BRIDPORT TO WATERHOUSE MINING LEASE AREAS: PRELIMINARY NATURAL VALUES FINDINGS

Environmental Consulting Options Tasmania (ECO*tas*) for Austrak Quarries Pty Ltd

31 March 2021

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AUTHORSHIP

Field assessment: Brian French

Report production: Brian French, Mark Wapstra

Habitat and vegetation mapping: Brian French

Base data for mapping: LISTmap, Integrated Land Management & Planning

Digital and aerial photography: Brian French, GoogleEarth, LISTmap

ACKNOWLEDGEMENTS

Barry Williams (Integrated Land Management & Planning) provided background information on the proposals.

COVER ILLUSTRATION

View toward Blackman Lagoon from the east of WH4.

Please note: the blank pages in this document are deliberate to facilitate double-sided printing.

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SUMMARY

General

Environmental Consulting Options Tasmania (ECO*tas*) was initially engaged to undertake a preliminary (desktop) review of the natural values associated with prospective mining lease areas in northeast Tasmania. This was reported in:

> ECO*tas* (2019). *Preliminary Review of Natural Values associated with Potential Mining Lease Areas between Bridport and Waterhouse Areas*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Kassem Holdings Pty Ltd, 27 July 2019.

The primary purpose of this initial assessment is to guide further land use planning and approvals through local, State and Commonwealth planning procedures (as relevant to particular sites), with particular emphasis on identifying the type of field surveys likely to be required, and any "fatal flaws" (critical constraints).

Environmental Consulting Options Tasmania (ECO*tas*) was further engaged to undertake on-ground assessments of the proposed mining leases as per recommendations made in ECO*tas* (2019), which primarily indicated spring-based surveys for threatened flora (as a minimum) were warranted. Due to various administrative factors, the 2019 "spring season" was entirely missed and surveys were limited in the 2020 "spring season" to the available funds.

Areas assessed

SP2, WH4, WH5 & WH6 have been field-assessed. SP1, WH1, WH2 & WH3 have only been subject to desktop review.

Summary of key findings

Land tenure

- WH1 to WH6 occur entirely within the Waterhouse Conservation Area managed by the Parks and Wildlife Service.
- SP1 and SP2 occur mostly within Single Tree Plain Conservation Area managed by the Parks and Wildlife Service.

Threatened flora

- One plant species, *Prasophyllum apoxychilum* (tapered leek-orchid), listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) was detected from the WH6 proposed extraction area.
- Several plant listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) were detected, or are known from database information, from either within or on the proposed access to SP2, WH5 and WH6 extraction areas including *Utricularia australis* (yellow bladderwort), *Gynatrix pulchella* (fragrant hempbush), *Hydrorchis* (*Microtis*) *orbicularis* (swamp onion-orchid), *Acacia ulicifolia* (juniper wattle), *Prasophyllum apoxychilum* (tapered leek-orchid), *Pomaderris paniculosa* subsp. *paralia* (shining dogwood) and *Pultenaea sericea* (chaffy bushpea).
- Further potential habitat occurs either within or adjacent to all the areas.

- Further assessments are recommended for threatened flora for SP1, WH1, WH2 and WH3, which includes the access to these sites.

Threatened fauna

- Numerous threatened fauna sites and potential habitat either within or adjacent to the area.
- *Limnodynastes peroni* (striped marsh frog), listed as endangered on the Tasmanian *Threatened Species Protection Act 1995* (TSPA), was recorded calling at SP1, WH4 and WH5.
- All wet areas including lagoons, creeks and swamps are potential/known habitat for Australasian bittern, eastern dwarf galaxias, green & golden and striped marsh frog. The access to WH1, WH2 and WH3 will need to be assessed due to known records and the access crossing potential habitat of these species.
- Tasmanian devil scats were noted at several sites. No dens were found, and it is likely that the species utilises the greater areas for foraging. All sites including access roads will need to be monitored and vehicle traffic prescriptions implemented if there is an anticipated impact on this species.
- All sites are potential habitat for marsupial carnivores (Tasmanian devil, eastern quoll and spotted-tail quoll).
- WH6 has potential habitat for the new holland mouse in the form of coastal heathland.
- A wedge-tailed eagle nest (nest #2490) occurs immediately to the south of WH6 on the southern slope of Hardwicks Hill. The presence and activity of the nest will need to be confirmed prior to any operation commencing. The nest is ca. 240 m from the southern boundary of the Stage 1 extraction area. If present, appropriate management prescriptions will need to be applied.
- SP1 is a 'data gap' for fauna records.
- Further assessments will be required for threatened fauna at either the unsurveyed lease areas or further stages of proposed extraction within the surveyed sites.

Vegetation types

- The aerial imagery indicates complex mosaic of vegetation types within each of the areas, which is not reflected in any version of TASVEG mapping.
- Threatened native vegetation is largely confined to wetland vegetation that is "freshwater aquatic herbland" (AHF) and freshwater aquatic sedgeland and rushland (ASF).
- There is potential for further areas of the above communities within all prospect areas.
- There is a marginal chance of *Eucalyptus ovata* forest and woodland (DOV) within drainage lines and poorly-drained sites at WH1, WH2 and WH3.
- Further assessments will be required to determine vegetation types present at SP1, WH1, WH2 and WH3.

Weeds, disease and pathogens

- *Phytophthora cinnamomi* (root rot fungus) (PC) is known from within WH6 and is known from the greater region.
- WH6 has extensive potential symptoms present. The vegetation types SCH and SSC are highly susceptible to the pathogen. Given the potential abundance of the pathogen, soil sampling will need to occur to determine presence/absence. The results from sampling will need to be considered carefully and specific management prescriptions applied given the extremely high risk of transporting the pathogen via vehicles and/or introducing the pathogen to other non-infected areas surrounding the lease.

- PC susceptible vegetation types are present within and adjacent to all prospect areas.
- PC susceptible plant species including threatened flora species occur within and adjacent to all areas.
- SP1, SP2, WH5 and WH6 occur entirely or partially within *Phytophthora* Management Zones.
- Frog chytrid fungus has been recorded in the past (1 record), which is potentially detrimental to frog populations (including two threatened species known or likely to be present).
- Weed records are sparse. However, boneseed, spanish heath, gorse, montpellier broom and african boxthorn are known from within 5,000 m of the potential prospect areas and have the potential to be introduced without adequate mitigation.

Other potential issues

CULTURAL HERITAGE

- It is likely that all sites will contain sites of Aboriginal heritage. All areas are coastal and occur near freshwater sources that are key environmental indicators of past occupation. Potential Aboriginal heritage sites (artefacts and middens) were observed during the field assessment.
- It is likely that a formal cultural heritage survey will be required to determine the presence of sites within the lease areas and access routes.

GEOCONSERVATION

- WH1 to WH6 are listed geoconservation sites (Waterhouse dunefield).
- WH1, WH2, WH5 and WH6 have portions listed as geoconservation sites (Northeast Tasmania Pleistocene Aeolian System).
- SP1 and SP2 have very small portions of the eastern sections of the sites listed as geoconservation sites (Northeast Tasmania Pleistocene Aeolian System).
- It is likely that a formal geoconservation assessment will be required to determine the potential impact of the proposals on these values.

OTHER MATTERS

- WH4, WH5 and WH6 areas all occur near popular recreational use areas including Blackman Lagoon, Big Waterhouse Lake and the Croppies Point camping areas.

Recommendations

It is clear that the prospective mining lease areas are challenging to develop with respect to several natural values, most notably the land tenure of several sites. Combined with localised patches of formally threatened vegetation, some populations of threatened flora, known sites of threatened fauna (and broader potential habitat for several species) and some potentially complex weed and hygiene management issues, it is our opinion that further detailed planning is required prior to undertaking further natural values assessments. In fact, while the overall high value of many natural values are already documented and recognised, it is likely that other values will also require detailed consideration.

One of these is Aboriginal cultural heritage. Cursory site assessments have clearly indicated that some (probably all) of these sites form part of a "cultural landscape" with direct evidence of past occupation (artefacts, middens). In our opinion, consideration of this value is likely to take precedence over most other planning issues. A comprehensive Aboriginal assessment is clearly indicated.

Another potentially complex issue is that of geoconservation. While some sites are already within recognised geoconservation areas, the management of shifting sand dunes relative to wetlands and drainage systems is complex. A comprehensive geoconservation assessment is clearly indicated.

Other matters, especially related to access, are also likely to critically constrain any particular proposal. This is related to both the proximity of some sites to popular reserve use areas but also the length of new road required within reserves. Associated with this are matters such as potentially complex management of weeds (known and potential), disease (including the fact that some sites are already within *Phytophthora* Management Zones and observed symptoms), and frog chytrid pathogen (with known populations and potential habitat of two threatened species).

Legislative and policy implications

Until the additional surveys are completed, it is difficult to anticipate the extent of application of different legislation and policy. However, in our opinion, these proposals should be subject to immediate consideration by the relevant divisions within DPIPWE (Environment Protection Authority, Conservation Assessments, Parks & Wildlife Service) to develop a comprehensive set of assessment and reporting guidelines. Without those in place, we do not believe that further natural values assessments should be undertaken. It is suggested that cultural heritage, geoconservation, access, weed and hygiene matters all be considered prior to more specific "footprints" being developed that take account of these values. At that point, more targeted natural values surveys will be most productive.

The key legislation (related to natural values) that will need to be taken into account is:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

  At this stage, unless the specific proposals are tightly refined, it is difficult to anticipate a scenario in which a formal referral under this Act would not become required for species such as *Prasophyllum apoxychilum* (tapered leek-orchid), *Litoria raniformis* (green and golden frog), *Sarcochilus harrisii* (Tasmanian devil), *Galaxiella pusilla* (eastern dwarf galaxiid) and potentially other matters.

- Tasmanian *Threatened Species Protection Act 1999*

  As above but noting this Act refers to "knowing taking a specimen of [listed flora or fauna]", the degree to which this could apply dependent on the final design of the extraction areas and access routes.

- Tasmanian *National Parks and Reserves Management Act 2002*

  It is assumed a Level 4 Reserve Activity Assessment will be required for nay proposal that could impact on natural, cultural or physical values of the Waterhouse Conservation Area and Single Tree Plain Conservation Area.

PURPOSE, SCOPE, LIMITATIONS AND QUALIFICATIONS OF THE ASSESSMENT

Purpose

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Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species (under the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant and animal disease management issues;
- weed management issues; and
- a discussion of some of the policy and legislative implications of the identified ecological values.

The present report only reports on sites SP2, WH4, WH5 & WH6. Within the budget and time constraints, these four sites chosen were considered to have the highest likelihood of threatened flora, fauna or vegetation communities being present but this does not assume that sites SP1, WH1, WH2 & WH3 are not likely to also support such values.

This report follows, at least in general terms, the government-produced *Guidelines for Natural Values Surveys – Terrestrial Development Proposals* (DPIPWE 2015) in anticipation that the report (or extracts of it) may be required as part of various approval processes.

At this stage, the report is unlikely to be suitable to meet any referral obligations to the Commonwealth Department of Agriculture, Water and the Environment that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) as the surveys are incomplete.

It is also unlikely that the surveys will be entirely satisfactory to satisfy standard *Environmental Effects Report Guidelines* issued by the Environmental Protection Authority (EPA), although it is likely to be useful to guide development of more project-specific guidelines.

Given the formal reserve status of some of the sites, some level of Reserve Activity Assessment (RAA) planning is likely to be required through the Tasmanian *National Parks and Reserves Management Act 2002*. The RAA process usually requires a much higher level of detail for this type of project than is provided herein, both in relation to natural values and physical and cultural values.

That is, in all respects, this report should be considered preliminary only. It should also be read in conjunction with ECO*tas* (2019) and associated database reports.

Limitations

The natural values assessments were undertaken on 28 Oct. 2020 and 10-12 Nov. 2020. Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason. However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording most species present (particularly those of conservation significance). Late spring and into summer is usually regarded as the most suitable period to undertake most botanical assessments. While some species have more restricted flowering periods, a discussion of the potential for the site to support these was presented in ECO*tas* (2019) and recommendations for further timed-targeted surveys are presented herein.

The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded. However, ECO*tas* (2019) made a consideration of threatened species (vascular and non-vascular) likely to be present (based on habitat information and database records).

Surveys for threatened fauna were largely limited to an examination of "potential habitat" (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the authors and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report. This report and associated documents do not constitute legal advice.

Permit

Any plant material was collected under DPIPWE permit TFL 20167 (in the names of Mark Wapstra & Brian French). Relevant data has been entered into DPIPWE's *Natural Values Atlas* database by the authors. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

No vertebrate or invertebrate material was collected.

STUDY AREA & LAND USE PROPOSAL

Refer to ECO*tas* (2019) for details, Figures 1 & 2 of the present report and appendices in the present report.

In summary, the proposed mining lease area and the Stage 1 extraction areas are as per Table 1.

Table 1. Summary of mining lease nomenclature, area of Stage 1 extraction and status of survey

ML area code	area (ha)	survey completed	date of survey
SP1 – Stage 1	42	No	n/a
SP2 – Stage 1	73	**Yes**	12/11/2020
WH1 – Stage 1	39	No	n/a
WH2 – Stage 1	25	No	n/a
WH3 – Stage 1	56	No	n/a
WH4 – Stage 1	89	**Yes**	11/11/2020
WH5 – Stage 1	128	**Yes**	10/11/2020
WH6 – Stage 1	122	**Yes**	28/10/2020

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated.

Vascular species nomenclature follows de Salas & Baker (2020) for scientific names and Wapstra et al. (2005+) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* report (DPIPWE 2021).

Vegetation classification follows TASVEG 4.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation (*Kitchener & Harris 2013+).

Preliminary investigation

Available sources of previous reports, threatened flora records, vegetation mapping and other potential environmental values were interrogated. These sources include:

- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* records for threatened flora and fauna (GIS coverage maintained by the authors current as at date of report);
- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* report ECOtas_AustrakPtyLtd_BridportArea_NVR for polygons defining the proposed lease areas, each buffered by 5 km, dated 25 Mar. 2021 (DPIPWE 2021) – appended;
- the TASVEG 4.0 vegetation coverages (as available through GIS coverage and via LISTmap);

- GoogleEarth and LISTmap aerial orthoimagery; and
- other sources listed in tables and text as indicated.

Field assessment

The assessments were undertaken by Brian French (ECO*tas*) as per Table 1.

Cadastral and mining lease data uploaded to the iGIS application guided the in-field assessment (as most boundaries of specific proposed tenements were not formally defined on the ground). Meandering transects were used to capture the greater range of aspects, slopes and site conditions.

Vegetation classification

Vegetation was classified by waypointing vegetation transitions for later comparison to aerial imagery. The structure and composition of the vegetation types was described using nominal 30 m radius plots at a representative site within the vegetation types, and compiling "running" species lists between plots and vegetation types. Hand-held GPS was used to waypoint the transition between vegetation types.

Threatened flora

With reference to the threatened flora, the survey included consideration of the most likely habitats for such species. Where threatened flora were located, hand-held GPS was used to waypoint individuals and/or define the extent of the population. Digital images and specimens were taken to confirm identity of some species.

Threatened fauna

Surveys for threatened fauna were largely limited to an examination of "potential habitat" (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs, except as indicated below.

Weed and hygiene issues

The study areas were also assessed with respect to plant species classified as declared weeds under the Tasmanian *Weed Management Act 1999*, Weeds of National Significance (WoNS) or "environmental weeds" (author opinion and as included in *A Guide to Environmental and Agricultural Weeds of Southern Tasmania*, NRM South 2017).

The study areas were also assessed with respect to potential impacts of plant and animal pathogens, by reference to habitat types and field symptoms.

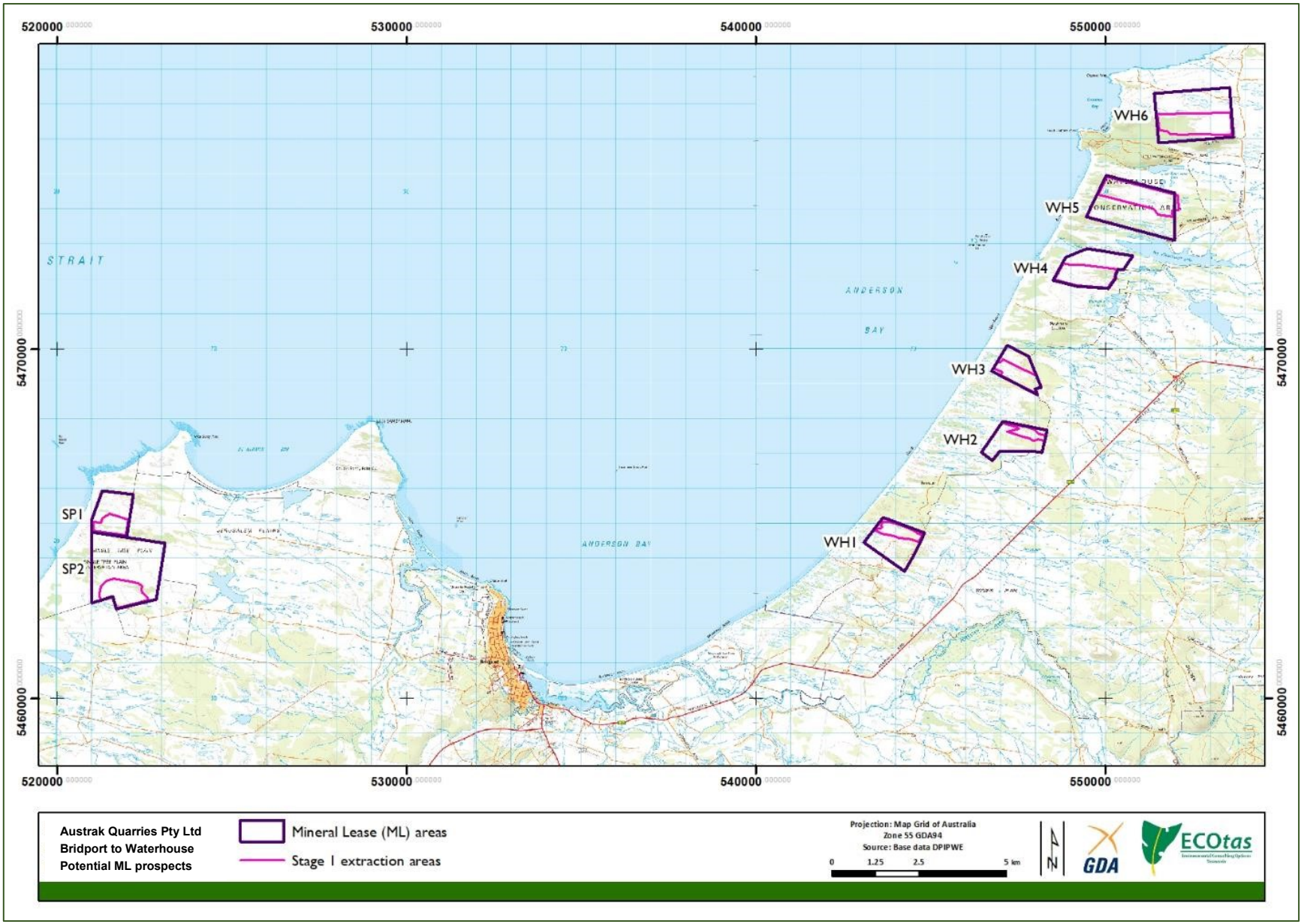

Figure 1. Location of mining lease prospects with Stage 1 extraction areas indicated

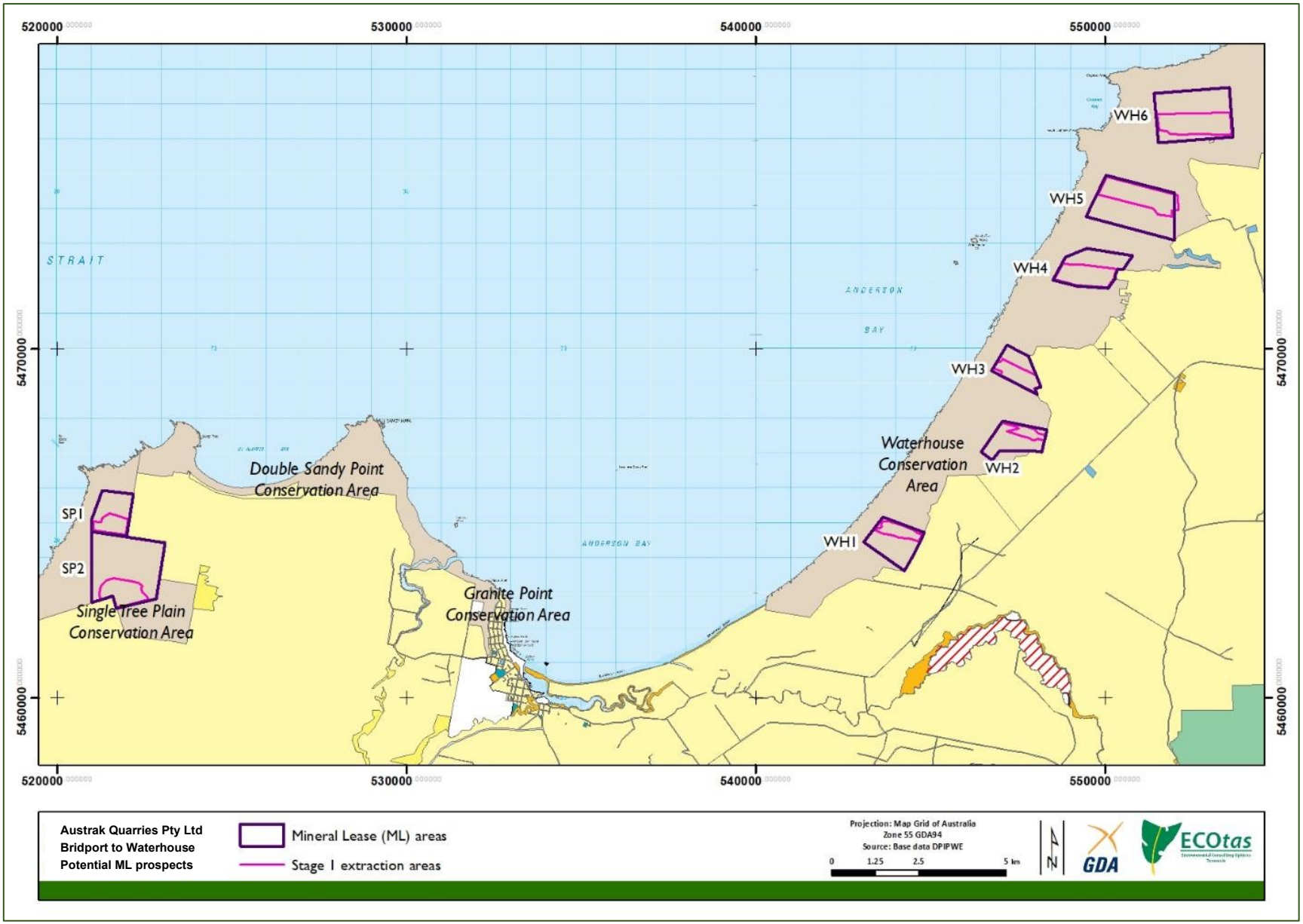

Figure 2. Land tenure of mining lease prospects land tenure [brown = formal crown reserved land; yellow = private land]

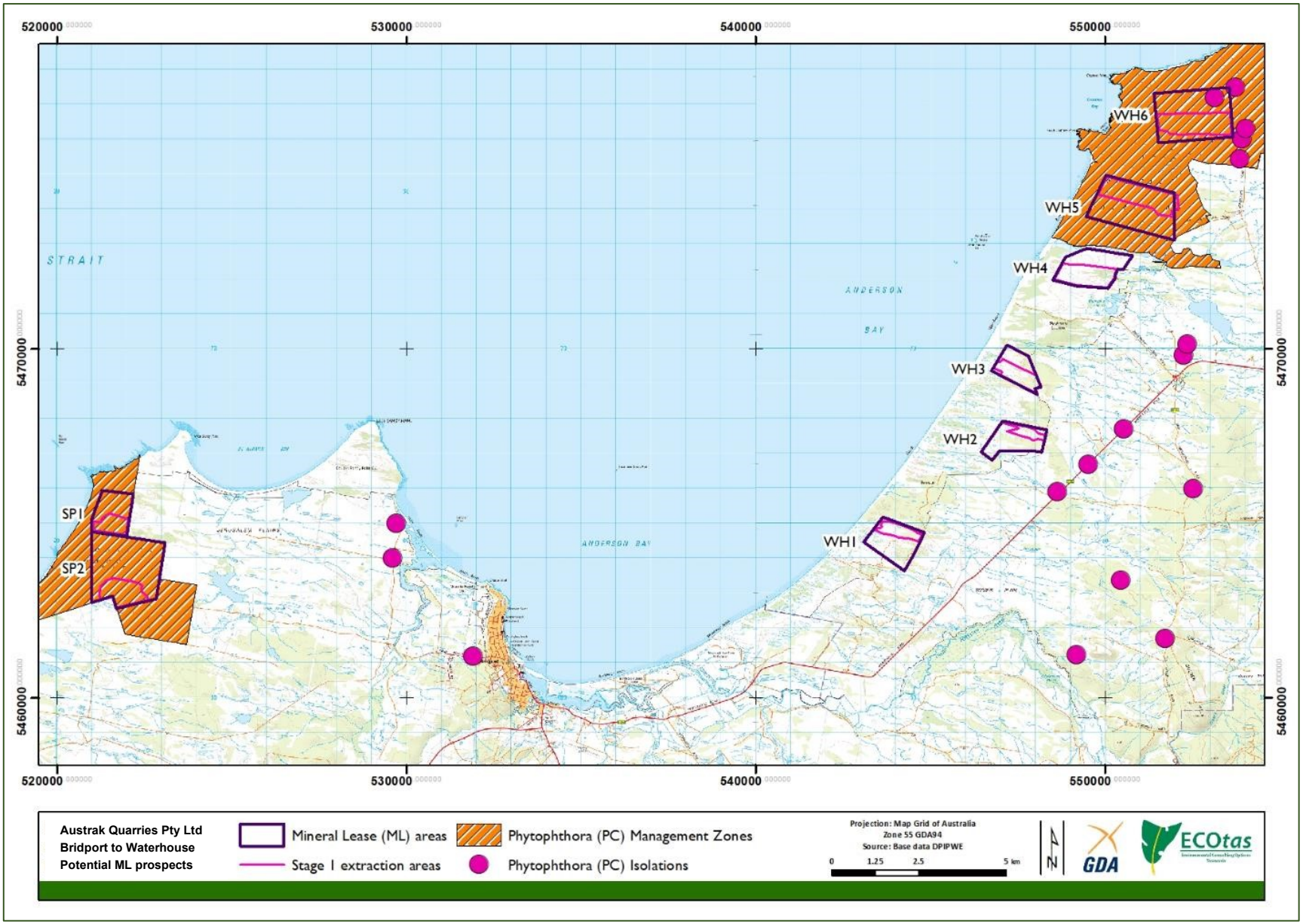

Figure 3. *Phytophthora cinnamomi* Management Zones and PC records associated with potential mining lease prospects

FINDINGS – SITE-BY-SITE ANALYSIS

SP1 (Sandy Point North - Stage 1 Extraction Area) – not field-assessed

Table 2 provides a summary of the known ecological values identified from the potential Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 4) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECO*tas* (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 2. Summary of natural values at SP1

Value	Name	Status	Distribution	Management/comments
Revised TASVEG vegetation type	*Acacia longifolia* coastal scrub (SAL)	not threatened	Probably occurs across much of the site.	No special management required if these vegetation communities present. Machinery hygiene prescriptions.
	coastal scrub (SSC)	not threatened	Stable dunes in the south.	
	Eucalyptus amygdalina coastal forest and woodland (DAC)	not threatened	Small areas on the margins.	Machinery hygiene prescriptions to protect susceptible plant species vegetation.
	sand, mud (OSM)	not threatened	Broad band in middle of site	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
	coastal grass and herbfield (GHC)	not threatened	Pockets along drainage lines between dunes.	Potential drainage issues to consider.
Known threatened flora	None known	-	-	*Xanthorrhoea* aff. *arenaria* is known ca. 1.7 km to the southeast of the prospect. Potential habitat is present within DAC vegetation type if present. Potential habitat is present for a number of other threatened plant species.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat in DAC.	Minimise disturbance to open heathy areas. Specialist survey may be required if DAC will be significantly disturbed.

Value	Name	Status	Distribution	Management/comments
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions are required.
	Limnodynastes peroni (striped marsh frog)	e/-	Potential habitat may be present if wetlands or watercourses are within area.	
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines. The area within Single Tree Plain CA is a PC Management Zone.

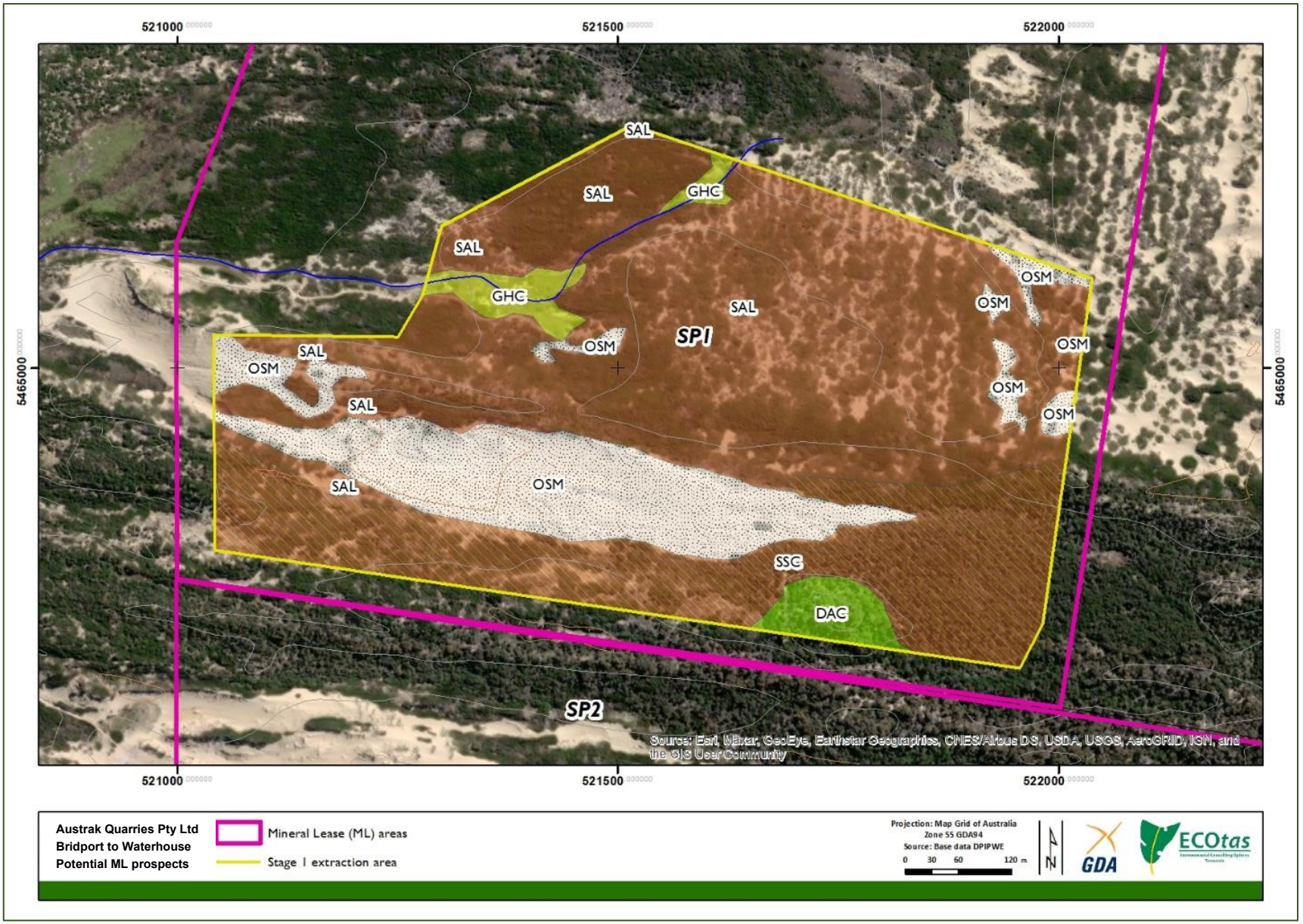

Figure 4. SP1: known ecological values

SP2 (Sandy Point south prospect – stage 1 extraction area) – field-assessed

Table 3 provides a summary of the known database and found ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following maps (Figures 5 & 6) indicating the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations.

Table 3. Summary of natural values at SP2

Value	Name	Status	Distribution	Management/comments
Revised TASVEG vegetation types	*Acacia longifolia* coastal scrub (SAL)	not threatened	Localised patches.	No special management required.
	coastal scrub (SSC)	not threatened	Dominates the vegetation in the area.	Machinery hygiene prescriptions. Some areas of SSC are in the east are long unburnt with numerous fern species present.
	Eucalyptus amygdalina coastal forest and woodland (DAC)	not threatened	Small areas on the margins.	Machinery hygiene prescriptions.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known/potential threatened flora habitat	*Pultenaea sericea* (chaffy bushpea)	v/-	Localised to wet heathland area near the farmland pasture boundary in the vicinity of the proposed access road (Figure 6).	This site can be avoided by moving the access road ca. 20 m to the west.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat in DAC.	Minimise disturbance to open heathy areas. Specialist survey may be required if DAC will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat present in wetlands in the southwest of the area.	

Value	Name	Status	Distribution	Management/comments
	Limnodynastes peroni (striped marsh frog)	e/-	Species was recorded in the southwest and south of the extraction area (Figure 5).	Ensure no disturbance to wetlands or drainage features present. Machinery hygiene prescriptions are required.
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat present in wetlands in the southwest of the area.	
	Sarcophilus harrisii (Tasmanian devil)	e/EN	Fresh scats found in centre of Stage 1 extraction area and in vicinity of proposed access road.	No dens found. Likely that this species utilises the greater area for foraging. Apply prescription if dens found.
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines. The area within Single Tree Plain CA is a PC Management Zone.

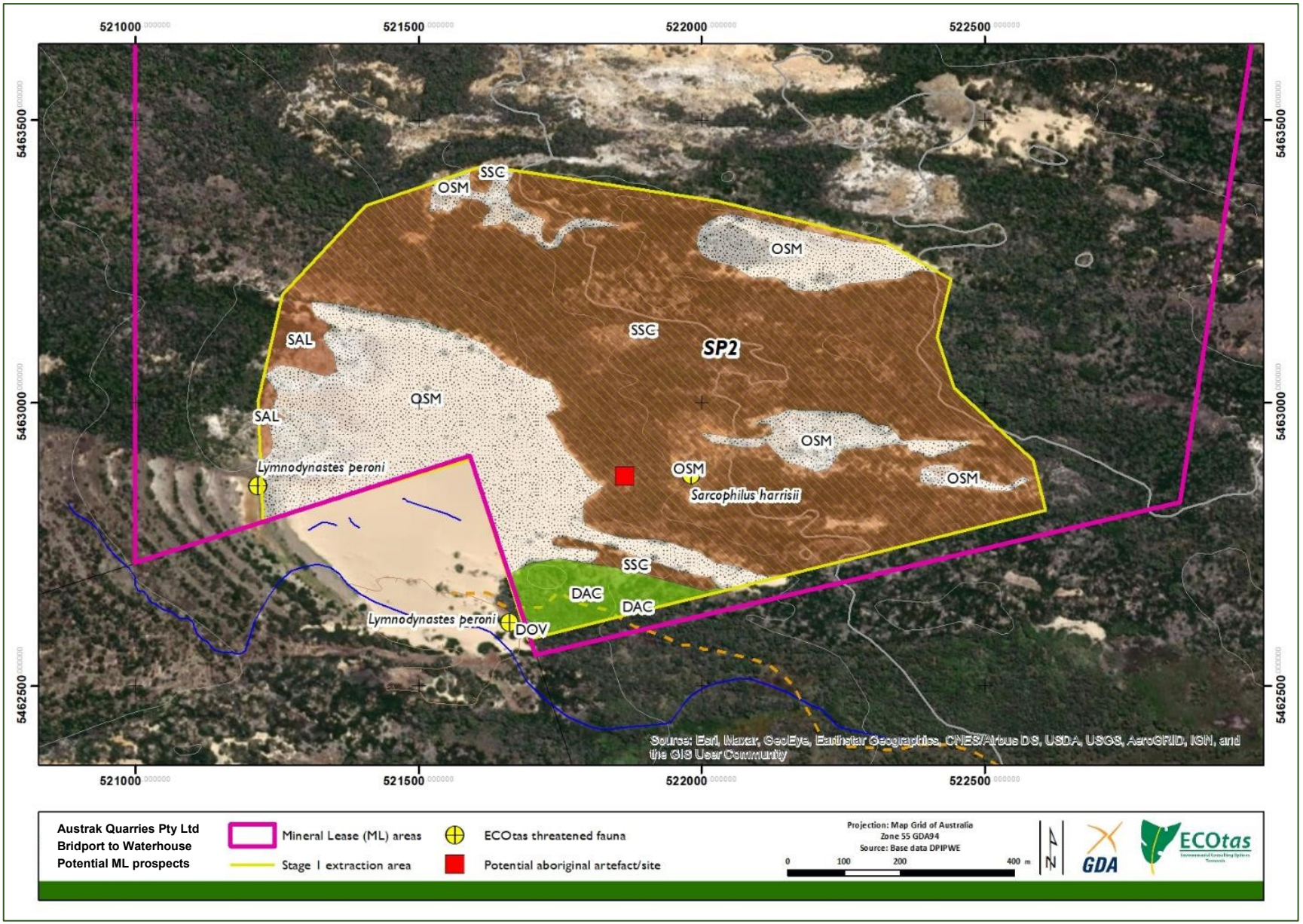

Figure 5. SP2 Stage 1 extraction area: known ecological values

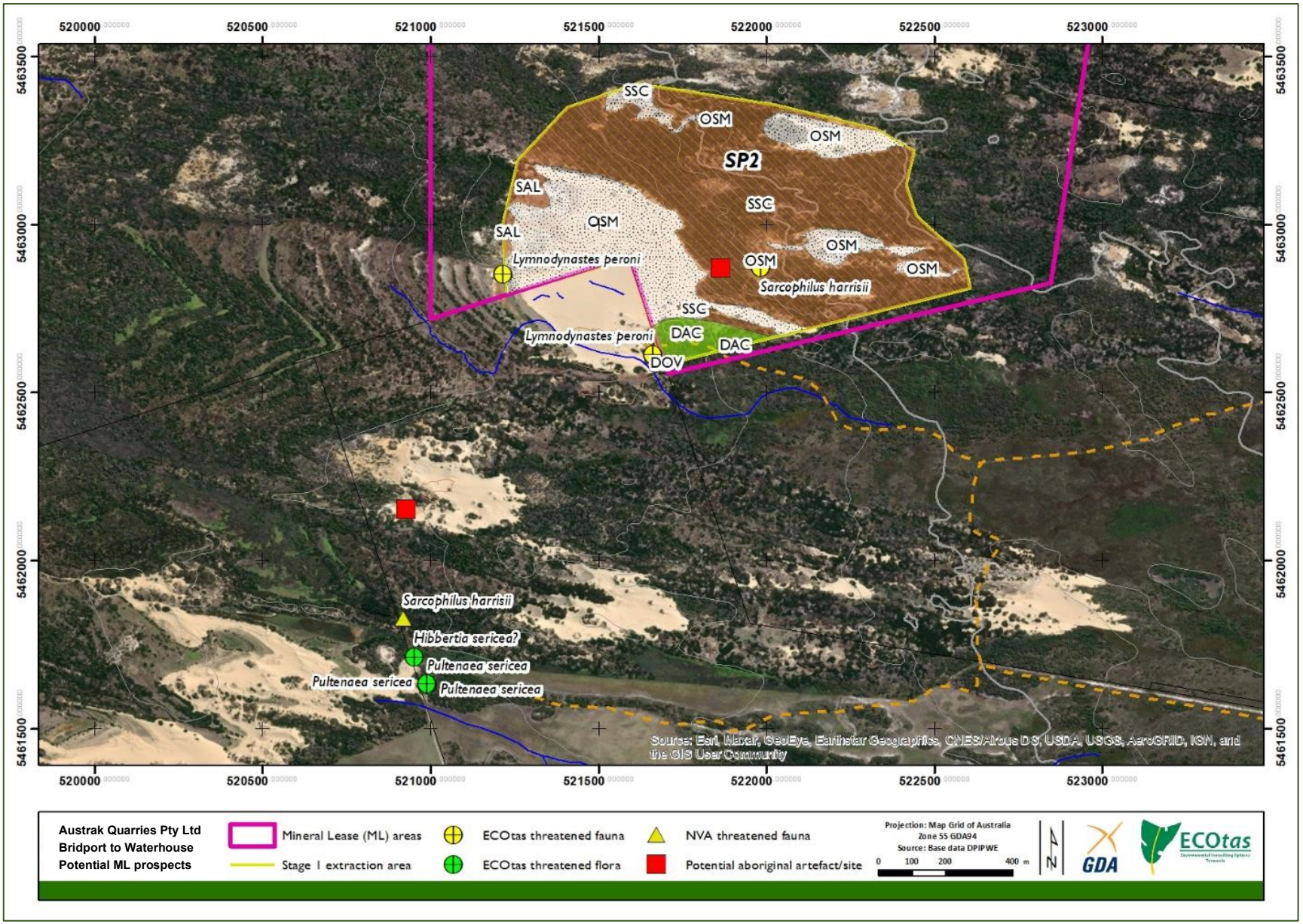

Figure 6. SP2 Stage 1 extraction area (south): known ecological values – access route area

WH1 (Waterhouse - stage 1 extraction area) – not field-assessed

Table 4 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 7) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECO*tas* (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 4. Summary of natural values at WH1

Value	Name	Status	Distribution	Management/comments
Revised TASVEG vegetation types	*Acacia longifolia* coastal scrub (SAL)	not threatened	Localised to fringes of sand.	No special management required.
	Eucalyptus amygdalina coastal forest and woodland (DAC)	not threatened	Small area on the eastern margin.	Machinery hygiene prescriptions.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known threatened flora	None known	-	-	Xanthorrhoea bracteata is known approx. 1 km to the south of the prospect. Potential habitat is present within DAC vegetation type if present. Potential habitat is present for a number of other threatened plant species.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat in DAC.	Minimise disturbance to open heathy areas if present. Specialist survey may be required if any heathy areas will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions will be required.
	Limnodynastes peroni (striped marsh frog)	e/-	Potential habitat may be present if wetlands or watercourses are within area.	

Value	Name	Status	Distribution	Management/comments
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines.

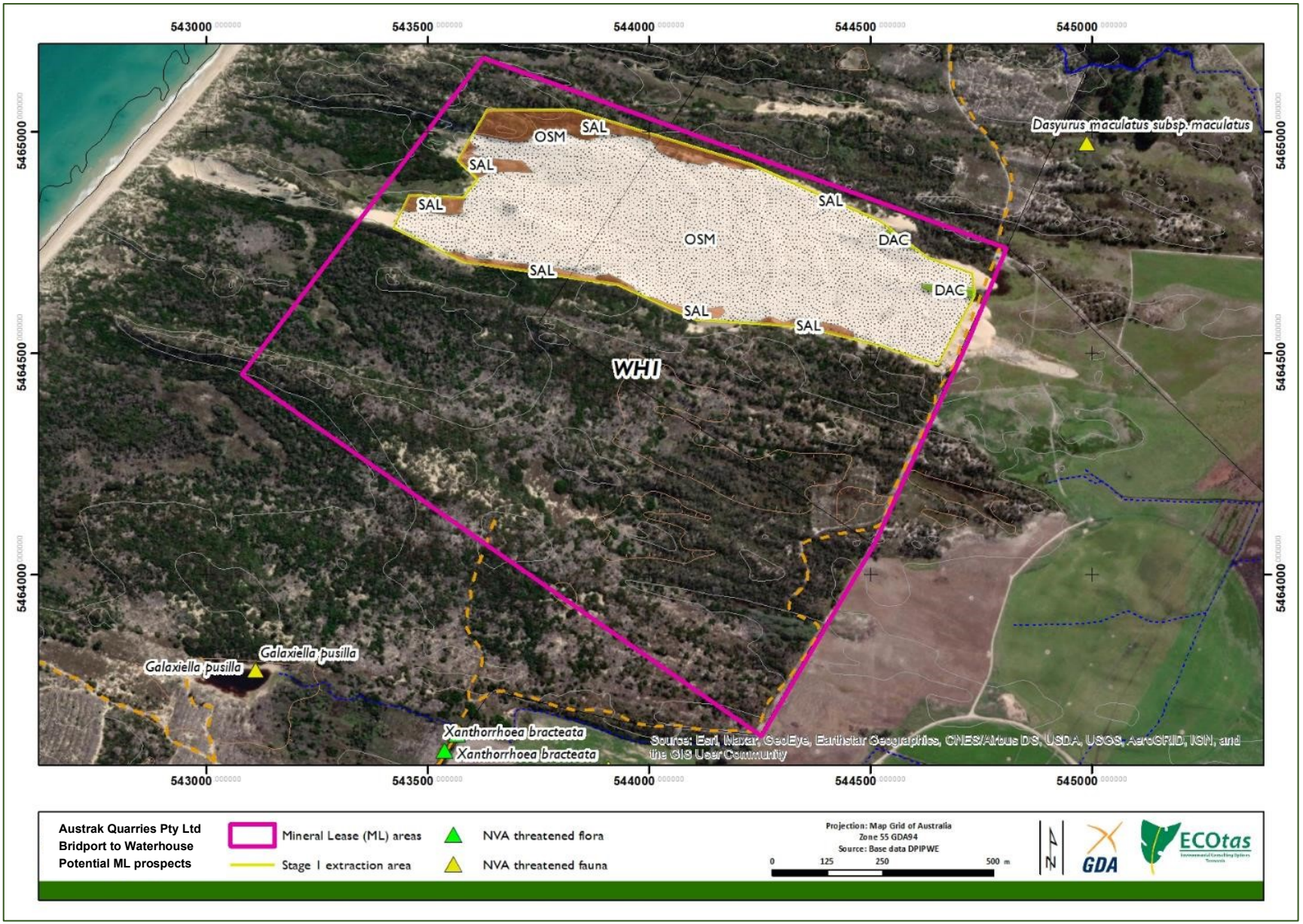

Figure 7. WH1 Stage 1 extraction area: known ecological values

WH2 (Waterhouse - stage 1 extraction area) – not field-assessed

Table 5 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 8) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECOtas (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 5 Summary of natural values at WH2

Value	Name	Status	Distribution	Management/comments
Revised TASVEG vegetation types	water, sea (OAQ)	not threatened	Small area in far west.	Possibly part of a wetland complex.
	coastal scrub (SSC)	not threatened	Dominates the vegetation in the area.	Machinery hygiene prescriptions.
	coastal grass and herbfield (GHC)	not threatened	Occurs in dune swale in the south.	No special management required.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known threatened flora	None known	-	-	Potential habitat is present for a number of threatened plant species.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Marginal potential habitat in SSC.	Minimise disturbance to open heathy areas if present. Specialist survey may be required if any heathy areas will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat present in the wetlands/watercourses on the northern margin of the area.	Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions.
	Limnodynastes peroni (striped marsh frog)	e/-	Potential habitat present in the wetlands/watercourses on the northern margin of the area. Known record on the northern margin (Figure 8).	

Value	Name	Status	Distribution	Management/comments
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat present in the wetlands/watercourses on the northern margin of the area.	
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines.

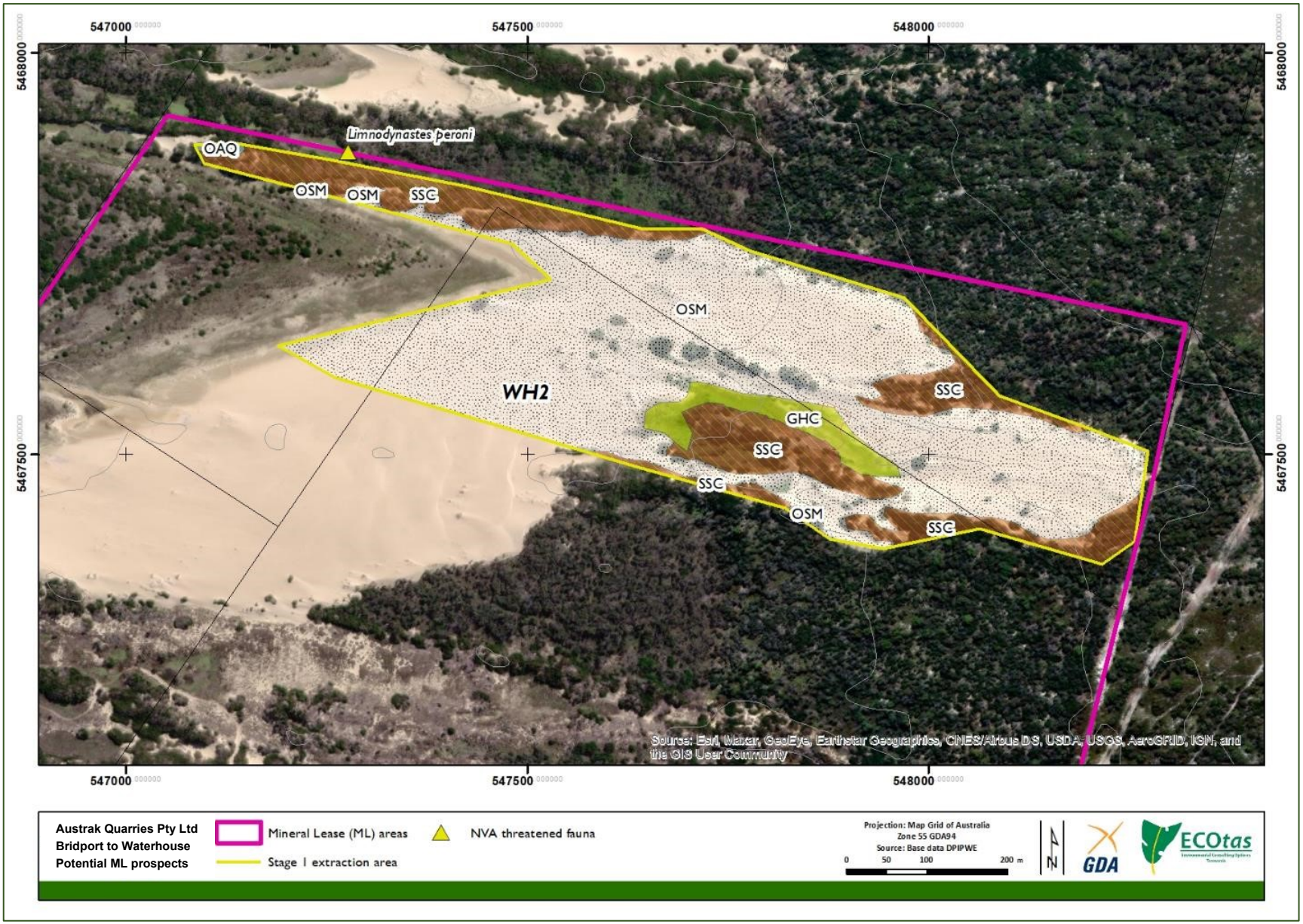

Figure 8. WH2 Stage 1 extraction area: known ecological values

WH3 (Waterhouse - stage 1 extraction area) – not field-assessed

Table 6 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 9) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECOtas (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 6 Summary of natural values at WH3

Value	Name	Status	Distribution	Management/comments
Mapped TASVEG vegetation type	*Acacia longifolia* coastal scrub (SAL)	not threatened	Small patches.	No special management required.
	coastal scrub (SSC)	not threatened	Dominates vegetated areas.	Machinery hygiene prescriptions.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known threatened flora	None known	-	-	Pomaderris paniculosa subsp. paralia and Ranunculus pumilio are known approx. 500 m to the north of the Stage 1 extraction area. Potential habitat is present for a number of threatened plant species.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat present.	Minimise disturbance to open heathy areas if present. Specialist survey may be required if heathy areas will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions will be required.
	Limnodynastes peroni (striped marsh frog)	e/-	Potential habitat may be present if wetlands or watercourses are within area.	

Value	Name	Status	Distribution	Management/comments
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines.

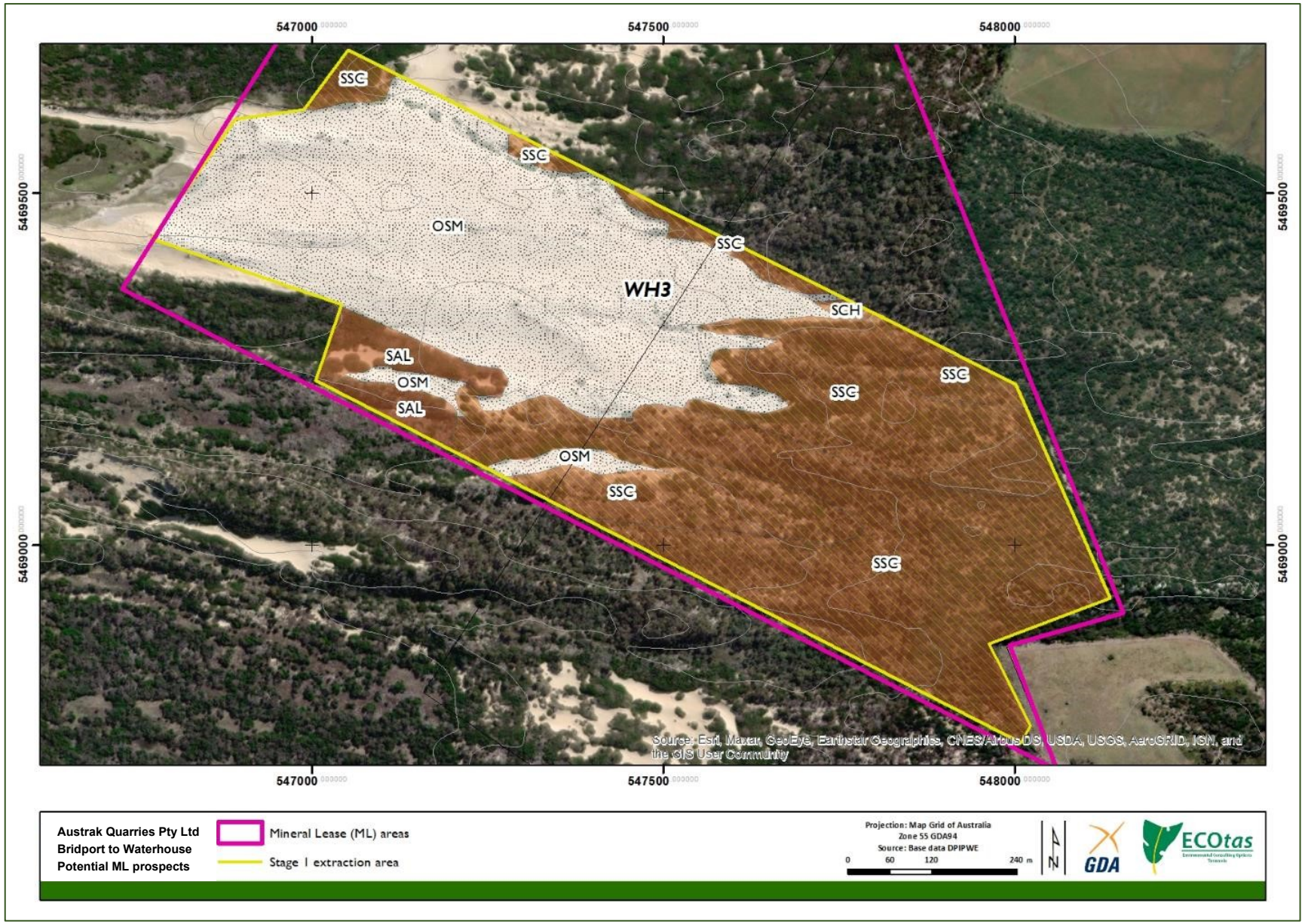

Figure 9. WH3 Stage 1 extraction area :known ecological values

WH4 (Waterhouse - stage 1 extraction area) – field-assessed

Table 7 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 10) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECOtas (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 7 Summary of natural values at WH4

Value	Name	Status	Distribution	Management/comments
Revised TASVEG vegetation types	*Acacia longifolia* coastal scrub (SAL)	not threatened	Common. Generally invading sandy areas dominated by marram grassland or active dune areas.	No special management required.
	coastal scrub (SSC)	not threatened	Occurs on stabilised dunes mainly in the west of the area.	Machinery hygiene prescriptions.
	coastal grass and herbfield (GHC)	not threatened	Mapped in the south of the area.	No special management required.
	marram grassland (FMG)	not threatened	Dominates the east of the area.	No special management required.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known threatened flora	None known	-	-	No threatened flora species were located within the extraction area.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat present.	Minimise disturbance to open heathy areas if present. Specialist survey may be required if heathy areas will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions will be required.

Value	Name	Status	Distribution	Management/comments
	Limnodynastes peroni (striped marsh frog)	e/-	Species was recorded in the northeast of the extraction area (Figure 10).	
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat may be present if wetlands or watercourses are within area.	
	Sarcophilus harrisii (Tasmanian devil)	e/EN	Fresh scats found in centre of Stage 1 extraction area and in vicinity of proposed access road.	No dens found. Likely that this species utilises the greater area for foraging. Apply prescription if dens found.
Known weeds	No weeds known.	-	-	Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines.

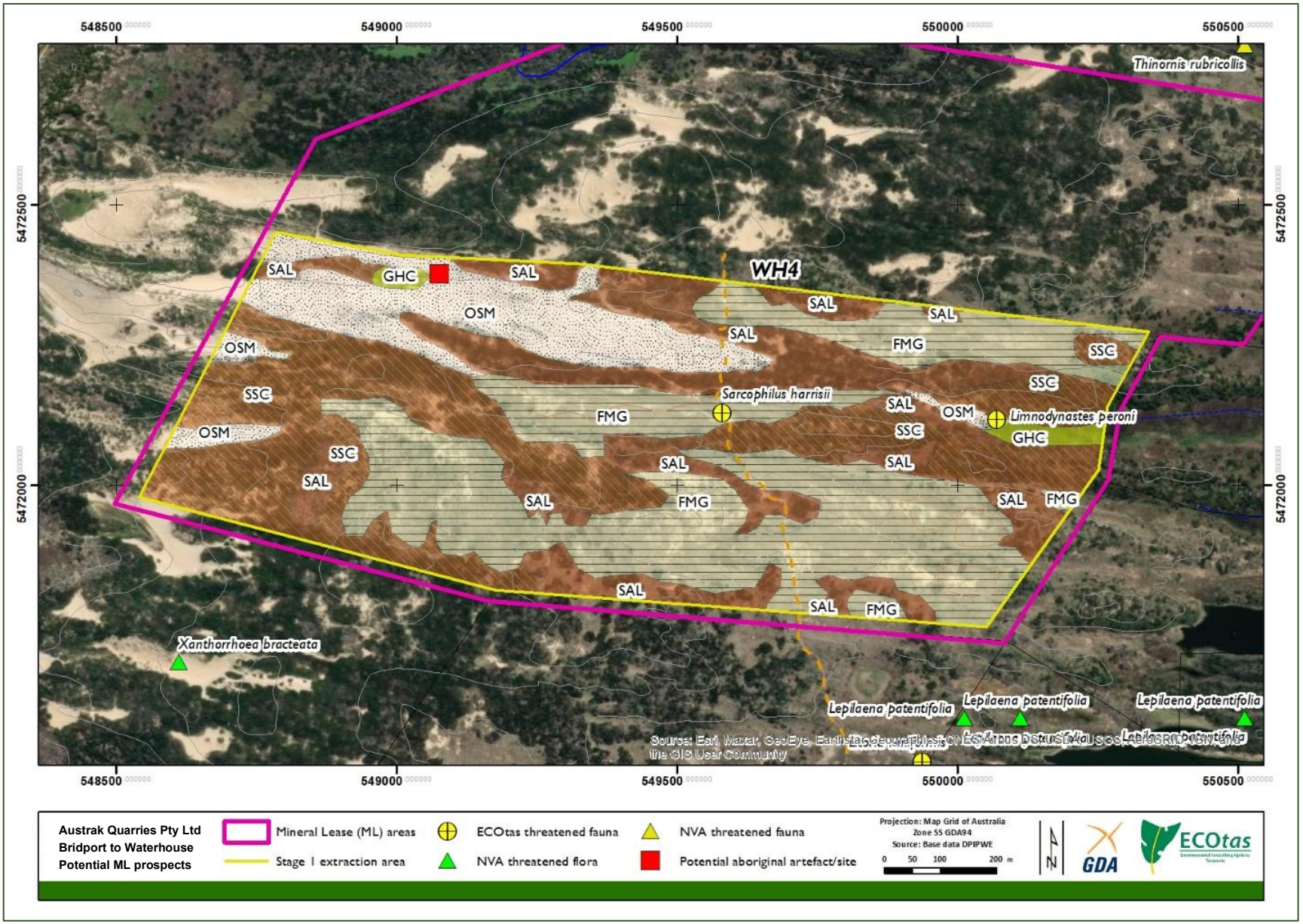

Figure 10. WH4 Stage 1 extraction area: known ecological values

WH5 (Waterhouse - stage 1 extraction area) – field-assessed

Table 8 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following map (Figure 11) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECOtas (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 8 Summary of natural values at WH5

Value	Name	Status	Distribution	Management/comments
Mapped TASVEG vegetation type	*Allocasuarina verticillata* forest (NAV)	not threatened	Localised to stable dune ridges in the northeast of the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
	Acacia longifolia coastal scrub (SAL)	not threatened	Dominates the vegetation in the area.	No special management required.
	coastal scrub (SSC)	not threatened	Small patches mapped across the area.	Machinery hygiene prescriptions.
	coastal grass and herbfield (GHC)	not threatened	Localised to dune swale areas.	No special management required.
	freshwater aquatic sedgeland and rushland (ASF)	threatened	Small areas in the east of the area.	Potential and known habitat for numerous threatened fauna species (see below). Any disturbance to this community will need to be avoided. Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
	marram grassland (FMG)	not threatened	Small area of planted marram in the southeast.	No special management required.

Value	Name	Status	Distribution	Management/comments
Known threatened flora	*Utricularia australis* (yellow bladderwort)	r/-	1 record within the area in swampy site.	Plant(s) not present as site engulfed by sand dune. This species was not located in wet areas elsewhere within the extraction area.
	Gynatrix pulchella (fragrant hempbush)	r/-	1 record in the east of the area.	Inaccurate record of ± 1,000 m with the location given as Big Waterhouse Lake Road. This species was not located within or adjacent to the extraction area. No further management recommended.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat marginally present in SSC in the northwest and the margin of NAV in the east.	Minimise disturbance to open heathy areas if present. Specialist survey may be required if any heathy areas will be significantly disturbed.
	Sternula albifrons subsp. *sinensis* (little tern)	e/-	Pair breeding near ephemeral freshwater wetland in the centre south of the area (Figure 11). The site is within the vast dune area with the pair nesting at a site that is potentially an Aboriginal midden (artefacts and shell fragments present on a very old soil horizon).	This site will need to be assessed for other values present (e.g. geoconservation and cultural heritage). It is recommended that this area be assessed prior to any resource extraction of other activities especially during the breeding season (October to February). If the species is present, any works will need to avoid disturbance breeding sites.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat present in the wetlands and watercourses within the area.	Ensure no disturbance to wetlands or drainage features. Machinery hygiene prescriptions.
	Limnodynastes peroni (striped marsh frog)	e/-	Species was recorded in the southwest and south of the extraction area (Figure 11).	
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat present in the wetlands and watercourses within the area.	
	Botaurus poiciloptilus (australasian bittern)	-/EN	Potential habitat present in the wetlands and watercourses within the area.	
	Sarcophilus harrisii (Tasmanian devil)	e/EN	Fresh scats found in centre of Stage 1 extraction area.	No dens found. Likely that this species utilises the greater area for foraging.

Value	Name	Status	Distribution	Management/comments
Known weeds	No weeds known.	-	-	*Erica lusitanica* (spanish heath) is known from immediately to the east of the area. Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	No symptoms known.	-	-	Apply general plant disease management guidelines. This area within Waterhouse CA is a PC Management Zone.

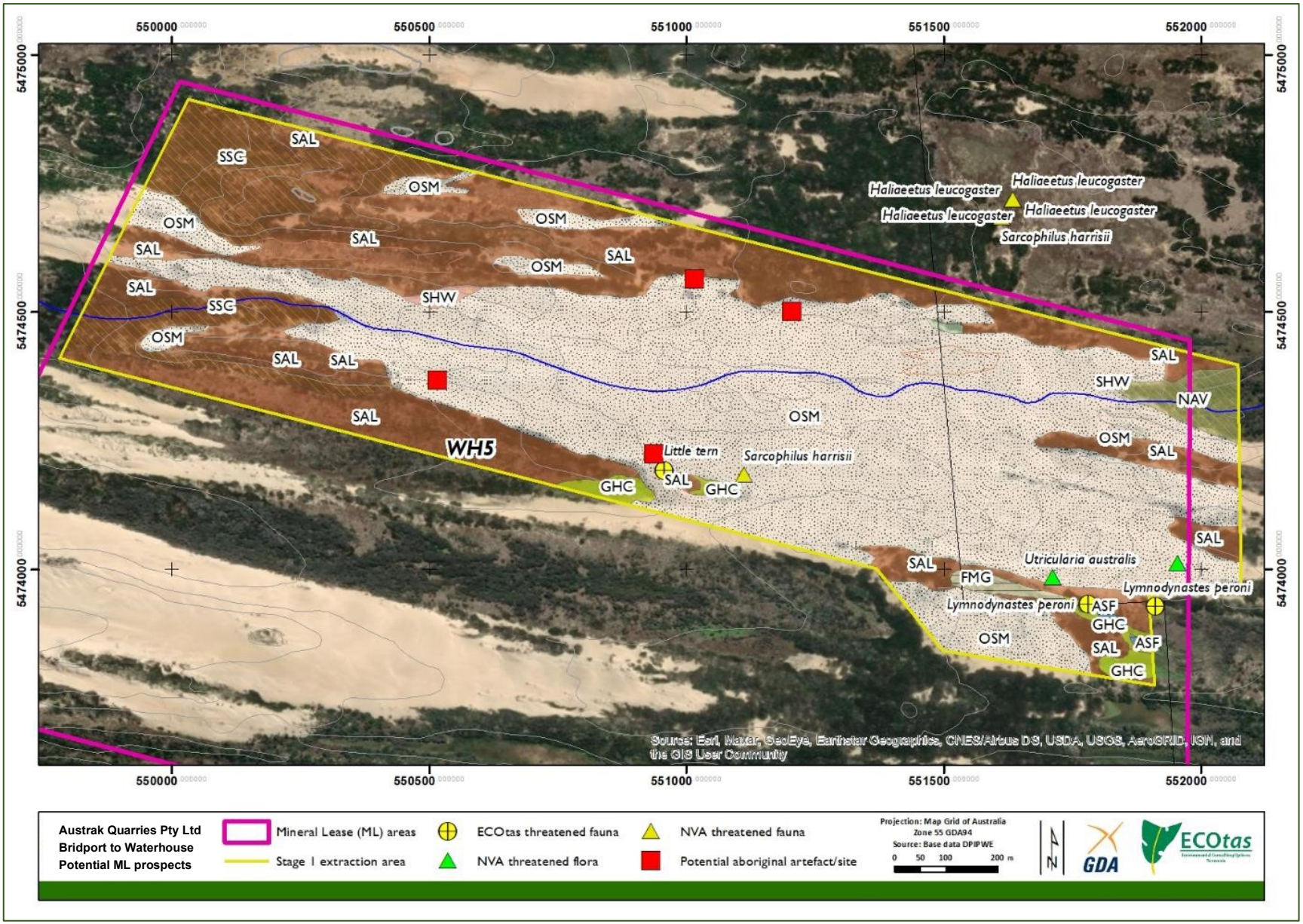

Figure 11. WH5 Stage 1 extraction area: known ecological values

WH6 (Waterhouse - stage 1 extraction area) – field-assessed

Table 9 provides a summary of the known ecological values identified from the Stage 1 extraction area. The table should be read in conjunction with the following maps (Figures 12, 13 & 14) showing the distribution of vegetation types, threatened flora populations, potential habitat of threatened fauna, and weed locations. This information is derived largely from ECOtas (2019). The vegetation mapping for this site has been updated by reference to aerial imagery and field assessment of the adjacent site.

Table 9. Summary of natural values at WH6

Value	Name	Status	Distribution	Management/comments
Mapped TASVEG vegetation type	*Acacia longifolia* coastal scrub (SAL)	not threatened	Dominates recent sands in the north of the area occurring on dunes and in dune swales.	No special management required.
	coastal scrub (SSC)	not threatened	Common on old sands over dolerite in the north and west of the area. At a finer-scale, other scrub communities could occur in the western area.	Machinery hygiene prescriptions. Threatened plant habitat. Threatened fauna habitat.
	wet heathland (SHW)	not threatened	Small patches occur along drainage lines. Most of the 'patches' are small and not practical to map and these areas merge with SSC (above) and SCH (below).	
	coastal heathland (SCH)	not threatened	Dominates the vegetation across the area.	
	Allocasuarina verticillata forest (NAV)	not threatened	Occurs on well-drained and rocky sites on dolerite in the east.	No special management required.
	coastal grass and herbfield (GHC)	not threatened	Localised to dune swale areas.	No special management required.
	freshwater aquatic sedgeland and rushland (ASF)	threatened	Small wetlands scattered across the area.	Potential and known habitat for numerous threatened fauna species (see below). Any disturbance to this community will need to be avoided. Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.

Value	Name	Status	Distribution	Management/comments
	sand, mud (OSM)	not threatened	Dominates the area.	Machinery hygiene prescriptions to protect susceptible surrounding vegetation types from potential introduction of PC and other diseases.
Known threatened flora	*Hydrorchis* (*Microtis*) *orbicularis* (swamp onion-orchid)	r/-	1 record within the area. This species was not located; however, the survey was conducted just prior to the known flowing period. In this regard, non-flowering individuals are difficult to locate due to the fine leaf that 'blends' with other heath vegetation.	Survey did not locate this species. If the area associated with the known site is to be disturbed, a follow-up survey is recommended within the peak flowering period to determine the presence/absence of this species. Ensure no disturbance to wetlands or drainage features if present. Machinery hygiene prescriptions. a permit may be required to 'take' the plants under the Tasmanian *Threatened Species Protection Act 1995* if individuals are located.
	Acacia ulicifolia (juniper wattle)	r/-	2 sites located in SCH in the centre of the extraction area.	This species was located at two separate sites within SCH in the area. Only single plants were recorded. If this species is to be disturbed, a permit will be required to 'take' the plants under the Tasmanian *Threatened Species Protection Act 1995*.
	Prasophyllum apoxychilum (tapered leek-orchid)	v/EN	2 sites located within SCH in the centre of the extraction area.	This species was located at two separate sites within SCH in the area. Only single plants were recorded. A permit will be required to 'take' the plants under the Tasmanian *Threatened Species Protection Act 1995* and a referral to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* may be required IF the proposal affects or disturbs these plants.
	Pomaderris paniculosa subsp. *paralia* (shining dogwood)	r/-	100s of individuals noted over a broad area in the northeast of the area (Figure 13). This species is the dominant shrub within SSC and is potentially the largest population on mainland Tasmania. Further individuals potentially could be recorded within scrub in the west of the extraction area.	Given the abundance of this species, any proposal is highly likely to disturb individuals. A permit will be required to 'take' the plants under the Tasmanian *Threatened Species Protection Act 1995*.

Value	Name	Status	Distribution	Management/comments
	Pultenaea sericea (chaffy bushpea)	v/-	2 sites located in SCH in the centre of the extraction area.	This species was located at two separate sites in wet depressions within coastal heathland. Approximately 30 plants were recorded in this area. A permit will be required to 'take' the plants under the Tasmanian *Threatened Species Protection Act 1995.*
	-	-	-	Given the high diversity of flora in the area, further surveys within the proposed lease area are likely to find further locations of threatened plants. Potential habitat is present for the following species which are known from adjacent to the extraction area: *Calandrinia granulifera, Lasiopetalum baueri, Trithuria submersa, Phyllangium distylis, Utricularia australis, Schoenoplectus tabernaemontani, Hibbertia virgata, Prasophyllum secutum, Brachyscome perpusilla, Schoenus brevifolius, Microtidium atratum, Cyrtostylis robusta, Prasophyllum secutum, Triglochin minutissima, Bolboschoenus caldwellii* and *Gynatrix pulchella*. Potential habitat is present for a number of other threatened plant species.
Known/potential threatened fauna habitat	*Pseudomys novaehollandiae* (New Holland mouse)	e/VU	Potential habitat in SCH (Figure 14).	Minimise disturbance to open heathy areas if present. Specialist survey may be required if any heathy areas will be significantly disturbed.
	Litoria raniformis (green and golden frog)	v/VU	Potential habitat present in the wetlands and watercourses within the area. The day of the survey was overcast and cool, which is not ideal for this species to call. The survey was conducted within the known breeding season.	Ensure no disturbance to wetlands or drainage features present. Machinery hygiene prescriptions.
	Limnodynastes peroni (striped marsh frog)	e/-	Potential habitat present in the wetlands and watercourses within the area. There are numerous known records within the greater area. The	

Value	Name	Status	Distribution	Management/comments
			day of the survey was overcast and cool, which is not ideal for this species to call. The survey was conducted within the known breeding season.	
	Galaxiella pusilla (eastern dwarf galaxiid)	v/VU	Potential habitat present in the wetlands and watercourses within the area (Figure 14).	
	Aquila audax subsp. *fleayi* (wedge-tailed eagle)	e/EN	Known nest (RND #2490) occurs on the southern slope of Hardwicks Hill ca. 240 m south of the prospect area.	The presence and activity of the nest will need to be confirmed prior to any operation commencing. The nest is ca. 240 m from the southern boundary of the Stage 1 extraction area. If present, appropriate management prescriptions will need to be applied.
	Sarcophilus harrisii (Tasmanian devil)	e/EN	Fresh scats found on access road to the Hardwicks Hill tower site.	No dens found. Likely that this species utilises the greater area for foraging.
Known weeds	No weeds known.	-	-	*Erica lusitanica* (spanish heath) is known from immediately to the east of the area along Homestead Road. Monitor for any invasive weed species to maintain weed-free status. Apply general weed management guidelines if any weed species found.
Disease	*Phytophthora cinnamomi* (root rot fungus).	-	The pathogen has been confirmed in the north of the study area on the access road to Croppies Point. Furthermore, three further isolations have been confirmed immediately to the east of the area along Homestead Road. The area mapped as SCH in Figure 12 has a remarkably high proportion of dead or dying *Xanthorrhoea australis* present indicating the presence of the pathogen.	The vegetation types SCH and SSC are highly susceptible to the pathogen. Given the potential abundance of the pathogen, soil sampling will need to occur to determine presence/absence. The results from sampling will need to be considered carefully and specific management prescriptions applied given the extremely high risk of transporting the pathogen via vehicles and/or introducing the pathogen to other non-infected areas surrounding the lease. General plant disease management guidelines need to be applied. Consultation with Tasmania Parks and Wildlife Service will need to occur in the Reserve Activity Assessment (RAA) process to ensure that management

Value	Name	Status	Distribution	Management/comments
				prescriptions are agreed upon. Follow-up monitoring may need to occur. This area within Waterhouse CA is a PC Management Zone.

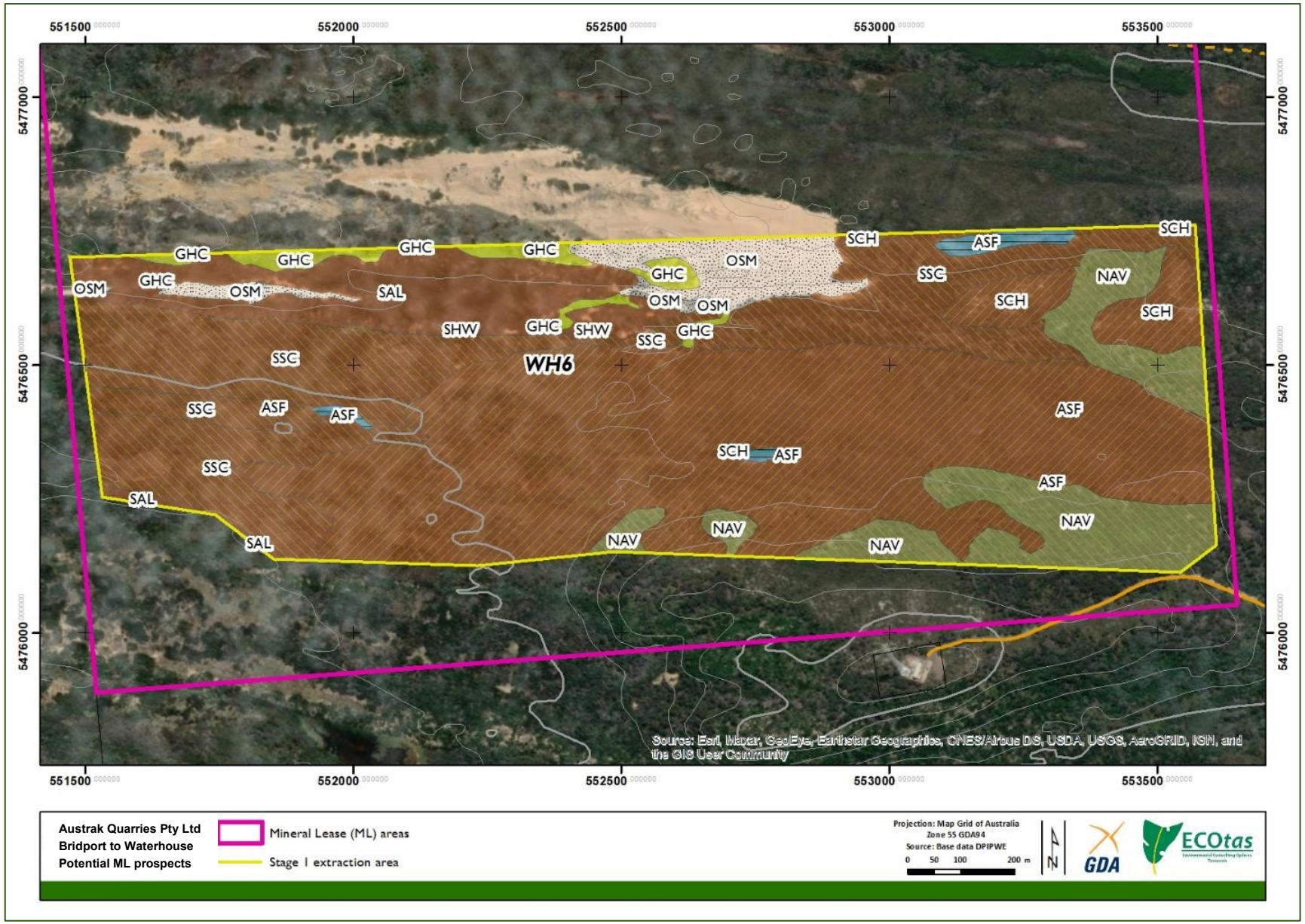

Figure 12. WH6 Stage 1 extraction area: revised vegetation mapping

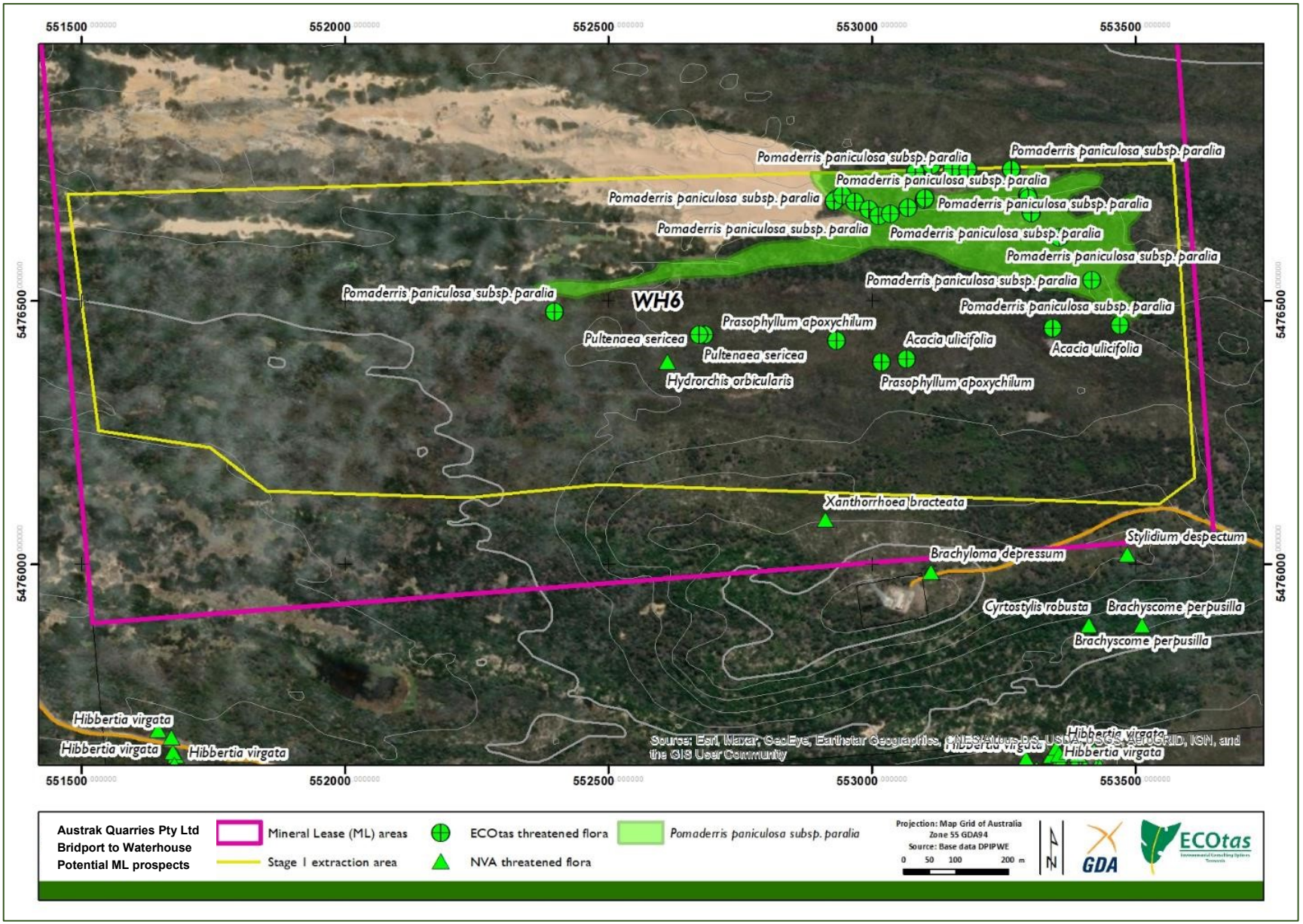

Figure 13. WH6 Stage 1 extraction area: known threatened flora records and extent of *Pomaderris paniculosa* subsp. *paralia*

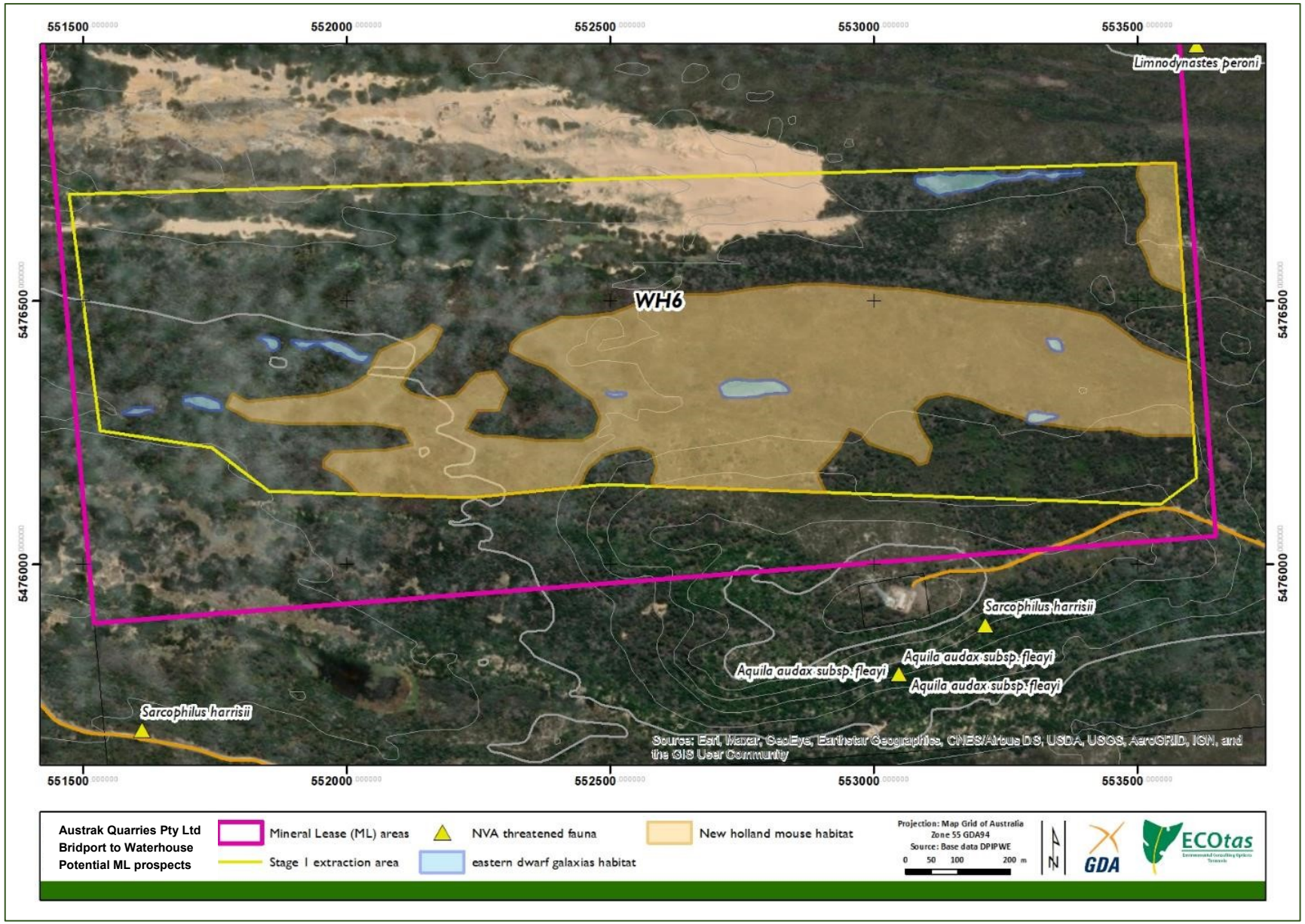

Figure 14. WH6 Stage 1 extraction area: known threatened fauna records and potential fauna habitat distribution

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