

APPENDIX 19

OBSTACLE LIMITATION SURFACE

REPORT

Obstacle Limitation Surfaces

Visualisation of Development Heights Available in the vicinity of the Cape Winelands Airport

Client: RSA.aero Limited

Reference: MD5423 -RHD-ZZ-XX-RP-Z-0001

Status: Final/01

Date: 16 August 2024

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A3	ATNS Obstacle penetrations (BD6245-NAC-MP-XX-DR-OL-0003)

1 Introduction

1.1 Overview

On the 6th of August 2024, Royal HaskoningDHV (Pty) Ltd, operating as NACO (Netherlands Airport Consultants), was commissioned to develop the Obstacle Limitation Surfaces (OLS) for the proposed runway 01-19 at Cape Winelands Airport. The purpose of this task was to provide information on the maximum permissible development heights in the surrounding areas, at specific distances from the runway. Additionally, NACO was requested to overlay these surfaces onto existing terrain and objects in the area and visualize them on layout drawings.

1.2 Scope of the report

This report outlines the process undertaken to achieve the required drawing outputs. It summarises the definition of the Obstacle Limitation Surfaces (OLS) and describes how the information received from the client was used to create the OLS for the specific site. The report describes the topographical data and survey information, and explains their implementation in the drawings.

Additionally, the output drawings (attached in the appendices) are explained to ensure accurate interpretation.

2 Obstacle Limitation Surfaces

The Obstacle Limitation Surfaces (OLS) are virtual surfaces that surround the runway of aerodromes. As defined in ICAO Annex 14, the objectives are to:

- Define the airspace around aerodromes to be maintained free from obstacles, ensuring the safe conduct of intended aeroplane operations.
- Prevent aerodromes from becoming unusable due to the growth of obstacles around them.

An obstacle is defined as any fixed (temporary or permanent) or mobile object, or parts thereof, that: a) is located on an area designated for the surface movement of aircraft; b) extends above a defined surface intended to protect aircraft in flight; or c) stands outside those defined surfaces and has been assessed as a hazard to air navigation.

The OLS defines the elevation above the runway that must remain clear of any obstacles or noted obstacles. The area above the OLS is used by aircraft during flight procedures. The dimensions of the OLS depend on the runway code and runway category (defined by the instruments of the runway). Figure 2-1 illustrates the different surfaces that form the OLS, with each surface described below:

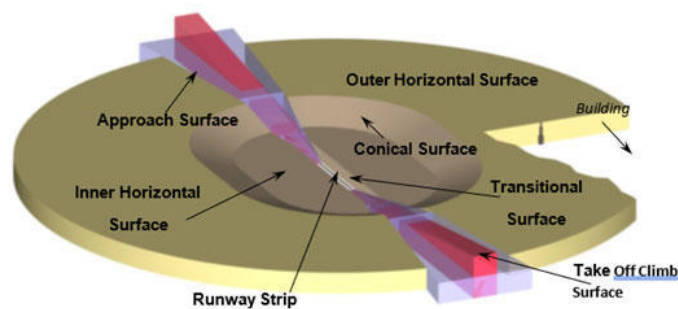


Figure 2-1: Obstacle limitation surfaces (source: www.caa.co.uk)

The surfaces that form the OLS are:

Approach Surface:

An inclined plane or combination of planes preceding the threshold as seen in Figure 2-2. The 3 orange surfaces form the approach.

Take-off Climb Surface:

An inclined plane or other specified surface beyond the end of a runway or clearway as seen in Figure 2-3. The red surface indicates the take-off climb.

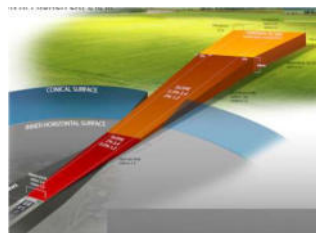


Figure 2-2: Approach surface (source: ACI Obstacle Restriction and Removal training, May 2021)

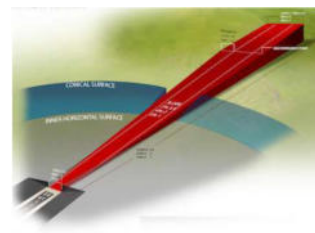


Figure 2-3: Take-off climb surface (source: ACI Obstacle Restriction and Removal training, May 2021)

Transitional Surface:

A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface as shown in Figure 2-4.



Figure 2-4: Transitional surface (source: ACI Obstacle Restriction and Removal training, May 2021)

Inner Horizontal Surface:

A surface located in a horizontal plane above an aerodrome and its environs. The surface is shown in Figure 2-5

Conical Surface:

A surface sloping upwards and outwards from the periphery of the inner horizontal surface as shown in Figure 2-6.

Outer Horizontal Surface:

An outer horizontal surface is a specified portion of a horizontal plane around an aerodrome beyond the limits of the conical surface as depicted in Figure 2-7.

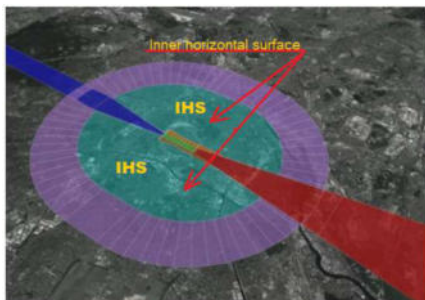


Figure 2-5: Inner horizontal surface (source: ACI Obstacle Restriction and Removal training, May 2021)

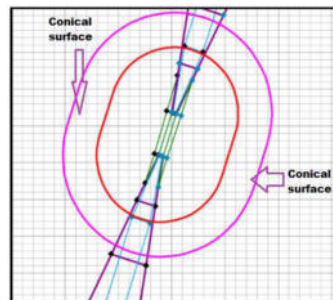


Figure 2-6: Conical surface (source: ACI Obstacle Restriction and Removal training, May 2021)

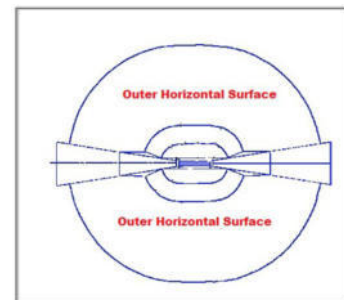


Figure 2-7: Outer horizontal surface (source: ACI Obstacle Restriction and Removal training, May 2021)

Ideally, all ICAO Annex 14 Obstacle Limitation Surfaces (OLS) should be free from obstacles. However, when a surface is infringed, any safety measures required by the SA CAA (South African Civil Aviation Authority) will consider:

- The nature of the obstacle and its location relative to the surface origin,
- Its position relative to the extended centerline of the runway or normal approach and departure paths, and existing obstructions,
- The extent to which the surface is infringed,
- The volume and type of air traffic at the aerodrome, and
- The instrument approach procedures published for the aerodrome.

3 Survey Information

Two sets of survey information were received from the client: a topographical survey of the existing ground surrounding the development, and a survey of all the potential obstacles in and around the development.

Topographical survey data of the area was received in the form of LiDAR (Light Detection and Ranging) data. The survey, conducted by a service provider of ATNS, was received by NACO on 9th of April 2024 (reference: Google Drive folder *CWA LiDAR*). The LiDAR data covered the area relevant to the Conical Surface and included most of the obstacles.

The obstacles were surveyed by ATNS on 4th of October 2022. NACO received the data from the client in the form of the OLS report prepared by ATNS (reference: *ICAO Amended Annex 14 Obstacle Assessment Report, For Cape Winelands Airport ATNS/Annex 14 - 04/10/2022 Issue 2*). The surveyed obstacles from Section 2.5.5 Table 12 of the ATNS OLS report was used for the task.

4 Visualisations

The OLS, terrain and obstacles are visualised on layout drawings. These drawings were created by developing the Obstacle Limitation Surfaces (OLS) using Autodesk Civil 3D 2024. The topographical data and objects were also plotted along with the OLS. The OLS were specifically created for Runway 01-19, a code 4, category III (precision approach) runway. Three drawings were created as described below:

1. BD6245-NAC-MP-XX-DR-OL-0001.pdf - Obstacle Limitation Surfaces (OLS) (Appendix A1):

The drawing shows the configuration of the OLS (Approach, Transitional, Take-off climb, Inner horizontal, Conical and Outer horizontal surfaces) plotted against a satellite image of the area. The image was captured from Autocad Maps.

The surfaces have been differentiated by colour. The text on the drawing indicated the Elevation of the point on the OLS above mean sea level (+MSL).

2. BD6245-NAC-MP-XX-DR-OL-0002.pdf - Obstacle Limitation Surfaces (OLS) - Zone Categories (Appendix A2):

The objective of this drawing is to understand the maximum height available for development in the area covered by the OLS. The drawing shows a colour-coded heat map which indicates the zoning categories. Each zoning category is assigned a colour and stipulates the maximum development height within the area of the assigned colour.

The maximum development height is determined by comparing the elevation of the OLS and the natural ground elevation. For example, if the OLS is at elevation 102m and the ground level is 98m, it means that the maximum development height is 4m.

3. BD6245-NAC-MP-XX-DR-OL-0003.pdf - ATNS Obstacle penetrations (Appendix A3):

The drawing shows a zoomed in area of the OLS which covers all the obstacles surveyed by ATNS (ATNS OLS report, Section 2.5.5 Table 12). The table shown on the drawing indicates the following:

- The obstacles listed in the ATNS Survey Report and their coordinates in DMS (Degrees, Minutes and Seconds).
- The obstacle number and correlating obstacle name. Each obstacle has been plotted on the drawing according to the obstacle coordinates. The plotted obstacles have been named according to the obstacle number. The obstacles plotted on the drawing can be matched to the obstacle number on the table.
- The elevation of the obstacle.
- OLS Penetration:

Height Exceeded shows the height of the object in relation to the OLS. The value is positive when the object exceeds the OLS. The value is negative when the object is lower than the OLS. Where there is no value, it is assumed that the object would have been removed or accounted for during a later stage as it falls within the runway strip (the area directly adjacent to the runway which is graded and should normally remain free of obstacles). The OLS column of the table indicates if the object exceeds or does not exceed the OLS. If the object exceeds the OLS, the surface name is mentioned. The elevation of the OLS is at the location of the obstacle.

5 References

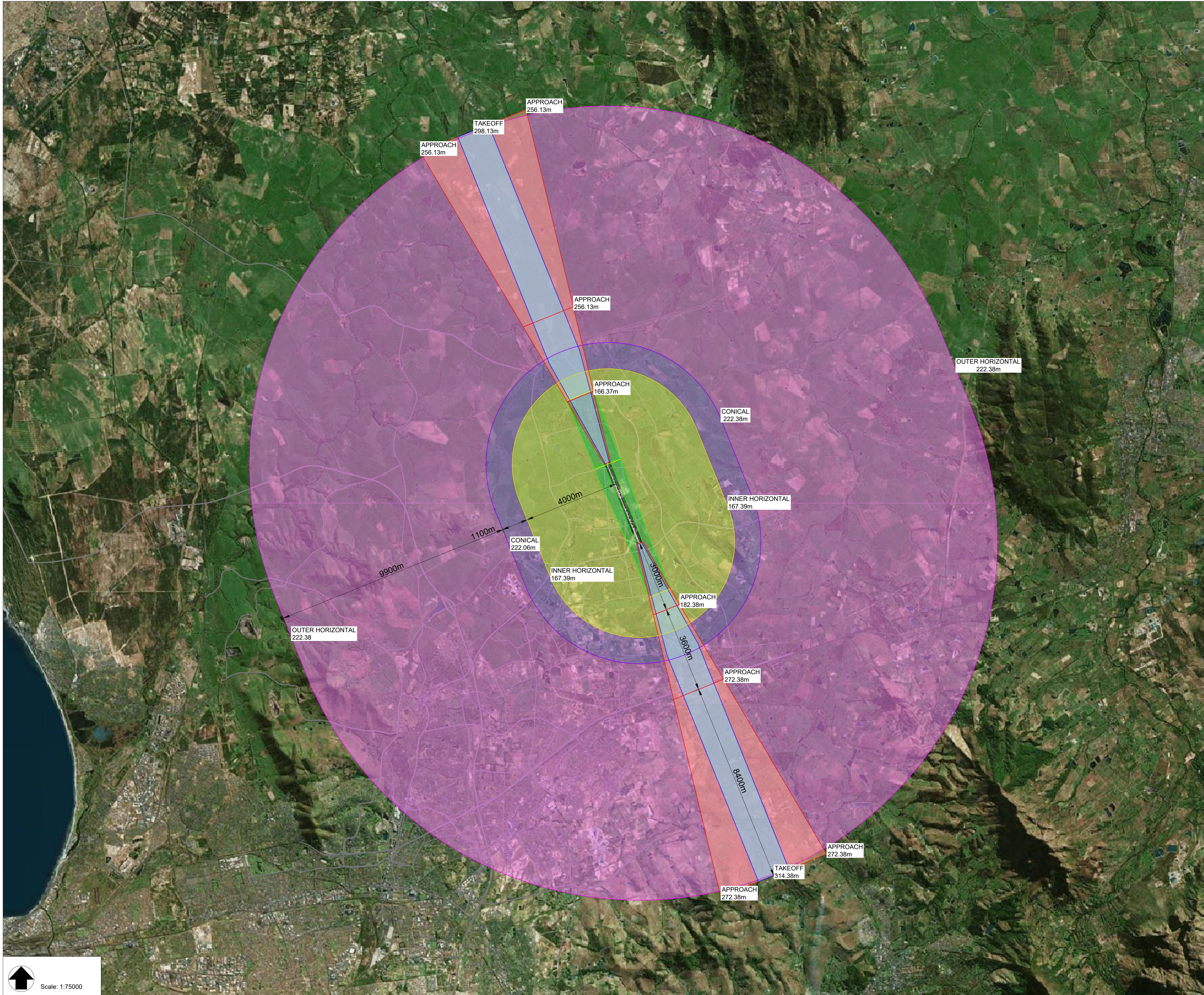
- ICAO AMENDED ANNEX 14 OBSTACLE ASSESSMENT REPORT, FOR CAPE WINELANDS AIRPORT, October 2022
- ICAO Annex 14, Volume 1: Aerodrome Design and Operations, 9th Edition, July 2022
- ACI Obstacle Restriction and Removal training, May 2021

6 Appendices

A1 Obstacle Limitation Surfaces (BD6245-NAC-MP-XX-DR-OL-0001)

A2 Obstacle Limitation Surfaces (OLS) - Zone Categories (BD6245-NAC-MP-XX-DR-OL-0002)

A3 ATNS Obstacle penetrations (BD6245-NAC-MP-XX-DR-OL-0003)



LEGEND

- Take off surface
- Approach surface
- Inner horizontal surface
- Outer horizontal surface
- Transitional surface
- Conical surface
- 000.00 OLS surface elevation (+MSL)
- Existing roads
- ATNS Obstacle point

NOTES

Runway 01-19 precision approach II or III, code 4

Location	Elevation (+MSL)
Runway end 19	123
Runway end 01	106

- The runway profile has been created from the design drawing in the appendix of the Preliminary Design Report, received on 23/04/2023.
(Drawing: 1002088-1100-DRG-CA-20-003-A)
- The OLS has been developed by following ICAO Annex 14, 9th edition (July 2022).
- The information used has been provided by the client (ICAO Amended ANNEX 14 Obstacle Assessment Report, For Cape Winelands Airport - ATNS/ANNEX 14 - 04/10/2022).
- The coordinate system is that of WGS84.

##	##	##	##
##	##	##	##
##	##	##	##
##	##	##	##
##	##	##	##
00	16/05/2024	OLS Layouts	ML
REV	DATE	DESCRIPTION	APPROVED

CLIENT

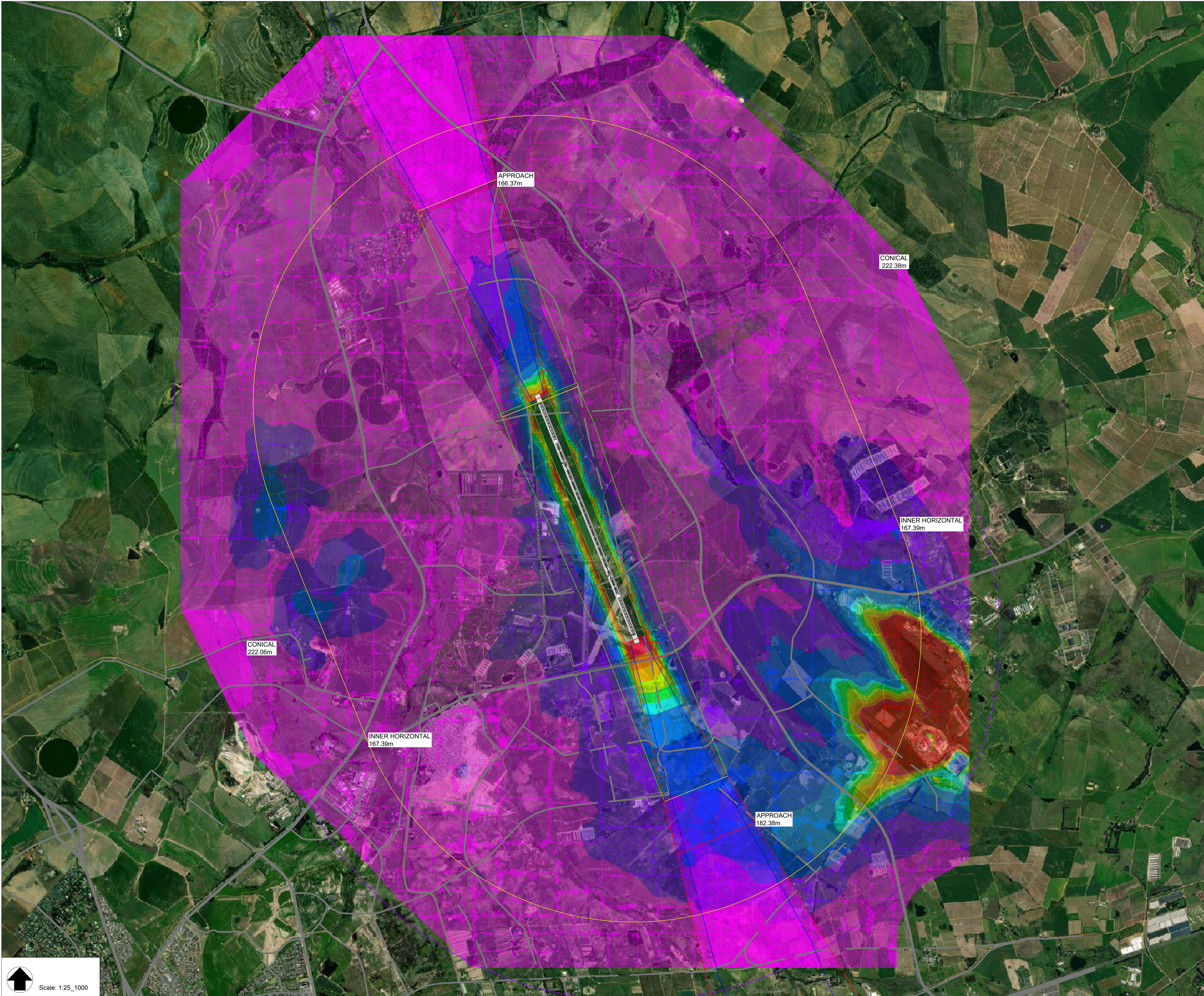
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PROJECT: CWA Master Plan

PROJECTNo: MD6245
Master Plan
Obstacle Limitation Surfaces (OLS)
Runway 01-19

PHASE: Planning		STATE: Work in progress	
DRAFT RR	CHECK MBI	APPROVED ML	
DATE 16-05-2024	SCALE Indicated in frame SHEET A1	REF. na	
DRAWING No. BD6245-NAC-MP-XX-DR-OL-0001	SUITABILITY S3	REVISION P01	



LEGEND

- Take off surface
- Approach surface
- Inner horizontal surface
- Outer horizontal surface
- Transitional surface
- Conical surface
- 000.00 OLS surface elevation (+MSL)
- Existing roads

NOTES

Runway 01-19 precision approach II or III, code 4

Location	Elevation (+MSL)
Runway end 19	123
Runway end 01	106

- The runway profile has been created from the design drawing in the appendix of the Preliminary Design Report, received on 23/04/2023. (Drawing: 1002088-1100-DRG-CA-20-003-A)
- The existing levels have been received on 09/04/2024 from the client in the form of a LIDAR survey. The data provided is the City's legal definition of ground level.
- The OLS has been developed by following ICAO Annex 14, 9th edition (July 2022).
- The Development Space Available legend represents the range of heights available that fall within a zoning category.
- The zoning categories define the different height bands relevant to the available space for development. The minimum and maximum available height of each band is based on the information received from the Client on 04/05/2024.
- A negative value represents any area that penetrates the OLS.

Development Space Available		
Number	Maximum Available Height	Color
1	PENETRATION OF THE OLS	
2	3.000	
3	6.000	
4	9.000	
5	12.000	
6	15.000	
7	18.000	
8	25.000	
9	38.000	
10	60.000	
11	164.000	

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##	##	##	##
01	16/08/2024	OLS Layouts	ML
00	16/05/2024	OLS Layouts	ML
REV	DATE	DESCRIPTION	APPROVED

CLIENT

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PROJECT: CWA Master Plan

PROJECTNo: MD6245
Master Plan
Obstacle Limitation Surfaces (OLS) - Zone Categories
Runway 01-19

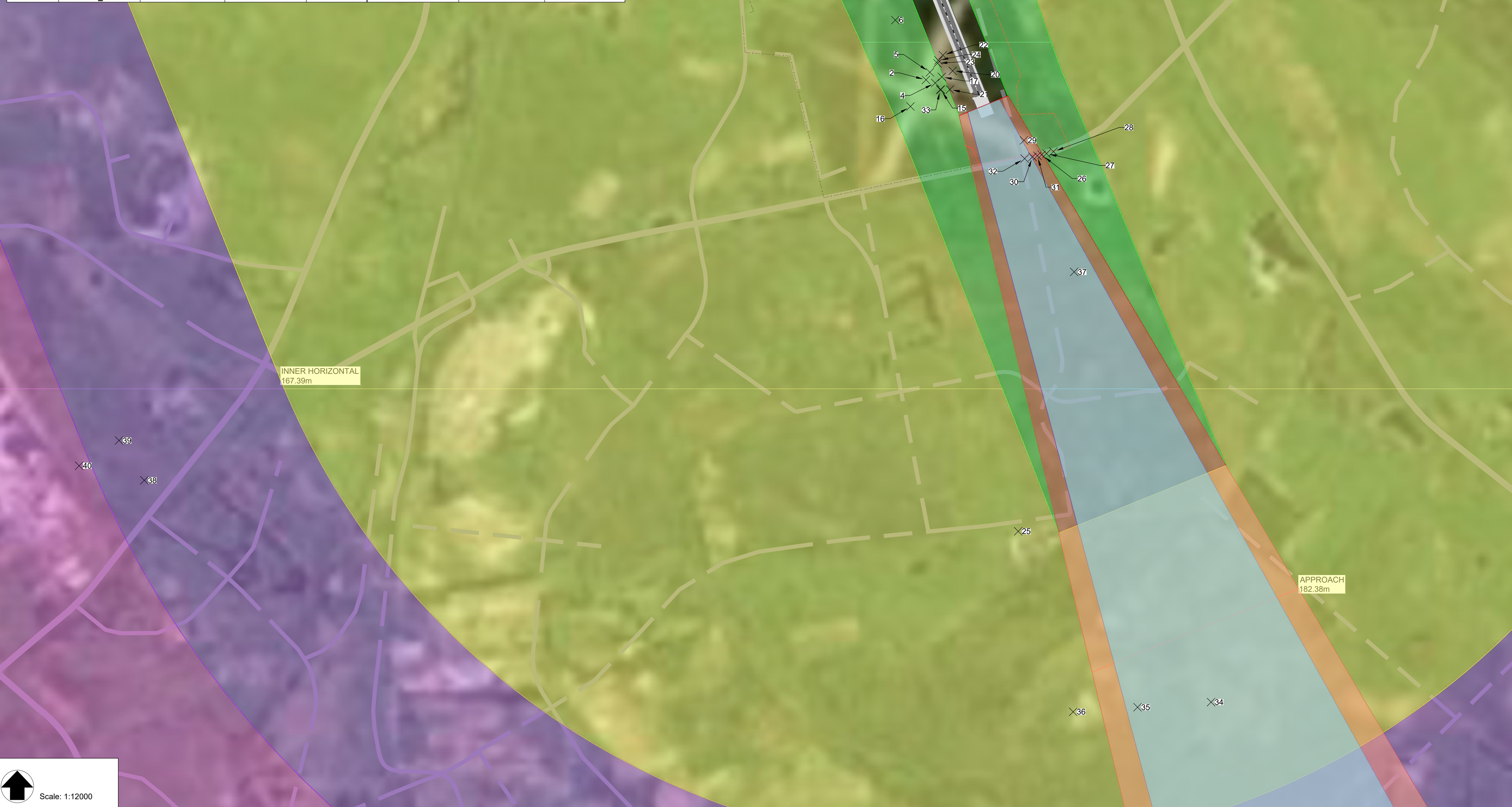
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DATE 16-08-2024	SCALE SHEET A1	Indicated in frame	REF. na
DRAWING No.	SUITABILITY	REVISION	
BD6245-NAC-MP-XX-DR-OL-0002	S3	P02	











Scale: 1:25_1000

0 750 1500 Meters

OBSTACLE NUMBER	OBSTACLE NAME	DEGREES, MINUTES AND SECONDS		OBSTACLE ELEVATION (m)	HEIGHT EXCEEDED (m)	OLS PENETRATION		
		LATITUDE	LONGITUDE			OLS		OLS ELEVATION (m)
1	RWY21 PP5	S 33° 45' 32.888"	E 18° 44' 10.292"	124.161	-1.239	BELOW OLS		125.400
2	HANGER_A1	S 33° 48' 15.249"	E 18° 44' 29.145"	133.502	0.768	BELOW OLS		134.270
3	PP1	S 33° 45' 54.649"	E 18° 44' 22.116"	126.789	4.629	TRANSITIONAL		122.160
4	FUEL FARM	S 33° 48' 15.817"	E 18° 44' 31.035"	130.433	1.693	TRANSITIONAL		128.840
5	HANGER_2	S 33° 48' 13.966"	E 18° 44' 29.979"	125.507	-3.703	BELOW OLS		129.210
6	MET STATION	S 33° 46' 4.855"	E 18° 44' 23.105"	131.535	-5.065	BELOW OLS		136.600
7	PP2	S 33° 45' 55.507"	E 18° 44' 23.816"	126.341	8.781	TRANSITIONAL		117.580
8	RWY21 PP2	S 33° 45' 34.697"	E 18° 44' E 18.033"	121.635	-	INSIDE STRIP		-
9	RWY21 PP3	S 33° 45' 34.068"	E 18° 44' 15.121"	122.707	-	INSIDE STRIP		-
10	RWY21 PP4	S 33° 45' S 33.554"	E 18° 44' 12.842"	123.945	6.275	TRANSITIONAL		117.670
11	RWY21_TREE1	S 33° 45' 44.854"	E 18° 44' E 18.55"	136.744	19.604	TRANSITIONAL		117.140
12	T64_BLD	S 33° 45' 53.998"	E 18° 44' 22.61"	122.003	2.683	TRANSITIONAL		119.350
13	T65_BLD	S 33° 45' 51.439"	E 18° 44' 19.595"	121.182	-3.918	TRANSITIONAL		125.100
14	TREE_1	S 33° 45' 16.997"	E 18° 44' 32.05"	134.781	-25.379	BELOW OLS		160.169
15	TREE_2	S 33° 48' 16.987"	E 18° 44' 32.157"	136.963	9.903	TRANSITIONAL		127.080
16	WINDSOCK MID	S 33° 48' 19.768"	E 18° 44' 25.832"	130.212	-23.118	BELOW OLS		153.390
17	HANGER_3	S 33° 48' 14.797"	E 18° 44' 32.413"	129.829	7.429	TRANSITIONAL		122.400
18	PP3	S 33° 45' 55.92	E 18° 44' 25.951"	126.209	-	INSIDE STRIP		-
19	RWY21 PP1	S 33° 45' 35.342"	E 18° 44' 20.966"	119.841	-	INSIDE STRIP		-
20	TANK_2	S 33° 48' 13.797"	E 18° 44' 34.687"	132.567	-	INSIDE STRIP		-
21	TREE_3	S 33° 46' 17.006"	E 18° 44' 34.019"	135.272	-	INSIDE STRIP		-
22	_WATER TANK	S 33° 48' 11.073"	E 18° 44' 32.742"	130.280	-	INSIDE STRIP		-
23	HANGER_A4	S 33° 46' 12.45"	E 18° 44' 31.599"	126.649	5.589	TRANSITIONAL		121.050
24	OFFICE	S 33° 46' 11.96"	E 18° 44' 31.768"	128.865	-	INSIDE STRIP		-
25	W_RESEVOIR	S 33° 47' S 33.272"	E 18° 44' 46.107"	151.944	-15.446	BELOW OLS		167.390
26	RWY32_TREE4	S 33° 46' 28.578"	E 18° 44' 52.632"	141.078	11.568	APPROACH		129.510
27	RWY32_TREE5	S 33° 48' 28.366"	E 18° 44' 53.842"	135.288	2.858	TRANSITIONAL		132.630
28	RWY32_TREE6	S 33° 46' 28.074"	E 18° 44' 55.06"	135.154	-2.906	BELOW OLS		138.050
29	RWY32_F1	S 33° 46' 26.029"	E 18° 44' 49.062"	126.269	-1.121	BELOW OLS		127.390
30	RWY32_TREE2	S 33° 46' 26.9	E 18° 44' 50.739"	141.005	11.655	APPROACH		129.350
31	RWY32_TREE3	S 33° 46' 28.728"	E 18° 44' 51.745"	141.078	11.648	APPROACH		129.430
32	RWY32_TREE1	S 33° 46' 29.17"	E 18° 44' 49.112"	135.239	6.029	TAKEOFF		129.210
33	TREE_1	S 33° 46' 16.997"	E 18° 44' 32.05"	134.781	7.321	TRANSITIONAL		127.460
34	RWY01_PYLON MID1	S 33° 48' 3.38"	E 18° 45' 25.077"	145.591	-44.469	BELOW OLS		190.080
35	RWY01_PYLON MID2	S 33° 48' 3.582"	E 18° 45' 9.901"	149.451	-38.189	BELOW OLS		187.640
36	RWY01_PYLON MID3	S 33° 48' 4.531"	E 18° 44' 56.615"	147.158	-20.232	BELOW OLS		167.390
37	STEEL TANK	S 33° 48' 48.851"	E 18° 44' 58.8"	143.339	-39.041	BELOW OLS		182.3



LEGEND

- | | |
|---|------------------------------|
|  | Take off surface |
|  | Approach surface |
|  | Inner horizontal surface |
|  | Outer horizontal surface |
|  | Transitional surface |
|  | Conical surface |
| 000.00 | OLS surface elevation (+MSL) |
|  | Existing roads |
|  | ATNS Obstacle point |

NOTES

Runway 01-19 precision approach II or III,
code 4

Location	Elevation (+MSL)
Runway end 19	123
Runway end 01	106

1. The runway profile has been created from the design drawing in the appendix of the Preliminary Design Report, received on 23/04/2023.
(Drawing: 1002088-1100-DRG-CA-20-003-A)
2. The OLS has been developed by following ICAO Annex 14, 9th edition (July 2022).
3. The information used has been provided by the client (ICAO Amended ANNEX 14 Obstacle Assessment Report, For Cape Winelands Airport - ATNS/ANNEX 14 - 04/10/2022).
4. The coordinate system is that of WGS84.

##	##	##	##
##	##	##	##
##	##	##	##
##	##	##	##
##	##	##	##
00	16/08/2024	OLS Layouts	ML
REV.	DATE	DESCRIPTION	APPROVED

CLIENT

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PROJECT:

CWA Master Plan

PROJECT No: MD6245

Master Plan
ATNS Obstacle penetrations
Runway 01-19

PHASE: Planning		STATE: Work in progress	
DRAFT	RR	CHECK	MBI
APPROVED		ML	
DATE	16-08-2024	SCALE	Indicated in frame
SHEET		A1	REF.
na			
DRAWING No.		SUITABILITY	REVISION
BD6245-NAC-MP-XX-DR-OL-0003		S3	P01