Bridges: Strength to Strength

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Risk Based Inspections

- Background
- The need for risk based inspections
- Framework
- Proposed Methodology
- Trial results
- Conclusions
- Next steps

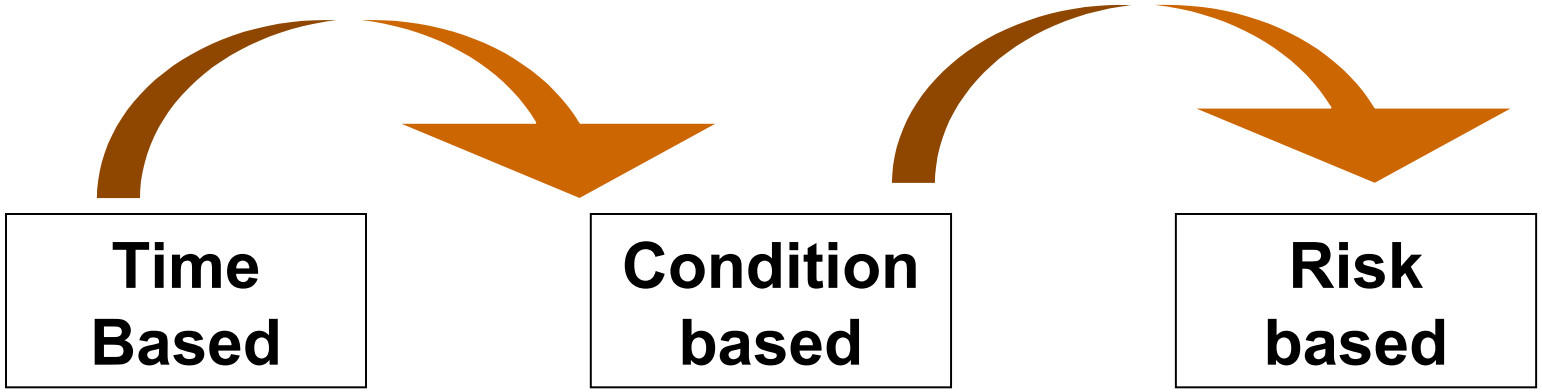
Background (1)

- **1945 – Ministry of War Transport – Memo 577 – Section 27**
  - Regular inspections – a matter of great importance
- **1971 – Interim Memo – IM 13**
  - Bridges to be inspected at least once a year and Culverts at intervals appropriate to their significance to the highway
- **1977- Tech. Memo - BE4/77**
  - ***General Inspection*** - Period not exceeding 2 years
  - ***Principal Inspection*** - Period not exceeding 6 years
- **2005 –Management of Highway Structures**
  - Section 6 – A basic outline given for Risk Based Inspection

Literature Review

- A review of inspection processes undertaken in other industries
  - Oil & Gas
  - Nuclear
  - Water
  - Rail
- Other asset owners are already managing risks effectively through some form of risk based inspection regime.

Evolution of Inspection Strategies



- Calendar based intervals (e.g. Every 2 years, 6 years etc.)
- Prescriptive regulatory/ rule requirements

- Trending (likelihood)
- Inspection intervals based on condition

- Holistic risk-based approach
- Balance between risk and inspection effort
- Proactive approach

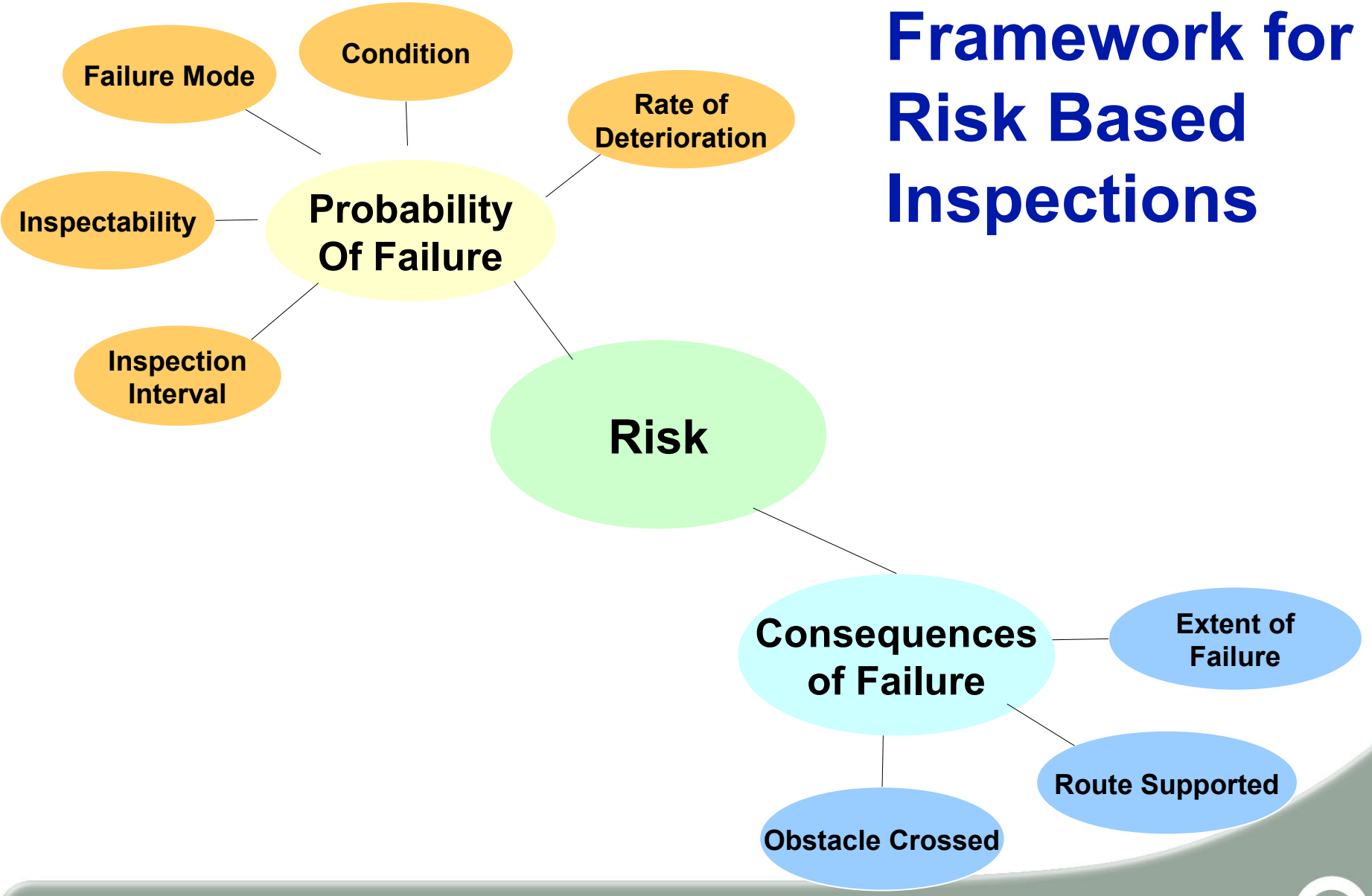
The Need for Risk Based Inspections

- Maintain safe structures – Safety is paramount
- Better allocation of resources
- Help to protect the inspection budget
- Better understanding of risk profile
- Not necessarily to reduce costs

RBI Study - Purpose

- to investigate the feasibility and practicality of developing and implementing a RBI Framework for TfL's highway structures
- to assess TfL's level of the risk exposure under the current inspection regime
- to support the determination of appropriate Principal Inspection intervals
  - e.g. standard 6 year interval, or increased/decreased from standard interval
  - General Inspection intervals will remain "as is"

Framework for Risk Based Inspections



Methodology

Evaluate the probability of deterioration or failure

Evaluate the consequence of failure

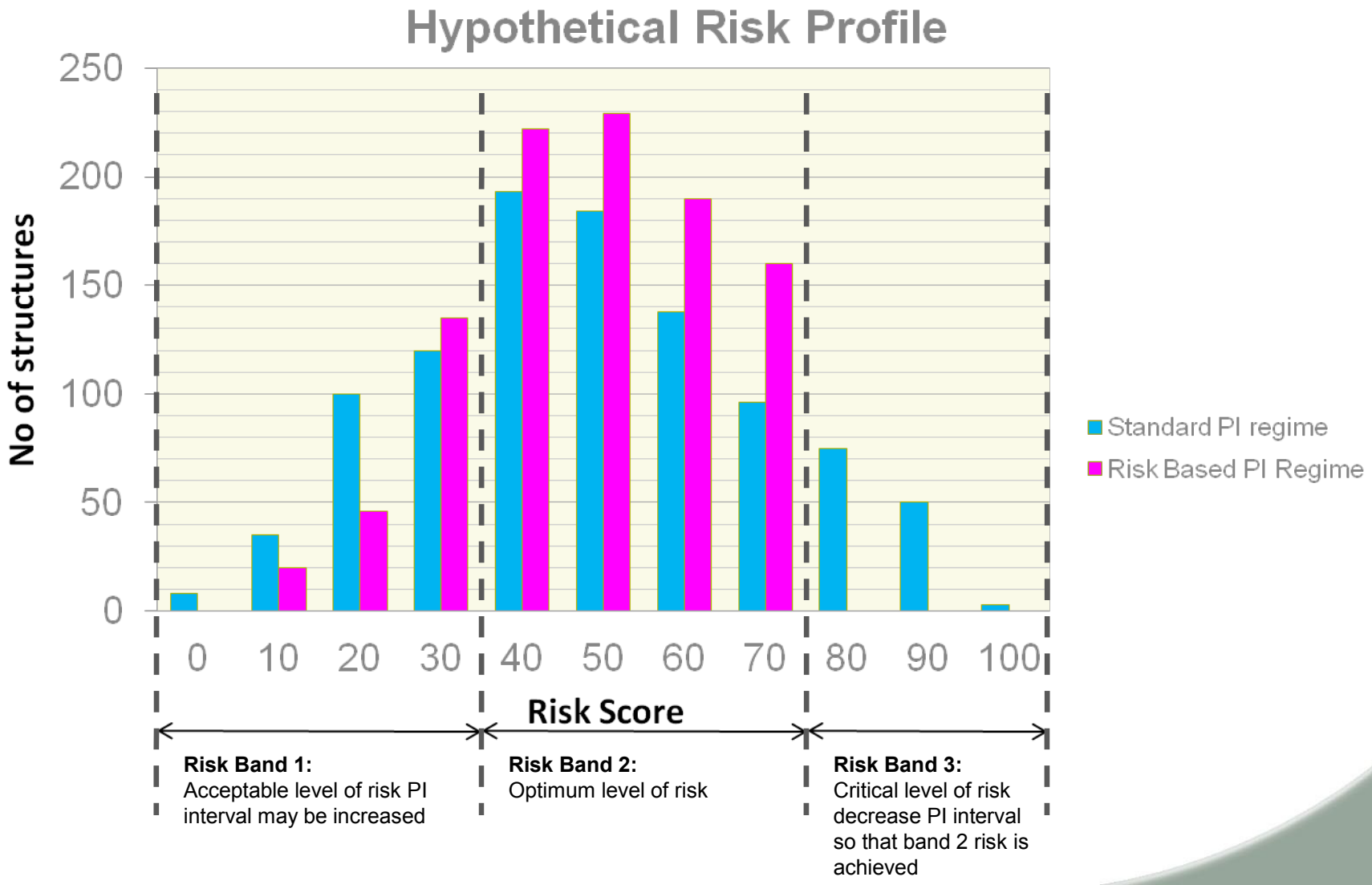
Determine the risk score

Consequence of Failure	Probability of Rapid Deterioration, Damage or Failure				
	Very Low 1 < 30	**Low 30 < 50**	**Moderate 50 < 70**	**High 70 < 90**	**Very High 90 < 100**
Very Low 1 < 30	Very Low 1	Very Low 15	Low 25	Moderate 40	Moderate 60
Low 30 < 50	Very Low 15	Low 25	Moderate 40	Moderate 50	High 70
Moderate 50 < 70	Low 25	Low 30	Moderate 50	High 70	High 80
High 70 < 90	Low 30	Moderate 40	Moderate 60	High 80	Very High 90
Very High 90 < 100	Moderate 40	Moderate 60	High 80	Very High 90	Very High 100

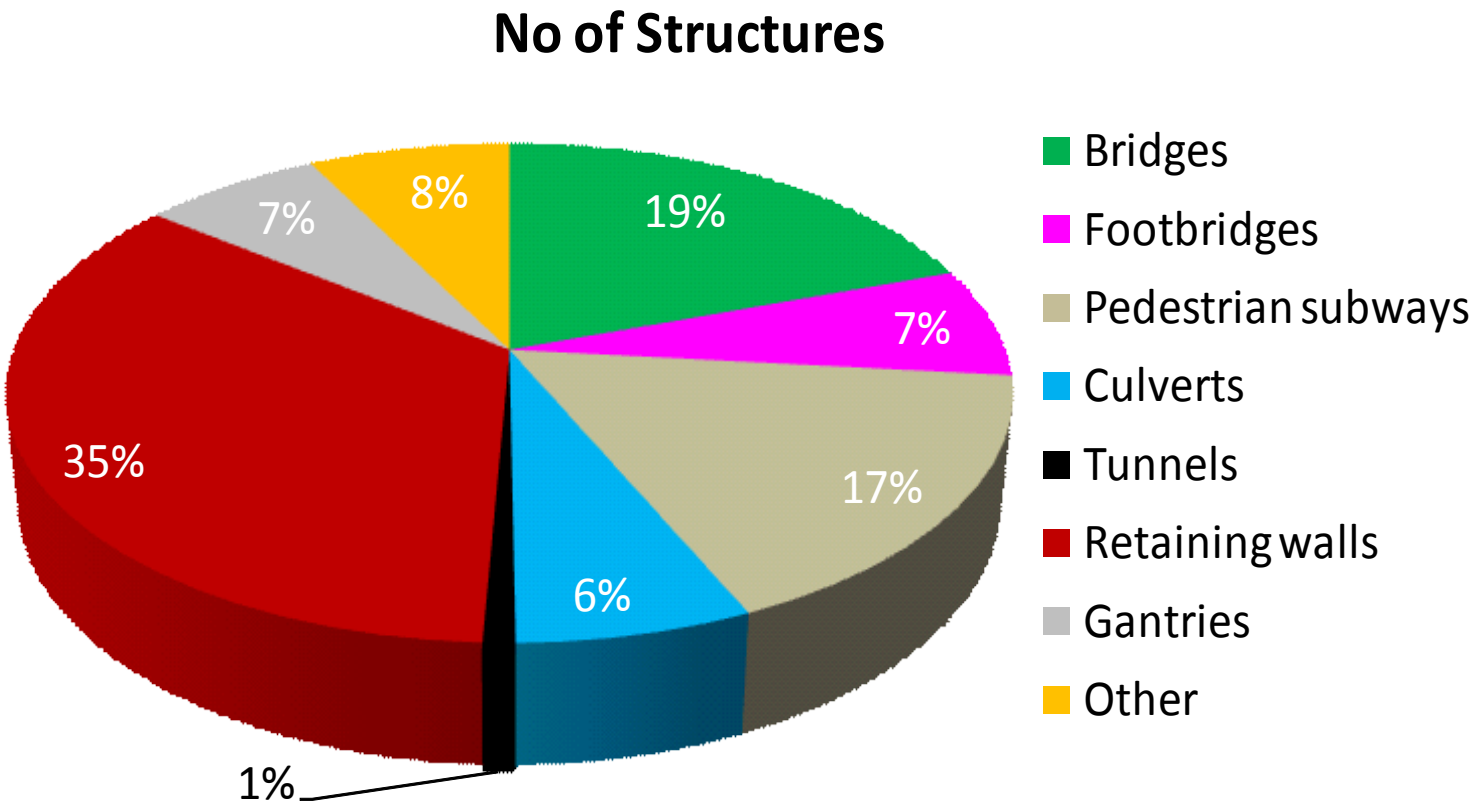
Matrix for Amending Principal Inspection Intervals

Consequence	Probability				
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Very Low	Very Low – PI not required	Very Low – PI not required	Low – interval max 12 years	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years
Low	Very Low – PI not required	Low – interval max 12 years	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years
Moderate	Low – interval max 12 years	Low – interval max 12 years	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years	High – interval of 2 to 6 years
High	Low – interval max 12 years	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years	High – interval of 2 to 6 years	Very High – interval of 6 months to 2 years
Very High	Moderate – interval of 6 to 12 years	Moderate – interval of 6 to 12 years	High – interval of 3 to 6 years	Very High – interval of 6 months to 2 years	Very High – interval of 6 months to 2 years

Methodology



Trial Results



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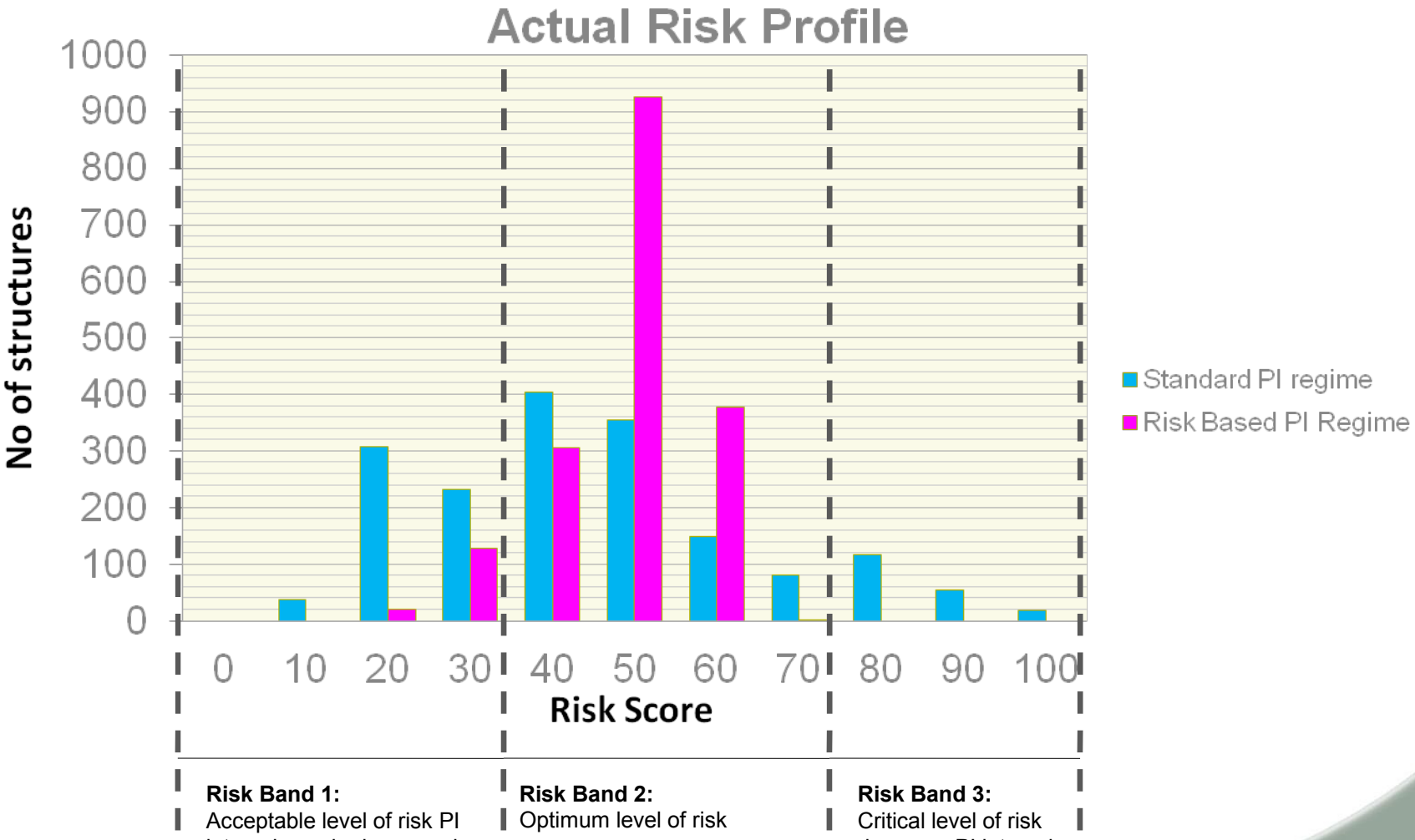

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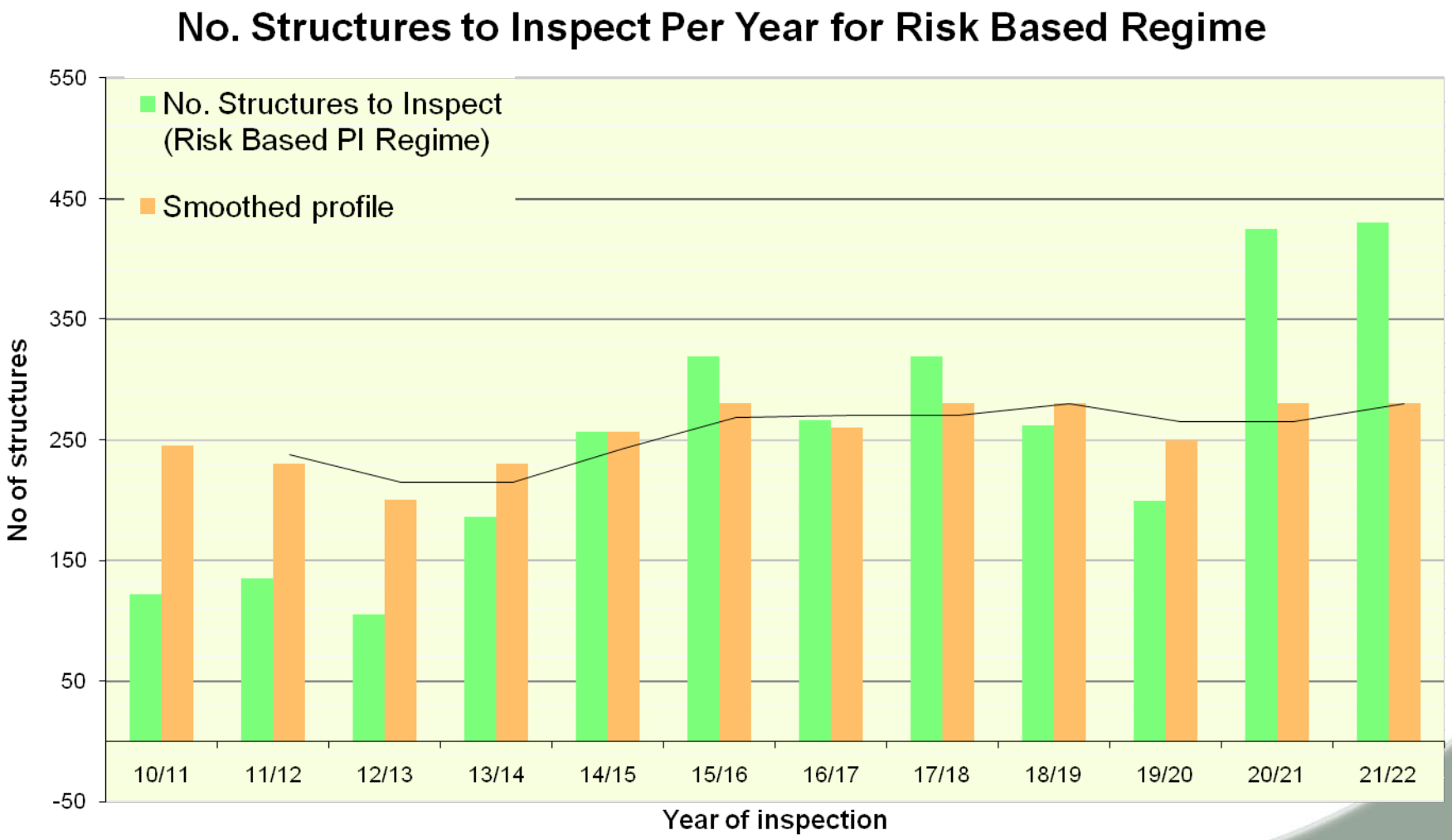


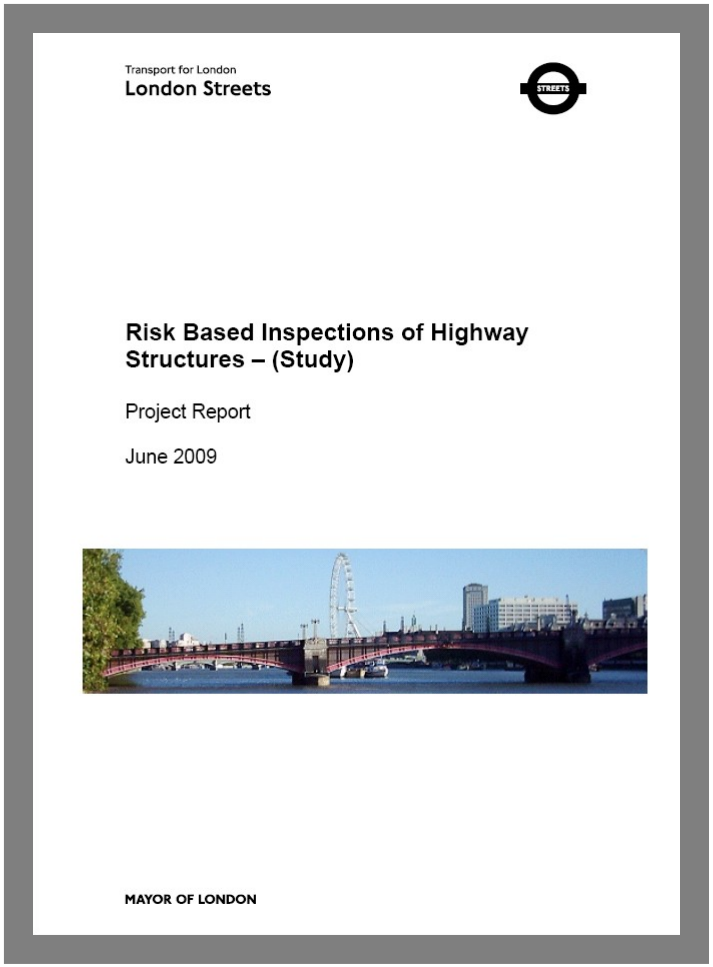
Conclusions

- It does work
- A better understanding of our risk profile
- Able to compare risks with other asset types
- Argument for defending budget cuts
- First time labour intensive
- Requires engineering judgement to complete

Next Steps

- Encode into our bridge management system
- Compare risk profile with other assets
- Analyse costs
- Automate smoothing

Risk Based Inspections



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