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Bitumen Treated Basecourse - Rapid and resilient network option

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Presentation Overview

- Report on floods in Queensland
 - Extent of damage to the transport network
 - Delivering the reconstruction program
 - Bitumen Treated Basecourse – review
 - Examples of BTB projects
 - BTB specification developed through AAPA
 - Draft specification details
 - Overview – BTB improved resilience
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Report on floods in Queensland

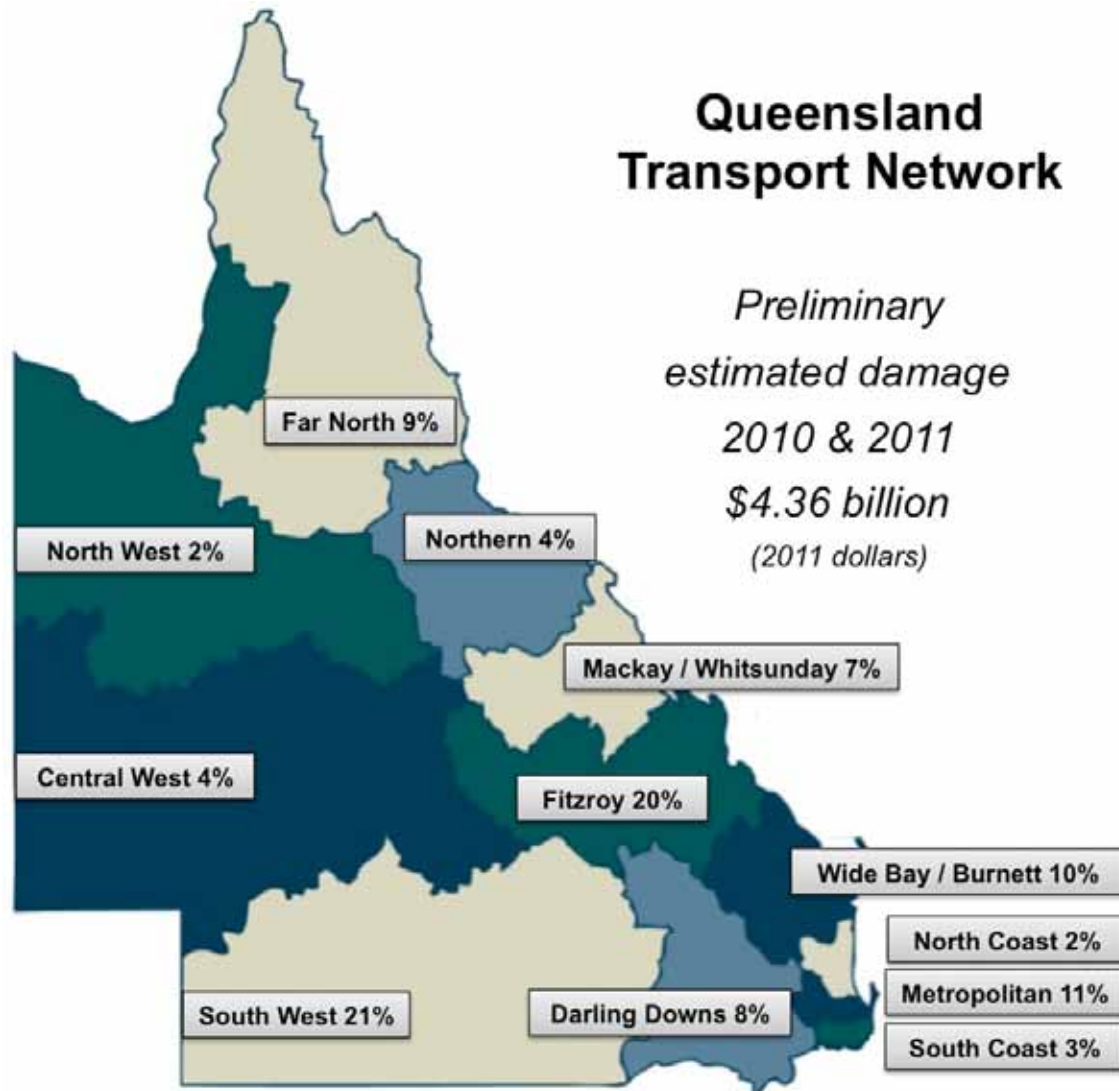


Damage across the whole state, 85% of roads with pavement damage, road users aware of the inconvenience and economic impact.

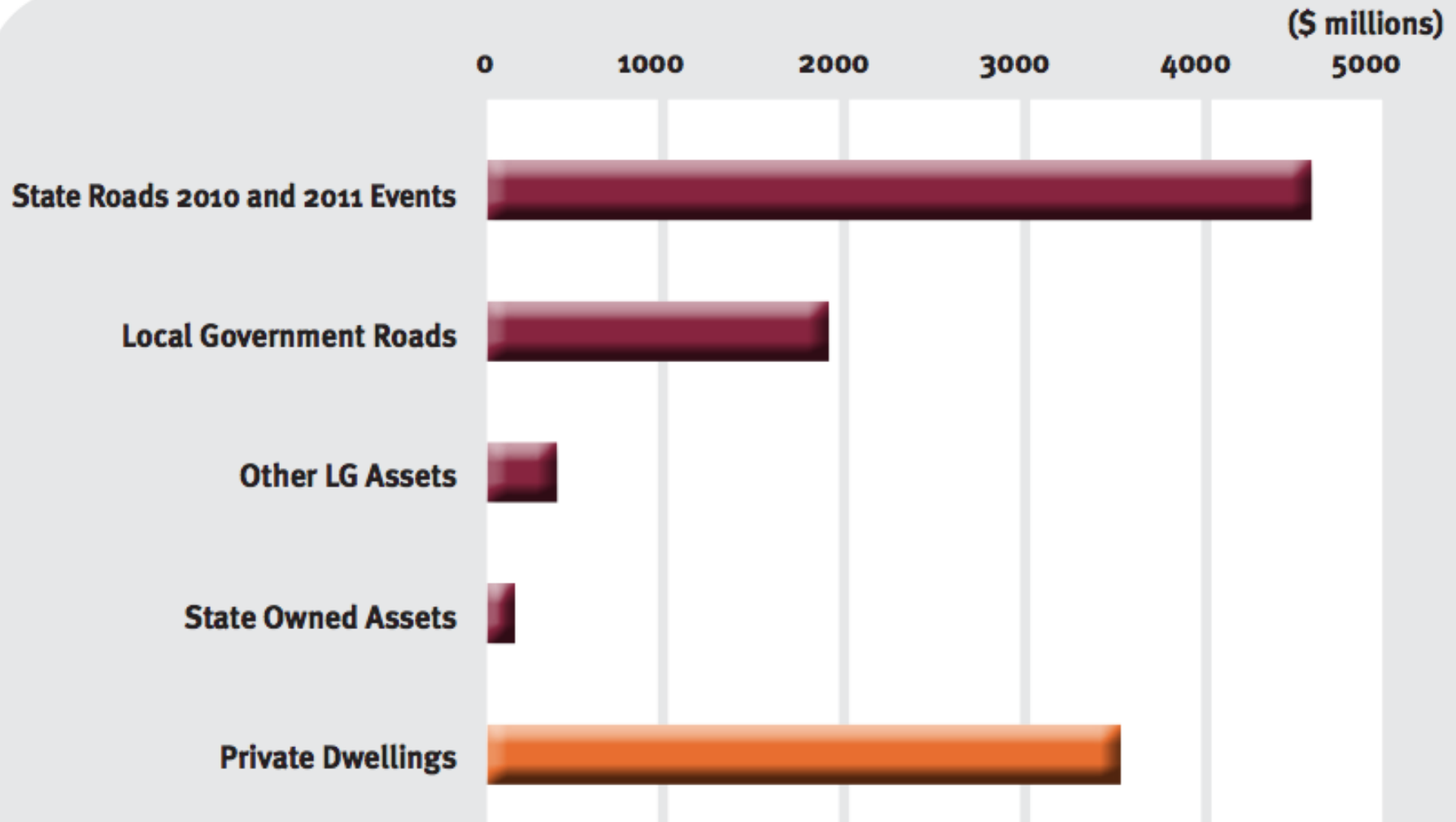




Extent of damage to the transport network



Extent of damage to the transport network



Source: QldRA, ICA

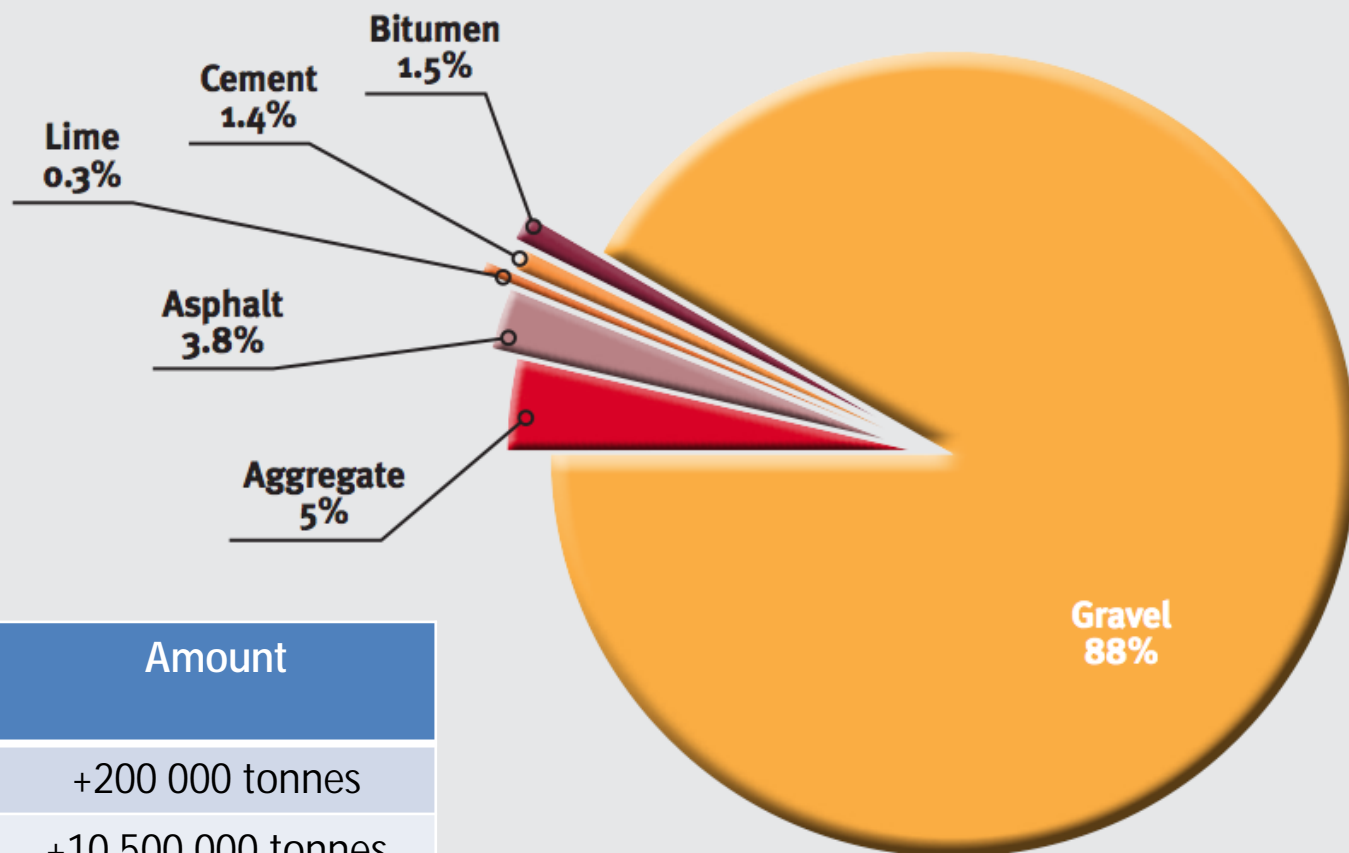
Delivering the reconstruction program

Table 1: Transport Network Reconstruction Program – Objectives and Strategic Risks ⁽¹⁾

Objectives	Strategic risks
<ul style="list-style-type: none">• Coordination across lines of reconstruction	<ul style="list-style-type: none">• Cost escalation - materials and labour
<ul style="list-style-type: none">• Resilience of network	<ul style="list-style-type: none">• Decreased availability – plant and material
<ul style="list-style-type: none">• Immunity enhancement opportunities	<ul style="list-style-type: none">• Market unable to meet demand
<ul style="list-style-type: none">• Value for money	<ul style="list-style-type: none">• Attracting and retaining contractor involvement
<ul style="list-style-type: none">• Timely completion	<ul style="list-style-type: none">• Market overheating
<ul style="list-style-type: none">• Communication and engagement	<ul style="list-style-type: none">• Competing demand for resources (mining)
<ul style="list-style-type: none">• Transition back to normal business	<ul style="list-style-type: none">• Lack of coordination in delivery
	<ul style="list-style-type: none">• Continued wet weather

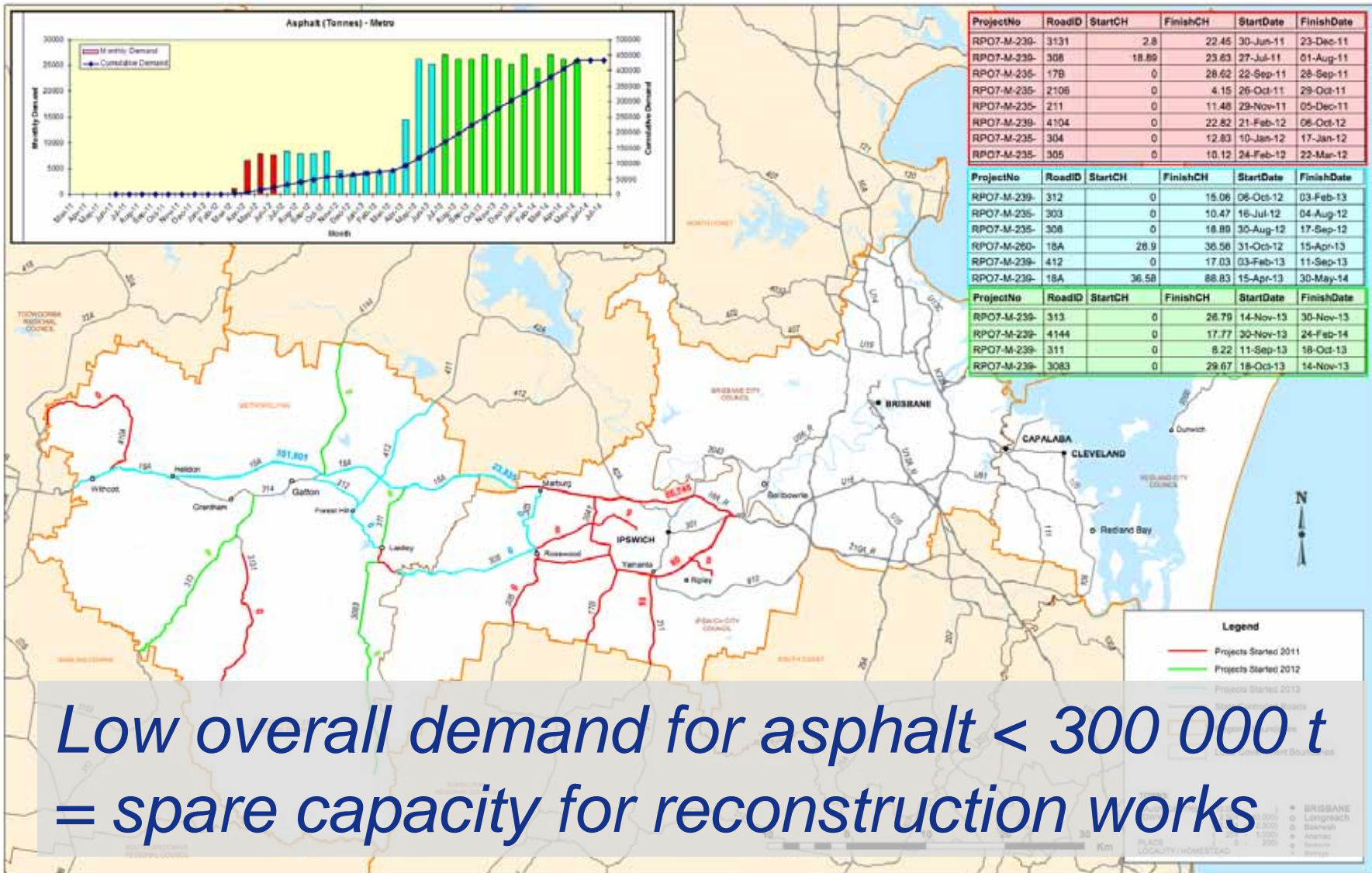
Extent of damage to the transport network

Critical Road Materials



Materials needed (36mths)	Amount
Bitumen	+200 000 tonnes
Granular & aggregates	+10 500 000 tonnes
Asphalt	+300 000 tonnes
Stabilisers	+65 full time

Extent of damage to the transport network



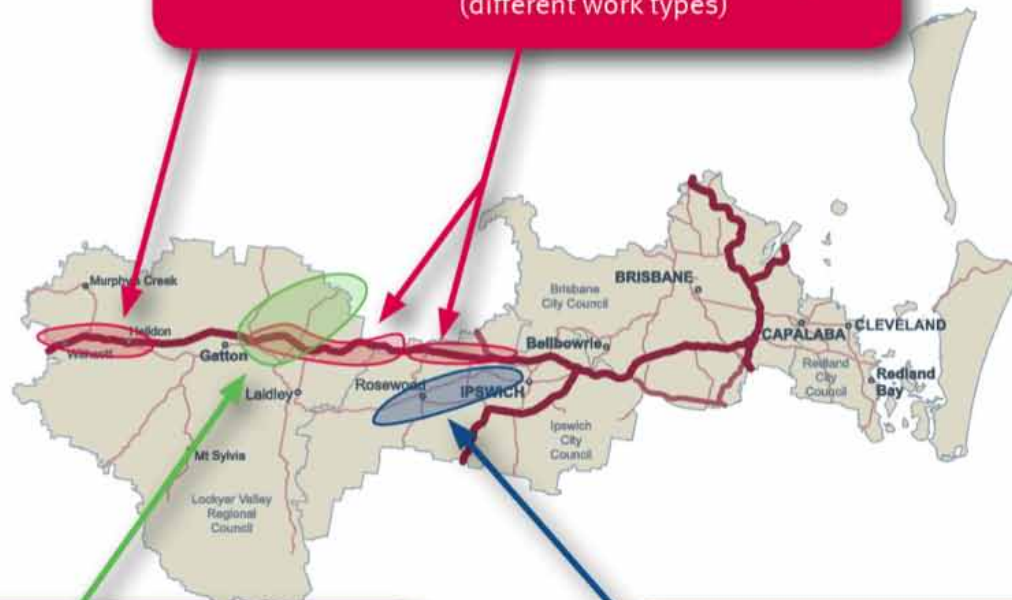
*Low overall demand for asphalt < 300 000 t
= spare capacity for reconstruction works*

Delivering the reconstruction program

Metropolitan Region

Warrego Highway

Length of repairs: Ipswich/Somerset/Lockyer LGAs
Treatment type: TBC
Tender date: From March 2012
Value of works: Over \$100 million – 3 packages (different work types)



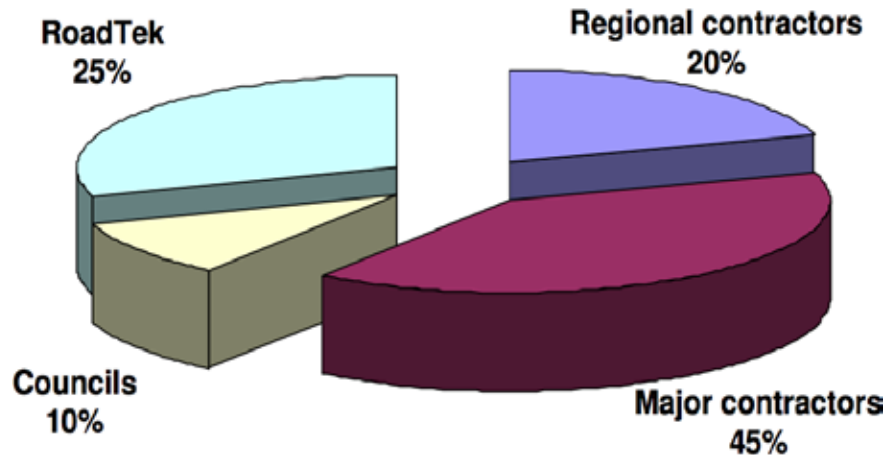
Gatton area

Length of repairs: Intermittent repairs
Treatment type: Overlay and widening
Tender date: June 2012
Value of works: \$18 million

Rosewood area

Length of repairs: Intermittent repairs
Treatment type: Overlay and widening/Patching
Tender date: October 2011
Value of works: \$12 million

Delivering the reconstruction program



Accessing spare capacity in the HMA sector to speed up delivery → BTB revisited

Materials needed (36mths)	Amount
Bitumen	+200 000 tonnes
Granular & aggregates	+10 500 000 tonnes
Asphalt	+300 000 tonnes
Stabilisers	+65 full time

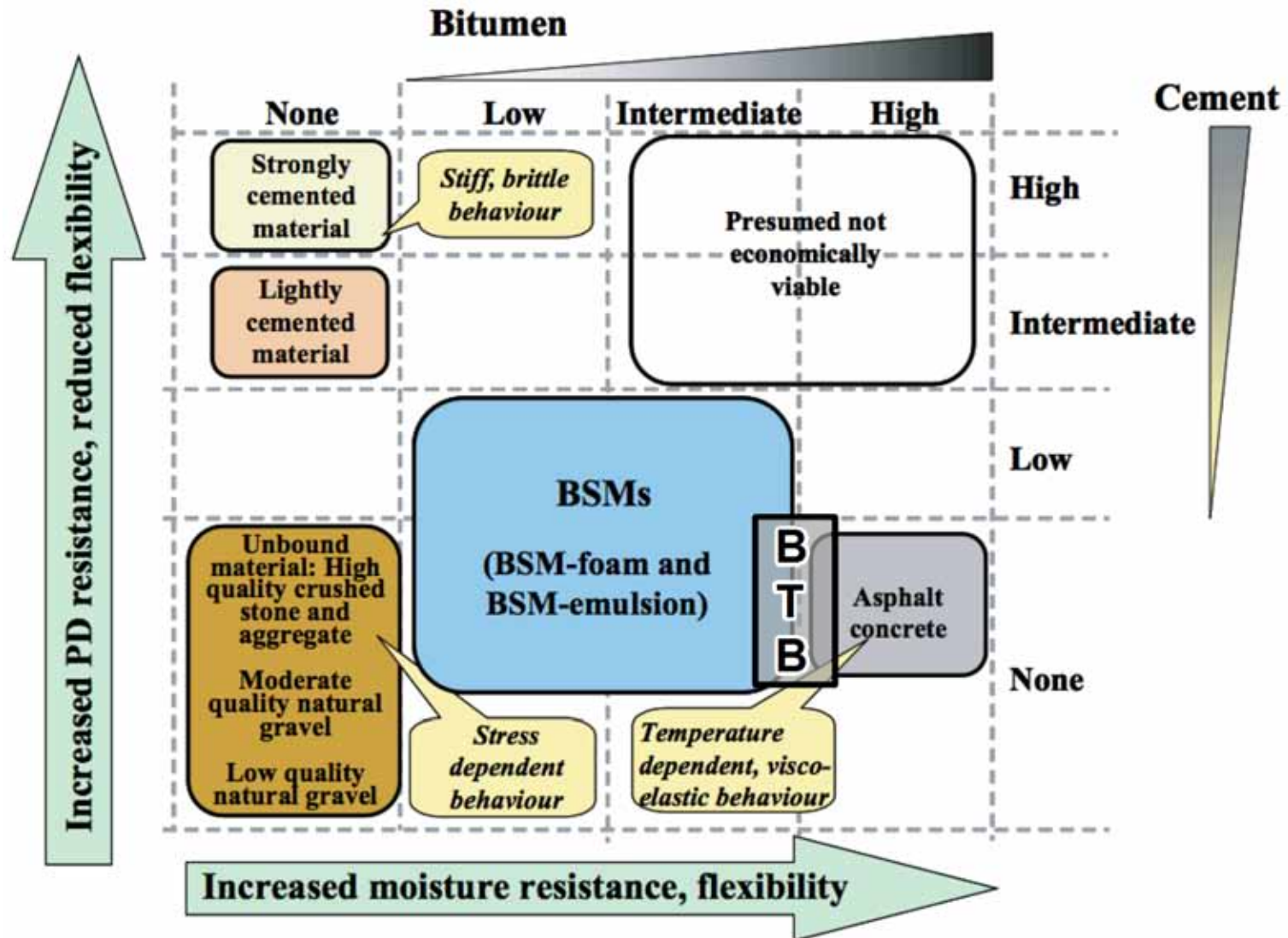
Region	2006	2008
Sunshine Coast	265	565
Metro	1060	2100
Toowoomba	200	200
Gold Coast	300	550
Rest of Queensland	835	875
Mobiles	950	1050
TOTALS (tonnes/hour)	3595	5340

Bitumen Treated Basecourse - review

Bitumen Treated Basecourse principles

- Is not a substitute for hot mix asphalt
 - Uses locally available quarry “run of crusher”
 - Uses good quality aggregate of large size
 - Has a smooth aggregate grading with mechanical interlock
 - Avoids rounded sands – natural sand is OK
 - Has a relatively low binder content
 - Uses production and laying techniques to minimise segregation
 - Recognises the importance of good compaction
-

Bitumen Treated Basecourse - review



Examples of BTB projects - 1

Enhanced Road Condition Project: Nanango for QTMR – contractor: Boral

- Binder 3.5% \pm 0.3%, Marshall 50 blow design,
- Compaction 96% CV min to Marshall design
- PI & Linear shrinkage limits set for fine aggregate
- 10+ years under traffic visually good condition



Examples of BTB projects - 2

Queensland Mackay Regional Council – various contractor: PRS / Fulton Hogan

- Based on QTMR basecourse and DGA specifications
- Binder 3.5% to 4.0%, Marshall 50 blow design,
- Placed from 150 to 350 mm thick, 50mm DG above
- Advantage of rapid placement in municipal area

Alfred St
Macalister St – Gregory St



AC – 50mm
DG14, (C320 binder)

BTB– 200mm
Type 2.3 BTB, 4% binder, (C320 binder) (two layers)

Insitu
Insitu (CBR 4.5)

Traffic Statistics

AADT = 5700

% H.G.V = 3.9%

Date Recorded: November 2006

Date of Construction

February 2007

Examples of BTB projects - 3

New South Wales
- Blacktown
Contractor: Boral



- Full depth asphalt pavement “black velvet” 310mm
- Carried 4.7×10^6 ESA since 1982
- Advantage of rapid placement in municipal area
- Weak subgrades, asphalt grader laid

Specification developed



Supported by the QTMR BTB Steering Committee, AAPA developed a draft BTB specification based on QTMR documents for dense graded asphalt and granular materials.

Draft specification details

1. Granular material
 2. Bitumen
 3. Mix design and parameters
 4. Compaction
 5. Armour coating
-

Draft specification details

1. Granular Material

- Based on MRTS 05 – Type 2.1 material

Table 10.3.1 – Grading limits (Particle Size Distribution Envelopes)

AS Sieve Size (mm)	Percentage Passing by Mass	
	Grading C	Grading B
53.0	100	100
37.5	100	85 – 100
19.0	80 – 100	55 – 90
9.5	55 – 90	40 – 70
4.75	40 – 70	28 – 55
2.36	30 – 55	20 – 45
0.425	12 – 30	10 – 25
0.075	5 – 12	4 – 10

Grading envelope narrowed at the 0.075mm sieve

Target gradation similar tolerances to dense graded asphalt

Draft specification details

2. Bitumen

- Class 320 based on MRTS17
- 3.5% to 4.5%



Draft specification details

3. Mix design & parameters

- 50 blow Marshall design
- 4 – 6% or 6 – 10% air voids – determine in trials

Table 10.3.3 – Bitumen Treated Base Design Requirements

Property	Unit	Limit	Value	
			Grading C	Grading B
Air Voids in the compacted job mix	%	Minimum	6	6
		Maximum	10	10
Stability	kN	Minimum	6	6
Flow	mm	Minimum	2	2
Stiffness	kN/mm	Minimum	1.5	1.5
Voids in mineral aggregate (VMA)	%	Minimum	11	11
Maximum density	t/m ³	-	Tbr	Tbr

Tbr to be recorded

Draft specification details

3. Mix design & parameters

Table 10.3.4.1 – Bitumen Treated Base Design Performance range

Property	Unit	Limit	Value	
			Grading C	Grading B
Wheel Tracking rut rate rut depth	mm/kCycle mm	Maximum Maximum	≤ 0.35 ≤ 5.0	≤ 0.35 ≤ 5.0
Indirect tensile resilient modulus @25°C	MPa	Range	2 000 to 7 000	2 000 to 7 000
Fatigue life of compacted bituminous mixes subject to repeated flexural bending	Cycles to Failure	Report	Report	Report
	% decrease in initial modulus	Report	Report	Report

Note: The Administrator retains the authority to approve the design if these properties above are exceeded.

Draft specification details

4. Compaction

either

- > 90% CV of Maximum Density, or
- > 96% CV of Marshall compaction of production mix

Concern was expressed at BTB Steering committee level about possible bitumen stripping and a higher density and binder content is to be trialed in the project

Draft specification details

5. Armour coat

- 7 mm aggregate, class 320 binder
- to reduce loss of binder into BTB
- To promote vertical impermeability



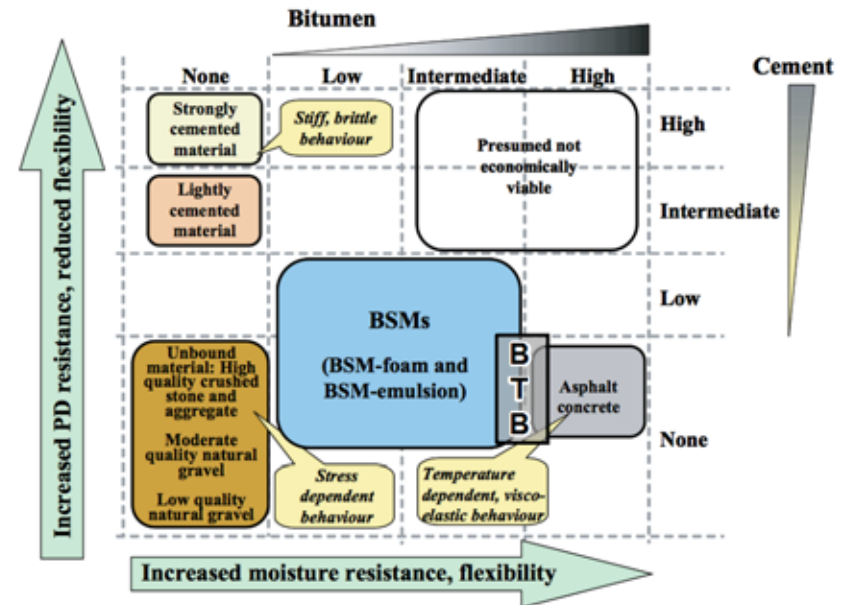
Draft specification details

Early contact outcomes

- Draft specification being used on the Warrego Highway
- Early test results with 4.05% binder have densities at 2% or more above minimum
- Contactor trialing foaming in the hot mix asphalt plant
- Material transfer device and auger fed paver used to limit segregation



Overview – BTB improved resilience



In the spectrum of bitumen additions to granular materials BTB offers:

- Rapid placement of high quantities of basecourse materials
- Minimised disruptions to traffic, lanes open for immediate occupation
- Bitumen treated base has greater resilience to flooding and water flow
- Provides improved performance for regionally available base materials
- Lower risk and economic pavement improvement