VRX Silica

Arrowsmith North Silica Sands Project

Phytophthora Dieback occurrence assessment – Version 1.0

GLEVAN
CONSULTING

Client	*VRX Silica*
Report name	*Arrowsmith North Silica Sands Project*

This report has been prepared in accordance with the scope of work agreed between VRX Silica 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 manuals, particularly Phytophthora Dieback Interpreters Manual for lands managed by the Department (DBCA), 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.

Executive Summary

VRX Silica (VRX) is seeking to develop the Arrowsmith Silica Sands Project, based on two high-grade silica sand orebodies in the Geraldton Sandplain bioregions of Western Australia (WA). Two sites form the Arrowsmith Silica Sands Project (Project), Arrowsmith North (E 70/5027) and Central (E 70/4987), (Project Area). This report has been prepared early in the planning phase of the Project. At this stage, the mining operation is expected to remove 3-8 m of sand from the soil profile from the Central deposit and 8-15 m over the North deposit. Mining operations will require the development of ancillary infrastructure such as roads, pipelines, dams, process plant, stockpiles, laydown and train load out.

Planning for the Project has identified the need for studies on Phytophthora Dieback, specifically:

- Assessment of the extent of dieback infection within the Project Area and surrounding landscape; and
- Identification of vegetation that can be protected and likely sources of dieback contamination.

The objective of this assessment conducted by Glevan Consulting is therefore the completion of environmental work necessary to further understand the potential impacts on the environment this Project may have in relation to dieback.

Phytophthora is a microscopic water mould that belongs to the class Oomycetes. *Phytophthora's* are considered parasitic. It behaves largely as a necrotrophic pathogen causing damage to the host plant's root tissues because of infection and invasion and infects a host when it enters at a cellular level and damages the cell structure.

Phytophthora Dieback is the result of interaction between three physical components forming a 'disease triangle': the pathogen (*Phytophthora species*), the environment and the host. All three components are needed for the disease to develop over time. Host species found in the area that will display Phytophthora Dieback symptoms include *Adenanthos cygnorum, Banksia candolleana, B. dallanneyi, B. menziesii, Isopogon tridens* and *Stirlingia latifolia.*

The Project Area experiences a long-term average annual rainfall of 492mm which places the site as being marginally vulnerable to *Phytophthora cinnamomi* but still vulnerable to other Phytophthora species.

Glevan Consulting has previously conducted surveys within and adjacent to the Project Area. During those surveys, *Phytophthora arenaria* had been recorded from 6 locations within the Project Area.

During the current assessment, seven sites with plant deaths expected to be caused by Phytophthora Dieback were sampled to determine the presence of the pathogen. Three of those sites did prove the presence of *Phytophthora arenaria*.

Despite the presence of Phytophthora in the Project Area, based on the current and previous assessments, no vegetation has yet been classified as Infested.

The main access track to the Beharra Springs Gas Facility, and the Project Area from Mt Adams Road has been classified as Excluded for hygiene management purposes.

The entire Project Area, aside from the Excluded access track, is considered Uninfested and should be managed as Protectable.

On the basis that the area is protectable from dieback, it is recommended that a Hygiene Management Plan be developed for the Project Area. Critical components to be addressed are:

- All vehicles arrive at site clean of soil and plant materials. Initial clean downs will be performed off-site.
- Vehicles will be cleaned prior to accessing drill lines and vegetation.

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1 Introduction

VRX Silica (VRX) is seeking to develop the Arrowsmith Silica Sands Project, a series of high-grade silica sand mines in the Geraldton Sandplain bioregions of Western Australia (WA). Two sites form the Arrowsmith Silica Sands Project, Arrowsmith North (E 70/5027) and Central (E 70/4987), (The Project). An overview of the location of each site is shown in Figure 1.

The mining operation will remove 8-15 m of sand from the base of the soil profile over the mining area. Further ground disturbance is required for ancillaries such as roads, pipelines, dams, process plant, stockpiles, laydown and train load out.

The mining operation will produce high grade silica sand according to the following process:

- Vegetation is trimmed in preparation for removal;
- Vegetation and topsoil are translocated in preparation for Vegetation Direct Transfer (VDT);
- Silica sand is mined in panels allowing for continuous rehabilitation of the site;
- Topsoil and vegetation are translocated to previously mined areas for VDT;
- Silica sand is mined and processed in a mobile collection site located at the mine face;
- The sand is mixed with water to form a slurry and pumped to a small processing plant via a movable surface pipeline;
- The sand is upgraded to a commercial grade using gravity and magnetic separation;
- The upgraded sand is dried, then transported via rail to Geraldton Port for export.

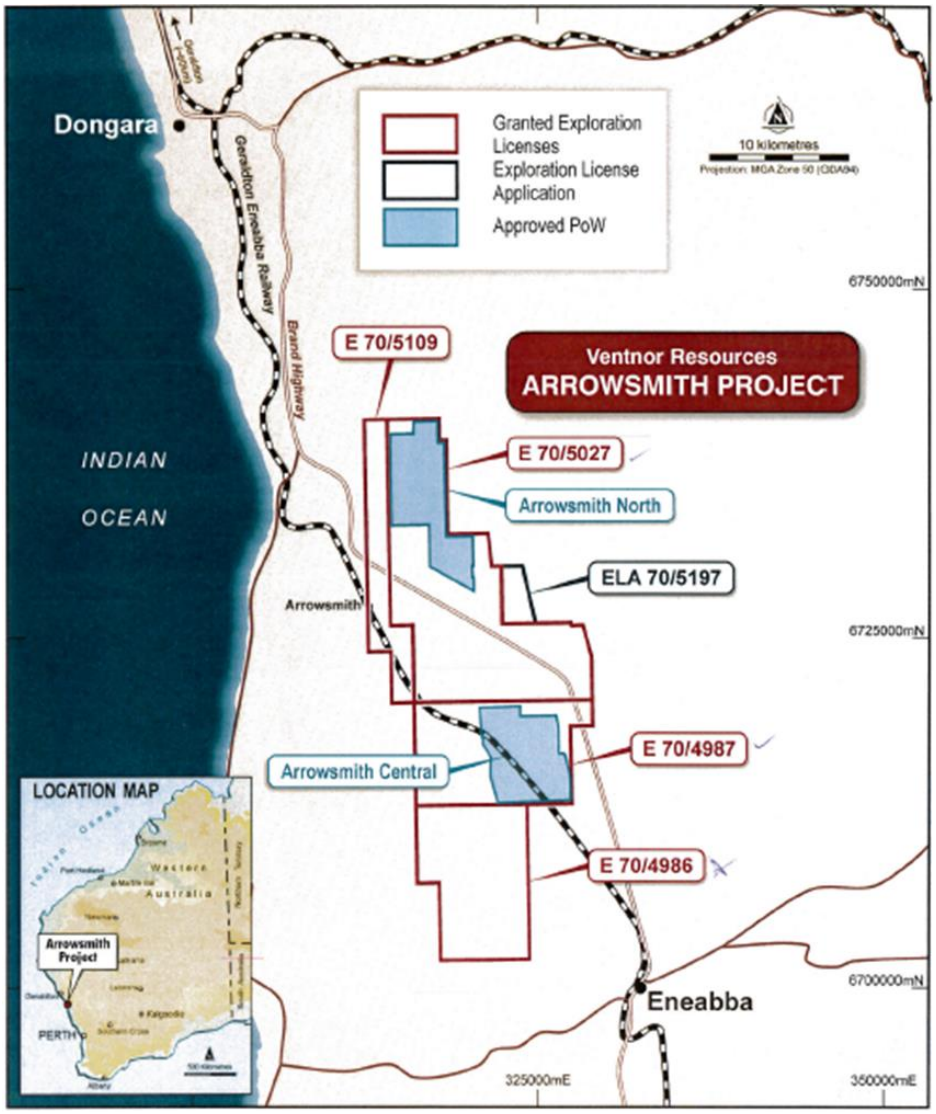

Figure 1 - Location of Arrowsmith Project sites

Whilst the Project is in its infancy, guidance by the EPA has suggested the need for further studies on Phytophthora Dieback, specifically:

- The extent of dieback infection within the project area and surrounding landscape needs to be assessed, and;
- Vegetation that can be protected and likely sources of dieback contamination needs to be identified.

The objective of the assessment conducted by Glevan Consulting is therefore the completion of environmental work necessary to further understand the potential impacts on the environment this project may have in relation to dieback. This will be done by determining

the potential for *Phytophthora* to be present within and surrounding the Arrowsmith Central Project area. The following tasks have been completed:

- Undertake a desktop assessment to determine the presence of dieback in the development envelope and surrounding area.
- Undertake a dieback site investigation according to relevant DBCA guidelines.
- As Phytophthora has been recovered from within and surrounding the project area, maps have been produced showing the extent of Phytophthora infestations in addition to the identification of:
    - Sites that can be protected; and
    - Potential sources of infection.

2 Background

Thousands of Australian native plant species are susceptible to Phytophthora dieback—a destructive disease caused by the pathogen *Phytophthora cinnamomi.* This disease is a major threat to Australia's biodiversity, placing important plant species at risk of death, local extirpation or even extinction. Its dramatic impact on plant communities can also result in major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources. Phytophthora dieback can cause permanent damage to ecosystems. Once an area is infested with the pathogen, eradication is usually impossible. Awareness that human activity can easily spread the pathogen will help prevent an increase in the extent of this disease (Commonwealth of Australia, 2018).

Phytophthora is a microscopic water mould that belongs to the class Oomycetes. Oomycetes organisms are filamentous and absorptive and reproduce both sexually and asexually. *Phytophthora's* are considered parasitic. It behaves largely as a necrotrophic pathogen causing damage to the host plant's root tissues because of infection and invasion (Department of Parks and Wildlife, 2015). The pathogen infects a host when it enters at a cellular level and damages the cell structure.

Phytophthora Dieback is the result of interaction between three physical components forming a 'disease triangle': the pathogen (*Phytophthora species*), the environment and the host. All three components are needed for the disease to develop over time. The relationship between the presence of *Phytophthora* and the development of Phytophthora Dieback disease is variable and based on the susceptibility of native plant species and the different environmental characteristics, landform types and rainfall zones across bioregions.

2.1 Vegetation

The Arrowsmith North Project Area is over the Erindoon-378 vegetation association (SouthCoast NRM, 2013). This association is described as 'Mixed heath with scattered tall shrubs Acacia spp., Proteaceae and Myrtaceae'. The vegetation generally contains sufficient species that are susceptible to Phytophthora and will therefore show disease presence.

Species found in the area that will display Phytophthora Dieback symptoms include *Adenanthos cygnorum, Banksia candolleana, B. dallanneyi, B. menziesii, Isopogon tridens* and *Stirlingia latifolia.*

2.2 Climate

The Project Area experiences a long-term average annual rainfall of 492mm recorded at the Green Grove station () located between the Arrowsmith North and Arrowsmith Central Project Areas (Bureau of Meteorology, n.d.) although this mean has not been reached since 2016. The long-term average is trending toward 400mm which places the site as being marginally vulnerable to *Phytophthora cinnamomi* (Department of Parks and Wildlife, 2015) but still vulnerable to other Phytophthora species. The rainfall in the previous three years has been well below the long-term average although over 50mm was recorded over the 2017-2018 summer months. This would have given ideal conditions for disease activity for subsequent months and it was noted by fresh disease expression in assessments conducted near the Project Area in 2018.

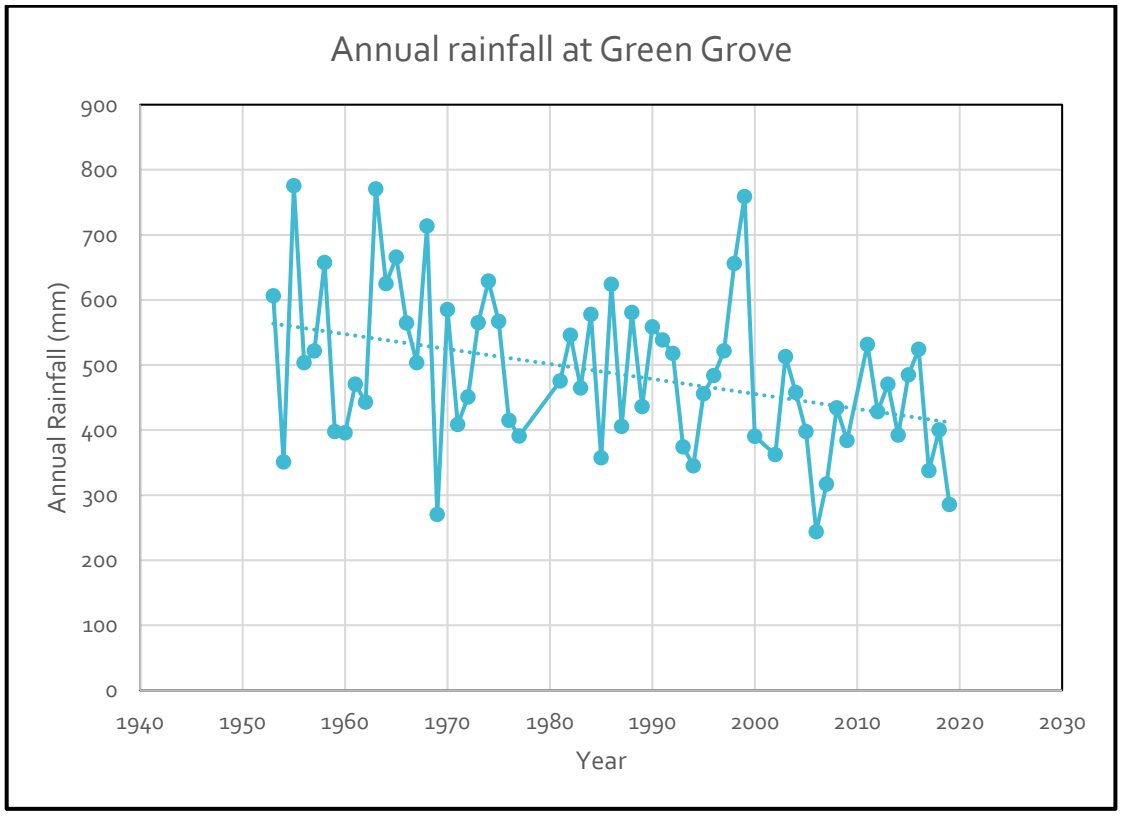

Figure 2 - Annual and trending rainfall in Project Area

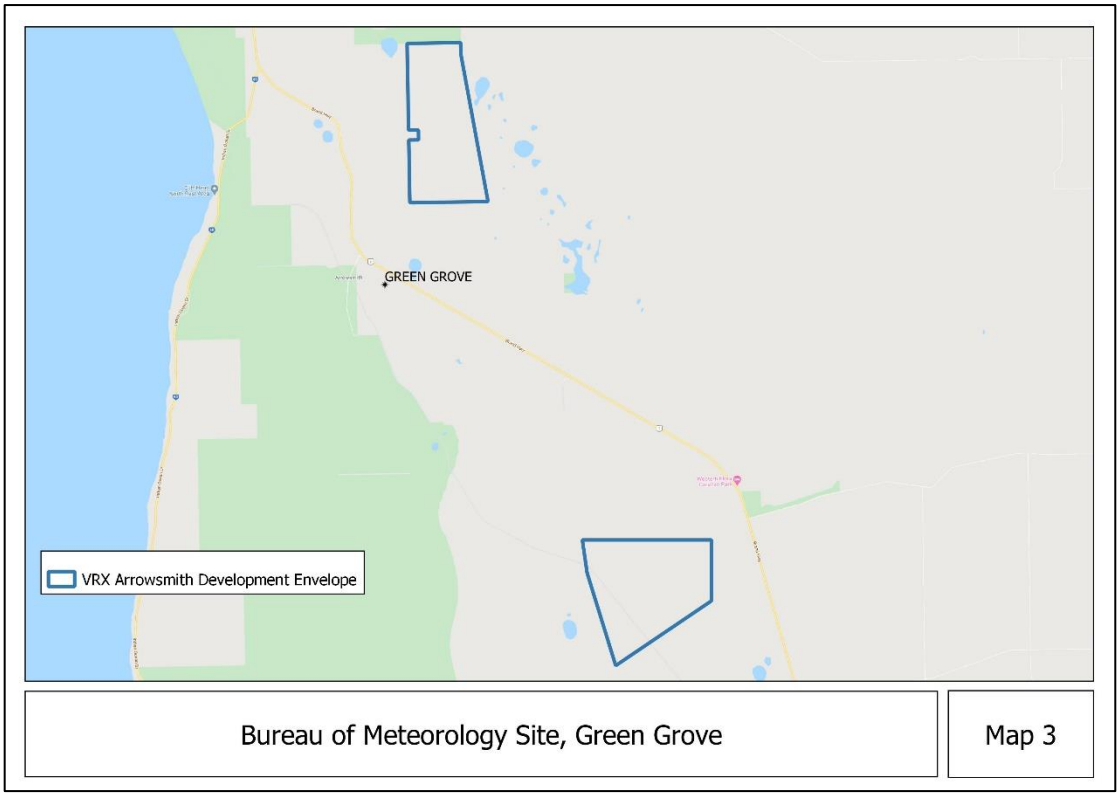

Figure 3 - Bureau of Meteorology Site, Green Grove

2.3 Previous Assessments

Glevan Consulting has conducted annual surveys within and adjacent to the Project Area since 2006, albeit for other clients. Each survey has been to the same methodology as the current assessment. During those surveys, *Phytophthora arenaria* has been recorded from 26 locations within the greater area.

Phytophthora arenaria has been isolated in Western Australia from kwongan heathland stands since the early 1980s. *Phytophthora arenaria* has been isolated exclusively from the northern sand plains and was named based on its association with sandy soils. Most isolates were associated with dead or dying Banksia spp. (Proteaceae). When active, symptomatic plants are scattered in the landscape. However, the overall impact of this species within the natural environment is low due to the low rainfall in the region and the sporadic nature of the disease (Burgess, 2013). No other Phytophthora species have been recovered during the previous surveys in the greater area.

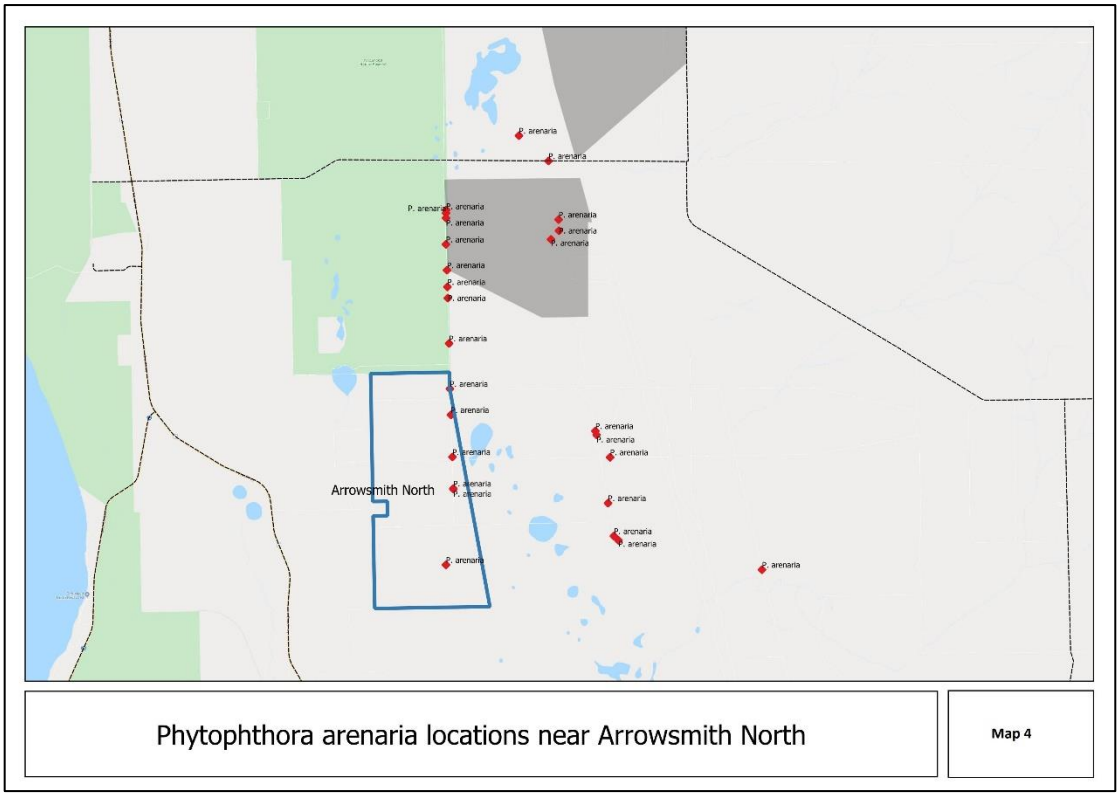

Figure 4 - P. arenaria locations

3 Materials and methods

3.1 The assessment area

The assessment of the vegetation for the presence of Phytophthora Dieback can only be undertaken if the vegetation is in suitable condition, based on the disturbance within the vegetation. This disturbance rating (Table 1) is based on Vegetation Condition Scales (Keighery, 1994). Areas that can be assessed are categorised during and post assessment into Phytophthora Dieback occurrence categories (Table 2).

Table 1 - Keighery Vegetation Condition Scale

Scale		Vegetation condition
1	Pristine	Pristine or nearly so; no obvious signs of disturbance.
2	Excellent	Vegetation structure intact; disturbance affecting individual species and weeds are non-aggressive species.
3	Very good	Vegetation structure altered; obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 2 - Phytophthora Dieback assessment for vegetation condition

Vegetation Condition	Phytophthora occurrence category
Naturally vegetated areas. Keighery disturbance rating of 3 or less Phytophthora occurrence categorisation is possible	Infested - Determined to have plant disease symptoms consistent with the presence of *Phytophthora cinnamomi.*
	Uninfested - Determined to be free of plant disease symptoms that indicate the presence of *P. cinnamomi*
	Uninterpretable - Undisturbed areas where susceptible plants are absent, or too few to make a determination of the presence or absence of *P. cinnamomi.*
	Not yet resolved.
Vegetation structure temporarily altered.	Temporarily Uninterpretable - Areas of disturbance where natural vegetation is likely to recover.
Vegetation structure severely altered. Keighery disturbance rating 4 or greater. Phytophthora occurrence assessment is not possible	Excluded.

3.2 The assessment method

All Phytophthora Dieback detection, diagnosis and mapping was performed to standards and procedures defined in FEM047 Chapter 6. These procedures are grounded on the presence in the vegetation of Indicator Species, and the observance of deaths in these plants. An indicator species is a plant species that is reliably susceptible to *Phytophthora*. Indicator species deaths (ISDs) alone do not necessarily indicate disease presence and it was necessary to consider all environmental and ecological factors that were present. These other factors (as listed in FEM047) include:

- Chronology of deaths;
- Pattern of deaths;
- Topographical position;
- Vectoring – causal agencies, and;
- Biomass and biological diversity reduction.

Other causes of plant deaths were considered when determining the presence of Phytophthora Dieback, including (from FEM047):

- Armillaria luteobubalina;
- various cankers;
- insects;
- drought, wind scorch and frost;
- salinity and waterlogging;
- fire and lightning;
- senescence and competition;
- physical damage, and;
- herbicides and chemical spills.

The assessment type conducted was a linear assessment using standards defined by Chapter 8, FEM047.

Prior to assessment, all information relevant to the project was assembled to assist the interpretation process (as defined in Chapter 7, FEM047). This information included previous assessments of the area, history of burning and other disturbances.

3.3 Collection of evidence of Phytophthora Dieback

During the assessment process, the collection of evidence to support the field diagnosis is recorded using a tablet running the ESRI Collector application. Waypoints are recorded at locations to show evidence of:

- where field diagnosis is certain or almost certain of Phytophthora Dieback infestation;
- healthy indicator species where field diagnosis is almost certain of the site being uninfested;
- sites with too few or devoid of indicator species, thus supporting uninterpretable classification, or
- areas of disturbance, which are temporarily uninterpretable or excluded from assessment.

Additional waypoints recorded include:

- Points located at soil and tissue sample sites with *Phytophthora cinnamomi* result;
- Points located at sites known to be infested by Phytophthora species other than *Phytophthora cinnamomi*;

- Points located where field diagnosis is certain or almost certain of Armillaria;
- points requiring soil and tissue sampling;
- points located where samples have been taken, results pending;
- points located at ISDs, and
- points that need to be revisited for further examination.

3.4 Sampling

All soil and tissue samples taken during the assessment were to standards and prescriptions defined in Chapter 11 of FEM047. All samples are analysed in the Vegetation Health Services (DBCA) laboratory using best-practice techniques.

3.5 Determining Protectable areas

Protectable areas will be:

- Determined to be Uninfested, Uninterpretable or Temporarily Uninterpretable;
- Situated in areas receiving more than 600 millimetres rainfall a year or those that are water-gaining sites in the 400- to 600-millimetres a year rainfall range;
- Both positioned in the landscape and of sufficient size such that it is adjudged that the pathogen will not autonomously engulf them in the short term (greater than four hectares with an axis greater than 100 metres);
- Areas of high conservation and/or socio-economic value (for example, areas with a known population of a susceptible species of threatened flora), and;
- Areas where human vectors are controllable. (Department of Parks and Wildlife, 2015)

4 Results

4.1 Disease distribution

The desktop assessment of Arrowsmith North using existing datasets indicated that *P. arenaria* has been recovered within and around the area on numerous occasions. The Project Area contains vegetation with moderate to high susceptibility to the Phytophthora pathogens. During the current survey of the Project Area, recoveries of Phytophthora were recorded within the Project Area () (Table 5). The species are yet to be identified by DNA analysis.

4.2 Disease symptoms and expression

The disease caused by Phytophthora arenaria is generally displayed in single or a cluster of deaths in susceptible species. Plant deaths in sample sites that were confirmed to have Phytophthora Dieback were isolated to confined to Banksia and Isopogon species.

4.3 Ecosystem health

The northern portion of the Project Area was burnt in 2013 and has recovered to be interpretable to Phytophthora Dieback. The southern portion was burnt pre-2012 and is in similar condition. Scattered deaths of Phytophthora Dieback indicating species, and species not expected to be susceptible were observed throughout the Project Area. These deaths, with no observed possible vector of pathogen introduction, have been attributed to the recent drier years of well below average rainfall (Figure 2).

4.4 Allocation of categories

Table 3 - Assessment area statement

Category	Area (ha)	Protectable Area (ha)
Infested		
Uninfested	235.18	
Uninterpretable		
Temporarily Uninterpretable		
Assessed Area	235.18	235.18
Excluded	36.71	

4.5 Excluded areas

The main north-south access track which is an extension of the Beharra Springs facility access track has been classified as Excluded. The northern section of the track is gravelled whilst the southern section is still sand. Whilst the vegetation adjacent to the track is still interpretable, the quantity of *P. arenaria* occurrences along the track required the track to be mapped separately to the drill lines.

4.6 Protectable and unprotectable areas

All vegetation within the Project Area, even sites infested with *P. arenaria* is considered Protectable. *P. arenaria* is regarded as native to the Geraldton sandplains and causes minor detrimental impact to the vegetation. Classifying the area as Protectable determines that hygiene measures should be introduced to mitigate the potential importation of other Phytophthora species which may cause greater harm, particularly *P. cinnamomi*.

4.7 Sampling

Taking a soil and tissue sample from dead and dying plants is an integral part of assessment – although in some cases sampling is not essential. Sample results provide evidence to support field diagnostic decisions. The following table (Table 4) shows the need for sampling to assist the disease diagnosis process (Department of Parks and Wildlife, 2015).
Seven samples were taken during the assessment (Table 5) and shown spatially on .

The samples were analysed by Vegetation Health Services (VHS), a division of the Department of Biodiversity, Conservation and Attractions. The laboratory uses a baiting process to extract the pathogen from the soil and root material taken from the site, the extracted pathogens are grown on agar plates to show growth patterns. *Phytophthora cinnamomi* can be identified in the laboratory by distinctive growth patterns on the agar plate. All other Phytophthora species are forwarded to the Centre of Phytophthora Science and Management (CPSM) at Murdoch University for DNA analysis an identification.

Table 4 - Determination of requirement for sampling

Observable factors indicating likelihood of *Phytophthora cinnamomi* presence				
ISD type	Multiple	Cluster	Scattered	Isolated
Species	Some or most indicator species	Any indicator plant	Any indicator plant	Any indicator plant
Pattern development	Obvious			Not obvious
Chronology	Obvious			Not obvious
Topographic situation	Gully/flat	Lower to mid slope	Mid slope to upper slope	Ridge
Causal agent	Obvious			Not obvious
Requirement for soil and tissue sample	Low	High	High	Low

Samples are also taken for the following strategic reasons:

- Supporting infested field diagnosis; and
- Incipient, subtle or cryptic disease in apparent uninfested sites.

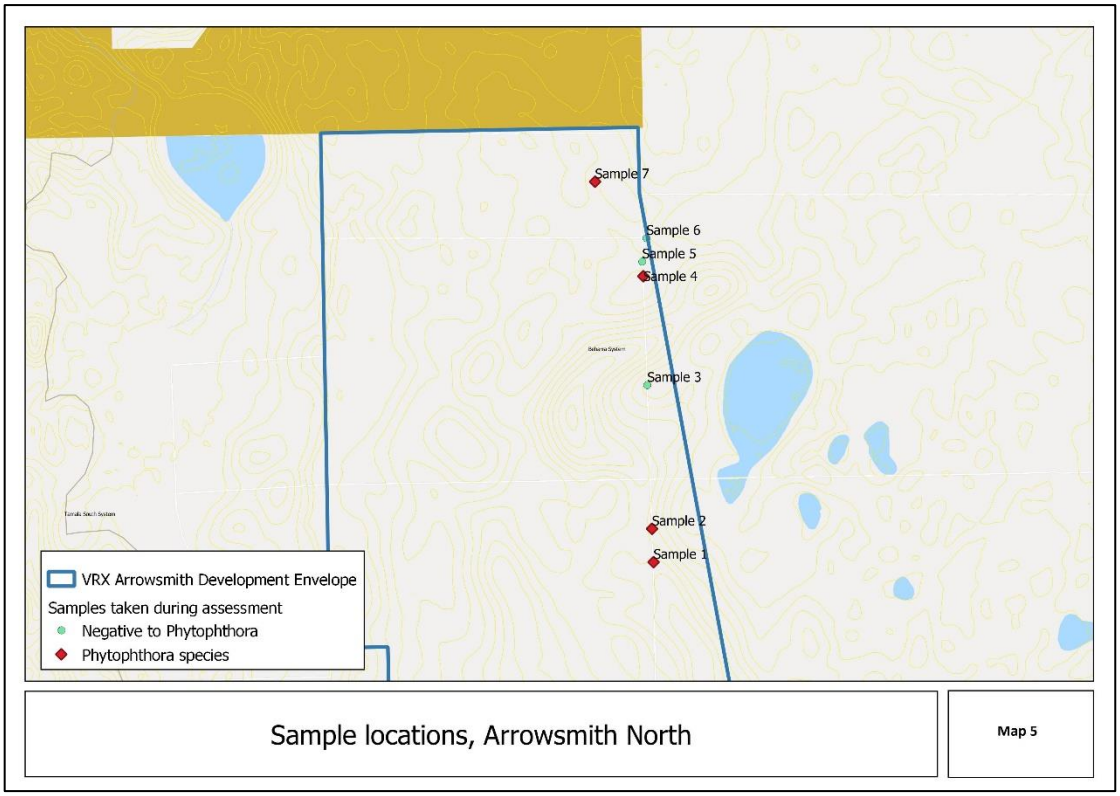

Figure 5 - Sample locations

5 Discussion

5.1 Desktop Assessment

The assessment area of Arrowsmith North covers approximately 1,728 hectares in tenement M70/1389. Some tracks within Arrowsmith North have been assessed annually by Glevan Consulting for several years. *Phytophthora arenaria* has been recorded at numerous locations from within Arrowsmith North and the main access track. Whilst these infestations are not having a significant impact on the vegetation, it is anticipated that the introduction of *P. cinnamomi* to Arrowsmith North would cause significant vegetation decline. Phytophthora Dieback caused by *P. cinnamomi* is having significant impact on vegetation in the Eneabba region (Figure 6). Although this area is nearly 40 kilometres south of the Project area, the Eneabba long-term average annual rainfall of 492mm (Green Grove 492mm) and the vegetation (Erindoon-378) (Figure 7) at both sites suggests that the environmental conditions are very similar.

It is acknowledged that "assessment areas situated between the 400 to 600-millimetre rainfall isohyets are very unlikely to have upland infestation" and "If upland infestations have initially established it is then possible for symptoms to dissipate or vanish altogether depending on rainfall received at a particular site" (Department of Parks and Wildlife, 2015).

Assessments have been conducted by Glevan Consulting within the Project Area and the greater area since 2006. In that period, 56 sites displaying suspicious deaths have been sampled to determine if Phytophthora was the cause of the vegetation decline. Twenty-six sites have shown the presence of *P. arenaria* and no other Phytophthora species has been recorded. Significantly, *P. cinnamomi* has not been recovered from the greater area.

Due to the period and repetition of assessments in the area, and the spatial distribution of Phytophthora recoveries, it is considered highly unlikely that *P. cinnamomi* will be in undisturbed vegetation.

5.2 Field Assessment

A vector is a moving component capable of introducing disease to a new site. For example, a vehicle is a vector while the track associated with the vehicle is potentially a disease risk site, given the appropriate conditions (Department of Parks and Wildlife, 2015). Similarly, creek lines and water-gaining sites are also potential disease risk sites if the pathogen is introduced. Due to the previous surveys, and the environmental conditions at the site, it is anticipated

that if all disease risk sites of possible Phytophthora introduction are free of the pathogen, then the undisturbed sections of vegetation will also be Uninfested.

The field assessment therefore consisted of a linear assessment of all tracks that have been created within the Project Area, and water-gaining sites. Tracks created for previous exploration activities with other entities in the area were also assessed.

Phytophthora

During the current assessment, seven sites with deaths of Phytophthora Dieback indicating species were sampled to determine the presence of the pathogen. Four of those sites did prove the presence of Phytophthora (Table 5). At the time of report writing, the species had not been confirmed by DNA analysis. It is known however that the pathogen is not *P. cinnamomi*.

Despite the presence of Phytophthora in the Project Area, no vegetation has been classified as Infested.

Excluded

The main access track to the Project Area that runs north-south from Mt Adams Road is gravelled in the northern end as it is used for access to Beharra Springs Gas Fields infrastructure. South of the gravelled section, the track is undeveloped sand. *P. arenaria* has been recovered from vegetation adjacent to the gravelled and sand sections. Although the remaining vegetation is not showing disease symptoms, the track has been classified as Excluded. It has been classified as such to provide a distinction that in any developed Hygiene Management Plan for the Project Area, clean down procedures are utilised for vehicles accessing offshoot drill lines and vegetation from this main access track.

Uninfested

The entire assessed area, aside from the Excluded access track, is considered Uninfested and should be managed as Protectable. Scattered deaths were observed throughout the area in Phytophthora Dieback susceptible and non-susceptible plant species. These deaths were most likely resulting from the drier conditions in the Project Area and are consistent with other heathland vegetation observed in adjacent areas.

Not mapped

Areas of the Development Envelope removed from disease vectors were not assessed. At this stage of the project development it was determined that these areas would have the disease status based on the likelihood of P. cinnamomi being present in the vegetation. This likelihood was based on disease vectors and proximity to known Phytophthora Dieback infestations. The areas not mapped are likely Uninfested.

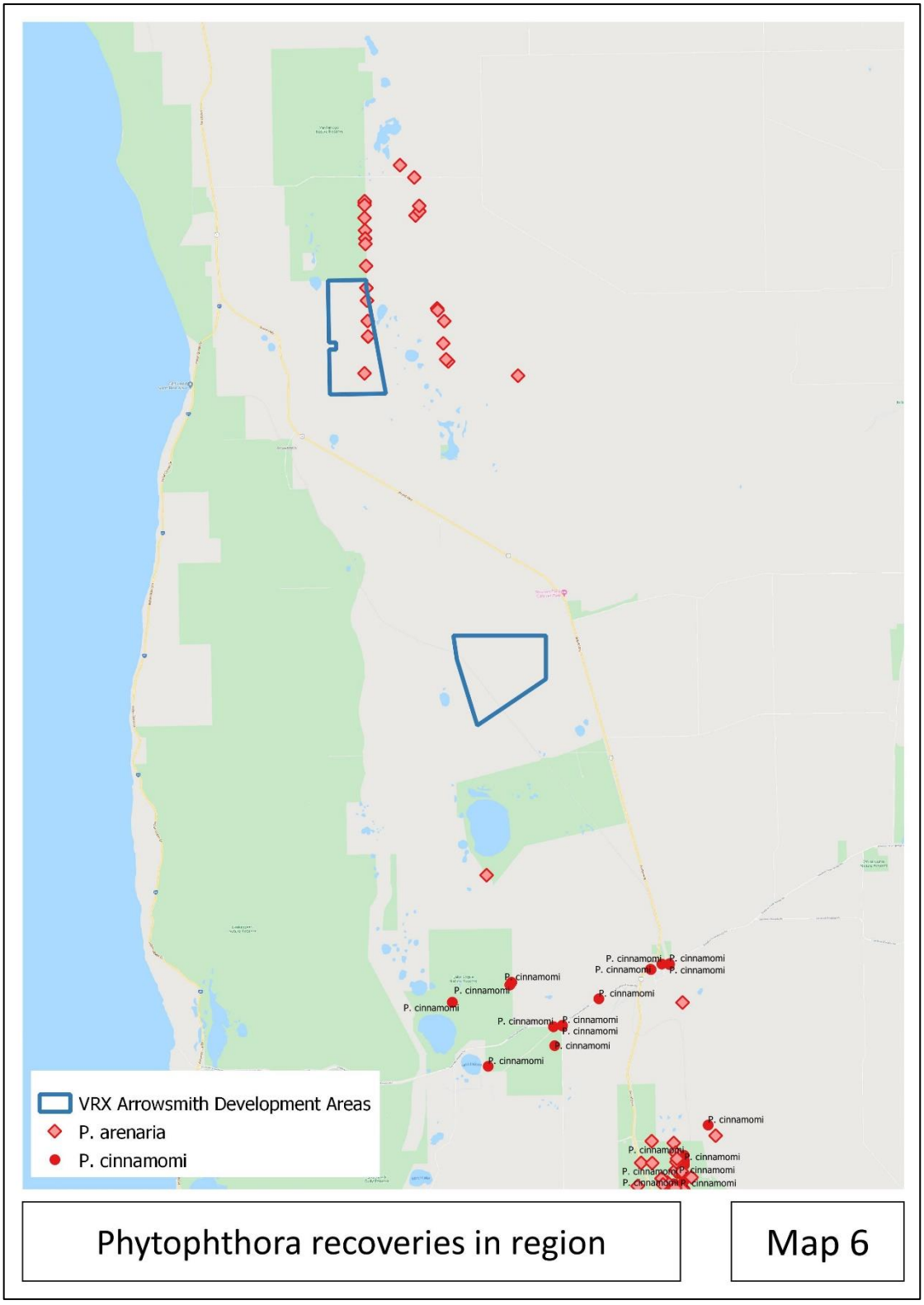

Figure 6 - Phytophthora recoveries in region

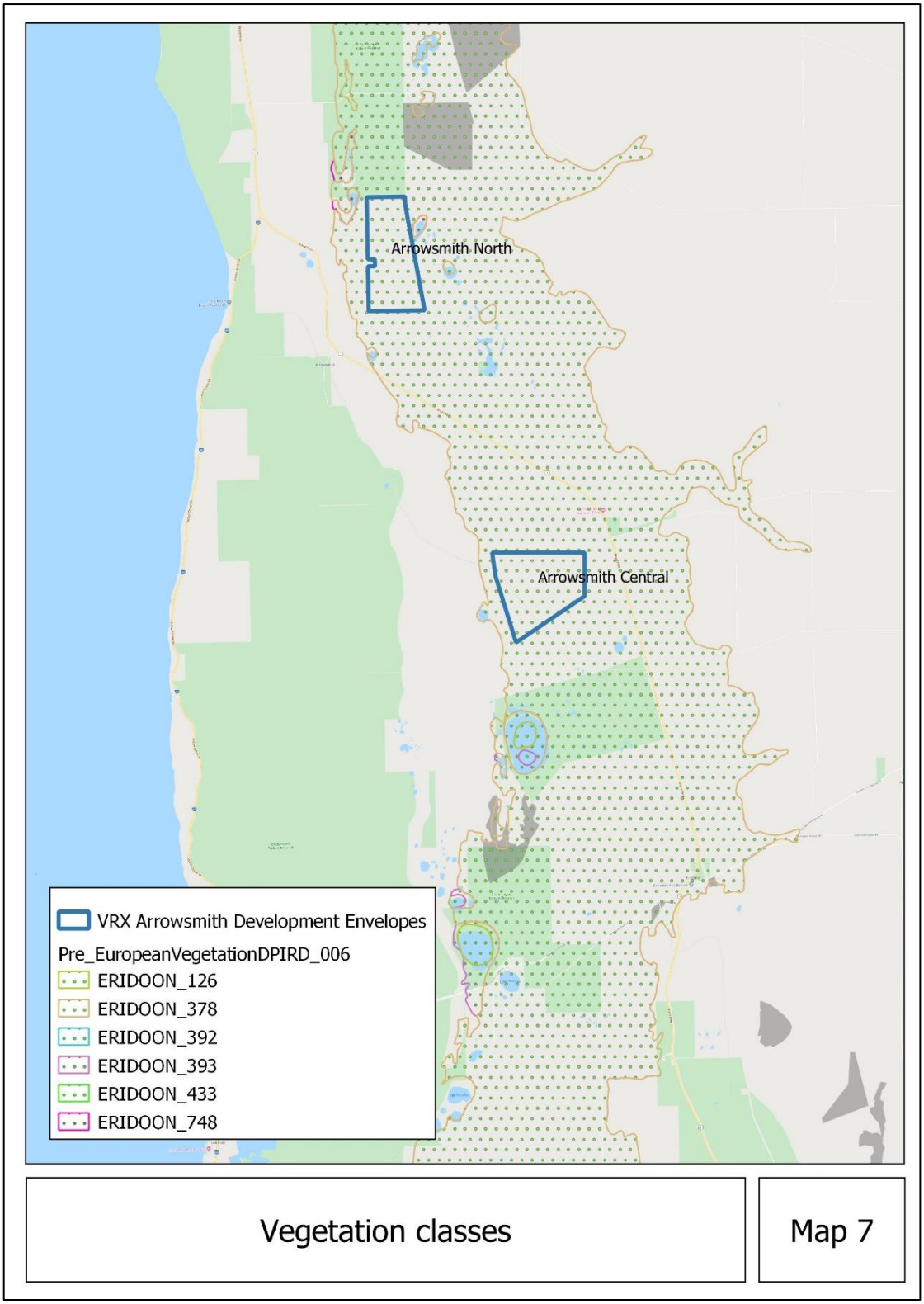

Figure 7 - Vegetation classes

6 Conclusion

The vegetation within the VRX Arrowsmith North Development Area has been strategically assessed and is considered Uninfested and Protectable from the introduction of *P. cinnamomi*.

Due to Phytophthora Dieback being considered a threat to the vegetation, an appropriate Hygiene Management Plan needs to be developed prior to soil moving activities occurring in the Development Envelope.

This plan may be developed in stages, addressing:

1. Use of light vehicles and heavy machinery in the Development Envelope using existing access tracks;
2. Installation of infrastructure;
3. Mining activities and post-mining rehabilitation.

This report is suitable for the development of Stage 1 of the Hygiene Management Plan, noting that the assessment has a currency of three years. Development of Stage 2 and Stage 3 will require further assessments targeted at the disturbance areas.

7 Bibliography

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8 Appendices

8.1 Sample summary

Table 5 - Samples taken during assessment

Sample	Plant Sampled	Easting	Northing	Result
1	**Banksia sp.**	**316107**	**6736609**	**P. arenaria**
2	**Banksia sp.**	**316097**	**6736840**	**P. arenaria**
3	Banksia sp.	316064	6737833	Negative
4	Banksia sp.	316037	6738585	Negative
5	Isopogon sp.	316029	6738868	Negative
6	Banksia sp	316058	6738849	Negative
7	**Banksia sp.**	**315703**	**6739239**	**P. arenaria**

Note: At the time of report production, the Phytophthora species had not been concluded.

8.2 Phytophthora Dieback Occurrence map

The project area is displayed as a blue boundary line. The following categories are also shown (if present in the project area):

- Excluded (shown as uncoloured). Areas of high disturbance where natural vegetation has been cleared and is unlikely to recover to a level that is interpretable.
- Infested (shown as a red). Determined from the assessment to have plant disease Phytophthora Dieback.
- Uninfested (shown as green). Determined from the assessment to be free of plant disease Phytophthora Dieback.
- Uninterpretable (shown as a purple). Undisturbed areas where susceptible plants are absent, or too few to decide the presence or absence of Phytophthora Dieback.
- Not yet resolved (shown as pale blue). Phytophthora occurrence diagnosis cannot be made at the time of assessment because of inconsistent or incomplete evidence.
- Temporarily Uninterpretable (shown as grey). Areas of disturbance where natural vegetation is likely to recover.

Additional spatial data that may be shown include:

- Sample location with result, and;
- Proposed Clean on Entry Points.

Phytophthora Dieback is a dynamic disease with autonomous spread of the pathogen not expected to be more than three metres a year upslope in average conditions. In unusual circumstances, such as heavy spring, summer or autumn rainfall, the spread of the disease may be rapid and breach the buffers. These buffers however provide the best chance of hygienic operating conditions within protectable areas over a set twelve-month period. The information on Phytophthora occurrence maps then becomes obsolete.

8.3 Mapping Metadata

DATASET DESCRIPTION	
Title	19-0825-VRX-ArrowsmithNorth
Contact Organisation	Glevan Consulting
Contact Name	Evan Brown
Contact Position	Phytophthora Dieback Interpreter
Contact Phone	1300 453 826
Contact Email	evan.brown@glevan.com.au
Lineage	All field data recorded using ESRI Collector on a GPS enabled tablet.
Datum / Coordinate System	GDA94 Zone 50
Restrictions	Data valid to November 2020

8.4 Shapefile spatial data

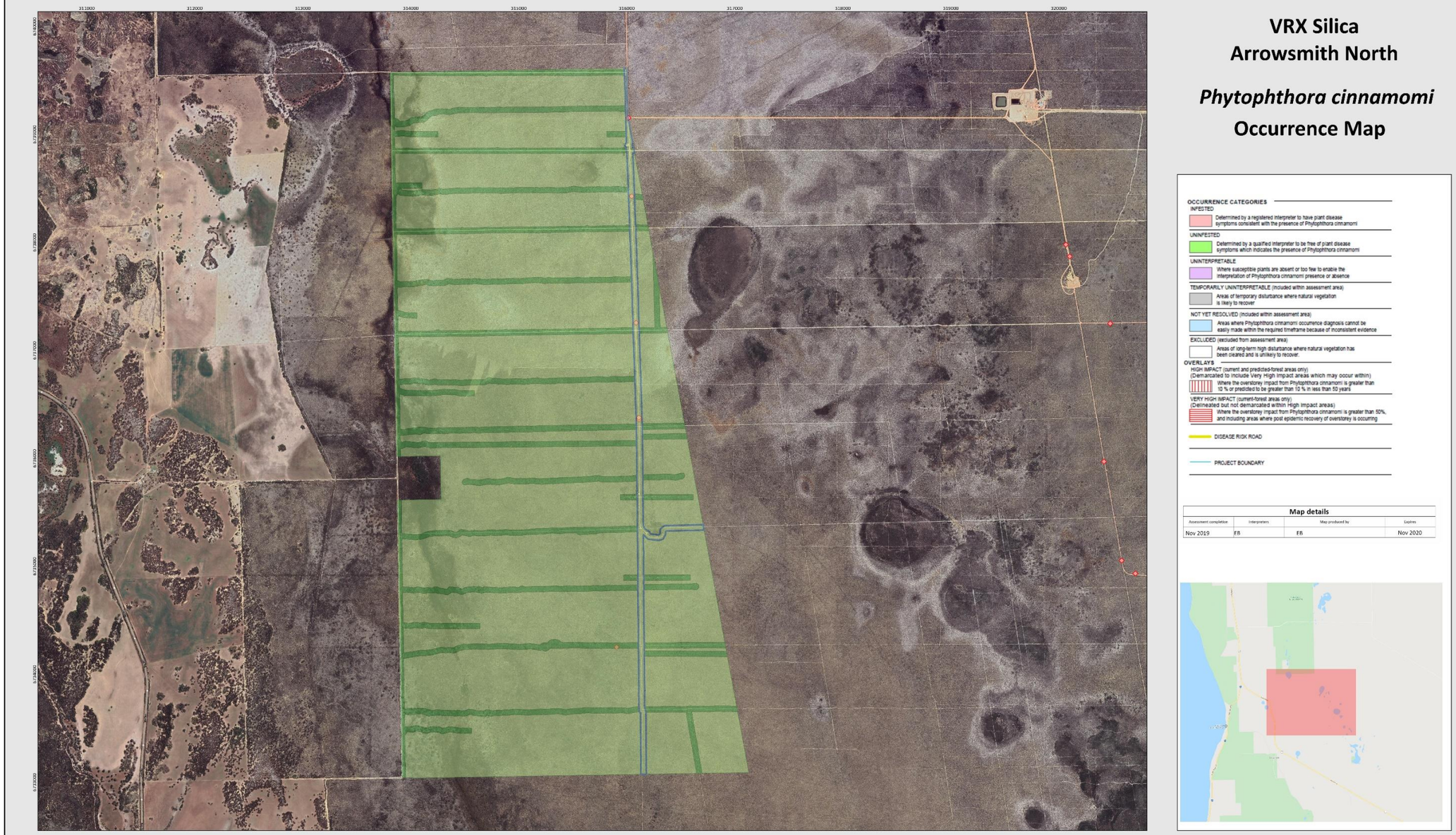

Figure 8 - Phytophthora cinnamomi occurrence map