Bridges and Active Travel

TII Conference
22 September 2022

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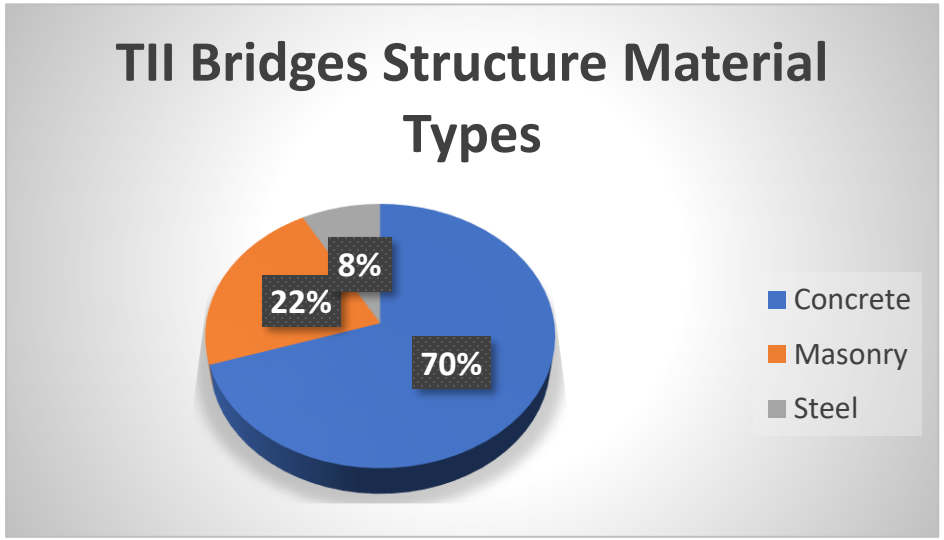
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

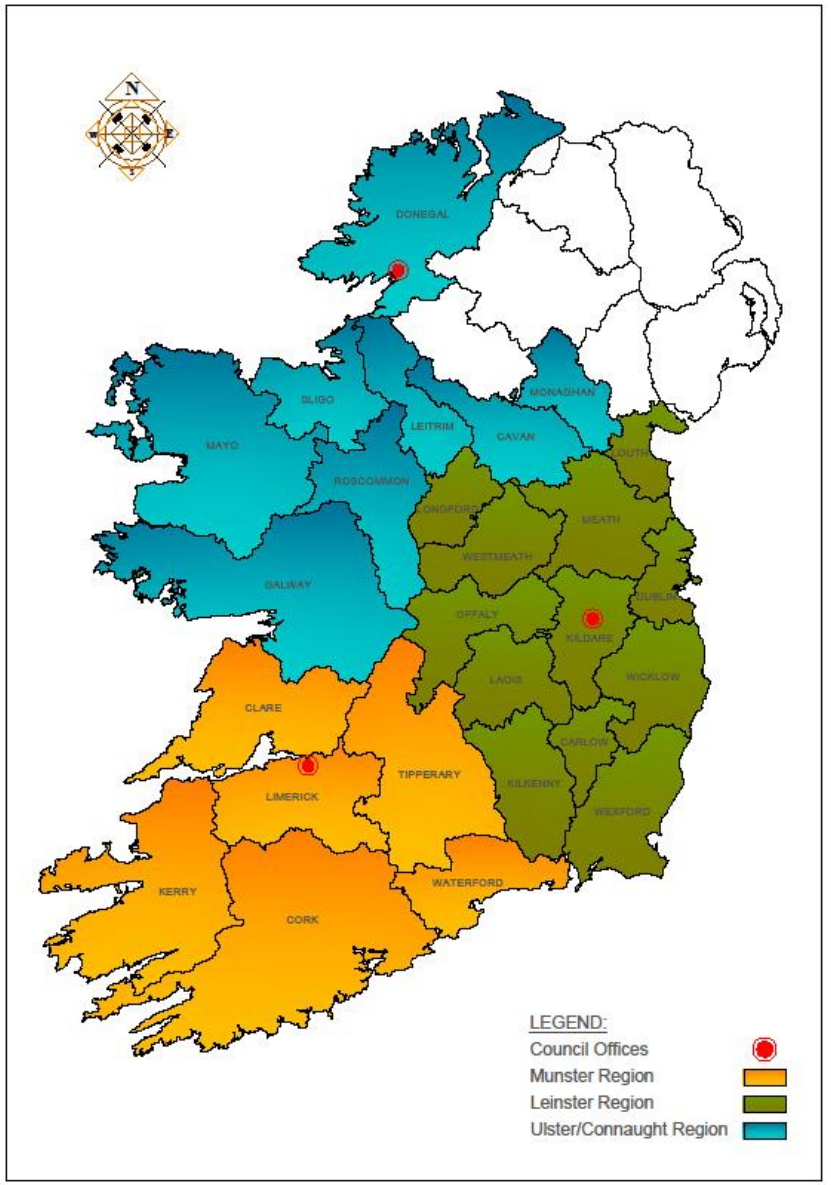
Contents

1.0 Context: Eirspan Bridge Management

Context: Eirspan Bridge Management System

Region	Bridge Numbers
TII Northwest	709
TII Munster	1,032
TII Leinster	955
Total TII-maintained	**2,696**
PPP	593
Grand Total	**3,289**





Eirspan Enhancing Pedestrian and Cycle Facilities

N62 Ferbane Bridge Co Offaly

Improved Pedestrian Facility

New Footbridge installed in 2009

N4 Carrick-on Shannon Bridge

Improved Pedestrian Facility

New Footbridge installed in 2010

Eirspan Enhancing Pedestrian and Cycle Facilities

Improved Pedestrian Facility

N22 Macroom Bridge Co Cork

New Footbridge installed in 2013

N78 Castlecomer Bridge Kilkenny New Footbridge installed in 2021

Eirspan Enhancing Pedestrian and Cycle Facilities

2.0 The Need for Greenways and Active Travel

Sustainability Commitment

Statement of Strategy Goal:

New Infrastructure - Deliver national road, light railway, metro and Active Travel infrastructure, contributing to compact growth, sustainable mobility, enhanced regional accessibility and the transition to a low-carbon future

Embedding sustainability objectives in our transition to Net Zero

TRANSPORT INFRASTRUCTURE IRELAND

SUSTAINABILITY STATEMENT

Transport Infrastructure Ireland's (TII's) mission statement is to provide high quality transport infrastructure and services, delivering a better quality of life and supporting economic growth.

TII will strive to incorporate sustainability principles into the development and operation of the road and light rail networks; therefore, contributing to social well-being, supporting economic efficiency, and protecting, restoring and enhancing environmental systems for future generations.

Through the following strategic goals, TII is committed to embedding sustainability objectives into our core activities.

Corporate Leadership:

- Ensure that consideration of sustainability principles are embedded at all levels of the decision-making process
- Promote the delivery of transport solutions that support land use planning policy to facilitate appropriate urban densities through engagement with our stakeholders and local authority partners
- Create and maintain transport links to enhance connectivity between rural and urban communities to support the development of the wider economy
- Maintain functionality, efficiency and safety of the national road and light rail network to accommodate sustainable land use patterns
- Explore sustainable funding mechanisms to support the delivery of road and light rail projects while preserving our network assets

Strategic Management:

- Use research, knowledge and experience to provide guidance and standards for industry to ensure common alignment of our sustainability goals and to enhance collaboration in the provision of road and light rail networks
- Deliver innovation in road and light rail network design, construction and maintenance, including the reduction and reuse of natural resources, protection of ecological habitats and green procurement
- Increase the use of information technology and new thinking to support innovation, optimise collaboration and refine processes; aiding and enhancing the user experience when interfacing with TII
- Achieve efficiency gains in the operational running of our network systems, particularly in the use of natural resources and energy efficiency
- Continue to adapt Ireland's national road and light rail networks to enhance resilience to climate change

Stakeholder & Public Engagement:

- Demonstrate leadership and commitment to sustainability through guidance to staff and supply chain partners
- Undertake dialogue with stakeholders and the wider community through the planning process

Evaluation & Continual Improvement:

- Periodically evaluate the effectiveness of our sustainability approach in the delivery of our core activities

Supporting these commitments, TII undertakes to prepare and deliver a sustainability plan, in order to integrate sustainability principles into our culture, our processes and our projects.

Chief Executive Officer

31 January 2018

TII Sustainability Statement

TII Statement of Strategy 2021 - 2025

TII Sustainability Implementation Plan

- TII Sustainability Implementation Plan:
  - Expansion of access for all to active travel e.g. cycle lanes, footpaths, greenways, and segregated from other modes where possible
  - Provide effective, efficient and equitable mobility
  - The National Energy and Climate Plan 2021-2030 (2019) (NECP) includes an action on expanding the network of cycling paths
  - Active Travel and Greenways contribute to lowering our carbon footprint and contributing to Net Zero
  - Subscribes to the 'Get Ireland Active!' National Physical Activity Plan

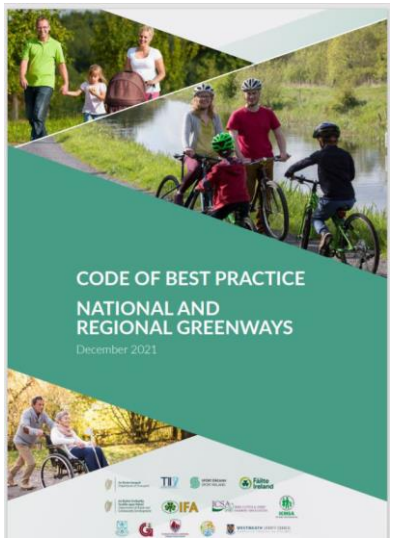
OUR FUTURE
TII Sustainability Implementation Plan

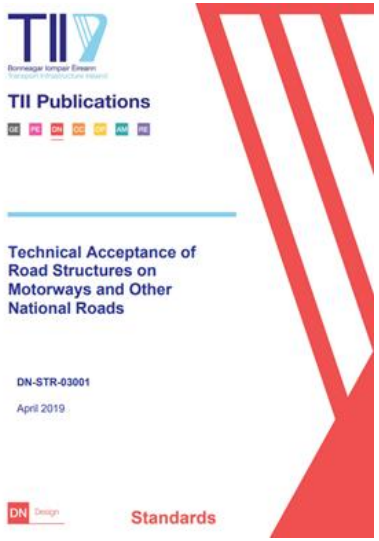
Athlone Bridge Greenway under construction 2022

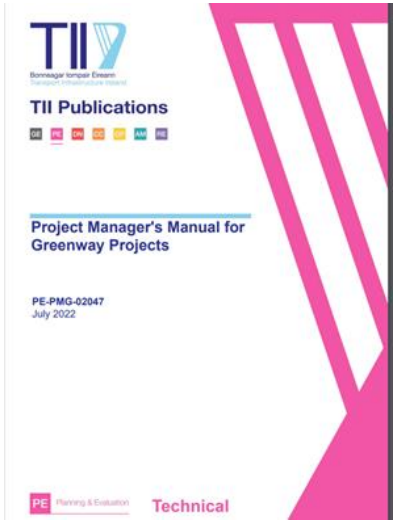
3.0 Greenways and Active Travel – Structures Guidance

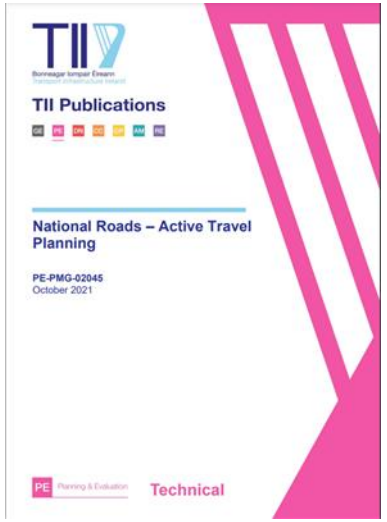
Greenways and Active Travel - Structures Guidance

- Documents:
  - DoT Code of Best Practice National and Regional Greenways – *Little reference to structures*
  - PE-PMG-02045 National Roads Active Travel Planning – *headroom guidance*
  - TII PE-PMG-02047 Project Manager's Manual for Greenway Projects – *Technical Acceptance*
  - TII DN-STR-03001 Technical Acceptance of Road Structures on Motorways and Other National Roads:
    - Outline Structures Report
    - Options Report
    - Preliminary Design Report
    - Technical Acceptance Report Design and Check Certs



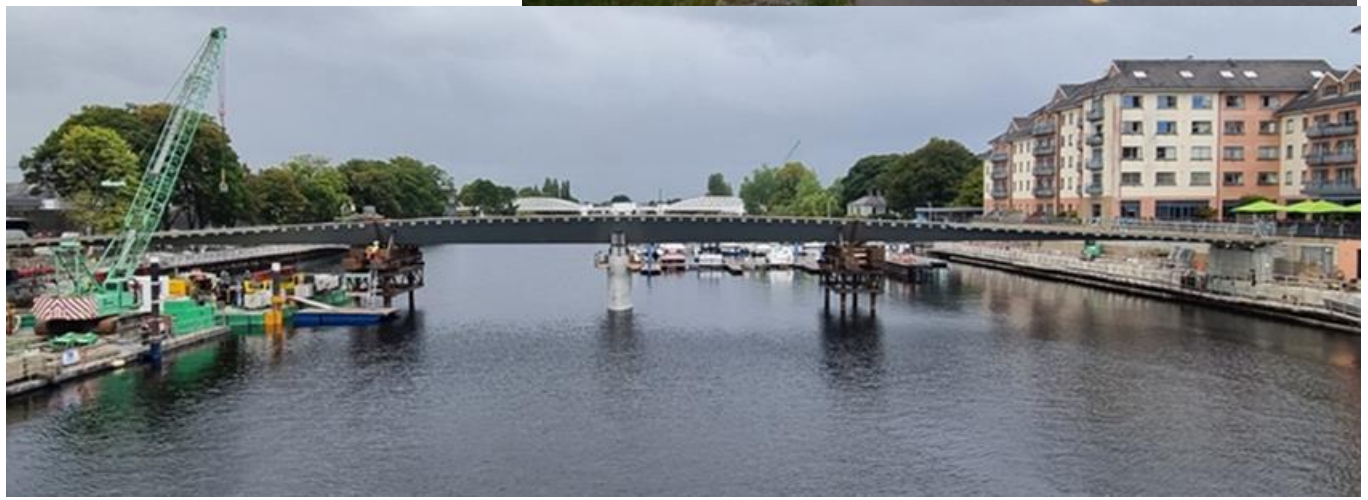






Constraints and Considerations for New Structures

- Existing topography and landscape geometry
- Visual Impact - Bridge Aesthetics for rural and urban settings
- Ecology and Environmental issues, Habitats Directive, AA Screening, NIS, EIA
- Archaeological and Conservation Heritage – TII Project Archaeologist assignment
- Architectural Heritage
- Public and stakeholder notification and buy-in
- Planning approval
- Constructability
- Funding



Constraints and Considerations for Existing Structures

- Who will maintain the Active Travel and Greenway structures?
- How many bridges are there in all of the schemes?
- What is the condition and maintenance history of the bridges?
- What is the structural capacity of the existing bridges?
- Will the bridges be managed as Eirspan structures?
  - Principal Inspections & Routine Maintenance
  - Underwater Inspections
  - Post-tensioning Special Inspections
- How do we use cross-asset management in prioritising maintenance funding allocations between Active Travel and Road structures?
- Existing bridge geometry constraints
  - 1.4m parapet height required for cyclists
  - Existing bridges often too narrow for shared facility


Regional Road Bridge


Bord na Mona Bridge

Sympathetic method to increase parapet height for pedestrians

Active Travel Headroom at Existing Structures

PE-PMG-02045 National Roads – Active Travel Planning: “A desirable minimum clearance / headroom shall be provided for active travel faci at structures”

Consider the need for maintenance of existing and new structures eg future maintenance painting of steelwork

Table 3.8 Minimum Height Dimensions for subways

Type of Subway	Length of Subway (m)	Height (m)
Wide	-	2.6
Normal	< 23	2.4
	≥ 23	2.7
Narrow	-	2.3

Table 3.9 Enclosed Footbridges Minimum Headroom Requirements

	Minimum Headroom (m) inside enclosure
Pedestrian Only	2.3
Pedestrian and Cyclist	2.4
Equestrian (dismounting provisions in accordance with DN-STR-03005 Section 12.14)	2.7
Equestrian (Mounted)	3.7

DN-GEO-03040 Subways for Pedestrians and Cyclists Layout and Dimensions
DN-STR-03005 Design Criteria for Footbridges
DN-GEO-03036 Cross Sections and Headrooms – *The desirable minimum headroom along cycle facilities is 2.7 metres, however over short distances a reduced head height of 2.4 metres is acceptable.*

Heritage Structures will Require Sympathetic Repairs

Adare Bridge
Constructed in the year 1410

NHL5 Lime Mortar – Specification Series 2400

Tie-bars and Pattress plates prevent overturning of parapet and spandrel wall

Stonework deterioration due to vegetation

Do the Concrete Bridges have Durability Defects?

Concrete delamination, concrete cracking, rust staining, leachate staining, dampness, failed expansion joints, marine environment, vulnerable half-joint detail

Are the Bridges Scour Susceptible?

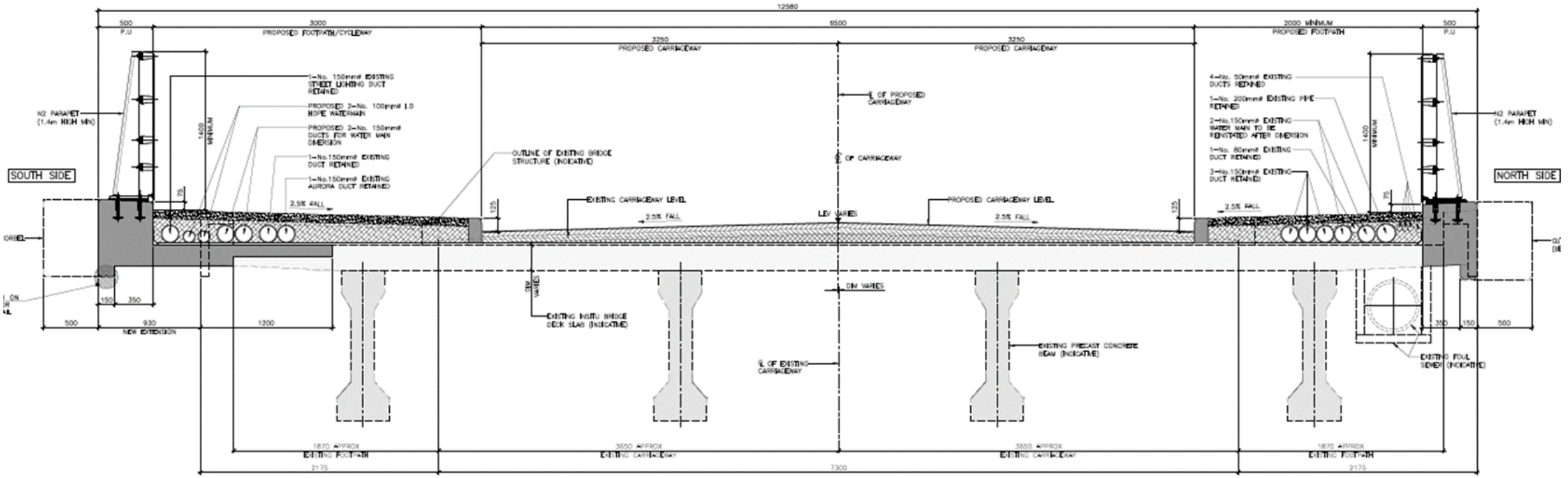
Bridges with shallow foundations are most susceptible to scour damage from erosion of the river bed

4.0 Case Study 1 – O’Hanrahan’s Bridge New Ross Wexford

O'Hanrahan's Bridge New Ross Wexford

- Rehabilitation of 1960s simply supported post-tensioned 170m long river bridge on a de-classified route (old N25)
- Works include Post-Tensioning Special Inspection, potential deck strengthening, replacement expansion joints, replacement parapets 1.4m high and N2 containment, deck waterproofing
- Bridge to be widened by 0.93m on southern side to accommodate a Greenway spur
- Widening of existing quay wall and bridge approach wingwalls required

O’Hanrahan’s Bridge New Ross Wexford



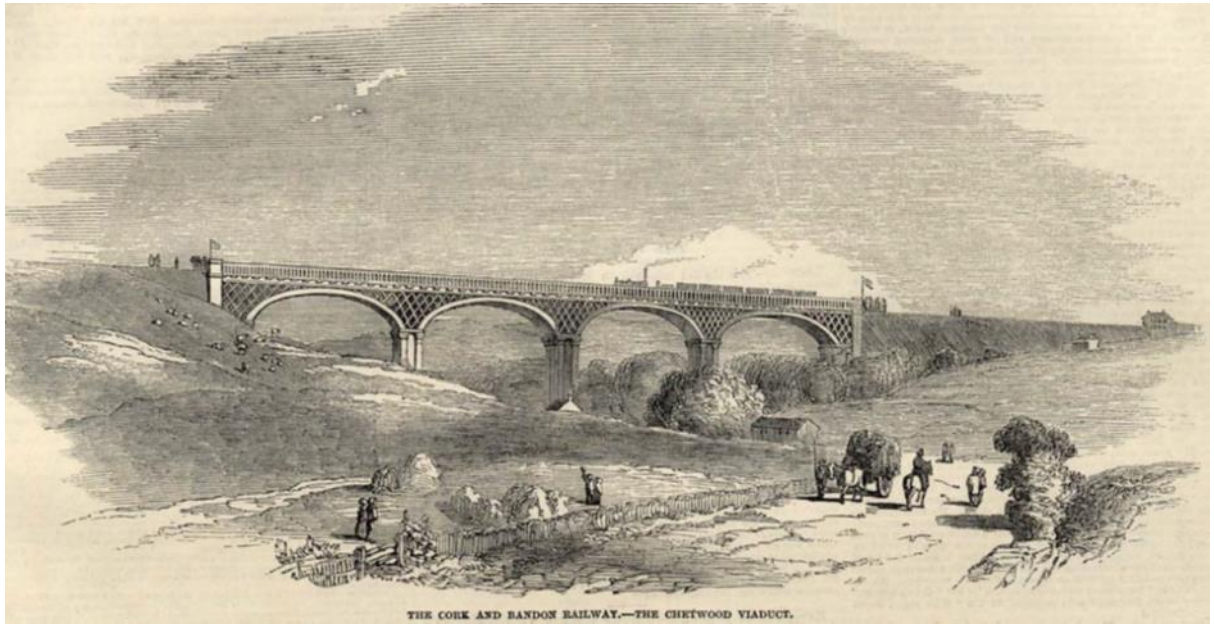
O’Hanrahan’s Bridge New Ross Wexford

Photo of Existing Road Layout

Photomontage of Proposed Road Layout

5.0 Case Study 2 – West Cork Greenway: N71 Chetwynd Viaduct Cork

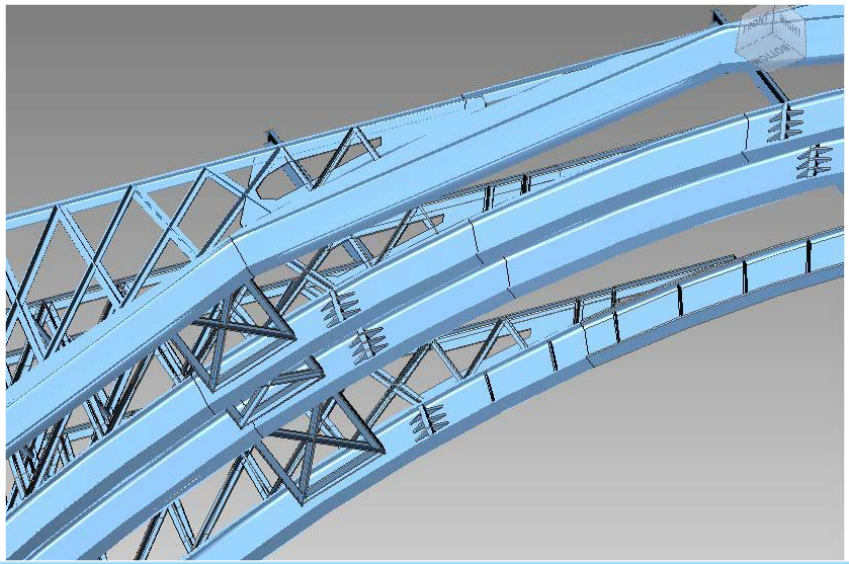
West Cork Greenway - N71 Chetwynd Viaduct

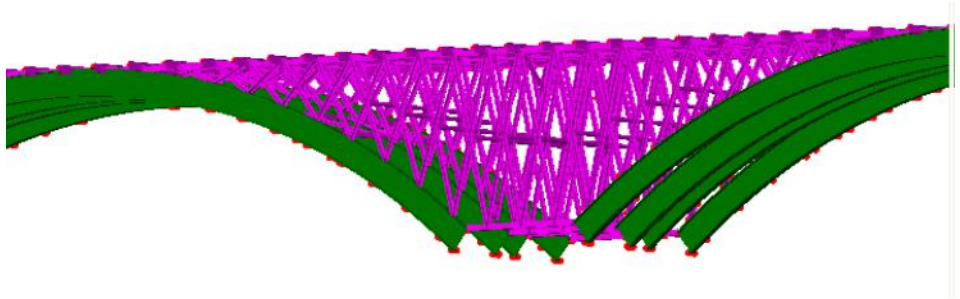


Chetwynd Viaduct, image from Illustrated London News, 1851
Bridge opened 1851, closed 1961

- Feasibility study in 2013 investigated the viability of a Greenway from Cork to Kinsale along the abandoned railway line
- Structures included 152m long (500 feet) Chetwynd Viaduct and 800m long Goggins Hill rock tunnel
- The feasibility of the proposed West Cork Greenway is about to reconsidered
- Deck removed in early 1970's

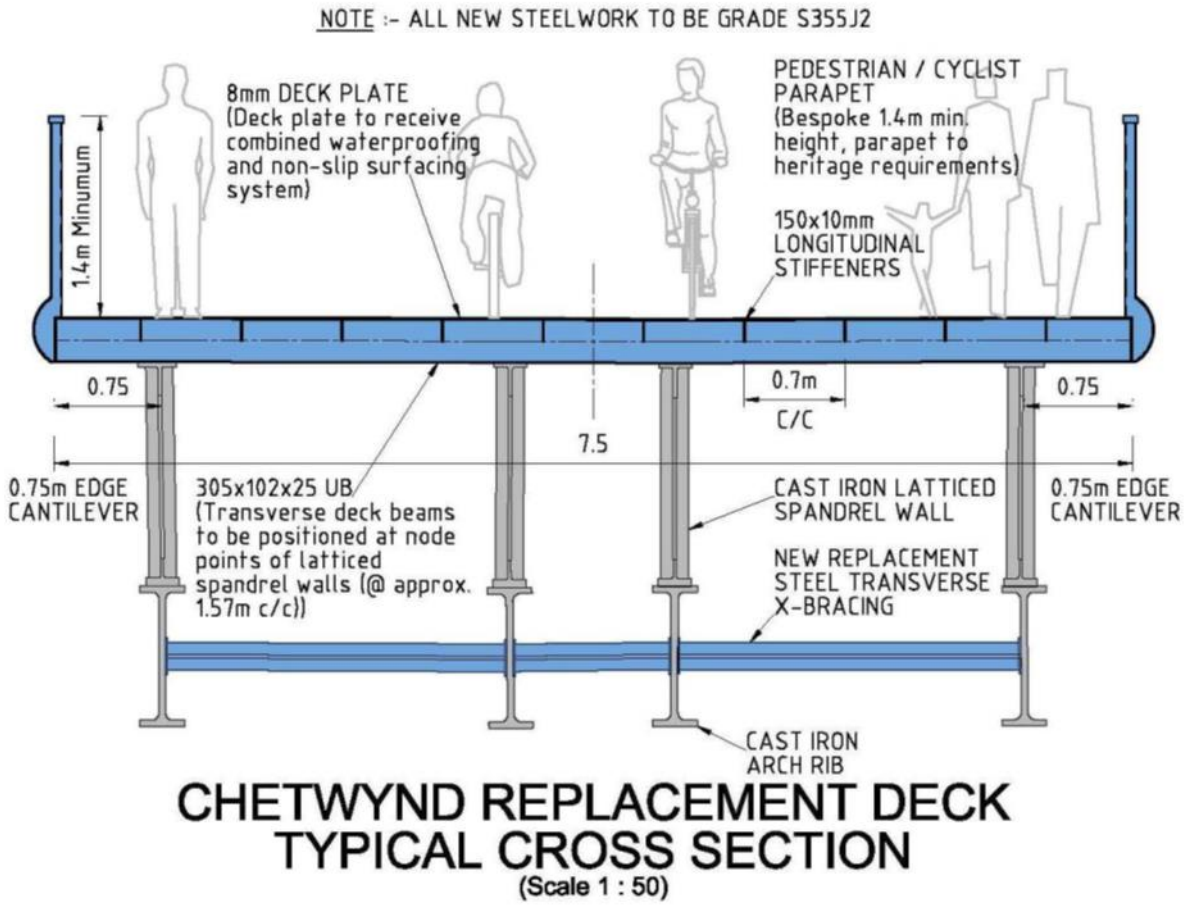
West Cork Greenway - N71 Chetwynd Viaduct





- RPS undertook a Principal Inspection and structural assessment of the bridge in 2013
- 3D laser scan output and 3D finite element model helped with the structural assessment
- Each deck span comprises four cast iron arch ribs with cast iron bracing and wrought iron tie rods
- Main structural members are in good condition and the bridge passed its assessment for the relatively low proposed live loading

West Cork Greenway - N71 Chetwynd Viaduct



- Options study will consider the potential of constructing a new steel deck with new steel bracing members
- 1.4m high parapets required for cyclists
- Heritage aspects to be addressed sympathetically
- The structure will have a new lease of life and will be an attraction in itself

West Cork Greenway – Goggins Hill Rock Tunnel

- 800m long rock tunnel
- TII will shortly arrange for a Principal Inspection of the tunnel and a feasibility study to ascertain the suitability of the tunnel for use as a Greenway
- Need to consider:
  - Geological investigation of the rock
  - Non-destructive testing of the rock
  - Assessment of the structural stability of the rock face
  - Need for lighting
  - Need for ventilation
  - Social aspects of using such a long tunnel
  - Inspect for rockfalls
  - Need for rockbolts or rock netting?

Caha Rock Tunnel Cork/Kerry Border

- Why does Goggins Hill rock tunnel require careful investigation?
- Reports of rockfalls in the 190m long Caha tunnel reported to Kerry Co Co in 2018
- Engineering and Geological Inspections of the tunnel rock followed by regular monitoring by engineers
- Geophysical Investigation of the tunnel rock
- Ground Penetrating Radar, resistivity testing and seismic profiling required to appraise the extent of fracturing within the rock mass around the tunnel
- Testing identified the need for rockbolts to safeguard the integrity of sections of the tunnel, and rock nets to prevent small rock pieces falling onto traffic

6.0 Sustainability Initiatives in Bridge Management

Sustainability Initiatives in Bridge Management

- Use of Electric Vehicles only for all Eirspan Routine and Principal Bridge Inspections
- Actively seeking sites for incorporating innovative bridges designed and constructed using wind turbine blades as main structural members as prototyped by Munster Technical university with their ‘Blade Bridge’ on the Midleton to Youghal Greenway
- Wind turbine blades are constructed from Glass Fibre Reinforced Polymer
- TII were the first organisation in Ireland to strengthen a bridge using bonded Carbon Fibre Reinforced Polymer (CFRP) plates. TII has also used stressed bonded CFRP plates to strengthen a bridge.


Blade Bridge 2021


Borim Bridge Strengthening

7.0 Summary

Summary

- All of the new structures and existing structures associated with Greenways and Active Travel will require incorporating into a Bridge Management System
- All of the new structures and existing structures associated with Greenways and Active Travel will require routine and structural inspections, and routine and structural intervention maintenance work
- There are specific challenges with existing structures regarding the addition of Active Travel lanes. Geometrical constraints including the width of the existing bridge and the need to maintain existing carriageway widths may present a significant obstacle to the design of an additional Active Travel provision on the structure
- It may be possible to widen bridges or to construct a new bridge adjacent to the existing structure in order to provide an Active Travel shared surface. Low parapets are an issue given cyclists require a parapet of 1.4m height.
- In widening existing footways on bridges there may be a need to divert statutory undertakers plant
- Heritage matters require addressing sympathetically when undertaking the works
- Well-considered changes to existing bridges can make a significant positive contribution to the ongoing provision of Greenways and Active Travel routes nationwide