Quarry Hygiene: Aggregate handling, transportation & storage

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Document Information

Version History

Date	Version	Author	Description of changes
March 2017	1.0	T. Beauchamp	Original version
March 2019	1.1	T. Ashcroft	Formatting and wording changes; removal of site selection criteria/certification information.
April 2019	1.2	T. Ashcroft	Changes to assumptions and risk management section based on workstream feedback.
July 2019	1.3	T. Ashcroft	Changes to Table 1 based on industry feedback.
July 2019	1.4	T. Ashcroft	Final version. Rewording of vehicle wash-down prior to entering quarry.

Consultation and peer review

Role	Name	Date submitted
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Aggregate and Quarry Association of New Zealand – AQA Planning Committee	W. Scott (CEO)	July 2019

Approval

Name	Role	Signature/ Date	Endorsement
R. Murrie Manager, Kauri Dieback Management Group	**Approve / Note** the contents of this document	Rebecca Murrie	Yes

Associated documents

Document name	Link
Hygiene Procedures for Kauri Dieback	https://www.kauridieback.co.nz/how-to-guides/
Land disturbance activities (including earthworks) around kauri	
Tree Removal and Pruning of Kauri	
Vehicle and Heavy Machinery Hygiene	
Landfill disposal of contaminated material	

Glossary

Terminology	Meaning
Controlled Area Notice	Areas subjected to regulatory control under the premises of the Biosecurity Act that enforce certain actions that forest visitors are required to do when entering and exiting kauri forests.
Deep burial	Deep bury material by at least 2 metres in depth.
Kauri dieback	Name of the disease that causes dieback on kauri caused by the pathogen *Phytophthora agathidicida*
KDP	Kauri Dieback Programme
Oospore	The 'resting' or 'hibernation' spore of *Phytophthora agathidicida*
Outermost dripline	The furthest (maximum) extend of the branch spread from the trunk.
PA	*Phytophthora agathidicida*
Propagule	Microscopic life stage (like seeds) whose role is to progress the propagation of an organism to the next stage in their life cycle.
Root Zone	The ground area around kauri, defined as 3 times the radius of the outermost canopy dripline.
Sterigene	2% solution of disinfectant Sterigene®
Wash-down	Removal of soil and organic material using pressurised water and brushes.
Zoospore	A motile spore of *Phytophthora agathidicida* capable of swimming in soil water.

Disclaimer

The information in this guideline is intended to be general information. It is not intended to take the place of, or to represent, the written law of New Zealand or other official guidelines or requirements. While every effort has been made to ensure the information in this document is accurate, the Kauri Dieback Programme (and any of their representatives involved in the drafting of these guidelines) does not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present nor for the consequences of any decisions based on this information.

1.0 Purpose

To provide guidelines to mitigate the spread of kauri dieback via Quarry Operations.

A precautionary approach is taken to manage the level of scientific uncertainty around ascertaining whether kauri and the surrounding soil is infected or not.

2.0 Background

Kauri dieback was first reported on Great Barrier Island in the 1970s and current evidence suggests the pathogen may have been present in New Zealand since the 1950's or potentially much longer.

Kauri dieback is a soil-borne disease that spreads primarily through the movement of contaminated soil. Just a pinhead of soil is all that is needed to spread the pathogen that causes kauri dieback, *Phytophthora agathidicida* (PA), to other areas.

Humans and their activities are the primary cause of long distance spread through soil contaminated conveyances.

Aggregate is an important resource for track construction (e.g. forestry operations, farm races) and road maintenance in New Zealand.

Many of the quarries that are used in the northern part of New Zealand are from hill sides that have native forest cover. These sites need to be cleared of this cover (or overburden) in order to access the quarry aggregate underneath. Given, kauri dieback disease has been recorded in the past in areas near quarries, quarry operations could pose a risk in spreading kauri dieback.

There are a number of potential pathways associated with Quarry activities that could spread kauri dieback.

3.0 Facts, Assumptions & Constraints

A number of facts, assumptions and constraints have been made which have informed these guidelines:

3.1 We do not know the time from infection to when disease symptoms first occur on kauri trees, therefore apparently healthy trees may be infected. Juvenile trees may take over 6 years to develop symptoms after infection and older trees can take a lot longer. Therefore we should assume that all kauri and their root zone (i.e. 3 x the radius of the outermost tree canopy dripline) are potentially contaminated with the pathogen and could spread PA (Figure 1).

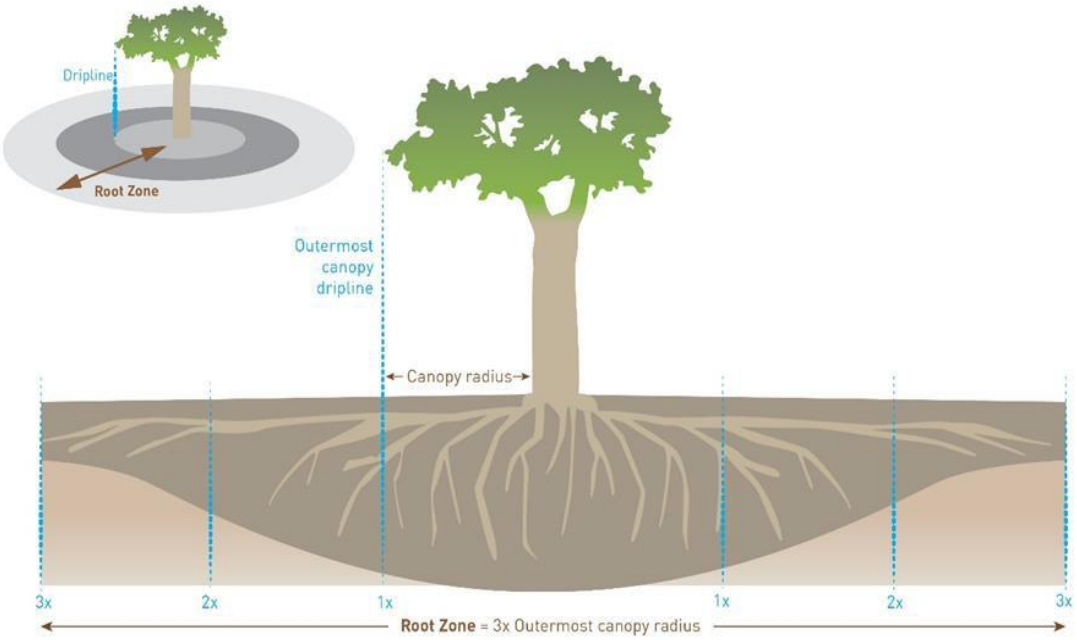

Figure 1: *Root zone of kauri (3 times the radius of the outermost canopy dripline).*

3.2 Movement of PA contaminated soil, roots, trunk, bark materials and associated by-products such as sawdust, can spread PA.

3.3 Vectors such as humans (footwear) and human-mediated pathways (vehicles, equipment) as well as pigs and livestock can spread PA.

3.4 PA does contain waterborne propagules i.e. zoospores which spread in soil water, however spread from open water sources has yet to be proven (Randell *et.al*, 2010). Spread via waterways during flooding is possible and spread via wastewater run-off is also possible.

3.5 The soil and waterborne propagules of PA remain viable and infectious for unknown periods of time. Long-lived spores (oospores) of PA can survive and remain viable in the soil, long after a tree dies (at least 6 years and potentially a lot longer) (Horner, 2015).

3.6 Clean aggregate is not considered a risk to the spread of kauri dieback.

3.7 Soil and water associated with kauri forests may carry PA, even where disease hasn't been observed,

4.0 Before you begin

4.1 These guidelines have been developed to provide written advice on the management of kauri dieback via quarry activities.

4.2 The guidelines are not policy but should be considered by planners, land managers and contractors when planning any operations.

4.3 Please contact your local council or land management agency if there are local policy or regulatory constraints. In particular whether the area is currently under a Controlled Area Notice.

4.4 The guide provides what is considered best practice based on the current information and uses risk management principles to reduce the likelihood of spread of PA during operations.

4.5 The associated documents listed on Page 2 of this guide should be read prior to undertaking any on-site operations.

5.0 Risk Assessment

Managing the possible spread pathways of the kauri dieback pathogen during aggregate handling, transportation and storage is critical to help mitigate the impact of kauri dieback in New Zealand.

A risk assessment should be carried out to assess the risks of spreading PA in association with aggregate from a quarry or equipment transporting material from that quarry to areas with kauri.

The risk assessment should be carried out with a person who is familiar with the quarry, its operational procedures and who can provide assurance that the aggregate can be provided with minimal risk of vectoring kauri dieback.

The soil in the overburden may be contaminated with the pathogen if kauri is present or may have historically been present. As a result, equipment, machinery and vehicles used to remove and transport the overburden and extract the aggregate material, can potentially be contaminated with the pathogen harboured in soil. This situation has occurred in the past in at least one site. In addition, trucks may become contaminated when delivering aggregate to muddy sites, and transport the pathogen back to the quarry.

A lot of water is used during quarry operations in the process of aggregate extraction so the surrounding soil is likely to be wet and muddy. This in turn causes infected soil to bond easier to vehicles and equipment. In addition, the pathogen can move through soil in water

and it is likely that surface water runoff will spread the pathogen. There is also potential for contaminated water to be re-circulated.

To support decision making around assessing the level of risk and subsequent management considerations, a list of questions and potential management solutions are outlined in Table 1.

Table 1: Proposed questions when assessing the level of risk associated with quarry vectors.

Potential Vector	Questions	Risk Assessment	Management Considerations
Overburden & Aggregate	Is kauri currently present or have they historically been present: • Above faces in areas where aggregate is being quarried now? • Where soil or runoff could contaminate aggregate during production and storage? • In the surrounding catchment? If no kauri is present or have been historically present, what is the likelihood that vectors may have spread PA (vehicles, equipment; pigs etc.) to the quarry?	• If kauri is present or was present historically then the risk of the pathogen being present in the overburden is higher compared to kauri being absent. • If there is information to suggest that vectoring has taken place from a contaminated area to where the quarry is located, then there is an increased risk that the disease may have spread to the quarry or surrounding area. • Clean aggregate is not considered a vector for kauri dieback.	If the pathogen is likely to be present, then: • Overburden may be contaminated with PA and may require deep burial in a secure facility on site or at an appropriate landfill if the material has to be removed from the quarry. Refer to: https://www.kauridieback.co.nz/how-to-guides/ for landfill disposal guidelines. • If the overburden is to be used on site for rehabilitation and landfill, then the overburden should be stored separately away from clean aggregate. The storage area should be located where vehicles, equipment and personnel are not exposed to possible overburden contamination and run-off does not occur towards areas where clean aggregate is stored. During rehabilitation operations, vehicles and equipment should be cleaned prior to exiting the quarry. • Clean aggregate is to be stockpiled in an area away from any potential source of contamination.

Potential Vector	Questions	Risk Assessment	Management Considerations
Vehicles, machinery, equipment	What is the likelihood that these vectors could spread PA to and from the quarry?	• If there is information to suggest that vectoring has taken place or is likely to take place from a PA contaminated area to where the quarry is located, then there is an increased risk that the disease may have spread to the quarry or surrounding area. • If the overburden or soil substrates at the quarry are near kauri (as above) then there is an increased risk that the pathogen may spread from the quarry to areas containing kauri.	If there is a risk of spread then: • Vehicles and equipment originating from an area where PA could occur, should be clean of soil prior to leaving that site. If this has not happened or cleaning was likely inadequate, then the vehicles and equipment should be washed down before entering the quarry. • Vehicles and equipment exiting the quarry must be washed down so that they are not transporting soil from the quarry. Refer to: https://www.kauridieback.co.nz/how-to-guides/ for vehicle and heavy machinery guidelines. • Footwear should be cleaned of soil and then sprayed using Sterigene.

Potential Vector	Questions	Risk Assessment	Management Considerations
Water	Is the water used in the quarry process sourced from streams or surface water in catchments with kauri?	• If water is sourced within catchments containing kauri forests then there is an increased likelihood that the water may contain the pathogen. • Water sourced from non-surface flow i.e. bore & rainwater carries a lower risk in spreading PA.	If the pathogen is likely to be present in water then: • The water used to wash gravel should not be recirculated from any system used to wash vehicles entering and exiting the quarry. • The gravel must be washed in clean water until the water exiting the washing is clear. • The water from washing should not be disposed of into areas or waterways where kauri are present at or below the outfall. • Water drainage should direct any surface flow away from aggregate storage areas and away from areas or waterways where kauri are present.
Pigs and other feral animals	What is the likelihood that these vectors may have spread or are likely to spread PA to the quarry?	• If there is information to suggest that vectoring has taken place or is likely to take place from a PA contaminated area to where the quarry is located, then there is an increased risk that the disease may have spread to the quarry or surrounding area.	• Fencing off the quarry to prevent movement of pigs and other feral animals onto the quarry site. • Pest Control

References

Randell, S.D, Burns, B.R; Bellgard, S.E & Beever, R.E. 2010. Fishing for Phytophthora in the Waitakere Ranges, Auckland, New Zealand. Landcare Research. University of Auckland.

Horner IJ, Hough EG. June 2015. Assay of stored soils for presence of Phytophthora agathidicida. A Plant & Food Research report prepared for: The Ministry for Primary Industries. Contract No. 32294. Job code: P/345061/01. PFR SPTS No. 11718.