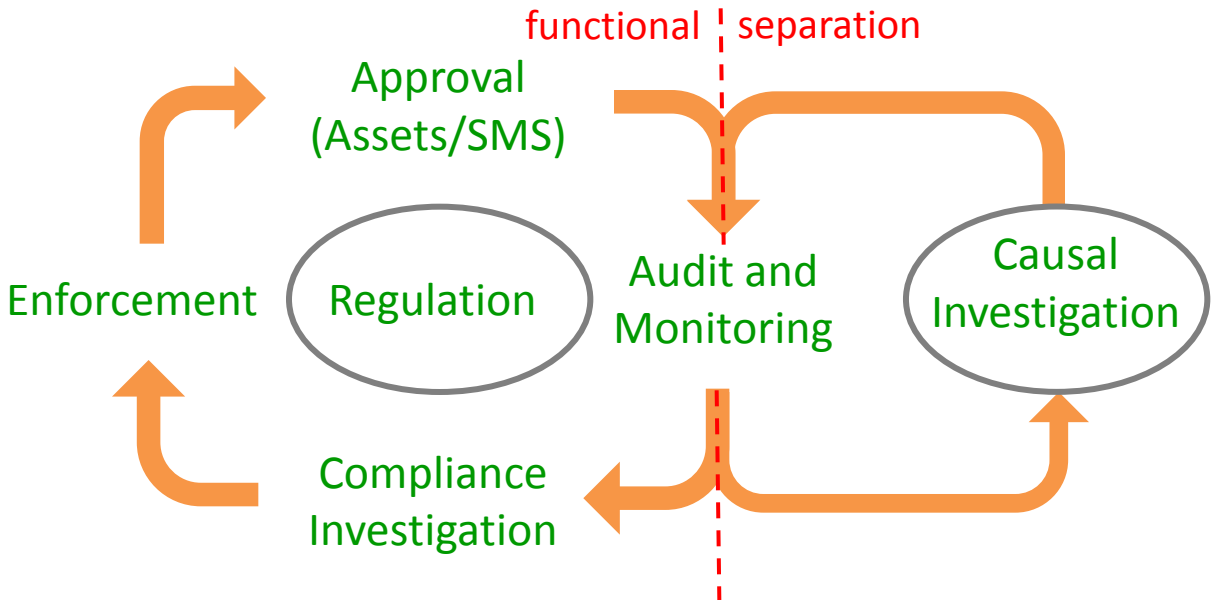
Malahide Viaduct Collapse

21st of August 2009

RSC/RAIU:


functional separation
Approval
(Assets/SMS)
Enforcement
Regulation
Audit and
Monitoring
Causal
Investigation
Compliance
Investigation


Derry
Belfast
Donegal
Portadown
Sligo
Ballina
Dundalk
Westport
Drogheda
Dublin
Galway
Portarlington
Limerick
Tralee
Mallow
Waterford
Rosslare
Cork

Location:

- Approximately 15km north of Dublin
- Double track
- 45 train movements/day each direction;
  - Inter city service to Belfast
  - Inner/outer suburban
- Max line speed 145 kph
- Typical suburban DMU consist 6 piece with c. 6-700 pax at rushour

Collapse:

- No alignment problems identified in recent inspection/monitoring
- 17.50 Pearse/Dundalk passed c. 18.20 with no observed problems
- 18.07 Balbriggan/Connolly passed c. 18.21-22, driver noted partial collapse of ‘down’ line
- Driver of 18.07 stopped in Malahide and walked back to inspect by which time *(15 minutes?)* both lines had substantially failed
- Failure was ‘catastrophic’

Prevailing Conditions:

- Subject to relatively aggressive tidal flows
- Collapse occurred at low tide (high tide was 12.44)
- Tides were high but not excessively so;
  - not at lunar cycle max (*c. 3.9m but 4.26m at full moon 090825*)
  - Tides range not at max (*projected 4.71 m at equinox 090922*)
  - No significant wind generated surge
- c. 45mm rain Wednesday/Thursday, heavy but again not excessive.
- Last trains over ‘up’ and ‘down’ were DMU’s i.e. not heaviest loadings
- No other extenuating/unusual circumstances

Investigations

- RU investigation

  internal investigation

- RSC investigation

  Compliance investigation

- RAIU investigation

  No blame investigation

RAIU investigation:

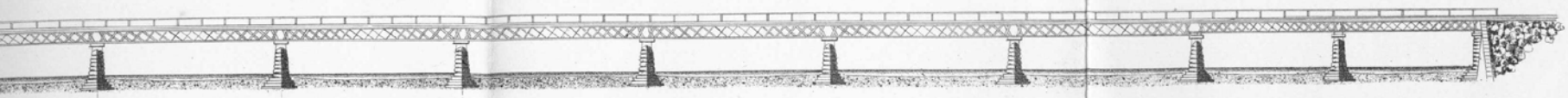
- Mobilised immediately to site following notification.
- Appeal to public for information;
- Date collection phase;

Viaduct History:

- Broad-Meadow estuary spanned by 2 x causeways and the viaduct, total 1800m
- Original timber structure c. 1843,
  - 11 equal spans
  - piers founded on piles
  - serious 'decay' identified 1859.
- Rebuilt 1860 with masonry piers and wrought iron lattice girder deck. (*cost c .£12,000*)
- Viaduct c. 176m, 12 spans (*2 x c.12.25m at each end, 8 x c.15.85m central*)
- Deck replaced with pre-stressed concrete beams c. 1960 *('rip-rap' rock armouring to protect piers added?)*

MALAHIDE VIADUCT.

Fig. 1.



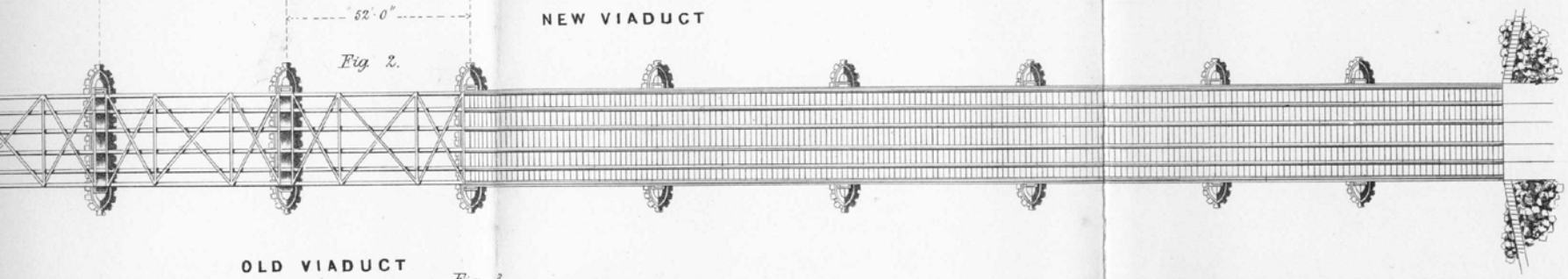


Fig. 2.

OLD VIADUCT

Fig. 3.

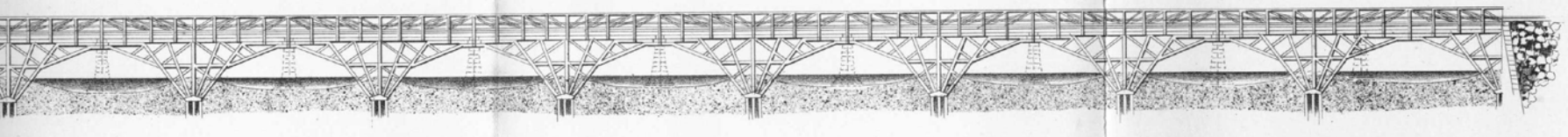


Fig. 5.

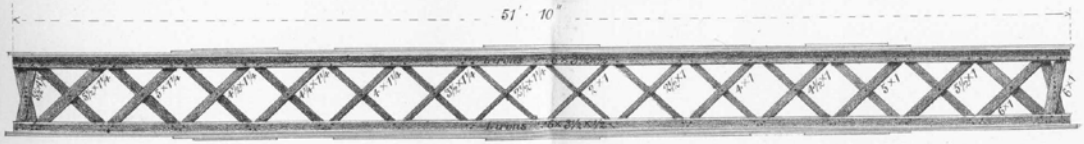


Fig. 6.

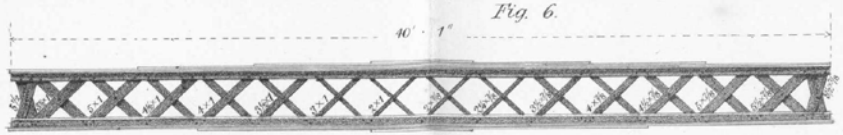


Fig. 7.

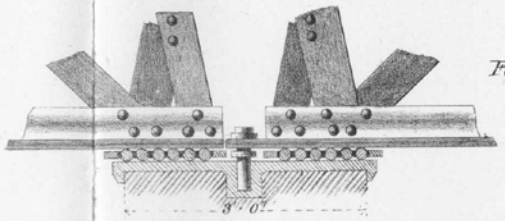
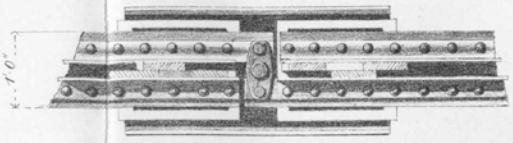


Fig. 8.

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© 2009 Europa Technologies
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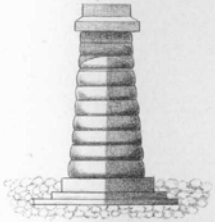
Image © 2009 DigitalGlobe
©2009 Google
Imagery Date: May 6, 2008
53°27'30.78" N 6°09'19.73" W elev 0 ft
Eye alt 1201 ft

Piers:

- Subsequent to construction of timber viaduct stones placed to protect piles/piers forming c. 40m wide submerged embankment.
- Current piers;
  - 11 ‘identical’ cut stone
  - date from 1860 reconstruction
  - founded c. 4.5m below rail level on submerged bank of rock
  - foundations are within the tidal range (*approx ½m above mean sea level*)

Fig. 2.



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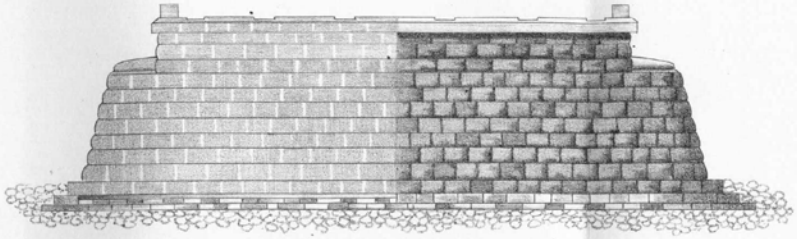

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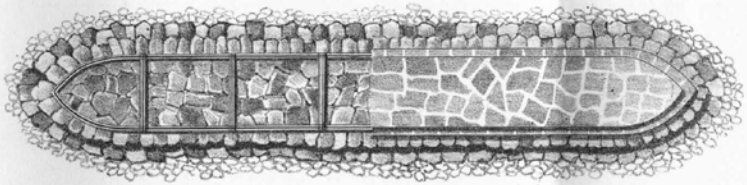

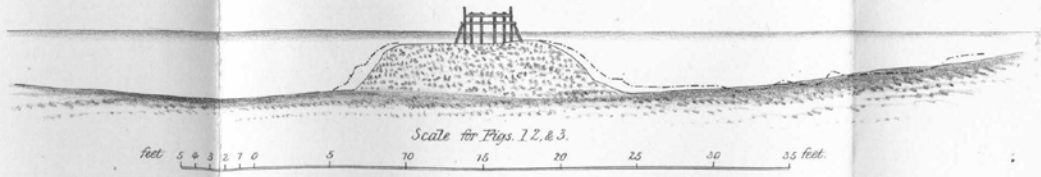

RSC actions:

- Compliance investigation;
  - share technical evidence with RAIU unless compromised by COI
  - conduct independent interviews
- Approval of;
  - re-use of existing residual structure
  - replacement structure
- Safety adequacy of;
  - interim working arrangement, particularly signalling and control
  - other major structure, particularly those at risk of scour

Media Response:

DRIVER AVERTS TRAIN TRAGEDY

DISASTER: The bridge

Narrow escape as bridge collapses into sea

AN EAGLE-EYED Irish Rail driver averted tragedy yesterday when he spotted a collapsed bridge ahead and managed to stop his train before it plunged into the water.

A 30-metre section of the Dublin to Belfast line just north of Malahide slumped into the waves of the Broadmeadow estuary at the peak of the evening rush hour.

The damaged line was noticed by the driver of the 5.47pm train from Balbriggan to Connolly Station in Dublin.

■ By **PAULIE SHERIDAN**

"This was a very serious incident which had the potential to be a major tragedy. It is obviously a busy time of the evening," said Barry Kenny of Iarnrod Eireann.

Serious

"It was extremely serious, and we are thankful that it was not more serious," he added.

"The driver saw the start of the subsidence and stopped his train in Malahide, raised the alarm and walked back to give a full report on the situation. There were no injuries," Mr Kenny added.

Asked about the extent of the damage and its effect on services Mr Kenny said it was too early to be definitive.

"It's impossible to say at this stage, but we are certainly looking at weeks at least.

"We're talking about a 20-metre section of the viaduct having given way," he explained.

Iarnrod Eireann said initial indications are that subsidence caused an embankment under the viaduct to collapse.

The line has been closed and there are no Dublin commuter and Belfast Enterprise trains running as a result.

Media Response:

'Rail chiefs lack safety plan for a derailment into water'

Shane Phelan
Investigative Correspondent

THE Irish rail safety watchdog has said there are no specific safety features to deal with the evacuation of passengers should a train become submerged in

Just four inspectors for 2,000km of rail lines

By **Cormac Byrne**

THE Railway Safety Commission (RSC) has blamed understaffing on not being able to carry out necessary safety checks on Irish railways.

including Luas extensions.

It has emerged that until this year there were only four inspectors responsible for 2,000km of railway line.

The commission claimed that it could not carry out as many

"The number of railway projects that required RSC approval meant we were able to commit less time to performance auditing and monitoring than we would have wished," it said

"A safety management system is only as effective as its

Track safety is the central task of state authority

Paul Melia

THE Railway Safety Commission (RSC) was established under the

also responsible for safety auditing and monitoring, safety enforcement and investigations.

Auditing and monitoring has included studies on the safety of level crossings,

Scandal of three-year delay in key rail checks

Watchdog had warned about lack of inspectors to monitor safety

Paul Melia

CRITICAL safety checks on the railway network have not been carried out for the past three years

additional three inspectors, bringing the total employed to seven.

The Broadmeadow viaduct, which runs over open water in north

It
pier
the
will

RSC issues:

- Steep organisational learning curve
- Clear that role of RSC not understood
- In context of RSC risk based inspection regime viaduct didn't appear on the radar
- Questions ;
  - Should it have?
  - Have we got the balancing act right?
  - To what extent should public expectation drive strategy?
  - What do we need to do to be better prepared?

Thank you for your attention