# Foamed Bitumen Stabilisation for Sustainable Airport Pavements

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# Scope

Australian airports

Airport Pavements

Benefits of Foamed Bitumen Stabilisation

Case study 1: Melbourne Airport Taxiway

Case study 2: Whitsunday Coast Airport Runway

Case study 3: Merimbula Airport Pavements

Future work required

# Australian Airports

700 registered airports in Australia

12 are considered ‘major international’

50 are considered ‘major regional’

Other 600+ are ‘regional, rural and remote’

98% are flexible pavements

No rigid pavement runways

Less than 100 airports are profitable

# Airport Pavements

Constructed by US Army Corps of Engineers (1940-1960)

Local marginal gravel and sprayed seal surfaces

Designed for small military aircraft

Later used for F27 and B727

Now Saab 340, Q400, F100 and B737

Non-standard materials, in flat areas, being over-loaded

Dependent on grants for upgrades, repairs and resurfacing

# Benefits of Foamed Bitumen

Fast to construct, surface and traffic

- Overnight work and returned to service
- Continuous closure period reduced

Marginal gravel friendly

- Re-use of existing pavement material
- Sustainable and resilient solution

Increases stiffness

- 150 MPa marginal gravel to 800+ MPa FBB
- Strengthens for larger aircraft

# Case Study 1: Melbourne Taxiway (2012)

Heavy trafficked taxiway

Wet area of the airfield

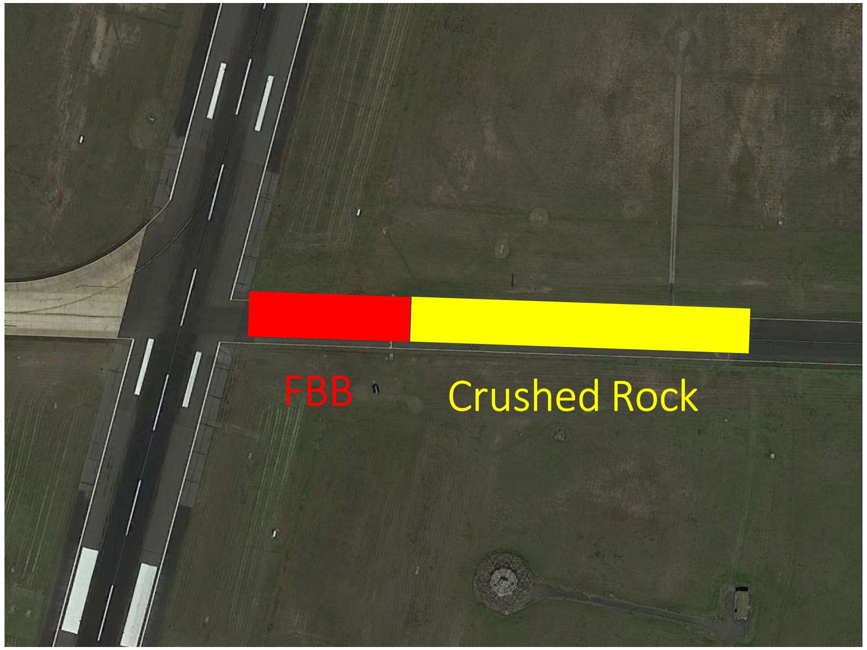
Extremity rebuilt in crushed rock

Intersection designed as 400 mm asphalt

Changed to 400 mm FBB and 60 mm asphalt

Performed in 10 hours night shifts

Trafficked by A380 at 0600 each morning



# Case Study 1: Melbourne Taxiway (2012)

Work complete in two FBB layers

Pugmil produced FBB with new crushed rock

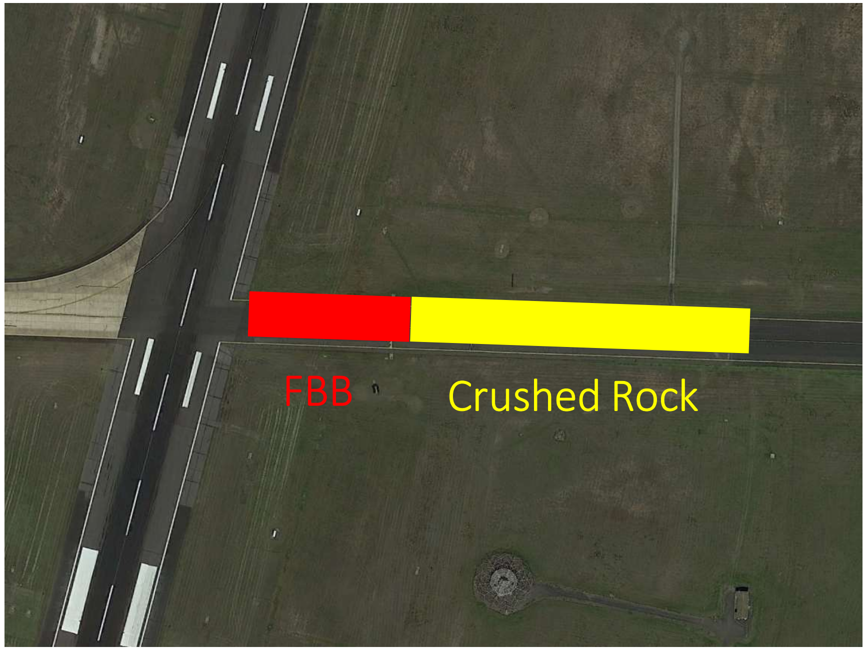
No unplanned interruption to aircraft

Made the impossible a viable solution

Inspected in 2019

- Perfect performance in FBB section
- Cracks and ruts in crushed rock section

Resilience in poor draining conditions



# Case Study 2: Proserpine Runway (2017)

Marginal local clayey gravel and thin asphalt surface

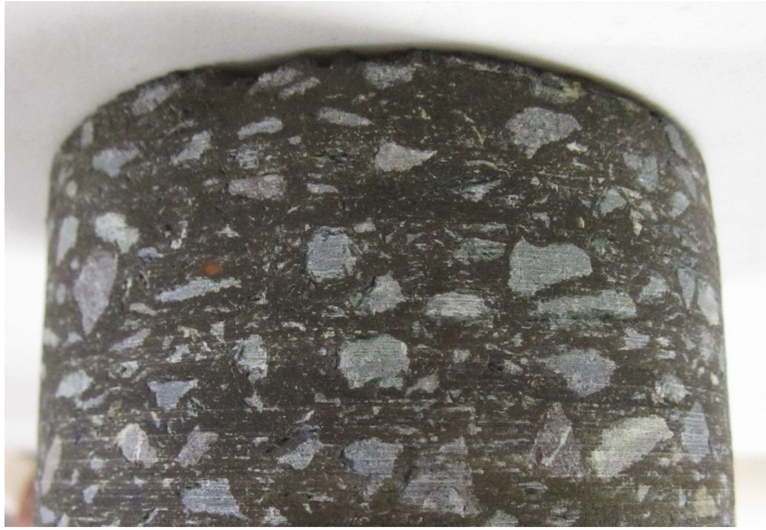
Periodic post-rain failures under B737 aircraft

Desired strengthening to A330 aircraft

Reduced moisture susceptibility a bonus

Pavement design

- 80 mm new asphalt
- 250 mm FBB
- Residual underlying pavement



# Case Study 2: Proserpine Runway (2017)

FBB produced in a pugmill and paved in one layer

Asphalt capping 30 mm thick with FBB

Asphalt surface 50 mm thick after FBB

FBB was existing gravel, fines, RAP

Known as the ‘zero waste runway upgrade’

Significant cost and environmental benefits

Performance excellent in 2022

# Case Study 3: Merimbula Airport (2022)

Saab 340 capable runway

- Marginal local gravel
- Sprayed seal surface

Upgraded to Q400 aircraft

- Lengthened 150 m at each end
- Strengthened
- Apron expanded

Moisture resistant base a bonus

# Case Study 3: Merimbula Airport (2022)

- Extensions used new crushed rock
- Existing pavement topped-up with crushed rock
- All pavements stabilised with foamed bitumen
- FBB design optimised for different granular materials
  - 37-51% less expensive than alternate design options
  - 19-35% less embodied carbon than alternate design options
  - Construction duration significantly reduced
- Excellent pavement performance during 2022 floods

# Future Work Required

Despite good case studies, FBB use in airports is limited

Foamed bitumen stabilisation in airports will be increased by

- Airport-focused specification
- Guidance on modelling
  - *Elastic modulus*
  - *Fatigue relationship*
- Relating laboratory to field modulus
- Education for awareness

Some progress made, but more to go

# Conclusion

Airports are often marginal gravel base with thin bituminous surface

Many airports require moisture resistance and strength increases

Foamed bitumen stabilisation is beneficial to airports

Case studies demonstrate the benefits

- Resilient pavements
- Sustainable strength increase

Further work on specification and structural modelling will help

Education is always a key to acceptance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