IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	submissions and further Submissions lodged by **Mercer Airport Limited on the Proposed Waikato District Plan**

REBUTTAL STATEMENT OF EVIDENCE OF DAVID STEWART PARK ON BEHALF OF MERCER AIRPORT AS SUBMITTER

SUBMITTER REFERENCE 921

1. INTRODUCTION

1.1. My full name is David Stewart Park. I am a Director of Astral Limited, a New Zealand based aviation consultancy. I have held this position for 23 years.

1.2. My qualifications and experience are set out in my statement of evidence in chief **(EIC)** dated 16 February 2021.

1.3. I am aware of the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note 2014. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.4. My rebuttal evidence is provided in response to the parts of the Section 42A report titled "Hearing 25: Zone Extents Mercer & Meremere", prepared on behalf of the Waikato District Council and dated 12 April 2021, that deal with the Obstacle Limitation Surfaces (OLS) sought by Submitter 921.

1.5. The specific points my rebuttal evidence addresses are:

1.5.1. The OLS operation and its importance for protecting the ongoing operation of Mercer Airport.

1.5.2. The location and extent of the OLS

1.5.3. The terrain heights beneath the OLS.

1.5.4. Existing buildings or trees affected by the proposed OLS.

1.5.5. What constraints will be placed on neighbouring landowners (if any) under the proposed OLS.

2. OLS OPERATION AND IMPORTANCE

2.1. At paragraph 6.6 of my EIC, I state that the purpose of OLS is to ensure aircraft flight paths are not infringed by obstructions in the take-off, approach and circling areas of a runway.

2.2. Civil Aviation Authority of New Zealand (CAA) aerodrome design standards, contained in CAA Advisory Circular (AC) 139-6, contains the design standards for OLS. Chapter 2 of CAA Advisory Circular AC139-10 – *Control of Obstacles*, attached as **Annexure 1** to this rebuttal evidence, specifies the methods airport operators should use to control obstacles that would infringe the OLS.

2.3. The foremost of these methods is "height zoning", being the enactment of ordinances identifying height limits underneath the aerodrome obstacle limitation surfaces to protect the aerodrome's OLS from intrusions by man-made objects and natural growth such as trees.

2.4. In my experience this method is universally adopted by aerodromes in New Zealand through the OLS being protected in District Plans. I mention several examples of airports protected by OLS height controls in District Plans at paragraph 6.8 of my EIC.

2.5. At paragraph 297 of the s42A report, the author correctly states that OLS enable aircraft to maintain a satisfactory level of safety in the vicinity of an airfield. At paragraph 299 the author states that she considers the current operation current operation of the airport is adequately provided for through the resource consent.

2.6. However, the resource consent does not provide for OLS and therefore it cannot be relied on to maintain a satisfactory level of safety for aircraft in the vicinity of the Aerodrome. The only means by which the OLS can be secured is to have it notified to the public and landowners through the District Plan.

2.7. I understand the consent the Aerodrome operates under was issued in 1996, prior to the current operator, Palms on George[1], acquiring the facility. In my opinion the Council and the District Plan should have required, or provided for, OLS to be established for its safe operation then. The current owner recognised this shortfall and commissioned Airbiz initially and later me to remedy this situation by recommending appropriate OLS.

2.8. It appears to me the s42A author has missed this essential point and is under the impression that there is no safety implication in the lack of OLS, where in my opinion there certainly is, especially in relation to future operation of the much larger DC3 and Catalina aircraft.

2.9. Consequently, I strongly disagree with the s42A report's implied recommendation against adopting OLS by stating that operation of the airport is adequately provided for under the consent.

3. LOCATION AND EXTENT OF THE OLS

3.1. BBO has prepared plans of the OLS from the Appendix 13 description and, to enable features on the ground beneath the OLS to be identified, I have superimposed these on Google Earth imagery included as Annexure 2 of my evidence.

3.2. Figure 1 in Annexure 2 shows the total extent of the OLS and identifies its components such as the take-off/approach and transitional surfaces. Figures 2 and 3 show closeup views of the areas beneath the take-off/approach and transitional surfaces at the west and east ends of the runway respectively. These plans also identify specific tree and building features that I discuss in section 4 of this evidence.

3.3. The take-off/approach and transitional OLS slope upwards away from the runway ends and sides from the ground level of the runway. Consequently, the height of these OLS over any neighbouring property depends on the distance of that

[1] Neale Russell Ltd owns the property and Palms on George operate the Mercer Airport.

property from the runway and the height of the property's terrain compared to runway level.

4. TERRAIN HEIGHTS BENEATH THE OLS

4.1. As stated in my EIC[2], the purpose of OLS is to provide a safe margin between aircraft flight paths and tall features on the ground beneath.

4.2. BBO has prepared a plan showing the difference between the OLS height and the terrain height beneath for the entire OLS area. This is shown in Figure 1 of Annexure 3 to my evidence. Figures 2 and 3 of Annexure 3 show the terrain height contours in intervals of 1m beneath the west and east take-off/approach and transitional surfaces respectively. These figures also show "long sections" of the terrain height beneath the runway extended centreline which assists in identifying the height of the OLS above the terrain at that location.

4.3. The terrain data has been obtained from "LIDAR" survey information held by the Waikato District Council.

4.4. From the tree and building features visible in Figures 2 and 3 of Annexure 2, and the corresponding terrain heights shown in Figures 2 and 3 of Annexure 3, I have made a preliminary assessment of the impact of the OLS on properties beneath it.

4.5. I am advised that the Operative District Plan height limit for a building in the rural zone is 10m.[3] Consequently the height of buildings in areas where the OLS height above local terrain exceeds 10m will not be limited by the presence of the OLS above. I am advised that any existing buildings that infringe the OLS will have existing use rights.

4.6. It is common for trees to exceed 20m in height. For example, mature pinus radiata can reach heights of 40-50m. I understand any existing trees have existing use rights and consequently are not subject to any rule on OLS infringements at their existing heights.

4.7. The area particularly critical to aircraft safety is 3000m from the runway strip ends on take-off and approach where the aircraft must be able to be aligned with the runway extended centreline. Under CAA aerodrome design standards, every effort must be made to keep structures and vegetation below the OLS in these areas. This is the area the take-off/approach OLS is intended to protect.

4.8. Protection of the transitional OLS from infringements is also very important as it protects aircraft having to abort their landings at a low height over the runway.

[2] EIC of Dave Park, paragraph 6.6

[3] The Proposed District Plan Rule 22.3.4.1 also states that the maximum height of any building in the Rural Zone is 10 metres. While this rule is not yet operative it signals that the Proposed District Plan will take the same approach to building height as the Operative District Plan.

4.9. Terrain and vegetation infringements of the inner horizontal and conical surfaces occur at many airports and are managed by designing aircraft approach, departure and circling flight paths to avoid those infringements. However, control must be maintained by way of District Plan Rules on the construction of new tall structures and the establishment of tall tree plantations within the inner horizontal and conical surfaces to ensure established aircraft flight paths are not adversely affected.

4.10. The usual procedure for any such development proposals under the inner horizontal and conical surfaces is for the Council to refer their consent applications to the airport operator who will check on their impact on aircraft flight paths. In my experience most such applications can be approved as they don't affect flight paths.

5. EXISTING BUILDING OR TREES INFRINGING THE OLS

5.1. I understand an issue for owners of property beneath the proposed OLS is the effect the OLS may have on their ability to build or have trees on their properties.

5.2. I have reviewed the Google Earth aerial images in Annexure 2 and the terrain height data in Annexure 3 to determine what existing trees or buildings may infringe the OLS. The Google images, dated 2021, show the following existing buildings and vegetation

5.3. Under the west take-off/approach OLS, as shown in Figure 2 of Annexure 2:

5.3.1. A house and group of trees 1000m from the runway strip end (FRSE) identified as "A" in the figure. The OLS height above the Moturiki height datum[4] at this point is 27m and the local terrain height is up to 22m, giving a clearance of 5m. I understand this property is owned by Mercer Airport or related parties.

5.3.2. Lines of shelter belts 40-60m long at approximately 1200m, 1300m, and 1400m from the FRSE identified as "B" in the figure. In these locations the OLS is 32m to 39m above datum and the terrain height is typically 8m above datum, giving a clearance of 24m to 31m. These trees should be surveyed to determine their heights and whether or not they infringe the OLS.

5.3.3. Trees and buildings approximately 1700m from the FRSE identified as "C" in the figure. In this location the OLS is 44m above datum and the terrain height is approximately 15m above datum, giving a clearance of 29m. The buildings will not infringe but any nearby trees should be surveyed to check their heights.

5.3.4. A large group of buildings 1850m from the FRSE, identified as "D" in the figure. In this location the OLS is 48m above datum and the terrain height is

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4 All height references are to the Moturiki Datum (1953) which is very close to mean sea level.

up to 30m, giving a clearance of 18m. The buildings will not infringe but any nearby trees should be surveyed to check their heights.

5.3.5. From this assessment I do not consider any existing houses or buildings are affected by the west take-off/approach OLS. However, it is likely some trees will infringe as noted. This should be established by survey.

5.4. Under the east take-off/approach OLS, as shown in Figure 3 of Annexure 2:

5.4.1. The Rocket Lab buildings are located at the runway strip end. I understand Rocket Lab may be relocating in 2021 and these buildings, which are on the Aerodrome's property, will be removed. There are no other buildings shown in the imagery.

5.4.2. There is a line of trees extending from 200m to 600m FSRE, identified as "E" in Figure 3, where the OLS height is 7m to 17m above datum. Although terrain level in this area is only about 2m it is likely some of these trees will infringe and would need to be removed.

5.4.3. There is a stand of trees approximately 720m FSRE, identified as "F" in the figure, at which location the OLS is approximately 22m above datum and the terrain is approximately 5m above datum, giving a clearance of 17m. These trees will also need to be surveyed to ascertain whether they infringe.

5.4.4. There is an extensive stand of vegetation extending from 900m to 1800m FSRE, identified as "G" in the figure, where the OLS ranges from 24m to 47m above datum and the terrain 5m above, giving a clearance of 19 to 42m. The closest of these trees will also need to be surveyed to ascertain whether they infringe.

5.4.5. From this assessment I do not consider any existing houses or buildings are affected by the east take-off/approach OLS. However, it is likely some trees will infringe as noted. This should be established by survey.

5.5. Under the north and south transitional OLS, as shown in Figures 2 and 3 of Annexure 2:

5.5.1. On the south side of the runway the Mercer Aerodrome buildings, shown as "H" in Figure 2, lie under the south transitional OLS which has a height of approximately 17m above datum and the terrain height is about 2m above, giving a clearance of 15m. Some trees in this area and 150m to the west of the buildings will likely infringe.

5.5.2. At the east end of the south side transitional surface, shown in Figure 3 the trees "K" may infringe the transitional OLS.

5.5.3. There are no other significant buildings or trees under the south side OLS apparent from the Google imagery.

5.5.4. On the north side of the runway, trees shown as “I” and “J” in Figure 3, lie under the north transitional OLS which has a height of approximately 12m to 47m above datum. The terrain is from 2m to 5m above, giving a clearance of 10m to 42m. Some of these trees are likely to infringe the transitional OLS.

5.5.5. On the north side of the runway, six lines of trees shown as “L” to “Q” in Annexure 3 Figure 2 lie under the transitional surface which in that area has a height of 32 to 47m above datum. The terrain level beneath ranges in height 5m to 15m above datum giving a clearance of 27m to 32m. Given the substantial clearance, only a few of these trees are likely to infringe the OLS.

5.5.6. There are no buildings apparent on the north side under the transitional OLS.

5.6. As shown in Annexure 3 Figure 1, the inner horizontal and conical OLS has only one area where the terrain infringes the OLS, shown in red to the south west of the aerodrome. The rest of these OLS areas have a vertical clearance of 25m or more over the terrain beneath and consequently any existing structures or vegetation does not affect aircraft flight paths.

6. CONSTRAINTS IMPOSED BY THE OLS ON NEIGHBOURING LANDOWNERS

6.1. It is essential to note that having an OLS in place over a property does not mean aircraft will suddenly start flying over that property or, if it is already over flown, that aircraft flight paths will suddenly become lower.

6.2. Within the horizontal and conical surfaces there is flexibility to allow infringements of the OLS. The objective of placing a control over this relatively large area is to avoid very tall man-made structures such as transmission towers, wind turbines and masts from being constructed without any consideration of flight paths.

6.3. I conclude from my assessment described in Section 4 above that no existing buildings or houses will be adversely affected. However, a number of trees may infringe and further survey work would be required to establish the exact extent of this.

6.4. In my experience it is usually possible for landowners and the aerodrome owner/operator to come to amicable arrangements to trim or remove any necessary trees.

7. CONCLUSION

7.1. In my opinion, there will be no impact from the proposed Mercer Airport OLS on existing buildings or houses in the surrounding community. As set out above the impact of the OLS would be limited to some of the existing trees which appear to infringe some of the OLS surfaces. On that basis, I disagree with the s42A report when it states that "the costs to the community of regulatory controls appear to outweigh the benefits of the airfield."

7.2. In my opinion, the OLS is a necessary regulatory instrument that will ensure that Mercer Airport can operate safely into the future as activities on the site grow and the air traffic also increases over time. As stated in my EIC[5], a number of other private airports in New Zealand have an OLS; including Te Kowhai, Ardmore, Whitianga and North Shore. I consider that the inclusion of an OLS at Mercer Airport is critical to ensure the safe operation of the airport into the future and ensure that the development objectives for the airport[6] can be achieved.

Signature

David Park ___________________________________

Date: 3 MAY 2021

[5] EIC of Dave Park, paragraph 6.8

[6] Air Transport Operations, being scheduled or charter services, for up to Code B aircraft for day non-instrument operations,
and b) Night/instrument operations for non-air transport operations for aircraft under 5700 kg MCTOP (Code B)
and c) Catalina/DC 3 operations

Annexure 1

CIVIL AVIATION ADVISORY CIRCULAR AC 139-10

Advisory Circular
AC 139-10

Revision 1

Control of Obstacles

27 April 2007

General

Civil Aviation Authority advisory circulars (AC) contain information about standards, practices and procedures that the Authority has found to be acceptable for compliance with the associated rule.

Consideration will be given to other methods of compliance which may be presented to the Authority.

When new standards, practices or procedures are found to be acceptable they will be added to the appropriate advisory circular.

In addressing a subject the use of the imperative "shall", a term not normally welcome in an AC, is because it is associated with mandatory provisions of the Rule itself.

Each reference to a number in this AC, such as 139.15, is a reference to a specific rule within Part 139.

Purpose

This Advisory Circular (AC) provides methods acceptable to the Authority for showing compliance with the requirements for continuing to meet the aerodrome design standards for the obstacle limitation surfaces in Part 139 of the Civil Aviation Rules (CAR).

Focus

This material is intended for the holder of an aerodrome operating certificate issued under Part 139 and any other aerodrome operator who promulgates aerodrome data and information in the aeronautical information publication (AIP).

Related Rules

This AC relates specifically to CAR Part 139, Rule 139.51, Aerodrome Design Requirements, Clause (a)(2) obstacle limitation surfaces.

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Change Notice

Revision 1 alters a number of references to other Advisory Circulars in this document. This is to reflect the new numbering of those ACs in line with a project to standardise the numbering of all ACs. This AC has also been re-formatted.

Table of Contents

Introduction

This AC contains guidance for compliance with the Part 139 requirements for obstruction limitation surfaces at certificated aerodromes. The same guidance can be used by the operator of a non-certificated aerodrome to ensure that the use of the aerodrome is not affected by obstacles.

Obstacle limitation surfaces are specified in AC139-6, Aerodrome design, aeroplanes above 5700 kg MCTOW, and in AC139-7, Aerodrome design, aeroplanes at or below 5700 kg MCTOW. An instrument approach runway will also have established obstacle-free surfaces as a basis on which the instrument procedure was designed and the minima established. For a precision approach runway the maintenance of the obstacle free surface is particularly critical, to protect the minimum descent altitude established, for the regularity of aircraft movements.

This advisory circular is not exhaustive in addressing the control of obstacles, particularly the wider spectrum of the ICAO PANS-OPS surfaces and obstruction charts. There are several publications available which address the control of obstacles, and the production of obstruction charts, in detail. They should be referred to by those who own aerodromes with precision approach runways.

Here is a list of publications to which you can referred for further information and guidance.

ICAO Annex 4, Aeronautical Charts
ICAO Doc 9137-AN/898 Airport Services Manual Part 6, Control of Obstacles
ICAO Doc 9137-AN/898 Airport Services Manual Part 8, Airport Operational Services
ICAO Doc 8168-OPS/611 PANS-OPS Volume 2

CHAPTER 1 — AERODROME OBSTACLE LIMITATION SURFACES

1.1 General

1.1.1 The effective utilisation of an aerodrome may be influenced by natural features and man made objects inside and outside the aerodrome boundary. These may result in:

(a) limitations on the distance available for aircraft take-off and landings;

(b) the range of meteorological conditions in which take-off and landings can be undertaken; or

(c) a reduction in the payload of some aircraft types, or all the above.

1.2 Obstacle limitation surfaces

1.2.1 Of the aerodrome design obstacle limitation surfaces the following are the essential elements —

- take-off climb surface
- approach surface
- transitional side surface
- inner horizontal surface
- conical surface

1.2.2 The aerodrome design specifications state that all existing objects penetrating the obstacle limitation surfaces should, as far as practical, be removed unless they are shielded by existing immovable objects. Detailed specifications about the marking and lighting of obstacles are contained in the AC139-6, Aerodrome design.

1.3 Aerodrome obstacle chart Type “A”

1.3.1 The aerodrome obstacle chart Type “A” represents a profile of the take-off obstruction environment on departure from a specific runway. The basic slope shown on the chart is 1.2 percent which is below the slope of the protected take-off climb surface established for a runway intended for use by Group A aircraft.

1.3.2 Although objects may penetrate the 1.2 percent (1:83.3) slope, there is no need to remove any which are beneath the aerodrome design take-off climb surface. However, all objects shown are accountable in the calculation of the aircraft take-off performance and in some instances may affect the payload of a particular aircraft type. The extent of this limitation depends on individual circumstances, but it is possible to significantly reduce the payload penalty by judicious obstacle removal close to the aerodrome. Conversely, it may be that an obstacle several kilometres from the aerodrome is the limiting factor.

1.4 ICAO PANS-OPS surfaces

1.4.1 The PANS-OPS surfaces are used in the construction of instrument flight procedures. They are designed to safeguard an aeroplane from collision with obstacles when flying on instruments. Pilots use minimum safe altitudes, established for each segment of the instrument procedures, which are based on obstacle clearances in the procedure areas.

1.4.2 Instrument flight procedure obstacle free surfaces sizes and dimensions do not usually coincide with the aerodrome design obstacle limitation surfaces. Look in PANS-OPS, Doc 8168, Volume 2 for the obstacle free surfaces needed for instrument flight approach, for missed approach procedures, and for visual manoeuvring (circling) procedures.

CHAPTER 2 — OBSTACLE CONTROL

2.1 General

2.1.1 When considering obstacle control the following should not be overlooked:

(a) objects which penetrate the approach surface are critical since they represent an erosion of the clearance between the final approach path, usually 3 degrees, and fixed or mobile obstacles on the ground.

On an approach where the approach surface is significantly obstructed, the safe operation of aircraft is ensured by raising the aerodrome approach meteorological minima. If the object penetrates into the approach surface, the landing threshold is displaced, effectively reducing the available landing distance. This can have an adverse effect on the regularity of aircraft operations and could impose payload penalties on landing aircraft.

(b) the transitional surfaces are adjacent to the runway strip and approach surface. Penetration of them by an obstacle results in the reduction in the clearance available whilst carrying out an approach to land or during a missed approach procedure.

Such obstacles may have an adverse effect on the aerodrome meteorological minima and may need marking and lighting.

(c) aircraft performance requirements, applicable to take-off and climb, require all aircraft to clear all obstacles by a minimum specified margin.

For a multi-engine aircraft, that requirement includes the climb following failure of the critical engine. Objects which penetrate approach and take-off climb surfaces do not represent a degradation of safety standards but they may impose significant payload penalties on aircraft taking off.

(d) the inner horizontal surface is more significant for VFR operations.

It also provides protection for circuiting aircraft following an instrument approach. It does not usually represent a critically limiting surface around a large aerodrome handling IFR traffic, except in so far that it extends beneath the approach surface.

(e) the conical surface represents the obstacle limiting surface some distance from the aerodrome.

It is often not practical to control obstacles which penetrate this surface, although it does usually provide a limit to new construction.

(f) obstacle control, to maintain or improve the Aerodrome Obstacle Chart - Type “A” obstacle profile, should be based on the clear understanding of the performance requirements of the aircraft regularly using the aerodrome or those proposed to be brought into regular use.

(g) any obstacles which are allowed to penetrate the established PANS-OPS surfaces could raise the minimum safe altitudes of the aerodrome instrument flight procedures.

This could have an adverse effect on the regularity of aircraft operations.

2.2 Identifying obstacles

2.2.1 Identification of obstacles requires a complete engineering survey of all areas beneath the aerodrome obstacle limitation surfaces.

2.2.2 The initial survey should produce a chart presenting a plan view of the entire aerodrome and its environs. The scope of the chart should be to the outer limit of the conical, approach and take-off climb surfaces. It will need to include profile views of all obstacle limitation surfaces. Each obstacle should be identified in both plan and profile with its description and height above the datum, which should be specified on the chart. Engineering field surveys can be supplemented by aerial photographs and photogrammetry to identify possible obstacles not readily visible from the aerodrome.

2.2.3 The survey specification for the aerodrome obstacle chart Type "A" is contained in AC139-9, Notification of aerodrome data and information, as it is data and information that is required to be provided for runways serving Group A aircraft.

2.2.4 Periodic surveys should be conducted to ensure the validity of the information in the initial survey. The aerodrome operator should make frequent visual observations of surrounding areas to determine the presence of new obstacles. Follow-up surveys should be conducted whenever significant changes occur. A detailed survey of a specific area may be necessary when the initial survey indicates the presence of obstacles for which a control programme is contemplated. Following completion of an obstacle control programme, the area should be resurveyed to provide corrected data on the presence or absence of obstacles. Similarly, revision surveys should be conducted if changes are made, or planned, to the aerodrome characteristics such as runway length, elevation or orientation. No firm rule can be set down for the frequency of periodic surveys, but constant vigilance is required. Changes in obstacle data arising from surveys are to be notified to the Aeronautical Information Service (AIS) as soon as practicable for promulgation to the aircraft operators.

2.3 Methods of control

2.3.1 The viability, and safety, of aerodrome use, by aircraft operators, can be assured by establishing effective obstacle control to maintain the obstacle limitation surfaces. Control can be achieved, in a number of ways, by:

(a) enactment of height zoning protection by the local government authority;

(b) establishing an effective obstacle removal programme; or

(c) purchasing of easement or property rights, or all of these.

2.4 Height zoning

2.4.1 The objective of height zoning is to protect the aerodrome obstacle limitation surfaces from intrusion by manmade objects and natural growth such as trees.

2.4.2 This is done by the enactment of ordinances identifying height limits underneath the aerodrome obstacle limitation surfaces. The responsibility for the enactment of such an ordinance is a matter between the aerodrome operator and the local authority.

2.4.3 To give effect to height-zoning a zoning map should be prepared for the guidance of the responsible local authority. The map is a composite, relating all zoning criteria to the ground level around the aerodrome. It should cover the aerodrome design obstacle limitation surfaces and, where applicable, the take-off flight path for the aerodrome obstacle chart Type "A" and any PANS-OPS surfaces.

2.4.4 Typical zoning ordinances include a statement of the purpose of, or necessity for, the action. They include a description of the obstacle limitation surfaces which should conform to the aerodrome design surfaces and, if applicable, the aerodrome obstacle chart Type "A" and the PANS-OPS surfaces. They also contain a statement of allowable heights which should conform to the specifications for these surfaces. Provisions are made, in the ordinances, for a maximum allowable height, for existing non-conforming uses, for marking and lighting of obstacles and for appeals from the provision of the ordinance.

The matter of bird control could also be addressed at the same time by defining areas which the siting of gravel pits, refuse dumps, sewage outfalls and other features, which attract birds, may be subjected to restriction in the interests of aviation safety.

2.5 Obstacle removal

2.5.1 When obstacles have been identified, the aerodrome operator should make every effort to have them removed, or reduced in height so that they are no longer an obstacle. If the obstacle is a single object it may be possible to reach agreement with the owner of the property to reduce the height to acceptable limits without adverse effect. Examples of such objects are a tree, a television aerial or a chimney.

2.5.2 In the case of trees, which are trimmed, agreement should be reached in writing with the property owner to ensure that future growth will not create new obstacles. Property owners can give such assurance by agreeing to trim the trees when necessary, or by permitting access to the premises to have the trimming done by the aerodrome operator’s representative. It is important to assess the growth rate of trees and trim them low enough so that the ensuing growth will be below the obstacle surface until the surface is next due for survey.

2.5.3 Some aids to navigation both electronic, such as ILS components, and visual, such as approach and runway lights, constitute obstacles which cannot be removed. Such objects should be frangibly designed and constructed, and mounted on frangible couplings so that they will fail on impact without significant damage to an aircraft.

2.6 Easements or property rights

2.6.1 In those areas where zoning is inadequate the aerodrome operator may take steps to protect the obstacle limitation surfaces by other means. Examples of zoning inadequacies might be locations close to runway ends or where obstacles exist. Examples of other means might be such as gaining easements or property rights. They should include removal or reduction in height of existing obstacles and measures to ensure that no new obstacles may be erected in the future.

2.6.2 Where agreement can be reached, for the reduction in height of an obstacle, the agreement should include a written aviation easement limiting heights over the property to specific levels unless effective height zoning has been established.

2.7 Marking and lighting of obstacles

2.7.1 Where it is impractical to eliminate an obstacle, it should be appropriately marked or lighted, or both, to be clearly visible to pilots in all weather and visibility conditions. AC139-6, Aerodrome design, contains detailed specifications about the marking and lighting of obstacles.

2.7.2 Note that the marking and lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be caused by the obstacle. AC139-6 specifies that obstacles be marked and, if the aerodrome is used at night, lighted, except that:

(a) lighting and marking may be omitted when the obstacle is shielded by another obstacle; and

(b) the marking may be omitted when the obstacle is lighted by high intensity obstacle lights by day.

2.7.3 Vehicles and other mobile objects, excluding aircraft, on movement areas of aerodromes should be marked and lighted, unless they are used on apron areas only.

2.8 Obstacle shielding

2.8.1 The principle of obstacle shielding is employed to permit a more logical approach to restricting new construction and to the requirements for marking and lighting of obstacles. Shielding principles are employed when some object, an existing building or natural terrain, already penetrates above one of the aerodrome design obstacle surfaces. If the obstacle is permanent, then additional objects within a specified area around it can penetrate the surface without being obstacles. The original obstacle dominates or shields the surrounding area. Further guidance material on the principle of obstacle shielding is contained in AC139-6, Aerodrome design, Chapter 4, Obstacle Restriction and Removal, and ICAO Doc 9137-AN/898, Airport Services Manual, Part 6, Control of obstacles.

Annexure 2

Google Earth Imagery

Annexure 2

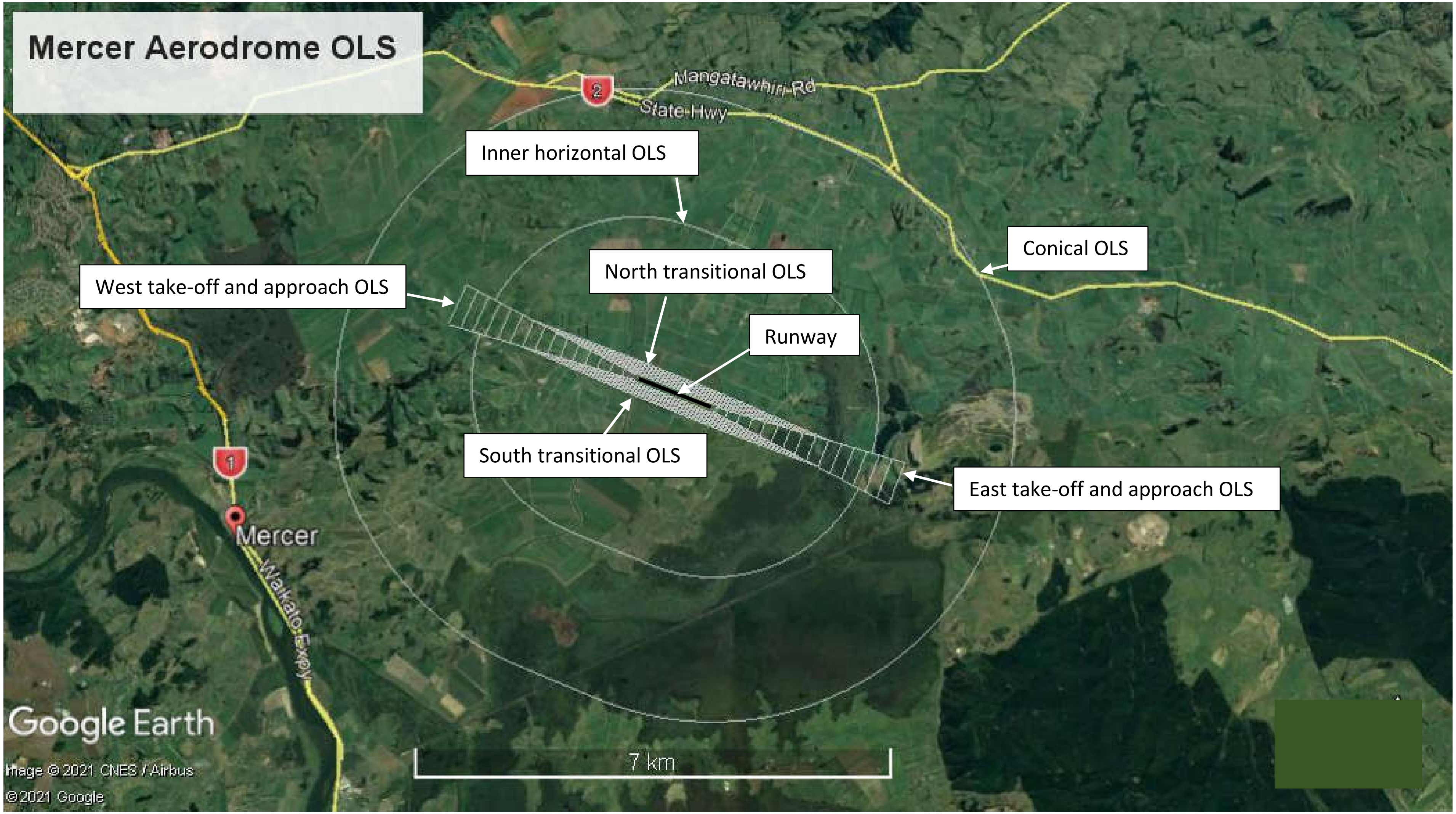


Figure 1: Extent of OLS

Annexure 2

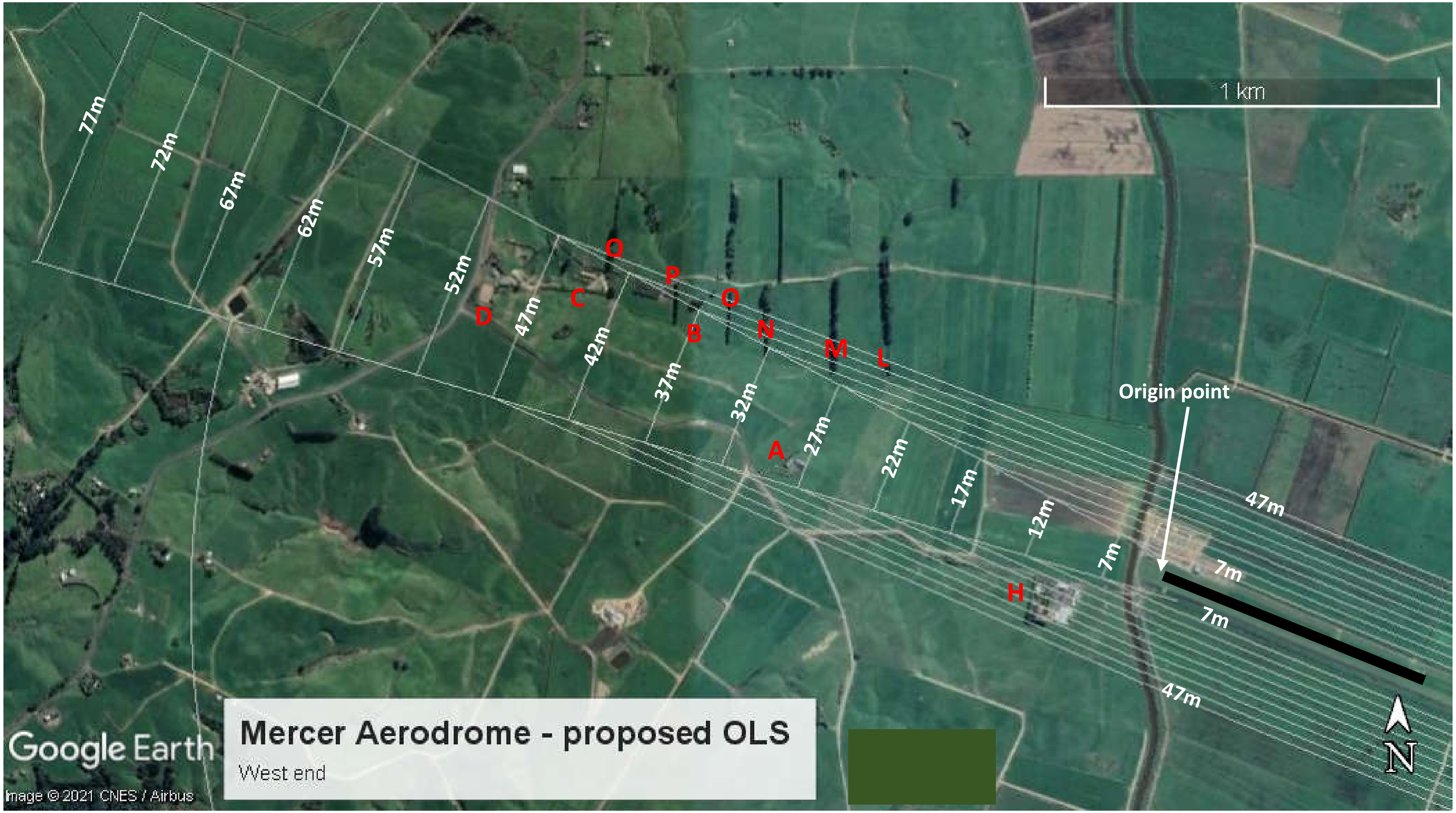


Figure 2: Western take-off and approach OLS and transitional OLS (figures are OLS heights above Moturiki datum 1953)

Annexure 2

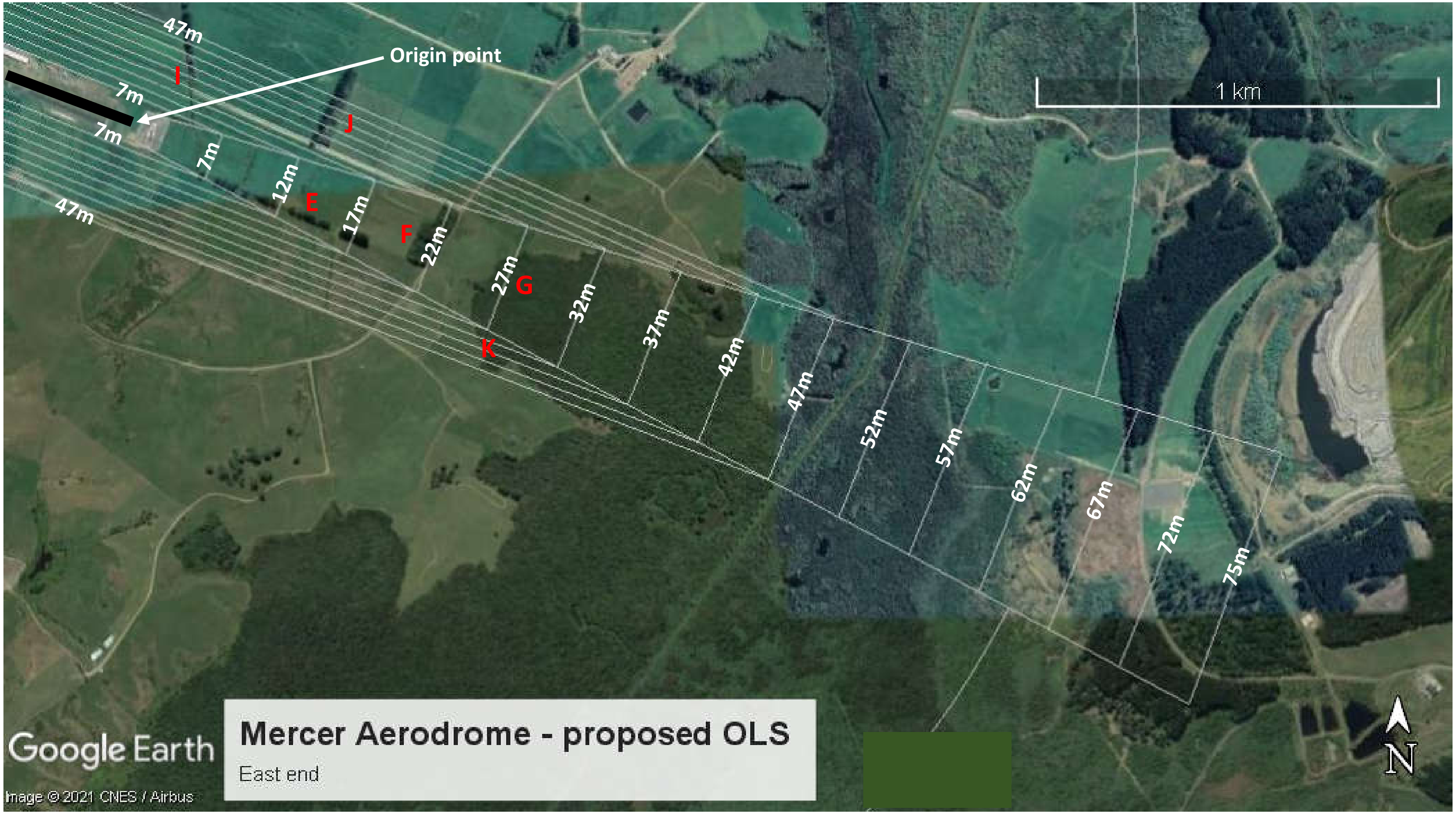


Figure 3: Western take-off and approach OLS and transitional OLS (figures are OLS heights above Moturiki datum 1953)

Annexure 3

OLS plans for Mercer Airport (BBO)

Annexure 3

Figure 1: Terrain beneath the inner horizontal and conical OLS (the key shows in colour code the height difference range between the terrain and the OLS above it)

Annexure 3

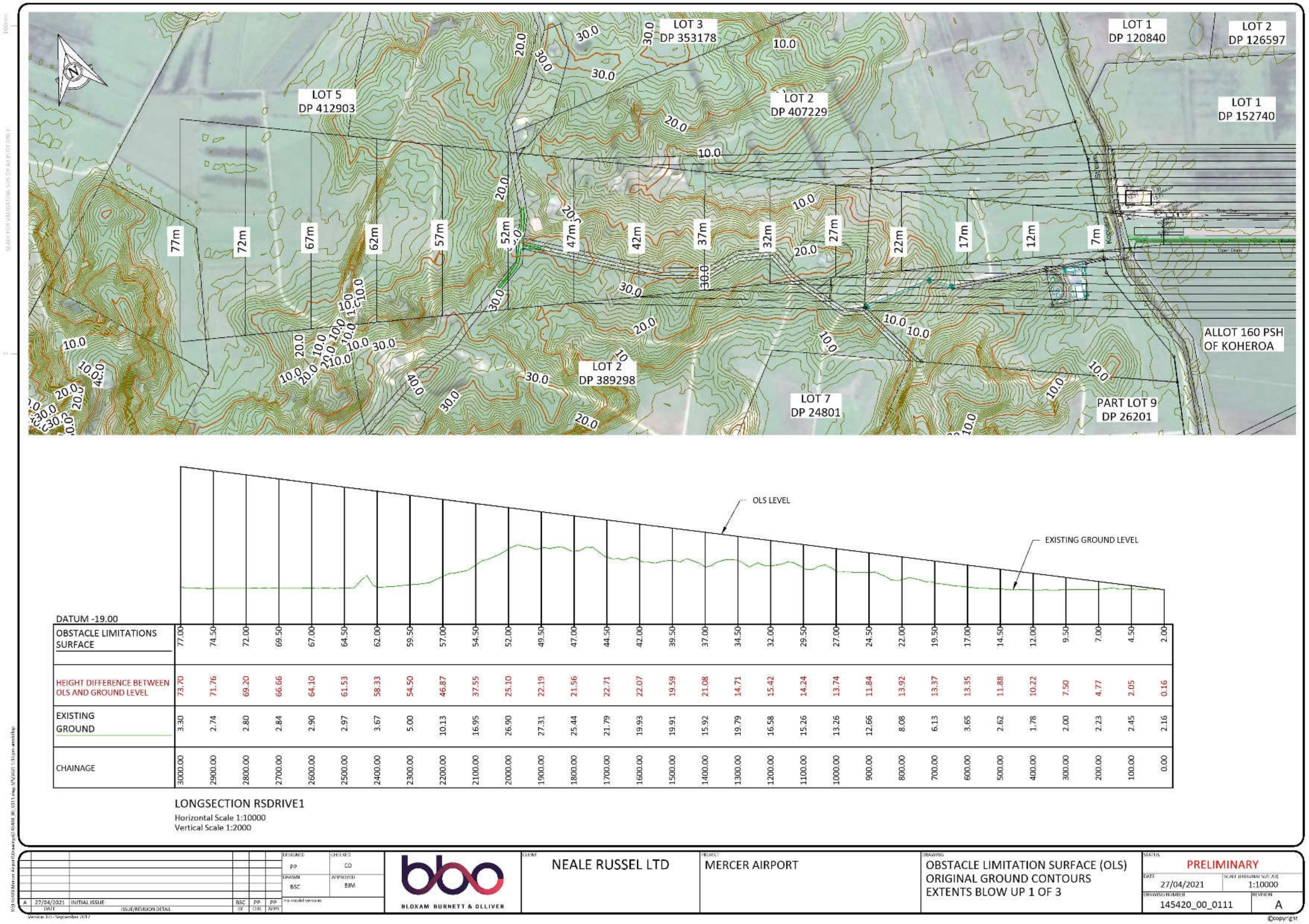
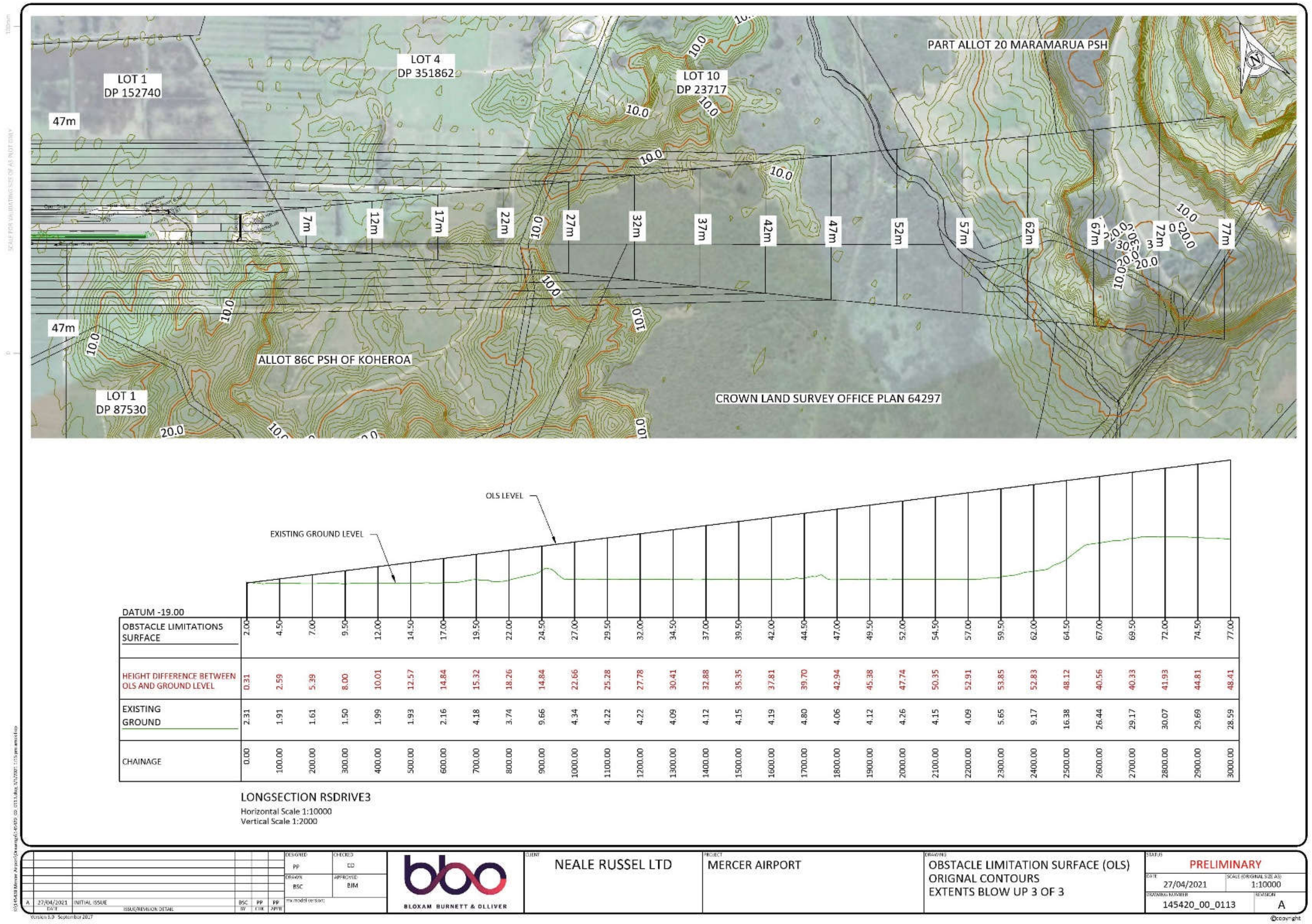


Figure 2: West take-off and approach OLS terrain contours and long section

Annexure 3



OBSTACLE LIMITATIONS SURFACE	2.00	4.50	7.00	9.50	12.00	14.50	17.00	19.50	22.00	24.50	27.00	29.50	32.00	34.50	37.00	39.50
HEIGHT DIFFERENCE BETWEEN OLS AND GROUND LEVEL	0.31	2.59	5.39	8.00	10.01	12.57	14.84	15.32	18.26	14.84	22.66	25.28	27.78	30.41	32.88	35.35
EXISTING GROUND	2.31	1.91	1.61	1.50	1.99	1.93	2.16	4.18	3.74	9.66	4.34	4.22	4.22	4.09	4.12	4.15
CHAINAGE	0.00	100.00	200.00	300.00	400.00	500.00	600.00	700.00	800.00	900.00	1000.00	1100.00	1200.00	1300.00	1400.00	1500.00

OBSTACLE LIMITATIONS SURFACE	42.00	44.50	47.00	49.50	52.00	54.50	57.00	59.50	62.00	64.50	67.00	69.50	72.00	74.50	77.00
HEIGHT DIFFERENCE BETWEEN OLS AND GROUND LEVEL	37.81	39.70	42.94	45.38	47.74	50.35	52.91	53.85	52.83	48.12	40.56	40.33	41.93	44.81	48.41
EXISTING GROUND	4.19	4.80	4.06	4.12	4.26	4.15	4.09	5.65	9.17	16.38	26.44	29.17	30.07	29.69	28.59
CHAINAGE	1600.00	1700.00	1800.00	1900.00	2000.00	2100.00	2200.00	2300.00	2400.00	2500.00	2600.00	2700.00	2800.00	2900.00	3000.00

Figure 3: East take-off and approach OLS terrain contours and long section