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Memorandum

To	**Leon Chew**	From	**Ben Green**
Copy	**Amanda Weston**	Reference	**525974**
Date	**2025-09-26**	Pages (including this page)	**42**
Subject	**Marri Wind Farm – Route Assessment and Site Access Review (Final_Rev2)**		

1 Project background

Marri WF Pty Ltd as trustee for the Marri WF Unit Trust (the Proponent), a wholly owned subsidiary of Alinta Energy Pty Limited (Alinta Energy), is seeking approval to develop Marri Wind Farm (the Proposal) located approximately 20 kilometres (km) south of the township of Dandaragan within the Shire of Dandaragan. This Proposal will have up to 82 wind turbines, each up to 275 m maximum height and capacity to generate up to 550 megawatts (MW) renewable energy. Aurecon have been engaged by Alinta Energy ('the Client') to conduct a transport study for the transportation of heavy equipment from ports of entry, to the Marri Wind Farm proposal site.

The objective of this study is to assess and analyse different route options for the transportation of specialised heavy equipment from port to site for the Project. This study constitutes a high-level review, identifying potential constraints and their potential impact. A high-level review of the windfarm site and access to the site is also included in the study. The scope of this assessment does not include detailed analysis or design.

The priority of the assessment is to identify and document areas along the potential routes from Port to site that may require any clearance of vegetation and upgrades to roads, to facilitate movements. This is intended to optimise the transportation process to enhance efficiency, cost-effectiveness, and minimises any potential delays and logistical challenges.

For the purposes of this study, Aurecon has reviewed the required design standards to be used, developed and compared alternative routes from various ports to the site, reviewed swept path movements and conducted stakeholder sessions. The information obtained from these investigations has been used to develop potential preferred routes from each port.

2 Abbreviations

Table 1 Summary of Abbreviations

Abbreviation	Definition
AMC	Australian Marine Complex
BOD	Basis of Design
BYDA	Before You Dig Australia
DBNGP	Dampier to Bunbury Gas Pipeline
GNH	Great Northern Highway
HVS	Heavy Vehicle Services
LT	Left turn
MOA	Mass Only Assessment

Abbreviation	Definition
MRWA	Main Roads Western Australia
OEM	Original Equipment Manufacturer
OSOM	Over Sized Over Mass
RAV	Restricted Access Vehicle
RJA	Rex J Andrew Pty Ltd (transport operator)
RT	Right turn
RTAA	Road Train Assembly Area
TIA	Transport Impact Assessment
TMP	Transport Management Plan

3 Reference information

The reference information used for the study includes:

- ArcGIS Pro and Nearmap aerial imagery used for the site drawings
- Oversize Overmass (OSOM) routes and RAV network applicable details
- Main Roads Western Australia OSOM guidelines – Guide to Design of OSOM Vehicle Corridors[1] and Traffic Guidance Schemes[2]
- Lessons learned and information from existing and previous projects
- Vehicle specifications
- Latest technology and industry best practice (internal)
- Stakeholder details
- Stakeholder feedback and supplied information

4 Project area

The proposed Marri Wind Farm site is located within the Shire of Dandaragan approximately 120 km north of Perth CBD and 40 km west of the town of Lancelin. The nearest major road is the Brand Highway that runs along the western side of the site in a north to south direction. The location of the project area is shown in Figure 4-1.

There are two ports considered as a point of entry for the wind turbine blades and component parts. They are as follows:

- Geraldton Port (approx. 250 km north of the site)
- Australian Marine Complex (AMC) Port (approx. 150 km south of the site)

[1] Guide to Design of Oversize and Over-Mass Vehicle Corridors | Main Roads Western Australia
[2] https://www.mainroads.wa.gov.au/heavy-vehicles/permit-order-scheme/osom/

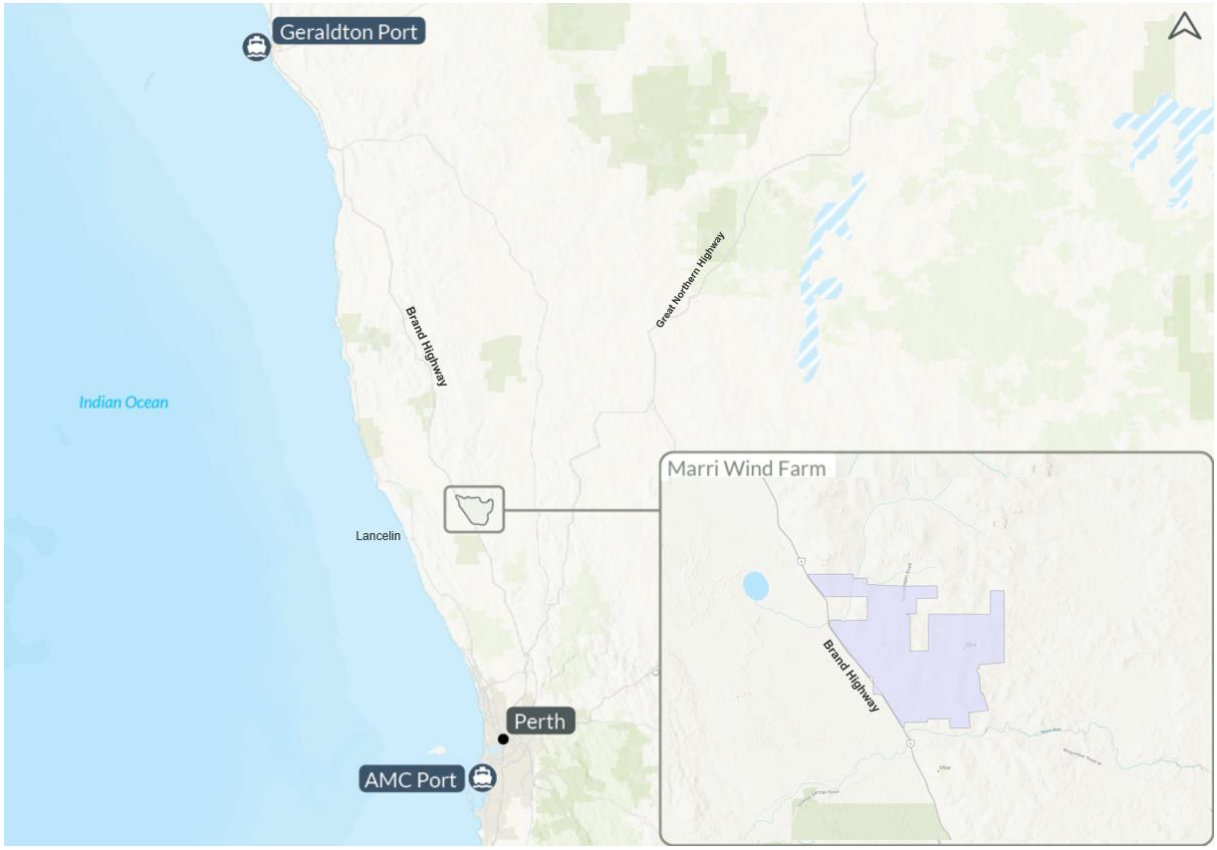

Figure 4-1 Marri Wind Farm site Location (SOURCE: ARCGIS Pro 2023)

5 Basis of design

The Basis of Design (BoD) detailed in Table 2 below sets out the parameters used for the investigation of the preferred transportation of the heavy equipment. Note all details below are subject to change based on the final selected OEM and their particular specifications. The below details are generally selected as the worst case as to provide an overarching guide for the purposes of this study.

Table 2 Basis of Design Summary (dependant on OEM selected)

Design element	Specification
Number of Turbines	82
Turbine type	Goldwind (GWH182-8.0)
Swept path analysis: Design Vehicle	Vestas Blade Pinned Trailer – Adjusted to suit 91m long and 5m wide blade (worst case) from above (Goldwind specs).
Minimum horizontal curvature (to stay lane corrected)	120m (inner radii)
Vertical clearance	6.8m
Longitudinal grades	9% (Goldwind)

Design element	Specification
Vertical curvature	Grades <15% for site area Grade <18% for transport route Approximate minimum K value = 9
Minimum required road width	5.5m
Passing requirements	Every 20km
Average traveling speed on gravel roads	7 – 20 km/h (assumed 15km/h)
Average travel speed on surfaced road	50km/h (note can travel up to 80km/hr in some instances – as advised by HVS)
Turning speed (Sharp turns)	5km/h
Turning time (Sharp turns)	15min
Max weight	See below

The general component mass for each of the wind turbine components is shown in Table 3, specific to the Goldwind specifications. Note, the turbine components may vary depending on the final decision regarding configuration etc (e.g. hub height) and so are a reference only.

Table 3 Wind turbine components mass (Goldwind specifications)

Wind turbine component	Estimated component mass (tonnes) for transportation*	Number of trips
Towers and accessories (bottom to top)	93 (T1), 91 (T2), 92 (T3), 64 (T4), 52 (T5), 11 (Accessories)**	492-656***(depending on final tower configuration)
Blade	32	246
Nacelle	43	82
Hub	54	82
Drivetrain and generator	106	82

*Includes transport frame but does not include vehicle mass
**General details provided by supplier only and not specific to exact tower height/configuration
***Could be up to 8 tower sections for 150m hub height (based on knowledge from previous projects – to be confirmed

6 Route assessment

6.1 Long list evaluation

A series of routes options from both ports of entry were evaluated to the site for the components. Each route underwent the following assessment:

- Total kilometre distance required
- Heavy vehicle approved route classification, starting with highest possible order routes – HVS Mapping (Main Roads WA) – see Figure 6-1
- Number of turns required
- Number of signalised intersections / roundabouts as part of the route

- Number of structures (overpasses, signs, etc) over the route and height clearance allowance for each structure
- Stop areas to allow for traffic to pass

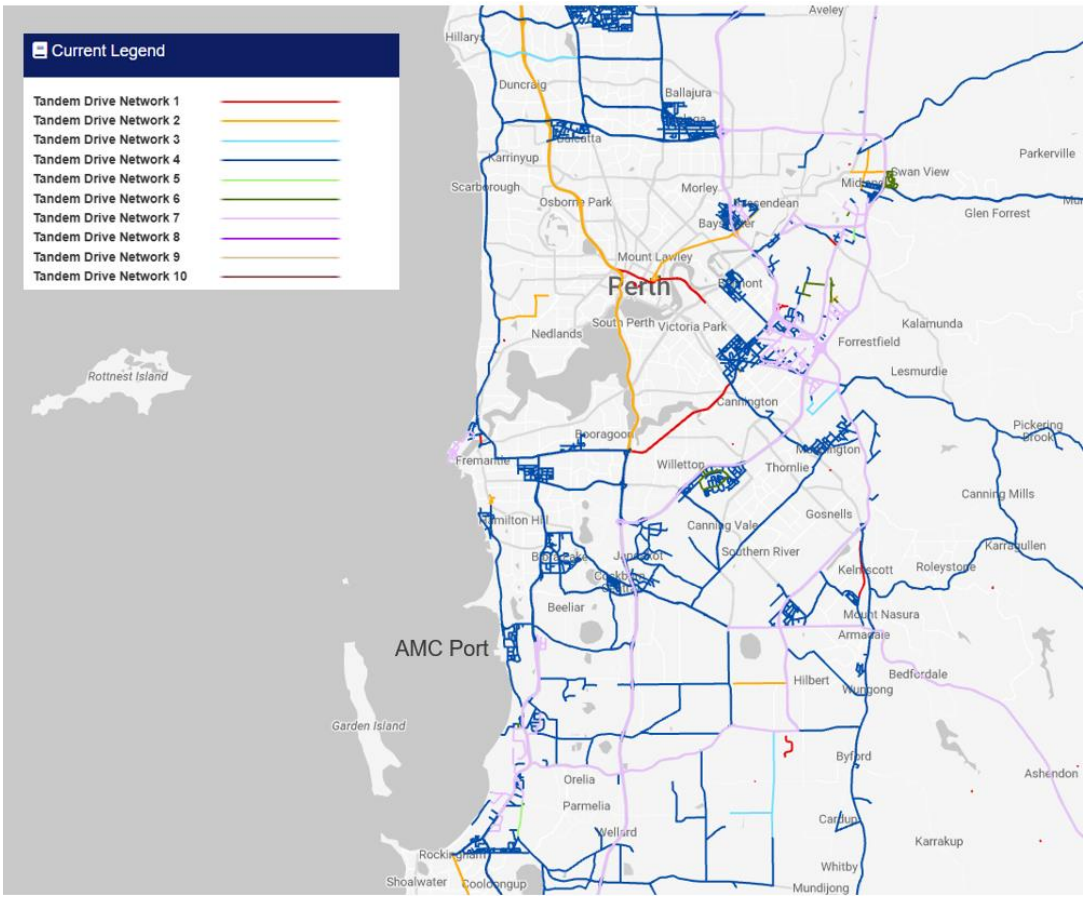

Figure 6-1: HVS Maps routes in Perth Metropolitan

The longlist of options is summarised in Table 4 for AMC Port to site and illustrated in Figure 6-2.

Table 4: Longlist of routes for AMC Port to site

No.	Route	Distance	Details
1	LT onto Cockburn Road > RT onto Russell Road > RT onto Rockingham Road > LT onto Russell Road > LT onto Hammond Road > RT at roundabout onto Armadale Road > LT onto Tonkin Highway > LT slip lane onto Brand Highway > RT into site.	187km Varies across networks such as 27.5m Oversize B-Double, 27.5m Oversize Road Train, 36.5m Oversize Road Train	10x turns 23x signalised intersections 11x roundabouts 15x structures above 25x on structure

No.	Route	Distance	Details
2	RT onto Cockburn Road > RT onto Rockingham Road > RT onto Anketell Road > LT onto Thomas Road > LT onto Tonkin Highway > LT slip lane onto Brand Highway > RT into site.	195km Varies across 27.5m Oversize Road Train, 36.5m Oversize Road Train	6x turns 18x signalised intersections 3x roundabouts 15x structures above 24x on structure
3	RT onto Cockburn Road > RT onto Rockingham Road > LT onto Thomas Road > LT onto Tonkin Hwy > Continuing along Tonkin Hwy (80 km)> LT onto Brand Hwy > RT into site.	195km Follows highest OSOM network possible – 36.5m Oversize Road Train	6x turns 19x signalised intersections 4x roundabouts 18x structures above 32x on structure
4	RT onto Cockburn Road continuing south > LT onto Mandurah Road continuing southeast, joins onto Kulija Road and Mundijong Road > LT onto Kwinana Freeway continuing north > RT bend onto Roe Highway at interchange continuing east > LT onto Brand Highway > RT into site.	203km Varies across 27.5m Oversize B-Double, 27.5m Oversize Road Train, 36.5m Oversize Road Train	8x turns 7x signalised intersections 3x roundabouts 33x structures above 31x on structure

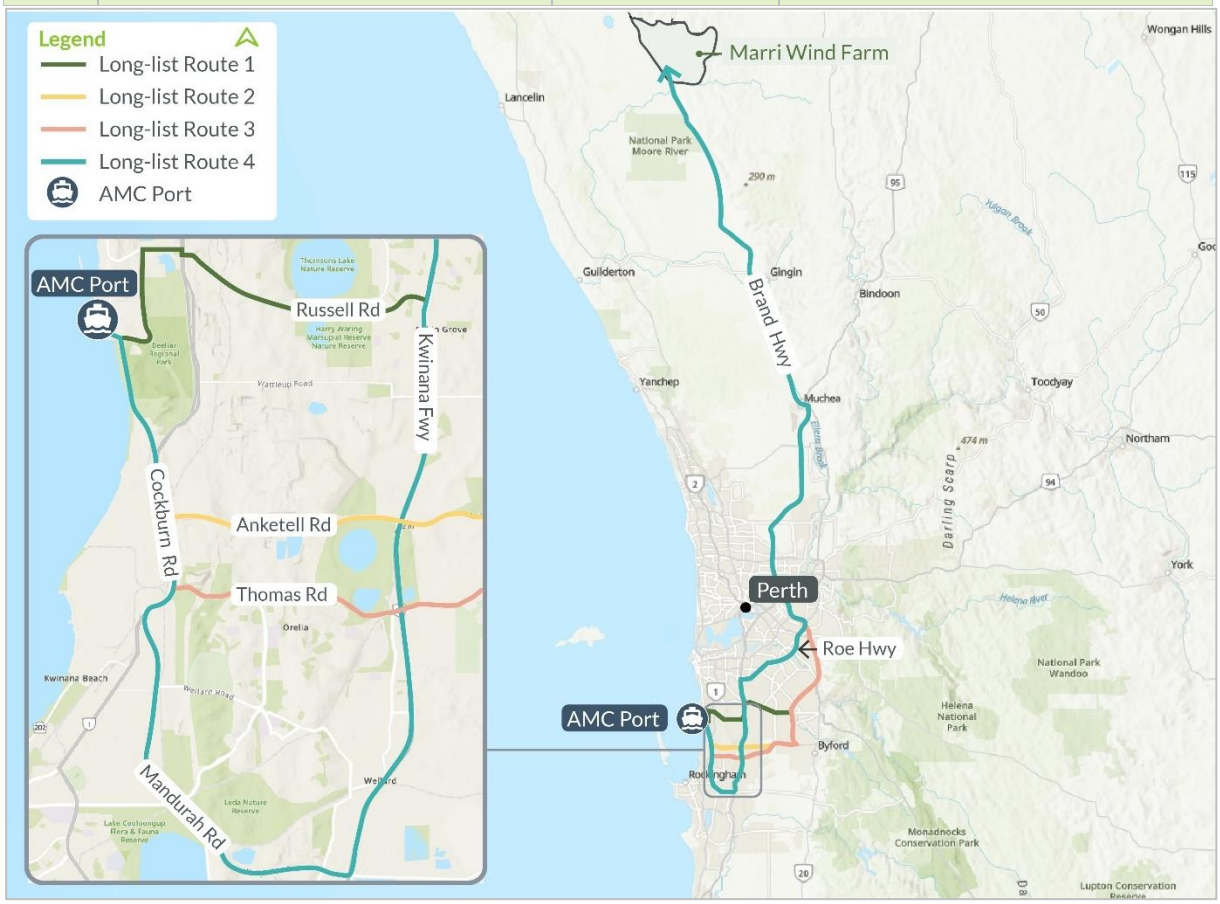

Figure 6-2 Longlist of Routes AMC Port to Site

The longlist of options for Geraldton Port to site are summarised below in Table 5 and illustrated in Figure 6-3.

Table 5: Longlist of routes for Geraldton Port to site

No.	Route	Distance	Details
1	RT onto Ian Bogle Road continues to John Willcock Link > RT onto Geraldton Mount Magnet Road > RT onto Great Northern Highway near Mount Magnet. Following south along Great Northern Highway Granary Drive, LT on Great Northern Highway / Wubin-Mullewa Road intersection at Wubin > LT slip lane to turn right onto Brand Highway > RT into site.	939km Follows highest OSOM network possible – 36.5m Oversize Road Train	5x turns 9x signalised intersections 2x roundabouts 5x structures above 2x on structure
2	RT onto Ian Bogle Road continues to John Willcock Link > continues to John Willcock Link > RT Brand Highway >RT Brand Highway (at Yardarino) > LT into site.	282km All 27.5m Oversize B-double	3x turns 5x signalised intersections 0x roundabouts 0x structures above 6x on structure
3	RT onto Ian Bogle Road continues to John Willcock Link > (RT) Geraldton Mount Magnet Road > (RT) onto Goulds Road >(RT) Rudds Gully Road > (LT) on Brand Highway >(RT) Brand Highway (at Yardarino) > (LT) into site.	286km All 27.5m Oversize B-double	6x turns 7x signalised intersections 0x roundabouts 4x structures above 4x on structure

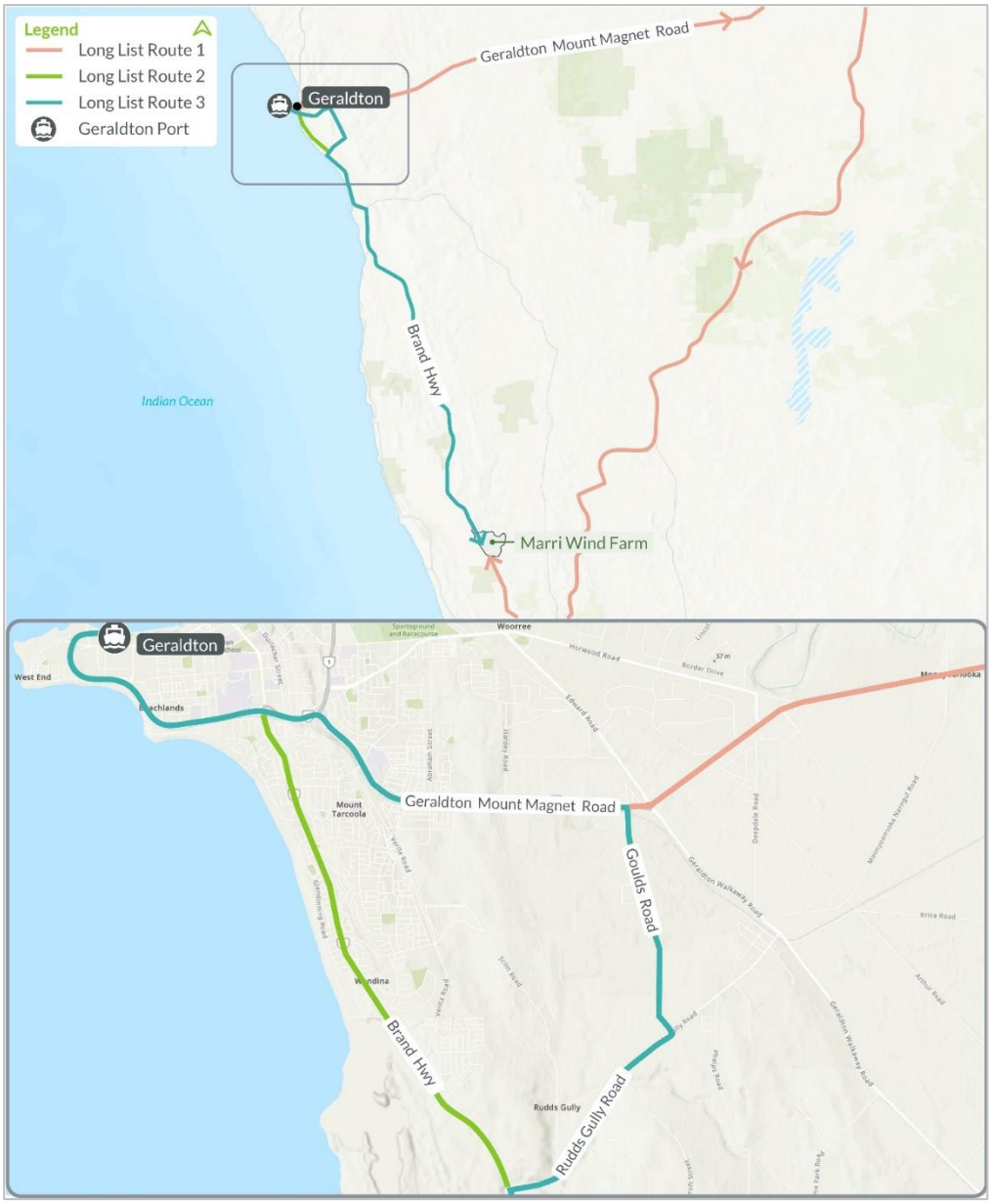

Figure 6-3 Geraldton Long list map

6.2 Stakeholder engagement

Once the long list of routes was considered, stakeholder engagement was undertaken to understand the local conditions at each port in addition to the broader transport network constraints. The key points from these meetings are provided below. Note this information was provided in relation to the specific project and should not be relied upon for other purposes.

6.2.1 Geraldton Port – Mid West Ports Authority

Mid-West Ports Authority is the current operation and facility managers for the Geraldton Port, and so were consulted as part of this this study. The key discussion points are summarised below:

- Currently only single berth available for receival of wind turbine equipment (Berth 6). This has recently handled 82m wind turbines with storage provided at the port (area north of Berth 7).

Currently can only handle one ship per month, and so a large project if required for transportation now, would take a significant duration.

- New berth (Berth 1) planned with construction to commence Q1 2026 and be complete by end of 2027, or early 2028. This would facilitate wind turbines up to 95m. This will increase capacity significantly with estimate to be able to handle four ships per week.
- Longer term plans for two new berths as part of westernmost expansion (Berth 8 and 9), expected to be operation by 2028. This is designed specifically for renewable energy.
- First Point of Entry (FPOE) will be implemented by early 2027, this will allow 24 hour operation essentially doubling capacity of current port (as can load/unload 24/7).
- Current route from Berth 6 and laydown near Berth 7 can in theory allow for up to 91m long blade (tested by Rex J Andrews – noting config of truck is important). Some minor amendments are required to do this but these can be undertaken right away if needed. Port maximising plan will address these requirements, which will be ready by end of 2026/ early 2027.

6.2.2 Australian Maritime Complex (AMC) Port – Ventia

Ventia is the current operation and facility managers for the Common User Facility (CUF) of AMC, and so were consulted as part of this this study The key discussion points are summarised below:

- The Common User Facility (CUF) is available for renewable projects, which is configured with high security First Point of Entry (FPOE). 'AMC 5 Wharf' is the typical port/handling area for wind turbines at the southern end of the Port (AMC Wharf 4 is also an option).
- The southern entry from Nautical Drive onto Cockburn Road is the main egress point for OSOM vehicles. The main entry from Quill Way/ Cockburn Rd cannot accommodate blades larger than 70m. All the posts at the gate at Nautical Drive can be removed and 88 metres blades have been shown to work (as shown by desktop assessment only). Reversing out and then going forward down Cockburn Road has also been shown to be possible.
- The largest blades previously transport from the port are 81 metre blades.
- There is extensive storage area available at the port. Laydown F would be the most likely laydown area, however C, D, and E are also available if booked.
- Appears to have no operational capacity constraints currently.

6.2.3 Main Roads WA Heavy Vehicle Service (HVS)

HVS is responsible for regulating heavy vehicles, including Restricted Access Vehicles (RAVs), and ensuring the safe and efficient movement of freight across the state. As such, HVS are required to be consulted as part of this this study. The key discussion points are summarised below:

- Tonkin Highway upgrades planned at Thomas Road intersection, where it will be extended south from here. Therefore, this intersection may be different at time of transportation requirement for project (timing not confirmed). Thomas Road east of Kwinana Freeway also has three roundabouts which are not preferred for the transportation of turbine blades.
- There is the need to be aware of operational hours inside and outside the Perth Metropolitan area as follows:
  - Inside the Perth Metropolitan area (For route from AMC Port to just south of Muchea – 2km south) - can only operate vehicles at night to avoid impact with general traffic. Time period of 9.30pm to 5am. Muchea Road Train Assembly Area is part of Metro boundary.

- Outside of Metropolitan area – Can only operate during the day for visibility (sunrise to 7.30pm).

- The recommended route for transporting wind turbines from AMC through Perth metropolitan area from south to north would utilise Kwinana Freeway and then Roe Highway and Tonkin Highway, rather than Thomas Road and then Tonkin Highway. It was recommended to talk further about recent studies completed by RJA who have considered the same route.
- Overhead constraints are caused by transportation of tower sections, which can be over 6.5m. A specific route would need to be selected allowing high loads through Perth metropolitan area. The general idea for this is utilising Thomas Road, Tonkin Highway and then a number of local roads and contraflow options adjacent to the airport (e.g. Abernethy Drive) prior to joining back onto the Roe Highway and travelling up the Great Northern Highway. It was recommended to talk further with RJA about this. The key contraflow option available for high overhead OSOM includes utilising the on-ramps of Tonkin Highway at Roe Highway and Abernethy Road interchanges (see proceeding sections for further details of additional engagement).
- Muchea Road Train Assembly Area – There will be challenges with utilising this given it would likely have other vehicles also using site, which could restrict access in and out if they come in after our vehicles (e.g. through the night). Therefore, this would require coordination. Inspection bays could be an alternative to the above, typically around 139m long but only 10m wide so would likely be difficult to fit two combinations next to each other (normally transported in pairs). Also not permitted to block access and need to consider operation hours, as would have a small window of allowable operation for metro and outside of metro operating times. This is to be considered by transport operator when engaged.
- Outside of metro would require passing opportunities approximately every 20km to let traffic past (requires pilot vehicles and variable message sign vehicles – refer to High Risk OSOM Guidelines for further details of traffic warden requirements).
- The potential trip volumes for transportation of components (see Table 3) are typical of what you would expect and are possible to be accommodated by the transport network including high haulage routes. Coordinating operational windows, traffic management, transport fleet, impacts from other projects (which are also transporting) etc would need to be managed by a logistics operator.

6.2.4 Rex J Andrews Pty Ltd (RJA)

RJA is a specialised transport contractor that are highly experienced in the transportation of wind turbines and other large equipment in WA. RJA were consulted to help inform the study. A meeting was held between representatives from Alinta Energy, RJA and Aurecon on the 20th June 2025 to discuss the Marri Windfarm Project. The key discussion points are summarised below:

- Geraldton Port
  - RJA team would have a general preference for using the Port of Geraldton for projects similar to this based on their experience and note that the Geraldton Port is the main port being used by other windfarms in the area.
  - Discussed preferred routes, noting use of Geraldton Mount Magnet Road and Goulds Road for heading south.
- AMC Port
  - Discussed preferred routes, noting Thomas Road is not preferred in the above because of the constrained left turn if getting onto the Kwinana Freeway and the three roundabouts if getting onto the Tonkin Highway.

- Driving in metro permitted at night only, whereas outside of metro is during day. This means that journey from AMC to site will have a two-day turnaround.
- RJA note that switching between night and day shift leads to greater fatigue considerations for drivers

- Tilt trailers can only operate up to 15km/hr, and typically introduce safety concerns. Usually handle blades smaller than what we are considering. Also limits amount of equipment available and so increases transportation timeframes. They would also require a cleared area close to site entrance where they are transferred from non-tilt trailer to tilt trailer. Therefore, were not recommended for this project.

6.2.5 Main Roads WA Gascoyne Region

Main Roads Gascoyne Region (MRGR) manages the state road network within the Gascoyne Region, which encompasses the potential routes in and surrounding Geraldton. In addition, MRGR are responsible for managing the Brand Highway which is adjacent to the Marri Windfarm project site. A meeting was held on the 24th July 2025 between representatives from MRGR, Alinta Energy and Aurecon to discuss the Project and the key discussion points from that meeting have been summarised below:

- An adjacent wind farm proponent (Yathroo Wind Farm) has just lodged their DA, which proposes to utilise Dandaragan Road as the primary access to site from AMC Port. It is uncertain what level of detail has been undertaken with these investigations (i.e. environmental impacts) as confirm this as the most appropriate access point.
- Another Wind Farm located further north, is currently sending clearance envelopes to Main Roads Gascoyne that has the same turns as Long List Route No.3.
- Goulds Road and Rudds Gully Road are Council Roads (City of Greater Geraldton). It is recommended we let them know that we are considering these routes as part of our route assessment.
- Southeast corner at Dandaragan Road would need to consider drainage infrastructure if upgraded.
- Brand Highway will see upgrades to the north and south of the project site, but not immediately adjacent to the site. However, the mentioned widening and overtaking lane projects could impact routes from both ports (as are both north and south of project site). This will need to be considered as part of the Traffic Management Plan (TMP) to be developed by the transport operator closer to time of transportation task.
  - Brand Hwy - Widening from Badgingarra to Eneabba - 151 - 224 SLK (approved 25/26). This is north of our project site.
  - Brand Hwy - Construct new overtaking lane - 166-169 SLK (approved 25/26).). This is north of our project site.
  - Brand Hwy - Extend Overtaking Lane -187-189 SLK (approved 25/26). This is north of our project site.
  - Brand Hwy - Construct new overtaking lane - 36.70 - 39.20 SLK (Not yet approved – future FY). This is south of our project site.
  - Brand Hwy - Extend Overtaking Lane - 34.20 - 35.30 SLK (Not yet approved – future FY). This is south of our project site.

- Passing opportunities should be considered by transport operator, but note parking opportunities are provided along the route and shoulders can also be used (up to transport company and proponent to determine).

6.3 Preferred routes

Based on the long list evaluation and stakeholder engagement, a more detailed assessment of potential routes was undertaken to determine feasibility and impacts. Additional route path information was considered such as cutting through access tracks between roads, travelling on the opposite side of the road ('contraflow') and gradients of slopes.

From this, it was most evident that overhead height would prove to be a challenge when travelling through the Perth metropolitan area as required from AMC Port to site (less so the case for Geraldton Port to site). Therefore for AMC Port to site, the preferred routes may vary depending on transportation of particular parts of the wind turbines. The turbine blades represent the longest combination load, and so provide challenges with navigation at constrained turns. The tower sections represent the highest combination load for specific wind turbine equipment, and so provide challenges with navigation under overhead constraints. Based on this, there are two separate routes recommended from AMC Port to site. From Geraldton Port to site, the same route can be utilised for all components.

It is assumed that the tower sections are the highest overhead component to be transported, and the blades are the longest component to be transported. However, it is acknowledged that the substation transformer is also one of the worst case OSOM movements. As advised by Alinta, a 190 tonne transformer is to be adopted. Based on Aurecon's experience on similar projects, it is unlikely that this will exceed the spatial requirements of the wind turbine components, and so is assumed to be the case.

6.1 AMC Port

From the stakeholder discussions with the AMC Port, it was discussed that the southern gate of the Port is the primary exit gate for large building components (wind turbine blades), as the main access from Quill Way further north is restrictive and cannot accommodate blades larger than 70m long. The gate and fencing can be dismantled to allow for larger blades to exit onto Cockburn Road. An overview of the location of the southern entrance gate from the AMC Port and the laydown areas is shown in Figure 6-4.

Various laydown areas could be used, such as C, D, E or F. Whilst Laydown F is the most likely to be used (based on stakeholder engagement), analysis should also consider vehicular access from Laydown C, D and E (i.e. using Road 5 and turning onto Quill Way to identify impacts – see Figure 6-4). It is assumed that the area within each laydown area would be available to provide turnaround of vehicles.

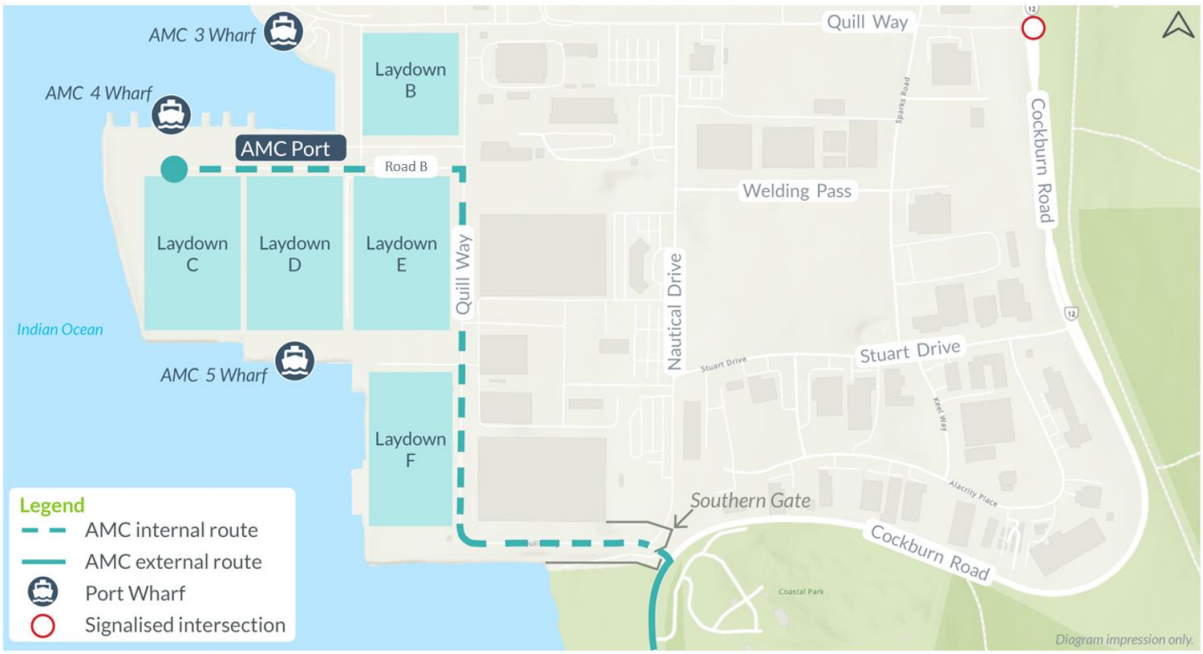

Figure 6-4 AMC Port layout and internal route

6.1.1 Preferred Route 1

The preferred route for AMC Port for the turbine blades is summarised in Table 6 and presented in Figure 6-5. The basis of this selection is as per Main Roads recommendations to avoid the Thomas Road/ Tonkin Highway intersection (and instead use Kwinana Freeway) as this is planned to be changed as part of the Tonkin Highway extension south. This is because upgrade of configuration, or construction impacts (date not yet confirmed) could impose spatial restrictions that would limit the ability for transportation of blades. Furthermore, it is well understood (based on stakeholder discussions) that the three roundabouts on Thomas Road introduce challenges for blade transportation. Furthermore, using Kulija Road to access Kwinana Freeway provides more space to navigate turn (in comparison with Thomas Road interchange – as confirmed in stakeholder discussions).

This route can accommodate a maximum loaded height of 5.6m, where the lowest unavoidable structure is Stanton Road overpass (5.6m). This will be able to transport the blades, which typically do not exceed 5m in height once loaded on the vehicle (including transport frame).

Table 6 Overview of AMC Port Preferred Route 1

Longlist route No.	Port	Route Summary	Route Distance	Number of turns	Maximum height
Option 4	AMC Port	Cockburn Road, Rockingham Road, Mandurah Road, Kwinana Freeway, Roe Highway and Tonkin Highway, Brand Highway	203km	8	5.6m
Starting at AMC Port: At Nautical Drive (30m) > RT onto Cockburn Road continuing south (3.2km) > LT onto Mandurah Road continuing southeast, joins onto Kulija Road and Mundijong Road (10.4km) > LT onto Kwinana Freeway continuing north (23.7km) > RT bend onto Roe Highway at interchange continuing east (18.5km) > LT bend onto Tonkin Highway at interchange continuing northwest and north (54.5km) > LT bend onto Brand Highway at interchange continuing west and north (89km).					

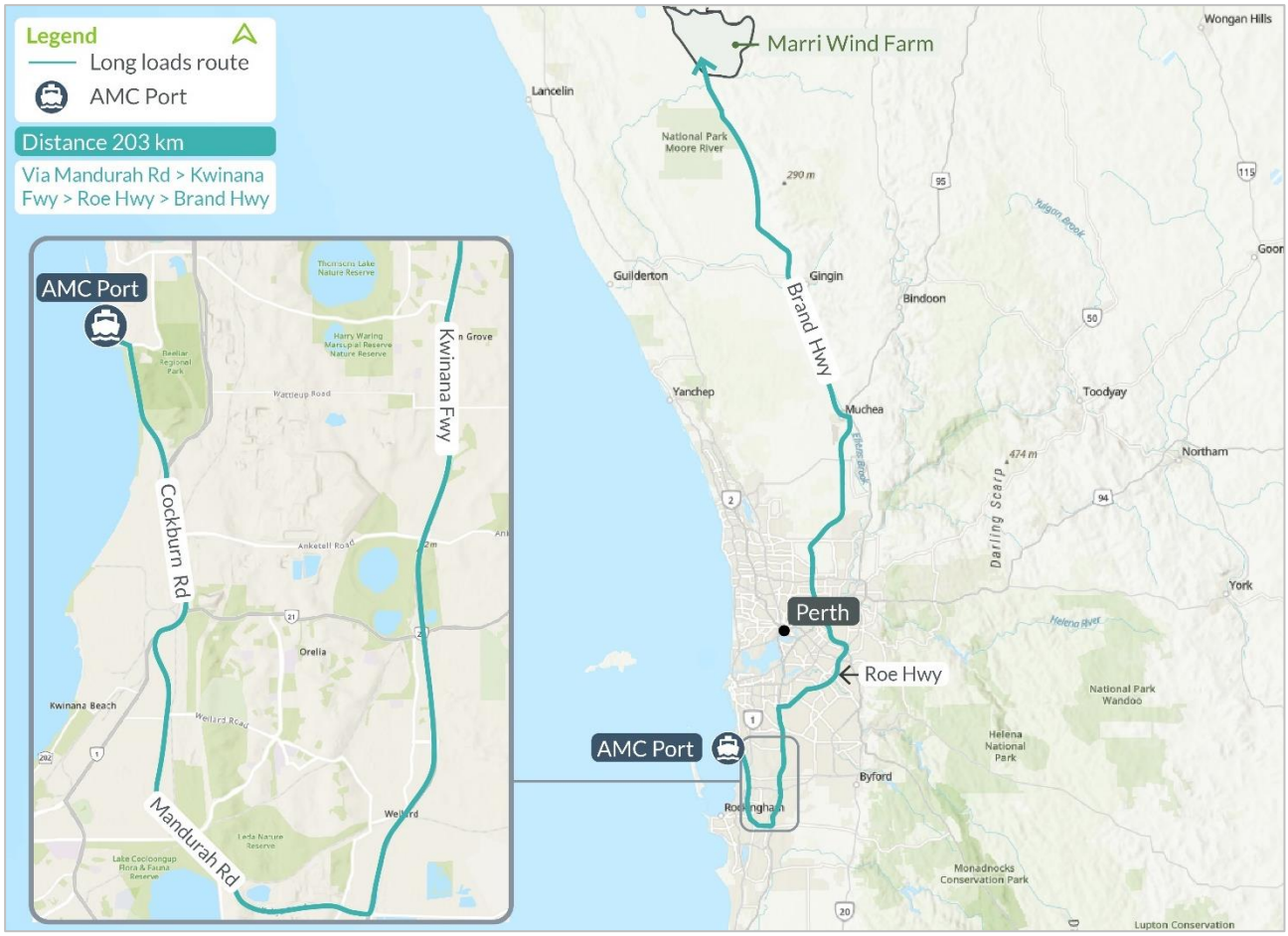

Figure 6-5 AMC Preferred Port Preferred Route 1 (Source: Aurecon GIS)

6.1.2 Preferred Route 2

An alternate route has also been investigated, with the intent to understand if an increased overhead loaded height can be achieved. The basis for the alternate route for AMC Port is summarised in Table 7 and shown inFigure 6-6. This instead utilises Thomas Road and Tonkin Highway (rather than Kwinana and Roe Freeways for Preferred Route 1) as the additional requirements for space to accommodate blade lengths would not be required, and is also a more simple route. Furthermore, this route has no overhead structures up to the Roe Highway/ Tonkin Highway interchange whereas Preferred Route 1 would have been limited to 6.18m to get to this point (even if using on/off ramp deviations at all possible points).

If transport loads remain on the primary route of Tonkin Highway (from Roe Highway/ Tonkin Highway interchange and north), this route can also only accommodate a maximum loaded height of 5.6m, due to Stanton Road overpass. Dunreath Drive (5.5m) must be avoided with use of on/off ramps. Dependant on selected OEM, this route should be acceptable for transportation of all other components for the wind turbines, except the tower sections, which require an overhead clearance above 5.6m. Alternate ‘sub-routes’ are subsequently discussed below.

Alternate ‘sub-routes’ have also been investigated here for transportation of components requiring overhead clearance exceeding 5.6m (i.e. tower sections). Note as per the Basis of Design (see Section 5), the vertical clearance requirement is 6.8m to accommodate tower sections. To avoid limitations of overhead structures on Tonkin Highway, sub-routes would have to deviate off the Tonkin Highway adjacent to the area near Perth Airport. Two preliminary options have been identified, which

are detailed in Figure 6-6 and Figure 6-7. Both routes require contraflow movements and ultimately connect onto the Roe Highway. Connection onto Roe Highway is shown following structures which would have limited overhead height, including the Roe Highway/ Maida Vale Road overpass (5.48m) and Roe Highway/ Bushmead Road overpass (5.6m).

Note the above alternate sub-routes would be subject to the selected vehicle configurations from the specific transport operator. HVS requires these vehicles are below the high-risk OSOM dimensions of 50m length, as to facilitate movements. Loading of towers on platform trailers rather than bookend trailers (bookends used when overhead height is heavily constrained but results in longer combination lengths) would result in shorter combination lengths and so would help facilitate use of the alternative sub routes. Note, the use of bookends to lower the height of tower transportation could be considered if tower sections have a diameter that permits loads less than 5.6m in height (subject to OEM selection – may not be an option for any), and so in this case could use the main route of Preferred Route 2 (i.e. continue up Tonkin Highway).

As noted previously, a potential option through the airport (Horrie Miller Drive> Paltridge Road> Kingsford Smith Avenue> Grogan Road> Abernethy Road) was also omitted from this section, as Grogan Road will be permanently closed in early 2026 (as advised by HVS).

Furthermore, deviation around the interchange at Brand Highway/ Great Northern Highway is required for loads exceeding 6.2m, if coming up Great Northern Highway (as per alternative sub-routes). This is also shown below, with a potential alternative to minimise contraflow travel, as documented under stakeholder engagement (see Section 6.2.4 – RJA).

Table 7 Overview of AMC Port Preferred Route 2

Longlist Route No.	Port	Route Summary	Route Distance	Number of turns	Overhead clearance
Longlist Option 3	AMC Port	Cockburn Road, Rockingham Road, Thomas Road and Tonkin Highway, Brand Highway	195km	6	5.6m
Starting at AMC Port: At Nautical Drive (30m) > RT onto Cockburn Road continuing south (3.2km) > LT onto Thomas Road continuing east (18.4km) > LT onto Tonkin Highway continuing north (80.3km), LT bend onto Brand Highway at interchange continuing west and north (80km). **Alternate sub-routes at area adjacent to Perth Airport:** <u>Tonkin Highway to Abernethy Road</u> Sub-route No. 1 (unrestricted/will allow 6.8m height) – See Figure 6-7. For further details, refer to the Main roads contraflow movement diagram included in Appendix A. Cross onto opposite side Tonkin Highway at Hale Road intersection> Continue onto Tonkin Highway On-ramp (contraflow – 2.4km)> RT onto Tonkin Highway on-ramp (contraflow). Option 2 (maximum height of 6.4m – Tonkin Hwy/ Abernethy Rd off-ramp footbridge) – see Figure 6-7 LT onto Roe Highway off-ramp> Continue onto Tonkin Highway On-ramp (2km)> LT from Tonkin Highway onto Abernethy Road off-ramp > RT Abernethy Road continuing west (1.6km) > RT onto Kewdale Road continuing north (900m) > RT Tonkin Highway continuing southeast (1.2km) > LT onto Tonkin Highway on-ramp (contra-flow). Option 1 and 2 (Abernethy Road to site) LT onto Abernethy Road > RT onto Great Eastern Highway Bypass continuing east (600m) > LT onto Stirling Crescent continuing north (0.7 km) > RT onto Bushmead Road continuing east (0.5km) > LT onto Military Road continuing (230m) > Merge right onto Roe Highway through access track continuing north (6.3km) > RT onto Great Northern Highway continuing north (34.6km) > Slight left turn onto access track continuing north (800m) adjacent to interchange > 180 degree LT onto Great Northern Highway continuing south (900m) at interchange on opposite side of road > RT bend onto Brand Highway at interchange continuing west and north (89 km).					

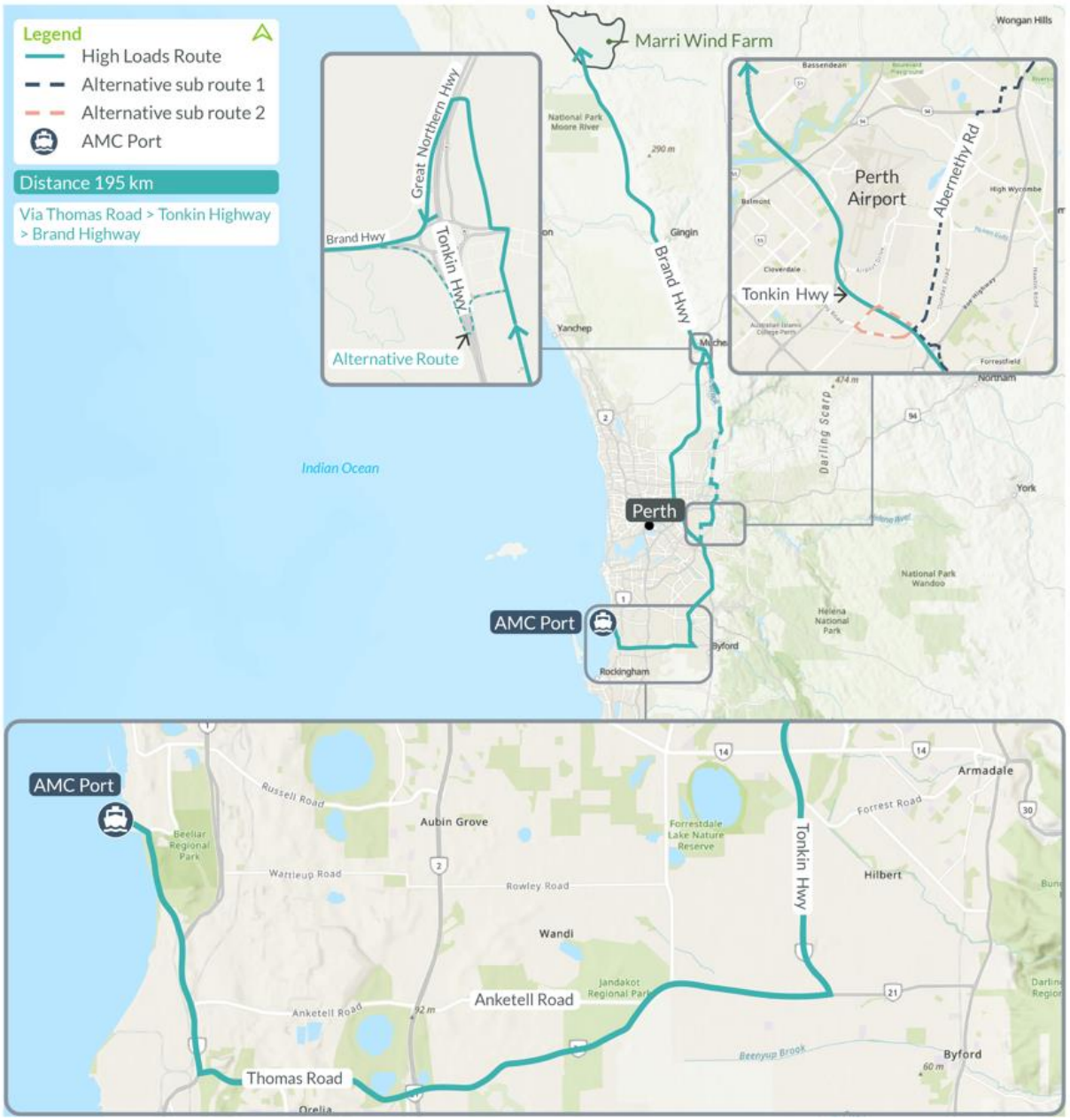

Figure 6-6 AMC Preferred Route 2 (Source: Aurecon GIS)

Figure 6-7: Sub-route details

6.2 Geraldton Port

From the stakeholder engagement with the Port of Geraldton, it was discussed that Reg Clarke Road would be utilised as the internal route to connect from Berth 6 and the laydown area to the external road network (see Figure 6-8). As per stakeholder discussions, an assessment has been previously undertaken that shows a 91m blade can be transported for this internal route with minor modifications (expected to be implemented early 2026) and so for the purposes of this study, is assumed to be made possible at the time needed for the Project (late 2026 and on).

Figure 6-8: Geraldton Port layout and internal route

6.2.1 Preferred Route

The preferred route for Geraldton Port is summarised in Table 8 and presented in Figure 6-9. This avoids the tight turn from John Willcock Link onto Brand Highway (Longlist Route No. 2) and the adjacent urban area (including overhead powerlines). This route also traverses area adjacent to Goulds Road, which provides options of storage. Furthermore, it is significantly shorter than Longlist Route No. 1, which utilised the highest order OSOM route possible (totalling 939km).

The preferred route can accommodate a maximum loaded height of 6.8m. Note this requires use of the formed bypass at Highbury Street and Abraham Street bridges, which consists of a slight deviation off road to travel under higher section of span.

Table 8 Overview of Geraldton Port Preferred Route

Longlist Route No.	Port	Route Path	Route Distance	Number of turns	Maximum height
Option 3	Geraldton	Ian Bogle Road, John Willcock Link, Geraldton Mount Magnet Road, Goulds Road, Rudds Gully Road, Brand Highway	287 km	6	6.8m
Starting at Ian Bogle Road > continuing west and turning south (450 m) > continues south onto John Willcock Link continuing south and east (4.8 km) > RT Geraldton Mount Magnet Road continuing east (5.3 km) > RT onto Goulds Road continuing south (3.5 km) > RT onto Rudds Gully Road continuing east (3.6 km) > LT on Brand Highway continuing south and east (62.1) > RT onto Brand Highway (at Yardarino T-intersection) continuing south (205.5 km) > LT into site.					

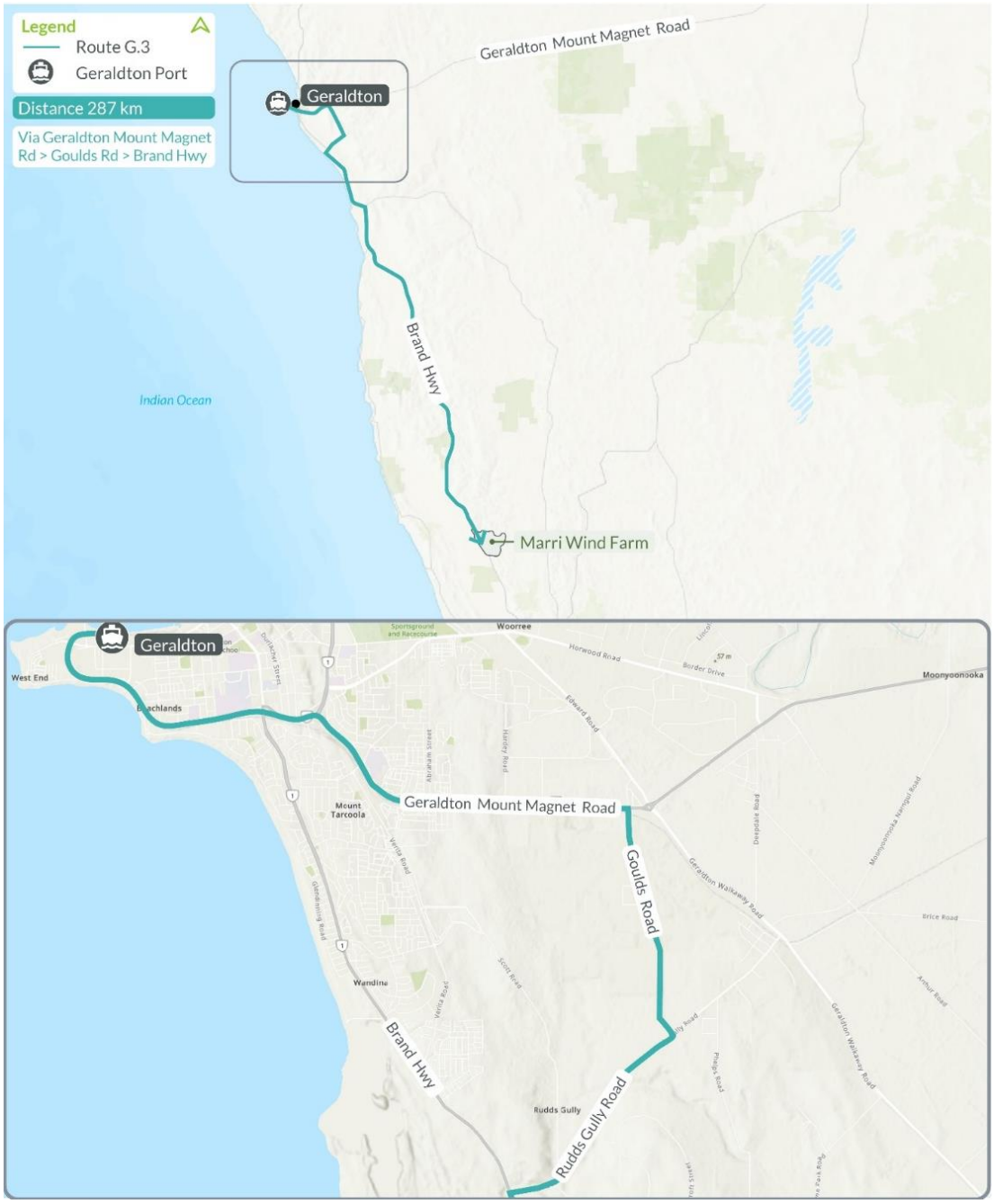

Figure 6-9 Geraldton Port Preferred route (Source: Aurecon GIS)

6.3 Swept path analysis

A swept path analysis is required to understand the spatial requirements for transporting the turbine blades from port to site. Vehicle tracking was completed using AutoTURN, a third-party CAD software developed by Transoft Solutions Inc., to determine the swept path of the test vehicle. The existing blade transporter models in AutoTURN were modified to suit the test vehicle, and the dimensions were adjusted to meet the required specifications.

The analysis focused on all turning points where the turning radii was less than the minimum radii required to stay lane correct (i.e. within the traffic lane). It was assumed that OSOM measures would

be in place, allowing the design vehicle to utilise the full paved area without staying lane correct. The following should be noted for all swept paths conducted as part of this study:

- The purposes of this review is to provide high-level insight of potential conflicts with the design vehicle as to inform the initial stages of the Project
- Identified conflicts should be verified on-site. This current review is a desktop study only (and subject to change based on any changes on-site).
- No detailed vertical geometry checks (e.g. no survey data reviewed).
- Further detailed swept path analyses required to determine cost of temporary works (e.g. quantities for hardstands)
- Swept paths may vary based on variations in preferences across OEM specifications and transport operator equipment/methodology.

6.3.1 Design vehicle parameters

Table 9 outlines the key parameters of the design vehicle used in the swept path analysis. The primary test vehicle selected is based on the Vestas V172 85m Blade Pinned Trailer which is modified to accommodate a 91m, with two thirds of blade supported on trailer and one third overhanging. Note the amount of overhang of blade can vary across OEM specifications and also transport operators preferences (related to trailer configuration etc). However, it is Aurecon's understanding that proposed test vehicle with one-third of blade overhanging the rear trailer axles is the most suitable assumption for this study, as it balances the amount of rear blade sweep (i.e. further increase in rear blade overhang increases impacts on outside of turn) and trailer manoeuvrability (i.e. decrease in rear blade overhang means trailer is longer which increases impacts on inside of turn). This configuration was presented to the transport operator (RJA) as part of the stakeholder engagement who agreed that this configuration appeared most realistic. The adopted test vehicle is mentioned throughout this study as '91m Blade Pinned Trailer'.

Table 9 Design parameters of design vehicle – 91m Blade Pinned Trailer

Design Parameter	Design Value
Prime mover width	2.5 m
Prime mover length	6.7m
Trailer width	3.4m
Trailer body width (with blade)	5m
Trailer length	60.5 m
Lock to Lock Time	6 seconds
Rear wheel configuration	Set to rear-steerable
Steering Lock Angle	40 degrees
Articulating angle	40 degrees
Assumed speed (turning movement)	5 km/h
Trailer axle spacing	1.8m

Design Parameter	Design Value
Rear blade overhang	31.8m
Combination length	103.1m
Swept Path Clearance Envelope	0.5 m

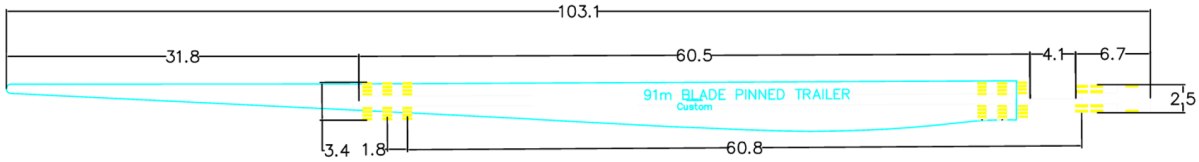

Figure 6-10: Design vehicle envelope

6.3.2 Outcomes

The 91m Blade Pinned Trailer was used to perform the vehicle tracking analysis, estimating the extent of the wheelbase and body as the vehicle navigated various turns. The analysis assessed whether realignment would be required and identified any potential impact on surrounding vegetation and infrastructure. At intersections where the design vehicle wheels cannot complete the turn without leaving the paved area, strengthening, widening or realignment will be required. In some instances, light poles, traffic poles, and signage will require temporary relocation, removal or replacement.

The turns tested along the blade routes are shown in Figure 6-11, Figure 6-12 and Figure 6-13Figure 7-1, and key conflicts are summarised in Table 10 and Table 11. Shapefiles are provided electronically with this report. Refer to Appendix B for imagery of swept paths and conflicts.

The conflict rationale/assumptions are listed below:

- Low height objects (i.e. less than 1.5m) such as signs can remain if is only the swept path of the blade over sail (i.e. the section overhanging off back of the trailer). Will require removal if actual truck envelope is over. Actual height of rear over sail dependant on final trailer configuration and OEM.
- Vegetation trimming rather than clearing may be an option for some situations just like above (i.e. if only blade over sail)
- Based on Near map aerial imagery and Google aerial imagery and Streetview only (site visits excluded from scope)
- Whilst remaining within road pavement is prioritised, traversing outside of this (i.e. over kerbs and onto shoulders and verges) is avoided where possible
- General order of priority for avoiding conflict with typical infrastructure elements: Structure, traffic poles, light poles, signs

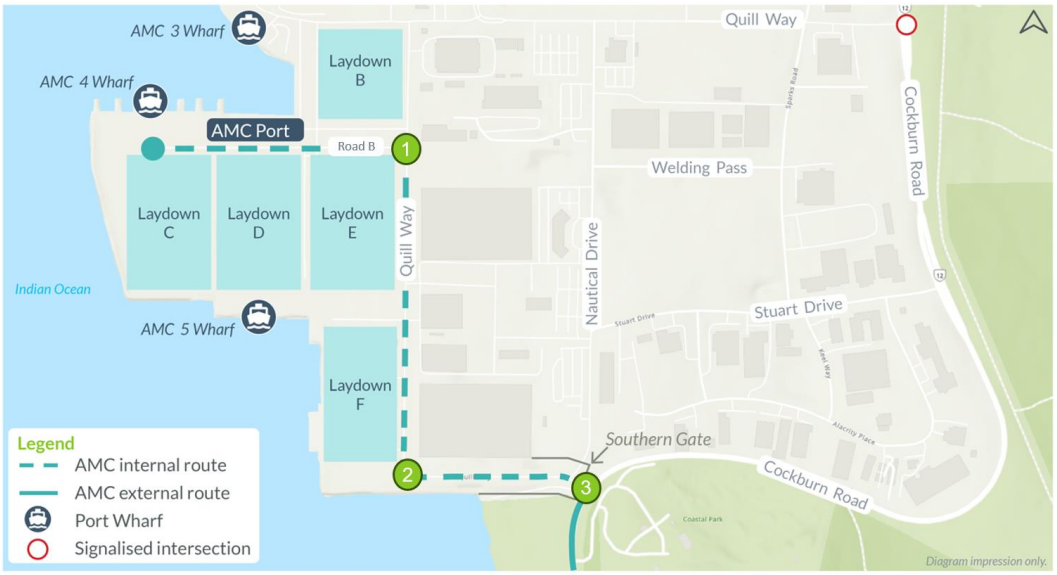

Figure 6-11: Swept path locations at AMC Port

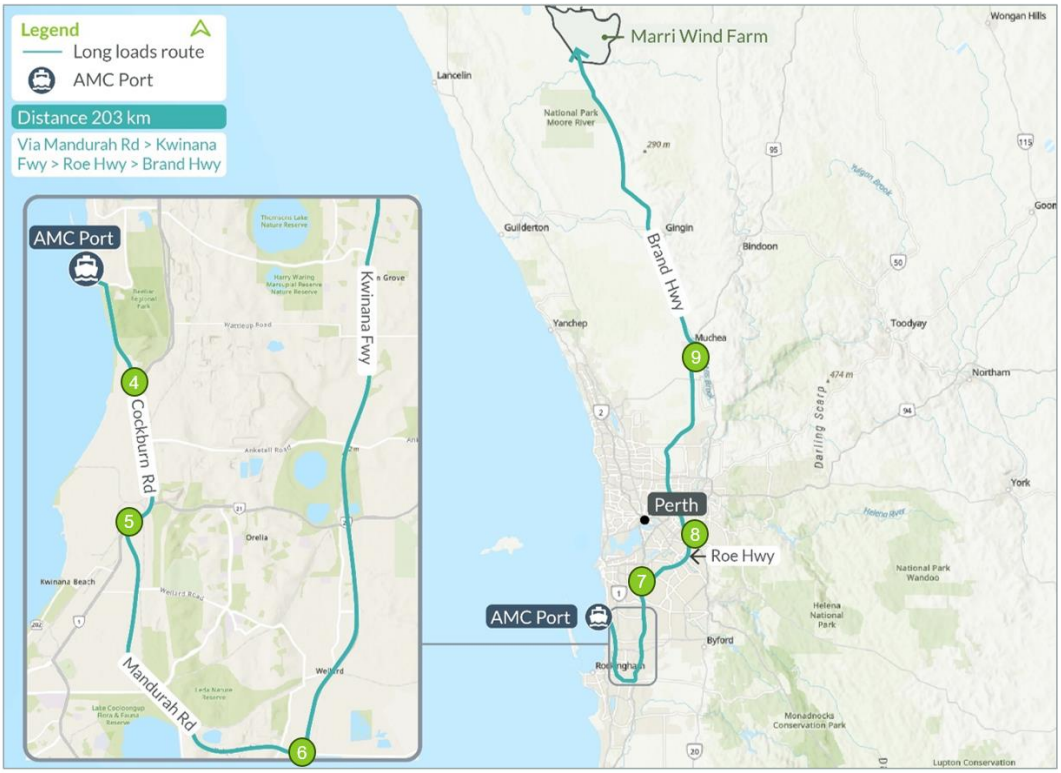

Figure 6-12: Swept path locations outside of AMC Port

Table 10: AMC Port to site swept path analysis

No.	Location	Movement	Impacts
1	CUF Road B/ Quill Way	Right turn onto Quill Way. Note this movement may not eventuate (dependant on wharf and laydown selected)	■ Jurisdiction – AMC Port ■ Over sails Laydown B or cuts corner of Laydown E (will require reserving some of holding area) ■ Traverses 90 degree parking on Quill Way opposite intersection (close approximately 25 bays)
2	Quill Way South end	Left turn around corner toward southern exit	■ Jurisdiction – AMC Port ■ Traverses some 90 degree parking on east-west section of Quill Way (close approximately 5 bays) ■ Over sails Laydown B (will require reserving some of holding area)
3	Quill Way/ Cockburn Road	Right turn through gates onto Cockburn Road <u>Alternative</u> - Reverse out to avoid significant impacts (see second row of impacts)	■ Jurisdiction – AMC Port – City of Cockburn ■ 4x Light poles (relocate) ■ Over sails carpark to north (requires some closure) ■ Likely conflict with structure to north (uncertain if this can be relocated) ■ Gate (remove) ■ Vegetation on north side of Quill Way and gate (requires trimming to allow over sail) ■ Leaves road surface on east side of Cockburn Road (requires hardstand) ■ Vegetation on east side of Cockburn Road (requires clearing)
			■ Jurisdiction – same as above ■ 2x Light poles (relocate) ■ Leaves road surface at security gate/fence (requires hardstand) ■ Vegetation at security gate/fence (requires clearing) ■ Vegetation on east and north sides of Cockburn Road (requires clearing or trimming)

No.	Location	Movement	Impacts
4	Cockburn/ Rockingham Road	Right turn through intersection on opposite side of road (contraflow) to Rockingham Road and then travel on opposite side of until 200m where veer over to correct side of road Alternative – Right turn through intersection on correct side of road to Rockingham Road	▪ Jurisdiction – Cockburn Road - City of Cockburn – Rockingham Road – Main Roads WA Metropolitan ▪ 2x Signs (relocate) ▪ Traverses traffic island at intersection (make trafficable) ▪ Traverses traffic island further south (make trafficable) ▪ Vegetation on traffic island for above (clear for under vehicle and trim where next to vehicle) ▪ Note power pole close to swept path ▪ Note overhead utilities (confirm adequate clearance)
			▪ Jurisdiction – same as above ▪ 2x Traffic poles (modify/relocate) ▪ 2x Signs (relocate) ▪ Vegetation to north (trim to allow over sail) ▪ Leaves road surface on eastern side of Rockingham Road (requires hardstand) ▪ Note overhead utilities (confirm adequate clearance)
5	Rockingham Road/ Mandurah Road	Left turn through intersection onto Mandurah Road	▪ Jurisdiction – Rockingham Road – Main Roads WA Metropolitan – Mandurah Road - City of Kwinana ▪ 1x Traffic pole (modify/relocate) ▪ 1x Sign (relocate) ▪ Note one light pole close to swept path
6	Kulija Road/ Kwinana Freeway	Veer onto opposite side of road 300m before intersection (contraflow) Left turn from opposite side of road (contraflow) onto Kwinana Freeway on-ramp	▪ Jurisdiction – Main Roads WA Metropolitan ▪ 4x Signs (relocate) ▪ 1x Tree in median (trim or remove) ▪ 2x Light poles (relocate) ▪ 1x Traffic pole (modify/relocate) ▪ Traverses traffic island (make trafficable – note grate at this location)

No.	Location	Movement	Impacts
7	Kwinana Freeway/ Roe Highway	Left onto off-ramp with large sweeping turn from left to right onto Roe Highway	■ Jurisdiction – Main Roads WA Metropolitan ■ Vegetation to west (trim to allow over sail) ■ 4x Light poles (relocate) ■ Note overhead utilities (confirm adequate clearance)
8	Roe Highway/ Tonkin Highway	Left onto off-ramp with large sweeping turn onto Tonkin Highway	■ Jurisdiction – Main Roads WA Metropolitan ■ No identified constraints
9	Tonkin Highway/ Brand Highway	Left onto off-ramp with large sweeping turn onto Brand Highway	■ Jurisdiction – Tonkin Highway - Main Roads WA Metropolitan – Brand Highway - Main Roads Gascoyne Region ■ No identified constraints

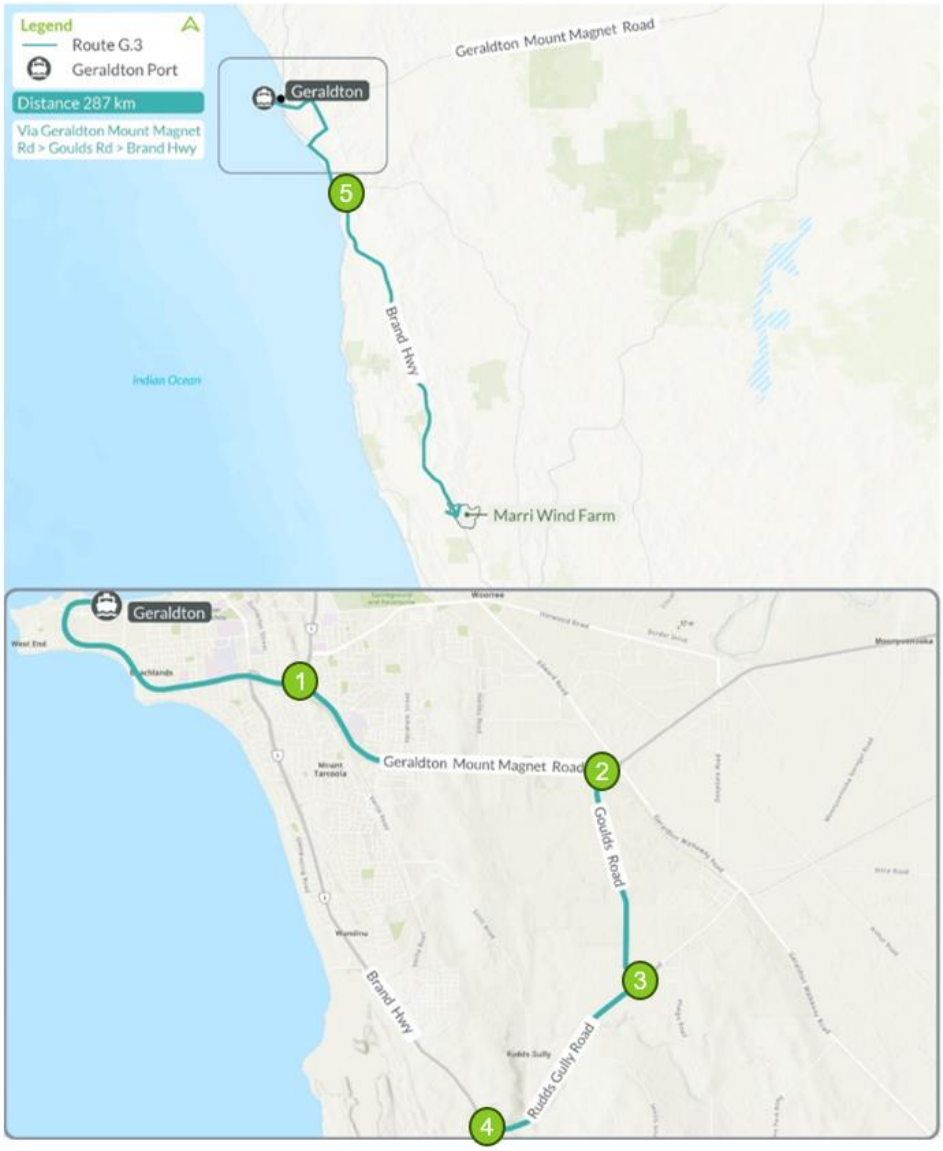

Figure 6-13: Swept path locations Geraldton Port to site

Table 11: Geraldton Port to site swept path analysis

No.	Location	Movement	Notes
1	Geraldton Mount Magnet Road/ North West Coastal Highway	Right turn across trafficable section of median and through slip lane onto Geraldton Mount Magnet Road	▪ Jurisdiction – Main Roads Gascoyne Region ▪ 3x Signs (relocate) ▪ Vegetation on trafficable median (trim if required) ▪ Traverses traffic island (make trafficable) ▪ Note one light pole close to swept path

No.	Location	Movement	Notes
2	Geraldton Mount Magnet Road/ Goulds Road	Right turn through intersection onto Goulds Road	■ Jurisdiction – Geraldton Mount Magnet Road - Main Roads Gascoyne Region – Goulds Road – City of Greater Geraldton ■ 2x Signs (relocate or allow over sail) ■ 3x Light poles (relocate) ■ Leaves road surface on western corner of intersection (requires hardstand) ■ Clear vegetation at above point
3	Goulds Road/ Rudds Gully Road	Right turn through intersection onto Rudds Gully Road	■ Jurisdiction – City of Greater Geraldton ■ Over sail private property on east side of Goulds Road (landholder permission) ■ Vegetation on east side of Goulds Road in private property (requires trimming to allow over sail) ■ 1x Power Pole (relocate outside of swept path). Note one other is also close to being impacted to north. ■ Leaves road surface on east side of Goulds Road and western corner of intersection (requires hardstand) ■ Note overhead utilities (confirm adequate clearance)
4	Rudds Gully Road/ Brand Highway	Left turn through intersection onto Brand Highway	■ Jurisdiction – Brand Highway - Main Roads Gascoyne Region – Rudds Gully Road – City of Greater Geraldton ■ Over sail private property on north side of Rudds Gully Road (landholder permission) ■ Vegetation on north side of Rudds Gully Road in private property (may require trimming to allow over sail) ■ Leaves road surface on north side of Rudds Gully Road (requires hardstand) ■ Traverses traffic island (make trafficable) ■ Note overhead utilities (confirm adequate clearance)

No.	Location	Movement	Notes
5	Brand Highway/ Midlands Road	Right turn through intersection onto Brand Highway Two options were tested here, as to try and minimise impact to vegetation. First option (preferred) cuts the corner more (increasing impact on southern corner and less impact north side of Brand Highway) <u>Alternative</u> – Cuts the corner less (minimising impact on southern corner and increasing impact on north side of Brand Highway – likely requires clearing outside of road reserve so is not preferred).	▪ Jurisdiction – Main Roads Gascoyne Region. – Note below may have impacts outside of road reserve (private property – 'General Farming'), which would require consultation with Shire of Irwin. To first confirm with Main Roads Gascoyne Region. ▪ 3x Light poles (relocate) ▪ Vegetation on northern side of Brand Highway (requires clearing and trimming) ▪ Vegetation on southern corner of intersection (requires clearing) ▪ Leaves road surface on southern corner of intersection (requires hardstand)
			▪ Jurisdiction – same as above ▪ 1x Sign (relocate) ▪ 4x Light poles (relocate) ▪ Vegetation on northern side of Brand Highway (requires clearing and trimming). Over sail private property (landholder permission) ▪ Vegetation on southern corner of intersection (requires clearing)

6.4 Route assessment summary

A detailed review of the routes have been undertaken through this study. These initial routes were based on desktop assessment and stakeholder engagement with the relevant authorities and ports (see Section 6.1 and 6.2). After assessing the initial routes, preferred routes were determined for the transportation of the wind turbine components from each port. A summary of the evaluation of the routes is shown in Table 12.

For AMC Port to site, there are considerable overhead constraints, and so two routes are identified dependant on component being transported. Furthermore, Muchea RTAA is a logical stop-over for AMC Port to site, given it is approximately halfway along route, and is located on the border of the Perth Metropolitan area (border of change in operational requirements).

Note trailer configuration is subject to transport operator specifications as to determine total overhead height for transportation of tower components, which would impact use of Preferred Route 2 mainline, Sub-route 1, or Sub Route 2.

Table 12 Route Option Evaluation Summary

Primary Routes	Route Evaluation Considerations
AMC Port	
Preferred Route 1 (blades)	■ Mandurah Road, Kwinana Freeway, Roe Highway and Tonkin Highway ■ Overhead clearance of 5.6m ■ 5 locations require modifications as to facilitate movement of 91m blade transportation. Two locations require contraflow (i.e. travel on opposite side of road). ■ AMC Port requires reversing out of southern gate due to significant constraints in area, including adjacent building and tight turn at Cockburn Road.
Preferred Route 2 (high loads)	■ Main route up along Thomas Road/Tonkin Highway/Brand Highway – Overhead clearance of 5.6m – Likely suitable for most components excluding blades and tower sections ■ Alternative routes to accommodate tower sections – Sub-route 1 onto Abernethy Road/ Roe Highway/ Great northern Highway ■ This is the Main Roads high haulage route and is extensively used ■ No overhead clearance limitation (i.e. allows 6.8m clearance) ■ Considerable length of contraflow requiring traffic management – Sub-route 2 onto Abernethy Road/ Roe Highway/ Great northern Highway ■ Overhead clearance of 6.4m ■ Has less significant length of contraflow and so may be an alternative for some components (i.e. loads >5.6m and <6.4m) – Sub-route 1 and 2 at Tonkin Highway/Brand Highway interchange ■ Requires contraflow to avoid overhead structure.
Geraldton Port	
Preferred Route (all components including blades and high loads)	■ John Willcock Link/ Geraldton Mount Magnet Road, Goulds Road and Brand Highway ■ Overhead clearance of 6.8m ■ Slight deviation off road to travel under higher section of bridge span to achieve above clearance – Highbury Street – Abraham Street ■ 5 locations require modifications as to facilitate movement of 91m blade transportation (assuming modifications at Geraldton Port/ Reg Clarke Road complete). All 5 locations require cutting through intersection on opposite site of road.

7 Site access review

In addition to the route assessment, a review of the site access constraints was also undertaken, in addition to some preliminary checks for the internal road layout. A swept path analysis was undertaken for this to identify the impacts that require further consideration. A high-level check with Before You Dig Australia (BYDA) was also undertaken.

7.1 Site access

The two primary accesses into the project site are off Brand Highway, at Dandaragan Road and Gillingarra Road (see Figure 7-1). A swept path assessment is undertaken below as to analyse impacts with surrounding constraints. Refer to Appendix C for further details.

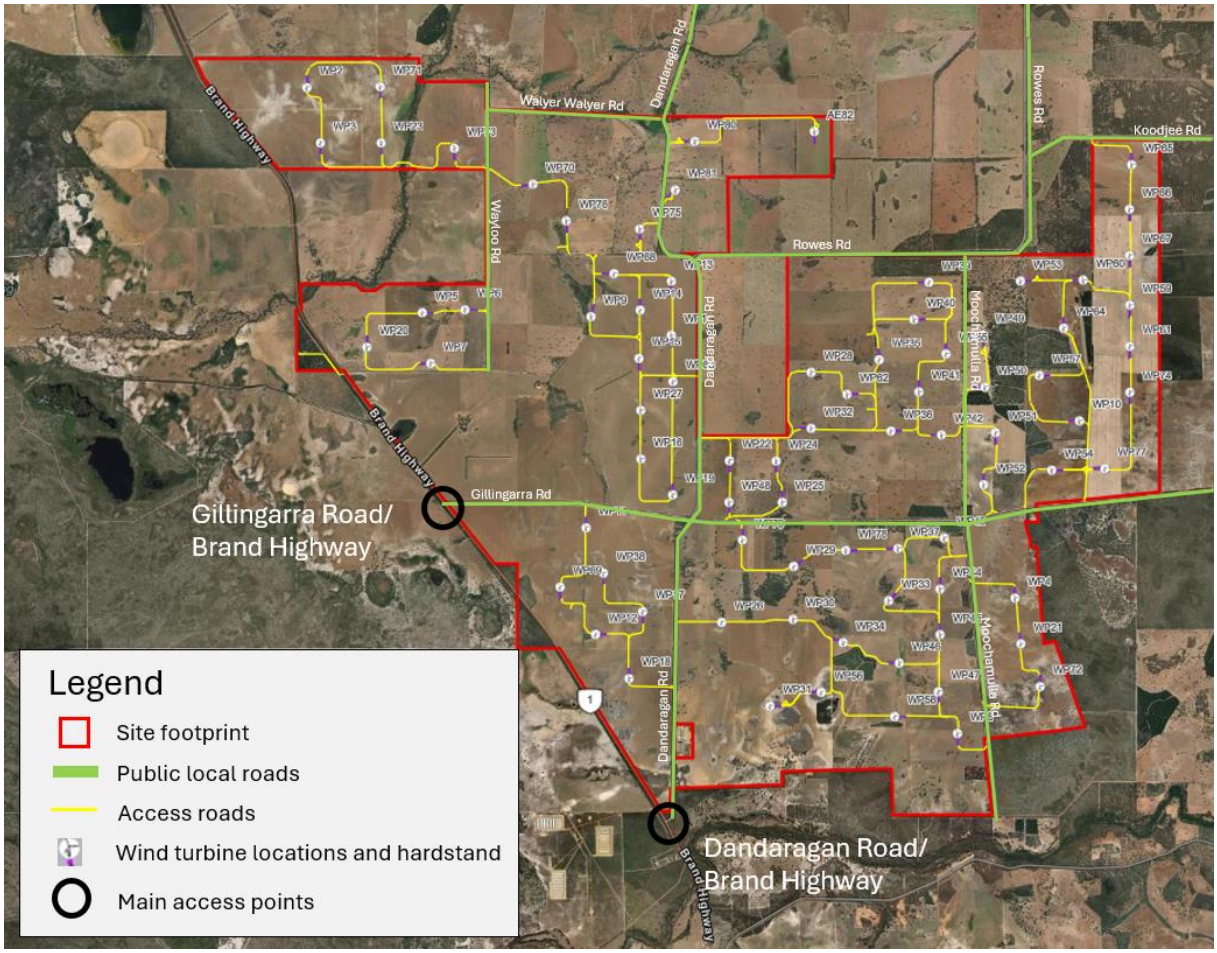

Figure 7-1: Site access

7.1.1 Dandaragan Road

The test vehicle swept paths are shown below in Figure 7-2. From this assessment, it is identified that significant vegetation is impacted when accessing Dandaragan Road, from both the north and south. Furthermore, the southeast corner at Dandaragan Road would need to consider drainage infrastructure if upgraded (based on consultation with Main Roads Gascoyne).

Figure 7-2: Dandaragan Road/ Brand Highway swept path analysis

7.1.2 Gillingarra Road

The test vehicle swept paths are shown below in Figure 7-3. From this assessment, it is identified that significant vegetation is impacted when accessing Gillingarra Road from the south but is not the case when accessed from the north. From the BYDA search, the building on the south east corner is a fixed constraint, associated with power utilities. This is avoided in the swept path, including the fence.

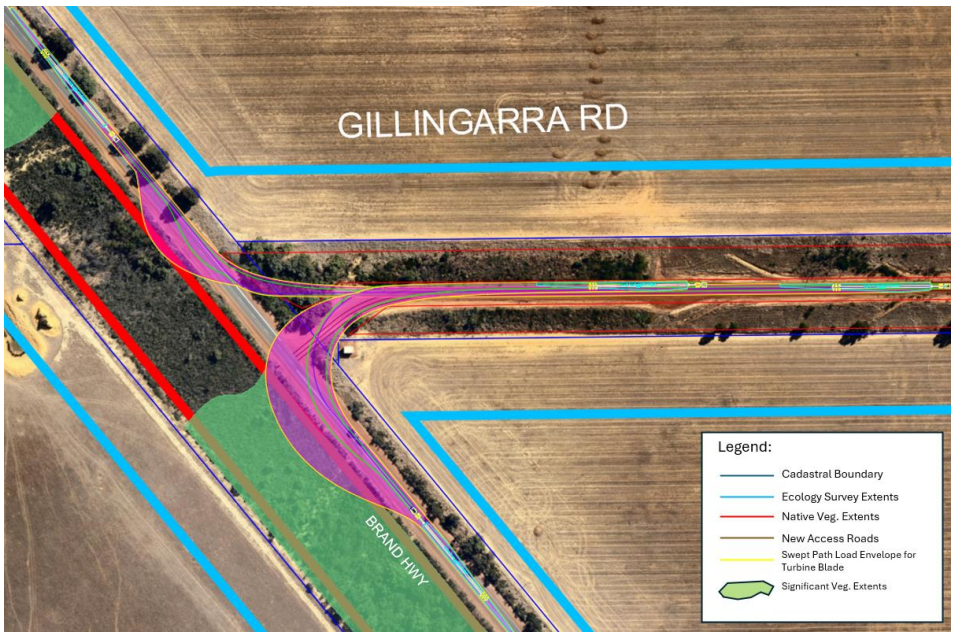

Figure 7-3: Gillingarra Road/ Brand Highway swept path analysis

7.1.3 Secondary access

Secondary accesses were also considered at a high level, as per Figure 7-4. The intent here was to highlight additional locations that could provide access to the project, or help support access for the primary access locations.

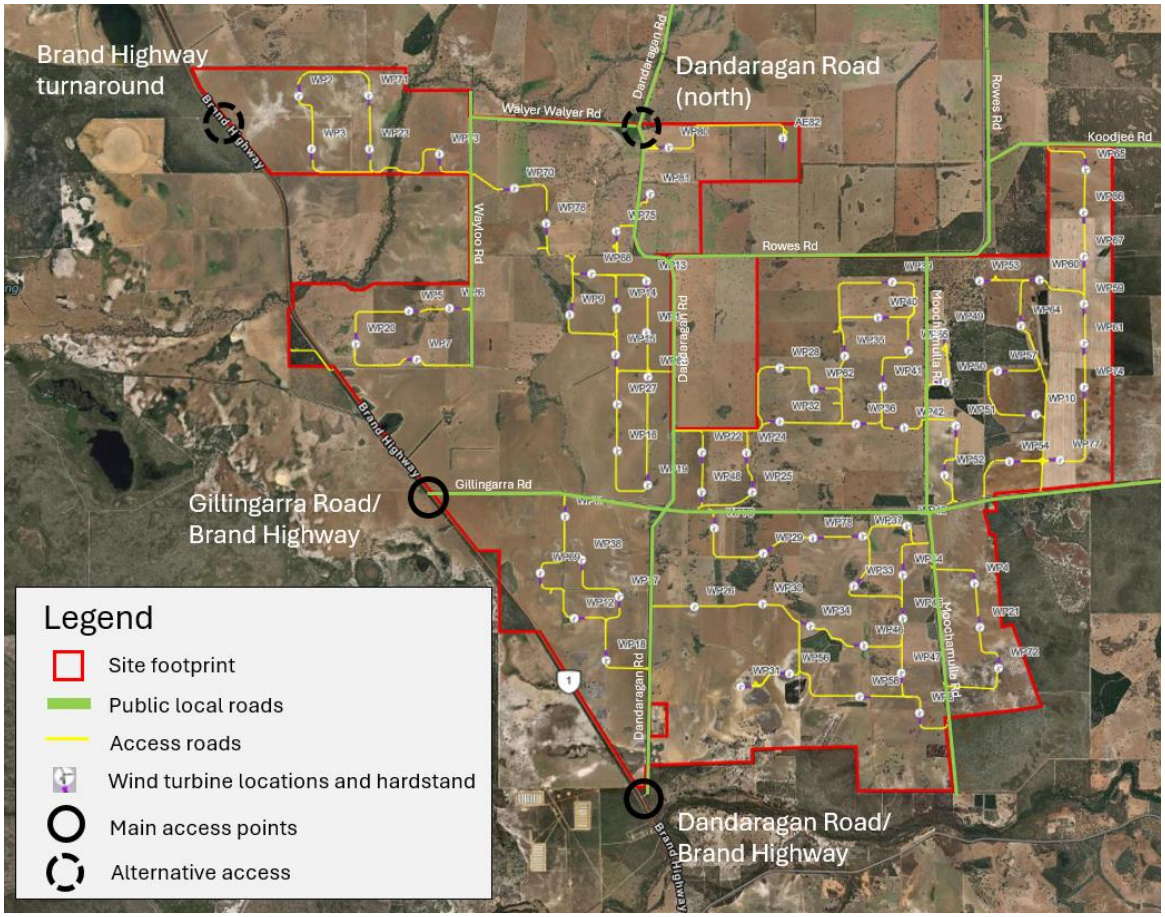

Figure 7-4: Alternative site access options

The secondary access are summarised below.

- Substation access on Brand Highway - A substation is proposed to be located north of Gillingarra Road and to the west of the Brand Highway. A proposed driveway connecting to the Brand Highway will provide access to the substation and satellite compound. Unlike the rest of the project site, this will not require facilitation of blade transportation, and so the most likely worst case vehicle for this location is associated with transformer transportation. A typical vehicle for this is a prime mover with platform trailer which has been tested below for a 190 tonne transformer (as advised) with a truck combination length of 44m. For conservativeness, a single point of articulation has been adopted for the vehicle (rather than two) as to accommodate for variations in trailer configurations and available transport operator equipment (refer to Appendix C for further details). See Figure 7-5 and Figure 7-6 for the swept paths analysis.
- Turnaround on Brand Highway - A turnaround facility further north as to allow vehicles travelling from the south to instead enter from the north was considered. This would minimise impacts to significant vegetation, if Gillingarra Road was selected as the primary access. This turn around facility could be located within the project site with the additional access off Brand Highway. This may also avoid the need for a bridge upgrade for internal roads in this area. See Figure 7-7 for the swept path analysis.

- Alternative points of entry - Accessing the site from the north via Dandaragan Road, either
  - Continuing north along Brand Highway and turning east on Cataby Road and then south onto Dandaragan Road. Equates to additional 70km of travel and likely introduces additional intersections which would require modifications to accommodate transportation of wind turbine components (e.g. Brand Highway/Cataby Road). This is not required to be investigated further as other more suitable locations are currently preferred (see primary and secondary above).
  - From Muchea, traveling along Great Northern Highway, turning west at Midlands Road, travelling through Moora and then onto Dandaragan Road. Equates to additional 110km of travel, and likely introduces additional intersections which would require modifications to accommodate transportation of wind turbine components, particularly at Moora. This is not required to be investigated further as other more suitable locations are currently preferred (see primary and secondary above).

Figure 7-5: Substation access/ Brand Highway swept path analysis (Prime mover from south)

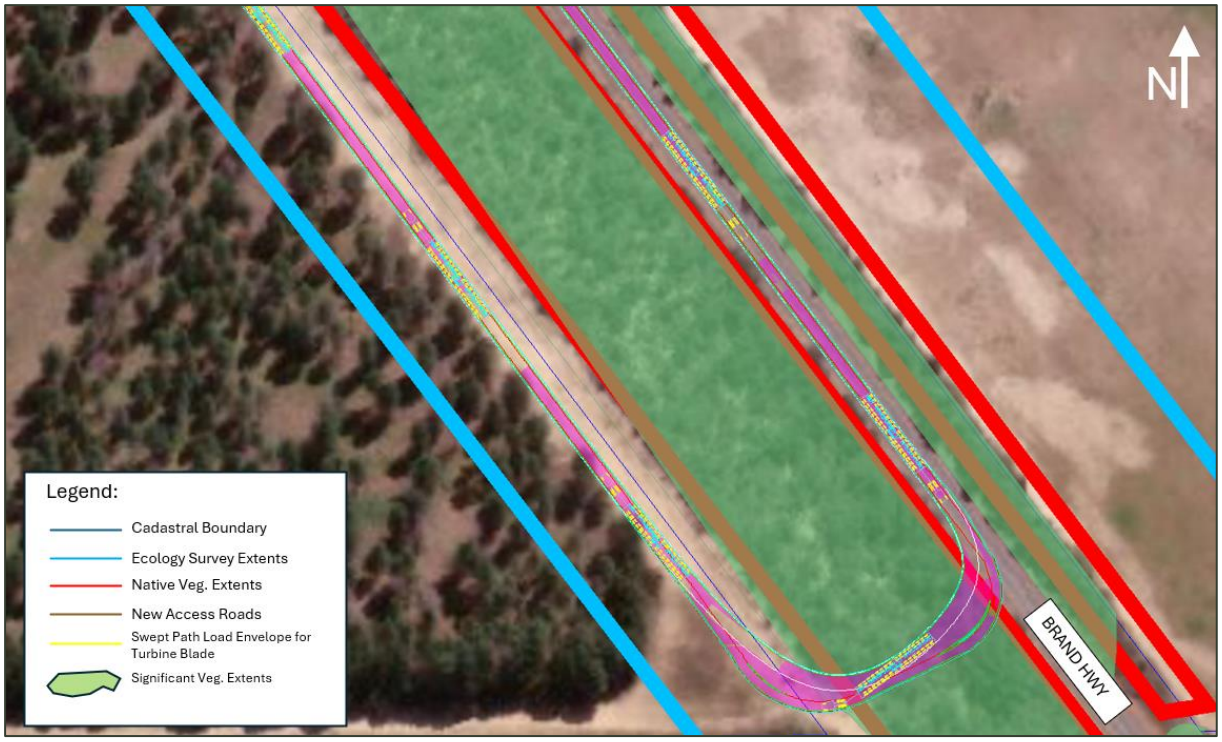

Figure 7-6: Substation access/ Brand Highway swept path analysis (Prime mover from north)

Figure 7-7: Turnaround/ Brand Highway swept path analysis

7.2 Internal roads

A preliminary review of the internal roads was also undertaken as to inform potential impacts with significant vegetation and services. Preliminary swept path checks were undertaken for the intersections of each of the public internal roads (see Figure 7-8), in addition to those intersections with the private access roads (specific to turbine access) where there may be an impact to significant vegetation.

The swept path analysis is included in Appendix C which outlines the spatial impacts and resultant conflict for transportation of wind turbine blades. A number of opportunities were identified for consideration, also documented in the above.

As part of the BYDA search, Dampier to Bunbury Gas Pipeline (DBNGP) was identified running north-south through the site, it has been noted in the updated internal roads layout (designed by others and received from Alinta Energy on 28th July 2025) shows a proposed access road alignment over the existing DBNGP. It should be noted that if the Project intends to build additional roads or access tracks over the top of the DBNGP then the authority will need to be contacted and the relevant engineering assessments and processes will need to be undertaken to ensure the safety and integrity of the pipeline.

It is noted that Telstra utilities run along some of the road reserves including Dandaragan Road. Western Power returns were also received along with the BYDA returns indicating that Western Power has electrical power assets in the area including overhead power lines running parallel to Brand Highway.

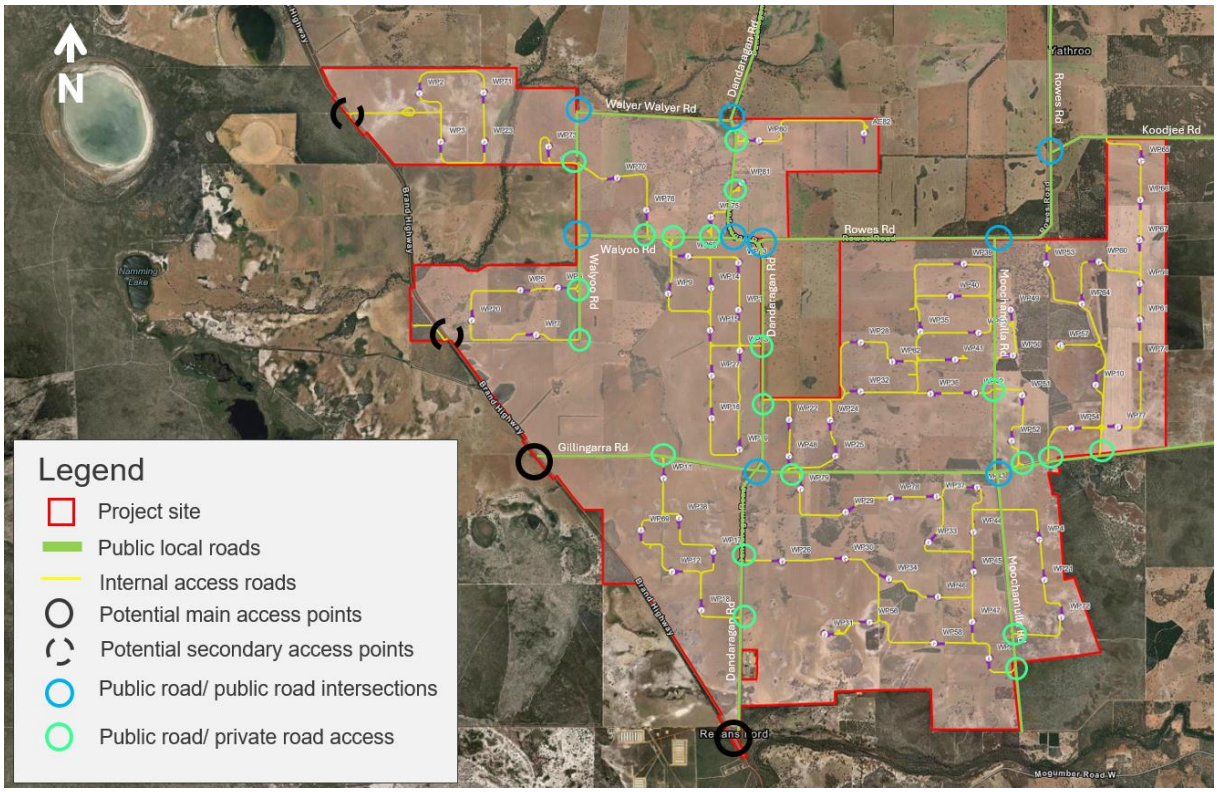

Figure 7-8: Internal swept path checks

8 Regulatory requirements

It is understood that the following is required for the approvals

- Following this preliminary assessment of the preferred routes, Main Roads (relevant regions and its Road and Traffic Engineering branch (RTE)) will need to provide approval of any required design considerations. The City of Greater Geraldton will also be required to be engaged for any required changes on Goulds Road and Rudds Gully Road. Furthermore, any other impacted asset owners (e.g. utilities) will also have to be engaged.

- Environmental and Heritage assessments and approvals where routes require vehicles to leave the existing road boundaries must be initiated well before transporting the goods to allow sufficient time for approvals to be granted
- Submission of the preferred route/s for a Mass Only Assessment by Heavy Vehicle Services (HVS) should be sought before committing to a preferred route to determine any potential constraints relating to the weight restrictions on bridges or other structures along the route. It is more than likely that most structures will require bridge surveillance as the loads are transported across. Once an OEM is confirmed, it is recommended this report and weights of components are sent to Main Roads HVS for assessment.
- Routes (along entire length) will need to be checked with Western Power for likely travel height restrictions.
- An OSOM Traffic Management Plan (TMP) must be prepared and approved by HVS prior to the transportation of any oversize over mass components (OSOM) such as the blades. This would be done in consultation with Main Roads and affected Shires. To minimise the impacts of the blade delivery, the TMP would set out strategies and processes to maintain the safety and performance of the local road networks (establish traffic wardens and processes etc – not part of current study). The TMP would include commentary on escort vehicles and temporary restrictions required to manage conflicts, so all intersections are clear from parking and oncoming traffic. If approval is not granted, a revision and resubmission will be required. The TMP will not be approved until the detailed route survey is completed. The detailed route survey is typically undertaken by the transport operator as to confirm that the modifications made to the transport network facilitate the OSOM movements.
- A Transport Impact Assessment considering broader impacts of construction staff and traffic (beyond just the transportation of specialised wind turbine equipment) will be required for development approval (separate form this current study). This route assessment can be attached to this, with a summary inserted into the main document.

9 Conclusions and recommendations

A route assessment for transportation of wind turbine equipment from AMC Port and Geraldton Port to site has been undertaken. The overarching intent of the route assessment is to provide Alinta Energy with an assessment of viable routes that could affect project costs and viability, in addition to helping inform the extent of early roadworks (including vegetation clearing – refer to appendices for estimated quantities) that may necessitate approvals from asset owners and authorities. Furthermore, the study has conducted a review of site access and key internal roads as to identify potential constraints for further consideration.

Based on the desktop analysis conducted, the preferred routes for transportation of wind turbine components are as per below:

- AMC Port to site:
  - Preferred Route 1 (blades only): Cockburn Road, Rockingham Road, Mandurah Road, Kwinana Freeway, Roe Highway and Tonkin Highway, Brand Highway
  - Preferred Route 2 (all other components): Cockburn Road, Rockingham Road, Thomas Road and Tonkin Highway, Brand Highway
    - High haulage sub-route 1 for tower components: Exit (from above) on Tonkin Highway on-ramp (contraflow) onto Abernethy Road, Great Eastern Highway Bypass, Stirling Crescent, Bushmead Road, Military Road, Roe Highway, Great Northern Highway, Tonkin

Highway/Brand Highway interchange (contraflow), Brand Highway. Note also alternative from Tonkin onto Aberneth Road (sub-route 2) however less likely to accommodate height requirements).

- Port of Geraldton to site:
  - Preferred Route (all components): Ian Bogle Road, John Willcock Link, Geraldton Mount Magnet Road, Goulds Road, Rudds Gully Road, Brand Highway

It is recommended that further analyses are undertaken to ensure that the optimal route is adopted for the transportation of the heavy vehicles. Further analysis and development of the following is recommended as per below. Note the selection of a preferred wind turbine and associated specifications is subject to change and should be considered as part of the outcomes of this study and below actions.

- Driving the route to check for any clearance or other obvious issues
- Vertical geometry checks (note high level checks undertaken to date only via desktop review)
- Send routes for mass checks by HVS to determine in weight restrictive elements, adopting the 190 tonne transformer combination (44m long prime mover and platform trailer) for the worst case.
- Detailed swept path analyses to determine cost of temporary works (e.g. quantities for hardstands)
- Traffic impact considerations
- A timeline for approvals and design requirements
- Risk analyses of flooding and fire events
- Whilst the proposed routes currently align with that recommended from Main Roads HVS (and other consulted stakeholders), the proposed routes may change subject to approvals from authorities.
- Note construction vehicles are outside of scope but need to be established further as part of the Traffic Impact Assessment (TIA). These additional components will also require further consideration, however are unlikely to exceed that of the turbine components (i.e. length and overhead height).

The site access review has established the spatial requirements and resultant impacts for the two potential main accesses to the site, at Brand Highway/Dandaragan Road and Brand Highway/Gillingarra Road. In addition, the key intersections in the internal road layout have been reviewed. Further consideration is recommended as per below.

- Potential shared use of Dandaragan Road access subject to engagement with adjacent wind farm proponent.
- Selection for Gillingarra Road for primary access as to limit impact to significant vegetation (when compared with Dandaragan Road)
- Potential turn-around facility north of Gillingarra Road (if Gillingarra Road is selected as the primary access) so that turbine blades enter from the north, which does not impact significant vegetation.
- Adjusting internal access road alignments to avoid conflict with significant vegetation.
- Confirmation of port of use, which may influence selection of the primary access and above points.

Shapefiles of the preferred routes and all swept path tests are provided with this report.

10 Limitations

This Report is provided by Aurecon to the Client is a guide only, developed in response to a specific scope. The following limitations should be read in conjunction with the findings.

10.1 Permitted Purpose

This Report is provided by Aurecon for the purpose described in the Agreement and no responsibility is accepted by Aurecon for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

10.2 Qualifications And Assumptions

The services undertaken by Aurecon in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and/ or recommendations in the Report (Conclusions) are based in the whole or in part on information provided by the Client and other parties identified in the report (Information), those Conclusions are based on assumptions by Aurecon of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. Aurecon accepts no responsibility for the Information.

Aurecon has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

Main Roads WA overhead structure data was utilised from the Main Roads HVS Maps portal online and Maximum Load Height adopted. For structures not detailed, this information was supplied by Main roads HVS team and 300mm deducted to provided clearance requirements.

10.3 Use And Reliance

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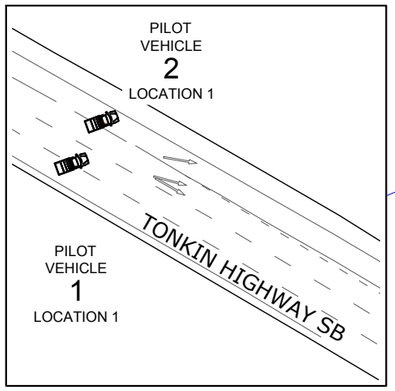
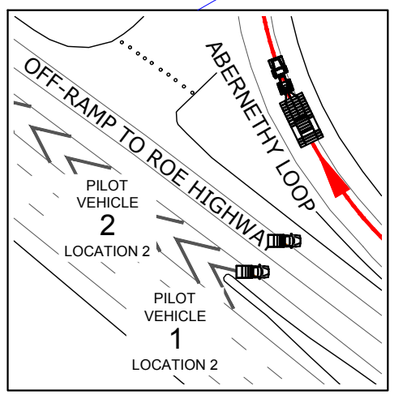
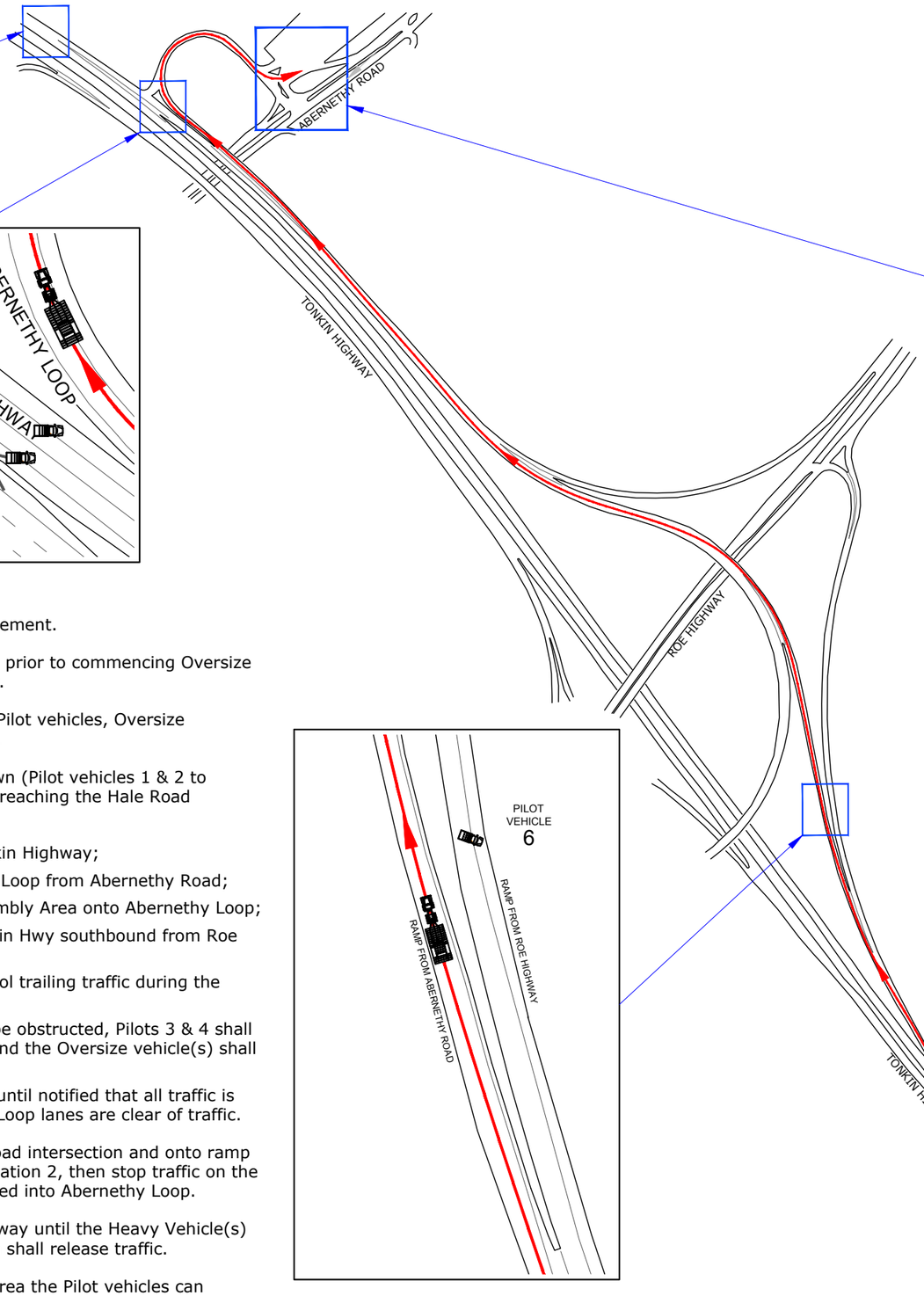
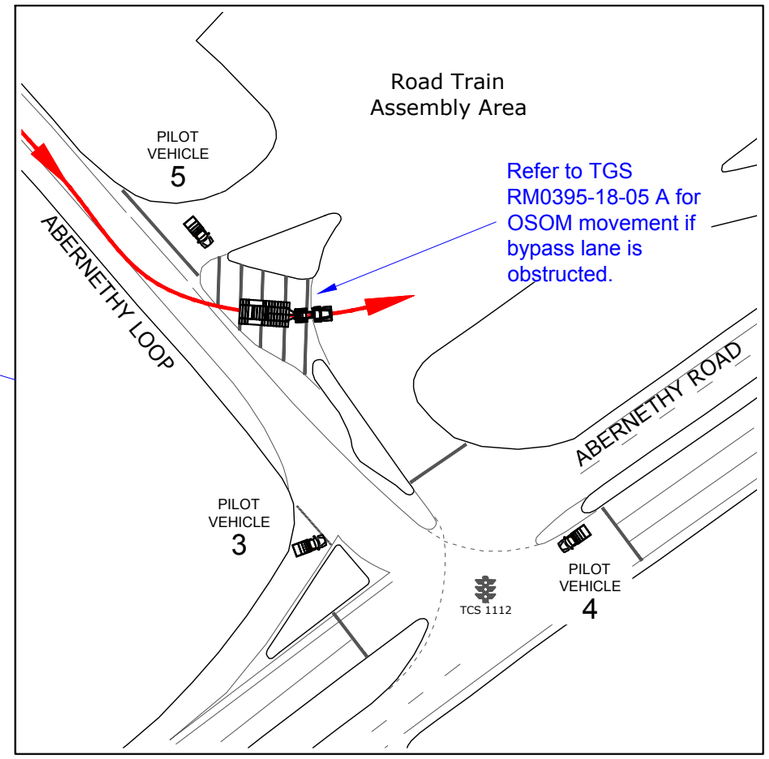
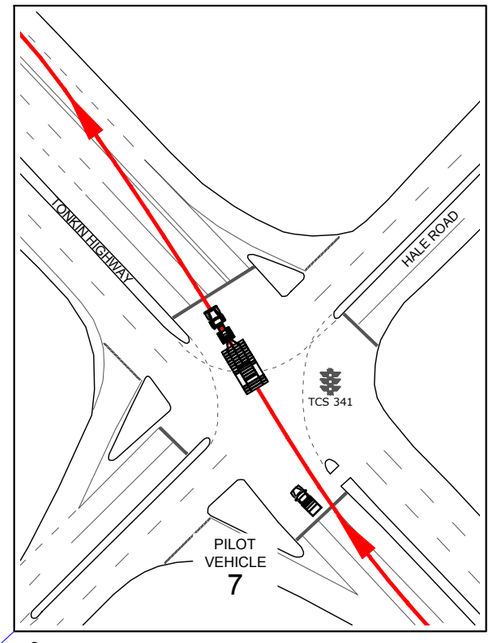
Appendix A – Contraflow movement diagram at Tonkin Highway











NOTES:

1. Minimum 7 Pilot vehicles required to facilitate contra flow movement.
2. Road Network Operations Centre shall be contacted (138 111) prior to commencing Oversize movement and at the conclusion of the contra flow movement.
3. Direct UHF radio communication is to be maintained between Pilot vehicles, Oversize vehicle(s) and Traffic Escort vehicle (if applicable) at all times.
4. Pilot vehicles 1, 2, 3, 4, 5 & 6 shall move to the locations shown (Pilot vehicles 1 & 2 to Location 1) and stop all traffic prior to the Oversize vehicle(s) reaching the Hale Road intersection:
   - Pilot vehicles 1 & 2 shall stop all traffic southbound on Tonkin Highway;
   - Pilot vehicles 3 & 4 shall stop traffic turning into Abernethy Loop from Abernethy Road;
   - Pilot vehicle 5 shall stop trucks exiting the Road Train assembly Area onto Abernethy Loop;
   - Pilot vehicle 6 shall stop all traffic from the ramp onto Tonkin Hwy southbound from Roe Highway;
   - Pilot vehicle 7 shall shadow the Oversize vehicle(s) to control trailing traffic during the Oversize vehicle manoeuvre to the contra flow lane;
   - Should the bypass through the Road Train Assembly Area be obstructed, Pilots 3 & 4 shall relocate to the locations shown on TGS RM0395-18-05 A, and the Oversize vehicle(s) shall follow the path shown on TGS RM0395-18-05 A.
5. Oversize vehicle(s) shall not enter the Hale Road intersection until notified that all traffic is stopped and the intersection, Tonkin Highway and Abernethy Loop lanes are clear of traffic.
6. Once the Oversize vehicle(s) have passed through the Hale Road intersection and onto ramp from Abernethy Road, Pilot vehicles 1 & 2 shall proceed to Location 2, then stop traffic on the off-ramp to Roe Hwy until the Heavy Vehicle(s) have progressed into Abernethy Loop.
7. Pilot vehicle 2 shall hold traffic on the on-ramp from Roe Highway until the Heavy Vehicle(s) have progressed onto the on-ramp from Abernethy Loop, then shall release traffic.
8. Once the Oversize vehicle(s) enter the Road Train Assembly Area the Pilot vehicles can release traffic and continue with duties as required.

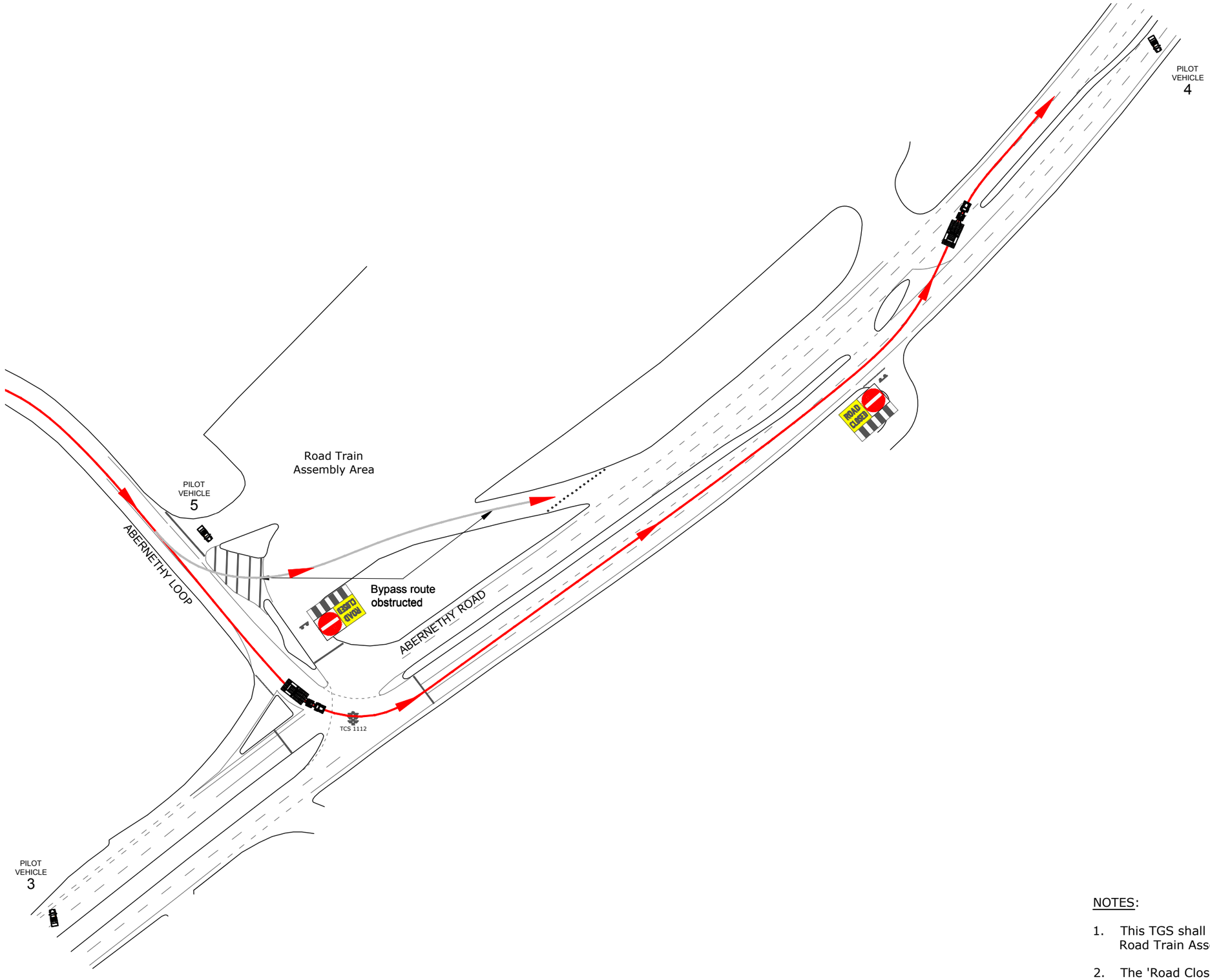
TRAFFIC FORCE
P: 1300 256 000
E info@trafficforce.com.au
W www.trafficforce.com.au

Client:	MRWA HEAVY VEHICLE SERVICES
Location:	TONKIN HIGHWAY NORTHBOUND INTO ABERNETHY LOOP, FORRESTFIELD
Title:	OVERSIZE VEHICLE MOVEMENT NORTHBOUND CONTRA FLOW ROUTE HALE ROAD TO ABERNETHY ROAD
Posted Speed:	80 kph
Temporary Speed:	N/A

LEGEND
- Contra flow path
- Signalised intersection
- Pilot vehicle
- Oversize vehicle

TGS No.: RM0395-18-05	Revision: F	Paper Size: A3
Date: 27 MAY 2020	Scale: Not to Scale	
Designed by: DALLAS MILLWARD AUS-AWTM-18-2352-02		
Reviewed by: SHAUNA ILEY AUS-AWTM-18-5651-01		

NORTH



NOTES:

1. This TGS shall be used where the bypass route through the Abernethy Road Train Assembly Area is obstructed.
2. The 'Road Closed' signage shall be implemented and Pilot vehicles 3 & 4 shall move to the locations shown and stop all traffic prior to the Oversize vehicle(s) reaching the off-ramp to Roe Highway:
   - Pilot vehicle 3 shall stop traffic on Abernethy Road eastbound;
   - Pilot vehicle 4 shall stop traffic on Abernethy Road westbound.
3. Once the Oversize vehicle(s) clear the contra flow route and return to the normal lane of travel the Pilot vehicles can release traffic and continue with duties as required.

TRAFFIC FORCE
P: 1300 256 000
E info@trafficforce.com.au
W www.trafficforce.com.au

Client:	MRWA HEAVY VEHICLE SERVICES
Location:	TONKIN HIGHWAY NORTHBOUND INTO ABERNETHY LOOP, FORRESTFIELD
Title:	OVERSIZE VEHICLE MOVEMENT NORTHBOUND CONTRA FLOW ROUTE HALE ROAD TO ABERNETHY ROAD ASSEMBLY AREA BYPASS SCHEME
Posted Speed:	80 kph
Temporary Speed:	N/A

LEGEND
- Contra flow path
- Signalised intersection
- Pilot vehicle
- Oversize vehicle

DISCLAIMER
This TGS is intended for use only with works managed by Main Roads WA Heavy Vehicle Services and its authorised representatives. Traffic Force is not responsible for misuse and/or alterations which are not authorised by Traffic Force.

TGS No.: RM0395-18-05 A	Revision: F	Paper Size: A3
Date: 27 MAY 2020	Scale: Not to Scale	
Designed by: DALLAS MILLWARD AUS-AWTM-18-2352-02		
Reviewed by: SHAUNA ILEY AUS-AWTM-18-5651-01		

NORTH

Appendix B – Route assessment review

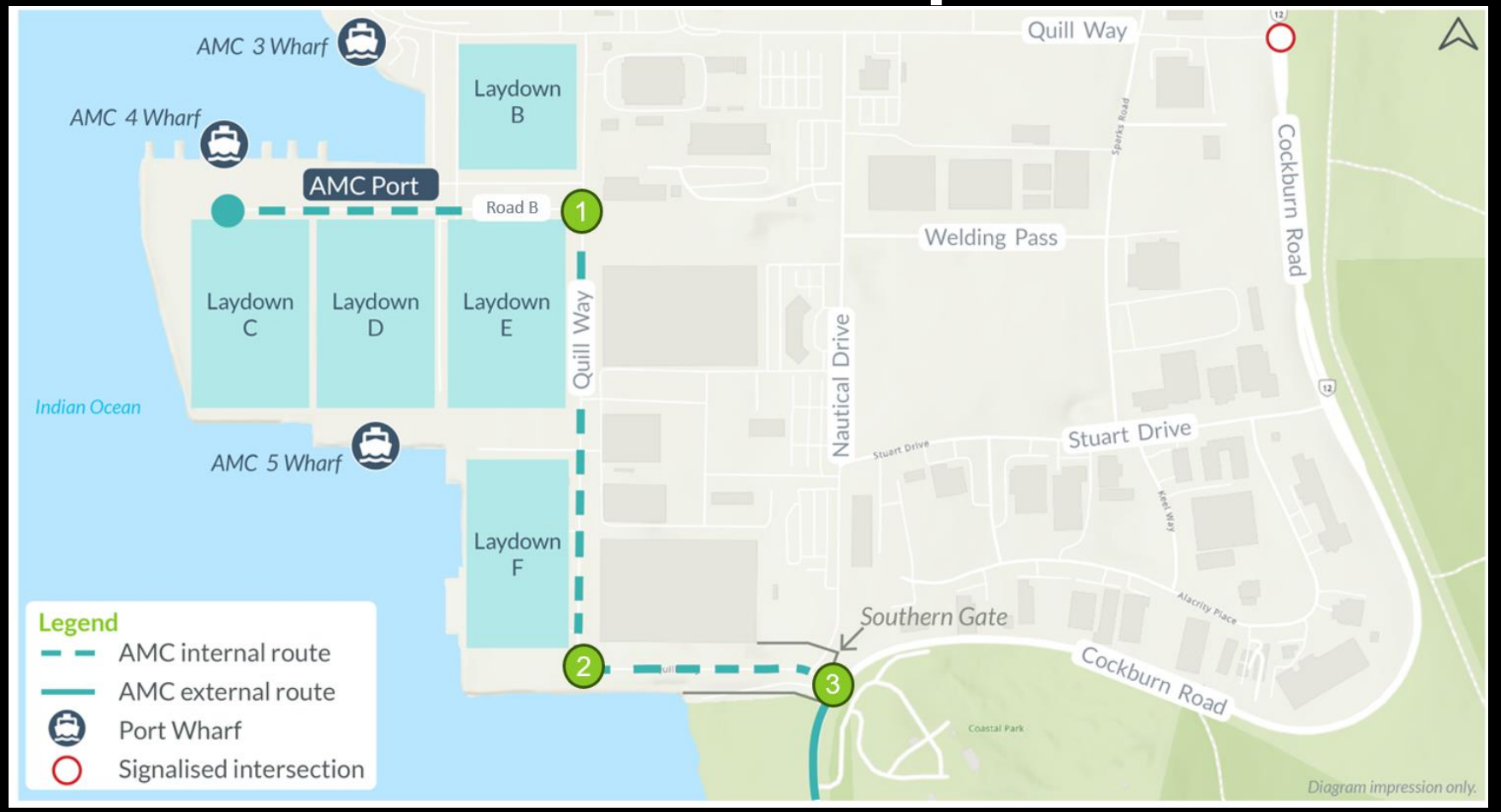
Route Assessment Review

Notes:

- The purposes of this review is to provide high-level insight of potential conflicts with the design vehicle as to inform the initial stages of the Project
- Identified conflicts should be verified on-site. This current review is a desktop study only (and subject to change based on any changes on-site).
- No detailed vertical geometry checks (e.g. no survey data reviewed).
- Further detailed swept path analyses required to determine cost of temporary works (e.g. quantities for hardstands)
- Swept paths based on AutoTURN software, noting other software applications may produce a different swept path profile. Furthermore, swept paths may vary based on variations in preferences across OEM specifications and transport operator equipment/methodology.
- Impacted vegetation is measured at a high-level only against the swept path profile and aerial imagery, with measurement encompassing the area of each indicated polygon. This quantity is subject to change and site investigations, and so should only be used for purposes of general quantification).
- Clearing requirements for impacted vegetation may vary if located within swept path of blade over sail (i.e. blade overhang which is approx. 1.8m above ground), or if under truck wheel path. Trimming rather than complete clearing may be an option for blade over sail (subject to further investigations).

AMC Port to Site

AMC Map

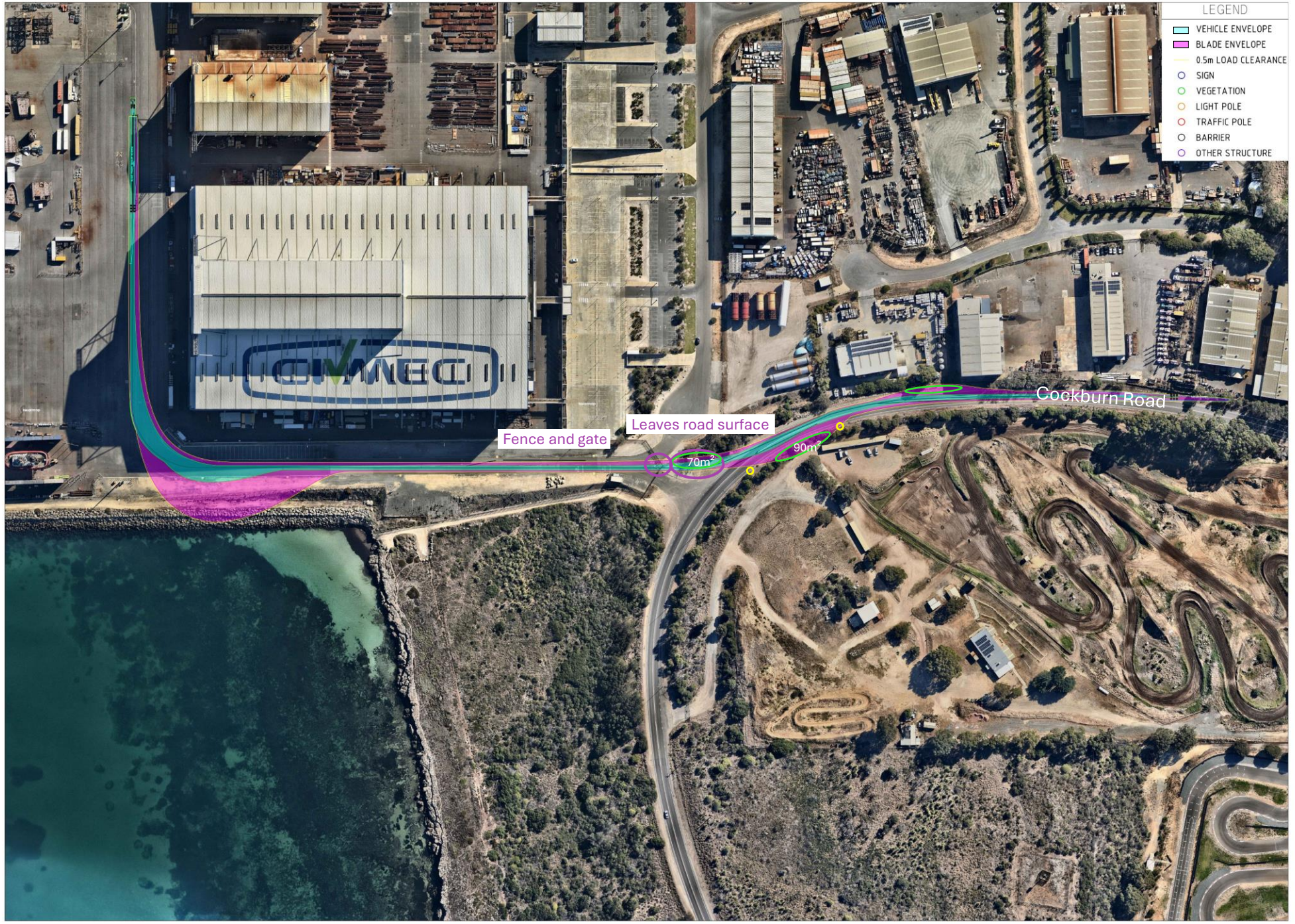

AMC 3 Wharf
AMC 4 Wharf
AMC 5 Wharf
Laydown B
AMC Port
Road B
Laydown C
Laydown D
Laydown E
Laydown F
Quill Way
Indian Ocean
Nautical Drive
Welding Pass
Quill Way
Cockburn Road
Stuart Drive
Southern Gate
Cockburn Road
Coastal Park
Legend
AMC internal route
AMC external route
Port Wharf
Signalised intersection
Diagram impression only.

1. Road B / Quill Way

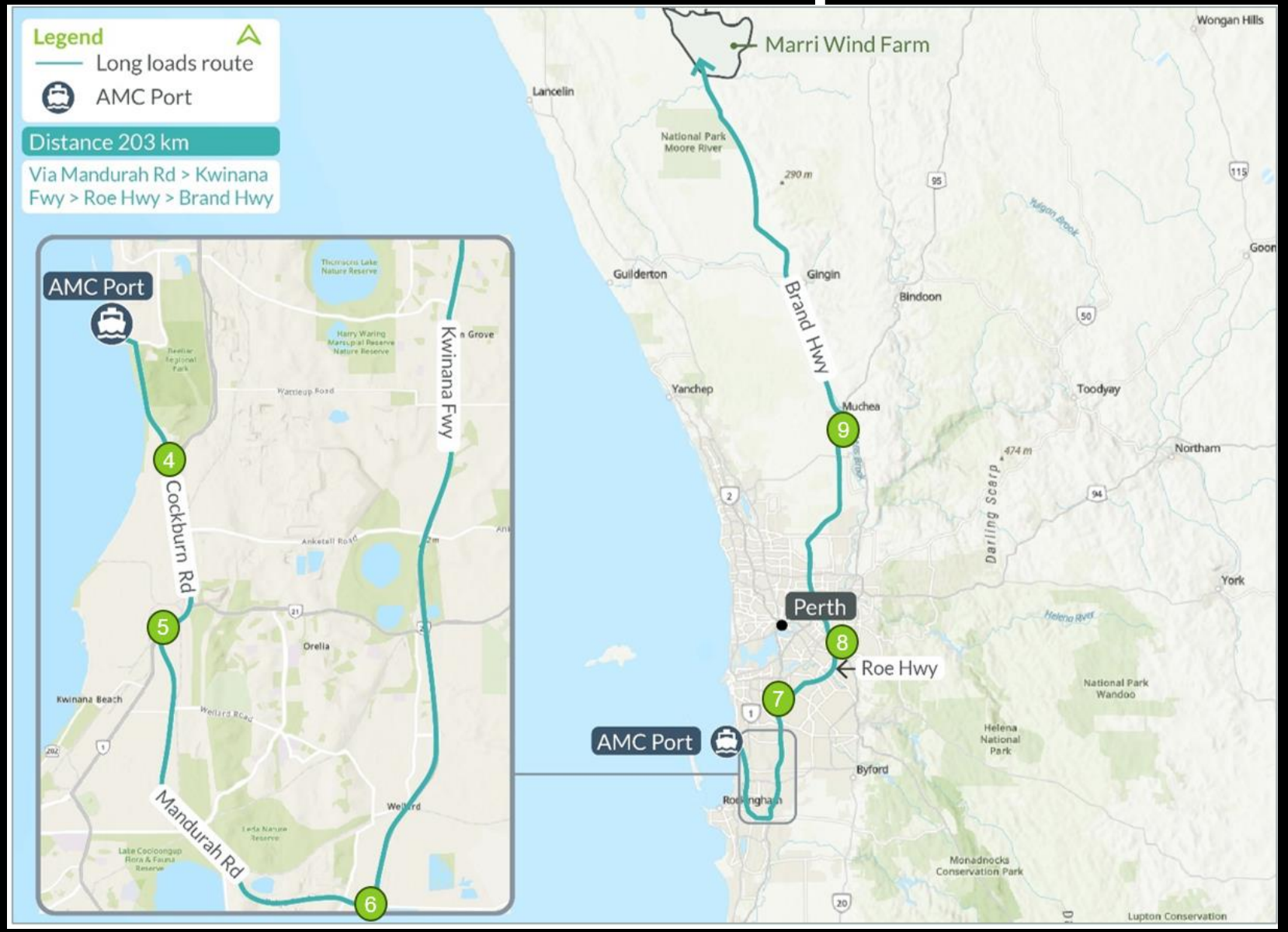
2. Quill Way / South End Rd

3. Cockburn Rd

2 & 3. Quill Way/ Cockburn Rd – Reverse



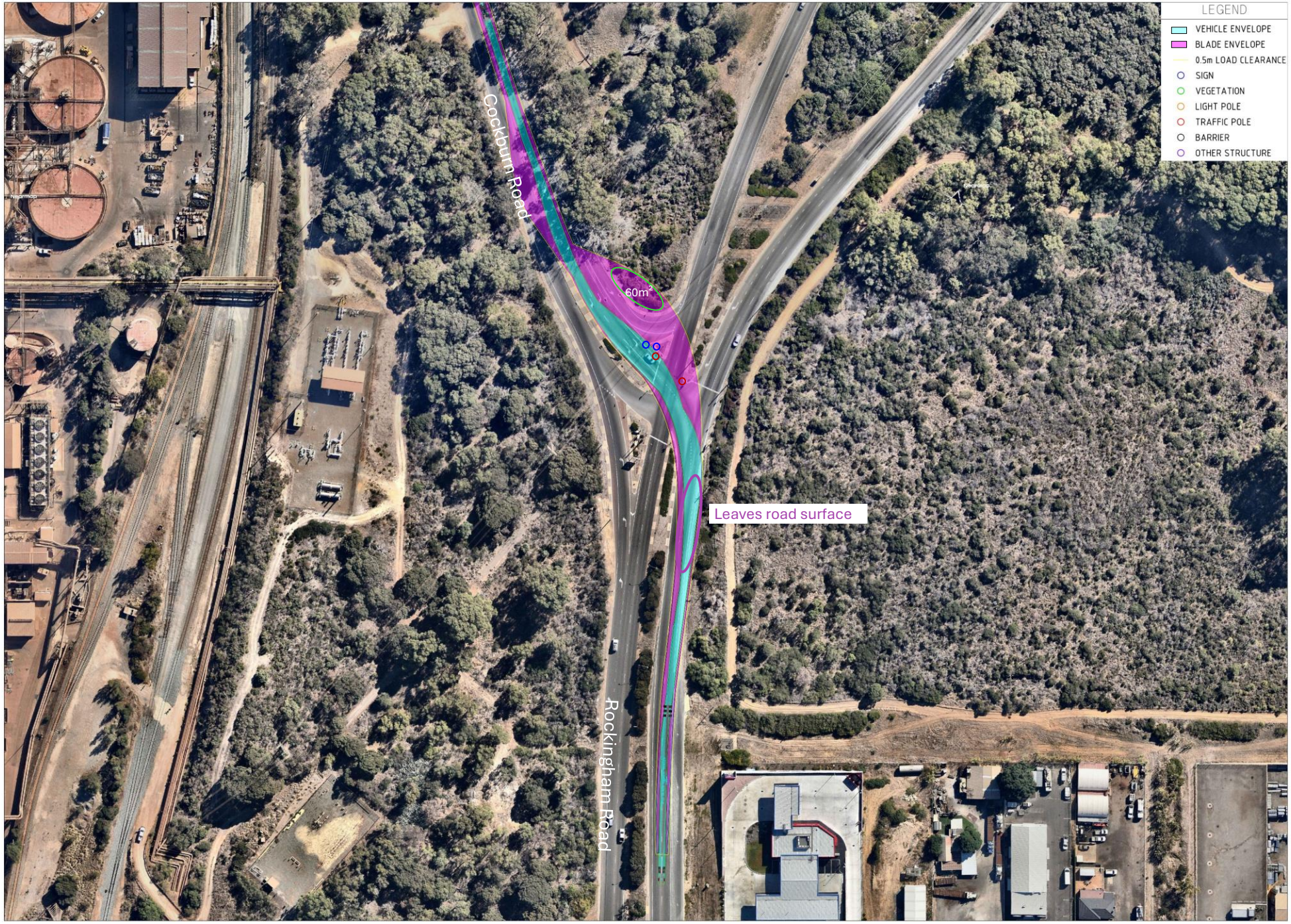
Route Map


Legend
Long loads route
AMC Port
Distance 203 km
Via Mandurah Rd > Kwinana Fwy > Roe Hwy > Brand Hwy
AMC Port
Kwinana Fwy
Cockburn Rd
Mandurah Rd
4
5
6
Marri Wind Farm
Brand Hwy
9
Perth
8
Roe Hwy
7
AMC Port
Lancelin
Guilderton
Gingin
Bindoon
Yanchep
Muchea
Toodyay
Northam
York
Byford
Wongan Hills
National Park Moore River
Darling Scarp
Helena National Park
National Park Wandoo
Monadnocks Conservation Park
Lupton Conservation

4. Cockburn / Rockingham Rd – Option 1

4. Rockingham Rd

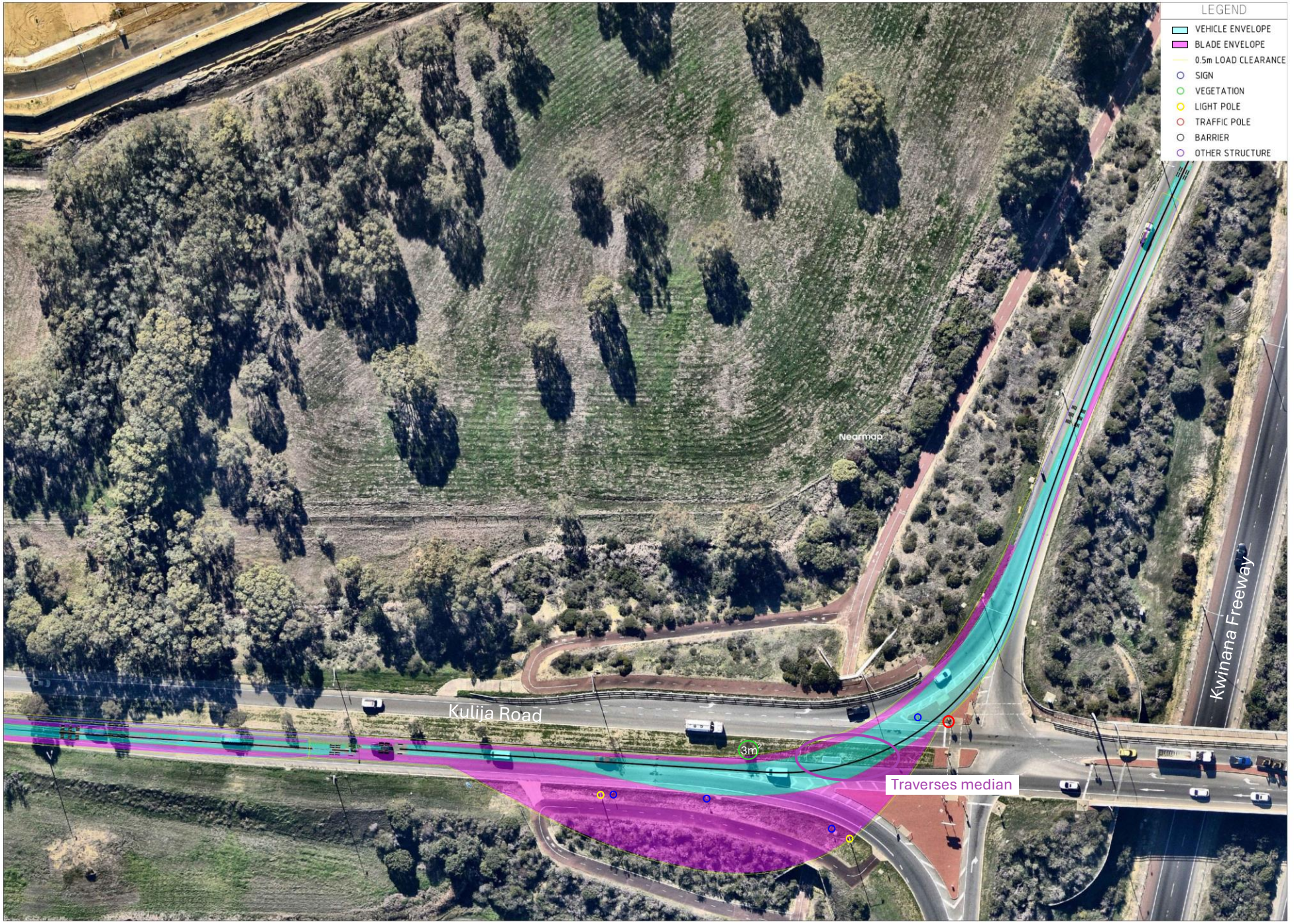
4. Cockburn / Rockingham Rd – Option 2



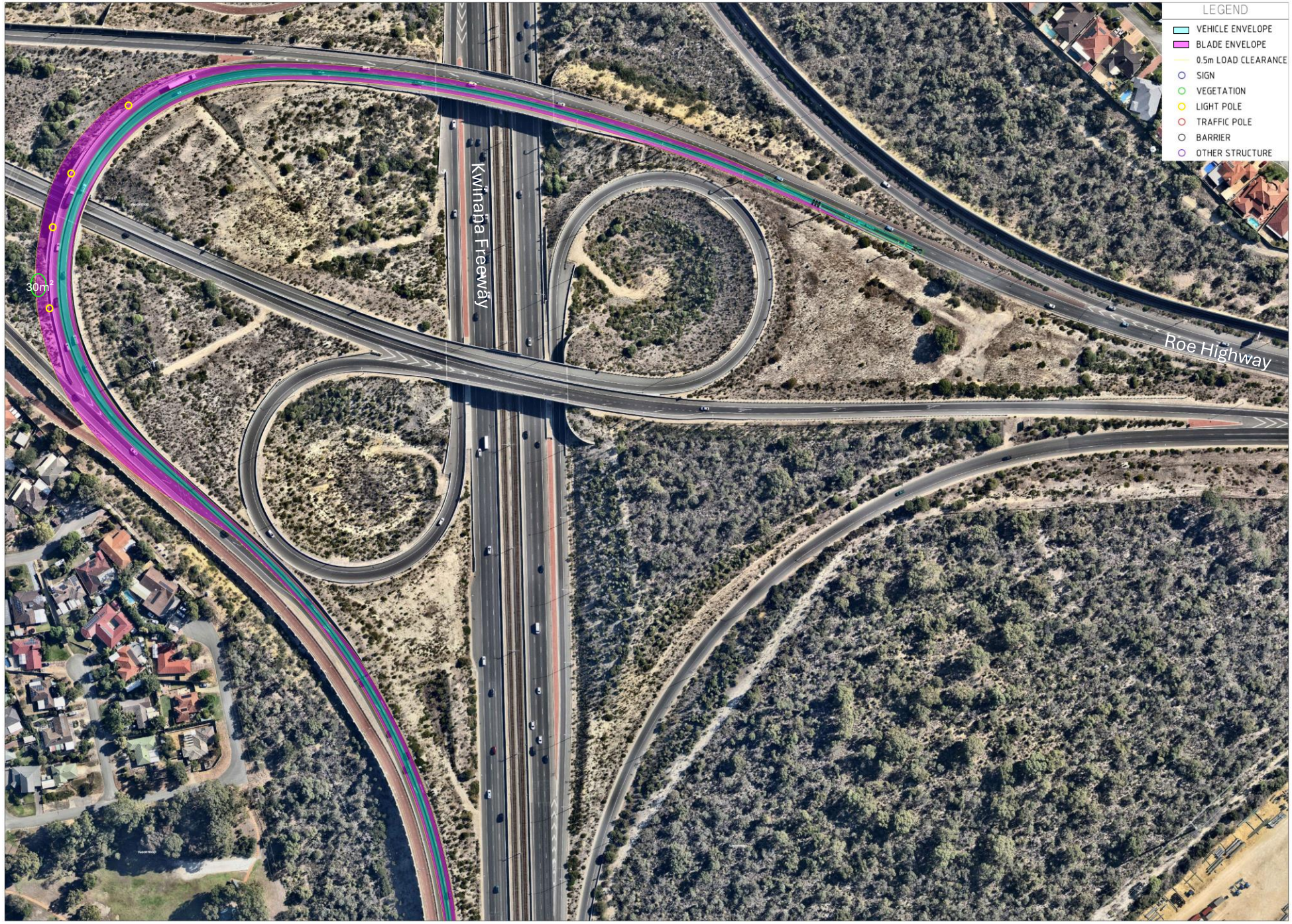
5. Rockingham Rd / Mandurah

6. Kulija Road

7. Kulija Road / Kwinana Fwy



8. Kwinana Fwy / Roe Hwy

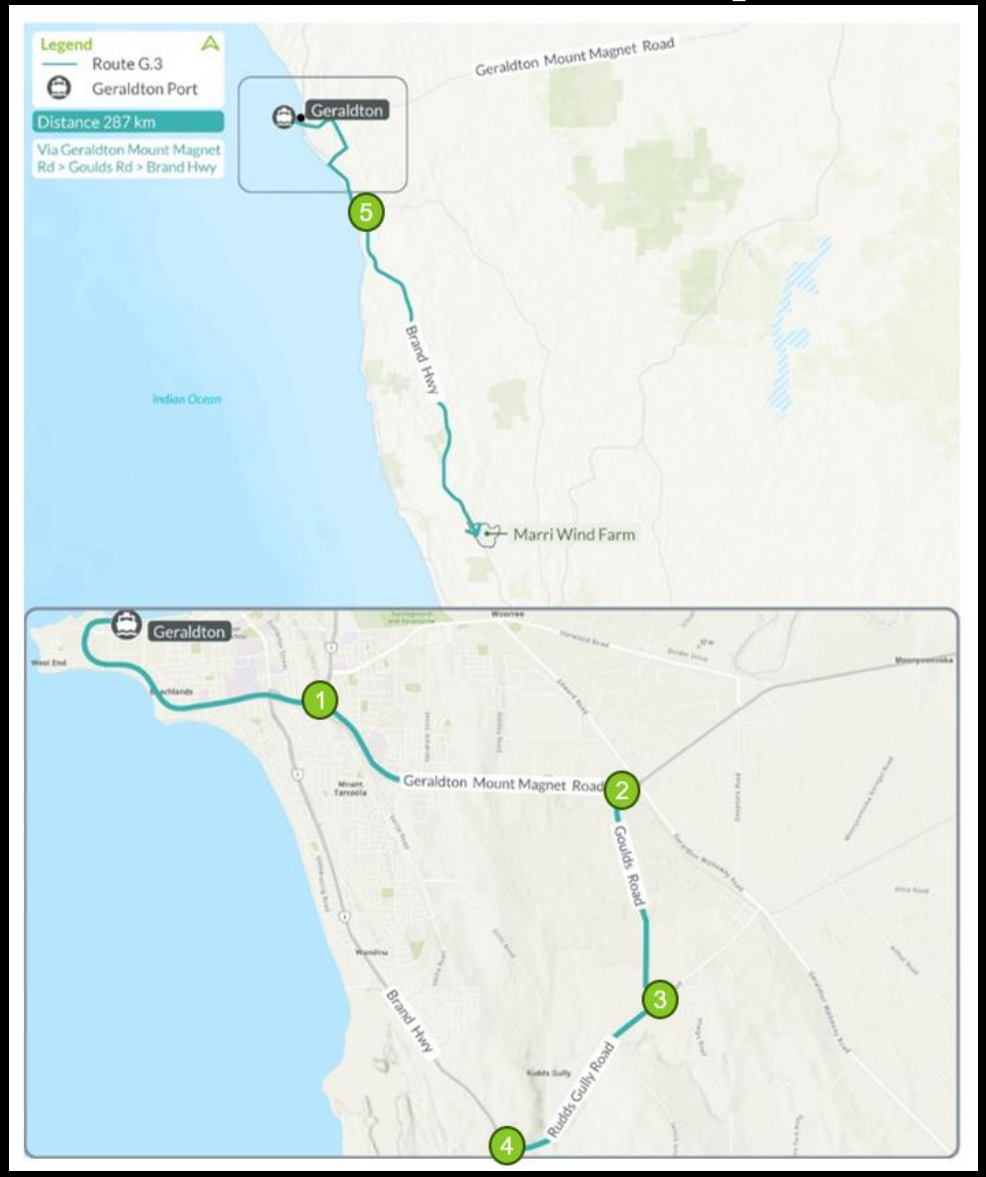


9. Roe Hwy / Tonkin Hwy

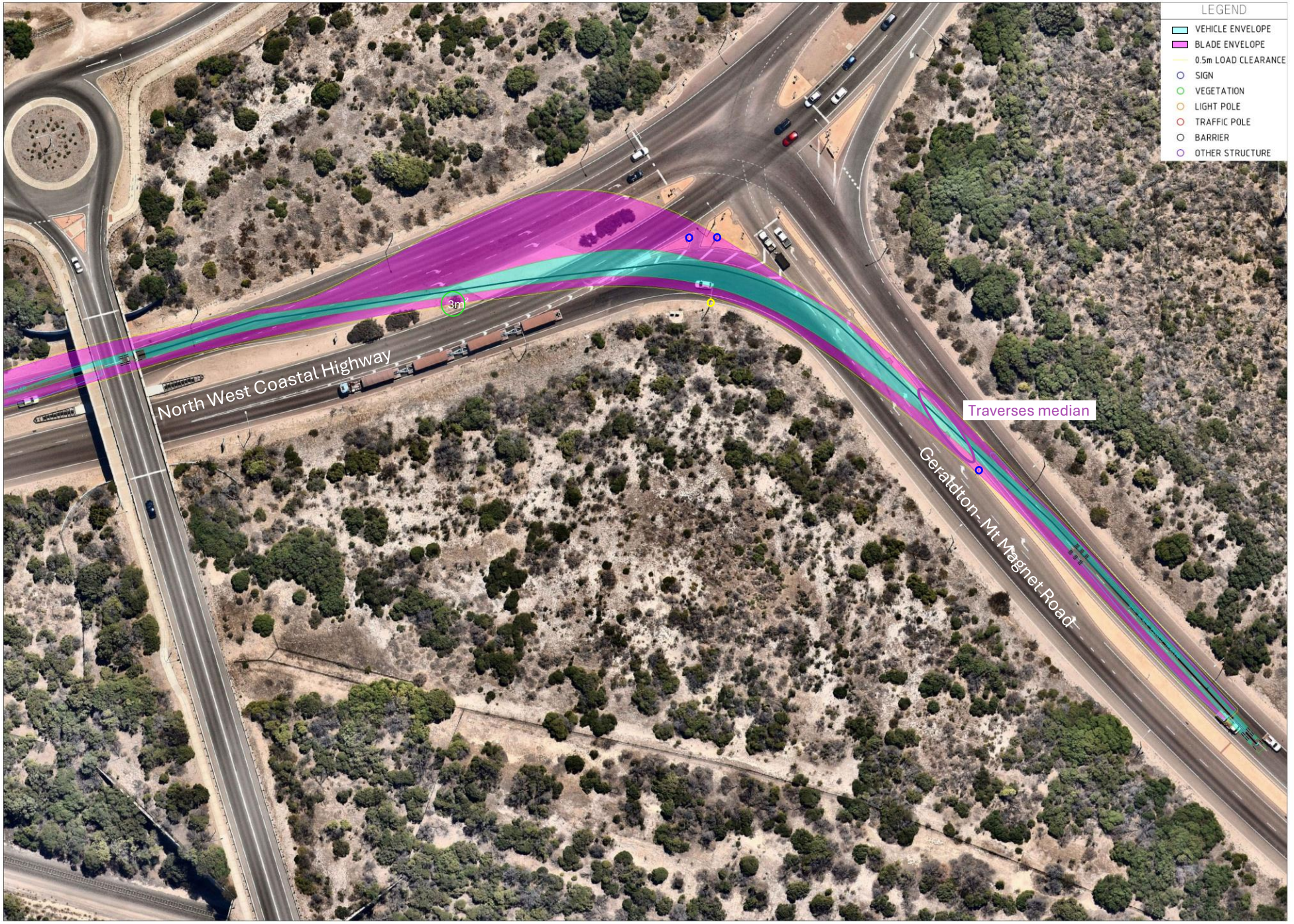
10. Tonkin Hwy / Brand Hwy

Geraldton Port to Site

Route Map

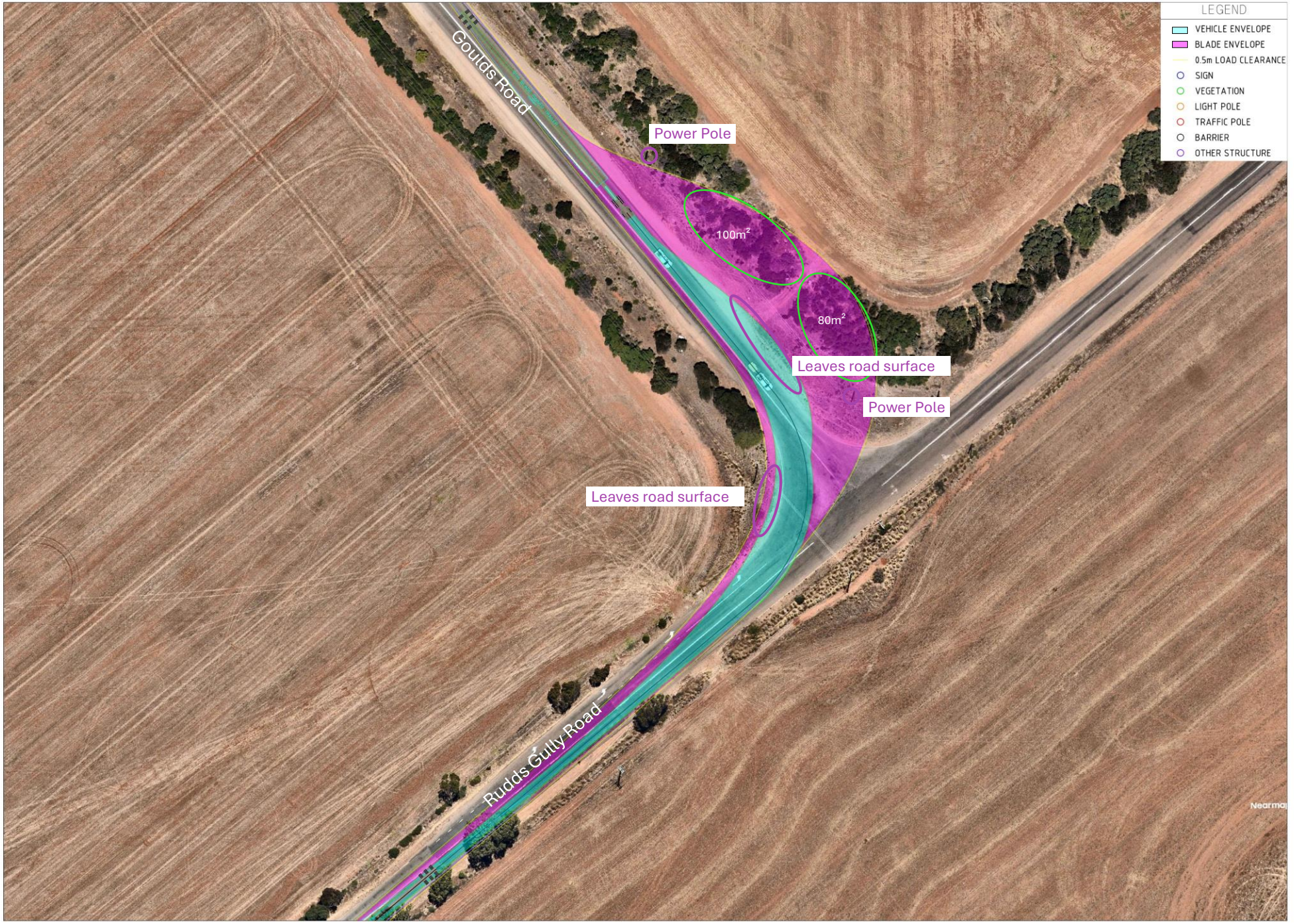

Legend
Route G.3
Geraldton Port
Distance 287 km
Via Geraldton Mount Magnet Rd > Goulds Rd > Brand Hwy
Geraldton
Geraldton Mount Magnet Road
5
Brand Hwy
Indian Ocean
Marri Wind Farm
Geraldton
1
Geraldton Mount Magnet Road
2
Goulds Road
3
Brand Hwy
Rudds Gully Road
4

1. North West Coastal Highway / Geraldton- Mt Magnet Road

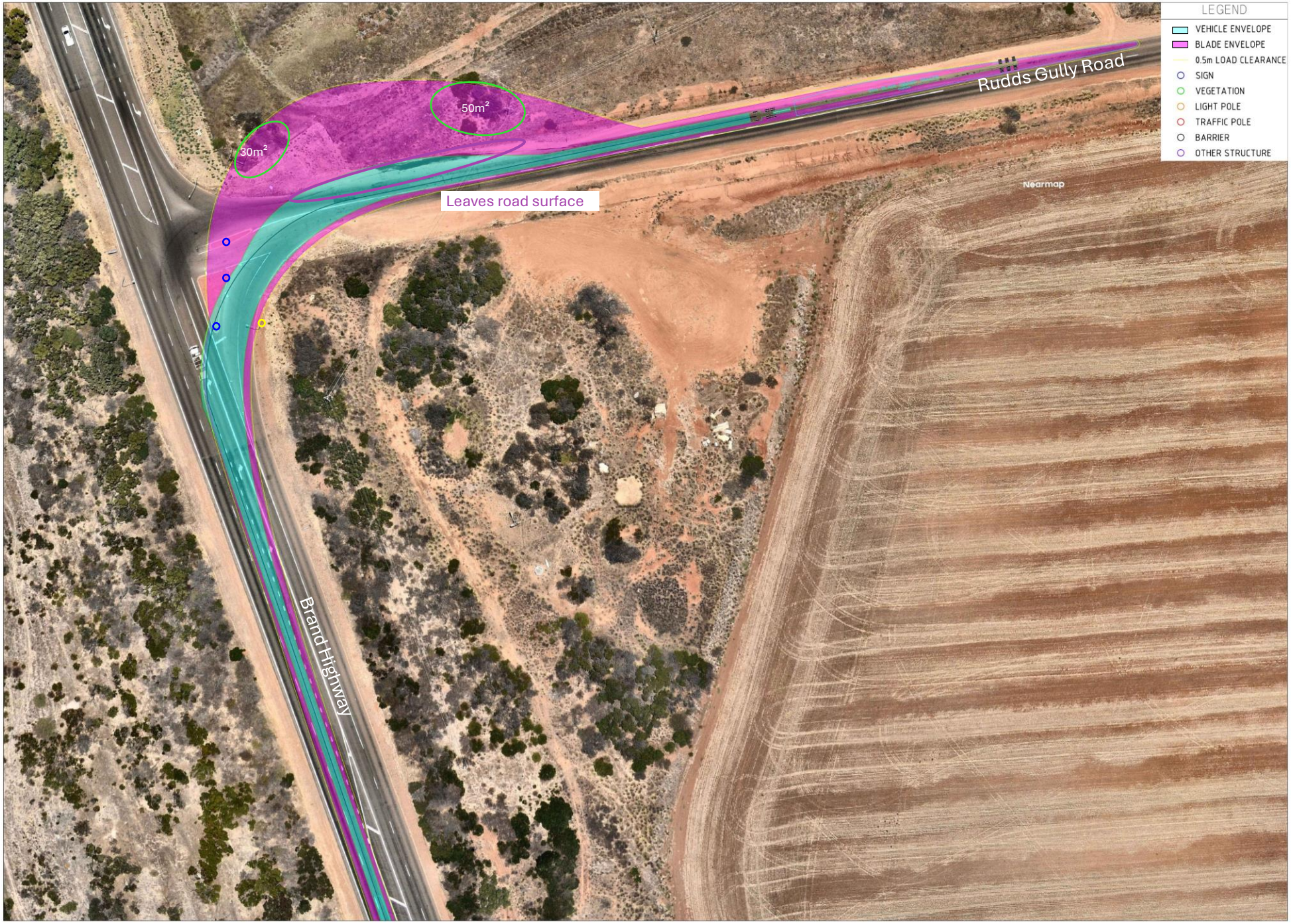


2. Geraldton-Mt Magnet Road / Goulds Road

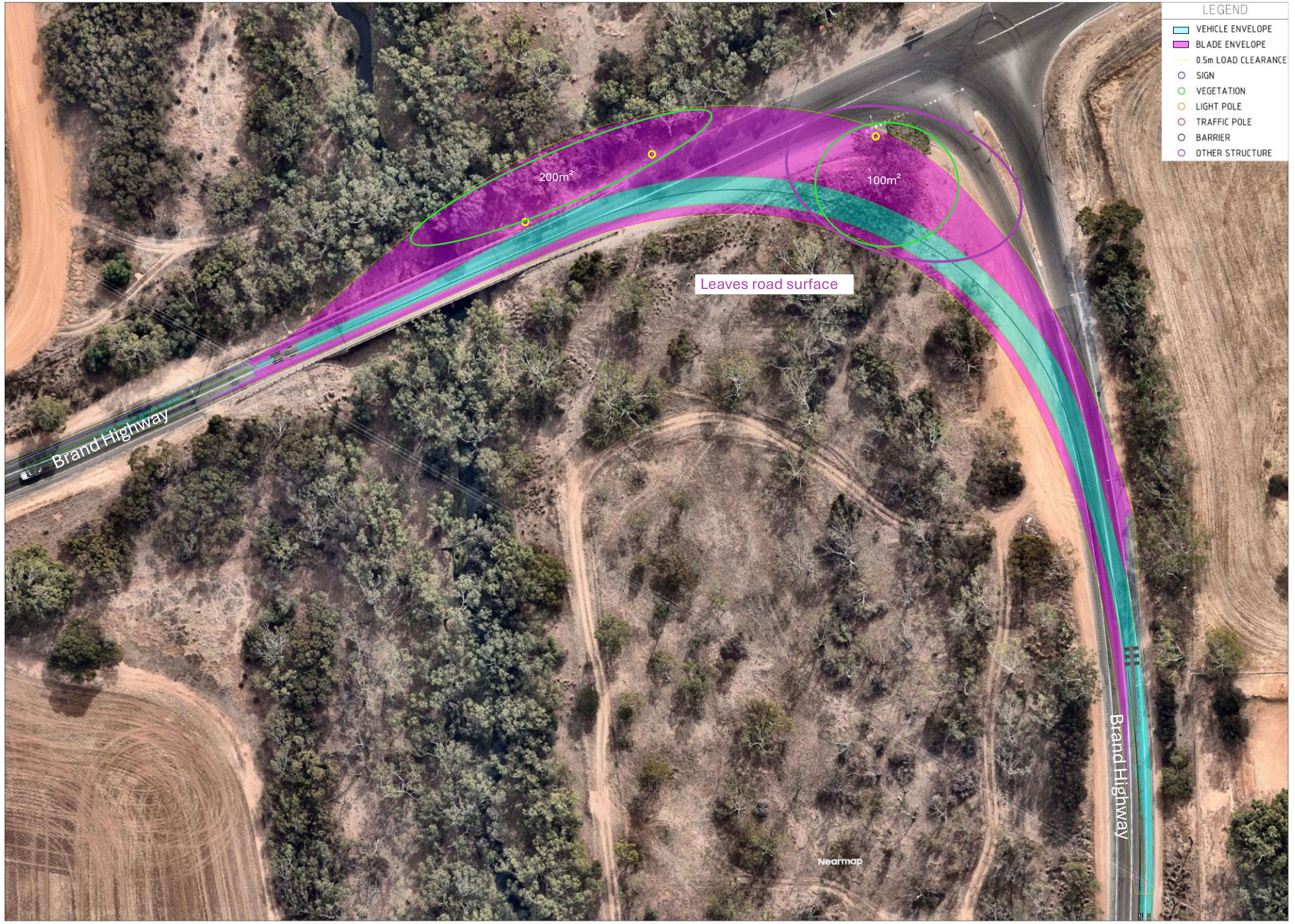
3. Goulds Road / Rudds Gully Road



4. Rudds Gully Rd / Brand Hwy



5. Brand Hwy / Midlands Rd – Option 1



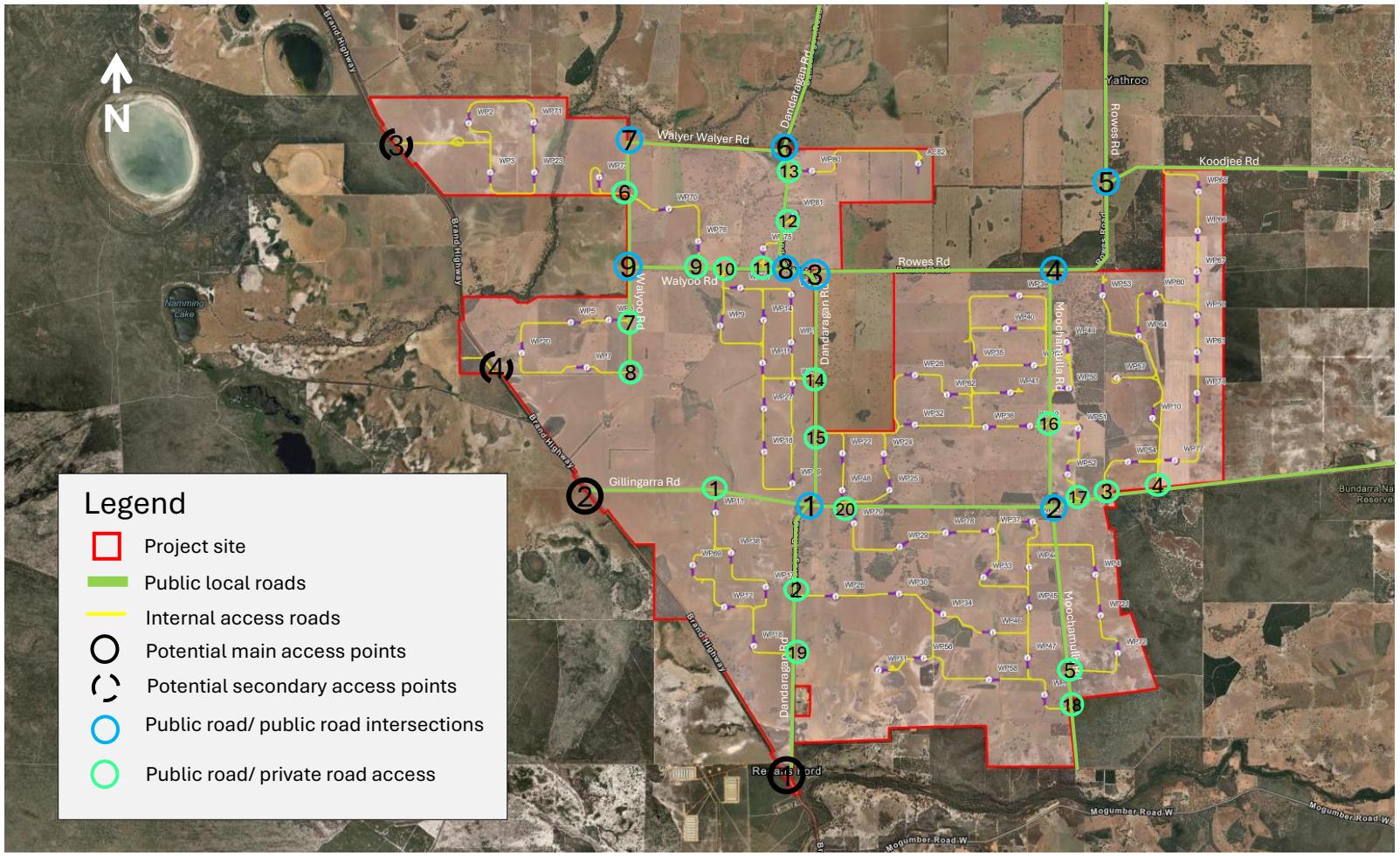
5. Brand Hwy / Midlands Rd – Option 2

Appendix C – Site access and internal roads review

Site Access Review

Notes

- The purposes of this review is to provide high-level insight of potential conflicts with the design vehicle as to inform the initial stages of the Project. The conduced swept path tests do not cover every possible turn and scenario at the site, and were rather selected based on interaction with public roads and connecting private access roads.
- Swept paths based on AutoTURN software, noting other software applications may produce a different swept path profile. Furthermore, swept paths may vary based on variations in preferences across OEM specifications and transport operator equipment/methodology.
- Identified conflicts should be verified on-site. This current review is a desktop study only (and subject to change based on any changes on-site).
- No vertical geometry checks (e.g. no survey data reviewed).
- Modelled vehicles are summarised in following slide.



Test vehicles

Turbine Blade

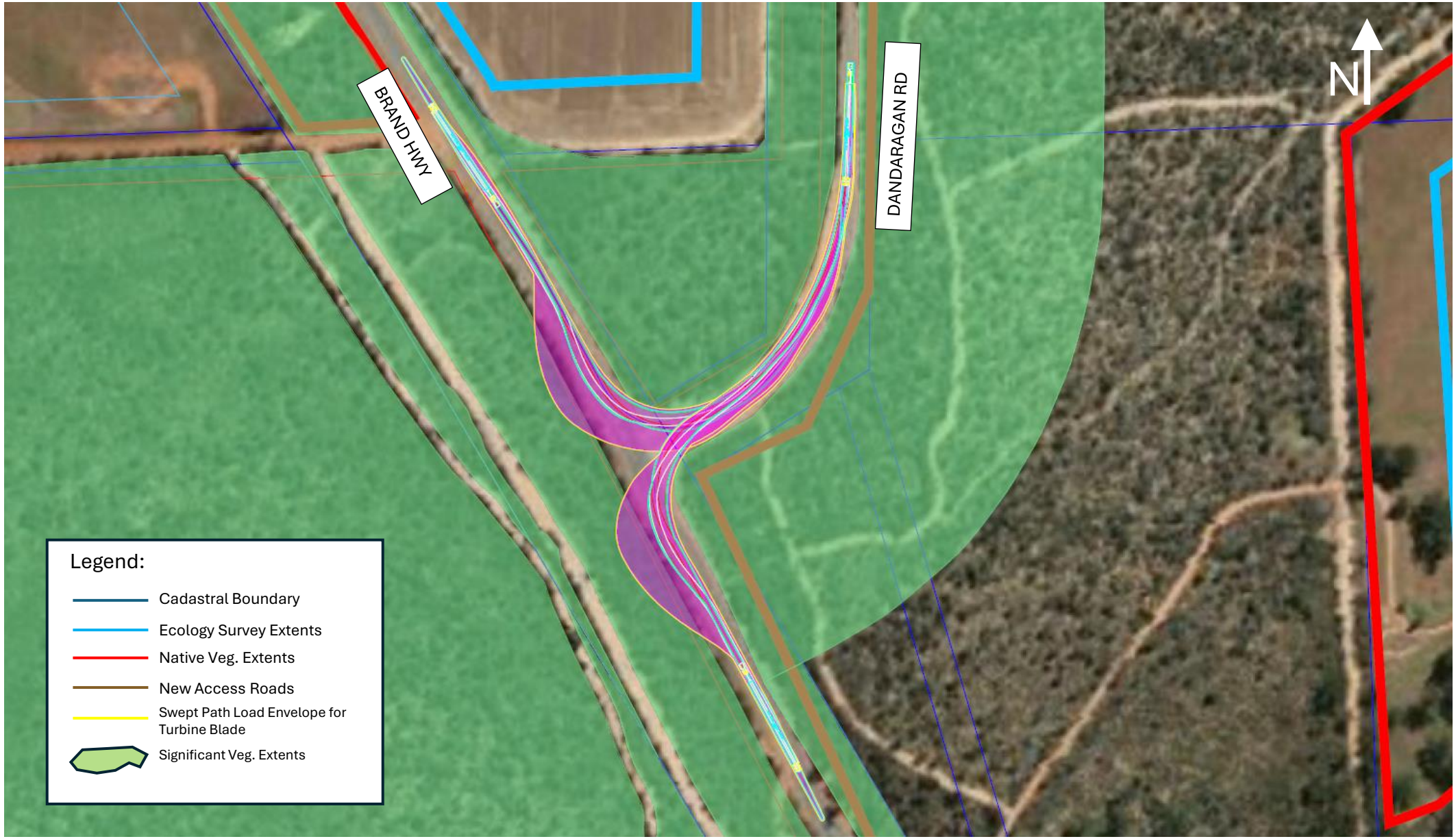
- Prime mover and extendable trailer configuration, based on the Vestas Blade Pinned Trailer in AUTOTURN
- 91m blade with 5m maximum width
- Prime mover length and width of 6.7m x 2.5m
- Trailer length of 60.5m with blade rear over sail of 31.8m. Trailer width of 3.4m
- Total combination length of 103.1m
- Rear wheel configuration of trailer set to rear-steerable
- Clearance envelope of 0.5m

Transformer

- Prime mover and platform trailer configuration, based on the 190T Transformer in AUTOTURN.
- Adopted single point of articulation between prime mover and trailer (as per template) for conservativeness. Whilst two points of articulation could be the case for some transport operators, this would result in a smaller swept path.
- There is risk that operators could opt for a different vehicle configuration to those modelled, which may result in different spatial requirements. However, above approach is likely to accommodate most situations. An increase in transformer size may also result in changes to vehicle configuration.
- Prime mover length and width of 7.8m x 2.5m.
- Total combination length of 44m
- Trailer length and width of 31m and 4.2m (assumed transformer does not hang over trailer)
- Trailer wheel configuration set to dual-steer.
- Clearance envelope of 0.5m.

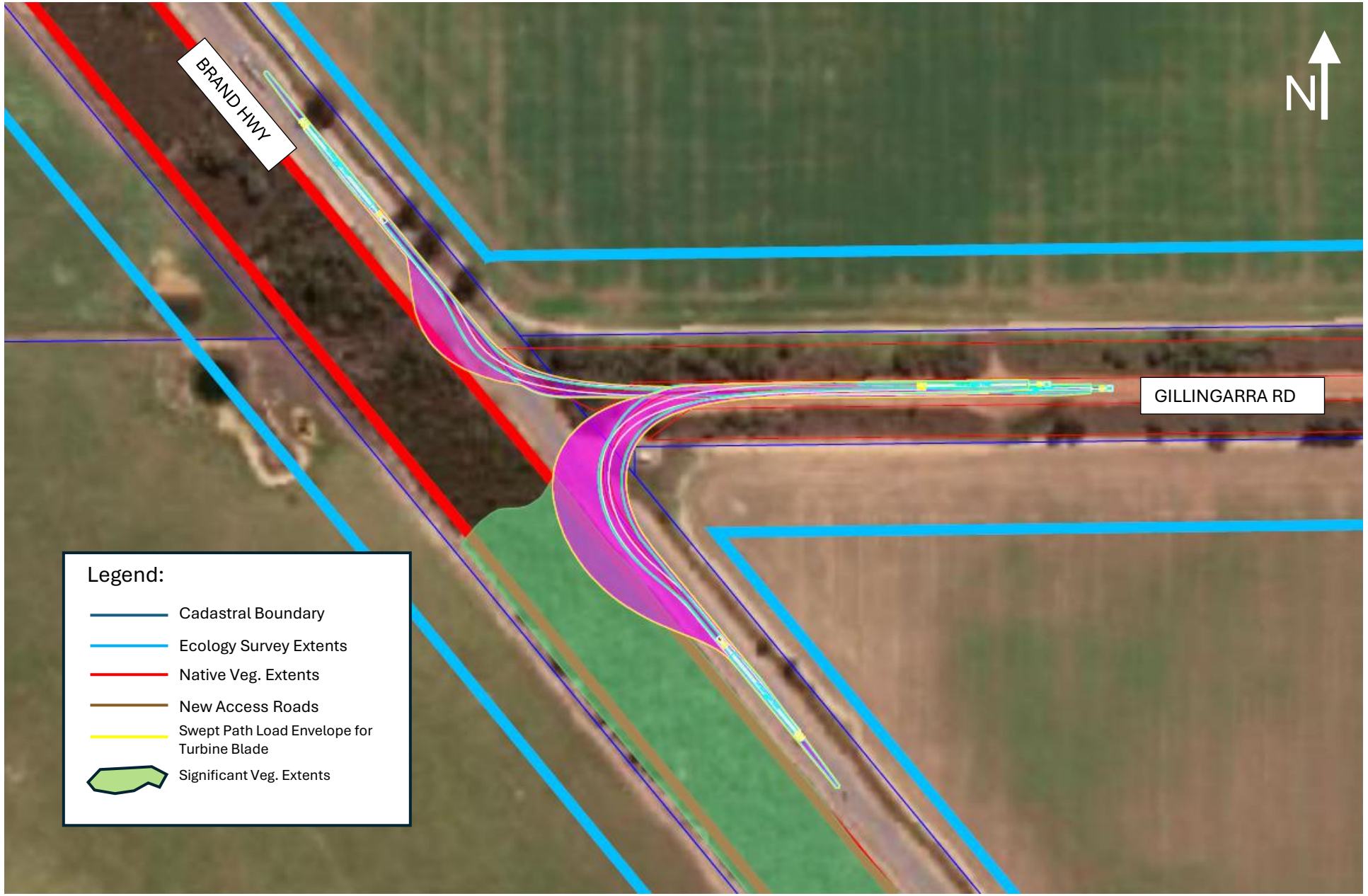
①

Dandaragan Road Site Access



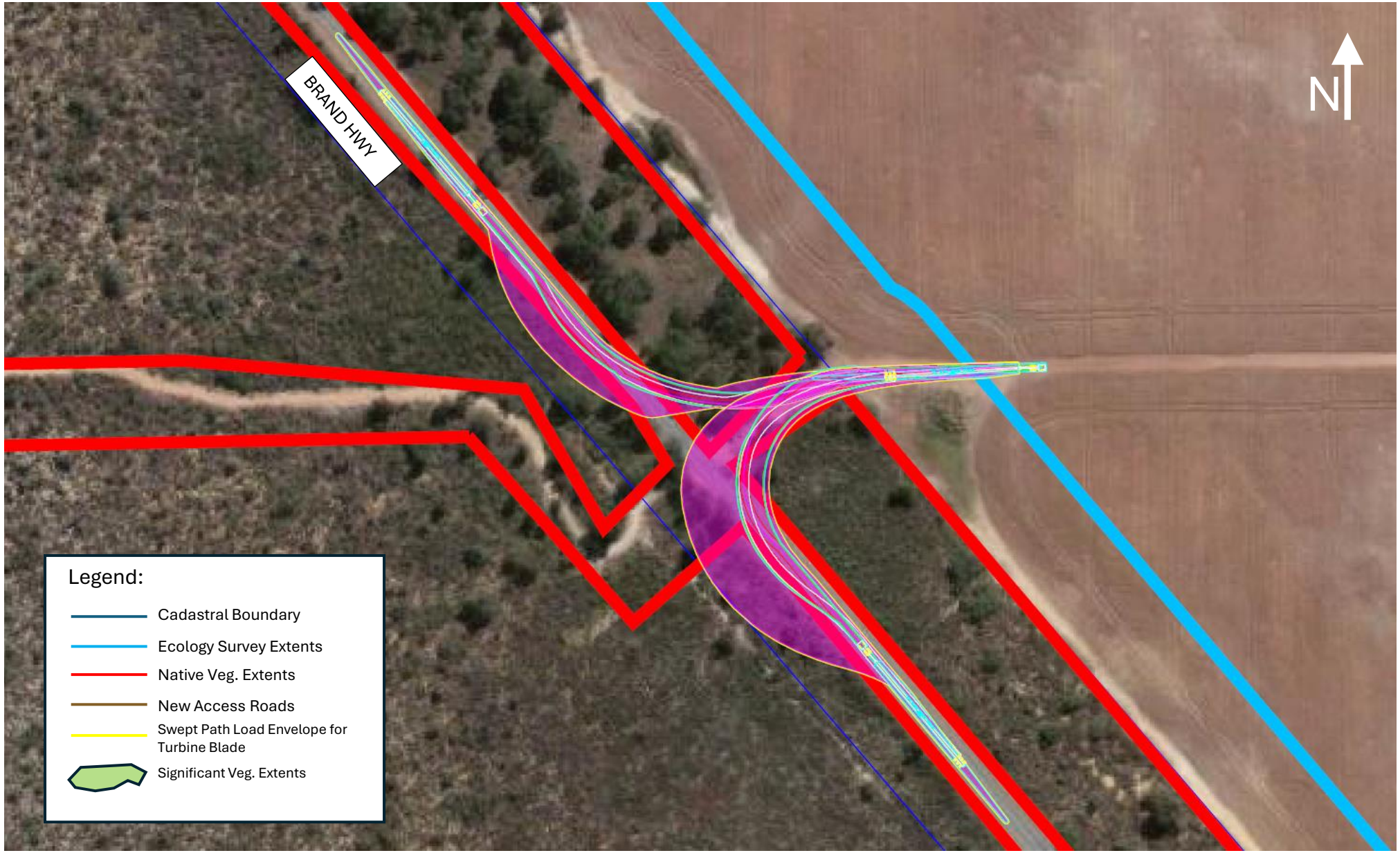
②

Gillingarra Site Access



③

Alternate Access via Gate off Brand Highway



④

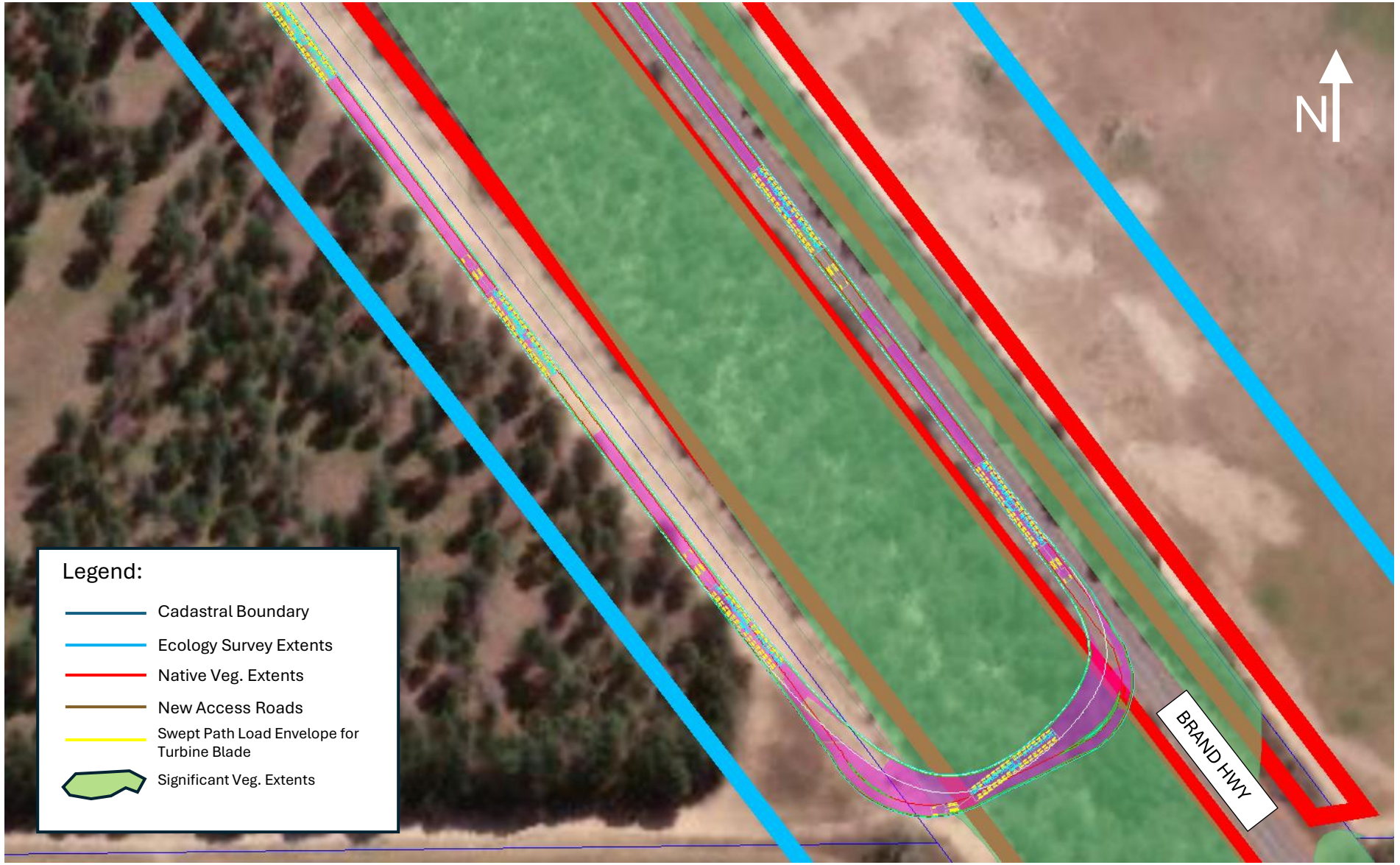
Substation Access via Gate off Brand Highway

190T Transformer – Option 1 (1 Articulation Point) – Northbound Approach

④

Substation Access via Gate off Brand Highway

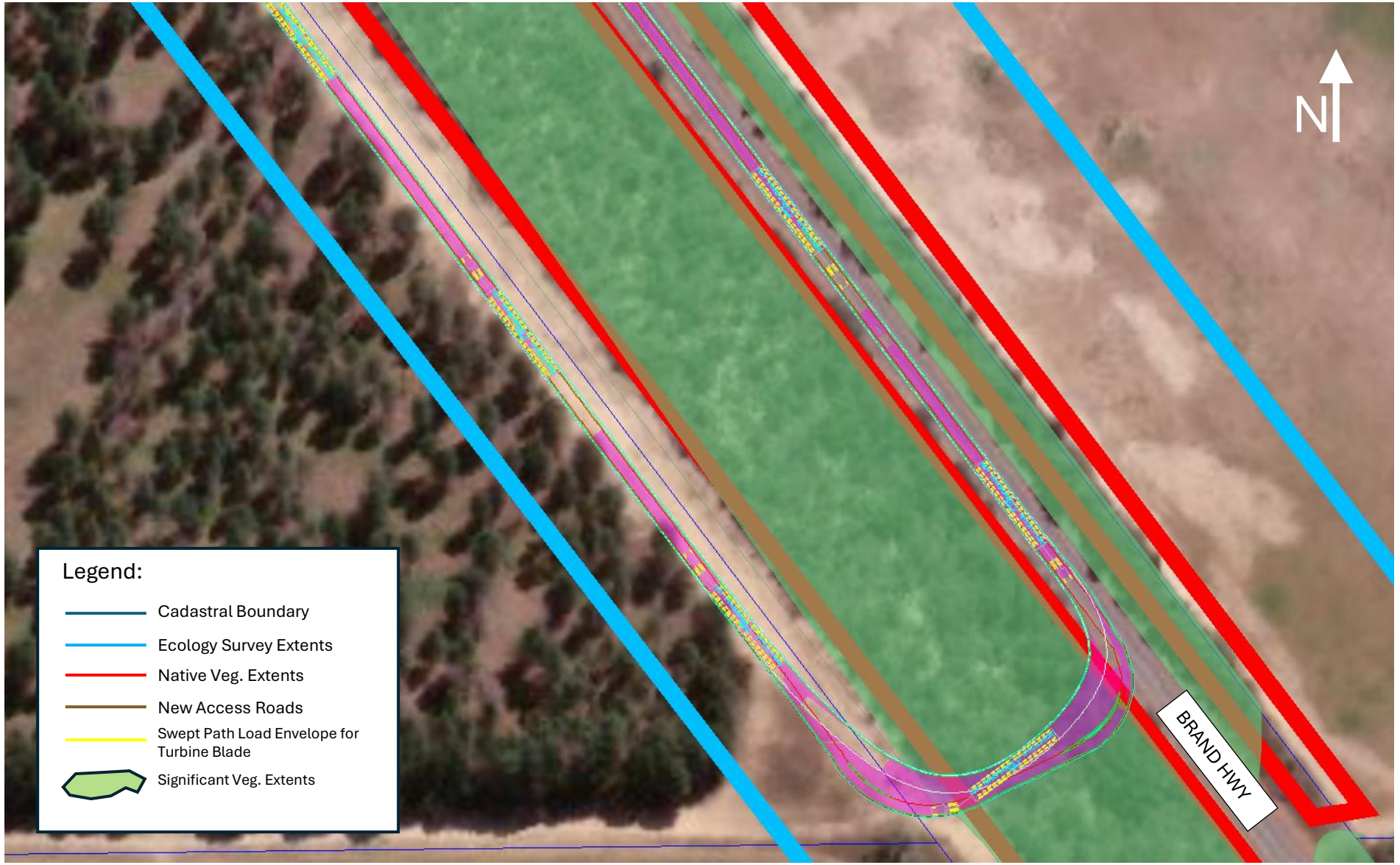
190T Transformer – Option 1 (1 Articulation Point) – Southbound Approach



④

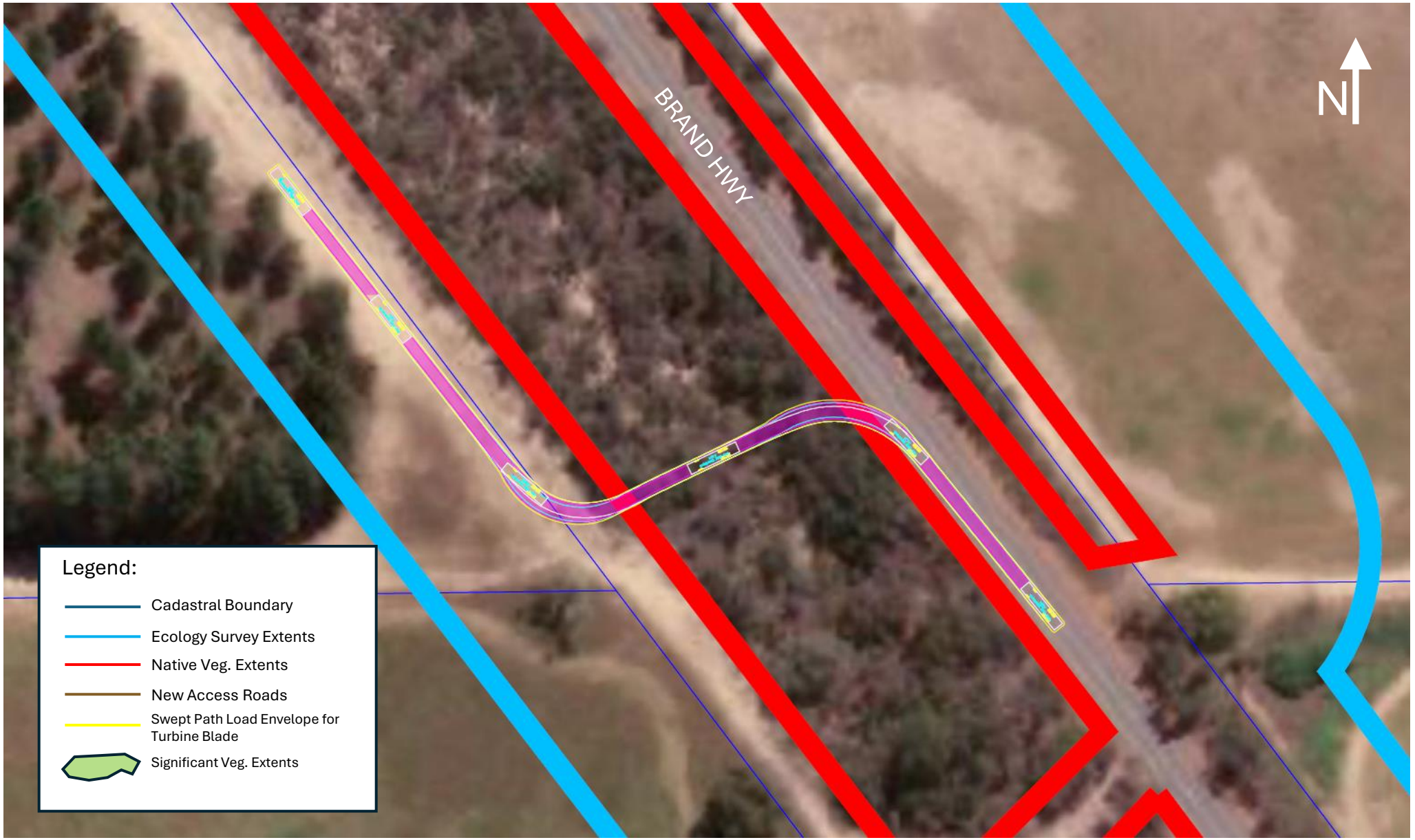
Substation Access via Gate off Brand Highway

190T Transformer – Option 1 (1 Articulation Point) – Southbound Approach



Substation Access via Gate off Brand Highway

12.5m Heavy Rigid Vehicle – Northbound Approach

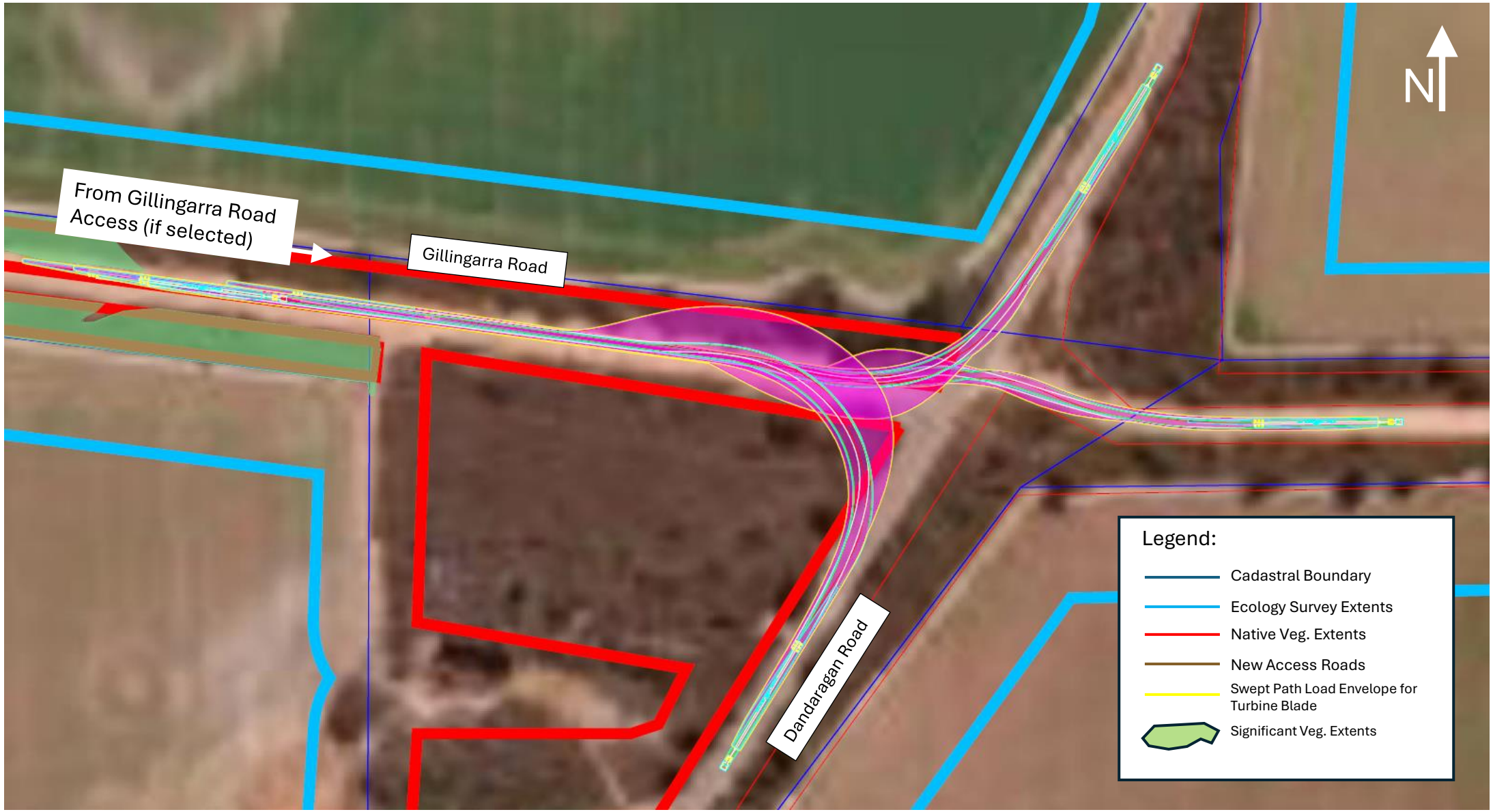


Substation Access via Gate off Brand Highway

12.5m Heavy Rigid Vehicle – Southbound Approach

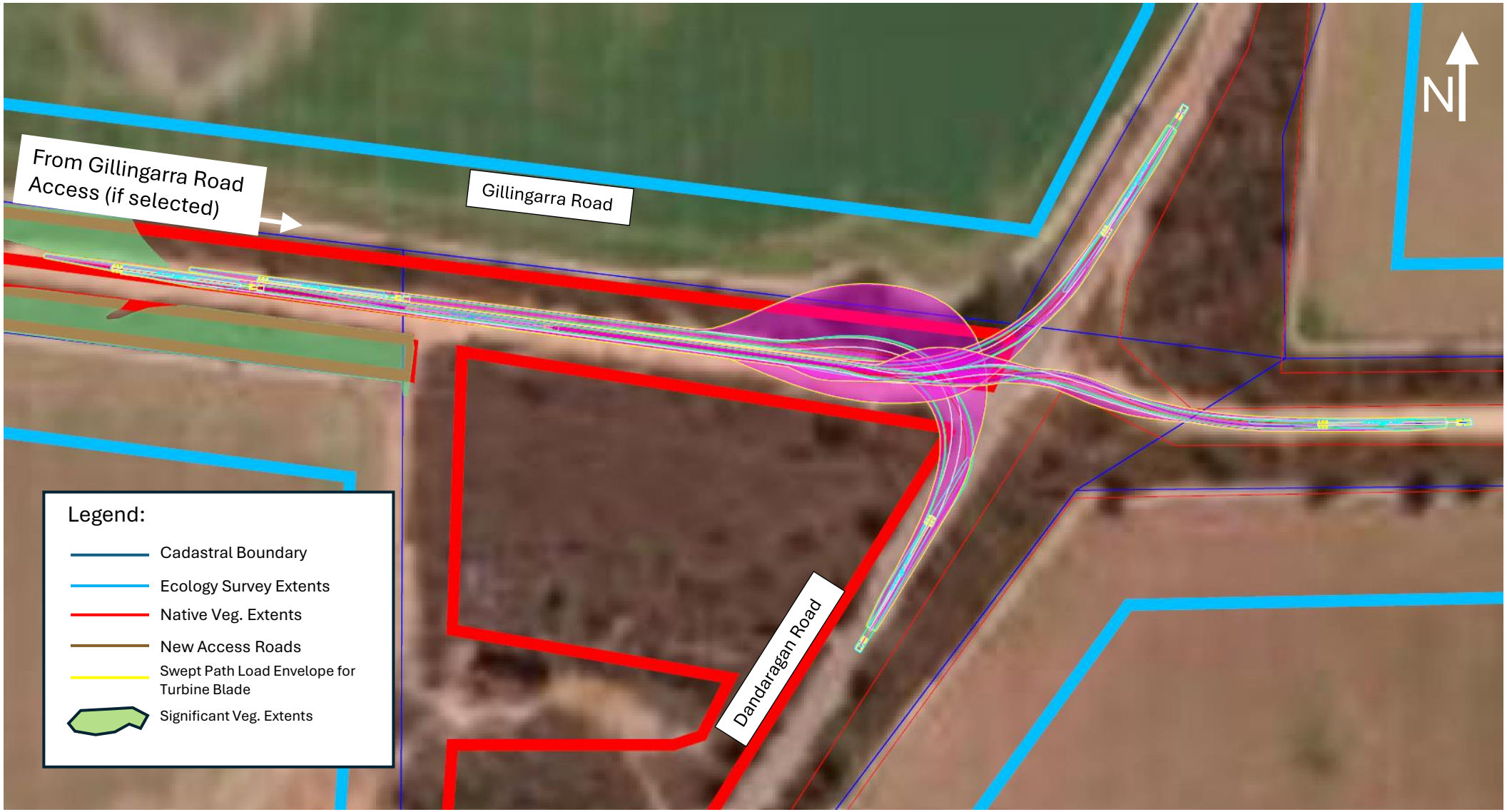
1

Turn From Gillingarra Road Northwards onto Dandaragan Road, Southwards onto Dandaragan Road and continuing East on Gillingarra Road



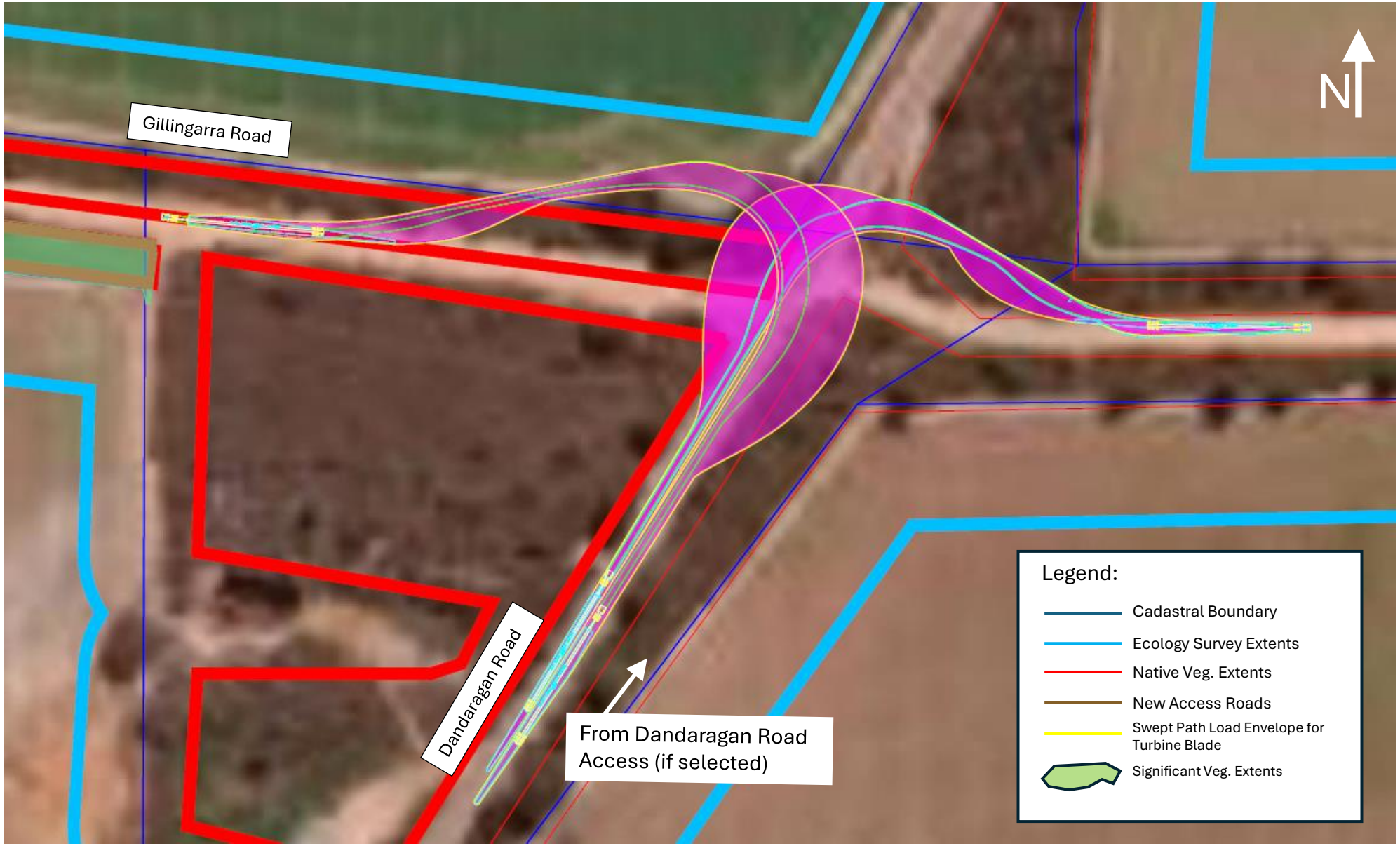
1

Turn From Gillingarra Road Northwards onto Dandaragan Road, Southwards onto Dandaragan Road and continuing East on Gillingarra Road (minimising impact to vegetation)



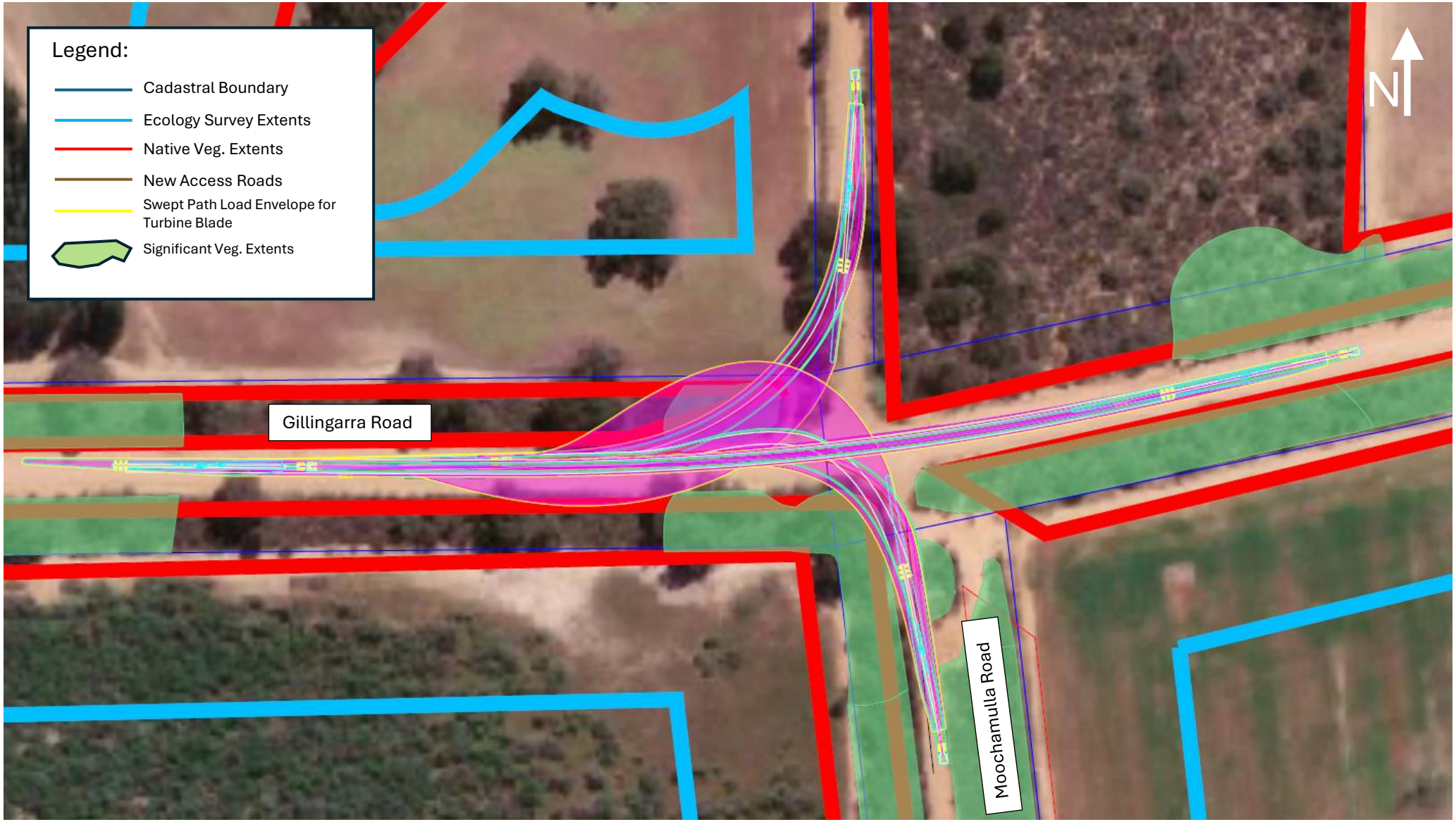
1

Turn From Dandaragan Road Eastwards onto Gillingarra Road, Westwards onto Gillingarra Road and continuing North on Dandaragan Road (minimising impact to vegetation)



2

Turn From Gillingarra Road Northwards onto Moochamulla Road, Southwards onto Moochamulla Road and continuing East on Gillingarra Road

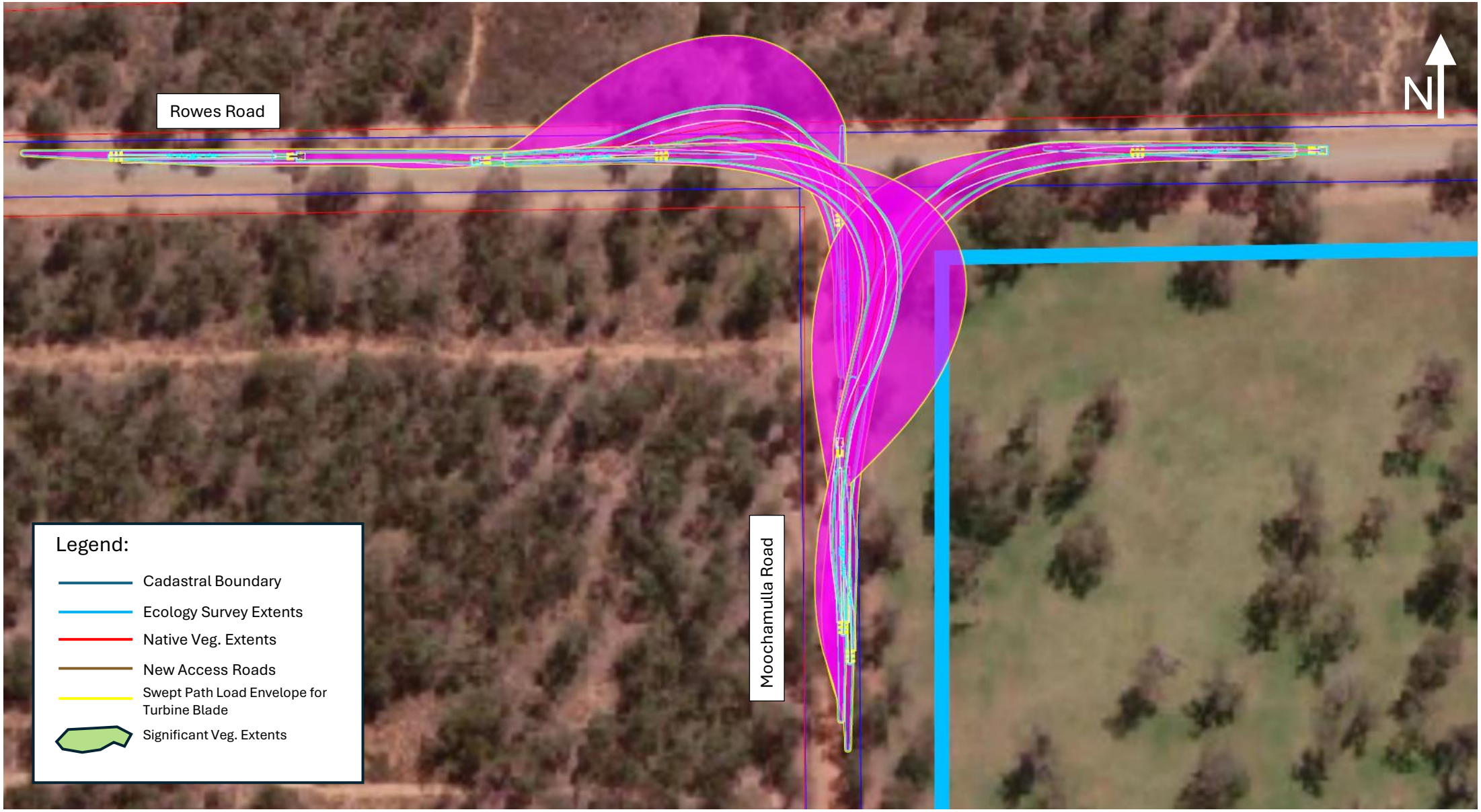


3

Turn From Dandaragan Road Eastward on Rowes Road and Westwards on Rowes Road

4

Turn From Moochamulla Road Eastwards onto Rowes Road, Westwards onto Rowes Road and turning from Rowes Road Southwards onto Moochamulla Road



5

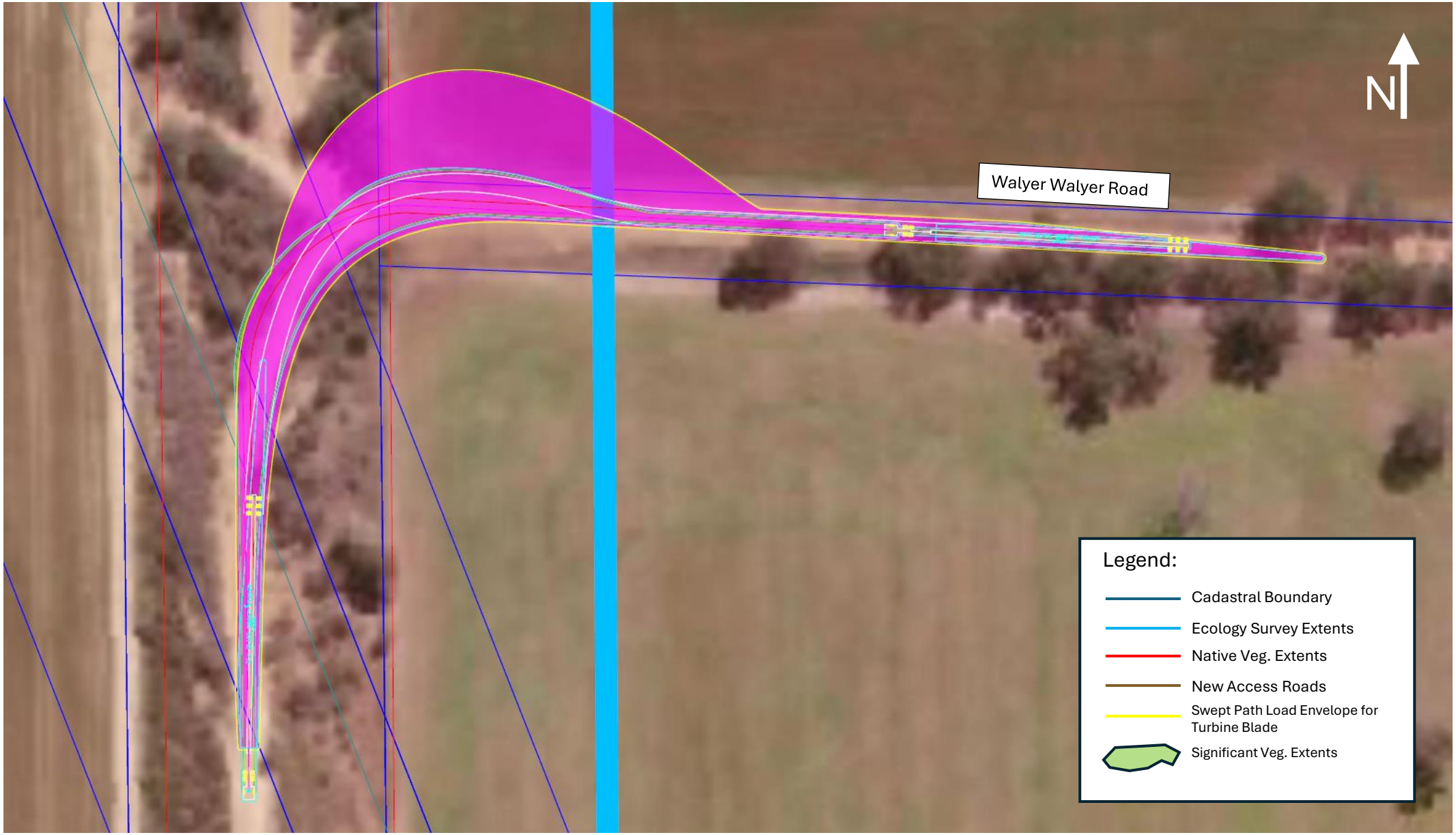
Turn From Rowes Road Eastwards on Koodjee Road

6

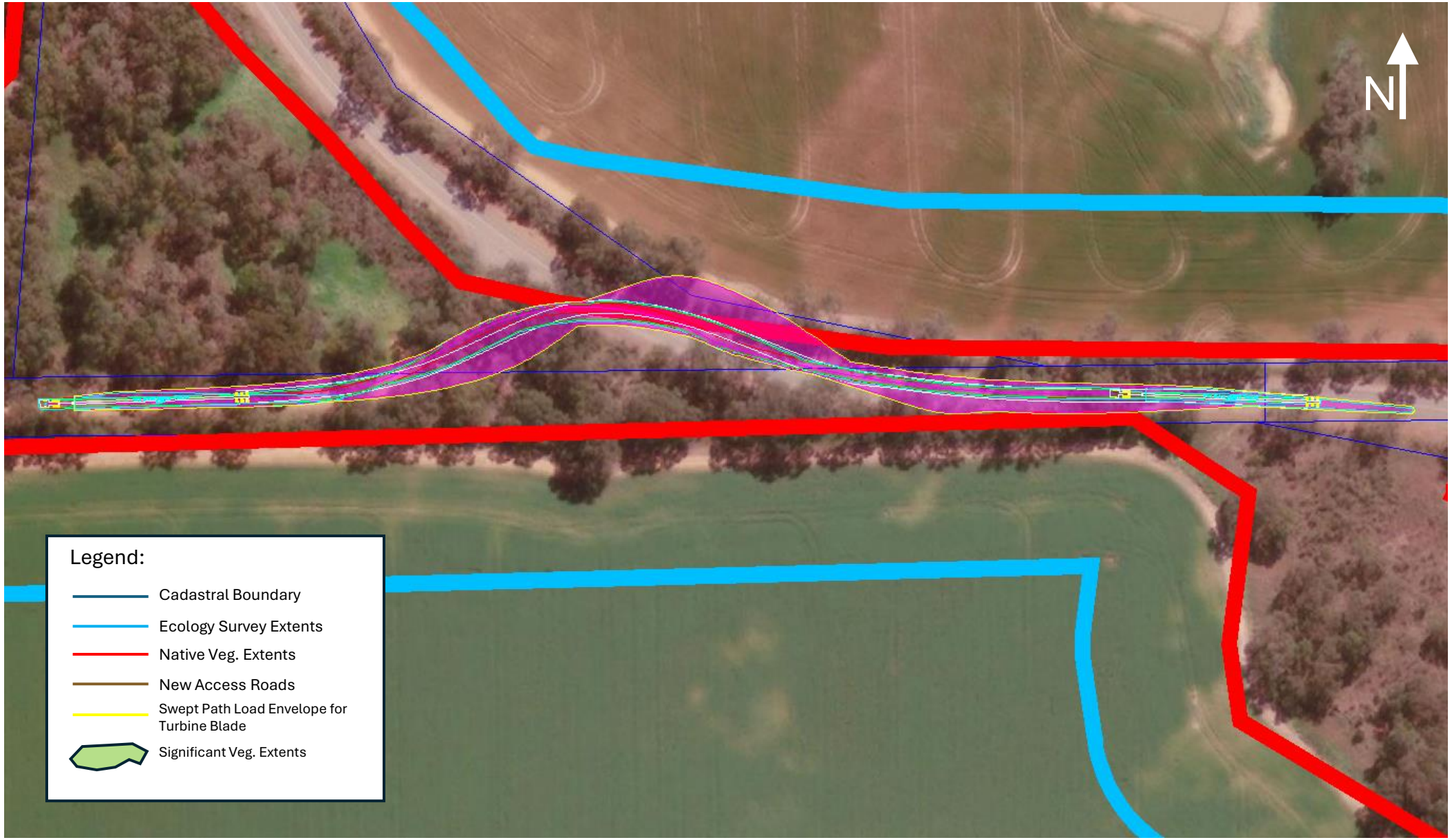
Turn From Dandaragan Road Westward on Walyer Walyer Road

7

Turn From Walyer Walyer Road Southwards

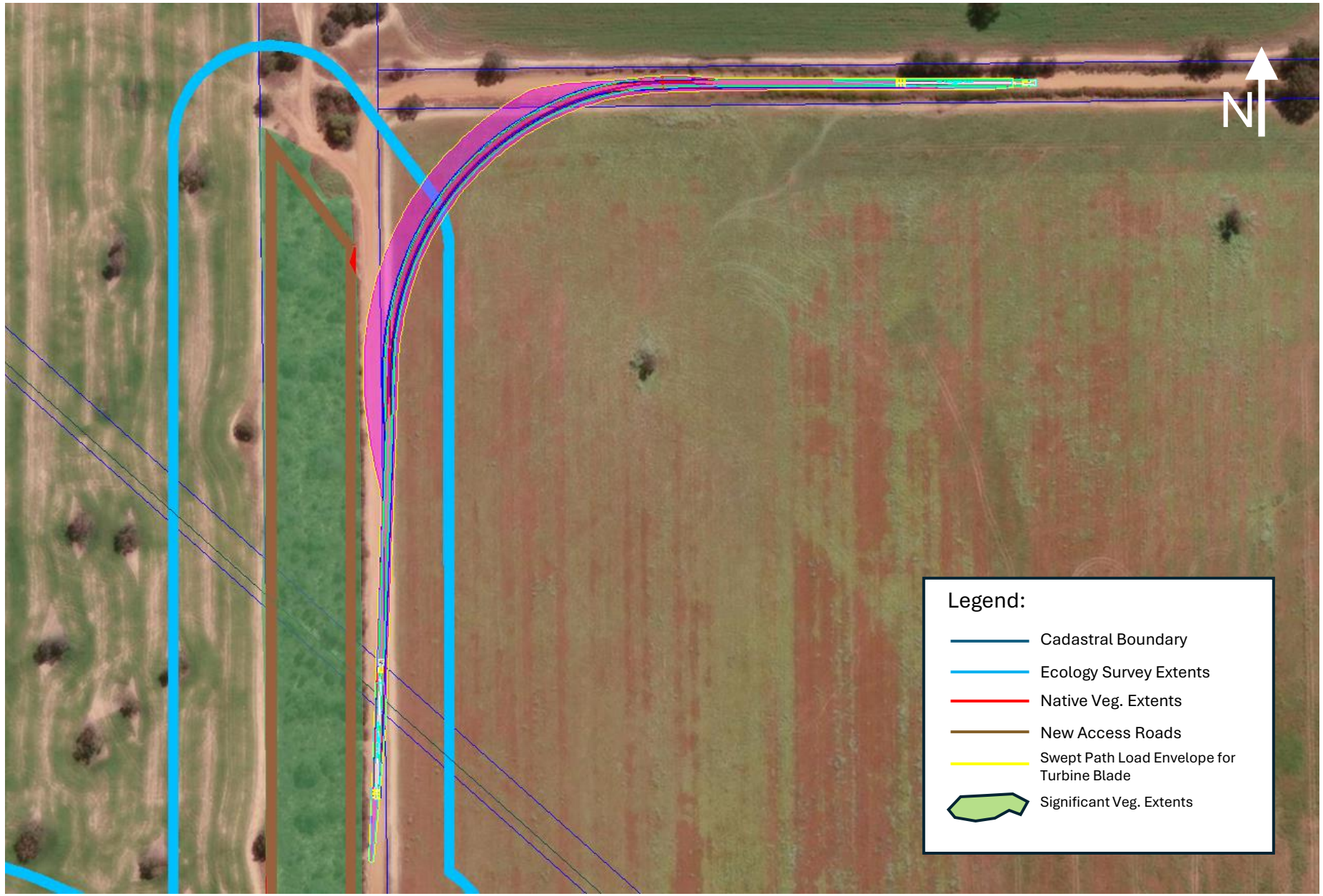


Dandaragan Road to Wayloo Road westbound



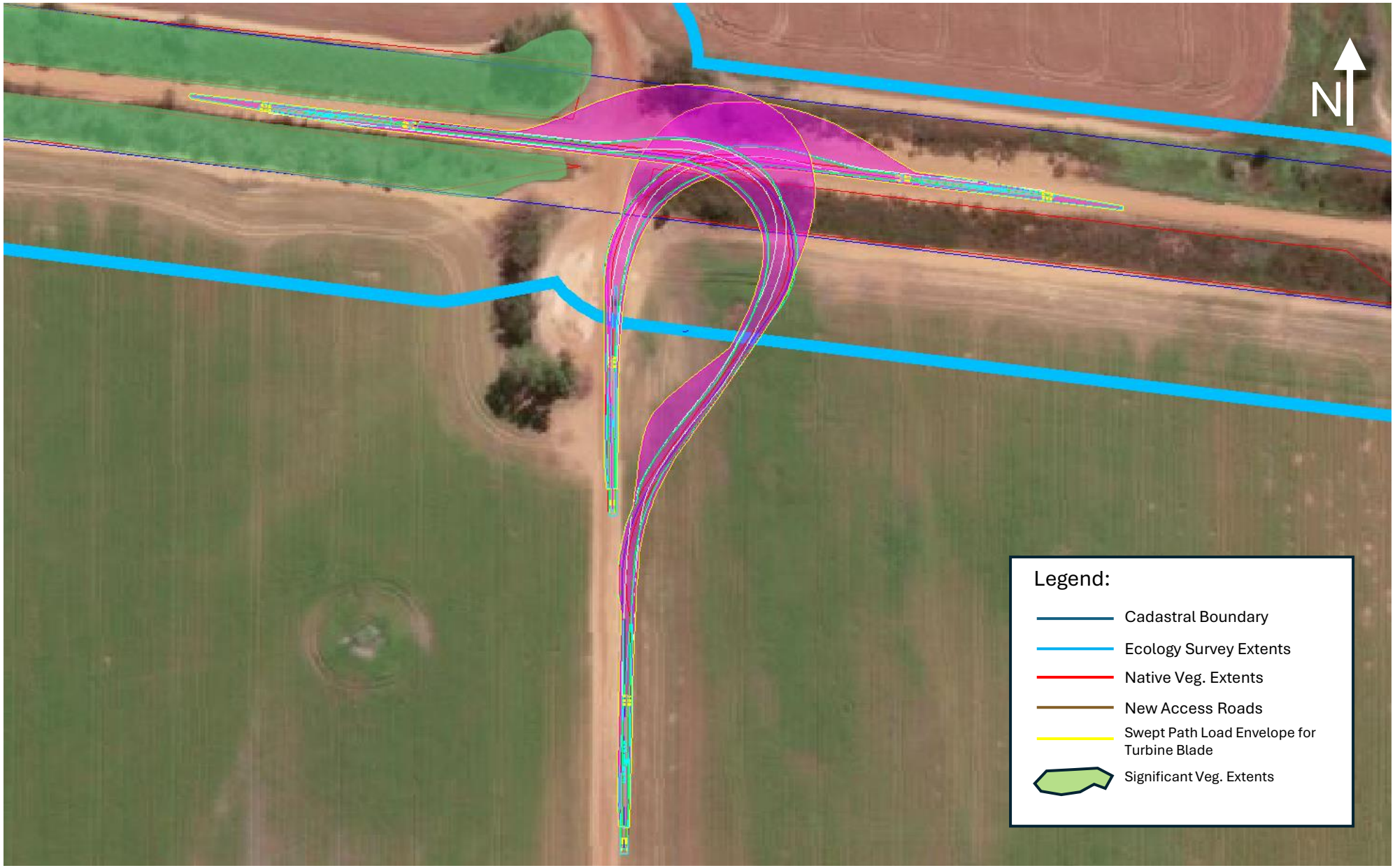
9

Walyoo Road south approach turning east



1

Turn From Gillingarra Road Southwards Towards Turbine 34

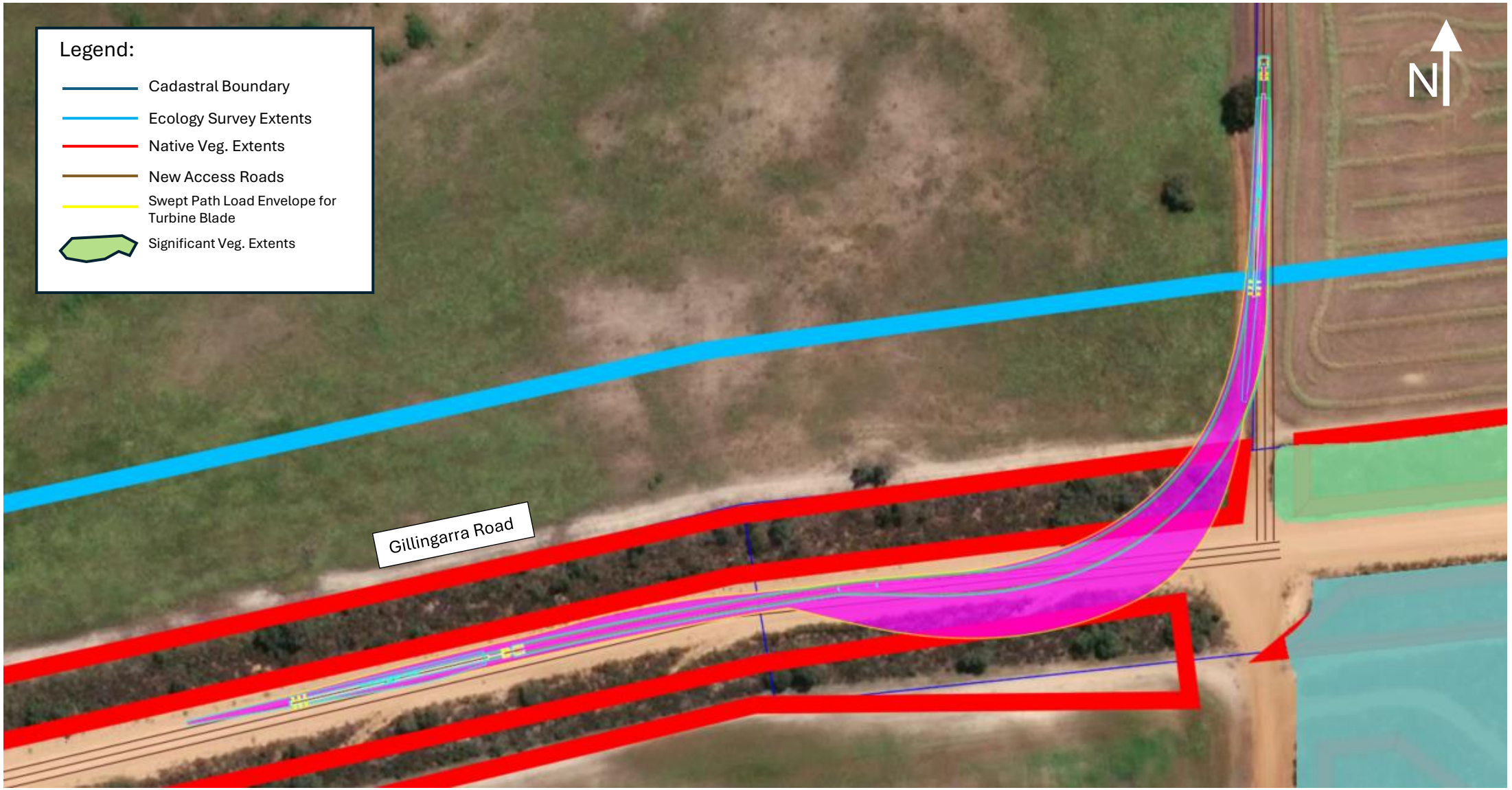


2

Turn from Dandaragan Road Eastwards

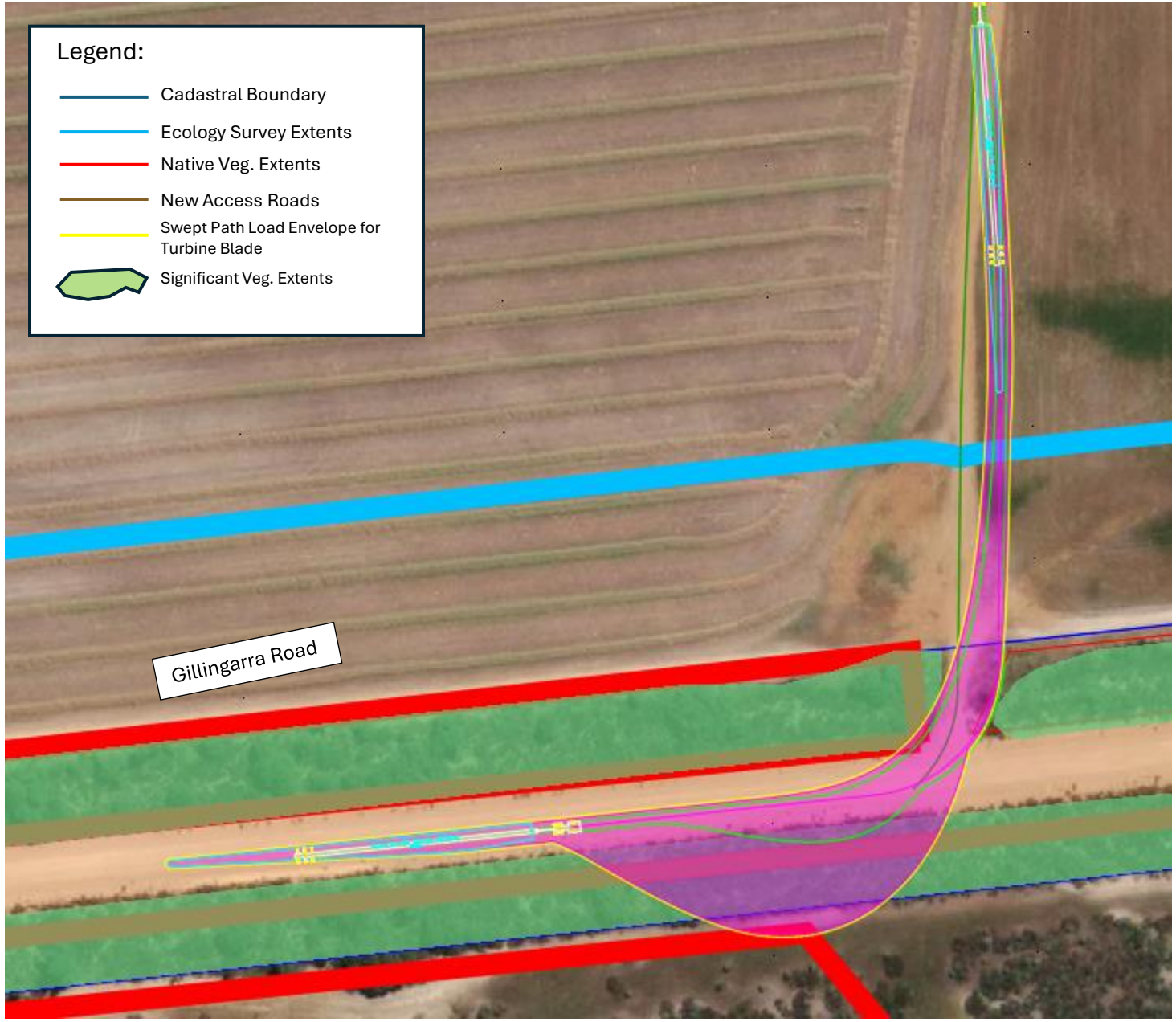
3

Turn From Gillingarra Road Northwards



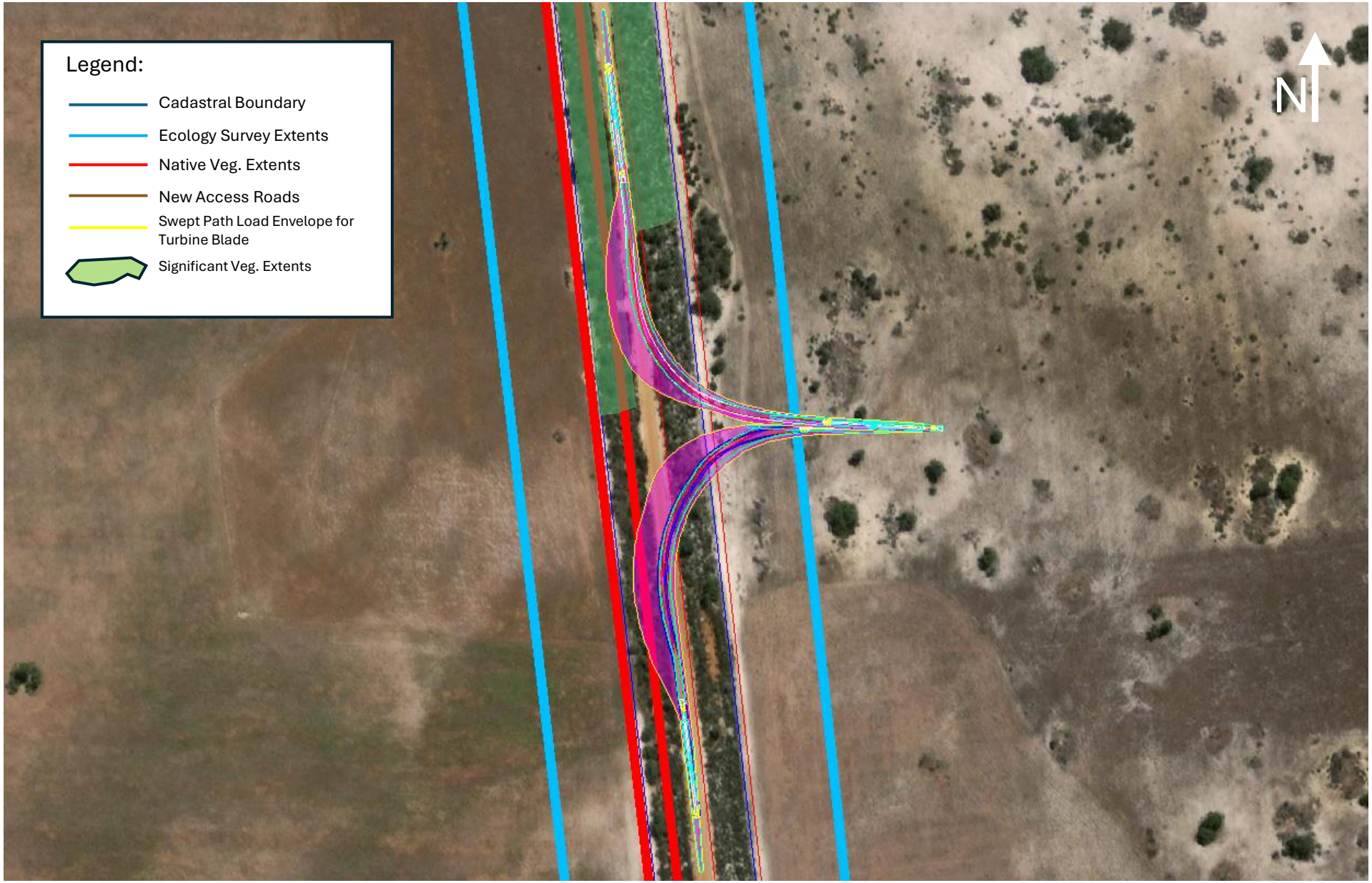
4

Turn From Gillingarra Road Northwards



5

Moochamulla Road turning eastbound

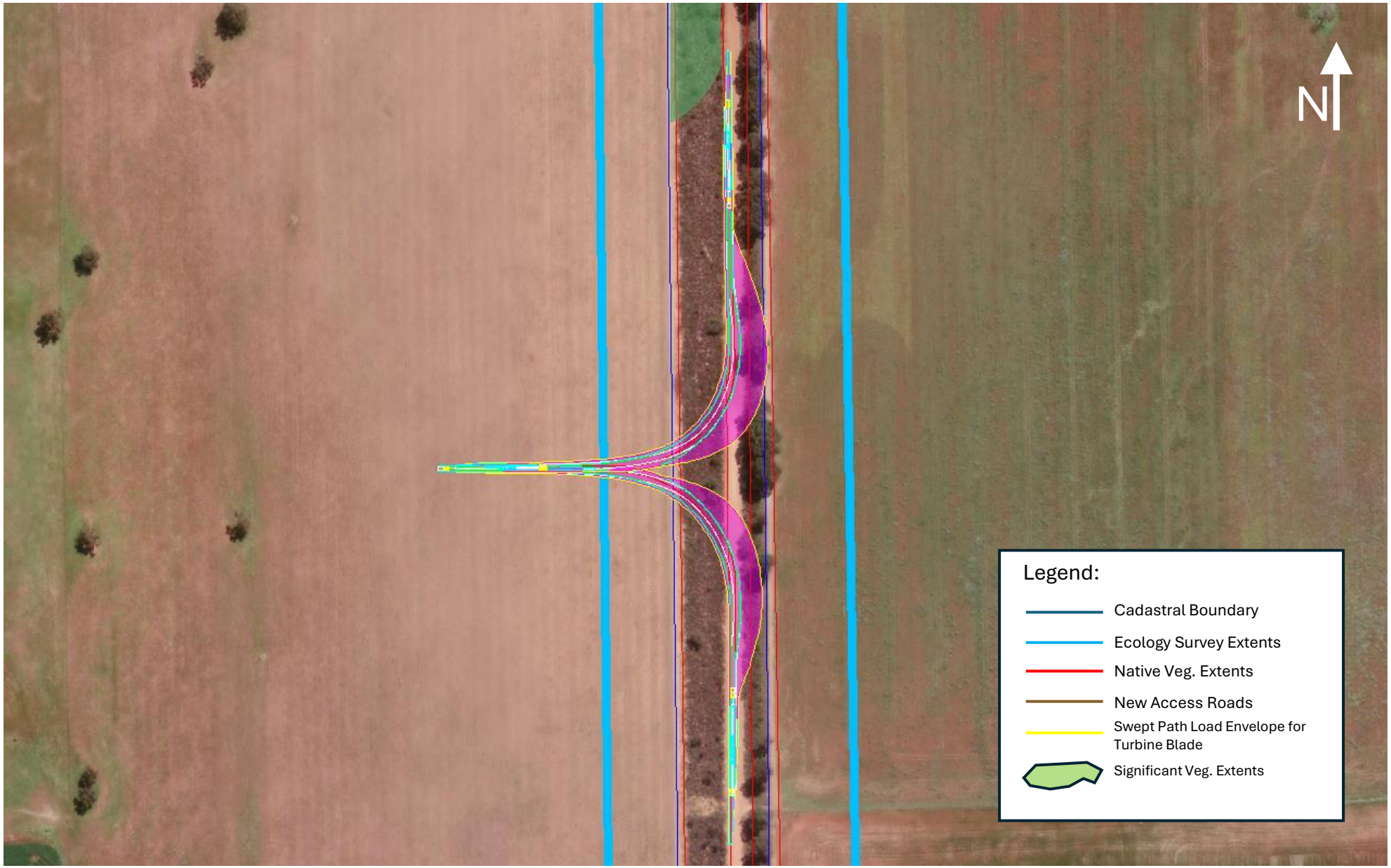


6

Turning Westwards

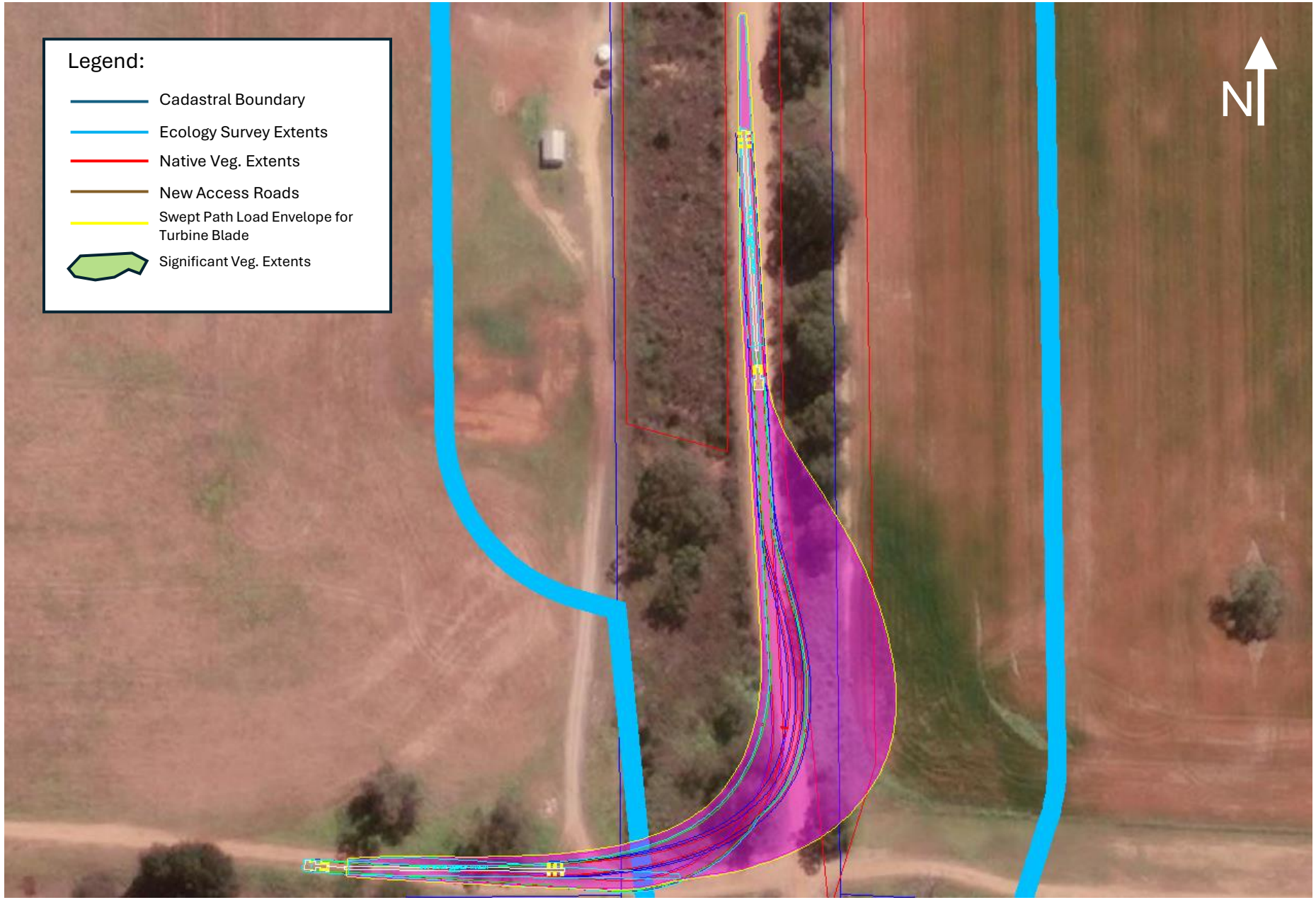
7

Walyoo Road turning west



8

Walyoo Road north approach turning west

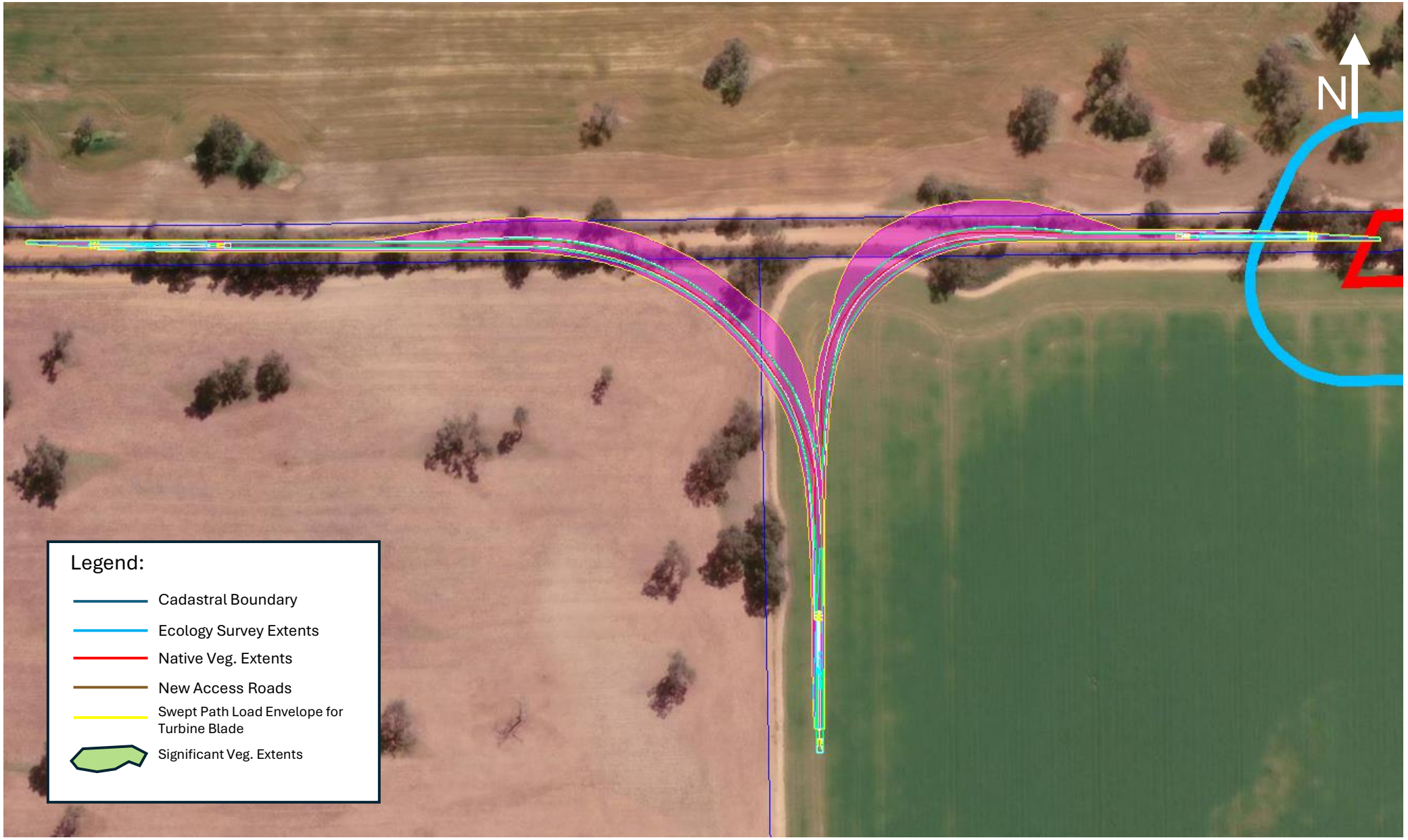


9

Walyoo Road east approach turning north

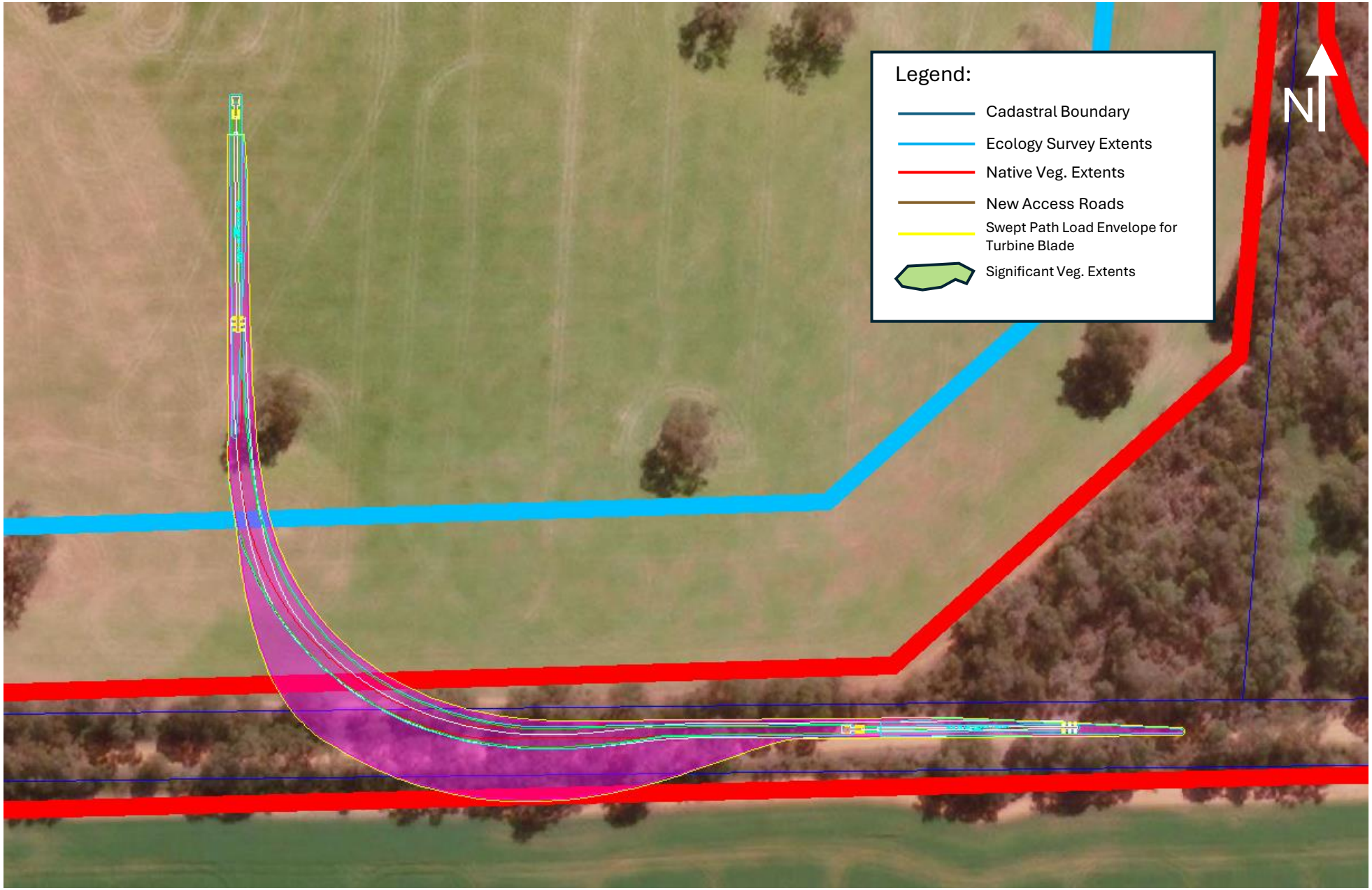
10

Walyoo Road west and east approach turning south



11

Walyoo Road east approach turning north

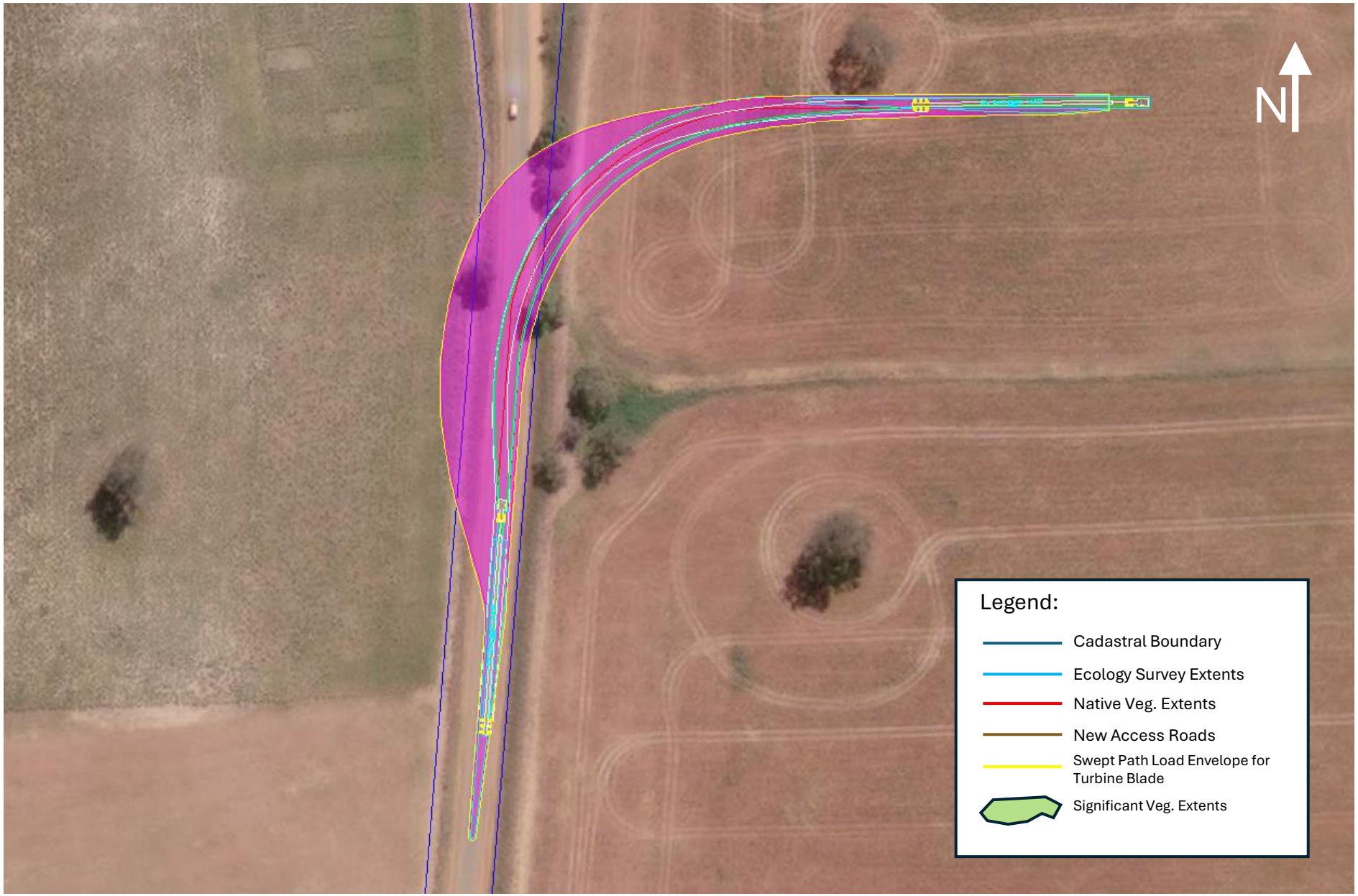


12

Dandaragan Road south approach turning northeast

13

Dandaragan Road south approach turning east



14

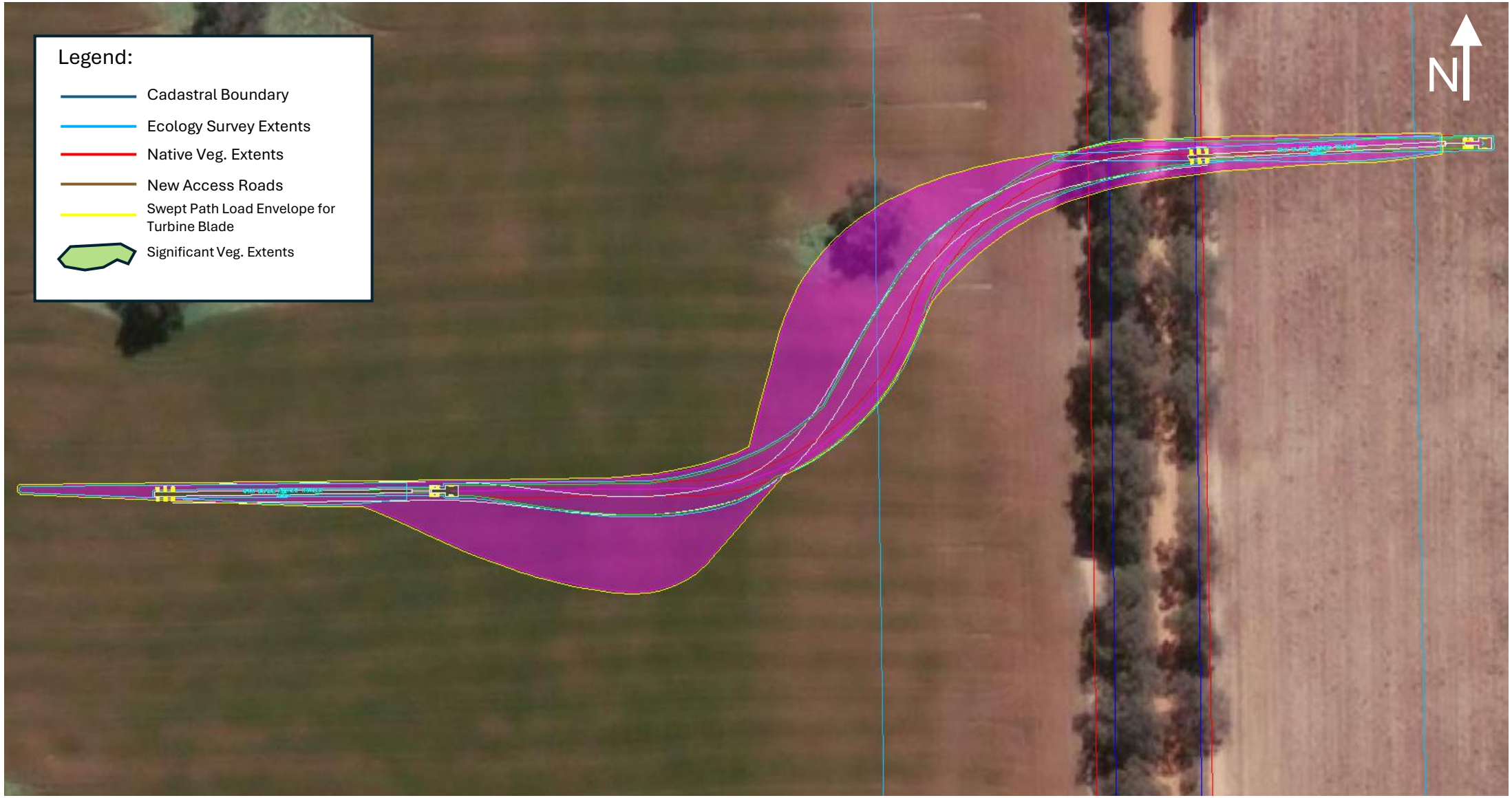
Dandaragan Road south approach turning west

15

Dandaragan Road south approach turning east

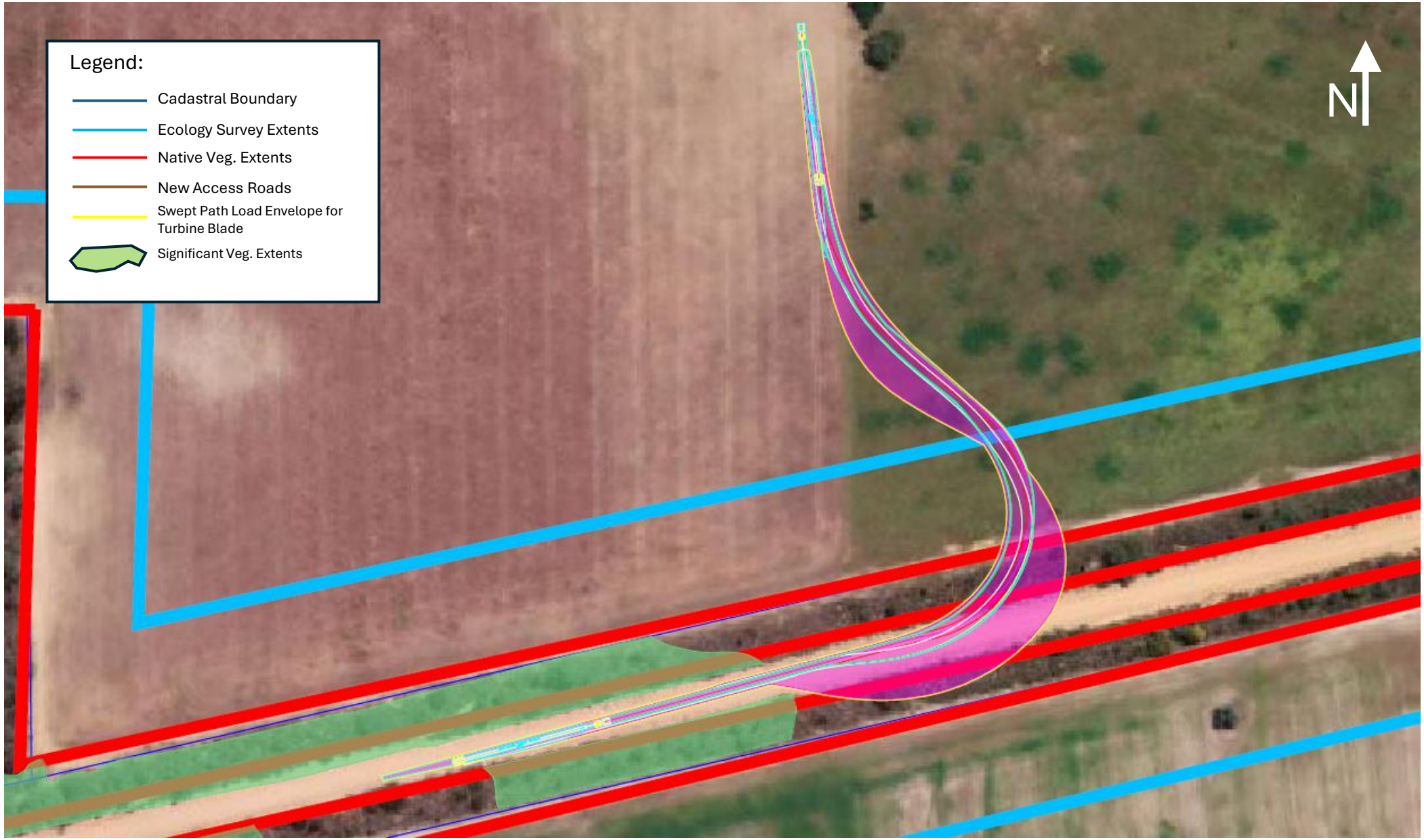
16

Moochamulla Road south approach turning west



17

Gillingarra Road west approach turning north

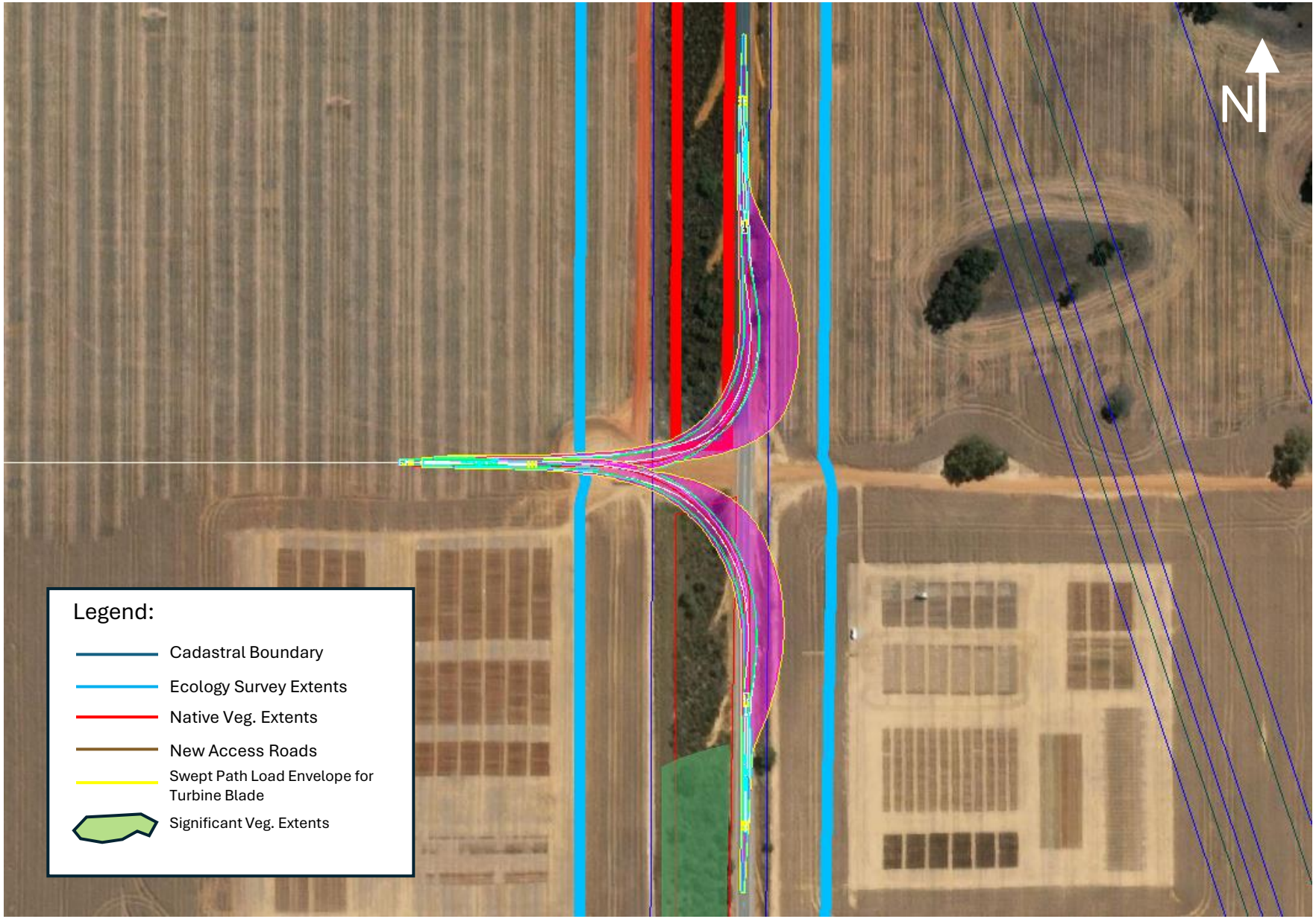


18

Moochamulla Road north approach turning west

19

Dandaragan Road south approach turning west



Gillingarra Road approach turning north