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A17 Cross Keys Bridge

This is one of 15 case studies informing the Infrastructure Systems Review.

System: An historic bridge within the regional transport network.

Systems contribution and value: Broadened framing from bridge condition to service availability, reliability and recovery. Potential to reduce disruption costs, improve network resilience, and support freight, economic and community connectivity.

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Summary

Cross Keys Bridge is a Grade II listed hydraulic swing bridge, opened in 1897, carrying the A17 across the River Nene at the Lincolnshire/Norfolk border. It provides the only road crossing at this location, with the nearest alternative around 10km away at Wisbech.

The bridge forms part of the major road network corridor linking the East Midlands with East Anglia and is one of only two principal routes connecting the A1 to Norfolk. It supports nationally significant freight movements serving agriculture, food manufacturing and logistics, seasonal tourism to the Norfolk coast. Cross Keys carries 16,000-18,000 vehicles per day, including 2,500-3,000 HGVs.

As a swing bridge, which opens to allow passage of larger vessels, it also enables river navigation.

Regular openings for river traffic, combined with age-related structural deterioration, maintenance requirements and wider A17 capacity constraints, impact the performance and resilience of the transport network. Closures or restrictions require road traffic diversions via Wisbech, increasing journey times, costs and disruption for businesses, commuters and visitors, and increasing carbon emissions.

The bridge represents a major single point of failure for the regional transport network and economy. Rather than viewing it as an isolated highway asset, it should be considered part of a wider transport and economic system, supporting a place-based resilience approach that prioritises coordinated investment, proactive maintenance and reduced whole life costs.

Regular openings for river traffic, combined with age-related structural deterioration, maintenance requirements and wider A17 capacity constraints, impact the performance and resilience of the transport network.

Scope

This case study defines the scope of Cross Keys Swing Bridge as both a critical infrastructure asset and a point of interaction between multiple transport, economic and community systems.

Geographically, it focuses on the A17 crossing of the River Nene at the Lincolnshire/Norfolk boundary, with recognition of its wider relationship to the regional highway network, including the A47. Its physical scope includes the bridge structure, carriageway, footway, safety features and hydraulic swing mechanism.

Functionally, the bridge provides a strategic road connection, supports nationally significant freight movements, seasonal tourism and river access to the ports of Wisbech and Sutton Bridge. It is also an important local transport link despite limited provision for active travel.

The study considers the bridge's influence on labour market connectivity, agri-food supply chains, tourism, port activity and access to essential services. It also examines interventions ranging from maintenance and operational improvements to wider corridor enhancements and long term replacement options.

Outcomes

Cross Keys Bridge and its associated services should support the safe, reliable and efficient movement of people and goods while maintaining navigational access on the River Nene. An outcomes based approach reframes the bridge from a vulnerable asset to a critical component of a wider transport, economic and community system that must deliver connectivity, resilience and economic stability.

The desired outcomes are to maintain dependable east/west movement along the A17, protect access for communities and emergency services, support freight and agri-food supply chains, sustain tourism and port activity, and improve safety and inclusion for all users, including pedestrians and cyclists.

At place level, outcomes include access to employment, education, healthcare and services; reliable freight and agricultural supply chains; a positive visitor experience supporting the economy. Outcomes align with national objectives for productivity, resilience and net zero by reducing friction in strategic journeys, maintaining connectivity under climate stress, and avoiding unnecessary carbon from unreliable operations and diversions.

These outcomes make clear the bridge's strategic importance. It represents a potentially significant single point of weakness. Structural limits, narrow geometry, swing operations, and exposure to flooding and severe weather could all result in failure of the bridge. It represents a risk hot spot within the context of wider A17 constraints affecting network reliability.

When performance deteriorates, impacts extend beyond the asset. Restrictions or closures force long diversions, increasing journey times, costs and emissions while weakening labour market connectivity, disrupting business operations and supply chains, and reducing resilience in a region with few alternative routes. A prolonged closure would affect residents and workers, delay emergency response, interrupt agricultural logistics, reduce visitor activity, and place pressure on alternative crossings and local roads not designed for sustained strategic traffic volumes.

A systems approach defines interventions not simply to preserve the structure, but to secure the outcomes it enables across the wider network and economy. This shifts focus to measurable service performance, including network availability, journey time reliability, navigation access,

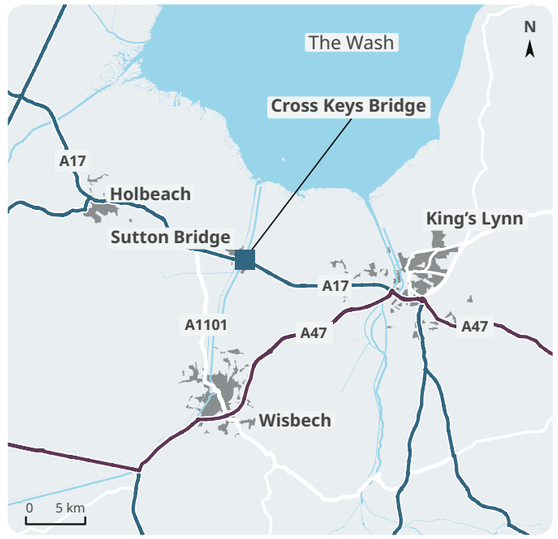
The evidence base for systems change Cross Keys Bridge

Cross Keys Bridge

Regional importance



Local detail



1897
year opened

16-18k
vehicles carried per day

2.5-3k
HGVs carried per day

Cross Keys Bridge at a glance

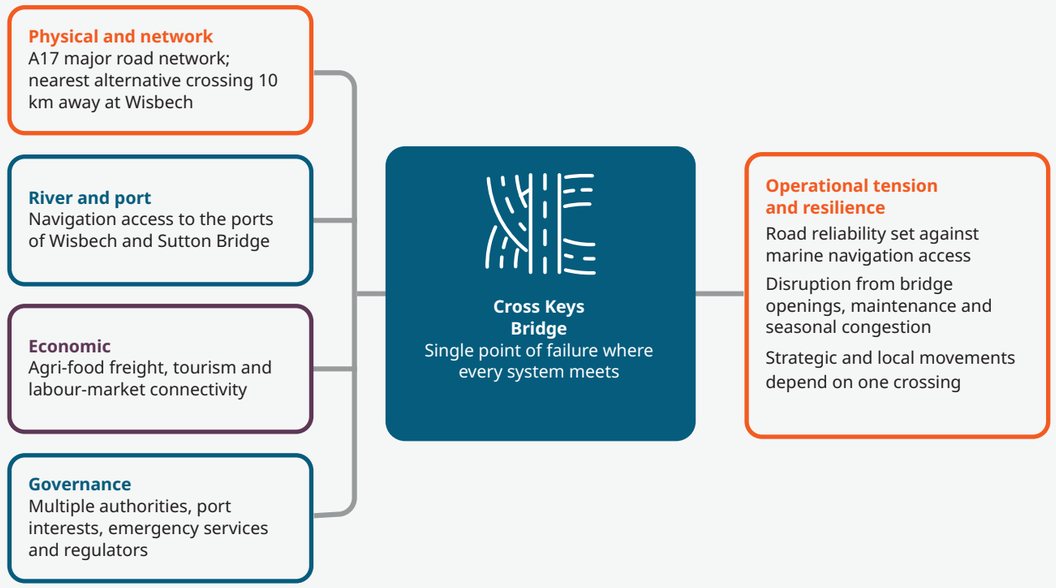
Location and overview
- Located on A17 at the River Nene crossing
- Nearest alternative crossing 10km away at Wisbech
- A17 is a primary east–west corridor
- Linking the East Midlands to East Anglia
- One of only two main routes connecting the A1 to Norfolk

Structure and challenges
- Grade II listed hydraulic swing bridge
- Major weakness on the network
- Single point of failure for local and strategic movements.
- Constraints: structural capacity limits; no segregated active travel; swing bridge openings for vessels; maintenance closures; seasonal congestion

Critical functions
- Supporting freight movements for agriculture, food processing and agri-logistics
- Carrying seasonal tourism traffic to Norfolk's north coast
- Enables river traffic to reach the ports of Wisbech and Sutton Bridge

Systems overview

Cross Keys Bridge operates within a multi-layered transport, economic and governance system.
- **Physical and network system:** the bridge carries the A17, part of the major road network.
- **River and port system:** maintaining navigation access to the ports of Wisbech and Sutton Bridge, creating operational tension between road reliability and marine access.
- **Economic system:** supporting agri-food freight, labour market connectivity, tourism and local business activity across South Lincolnshire, West Norfolk and surrounding areas.
- **Governance system:** responsibilities and impacts are spread across multiple authorities, port interests, emergency services, regulators, businesses and residents.



and recovery from incidents. It also supports proactive maintenance, improved condition monitoring, obsolescence planning, and coordinated working between highway, navigation and emergency stakeholders to anticipate disruption, reduce its frequency, and manage it more effectively when unavoidable.

Critical success factors
Success should be measured through outcome focused indicators: fewer unplanned closures; improved journey time reliability; reduced diversions; maintained emergency access; reduced disruption to freight, tourism and port traffic; improved safety for all users; and greater resilience to flooding and deterioration.

At programme level, success is also shown through lower whole life disruption costs, stronger user confidence, and tangible contribution to regional growth, resilience and lower carbon travel outcomes.

Systems

Cross Keys Bridge operates within a multi-layered transport, economic and governance system rather than as a standalone asset. It sits at the intersection of the A17 corridor, River Nene navigation, local and regional economies, and communities relying on the crossing for access to jobs, services and markets.

Because the bridge is both a route and a node, any change in performance creates ripple effects through traffic reassignment, journey reliability, business activity and accessibility. However, addressing the systemic importance of the bridge is complicated by organisational silos: The bridge sits at the boundary of three counties – Lincolnshire, Norfolk, and Cambridgeshire – requiring coordination between different local highway authorities, each with different priorities.

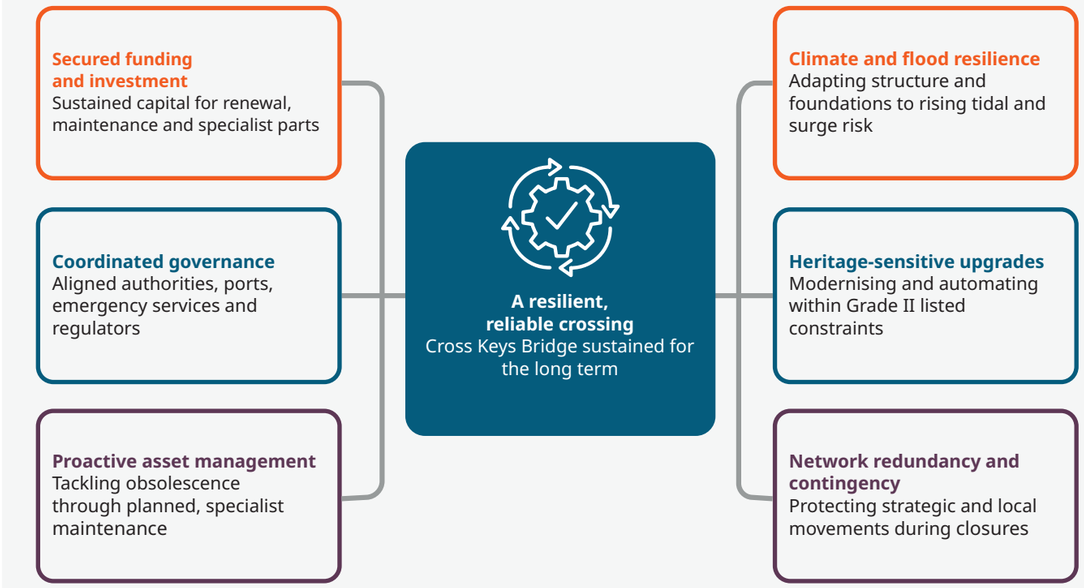
The principal systems are fourfold.

- **The physical and network system:** the bridge carries the A17, part of the Major Road Network and one of only two main routes linking the A1 to Norfolk, with the nearest alternative crossing around 10km away in Wisbech.
- **The river and port system:** as a movable bridge it must maintain navigation access to the ports of Wisbech and Sutton Bridge, creating tension between road reliability and marine access.
- **The economic system:** the route supports agri-food freight, labour connectivity, tourism and business activity across South Lincolnshire, West Norfolk and surrounding areas.
- **The governance system:** responsibilities are shared across highway authorities, navigation interests, emergency services, regulators, businesses and residents.

These systems operate within constraints including structural and geometric limits, flood and climate risk, seasonal peaks, heritage considerations, and the need to balance strategic traffic, local access, freight, tourism, navigation and active travel. These interacting pressures mean decisions in one area can generate consequences elsewhere.

A systems approach makes these interdependencies visible and supports interventions that improve whole system performance rather than preserving the structure alone. This focuses on service outcomes such as availability, reliability, recovery time and diversion readiness. It strengthens governance and reduces the wider economic and social costs of disruption.

The evidence base for systems change Cross Keys Bridge



Alongside physical works, system wide actions are required, including coordinated closure protocols, agreed diversion strategies, clearer communication with users, and alignment with wider A17 management.



10km
Nearest alternative road crossing

Interventions

Interventions should focus on improving whole system performance rather than treating Cross Keys Bridge as an isolated structure. This means combining measures that address the bridge's physical and operational vulnerabilities – its ageing listed fabric, narrow geometry and exposure to flooding, plus measures that address both heavy A17 traffic and river navigation, and that reduce disruption across the surrounding network and dependent economic activity.

The aim is to protect service continuity, manage risk proactively, and balance reliability, heritage, safety and navigation requirements.

In the short term, priority measures include risk based maintenance, renewal of critical hydraulic and mechanical components, improved spares and obsolescence planning, condition monitoring, and targeted safety improvements. Medium term measures could include junction improvements on approaches, better provision for walking and cycling, and improved integration with wider corridor operations. Longer term options may include major refurbishment, a parallel crossing, capacity enhancement, or structural replacement where this improves resilience and performance.

Alongside physical works, system wide actions are required, including coordinated closure protocols, agreed diversion strategies, clearer communication with users, and alignment with wider A17 management. Together, these should reduce closures, improve reliability, strengthen resilience to extreme events, and lower the wider economic and social costs of disruption while supporting more coordinated governance based on shared service outcomes.

Cross Keys Bridge vulnerabilities, constraints and challenges

Current vulnerabilities

- Ageing structure and mechanical/hydraulic systems
- Structural capacity limits
- Exposure to flooding and extreme weather
- Heritage constraints, reliance on specialist parts/maintenance

Operational constraints

- Single crossing point and narrow geometry
- High traffic demand (18,000 vehicles per day)
- High HGV demand (18%)
- Seasonal variations
- 3–4 bridge openings for river traffic per day (uncertain demand)
- Planned maintenance closures, and limited alternative routes

Long-term resilience challenges

- Increasing traffic and HGV demand
- Seasonal tourism peaks
- Climate change impacts
- Rising maintenance burden
- Parts obsolescence
- Risk of longer and more frequent disruption events

Economic assessment

Improving Cross Keys Bridge would generate significant economic benefits by reducing the risk and cost of disruption on a critical section of the A17, strengthening connectivity between agri-food production, processing, logistics and port activity, and improving access to jobs and services across county boundaries. The strongest economic case is likely to arise not only from conventional transport benefits but from avoided disruption and protection of wider system performance.

Baseline – do minimum
Under a reactive approach, costs accumulate through increasing maintenance visits and emergency repairs as components age, alongside growing user disruption from restrictions, closures and diversions. These costs include lost time, higher vehicle operating costs, logistics inefficiency, missed appointments, reduced visitor spend and higher emissions. Because alternative routes are long and often unsuitable for sustained diversion traffic, even short closures generate disproportionately high economic, social and environmental costs. The do minimum case also carries the risk of a major failure event resulting in prolonged closure, significant repair costs, and reputational and heritage impacts.

Economic impacts
Upgrading or replacing the bridge would reduce the frequency and duration of closures and restrictions, generating benefits through journey time savings, improved reliability, lower vehicle operating costs and reduced diversion mileage. These effects also deliver external benefits linked to decongestion, safety, emissions, air quality, noise and infrastructure wear. For appraisal, monetised impacts are likely to include travel time savings, vehicle operating costs, reliability benefits, selected externalities and infrastructure carbon. The freight function is particularly important as more dependable HGV journeys would improve supply chain efficiency, reduce logistics costs and support time sensitive sectors such as agriculture and food processing.

Lessons learnt are transferable across similar assets: critical crossings should be managed as service platforms rather than isolated structures, with clear availability and recovery targets, and appraisal based on whole system impacts.

Wider economic impacts
The bridge supports economic performance beyond direct user benefits. Greater reliability on the A17 would strengthen links between production areas, processing centres, logistics hubs and the ports of Wisbech and Sutton Bridge, maintaining market access and productivity in logistics dependent sectors. Improved east/west connectivity would expand labour market catchments across Lincolnshire and Norfolk, supporting recruitment, workforce flexibility and access to employment. Sustained road and river access would support port activity and multimodal connectivity. Reducing disruption risk also improves business confidence and investor certainty, supporting growth including housing, employment land and agri-tech development.

Social and non-monetised impacts
Beyond monetised benefits, improvements would deliver social value by reducing rural isolation, improving access to healthcare, education, employment and retail, and enhancing reliability for emergency services. Safer, more dependable journeys improve community resilience, while better walking and cycling provision can support inclusion. These impacts strengthen the case by reducing vulnerability in areas with limited alternative routes and reinforcing the crossing as an essential service link rather than simply a transport asset.

The evidence base for systems change Cross Keys Bridge

Recommendations framework

Recommendation theme	Lead audience	Action focus	Intended outcome
A17 corridor resilience strategy	Local authorities, funders and strategic partners	Assess diversion resilience and longer-term crossing options	Reduced single point of failure and stronger regional connectivity
Long-term resilience planning	Local authorities, funders and strategic partners	Include resilience in forward investment pipeline planning	Clearer long-term investment direction
Whole-system appraisal	Government / HM Treasury	Include disruption, freight, carbon and distributional effects in critical asset business cases	Investment decisions reflect the full consequences of failure
Outcome-led approvals	Regulators and heritage bodies	Engage early to balance heritage protection with operability, maintainability and resilience	Reduced approval risk and improved long-term function
Service-led asset management	Asset owners and funders	Use availability, unplanned closure and time-to-repair metrics to trigger proactive investment	Fewer closures, faster recovery and lower whole-life disruption costs
Cross-sector resilience	Highways, navigation, emergency services and local partners	Create scenarios, common expectations, comms protocols and alternative diversion plans	More coordinated response to disruption and clearer shared accountability

Systemic assessment

This case study highlights systemic issues that reduce value for money in managing ageing infrastructure, particularly where a single asset supports multiple services and sectors. It identifies key inefficiencies and barriers.

Siloed appraisal and funding can underweight disruption, carbon and resilience impacts borne by businesses, emergency services and communities. Performance is often measured in terms of condition rather than service, meaning condition grades alone may not trigger timely investment; service metrics such as availability, reliability and repair time provide stronger decision signals.

Movable bridge capability gaps, including specialist skills, parts obsolescence and long lead times, can increase downtime without proactive planning. Heritage constraints are sometimes treated as a barrier rather than an integrated design parameter that can enable more resilient solutions. Weak cross border coordination can delay decisions and increase long term costs where impacts span administrative boundaries.

Several transferable lessons emerge.

- Resilience decisions should be framed around service outcomes and whole system costs rather than maintenance budgets.
- Rural crossings can be nationally significant because diversion impacts are high and small investments can prevent disproportionate disruption.
- Integrating transport, navigation and heritage from the outset reduces programme risk.
- Using consistent metrics such as availability, disruption days avoided, carbon avoided and failure cost avoided supports better national prioritisation.

Recommendations

Lessons learnt are transferable across similar assets: critical crossings should be managed as service platforms rather than isolated structures, with clear availability and recovery targets, and appraisal based on whole system impacts including disruption, carbon and emergency access. This avoids under investment that can later manifest as high cost, high disruption failure. Recommendations are:

- Develop a coordinated A17 corridor resilience programme, including diversion route improvements and assessment of long term crossing options, to address this potential single point of failure and support economic growth.
- Prepare a long term resilience phased plan moving beyond reactive maintenance. It should define required service levels over 30-50 years, assessing risks from ageing assets, flooding, extreme weather, traffic growth and obsolescence. It should set trigger points for refurbishment, strengthening or replacement, including whole life option appraisal.
- Establish a multi-agency resilience group to coordinate highway, navigation and emergency stakeholders, with agreed closure protocols, diversion strategies and communications.
- Develop business cases to capture disruption, resilience and carbon impacts, including rural distributional effects.
- Shift from asset management to service-led performance using availability, reliability and repair time to trigger proactive investment.
- Initiate early engagement with heritage bodies to find and enable solutions that balance protection with long term operability and resilience requirements.

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