NETWORK WIDE ASSESSMENT FOR PERMIT VEHICLES

transport | community | mining | industrial | food & beverage | carbon & energy

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Dr Andrew Sonnenberg

National Bridge Engineering Manager

Overview

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- What Vehicles need permits?
- Why provide permits?
- What are the risks?
- The benefits of automated bridge assessment
- Where to next?

Background

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Tasmanian Government

- Collaboration between Pitt&Sherry and Department of State Growth.

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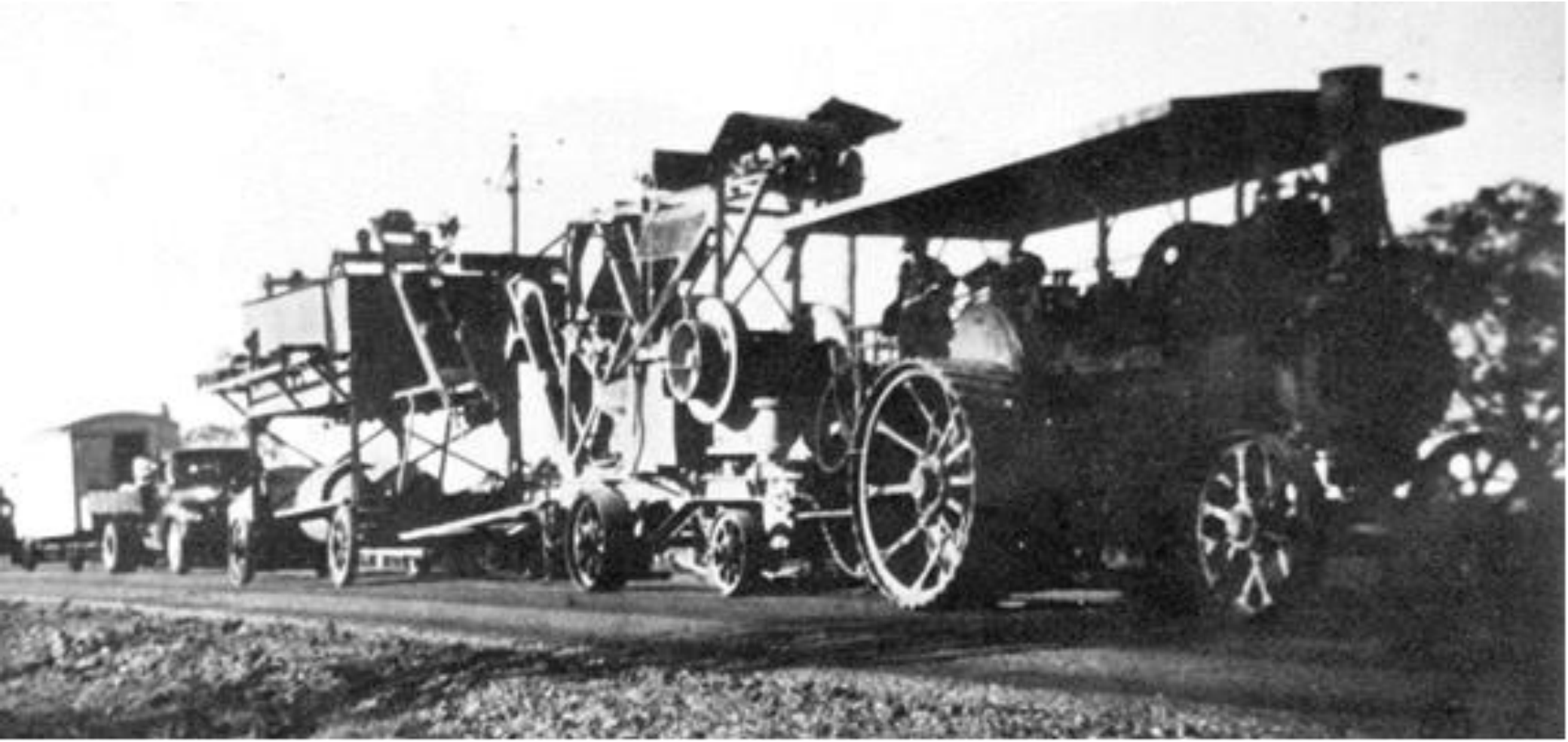

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M.R.B.

DIAGRAM OF LIVE LOADS TO BE USED IN DESIGN OF BRIDGES AND CULVERTS ON MAIN ROADS

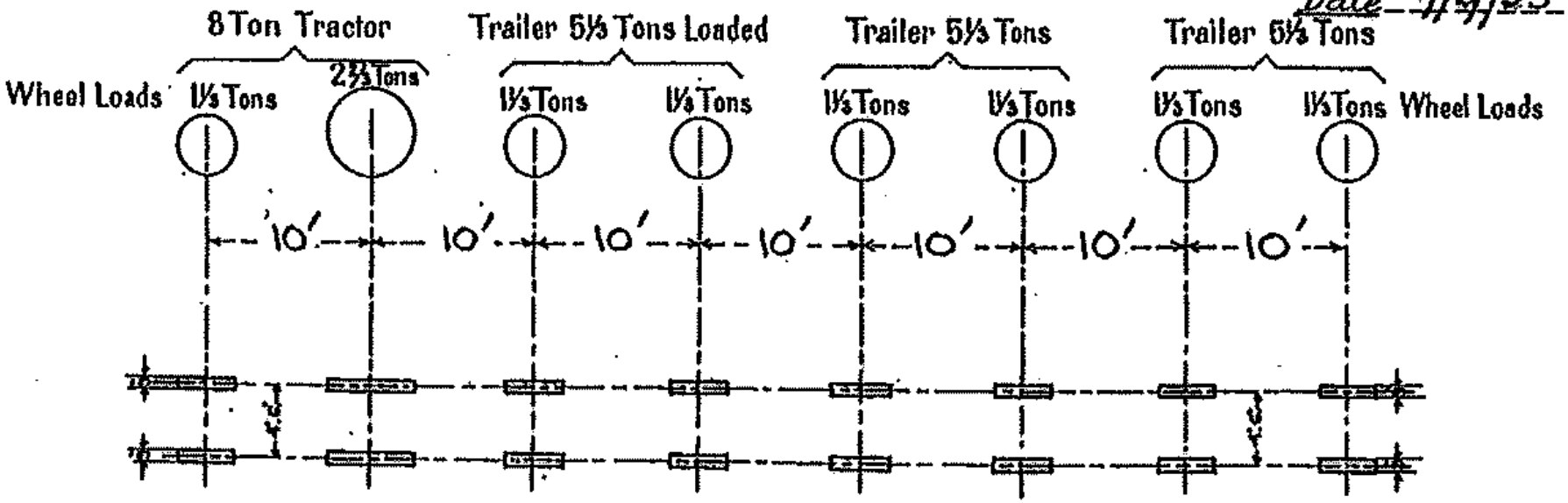
CLASS B
(2nd Class Bridges)

APPROVED

J.A. Kerr M.I.E. Aust.

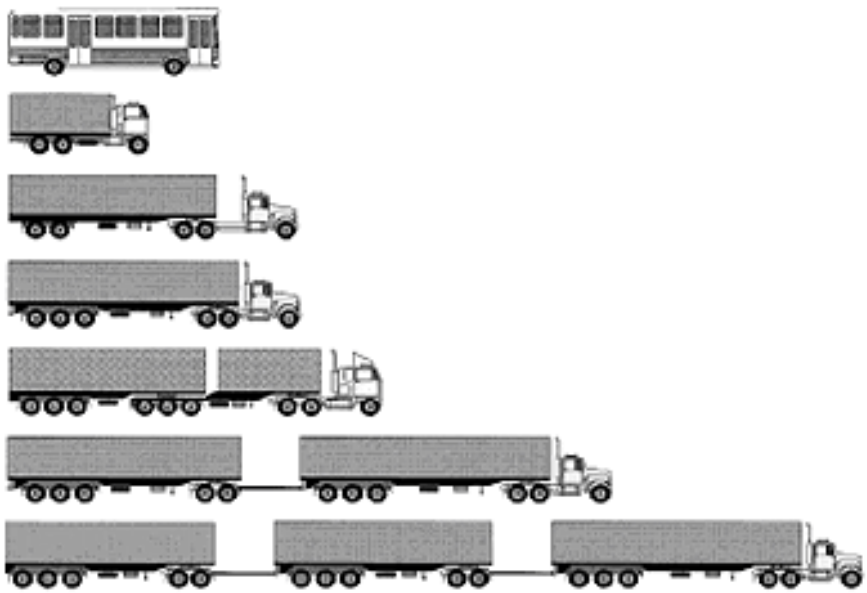
Chairman

Date 7/9/25



In 1996 NRTC report identified benefits of increasing mass limits for vehicles fitted with road friendly suspension systems.

- Carry heavier loads
- Reduce exports costs
- Fewer vehicles
- Better safety
- Improved environmental performance



Vehicle Type	Current Maximum (tonnes)	Proposed Maximum (tonnes)
	15.0	16.0
	22.5	23.0
	39.0	40.0
	42.5	45.5
	62.5	68.0
	79.0	85.7
	115.5	125.2

OSOM

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OSOM

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SPV

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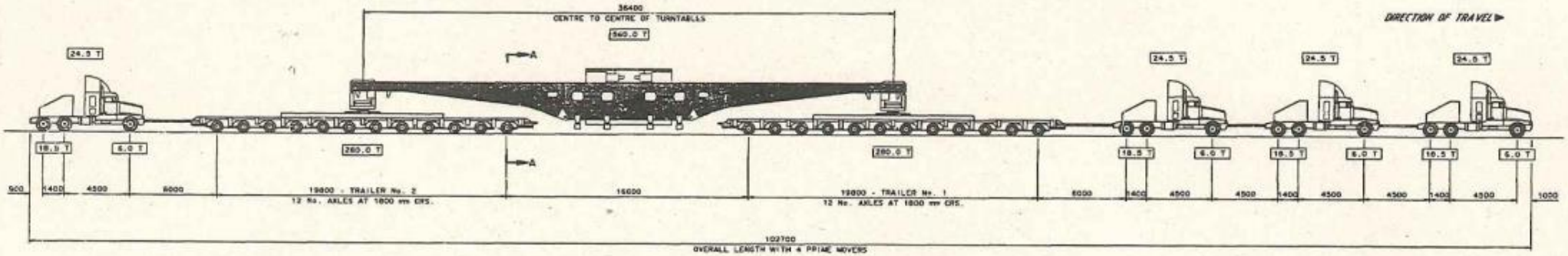
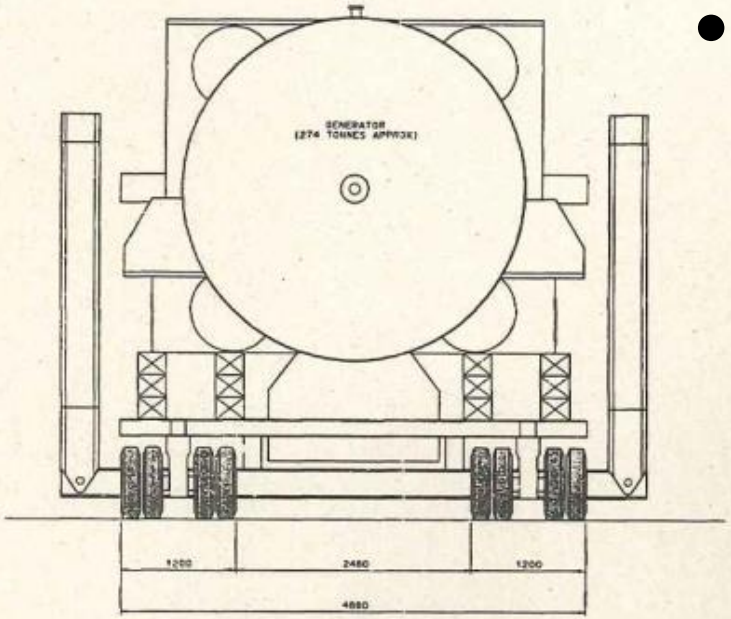


SIDE ELEVATION



SECTION A-A

- 280 tonne gross trailer mass

TRAILER MASS TABLE	
GROSS (TONNES)	280
AXLE (TONNES)	23.33
TYRE (TONNES)	2.917

Historical Design Loads

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Year	Vehicle	Total Mass
Pre 1945	Varied, examples include Steam Rollers, Crusher Train and Standard Truck	Around 8 - 30T
1946 to 1976 approx	MS18 (H20-S16-44)	32T
1976 to 2004 approx	T44	44T
2004 to current	SM1600	160T

Why provide permits?

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- Manage the safety
- Protect Assets
- Benefits
  - Reduced number of trucks on the road
  - Difficulty in splitting loads
  - Reduced time for construction (bigger equipment the faster the process)
  - Overall reduction in costs

What needs to be assessed

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What needs to be assessed

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What needs to be assessed

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What are the risks?

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Is this 108 tonne permit vehicle safe to travel?

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- One person died and ten others were injured

Guidelines for assessment

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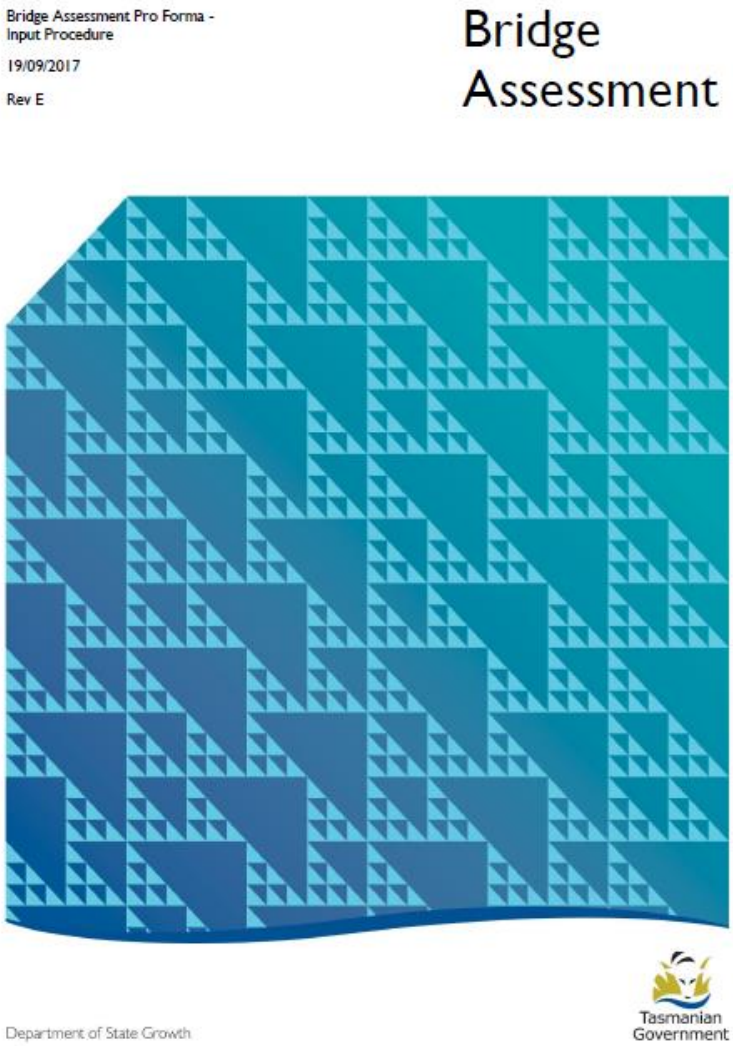
Pitt&Sherry used the guidelines on over 400 structures for Councils in the North of Tasmania and for over 300 structures for the Department of State Growth


Bridge Assessment Pro Forma - Input Procedure

19/09/2017

Rev E

Bridge Assessment

Department of State Growth

Tasmanian Government

Assessment levels

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- Five levels of assessment
  - BAL 1 : The capacity available for live load based on original design standard
  - **BAL2: Capacity is calculated for each structural element, with distribution factors determined from formulae**
  - BAL 3: An extension of BAL 2 for specific purposes
  - BAL 4: Distribution factors from a grillage or similar model
  - BAL 5: Advanced assessment that may utilise finite element models or load test data.

Analysis Tool

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	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1																			
2		Bridge Span Details																	
3																			
4	Bridge Name	Bridge Number	Segment	Segment Group	Representative Segment	Representative Segment Check	Support Type Configuration 1		Support Type Configuration 2 (If Applicable)		Centre of Supports Span	Bearing Offset End A	Bearing Offset End B	Effective Span	Average Beam Spacing	Edge Beam Centre to Face of Kerb	Edge of Maked Lane to Face of Kerb	Benefitted by Widening Axles?	Modulus of Elasticity of Beam
5							Support A	Support B	Support A	Support B									E_E
6											m	m	m	m	m	m	m		GPa
7	Crayfish Creek Bridge	102	1	1	N		SS	SS	0	0	18.29	0.1905	0.1905	17.91	2.29	0.00	0.00	Y	200.0
8	Crayfish Creek Bridge	102	2	1	Y		SS	SS	0	0	18.29	0.1905	0.1905	17.91	2.29	0.00	0.00	Y	200.0
9	Crayfish Creek Bridge	102	3	1	N		SS	SS	0	0	18.29	0.1905	0.1905	17.91	2.29	0.00	0.00	Y	200.0
10	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
11	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
12	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
13	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
14	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
15	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
16	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
17	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
18	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
19	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
20	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
21	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
22	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
23	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
24	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			
25	#N/A				N		0	#N/A	0	#N/A	#N/A			#N/A	0.00	0.00			

Version History | Bridge Layout | **Bridge Segments and Dead Loads** | Distribution Factors | Superstructure Capacity | Substructure Capacity | Comments | Desig ...

Analysis Tool

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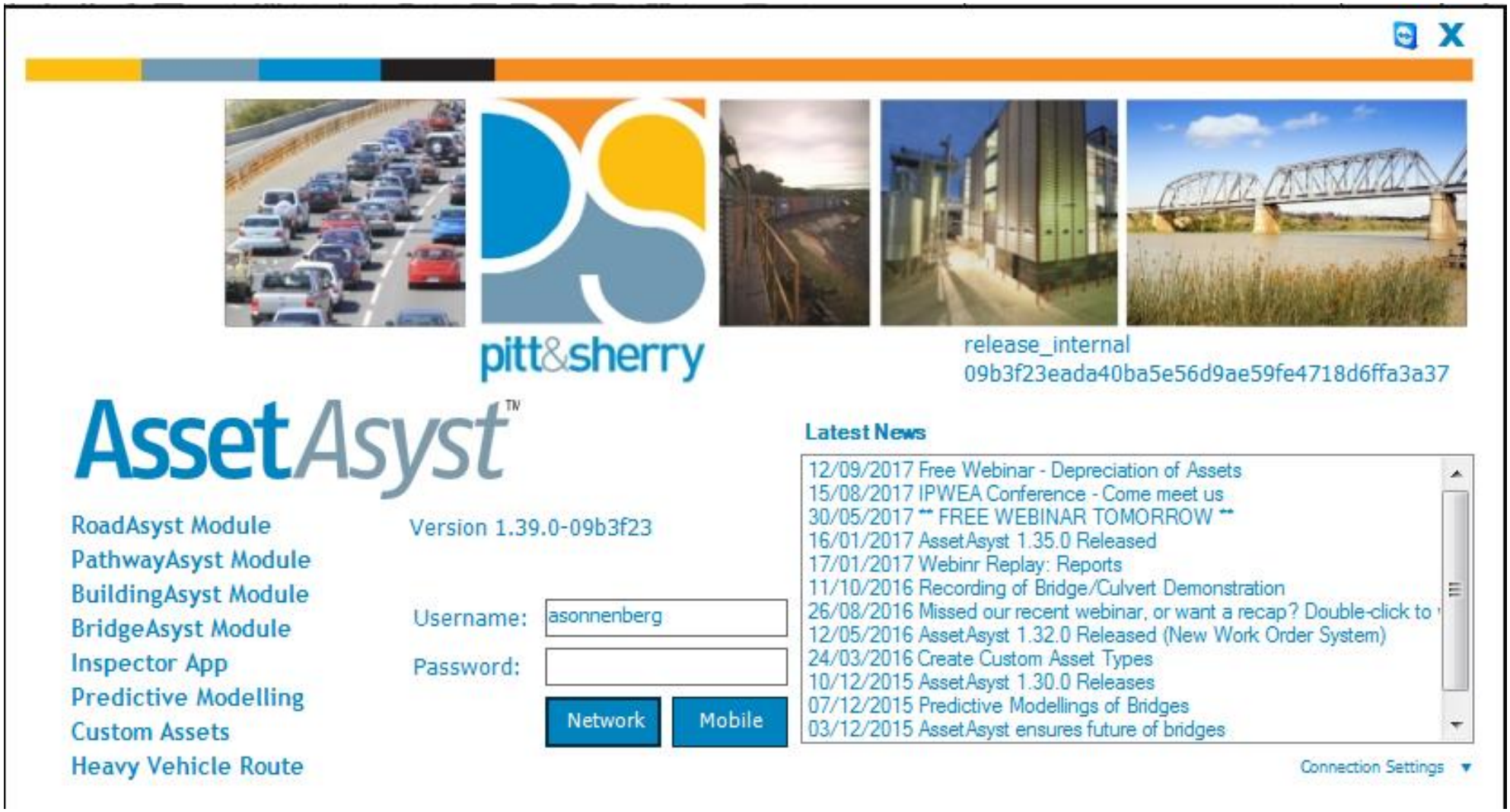

User interface

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pitt&sherry - AssetAsyst connected to Production Network

File Tree Reports Financial Predictive Analysis Mobile Map Tools Help

Asset Tree | Inspection Tree

Asset Tree

Quick Search

Asset Name | like

Add another parameter

Search | Reset

- Artwork
- Building
- Bus Shelters
- Crane
- Dilapidation Survey
- Fleet
- Pathway
- Road
- Structure
- Trees

View all 5487

Legend | GPS | Statistics

Above Ground

Level 4*

Level 3*

Level 2*

* missing primary GIS layers for this level

- Local Government Boundaries
- bridges

500 km

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File Tree Reports Financial Predictive Analysis Mobile Map Tools Help

Customers...
Vehicle Builder...
Analyse...
Results...

Asset Tree | Inspection Tree

Asset Tree

Quick Search

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500 km

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Inputs Required - Customers

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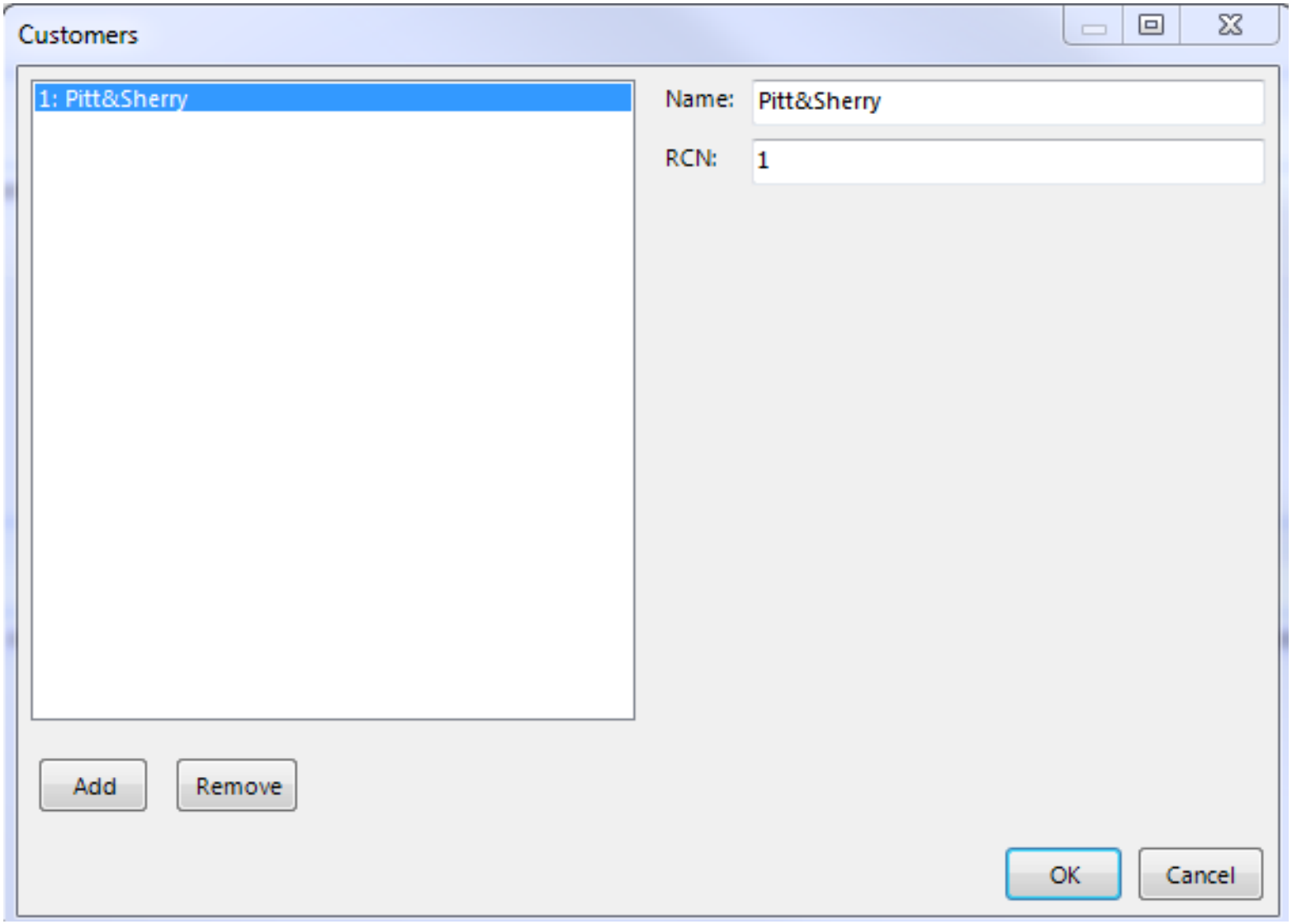

Inputs in AssetAsyst

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Structure Information

Generic Data | Custom Fields | Units | Defects | Inspections | Works | Risk | Financial | Capacity | History | Attachments

Layout

Add Remove

Point	Label	Group	Substructure Check Required	Distance from point 1 (m)	Support Type
1	Abutment 1	0	☑	0	Simply Supported
2	Pier 1	0	☐	10	Continuous
3	Pier 2	0	☐	20	Continuous
4	Abutment 2	0	☐	30	Simply Supported

Superstructure Capacity

Add Remove

Seg. Number	Location (m)	Beam	V (kN)	M+ (kNm)	M- (kNm)
1	0	Internal	200		
1	5	Internal	20		
1	10	Internal	220		
1	0	External	150		

Substructure Capacity

Add Remove

Point	Label	Vehicle Drive Line	Available Capacity For Live Load
1		Design Lane	500

Input required – Distribution factors

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- Advice provided by ASSHTO.
- Vary depending on the type of vehicle on the bridge and hence a range of distribution factors are needed.
- Allow different values for external and internal beams.

Vehicle builder

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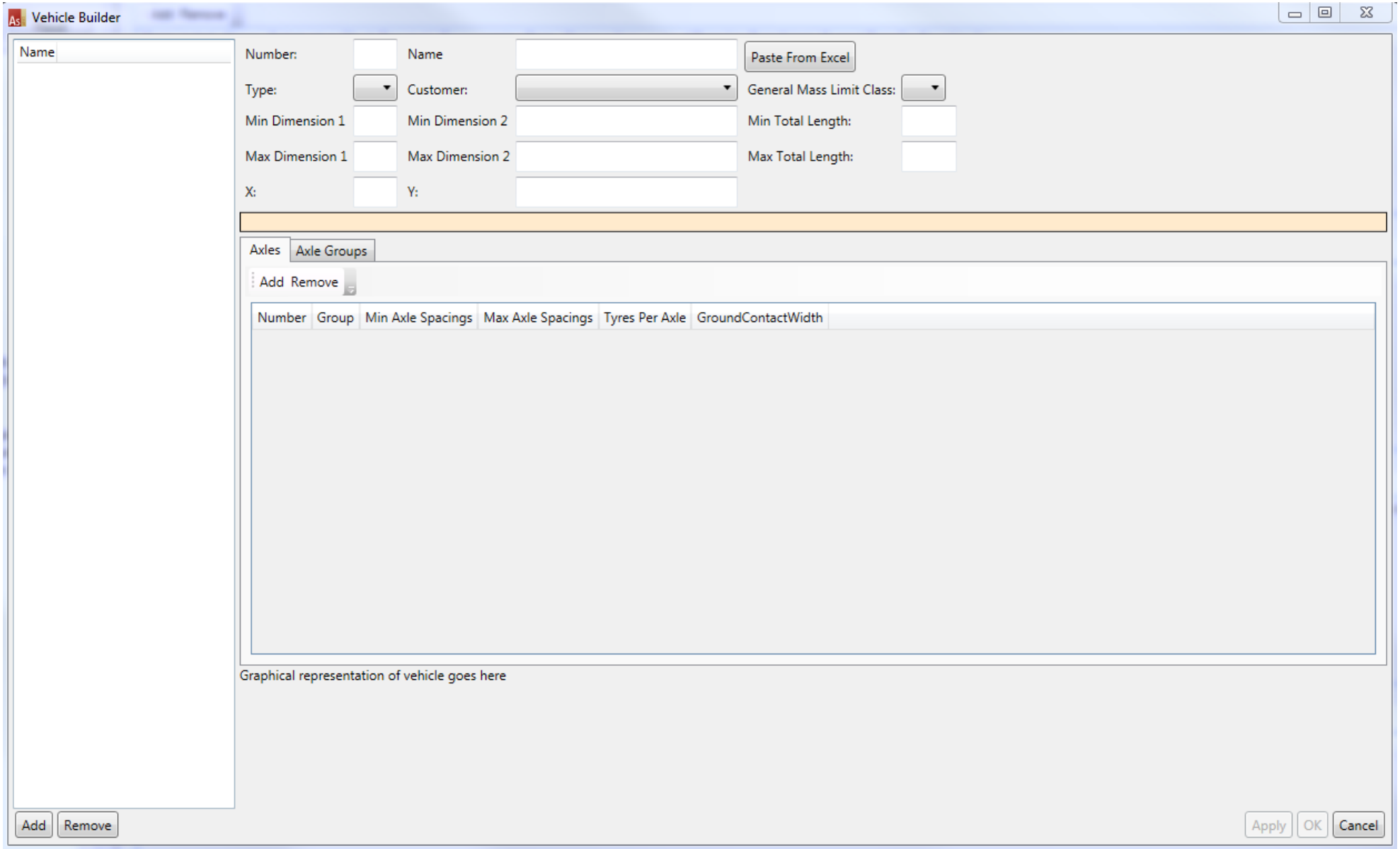

Inputs – Choose vehicles

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Heavy Vehicle Analysis Wizard

Heavy Vehicle Analysis Wizard

AssetAsyst

Number:

Name:

Customer:

Type:

General Mass Class:

Filter | Reset

Number	Name	Customer	Type	General Mass Class
1	Rigid Vehicle	Pitt&Sherry	HML	

1 item

Add Selected | Add All | Remove Selected | Remove All

Number	Name	Customer	Type	General Mass Class

0 items

< Previous | Next > | Cancel

Inputs – Choose the structures

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Heavy Vehicle Analysis Wizard

Heavy Vehicle Analysis Wizard

AssetAsyst

Number:

Name:

Line:

Span Type:

Structure Class:

Owner:

Search | Reset

Number	Name	Line	Chainage	Span Type	Asset Class
B50193	B50193	Watermans Place	0	Deck/Slab	Bridge
B50194	B50194	Surrey Street	0	Deck/Slab	Bridge
B50195	B50195	Freehold Place	0	Open Girder	Bridge
B50196	B50196	South Street	0	Deck/Slab	Bridge
B50197	B50197	Isabella Place	0	Deck/Slab	Bridge
B50200	B50200	Ripon Street South	0	Arch Culvert	Culvert
B50201	B50201	Darling Street	0	Arch Culvert	Culvert
B50203	B50203	Steinfeld Street North	0	Box Culvert	Culvert
B50205	B50205	King Street South	0	Arch Culvert	Culvert

4006 items

Add Selected | Add All | Remove Selected | Remove All

Number	Name	Line	Chainage	Span Type	Asset Class

0 items

< Previous | Finish | Cancel

Results

- Vehicle passes all checks
- Vehicle requires marked lane travel
- Vehicle required centreline travel
- Further assessment required
- Vehicle not permitted to travel

Benefits of using technology

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- Use the information from previous assessments (vehicles and capacities)
- Low cost assessment
- Consistency of approach
- Integration with other systems, GIS, Heavy Vehicle Regulator
- Save permit history against each asset
- Less trained workers can undertake vehicle checks

Benefits of automation

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- Reducing the risk of injury and death

Future works

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- Extend the analysis for drop in spans and cantilevers
- Refine the reporting
- Determine capacity based on a generic load assessment (auto filled from BAL-1 type check)
- Display the vehicle load configuration
- Integrate with the heavy vehicle regulator
- Place in coding of the automatic calculation of distribution factors

Summary

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- There is a need to assess permit vehicles
- If you get the process wrong it could be deadly
- It’s a task that is well suited to automation