



**London
Streets**

TfL BOF Update

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Risk Based Inspection Intervals

- **Phase 1 trial successfully completed in 2010**
- **Phase 2 improvements**
 - **Atkins to commence in Feb 2011**
 - **Minor tweaks**
 - **Profile smoothing**
 - **User guide**
 - **Integrate with BridgeStation and LoBEG**



Parapet Risk Assessment



The Issues



Background

Not deemed
suitable for the
TLRN

- Speed < 50mph
- Lower AADT
- Higher impact angles
- Non-standard road configurations
- Other high risk hazards



Parapet Risk Assessment

- **Bespoke TfL system based on the principles set out in TD19 to assess and rank parapet incursion risk for TLRN structures - developed with Hyder**
- **Based on the three main elements that define parapet requirements on a highway structure:**
 - **Incidence**
 - **Consequence**
 - **Mitigation**



Assessing the Risk

- **Incidence**
- **Risk of a vehicle departing from its line of travel and crossing the boundary of the structure**
- **Governed largely by site geometry and highway usage**
 - Traffic volume
 - Traffic speed
 - Traffic manoeuvres / junctions
 - Highway alignment
 - Carriageway configuration
 - Parapet length
 - Visibility
 - Highway interactions



Assessing the Risk

- **Consequence**
- **Consequence varies dramatically depending on land use**
- **Categories:**
 - **Railways: main line, underground, light rail, industrial, depots, sidings**
 - **Industrial and utility complexes: Ranging from high risk gas, fuel and chemical facilities to industrial estates and retail facilities**
 - **Highway adjacent or below**
 - **Schools, hospitals, social complexes, car parks and recreational areas**
 - **Residential Properties**
 - **Waterways: Tideway, navigable and non-navigable**



Assessing the Risk

- **Mitigation**
- **Parapet or other vehicle restraint system**
 - Parapet type
 - Proximity to carriageway
 - Orientation to direction of travel
 - Parapet condition
- **Other factors that either reduce the likelihood of incidence or directly provide mitigation**
 - Additional vehicle restraint systems placed in front of parapets
 - Safety fences
 - Vertical concrete barriers
 - Pedestrian guardrail
 - Trief kerbs



Assessing the Risk

- **Parapet Index**

$$\text{PI} = 100 \cdot \text{IS} \cdot \text{CS} \cdot \text{MF}^{-1} / \text{PS (maximum)}$$

Where:

$$\text{IS} = \text{s.kf}(n(x)) \text{ (actual)} / \text{kf}(n(x)) \text{ (maximum)}$$

$$\text{CS} = \text{s (actual).k (actual)} / \text{s (maximum).k (maximum)}$$

$$\text{MF} = \text{s.n (actual)} / \text{n (maximum)}$$

- **Parapet Index scale from 0 (best) to 100 (worst)**



Classifying the Risk

- **Red Amber Green (RAG)**
- **Based on the consequences (measured by cost) of an incursion**
- **Cost of an incursion estimated as the sum of a number of component costs e.g.:**
 - remedial works
 - traffic diversions
 - injury/loss of life



Classifying the Risk

Red Zone (unacceptable risk)

- **PI score equal to or greater than 90**
- **Cost of an event greater than £1 million**
- **Multiple fatalities**
- **Major disruption to the network for significant durations**
- **Significant indirect costs**
 - rail delay
 - traffic delay
 - disruption to industrial facilities and utilities supplies
- **National political and reputational implications with national media coverage**



Classifying the Risk

Amber Zone (tolerable risk)

- **PI score <90 and >45**
- **Cost of an event <£1M and >£40K**
- **Possible fatality**
- **Disruption to the network for up to a few days**
- **Likely to result in some indirect costs**
- **Regional political and reputational implications with regional media coverage**



Classifying the Risk

Green Zone (broadly acceptable risk)

- **PI score equal to or less than 45**
- **Cost of an event up to £40k**
- **Unlikely to result in a fatality, but possible serious injury**
- **Minor network disruption over a short duration of less than a day**
- **Likely to lead to minor indirect costs**
- **Possible local political implications with local media coverage - unlikely to affect reputation**

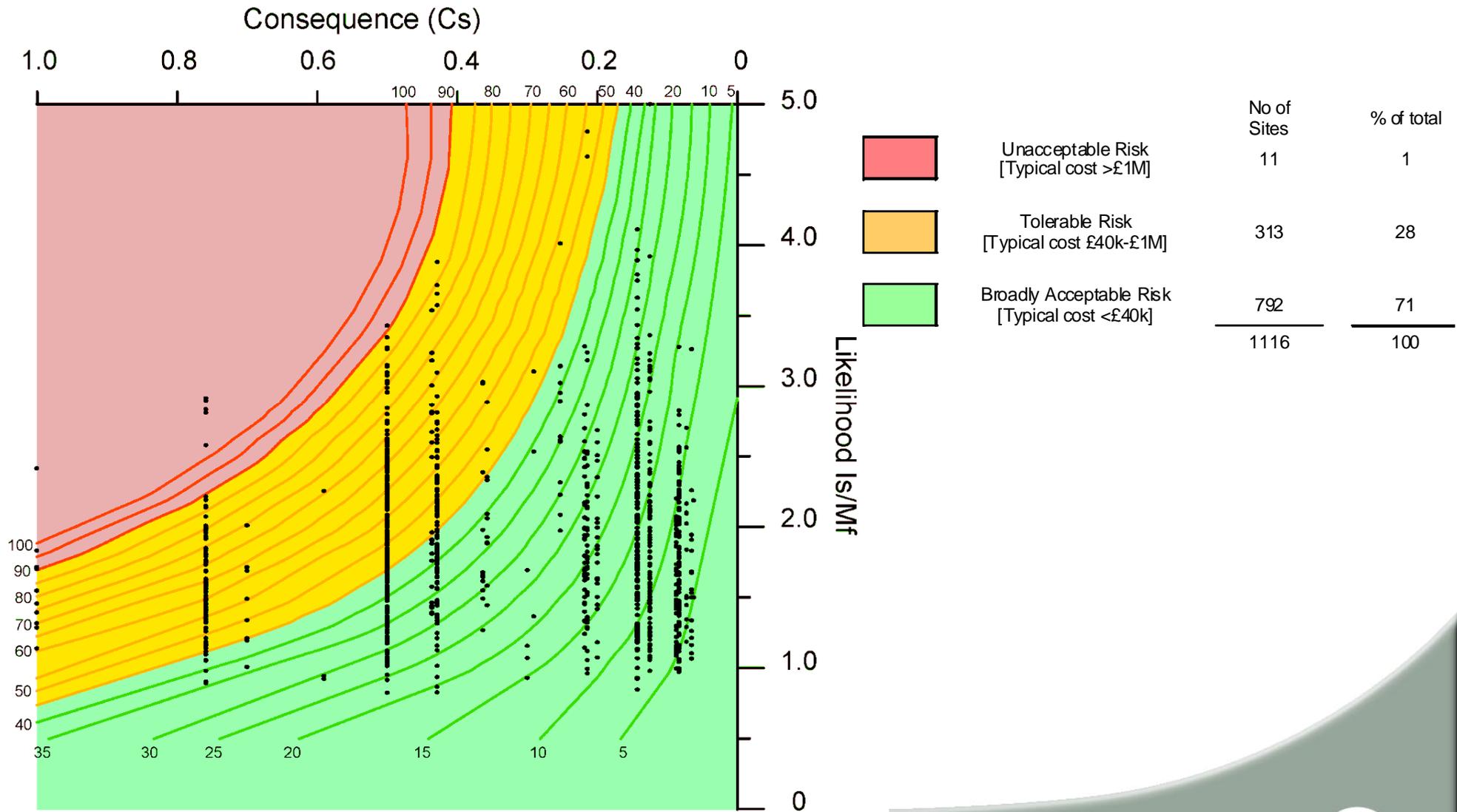


Our Approach

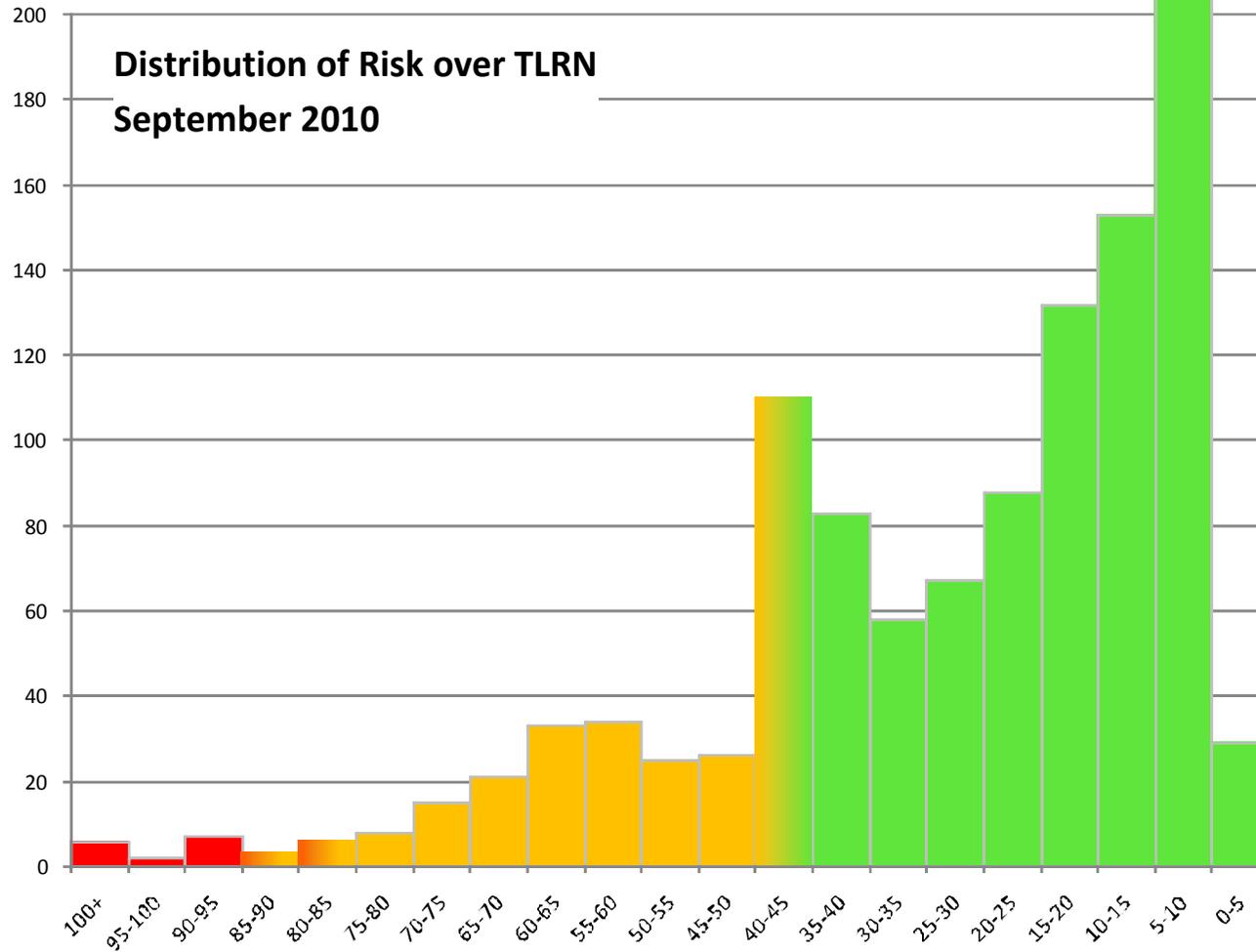
- **Desk top study**
 - **Initial sift**
 - 277 forms
 - Google maps, street view etc.
 - Local knowledge
 - **More detailed review starting with high risk structures**
 - Greater interrogation of structure records
 - Site visit and measurements may be appropriate
 - Some risk scores reduced, others increased
 - Initial proposals and estimated costs for mitigation works - ALARP
 - Simple cost benefit analysis
- **Installation of interim measures**
- **Design of permanent upgrades, replacement, strengthening**
 - Include detailed site survey, testing etc to confirm assumptions made during desk study
 - May lead to further reduction in sites that need to be addressed



Outcome after initial desk study



Outcome after initial desk study



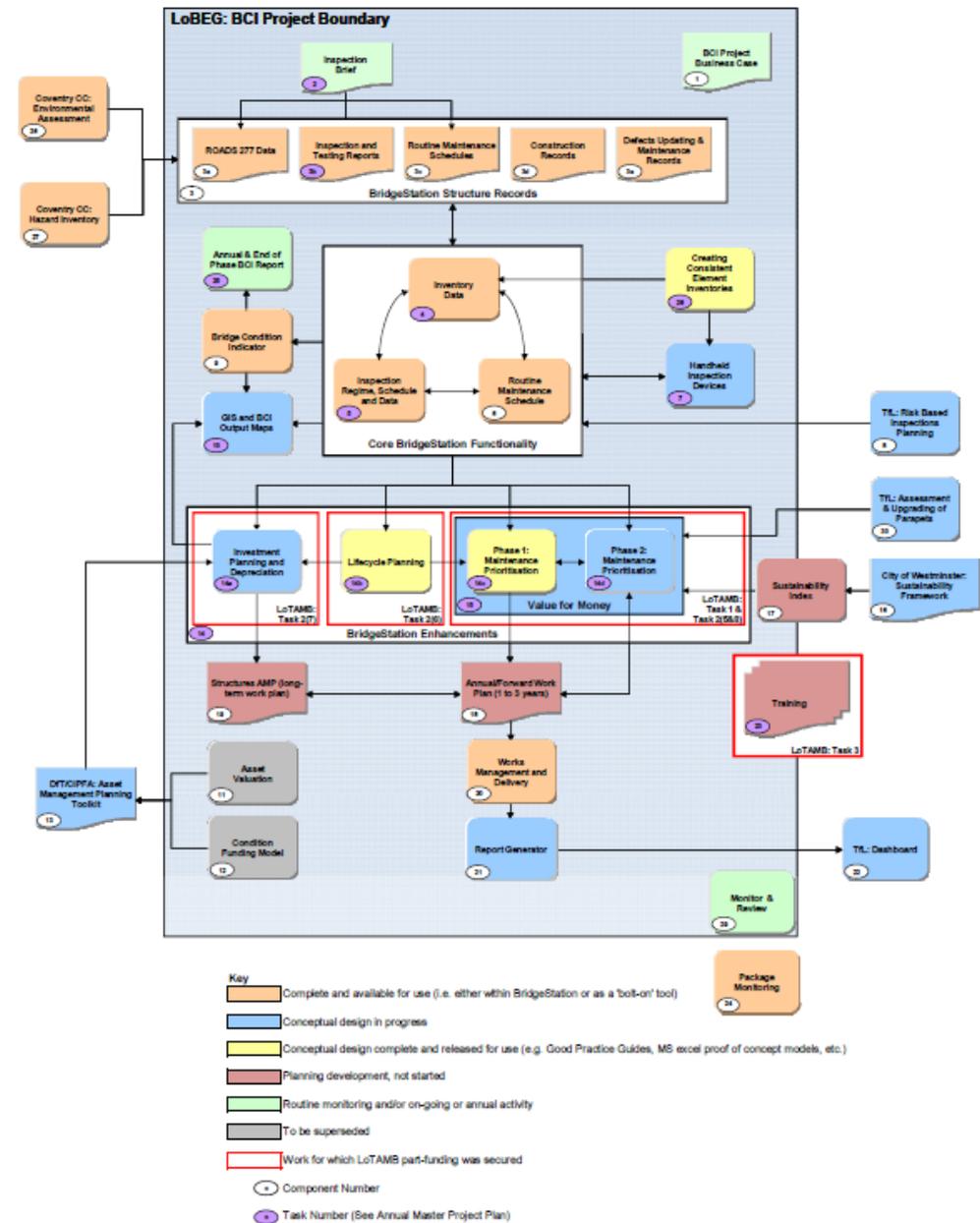
Next Steps

- **Production of user guide**
- **Adoption by LoBEG**
- **Trial by ADEPT Bridges Group Members**
- **Extending to include all road restraint systems**
- **Add module to bridge management system**
- **Debate?**



LoBEG/TfL

- Lifecycle planner
- Maintenance Prioritisation
- Value for Money
- Structures Investment Planner (DfT)
- General improvements to BridgeStation



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