SW Environmental

Pinjarra Williams Road SLK 24-40

Phytophthora Dieback occurrence assessment – Version 0.3

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GLEVAN
CONSULTING

Disclaimer

This report has been prepared in accordance with the scope of work agreed between the Client and Glevan Consulting and contains results and recommendations specific to the agreement. Results and recommendations in this report should not be referenced for other projects without the written consent of Glevan Consulting.

Procedures and guidelines stipulated in various Department of Environment and Conservation and Dieback Working Group manuals are applied as the base methodology used by Glevan Consulting in the delivery of the services and products required by this scope of work. These guidelines, along with overarching peer review and quality standards ensure that all results are presented to the highest standard.

Glevan Consulting has assessed areas based on existing evidence presented at the time of assessment. The Phytophthora pathogen may exist in the soil as incipient disease. Methods have been devised and utilised that compensate for this phenomenon; however, very new centres of infestation, that do not present any visible evidence, may remain undetected during the assessment.

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1 Summary

Glevan Consulting was commissioned by SW Environmental in May 2017 to conduct a recheck of vegetation adjacent to Pinjarra Williams Road from SLK 24 to SLK 40 for the presence of Phytophthora Dieback.

The previous 2011 assessment had determined that the majority of the alignment covered by this assessment was infested, apart from a Protectable area between 39.82 SLK and 40.00 SLK.

Fresh expression of the disease is present all along the Infested section with recent deaths in Phytophthora Dieback indicating species, particularly *Banksia grandis*. Some sections have recently been burnt but this does not affect the occurrence status. Several sections are classified as Excluded (previously Unmappable), being that no or minimal vegetation is present on the verge and the presence of Phytophthora Dieback could not be determined. These sections are also determined to be Unprotectable.

The eastern end of the assessed section in between 39.82 SLK and 40.00 SLK is classified as Protectable Uninterpretable and has been demarcated with pink and black striped tape. This section extends beyond the bounds of this assessment and creates a larger Protectable area.

From a dieback management perspective, the site is classified as Unprotectable (Infested, or Excluded) between 24.00 and 39.82 SLK and Protectable (Uninterpretable) between 39.82 – 40.00 SLK. The Protectable section occurs on both sides of the road.

2 Phytophthora Dieback

The pathogen *Phytophthora cinnamomi* is an agent of environmental disease found in vulnerable areas of Western Australia.

Phytophthora Dieback is the common name for the observable disease result of interaction between the pathogen (*P. cinnamomi*) and the vegetation hosts (susceptible plant species within vulnerable areas). The environment conditions of the site significantly affect the pathogens ability to survive or flourish and spread over time.

All land with an annual average rainfall of more than 400 millimetres and suitable soil composition is considered vulnerable to Phytophthora Dieback. This large area stretches approximately from Perth, Bunbury and Augusta in the west to Narrogin, Ravensthorpe and Esperance in the east, and as far north as Kalbarri.

This vulnerable area has many different bioregions, having specific characteristics of each having been formed by climate and geology. These two factors are highly significant in determining the pathogen's effectiveness and resulting disease impact levels.

2.1 The Pathogen

Phytophthora cinnamomi is a microscopic water mould. It belongs to the class Oomycetes and belongs in the Kingdom Stramenopila. It is more closely related to brown algae than to true fungi.

Oomycetes organisms occupy both saprophytic and pathogenic lifestyles however *P. cinnamomi* is considered parasitic. It behaves largely as a necrotrophic pathogen causing damage to the host plant's root tissues because of infection and invasion.

The life cycle of *Phytophthora cinnamomi* is a continuous circle of infection, sporulation and further infection and is readily vectored by animals and human activity allowing for rapid invasion into new areas.

2.2 Host

A population of hosts is made up of susceptible, infected and immune or resistant individuals. The infection of host plants is an unseen activity happening constantly beneath the soil at an infested site.

The environmental conditions favouring or disfavouring the pathogen may change at a critical point during disease development, temporarily changing the rates of infection and invasion. This can be observed symptomatically after soil temperature change through winter months.

The plant host is a highly variable component of the disease development. Within vulnerable areas, three main family groups are regarded as highly susceptible to Phytophthora Dieback disease, being:

- Proteaceae
- Ericaceae
- Xanthorrhoeaceae.

2.3 Environment

Two fundamental environmental characteristics influencing Phytophthora Dieback disease are rainfall and soil.

Areas vulnerable to Phytophthora Dieback are defined as native vegetation which occur west of the 400 millimetre rainfall isohyet. The correlation of increased Phytophthora Dieback impact with increased annual rainfall is generally applicable.

Certain soil properties influence Phytophthora Dieback disease development within the vulnerable areas:

1. Moisture is critical for *Phytophthora cinnamomi* to survive in the soil and for sporangia production.
2. Soil pH affects the growth and reproduction of the pathogen. The calcareous sands closest to the coast are alkaline and hostile to *Phytophthora cinnamomi,* but are favourable to *P. multivora* which is not as virulent as *P. cinnamomi*.
3. Fertile soils are less favourable to Phytophthora Dieback because the richness of nutrients aids strong host resistance, good soil structure allows water movement and drainage, and high organic matter provides antagonistic microflora.
4. Coarse-textured soils have larger pore spaces which favour dispersal of spores.
5. The optimum temperature for *Phytophthora cinnamomi* sporulation is 21 to 30°C, peaking at 25°C., but some sporangia can still be produced at temperatures as low as 12°C. The optimum growth range is 15 to 30°C and temperatures lower than 5°C or greater than 35°C are unfavourable for the persistence of survival of spores and the vegetative mycelia of *P. cinnamomi.*

Based on the field assessment, the Project Area can be distributed to the following occurrence categories.

Table 1 - Phytophthora Dieback occurrence categories

Vegetated area	Infested	Areas that have plant disease symptoms consistent with the presence of Phytophthora Dieback
	Uninfested	Areas free of plant disease symptoms that indicate the presence of Phytophthora Dieback.
	Uninterpretable	Areas where indicator plants are absent or too few to determine the presence or absence of Phytophthora Dieback.
	Temporarily Uninterpretable	Areas that are sufficiently disturbed so that Phytophthora Dieback occurrence mapping is not possible at the time of inspection.
	Not yet resolved	Areas where the interpretation process has not confidently determined the status of the vegetation.
Non-vegetated area	Excluded	Areas devoid of vegetation are excluded from the assessment area.

2.4 Limitations of disease mapping

The assessment for the disease caused by Phytophthora Dieback is based on interpreting the vegetation for symptoms which can be ascribed to the disease presence. These observable factors must be present during the assessment period. Management recommendations may be included if it is considered that the disease may be cryptic, or the project area displays evidence of activities that are considered a high risk of introducing the disease.

The validity of the hygiene boundaries mapped for this project is twelve months from the completion of this project. All boundaries should be reassessed by March 2020 if activities are still occurring beyond this time.

3 Results and Discussion

Glevan Consulting was commissioned by SW Environmental to conduct a recheck of vegetation adjacent to Pinjarra Williams Road from SLK 24 to SLK 40 for the presence of Phytophthora Dieback.

This section of Pinjarra Williams Road was previously assessed in 2011 by Glevan Consulting as part of an assessment of the entire road from Pinjarra to Marradong. The assessed section starts (SLK 24) just east of the Dwellingup townsite and finishes just east of the Murray Road intersection (SLK 40).

The previous assessment had determined that the majority of the alignment was infested, apart from a Protectable area between 39.82 SLK and 40.00 previously classified as Uninfested. This is shown in Table 2. It should be noted that a change in nomenclature has occurred in Phytophthora Dieback categories since the previous assessment. Areas that had been classified as 'Unmappable' in the previous assessment report are now referred to as 'Excluded', as defined in Table 1.

Table 2 -– Current Area Statement SLK24-40

	Category	Hectares	% of total
Unprotectable	Infested	40.29	83.6 %
	Excluded	7.34	15.2 %
Subtotal		47.63	98.8%
Protectable	Uninfested	0	0
	Uninterpretable	0.57	1.2 %
Subtotal		0.57	1.2%
Total area		48.2	

As shown in Table 2, the majority of the vegetation on the margins of the road is infested with Phytophthora Dieback. Fresh expression of the disease is present all along the Infested section with recent deaths in Phytophthora Dieback indicating species, particularly *Banksia grandis*. Some sections have recently been burnt but this does not affect the occurrence status.

Several sections are classified as Excluded (previously Unmappable), being that no or minimal vegetation is present on the verge and the presence of Phytophthora Dieback could not be determined. These sections are also determined to be Unprotectable.

The eastern end of the assessed section (Figure 1) in between 39.82 SLK and 40.00 classified as Protectable Uninterpretable and has been demarcated with pink and black striped tape. The Uninterpretable section extends beyond the bounds of this assessment and creates a larger Protectable area.

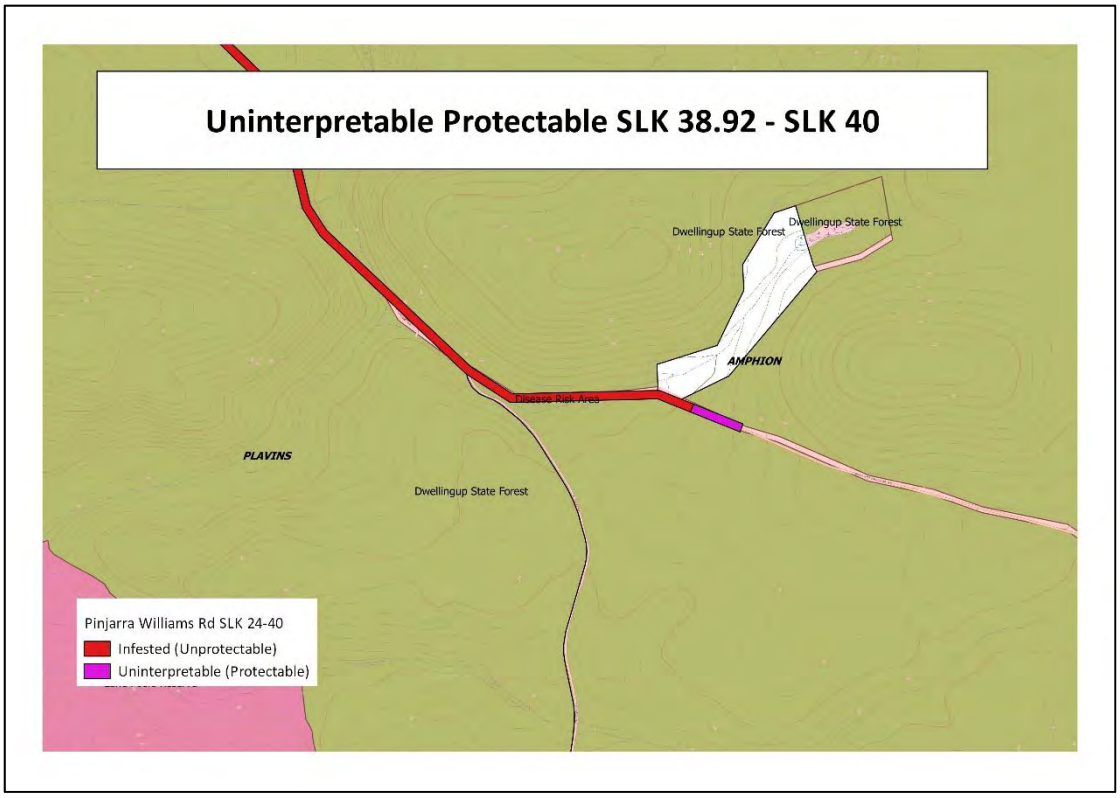

Figure 1 - Uninterpretable SLK 38.92-SLK40

From a dieback management perspective, the site is classified as Unprotectable (Infested or Excluded) between 24.00 and 39.82 SLK and Protectable (Uninterpretable) between 39.82 and 40.00 SLK. The Protectable section occurs on both sides of the road.

4 Appendix – Phytophthora occurrence map