

**Annual Weed Survey of the Amrun Project Area
July 2018**



Revised Final Report


Prepared for Rio Tinto Aluminium, Brisbane.

8th November 2018

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Cover Photo: Thick patch of stinking Roger (*Mesosphaerum suaveolens*) on the original seismic line access track into the construction area, which has successfully been treated and controlled by the LSMP team.

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1. Introduction

1.1 Background and Scope

Ecotone Flora Fauna Consultants have previously undertaken baseline and annual weed surveys of the Amrun Project Area as required to meet project approvals and site monitoring requirements. These surveys have included:

- a July 2013 Baseline Weed Survey, encompassing all accessible areas of the lease and adjoining area, and including areas surveyed for vegetation classification as part of the EIS for the project;
- a July 2015 Annual Weed Survey, which re-surveyed these access routes, with some additional, more detailed inspections to sites which could not be easily accessed in previous visits;
- a June 2016 Periodic Weed Survey, which covered the annual weed survey of construction areas and access roads plus the three yearly Periodic survey focussing on areas used for recreation and by Traditional Owners, and other areas where key weed species are most likely to become established, for instance rubber vine along mangrove edges near recreational areas; and
- a June 2017 Annual Weed Survey, which re-surveyed access routes and accessible areas around newly cleared sites for construction activities. Some additional, more detailed inspections of sites which could not be easily accessed in previous visits were also made in this survey period where access permitted.

The implementation of these weed surveys is outlined in the Land Use Management Plan and Terrestrial Management Plan for the Amrun Project. The objective of these surveys has been to determine whether there have been any major changes in the status of exotic weed species within the Amrun Project area since the previous weed surveys and following targeted treatment of identified weeds conducted in succession between late 2015 and early 2018. As a result, these previous surveys have effectively documented the baseline level of incidence of exotic weeds within the Amrun Project area, associated with limited levels of clearing and site development works by plant and other machinery during the assessment and exploration phases of the project, and along certain tracks cleared and/or re-cleared to support these activities.

As with the June 2017 weed surveys, this year's survey comprises an Annual Weed Survey only, and repeats the weed survey method conducted previously where inspections were undertaken from a slow-moving vehicle along the main tracks and roads, supported by foot-based inspections at key locations including recent clearings and construction areas, where these sites are safely accessible. The objective of the current (July 2018) Annual Weed Survey is to document levels of weed infestation following and during the initial construction stages of the project.

The scope of the current reporting is focused on determining the extent to which any exotic weed species have been unintentionally introduced to the Amrun Project area, and focuses on weed infestations along existing and new tracks, and other cleared and disturbed areas. Any other exotic plant species which may or have been used intentionally for landscaping (turf *etc*) and other forms of soil stabilisation around site facilities falls outside the scope of the current report.



2. Survey Approach

The survey utilised the rapid survey method approach of the previous surveys whereby inspections were undertaken from a slow-moving vehicle along the tracks and roads to be inspected, with supporting foot-based inspections at key locations.

The survey recorded all exotic plant species present, including all scheduled weeds and WoNS (Weeds of National Significance) under Queensland and Commonwealth legislation and provisions. Areas included in the Annual Weed Survey are shown in **Figure 2-1** and comprised:

- Main access road and construction camp;
- Accessible parts of the MIA (Mine Infrastructure Area);
- Tracks developed for construction of the Arraw Dam and associated infrastructure, including
 - 70,000 line;
 - Seismic line;
 - ICT corridor between MIA and Arraw Dam;
 - Fishway access tracks on south and north side of dam wall;
 - North-south access to watering points, dam bores and dam area;
- Boyd Point fly camp and Boyd Bay Point access tracks;
- Recent localised access tracks around facilities, including MIA, construction camp and communications towers;
- additional access tracks managed as part of the project (as indicated in the *Amrun Managed Tracks* GIS coverage), including the
 - original North-South tracks between seismic line and South Gate;
 - South Gate to Beagle Camp Track;
 - Main managed track between Beagle Camp and southern entrance to Arraw Dam;
 - original tracks from seismic line to Winda Winda Ck;
 - accessible north and south extremities of original Winda Winda Creek to Hey Point track;
 - disused north and south heavy vehicle tracks between Winda Winda Creek and Hey Point;

The scope for the Annual Weed Survey has changed considerably since previous weed surveys associated with the expansion and development of the construction footprint. Additional tracks have been made, and others widened or redeveloped for mine infrastructure. Several areas were not safely accessible due to heavy machinery activity, or were otherwise inaccessible as a result of tree falls and dense vegetation regrowth, and were subsequently not accessed during the July 2018 site inspections. Notably these areas included

- Pera swamp and associated historical tracks west and south of MIA port facilities;
- All access tracks south of the MIA/tailings dam construction area and ICT corridor;
- The central portion of the original Winda Winda Creek to Hey Point track;
- All southern access tracks to Norman Creek/Arraw Dam, apart from the main managed track from Beagle Camp.

The weed survey involved slow vehicle traverses (approximately 20-40km/h depending on conditions) along the tracks observing the vegetation at the side of the tracks and up to 10m in to the woodland. This approach was based on the premise that weed translocation into the area was most likely to occur via vehicles and that weeds, if present, would initially colonise areas where vehicles had been operating especially tracks, laydown areas and parking areas. At discrete locations where there had been intensive vehicle visitation (such as the Boyd Bay fly camp, new construction camp, and Hey River Terminal site), or where there has been a documented history of previous weed infestation (eg. Beagle Camp), these areas were inspected closely on foot. The position of any located weeds was recorded using GPS, and a description of the general weed occurrence was also



recorded (including species present, numbers, spatial distribution, growth stage, and any other relevant comments).

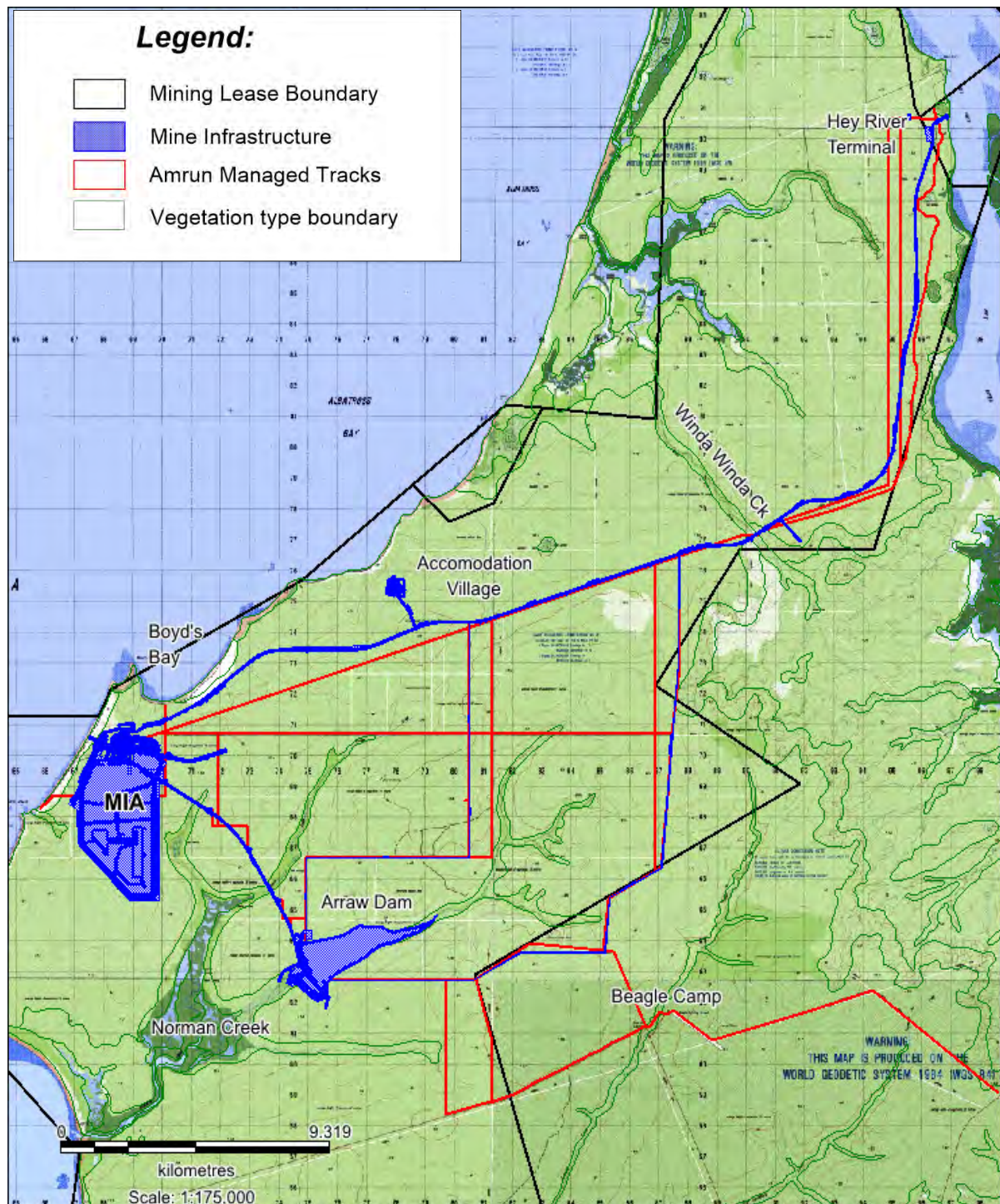


Figure 2.1 Locality Map

The initial identification of exotic weed species was undertaken by Senior Ecologist Jason Searle in the field. Any plants suspected to be potential new weed species were collected and submitted to the Queensland Herbarium for positive identification. This approach allows for any new weeds to the Amrun Project area to be positively identified, and for any unusual looking or otherwise unrecorded plants not regularly encountered in prior surveys of the site to be identified and eliminated from contention as new weed species.



It is acknowledged that a limitation of this approach is that it does not fully document the distribution and extent of weeds across paddocks, creeklines and other areas separated from tracks, and potentially under-represents the prior distribution of weeds across adjoining properties, particularly where weeds have been spread in these areas by grazing or other historical land uses. However, the intent of this survey is primarily to establish a baseline for weed occurrence in areas where there is the potential for weeds to be brought in on machinery or other vehicle access in the future.

Some land surrounding the tracks surveyed had recently been burnt, or otherwise had limited ground cover growth (as a result of grazing or seasonally dry conditions). It is expected that the recorded level of weed incidence across some portions of the property with a poorly represented understorey at the time of this survey would be greater if the survey were undertaken in more favourable conditions for understorey development (*i.e.* after wet season rains *etc.*).

3. Results and Discussion

3.1 Weed Species Identification

A list of all known exotic weed species recorded at the Amrun site during recent field surveys (July 2013 onwards) is shown in **Table 3-1**.

This list formed the baseline “search” list for the current weed surveys with any additional suspected weed species also collected and sent to the Queensland Herbarium for positive identification. An additional 7 species of exotic plants have been recorded at the site in the past 12 months, and these are indicated by underlining in **Table 3-1**. The identification results and accompanying images of weed species are included in **Appendix B** and **Appendix C** respectively.

Table 3-1. Summary of Known Exotic Plant Species for the Amrun Area (up to July 2018).

Scientific Name	Common Name	Herbarium Identification
<u><i>Aeschynomene americana</i></u>	American joint-vetch	<u>Unconfirmed</u>
<i>Andropogon gayanus</i>	Gamba grass	Matched with specimens from confirmed infestation at Andoom mine
<i>Cenchrus pedicellatus</i> subsp <i>unispiculus</i>	mission grass	Confirmed BRI - 571/16, 29 Jul 2016
<i>Cenchrus echinatus</i>	spiny sandbur	Confirmed BRI - 393/17, 13 Jun 2017
<i>Chloris gayana</i>	Rhodes grass	Matched with confirmed specimens from Weipa mine
<i>Crotalaria goreensis</i>	rattlepod	Retained BRI - 623/10, 9 Aug 2010
<i>Dactyloctenium aegyptium</i>	button grass	Unconfirmed
<i>Echinochloa esculenta</i>	Japanese millet	No specimens collected to date, but seen and seed mix used
<u><i>Erechtites valerianifolius</i></u>	<u>Brazilian fireweed</u>	<u>Unconfirmed</u>
<i>Ipomoea quamoclit</i>	Star of Bethlehem	Retained BRI - 393/17, 13 Jun 2017
<u><i>Macroptilium atropurpureum</i></u>	<u>Siratro</u>	<u>Unconfirmed</u>
<i>Mesosphaerum suaveolens</i>	stinking Roger	Matched with specimens from confirmed infestation at Weipa mine
<i>Mitracarpus hirtus</i>	tropical girdlepod	Confirmed BRI - 348/16, 10 May 2016
<i>Paspalum mandiocanum</i>	broad-leaved paspalum	Unconfirmed



<i>Passiflora foetida</i>	stinking passionflower	Matched with specimens from confirmed infestation at Andoom mine
<i>Sida acuta</i>	smooth sida	Retained BRI - 623/10, 9 Aug 2010
<i>Sida cordifolia</i>	flannel weed	Retained BRI - 393/17, 13 Jun 2017
<i>Solanum nigrum</i>	black nightshade	<u>Unconfirmed</u>
<i>Stachytarpheta jamaicensis</i>	Jamaican snakeweed	<u>Matched with specimens from confirmed infestation at Weipa mine</u>
<i>Sporobolus jacquemontii</i>	American rat's tail grass	<u>Confirmed BRI - 784/18, 23 Oct 2018</u>
<i>Stylosanthes guianensis</i>	hairy stylo	<u>Matched with specimens from confirmed infestation at Weipa mine</u>
<i>Stylosanthes scabra</i>	common stylo	Matched with specimens from confirmed infestation at Weipa mine
<i>Themeda quadrivalvis</i>	grader grass	Confirmed BRI - 720/15, 27 Aug 2015
<i>Tridax procumbens</i>	coat buttons	Matched with specimens from confirmed infestation at Weipa mine
<i>Triumfetta pentandra</i>	burbark	Retained BRI - 393/17, 13 Jun 2017
<i>Urena lobata</i>	pink-flowered Chinese burr	Matched with confirmed specimens from within regeneration at Weipa mine
<i>Urochloa decumbens</i>	signal grass	Matched with confirmed specimens from within regeneration at Weipa mine

Of the newly identified exotic species present at the site, all were recorded as isolated specimens, and are considered present but not currently 'established' at the site. These species can potentially be eliminated from the site if controlled urgently. Alternatively, two exotic species (signal grass *Urochloa decumbens* and Japanese millet *Echinochloa esculenta*) have been used intentionally in defined areas for soil stabilisation purposes and are not reported on further here.

3.2 Overall Weed Species Distribution and Abundance

The patterns of weed distribution and abundance over the Amrun Project area, as recorded in June 2017 and July 2018, are shown in **Figure 3-1** and **Figure 3-2** for each of these survey events respectively. Each record taken during the current (July 2018) survey, including location and associated details, is listed in **Appendix D**, whilst the distribution and abundance of each individual weed species recorded during the current (July 2018) survey are also depicted in maps in **Appendix E**.

The overall incidence of weeds across the Amrun Project area is similar between the June 2017 and July 2018 surveys, which in both cases is lower than the recorded level of incidence in previous surveys dating back to July 2013, and confirms the benefit of the existing weed control program.

Further comparison between June 2017 and July 2018 (see **Figures 3-1 & 3-2**) indicate the following three major trends in weed distribution and abundance across the Amrun Project area:

1. the more common established weeds exhibit a similar spatial distribution across the area between 2017 and 2018, indicating that these established weeds are persistent, and also that the control measures currently in place are at least partially effective in reducing the further spread and introduction of weeds across the Amrun Project area;
2. three of the main sites of heavy infestation (*i.e.* Boyds Bay flycamp and access track; Hey River Terminal; Beagle Camp) are greatly reduced in incidence and diversity of weeds, showing the benefit of targeted and sustained weed control activities at these sites; and
3. the major increase in exotic plant species in the Amrun project area between 2017 and 2018 is the ongoing intentional establishment of signal grass on the batters of all major borrow pits/detention basins along the main access road from HRT (Hey River Terminal) to MIA.

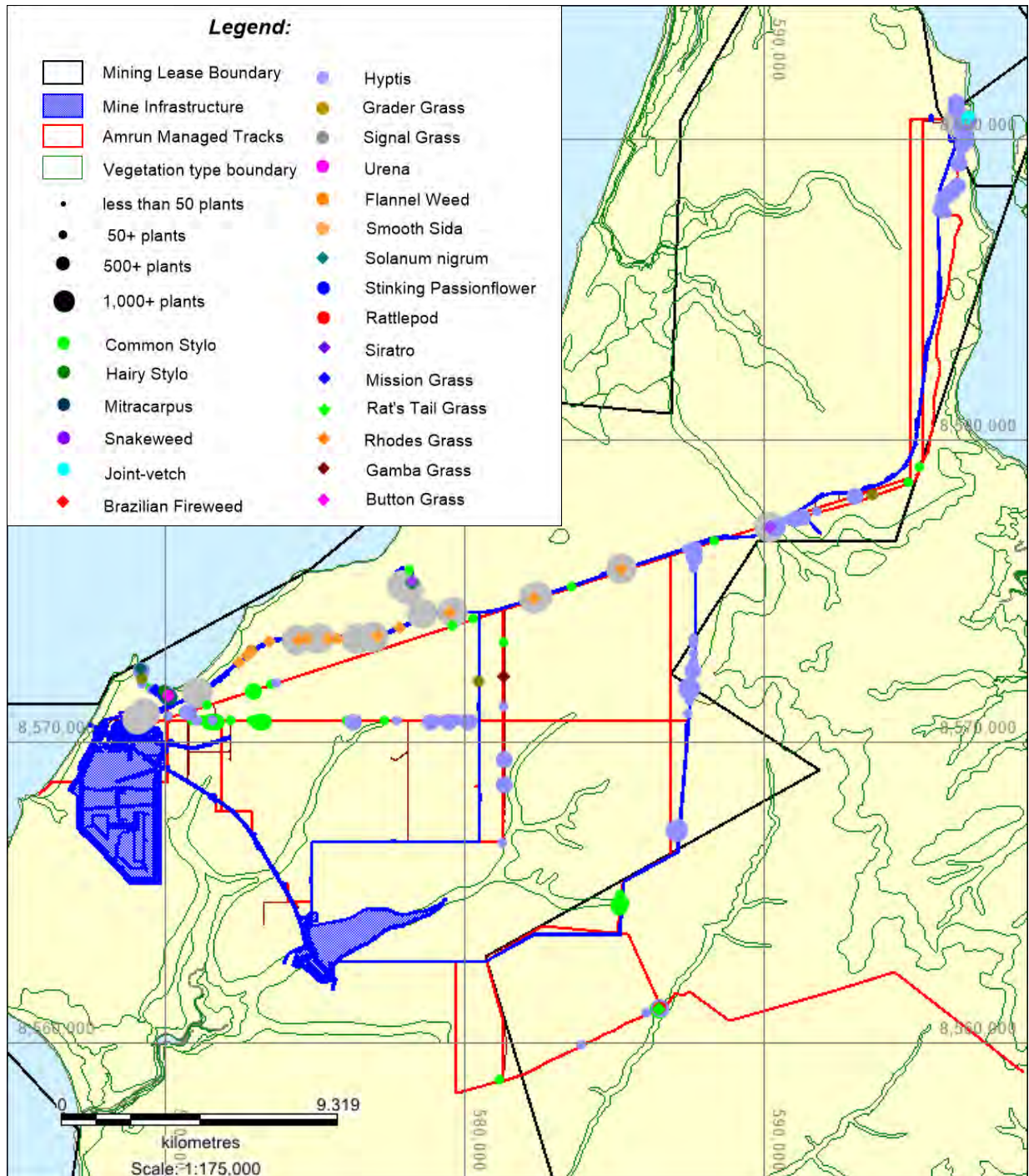


Figure 3.1 Location of Weeds recorded within the investigation area (July 2018)

In terms of common established weeds, common stylo (*Stylosanthes scabra*) and stinking Roger (*Mesosphaerum suaveolens*) are the most common and persistent weed species on established tracks and other cleared areas of the site, especially in areas used regularly prior to the opening of the bitumen access road. Both of these species are herbaceous perennial weeds, and continue to persist in areas where they have previously established.

Much of the stinking Roger weed recorded during the current survey period appeared to have been sprayed and may have been killed off, however almost all stems of this plant were dried off, which could have been either from spraying or natural seasonal die-off in the absence of soil moisture, so



all plants were therefore recorded. Although this may have resulted in some over-recording of stinking Roger weed abundance in July 2018, a number of these plants had new green regrowth at the bases of the old dead stems, indicating at least some plants were alive and/or were undergoing seasonal regrowth.

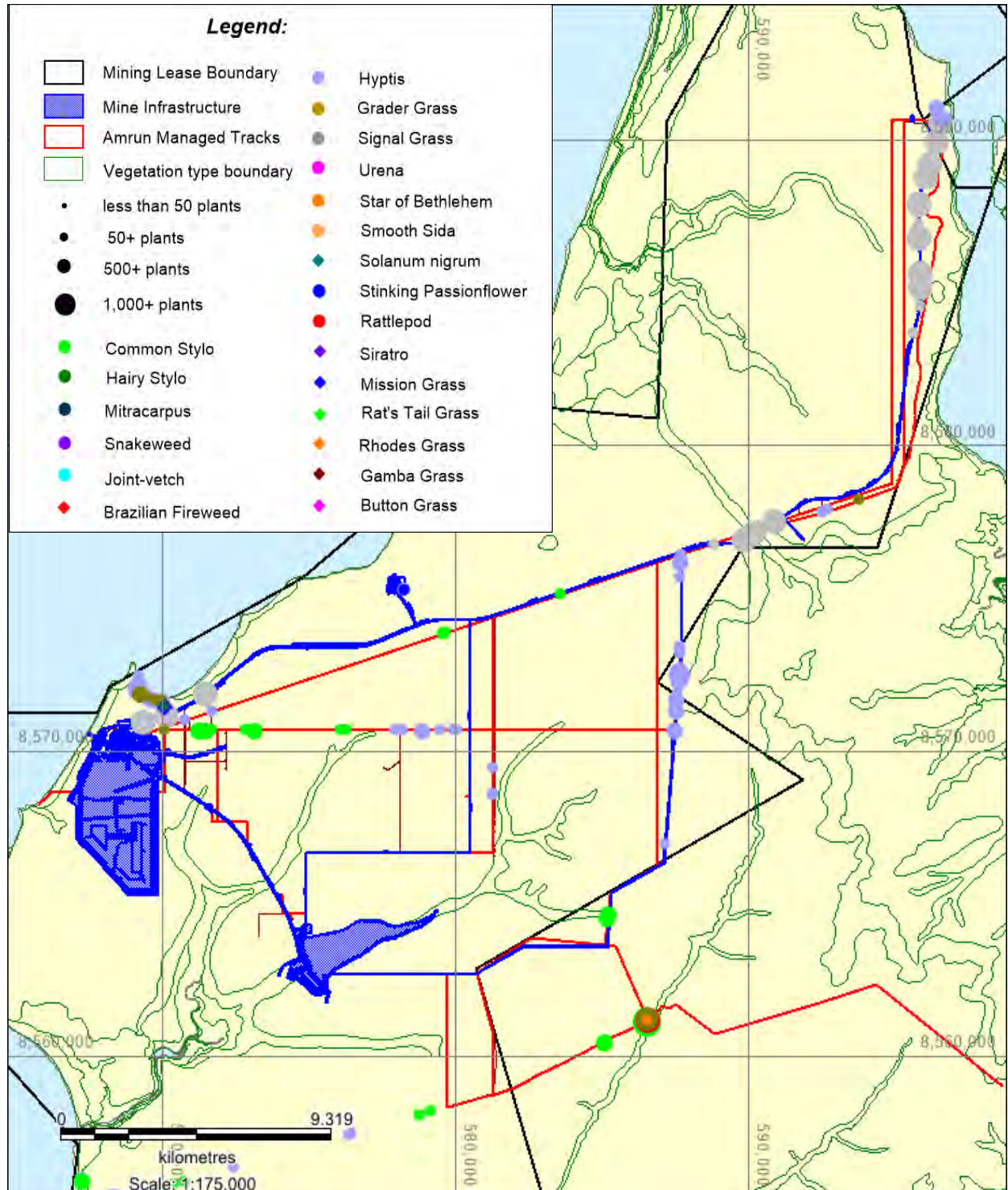


Figure 3.2 Location of Weeds recorded within the investigation area (June 2017)



Treatment and control of these common established weeds (common stylo and stinking Roger) has been particularly effective at the three main sites of heavy infestation within the vicinity of the Amrun construction area (*i.e.* Boyds Bay flycamp and access track, Hey River Terminal and Beagle Camp). The success of weed treatment activities at these three sites in particular highlights the benefit of targeted and sustained weed control activities undertaken by the Land and Sea Management Program (LSMP) team.

Other areas of previous heavy infestation of weeds (*i.e.* Amban beach camping area, Ina and Waterfall Creeks) were not accessible as part of the Annual Weed Survey, and will be assessed further in the Period (3-yearly) Weed Survey in 2019. Amban has now been treated by the LSMP team, and weed control is expected to have reduced the incidence of weeds at this site. Alternatively, the Ina and Waterfall Creek tracks were closed and apparently inaccessible during 2018, and the incidence of established weeds is expected to have remained high at these locations.

As indicated above and depicted in **Figures 3-1 & 3-2**, the major recorded increase in exotic plant species in the Amrun project area between 2017 and 2018 has been the ongoing intentional establishment of signal grass on the batters of all major borrow pits/detention basins along the main access road, and associated batters around the accommodation camp, MIA and Arraw Dam wall batters. This measure is required for batter stabilisation, however regular isolated incidences of Rhode's grass (*Chloris gayana*), also occur along this main access road corridor, and suggest minor contamination of the seed source used with this weed species.

3.3 Listed Weed Species

Two species of weeds classed as restricted invasive plants (Category 3) under the Queensland *Biosecurity Act 2014* were recorded in the current (July 2018) weed survey of the Amrun Project area. These were:

- Gamba grass (*Andropogon gayanus*), which was recorded as one isolated specimen found on the main approach track to site between the seismic line and 70000 line (see **Image C9, Appendix C**). This specimen was removed on 26 July 2018 and the area quarantined by the LSMP team as per the site weed management protocols;
- American rat's tail grass (*Sporobolus jacquemontii*), which was recorded as a small cluster of 5-10 plants within an area of approximately 50m² at Beagle Camp clearing (see **Images C10 & C11, Appendix C**). This clearing, although not within the Amrun mining lease area, is located immediately east of the lease on the main access track into the site from the Aurukun Road, and therefore has the potential to be transferred by vehicles and other machinery if left unmanaged at this location.

Gamba grass is additionally listed as on the WoNS by the Commonwealth Government. The nation's 32 worst weeds are listed under the WoNS Strategy (Australian Government, 2018), and are targeted for management under the Biosecurity legislation of the State in which they occur. The Queensland *Biosecurity Act 2014* came into force on 1 July 2016 and replaces previous legislation in which certain weed species were Declared Plants and required various levels of management or intervention by landholders.

The Queensland *Biosecurity Act 2014* prohibits the release of either Gamba grass or American rat's tail grass into the environment, and requires all parties to take all reasonable and practical steps to minimise the risks associated with restricted invasive plants on lands under their control (called a general biosecurity obligation, or GBO). The recent record of Gamba grass in the current (July 2018) weed survey on the entry track in the Amrun Project area will therefore need to continue being monitored for Gamba grass as a high priority, and treated if required. It is recommended that this area continue to be monitored and treated for Gamba grass at least every six months for a period of at least three years to ensure the current infestation is eradicated. Hand removal of plants, as occurred



with this recent sighting, provides a valid treatment option for any low number of plants typically identified at this locality (Queensland Government, 2018c).

Alternatively, no Gamba grass plants have been identified at the previously treated and quarantined area at Boyd Bay, which has been subject to periodic reinfestation of Gamba grass. Gamba grass was last treated and removed at Boyd Bay in February 2017. Similarly, it is recommended that this area, continues to be monitored and treated for Gamba grass at least every six months for a period of at least three years, at this stage until at least February 2020.

This is the first confirmed record for American rat's tail grass (*Sporobolus jacquemontii*) within the Weipa region, although the similar, closely-related giant rat's tail grass (*Sporobolus pyramidalis*) was also recently recorded for Weipa in April 2018. The taxonomy of these closely-related *Sporobolus* weed species has only recently been reviewed, and isolated specimens of the similarly related giant Paramatta grass (*Sporobolus fertilis*) have been confirmed for the area since January 2000 (Queensland Government, 2018e). All three of these similar looking and closely-related species are listed as restricted invasive plants in Queensland (Queensland Government, 2018d), and each is also well adapted to colonise large areas of pasture and paddock on Cape York (Queensland Government, 2018a). All efforts should be made to keep these species from entering cleared areas left by mining, as they are expected to be highly invasive in these environments, and could potentially cause large infestations and reduce the effectiveness of rehabilitation of native woodland communities.

Other WoNS potentially present or with a higher likelihood of establishing on site within the Amrun Project area include rubber vine (*Cryptostegia grandiflora*), hymenachne (*Hymenachne amplexicaulis*) and several species of exotic asparagus ferns (*Asparagus* spp.) listed under WoNS and Queensland legislation. None of these species have been recorded on or in the vicinity of the Amrun Project area to date, although it is recommended that considerable focus should be placed on targeting the potential presence of these species more broadly across the Amrun Project area, and these weed species should be a focus of the 2019 Periodic Weed Survey.

3.4 Weed Infestation Locations

3.4.1 Boyd Bay Flycamp and Beach Access

This area was previously heavily infested with weeds (common stylo, stinking Roger, smooth sida *Sida acuta*, mission grass *Cenchrus pedicellatus* and grader grass *Themeda quadrivalvis*), and was the location of the previous Gamba grass infestation.

These areas have been successfully treated for weeds and clearly show the benefits of the targeted and sustained weed treatment activities by the LSMP team. Only isolated regrowth of exotic weeds recently occurred in the open areas remaining after treatment, with mission grass in particular having regrown or withstood repeated treatment in patches, and to a lesser extent some repeated regrowth of stinking Roger at the base of otherwise dead plants (see **Images C5 & C6, Appendix C**).

Similarly, the infestations at the beach access and quarantine area at Boyd Bay Point have been convincingly controlled (see **Images C7 & C8, Appendix C** for comparison), and no sign of Gamba grass has been recorded since February 2017.

These areas are now considered to be at a maintenance level for ongoing weed control and will require only selective and highly targeted weed spraying, and re-establishment of native ground cover is recommended as the primary focus for the remaining bare areas left after heavy weed removal.

3.4.2 Amrun Accommodation Village

Despite the large open area and high number of vehicles accessing this site, the area is still largely weed free. The periphery of the clearing was traversed during the current (July 2018) survey, and was largely bordered with native grassland regrowth. One area of potential concern is the effluent



irrigation bank area to the north of the car park, which is irrigated and is heavily vegetated with a slightly unusual assemblage of native plants (eg. mangrove fern *Acrostichum speciosum*, watersprite *Ceratopteris thalictroides* and vernonia *Cyanthilium cinereum*), together with large expanses of the exotic black nightshade (*Solanum nigrum*) and isolated occurrences of other weed species (eg. stinking passionflower *Passiflora foetida*, Brazilian fireweed *Erechtites valerianifolius* and Jamaican snakeweed *Stachytarpheta jamaicensis*) (see **Images C20-23, Appendix C**). This unusual assemblage of native and exotic plants colonising the irrigation bund suggests the water is both high in nutrients and has some balance issue (i.e. high in salts, pH, etc).

Several new weeds have now been recorded growing on the irrigation bund, suggesting it is a potential entry point for new weeds into the Amrun Project area. It is therefore recommended that this location be monitored regularly (minimum every 6 months) and any weeds identified be controlled, to prevent introduction of new and unusual weeds more broadly into the Project area.

3.4.3 Amrun Access Road and associated borrow pits

As mentioned previously, perhaps the major increase in exotic plant species in the Amrun project area between 2017 and 2018 has been the ongoing intentional establishment of signal grass on the batters of all major borrow pits/detention basins along the main access road from HRT (Hey River Terminal) to MIA, and also on localised drainage structures throughout the accommodation camp, MIA and Arraw Dam wall batters.

This measure has been required for batter stabilisation, to counter difficulties with the initial establishment of ground cover in these locations prior to the onset of heavy seasonal rainfall and consequent erosion. However regular isolated incidences of weeds including Rhode's grass, and to a lesser extent grader grass (see **Image C17, Appendix C**) have also occurred along this main access road corridor. Rhode's grass in particular has occurred as a regular isolated but widespread weed along this main access road corridor, suggesting some minor contamination of the seed source for either Japanese millet or signal grass.

Some areas along the main access road including the Winda Winda crossing and borrow pit areas and batter slopes, have revegetated naturally with native grasses (i.e. spikey mat grass *Pseudorhaphis spinescens*, blue couch *Cynodon dactylon*, giant speargrass *Heteropogon triticeus*, plumed sorghum *Sarga plumosa*) (**Images C19, Appendix C**), while some road verges have been colonised naturally by native panic (*Panicum seminudum* and/or *Panicum mindanaense*) and other spreading grasses (i.e. *Thaumastochloa pubescens*, *Schizachyrium pachyarchon*, etc), showing that native grasses are potentially suited to soil stabilisation in these situations. It is suggested that attempts be made to phase out the use and occurrence of signal grass and other exotic ground cover species in these areas as the construction and establishment phase transitions into mining and ongoing site maintenance and rehabilitation. These species can be gradually replaced by native grasses, including those identified above.

3.4.4 Winda Winda Creek Crossing

The Winda Winda Creek crossing, like other portions of the main access road corridor, was subject to potential erosion during site development, and was intentionally managed with a mix of hard erosion control and exotic ground cover species. Some portions of this area, notably including parts of the alluvial creek flat downstream of the culvert crossing (see **Image C19, Appendix C**), are now almost exclusively colonised by a ground cover of native spikey mat grass and low copses of native woody regrowth (i.e. Broad-leaved paperbark *Melaleuca viridiflora*, swamp box *Lophostemon suaveolens*). These species have revegetated naturally, appear to be effective in minimising instream erosion, and reducing the incidence of exotic weeds. Only isolated weeds such as siratro (*Macroptilium atropurpureum*) (see **Image C18, Appendix C**) were recorded.

These areas are now considered to be at a maintenance level for ongoing weed control and will require only selective and highly targeted weed spraying, and re-establishment of native ground cover is recommended as the primary focus for the remaining bare areas left after heavy weed removal.



3.4.5 Hey River Terminal

The terminal access road, like much of the northern access road corridor, has been seeded for soil stabilisation in response to potential erosion during the onset of seasonal rains in late 2016. This area is also intentionally managed with a mix of exotic and native grass ground cover species.

The surrounding native bushland around terminal laydown areas and adjoining original access tracks to the north and south, were previously subject to heavy infestations of weeds, especially stinking Roger. These infestations have now been subject to repeated targeted application of herbicides by the LSMP team, and clearly show the benefit of sustained weed control efforts (see **Images C13-C14, Appendix C**). This area is still the subject of repeated and persistent regrowth of stinking Roger, and the ongoing colonisation of new additional weeds, including American Joint-vetch (*Aeschemone americana*) (**Images C12, Appendix C**).

The HRT area has been greatly reduced in overall incidence of weed occurrence, and is now approaching a maintenance level of ongoing weed control. However, given the repeated and persistent occurrence and regrowth of stinking Roger, and introduction of other new weeds to the site, ongoing sustained and targeted weed spraying are recommended for this area, together with the progressive re-establishment of native ground cover for the remaining bare areas left after heavy weed removal.

3.4.6 Local Access Tracks (Boyd Bay area)

The access tracks around the main site area (*i.e.* 70000 line, seismic line, wash basket loop, ART bore hole access tracks, Arraw Dam access track, lease boundary loop), mostly represent upgraded access tracks that were in use between 2007 and 2015 for local site access. These areas have historically been subject to colonisation by weeds, particularly the established environmental weeds, common stylo and stinking Roger.

Despite the sustained and targeted treatment activities undertaken by the LSMP team, both these herbaceous perennial weed species have persisted in many of the locations where they were recorded in previous weed survey events (see **Images C1 & C3, Appendix C** for common stylo; see **Images C3 & C4** for stinking Roger). In some locations (such the 70,000 line and easternmost north-south track) where no obvious signs of recent treatment are evident, incidence may have increased slightly (refer **Figure 3-1 & 3-2** for comparison). This may be due to these specific areas not being sprayed on a regular basis. In other areas however, these weeds have survived and/or regrown despite clear signs of previous treatment.

Further targeted and sustained treatment in these areas is recommended as the best method of killing and removing the remaining individuals of these persistent and established weed species. The use of a surfactant may aid with the uptake of herbicides on these species in particular. Planning and keeping to a regular schedule of weed control activities on each access track may also be of benefit in ensuring that no individual patches of weeds are left untreated, or to ensure that intervals between treatment are consistent.

Despite the persistence of established weeds, both the introduction of new weeds and spread of existing weeds appears to be minimal. This is a positive reflection of the weed management practices initiated on site, notably including:

- Weed treatment activities being undertaken by the LSMP team, evidenced through widespread observation of dead stinking Roger stems and other relicts of herbicide spraying across these tracks;
- Weed washdown practices for new vehicles entering the site; and
- Track verge maintenance, in which side rills are created on the sides of these tracks as they are progressively upgraded. The subsequent mounds of soil left on the verge of the tracks cover and effectively bury established weed growth, but will consequently require ongoing maintenance as new weed habitat has been created by the rill. Many of these tracks now have established native grasses fringing the track verges.



3.4.8 Beagle Camp

The Beagle camp site clearing, although not within the lease area, has regularly been used for site access and turning of heavy vehicles. This area, including the boundaries of the current truck turning circle, were previously subject to a particularly dense infestation of numerous weeds (including stinking Roger, common stylo, smooth sida, mission grass, grader grass, tropical girdlepod *Mitracarpus hirtus* and Star-of-Bethlehem *Ipomoea quamoclit* recorded in June 2017).

This area has clearly been the focus of sustained and targeted weed control activities by the LSMP team, and the incidence of the majority of exotic weeds previously present in this location has been greatly reduced (see **Image C15, Appendix C**).

The Beagle Camp clearing has been greatly reduced in overall incidence of weed occurrence, and is now approaching a maintenance level of ongoing weed control. However, given the presence of a small patch of the Category 3 restricted invasive plant American rat's tail grass, the strategic location of the clearing which must be passed through to access the site, and the high amount of vehicle traffic which passes through, it is recommended that:

- initial targeted treatment and potential quarantining of this site be implemented as a priority to eradicate American rat's tail grass before it has the opportunity to further spread into the Amrun Project area; and,
- ongoing sustained and targeted weed spraying be applied to this area, together with the progressive re-establishment of native ground cover for the remaining bare areas left after heavy weed removal.

3.4.9 MIA boundary and access areas

This MIA boundary, including the entire edge of clearing for the tailings dam facility, was traversed by vehicle during the July 2018 weed survey, together with the newly established Arraw Dam wall clearing area and connecting ICT corridor. These areas were devoid of weeds during the current survey, and imply the success of existing weed control measures on site.

These areas include a large increase in the clearing footprint for the Amrun Project, and greatly increase the open areas and clearing edge of the mine with surrounding bushland. These areas in particular are potentially prone to invasion and colonisation by weed species, and it is recommended that future weed surveys focus on maintaining the current nil incidence of exotic weeds at these locations.

3.4.10 Pera Swamp and western access areas.

These areas were inaccessible during the recent July 2018 weed survey. Those areas that were accessible or visible from accessible areas, appeared to have newly pushed boundaries and little established edge area for weed development. However, these areas have extensive edge areas and represent key potential locations for weed growth over time, and should be regularly monitored for weed incidence. There was previously (*i.e.* when last visited in 2016) a low incidence of some weed species on parts of the access track to Pera Swamp, and these areas should be surveyed if possible during the 2019 Periodic Weed Survey to confirm the ongoing potential presence of weeds in these locations.



3.5 Summary, Recommendations and Actions

The extent of potential weed habitat and areas for potential weed infestation within the Amrun Project area have increased considerably over the past 12 to 24 months, as construction of the Amrun mine and associated facilities nears completion, and clearing continues for the commencement of mining operations. Despite this expansion in area, the incidence of exotic weed species generally remains low, suggesting that existing measures for weed control are largely effective to date, and that the site can potentially be managed in a relatively weed-free condition into and beyond the operational phase of mining operations if an adequate weed monitoring and treatment program continues to be refined and implemented at the site.

Some positive outcomes that were evident during the 2018 surveys, in particular with respect to the past 12 months of weed management activities include:

- The Gamba grass infestation at Boyd Bay has been effectively controlled since February 2017, and the area potentially declared free of this restricted invasive plant by February 2020;
- The weed protocols currently in place on site have been largely effective in preventing the invasion and spread of exotic weed species into the Amrun Project area, with only one further specimen of Gamba grass recorded in July 2018 on the main access into site. Furthermore, this incidence of Gamba grass was effectively controlled and contained by the implementation of a quarantine zone on 26 July 2018;
- The recently identified incidence of American rat's tail grass at Beagle Camp has apparently been identified early, and has a high potential to be controlled effectively with the implementation of adequate planning and weed treatment activities, and prevented from entering the Amrun Project area;
- Despite the persistence and ongoing survival/regrowth of two main established herbaceous perennial weed species (common stylo and stinking Roger), these species have been greatly reduced at three of the main heavy infestations in the vicinity of the construction area (Boyd's Bay flycamp and access track, Hey River Terminal and Beagle Camp), and largely contained to their existing distribution over the broader access tracks across the site. The success of the associated weed treatment activities to achieve this result highlights the benefit of targeted and sustained weed control activities undertaken by the LSMP team;
- Apart from the identification of isolated occurrences of six new, additional weeds at isolated locations on site, there is no evidence of broad-scale infestation of new weed species or large increases in the incidence of established weeds at the site, despite the greatly increased extent of clearing and volume of heavy machinery activity on site. This is at least partially, and most likely predominantly, a reflection of weed management practices including weed washdown practices and other weed control protocols currently enforced at the site; and
- very few weeds were recorded in newly opened areas for construction (such as the tailings storage facility clearing area, Arraw Dam wall and fishway clearing footprint, ICT corridor and MIA expansion areas). This also implies that the existing weed management practices currently enforced on site have been largely effective.

One area for potential improvement of management practices for exotic plant species on site identified in the current survey includes the potential future use of only Japanese millet (which disappears after initial stabilisation growth is complete) and native grassy ground cover species when applying seed for soil stabilisation in response to potential erosion during the onset of seasonal rains in future years (*i.e.* from late 2018 or 2019 onwards).

This recommended future practice has the distinct advantages of being recognised as current environmental best practice, and minimises the the chance of any legacy issues (and the associated



potential cost) of having to remove these exotic species at future mine closure. The main risk associated with implementing this recommendation (*i.e.* that soil stabilisation will be inadequate using native species alone, and serious soil erosion issues will occur on site), although very real during the initial management stage in 2015-2016, is now largely ameliorated by what has recently been learned from the performance of Japanese millet and a variety of suitable native species.

Significantly, several native species (notably including spikey mat grass, fragile friegrass *Schizachyrium fragile* and other prostrate spreading grasses *Thaumastochloa pubescens/major/rariflora*) have now been identified as good ground cover species for stabilising the soil surface in these situations. It is recommended that these native species be fully utilised with an initial cover crop of Japanese millet in any future soil stabilisation works.

Other recommended actions and priorities for weed management and control on site include:

- Continue to implement prioritised early wet-season treatment and ongoing routine monitoring of Gamba grass at Boyd's Bay quarantine area, and implement similar treatment at the newly quarantined area on the access track between the seismic line and 70,000 line. These areas should again be treated as a priority once the first new growth commences in the early wet-season of late 2018;
- Continue to prioritise early wet-season treatment of other exotic plant species at high weed incidence areas, including Boyd's Bay flycamp and access area, Hey River Terminal, Ina/Waterfall Creek and Beagle Camp to remove remaining large source areas for exotic weeds. These areas should also be treated as a priority once the first new growth commences in the early wet-season of late 2018;
- Plan and implement a schedule for periodic weed monitoring and control along defined segments of all Amrun managed tracks, to overcome any potential missed segments that would benefit from the control of established or new weed infestations. This schedule could be formally adopted by the LSMP team and continue their current success in treating and controlling/eradicating weeds across the entire Amrun mining lease area;
- As a high priority, implement appropriate weed control treatment activities to remove isolated incidences of new or poorly represented weeds across the site where they are known to occur, effectively preventing them from establishing on site. Notably, this could include Rhodes grass and siratro at isolated locations along the main access road, American joint-vetch at HRT, and also black nightshade, stinking passionflower, snakeweed and Brazilian foreweed at the effluent disposal bund area at the Accommodation Camp;
- Initiate a process for the enhancement and/or replacement on native ground cover species in areas of previous heavy weed infestation. The bare areas left by successful treatment by the LSMP team will be much easier to manage and maintain if revegetation of native ground cover is facilitated/encouraged in these areas. Whilst seeding and rehabilitation with native ground covers will be beneficial, the retention of any successful rehabilitation and any natural recolonisation of these areas by native ground cover species is paramount, and will require effective spot targeting of weeds and retention of native ground cover during ongoing maintenance and associated weed ongoing treatment activities;
- Undertake appropriate weed control and treatment activities at the more peripheral areas of the Amrun mining lease area (notably Waterfall Creek, Ina Creek track heads; Amban and Pera Swamp campsite areas) where possible ahead of the Periodic Weed survey scheduled for 2019; and
- Continue training and skill development for the LSMP rangers in weed identification and control. The work done by these rangers to date is impressive in terms of the volume and effectiveness of areas treated. Broad scale application and control will have been an initial priority for many areas given the high incidence of weeds present. However further training and skill development in weed (vs similar native plant) species identification, and ongoing



targeted spot spraying will be invaluable to gain the best results into the future. This could potentially include the use of surfactants to target persistent perennial weed species, and use of colored dye in targeted spraying (and associated water cleansing of any native species affected by incidental overspraying).

The numerous successes of the current weed control program provide an effective and efficient platform to further develop and refine the ongoing management and control of weeds within the Amrun Project area. As development and operation of the Amrun mine transitions from construction into an operation stage, now is the critical time to refine and enhance the existing weed planning and management practices and processes, and effectively implement weed control and treatment activities so the site remains relatively weed free into the future.



4. References

- Australian Government (2018).** Australian Government Weeds of National Significance (WoNS) Website, Weeds in Australian Publications and Resources, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html> Accessed 04 October 2018.
- Queensland Government (2018a).** Queensland Government Business & Industry Portal Website, Restricted and Invasive Plants, <https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/giant-rats-tail-grass> Accessed 04 October 2018.
- Queensland Government (2018b).** Queensland Government Business & Industry Portal Website, Restricted and Invasive Plants, <https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/gamba-grass> Accessed 04 October 2018.
- Queensland Government (2018c).** Queensland Government Business & Industry Portal Website, Gamba Grass Factsheet. https://www.daf.qld.gov.au/data/assets/pdf_file/0011/67466/IPA-Gamba-Grass-PP147.pdf Biodiversity Queensland, Department of Agriculture and Fisheries, Queensland Government, 2018. Accessed 04 October 2018.
- Queensland Government (2018d).** Queensland Government Business & Industry Portal Website, Rat's Tail Grasses Factsheet. https://www.daf.qld.gov.au/data/assets/pdf_file/0010/69616/IPA-Giant-Rats-Tail-Grass-PP48.pdf Biodiversity Queensland, Department of Agriculture and Fisheries, Queensland Government, 2018. Accessed 04 October 2018.
- Queensland Government (2018e).** Queensland Herbarium HERBREC's records and locational data. Department of Environment & Science, Queensland Government, 2018. Accessed 04 October 2018.



5. Appendices

Appendix A Schedule of Data Deliverables

Appendix B Weed Species Identification Results

Appendix C Survey Site Images

Appendix D Weed Survey Results –Amrun Construction Area and Access Tracks

(24-27 July 2018 Survey)

Appendix E Distribution Maps for Individual Weed Species



Appendix A Schedule of Data Deliverables

Data Type	Filename
Raw survey data	<i>Weed Survey Results 27Sep2018.xlsx</i>
Summary species list	<i>N/A; included in Appendix D</i>
Survey site locations	<p><i>Amrun Project Area, including:</i></p> <ul style="list-style-type: none"> - <i>Boyd Point fly camp and access tracks;</i> - <i>Main access road and construction camp;</i> - <i>Accessible parts of the MIA area;</i> - <i>Tracks developed for construction of the Arraw Dam and associated infrastructure, including</i> <ul style="list-style-type: none"> <i>> 70,000 line;</i> <i>> Seismic line;</i> <i>> North-south access to watering points, dam bores and dam area;</i> <i>> Recent additional access tracks cleared for site development, and</i> - <i>Main access tracks throughout the Amrun Project area including:</i> <ul style="list-style-type: none"> <i>Beagle Camp-Boyd Bay</i> <i>Seismic line Boyd Bay-Winda Winda Ck</i> <i>Beagle Camp-Amban</i> <i>Waterfall (Ina Ck) track</i> <i>Hey Point track</i>
Survey trackers	<i>N/A</i>
Survey coverage polygons (flora and fauna)	<i>N/A</i>
Polyline tracks/Waypoints	<p><i>24_July_2018_Track_polyline.shp</i> <i>25_July_2018_Track_polyline.shp</i> <i>26_July_2018_Track_polyline.shp</i> <i>27_July_2018_Track_polyline.shp</i> <i>Amrun Managed Roads On Site_polyline.shp</i></p>



GIS map output files	<i>Br_Fire_2018_font_point.shp</i> <i>(Erechtites valerianifolius</i> <i>Button_2018_font_point)</i> <i>(Dactyloctenium aegyptium)</i> <i>Chloris_2018_font_point</i> <i>(Chloris gayana)</i> <i>Crot_2018_font_point</i> <i>(Crotalaria goreensis)</i> <i>Gamba_2018_font_point</i> <i>(Andropogon gayanus)</i> <i>Hyptis_2018_font_point</i> <i>(Mesosphaerum suaveolens)</i> <i>Mission_2018_font_point</i> <i>(Cenchrus pedicellatus subsp unispiculus)</i> <i>Mitr_hirt_2018_font_point</i> <i>(Mitracarpus hirtus)</i> <i>Pass_foet_2018_font_point</i> <i>(Passiflora foetida)</i> <i>Sida_2018_font_point</i> <i>(Sida acuta)</i> <i>Signal_2018_font_point</i> <i>(Uroichloa decumbens)</i> <i>Siratro_2018_font_point</i> <i>(Macroptilium atropurpureum)</i> <i>Snakeweed_2018_font_point</i> <i>(Stachytarpheta jamaicensis)</i> <i>Solanum_torv_2018_font_point</i> <i>(Solanum nigrum)</i> <i>Spor_pyr_2018_font_point</i> <i>(Sporobolus jacquemontii)</i> <i>Styl_guian_2018_font_point</i> <i>(Stylosanthes guianensis)</i> <i>Styl_scab_2018_font_point</i> <i>(Stylosanthes scabra)</i> <i>Themeda_2018_font_point</i> <i>(Themeda quadrivalvis)</i> <i>Urena_2018_font_point</i> <i>(Urena lobate)</i> <i>Vetch_2018_font_point</i> <i>(Aeschynomene americana)</i>
Reference images	<i>Included as deliverables in folder "NoW Weed Survey Images July 2018"</i>
Details of Herbarium/Museum specimen	<i>N/A; included in Appendix B</i>
Flora fauna data	<i>N/A</i>



Appendix B Weed Species Identification Results



Queensland
Government

Department of
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Your reference
Our reference MJL: 784/18

23 October 2018

Jason Searle
57 Fifteenth Ave
PALM BEACH Qld 4221

Dear Jason

The botanical specimens received by the Queensland Herbarium on 11 October 2018 have been identified as:

- JS18067 #*Blumea axillaris*
JS18068 *Sporobolus* sp, possibly **Sporobolus jacquemontii*
 This specimen has been identified as an invasive, non-native species of
 Sporobolus (Restricted Category 3) under the *Biosecurity Act 2014*. The
 taxonomy of this species group is currently being researched by the
 Herbarium and Biosecurity Queensland.
JS18069 *Dichanthium sericeum* subsp. *polystachyum*
JS18125 #*Macaranga polyadenia*
JS18129 *Cryptocarya hypospodia*
JS18133 #*Taenitis blechnoides*
JS18135 *Sterculia shillinglawii*
JS18184 *Melaleuca argentea*
JS18185 #*Dalbergia densa*

* Naturalised, non-native species

These specimens have been retained for incorporation into the Herbarium collection, with thanks.

Yours sincerely

G.P. Guymmer
Director

Download a full version of Census of the Queensland Flora 2017
<https://data.qld.gov.au/dataset/census-of-the-queensland-flora-2017>

Centre for botanical research and information on the Queensland flora



Appendix C Survey Site Images



Image C1 & C2. Common stylo (*Stylosanthes scabra*), close-up of healthy plant and flowers (above), and (below) as one of the few persistent green ground-cover plants in dry conditions, track-side along the easternmost track joining the seismic line with the main track to South Gate (26 July 2018).



Image C3 & C4. Stinking Roger (*Hyptis suaveolens*) plant, purple flower and seed capsule (above), and (below) as a persistent herbaceous perennial weed commonly found in patches along older access tracks (24 July 2018).



Image C5 & C6. Earthen mound on eastern edge of Boyd's Bay flycamp clearing heavily infested with weeds on 7 June 2017 (above), and (below) largely devoid of weeds or other ground cover on 24 July 2018, following targeted and sustained weed control by LSMP work team (some weeds, particularly mission grass *Cenchrus pedicellatus* persist as regrowth after spraying).



Image C7 & C8. Declared Weed exclusion area at Boyd's Bay Point track, after initial treatment for Gamba grass on 10 April 2016 (above), and more recently on 24 July 2018 (below). All weeds have been treated and controlled, and no weeds or native ground cover regrowth were present on the recent 2018 inspection.



Image C9. Gamba grass (*Andropogon gayanus*), an isolated specimen of this Class 3 Restricted Plant was recorded on the eastern verge of the main north-south access track into the construction camp between the 70,000 line and seismic line (25 July 2018).



Image C10 & C11. American rat's tail grass (*Sporobolus jacquemontii*), approximately 10 plants of this Class 3 Restricted Plant were recorded for the first time on 26 July 2018 within a 50m² area in the Beagle Camp clearing just to the east of the Amrun mining lease. This clearing is on the access track to both the construction camp and to the southern site access of Arraw Dam from the Aurukun Road.



Image C12. American joint-vetch (*Aeschemone americana*), and exotic weed first recorded for the Amrun mining lease at hay River Terminal on 26 July 2018.



Image C13. Isolated regrowth of stinking Roger (*Mesosphaerum suaveolens*), dense localised occurrences across the investigation area in September 2017 and May 2018.



Image C14. Dense infestations of stinking Roger (*Mesosphaerium suaveolens*) on the margins of clearing at Hey River Terminal appear to have been largely killed off. However, some of the dead stems have new regrowth at their bases and will require further respraying until native ground cover is re-established (26 July 2018).



Image C15. Previous dense infestations of numerous weed species at Beagle Camp clearing appear to have been largely controlled, with incidence of exotic weed species now low and native grass cover is dominant (26 July 2018).



Image C16. Arraw Dam wall (above) has been seeded with signal grass (*Urochloa decumbens*), an exotic species used intentionally to stabilise batters from erosion. This exotic species is now also growing in the downstream discharge area of the dam wall and will need to be controlled in the downstream catchment (27 July 2018).



Image C17. In addition to the intentional use of signal grass (*Urochloa decumbens*) on batters and culvert edges of the main access road, small numbers of exotic grasses, particularly Rhode's grass (*Chloris gayana*) and grader grass (*Themeda quadrivalvis*, see isolated tall grass above) also occur along these open verges (24 July 2018).



Image C18. Siratro (*Macropodium atropurpureum*), seen as an isolated specimen at Winda Winda Creek crossing (26 July 2018).



Image C19. Winda Winda Crossing was previously open and heavily seeded with Japanese millet (*Echinochloa esculenta*) and signal grass (*Urochloa decumbens*). This area is now has only isolated weeds present, and is densely colonised by the native spikey mat-grass (*Pseudorhaphis spinescens*)(26 July 2018).



Image C20. Dense lush plant growth colonising the irrigation bund area on the eastern edge of Amrun accommodation camp (27 July 2018). The exotic weed black nightshade (*Solanum nigrum*) is dominant, whilst salt-loving native species (including mangrove fern *Acrostichum speciosum*) are also common.



Image C21. Stinking passionflower (*Passiflora foetida*), isolated in occurrence on the irrigation bund area on the eastern edge of Amrun accommodation camp (27 July 2018).



Image C22. Brazilian fireweed (*Erechtites valerianifolius*), also isolated in occurrence on the irrigation bund area on the eastern edge of Amrun accommodation camp (27 July 2018).



Image C23. Jamaican snakeweed (*Stachytarpheta jamaicensis*), also isolated in occurrence on the irrigation bund area on the eastern edge of Amrun accommodation camp (27 July 2018).



Appendix D Weed Survey Results –Amrun Construction Area and Access Tracks (24-27 July 2018 Survey)

Wpt	X	Y	Weed Species	Count	Comments
541	569096	8570735	<i>Urochloa decumbens</i>	1000	Continuous from MIA northwards on both sides of main acces road, including road verge and baters of borrow pits
542	569349	8570883	<i>Urochloa decumbens</i>	1000	Continuous, including culvert
543	570095	8571364	<i>Hyptis suaveolens</i>	5	S side possibly sprayed
544	570095	8571474	<i>Hyptis suaveolens</i>	5	S side possibly sprayed
545	570127	8571520	<i>Hyptis suaveolens</i>	50	NE cnr, infestation reduced to <5% original amount in 2016/17
545	570127	8571520	<i>Mitracarpus hirtus</i>	50	NE cnr, infestation reduced to <5% original amount in 2016/17
545	570127	8571520	<i>Cenchrus pedicellatus</i>	50	NE cnr, infestation reduced to <5% original amount in 2016/17
545	570127	8571520	<i>Urena lobata</i>	5	NE cnr, infestation reduced to <5% original amount in 2016/17
545	570127	8571520	<i>Stylosanthes guianensis</i>	5	NE cnr, infestation reduced to <5% original amount in 2016/17
545	570127	8571520	<i>Dactyloctenium aegyptium</i>	5	NE cnr, infestation reduced to <5% original amount in 2016/17
546	570093	8571517	<i>Hyptis suaveolens</i>	50	SE cnr, infestation reduced to <5% original amount in 2016/17
546	570093	8571517	<i>Cenchrus pedicellatus</i>	50	SE cnr, infestation reduced to <5% original amount in 2016/17
547	570090	8571580	<i>Hyptis suaveolens</i>	20	On track to point, mostly sprayed, some regrowth
548	570118	8571626	<i>Hyptis suaveolens</i>	20	On track to point, mostly sprayed, some regrowth
549	570010	8571644	<i>Hyptis suaveolens</i>	50	Track to point, mostly sprayed and bare, isolated plants and regrowth
549	570010	8571644	<i>Themeda quadrivalvis</i>	10	Track to point, mostly sprayed and bare, isolated plants and regrowth
549	570010	8571644	<i>Mitracarpus hirtus</i>	20	Track to point, mostly sprayed and bare, isolated plants and regrowth
550	570010	8571644	<i>Hyptis suaveolens</i>	20	Mostly sprayed, some regrowth
550	570010	8571644	<i>Cenchrus pedicellatus</i>	10	Mostly sprayed, some regrowth
550	570010	8571644	<i>Stylosanthes guianensis</i>	5	live
551	569736	8571672	<i>Hyptis suaveolens</i>	20	Mostly sprayed, some regrowth
552	569735	8571671	<i>Cenchrus pedicellatus</i>	5	live
553	569578	8571697	<i>Hyptis suaveolens</i>	5	Mostly sprayed, some regrowth
554	569536	8571718	<i>Stylosanthes scabra</i>	5	live
555	569267	8571897	<i>Hyptis suaveolens</i>	20	Mostly sprayed, some regrowth
556	569251	8572076	<i>Themeda quadrivalvis</i>	5	live
557	569216	8572160	<i>Hyptis suaveolens</i>	20	Mostly sprayed, some regrowth
558	569207	8572255	<i>Hyptis suaveolens</i>	10	Mostly sprayed, some regrowth
559	569188	8572401	<i>Hyptis suaveolens</i>	50	Quarantine area, mostly sprayed and bare, isolated plants and regrowth
559	569188	8572401	<i>Mitracarpus hirtus</i>	50	Quarantine area, mostly sprayed and bare, isolated plants and regrowth
559	569188	8572401	<i>Stylosanthes scabra</i>	50	Quarantine area, mostly sprayed and bare, isolated plants and regrowth
560	571107	8571604	<i>Urochloa decumbens</i>	1000	Continuous from BB turnoff northwards on both sides of main acces road, including road verge and baters of borrow pits
561	571985	8572242	<i>Cenchrus pedicellatus</i>	5	isolated plants N of borrow pit
562	572499	8572638	<i>Chloris guyana</i>	5	isolated plants within Signal grass



Wpt	X	Y	Weed Species	Count	Comments
563	572759	8572837	<i>Chloris guyana</i>	5	isolated plants within Signal grass
564	572926	8572998	<i>Chloris guyana</i>	5	isolated plants within Signal grass
564	572926	8572998	<i>Themeda quadrivalvis</i>	5	isolated plant in culvert outwash
564	572926	8572998	<i>Hyptis suaveolens</i>	20	patch
565	573498	8573293	<i>Chloris guyana</i>	5	isolated plants within Signal grass
566	574428	8573377	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and batters of borrow pits
567	574493	8573379	<i>Chloris guyana</i>	5	isolated plants within Signal grass
568	574782	8573381	<i>Chloris guyana</i>	5	isolated plants within Signal grass
569	575161	8573385	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and batters of borrow pits
570	575463	8573387	<i>Chloris guyana</i>	5	isolated plants within Signal grass
571	575778	8573406	<i>Chloris guyana</i>	5	isolated plants within Signal grass
572	576437	8573394	<i>Urochloa decumbens</i>	1000	S end airstrip, continuous northwards on both sides of main acces road, including road verge and batters of borrow pits
573	577004	8573465	<i>Urochloa decumbens</i>	1000	N end airstrip, continuous northwards on both sides of main acces road, including road verge and batters of borrow pits
574	577135	8573499	<i>Chloris guyana</i>	5	isolated plants within Signal grass
575	577862	8573776	<i>Chloris guyana</i>	5	isolated plants within Signal grass
576	578611	8574258	<i>Urochloa decumbens</i>	1000	Road to camp, continuous on both sides of acces road
577	578134	8575040	<i>Urochloa decumbens</i>	1000	Road to camp, continuous on both sides of acces road
578	577964	8575184	<i>Urochloa decumbens</i>	1000	Road to treatment plant, continuous on both sides of acces road
579	579537	8574286	<i>Chloris guyana</i>	5	isolated plants within Signal grass
580	579615	8574287	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and batters of borrow pits
581	580498	8571973	<i>Themeda quadrivalvis</i>	30	both sides track
582	581306	8566582	<i>Hyptis suaveolens</i>	20	looks sprayed
583	581310	8568510	<i>Hyptis suaveolens</i>	20	looks sprayed
584	581309	8568611	<i>Hyptis suaveolens</i>	50	looks sprayed
585	581311	8569440	<i>Hyptis suaveolens</i>	50	looks sprayed
586	580292	8574037	<i>Stylosanthes scabra</i>	5	isolated patch
587	579632	8573827	<i>Stylosanthes scabra</i>	5	isolated patch
588	579597	8573822	<i>Stylosanthes scabra</i>	5	isolated patch
589	573735	8571935	<i>Hyptis suaveolens</i>	30	over 50m on side of track
590	573551	8571878	<i>Stylosanthes scabra</i>	5	isolated patch
591	573026	8571709	<i>Stylosanthes scabra</i>	5	isolated patch
592	572942	8571681	<i>Stylosanthes scabra</i>	200	over 50m on side of track
593	571438	8571203	<i>Stylosanthes scabra</i>	5	isolated patch
594	570796	8570997	<i>Hyptis suaveolens</i>	300	over 50m on side of track



Wpt	X	Y	Weed Species	Count	Comments
595	570940	8570666	<i>Stylosanthes scabra</i>	30	over 50m on side of track
596	571054	8570663	<i>Hyptis suaveolens</i>	5	isolated patch
597	571090	8570663	<i>Hyptis suaveolens</i>	5	isolated patch
598	571177	8570664	<i>Stylosanthes scabra</i>	5	isolated patch
599	571226	8570666	<i>Stylosanthes scabra</i>	5	isolated patch
600	571253	8570664	<i>Stylosanthes scabra</i>	30	patch at intersection of tracks
601	571424	8570664	<i>Stylosanthes scabra</i>	5	isolated patch
602	571503	8570666	<i>Stylosanthes scabra</i>	100	over 50m on side of track
603	571550	8570663	<i>Stylosanthes scabra</i>	100	patch at intersection of tracks
604	571627	8570665	<i>Stylosanthes scabra</i>	100	over 50m on side of track
604	571627	8570665	<i>Hyptis suaveolens</i>	10	isolated patch
605	571701	8570667	<i>Stylosanthes scabra</i>	100	patch at intersection of tracks
606	571843	8570665	<i>Stylosanthes scabra</i>	20	isolated patch
607	572222	8570666	<i>Stylosanthes scabra</i>	5	isolated patch
608	572896	8570665	<i>Stylosanthes scabra</i>	30	over 50m on side of track
609	573073	8570664	<i>Stylosanthes scabra</i>	20	isolated patch
610	573146	8570664	<i>Stylosanthes scabra</i>	200	isolated patch
611	573219	8570665	<i>Stylosanthes scabra</i>	100	over 50m on side of track
612	573266	8570665	<i>Stylosanthes scabra</i>	500	over 50m on side of track
613	576107	8570666	<i>Stylosanthes scabra</i>	20	over 50m on side of track
614	576307	8570667	<i>Stylosanthes scabra</i>	100	isolated patch
614	576307	8570667	<i>Hyptis suaveolens</i>	100	isolated patch
615	577367	8570664	<i>Stylosanthes scabra</i>	5	isolated patch
616	577788	8570666	<i>Hyptis suaveolens</i>	5	isolated patch
617	578862	8570666	<i>Hyptis suaveolens</i>	50	isolated patch
618	579200	8570665	<i>Hyptis suaveolens</i>	20	isolated patch, might be sprayed
619	579490	8570666	<i>Hyptis suaveolens</i>	200	isolated patch, might be sprayed
620	579698	8570670	<i>Hyptis suaveolens</i>	30	patch at intersection of tracks
621	579759	8570665	<i>Hyptis suaveolens</i>	30	over 50m on side of track, might be sprayed
622	579829	8570664	<i>Hyptis suaveolens</i>	10	over 50m on side of track, might be sprayed
623	579900	8570665	<i>Hyptis suaveolens</i>	10	over 50m on side of track, might be sprayed
624	580115	8570665	<i>Hyptis suaveolens</i>	50	over 50m on side of track, might be sprayed
625	580226	8570664	<i>Hyptis suaveolens</i>	10	over 50m on side of track, might be sprayed
626	580297	8570667	<i>Hyptis suaveolens</i>	5	isolated patch, might be sprayed
627	581312	8571126	<i>Hyptis suaveolens</i>	5	isolated patch, might be sprayed
628	581314	8572172	<i>Andropogon gayanus</i>	1	isolated patch
629	581314	8573287	<i>Stylosanthes scabra</i>	5	isolated patch



Wpt	X	Y	Weed Species	Count	Comments
630	583615	8575114	<i>Stylosanthes scabra</i>	5	isolated patch
631	587444	8576349	<i>Hyptis suaveolens</i>	5	isolated patch
632	587659	8576414	<i>Hyptis suaveolens</i>	5	isolated patch
633	587690	8576421	<i>Hyptis suaveolens</i>	50	patch at intersection of tracks
634	588354	8576642	<i>Stylosanthes scabra</i>	5	isolated patch
635	587691	8576331	<i>Hyptis suaveolens</i>	20	over 50m on side of track
636	587690	8576213	<i>Hyptis suaveolens</i>	10	isolated patch
637	587690	8576144	<i>Hyptis suaveolens</i>	50	over 50m on side of track
638	587694	8575901	<i>Hyptis suaveolens</i>	10	isolated patch
639	587691	8575701	<i>Hyptis suaveolens</i>	20	over 50m on side of track
640	587691	8573407	<i>Hyptis suaveolens</i>	5	isolated patch
641	587692	8573346	<i>Hyptis suaveolens</i>	20	over 50m on side of track
642	587693	8573200	<i>Hyptis suaveolens</i>	20	over 50m on side of track
643	587695	8572872	<i>Hyptis suaveolens</i>	20	over 50m on side of track
644	587658	8572635	<i>Hyptis suaveolens</i>	5	isolated patch
645	587645	8572474	<i>Hyptis suaveolens</i>	20	over 50m on side of track
646	587650	8572367	<i>Hyptis suaveolens</i>	100	over 50m on side of track
647	587554	8571670	<i>Hyptis suaveolens</i>	500	over 50m on side of track
648	587540	8571303	<i>Hyptis suaveolens</i>	10	isolated patch
649	587505	8570911	<i>Hyptis suaveolens</i>	5	isolated patch
650	587131	8566957	<i>Hyptis suaveolens</i>	500	over 50m on side of track
651	587137	8567070	<i>Hyptis suaveolens</i>	100	over 50m on side of track
652	587148	8567163	<i>Hyptis suaveolens</i>	50	over 50m on side of track
653	587158	8567262	<i>Hyptis suaveolens</i>	20	over 50m on side of track
654	582343	8574763	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and baters of borrow pits
654	582343	8574763	<i>Chloris guyana</i>	5	isolated plants within Signal grass
655	582455	8574800	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and baters of borrow pits
656	585261	8575709	<i>Urochloa decumbens</i>	1000	Continuous northwards on both sides of main acces road, including road verge and baters of borrow pits
656	585261	8575709	<i>Chloris guyana</i>	5	isolated plants within Signal grass
657	590428	8577152	<i>Hyptis suaveolens</i>	50	At edge to old track to Winda Winda
658	590374	8577105	<i>Hyptis suaveolens</i>	50	At edge to old track to Winda Winda
659	591291	8577474	<i>Hyptis suaveolens</i>	50	over 50m on side of track
660	591041	8577411	<i>Hyptis suaveolens</i>	50	over 50m on side of track
661	590963	8577389	<i>Hyptis suaveolens</i>	30	over 50m on side of track
662	590759	8577331	<i>Hyptis suaveolens</i>	20	over 50m on side of track



Wpt	X	Y	Weed Species	Count	Comments
663	596633	8590531	<i>Hyptis suaveolens</i>	5	on mound near HRT security
664	596656	8590535	<i>Stylosanthes scabra</i>	5	on mound near HRT security
665	596673	8590535	<i>Hyptis suaveolens</i>	5	on mound near HRT security
666	596767	8590629	<i>Hyptis suaveolens</i>	20	HRT, patches, possibly sprayed, regrowth
667	596768	8590628	<i>Hyptis suaveolens</i>	100	HRT, patches, sprayed, regrowth
668	596813	8590641	<i>Hyptis suaveolens</i>	50	HRT, patches, sprayed, regrowth
669	596855	8590662	<i>Hyptis suaveolens</i>	50	HRT, patches, sprayed, regrowth
670	596875	8590751	<i>Hyptis suaveolens</i>	30	HRT, patches, sprayed, regrowth
670	596875	8590751	<i>Aeschynomene americana</i>	50	HRT, patches, sprayed, regrowth
670	596875	8590751	<i>Chloris guyana</i>	5	isolated plants
671	596779	8590685	<i>Aeschynomene americana</i>	20	HRT, patches, sprayed, regrowth
671	596779	8590685	<i>Chloris guyana</i>	5	isolated plants
672	596756	8590680	<i>Hyptis suaveolens</i>	50	HRT, patches, sprayed, regrowth
673	596676	8590650	<i>Hyptis suaveolens</i>	20	HRT, patches, sprayed, regrowth
674	596638	8590632	<i>Hyptis suaveolens</i>	20	HRT, patches, sprayed, regrowth
675	596526	8590585	<i>Hyptis suaveolens</i>	30	HRT, patches, sprayed, regrowth
676	596493	8590554	<i>Urochloa decumbens</i>	1000	Northern end of continuous band on both sides of main acces road, including road verge and batters of borrow pits
677	596593	8590510	<i>Urochloa decumbens</i>	1000	Northern end of continuous band on both sides of main acces road, including road verge and batters of borrow pits
678	596612	8590485	<i>Hyptis suaveolens</i>	50	over 50m on side of track
679	596649	8590428	<i>Hyptis suaveolens</i>	20	over 50m on side of track
680	596676	8590375	<i>Hyptis suaveolens</i>	200	dense patch
680	596676	8590375	<i>Stylosanthes scabra</i>	5	isolated patch
681	596663	8590305	<i>Hyptis suaveolens</i>	50	over 50m on side of track
681	596663	8590305	<i>Stylosanthes scabra</i>	5	isolated patch
682	596683	8590180	<i>Hyptis suaveolens</i>	50	over 50m on side of track
683	596719	8590110	<i>Hyptis suaveolens</i>	100	over 50m on side of track
684	596747	8590047	<i>Hyptis suaveolens</i>	100	over 50m on side of track
685	596724	8589985	<i>Hyptis suaveolens</i>	100	over 50m on side of track
686	596661	8589888	<i>Hyptis suaveolens</i>	50	over 50m on side of track
687	596591	8589528	<i>Hyptis suaveolens</i>	10	over 50m on side of track
688	596494	8589218	<i>Hyptis suaveolens</i>	200	over 50m on side of track
689	596445	8588508	<i>Hyptis suaveolens</i>	200	over 50m on side of track
690	596346	8588396	<i>Hyptis suaveolens</i>	5	over 50m on side of track
691	596278	8588325	<i>Hyptis suaveolens</i>	50	over 50m on side of track
692	596245	8588274	<i>Hyptis suaveolens</i>	50	over 50m on side of track
693	596010	8588072	<i>Hyptis suaveolens</i>	50	over 50m on side of track



Wpt	X	Y	Weed Species	Count	Comments
694	595911	8587715	<i>Hyptis suaveolens</i>	200	over 50m on side of track
695	596136	8587525	<i>Hyptis suaveolens</i>	10	over 50m on side of track
697	585224	8564879	<i>Stylosanthes scabra</i>	5	isolated patch
698	585203	8564664	<i>Stylosanthes scabra</i>	50	over 50m on side of track
699	585196	8564615	<i>Stylosanthes scabra</i>	50	over 50m on side of track
700	585185	8564538	<i>Stylosanthes scabra</i>	50	over 50m on side of track
701	586547	8561119	<i>Stylosanthes scabra</i>	20	remains of dense patch after spraying, some regrowth
701	586547	8561119	<i>Crotalaria goorensis</i>	50	remains of dense patch after spraying, some regrowth
701	586547	8561119	<i>Hyptis suaveolens</i>	50	remains of dense patch after spraying, some regrowth
702	586496	8561111	<i>Crotalaria goorensis</i>	20	remains of dense patch after spraying, some regrowth
702	586496	8561111	<i>Hyptis suaveolens</i>	20	remains of dense patch after spraying, some regrowth
703	586484	8561159	<i>Stylosanthes scabra</i>	50	remains of dense patch after spraying, some regrowth
703	586484	8561159	<i>Hyptis suaveolens</i>	20	remains of dense patch after spraying, some regrowth
704	586498	8561180	<i>Stylosanthes scabra</i>	20	remains of dense patch after spraying, some regrowth
704	586498	8561180	<i>Hyptis suaveolens</i>	50	remains of dense patch after spraying, some regrowth
705	586518	8561153	<i>Hyptis suaveolens</i>	5	remains of dense patch after spraying, some regrowth
705	586518	8561153	<i>Sida subspicata</i>	5	remains of dense patch after spraying, some regrowth, near shed
705	586518	8561153	<i>Cenchrus pedicellatus</i>	5	remains of dense patch after spraying, some regrowth, near shed
706	586535	8561076	<i>Sporobolus jacquemontii</i>	10	remains of dense patch after spraying, some regrowth, near old dongas
706	586535	8561076	<i>Mitrasacme hirtus</i>	10	remains of dense patch after spraying, some regrowth, near old dongas
706	586535	8561076	<i>Stylosanthes scabra</i>	50	remains of dense patch after spraying, some regrowth, near old dongas
706	586535	8561076	<i>Themeda quadrivalvis</i>	10	remains of dense patch after spraying, some regrowth, near old dongas
707	586100	8560964	<i>Hyptis suaveolens</i>	5	isolated plants
708	583924	8559907	<i>Hyptis suaveolens</i>	5	isolated plants
709	581183	8558717	<i>Stylosanthes scabra</i>	5	isolated plants
710	590240	8577084	<i>Macroptilium atropurpureum</i>	5	isolated plants, Winda Crossing, downstream side
710	590240	8577084	<i>Cenchrus pedicellatus</i>	5	isolated plants, Winda Crossing, downstream side
710	590240	8577084	<i>Urochloa decumbens</i>	1000	Continuous on batters, outgrown by native Pseudorhaphis on creek floor, Winda Crossing, downstream side
711	593054	8578187	<i>Hyptis suaveolens</i>	50	isolated patch
712	596442	8591071	<i>Hyptis suaveolens</i>	100	over 50m on side of track
713	596434	8591173	<i>Hyptis suaveolens</i>	100	over 50m on side of track
714	596433	8591255	<i>Hyptis suaveolens</i>	100	over 50m on side of track
715	595214	8579079	<i>Stylosanthes scabra</i>	5	isolated plants
716	594858	8578577	<i>Stylosanthes scabra</i>	5	isolated plants
717	593647	8578151	<i>Themeda quadrivalvis</i>	5	isolated plants
718	591797	8577628	<i>Hyptis suaveolens</i>	5	isolated plants



Wpt	X	Y	Weed Species	Count	Comments
721	570149	8570788	<i>Hyptis suaveolens</i>	5	isolated plants
722	570623	8570938	<i>Stylosanthes scabra</i>	20	isolated patch
723	578164	8575653	<i>Stylosanthes scabra</i>	10	isolated patch
724	578287	8575250	<i>Solanum torvum</i>	1000	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits
724	578287	8575250	<i>Erechtites valerianifolius</i>	50	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits
724	578287	8575250	<i>Passiflora foetida</i>	5	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits
725	578287	8575292	<i>Stachytarpheta jamaicensis</i>	5	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits
725	578287	8575292	<i>Solanum torvum</i>	1000	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits
725	578287	8575292	<i>Erechtites valerianifolius</i>	100	Effluent disposal area on NE bdy, raised hill with numerous weeds and other recruits



Appendix E Distribution Maps for Individual Weed Species

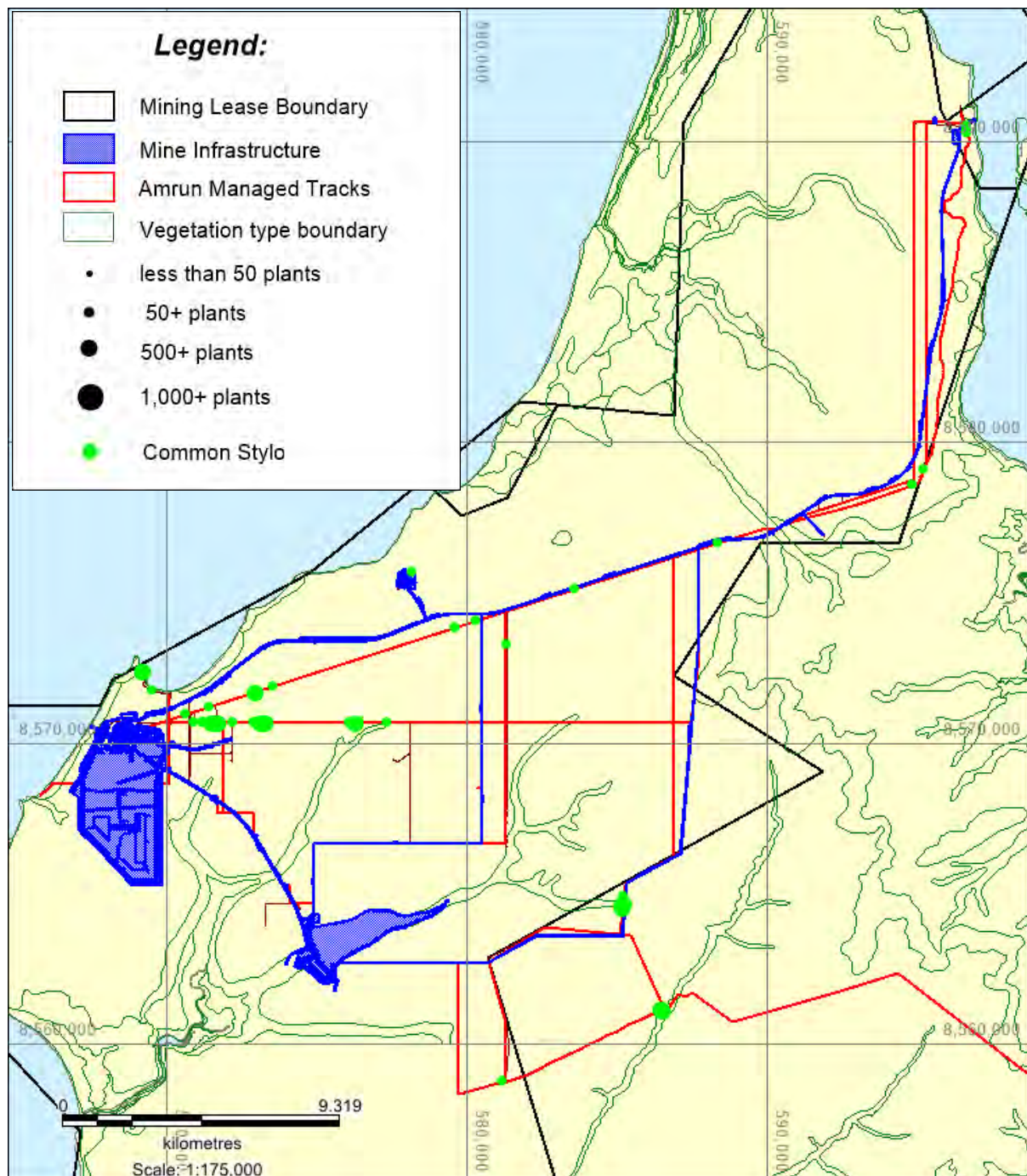


Figure E1 Location of common stylo (*Stylosanthes scabra*) in the Amrun Project area (July 2018)

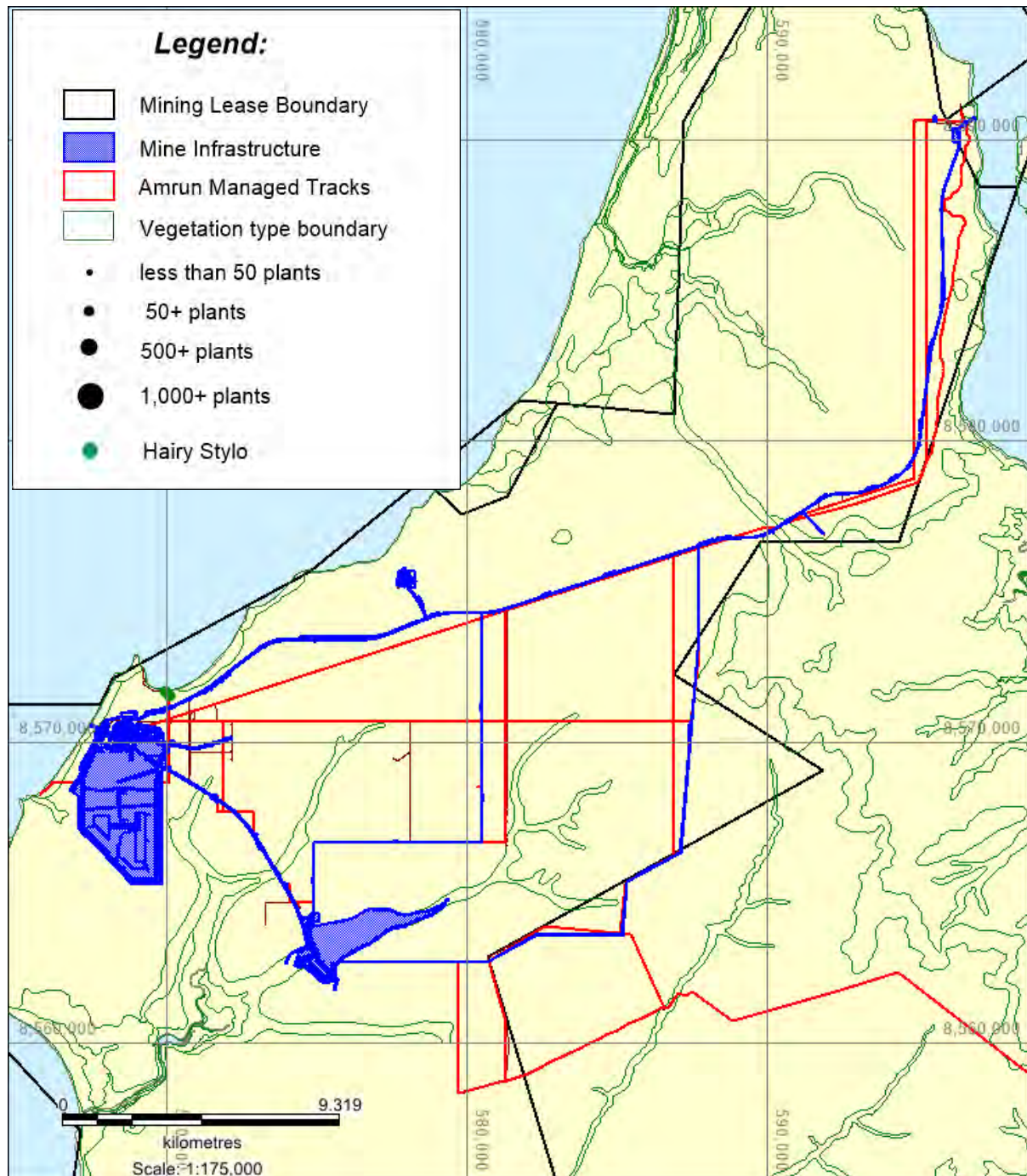


Figure E2 Location of hairy stylo (*Stylosanthes guianensis*) in the Amrun Project area (July 2018)

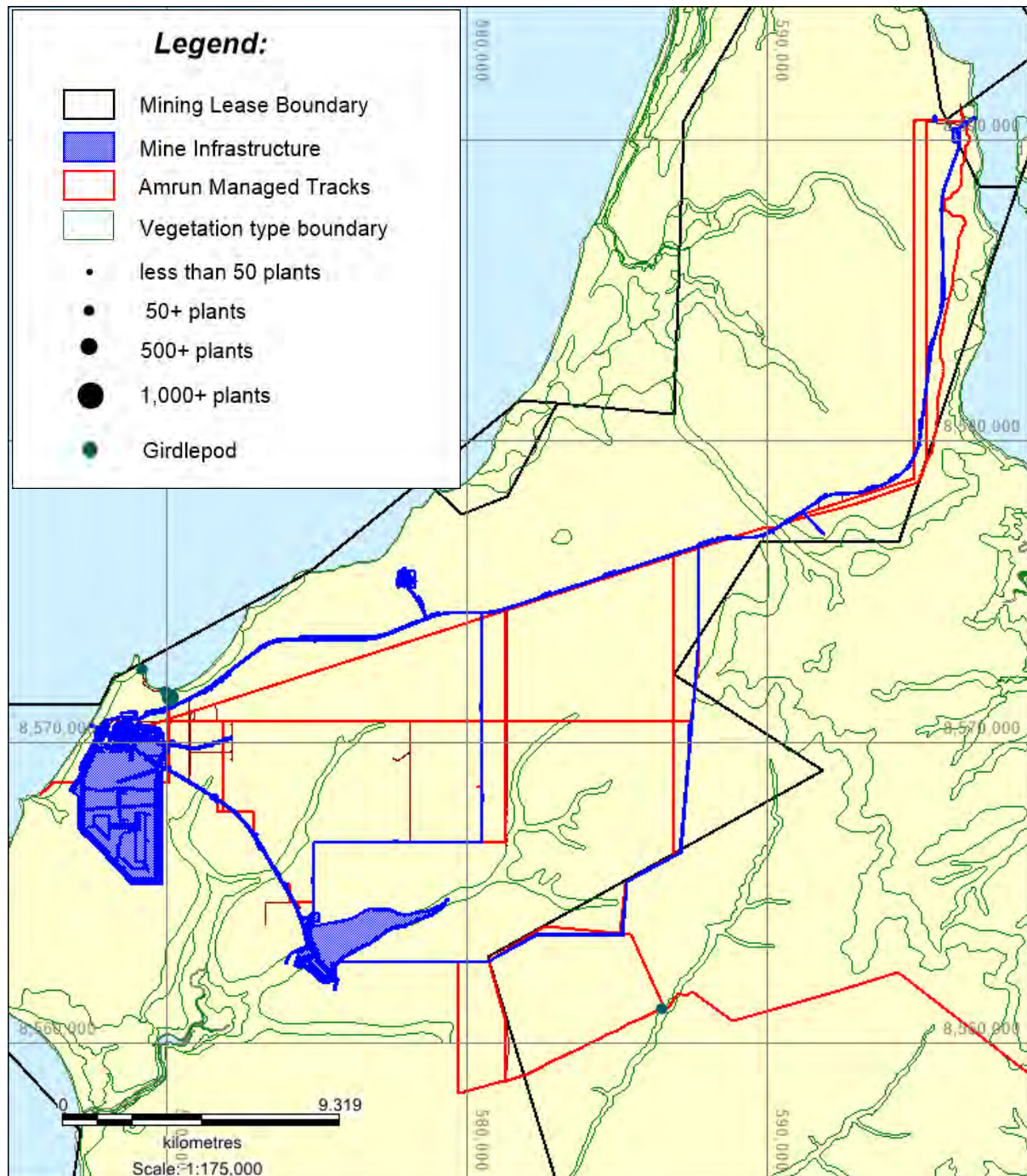


Figure E3 Location of tropical girdlepod (*Mitracarpus hirtus*) in the Amrun Project area (July 2018)

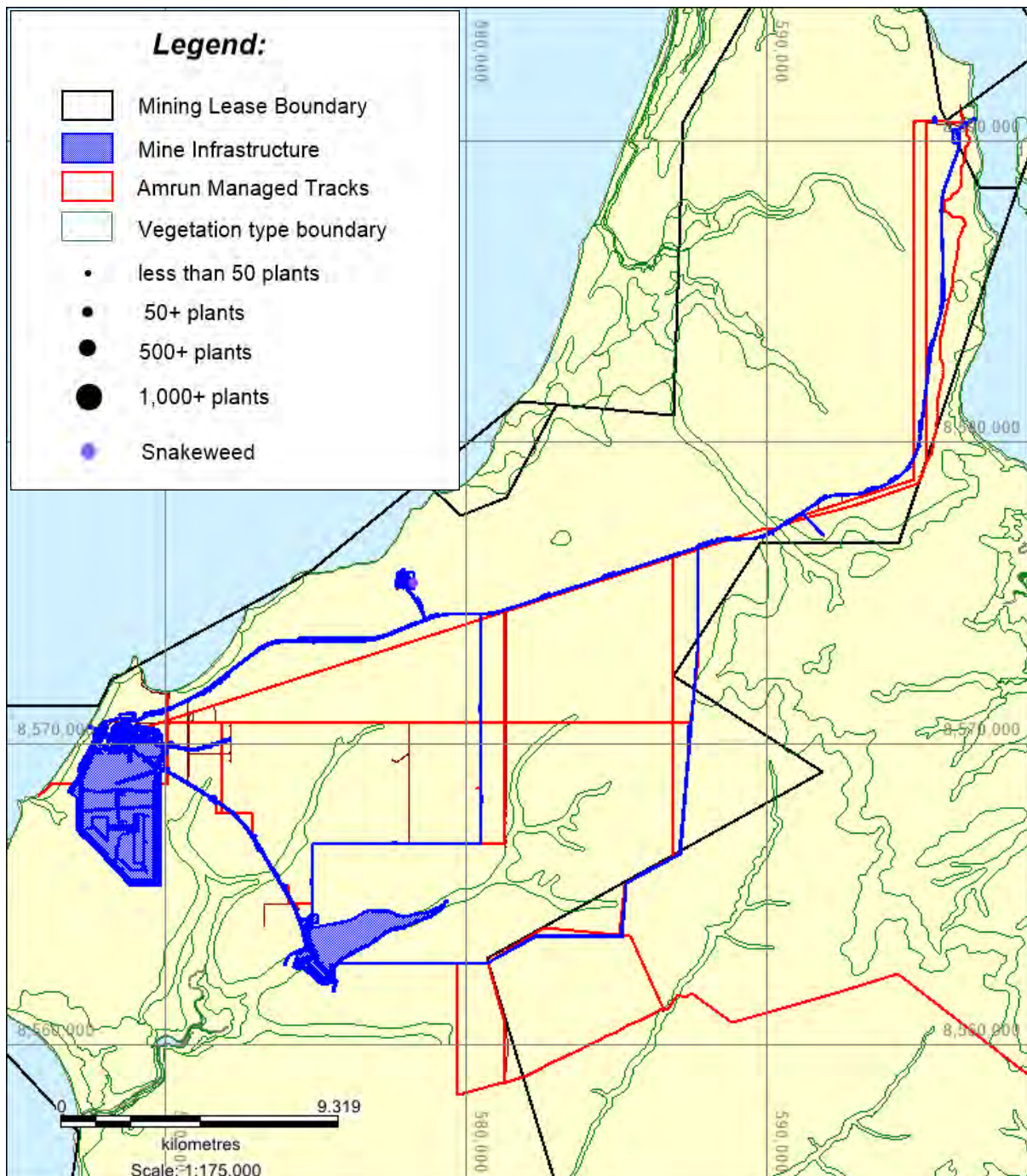


Figure E4 Location of Jamaican snakeweed (*Stachytarpheta jamaicensis*) in the Amrun Project area (July 2018)

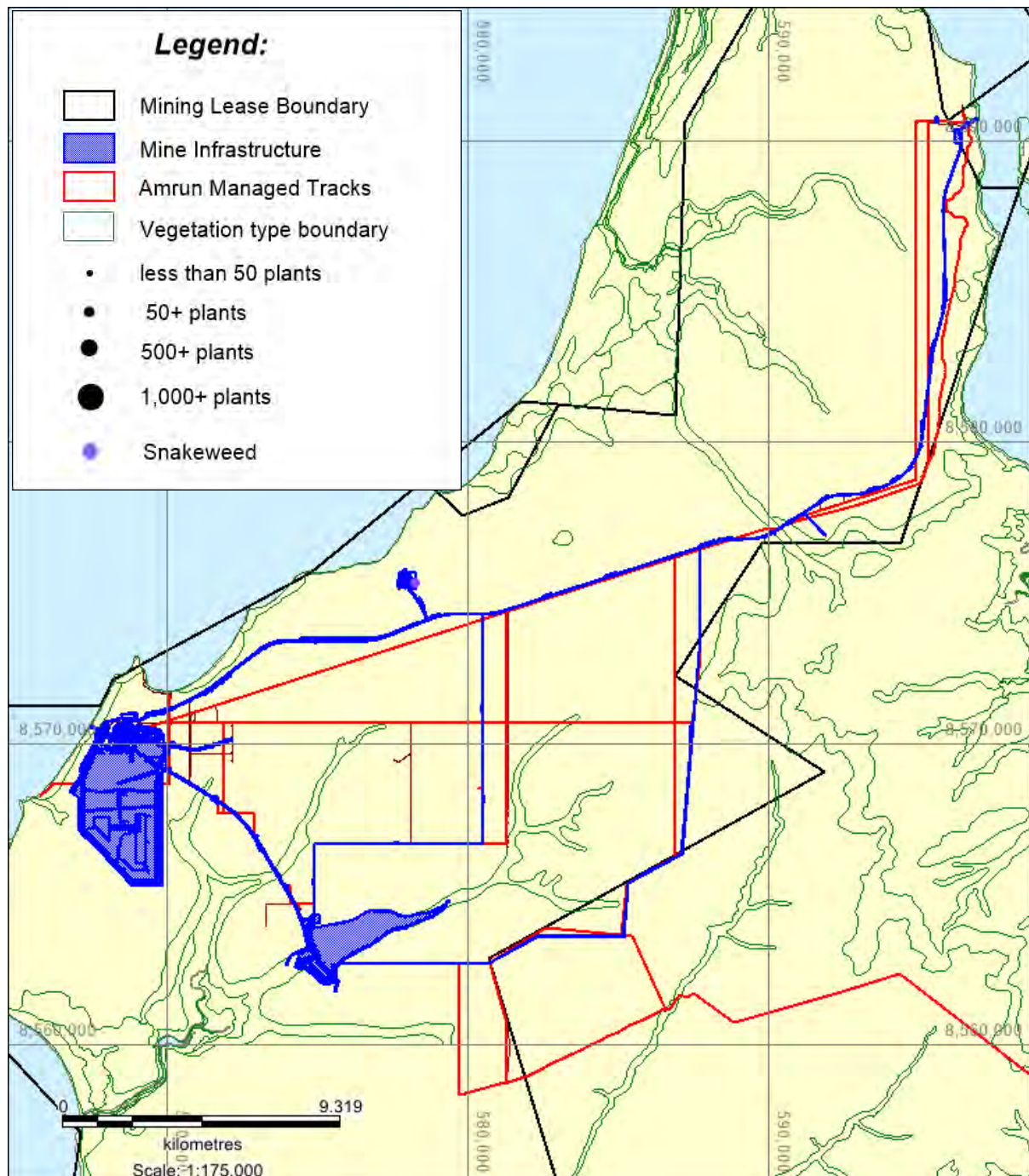


Figure E5 Location of Jamaican snakeweed (*Stachytarpheta jamaicensis*) in the Amrun Project area (July 2018)

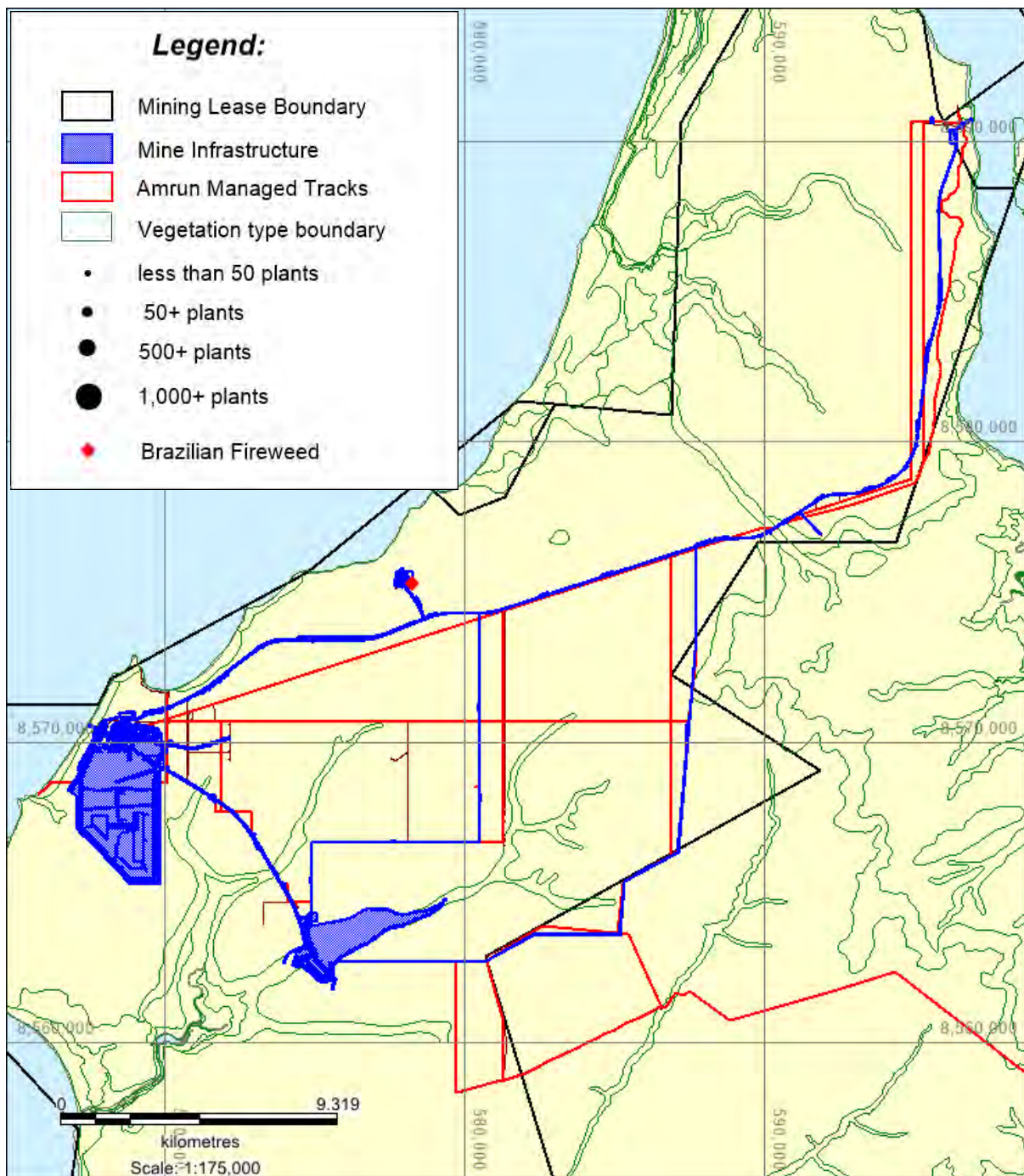


Figure E6 Location of Brazilian fireweed (*Erechtites valerianifolius*) in the Amrun Project area (July 2018)

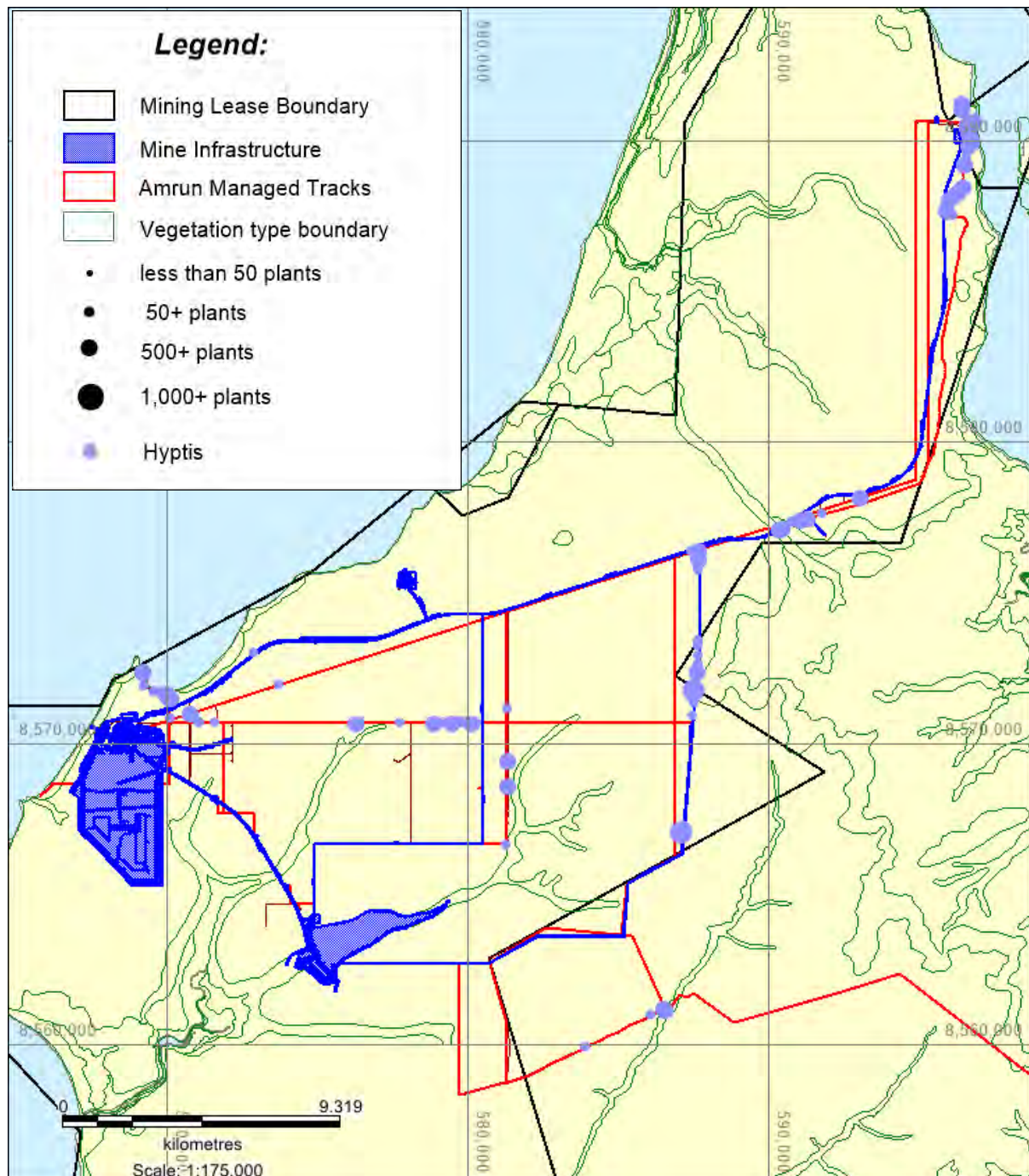


Figure E7 Location of hyptis (*Mesosphaerum suaveolens*) in the Amrun Project area (July 2018)

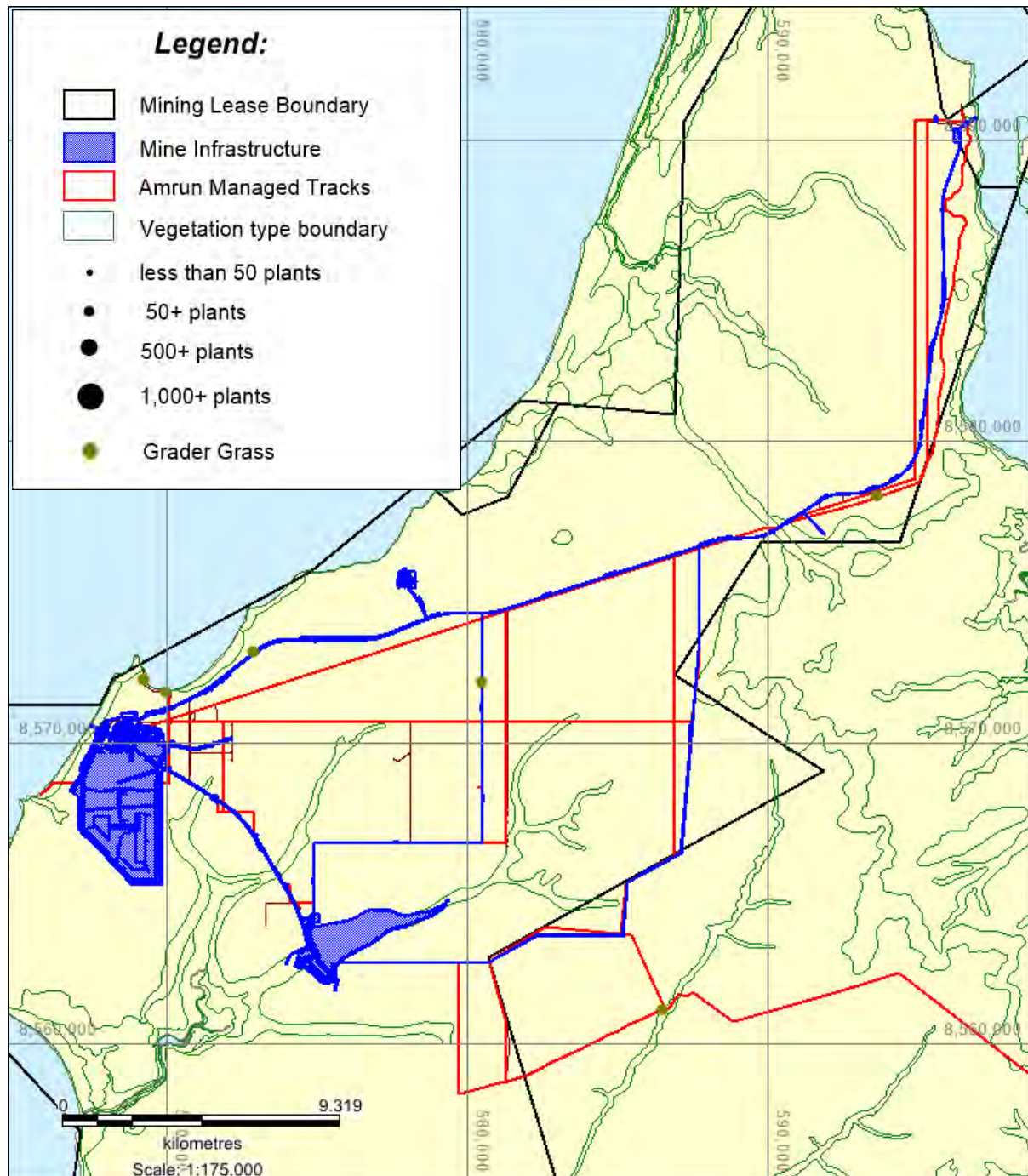


Figure E8 Location of grader grass (*Themeda quadrivalvis*) in the Amrun Project area (July 2018)

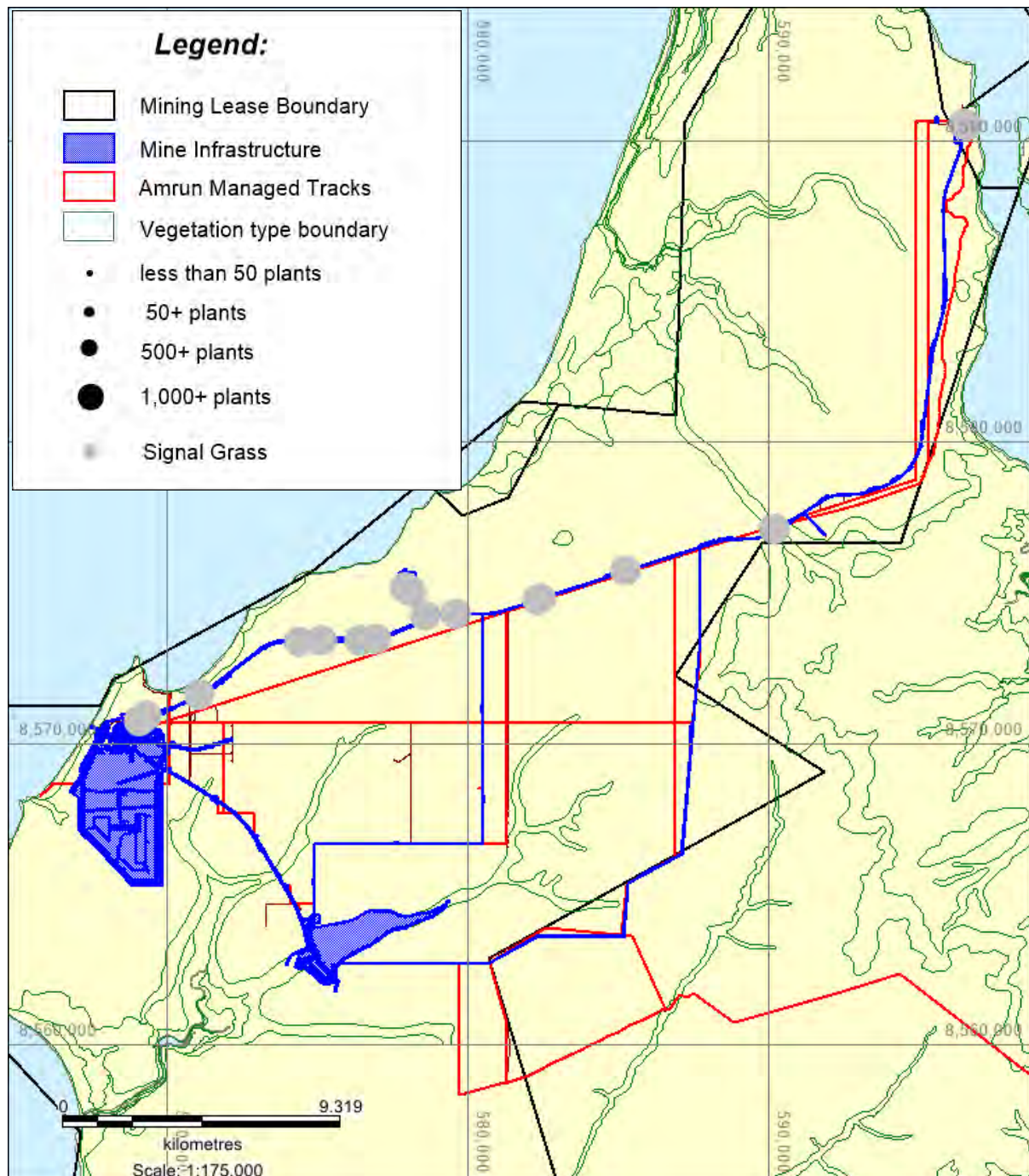


Figure E9 **Location of signal grass (*Urochloa decumbens*) in the Amrun Project area (July 2018)**

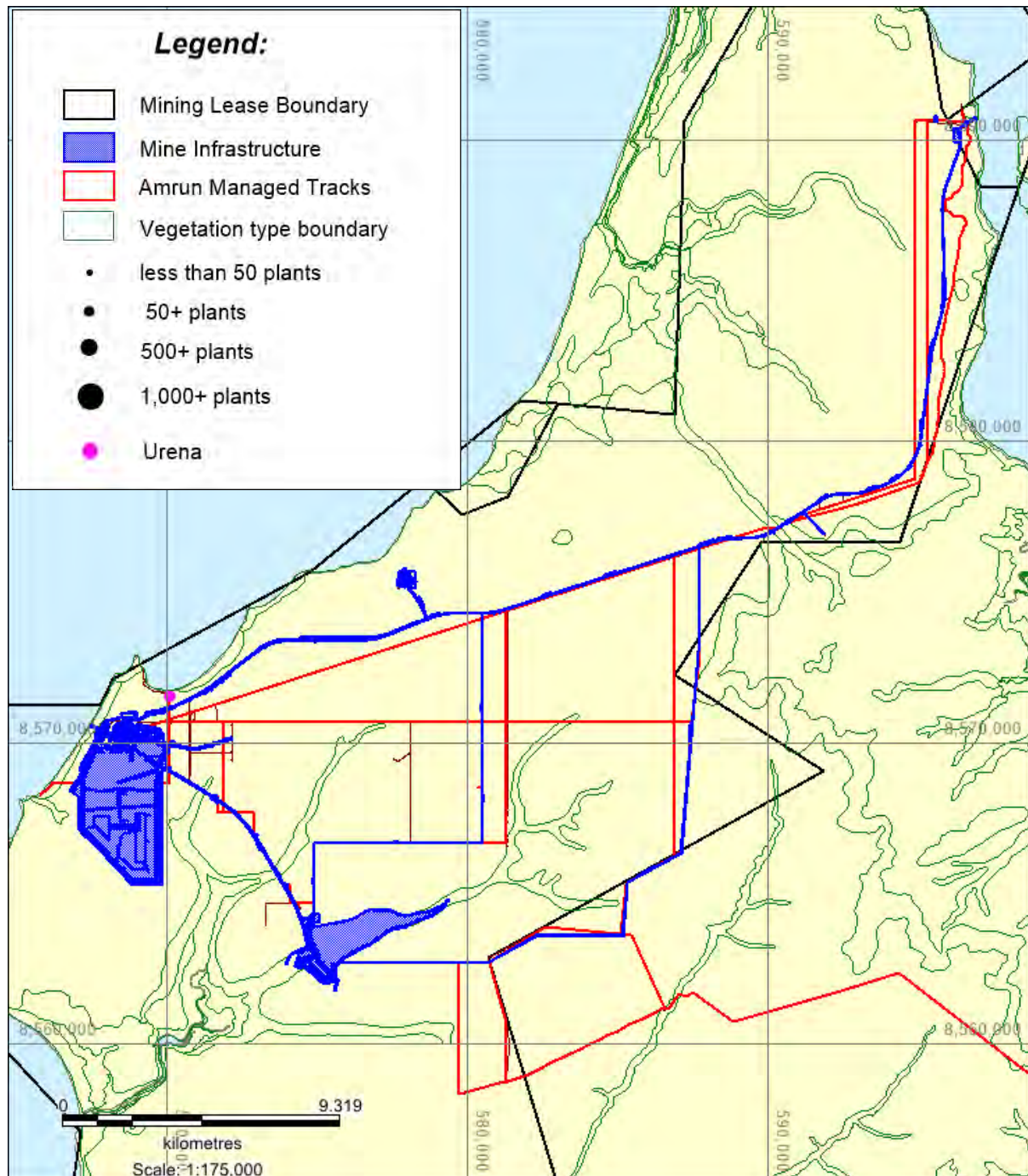


Figure E10 Location of pink-flowered Chinese burr (*Urena lobata*) in the Amrun Project area (July 2018)

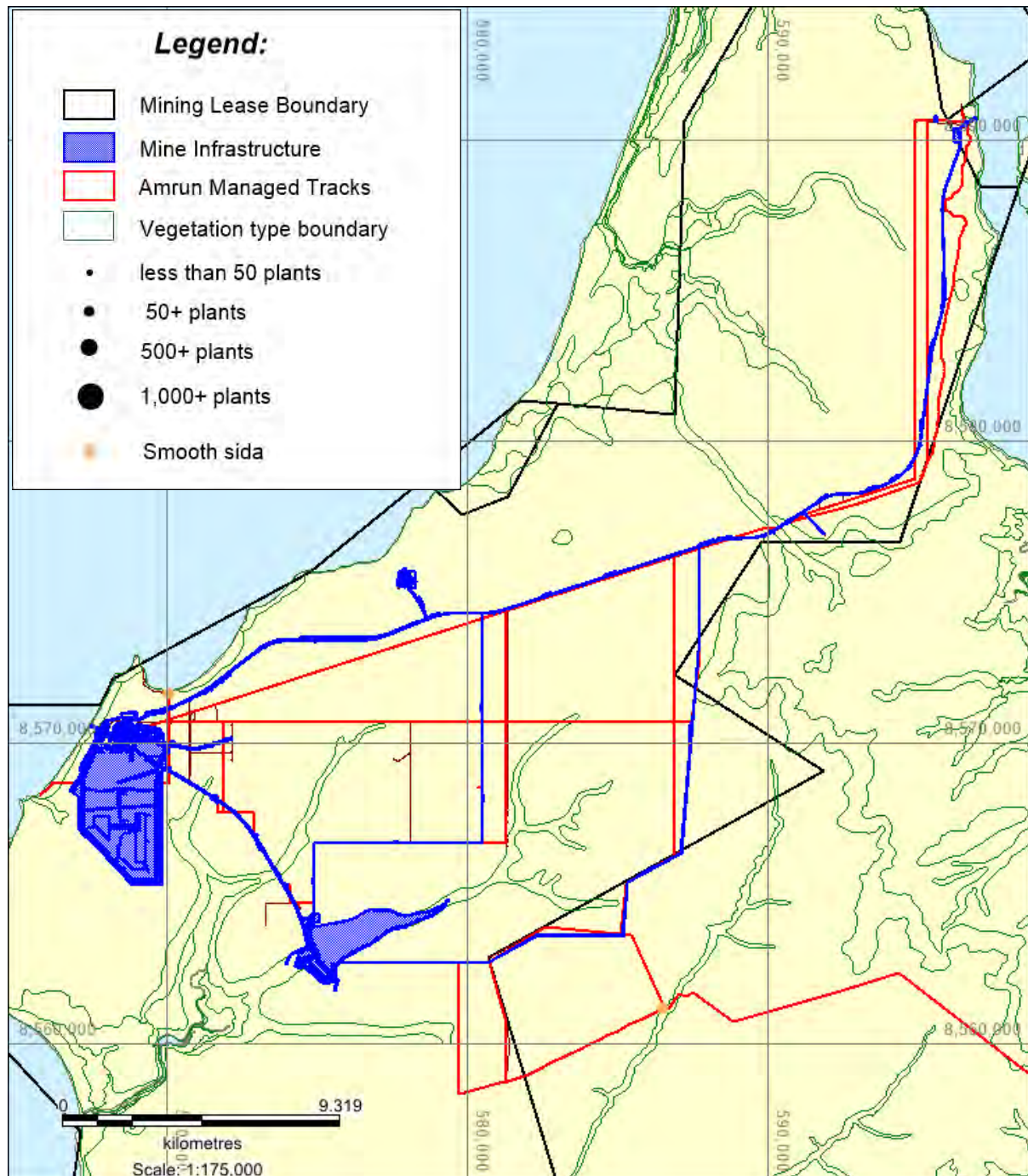


Figure E11 Location of smooth sida (*Sida acuta*) in the Amrun Project area (July 2018)

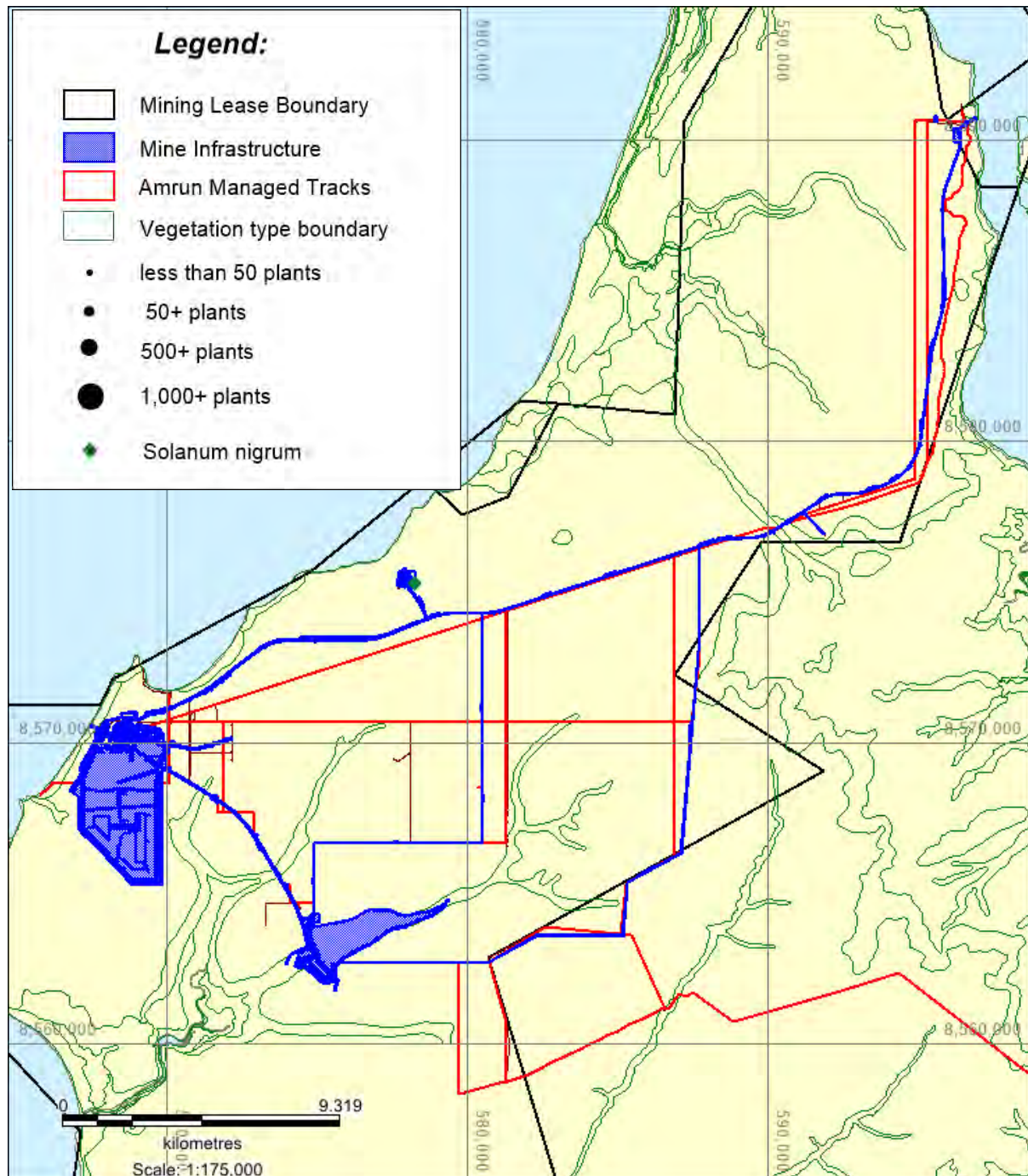


Figure E12 Location of black nightshade (*Solanum nigrum*) in the Amrun Project area
(July 2018)

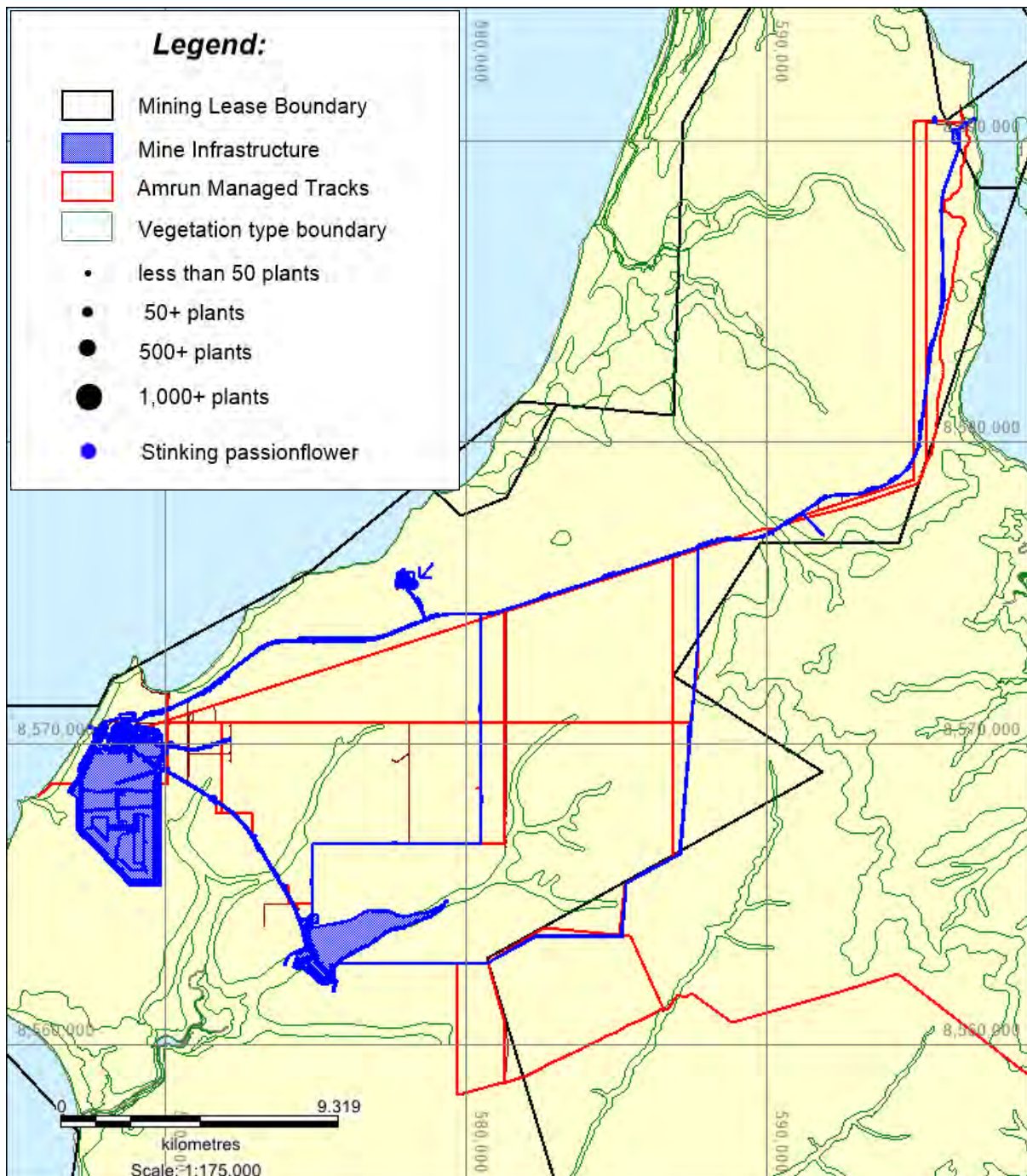


Figure E13 Location of stinking passionflower (*Passiflora foetida*) in the Amrun Project area (July 2018)

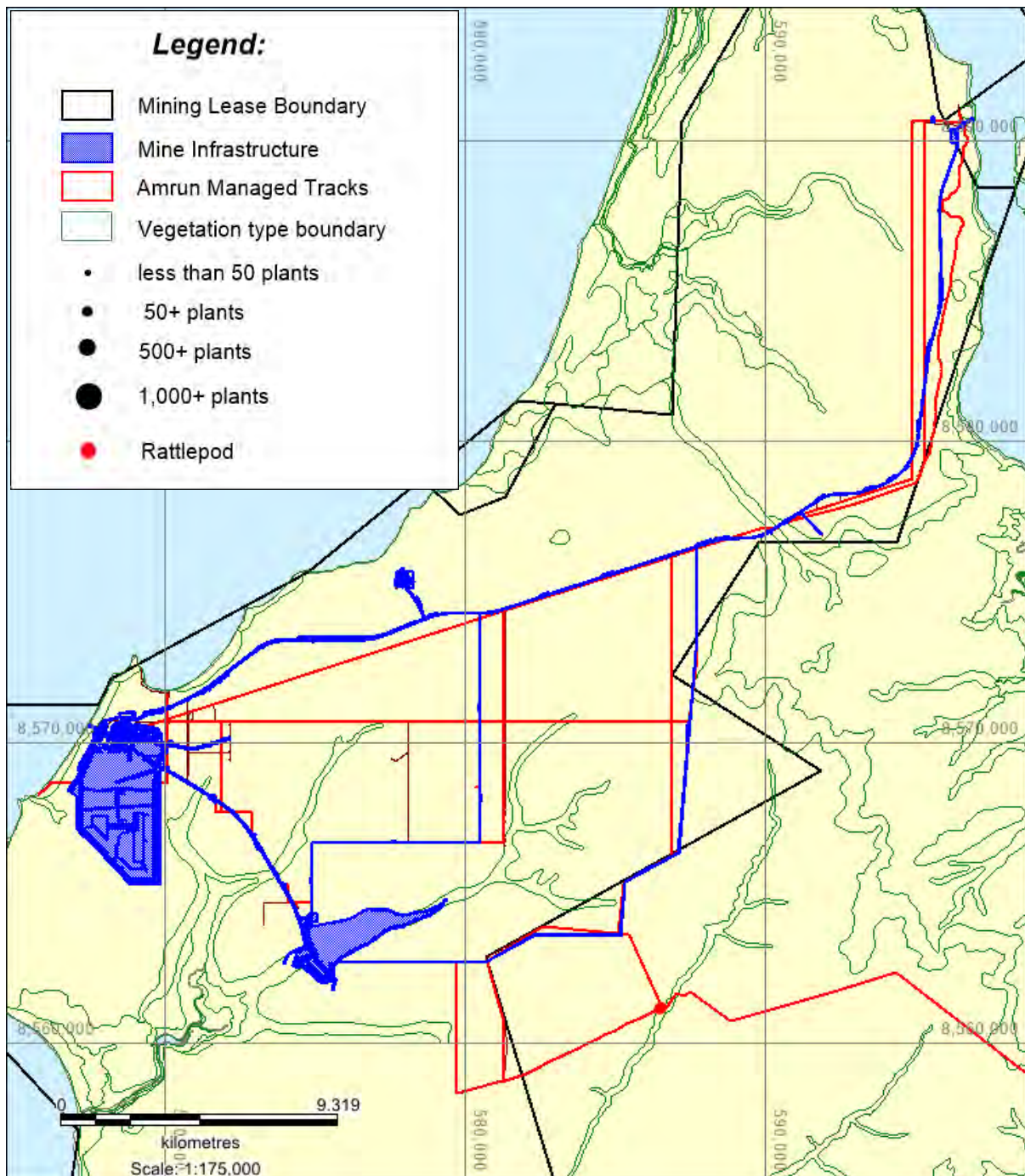


Figure E14 Location of rattlepod (*Croatalaria goorensis*) in the Amrun Project area (July 2018)

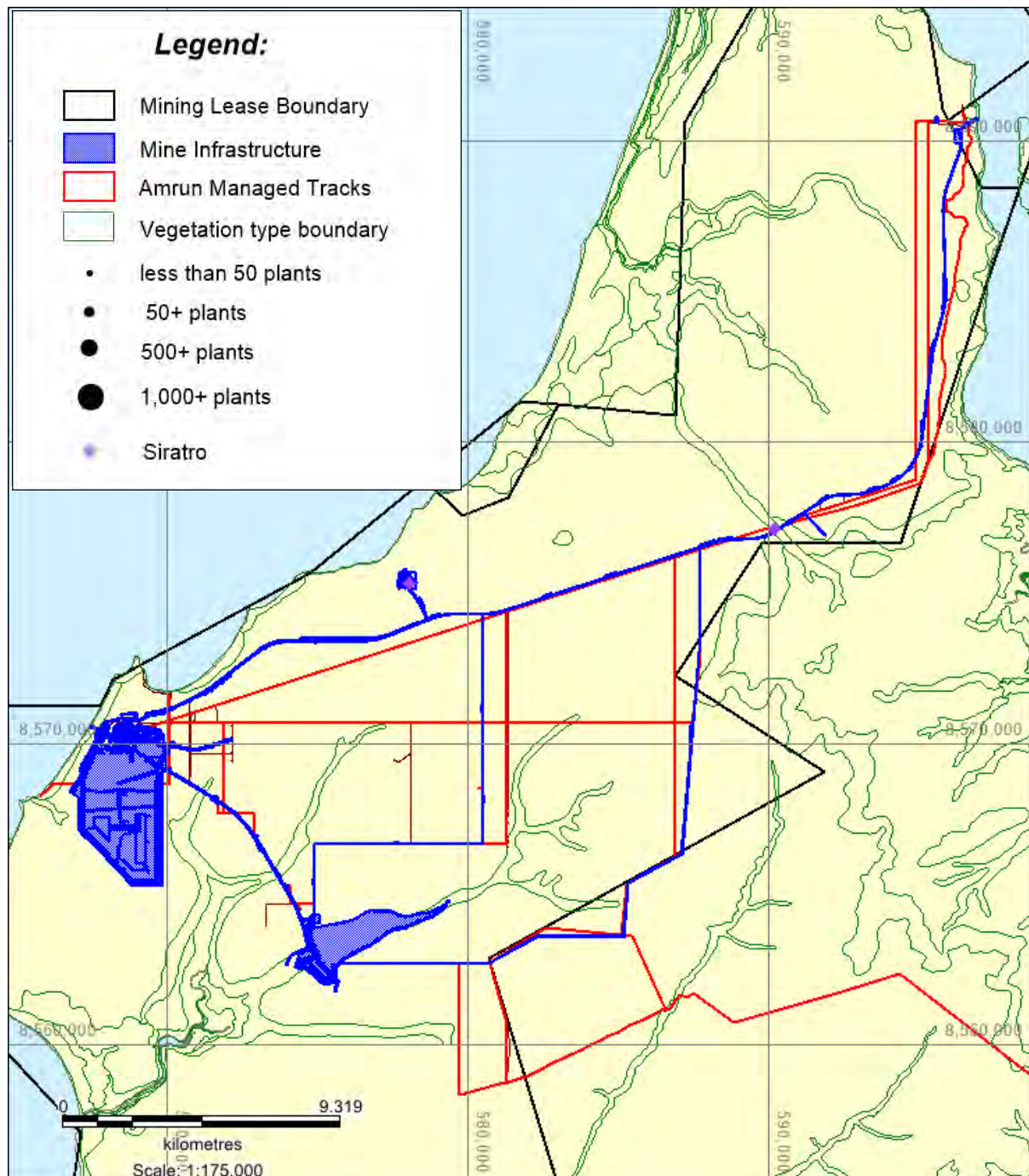


Figure E15 Location of siratro (*Macropodium atropurpureum*) in the Amrun Project area (July 2018)

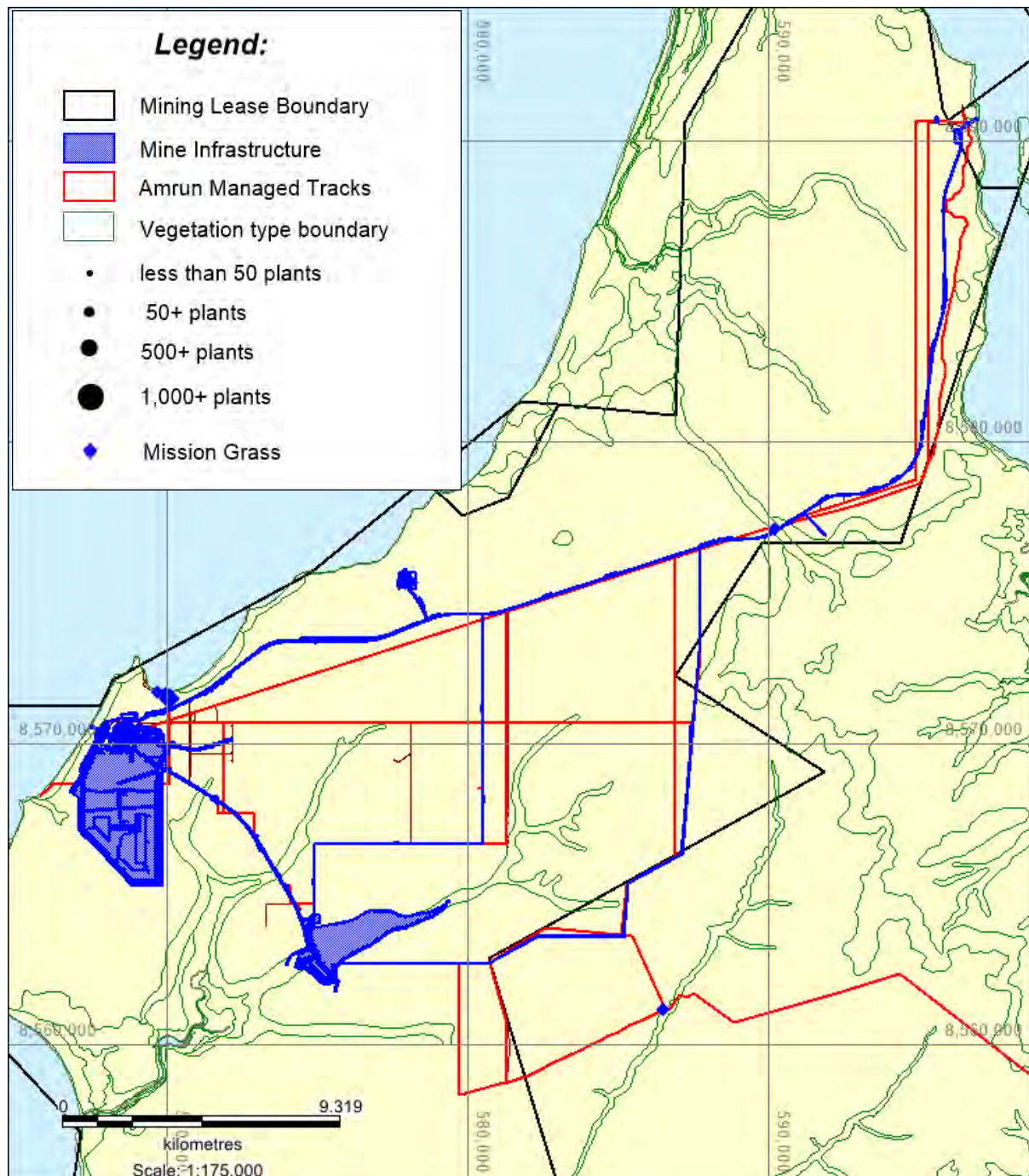


Figure E16 Location of mission grass (*Cenchrus pedicellatus*) in the Amrun Project area (July 2018)

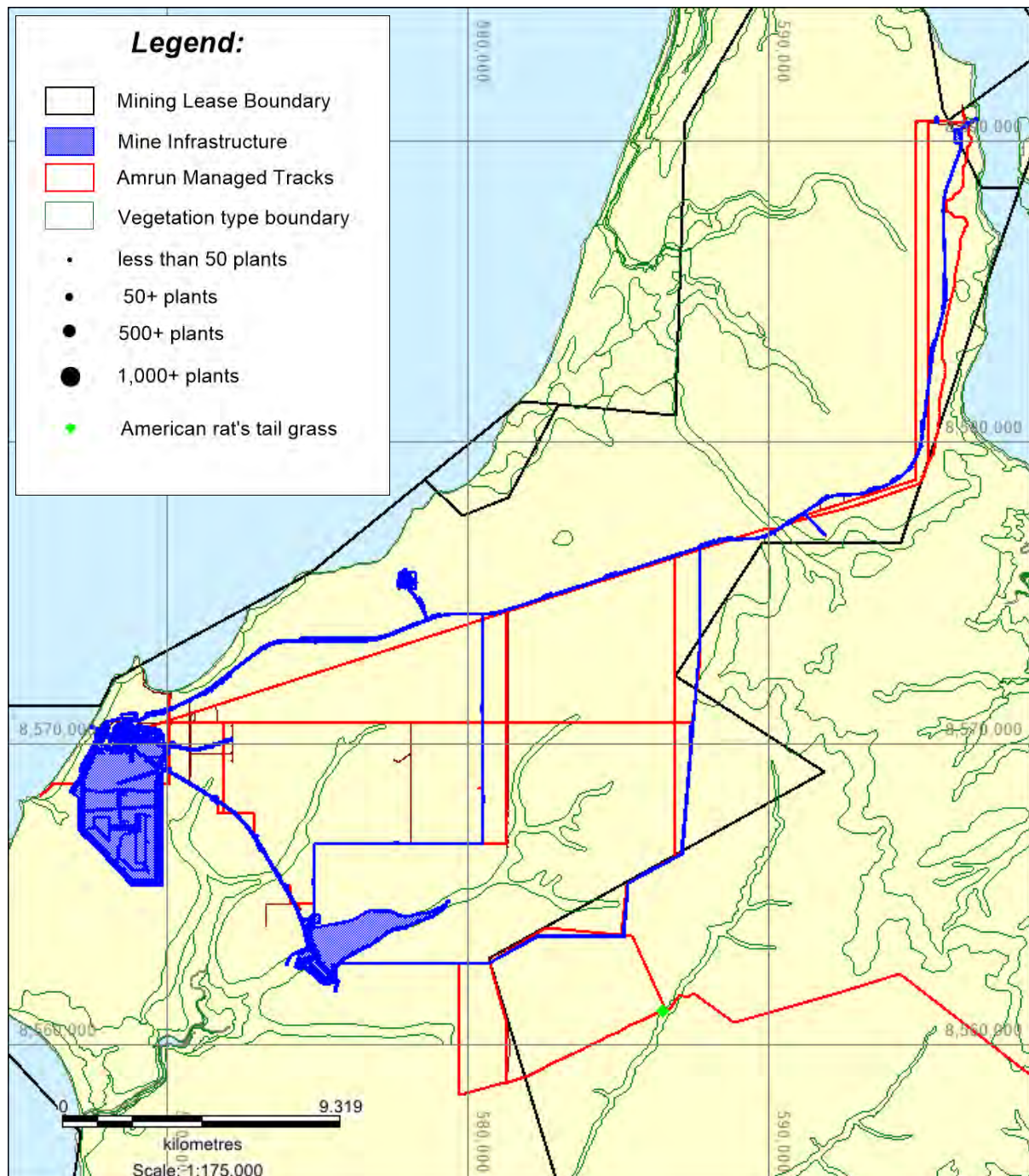


Figure E17 Location of American rat's tail grass (*Sporobolus jacquemontii*) in the Amrun Project area (July 2018)

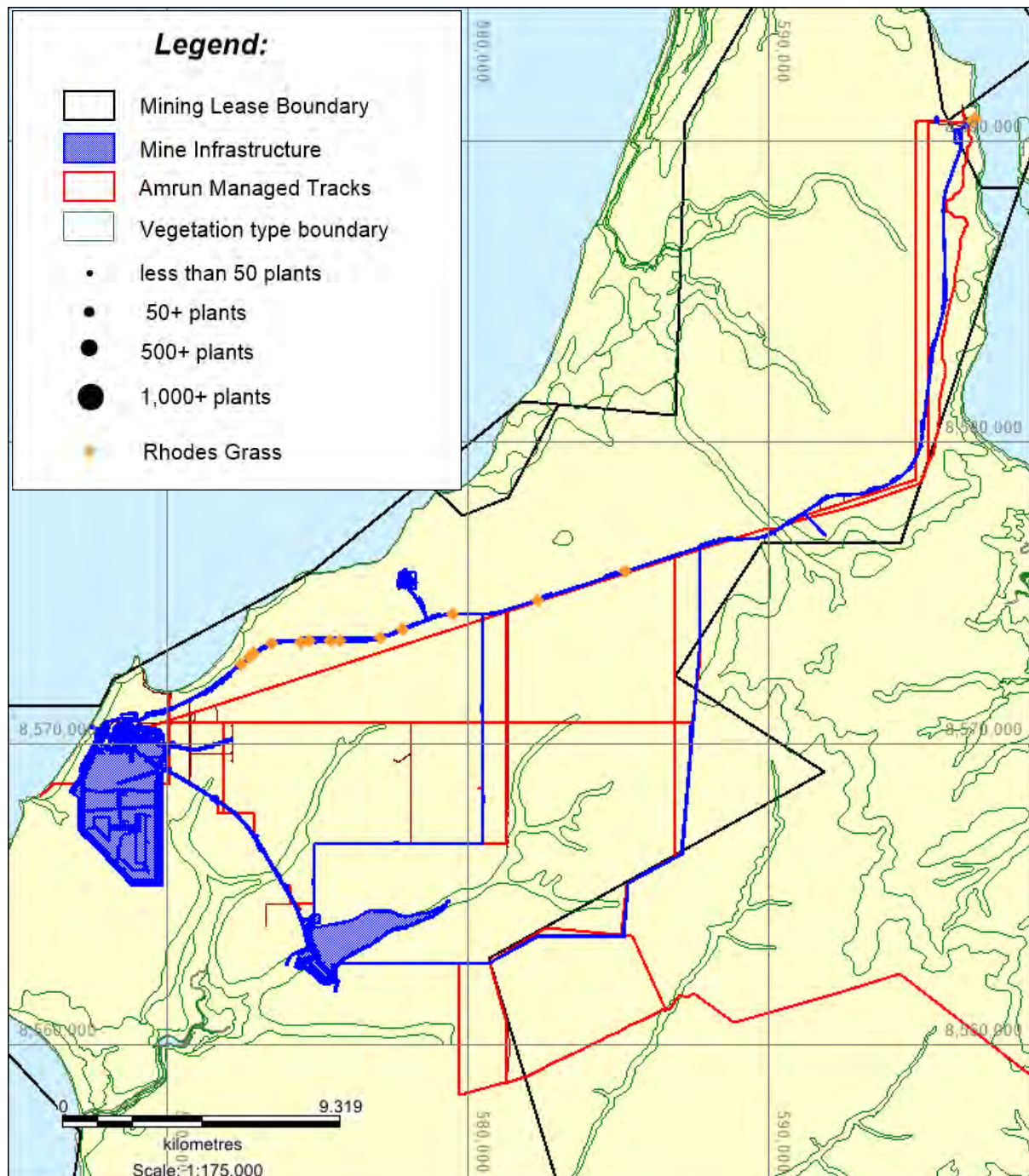


Figure E18 Location of Rhode's grass (*Chloris gayana*) in the Amrun Project area (July 2018)

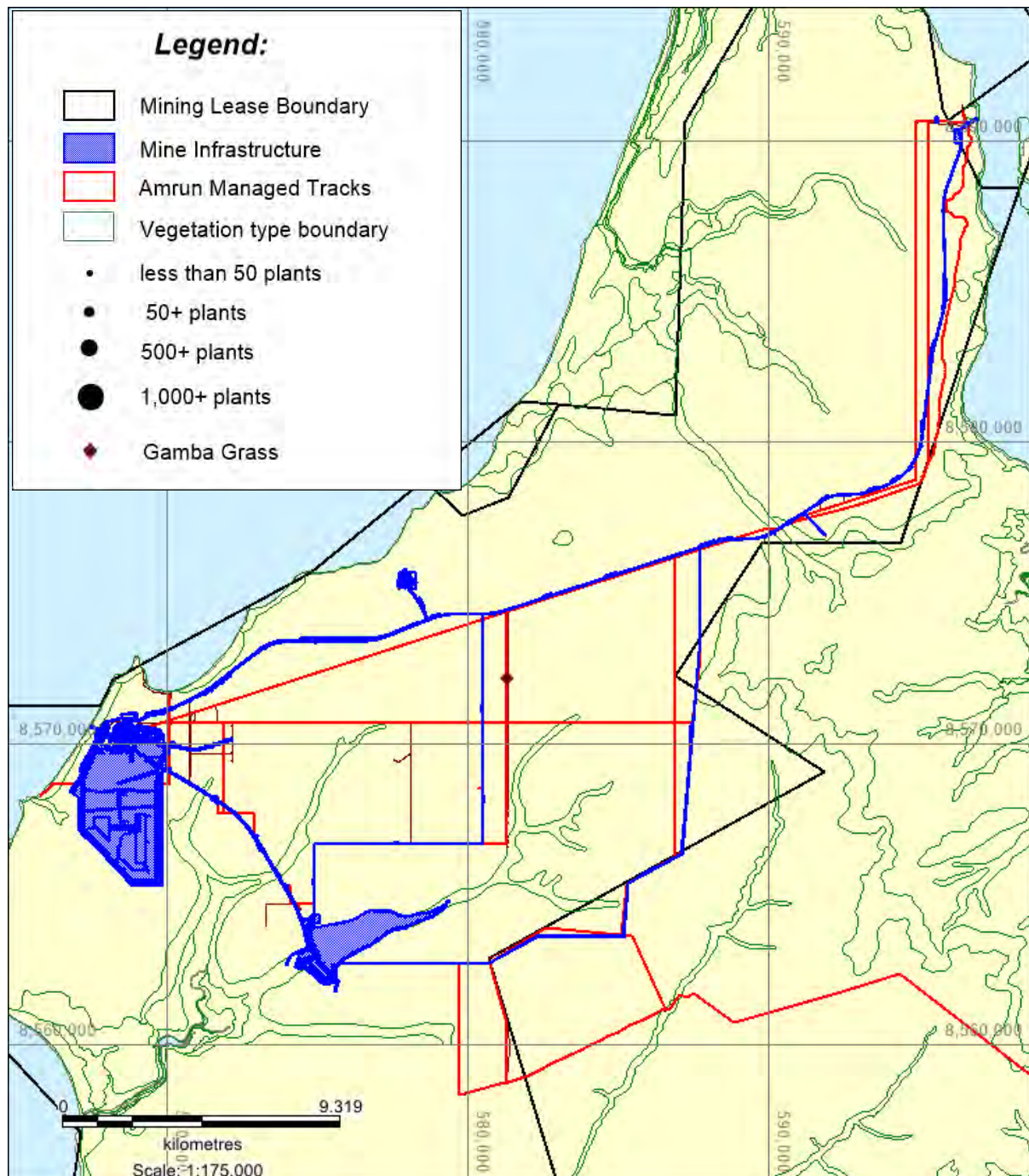


Figure E19 Location of Gamba grass (*Andropogon gayanus*) in the Amrun Project area (July 2018)

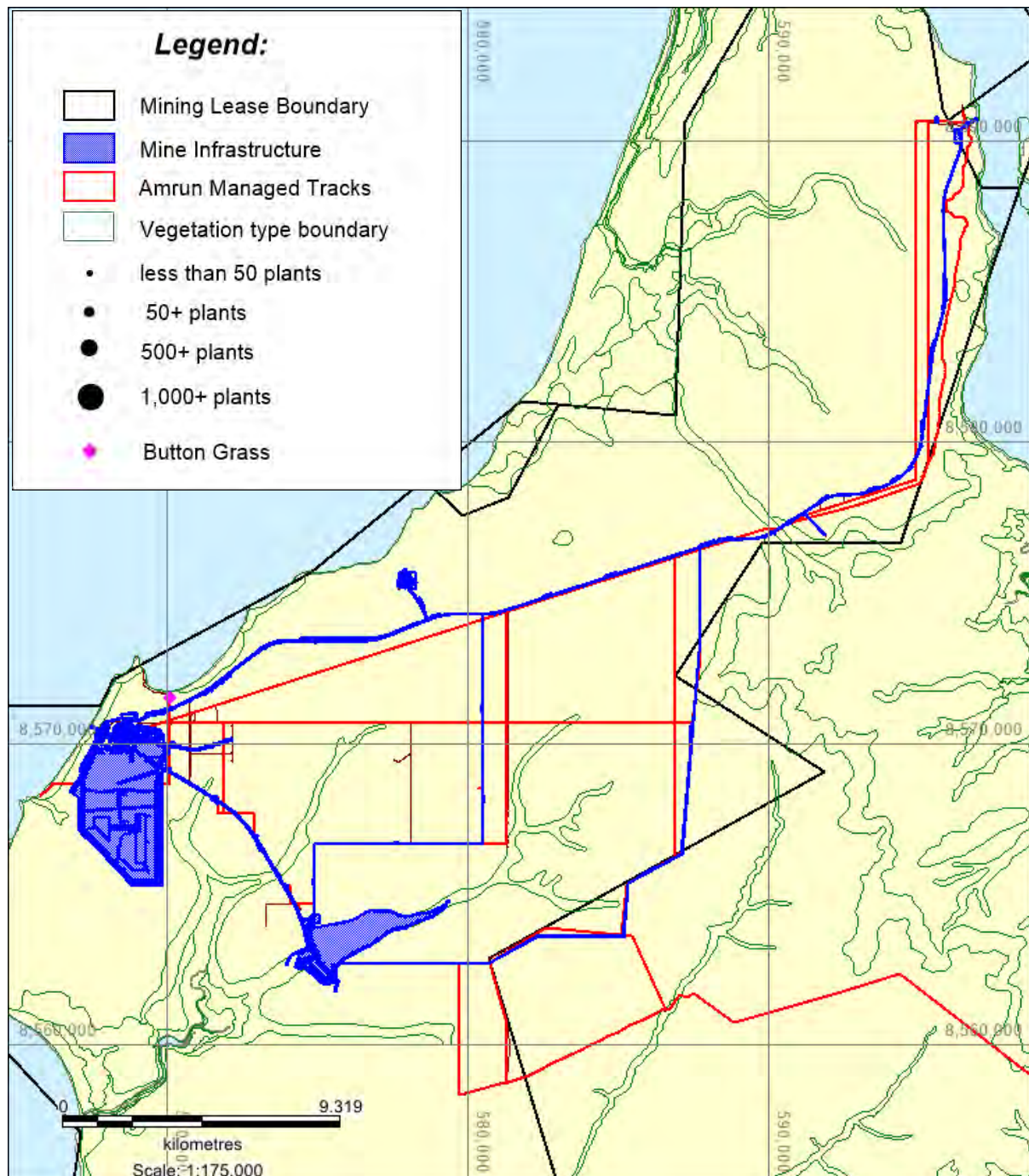


Figure E20 Location of button grass (*Dactyloctenium aegyptium*) in the Amrun Project area (July 2018)