



The Strategic Local Government Asset Assessment Project

Webinar 4
Tier 1 Assessments



Webinar Topics

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1	About the Strategic Local Government Asset Assessment Project
2	Basic Vehicle/ Bridge Interactions
3	Bridge Assessment Framework
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5	Interpreting Engineering Reports for Access Decision Making
6	Vehicles and Route Assessment
7	Applying Conditions for Heavy Vehicle Access
8	NHVR Portal – Digital Asset Management
9	Pre-approvals for key routes

Webinar Presenters



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Contents

11:00 - 11:05	Welcome	Todd Wellard
11:05 - 11:45	Tier 1 Assessments	Dr Neal Lake
11:50 - 12:00	QNA	All

Session format

- QnA (end and in chat)
- Please mute microphones
- Session recorded and will be emailed with slides
- Please watch in order as designed to build on knowledge

SLGAAP - Stay connected

Road Manager Toolkit

01



PLAN

02



COMPARE

03

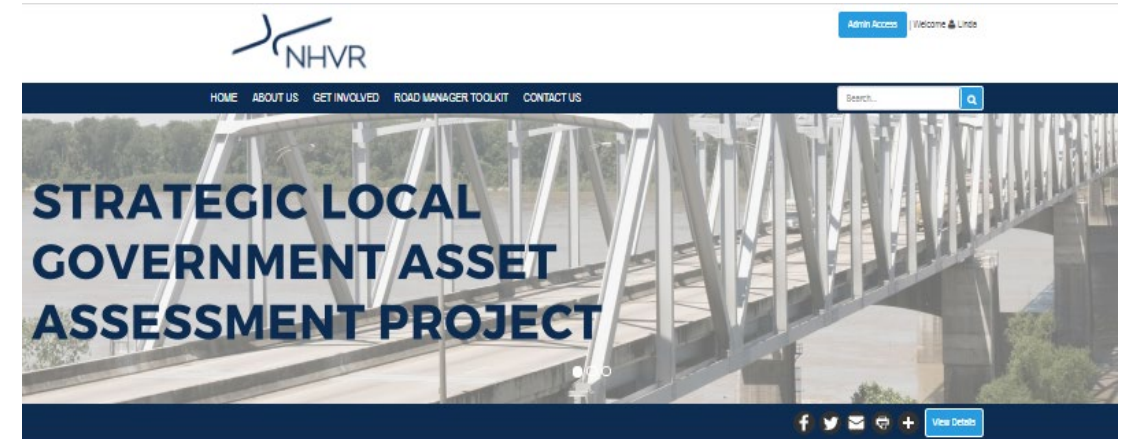


ASSESS

04



INTERPRET



What is SLGAAP?

In late 2016, the Australian Government provided the National Heavy Vehicle Regulator (NHVR) with \$7.60 million in funding to assist road managers with the assessment of important infrastructure assets, like bridges and culverts. A better understanding of these assets on key local government heavy vehicle routes will improve heavy vehicle access across Australia.

The Strategic Local Government Asset Assessment Project (SLGAAP) was established as a national project to:

- Improve access for heavy vehicles across regional freight routes.
- Build capacity of local government to conduct risk-based assessments and optimise network use.
- Focus on priority routes to connect regions and provide seamless access across jurisdictions.
- Provide asset information to heavy vehicle operators for open data and transparency of access.

Strategic Local Government Asset Assessment Project



Visit the SLGAAP Website to keep updated with all of the project news and progress.
<https://nhvr.engagementhub.com.au>
E: roadassetproject@nhvr.gov.au

Bridge Assessment Framework

Key outcomes from today to understand the:

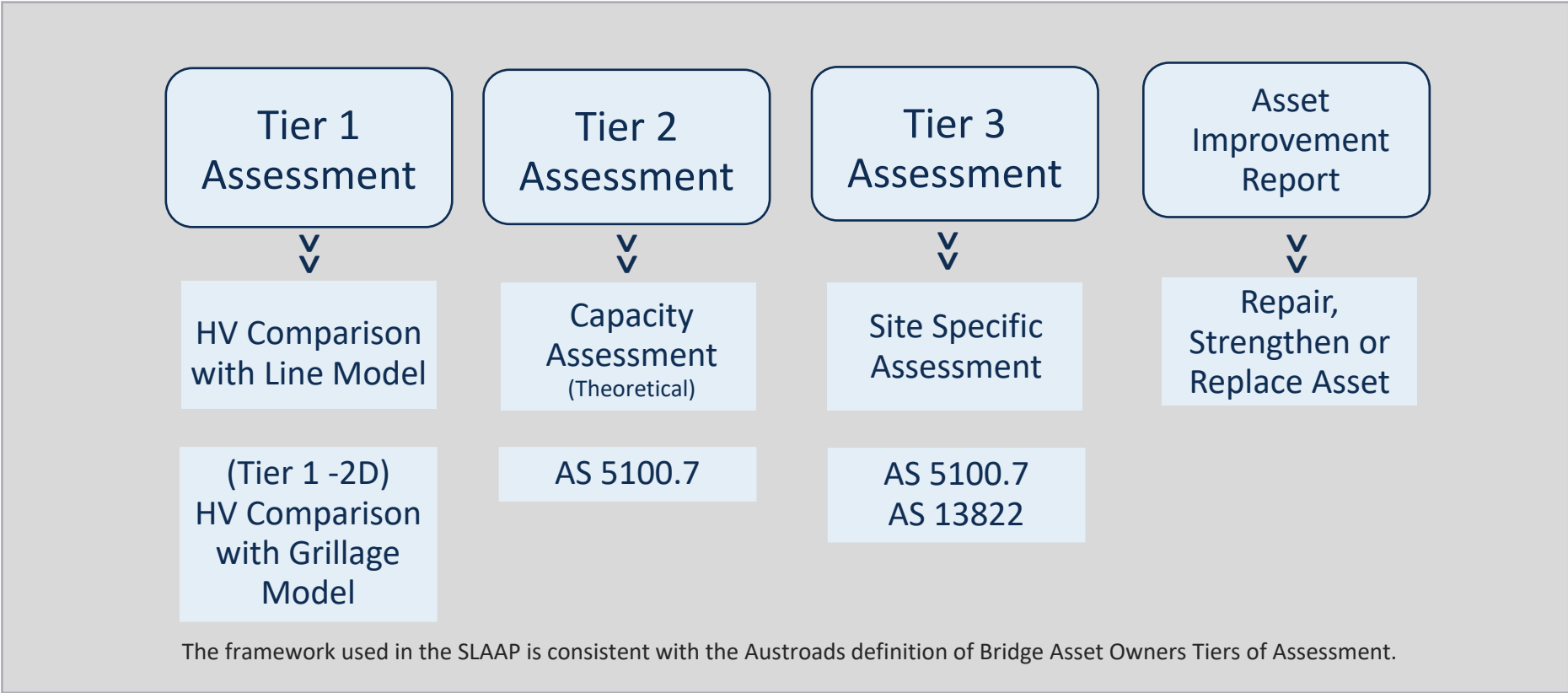
- How Tier 1 Assessment works
- How to develop envelopes of bridge capability
- How to select relevant reference vehicles
- Factors affecting valid Tier 1 assessment



Tier 1 Assessments

Dr Neal Lake

Tiers of Bridge Assessment



Heavy Vehicle
Access
Assessment



Bridge
Assessment

Assessment Type Selection

A reference vehicle must be of similar ground contact width and position on bridge. Typically, different reference vehicles for in-lane vehicles and straddling lane OSOM vehicles are needed. Some consideration needs to be made to the axle configuration and mass concentration when deciding on the appropriateness of a reference vehicle for comparison to an application vehicle. Reference vehicles may have come from:

- Previous design vehicles
- Previous Tier 2 assessment vehicles
- Previous Tier 3 assessment vehicles

Note: Design vehicles need to be verified on design drawings, otherwise engineering judgement is needed. All reference vehicles must have been developed considering associated lane vehicles.

Tier 1 Assessment: Heavy Vehicle Access Assessment

Line Model Comparison (Reference vs Application vehicle)

A.k.a. TMR Tier 0, Tier 2 PBS Assessment

Line model (comparison) comparing load effect of application vehicle and design vehicle or previously approved commercial vehicle. Must consider condition of structures.

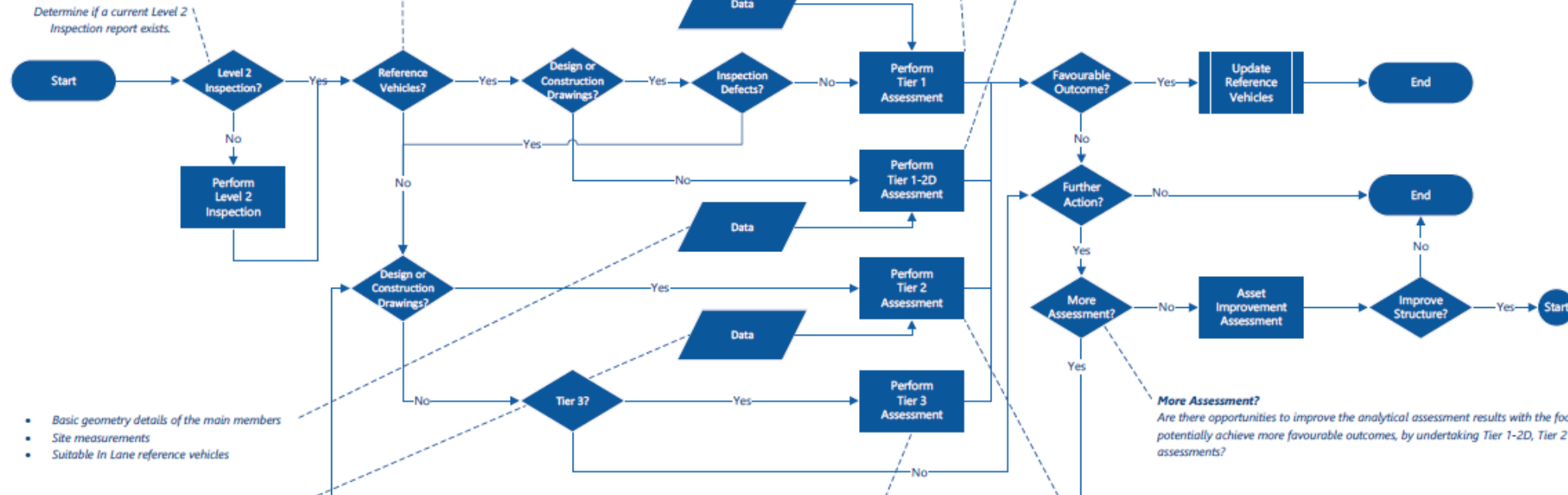
Note: A Tier 1 assessment is not a bridge assessment, it is a heavy vehicle assessment.

- Span lengths
- Articulation
- Reference Vehicle Loads and Spacings

Tier 1-2D Assessment

2D Grillage Model Comparison (Reference vs Application vehicle)

- 2D grillage model used for the comparison of reference vehicles (in lane, including associated lane vehicles) to the application vehicles (out of lane)
- Need suitable in lane reference vehicles
- Need basic geometry of the main members to model the stiffness of individual members, may require some site measurements
- Don't need reinforcing details



- Basic geometry details of the main members
- Site measurements
- Suitable In Lane reference vehicles

- Full geometry details
- Material properties
- Reinforcing details
- Pre-stressing details, etc.

Tier 3 Assessment: Capacity Assessment+

A.k.a. TMR Tier 2

More advanced method which involves bridge specific analysis and the use of international standards that are more sophisticated than AS5100.7. Analysis includes, but is not limited to, non-linear analysis and load testing to support either recalibration of computer models/determination of capacity estimates. It is used in special cases where we have:

- A 'plausibility' gap
- Insufficient information to conduct a Tier 2
- Reason to believe better outcomes can be obtained by understanding behaviour and/or understanding uncertainty to improve load/capacity factor estimates.

Tier 2 Assessment: Capacity Assessment

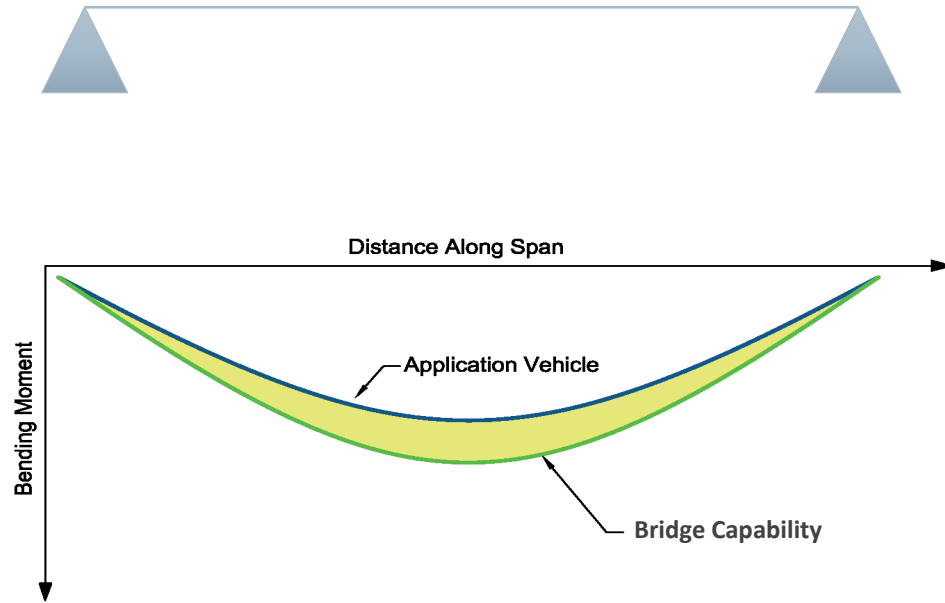
A.k.a. TMR Tier 1, Tier 3 PBS Assessment

2D grillage model or line model with appropriate distribution factors analysis. Must include assessment of structural capacity. Must consider condition of structure and all critical elements including the substructure. Judgement may be used for some elements but cannot be excluded from consideration for convenience.

Tier 1 Assessment in a nutshell

- For a Tier 1 assessment
 - Need reference vehicles (%) that represent the bridge capability
 - Compare these reference vehicles to an application vehicle using a line model of the structure (basic engineering statics)
 - **% Reference > Application** 
 - **% Reference < Application**  need to think about the risks

Comparing Vehicles (Tier 1 Assessment)



Maximum % of reference vehicle (Bridge Capability)

- Design vehicle
- Reference vehicle used in a bridge capacity assessment
- Previously approved vehicle that has proven performance/bridge impact

Uses a line model to represent a structure

Compares the bridge capability to the application vehicle

Need to compare load action effect:

- Moment
- Shear
- Pier Reaction

Note: This is not
Bridge
Assessment !!

How to create the envelopes of Capability

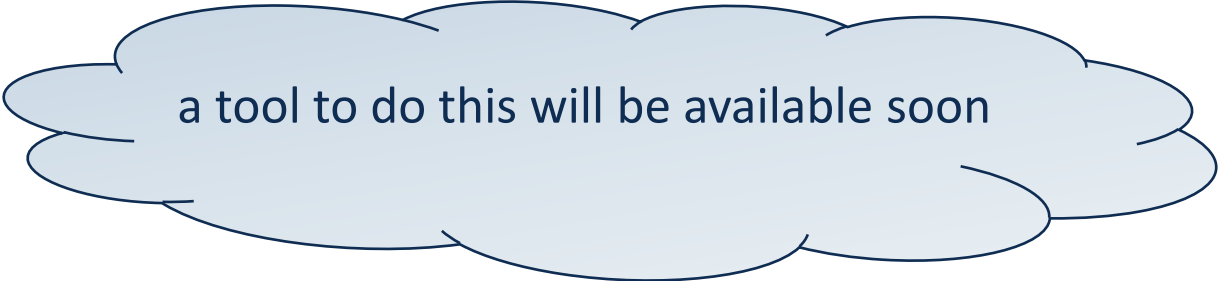
- Step vehicle across the line model of the bridge (0.1 m - 0.2 m increments)
- Calculate load action effects at each step (Moment, Shear and Reactions)
 - Using basic statics
- Take the envelope of the effects (Maximums define bridge capability, not minimums)
- **Repeat for all relevant reference vehicle to get an envelope of capability** (for the lateral position/ground contact width case)
 - Typically 2 capability envelopes
 - “In lane”
 - “Straddling lane”
- Multiple presence is **not** considered when developing these **line model** envelopes of capability..... **BUT!!!!**

Selection of Appropriate Reference Vehicles to Define Bridge Capability

- Reference vehicles must have been developed considering appropriate multiple presence of vehicles (adjacent lanes and/or trailing vehicles in Tier 2 assessment or original design)
- Reference vehicles can be:
 - Previous design vehicles
 - Tier 2/3 assessment vehicles (RF becomes % reference vehicles)
 - Previous approved vehicles (legacy) that have not produced any adverse effects and have “proven performance”

Tier 1 Heavy Vehicle Access Assessment

- Calculating the line load action effects of the application vehicle
 - Use the same process considering just the application vehicle
(remember no multiple presence)



a tool to do this will be available soon

- Tier 1 Heavy Vehicle Access Assessment

$$\text{Tier 1 Assessment Ratio} = \frac{\text{peak reference vehicle effect} \times LLF_{RV} \times DLA_{RV}}{\text{peak application vehicle effect} \times LLF_{AV} \times DLA_{AV}}$$

Developing Bridge Capability Envelopes, the Critical Issues

Understanding that:

1. Lateral position and ground contact width affect the validity of a Tier 1 assessment
2. Dynamic load allowance and live load factor may be different for the reference vehicle and application vehicle
3. Associated lane factors (multiple presence/lanes and/or trailing vehicles) must be considered in the development of bridge capability (Tier 2 assessment or original design)

Recapping the main points

- Tier 1 is Heavy Vehicle access assessment
- Rapid Tier 1 assessment has the potential to be very accurate
 - But need appropriate reference vehicles
 - In lane
 - Straddling lane
- Multiple presence is not incorporated in Tier 1 heavy vehicle access assessment **but is taken into account in the development of any relevant reference vehicles (Tier 2) used to define bridge capability**
- LLF and DLA may be different for the reference vehicle/s and the application vehicle
- % Reference > Application



Further Training



- Overview of heavy vehicle access landscape in Australia
- Understanding the tiers of bridge assessment
- The decision making process for bridge access
- Defining bridge capability
- Critical variables that affect assessment
- Resourcing assessments and getting the most from consultants



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<https://www.ipweaq.com/courses>

Questions?

**Next Webinar
Tuesday 20 July**

*Interpreting Engineering Reports
for Access Decision Making*

Register for the rest of the
Webinar series here:

<https://www.eventbrite.com.au/o/national-heavy-vehicle-regulator-11836541834>