Project Brief: A National Pathway to Market for Dieback Risk-Managed Basic Raw Materials (BRM)

Project Overview

Movement of gravel and other basic raw materials (BRM) is recognised as a major pathway for the spread of *Phytophthora* species in Australia. In Western Australia, this risk is actively managed through policy, procurement requirements, and operational hygiene frameworks, including Main Roads Western Australia (MRWA) specifications and the Department of Biodiversity, Conservation and Attractions (DBCA) *Phytophthora Dieback Management Manual*.

However, access to verified uninfested gravel is increasingly constrained, expensive to transport, and often relies on clearing intact native vegetation to source suitable material.

The Dieback Working Group (DWG), with support from the Australian Commonwealth's Saving Native Species Program, undertook a large-scale field trial to assess metham sodium treatment as a practical risk-management option for lateritic gravel used in civil and infrastructure projects.

The project builds on more than twenty years of research and operational development, including foundational work by Dr Elaine Davison, previous Curtin University and Main Roads WA investigations, and field trials conducted in 2012, 2019, and 2024.

This briefing summarises the project outcomes, operational relevance, and future pathway toward broader industry adoption.

Why This Matters

Phytophthora cinnamomi is one of Australia's most destructive introduced plant pathogens and is listed as a Key Threatening Process under the EPBC Act. Movement of infested gravel and soil during construction and maintenance activities presents an ongoing environmental biosecurity risk.

In Western Australia alone, demand for lateritic gravel is significant, with millions of cubic metres used annually across road construction, mining, utility, and infrastructure projects.

Historically, achieving "dieback-free" gravel has often depended on sourcing material from intact native vegetation areas considered uninfested. This creates additional environmental pressure, logistical complexity, and increasing transport costs.

Metham sodium treatment offers an alternative pathway by allowing gravel to be treated within controlled stockpile environments, reducing pathogen presence and providing a

practical supply option where verified uninfested material is limited or not economically viable to transport.

The project does not propose metham sodium treatment as a universal replacement for sourcing uninfested material. Rather, it provides an additional risk-management tool that may be suitable within many operational and infrastructure contexts when integrated alongside broader hygiene and biosecurity practices.

2025 Large-Scale Operational Trial

The primary field trial was conducted between September and November 2025 at Culford Quarry, North Bannister, Western Australia.

Two stockpiles were constructed using lateritic gravel meeting MRWA Specification 501:

- Treated stockpile: approximately 2,117 m^3
- Untreated control stockpile: approximately 529 m^3

Metham sodium was applied during stockpile construction under operational quarry conditions. Once mixed with water, metham sodium converts into methyl isothiocyanate (MITC) gas, which moves through the stockpile and targets *Phytophthora* species.

The project incorporated substantial refinements informed by earlier trials, including:

- improved stockpile geometry and bunding
- refined gas retention and sealing approaches
- modular PVC sampling infrastructure
- increased quality assurance of inoculum preparation
- intergranular MITC monitoring throughout the stockpile
- strengthened traceability and monitoring systems

The trial used inoculated pine plug bioassays containing:

- three isolates of *Phytophthora cinnamomi*
- one isolate of *Phytophthora multivora*

A total of 380 monitored sampling locations were installed throughout the stockpiles to assess treatment performance under commercial-scale conditions.

Key Outcomes

The 2025 trial demonstrated a strong reduction in *Phytophthora* recovery within treated gravel under operational conditions.

Overall Results

- 96.6% reduction in *P. cinnamomi*
- 91.8% reduction in *P. multivora*

The results strongly aligned with the earlier 2019 proof-of-concept field trial while also demonstrating a higher percentage of *Phytophthora* reduction, and greater consistency of outcomes across the stockpile profile.

Importantly, refinements introduced after the 2019 trial successfully addressed previously identified issues associated with gravel segregation and lower gas retention at the toe of the stockpile.

The project also demonstrated:

- repeatable treatment outcomes at commercial scale
- effective MITC permeation throughout the stockpile
- improved operational control and traceability
- compatibility with existing quarry and infrastructure workflows
- greater statistical confidence in the treatment, through increased stockpile size and an increased number of infested plugs installed and tested.

These outcomes reinforce that metham sodium treatment should be viewed as part of an integrated management approach alongside:

- environmental hygiene practices
- movement controls
- material traceability
- site-specific risk assessment
- operational monitoring
- emerging detection techniques and sampling methodologies, suitable for soil-only samples
- ongoing engagement with land managers, to better understand real-world application, particularly in remote sites.

Understanding Residual Risk

From the trial results, conservative estimates for residual risk are:

- 3.4% for *P. cinnamomi* (6 of 177 surviving plugs)
- 7.2% for *P. multivora* (xx of xx surviving plugs)

This difference in survival rates between *Phytophthora* species can be attributed to biological differences between the *Phytophthora* species. Due to the political emphasis on managing *P. cinnamomi,* reflected by the severe environmental effects of this species of pathogen, the remainder of this brief will focus on the residual risk *for P. cinnamomi* only.

Research undertaken by Murdoch University to support this project indicates that the 3.4% residual risk estimate for *P. cinnamomi* in metham sodium treated gravel can potentially be attributed to variation in environmental factors which interact with the fumigant (temperature, moisture). Pathogen biology or technical errors such as uneven treatment coverage and material handling are also plausible explanations. Future research is required to properly address the root cause, however should not be seen as a barrier to implementation given the extremely high efficacy rate observed in this experiment. Regardless, a very low percentage of residual risk is always expected, consistent with any current strategy or tool for disease management.

This project was intentionally designed using a conservative field-based bioassay under commercial operating conditions rather than a controlled laboratory sterilisation exercise, intentionally providing an inflated assessment of residual risk, since the environmental impacts of underestimating the risk could be detrimental to the conservation objectives underpinning this work.

With the 3.4% residual risk in mind, the outcomes of this project demonstrate that for many infrastructure, operational, and land management contexts, metham sodium treated BRM provides a practical and substantially lower-risk alternative where uninfested material is limited or cost-prohibitive.

For the highest-value conservation environments (such as declared rare flora, and threatened priority flora and TECs), where tolerance for residual risk is effectively zero, sourcing verified uninfested material may still remain the preferred management approach (per the Phytophthora Dieback Management Manual, DBCA, 2020).

This said, current protocols still rely on risk reduction tactics, and *Phytophthora* risk in BRM is never absolutely eliminated. This is because pit management protocols rely on human actions and immaculate machinery hygiene. Green Card training for all operational staff, strict record keeping, and a protocol for hygiene auditing is recommended to accompany any method of BRM management.

Industry and Operational Relevance

The project demonstrates that a scalable operational pathway for integrating treated BRM into existing civil construction supply chains is both feasible and of interest to land managers.

Potential applications include:

- road construction and maintenance
- mining and resource sector operations
- utility corridors and linear infrastructure
- local government works
- regional and remote infrastructure projects
- temporary construction access works
- tourism infrastructure, such as bike paths, trails, and carparks

Implementation requires:

- defined treatment procedures
- material traceability systems
- withholding period management
- integration into procurement frameworks
- verification and quality assurance processes
- alignment with jurisdictional policy settings
- industry training programs

The work also highlights the importance of early material planning within project scoping and delivery.

In many circumstances, treatment closer to the point of need may reduce:

- long-distance haulage costs
- pressure on uninfested gravel sources
- environmental disturbance associated with new extraction areas
- logistical complexity across regional projects

A National Pathway

Although the project has been developed within Western Australia, the broader model has national relevance.

Many Australian jurisdictions face similar challenges associated with:

- movement of soilborne pathogens
- infrastructure demand
- constrained access to clean materials
- environmental biosecurity obligations
- increasing transport costs for verified material

The WA model demonstrates how treatment, verification, procurement, and operational delivery can be integrated into a broader assurance framework.

Future implementation beyond Western Australia would require:

- adaptation to local policy and regulatory settings
- development of jurisdiction-specific assurance pathways
- standardised treatment and verification procedures
- ongoing operational monitoring
- engagement with infrastructure, quarrying, and environmental sectors
- expansion of training programs, to communicate management protocols required alongside the treatment option

Next Steps

The project establishes a strong operational proof of concept for metham sodium treatment as a risk-management tool for lateritic gravel.

Future priorities include:

- continued operational validation and monitoring
- monitoring of treated sites and surrounding vegetation
- refinement of assurance and certification frameworks
- development of specification and procurement wording
- investigation of mobile treatment approaches
- additional trials using naturally infested gravel sources
- expansion of industry and government engagement

Further research would strengthen understanding of:

- treatment performance under different environmental conditions
- long-term operational monitoring outcomes
- optimisation of stockpile design and MITC distribution
- integration with broader environmental biosecurity frameworks

Project Partners and Acknowledgements

This project received grant funding from the Australian Government Saving Native Species Program.

Project partners and contributors include:

- Dieback Working Group (DWG)
- ArborCarbon Pty Ltd
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Main Roads Western Australia
- Murdoch University Harry Butler Institute
- Binalup Aboriginal Corporation
- Culford Agri Industries

This briefing has been developed from the project report:

A National Pathway to Market for Dieback-Free Basic Raw Materials: Mitigating the risk of Phytophthora spread from gravel resources using metham sodium.

Date: 30 April 2026

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