PROJECT CONTROLS EXPO, AUSTRALIA – 26TH NOVEMBER 2019

MELBOURNE CRICKET GROUND, MELBOURNE

Uncovering the Unknown Knowns

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WHY?

- **The Problem**:

Engineering failures resulting in fatalities and huge financial loss, can be traced back to the lack of scrutiny in uncovering unknown knowns.

- **The Solution**:

By investing time and energy in preventative treatments we can return a 17:1 BCR compared with the impact of adverse events.

TODAY’S OUTLINE

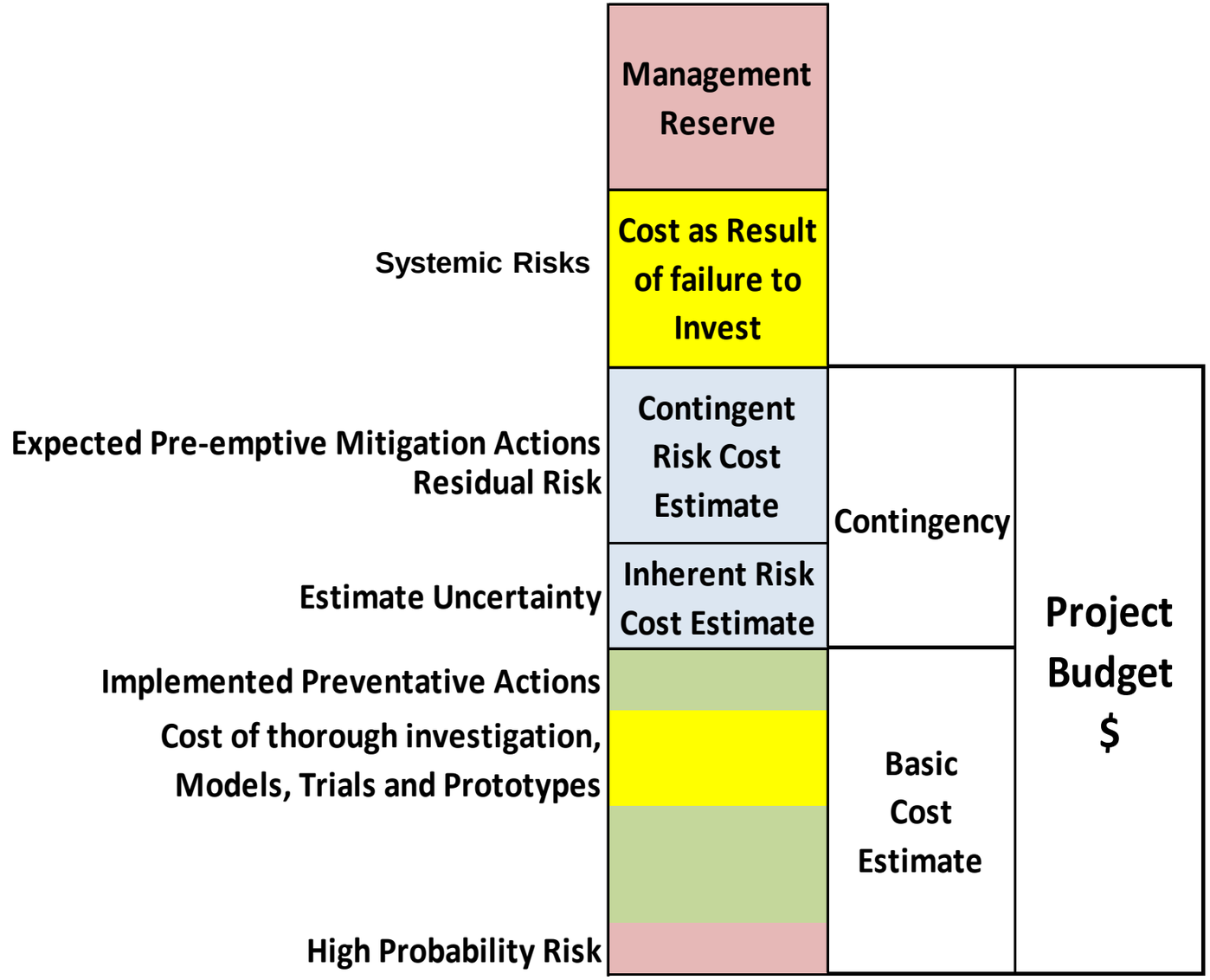
- Areas where most risks occur.
- Tools, Methods and Processes to investigate, test and probe the future
- Leadership - The work managers need to do to successfully invest in treatment solutions.

UNCOVERING THE UNKNOWN KNOWNS

- **Donald Rumsfeld**
    - Known Knowns
    - Known Unknowns
    - Unknown Unknowns
- **Unknown Known**
    - An issue known to some stakeholders but overlooked by the Project Group

Risk Types to Project Budget

Level of Control v	Risk Types: Known	Known Unknown	Unknown Known	Unknown Unknown
Full Control				
Some Control				
Can Get Some Control				
No Control				

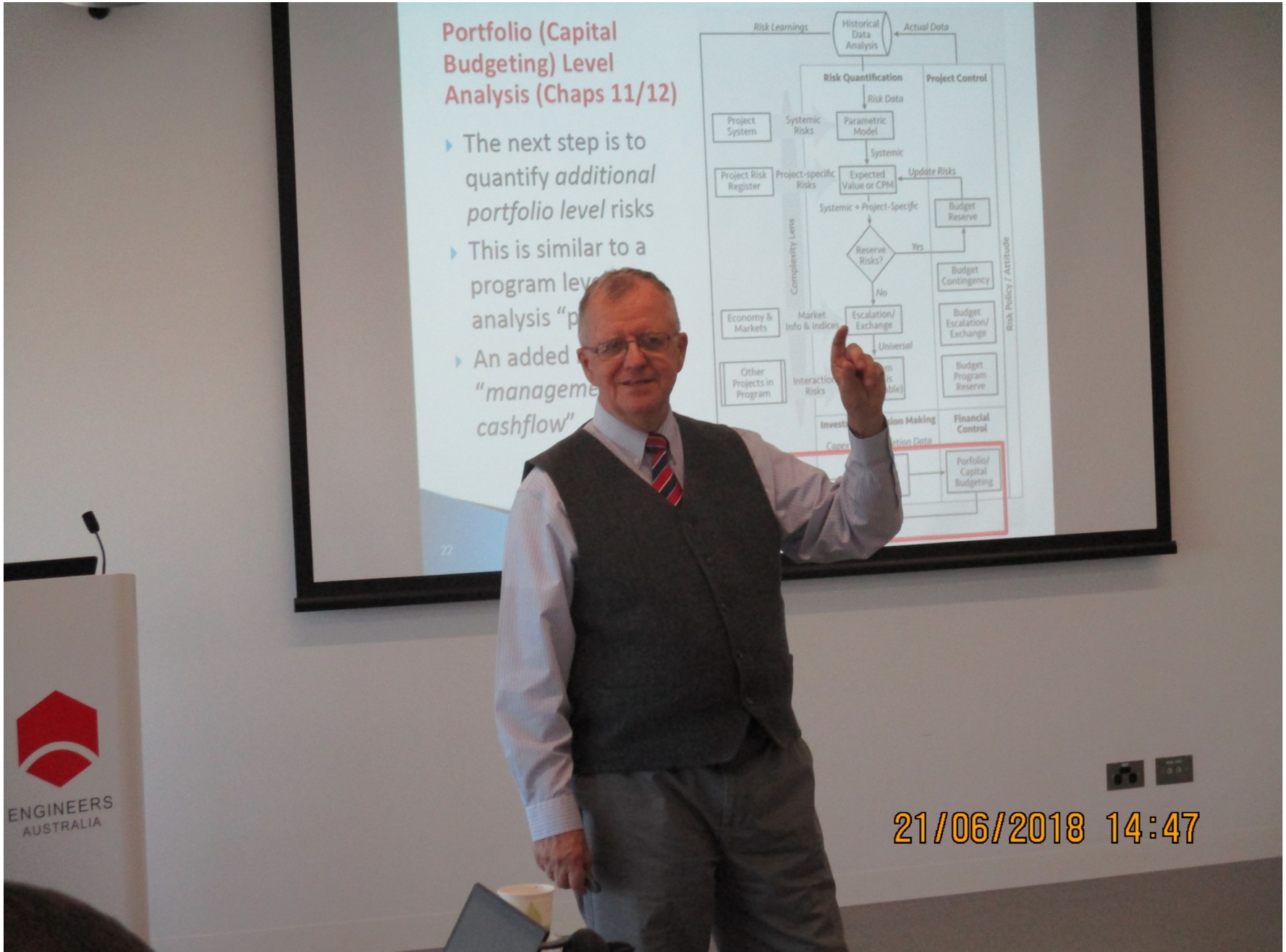


SYSTEMIC RISKS

SYSTEMIC RISKS ARE UNKNOWN KNOWNS - RISKS THAT MANAGEMENT KNOWS BUT CHOSES TO IGNORE

- Scope Definition - Refer CII PDRI
- Team Development
- First of a Kind (FoaK)
- Project Controls
- Likelihood of Occurrence = 100%

SYSTEMIC RISK - PARAMETRIC MODEL



PROJECT RISK QUANTIFICATION

A Practitioner's Guide to Realistic Cost and Schedule Risk Management

JOHN K. HOLLMANN

Risk Driver	Enter Parameter (*a*)	Coefficient (*b*)	*a* x *b*
Constant			-30.5
Scope	3		
Planning	4		
Engineering	3		
Scope Definition	3.3	9.8	32.3
New Technology	5%	0.12	0.60
Process Severity	3	1.0	3.0
Complexity	5	1.2	6.0
Subtotal Base (prior to adjustments)			**11.4**
Adjustments			
Team Development	Poor	(assume complex)	+6
Project Control	Poor	(assume complex)	+6
Estimate Basis	Fair		0
Equipment	15%		+2
Fixed Price	<10%		0
Total Base (prior to basis adjustment; rounded to whole number)			**25**
Bias	Low		+5
Systemic Cost Contingency			
Mean	25 + 5		**30%**
*p*10	25 x (-0.5) + 5		**-7%**
*p*70 (indicated funding)	25 x 1.5 + 5		**43%**
*p*90	25 x 2.6 + 5		**72%**

Table 11.16: Case Example Parametric Model Applications for Cost Growth (incorporate this as the impact of systemic risk in the expected value model)

PDRI 1 - Summary Results

Project:
McKinnon Rd & Centre Rd
Project Manager:
Brendan Pauwels
Facilitator:
John Paterson
Status of Project:
Complete
Date:
Thursday, 19 July 2018

Section	Description	PDRI 1 Score	Min Score	Max Score	Def[1] (%)
I	BASIS OF PROJECT DECISION	155	26	437	69%
II	BASIS OF DESIGN	112	23	293	67%
III	EXECUTION APPROACH	50	21	270	88%
	Total	**317**	**70**	**1,000**	**73%**
	PDRI TOTAL MAXIMUM SCORE = 1000				
	Normalized Score:				**317**

PROJECT SPECIFIC RISKS ON MAJOR CIVIL PROJECTS

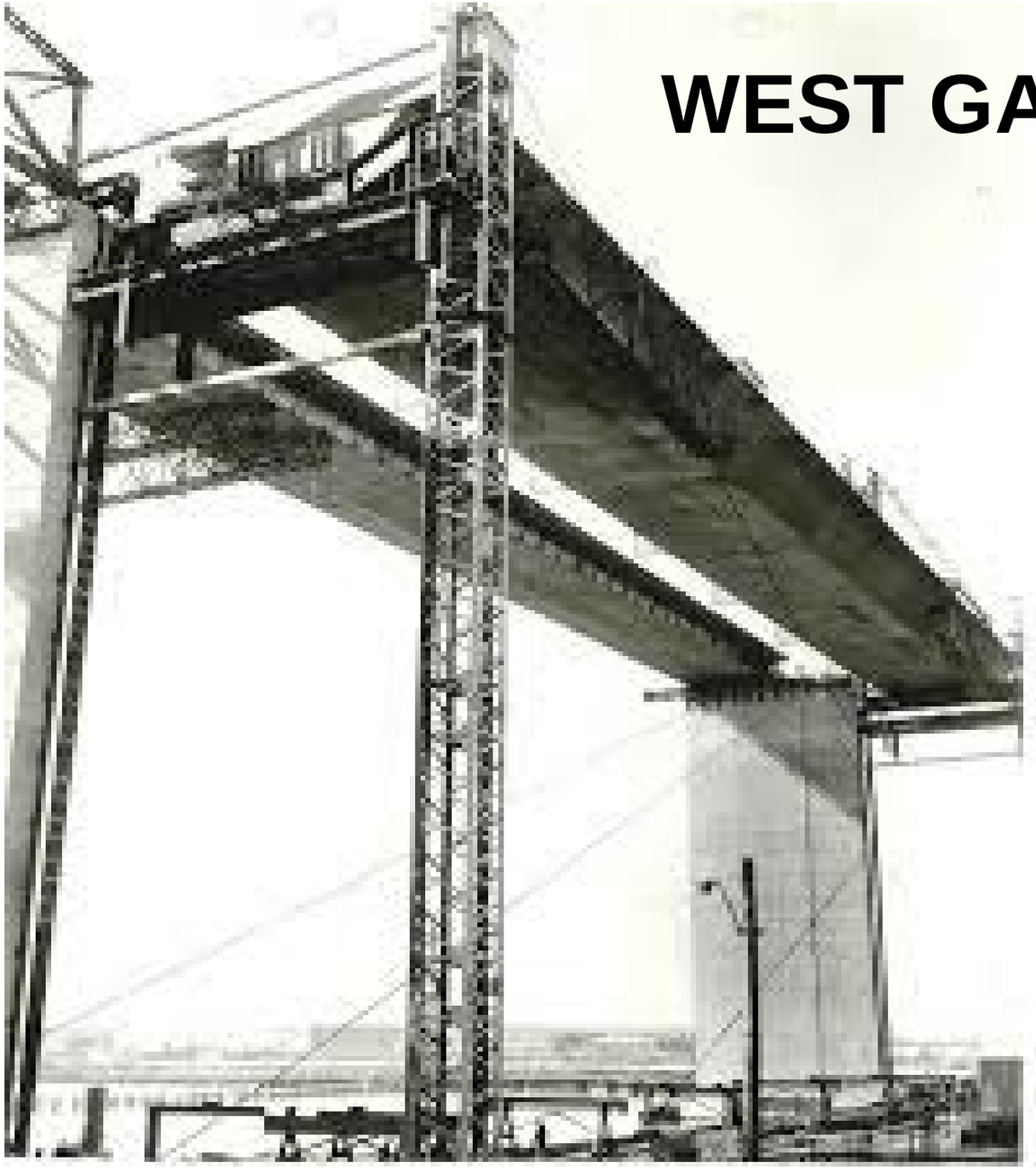
- Design
- Access, Approvals & Availability
- Relocating Utility Services
- Unsuitable Conditions
- Procurement
- Traffic Management
- Out of Sequence Work

INSUFFICIENT INVESTMENT IN DESIGN

- Collapse of West Gate Bridge
- Bolte Bridge spalling concrete into Yarra River
- Failure at 24hours of Murrin Murrin Valves
- First of a Kind (FoaK) - CTD Skyrail over Live Rail


WEST GATE BRIDGE

WEST GATE BRIDGE



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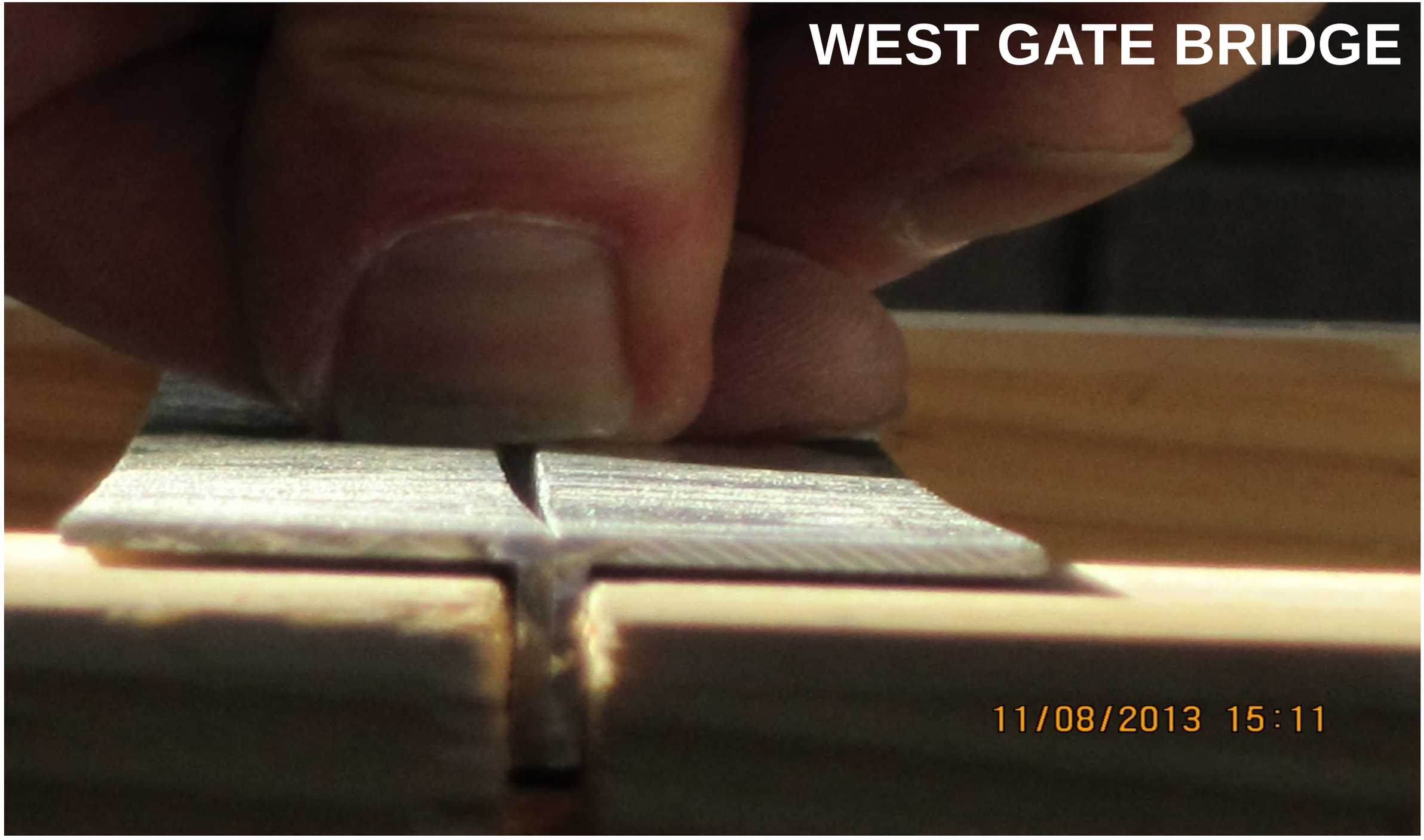
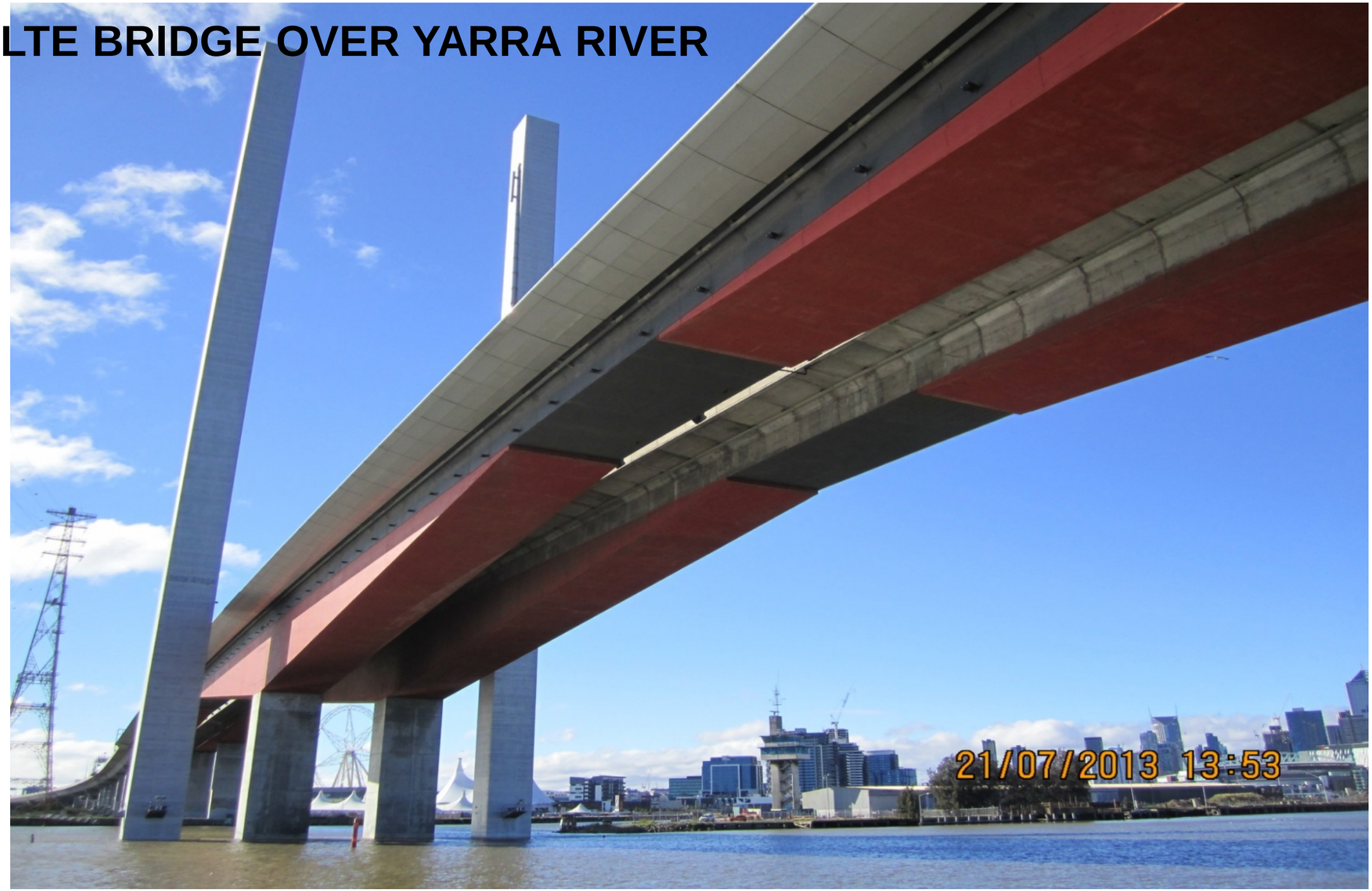

WEST GATE BRIDGE
11/08/2013 15:11

WEST GATE BRIDGE

BOLTE BRIDGE OVER YARRA RIVER



BOLTE BRIDGE OVER YARRA RIVER

MURRIN MURRIN NICKEL – LEONORA WA

CAULFIELD TO DANDENONG - SKYRAIL

ACCESS & APPROVAL TOOLS

- Engage a diverse range of stakeholders
  - Each will have different requirements and expectations

UTILITY SERVICES

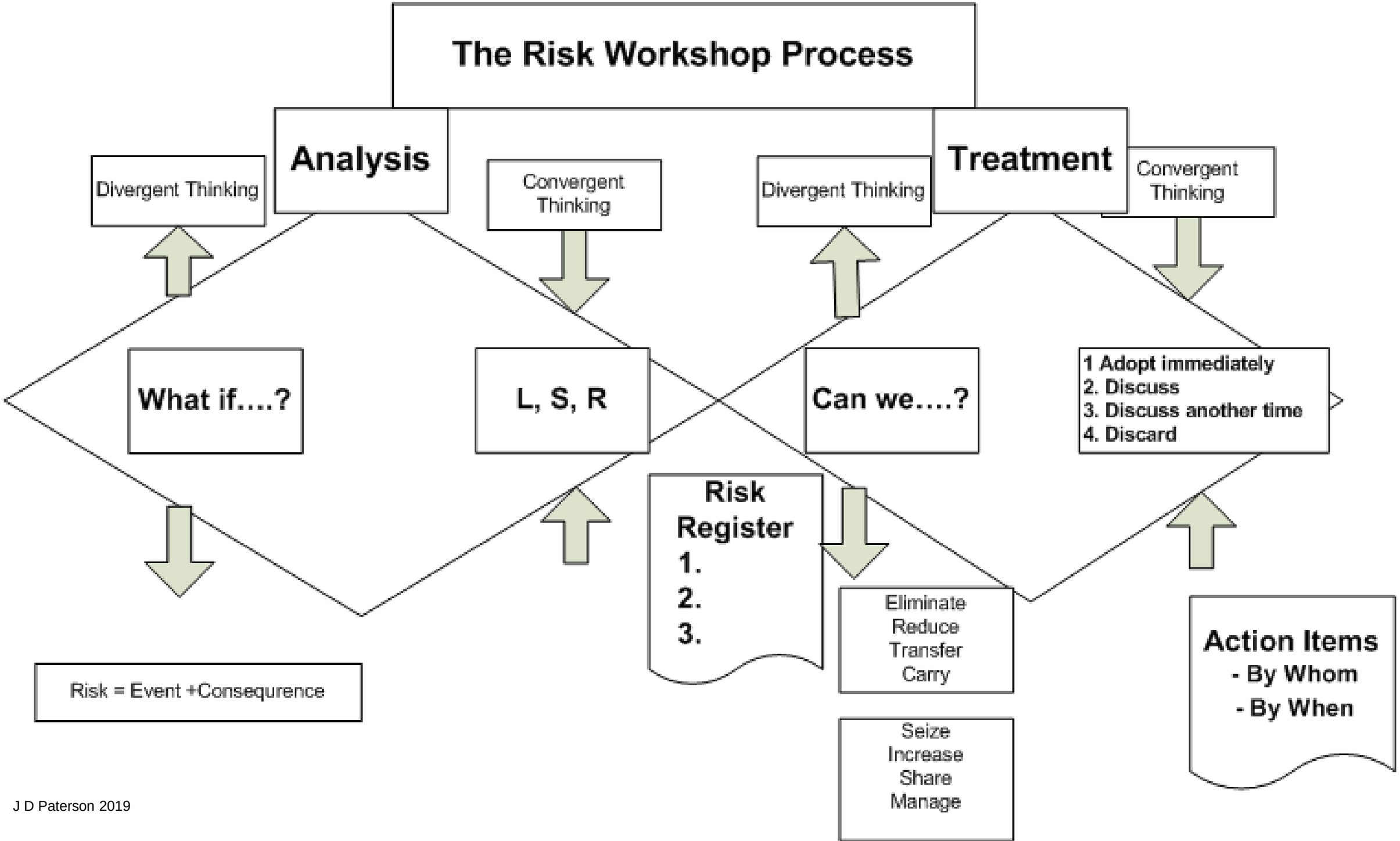
- **Soil nail disasters**
  - FOC punctured near Toorak Rd Underpass
  - Sewer filled with grout near Coonans Rd on Tullamarine Freeway
- Near miss survey star picket driven near 2200V cable near Flemington Bridge

UNSUITABLE ON HUME FREEWAY - BENALLA

PROCUREMENT

INVESTIGATIVE TOOLS

- Divergent / Convergent Thinking Model
- Engaging a diverse range of Stakeholders
- Review Lessons Learned and interview people
- Use techniques of de Bono and Rumsfeld
- Use John Hollmann’s Parametric model to evaluate systemic risks



THINKING AND ACTION TOOLS

- Use de Bono’s
  - Red Hat for complex projects
  - Grey sneakers to collect information
  - Brown brogues to do the hard work
  - Value medals for valuing treatments
- Use Rumsfeld's
  - What else? and What's missing?
- Use “Sabotage” Phase to list more treatments

PRACTICAL METHODS

- Make Scale Models
- Test function with simple tests
- Engage hands-on experienced persons to train and advise
- Intensify QA in high risk areas
- Provide pre-emptive mitigation plans and resources

MOONEE PONDS CREEK MODEL

Photo: Frank Winston
Monash University

GREENVALE DAM, VIC – FILTER INSTALLATION

Laing O’Rourke
Digital Engineering

LEVEL CROSSING REMOVAL PROJECT

Design Reuse trial

Digital Models to Uncover Unknown Knowns

VICTORIA State Government

Mentone Station – Structural Envelope

Mentone Station – St. Albans option

Mentone Station – St. Albans option

Mentone Station – St. Albans option

Mentone Station – Ginifer comparison

Cheltenham Station – Structural Envelope

Cheltenham Station – Structural Envelope

Cheltenham Station – Track Arrangement

Cheltenham Station – Bentleigh Option

Cheltenham Station – McKinnon Option

Cheltenham Station – Ormond Option

YARWUN TAILINGS DAM, GLADSTONE QLD

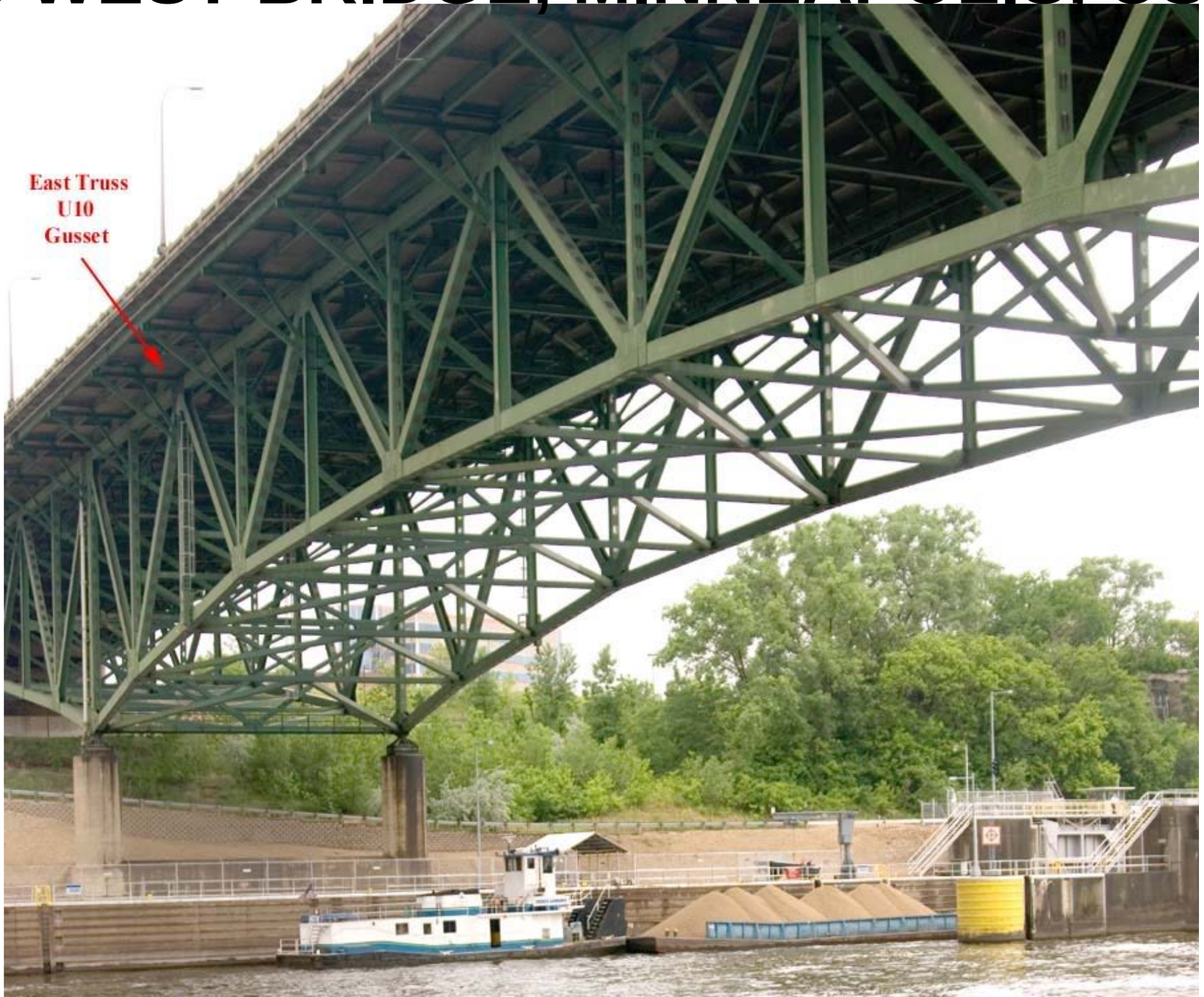
YARWUN TAILINGS DAM, GLADSTONE QLD

EADES COLORADO, USA

PROJECT PROCESSES

- Vigorous investigation of early Warning Signs
- Reward issue Identification
- Define early Standards of Conduct, Operating procedures and Quality of outputs
- Use CII Disputes Potential Index
- Use Dispute Resolution Boards

I-35 WEST BRIDGE, MINNEAPOLIS, USA



I-35 WEST BRIDGE, MINNEAPOLIS, USA

I-35 WEST BRIDGE, MINNEAPOLIS, USA

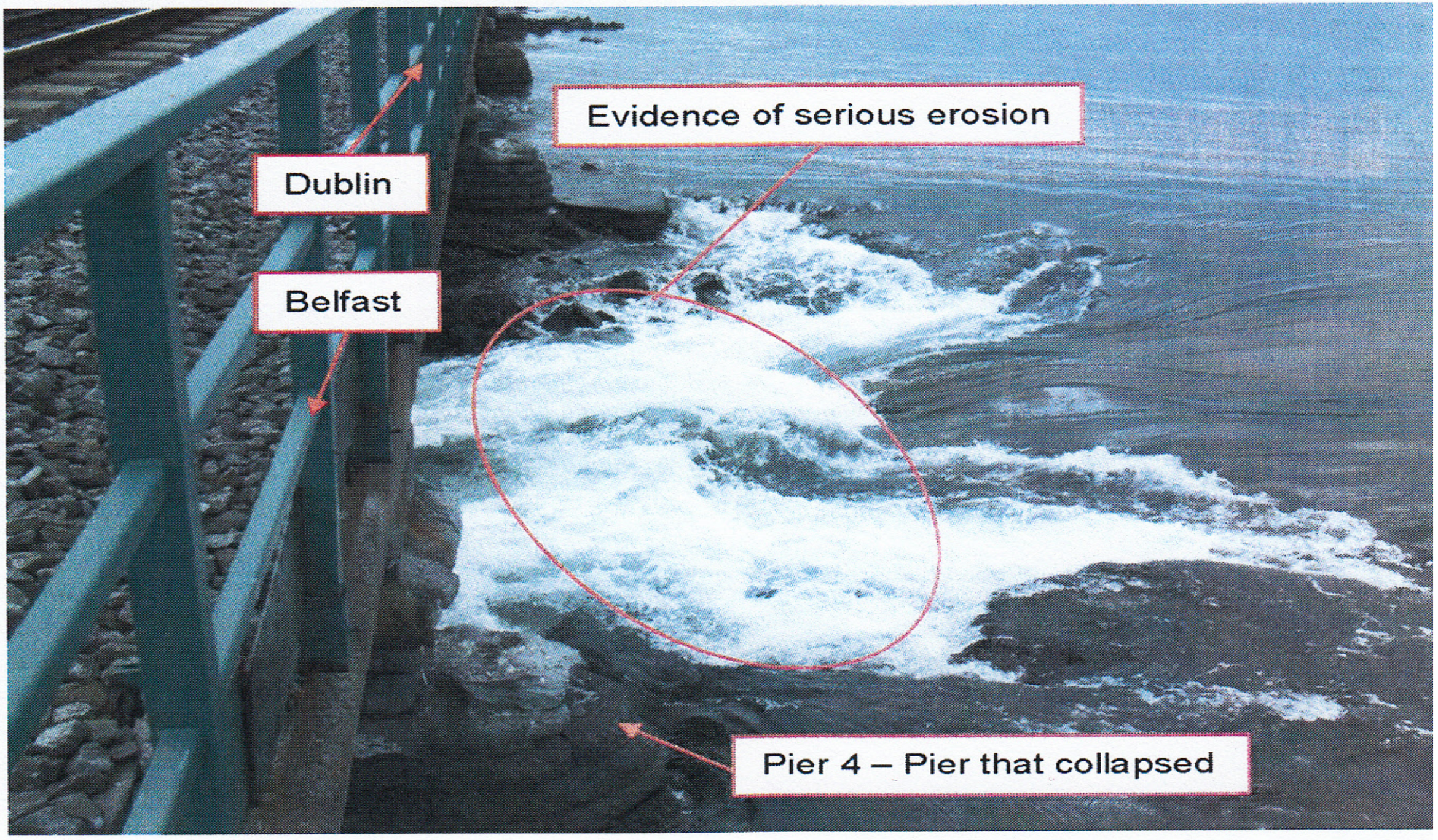
ESSO LONGFORD, VIC.

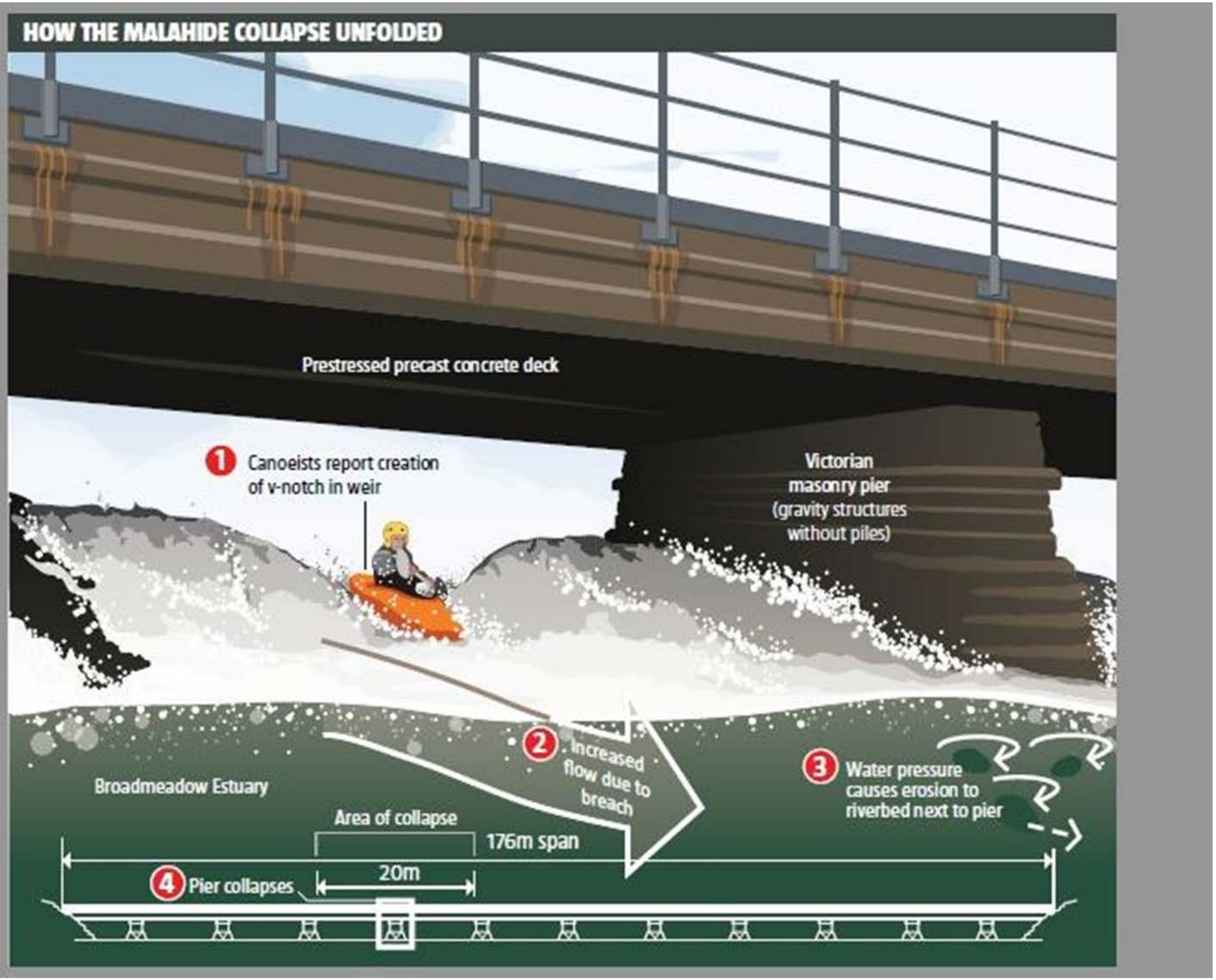
MALAHIDE BRIDGE IRELAND


LOCATION PLAN
M1
TRAIN LINE COLLAPSE
MALAHIDE
DUBLIN
M50
0 km 5
N

MALAHIDE DESIGN – HYDRAULIC JUMP 20M EAST

MALAHIDE ACTUAL – HYDRAULIC JUMP WEST OF BRIDGE


Dublin
Belfast
Evidence of serious erosion
Pier 4 – Pier that collapsed


HOW THE MALAHIDE COLLAPSE UNFOLDED
Prestressed precast concrete deck
1 Canoeists report creation of v-notch in weir
Victorian masonry pier (gravity structures without piles)
2 Increased flow due to breach
3 Water pressure causes erosion to riverbed next to pier
Broadmeadow Estuary
Area of collapse
176m span
20m
4 Pier collapses

CII – PROJECT DEFINITION RATING INDEX

Allows the project planning team to quantify, rate and assess the maturity level of scope definition on projects prior to detailed design and construction.

Section 1 – Basis of Project Decision

- Project Strategy
- Owner/Operator Philosophies
- Project Funding and Timing
- Project Requirements
- Value Analysis

Section 2 – Basis of Design

- Site Information
- Location and Geometry
- Associated Structures and Equipment
- Project Design Parameters

Section 3 – Execution Approach

- Land Acquisition Strategy
- Procurement Strategy
- Project Control
- Project Execution Plan

CII – DISPUTE POTENTIAL INDEX

- Analyses 8 Variables in response to 21 questions
  - Owner's Management and Organisation
  - Contractor's Management and Organisation
  - Project Complexity
  - Project Size
  - Financial Planning
  - Project Scope Definition
  - Risk Allocation
  - Contract Obligations

DISPUTE RESOLUTION BOARDS

- A DRB can be one or three persons
- Role is early Identification of issues and consequences
- Discussion with Parties in such a way they can understand and deal with the issues
- Excellent Track Record


Decision Making
Leadership in Risk Management
Motivating
Selecting & Developing People
Communicating

LEADERSHIP IN RISK MANAGEMENT

- **Make Decisions**
  - Defining the ranges for Likelihood of Occurrence, Severity of Consequence & Risk Level
  - Investing in thorough investigation, models & trials
- **Select & Develop People**
  - Improving knowledge, skills and attitude to risk
- **Communicate**
  - So that risk treaters understand what to do & why
  - Learn from doing, training, simulation, practice
- **Motivate**
  - Inspire, encourage, impel people to vigorously implement required action

Risk Types to Project Budget

Level of Control v	Risk Types: Known	Known Unknown	Unknown Known	Unknown Unknown
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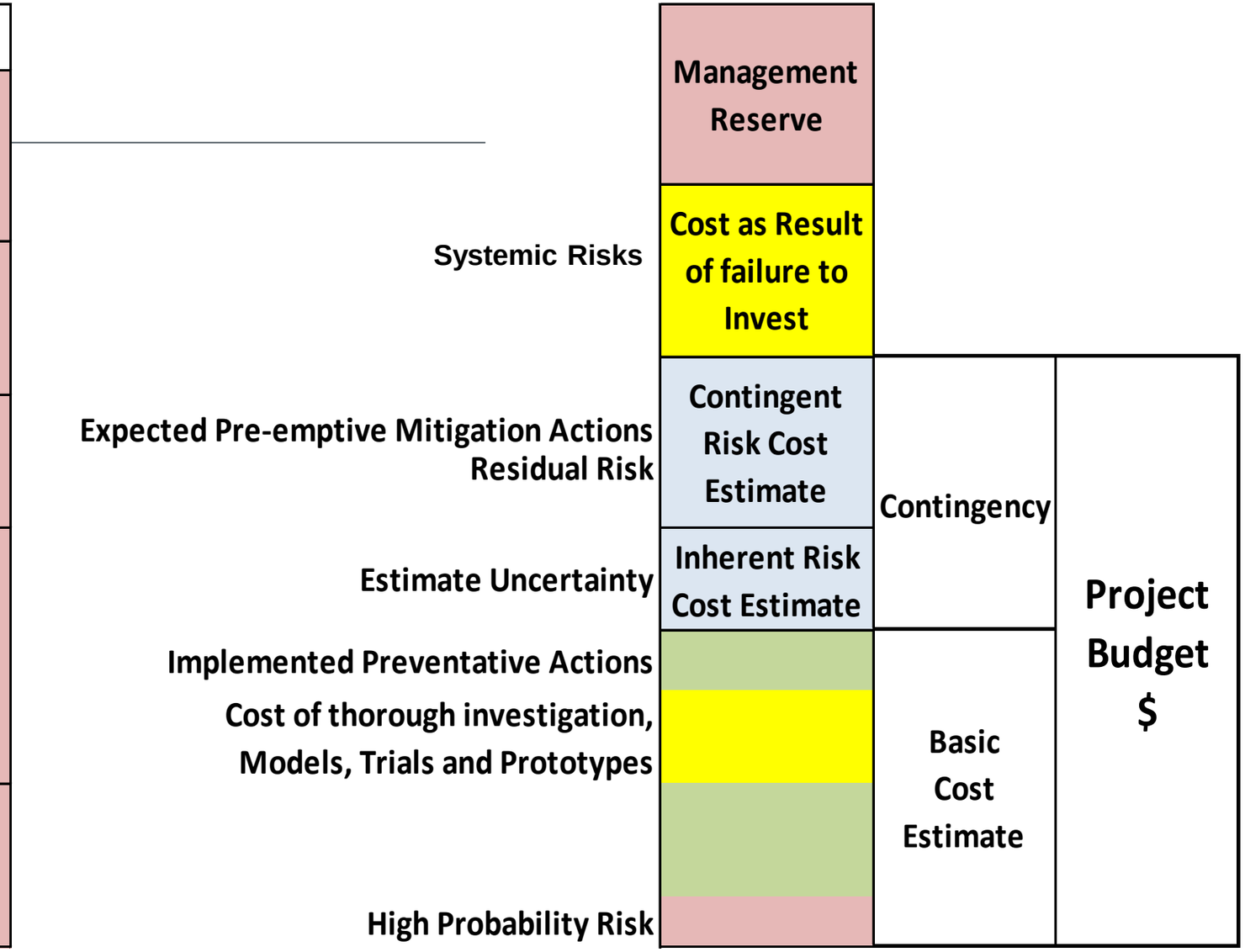

SUMMARY

- Invest
- Treatments don’t have to cost
- Engage with a diverse range of stakeholders
- Vigorously implement treatments
- Hold people accountable

GOOD LUCK ON YOUR PROJECTS