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Instrument Procedure Assessment Report

**FEASIBILITY STUDY RNP APCH RWY 09/27
SOUTHERN CROSS AERODROME, WA**

SOUTHERN CROSS WIND FARM

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EXECUTIVE SUMMARY

Global Airspace Solutions Pty Ltd (GAS) has been commissioned by Yilgarn Holdings Pty Ltd to investigate the feasibility of developing and publishing RNP Approaches for runways 09 and 27 at Southern Cross Aerodrome, WA.

Yilgarn Holdings Pty Ltd is planning to build a wind farm near Southern Cross, which would impact the published Minimum Sector Altitude (MSA) and Lower Safe Altitudes (LSALT) and therefore impact the operations of certain aircraft operators landing in accordance with the Visual Flight Rules (VFR) at Southern Cross Aerodrome.

The proposed wind farm is located approximately 12 km southeast of the outskirts of Southern Cross township and approximately 10 km southeast of Southern Cross Aerodrome, in Western Australia Wheatbelt region.

ASSESSMENT OF INSTRUMENT FLIGHT PROCEDURES

The aerodrome has no ground nav aids, therefore the only possible instrument flight procedures are based on satellite navigation with PBN specification RNP APCH. The proposed wind farm does not impact the assessed instrument flight procedures, except for the starting altitude, which is based on the MSA.

CONCLUSIONS

The Southern Cross Wind Farm impacts the Minimum Sector Altitude and Lowest Safe Altitude, i.e. altitudes must be increased. An aircraft is not allowed to fly lower than the published LSALT under the Instrument Flight Rules (IFR) unless taking off or landing using instrument flight procedures.

If there are no instrument flight procedures available for landing, then an aircraft can only descent below the LSALT when able to continue under the Visual Flight Rules (VFR), which means the aircraft has to fly in Visual Meteorological Conditions (VMC).

When increasing the altitude of the LSALT and/or MSA the probability that an aircraft can continue under the VFR in VMC decreases and therefore the need for instrument flight procedures becomes more important.

The mitigation to maintain Southern Cross Aerodrome runway 09/27 accessible during construction and operational lifetime of the Southern Cross Wind Farm is to develop and publish RNP Approaches for these runways. This study shows it is feasible and that the proposed wind farm does not impact the approaches, except for the starting altitude, which is driven by the MSA.

The approaches are straight-in approaches down to circling minima, because the strip width is not in accordance with Part 139 MOS for a Code 2 Non-Precision runway and therefore the runway is classified as a Non-Instrument runway.

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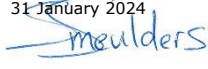
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ABBREVIATIONS

½AW	Semi-Area Width	Kts	Knots
AGL	Above Ground Level	Lat	Latitude
AIA	Aviation Impact Assessment	LNAV	Lateral Navigation
AIP	Aeronautical Information Package	Long	Longitude
AHD	Australian Height Datum	LSALT	Lowest Safe Altitude
Alt	Altitude	m	metres
AMSL	Above Mean Sea Level	MAPt	Missed Approach Point
APCH	Approach	Max	Maximum
ARP	Aerodrome Reference Point	MDA/H	Minimum Descent Altitude/Height
ATT	Along-Track Tolerance	MOC	Minimum Obstacle Clearance
AWIS	Aerodrome Weather Information Service	MOCA	Minimum Obstacle Clearance Altitude
BoM	Bureau of Meteorology	MOS	Manual of Standards
CASA	Civil Aviation Safety Authority	MS	Microsoft
CAT	Category	MSA	Minimum Sector Altitude
CEO	Chief Executive Officer	NM	Nautical Mile
CTAF	Common Traffic Advisory Frequency	OCA/H	Obstacle Clearance Altitude/Height
DAH	Designated Airspace Handbook	PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
DAP	Departure and Approach Procedures	PBN	Performance Based Navigation
DOC	Document	Pty Ltd	Proprietary Limited
Elev	Elevation	RNAV	Area Navigation
ERSA	En-Route Supplement Australia	RNP	Required Navigation Performance
FAC	Facilities	RWY	Runway
FAF	Final Approach Fix	SOC	Start of Climb
ft	Feet	TAS	True Airspeed
GAS	Global Airspace Solutions Pty Ltd	TCH	Threshold Crossing Height
GNSS	Global Navigation Satellite System	THR	Threshold
IAF	Initial Approach Fix	Tol	Tolerance
IAS	Indicated Airspeed	VODB	Vertical Obstacle Database
ICAO	International Civil Aviation Organization	Vol	Volume
IF	Intermediate approach Fix	WA	Western Australia
IFP	Instrument Flight Procedure	WTG	Wind Turbine Generator
ISA	International Standard Atmosphere	XTT	Cross-Track Tolerance
km	Kilometres	YSCR	Southern Cross Aerodrome, WA

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1 INTRODUCTION

1.1 MOTIVATION

Global Airspace Solutions Pty Ltd (GAS) has been commissioned by Yilgarn Holdings Pty Ltd to investigate the feasibility of developing and publishing RNP Approaches for runways 09 and 27 at Southern Cross Aerodrome, WA.

Yilgarn Holdings Pty Ltd is planning to build a wind farm near Southern Cross, which would impact the published Minimum Sector Altitude (MSA) and Lower Safe Altitudes (LSALT) and therefore impact the operations of certain aircraft operators landing in accordance with the Visual Flight Rules (VFR) at Southern Cross Aerodrome.

Southern Cross Aerodrome has already 2 published RNP Approaches for Runways 14 and 32 (RNP N and RNP S). The width of runway 14/32 is 18 metres and therefore not suitable for these aircraft operators and circling is not an option either.

The width of runway 09/27 is 30 metres and therefore publishing instrument flight procedures for this runway would assure that the aircraft operators are able to descent below the MSA and LSALT in marginal weather and still able to land.

This assessment uses the ICAO PANS-OPS and CASA MOS Part 173 design criteria.

1.2 PURPOSE, TARGET AUDIENCE, STATUS

The purpose of this document is to determine the feasibility of instrument flight procedures for runway 09 and 27 at Southern Cross Aerodrome, WA and to inform appropriate stakeholders.

The appropriate stakeholders are as follows and in no particular order:

- Yilgarn Holdings Pty Ltd;
- Southern Cross Aerodrome, WA (YSCR);
- Aircraft operators operating to/from Southern Cross Aerodrome;
- Western Australia Government Department of Planning, Lands and Heritage;
- Civil Aviation Safety Authority (CASA);
- Airservices Australia.

1.3 CRITERIA

- ICAO Doc 8168 PANS OPS "Aircraft Operations", Vol II, "Construction of Visual and Instrument Flight Procedures", Seventh edition – 2020;
- ICAO Doc 9137, Part 6 "Control of Obstacles", Second Edition – 1983;
- ICAO Doc 9613, "Performance-based Navigation (PBN) Manual", Fourth Edition – 2013;
- CASA Manual of Standards Part 173, Version 1.8, 11 August 2022.
- GAS Instrument Flight Procedure Design Operations Manual, Version 1.5, May 2023.

1.4 REFERENCE DATA

- Aeronautical Information Package (AIP) Australia, including, En route Supplement Australia (ERSA);
- Data provided by Yilgarn Holding Pty Ltd, including the proposed wind turbine coordinates and heights;
- Data derived from Geoscience Australia;
- Data derived from Google Earth;
- Vertical Obstacle Database (VODB).

1.5 SOFTWARE TOOLS

- PDToolkit, Version 2021.10.22.15733, Windows 10, 64-bit;
- Autodesk AutoCAD Map 3D 2021.0.1, Version 24.0.30.14;
- MS Office Excel 365;
- Blue Marble Global Mapper, Version 21.1.0 (b021820) (59) (64-bit)
- Google Earth Pro, Version 7.3.6.9345 (64-bit) – 29 December 2022.

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2 GENERAL INFORMATION

This chapter provides the general information of the proposed Southern Cross wind farm and Southern Cross Aerodrome (See Figure 2-1 and Figure 2-2).

2.1 PROPOSED WIND FARM, VICINITY OF SOUTHERN CROSS, WA

The closest part of the proposed Southern Cross Wind Farm area is located approximately 12 km southeast of the outskirts of Southern Cross township and approximately 10 km southeast of Southern Cross Aerodrome, in Western Australia Wheatbelt region.

The elevation of the terrain at the proposed wind farm location varies between 379 m AHD and 438 m AHD.

The feasibility study used the following values for the proposed wind farm¹:

- Wind turbine height including blades: 240 m AGL
- Assessed wind turbine locations (named as WTG_001, WTG_002, etc.), using a radius of 500 m around the specified location: See Table 2-1

WTG NAME	Location		Ground Elevation (m AHD)	WTG Elevation (m AHD)
	Easting	Northing		
WTG_001	733567.00	6536327.00	438	678
WTG_002	733483.00	6535674.00	424	664
WTG_003	733468.00	6534828.00	422	662
WTG_004	732349.00	6534880.00	408	648
WTG_005	732019.00	6534307.00	400	640
WTG_006	733357.00	6533235.00	398	638
WTG_007	733367.00	6532536.00	393	633
WTG_008	733351.00	6531837.00	387	627
WTG_009	732184.00	6531641.00	379	619
WTG_010	732142.00	6530471.00	381	621

Table 2-1 Windfarm obstacle data as of September 2023, AIA Southern Cross Wind Farm, Aviation Projects

2.2 AERODROME

Southern Cross Aerodrome, WA is a certified regional civil aerodrome, suitable mainly for CAT A, B and C aircraft.

The Aerodrome has two runways which are designated RWY 09/27 and RWY 14/32.

Instrument flight procedures are available for runway 14 and 32.

¹ Source Data: Aviation Projects: Aviation Impact Assessment, Southern Cross Wind Farm, September 2023

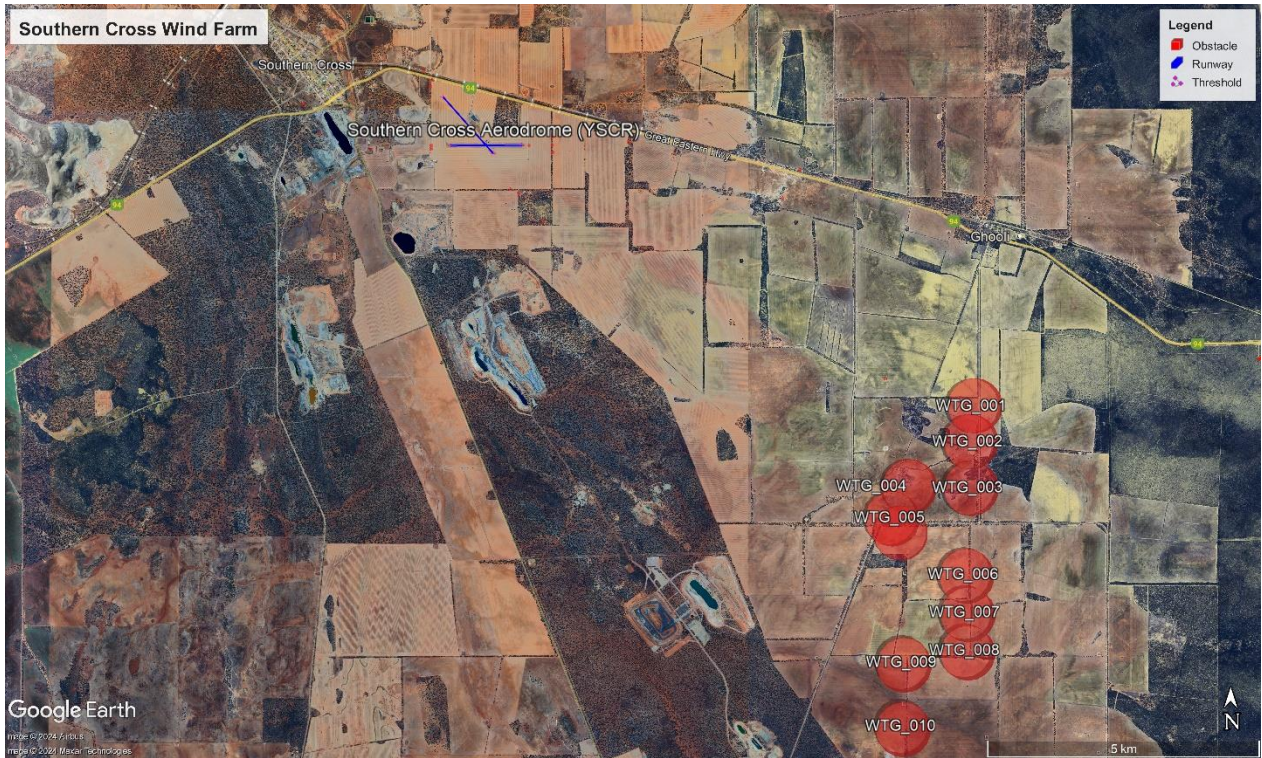


Figure 2-1 Proposed wind farm Location, Southern Cross, WA. Diagrammatic view, not reflecting wind turbine specifications.



Figure 2-2 Overview Southern Cross Aerodrome and most northern WTG of the Project Area

2.2.1 AIRSPACE

Southern Cross aerodrome is located within uncontrolled airspace and is serviced by the Flight Information Area of Melbourne Centre (See Figure 2-3). Southern Cross Aerodrome has its own Common Traffic Advisory Frequency (CTAF) as well.

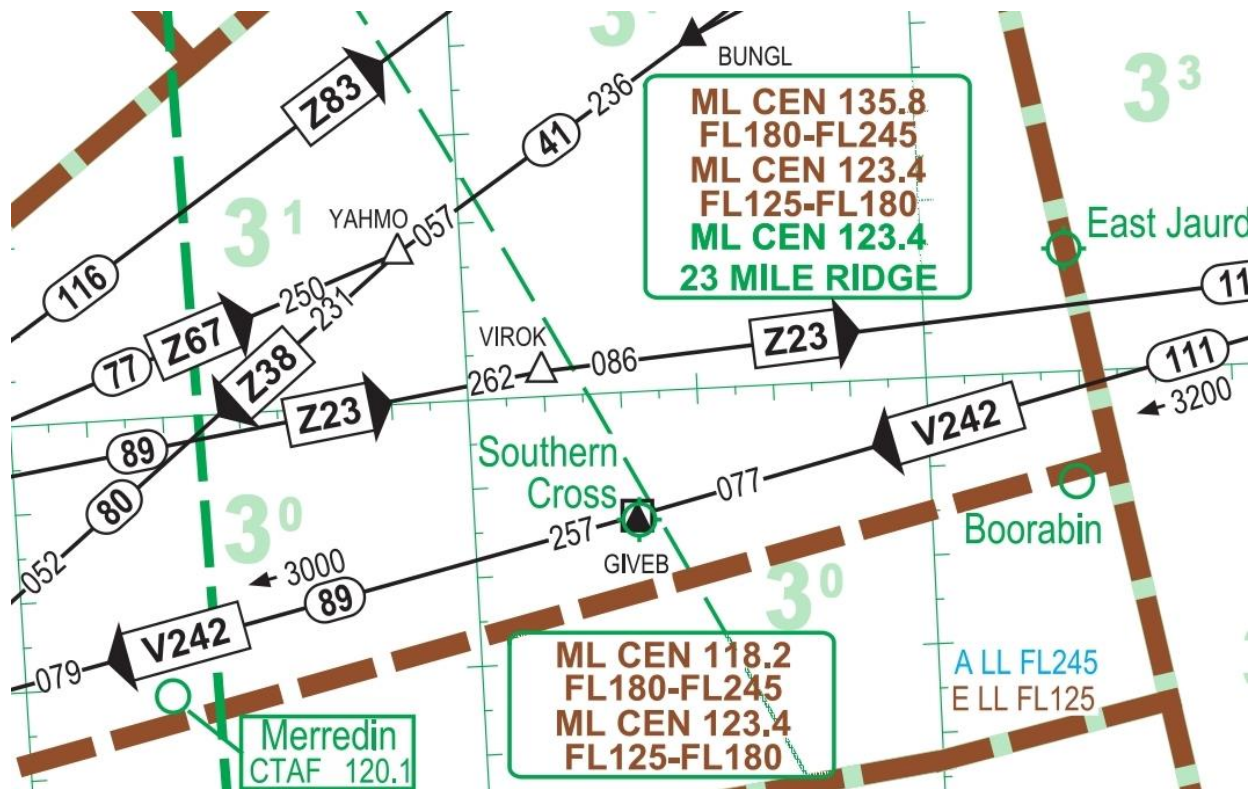


Figure 2-3 Overview of Airspace above Southern Cross Aerodrome

2.2.2 AERODROME REFERENCE POINT AND ELEVATION

The Aerodrome Reference Point (ARP) is published in the DAH:

- ARP coordinates: **31°14'25" S 119°21'35" E** and (Source: DAH, Section 17, 30 NOV 2023)
- Aerodrome elevation: **354.4824 m (1163 ft)** (Source: ERSA, FAC YNRG – 1, 30 NOV 2023)

2.2.3 MAGNETIC VARIATION

Magnetic variation has been derived using the Geoscience Australia tool.

- Magnetic Variation: **0.031°W**

2.2.4 ISA TEMPERATURE

The reference temperature mentioned in the monthly climate statistics provided by the Bureau of Meteorology² is 34.8°C. Therefore, for aircraft speed calculations ISA +20°C has been used, i.e. the maximum average temperature at the aerodrome can be higher than 30°C.

2.2.5 LIGHTING SYSTEMS AND MARKINGS

For an overview of the different lighting systems see ERSA FAC YSCR – 1.

2.2.6 METEOROLOGICAL INFORMATION

For an overview of the meteorological information see ERSA FAC YSCR – 1.

² Source: BoM Australia, Site number 012320 (Southern Cross Airfield), 04 Jan 2024

2.2.7 NAVIGATION AIDS

Southern Cross Aerodrome does not have any ground-based navigation aids, only GNSS could be used for possible future instrument flight procedure development.

Navaid	Ident	Coordinates	Function
GNSS	N/A	N/A	Could be used for: <ul style="list-style-type: none"> RNP approaches for RWY 09/27

Table 2-2 Navaid information

2.2.7.1 XTT, ATT and ½AW

XTT, ATT and Area Semi-Width for RNP APCH in NM Aeroplane											
IF/IAF/missed approach (<30 NM ARP)			FAF			MAPt			Missed approach (<15 NM ARP)		
XTT	ATT	½AW	XTT	ATT	½AW	XTT	ATT	½AW	XTT	ATT	½AW
1.00	0.80	2.50	0.30	0.24	1.45	0.30	0.24	0.95	1.00	0.80	2.00

Table 2-3 XTT, ATT and ½AW information RNP APCH

2.2.8 RUNWAY INFORMATION

Runway	THR Elev* (ft)	Threshold Coordinates**	Runway-end Coordinates**	RWY End Elev* (ft)	Direction (°T)	Direction (°M)
09	1140 ft	31°14'26.83" S 119°21'09.50" E	31°14'26.83" S 119°21'59.34" E	1162 ft	090.00°T	090.03°M
27	1162 ft	31°14'26.83" S 119°21'59.34" E	31°14'26.83" S 119°21'09.50" E	1140 ft	270.00°T	270.03°M
14	1137 ft	31°13'57.74" S 119°21'04.25" E	31°14'31.79" S 119°21'39.55" E	1153 ft	138.31°T	138.34°M
32	1153 ft	31°14'31.79" S 119°21'39.55" E	31°13'57.74" S 119°21'04.25" E	1137 ft	318.30°T	318.33°M

Table 2-4 Runway information

* Source: DAP Aerodrome Chart YSCR, 08 SEP 2022

** Source: DAH, 30 NOV 2023

2.3 OBSTACLE TOLERANCE

Vertical tolerances used are dependent on the type of obstacles (e.g. 6 m for trees, 1 metre for surveyed antennas, etc.) or as provided for in the Vertical Obstacle Database (VODB) Australia.

The horizontal tolerance for the proposed wind turbine locations is set at a radius of 500 metres to account for the rotor radius, the accuracy of the installation site and possible changes after further detailed geotechnical surveys of each turbine location.

2.4 FLIGHT PROCEDURES

2.4.1 PUBLISHED INSTRUMENT FLIGHT PROCEDURES

Southern Cross Aerodrome has two published instrument flight procedures. RNP N for RWY 14 and RNP S for RWY 32. These procedures have been developed by Airservices Australia.

Certain aircraft operators cannot use runway 14/32 due to the width of 18 metres and therefore have to use runway 09/27, which has a width of 30 metres. The aircraft operators do

not use the published instrument flight procedures, because their operations do not allow for circling approaches.

2.4.2 FUTURE INSTRUMENT FLIGHT PROCEDURES

The aviation impact assessment provided by Aviation Projects describes that the Southern Cross Wind Farm will have an impact on the published MSA and LSALT. This means that the MSA and LSALT have to be raised from 2900 ft to 3300 ft AMSL.

Due to this increase, it could become more of a challenge to use runway 09/27 when approaching in accordance with the Visual Flight Rules due to weather circumstances (e.g. cloud base, visibility, etc.).

A mitigation could be to develop instrument flight procedures for runway 09 and 27. This study looks at the development of RNP APCH procedures for RWY 09 and RWY 27 down to circling minima only. The runway infrastructure does not allow for the publication of straight-in minima, due to:

- Runway Strip width of 90 metres not in accordance with the criteria provided in Part 139 MOS for a Non-Precision Code 2 runway, i.e. 140 metres;
- The runway does not have secondary wind direction indicators near the landing thresholds;
- The aerodrome does not have a broadcasting AWIS.

The approaches can be flown as straight-in approaches, but when approaching the circling MDA, the pilot has to take over visually and land the plane.

2.4.2.1 Waypoints

The waypoint naming convention is as follows:

- The first two letters are assigned for a given location and will be used for waypoints used in RNAV Instrument Approach procedures. These first two letters would remain static for a given location. These two letters could be taken from the aerodrome location code, NAVAID or another combination. These characters aren't used in normal pilot communications;
- The third letter is replaced by a digit starting from 2, excluding 0 and 1. When the instrument approach procedure is revised and deemed necessary to change waypoint names, the number can be changed from 2 to 3, 3 to 4 etc;
- The fourth and fifth letter still follow the current convention of indicating the true direction from which the procedure approaches and the fix type respectively. This is to ensure that they correlate with current pilot operational procedures for radio telephony, direction and waypoint sequence;

The first two letters for waypoints used for Southern Cross Aerodrome are "SQ". This has been allocated by Airservices.

Waypoint Name	Lat	Long	Description	Fly by / Fly over	Used by which RWY
SQ2WO	S31° 19' 08.56"	E119° 07' 29.39"	Right IAF	Fly By	RWY 09
SQ2WP	S31° 14' 25.58"	E119° 03' 39.85"	Straight IAF	Fly By	RWY 09
SQ2WR	S31° 09' 43.55"	E119° 07' 30.78"	Left IAF	Fly By	RWY 09
SQ2WI	S31° 14' 26.26"	E119° 09' 29.75"	IF	Fly By	RWY 09
SQ2WF	S31° 14' 26.68"	E119° 15' 19.63"	FAF	Fly By	RWY 09
RW09	S31° 14' 26.83"	E119° 21' 09.50"	MAPt	Fly Over	RWY 09

Waypoint Name	Lat	Long	Description	Fly by / Fly over	Used by which RWY
SQ2EK	S31° 09' 43.62"	E119° 35' 37.97"	Right IAF	Fly By	RWY 27
SQ2EL	S31° 14' 25.58"	E119° 39' 28.82"	Straight IAF	Fly By	RWY 27
SQ2EN	S31° 19' 08.49"	E119° 35' 39.36"	Left IAF	Fly By	RWY 27
SQ2EI	S31° 14' 26.26"	E119° 33' 39.01"	IF	Fly By	RWY 27
SQ2EF	S31° 14' 26.68"	E119° 27' 49.19"	FAF	Fly By	RWY 27
RW27	S31° 14' 26.83"	E119° 21' 59.34"	MAPt	Fly Over	RWY 27

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3 DEVELOPMENT OF INSTRUMENT FLIGHT PROCEDURES RWY 09/27

The following paragraphs describe the development of the RNP APCH procedures for runway 09 and runway 27, including the MSA and the Circling minima.

3.1 MINIMUM SECTOR ALTITUDE (MSA)

The MSA is divided in 2 sectors, i.e. 25 NM MSA sector and 10 NM MSA sector. The published MSA has no subsectors and with the construction of the wind turbines, this will not change. The wind turbines impact the MSA. The minima for the MSA sectors are:

- **25 NM MSA:** 678 + 300 = 978 m (rounded up: **3300 ft**)
- **10 NM MSA:** 678 + 300 = 978 m (rounded up: **3300 ft**)

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
WTG_001	S31°17'02.34"	E119°27'12.78"	678	0	25 NM MSA 10 NM MSA	300	978 m 3209 ft	Critical

Table 3-1 Obstacle information MSA



Figure 3-1 Overview of MSA Areas, Southern Cross Aerodrome

3.2 VISUAL MANOEUVRING (CIRCLING)

The instrument part of the approaches for RWY 09/27 are down to circling minima only and therefore circling areas have to be assessed to calculate the MDA for CAT A&B and CAT C aircraft.

The Southern Cross Wind Farm is not impacting the circling minima, because the wind turbines are located outside the Circling assessment areas (See Figure 3-2).

The minima for the circling areas are:

- **Circling CAT A/B**: $456 + 90 = 546$ m (rounded up: **1800 ft**)
- **Circling CAT C** : $470 + 120 = 590$ m (rounded up: **1940ft**)

An allowance of 100 ft must be added to the lowest OCA [CASA MOS Part 173, Chapter 8, Paragraph 8.1.5(b)] and the published Circling MDA box will be shaded.

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA/OCA (m/ft)	Remarks
SCR_020	S31°14'58.95"	E119°25'01.47"	415.52	40.48	CAT A/B circling area	90	546 m / 1792 ft	Critical
SCR_021	S31°16'46.37"	E119°26'12.75"	429.52	40.48	CAT C circling area	120	590 m / 1936 ft	Critical

Table 3-2 Obstacle information circling

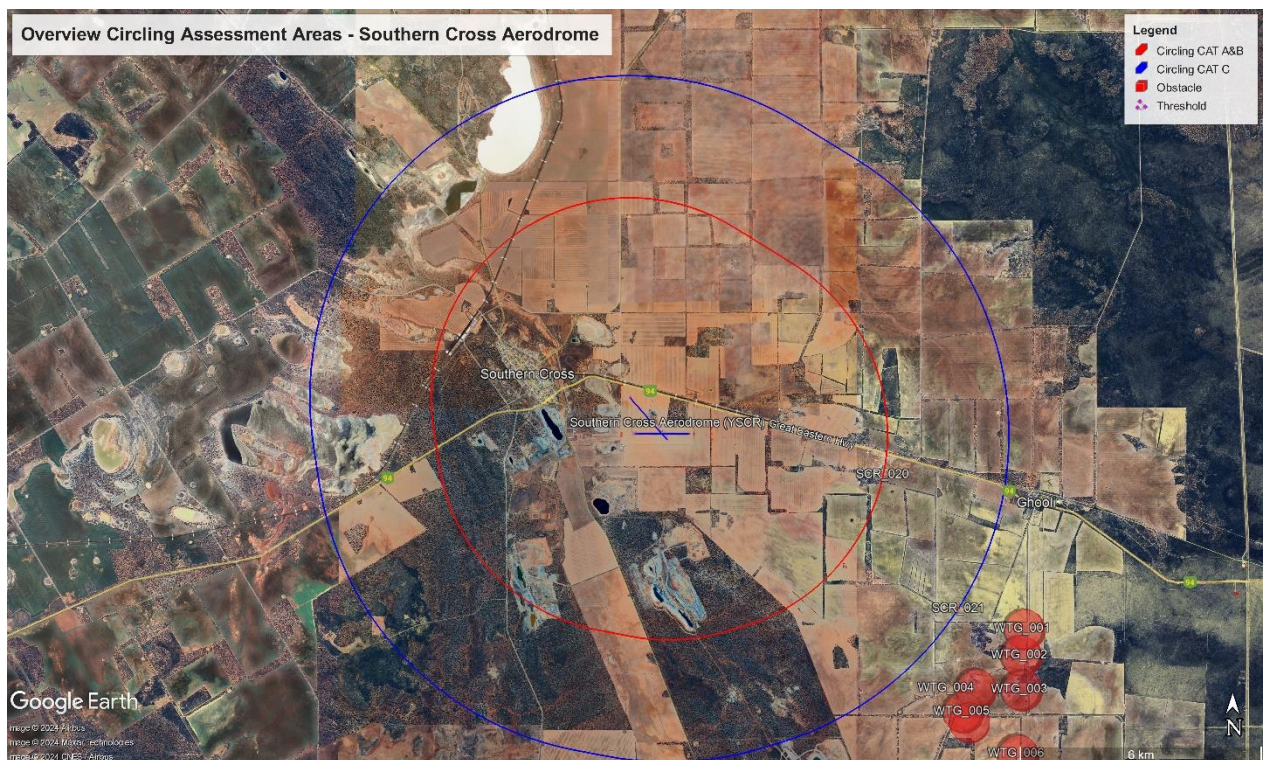


Figure 3-2 Overview of CAT A&B and CAT C Circling approach areas, Southern Cross Aerodrome

3.3 RNP W (RWY 09) APPROACH

The following paragraphs describe the RNP approach for RWY 09, including the holding, initial segment, intermediate segment, final segment and missed approach segment. The PBN specification for this approach is RNP APCH. If nothing is mentioned regarding criteria, then the standard PANS-OPS criteria has been used. See Figure 3-3 for an overview of the assessment areas.

3.3.1 HOLDING RNP W (RWY 09) APPROACH

The holding is positioned at Straight IAF SQ2WP.

The **minimum holding altitude** is: $520 \text{ m} + 300 \text{ m} = 820$ m (rounded up: **2700 ft**). The published holding altitude will be 3300 ft, same as the MSA 25 NM.

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_027	S31°12'13.45"	E119°02'36.49"	479.52	40.48	Basic holding	300	820 m 2691 ft	Critical

Table 3-3 Obstacle information Holding RNP W

3.3.2 INITIAL SEGMENTS RNP W (RWY 09) APPROACH

The initial segment of the approach is constructed according the Y-bar criteria. There are 3 initial fixes, i.e. SQ2WO (Right IAF), SQ2WP (Straight IAF) and SQ2WR (Left IAF). The maximum IAS is set to 210 kts, which is standard for a 5 NM segment length. The initial segments end at SQ2WI.

The **MOCA** is: 504 m + 300 m = 804 m (rounded up to: **2700 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_022	S31°09'31.25"	E119°07'03.45"	463.52	40.48	Primary	300	804 m 2638 ft	Critical

Table 3-4 Obstacle information Initial Segment RNP W

3.3.3 INTERMEDIATE SEGMENT RNP W (RWY 09) APPROACH

The intermediate segment starts at the intermediate approach fix SQ2WI and ends at the final approach fix SQ2WF. The segment length is 5 NM.

The **MOCA** is: 458 m + 150 m = 608 m (rounded up to: **2000 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_023	S31°12'34.07"	E119°09'12.66"	417.52	40.48	Primary	150	608 m 1995 ft	Critical

Table 3-5 Obstacle information Intermediate Segment RNP W

3.3.4 FINAL APPROACH SEGMENT RNP W (RWY 09) APPROACH

The final approach segment starts at the final approach fix SQ2WF and ends at the MAPt RW09. The segment length is 5 NM.

The final approach is designed as a straight-in approach, but the minima box will only publish circling minima, due to the strip width of the runway not in accordance with the criteria of Part 139 MOS for a Non-Precision Approach Code 2 runway and there is no secondary wind direction indicator available near Threshold RWY 09.

This means that the published minima will be higher than the calculated minima.

The final approach segment **OCA/H** could be: 438 m + 75 m = 513 m (rounded up to: **1690 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_019	S31°14'02.62"	E119°19'27.07"	428	10	Primary	75	513 m 1684 ft	Critical

Table 3-6 Obstacle information Final Segment RNP W

The straight-in approach minima are 110 ft lower than the circling minima for CAT A&B and 250 ft lower than the circling minima for CAT C.

3.3.5 MISSED APPROACH SEGMENT RNP W (RWY 09) APPROACH

The straight missed approach starts at the MAPt RW09 and is described as:

“TRACK 090°, CLIMB TO 3300FT”

There is no turn specified in the missed approach. The MOC for the part of the missed approach before the Start of Climb (SOC) is 75 metres and at 1800 metres before the SOC reduces linearly from 75 metres to 30 metres to be reached at the SOC location.

There are no critical obstacles identified in the missed approach segment. The wind turbines located in the proposed Southern Cross Wind Farm are outside the obstacle assessment area for the missed approach and therefore have no impact on the approach (See Figure 3-4).

3.3.6 VSS RNP W (RWY 09) APPROACH

The Visual Segment Surface (VSS) is not applicable for approaches with only circling minima.

Assessing the VSS in case straight-in minima can be published, then it shows that the VSS is not penetrated.

3.3.7 MINIMA BOX RNP W (RWY 09) APPROACH

The minima are derived by adding the applicable MOC to the critical obstacle in the specific obstacle evaluation areas and then add the allowance of 100 ft to the lowest OCA (CASA MOS Part 173, Chapter 8, Paragraph 8.1.5.1(b) for the occasion that a local QNH is not available. The published MDA box will be shaded.

The minima box for the RNP W approach plate is:

CATEGORY	A	B	C	D
				NOT APPLICABLE
CIRCLING	1900 (737 - 2.4)		2040 (877 - 4.0)	
ALTERNATE	(1237 - 4.4)		(1377 - 6.0)	

Table 3-7 - Table MDA/H RNP W approach

3.4 RNP E (RWY 27) APPROACH

The following paragraphs describe the RNP approach for RWY 27, including the holding, initial segment, intermediate segment, final segment and missed approach segment. The PBN specification for this approach is RNP APCH. If nothing is mentioned regarding criteria, then the standard PANS-OPS criteria has been used. See Figure 3-5 for an overview of the assessment areas.

3.4.1 HOLDING RNP E (RWY 27) APPROACH

The holding is positioned at Straight IAF SQ2EL.

The **minimum holding altitude** is: 500 m + 300 m = 800 m (rounded up: **2700 ft**). The published holding altitude will be 3300 ft, same as the MSA 25 NM.

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_028	S31°13'11.99"	E119°35'27.45"	459.52	40.48	Basic holding	300	800 m 2625 ft	Critical

Table 3-8 Obstacle information Holding RNP E

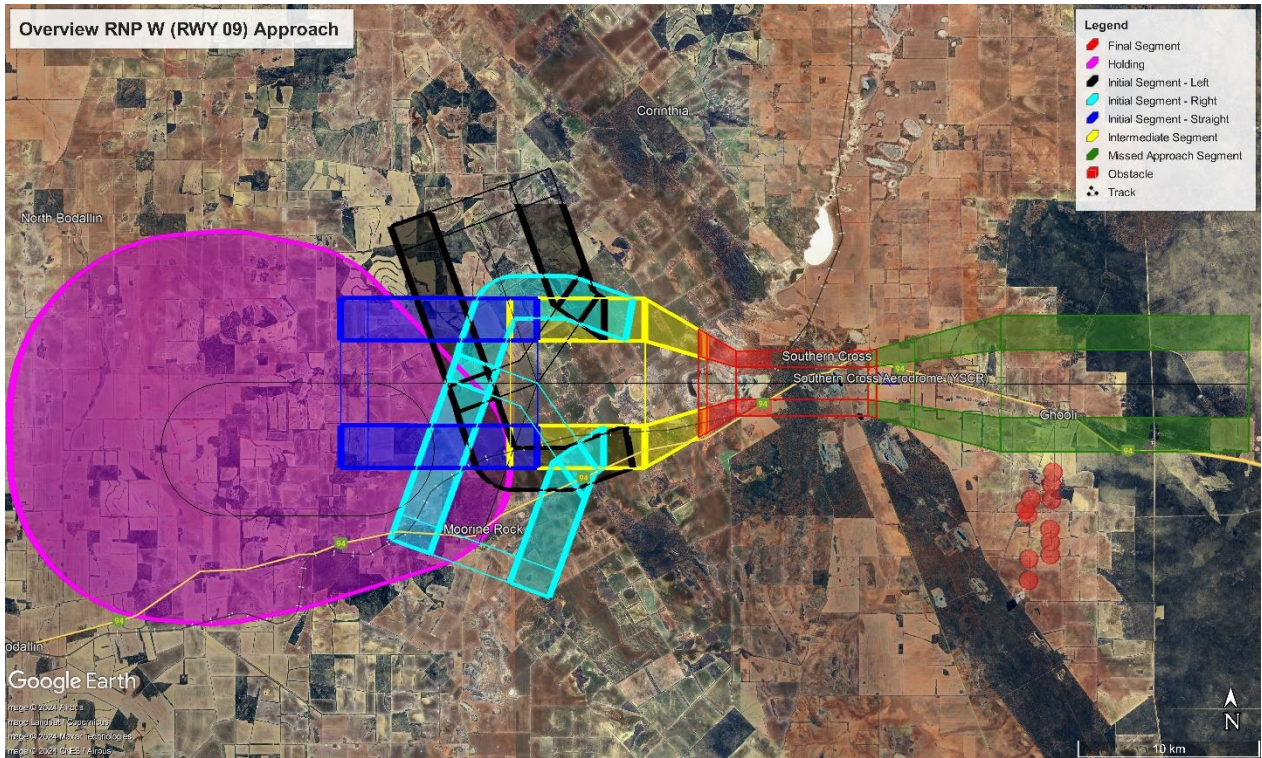


Figure 3-3 Overview RNP W (RWY 09) Approach



Figure 3-4 Overview RNP W (RWY 09) Missed Approach vs Southern Cross Wind Farm

3.4.2 INITIAL SEGMENTS RNP E (RWY 27) APPROACH

The initial segment of the approach is constructed according to the Y-bar criteria. There are 3 initial fixes, i.e. SQ2EK (Right IAF), SQ2EL (Straight IAF) and SQ2EN (Left IAF). The maximum IAS is set to 210 kts, which is standard for a 5 NM segment length. The initial segments end at SQ2EI.

The **MOCA** is: 502 m + 300 m = 802 m (rounded up: **2700 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_024	S31°13'39.56"	E119°34'58.93"	461.52	40.48	Primary	300	802 m 2632 ft	Critical

Table 3-9 Obstacle information Initial Segment RNP E

3.4.3 INTERMEDIATE SEGMENT RNP E (RWY 27) APPROACH

The intermediate segment starts at the intermediate approach fix SQ2EI and ends at the final approach fix SQ2EF. The segment length is 5 NM.

The **MOCA** is: 504 m + 150 m = 654 m (rounded up: **2200 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_025	S31°13'21.96"	E119°32'08.44"	463.52	40.48	Primary	150	654 m 2146 ft	Critical

Table 3-10 Obstacle information Intermediate Segment RNP E

3.4.4 FINAL APPROACH SEGMENT RNP E (RWY 27) APPROACH

The final approach segment starts at the final approach fix SQ2EF and ends at the MAPt RW27. The segment length is 5 NM.

The final approach is designed as a straight-in approach, but the minima box will only publish circling minima, due to the strip width of the runway not in accordance with the criteria of Part 139 MOS for a Non-Precision Approach Code 2 runway and there is no secondary wind direction indicator available near Threshold RWY 27.

This means that the published minima will be higher than the calculated minima.

The final approach segment **OCA/H** could be: 458 m + 75 m = 533 m (rounded up: **1750 ft**).

Obst Name	Lat	Long	Elev (m)	Tol (m)	Position	MOC (m)	MOCA (m/ft)	Remarks
SCR_026	S31°14'41.94"	E119°25'13.32"	417.52	40.48	Primary	75	533 m 1749 ft	Critical

Table 3-11 Obstacle information Final Segment RNP E

The straight-in approach minima are 50 ft lower than the circling minima for CAT A&B and 190 ft lower than the circling minima for CAT C.

The wind turbines located in the proposed Southern Cross Wind Farm are outside the obstacle assessment area for the final approach and therefore have no impact on the approach (See Figure 3-6).

3.4.5 MISSED APPROACH SEGMENT RNP E (RWY 27) APPROACH

The straight missed approach starts the MAPt RW27 and is described as:

“TRACK 270°, CLIMB TO 3300FT”

There is no turn specified in the missed approach. The MOC for the part of the missed approach before the Start of Climb (SOC) is 75 metres and at 1800 metres before the SOC reduces linearly from 75 metres to 30 metres to be reached at the SOC location.

There are no critical obstacles identified in the missed approach segment.

3.4.6 VSS RNP E (RWY 27) APPROACH

The Visual Segment Surface (VSS) is not applicable for approaches with only circling minima.

Assessing the VSS in case straight-in minima can be published, then it shows that the VSS is penetrated by obstacles (trees) higher than 15 metres above threshold elevation. If Southern Cross aerodrome is keen to publish straight-in minima and deal with the appropriate runway infrastructure as per Part 139 MOS, then also these obstacles have to be removed or a higher descent gradient could possibly be applied.

3.4.7 MINIMA BOX RNP E (RWY 27) APPROACH

The minima are derived by adding the applicable MOC to the critical obstacle in the specific obstacle evaluation areas and then add the allowance of 100 ft to the lowest OCA (CASA MOS Part 173, Chapter 8, Paragraph 8.1.5.1(b) for the occasion that a local QNH is not available. The published MDA box will be shaded.

The minima box for the RNP E approach plate is:

CATEGORY	A	B	C	D
				NOT APPLICABLE
CIRCLING	1900 (737 – 2.4)		2040 (877 – 4.0)	
ALTERNATE	(1237 – 4.4)		(1377 – 6.0)	

Table 3-12 - Table MDA/H RNP E approach

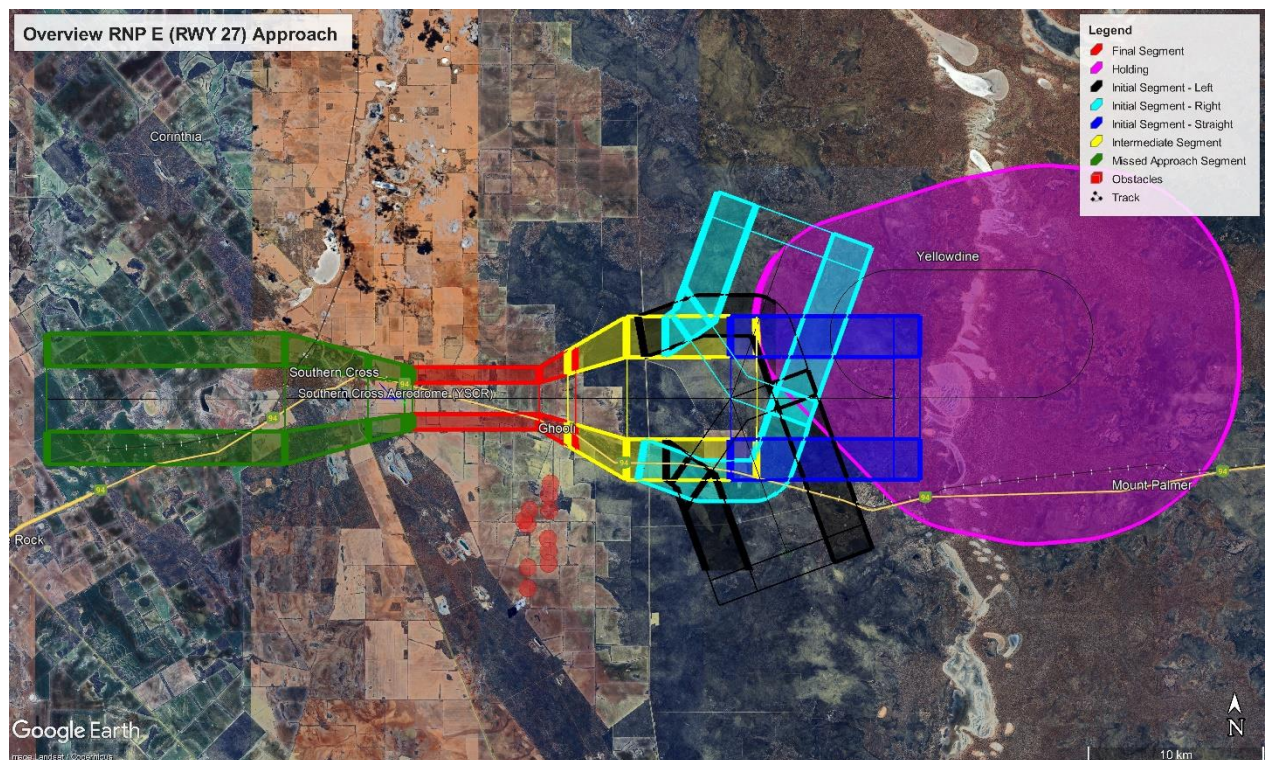


Figure 3-5 Overview RNP E (RWY 27) Approach

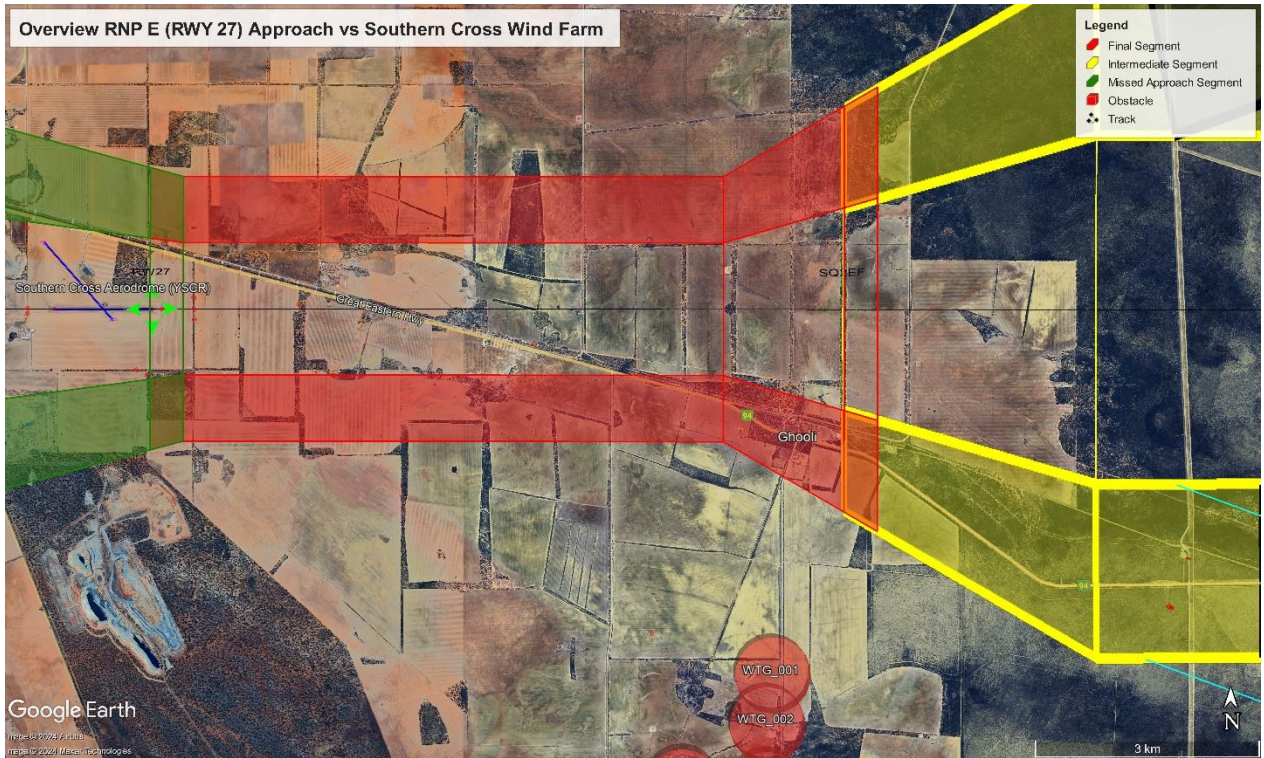


Figure 3-6 Overview RNP E (RWY 27) Final Approach vs Southern Cross Wind Farm

4 CONCLUSION

The Southern Cross Wind Farm impacts the Minimum Sector Altitude and Lowest Safe Altitude, i.e. altitudes must be increased. An aircraft is not allowed to fly lower than the published LSALT under the Instrument Flight Rules (IFR) unless taking off or landing using instrument flight procedures.

If there are no instrument flight procedures available for landing, then an aircraft can only descent below the LSALT when able to continue under the Visual Flight Rules (VFR), which means the aircraft has to fly in Visual Meteorological Conditions (VMC).

When increasing the altitude of the LSALT and/or MSA the probability that an aircraft can continue under the VFR in VMC decreases and therefore the need for instrument flight procedures becomes more important.

Runway 09/27 at Southern Cross Aerodrome is being used by certain aircraft operators, due to the width of the runway. The aircraft operators are landing on the runway under the VFR in VMC, because there are no instrument flight procedures available for runway 09/27.

The mitigation to maintain Southern Cross Aerodrome runway 09/27 accessible during construction and operational lifetime of the Southern Cross Wind Farm is to develop and publish RNP Approaches for these runways. This study shows it is feasible and that the proposed wind farm does not impact the approaches, except for the starting altitude, which is driven by the MSA.

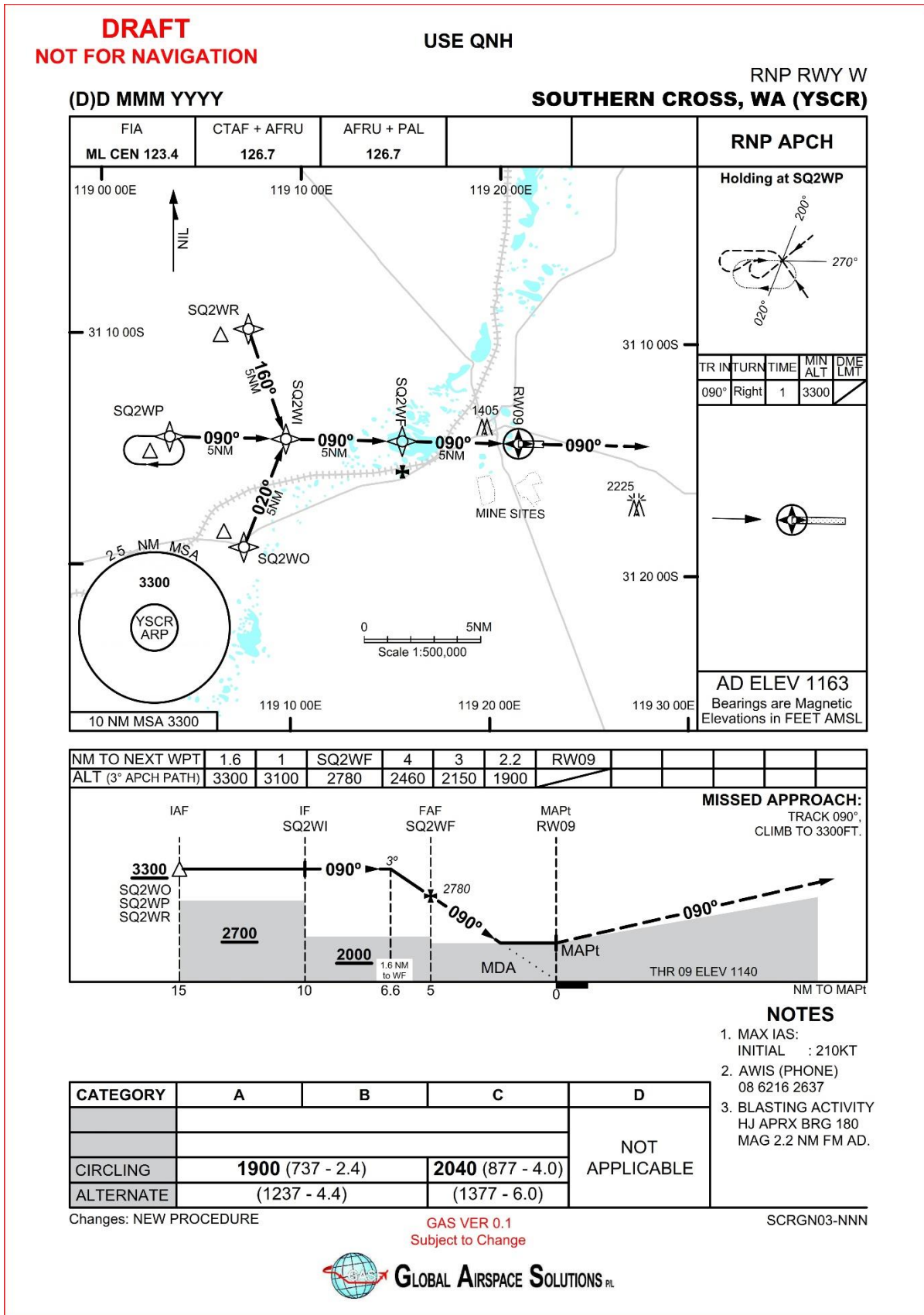
The approaches are straight-in approaches down to circling minima, because the strip width is not in accordance with Part 139 MOS for a Code 2 Non-Precision runway and therefore the runway is classified as a Non-Instrument runway.

Draft publications are available in Appendix 1 to this report.

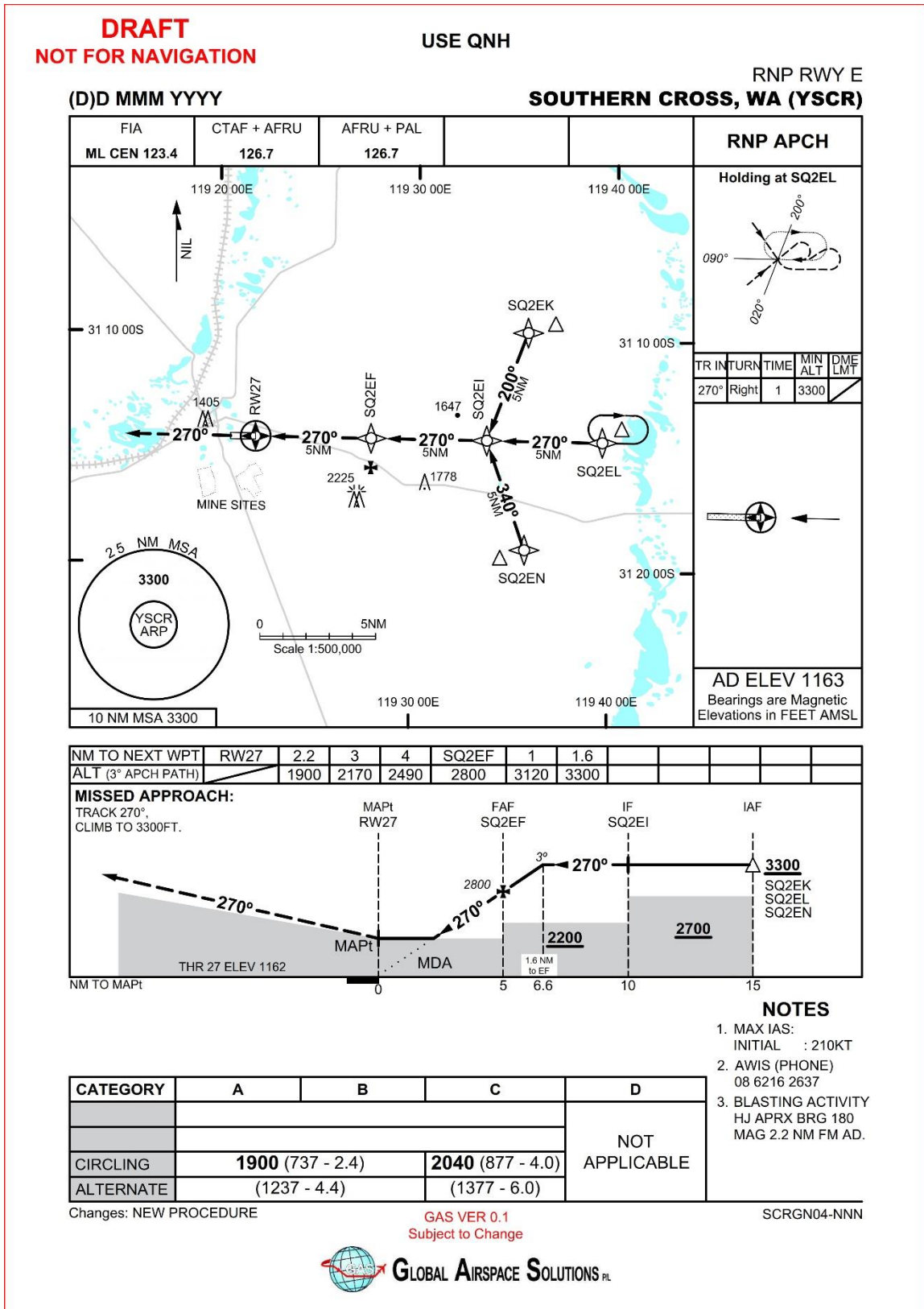
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APPENDIX 01: DRAFT PUBLICATIONS FOR DAP AUSTRALIA

DAP Australia – SOUTHERN CROSS, WA (SCR) - RNP W



DAP Australia – SOUTHERN CROSS, WA (SCR) - RNP W



- NOTES**
- MAX IAS:
INITIAL : 210KT
 - AWIS (PHONE)
08 6216 2637
 - BLASTING ACTIVITY
HJ APRX BRG 180
MAG 2.2 NM FM AD.

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