GHD

Pipeline Route

Phytophthora Dieback occurrence assessment – Version 0.3

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.

Author Evan Brown

Table of Contents

List of Figures

List of Tables

2 Summary

The Myalup-Wellington project is an industry-led initiative, proposed by Collie Water to reduce salinity in Wellington Dam, Western Australia's second largest reservoir with a capacity of 185 gigalitres (GL). It is proposed that saline water flowing into Wellington Dam be diverted from the Collie River East Branch to a mine void, with that water then treated in a new desalination plant located near Collie. A new, smaller Burekup Weir will be built upstream to enable water delivery to be powered by gravity.

As part of the project:

- Up to 14 GL per year of saline water in Collie River East Branch to be diverted into a disused mine void for storage. This will prevent between 60 000 to 110 000 tonnes of salt entering Wellington Dam per year.
- Stored water to be pumped to a newly-constructed 20 GL per year privately-owned desalination plant near Collie with disposal of brine pumped to an ocean outfall using an existing pipeline.
- New Burekup Weir to be constructed upstream of its current location to provide increased head pressure to enable (Water for Food, n.d.)

Glevan Consulting was contracted by GHD to assess these components of the project for the presence of Phytophthora Dieback.

The Project Area is shown in Figure 1 and traverses public and private property. The assessment area covers 194.5 hectares.

The assessment was conducted by Matthew Stewart of Glevan Consulting in July of 2017. Mr Stewart is accredited by the Department of Parks and Wildlife (DPaW) in the detection, diagnosis and mapping of the Dieback disease. This accreditation recognises the skills and experience of Mr Stewart.

Phytophthora Dieback is located broadly across the Project Area with nearly all vegetated areas showing symptoms of the disease. One small Uninfested areas was demarcated.

3 Introduction

3.1 Background

The Myalup-Wellington project is an industry-led initiative, proposed by Collie Water to reduce salinity in Wellington Dam, Western Australia's second largest reservoir with a capacity of 185 gigalitres (GL). It is proposed that saline water flowing into Wellington Dam be diverted from the Collie River East Branch to a mine void, with that water then treated in a new desalination plant located near Collie. A new, smaller Burekup Weir will be built upstream to enable water delivery to be powered by gravity.

As part of the project:

- Up to 14 GL per year of saline water in Collie River East Branch to be diverted into a disused mine void for storage. This will prevent between 60 000 to 110 000 tonnes of salt entering Wellington Dam per year.
- Stored water to be pumped to a newly-constructed 20 GL per year privately-owned desalination plant near Collie with disposal of brine pumped to an ocean outfall using an existing pipeline.
- New Burekup Weir to be constructed upstream of its current location to provide increased head pressure to enable (Water for Food, n.d.)

Glevan Consulting was contracted by GHD to assess these components of the project for the presence of Phytophthora Dieback.

3.2 Location of Project Area.

The Project Area (Figure 1) is in two sections and traverses public and private property. The assessment area covers 194.5 hectares.

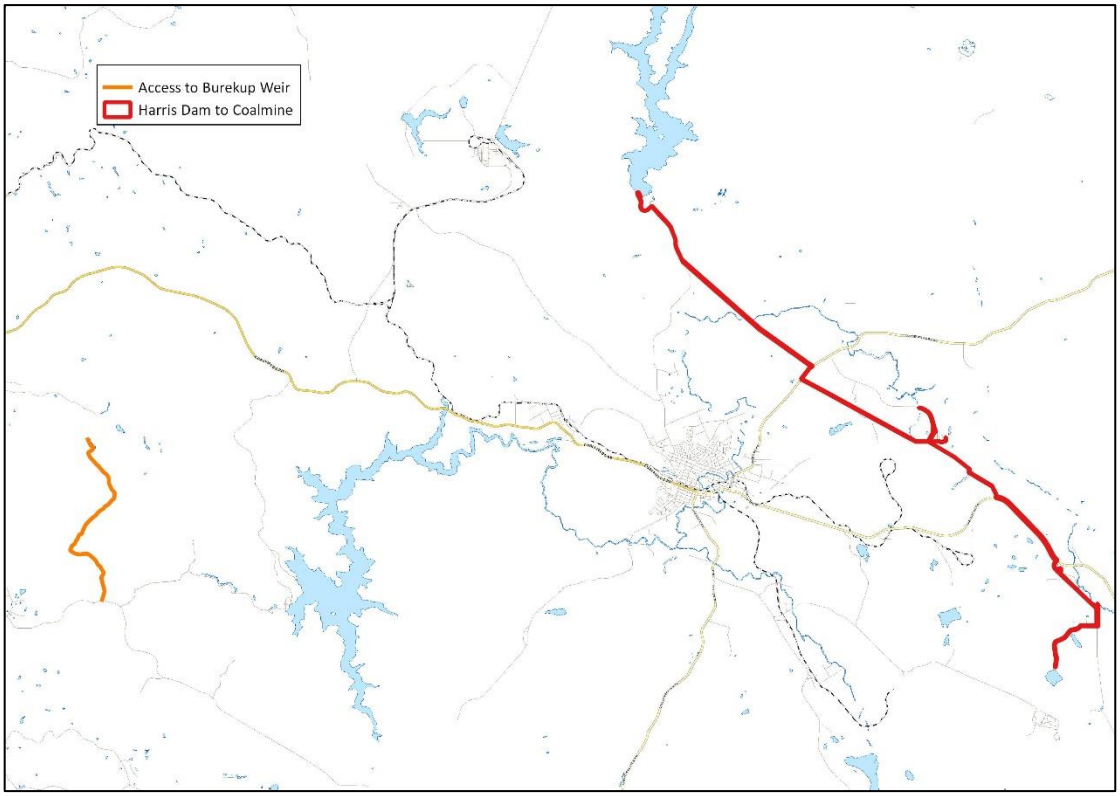


Figure 1 - Project Area

3.3 Historical land use and previous disturbances.

Portions of the study area traverse through State Forest along existing easements or tracks with the majority of the proposed pipeline on cleared private property.

3.4 Study team

The assessment was conducted by Matthew Stewart of Glevan Consulting in July of 2017. Mr Stewart is accredited by the Department of Parks and Wildlife (DPaW) in the detection, diagnosis and mapping of the Dieback disease. This accreditation recognises the skills and experience of Mr Stewart.

4 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.

4.1 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.

4.2 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. Sites may range from having no susceptible host. Within vulnerable areas, three main family groups are regarded as highly susceptible to Phytophthora Dieback disease, being:

- Proteaceae
- Ericaceae
- Xanthorrhoeaceae.

4.3 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.*
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.*

5 Methods

5.1 Pre survey desktop study

Known databases of *Phytophthora* locations retained by Glevan Consulting and Vegetation Health Services (DPaW) were searched to determine previous recoveries of *Phytophthora* within the project area.

Previous Phytophthora Dieback Occurrence reports and maps pertaining to the study area were also studied prior to undertaking the field work.

5.2 Interpretation

Based on the considerations of Section 4 'Phytophthora Dieback', the personnel involved in the field work determined the presence of Phytophthora Dieback based on symptoms and disease signatures displayed in susceptible vegetation. These symptoms are supported through the strategic sampling and subsequent recovery of Phytophthora from soil and tissue samples taken during the assessment.

The detection of the plant pathogen Phytophthora Dieback involves the observation and interpretation of plant deaths (or reduction of biomass or perceived temporal change in vegetation structure) using a logical assessment of factors that imply pathogen presence above other possible causes of plant deaths or vegetation change. A combination of the following factors may indicate the presence of disease caused by *Phytophthora* Dieback or other *Phytophthora* species.

<u>Deaths of disease indicating species:</u>

An indicator species is a plant species, which is reliably susceptible to Phytophthora Dieback (i.e. will die). Common indicators include several species of *Banksia, Patersonia*, *Persoonia*, and *Xanthorrhoea*. The distribution and composition of indicator species will vary from place to place according to vegetation types.

Chronology of deaths:

As the pathogen spreads through an area, some or all susceptible plants become infected and die. Consequently there will be an age range from more recent deaths with yellowing or brown leaves through to older leafless stags to remnant stumps in the ground.

Pattern of deaths:

The topography, soil type, vegetation type and drainage characteristics of an area together with the influence of climatic patterns and disturbances will influence the shape or pattern of an infested area over time. A typical recent infestation may show a small cluster of dead indicator species which, in time, will spread to become a small circular shape 'the ulcer effect' and then begin lengthening towards natural drainage channels. A fringe of recent deaths is often seen around the edge of the infested area. Patterns may be further highlighted by a paucity of ground cover within the infested area.

Other causes of indicator species death:

Phytophthora cinnamomi is not the only agent to cause death of native vegetation. Other agents include, but are not limited to:

- other *Phytophthora* spp, *Armillaria luteobubalina*, various cankers, insects;
- drought, wind scorch, frost, salinity, water logging, fire and lightning;
- senescence, competition, physical damage;
- herbicides, chemical spills (for example fuel).

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.

5.3 Demarcation of hygiene boundaries

Phytophthora Dieback infestations were demarcated with day-glow pink flagging tape. A single band of tape was tied to a suitable tree with the knot facing towards the infestation. The Uninterpretable boundaries were denoted with black and pink tiger tape. The taped boundaries were positioned approximately 15m outside the infested or uninterpretable areas, to provide the required buffer zone, and placed approximately 10 -15m apart.

5.4 Soil and tissue sampling

Suspicious sites can have a representative soil and tissue sample taken to assist with the interpretation process. The laboratory result can confirm the presence of the *P. cinnamomi* pathogen. A negative result does not necessarily prove that the pathogen isn't present at the site, and should be supported by the field interpretation.

Sampling was conducted using the following procedure:

- All digging implements used were thoroughly sterilised prior to use with methylated spirits. The implements were then allowed to dry so that the integrity of the sample was not compromised.
- The area around the base of the plant/s to be sampled was cleared of vegetative matter to aid the digging process.
- The plant was dug to a satisfactory depth so that the tissue with the highest moisture content was obtained.
- Sections of the roots and stem base from all sides of the plant were taken and placed in a plastic bag. If any lesion was noticed on the tissue, it was also placed in the bag. A few handfuls of sand from various depths were also deposited in the plastic bag.

- The sample bags were irrigated with distilled water to try and simulate the optimum conditions for the *Phytophthora* to survive.
- Details, such as the date, sample number and interpreters were written on an aluminium tag, which was left at the site. The tag was demarcated with a strip of day-glow orange flagging tape.
- All digging implements used were again sterilised after each sample was taken to ensure that infected soil was not transported to the next sample site.

5.5 Mapping

Subsequent to hygiene boundary demarcation, the boundaries were again walked and recorded utilising a handheld GPS. The recorded data was then transferred to a desktop computer and used to produce the relevant maps.

5.6 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.

6 Results

6.1 Phytophthora Dieback occurrence distribution

Phytophthora Dieback is located broadly across the Project Area with nearly all vegetated areas showing symptoms of the disease (Table 2). One small Uninfested areas was demarcated.

Table 2 - Area Summary

Category	Area (ha)	% of total area
Infested (with *P. cinnamomi*)	82.17 ha	42.3 %
Uninfested	2.97 ha	1.5 %
Uninterpretable	2.60 ha	1.3 %
Temporarily Uninterpretable	9.09 ha	4.7 %
Excluded	97.62 ha	50.2 %
TOTAL AREA	194.48 ha	

6.2 Soil and tissue samples

Two soil and tissue samples were taken to assist the assessment process. The result of Sample 2 extended the known Infested area further west along the corridor.

Table 3 – Project Area Sample Summary

Sample	Plant sampled	Easting	Northing	Result
1	*Xanthorrhoea gracilis*	433388	6308487	*Negative*
2	*Xanthorrhoea gracilis*	433223	6308653	*P. cinnamomi*

7 Discussion

Harris Dam -Harris River Road

The Project Area corridor (Map 1 – Map 2) follows Collie-Tallanalla Road from Harris Dam until the alignment joins the Muja North Terminal alignment. This section, through Arklow State Forest is Infested. Historic mapping showed this section to be Infested.

Muja North Terminal alignment

The Project Area follows the Muja North Terminal alignment from Collie-Tallanalla Road to Collie-Williams Road (Map 2 - Map 5). Within this section, the corridor traverses two sections of Darrell State Forest (both Infested). The northern section is supported by historic mapping, the extent of the disease in the southern section has spread beyond the existing data and multiple deaths of Phytophthora Dieback indicating species, particularly *Xanthorrhoea gracilis* were observed in this section.

The remaining sections are cleared to farmland or are plantations and haven been classified as Excluded.

Collie-Wagin 66Kv alignment

The vegetation adjacent to the intersection of Collie-Williams Road and the Collie-Wagin 66Kv alignment (Map 5) has been recently interpreted by Department of Parks and Wildlife (DPaW). The existing demarcation of the Phytophthora Dieback and Uninterpretable section was still valid. This area is also undergoing current harvesting. The remaining section (Bluewaters Power Station Map 6 – Map 8) was not assessed as access was not allowed at the time of assessment.

The eastern end of this section (to Quinns Road) has been classified as Infested (Map 9). Some uninfested vegetation was observed in this section however *X. gracilis* deaths were observed in gutters along this section rendering the uninfested vegetation too small and fragmented to be demarcated. Sample 2 was taken in this section and proved the presence of Phytophthora Dieback.

Coalfields Highway

The corridor traverses the verge of Coalfields Highway (Map 10). The vegetation on the northern side has been burnt and has been classified as Temporarily Uninterpretable. A small section on the southern side has been classified as Uninfested. This has only been demarcated

with a double flag of pink tape tied to a single tree. A fence line prohibited further demarcation.

Griggs Road

This section of the corridor, south of Coalfields Highway, is infested within Reserve R15410 (Map 11) and has been classified as Excluded for the remainder (Map 11 – Map 13).

Burekup Dam to Pile Road

This section of the Project Area is within the proposed National Park. The proposed construction area at Burekup Dam (Map Burekup 1) has been classified as Infested. The nominated access route to Burekup Dam is from the bitumised Pile Road, north along Lennard Road, and then east along Sappers Road to the Burekup Weir. This access route was also assessed for the presence of Phytophthora Dieback and the roads have been classified as Infested. Phytophthora Dieback was observed at many locations along these roads with recent deaths displaying in indicating species. Lennard Road also exhibited uncontrolled public access.

Sappers Road has been blocked with signage and is in very poor condition.

8 Recommendations

- Soil and plant material of infested or unknown dieback status should not be introduced to uninfested or unmappable sections of the study area.

- Soil and plant material should not be transported from the infested or unmappable sections of the study area for use at any other protectable area site.

- Soil movement within each category is permissible, but should not occur across category boundaries, except where the source is uninfested.

- Vehicles and machinery should be clean upon entry into any of the site categories (except infested), and when moving across category boundaries. Moving from uninfested areas into other categories does not require clean down measures.

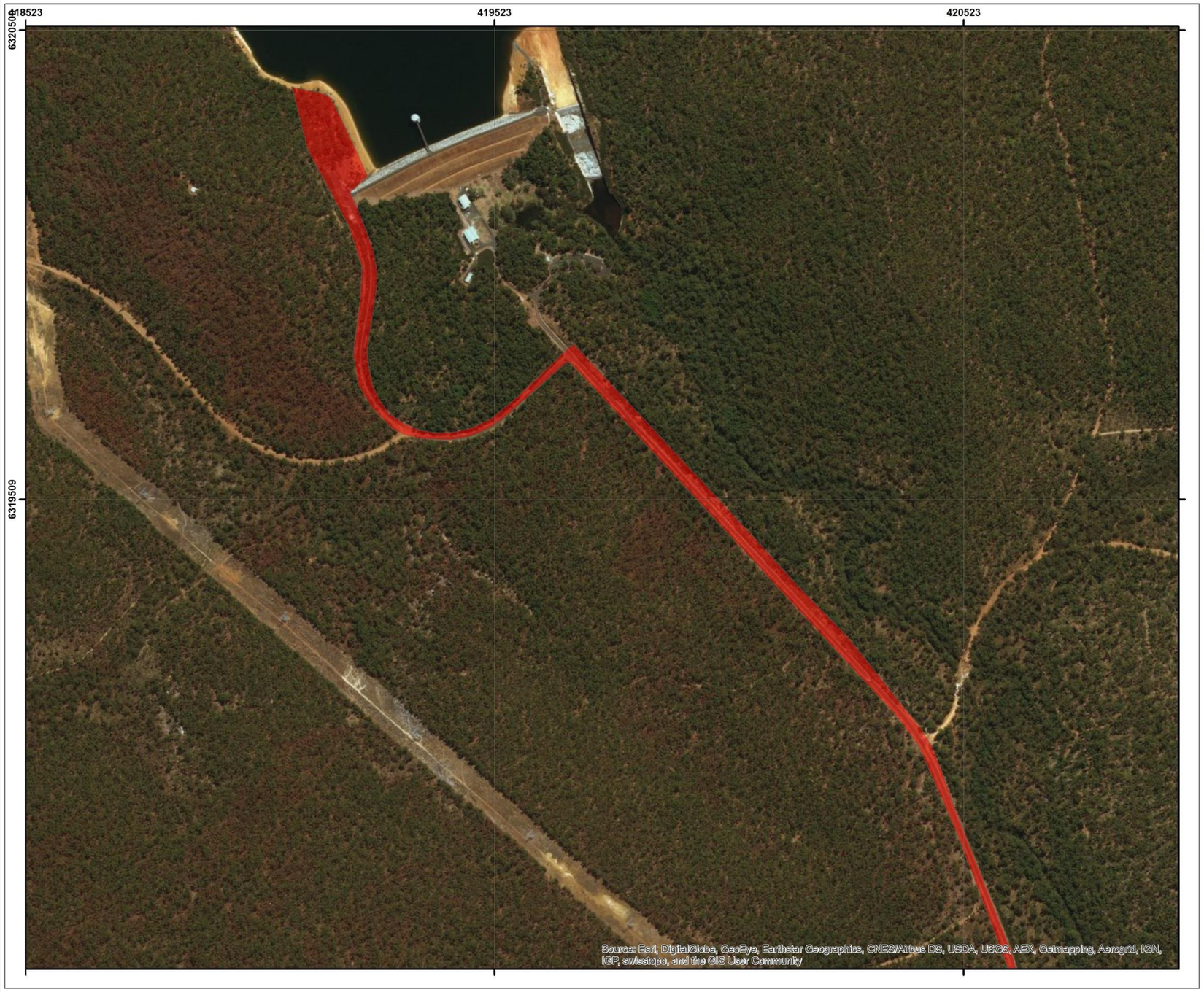
- Restrict access, where possible, to dry soil conditions only. Where vehicles or machinery are required to access the area during, or shortly after rainfall, they must carry clean down equipment, and remove any soil or plant material at designated hygiene points.

9 Bibliography

Department of Parks and Wildlife. (2015). *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department.* Unpublished.

Water for Food. (n.d.). *Myalup-Wellington Water for Growth*. Retrieved from http://www.waterforfood.wa.gov.au/Projects/Myalup-Wellington

10 Appendix – Phytophthora occurrence maps



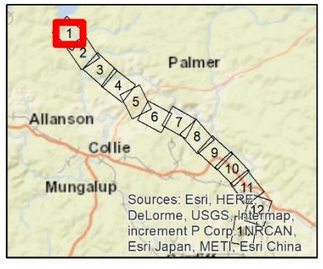
GHD

Pipeline Route

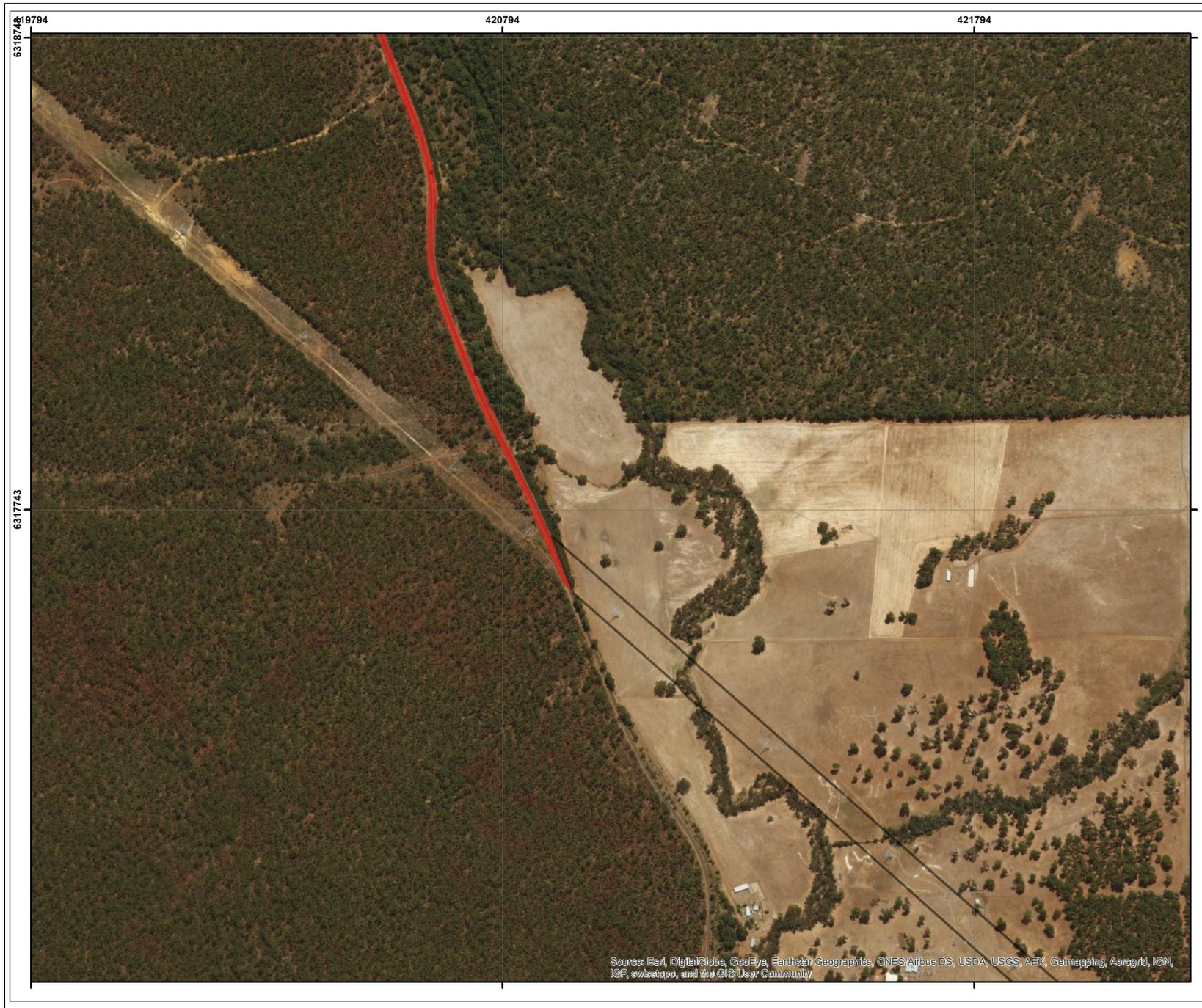
MAP 1

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



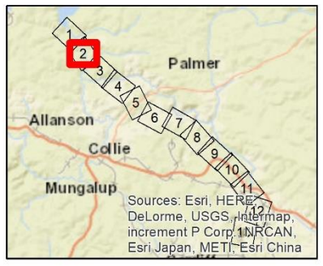
GHD

Pipeline Route

MAP 2

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

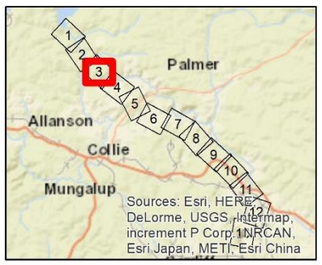
GHD

Pipeline Route

MAP 3

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

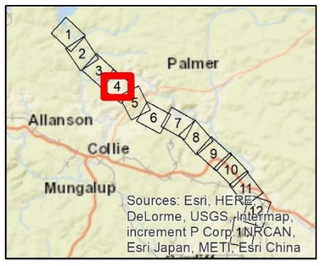
GHD

Pipeline Route

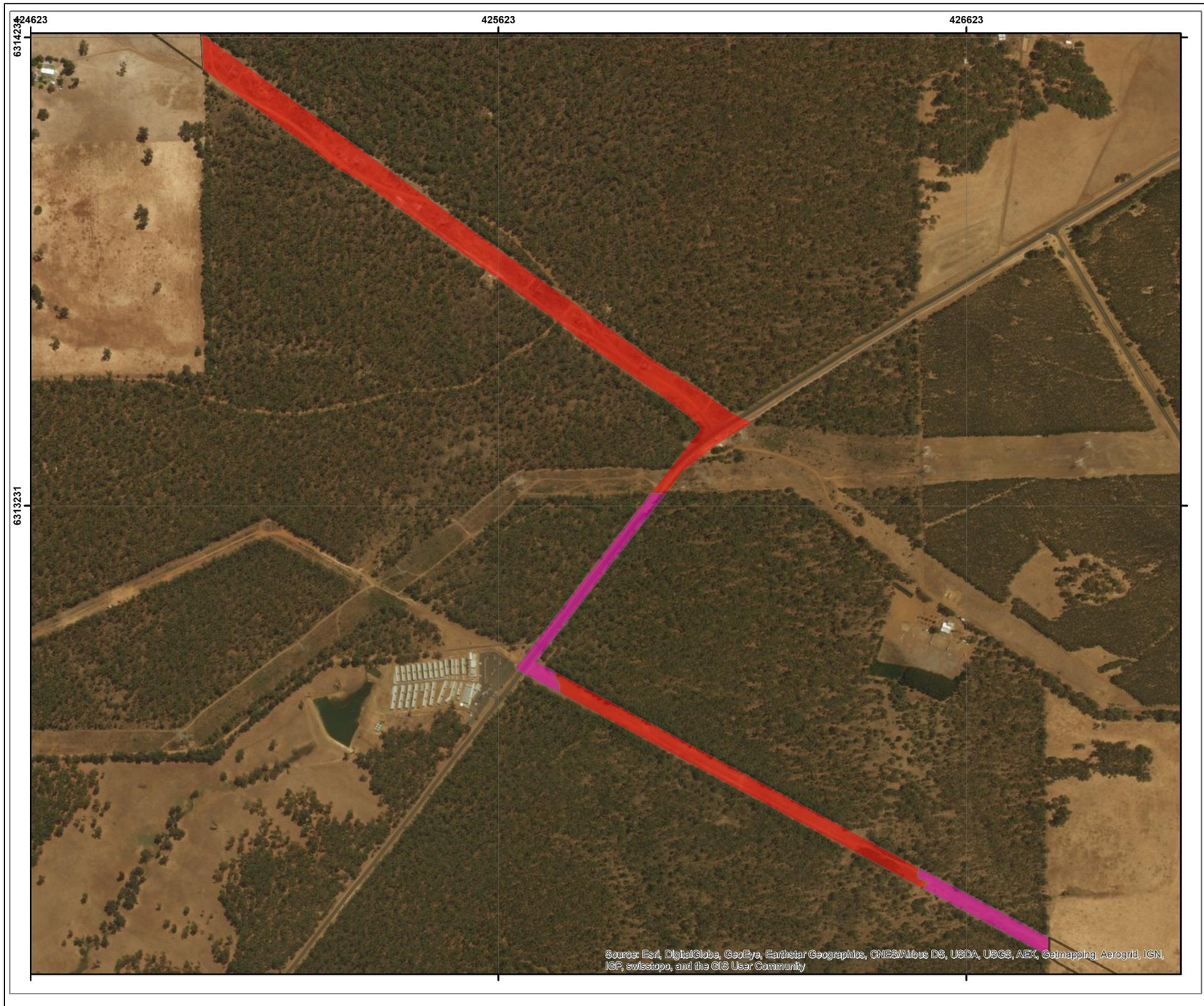
MAP 4

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



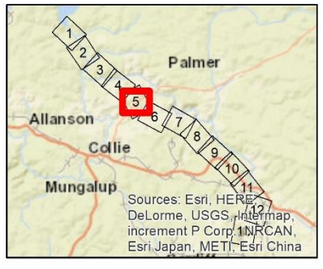
GHD

Pipeline Route

MAP 5

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

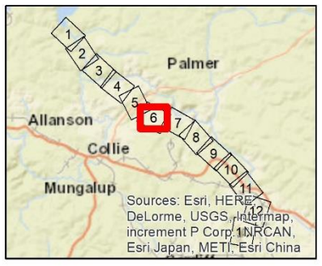
GHD

Pipeline Route

MAP 6

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

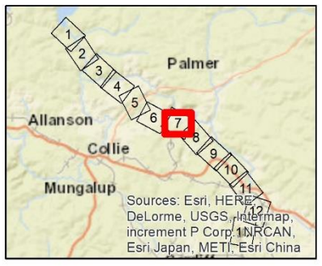
GHD

Pipeline Route

MAP 7

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

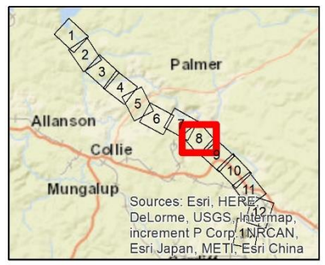
GHD

Pipeline Route

MAP 8

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

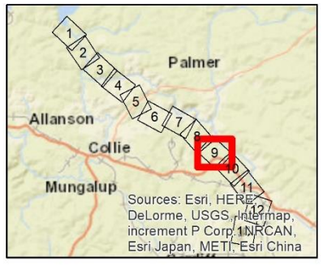
GHD

Pipeline Route

MAP 9

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

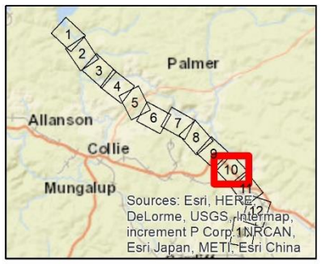
GHD

Pipeline Route

MAP 10

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

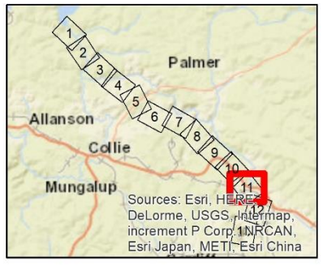
GHD

Pipeline Route

MAP 11

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING

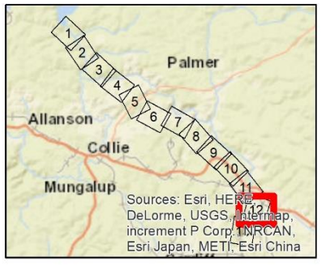
GHD

Pipeline Route

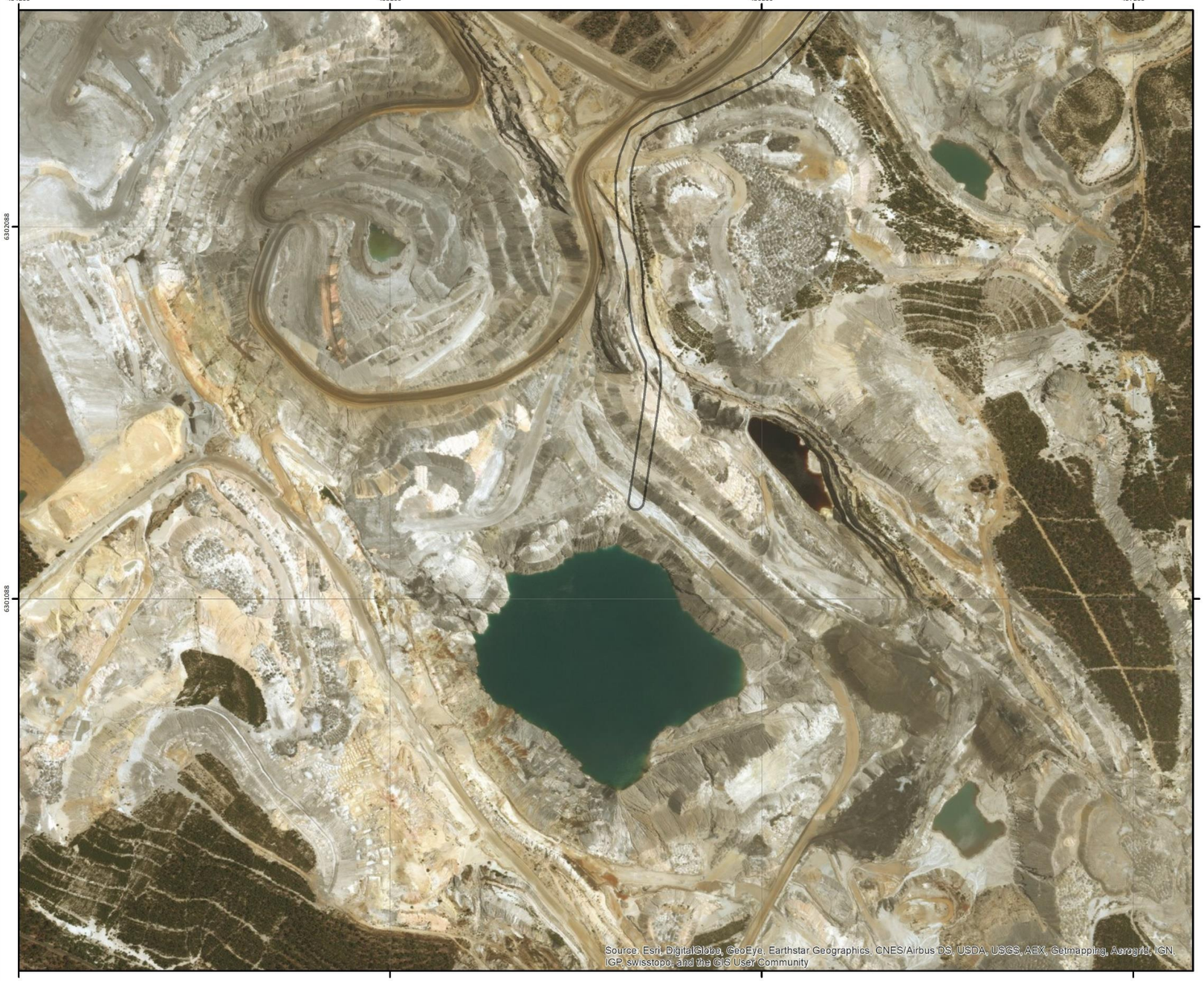
MAP 12

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



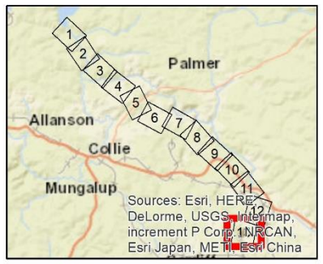
GHD

Pipeline Route

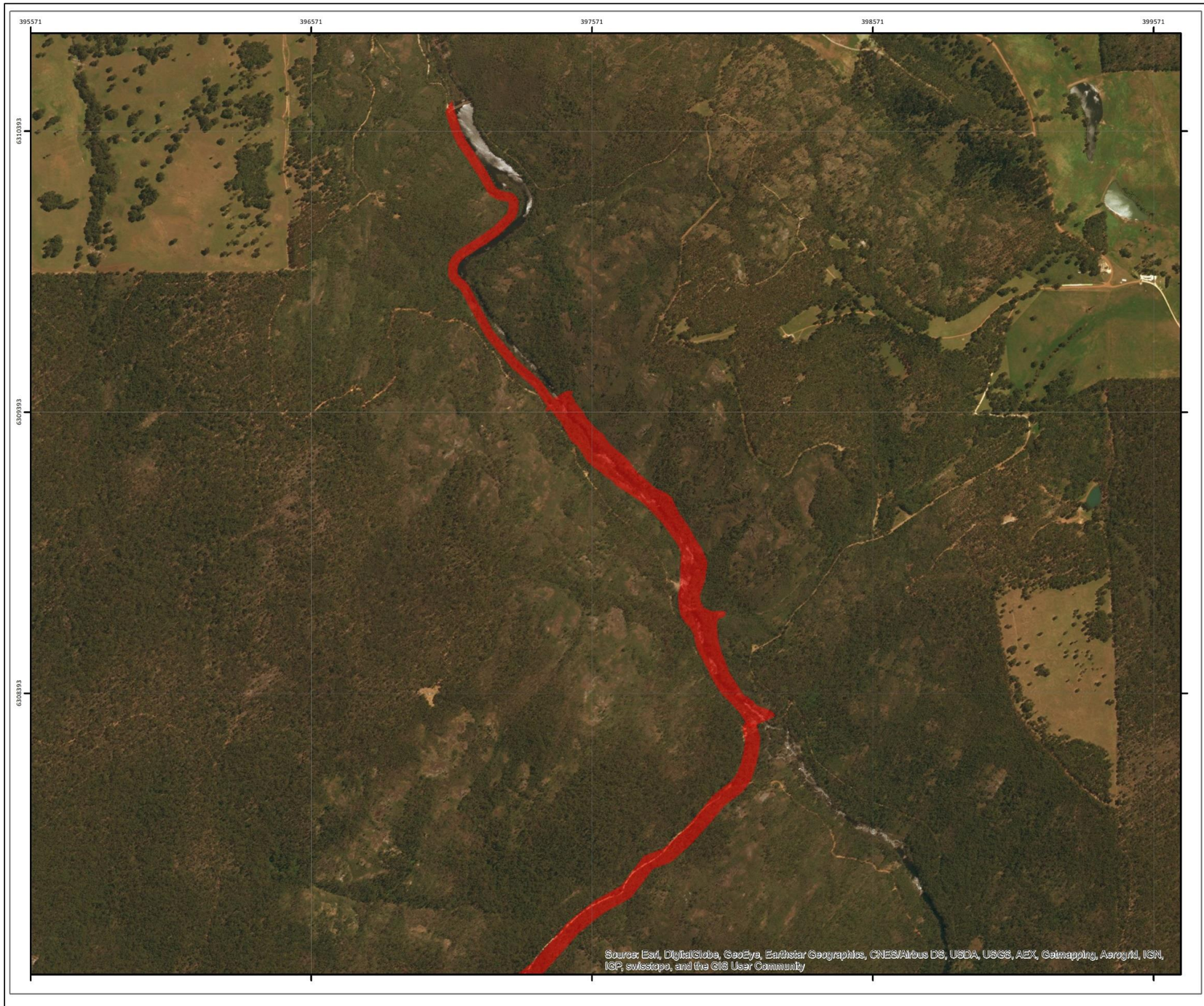
MAP 13

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



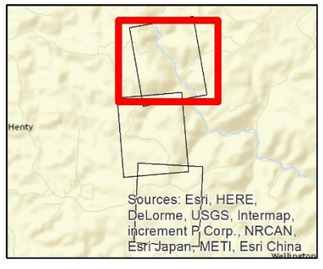
GHD

Burekup Pipeline Route

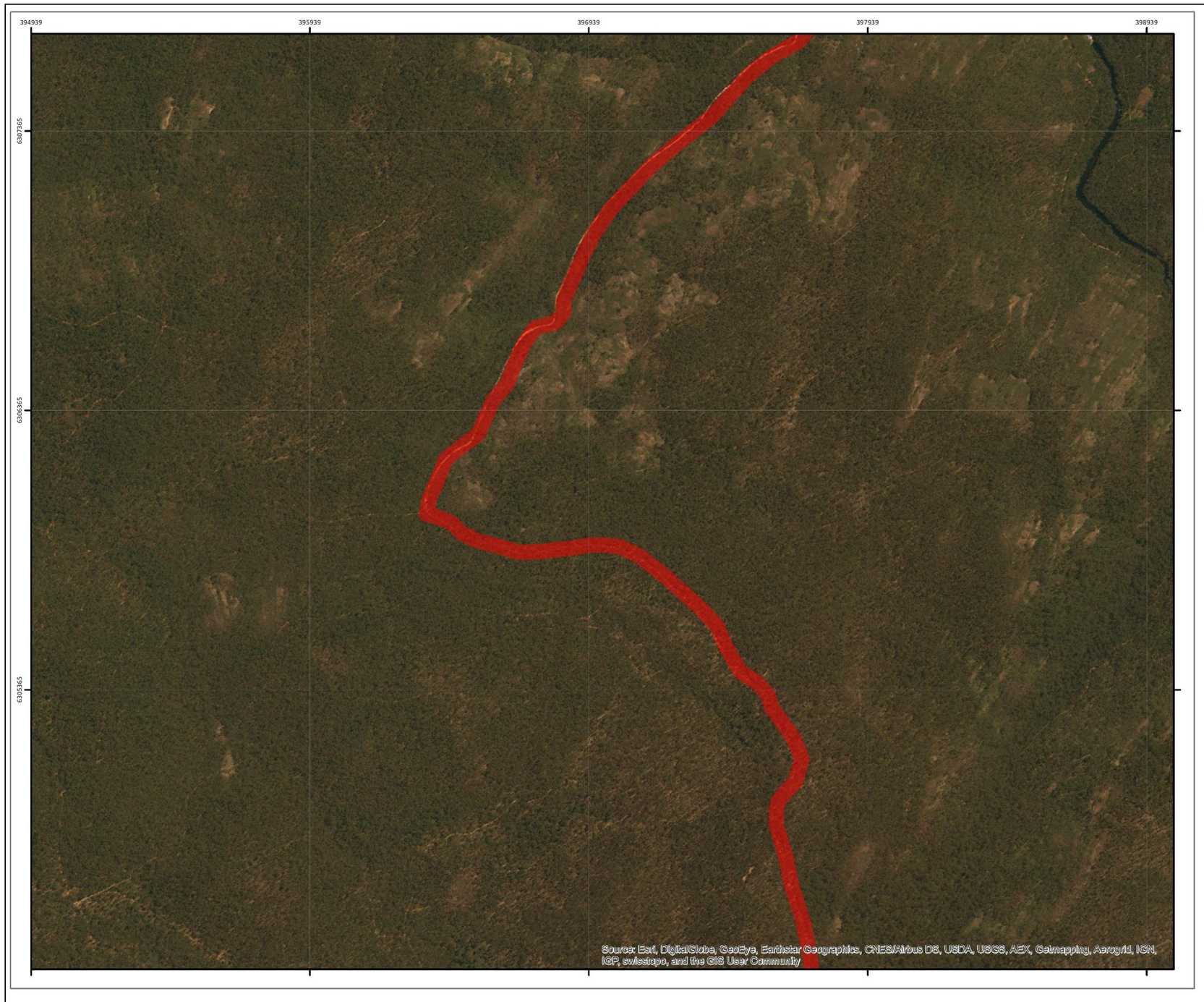
MAP 1

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



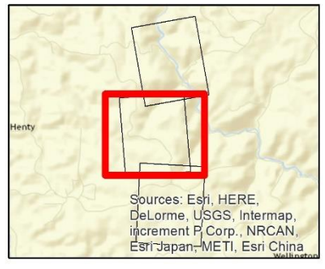
GHD

Burekup Pipeline Route

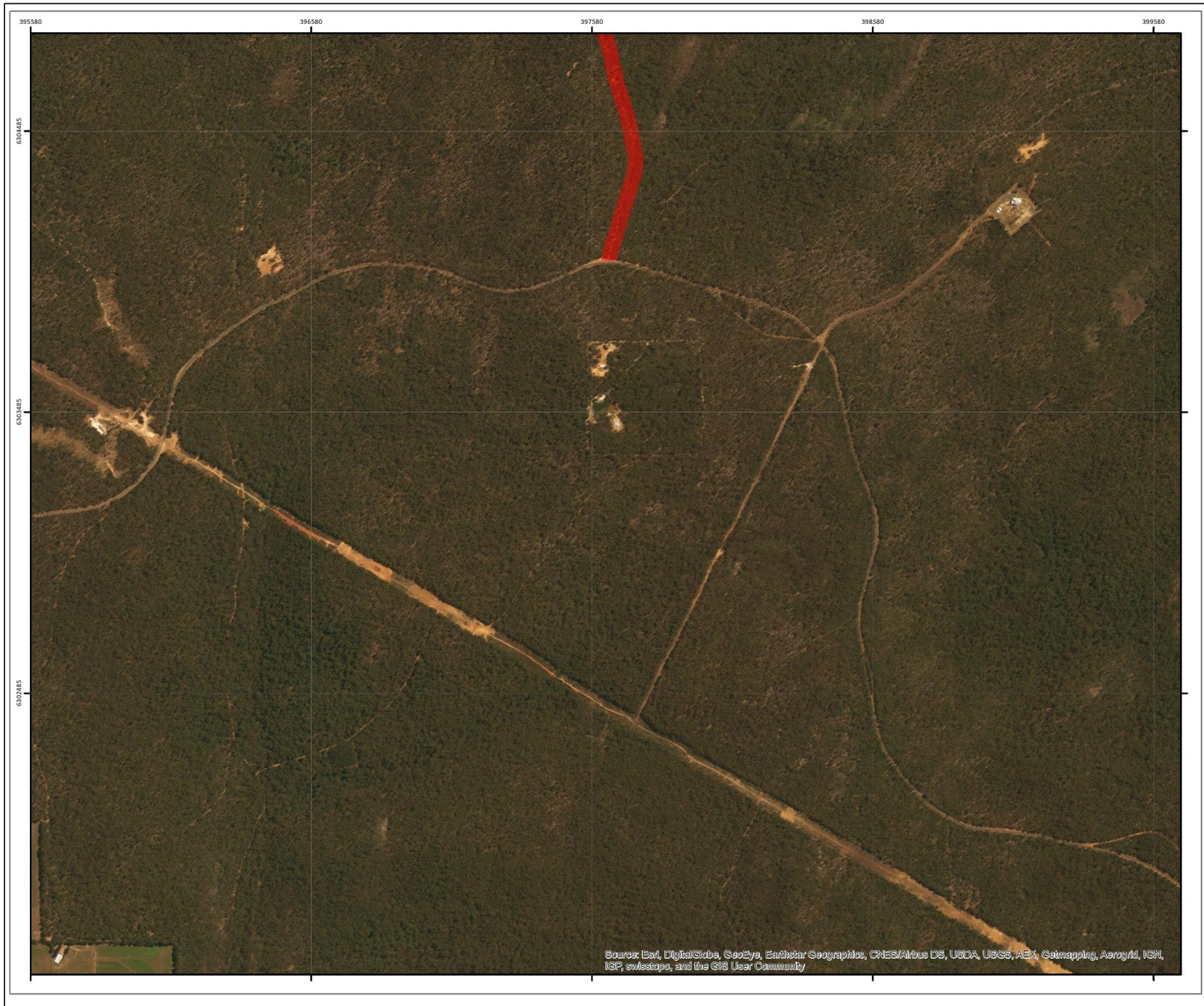
MAP 2

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING



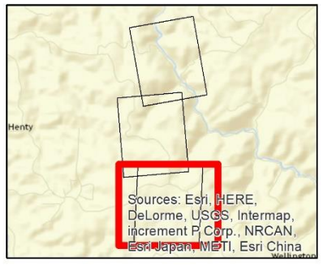
GHD

Burekup Pipeline Route

MAP 3

Dieback_Occurrence_Polygons

- EXCLUDED
- EXCLUDED, UNPROTECTABLE
- INFESTED
- UNINFESTED
- UNINFESTED, UNPROTECTABLE
- UNINTERPRETABLE
- UNINTERPRETABLE, UNPROTECTABLE
- NOT YET RESOLVED
- NOT YET RESOLVED, UNPROTECTABLE
- TEMPORARILY UNINTERPRETABLE
- TEMPORARILY UNINTERPRETABLE, UNPROTECTABLE



GLEVAN CONSULTING