



Phytophthora Dieback Occurrence Survey

Bussell Highway (H043) Duplication

Hutton to Sabina, SLK 31.15 – 43.95



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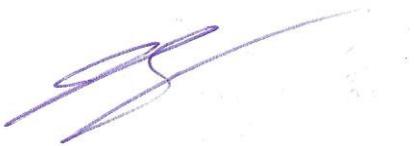
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EXECUTIVE SUMMARY

Main Roads Western Australia (Main Roads) is currently undertaking planning associated with development of the proposed Bussell Highway (H043) Duplication Hutton to Sabina, SLK 31.15 – 43.95. The alignment is yet to be finalised; however, a likely project footprint has been developed and forms the Environmental Study Area (Study Area) that is the current focus of planning activities.

As a part of the environmental surveys that will inform project planning there is a requirement to assess the occurrence of *Phytophthora Dieback* within remnant native vegetation and identify areas within the Study Area that can be protected from the disease.

The *Phytophthora Dieback* occurrence survey was undertaken using survey linear survey method which is consistent with the DBCA guideline, *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015). The information produced using this method of survey provides operational level disease hygiene information for application across all assessable vegetation within the survey area. Due to the mobility of the disease through autonomous spread and human vectoring, all operational scale disease occurrence data has a limited life of 12 months.

During the desktop assessment and preliminary field visits, it was identified that most of the Study Area consists of cleared land or remnant vegetation in a degraded state. These areas were excluded from survey as they cannot be assessed due to the lack of disease indicator species required for disease diagnosis and/or a significant history of site disturbance.

Disease occurrence surveys were undertaken in all assessable vegetation within the Study Area, which covered approximately 30 ha of the total Study Area. The surveys identified two infested areas, both influencing vegetation on both sides of the current highway. The infested areas cover approximately 2.3 ha. A single uninfested area of vegetation was also identified and this occurs adjacent infested vegetation that is on the Bussell Highway and Ruabon Road intersection. This area is only 0.3 ha and is considered to be unprotectable from future disease spread. All other areas of assessable vegetation were determined to be uninterpretable due to a lack of susceptible species.

Three soil and tissue samples were collected from assessable areas within the Study Area. The samples were collected to support visual disease assessment observed within infested areas. Only 1 sample returned a negative result for *P. cinnamomi* while the remaining 2 were positive.

Following the determination of disease hygiene categories, all uninterpretable or uninfested vegetation was assessed for protectability, using the Department of Biodiversity, Conservation and Attractions (DBCA) Protectable Areas criteria. No assessable vegetation has been classified as protectable.

CONTENTS

EXECUTIVE SUMMARY	I
1 INTRODUCTION	4
1.1 Background	4
1.2 Objectives	4
1.3 Scope of Works	4
1.4 Site Characteristics	5
1.4.1 Study Area	5
1.4.2 Land Use	5
1.4.3 Climate	5
2 METHOD	7
2.1 Desktop Interpretation	7
2.2 Field Survey	7
2.3 Sampling Program	8
3 ASSESSMENT CRITERIA	9
4 RESULTS AND DISCUSSION	11
4.1 Desktop	11
4.1.1 Previous interpretation data	11
4.1.2 Assessable remnant native vegetation	11
4.2 Linear Assessment	11
4.2.1 Vegetation	12
4.2.2 Disease Expression	12
4.2.3 Disease Occurrence and Hygiene Categories	12
4.3 Protectability Assessment	13
4.4 Sample Program	13
4.5 Limitation of results	13
5 RECOMMENDATIONS	15
6 REFERENCES	16
7 REPORT DISCLAIMER	17

LIST OF ATTACHMENTS

Tables

Table 1: Bussell Highway Phytophthora Dieback occurrence categories, area statement

Table 2: Sample data from the Bussell Highway Duplication Study Area

Figures

Figure 1: Environmental Study Area showing extent of assessable vegetation

Figure 2e- 2f: Environmental Study Area showing Disease Status, Protectability and Sample Results

Appendices

Appendix A: VHS soil and tissue sample analysis report

1 INTRODUCTION

1.1 Background

Main Roads Western Australia (Main Roads) is currently undertaking planning associated with development of the proposed Bussell Highway (H043) Duplication, Hutton to Sabina, SLK 31.15 – 43.95 (the project). The alignment of the project is yet to be finalised; however, a likely project footprint has been developed and forms the study area that is the current focus of planning activities. Main Roads are currently undertaking the project planning phase of the project and co-ordinating a suite of environmental surveys to assess the environmental values within the proposed project assessment area. The environmental surveys are being performed within the Environmental Study Area (Study Area) which is presented in Figure 1.

As a part of the environmental surveys that will inform project planning there is a requirement to assess the distribution of Phytophthora Dieback within remnant native vegetation and identify areas within the Study Area that can be protected from the disease. Phytophthora Dieback is an introduced soil borne plant pathogen that affects up to 40% of native plant species within Western Australia. Most commonly the disease is caused by the species *Phytophthora cinnamomi*, however, other species such as *P. multivora* can also have significant impact under specific environmental conditions. Phytophthora Dieback is commonly introduced to an area through infested soils carried as basic raw materials or on vehicles, plant and machinery. In favourable conditions the pathogen can result in the collapse of entire vegetation communities. Once introduced to an area, Phytophthora Dieback will spread through further human vectoring and also via water movement and root to root contact, resulting in extensive infestations which may cause significant impact to native vegetation communities. There is currently no practical method of eradication of the pathogen.

1.2 Objectives

The objectives of the Phytophthora Dieback survey were to:

- determine the presence/absence of the disease within areas of remnant native vegetation across the Study Area;
- map the occurrence of the disease within areas of remnant native vegetation across the Study Area; and
- apply relevant criteria to areas of disease free vegetation to determine the distribution of vegetation that can be protected from the future introduction and spread of the disease.

1.3 Scope of Works

The required Scope of Works was developed by Main Roads and was presented in the consultant brief. The required scope as per the consultant brief is presented below:

Desktop Assessment

- Complete a desktop assessment of the survey area prior to the field survey
- Review relevant *Phytophthora* database results for recorded occurrence within survey area and surrounds, including historic Department of Biodiversity, Conservation and Attractions (DBCA) mapping where available



- Review relevant reports applicable to the survey area (if available).

Field Survey

- Conduct field survey (to be done by an accredited Dieback interpreter) to assess the potential for *Phytophthora cinnamomi* and/or other pathogens
- Take samples for lab testing as required
- Undertake dieback mapping as appropriate for the survey area (as outlined in Figure 1) and field demarcation of infested areas in accordance with DBCA standard methodology.
- Refer to Department of Parks and Wildlife “Corporate Policy Statement No. 3 - Management of *Phytophthora* disease” and “Manual for detecting and mapping *Phytophthora* dieback disease (Procedures for CALM Act land)”.

Reporting

The following reporting requirements are requested:

- Draft report on desktop assessment, methodology and results.
- Table of management actions relating to the clearing and construction of the project.
- Mapping of results (including spatial data) of Dieback assessment.

Data

- Survey data (results) are to be provided at Rev A Report Stage, then at Project completion (Rev 0/final report) in electronic format. The data is to be provided in a format that satisfies Main Roads data standards

1.4 Site Characteristics

1.4.1 Study Area

The Study Area for the project is shown in Figure 1 and is approximately 12.5 km in length, covering an area of approximately 135 ha. It sits predominantly within the existing Bussell Highway Road Reserve between Hutton Road in the north and the locality of Sabina in the south, between SLK 31.15 – 43.95. The Study Area footprint covers the existing road reserve but small areas cover land that is currently privately owned. The majority of the Study Area is cleared however some limited areas of remnant vegetation do occur.

1.4.2 Land Use

The Study Area traverses a range of current land uses vested as both private and public lands. Tuart Forest National Park lies to the north, while land uses to the south are either agricultural, horticultural or industrial. The Bussell Highway Road Reserve itself is managed as the main transport corridor between Busselton and Bunbury.

1.4.3 Climate

The Bureau of Meteorology (BoM) broadly classifies the climate across the south west region of Western Australia as warm summers with cold winters. The BoM maintains a network of weather stations across

Australia to record weather data, with the nearest station to the project area being Ludlow. The long-term average annual rainfall data from Ludlow shows that that annual average rainfall is 666.6 mm/yr.

This is an important figure as the accepted distribution of *Phytophthora* is generally restricted by the 400mm isohyet with distribution in the 400-600mm/yr zone further restricted to sites with high summer rainfall averages or associated with water gaining sites. Based on the BoM climate classification and rainfall data the Study Area experiences suitable climatic conditions for *Phytophthora* to have a significant impact.

2 METHOD

In accordance with the agreed project scope of works, the field survey was undertaken using a survey methodology referred to as linear survey. The linear survey method is consistent with the DBCA guideline, *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015). The information produced using this method of survey provides operational level disease hygiene information for application across all assessable vegetation within the Study Area.

Due to the mobility of the disease through autonomous spread and human vectoring, all operational scale disease occurrence data has a limited life of 12 months. A summary of key survey activities is provided below.

2.1 Desktop Interpretation

The proposed project Study Area was subject to an initial desktop assessment involving a review of the Vegetation Health Service (VHS) *Phytophthora* sample database and examination of available aerial imagery to assess:

- the extent of assessable remnant native vegetation occurring within the Study Area;
- review of previous *Phytophthora* Dieback occurrence reports associated with the Study Area;
- the known occurrence of *Phytophthora* Dieback within or influential to the Study Area;
- the occurrence of site specific or influencing high risk vectors including but not limited to roads, creek lines and gravel pits; and
- evidence of existing disease signatures such as areas of obvious vegetation decline.

2.2 Field Survey

The operational scale survey was undertaken by a DBCA registered disease interpreter and involved visual diagnosis of the disease within areas of assessable remnant vegetation within the Study Area. Visual diagnosis was supported by laboratory assessment of soil and tissue samples.

Once identified, the occurrence of the disease was mapped using a hand-held GPS unit and demarcation of disease hygiene boundaries was performed in the field using appropriately coloured flagging tape. All potentially uninfested areas upslope of infestations were traversed on foot to confirm the absence of the disease.

Demarcation of disease hygiene boundaries was performed in accordance with the requirements defined in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015). Flagging tape used for demarcation of hygiene boundaries is defined below:

- Infested vegetation – Dayglo Pink tape
- Uninterpretable – Pink and Black striped tape
- Uninfested – No demarcation

Demarcation tapes are tied on trees and other suitable bushes or shrubs, along the category boundary. Knots on the demarcation tapes face the category being demarcated. When demarcating infested or uninterpretable vegetation adjoining uninfested vegetation, the tapes are placed 20 m into the uninfested vegetation to allow a buffer between the hygiene categories.

Field data including disease presence and vegetation information was collected using a hand-held GPS unit and converted to ArcGIS™ shapefiles. Collected field data included all sample locations, a point file of all identified individual plant deaths attributed to *Phytophthora*, disease hygiene boundaries and track files of the area covered during survey.

2.3 Sampling Program

Sampling for Phytophthora Dieback involves the collection of soil and tissue samples from fresh deaths of plants considered to be reliable indicator species of *Phytophthora* expression. Where suspicious deaths were identified, soil and root tissue material was collected into heavy duty plastic bags and forwarded to the Vegetation Health Service (VHS) laboratory for analysis.

All sampling undertaken was performed in accordance with the methods described in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (DBCA, 2015).

3 ASSESSMENT CRITERIA

DBCA (2015) guidelines identify six potential disease hygiene categories based on presence/absence of the disease, or the unknown disease status of an area. An area can have an unknown disease status if the vegetation at the site is not susceptible to the disease or it cannot be assessed because of disturbance, e.g. fire. As a result, even if the pathogen is present, there may be no interpretable signs.

Only areas with suitable remnant native vegetation can be assessed. Areas that have been cleared or significantly altered are excluded from survey. In some cases, small excluded areas may be afforded a hygiene category if they are small enough to be influenced by adjacent surveyed vegetation or situated such that topographical influences can be used to determine disease presence or absence.

The six possible disease categories are listed and described below:

1. **Infested** – Areas a registered interpreter determines to have plant disease symptoms consistent with the presence of *Phytophthora cinnamomi*.
2. **Uninfested** – Areas determined by a registered interpreter to be free of plant disease symptoms that indicate the presence of *P. cinnamomi*.
3. **Uninterpretable** – Natural, undisturbed areas where susceptible plants are absent, or are too few to make a determination of the presence or absence of *P. cinnamomi*.
4. **Temporarily uninterpretable** – Areas where disease presence or absence cannot be determined due to a level and type of site disturbance that will recover within the short to medium term, e.g. fire, rehabilitation.
5. **Not yet resolved** – *Phytophthora* occurrence diagnosis cannot be made because of inconsistent or incomplete evidence (including sample results). The category is only to be used in low interpretability zones (400 mm to 600 mm rainfall range).
6. **Disease risk roads (DRR)** – Interpreters will use the DRR category to show the disease status is unknown because of suspected or apparent recent use under unknown hygiene conditions.

Following the determination of disease categories, areas are identified that are likely to be protectable from the disease with the application of appropriate disease hygiene as required.

Protectable Areas are defined in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015) as areas that:

- have greater than 600 mm of annual rainfall or are water gaining sites in the 400 mm -600 mm rainfall zone;
- are determined to be free from *Phytophthora cinnamomi* by a DBCA registered disease interpreter. Uninterpretable areas may be classified as Protectable;
- comprehensive transect survey areas that are positioned in the landscape and are of sufficient size that they will not be engulfed by *Phytophthora* via autonomous spread. Such an area is defined as being greater than 3 ha with a minimum axis greater than 100 m, and not down slope of an infested area;
- linear assessment areas longer than 100 m after the application of appropriate disease category buffers;

- have controllable human vectors; or
- include high conservation and/or socio economic values.

4 RESULTS AND DISCUSSION

The project Study Area is shown in Figure 1. A summary of key statistics is presented in Table 1 below while the disease occurrence and location of soil and tissue samples across the Study Area is shown in Figures 2a – 2f. The location of Protectable Areas that will require the application of appropriate hygiene during operational soil movement activities are also presented in Figures 2a – 2f. The results of the protectability assessment are presented in Section 4.3. Appendix A presents the VHS laboratory certificates for all samples collected during the assessment.

4.1 Desktop

4.1.1 Previous interpretation data

The Study Area was subject to a previous assessment undertaken by Glevan Consulting in 2016 who performed a series of assessments along the Forrest Highway, Bussell Highway and Old Coast Road, including the Study Area.

Glevan Consulting excluded the majority of the study area on the basis of vegetation condition. From the assessable vegetation within the Study Area the previous assessment identified one area of uninfested vegetation associated with the junction of Ruabon Road and the Bussell Highway. The remaining areas of assessable vegetation were determined to be uninterpretable due to the lack of susceptible species. No infested vegetation was identified, and no soil and tissue samples were collected.

4.1.2 Assessable remnant native vegetation

As defined in the assessment criteria presented in Section 3, only areas with suitable remnant native vegetation can be assessed. Areas that have been cleared or significantly altered are excluded from assessment (i.e. those classed as degraded or completely degraded under the Keighery (1994) condition scale). The extent of areas considered to be assessable due to the presence of remnant vegetation was initially determined during a review of available aerial imagery. Following this preliminary desktop assessment all vegetated land intersecting with the Study Area was included for ground assessment.

4.2 Linear Assessment

The disease occurrence categories, location and results of soil and tissue samples and distribution of Protectable Areas within the Study Area are shown in 2a – 2f. The laboratory certificate of analysis for the soil and tissue samples is presented in Appendix A.

The majority of the Study Area covers cleared land or vegetation that is classified as either degraded or highly degraded condition. These areas have been excluded from assessment in accordance with the assessment criteria presented in Section 3. Several vegetated areas identified during the desktop assessment as potentially assessable were subsequently excluded from assessment following preliminary site visits because the field assessment of vegetation condition determined them as degraded or completely degraded.

A summary of key assessment statistics is presented in Table 1 below.

Table 1: Bussell Highway Phytophthora Dieback occurrence categories, area statement

Disease occurrence Categories – Area Statement	
Category	Area (ha)
Total Study Area	135.4
Infested	2.3
Uninfested	0.3
Uninterpretable	27.5
Protectable vegetation	0
Excluded from Survey	105.2

4.2.1 Vegetation

Vegetation descriptions provided are not intended as botanical descriptions but instead are suitable for defining the vegetation in terms of assessability and interpretability for Phytophthora Dieback. It is assumed that detailed flora and vegetation descriptions will be provided by flora and vegetation surveys conducted independently of this Phytophthora Dieback report.

Vegetation communities appear to be highly modified and include large areas of revegetation. Much of the revegetation consists of unsusceptible species or species with high resistance to Phytophthora Dieback, such as plants from *Acacia* and *Hakea* genera. Remnant vegetation within the Study Area consists of either riparian vegetation along creeks and rivers or within wetlands. This is dominated by *Melaleuca preissiana* and *Agonis flexuosa*, however, occasional *B. littoralis* were observed. The remaining areas of remnant vegetation consisted of a mixed forest of either Tuart or Marri over *Agonis flexuosa* with some areas with *Banksia grandis* and various *Xanthorrhoea* species.

4.2.2 Disease Expression

As shown in Table 1, most of the assessable vegetation was classified as uninterpretable, due to the lack of component susceptible species. In the interpretable infested vegetation, the disease was identified through recent fresh deaths of *B. grandis* and *X. gracilis*. All identified deaths were fresh and there was limited historic evidence of infestation.

4.2.3 Disease Occurrence and Hygiene Categories

Infested vegetation was identified at the junction of Ruabon Road and the Bussell Highway. Disease expression was limited to the northern side of the highway however, the identified deaths were associated with a roadside drain that linked both sides via an underground culvert. Therefore, the extent of the infested area has been extended to cover vegetation along the drain on either side of the Bussell Highway.

A second infested area was identified at the eastern end of the Study Area, with a positive sample being collected from the southern side of the highway in vegetation that was draining across the road.

A small uninfested area was identified south of the highway and west of the infested vegetation at the junction of Ruabon Road and the Bussell Highway. The remainder of the assessable vegetation within the Study Area has been classified as uninterpretable.

4.3 Protectability Assessment

The assessment of protectability for each area of assessable vegetation within the Study Area uses the protectability criteria presented in Section 3, applied to the vegetation under the circumstances observed during the disease occurrence survey. Following application of the protectability criteria, no protectable areas were identified.

The uninfested vegetation is only 0.3 ha in size and therefore does not meet the minimum size requirement to be considered protectable. While the uninterpretable areas are of sufficient size, most receive direct drainage from the highway and are also influenced by adjoining infested areas. It is therefore considered likely that the disease is present within the uninterpretable vegetation but cannot be detected due to the lack of indicator species. Therefore the uninterpretable vegetation has all been classified as unprotectable.

4.4 Sample Program

Three soil and tissue samples were collected from assessable vegetation within the Study Area. The samples were collected to support visual disease assessment observed within infested areas. All sample locations and results are presented on Figures 2a – 2f, which also show the locations of historic VHS positive sample records. Two samples returned a positive result for *P. cinnamomi* as shown in Table 2 below.

Table 2 – Sample data from the Bussell Highway Duplication Study Area

Soil and Tissue Sample Data – Bussell Highway Duplication Study Area			
Sample label	Species sampled	Location	Sample result
Bussell Highway Duplication 1	<i>X. gracilis</i>	E 361208 N 6280414	<i>P. cinnamomi</i>
Bussell Highway Duplication 2	<i>X. gracilis</i>	E 357015 N 6277417	<i>P. cinnamomi</i>
Bussell Highway Duplication 3	<i>B. grandis</i>	E 356614 N 6277039	Negative

4.5 Limitation of results

Phytophthora Dieback is a soil borne plant pathogen that spreads autonomously via root to root transmission, independently through the soil and with the movement of water. The disease is also widely spread by human activities involving the movement of infested soil and plant material. As a result, the edge of a disease infestation is considered to be an actively spreading disease front, and all uninfested areas of vegetation that are associated with human vectors such as tracks and access ways are considered to be at risk of future infestation unless appropriate management is applied.

The disease occurrence data presented in this report is representative of the distribution of *Phytophthora Dieback* within assessable vegetation in the Bussell Highway Duplication Study Area at the time of assessment. In accordance with DBCA guidelines (2015, 2017) *Phytophthora Dieback* occurrence data is valid for a period of 12 months from the date of assessment. After 12 months a disease re-check assessment is required and after three years a full re-assessment of the survey area will be required.

5 RECOMMENDATIONS

As shown in Figures 2a – 2f, no protectable vegetation has been identified within the Study Area.

The DBCA *Phytophthora dieback management manual* (2017) guides the development of Phytophthora Dieback Management Plans (PDMP) that aim to maintain the disease free status of protectable areas within specific projects. The manual is designed for application across lands vested with the DBCA during all potential soil movement activities.

As no protectable areas have been identified in the Study Area it is concluded that a detailed PDMP is not required. Instead it is recommended that Main Roads employ a general standard of operational hygiene that will mitigate risks of exporting disease from infested and potentially infested areas within the Study Area to all other areas, including other Main Roads sites external to the Study Area. To achieve this all operational vehicles, machinery and equipment should be clean and free from soil and/or plant material before leaving the Study Area and being deployed to other Main Roads project areas.

6 REFERENCES

Bureau of Meteorology (BoM) (2020): <http://www.bom.gov.au/climate/data/>

Department of Biodiversity Conservation and Attractions (DBCA) (2015), *Phytophthora Dieback Interpreters Manual for lands managed by the department*, Perth

Department of Biodiversity Conservation and Attractions (DBCA) (2017), *Phytophthora Dieback Management Manual*, Perth

Glevan Consulting (2016): *Forrest and Bussell Highway Upgrades, Phytophthora Dieback occurrence assessment – Version 2.3*, Unpublished report for Main Roads

Keighery, B.J. (1994), *Bushland plant survey. A guide to plant community survey for the community*. Wildflower Society of WA (Inc.), Nedlands, Western Australia.

7 REPORT DISCLAIMER

This report was prepared for Main Roads, solely for the purposes set out in the scope of works and it is not intended that any other person use or rely on the contents of this report.

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Figures

*Bussell Highway (H043) Duplication
Hutton to Sabina, SLK 31.15 – 43.95*

