Targeted Flora Survey, Laguna Green Granite Quarry, Marnigarup Rd, Jerramungup, Western Australia

17 November 2023

Nathan McQuoid

Landscape Ecologist, McQuoid Ecology and Design

Report prepared for Australia Jowin Mining Industry Pty Ltd Laguna Green Granite Quarry Project

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Cover photo: Threatened flora *Myoporum cordifolium* recorded in the targeted survey in the southern area of Lot 1, Marnigarup Rd, Jerramungup.

Limitations Statement

This report has been solely prepared for the Australia Jowin Mining Industry Pty Ltd and Newland Environmental. No express or implied warranties are made by Nathan McQuoid Landscape Ecologist of McQuoid Ecology and Design, regarding the findings and data contained in this report. No new research or field studies were conducted other than those specifically outlined in this report. All of the information details included in this report are based upon the research provided and obtained at the time Nathan McQuoid Landscape Ecologist conducted its assessment.

In undertaking this work the author has made every effort to ensure the accuracy of the information used. Any conclusions drawn or recommendations made in the report are done in good faith and the consultants take no responsibility for how this information and the report are used subsequently by others.

Please note that the contents in this report may not be directly applicable towards another organisation's needs. Nathan McQuoid Landscape Ecologist accepts no liability whatsoever for a third party's use of, or reliance upon, this specific report.

Summary

The Laguna Green Granite Quarry property Lot 1 sits on Marnigarup Rd East, south east of Jerramungup near the south coast of Western Australia. Lot 1 is approximately 32 ha in size.

Lot 1 is surrounded by farmland on rural zoned private properties and adjoins public road reserve to the north.

The owner of Lot 1, Australia Jowin Mining Industry Pty Ltd (AJMI), engaged Nathan McQuoid Landscape Ecologist of Bremer Bay in 2019 to undertake a field survey to assess the proposed quarry target area on Lot 1 for the presence of the *Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia* (*Proteaceae Dominated Kwongkan Shrubland*) Nationally Listed Threatened Ecological Community (TEC) and WA State Listed Priority Ecological Community (PEC); and the presence of Threatened and Priority Flora. The 2019 survey report is entitled:

- "Assessment for Threatened and Priority Ecological Communities and Flora, Laguna Green Granite Quarry, Marnigarup Rd, Jerramungup, Western Australia, April 2019 (McQuoid 2019)" (IBSA-2023-0245).

At the time of survey in April 2019, vegetation in Lot 1 was extensively affected by a recent fire such that species confirmation was not always possible. One recommendation from McQuoid (2019) was that:

- A follow-up spring survey in 2019 or 2020 would help confirm the presence or absence of Threatened and Conservation Priority Flora, not able to be fully determined by this autumn 2019 survey.

Additionally, Lot 1 one is now under clearing permit application (CPS 10280/1). As part of the preliminary assessment of the application, the Department of Water and Environmental Regulation (DWER) found that two threatened flora species are likely to be found in, or in proximity to, the application area; these species being:

- Jerramungup Myoporum (*Myoporum cordifolium*); and
- Dwarf spider Orchid (*Caladenia bryceana* subsp. *bryceana*).

AJMI then engaged Nathan McQuoid Landscape Ecologist of McQuoid Ecology and Design to conduct a targeted flora survey of Lot 1 for conservation significant species, and specifically *Myoporum cordifolium* and *Caladenia bryceana* subsp. b*ryceana.*

The conservation flora survey was undertaken on 28 September 2023 by Nathan McQuoid and Charles Newland Field Ecologist from Newland Environmental, and then on 29 September by Mr Newland conducting additional infill mapping. Charles Newland conducted further targeted flora searches and infill traverses on 29 September 2023.

The whole of Lot 1 was traversed by 10 to 20m spacings (approximately) by the two field ecologists.

Caladenia bryceana subsp. *bryceana* was not located despite an intensive search. Other orchards were present, indicating that the orchard flowering season was still current.

Myoporum cordifolium was recorded in the southern half of Lot 1 in Mallee communities on mineralised soils. *Myoporum cordifolium* occurred as individuals or small groups of plants or in small populations. The locations and numbers of plants counted are provided in this report. *Myoporum cordifolium* was not recorded in the northern areas of Lot 1 where extensive historical quarrying occurred, and where the proposed activities will be located. This was expected by Nathan McQuoid who has local experience with *Myoporum cordifolium,* due to the lack of Mallee communities and the non-mineralised soils in the northern areas of Lot 1.

The following recommendations are proposed:

- No surface disturbances to occur in the area of Lot 1 that is located south of the minor drainage line that bisects Lot 1 in a north westerly direction (the northern extent of the recorded occurrences of *Myoporum cordifolium*). This exclusion area also includes a 50m no surface disturbance conservation buffer extending to the north of the drainage line.

- The boundary of the conservation buffer to be fenced off and sign posted as a "no disturbance exclusion area" with no mention on the signage of the occurrence of rare flora.

- The site layout for the quarry to be designed to maximise the distance between quarrying activities and the recorded locations of *Myoporum cordifolium*.

- All access roads towards the *Myoporum cordifolium* area will be blocked-off and rehabilitated.

- All drainage from the quarry areas will be contained to the quarry areas though the use of water management structures such as drains, berms, interceptor banks sumps and windrows, such that no runoff or quarry process water will enter the drainage line.

- Awareness of the importance of not disturbing the *Myoporum cordifolium* area will be included in the site induction procedures.

- A standard work practice (SWP) for the protection of the *Myoporum cordifolium* will be developed and issued to all site personnel, as well as being posted on the mine notice board.

Acknowledgements

Charles Newland, Principal of Newland Environmental, for assisting with the field survey and with the preparation of figures, spatial data and technical support for the report.

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Location

The Laguna Green Granite Quarry property Lot 1 sits on Marnigarup East Rd, south east of Jerramungup near the south coast of Western Australia (Figure 1, Figure 2). Lot 1 is approximately 32ha in size.

The owner of Lot 1 is Australia Jowin Mining Industry Pty Ltd (AJMI).

Lot 1 is adjoined to the west, south and east by farmland on rural zoned private properties, and to the north by public road reserve vested in the Shire of Jerramungup (Figure 3).

The Bremer River is located to the east of Lot 1, flowing in a southerly direction (Figure 3). There is a minor drainage line that flows through the southern section of Lot 1 into the Bremer River (Figure 3).

Figure 1. Regional location of the Laguna Green Granite Project

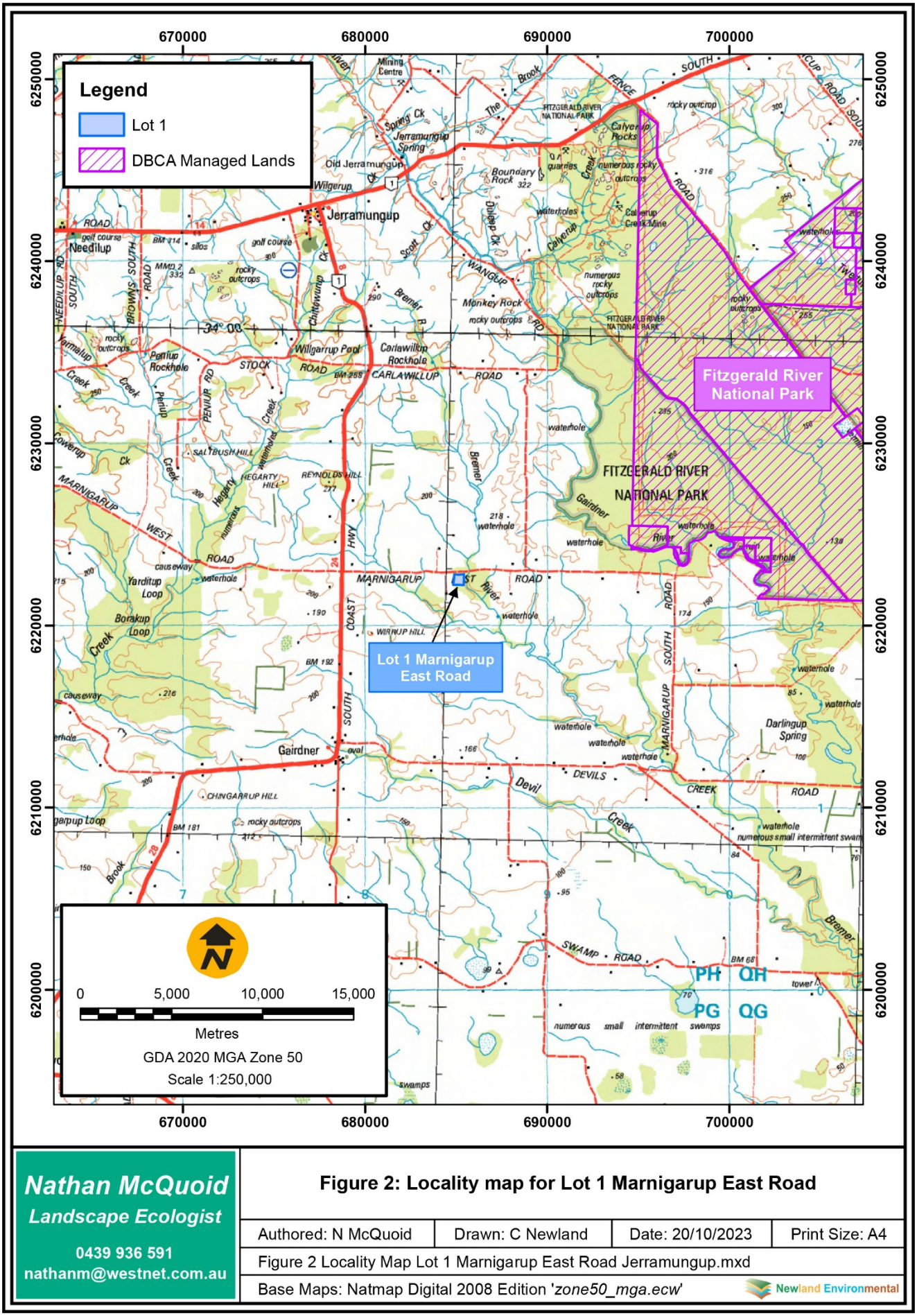

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Figure 2: Locality map for Lot 1 Marnigarup East Road

Authored: N McQuoid	Drawn: C Newland	Date: 20/10/2023	Print Size: A4
Figure 2 Locality Map Lot 1 Marnigarup East Road Jerramungup.mxd			
Base Maps: Natmap Digital 2008 Edition '*zone50_mga.ecw*'			Newland Environmental

Figure 2. Locality of the Laguna Green Granite Quarry Lot 1 Marnigarup Rd

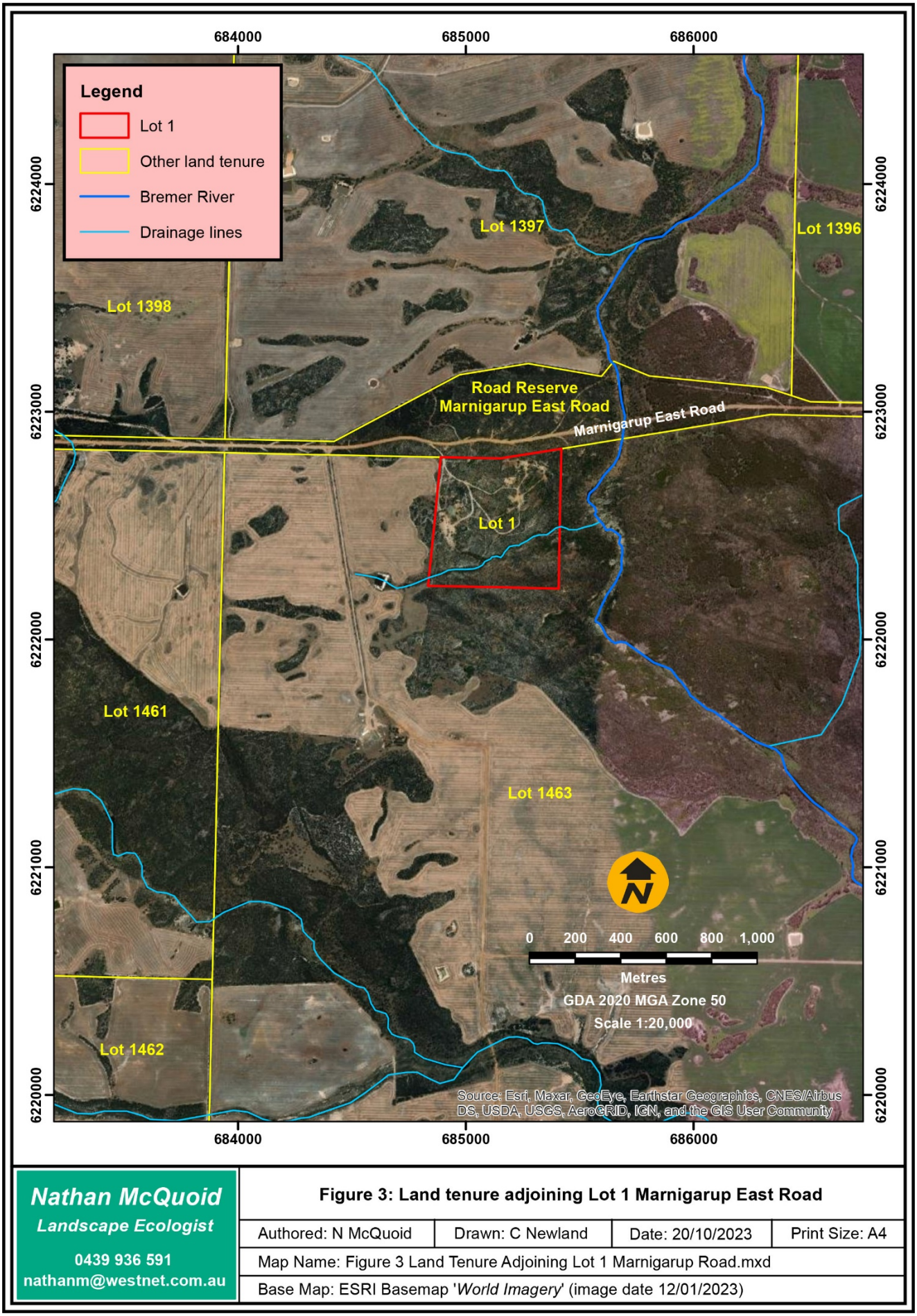

Figure 3. Land tenure adjoining Lot 1 Marnigarup East Rd

Scope and Objectives

AJMI engaged Nathan McQuoid Landscape Ecologist of McQuoid Ecology and Design to conduct a targeted flora survey for conservation significant species at Lot 1, and specifically to search for *Myoporum cordifolium* and *Caladenia bryceana* subsp. *bryceana.*

The objectives were to:

- Conduct a targeted flora survey for conservation significant taxa over the entirety of Lot 1.
- Record the locations of any conservation significant flora and map the extent of any located populations.
- Prepare management recommendations for the protection of any located conservation significant flora.

Background

Nathan McQuoid originally conducted a field survey in April 2019 to assess the proposed quarry target area on Lot 1 for the presence of:

- the *Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia* (*Proteaceae Dominated Kwongkan Shrubland*) Nationally Listed TEC;
- WA State Listed PECs; and
- and the presence of Threatened and Priority Flora.

The 2019 survey report is entitled:

- "Assessment for Threatened and Priority Ecological Communities and Flora, Laguna Green Granite Quarry, Marnigarup Rd, Jerramungup, Western Australia, April 2019 (McQuoid 2019)" (IBSA-2023-0245).

At the time of survey in April 2019, vegetation in Lot 1 was extensively affected by a recent fire such that species confirmation was not always possible. As such, one recommendation from McQuoid (2019) was that:

- A follow-up spring survey in 2019 or 2020 would help confirm the presence or absence of Threatened and Conservation Priority Flora, not able to be fully determined by this autumn 2019 survey.

Additionally, Lot 1 one is now under clearing permit application (CPS 10280/1). As part of the preliminary assessment of the application, the Department of Water and Environmental Regulation (DWER) found that two threatened flora species are likely to be found in, or in proximity to, the application area; these species being:

- Jerramungup Myoporum (*Myoporum cordifolium*); and

- Dwarf spider Orchid (*Caladenia bryceana* subsp. *bryceana*).

AJMI subsequently engaged Nathan McQuoid to conduct a targeted flora survey of Lot 1 for conservation significant species, and specifically *Myoporum cordifolium* and *Caladenia bryceana* subsp. *Bryceana.*

Methods

Field and Desktop Assessment

A pre-survey desktop assessment was undertaken by downloading images of conservation significant flora occurring in the locality and other information on their taxonomy, habitat preference and known distributions. This information was printed out as hard copies and kept in folders that were carried in the field and used as reference guides.

The targeted flora survey was undertaken on 28 September 2023 by field ecologists Nathan McQuoid (Flora Licence FB62000466) and Charles Newland (Flora Licence FB62000498). Charles Newland conducted further targeted flora searches and infill traverses on 29 September 2023.

The survey was undertaken in general accordance the "*Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, Environmental Protection Authority, December 2016*" (EPA 2016) as a "Targeted Survey".

The whole of Lot 1 was traversed by 10 to 20m spacings (approximately) by the two field ecologists on 28 September 2023 (one full field day). The area where *Myoporum cordifolium* was located was subjected to a secondary intensive survey effort using griding to define the limits of the population, and then searching in surrounding areas for any outlying individuals. Further infill traverses were conducted on 29 September 2023 by one ecologist at the area where *Myoporum cordifolium* was located to ensure that all individuals had been recorded, and in other areas of Lot 1 to re-check that they were free of this species (half a field day). When continuous populations were located, the perimeter of the population was mapped using a series of waypoints. The total field survey time was 2.5 person days (1 day x 2 people and 0.5 days x 1 person).

Spatial data was recorded using a Garmin 66ST GPS. The spatial data consisted of GPS waypoints and track logs. A Unistrong UT12P tablet was loaded with the spatial coordinates for Lot 1 as well as an aerial background map that was used to navigate on site. The GPS datum was WGS 1984 and was projected in GIS to GDA 2020 MGA Zone 50 for mapping purposes and for generation of spatial data. Photographs were taken using a Panasonic Lumix FT3 camera and a Samsung Galaxy 21 Ultra smartphone.

The location of transects for the targeted flora survey are displayed in Figure 4.

Spatial data from the survey was converted into the "Index of biodiversity surveys for assessments" (IBSA) format for the following available categories:

- Survey details (the entirety of Lot 1).
- Sample sites (the traverse routes).
- Flora (locations of *Myoporum cordifolium*).

The IBSA datasets will be lodged for this survey.

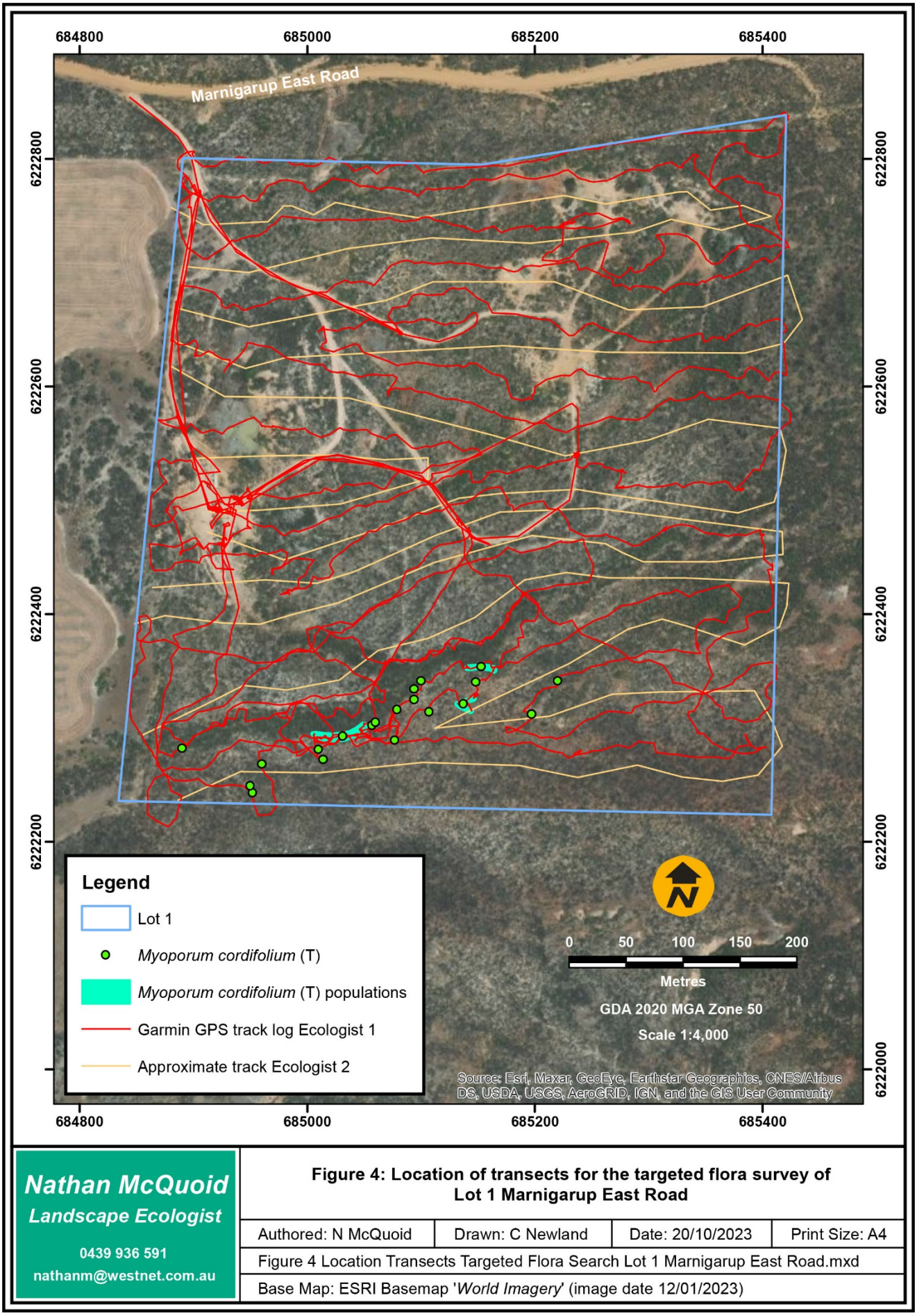

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Figure 4: Location of transects for the targeted flora survey of Lot 1 Marnigarup East Road

Authored: N McQuoid	Drawn: C Newland	Date: 20/10/2023	Print Size: A4
Figure 4 Location Transects Targeted Flora Search Lot 1 Marnigarup East Road.mxd			
Base Map: ESRI Basemap '*World Imagery*' (image date 12/01/2023)			

Figure 4. Location of transects for the targeted flora survey of Lot 1 Marnigarup East Road

Constraints and Limitations

The author has a significant working knowledge of the Threatened, Priority and other conservation significant flora of the Bremer Bay and Jerramungup areas. This includes experience in flora survey work in the Jerramungup and Ravensthorpe area through involvement in the investigation of floristics and vegetation in a number of projects and surveys in the area. One such project included the vegetation mapping of the Ravensthorpe Range (Craig *et al.* 2008). Numerous other Threatened and Priority Flora surveys have been undertaken such as for mineral exploration developments, walking trails, and for nominations of TECs including the Kwongkan TEC (Commonwealth of Australia 2014). From significant past experience, the author is able to infer the presence of TEC's in the Jerramungup and Ravensthorpe area. In relation to this survey, the author is familiar with the conservation significant flora that could occur in the Lot 1 locality, and has previously recorded and mapped *Myoporum cordifolium* and *Caladenia bryceana* subsp. *bryceana*.

The timing of the survey at the end of September was considered optimal for a spring survey and in line with the flowering seasons for *Myoporum cordifolium* and *Caladenia bryceana* subsp. b*ryceana*. This was evidenced by *Myoporum cordifolium* being recorded in full flower on the survey days. In regards to *Caladenia bryceana* subsp. *bryceana,* although this species was not recorded in Lot 1, other orchards were observed at numerous locations, indicating that the orchard flowering season was still current.

In the previous survey of Lot 1 in April 2019, the survey area was found to have been extensively disturbed by a wild fire in November 2018. Although some individual plants had been reduced to blackened stalks albeit with resprouting leaves, there were sufficient unburnt plants that could be identified to species level to enable broad scale vegetation mapping and accurate community descriptions. In this current survey, five years post-fire, although numerous trees and large shrubs had been killed by the 2018 fire and remained as dead trucks, the understorey had fully recovered to allow positive identification to species level. Thus, fire history was not considered as being a limitation to the effectiveness of this survey.

The entirety of Lot 1 was traversed at 10 to 20ms spacing by two experienced ecologists, refer to Figure 4. When *Myoporum cordifolium* was located, an intensive effort was undertaken by gridding the area to map the limits of the population, and then searching in adjacent areas for outlier plants. The field survey intensity was 2.5 person days over 32ha. This survey intensity was considered more than sufficient to provide a high level of certainty as to which conservation significant flora occurred in Lot 1, and with accurately defined locations.

The GPS accuracy on the day was checked against the surveyed corner points of Lot 1. The accuracy was <2.5m. GPS accuracy was not considered as being a survey limitation in relative to the spatial extent of the *Myoporum cordifolium* population that extended >330m long by >30m wide.

Results

One conservation significant species (Threatened) was recorded in Lot 1:

- *Myoporum* cordifolium (Scrophulariaceae).

Myoporum cordifolium is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*, and Endangered under the *Biodiversity Conservation Act 2016*.

A population of *Myoporum cordifolium* was mapped in the southern half of Lot 1 in Mallee communities on mineralised soils. The location of where *Myoporum cordifolium* was recorded is displayed in Figure 5. Information on the each of the recorded locations is provided in Table 1. Photographs of *Myoporum cordifolium* and the associated communities and soils are provided in Plates 1 to 6.

Table 1: Location and numbers of recorded *Myoporum cordifolium*

Wpt	GDA 2020 MGA Zone 50		Comments/ numbers
	Easting	Northing	
WP0016	685058	6222303	3 p
WP0019	685011	6222282	2 p
WP0020	685015	6222273	2 p
WP0021	684961	6222270	8 p
WP0022	684953	6222245	4 p
WP0023	684951	6222250	10 p
WP0024	684891	6222284	2 p
WP0026	685034	6222295	Population >75 p
WP0027	685078	6222291	1 p
WP0028	685108	6222316	1 p
WP0029	685133	6222322	Population 14 p
WP0032	685149	6222341	3 p
WP0035	685221	6222342	8 p
WP0036	685198	6222314	2 p
WP0045	685061	6222306	2 p
WP0046	685080	6222318	4 p
WP0049	685095	6222327	1 p
WP0050	685095	6222336	6 p
WP0051	685101	6222342	2 p
WP0053	685152	6222356	Population 15 p
Total			**>165 plants**

Caladenia bryceana subsp. *bryceana* was not located despite an intensive search. Other orchards were present, indicating that the orchard flowering season was still current.

No other conservation significant flora were observed in Lot 1.

In the 2019 flora survey, one of the objectives was to search for the presence of the Proteaceae Dominated Kwongkan Shrubland TEC (Commonwealth of Australia 2014). The lack of TEC occurrence was reconfirmed in this survey.

From Figure 5 it can be seen that *Myoporum cordifolium* was located in the Mallee communities 2 and 3:

- Vegetation Community 2: Mallee shrubland on sand over clay duplex; and
- Vegetation Community 3: Mallee shrubland on dark cracking loamy clay.

The dominant species recorded in the *Myoporum cordifolium* area are provided in Table 2. Habitat photos of the *Myoporum cordifolium* area are provided as Figures 4 and 5.

Table 2: Dominant species recorded in the *Myoporum cordifolium* area

Species	**Community Strata**
Eucalyptus flocktoniae	Mallee
Eucalyptus uncinata	Mallee
Eucalyptus annulata	Mallee
Eucalyptus calycogona	Mallee
Eucalyptus xanthonema	Mallee
Eucalyptus sporadica	Mallee
Eucalyptus vegrandis	Mallee
Acacia glaucoptera	Shrubland
Acacia erinacea	Shrubland
Wilsonia spp.	Ground cover

The locations of the waypoints in Table 1 were *Myoporum cordifolium* was located are displayed in Figure 6. At most of the waypoint locations, the species occurred as closely spaced groups of plants that ranged from one to 10 individuals. At three locations, *Myoporum cordifolium* was recorded as continuous populations ranging from 14 to >75 plants. The spatial extent of the *Myoporum cordifolium* population in Lot 1 extends for >330m long by >30m wide. As can be seen in Figure 6, all recorded locations occurred to the south of the drainage line. Although the survey area was confined to Lot 1, Waypoints 22 and 23 show that the population could possibly extend further south of the boundary. The property to the south (Lot 1463) is farming land with areas of native vegetation that has no relation to the Laguna operation (Figure 3).

From previous experience with *Myoporum cordifolium*, the author associates this species with mineralised soils in Mallee communities in the Jerramungup district. These habitat preferences do not occur in the northern section of Lot 1 where historical quarrying has occurred and the new operations are proposed.

Plate 1: ***Myoporum cordifolium***

Plate 2: Another view of ***Myoporum cordifolium***

Plate 3: Close-up of flowers and leaves

Plate 4: View of *Myoporum cordifolium* in the Mallee community

Plate 5: Mallee community where *Myoporum cordifolium* was located

Plate 6: Typical soils where *Myoporum cordifolium* was located

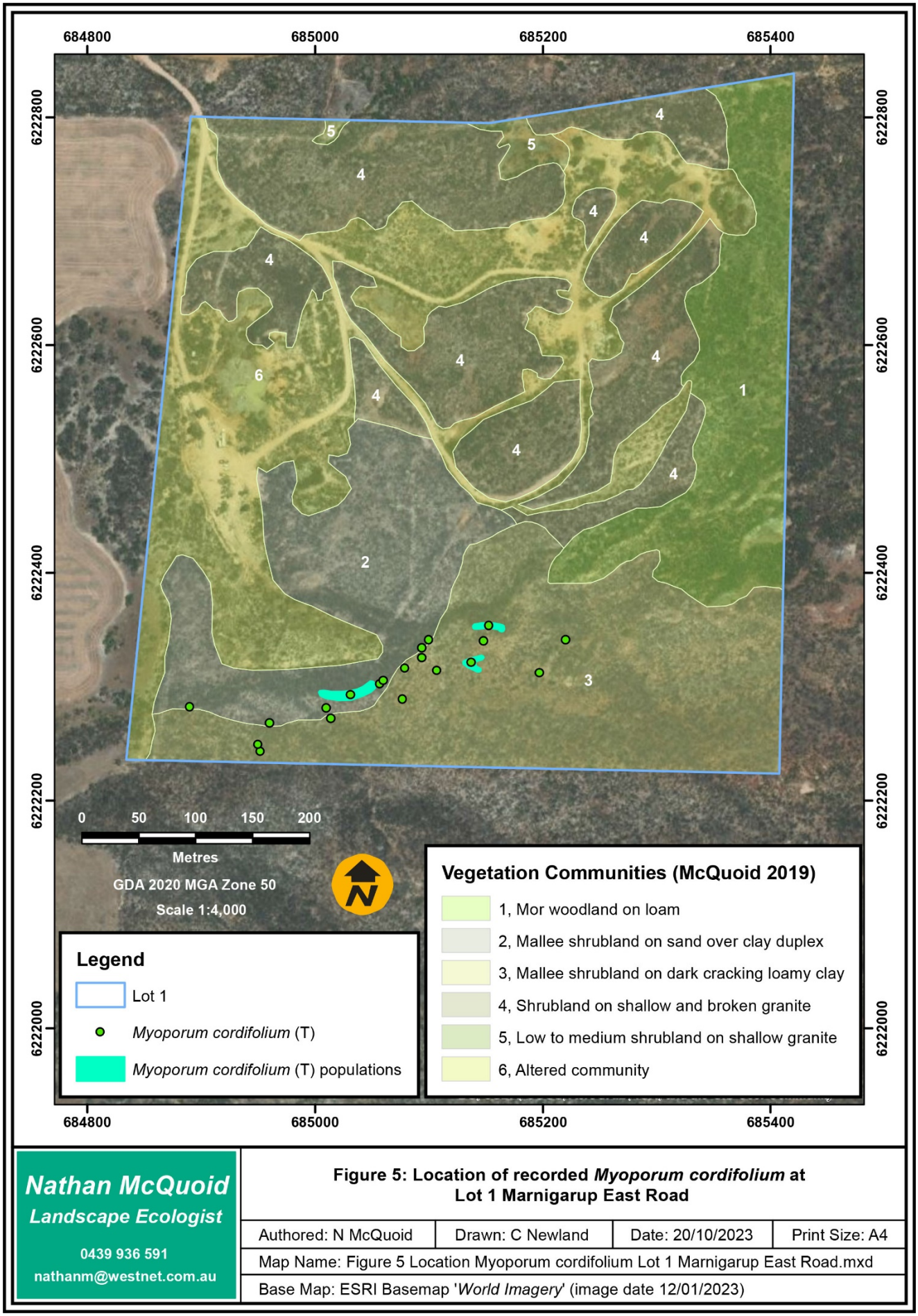

Figure 5. Location of recorded *Myoporum cordifolium* at Lot 1 Marnigarup Road

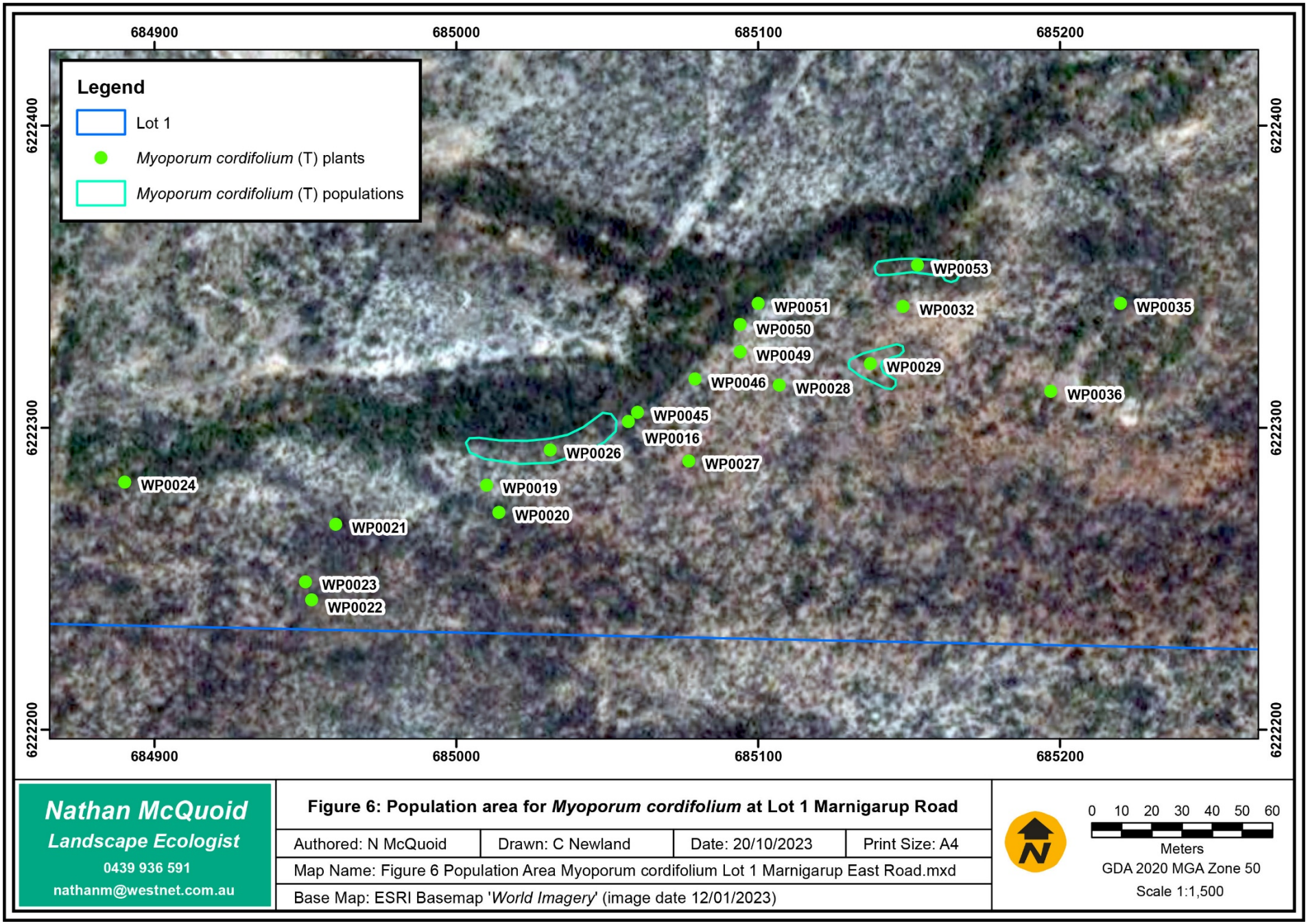

Figure 6. Population area for *Myoporum cordifolium* at Lot 1 Marnigarup Rd

Discussion

The FloraBase (WA Herbarium 1998-) distribution for *Myoporum cordifolium* is displayed in Figure 7. In an east-west direction, the distribution extends 260km from the Fitzgerald River National Park (Shire of Ravensthorpe) to near the Mt Roe National Park (Shire of Plantagenet). The main area of distribution is centred in the Shires of Jerramungup and Gnowangerup. The population in Lot 1 provides a minor infill extension to the currently known range.

The mapped extent of *Myoporum cordifolium* from the targeted survey is confined to a discrete area within the southern section of Lot 1 in undisturbed vegetation (Figure 6). This area is outside of the proposed quarrying footprint in the northern area of Lot 1 (AJMI pers. com.). The mapped extent of *Myoporum cordifolium* in Lot 1 is considered as being accurately defined given the intensity of the survey. No current or perceived threats individual plants or the population were observed. *Myoporum cordifolium* was considered as having recovered from the fire damage in 2018.

Recommendations for the continued preservation of the population in Lot 1 is provided overpage. Provided the area of occurrence is not disturbed by quarrying activities (including site drainage effects), the proposed operation is considered unlikely to have any adverse impact *Myoporum cordifolium*.

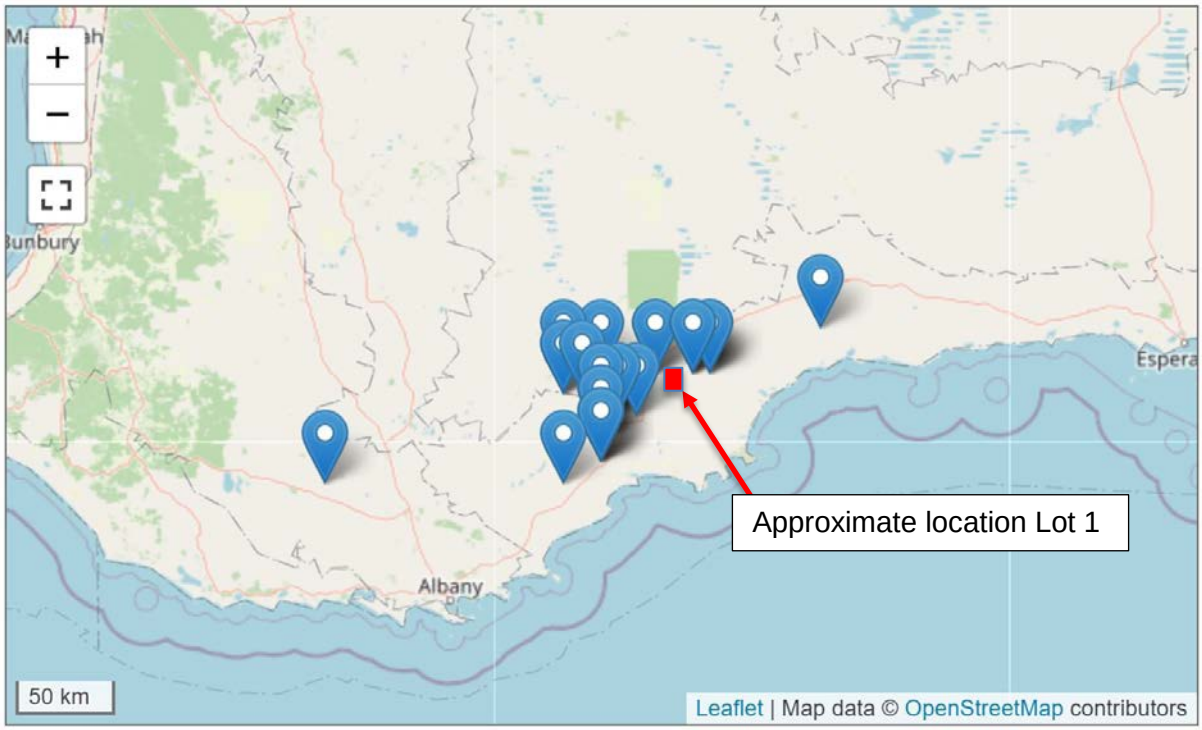

Figure 7: FloraBase (WAM 2023) distribution for *Myoporum cordifolium*

Recommendations

The following recommendations are proposed:

- No surface disturbances to occur in the area of Lot 1 that is located south of the minor drainage line that bisects Lot 1 in a north westerly direction (the northern extent of the recorded occurrences of *Myoporum cordifolium*). This exclusion area also includes a 50m no surface disturbance conservation buffer extending to the north of the drainage line. The location of the conservation buffer is displayed in Figure 8.

- The boundary of the conservation buffer to be fenced off and sign posted as a "no disturbance exclusion area" with no mention on the signage of the occurrence of rare flora.

- The site layout for the quarry to be designed to maximise the distance between quarrying activities and the recorded locations of *Myoporum cordifolium*.

- All access roads towards the *Myoporum cordifolium* area will be blocked-off and rehabilitated.

- All drainage from the quarry areas will be contained to the quarry areas though the use of water management structures such as drains, berms, interceptor banks sumps and windrows, such that no runoff or quarry process water will enter the drainage line displayed in Figure 8.

- Awareness of the importance of not disturbing the *Myoporum cordifolium* area will be included in the site induction procedures.

- A standard work practice (SWP) for the protection of the *Myoporum cordifolium* will be developed and issued to all site personnel, as well as being posted on the mine notice board.

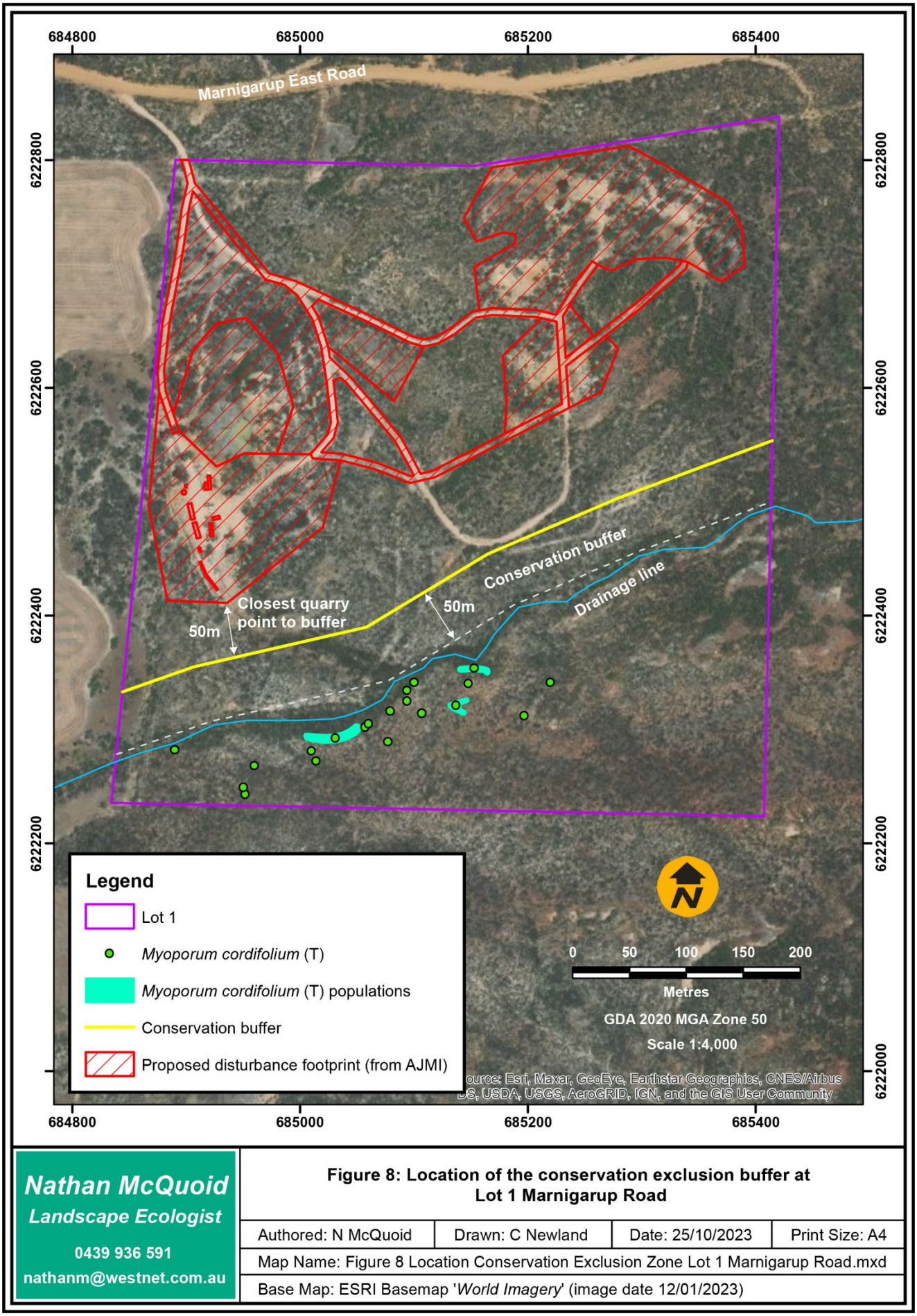

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Figure 8: Location of the conservation exclusion buffer at Lot 1 Marnigarup Road

Authored: N McQuoid	Drawn: C Newland	Date: 25/10/2023	Print Size: A4
Map Name: Figure 8 Location Conservation Exclusion Zone Lot 1 Marnigarup Road.mxd			
Base Map: ESRI Basemap '*World Imagery*' (image date 12/01/2023)			

Figure 8: Location of the conservation exclusion zone at Lot 1 Marnigarup Road

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