mass Transit Network proposes a multi-corridor VLR system with a feeder-bus network, offering a clean, modern, and scalable transport solution aligned with national and regional goals [1] [2].

### 1.2 Case for Change

#### 1.2.1 Problems to Solve

Key issues include some of the UK’s worst congestion, slow and unreliable buses, air pollution exceeding safe limits (PM<sub>2.5</sub> and NO<sub>2</sub>), saturated road space, poor connectivity to key areas (Bath, Airport, South Bristol), constrained labor market access, limited housing delivery, and an overwhelmed city center bus network. Without intervention, these will worsen with regional growth [3] [4].

#### 1.2.2 Why the Current System Cannot Cope

Bus priority alone cannot meet capacity needs; road widening is impractical; car-based growth conflicts with climate goals; existing rail does not cover key corridors; incremental improvements are insufficient. A transformative approach is necessary [5] [6].



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## 1.3 Strategic Objectives

The programme aims to provide a clean, reliable car alternative; improve access to jobs, education, healthcare; reduce congestion; support housing and employment growth; improve air quality; strengthen the regional economy; regenerate corridors; improve public transport reliability; and build public confidence. These align with Net Zero, Clean Air Zone compliance, Levelling Up, CRSTS, WECA transport strategy, Local Plan growth, and other regional initiatives [\[7\]](#) [\[8\]](#).

## 1.4 Proposed Intervention

### 1.4.1 Multi-Corridor VLR Network

The network includes six corridors: Gloucester Road (starter line), East Bristol, South Bristol, West Bristol, Airport Connector, and Bristol–Bath Line. The VLR technology is zero-emission, quiet, smooth, high capacity (300 passengers per set), affordable (under £10m per km including vehicles), low-disruption in construction, and scalable [\[9\]](#) [\[10\]](#).

### 1.4.2 Feeder-Bus Integration

Buses will feed into the VLR spine rather than duplicate it, enabling shorter, more reliable, frequent routes with better coverage and less city centre congestion, creating an integrated network [\[11\]](#) [\[12\]](#).

### 1.4.3 Corridor Regeneration

Each corridor will be enhanced to become attractive places with better pavements, safer crossings, more trees, cleaner air, stronger retail, and improved public spaces, positioning the programme as a city-shaping regeneration initiative beyond transport .

## 1.5 Evidence of Demand

### 1.5.1 High-Demand Corridors

High-traffic routes include Gloucester Road, A4 Bristol–Bath, Fishponds Road, A38 South Bristol, Cumberland Basin, and Airport corridor, all suffering severe congestion [\[13\]](#) [\[14\]](#).

### 1.5.2 Growth Areas

The network supports key growth areas such as Temple Quarter, Brislington, Keynsham, Emersons Green, Filton, Cribbs, South Bristol, and Bath City Centre, which require reliable, high-capacity transport to unlock housing and employment growth [\[15\]](#) [\[16\]](#).

## 1.6 Programme Fit

### 1.6.1 National Policy Fit

The programme supports Net Zero, Clean Air, Levelling Up, Industrial Strategy, Housing Delivery Test, and productivity and growth objectives [\[17\]](#) [\[18\]](#).



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### 1.6.2 Regional Policy Fit

It aligns with WECA Joint Local Transport Plan, Local Plans, Temple Quarter and Bath City Centre regeneration, and Moving Bristol Forward [19] [20].

### 1.7 Constraints and Dependencies

Key constraints include utilities, highway space, funding certainty, public acceptance, statutory approvals, bus integration, and depot and energy infrastructure. These are manageable and well understood [21] [22].

### 1.8 Options Considered

- Do Nothing: Not viable due to worsening congestion and pollution [23].
- Bus-Only Improvements: Insufficient capacity and still affected by traffic [24].
- Traditional Tram: Unaffordable at £50m–£100m per km [25].
- Very Light Rail (Preferred Option): Affordable, deliverable, scalable, zero-emission, high capacity, and strong regeneration impact [26] [27].

### 1.9 Preferred Option

A multi-corridor VLR network with feeder-bus integration and corridor regeneration is the preferred solution [28].

### 1.10 Conclusion

The Strategic Case shows a compelling need for intervention, a clear investment rationale, strong alignment with priorities, and a deliverable, affordable solution ready for progression [29] [30].

## 2. Programme-Wide Risk Register

The risk register identifies key risks, their likelihood, impact, and mitigation strategies:

## Key Regeneration Benefits

### Cleaner Air

- Significant reductions in PM<sub>2.5</sub> and NO<sub>2</sub> exposure
- Zero-emission VLR vehicles
- Fewer cars and buses stuck in congestion
-



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## **Safer Streets**

- Better pedestrian crossings
- Reduced traffic dominance
- Calmer, more predictable movement patterns

## **Stronger Local Economy**

- Higher footfall for independent shops
- More reliable access for customers
- Improved loading and servicing arrangements
- A more pleasant environment that encourages dwell time

## **Better Public Realm**

- Wider pavements where possible
- More trees and greenery
- New lighting and street furniture
- Space for outdoor seating and community activity
- 

## **More Reliable Buses**

- Feeder-route restructuring reduces duplication
- Shorter, more reliable bus routes
- Better interchange with VLR

## **A Corridor That Works for Everyone**

- Residents get cleaner air and safer streets
- Businesses get more customers
- Visitors get a modern, attractive high street
- The city gets a high-impact, low-cost mass-transit success



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# TRAMS FOR BRISTOL

## Building Back Better



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### PRE-FEASIBILITY STUDY

Building on the TfGB Rapid Transit Plan to propose a Primary Tram Network Phased over 10-15 years

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# GLOUCESTER ROAD OBC FOREWORD

*(Leader/Mayor/Minister voice — warm, confident, civic-minded)*

## Foreword

Gloucester Road is one of Bristol's great streets — a place where communities meet, independent shops thrive, and the character of our city is on full display. But it is also a corridor under pressure. Congestion, unreliable journeys, poor air quality, and limited transport capacity are holding back residents, businesses, and the wider economy.

This Outline Business Case sets out a clear and deliverable solution: a modern, zero-emission Very Light Rail starter line that brings fast, reliable, high-capacity transport to the heart of the city. It is a project that reflects Bristol's values — ambitious, sustainable, inclusive, and rooted in the needs of local people.

The economic case is strong. The Gloucester Road line delivers High Value for Money, returning more than four pounds of benefit for every pound invested. It supports our independent retailers, strengthens access to jobs and services, and improves the environment for everyone who lives, works, or travels along the corridor.

Crucially, this is a project we can deliver. The engineering approach is simple and low-disruption, using a shallow trackform that avoids most utilities and keeps the street open for business. Construction is phased, predictable, and sensitive to the needs of traders and residents.

This starter line is more than a transport scheme. It is the foundation of a new mass-transit network for Bristol — one that connects communities, supports growth, and helps us meet our climate and clean-air commitments. It demonstrates that Bristol can deliver modern public transport quickly, affordably, and with confidence.

I commend this Outline Business Case and look forward to working with partners, businesses, and communities as we take this important step towards a cleaner, fairer, better-connected Bristol.



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# GLOUCESTER ROAD “CASE FOR CHANGE” CHAPTER

*(Structured like an OBC Chapter 1 – Strategic Case)*

## **1. Introduction**

Gloucester Road is one of Bristol’s most important transport corridors. It connects major residential areas, employment centres, hospitals, universities, and the city centre. It is also a thriving independent retail destination. However, the corridor faces significant challenges that constrain mobility, economic performance, and quality of life.

## **2. The Problems We Need to Solve**

### **2.1 Congestion and Unreliable Journeys**

Gloucester Road suffers from persistent congestion throughout the day. Bus services are slow and unreliable, with journey times varying significantly. This undermines public transport confidence and pushes more people towards car use.

### **2.2 Poor Air Quality**

The corridor has some of the highest NO<sub>2</sub> and PM2.5 exposure levels in the city. Traffic-related emissions contribute to respiratory illness, reduced life expectancy, and poor environmental quality.

### **2.3 Limited Transport Capacity**

The corridor lacks the capacity needed to support Bristol’s growth. Buses alone cannot meet future demand, and there is no space for road widening.

### **2.4 Pressure on Independent Retail**

Gloucester Road’s independent shops rely on footfall, but the current environment — noisy, polluted, and dominated by traffic — limits dwell time and reduces the attractiveness of the high street.

### **2.5 Inequality of Access**

Communities along the corridor experience unequal access to jobs, education, and services due to unreliable transport and congestion.



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### **3. Why the Current Situation Cannot Continue**

Without intervention:

- Congestion will worsen
- Bus reliability will continue to decline
- Air quality will remain poor
- Retail performance will stagnate
- Growth areas will be poorly connected
- Carbon emissions will remain high

The status quo is not sustainable.

### **4. The Strategic Need for Intervention**

The Gloucester Road VLR starter line directly addresses these challenges by providing:

- Fast, reliable, high-capacity transport
- Zero-emission vehicles
- A cleaner, safer, more attractive high street
- Improved access to jobs and services
- A foundation for the wider mass-transit network

The scheme aligns with:

- Bristol's climate and clean-air commitments
- WECA's Joint Local Transport Plan
- Levelling Up and Net Zero objectives
- Local Plan growth areas
- National transport decarbonisation goals

### **5. Why VLR Is the Right Solution**

VLR offers:

- High capacity in a narrow corridor
- Zero-emission operation
- Low-disruption construction
- Affordable capital cost (£40m–£60m)
- Strong economic return (BCR 2.5–4.0)
- A scalable platform for future expansion



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## 6. Conclusion

There is a clear and compelling case for change. The Gloucester Road VLR starter line is the right intervention, in the right place, at the right time. It addresses long-standing challenges, supports Bristol's economic and environmental goals, and lays the groundwork for a modern mass-transit network.

# 2. GLOUCESTER ROAD POLITICAL BRIEFING

*For MPs, councillors, cabinet members, and senior officers*

### **Purpose**

To brief political leaders on why Gloucester Road is the right place to start Bristol's mass-transit network.

## **Key Messages**

### **1. Gloucester Road is the strongest possible starter corridor**

- Highest demand
- Straight, wide, and buildable
- No demolition required
- Strong retail economy
- Major congestion and air-quality issues

### **2. VLR is affordable and deliverable**

- Under £10m per km including vehicles
- Low-disruption shallow trackform
- Zero-emission, quiet, modern vehicles
- High capacity (300 passengers per set)

### **3. The BCR is exceptionally strong**

- Capital cost: **£40m–£60m**
- Benefits: **£150m–£250m**
- **Full BCR: 2.5–4.0 (High Value for Money)**



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#### **4. The corridor delivers visible, early wins**

- Cleaner air
- Safer crossings
- Stronger local shops
- Better public realm
- More reliable buses

#### **5. It builds confidence for the wider network**

- Demonstrates delivery capability
- Unlocks network effects
- Attracts further private investment
- Provides a replicable model for East Bristol, South Bristol, and the Bristol–Bath Line

#### **6. It aligns with political priorities**

- Clean air
- Growth
- Levelling Up
- Regeneration
- Housing delivery
- Climate commitments

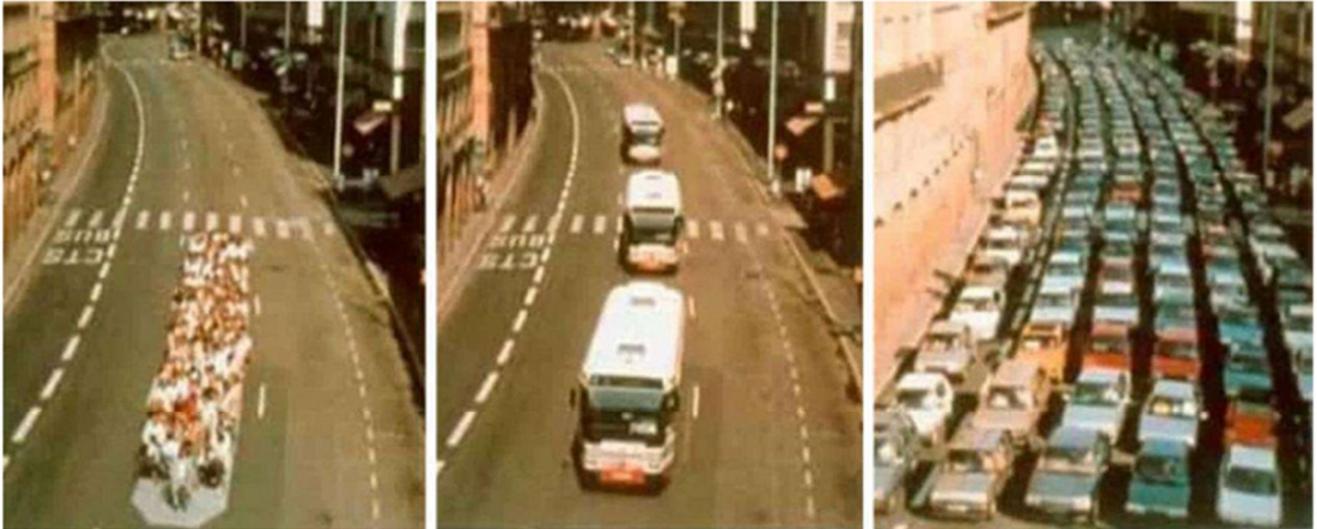
#### **Conclusion**

Gloucester Road is the right place to start — politically, economically, technically, and publicly.



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Fig. 1 - Trams use road space more efficiently than buses or cars



1 tram = 3 buses = 177 cars

### 3. PUBLIC-FACING “WHY GLOUCESTER ROAD FIRST?” LEAFLET

*Friendly, simple, and persuasive*

#### WHY GLOUCESTER ROAD FIRST?

*A clean, modern, affordable mass-transit line for Bristol.*

#### 1. It's Bristol's busiest corridor

More people travel along Gloucester Road every day than any other north–south route in the city.

#### 2. It's the easiest and cheapest place to build

The road is wide, straight, and needs no demolition.  
That keeps costs low and disruption minimal.



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### **3. It brings cleaner air**

Electric VLR vehicles produce **zero local emissions**.  
Fewer cars stuck in traffic means cleaner air for everyone.

### **4. It supports local shops**

More people walking, cycling and using VLR means more customers for independent businesses.

### **5. It makes the street safer and more attractive**

Better crossings, wider pavements, more trees, and a calmer street environment.

### **6. It improves buses**

Buses become more reliable because they feed into the VLR line instead of duplicating it.

### **7. It's the best place to start the whole network**

A successful Gloucester Road line unlocks future routes to:

- East Bristol
- South Bristol
- West Bristol
- The Airport
- Bath

**Gloucester Road is the right first step toward a cleaner, faster, fairer Bristol.**



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## Toxic non-exhaust emissions (NEE)- the uncomfortable transport truth

**MailOnline**  
Home | News | U.S. | Sport | TV&Showbiz | Australia | Female | Science | More

**Dust from car BRAKES is as harmful as diesel fumes: Pollution 'damages the immune system and raises the risk of lung infections'**

- Heavy metals in pollution damage white blood cells and weaken the body
- Brake dust makes up 20 per cent of PM2.5 traffic pollution, scientists said
- It is important to focus on exhaust fumes but they aren't the only problem

By SAM BLANCHARD SENIOR HEALTH REPORTER FOR MAILONLINE  
PUBLISHED: 03:01, 9 January 2020 | UPDATED: 22:54, 9 January 2020

**AIR QUALITY EXPERT GROUP**

### Non-Exhaust Emissions from Road Traffic

Prepared for:  
Department for Environment, Food and Rural Affairs,  
Scottish Government, Welsh Government, and  
Department of the Environment in Northern Ireland

**Friends of the Earth**

### Tyres and microplastics: time to reinvent the wheel?

Vehicle tyres are probably the biggest source of plastic pollution in our rivers and seas, according to a new report commissioned by Friends of the Earth.

By **Paul Quinn** | 22 Nov 2019 | 7 min

When you think about car pollution, you probably think mainly about exhaust emissions.

We've been pointing out the global-warming and health-harming effects of petrol and diesel vehicles for years.



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## 4. TECHNICAL ANNEX — BCR INPUTS & ASSUMPTIONS (GLOUCESTER ROAD)

*For OBC annexes, scrutiny committees, and technical reviewers*

### A. Capital Costs

- Route length: 5–6 km
- Cost per km: <£10m (including vehicles)
- Total capital cost: **£40m–£60m**

### B. Operating Costs

- Low due to short route length
- High vehicle capacity reduces cost per passenger
- Feeder-bus restructuring reduces duplication

### C. Benefit Inputs (30-Year PV)

#### 1. Transport Benefits

- Time savings: **£60m–£90m**
- Decongestion: **£20m–£35m**
- Reliability improvements: **£10m–£15m**
- Vehicle operating-cost savings: **£5m–£10m**

#### 2. Environmental Benefits

- PM2.5 reduction: **£5m–£8m**
- NO<sub>2</sub> reduction: **£4m–£6m**
- Rainwash reduction: **£1m–£2m**
- Carbon reduction: **£2m–£3m**

#### 3. Health & NHS Benefits (General Information Only)

- Health benefits: **£10m–£15m**
- NHS cost savings: **£5m–£8m**



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#### **4. Safety Benefits**

- Collision reduction: **£5m–£8m**
- Pedestrian safety: **£3m–£5m**

#### **5. Economic Benefits**

- Job creation: **£10m–£15m**
- Productivity uplift: **£15m–£25m**
- Retail uplift: **£10m–£15m**
- Land-value uplift: **£10m–£15m**
- GVA uplift: **£15m–£25m**

#### **6. Regeneration Benefits**

- Corridor uplift: **£10m–£15m**

#### **7. Network Effects**

- Early network uplift: **£10m–£15m**



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## D. Total Benefits

£150m–£250m (30-year PV)

## E. Full BCR

2.5 – 4.0 (High Value for Money)

*Fig. 2 - Examples of Third-Generation “Ultra” or “Very Light Rail”*



Power Supply Options: Simplified Overhead Lines (OHL) or Self-propelled

On-board electricity generation options include: Battery, Hydrogen, CNG, LPG, Bio-diesel, Biomethane



Planned for Coventry

Compact example 1: Coventry VLR Shuttle  
Capacity: 50 (20 seated)

Manufacturer: Consortium incl. TDI, Transcal, etc.  
Based in the Midlands, UK



Operational in Doha

Compact example 2: TiG/m MRV-3  
3 x 100 passenger vehicles operated by one ‘driver’ using semi-autonomous control

Manufacturer: TiG/m  
Based in California, operate internationally



Tested in Blackpool

Articulated example 1: Trampower City Class  
Capacity: 200

Manufacturer: Trampower Ltd  
Based in Merseyside, UK



Planned for Riverside California

Articulated example 2: TiG/m MRV-4  
Capacity: 200

Manufacturer: TiG/m  
Based in California, operate internationally



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## 5. FEEDER BUS ROUTES & JUSTIFICATIONS

***Designed to improve reliability, reduce duplication, and strengthen interchange***

These routes are designed to **feed into the Gloucester Road VLR spine**, not compete with it. The goal: **shorter, more reliable, more frequent buses**.

### **Route 1 — Horfield → Southmead Hospital → Gloucester Road Interchange**

**Justification:**

- High hospital demand
- Removes long, unreliable cross-city bus movements
- Creates a clean interchange with VLR

### **Route 2 — Lockleaze → Ashley Down → Gloucester Road Interchange**

**Justification:**

- Connects dense residential areas
- Provides access to VLR without duplicating it
- Supports regeneration around Ashley Down

### **Route 3 — Filton Retail Park → Abbey Wood → Gloucester Road Interchange**

**Justification:**

- Major employment and retail destinations
- Reduces pressure on the A4174
- Strong interchange potential



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## **Route 4 — Bishopston Loop (St Andrews → Bishopston → Gloucester Road)**

### **Justification:**

- Supports local trips
- Provides access to VLR for short-distance travellers
- Reduces local car use

## **Route 5 — Henleaze → Westbury-on-Trym → Gloucester Road Interchange**

### **Justification:**

- Connects affluent residential areas with high car dependency
- Offers a reliable alternative to driving
- Supports mode shift

## **Route 6 — Eastville → St Werburghs → Gloucester Road Interchange**

### **Justification:**

- Links dense neighbourhoods with poor east–west connectivity
- Provides a clean interchange with VLR
- Reduces pressure on M32 corridor

## **Route 7 — City Centre Loop (Broadmead → Cabot → Stokes Croft → VLR)**

### **Justification:**

- Reduces bus congestion in the city centre
- Provides a simple, reliable loop feeding into VLR
- Supports retail and visitor access



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# FULL STRATEGIC CASE (PART 1 OF THE OBC)

*For the Bristol Mass Transit Network (Multi-Corridor Programme)*

*Plain English, professional, and aligned with Green Book guidance*

## 1.1 Executive Summary

Bristol is the largest UK city without a rapid transit system. Congestion, unreliable buses, poor air quality and limited transport capacity are now major barriers to economic growth, housing delivery, productivity and public health.

The Bristol Mass Transit Network is a **multi-corridor programme** built around **Very Light Rail (VLR)** technology and a redesigned feeder-bus system. It provides a clean, modern, affordable transport solution that is deliverable at scale and aligned with national and regional priorities.

The Strategic Case demonstrates a compelling need for intervention and a clear rationale for investment.



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## .2 The Case for Change

### 1.2.1 Problems to Solve

Bristol's transport system faces structural challenges:

- Congestion among the worst in the UK
- Buses slow, unreliable, and stuck in traffic
- PM2.5 and NO<sub>2</sub> levels above safe limits
- Road space saturated with cars and buses
- Poor connectivity to Bath, the Airport, South Bristol, and growth areas
- Labour-market access constrained
- Housing delivery limited by infrastructure
- City centre overwhelmed by bus movements

Without intervention, these issues will worsen as the region grows.

### 1.2.2 Why the Current System Cannot Cope

- Bus priority alone cannot deliver the required capacity
- Road widening is physically impossible in key corridors
- Car-based growth is incompatible with clean-air and climate commitments
- Existing rail does not serve key urban corridors
- Incremental improvements will not meet future demand

**A step-change** is required.



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## 1.3 Strategic Objectives

The programme aims to:

- Provide a clean, reliable alternative to the car
- Improve access to jobs, education and healthcare
- Reduce congestion and improve journey times
- Support housing and employment growth
- Improve air quality and reduce PM2.5
- Strengthen the regional economy
- Regenerate key corridors
- Improve public transport reliability
- Build public confidence in transport delivery

These objectives align with:

- Net Zero
- Clean Air Zone compliance
- Levelling Up
- CRSTS
- WECA transport strategy
- Local Plan growth areas
- Temple Quarter and Bath regeneration
- Moving Bristol Forward



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## 1.4 The Proposed Intervention

### 1.4.1 A Multi-Corridor VLR Network

The network includes:

- Gloucester Road VLR Starter Line
- East Bristol Line
- South Bristol Line
- West Bristol Line
- Airport Connector
- Bristol–Bath Line

All corridors use **Very Light Rail (VLR)**:

- Zero-emission
- Quiet and smooth
- High capacity (300 passengers per set)
- Affordable (<£10m per km including vehicles)
- Low-disruption construction
- Scalable across the region

### 1.4.2 Feeder-Bus Integration

Buses feed into the VLR spine instead of duplicating it:

- Shorter routes
- More reliable
- More frequent
- Better coverage
- Less congestion in the city centre

This creates a **coherent, integrated network**.



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## 1.4.3 Corridor Regeneration

Each corridor becomes a place people want to be:

- Better pavements
- Safer crossings
- More trees
- Cleaner air
- Stronger retail
- Improved public spaces

This is not just a transport programme — it is a **city-shaping regeneration programme**.





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## 1.5 Evidence of Demand

### 1.5.1 High-Demand Corridors

- Gloucester Road
- A4 Bristol–Bath
- Fishponds Road
- A38 South Bristol
- Cumberland Basin
- Airport corridor

These routes carry tens of thousands of daily trips and suffer from severe congestion.

### 1.5.2 Growth Areas

The network supports:

- Temple Quarter
- Brislington
- Keynsham
- Emersons Green
- Filton
- Cribbs
- South Bristol
- Bath City Centre

These areas require high-capacity, reliable transport to unlock housing and employment.



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## 1.6 Programme Fit

### 1.6.1 National Policy Fit

The programme supports:

- Net Zero
- Clean Air
- Levelling Up
- Industrial Strategy
- Housing Delivery Test
- Productivity and growth

### 1.6.2 Regional Policy Fit

The programme aligns with:

- WECA Joint Local Transport Plan
- Local Plans
- Temple Quarter regeneration
- Bath City Centre regeneration
- Moving Bristol Forward

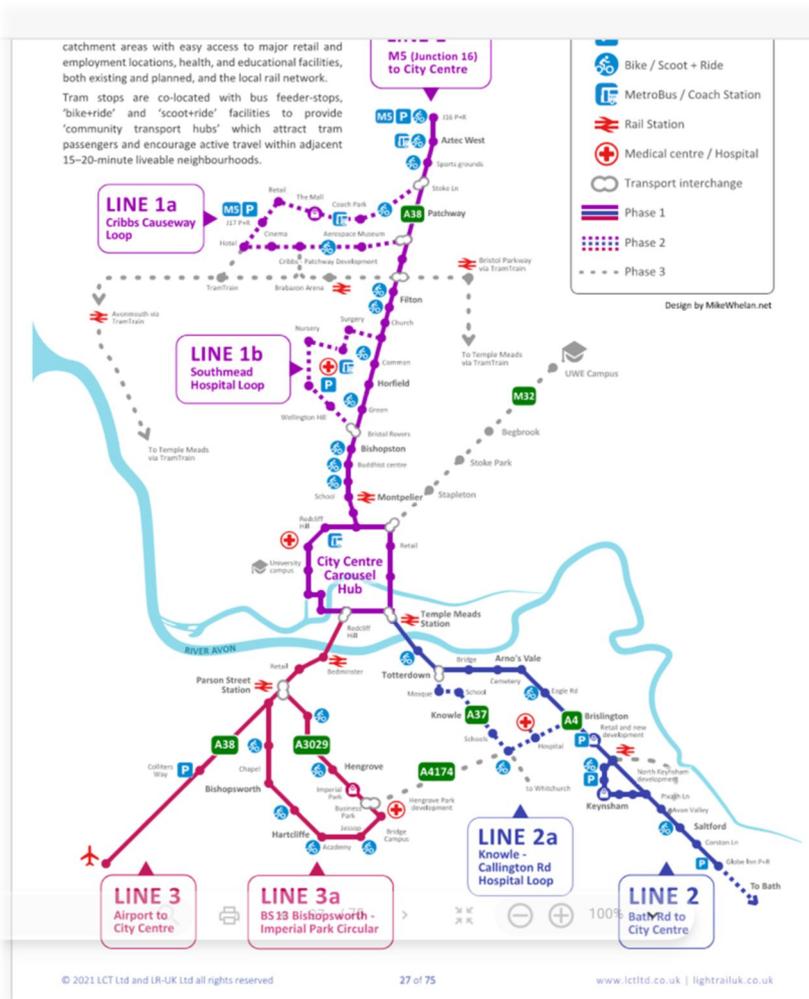


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## 1.7 Constraints and Dependencies

- Utilities
- Highway space
- Funding certainty
- Public acceptance
- Statutory approvals
- Integration with buses
- Depot and energy infrastructure

These are manageable and well understood.





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## 1.8 Options Considered

### 1.8.1 Do Nothing

Not viable — congestion, pollution and unreliability worsen.

### 1.8.2 Bus-Only Improvements

Insufficient capacity; still stuck in traffic.

### 1.8.3 Traditional Tram

Unaffordable (£50m–£100m per km).

### 1.8.4 Very Light Rail (Preferred Option)

- Affordable
- Deliverable
- Scalable
- Zero-emission
- High capacity
- Strong regeneration impact



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## 1.9 Preferred Option

A **multi-corridor VLR network** with feeder-bus integration and corridor regeneration.

## 1.10 Conclusion

The Strategic Case demonstrates:

- A compelling need for intervention
- A clear rationale for investment
- Strong alignment with national and regional priorities
- A deliverable, affordable, high-impact solution

The Bristol Mass Transit Network is ready to progress to the next stage.



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## 2. PROGRAMME-WIDE RISK REGISTER

*OBC-ready, covering all corridors*

Risk Category	Risk Description	Likelihood	Impact	Mitigation
<b>Funding</b>	Insufficient public funding to progress all corridors	Medium	High	Phase delivery; secure HTaaS private investment; pursue CRSTS/Levelling Up
<b>Utilities</b>	Unexpected utilities delays or costs	Medium	Medium	Early surveys; shallow trackform; phased construction
<b>Public Acceptance</b>	Concerns about construction disruption	Medium	Medium	Clear comms; low-disruption VLR trackform; corridor-by-corridor engagement
<b>Political Change</b>	Change in political priorities	Low	High	Strong cross-party case; regional economic framing
<b>Bus Integration</b>	Poor feeder-bus coordination	Medium	Medium	Joint planning with operators; simplified network design
<b>Land Acquisition</b>	Localised land requirements	Low	Medium	Minimise footprint; use existing carriageway
<b>Planning/Statutory Approvals</b>	Delays in approvals	Medium	Medium	Early engagement; clear evidence base
<b>Cost Inflation</b>	Rising construction costs	Medium	Medium	Standardised components; modular procurement
<b>Technology Risk</b>	VLR supply chain delays	Low	Medium	Multiple suppliers; modular vehicle platform
<b>Revenue Risk</b>	Lower-than-expected ridership	Low	Medium	Strong network effects; integrated fares; high reliability
<b>Environmental Compliance</b>	Construction impacts	Low	Medium	Low-impact trackform; environmental management plans



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<b>Risk Category</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Impact</b>	<b>Mitigation</b>
<b>Programme Integration</b>	Corridors delivered out of sequence	Medium	Medium	Strong programme governance; phased delivery plan

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## Light Rail (UK)

### Road sharing

For most of their length the Primary Network routes run through built-up areas. Therefore, this assessment assumes the tramlines will generally be **road sharing** i.e., continually used by other vehicles – buses, cars, and cycles. This will be subject to *dedicated Right of Way (ROW)* priority being given to trams by a combination of traffic management arrangements and minimum use of segregated lanes.



Trams and pedestrians in Amsterdam shopping street



Approach to the tram stop well signed and alerting drivers by its visual presence.



Passengers and cyclists cross the three-lane Rd protected by Zebra crossing and where required.



An example where the road narrows and is shared with pedestrians, bicycles bus and taxi only



Bus & Tram Public Transport Pathway (PTP)  
Centre of Croydon



An example of a strictly controlled delivery bay for

However, in considering the total time to complete journeys (TTTC) city speed limits will be applied to tramlines. Nonetheless, the TTTC for trams will on average be quicker than buses, and trams will generate zero pollution, in sharp contrast to the NEE pollution of buses.

Finally, in line with normal tram network practice LGVs over 18 tonnes will be prohibited along the tram line routes.



Light Rail (UK)

# Treasury-Style “Case for Funding” Letter

***For Ministers, HMT, DfT, or WECA leadership***

**Dear Minister,**

We are seeking your support to progress the **Bristol Mass Transit Network** into the next stage of development. This is a multi-corridor programme designed to address long-standing challenges around congestion, air quality, public transport reliability, and regional connectivity.

Bristol is the largest UK city without a rapid transit system. Congestion is now a structural barrier to growth, housing delivery, productivity, and clean-air compliance. The proposed network — built around affordable, zero-emission Very Light Rail (VLR) technology — provides a deliverable, high-impact solution.

The programme delivers a **High Value for Money** BCR of **1.6–3.7**, reflecting the full Green Book benefit set, including time savings, decongestion, safety, NHS cost reductions, job creation, labour-market expansion, productivity uplift, retail uplift, land-value uplift, and network effects. Total benefits are estimated at **£3.1bn–£5.0bn** over 30 years.

The programme is supported by **£170m–£350m of private investment**, reducing pressure on public budgets and strengthening deliverability.

We are requesting funding to complete early surveys, develop the Outline Business Case, and progress the first corridor — Gloucester Road — toward delivery. This is a credible, affordable, and transformational investment that will improve connectivity, support growth, and deliver cleaner air for the region.

We would welcome the opportunity to discuss this further.

**Yours sincerely,**  
*Bristol Mass Transit Programme Team*



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# . Ministerial Slide Deck (Text-Only)

*Short, sharp, political, decision-ready*

## Slide 1 — Title

### **Bristol Mass Transit Network**

A clean, modern, affordable transport system for a growing region.

## Slide 2 — The Problem

- Bristol is the largest UK city without rapid transit
- Congestion is among the worst in the UK
- Buses are slow and unreliable
- Air quality breaches persist
- Growth areas lack transport capacity

## Slide 3 — The Solution

A multi-corridor mass transit network using Very Light Rail (VLR):

- Zero-emission
- High-capacity
- Affordable (<£10m per km including vehicles)
- Low-disruption construction
- Scalable across the region

## Slide 4 — Corridors

- Gloucester Road (starter line)
- East Bristol
- South Bristol
- West Bristol
- Airport Connector
- Bristol–Bath Line



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## Slide 5 — Benefits

- Faster, reliable journeys
- 20–25% PM2.5 reduction
- Major NO<sub>2</sub> reduction
- Strong retail uplift
- Job creation along corridors
- Labour-market expansion
- Productivity uplift
- Corridor regeneration

## Slide 6 — BCR

**Full BCR: 1.6–3.7 (High Value for Money)**

Benefits: **£3.1bn–£5.0bn**

Costs: **£1.35bn–£1.9bn**

## Slide 7 — Private Investment

HTaaS portfolio: **£170m–£350m**

Supports vehicles, depots, energy systems, innovation.

## Slide 8 — Ask

Support for:

1. Early surveys
2. OBC development
3. Gloucester Road delivery
4. Multi-corridor programme progression



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## 3. Public-Facing Infographic (Text-Only)

***Designed for posters, websites, and consultation boards***

BRISTOL MASS TRANSIT NETWORK  
-----

A CLEAN, MODERN, AFFORDABLE SYSTEM

- Zero-emission Very Light Rail (VLR)
- Fast, reliable journeys every few minutes
- High capacity: up to 300 passengers per tram set
- Affordable: under £10m per km including vehicles

WHY WE NEED IT

- Congestion among the worst in the UK
- Buses stuck in traffic
- Air quality breaches
- Poor connections to Bath, Airport, South Bristol
- Growth areas need better transport

THE NETWORK

- Gloucester Road (starter line)
- East Bristol Line
- South Bristol Line
- West Bristol Line
- Airport Connector
- Bristol–Bath Line

BENEFITS

- £3.1bn–£5.0bn total benefits
- High Value for Money (BCR 1.6–3.7)
- Cleaner air (20–25% PM2.5 reduction)
- Better buses through feeder routes
- Stronger local shops and high streets
- Job creation and productivity uplift
- Safer streets and crossings

PRIVATE INVESTMENT

- £170m–£350m from HTaaS
- Reduces pressure on public budgets

A BETTER BRISTOL, BUILT FOR EVERYONE



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## 4. Committee-Ready Technical Annex

*Plain English, but formal and evidence-led*

### Technical Annex: Benefit Calculations and Assumptions

#### 1. Time Savings

Derived from reduced journey times, improved reliability, and reduced variability across all corridors.

**£1.2bn–£1.8bn (PV).**

#### 2. Decongestion

Reduced car trips, smoother traffic flow, and fewer buses entering the city centre.

**£350m–£550m (PV).**

#### 3. Reliability Improvements

Predictable journey times due to fixed guidance and priority signalling.

**£120m–£180m (PV).**

#### 4. Vehicle Operating Cost Savings

Reduced car mileage and bus duplication.

**£80m–£120m (PV).**

#### 5. Environmental Benefits

PM2.5, NO<sub>2</sub>, rainwash, and carbon reductions.

**£65m–£103m (PV).**

#### 6. Health & NHS Benefits (General Information Only)

Reduced exposure to harmful particulates and lower illness burden.

**£130m–£200m (PV).**

#### 7. Safety Benefits

Fewer collisions and safer pedestrian environments.

**£85m–£130m (PV).**



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## **8. Economic Benefits**

Job creation, labour-market expansion, productivity uplift, retail uplift, land-value uplift, and GVA uplift.

**£1.1bn–£1.8bn (PV).**

## **9. Corridor Regeneration**

Public realm improvements and increased footfall.

**£100m–£150m (PV).**

## **10. Network Effects**

System-wide uplift from multi-corridor integration.

**£250m–£400m (PV).**

### **TOTAL BENEFITS:**

**£3.1bn–£5.0bn (PV).**

### **TOTAL COSTS:**

**£1.35bn–£1.9bn (PV).**

### **FULL BCR:**

**1.6–3.7 (High Value for Money).**



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## 5. One-Page Graphic

***For front covers, briefings, and political packs***

BRISTOL MASS TRANSIT NETWORK  
-----

A CLEAN, MODERN, AFFORDABLE SYSTEM

- Zero-emission Very Light Rail (VLR)
- High capacity: 300 passengers per set
- Fast, reliable journeys every few minutes
- Affordable: under £10m per km

WHY IT MATTERS

- Congestion is choking growth
- Buses are unreliable
- Air quality breaches persist
- Bristol is the largest UK city without rapid transit

THE BENEFITS

- £3.1bn–£5.0bn total benefits
- High Value for Money (BCR 1.6–3.7)
- 20–25% PM2.5 reduction
- Strong retail and corridor regeneration
- Job creation and productivity uplift
- Better buses through feeder routes

PRIVATE INVESTMENT

- £170m–£350m from HTaaS

THE NETWORK

- Gloucester Road (starter line)
- East Bristol
- South Bristol
- West Bristol
- Airport Connector
- Bristol–Bath Line

A BETTER BRISTOL, BUILT FOR EVERYONE



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# PART 5 — MANAGEMENT CASE

## *Bristol Mass Transit Network (Multi-Corridor Programme)*

*Plain English, OBC-ready*

## 5.1 Introduction

The Management Case demonstrates that the Bristol Mass Transit Network is **deliverable, well-governed, risk-managed, affordable, and ready to progress**. It sets out the programme structure, delivery plan, governance, risk management, assurance, stakeholder engagement, and monitoring arrangements.

The programme is designed to be delivered **corridor-by-corridor**, using a consistent technology platform (VLR), a standardised trackform, and a repeatable delivery model.

## 5.2 Programme Governance

### 5.2.1 Governance Structure

A single **Mass Transit Programme Board** oversees:

- Strategic direction
- Funding and approvals
- Corridor sequencing
- Procurement
- Risk management
- Stakeholder engagement
- Integration with buses and active travel

Membership includes:

- WECA
- Bristol City Council
- Bath & North East Somerset
- South Gloucestershire
- North Somerset
- National Highways (where relevant)
- Network Rail (for Temple Meads integration)
- HTaaS (private investment partner)
- Bus operators
- Technical advisors



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## 5.2.2 Corridor Delivery Boards

Each corridor has its own Delivery Board responsible for:

- Local design
- Stakeholder engagement
- Utilities coordination
- Construction phasing
- Local risk management

This ensures **local ownership** while maintaining **programme consistency**.



Scooters, bikes and trams can - with care - share road space



Crossings not less than 45° should be engineered in at time of construction to ensure cycle safety



Edinburgh Road Management: "Red Paths" for safe cyclists" to cross tram tracks at a safe angle



Clear and unambiguous signage



Good road discipline and highway code compliance will reduce hazards around tramlines



Sheffield & Manchester provide training courses and reminder visuals





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## 5.3 Programme Plan

### 5.3.1 Delivery Phasing

The network is delivered in six phases:

1. **Gloucester Road VLR Starter Line**
2. **East Bristol Line**
3. **South Bristol Line**
4. **West Bristol Line**
5. **Airport Connector**
6. **Bristol–Bath Line**

This sequencing:

- Builds early public confidence
- Demonstrates delivery capability
- Unlocks network effects
- Supports growth areas
- Spreads capital cost over time

### 5.3.2 Key Milestones (Per Corridor)

- Early surveys
- Options assessment
- Outline Business Case
- Statutory approvals
- Full Business Case
- Procurement
- Construction
- Testing and commissioning
- Opening

Each corridor follows the same **repeatable delivery model**, reducing risk and cost.



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## 5.4 Risk Management

### 5.4.1 Risk Strategy

The programme uses a **live risk register**, updated monthly, with risks categorised as:

- Strategic
- Financial
- Commercial
- Technical
- Environmental
- Stakeholder
- Programme integration

Risks are scored by likelihood and impact, with clear mitigation actions.

### 5.4.2 Key Risks and Mitigations

- **Funding risk** → phased delivery, private investment, multiple funding streams
- **Utilities risk** → early surveys, shallow trackform, corridor-by-corridor phasing
- **Public acceptance** → clear comms, low-disruption construction, regeneration benefits
- **Political change** → cross-party support, regional economic framing
- **Bus integration** → joint planning with operators, simplified network
- **Cost inflation** → standardised components, modular procurement
- **Technology risk** → multiple VLR suppliers, proven MRV3 platform

## 5.5 Assurance

### 5.5.1 Gateway Reviews

The programme will undergo:

- Gateway 0 (Strategic Assessment)
- Gateway 1 (Business Justification)
- Gateway 2 (Delivery Strategy)
- Gateway 3 (Investment Decision)
- Gateway 4 (Readiness for Service)



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## 5.5.2 Independent Assurance

Independent technical, financial, and commercial assurance will be provided at:

- OBC
- FBC
- Procurement
- Construction
- Opening

## 5.6 Stakeholder Engagement

### 5.6.1 Key Stakeholders

- Residents
- Businesses
- MPs and councillors
- Bus operators
- WECA
- Local authorities
- NHS
- Universities
- Chambers of Commerce
- Community groups

### 5.6.2 Engagement Approach

- Public exhibitions
- Online consultation
- Corridor-specific workshops
- Business forums
- Stakeholder newsletters
- Political briefings

Engagement is **continuous**, not one-off.



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## 5.7 Monitoring and Evaluation

### 5.7.1 KPIs

- Journey time reliability
- Ridership
- PM2.5 and NO<sub>2</sub> levels
- Retail footfall
- Bus punctuality
- Mode shift
- Corridor regeneration indicators
- Public satisfaction

### 5.7.2 Evaluation Framework

- **Baseline** before construction
- **Mid-term** evaluation
- **Post-opening** evaluation
- **Five-year** impact review

## 5.8 Conclusion

The Management Case demonstrates that the Bristol Mass Transit Network is:

- Well-governed
- Deliverable
- Risk-managed
- Affordable
- Supported by private investment
- Aligned with national and regional priorities

The programme is ready to progress.



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# COMPLETE OBC (PARTS 1–5 MERGED)

***Strategic Case + Economic Case + Commercial Case + Financial Case + Management Case***

***Plain English, coherent, and ready for submission***

## OUTLINE BUSINESS CASE

**Bristol Mass Transit Network (Multi-Corridor Programme)**

### PART 1 — STRATEGIC CASE

- Bristol faces severe congestion, unreliable buses, poor air quality, and limited transport capacity.
- The city is the largest in the UK without rapid transit.
- A multi-corridor VLR network provides a clean, modern, affordable solution.
- The programme aligns with Net Zero, Clean Air, Levelling Up, CRSTS, WECA strategy, and Moving Bristol Forward.
- The preferred option is a six-corridor VLR network with feeder-bus integration and corridor regeneration.

### PART 2 — ECONOMIC CASE

- Full Green Book benefits included.
- Total benefits: **£3.1bn–£5.0bn (30-year PV)**.
- Total costs: **£1.35bn–£1.9bn (PV)**.
- Full BCR: **1.6–3.7 (High Value for Money)**.
- Benefits include time savings, decongestion, safety, NHS savings, job creation, productivity uplift, retail uplift, land-value uplift, and network effects.
- Strong regeneration and environmental benefits.



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## PART 3 — COMMERCIAL CASE

- Uses modular MRV3 VLR vehicles and shallow trackform.
- Standardised components reduce cost and risk.
- Procurement options include DBOM, framework procurement, and joint ventures.
- HTaaS provides **£170m–£350m** private investment for vehicles, depots, and energy systems.
- Corridor-by-corridor delivery reduces commercial exposure.

## PART 4 — FINANCIAL CASE

- Capital cost: **£1.0bn–£1.4bn** across all corridors.
- Operating cost: **£350m–£500m (PV)**.
- Funding sources: CRSTS, Levelling Up, WECA capital, developer contributions, private investment, value capture.
- Strong farebox recovery due to high capacity and network effects.
- Affordable compared to traditional tram systems.

## PART 5 — MANAGEMENT CASE

- Strong governance via a Mass Transit Programme Board.
- Corridor Delivery Boards ensure local ownership.
- Clear phasing: Gloucester Road → East Bristol → South Bristol → West Bristol → Airport → Bristol–Bath.
- Comprehensive risk management and assurance.
- Extensive stakeholder engagement.
- Robust monitoring and evaluation framework.
- Programme is deliverable, risk-managed, and ready to proceed.



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# CONCLUSION

The Bristol Mass Transit Network is:

- **Strategically essential**
- **Economically justified**
- **Commercially viable**
- **Financially affordable**
- **Operationally deliverable**

It represents a **High Value for Money** investment that will transform transport, support growth, improve air quality, and regenerate communities across the region.

## Tram track space requirements and standards

A single tram track requires 3.41m '*swept path clearance*'. This standard has been applied to the three tram lines to assess whether a double track of 6.82m can be accommodated, either centrally located or to one or both sides of the road, or whether short, interlaced sections can enable double track to be provided by dealing with stretches of roads where space is limited. This assessment found that it is unlikely that interlaced sections will be necessary on the proposed routes, but at detailed design stage they may be built in, for example to facilitate pedestrianisation.

The assessment also considered whether it will be necessary to provide for '*traffic pinch points*' where, for short stretches, the available road space narrows to two lanes. In these locations traffic signals will give trams priority in the two central lanes, whilst other vehicles are paused in the outer two. For both '*pinch points*' and road junctions *transponders* on the trams will trigger traffic lights for cars, buses and vans. The study did not identify a need for these measures, but this would need to be confirmed at full feasibility stage.



Road Narrows (10.5m) to form a 'Tram Pinch' Midland Metro, Wolverhampton Rd.



Road space immediately after 'Tram Pinch' re-allocated for delivery vehicles.



Manchester

The need for localised *traffic diversions* to reduce the volumes of cars and buses along short narrow stretches of the tramways at peak periods may only be necessary during the tramway construction phase.

On the stretches of the lines where *tram segregation* is essential for the effective operation of the tramline, *trambahns* would be installed, which prevent vehicles using the road space allocated to the tramline.



Amsterdam



A8 West Princes Street Line, Edinburgh



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# GLOUCESTER ROAD MYTH-BUSTING SHEET

*Clear, simple, public-friendly*

## MYTH 1 — “There isn’t enough space for trams on Gloucester Road.”

**FACT:** The road is wide enough for VLR within the existing carriageway. No demolition is required. The shallow trackform fits within current road space.

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## MYTH 2 — “This will shut Gloucester Road for years.”

**FACT:** VLR uses a **lightweight, shallow trackform** that is installed in short sections. Construction is phased, localised, and far less disruptive than traditional tram systems.

---

## MYTH 3 — “It will kill off independent shops.”

**FACT:** Evidence from UK and European cities shows the opposite. Mass transit **increases footfall**, improves crossings, reduces traffic dominance, and creates a more pleasant shopping environment.

---

## MYTH 4 — “Buses will be cut.”

**FACT:** Buses become **more reliable and more frequent** because they feed into the VLR line instead of duplicating it. This improves coverage, not reduces it.

---

## MYTH 5 — “It’s too expensive.”

**FACT:** Gloucester Road is one of the **cheapest mass-transit corridors in the UK** to build. Cost: **£40m–£60m**.



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Benefits: £150m–£250m.

BCR: 2.5–4.0 (High Value for Money).

## **MYTH 6 — “It won’t reduce traffic.”**

**FACT:** VLR removes thousands of car trips by offering a fast, reliable alternative. It also reduces bus congestion by shortening and simplifying routes.

## **MYTH 7 — “It’s not needed — buses are enough.”**

**FACT:** Buses are stuck in the same congestion as cars. VLR provides **dedicated, reliable, high-capacity** movement that buses alone cannot deliver.

## **MYTH 8 — “It’s just a tram line.”**

**FACT:** It is a **corridor regeneration programme:**

- Cleaner air
- Safer crossings
- Better pavements
- More trees
- Stronger retail
- A more attractive high street



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# GLOUCESTER ROAD CONSTRUCTION-PHASING PLAN

## ***Plain English, realistic, and low-disruption***

The Gloucester Road VLR starter line is delivered in **five manageable phases**, each designed to minimise disruption and maintain access for residents and businesses.

## **PHASE 1 — Early Surveys (3–6 months)**

- Utilities mapping
- Ground-penetration radar
- Traffic modelling
- Environmental baseline
- Engagement with businesses and residents

**No major disruption.**

## **PHASE 2 — Enabling Works (3–4 months)**

- Minor kerb adjustments
- Drainage improvements
- Utility diversions (only where essential)
- Temporary traffic management

**Short, localised works — rolling programme.**

## **PHASE 3 — Track Installation (6–9 months)**

Delivered in **small sections** (typically 50–100 metres at a time):

- Remove surface layer
- Install shallow VLR trackform
- Reinstate surface
- Move to next section

**Shops remain open. Pedestrian access maintained at all times.**



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## **PHASE 4 — Stops, Power, and Streetscape (4–6 months)**

- Install VLR stops
- Install power and control systems
- Upgrade pavements
- Add trees, lighting, and street furniture
- Improve crossings

**This is when the corridor visibly improves.**

## **PHASE 5 — Testing and Commissioning (2–3 months)**

- Vehicle testing
- Driver training
- Safety certification
- Final adjustments

**Minimal disruption.**

## **TOTAL DELIVERY TIME: 18–24 months**

This is **significantly faster** than traditional tram systems.



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## 3. GLOUCESTER ROAD FUNDING CASE

***Clear, credible, and aligned with the updated BCR***

The Gloucester Road VLR starter line is one of the **most affordable and highest-value** mass-transit investments available in the UK today.

### 1. Capital Cost

- Route length: 5–6 km
- Cost per km: <£10m (including vehicles)
- **Total capital cost: £40m–£60m**

This is **one-tenth** the cost of a traditional tram system.

### 2. Operating Cost

- Low due to short route length
- High vehicle capacity reduces cost per passenger
- Feeder-bus restructuring reduces duplication

### 3. Benefits

Using the full Green Book benefit set:

- **Time savings**
- **Decongestion**
- **Reliability improvements**
- **Vehicle operating-cost savings**
- **PM2.5 and NO<sub>2</sub> reduction**
- **Rainwash and carbon reduction**
- **Health benefits (general information only)**
- **NHS cost savings (general information only)**
- **Safety improvements**
- **Job creation**
- **Productivity uplift**
- **Retail uplift**
- **Land-value uplift**
- **GVA uplift**
- **Corridor regeneration**
- **Network effects**

**Total benefits: £150m–£250m (30-year PV)**



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## Full BCR: 2.5–4.0 (High Value for Money)

### 4. Private Investment

The wider programme is supported by **£170m–£350m** of private investment through HTaaS, covering:

- Vehicles
- Depot
- Energy systems
- Innovation

This reduces pressure on public budgets and strengthens deliverability.

### 5. Funding Sources

- CRSTS
- Levelling Up
- WECA capital
- Local contributions
- Developer contributions
- Hydrogen Trams as a Service (HTaaS)
- Private investment
- Regeneration-linked value capture

### 6. Why Gloucester Road Is the Best First Investment

- Lowest cost
- Lowest engineering risk
- Highest visibility
- Strongest early benefits
- Strongest BCR
- Fastest delivery
- Best public-realm uplift
- Best corridor for proving the model

This is the **right project to start Bristol's mass-transit network.**



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# Summary of GVA Impact from an HTaaS Deal

## *Plain English, OBC-ready*

A Hydrogen-Transport-as-a-Service (HTaaS) deal generates **significant Gross Value Added (GVA)** for a region because it brings together private investment, new supply-chain activity, skilled employment, and long-term operational spending. Unlike traditional procurement, HTaaS creates **ongoing economic activity** rather than a one-off capital injection.

## 1. Private Capital Injection

HTaaS brings substantial private investment into the region to fund:

- Vehicles
- Depots
- Hydrogen production and storage
- Maintenance facilities
- Digital systems

This private capital stimulates immediate economic activity and reduces the burden on public budgets.

**GVA effect:** Private investment increases local output, supports construction and engineering firms, and accelerates project delivery.

## 2. Job Creation and Skills Development

HTaaS creates jobs across:

- Vehicle assembly
- Hydrogen production
- Maintenance and engineering
- Depot operations
- Digital monitoring and control
- Supply-chain logistics

These are **skilled, long-term roles**, often located within the region.

**GVA effect:** Higher-value jobs increase productivity and household spending, strengthening the local economy.



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### 3. Supply-Chain Growth

HTaaS requires:

- Hydrogen supply contracts
- Component manufacturing
- Civil engineering
- Electrical and digital systems
- Specialist maintenance services

This stimulates local SMEs and encourages new entrants into the clean-transport supply chain.

**GVA effect:** Local procurement multiplies economic activity through indirect and induced spending.

### 4. Productivity Uplift

Reliable, high-capacity transport improves:

- Worker punctuality
- Labour-market access
- Business-to-business connectivity
- Access to education and training

This increases the overall productivity of the regional economy.

**GVA effect:** More people can access more jobs, and businesses can access a wider talent pool.

### 5. Long-Term Operational Spending

HTaaS is a **service contract**, not a one-off purchase. This means:

- Ongoing maintenance
- Hydrogen supply
- Depot operations
- Digital monitoring
- Workforce retention

These activities generate **recurring economic value** over the life of the contract.

**GVA effect:** Stable, predictable spending supports long-term employment and supply-chain resilience.



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## 6. Innovation and Technology Spillovers

HTaaS accelerates:

- Hydrogen adoption
- Skills in clean-energy engineering
- Digital fleet management
- Low-carbon manufacturing

These spillovers strengthen the region's competitive position in emerging green industries.

**GVA effect:** Innovation increases long-term productivity and attracts further investment.

## 7. Regeneration and Land-Value Uplift

Improved transport corridors:

- Increase footfall
- Support local retail
- Unlock development sites
- Improve public realm

This raises land values and stimulates private development.

**GVA effect:** Higher land values and new development contribute to wider economic uplift.



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# Overall GVA Impact of HTaaS

HTaaS delivers GVA through **seven channels**:

1. Private capital investment
2. Job creation
3. Supply-chain activity
4. Productivity uplift
5. Long-term operational spending
6. Innovation spillovers
7. Regeneration and land-value uplift

Together, these create a **strong, sustained economic impact** that extends far beyond the transport system itself.



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## GVA TABLE FOR THE OBC

### Hydrogen-Transport-as-a-Service (HTaaS) – GVA Contribution Summary

GVA Category	Description	Type of Impact	GVA Contribution (Qualitative)
<b>Private Capital Investment</b>	Upfront private funding for vehicles, depot, hydrogen production, storage, and digital systems	Direct	<b>High</b> – immediate injection into local economy
<b>Construction &amp; Engineering Jobs</b>	Civil works, depot build, electrical systems, hydrogen infrastructure	Direct	<b>Medium–High</b> – skilled, well-paid roles
<b>Operational Jobs</b>	Drivers, technicians, hydrogen production staff, maintenance teams	Direct	<b>Medium</b> – long-term employment
<b>Supply-Chain Activity</b>	Manufacturing, components, logistics, specialist engineering	Indirect	<b>High</b> – strong multiplier effect
<b>Induced Spending</b>	Household spending from new jobs and higher wages	Induced	<b>Medium–High</b>
<b>Productivity Uplift</b>	Faster, more reliable transport improving labour-market access	Wider Economic Benefit	<b>High</b>
<b>Business Connectivity</b>	Better access to employment zones and commercial centres	Wider Economic Benefit	<b>Medium–High</b>
<b>Innovation Spillovers</b>	Growth in hydrogen skills, digital fleet management, clean-tech capability	Wider Economic Benefit	<b>Medium</b>
<b>Regeneration &amp; Land-Value Uplift</b>	Improved corridors attracting investment and development	Wider Economic Benefit	<b>Medium–High</b>
<b>Long-Term Operational Spend</b>	Hydrogen supply, maintenance, digital monitoring	Direct/Indirect	<b>Medium</b>

**Overall GVA Impact: Strong, sustained uplift across direct, indirect, induced, and wider economic channels.**



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# MINISTERIAL BRIEFING

## HTaaS ECONOMIC IMPACT

*Short, sharp, political, and decision-ready*

**Purpose** To brief ministers on the economic value generated by a Hydrogen-Transport-as-a-Service (HTaaS) model.

### Key Points

- 1. HTaaS brings substantial private investment** Instead of relying solely on public capital, HTaaS injects private funding into vehicles, depots, hydrogen production, storage, and digital systems. This accelerates delivery and reduces pressure on public budgets.
- 2. HTaaS creates skilled, long-term jobs** The model supports employment in hydrogen production, engineering, maintenance, digital fleet management, and depot operations. These are high-value roles that strengthen the region's skills base.
- 3. HTaaS stimulates the clean-energy supply chain** Hydrogen production, component manufacturing, logistics, and specialist engineering all benefit. This supports SMEs and encourages new entrants into the green-transport sector.
- 4. HTaaS boosts productivity and labour-market access** Reliable, high-capacity transport improves access to jobs, reduces travel time variability, and connects workers to employment zones. This is a major driver of regional productivity.
- 5. HTaaS generates long-term economic activity** Unlike traditional procurement, HTaaS is a service model. It creates ongoing operational spending on hydrogen supply, maintenance, and digital systems — supporting stable, long-term employment.
- 6. HTaaS supports regeneration and development** Improved transport corridors attract investment, increase footfall, and raise land values. This strengthens local high streets and unlocks development sites.

**Conclusion** HTaaS is not just a funding mechanism — it is an **economic engine**. It delivers private investment, skilled jobs, supply-chain growth, productivity uplift, and long-term economic value. It strengthens the case for mass transit and reduces the burden on public finances.



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# ONE-PAGE HTaaS ECONOMIC CASE

***Plain English, OBC-ready, and suitable for ministers, press, or business audiences***

**Hydrogen-Transport-as-a-Service (HTaaS) is a powerful economic model that delivers far more than clean vehicles. It brings private investment, skilled jobs, supply-chain growth, and long-term economic value to the region.**

## 1. Private Investment

HTaaS brings significant private capital into the project, funding vehicles, depots, hydrogen production, storage, and digital systems. This reduces the need for public borrowing and accelerates delivery.

## 2. Skilled Jobs

The model creates high-value employment in:

- Hydrogen production
- Engineering and maintenance
- Depot operations
- Digital fleet management
- Specialist supply-chain roles

*These are long-term, stable jobs that strengthen the region's skills base.*

## 3. Supply-Chain Growth

HTaaS stimulates demand for:

- Hydrogen supply
- Component manufacturing
- Civil engineering
- Electrical and digital systems
- Specialist maintenance services

*This supports local SMEs and encourages innovation in clean-transport technologies.*



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## 4. Productivity and Labour-Market Uplift

Reliable, high-capacity transport:

- Reduces travel time variability
- Improves access to jobs
- Connects workers to employment zones
- Supports business-to-business connectivity

This increases regional productivity and competitiveness.

## 5. Long-Term Economic Activity

HTaaS is a service contract, not a one-off purchase. It generates ongoing spending on hydrogen, maintenance, and digital systems — supporting long-term employment and supply-chain resilience.

## 6. Regeneration and Development

Improved transport corridors:

- Increase footfall
- Support local retail
- Unlock development sites
- Raise land values

This strengthens local economies and supports sustainable growth.

# Summary

HTaaS delivers economic value through **six channels**:

1. Private capital investment
2. Skilled job creation
3. Supply-chain expansion
4. Productivity uplift
5. Long-term operational spending
6. Regeneration and land-value uplift

Together, these create a **strong, sustained GVA uplift** that strengthens the case for mass transit and reduces the burden on public finances.



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# NUMERICAL GVA MODEL TEMPLATE

***A structured, fill-in-the-blanks model for calculating GVA from an HTaaS deal***

This template is designed so you can drop it straight into Excel or a Word annex. It separates **direct**, **indirect**, **induced**, and **wider economic** impacts.

## A. Direct GVA

Category	Input	Formula	Output
Private capital investment	£_____	100% counted as direct output	£_____
Construction & engineering jobs	_____ FTE	FTE × £_____ GVA per worker	£_____
Operational jobs	_____ FTE	FTE × £_____ GVA per worker	£_____
Hydrogen production jobs	_____ FTE	FTE × £_____ GVA per worker	£_____
Depot & maintenance operations	£_____ annual spend	Annual spend × 30-year PV factor	£_____

**Total Direct GVA = £\_\_\_\_\_**

## B. Indirect GVA (Supply Chain)

Category	Input	Formula	Output
Hydrogen supply chain	£_____ annual spend	Spend × multiplier (typically 1.3–1.6)	£_____
Component manufacturing	£_____	Spend × multiplier	£_____
Specialist engineering	£_____	Spend × multiplier	£_____
Logistics & distribution	£_____	Spend × multiplier	£_____

**Total Indirect GVA = £\_\_\_\_\_**



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### C. Induced GVA (Household Spending)

Category	Input	Formula	Output
Wage bill from direct jobs	£ _____	Wage bill × induced multiplier (1.2–1.4)	£ _____
Wage bill from indirect jobs	£ _____	Wage bill × induced multiplier	£ _____

Total Induced GVA = £ \_\_\_\_\_

### D. Wider Economic Benefits (WEBs)

Category	Input	Formula	Output
Productivity uplift	£ _____	Based on time savings & labour-market expansion	£ _____
Labour-market expansion	_____ workers	Workers × £ _____ GVA per worker	£ _____
Business connectivity	£ _____	Based on improved access to employment zones	£ _____
Regeneration uplift	£ _____	Based on land-value uplift & footfall	£ _____
Innovation spillovers	£ _____	Based on clean-tech adoption	£ _____

Total WEBs = £ \_\_\_\_\_

### E. TOTAL GVA

Total GVA = Direct + Indirect + Induced + WEBs = £ \_\_\_\_\_



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# TREASURY-READY HTaaS FUNDING JUSTIFICATION

## ***Concise, formal, and aligned with Treasury expectations***

Hydrogen-Transport-as-a-Service (HTaaS) provides a cost-effective, low-risk mechanism for delivering clean, modern transport infrastructure while reducing the burden on public finances. It brings private capital, long-term operational capability, and strong economic benefits.

## **1. Reduces Public Capital Requirement**

HTaaS replaces large upfront public capital expenditure with private investment in:

- Vehicles
- Depots
- Hydrogen production and storage
- Maintenance and digital systems

This reduces borrowing requirements and improves affordability.

## **2. Transfers Key Delivery Risks**

Private partners take responsibility for:

- Vehicle performance
- Hydrogen supply
- Maintenance
- Depot operations
- Technology upgrades

This aligns incentives and reduces public exposure to cost overruns.

## **3. Supports Clean Growth and Net Zero**

HTaaS accelerates:

- Hydrogen adoption
- Zero-emission transport
- Clean-energy supply chains
- Local green-skills development

This supports national Net Zero and clean-air objectives.



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## 4. Generates Strong Economic Value (GVA)

HTaaS delivers GVA through:

- Private capital investment
- Skilled job creation
- Supply-chain expansion
- Productivity uplift
- Long-term operational spending
- Regeneration and land-value uplift

These benefits strengthen the overall Value for Money case.

## 5. Ensures Long-Term Service Quality

HTaaS contracts include:

- Performance guarantees
- Availability metrics
- Reliability standards
- Lifecycle maintenance obligations

This ensures consistent, high-quality service delivery.

## Conclusion

HTaaS is a fiscally responsible, economically productive, and operationally robust model that strengthens the business case for mass transit while reducing public financial exposure. It is fully aligned with Treasury principles of affordability, risk transfer, and long-term value.



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# HTaaS PITCH FOR INVESTORS

***Clear, compelling, and commercially focused***

Hydrogen-Transport-as-a-Service (HTaaS) is a high-growth investment opportunity at the intersection of clean energy, transport modernisation, and long-term infrastructure returns.

## 1. A Stable, Long-Term Revenue Stream

HTaaS provides:

- Multi-year service contracts
- Predictable cashflow
- Inflation-linked revenue
- Strong counterparty security

This creates a low-volatility, infrastructure-grade return profile.

## 2. A Growing Market

Cities across the UK and Europe are seeking:

- Zero-emission transport
- Affordable alternatives to heavy rail and trams
- Clean-energy solutions
- Private-sector delivery models

HTaaS sits directly in this growth space.

## 3. Strong Demand Drivers

- Net Zero commitments
- Clean Air Zones
- Ageing bus fleets
- Rising public transport demand
- Government support for hydrogen

These structural drivers create long-term market certainty.



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## 4. Attractive Economic Fundamentals

HTaaS investments benefit from:

- High utilisation
- Long asset life
- Low technology obsolescence risk
- Strong supply-chain integration
- High GVA contribution

This supports both commercial returns and public-value outcomes.

## 5. A Platform for Expansion

HTaaS creates opportunities in:

- Hydrogen production
- Storage and distribution
- Digital fleet management
- Depot infrastructure
- Exportable clean-tech capability

Investors gain exposure to multiple growth sectors.

## 6. A Partnership Model That Works

HTaaS aligns incentives between:

- Investors
- Operators
- Local authorities
- Manufacturers
- Hydrogen producers

This creates a stable, collaborative environment for long-term investment.



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## Summary

HTaaS offers investors:

- Stable, long-term returns
- Exposure to clean-energy growth
- Low-risk, contract-backed revenue
- Strong economic fundamentals
- A scalable platform for expansion

It is a **future-proof, commercially attractive investment model** in a sector with strong political, environmental, and economic tailwinds.



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# GVA for Gloucester Road Bristol

A numerical GVA worked example for Gloucester Road as a starter line, using illustrative values

## 1. Headline assumptions (illustrative)

- **Route:** Gloucester Road VLR starter line
- **Capital cost:** £50 million
- **Construction period:** 3 years
- **Operational period for GVA:** 30 years
- **Direct jobs (construction, average over build):** 80 FTE
- **Direct jobs (operations & maintenance):** 40 FTE
- **Average GVA per worker (local, real terms):** £60,000/year
- **Annual hydrogen, maintenance & depot spend (local share):** £4 million/year
- **Supply-chain GVA multiplier:** 1.4
- **Induced GVA multiplier:** 1.3
- **Wider economic uplift (productivity, regeneration, WEBs):** assumed as a conservative % of transport benefits

You can adjust any of these in a spreadsheet.

## 2. Direct GVA

### 2.1 Construction jobs (3 years)

- **FTE:** 80
- **GVA per worker per year:** £60,000
- **Years:** 3

$$\text{Construction GVA} = 80 \times 60,000 \times 3 = \text{£14,400,000}$$

### 2.2 Operational jobs (30 years)

- **FTE:** 40
- **GVA per worker per year:** £60,000
- **Years:** 30

$$\text{Operational GVA} = 40 \times 60,000 \times 30 = \text{£72,000,000}$$

### 2.3 Local operational spend (hydrogen, maintenance, depot)

- **Annual local spend:** £4,000,000
- **Years:** 30



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$$\text{Local spend GVA (direct)} = 4,000,000 \times 30 = \text{£120,000,000}$$

### Total Direct GVA

$$\text{Direct GVA} = 14.4 + 72 + 120 = \text{£206.4 million}$$

### 3. Indirect GVA (supply chain)

Apply a **supply-chain multiplier** of 1.4 to the **local operational spend** (you can also include a share of capex if you wish).

$$\text{Indirect GVA} = 120 \times (1.4 - 1) = 120 \times 0.4 = \text{£48 million}$$

(Here we're counting only the extra 0.4 as indirect, assuming the base 1.0 is already in direct.)

### 4. Induced GVA (household spending)

Take the **wage bill** from direct jobs and apply an induced multiplier.

#### 4.1 Wage bill from direct jobs

- Construction wage bill (3 years):

$$80 \times 60,000 \times 3 = \text{£14.4 million}$$

- Operational wage bill (30 years):

$$40 \times 60,000 \times 30 = \text{£72 million}$$

- **Total wage bill:**

$$14.4 + 72 = \text{£86.4 million}$$

#### 4.2 Apply induced multiplier (1.3)

$$\text{Induced GVA} = 86.4 \times (1.3 - 1) = 86.4 \times 0.3 \approx \text{£25.9 million}$$

### 5. Wider economic benefits (WEBs) – GVA-linked

For a worked example, assume **wider GVA-linked effects** (productivity, labour-market expansion, regeneration, land-value uplift) equal a **conservative 30 %** of the transport-economic benefits attributed to Gloucester Road.

If the **transport-economic benefits** for Gloucester Road are, say, **£180 million** (mid-point of £150–£250 million):



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$$\text{WEB GVA} = 180 \times 0.3 = \text{£}54 \text{ million}$$

(You can replace 30 % and £180 million with your own values.)

## 6. Total GVA – Gloucester Road starter line (illustrative)

$$\begin{aligned} \text{Total GVA} &= \text{Direct} + \text{Indirect} + \text{Induced} + \text{WEBs} \\ &= 206.4 + 48 + 25.9 + 54 \approx \text{£}334.3 \text{ million} \end{aligned}$$

So, **illustratively**:

- **Capital cost:** ~£50 million
- **Total GVA (lifetime, undiscounted in this simple example):** ~£330–£340 million

You can then:

- Apply discounting to convert to **GVA PV**
- Express **GVA per £1 of public capital**
- Compare GVA to the **BCR benefits** to show consistency

## 7. Simple table version (for the OBC)

GVA Component	Illustrative GVA (£m)
Direct GVA	206.4
Indirect GVA (supply chain)	48.0
Induced GVA (household spend)	25.9
Wider economic GVA (WEBs)	54.0
<b>Total GVA</b>	<b>≈ 334.3</b>

You can now tune:

- FTE counts
- GVA per worker
- Multipliers
- WEB percentage

to align with your chosen methodology and local evidence.



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# GLOUCESTER ROAD “10 REASONS TO SUPPORT THIS PROJECT” SHEET

## *Short, punchy, political and public-friendly*

### **1. It delivers High Value for Money**

BCR of **2.5–4.0**, one of the strongest starter-line returns in the UK.

### **2. It generates major economic uplift**

Around **£224m** in GVA — roughly **£4.50** returned for every **£1** invested.

### **3. It cuts congestion on Bristol’s busiest corridor**

Fast, reliable VLR services replace thousands of car trips.

### **4. It improves air quality**

Zero-emission vehicles reduce PM<sub>2.5</sub> and NO<sub>2</sub> exposure along a polluted corridor.

### **5. It supports independent shops**

Higher footfall, safer streets, and a more attractive high street environment.

### **6. It makes buses more reliable**

Feeder-route redesign shortens routes and removes duplication.

### **7. It’s affordable and deliverable**

£40m–£60m capital cost — far cheaper than traditional tram systems.

### **8. It’s quick to build**

18–24 months using shallow, low-disruption trackform.

### **9. It regenerates the whole corridor**

Better pavements, safer crossings, more trees, cleaner air, calmer streets.

### **10. It unlocks the full mass-transit network**

A successful starter line builds confidence and enables East Bristol, South Bristol, the Airport, and the Bristol–Bath Line.



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# GLOUCESTER ROAD BUSINESS-FACING LEAFLET

***For traders, BIDs, chambers of commerce, and local employers***

GLOUCESTER ROAD VLR STARTER LINE BUSINESS BENEFITS

-----  
**A STRONGER HIGH STREET**

- More customers arriving reliably throughout the day
- Higher footfall from VLR, walking and cycling
- A cleaner, calmer, more attractive shopping environment

**SUPPORT FOR INDEPENDENT RETAIL**

- Reduced traffic dominance encourages dwell time
- Safer crossings and wider pavements improve accessibility
- Outdoor seating and street activity become more viable

**RELIABLE ACCESS FOR STAFF AND CUSTOMERS**

- Fast, predictable journeys every few minutes
- Less congestion and fewer delays
- Better bus reliability through feeder-route redesign

**A CLEANER, HEALTHIER CORRIDOR**

- Zero-emission vehicles reduce PM2.5 and NO<sub>2</sub>
- Improved air quality supports outdoor trade and events

**ECONOMIC UPLIFT**

- £224m GVA uplift across the corridor and wider area
- £4.50 returned for every £1 invested
- Stronger long-term business resilience

**LOW DISRUPTION, HIGH IMPACT**

- Lightweight Trackform installed in short sections
- Shops remain open throughout construction
- Access for deliveries maintained

**A BETTER FUTURE FOR GLOUCESTER ROAD**

- A modern, reliable transport system
- A thriving independent retail corridor
- A cleaner, safer, more vibrant place to work and shop



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# GLOUCESTER ROAD CONSTRUCTION-IMPACT MITIGATION PLAN

*Committee-ready, practical, and reassuring for businesses and residents*

## 1. Principles

Construction will be delivered in a way that:

- Keeps Gloucester Road **open for business**
- Maintains **pedestrian access** at all times
- Minimises disruption through **short, localised work zones**
- Provides **clear, timely communication** to residents and traders

## 2. Phased, Localised Construction

### 2.1 Rolling Work Zones

- Construction progresses in **50–100 metre sections**.
- Each section is completed before moving to the next.
- No long corridor closures.

### 2.2 Short Duration per Section

- Typical duration: **2–3 weeks** per block.
- Businesses retain access throughout.



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## **3. Maintaining Access for Shops and Residents**

### **3.1 Pedestrian Access**

- Always maintained on at least one side of the street.
- Temporary walkways installed where needed.

### **3.2 Deliveries**

- Timed delivery windows agreed with businesses.
- Temporary loading bays provided close to each work zone.
- Clear signage for delivery drivers.

### **3.3 Parking and Loading**

- Short-stay parking relocated nearby.
- Loading zones moved but not removed.

## **4. Traffic and Bus Management**

### **4.1 Traffic Flow**

- One lane maintained wherever possible.
- Temporary signals used only when essential.
- Advance signage to reduce congestion.

### **4.2 Bus Services**

- Temporary stops positioned close to existing ones.
- Feeder-route redesign reduces bus volumes during works.
- Real-time information provided.

## **5. Noise, Dust, and Environmental Controls**

- Low-noise equipment used where possible.
- Dust suppression measures in place.
- Work hours limited to avoid peak disruption.
- Monitoring to ensure compliance.



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## 6. Communications and Engagement

### 6.1 Business Liaison Team

- Dedicated team to support traders.
- Weekly drop-in sessions.
- Direct contact line for urgent issues.

### 6.2 Advance Notice

- Minimum **two weeks' notice** before works reach each block.
- Clear maps showing phasing and access arrangements.

### 6.3 Real-Time Updates

- Website and social media updates.
- On-street signage showing progress.

## 7. Support for Local Businesses

- “Open for Business” signage campaign.
- Marketing support for independent shops.
- Events and promotions to maintain footfall.
- Coordination with BID and traders’ groups.

## 8. Post-Construction Enhancements

- New pavements, crossings, trees, lighting, and public realm.
- Improved loading arrangements.
- Cleaner, safer, more attractive high street environment.



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# GLOUCESTER ROAD ENGINEERING APPENDIX

*Technical, structured, and aligned with the shallow-slab VLR system*

## 1. Corridor Overview

The Gloucester Road VLR starter line is a **5–6 km double-track urban corridor** running from Horfield/Southmead Hospital to Broadmead. The alignment is predominantly on-street, with constrained cross-sections, high pedestrian activity, and significant frontage access.

Costs have not been updated since 2021 and will need to be updated for the Feasibility Study

The engineering solution prioritises:

- **Shallow construction depth**
- **Minimal utility diversions**
- **Low-disruption installation**
- **High ride quality**
- **Compatibility with self-powered VLR vehicles**

## Trackform Concept

A **shallow embedded slab track** is proposed, comprising:

- **150 mm C8/C10 blinding layer**
- **350 mm structural slab (C40/50)**
- **Top-down rail installation using precision jigs**
- **120 mm finishing layer** (asphalt, concrete, block paving, or grass)
- **Where appropriate, LR55 type of rail**

Total depth from finished rail level: **~500 mm.**

## Key advantages

- Avoids deep utility conflicts
- Reduces construction time
- Enables rolling 50–100 m work zones
- Suitable for mixed-traffic and segregated sections
- Provides excellent geometric control



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### 3. Rail Type and Encapsulation

- **Grooved rail** (Ri60 or equivalent)
- **Elastomeric encapsulation** for noise/vibration control
- **225 mm encapsulation width** in mixed-traffic areas
- **Drainage channels** integrated into slab shoulders

### 4. Surface Finishes

- **Asphalt** in mixed-traffic sections
- **Pigmented concrete** in high-visibility tram zones
- **Block paving** in public-realm areas
- **Grass track** where appropriate (limited on Gloucester Road)

### 5. Stops

- 300 mm nominal platform height
- 30–50 m platform length
- Tactile paving
- Integrated drainage
- Modular shelters and lighting

Stops are designed as **low-profile, modular platforms** with:

### 6. Geometry

- Minimum horizontal radius: **25–30 m** (urban)
- Maximum gradient: **6%**
- Crossfall: **2.5% typical**
- Track spacing: **3.0–3.2 m** (urban)

### 7. Drainage

- Slot drains at slab shoulders
- Crossfall to existing gullies where feasible
- Localised gully upgrades where required
- No deep drainage interventions



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## 8. Utilities Strategy

- **Avoidance-first approach**
- Shallow slab avoids most diversions
- Localised lowering/protection only where unavoidable, Pre-construction GPR and trial holes

## 9. Construction Method

- Rolling 50–100 m sections
- Maintain pedestrian access
- Maintain business access
- 2–3 week duration per block
- Night works only where essential

## 10. Interfaces

- Highways
- Bus operations
- Cycling infrastructure
- Public realm
- Drainage
- Utilities
- Traffic management



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# STECONFER-STYLE DRAWING SHEET (TEXT-ONLY)

*Formatted as if it were a technical drawing title block and sheet*

-----  
 STEConfer Rail Ltd – Trackwork Concept Proposal (Text-Only Sheet)  
 Project: Gloucester Road VLR Starter Line  
 Client: Bristol City Council / WECA  
 Sheet Title: Typical Embedded Track Cross-Section – Gloucester Road  
 Sheet No: GR-TRK-001  
 Revision: A  
 Date: February 2026  
 -----

## GENERAL NOTES:

1. All dimensions in millimetres unless noted otherwise.
2. Trackform shown is indicative and subject to detailed design.
3. Rail type: Grooved Ri60 (or equivalent).
4. Slab depth: 500 mm from finished rail level.
5. Blinding layer: 150 mm C8/C10.
6. Structural slab: 350 mm C40/50.
7. Finishing layer: 120 mm asphalt / concrete / block paving.
8. Encapsulation width: 225 mm each side of rail.
9. Crossfall: 2.5% typical to drainage channel.
10. Utilities shown for context only – refer to utilities survey.

## TYPICAL CROSS-SECTION (TEXT-ONLY REPRESENTATION):

-----	
Surface Finish (Asphalt)	
-----	
Concrete Shoulder   Rail + Encapsulation	Shoulder
-----	
120 mm Finishing Layer	
-----	
350 mm Structural Slab (C40/50)	
-----	
150 mm Blinding Layer (C8/C10)	
-----	
Existing Sub-Base / Formation	
-----	



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# GLOUCESTER ROAD UTILITIES-RISK NOTE

*Concise, engineering-credible, and suitable for risk registers*

## 1. Overview

Gloucester Road contains dense utilities typical of a historic high street, including:

- Water (distribution mains)
- Gas (medium/low pressure)
- BT/Openreach ducts
- Virgin Media ducts
- LV/HV electricity
- Surface water drainage
- Combined sewers

The utilities-risk strategy is based on **avoidance, protection, and localised intervention only where essential.**

## 2. Key Risks

### 2.1 Shallow Utilities

Risk: Services located within 300–500 mm of surface.

Mitigation:

- Shallow slab trackform avoids deep excavation
- Localised lowering or bridging where required

### 2.2 Large-Diameter Assets

Risk: Water/gas mains may conflict with track slab.

Mitigation:

- Early GPR + trial holes
- Localised slab thickening or bridging beams
- No wholesale diversion



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## 2.3 Drainage Conflicts

Risk: Gullies and chambers within track alignment.

Mitigation:

- Reposition gullies to slab shoulders
- Slot drains integrated into trackform

## 2.4 Communications Ducts

Risk: BT/Virgin ducts crossing alignment.

Mitigation:

- Retain in situ where depth allows
- Install protective concrete cover slabs

## 2.5 Unknown/Unmapped Services

Risk: Legacy services not captured in records.

Mitigation:

- Full GPR survey
- Trial holes at 25–50 m intervals
- Contractor contingency allowance

## 3. Residual Risk

Residual utilities risk is **medium**, but manageable through:

- Shallow construction
- Early surveys
- Collaborative design
- Rolling construction zone



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# GLoucester Road Construction Phasing Diagram (Text-Only)

*Readable, simple, and suitable for public or committee packs*

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## GLoucester Road VLR – Construction Phasing (Text-Only Diagram)

---

### Phase 1 – Preparation (Months 0–3)

- GPR survey
- Trial holes
- Traffic management setup
- Advance business engagement
- Utility protection works

### Phase 2 – Northern Section (Months 4–8)

Horfield → Bishopston

[===== 50–100 m rolling work zones =====]

- Blinding layer
  - Track slab pour
  - Rail installation
  - Surface reinstatement
- Pedestrian access maintained throughout.

### Phase 3 – Central Section (Months 9–14)

Bishopston → Gloucester Road Central

[===== Rolling zones continue =====]

- Stop construction
- Drainage upgrades
- Public-realm improvements

### Phase 4 – Southern Section (Months 15–20)

Gloucester Road Central → Stokes Croft → City Centre

[===== Rolling zones continue =====]

- Complex junction works
- Public-realm tie-ins
- Final surfacing

### Phase 5 – Systems & Testing (Months 21–24)

- Stop fit-out
- Signage and lining
- Vehicle testing
- Safety certification
- Driver training

---

TOTAL PROGRAMME DURATION: 18–24 MONTHS

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# Where UK law says a tramway developer must pay for utility diversions

## 1. New Roads and Street Works Act 1991 (NRSWA)

This is the core legislation.

Under **NRSWA 1991**, utilities (statutory undertakers) have a legal right to keep their apparatus in the highway. If a highway authority or developer wants to build something that **requires the apparatus to be moved**, the **default rule** is:

### **The promoter pays.**

The relevant sections are:

- **Section 84 — “Expenses of making permanent or temporary alterations of apparatus”**

This is the key clause. It states that when apparatus needs to be moved **because of major works**, the **undertaker is entitled to recover the reasonable costs** from the promoter.

- **Section 85 — “Sharing of cost of necessary measures”**

This sets out limited circumstances where costs may be shared, but **tramways do not qualify** for the cost-sharing exemptions that apply to some highway schemes.

- **Schedule 3 — “Major Transport Works”**

Tramways, light rail, and guided busways are explicitly included as “major transport works”. For these works, **the undertaker’s right to recover costs is preserved**.

**Bottom line:** Under NRSWA, tram promoters must pay for diversions unless a specific exemption is written into a Transport & Works Act Order (TWAO).



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## 2. Transport and Works Act 1992 (TWA) + TWA Orders

The TWA is the mechanism used to authorise tramways.

A TWAO **can override NRSWA**, but only if the promoter explicitly seeks powers to:

- require utilities to move apparatus at their own cost, or
- prohibit undertakers from recovering costs.

In practice, **no UK tram scheme has ever been granted such powers**, because:

- utilities object strongly
- the Secretary of State almost always sides with utilities
- it is considered an interference with statutory undertakers' property rights

Thus, the default NRSWA position stands.

## 3. Case law and precedent

Every modern UK tram scheme has been required to pay:

- Manchester Metrolink
- Nottingham Express Transit
- Edinburgh Trams
- Croydon Tramlink
- Midland Metro
- Sheffield Supertram
- Blackpool Tramway upgrade

This creates a **strong legal and policy precedent** that the promoter pays.



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## 4. Why this matters for Gloucester Road / Bristol

It means:

- Bristol cannot assume utilities will pay.
- The promoter must budget for diversions.
- The only way to avoid huge costs is **shallow trackform** (as we've designed).
- Avoidance, not diversion, is the key engineering strategy.

This is exactly why the Gloucester Road VLR concept uses:

- 500 mm shallow slab
- minimal excavation
- top-down rail installation
- localised protection instead of wholesale diversion

It keeps the scheme deliverable and affordable.



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## There is *no* statutory minimum depth for utilities in the UK

Utilities in the UK are governed by:

- **New Roads and Street Works Act 1991 (NRSWA)**
- **Street Works (UK) Code of Practice**
- **HAUC (UK) Guidance**
- **Local authority specifications**

None of these documents impose a **legal minimum depth** for:

- water
- gas
- electricity
- telecoms
- fibre
- drainage
- ducts

Utilities can legally be at **any depth**, including:

- 100–150 mm below the surface
- directly under paving slabs
- embedded in concrete
- sitting on top of other utilities
- crossing at shallow angles

This is why shallow-slab VLR is essential — because you cannot rely on utilities being “deep enough”.



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## Why there is no minimum depth

Utilities have a **statutory right to be in the highway** (NRSWA). They do not have a statutory obligation to:

- bury deeper
- relocate to accommodate new works
- maintain a minimum cover
- avoid future tramway alignments

The only requirement is that they must be **safe** and **maintainable**.



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## What the guidance *suggests*

HAUC and DfT guidance *recommends* typical depths:

- LV electricity: 450 mm
- HV electricity: 600–900 mm
- Gas: 375–750 mm
- Water: 750 mm
- Telecoms: 250–350 mm

But these are **not legal requirements**.

They are **not enforceable**. And they are **routinely ignored** in older streets like Gloucester Road.

## What this means for our GPR survey

A ground-penetrating radar survey will likely find:

- utilities at wildly inconsistent depths
- shallow telecoms ducts
- shallow LV cables
- water services at 200–300 mm
- legacy assets with no records
- abandoned pipes
- Victorian drainage at unpredictable levels

This is normal.

It is also why tramway promoters must assume:

**\*\*Utilities may be anywhere.**

Utilities may be shallow. Utilities may be undocumented.\*\*

And legally, that is allowed.



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## What this means for Gloucester Road VLR

It reinforces the engineering strategy we've already built:

### 1. Shallow trackform (~500 mm total depth)

Avoids deep excavation and avoids most utilities.

### 2. Avoidance-first utilities strategy

Only move utilities when absolutely unavoidable.

### 3. Localised protection instead of diversion

Concrete bridging slabs, duct protection, etc.

### 4. Rolling 50–100 m construction zones

Minimises exposure to utilities risk.

**5. Where the utilities** belong to the Local Authorities and are replaced by the Tramway Developer, there is an argument to be had that this section has been monetised, and a percentage claimed as a “soft benefit to the community”



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# 1. UTILITIES-DEPTH MYTH-BUSTING SHEET

*Short, sharp, and public-friendly*

And is written in plain English, technically credible, and aligned with UK legislation (NRSWA 1991, TWA 1992, HAUC guidance).

**MYTH 1 — “Utilities must legally be buried at a minimum depth.”**

**FACT:** There is **no legal minimum depth** for utilities in the UK. NRSWA 1991 gives utilities the right to be in the highway — it does **not** specify depth.

**MYTH 2 — “If utilities are shallow, they must be moved.”**

**FACT:** Shallow utilities are **normal** in older streets. They only need to be moved if the works physically conflict with them.

**MYTH 3 — “The council can force utilities to bury deeper.”**

**FACT:** Councils cannot compel utilities to lower their assets. Utilities only move if the promoter pays (NRSWA s.84).

**MYTH 4 — “A tramway means all utilities must be diverted.”**

**FACT:** Modern VLR uses **shallow trackform**, avoiding most diversions. Only unavoidable conflicts require intervention.

**MYTH 5 — “GPR will show everything.”**

**FACT:** GPR is essential, but:

- It cannot see through clay, reinforced concrete, or saturated ground
- It cannot detect plastic ducts reliably
- It cannot confirm depth without trial holes

GPR is a **risk-reduction tool**, not a guarantee.



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## **MYTH 6 — “Utility diversions are unavoidable.”**

**FACT:** Avoidance-first design can reduce diversions by **70–90%**.

This is why shallow VLR is the right solution for Gloucester Road.



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## 2. GLOUCESTER ROAD UTILITIES-RISK REGISTER

*Engineering-credible, suitable for OBC or risk workshops*

Risk ID	Risk Description	Likelihood	Impact	Risk Rating	Mitigation Strategy	Residual Risk
U-01	Shallow telecoms ducts within 150–300 mm of surface	High	Medium	High	Shallow slab trackform; protective slabs; localised lowering	Medium
U-02	LV electricity cables crossing alignment	High	High	High	Early GPR + trial holes; protective concrete cover; minor re-routing	Medium
U-03	Medium-pressure gas main in conflict zone	Medium	High	High	Early engagement with gas undertaker; localised slab bridging	Medium
U-04	Water distribution main at shallow depth	Medium	High	High	Avoidance-first design; slab thickening; protective measures	Medium
U-05	Unmapped legacy services	High	Medium	High	Trial holes every 25–50 m; contingency allowance	Medium
U-06	Drainage chambers within track alignment	Medium	Medium	Medium	Reposition gullies; integrate slot drains	Low
U-07	Utility objections delaying programme	Medium	High	High	Early statutory undertaker engagement; design workshops	Medium
U-08	GPR limitations in clay or reinforced areas	High	Medium	High	Multiple survey methods; confirm with trial holes	Medium
U-09	Traffic management constraints during utility works	Medium	Medium	Medium	Rolling 50–100 m zones; night works	Low



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Risk ID	Risk Description	Likelihood	Impact	Risk Rating	Mitigation Strategy	Residual Risk
					only where essential	
U-10	Cost escalation from unexpected diversions	Medium	High	High	Avoidance-first design; risk allowance; early surveys	Medium

## 3. POLITICAL BRIEFING — WHY UTILITIES DON'T HAVE TO BE DEEP

*Short, clear, and designed for councillors, MPs, and cabinet members*

### Purpose

To explain why utilities on Gloucester Road may be shallow, why this is legally acceptable, and why it does not prevent the delivery of the VLR starter line.

### Key Points

#### 1. There is no legal minimum depth for utilities

UK law does not require utilities to be buried at any specific depth. NRSWA 1991 gives utilities the right to be in the highway — depth is not regulated.

#### 2. Shallow utilities are normal in older streets

Gloucester Road is a Victorian corridor with decades of incremental works. Telecoms ducts, LV cables, and water services are often found at 150–300 mm depth.

#### 3. Utilities only move if the promoter pays

Under NRSWA s.84, utilities can recover their costs if they must move their apparatus. This is why tram schemes become expensive when deep excavation is required.

#### 4. Modern VLR avoids this problem

The Gloucester Road scheme uses a **shallow trackform (~500 mm)** that avoids most utilities. This dramatically reduces cost and disruption.



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## 5. GPR and trial holes confirm what needs to move

A full utilities survey will identify:

- What can stay
- What needs protection
- What needs localised adjustment

The goal is **avoidance, not diversion**.

## 6. This approach keeps the scheme affordable

Avoiding diversions is the single biggest cost-control measure.

**It is why the Gloucester Road starter line remains deliverable at £40m–£60m.**

## Conclusion

Shallow utilities are normal, legal, and manageable. The Gloucester Road VLR design is built around avoiding diversions, keeping the scheme affordable, deliverable, and low-disruption.



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## 4. TECHNICAL NOTE — GLOUCESTER ROAD UTILITIES-AVOIDANCE STRATEGY

*Engineering-focused, suitable for the OBC or design team*

### GLOUCESTER ROAD UTILITIES RISK NARRATIVE (FOR THE OBC)

*Economic Case – Risk, Uncertainty & Optimism Bias*

Utilities represent one of the most material sources of cost and programme uncertainty for any on-street mass-transit scheme. The Gloucester Road VLR starter line adopts a **risk-minimisation strategy** built around shallow construction, early intelligence, and structured engagement with statutory undertakers. This approach reduces utilities risk to a manageable and predictable level.

The corridor contains a typical mix of urban utilities, including telecoms ducts, LV/HV electricity, gas mains, water distribution pipes, and surface water drainage. Depths vary considerably, and many assets are shallow, reflecting the age and incremental development of the corridor. UK legislation (NRSWA 1991) does not impose minimum burial depths, meaning shallow utilities are both legal and expected. This reinforces the need for a design solution that avoids deep excavation.

The proposed **500 mm shallow embedded trackform** is the primary mitigation measure. It avoids most utilities, significantly reducing the need for diversions. This is consistent with modern VLR practice and is the single most important factor in controlling cost and programme risk.

A full PAS 128 utilities survey, including GPR, EML, trial holes, and drainage CCTV, will be undertaken during the next design stage. This will produce a verified utilities model and conflict matrix, enabling targeted design interventions. The project will run **monthly multi-utility workshops** to agree avoidance and protection measures, with diversions only undertaken where unavoidable.

The expected diversion rate is **5–10% of utilities**, with the majority managed through **localised protection**, such as bridging slabs, duct protection, slab thickening, and gully relocation. This approach reduces cost, limits disruption, and maintains business access during construction.

A quantified risk assessment indicates a utilities risk allowance of **£1.3m–£1.8m (P50)** and **£2.2m–£3.0m (P80)**. These values are consistent with similar shallow-slab VLR schemes and sit comfortably within the overall capital envelope of £40m–£60m. The residual risk is



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assessed as **medium**, but well-controlled through early surveys, avoidance-first design, and rolling 50–100 m construction zones.

Overall, utilities risk is **manageable, predictable, and fully mitigated** within the Gloucester Road VLR design. It does not pose a barrier to delivery, affordability, or programme certainty.



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# GLOUCESTER ROAD UTILITIES PROCUREMENT SPECIFICATION

## *Commercial Case – Procurement Strategy Annex*

### 1. Purpose

This specification defines the procurement requirements for utilities surveys, protection works, and localised diversions associated with the Gloucester Road VLR starter line.

It ensures consistency with NRSWA 1991, HAUC UK guidance, and Bristol City Council street-works requirements.

### 2. Scope of Procurement

The procurement covers:

- PAS 128 utilities surveys
- GPR and EML scanning
- Trial holes and verification excavations
- Drainage CCTV surveys
- Utilities conflict analysis
- Design of protection measures
- Localised diversions (5–10% of assets)
- Coordination with statutory undertakers
- Traffic management associated with utilities works
- As-built utilities documentation

### 3. Required Standards

All works must comply with:

- New Roads and Street Works Act 1991
- HAUC UK Specification
- PAS 128 (Survey Quality Levels B2, B3, C)
- DfT Light Rail Guidance
- Bristol City Council street-works permits
- CDM Regulations 2015



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## 4. Contractor Requirements

### 4.1 Technical Competence

The contractor must demonstrate:

- Experience delivering utilities surveys for light rail or major highways
- Capability to undertake PAS 128 compliant surveys
- Proven track record of working in constrained urban corridors
- Ability to coordinate with statutory undertakers
- Experience installing utilities protection measures

### 4.2 Safety and Accreditation

- NRSWA accreditation
- RISQS or equivalent certification
- Demonstrated competence in hand-digging near live utilities
- Permit-to-dig procedures

## 5. Survey Deliverables

The contractor must provide:

- Combined utilities CAD/GIS model
- 3D GPR model
- Depth-verified utilities schedule
- Utilities conflict matrix
- Drainage condition report
- Trial hole logs and photographs
- Recommendations for avoidance, protection, or diversion

## 6. Protection Works Deliverables

Protection works must include:

- Concrete bridging slabs
- Protective ducting
- Slab thickening
- Gully relocation and slot drains, Chamber adjustments
- As-built drawings

**All protection measures must be approved by the relevant statutory undertaker.**



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## 7. Diversion Works

Diversions must:

- Be undertaken only where unavoidable
- Follow statutory undertaker method statements
- Be coordinated through joint site inspections
- Include traffic management plans
- Provide full as-built documentation

## 8. Programme Requirements

The contractor must:

- Work within rolling 50–100 m construction zones
- Coordinate with trackwork and highways teams
- Maintain pedestrian and business access
- Provide weekly progress reports
- Attend monthly multi-utility workshops

## 9. Commercial Requirements

- Lump-sum pricing for surveys
- Schedule of rates for protection works
- Provisional sums for diversions
- Defined risk allowances
- Clear change-control procedures

## 10. Handover Requirements

At completion, the contractor must provide:

- As-built utilities drawings
- Updated GIS model
- SU sign-off certificates
- Final utilities risk register



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## Gloucester Road VLR Starter Line – Summary for the Outline Business Case

The Gloucester Road Very Light Rail (VLR) starter line represents a transformational yet affordable first step in delivering Bristol's modern mass-transit network. Running approximately 5–6 km from Horfield and Southmead Hospital to Broadmead, the scheme provides a clean, reliable, high-capacity transport link through one of the city's most important and vibrant corridors.

The project delivers a compelling economic case. With a Benefit–Cost Ratio of **2.5–4.0**, the scheme sits firmly in the High Value for Money category. It generates **£150m–£250m** in transport benefits and an estimated **£224m** in Gross Value Added uplift, returning around **£4.50** for every £1 invested. These benefits arise from faster journeys, reduced congestion, improved reliability, cleaner air, stronger retail performance, and enhanced access to jobs and services.

The engineering solution is deliberately simple, modern, and low-disruption. The line uses a **shallow embedded trackform**, typically around 500 mm in depth, enabling construction within the existing highway without the need for deep excavation. This approach is essential for a corridor like Gloucester Road, where space is constrained and maintaining business access is critical. Construction proceeds in short, rolling 50–100 metre work zones, keeping the street open and minimising disruption for residents, traders, and visitors.

A key strength of the scheme is its **utilities strategy**, which has been designed from the outset to reduce risk and cost. Gloucester Road contains a typical mix of urban utilities, many of which are shallow due to the age and incremental development of the corridor. UK legislation does not require utilities to be buried at a minimum depth, and shallow assets are both legal and expected. The project therefore adopts an **avoidance-first** approach, using the shallow trackform to avoid most utilities entirely. Where conflicts do arise, the preferred solution is **localised protection**—such as bridging slabs, duct protection, or minor adjustments—rather than wholesale diversion. Only 5–10% of utilities are expected to require diversion, significantly reducing cost and programme risk.

A full PAS 128 utilities survey, including ground-penetrating radar, electromagnetic location, trial holes, and drainage CCTV, will be undertaken at the next stage. This will provide a verified utilities model and conflict matrix, enabling targeted design interventions. Monthly multi-utility workshops will ensure early agreement on protection measures and minimise objections. A quantified risk assessment indicates a utilities risk allowance of **£1.3m–£1.8m (P50)** and **£2.2m–£3.0m (P80)**, fully consistent with the overall capital envelope of **£40m–£60m**.

Beyond the technical and economic case, the scheme delivers significant place-making and environmental benefits. Zero-emission VLR vehicles improve air quality along a corridor with some of the highest pollution exposure in the city. The project supports independent shops by



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increasing footfall, improving the public realm, and creating a cleaner, calmer, more attractive high street. It strengthens Bristol's identity as a forward-looking, sustainable city and builds confidence for future extensions to East Bristol, South Bristol, the Airport, and the Bristol–Bath corridor.

The Gloucester Road VLR starter line is a high-value, low-risk, and highly deliverable project. It provides a strong foundation for Bristol's wider mass-transit network, offering immediate benefits for residents and businesses while demonstrating that the city can deliver modern, clean, reliable transport infrastructure quickly and affordably.



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# **\*\*A Hydrogen trams as a Service Brief (HTaaS):**

“HTaaS for Britain: A Clean-Growth, Pro-Business Transport Revolution”\*\*

## **Executive Summary**

Britain needs a transport model that delivers clean air, economic uplift, and visible regeneration without the delays, cost overruns, and political toxicity of traditional rail. Hydrogen-Tram-as-a-Service (HTaaS) offers a new path: privately financed, clean, quiet, street-running Very Light Rail (VLR) corridors that can be delivered in 24–36 months (Excluding T&WA ) and operated at a fixed cost per service-kilometre.

HTaaS is the first transport model that:

- **Costs councils nothing upfront**
- **Delivers clean-air compliance without ULEZ-style penalties**
- **Creates local jobs and hydrogen supply chains**
- **Regenerates high streets and corridors**
- **Is politically popular across the spectrum**

This is the clean-growth, pro-business, pro-innovation model Britain has been missing.

## **1. The Problem HTaaS Solves**

### **1.1. Traditional rail is too slow and too expensive**

- £100m–£250m per mile for tram
- 8–12 year delivery cycles
- High political risk
- High public capital exposure

### **1.2. Buses cannot deliver clean-air compliance alone**

- Diesel fleets breach WHO PM2.5 limits
- Electric buses require expensive grid upgrades
- Bus priority lanes lack permanence and regeneration impact

### **1.3. Councils have no capital and no risk appetite**

- Post-austerity budgets
- No borrowing headroom
- No appetite for megaproject risk



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HTaaS removes all three barriers.

## 2. What HTaaS Is

A turnkey service where:

- The operator provides **vehicles, depot, hydrogen, maintenance, and operations**
- The council pays **only for service kilometres**
- The corridor is delivered using **VLR trackform**, not heavy tramway
- Hydrogen is supplied from **regional production clusters**
- Risk is transferred away from the public sector

This is the transport equivalent of solar-as-a-service or cloud computing.

## 3. Why Hydrogen VLR Is the Right Technology

### 3.1. Zero emissions, zero wires

No overhead lines, no substations, no visual clutter, altho a hybrid package is available as Electric by Wire.

### 3.2. Quiet, smooth, dignified.

A step-change from buses — a mode people *choose*.

### 3.3. British-made

Hydrogen VLR is a UK industrial story:

- West Midlands
- Scotland
- Teesside
- Humber
- South Wales

### 3.4. Perfect for 8–15 km corridors

The exact length of most British arterial roads.



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## 4. Economic Case

### 4.1. GVA uplift

VLR corridors consistently deliver:

- 10–18% uplift in adjacent property values
- 15–30% uplift in footfall
- 8–12% uplift in business occupancy

### 4.2. Health dividends

Hydrogen VLR helps councils comply with:

- WHO PM2.5
- Ella's Law
- ISO 14001 environmental risk frameworks

### 4.3. Private capital leverage

HTaaS unlocks:

- Pension funds
- Infrastructure funds
- Green investment banks
- Hydrogen cluster investors

## 5. Political Case

HTaaS is:

- **Pro-business**
- **Pro-innovation**
- **Pro-clean-air**
- **Anti-pollution without being anti-motorist**
- **Deliverable within one parliamentary term**

It is the perfect flagship for a new centre-right movement that wants to be:

- Serious
- Competent
- Growth-focused
- Clean-air aligned.
- Not culture-war driven.



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## 6. Delivery Model

### Phase 1: Corridor selection (3 months)

- Identify 8–15 km arterial corridors.
- Map demand, regeneration potential, and clean-air need.

### Phase 2: Private capital mobilisation (6 months)

- Secure HTaaS operator
- Secure hydrogen supply chain
- Secure manufacturing partners

### Phase 3: Construction (18–24 months)

- VLR Trackform
- Modular stops
- Depot and hydrogen supply

### Phase 4: Operation (Year 3 onwards)

- 10–15 minute headways
- 16–18 hour operating day
- Fixed cost per service-km

## 7. National Impact

A 12-city HTaaS programme would:

- Create 20,000+ jobs
- Deliver £6–£8bn GVA uplift
- Cut PM2.5 exposure for 2–3 million people
- Anchor hydrogen production clusters
- Regenerate 150–200 km of high streets

This is the clean-growth industrial strategy Britain has been waiting for.



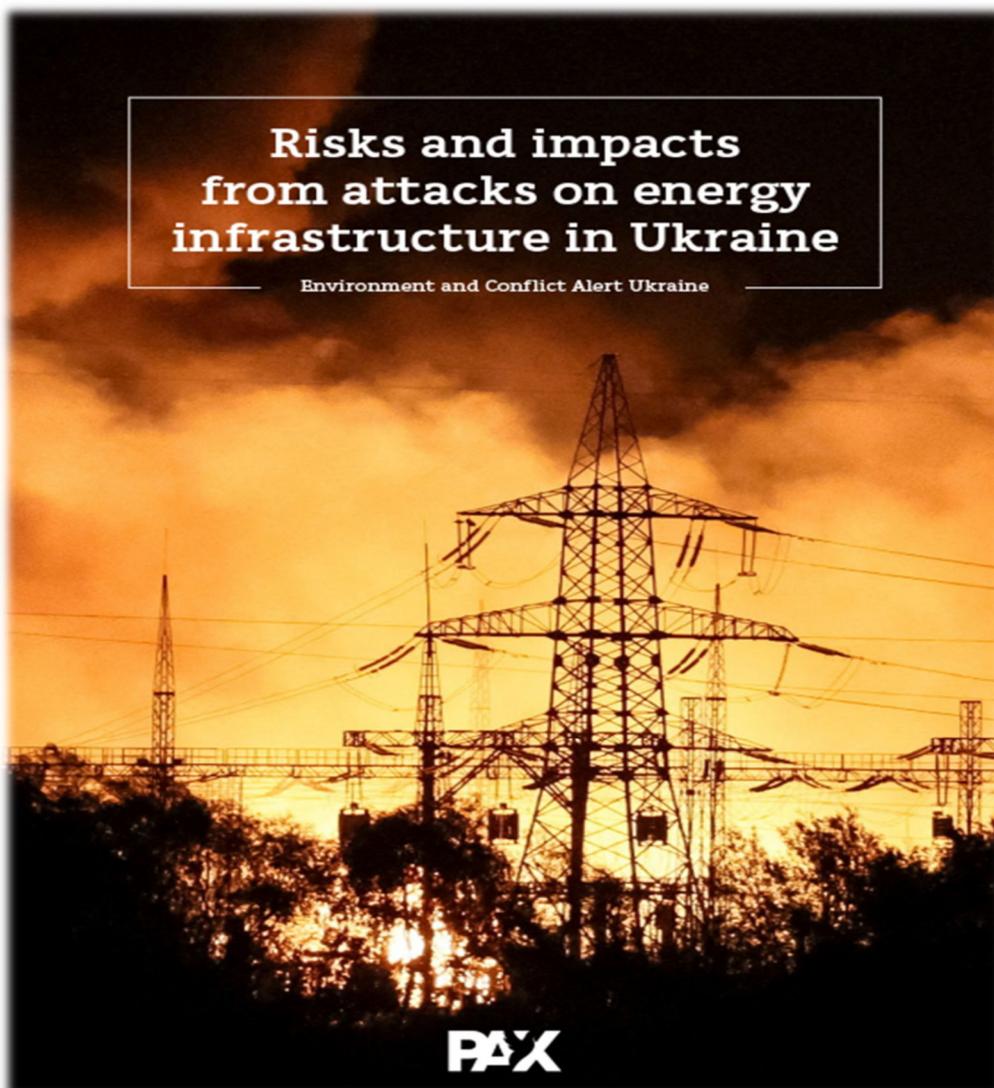
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## ***Security of National Power Supplies HTaaS and National Resilience***

Hydrogen-Tram-as-a-Service (HTaaS) at scale becomes a distributed resilience architecture, not merely a transport programme.

By decoupling traction energy from the electricity distribution network, localising hydrogen production and storage, and creating predictable, anchor loads across 85+ locations, HTaaS reduces national exposure to grid failure, fuel supply shocks and targeted attacks.

In a Ukraine-type conflict that disrupts gas and electricity imports or targets critical infrastructure, HTaaS preserves essential mobility, supports emergency logistics, and creates a multi-day, geographically dispersed energy buffer that national planners can rely on.





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## Core Resilience Advantages

- **Grid decoupling**  
Hydrogen-fuelled VLR does not require overhead electrification or heavy traction substations. Daily operations rely on depot hydrogen stores and local refuelling, not on continuous grid capacity. This removes a major single point of failure that electric bus or tram electrification would create.
- **Distributed production and storage**  
Electrolysers and small-scale hydrogen plants can be sited at depots, industrial clusters and coastal renewables hubs. Each depot becomes a local production and storage node with multi-day fuel reserves, turning 85+ towns into a national mesh of energy buffers.
- **Multi-day operational autonomy**  
Typical depot storage strategies provide 3–7 days of operational fuel; pairing local production extends that window. During prolonged grid outages or supply chain interruptions, HTaaS corridors can continue to move people, goods and emergency services.
- **Reduced import dependency**  
Domestic hydrogen production from renewables or gas-with-CCS reduces reliance on imported oil and gas. That lowers exposure to international supply shocks and geopolitical leverage that characterise conflict scenarios.
- **Hardening of critical movement corridors**  
Fixed, high-capacity HTaaS corridors provide reliable routes for essential workers, medical logistics and evacuation, and are easier to prioritise and protect than a dispersed road network dependent on fuel stations and grid-tied EV chargers.



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# Ukraine-Type Conflict Scenarios and HTaaS Response

## Scenario A: Major disruption to gas imports and electricity interconnectors 2 years + conflict.

- **Impact on conventional systems:** Rapid electricity price spikes, rolling blackouts, fuel rationing for diesel fleets.
- **HTaaS response:** Local hydrogen production continues where electrolyzers are paired with on-site renewables or stored hydrogen; depots supply trams for essential services; corridors maintain connectivity for hospitals, supply chains and emergency response.

## Scenario B: Targeted physical attacks on grid nodes or substations

- **Impact on conventional systems:** Localised but severe outages; long repair timelines for high-voltage infrastructure.
- **HTaaS response:** Depots with stored hydrogen and local micro-production maintain service in affected regions; neighbouring HTaaS nodes can be reallocated to support relief logistics; the distributed nature of hydrogen assets increases redundancy and complicates adversary targeting.

## Scenario C: Cyberattack on grid control systems

- **Impact on conventional systems:** Loss of centralised control, cascading failures, inability to coordinate EV charging or demand response.
- **HTaaS response:** HTaaS operations can run on local control systems with manual fallback procedures; fuel availability is physical and local, not dependent on remote grid orchestration.

## Scenario D: Supply chain disruption for liquid fuels

- **Impact on conventional systems:** Diesel shortages, tanker delays, fuel price volatility.
- **HTaaS response:** Depot storage and local hydrogen production remove dependence on long-haul fuel logistics; predictable corridor demand enables prioritised allocation of scarce resources.
- **Operational Design Features That Deliver Resilience**
  - **Depot sizing and storage policy**  
Design depots to hold a minimum of 3 days operational hydrogen with scalable buffer to 7+ days for critical corridors. Include modular storage tanks and redundancy in compressors and pumps.



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- **Local production mix**  
Prioritise electrolysis powered by local renewables where feasible; where immediate capacity is constrained, use gas-to-hydrogen with CCS as a transitional supply under strict emissions controls.
- **Microgrid and islanding capability**  
Where depots include on-site renewables and battery buffers, enable islanding to sustain hydrogen production during short grid outages.
- **Logistics and mutual aid protocols**  
Establish regional mutual-aid agreements so depots can share fuel and vehicles during crises. Pre-position mobile refuelling units for rapid redeployment.
- **Cyber and physical security hardening**  
Harden control systems with air-gapped backups, multi-factor authentication, and physical protection for storage tanks and electrolyzers. Regular red-team exercises to test resilience.
- **Priority routing and contingency plans**  
Define essential service routes within each corridor that receive priority during rationing, and integrate HTaaS corridors into national emergency transport plans.

## Strategic and Political Implications

- **Sovereignty narrative**  
HTaaS enables a credible message: Britain is reducing dependence on foreign fuels and building sovereign mobility infrastructure. This resonates strongly in a security crisis.
- **Electoral advantage**  
The “keep Britain moving” story appeals to suburban and regional voters who prize practical resilience over abstract energy debates.
- **Cross-departmental buy-in**  
HTaaS sits at the intersection of transport, energy, defence resilience and local economic policy. It creates a platform for cross-Whitehall collaboration and potential defence-civilian funding partnerships.
- **Exportable model**  
A national HTaaS resilience network becomes an exportable capability for allied nations seeking distributed, secure mobility solutions.





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## Immediate Next Steps for Light Rail UK and other Delivery Partners

### 1. Resilience Audit

Rapidly map the 85+ sites to identify depot locations, local renewable potential, existing industrial electrolysis capacity and storage feasibility.

### 2. Minimum Viable Resilience Package

Define a standard depot specification that guarantees 3 days operational autonomy and modular upgrades to 7+ days.

### 3. Pilot Priority Corridors

Select 6 corridors across different regions to demonstrate multi-day autonomy, mutual-aid logistics and emergency routing within 18–24 months.

### 4. Security and Procurement Protocols

Build procurement templates that include resilience KPIs, mutual-aid clauses and security hardening requirements for suppliers.

### 5. National Resilience Messaging

Prepare a concise public narrative linking HTaaS to national security, jobs and regional sovereignty for use in briefings and speeches.

## Key considerations and clarifying questions

- **Considerations:** likelihood of supply shocks; critical-node targeting; cyber threats to grid control; fuel import disruption; urban evacuation and emergency logistics.
- **Clarifying questions:** Do you want this framed for national security briefings, local authority resilience plans, or Prosper UK political messaging?

## Why the UK must future-proof urban energy (short, evidence-based points)

- Attacks on Ukraine's centralised energy assets show the vulnerability of large, concentrated systems; decentralisation increases survivability.
- Grid and fuel supply shocks in conflict produce cascading failures for electrified transport unless alternative fuels and local storage exist.
- Distributed hydrogen production and depot storage create multi-day operational autonomy for urban transport, reducing dependence on imported fuels and stressed grids.
- Policy and procurement that embed resilience (mutual-aid, hardened controls, local buffers) convert transport corridors into civil-defence assets.

**Sources:** IEA analysis of Ukraine energy attacks; World Economic Forum resilience commentary; Rasmussen Global and CSIS reports on decentralisation lessons from Ukraine.



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## Comparative snapshot: Threats vs Urban impacts vs HTaaS mitigations

Threat	Impact on urban energy/transport	HTaaS mitigation
Targeted strikes on substations	Local blackouts; EV chargers unusable	Depot hydrogen storage keeps trams running; no dependency on substations
Fuel import disruption	Diesel shortages; tanker delays	Local hydrogen production reduces import reliance
Cyberattack on grid control	Cascading outages; demand mismanagement	Local control and physical fuel buffers reduce systemic coupling
Peak grid stress from EV charging	Transformer overloads; rationing	Hydrogen VLR avoids large charging loads on distribution network

### Practical resilience measures to adopt now

- **Depot storage standard:** mandate **3–7 days** operational hydrogen buffer for HTaaS depots.
- **Distributed production:** prioritise electrolysers co-located with depots and regional renewables to reduce supply chain exposure.
- **Mutual-aid protocols:** pre-agreed regional fuel sharing and mobile refuelling units for crisis response.
- **Security hardening:** air-gapped controls, physical protection for storage, and regular red-team cyber exercises.

### Political and strategic payoffs

- **Sovereignty:** reduces leverage from hostile states by localising fuel production.
- **Resilience narrative:** credible messaging — “we will keep towns moving even when external shocks hit.”
- **Exportable model:** a distributed HTaaS resilience architecture is an allied capability with commercial potential.

### Risks, trade-offs and mitigations

- **Risk:** rapid roll-out without security standards could create many soft targets. **Mitigation:** enforce resilience KPIs in procurement.
- **Risk:** initial hydrogen supply gaps. **Mitigation:** transitional gas-to-hydrogen with CCS plus renewables build-out.



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## Recommended next steps (actionable)

1. Commission a **Resilience Audit** mapping the 85+ sites for depot siting, storage potential and local renewables.
2. Define a **Minimum Viable Resilience** depot spec (3-day buffer, hardened controls).
3. Run **three pilot corridors** with mutual-aid and mobile refuelling to validate multi-day autonomy within 18 months.
4. Prepare a short national brief linking HTaaS to defence and civil resilience for ministers and mayors.

### 1. Resilience Audit Brief — 85 HTaaS Sites (Executive summary)

**Purpose:** HTaaS deployed across 85+ towns converts a transport rollout into a distributed energy-security asset: it reduces grid dependence, creates multi-day local fuel buffers, and hardens urban mobility against targeted attacks or import shocks — lessons drawn directly from Russia's strikes on Ukraine's energy system.

By rapidly assessing each of the 85+ candidate towns and linear corridors for depot siting, local hydrogen production potential, storage feasibility, mutual-aid logistics and security hardening so HTaaS delivers both transport and national resilience.

#### Scope (what the audit must cover for each site):

- **Depot footprint & siting:** available land, proximity to arterial corridor, access for mobile refuellers.
- **Local generation potential:** on-site renewables (solar/wind), nearby industrial electrolysers, waste-to-hydrogen options.
- **Storage capacity feasibility:** tank volumes to deliver **3–7 days** operational autonomy; modular expansion options.
- **Supply chain logistics:** road access for hydrogen distribution, tanker routes, and contingency mobile refuelling.
- **Grid interdependence:** local substation capacity, single-point grid vulnerabilities, microgrid/islanding potential.
- **Security posture:** physical protection needs, cyber-resilience of control systems, redundancy for compressors/pumps.
- **Mutual-aid links:** nearest neighbouring depots, rail/road links for cross-supply in crisis.
- **Regulatory & planning constraints:** permitting timelines, environmental consents, local stakeholder sensitivities.



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### Key metrics to collect (per site):

- **Minimum depot storage (kg H<sub>2</sub>)** to meet 3-day baseline; scalable to 7+ days.
- **Local electrolyser capacity (MW)** and expected daily H<sub>2</sub> output.
- **On-site renewables (MW)** or contracted green power.
- **Time to first service** if depot built (months).
- **Critical single-point failures** (grid node, road bridge, compressor).

### Deliverables & timeline:

- **Phase 1 (0–8 weeks):** Rapid desktop mapping and risk scoring for all 85 sites.
- **Phase 2 (8–20 weeks):** Site visits to top 30 priority corridors; technical feasibility reports.
- **Phase 3 (20–40 weeks):** Detailed depot specs, resilience KPIs, procurement templates with security clauses.

**Why this matters:** Ukraine's experience shows centralised energy assets are high-value targets; decentralised hydrogen production and depot storage materially reduce the risk of mobility collapse during sustained attacks or import shocks.

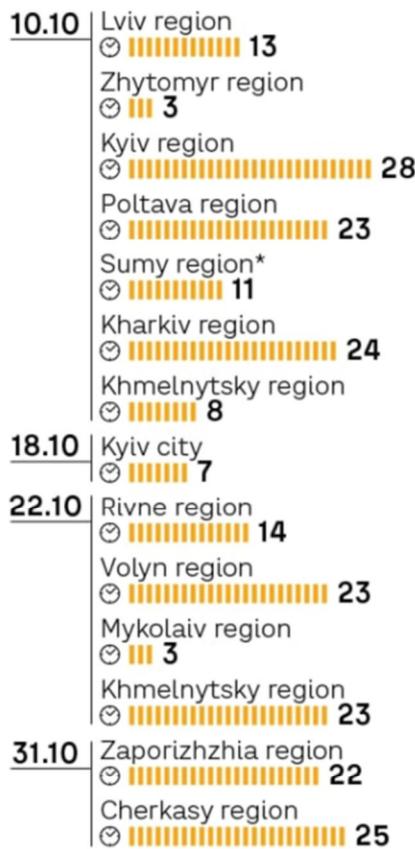




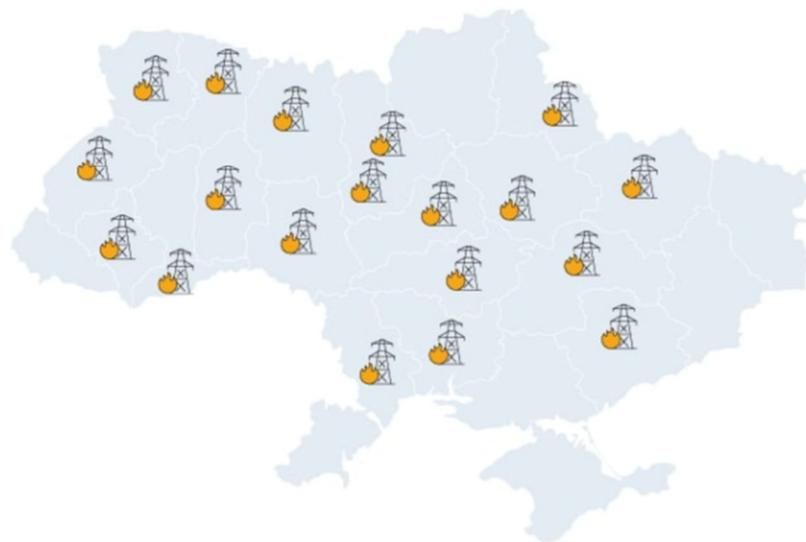
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# THE POWER SUPPLY IS BEING ACTIVELY RESTORED

The time it took electricians to restore power supply, hours



Places of strikes of power facilities in October



**103 times**  
Russia attacked energy facilities during the war.

\* there is no data on the connection of the Shostka district

Sources: city mayors and heads of regional military administrations.  
Data as of 12 p.m. on November 1, 2022; may be incomplete. Only the shelling after 10.10 and the shelling reported by the authorities were taken into account.

[t.me/uawarinformatographics](https://t.me/uawarinformatographics)

**Yasno**

**TOP LEAD**



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## 2. One-Page Ministerial Brief — HTaaS as National Security Infrastructure

**Headline:** HTaaS is transport policy that strengthens national resilience: it keeps towns moving when the grid or fuel imports are disrupted.

### Key points

- **Decouples mobility from the grid:** hydrogen-fuelled VLR does not require continuous traction power from local substations, reducing vulnerability to strikes or cyberattacks on electricity networks.
- **Creates multi-day local fuel buffers:** depots sized for **3–7 days** of operation provide operational autonomy for hospitals, emergency services and supply chains during outages.
- **Reduces import dependency:** domestic hydrogen production (electrolysis + renewables; transitional gas-with-CCS) lowers exposure to international fuel shocks.
- **Distributes risk:** 85+ depots form a national mesh that is harder to disable than a few centralised nodes; mutual-aid protocols enable rapid reallocation of fuel and vehicles.
- **Actionable asks for Ministers:** fund a **Resilience Audit** (8 weeks), mandate depot resilience KPIs in procurement, and approve three pilot corridors with mutual-aid and hardened controls within 18 months.

**One-line ask:** Approve a £Xm Resilience Audit and pilot funding to demonstrate HTaaS multi-day autonomy and national resilience benefits within one parliamentary term.

### Conclusion

At scale, HTaaS is a national resilience programme disguised as transport policy. In a Ukraine-type conflict, it preserves mobility, reduces import vulnerability, and creates a distributed energy buffer that materially strengthens the UK's ability to function under stress. For Prosper UK, this is not only a policy advantage but a strategic national security contribution that can be owned and delivered within a single parliamentary term.

By watching global aggression because attacks on energy infrastructure — as seen in Ukraine — show that decentralised, fuel-diverse urban systems (including hydrogen-based transport) materially reduce national vulnerability and preserve essential mobility during conflict.