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28 September, 2015

Project Manager
Savills Australia
Level 7, 50 Bridge Street
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Attention: Phill Andrew

RE: AVIATION ASSESSMENT OF PROPOSED ENERGY FROM WASTE FACILITY EASTERN CREEK.

Airspace Design Solutions has been commissioned by Savills Australia to assess a proposed Energy from Waste Facility located at Eastern Creek NSW with reference to the surrounding airspace, namely:

- The current and future Obstacle Limitation Surfaces (OLS) for Bankstown and Sydney Airports;
- The likely future airspace requirements for the proposed Western Sydney Airport (Badgerys Creek)
- The current and future airspace associated with aircraft instrument procedures, defined by the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) protections surfaces for Bankstown, Sydney and Western Sydney Airports;
- Transiting air routes; and
- Designated airspace.

No site visit was conducted by Airspace Design Solutions personnel. The Concept Design Report Issue 6 March 2015 provided by Savills Australia was used as the basis of this assessment.

Airspace was assessed by reference to the Aeronautical Information Package (AIP) published by Airservices Australia and effective 20 August 2015.

1. TNG ENERGY FROM WASTE FACILITY

The Next Generation NSW (TNG) is proposing to construct an Energy from Waste Facility at Eastern Creek. The proposed building will extend to a maximum RL 115m AHD however; the associated exhaust stacks are planned to extend to 162.5m AHD. Ground level across the site is approximately 60-65m AHD. The facility will process waste material to extract energy via turbine generators which will be fed into the electrical grid. The site and surrounding area is generally industrial in nature and the facility will be bounded by the Genesis Recycling Facility from which some of the facilities fuel supply will be sourced.

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The site of the proposed Energy from Waste Facility is approximately 35km North West of Sydney Airport and 19km North West of Bankstown Airport. Additionally, the proposed site is approximately 13km North East of the proposed new Western Sydney Airport however actual runway positional data is yet to be finalised.

2. PRESCRIBED AIRSPACE

Sydney and Bankstown Airports are leased federal airports operated by Sydney Airport Corporation Limited (SACL) and Bankstown Airport Limited (BAL) respectively. For the purpose of this assessment, it has been assumed that the proposed Western Sydney Airport (Badgerys Creek) will also be a federally lease airport. As leased federal airports, they are subject to the *Airports Act 1996* and the regulations made pursuant to it, including the *Airports (Protection of Airspace) Regulations 1996*. The Regulations prescribe airspace in the vicinity of airports for protection from intrusion by obstacles. The airspace is defined by the airport's Obstacle Limitation Surfaces (OLS) and the PANS-OPS protection surfaces and includes those surfaces planned to accommodate existing and future expansion or new procedures for the airport.

No permanent penetration of the prescribed PANS-OPS protection surfaces is permitted. Temporary penetrations of the prescribed PANS-OPS protection surfaces and permanent or temporary penetrations of the prescribed OLS may be permitted, with or without conditions. Penetrations are assessed on a case by case basis.

Ordinarily, the proponent advises potentially affected airports, which then pass it on to Airservices Australia to assess the impact on the PANS-OPS surfaces, after which the CASA reviews the impact on the OLS. The consolidated views of both agencies would then be passed to the Department of Infrastructure and Transport, which is responsible for making a decision after reviewing the advice.

OLS and PANS-OPS protections surfaces not directly associated with leased federal airports do not constitute prescribed airspace and are not subject to the same protections. However, obstacles can have an effect on the useability of the airspace and may require changes in airspace or procedure design. The general nature of the OLS and PANS-OPS surfaces are expanded upon in Section 3 and Section 4 respectively.

3. OBSTACLE LIMITATION SURFACES (OLS)

The OLS is a set of imaginary surfaces positioned in space to provide protection from obstacles for an associated aerodrome. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to aircraft during an entirely visual approach or during the final visual segment of an instrument approach procedure. These surfaces are of a permanent nature and comprise the reference datum which defines an obstacle. Anything above the vertical limits of the OLS is regarded as an obstacle.

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The Manual of Standards Part 139 of the Civil Aviation Safety Regulations (MOS Part 139) defines the OLS criteria to be applied to certified aerodromes such as Sydney, Western Sydney and Bankstown Airport.

Some penetrations of the OLS are permissible if it is determined not to interfere with the safety, efficiency or regularity of existing or future operations at an airport. Pursuant to the Airports (Protection of Airspace) Regulations 1996, this is a matter for the Department of Infrastructure and Transport to determine on advice from the CASA and the airport operator. An approval may also be granted with conditions, such as requirements to mark or light the structure in a particular way.

4. PANS-OPS SURFACES

Airspace associated with aircraft instrument procedures is defined by the PANS-OPS protection surfaces for an aerodrome. These surfaces are ascertained in accordance with the criteria in the International Civil Aviation Organisation (ICAO) *Procedures for Air Navigation Services - Aircraft Operations* (Doc 8168, PANS-OPS) and the Manual of Standards Part 173 of the Civil Aviation Safety Regulations (MOS Part 173).

The PANS-OPS surfaces are intended to safeguard an aircraft from collision with obstacles when the pilot is flying by reference to instruments. Protection of these surfaces is critical as pilots may be navigating without any visual reference outside the aircraft.

The designer of an Instrument Approach Procedure (IAP) determines the lateral extent of areas needed for an aircraft to execute a particular manoeuvre. The designer then applies a Minimum Obstacle Clearance (MOC) to structures and terrain within that area to determine the lowest altitude at which the manoeuvre can be safely executed. Numerous published procedures exist for both Sydney and Bankstown Airports, and although not prescribed at this point in time, it is anticipated that similar will be introduced to accommodate the proposed Western Sydney Airport. The extent of the protected area for the procedures varies depending on the type of procedure and the segment of the procedure.

Instrument procedures and air routes can be redesigned if a new obstacle penetrates the PANS-OPS protection surfaces but that is not applicable to those which constitute prescribed airspace. Prescribed airspace, including that associated with Sydney and Bankstown Airports is specifically protected by the *Airports Act 1996* and the Airports (Protection of Airspace) Regulations 1996.

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5. SYDNEY AIRPORT

Sydney Airport accommodates both international and domestic flights on three runways. Two parallel runways orientated at 155°/335° magnetic are designated as Runways 16L/34R and 16R/34L and a cross runway designated Runway 07/25 is orientated 062°/242° magnetic and there are a significant number of instrument approach and departure procedures.

The proposed Energy from Waste Facility is outside the 15,000m radius from Sydney Airport and therefore beyond the furthest lateral extent of its OLS. (See Figure 1)



Figure 1: Sydney Airport Obstacle Limitation Surfaces.

A preliminary review of instrument procedure charts published in the AIP Departure and Approach Procedures (AIP-DAP) indicates that the facility is located under the protected airspace associated with Sydney Airport's 25 nautical mile (NM) Minimum Safe Altitude (25NM MSA).

This preliminary assessment indicates that the 25NM MSA protection surface is the most restrictive.

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Sydney Airport has a published 25NM minimum safe altitude (MSA) of 2700ft (822m). The PANS-OPS inspection area established for the 25NM MSA extends to 30NM, which encompasses the location of the proposed Energy from Waste Facility. A MOC of 300m is applied to the MSA, which results in a PANS-OPS protection surface being positioned at 522m AHD. With a proposed development height of 162.5m AHD the surface will not be penetrated.

The PANS-OPS surfaces published in the Sydney Airport Master Plan do not show any surfaces in the vicinity of the proposed facilities location. The Master Plan does not foreshadow any changes to the airport that would impact upon the current OLS or the PANS-OPS protection surfaces.

6. BANKSTOWN AIRPORT

Bankstown Airport is a significant airport for flying training and other general aviation activity. It has three (3) parallel runways aligned at 111°/291° magnetic and designated Runways 11L/29R/ 11C/29C and 11R/29L.

The future OLS for Bankstown Airport, which includes provision for the installation of a precision instrument approach procedure on one runway, extends outwards from the Aerodrome Reference Point (ARP) for 15,000m.

The proposed Energy from Waste Facility is outside the 15,000m radius from Bankstown Airport and therefore beyond the furthest lateral extent of its OLS. (See **Figure 2**)

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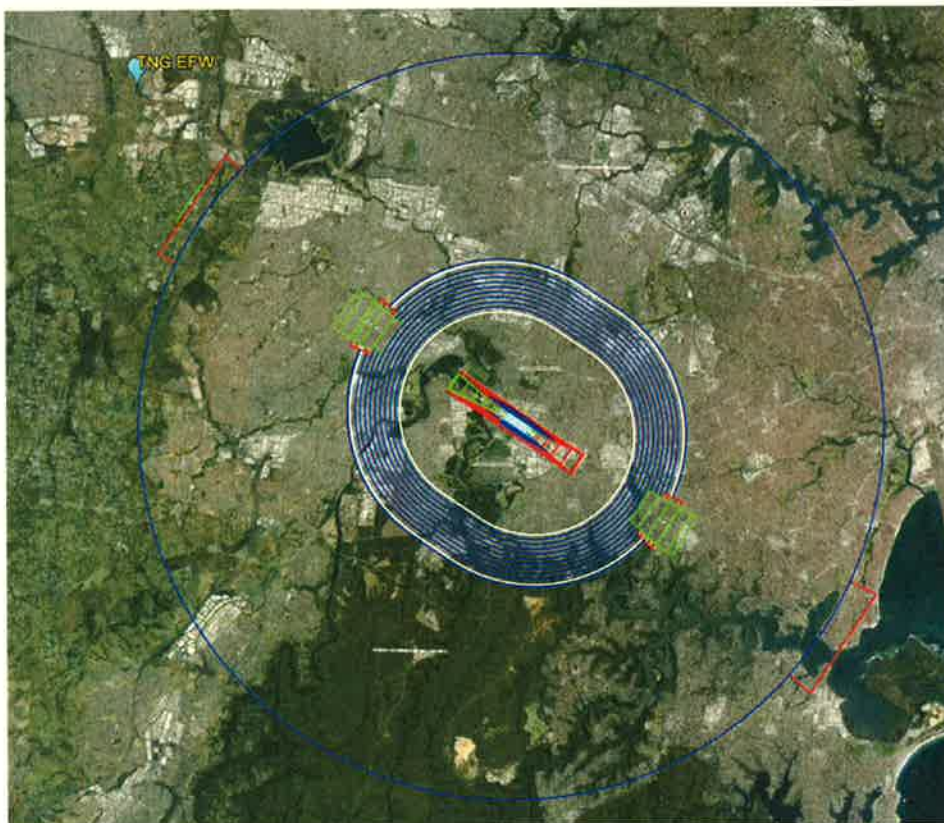


Figure 2: Bankstown Airport Obstacle Limitation Surfaces.

Bankstown Airport has a number of published instrument approach and departure procedures. A review of Bankstown Airport's IAP identified that the critical PANSOPS surface overlying the proposed facilities location is associated with the missed approach for the Runway 11C NDB (NDB RWY11C). The missed approach surface rises at a slope of 2.5% from the point that the aircraft is assumed to commence its climb. A simplified drawing of the missed approach obstacle inspection area is attached (**Figure 3**).

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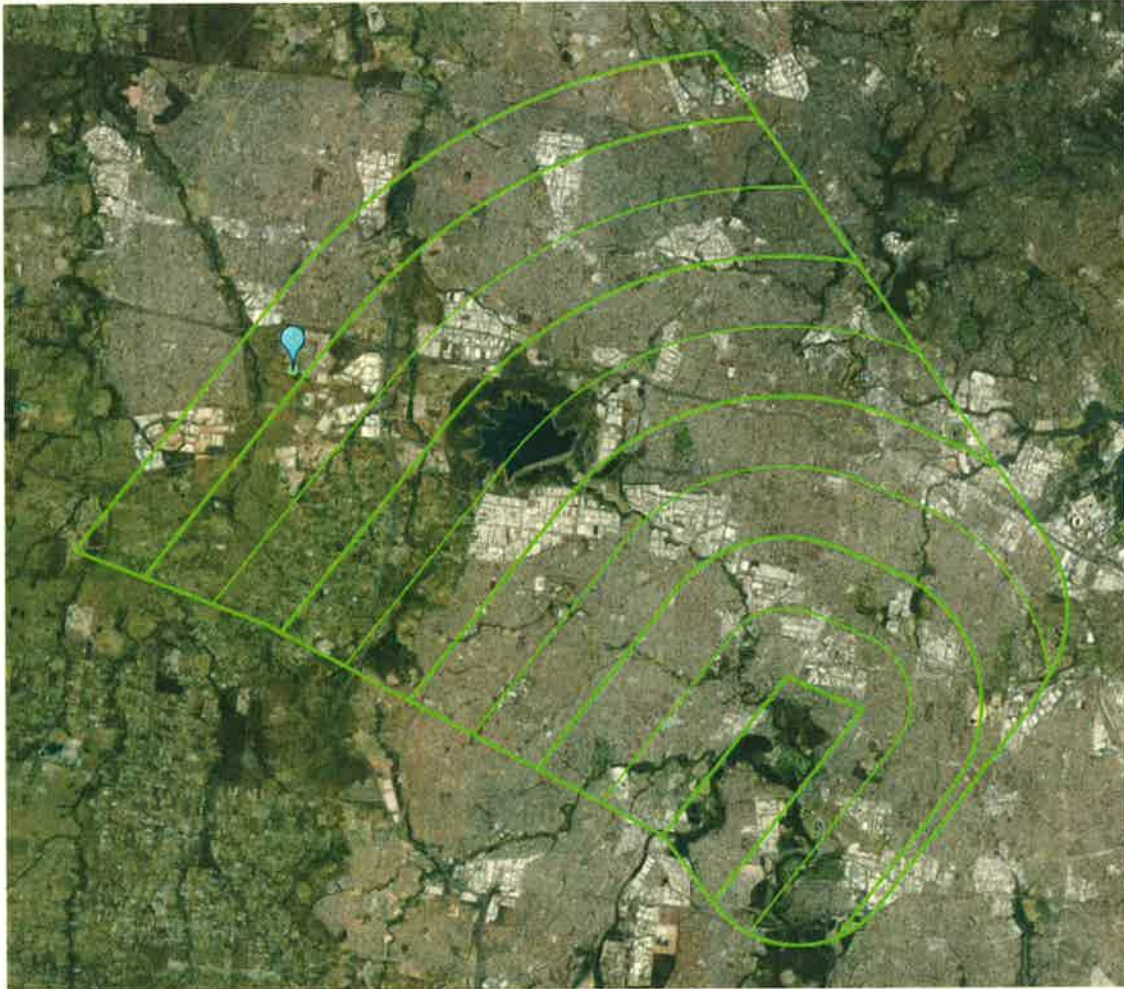


Figure 3: PANSOPS Missed Approach Surface RWY 11C NDB.

The height of the PANSOPS surface over the proposed site is estimated to be approximately 505m AHD.

As a result of this assessment the proposed facility will not penetrate the critical PANSOPS surface associated with the RWY 11C NDB missed approach.

7. WESTERN SYDNEY AIRPORT (BADGERYS CREEK)

A new airport is proposed to be constructed at Badgerys Creek NSW and has been considered as part of this assessment. At this stage only preliminary planning has been conducted for the new Western Sydney Airport and no airspace has been prescribed. Due to the location of the proposed Energy from Waste Facility it is pertinent to consider the possible impacts that either proposed development may have on each other. Due to

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the lack of planning and design information available a number of assumptions have been made in order to undertake this part of the assessment. These include;

- Two parallel precision approach runways will be in operation,
- The orientation of the runway system will be North East / South West,
- The aerodrome will be designed and operated as an International Aerodrome,
- The Obstacle Limitation Surfaces will be for a Code 4 Precision Runway,
- All Runway ends will be serviced by precision approach Instrument Landing Systems (ILS), and
- The aerodrome will have a reference height of 73m AHD.

7.1 Obstacle Limitation Surfaces (OLS)

Based on the above assumptions, **Figure 4** illustrates an indicative OLS likely to be implemented for the protection of Western Sydney Airport. As the actual position of the runway infrastructure is unknown some caution should be exercised into the accuracy of calculations however; in general a conservative and a 'worst case' scenario has been illustrated.

The proposed Energy from Waste Facility will be located approximately 13km from the proposed Western Sydney Airport and its position would essentially be on the proposed runways extended centrelines. This assessment has determined that the most critical surface in relation to the OLS would be the Outer Horizontal Surface. This surface is estimated to be approximately 223m AHD. With a planned development height of 162.5m AHD, the surface will not be penetrated. The potential plume rise from the facility exhaust stacks is more likely to be a greater risk with regard to OLS penetration and is discussed in **Section 9**.



Figure 4: Proposed Western Sydney Airport OLS Surfaces.

*Caution: Based on limited data. Position and accuracy subject to verification.

7.2 PANSOPS

The level of instrument approach capabilities proposed for the Western Sydney Airport is currently unknown however; in line with best practice for an International Airport it is assumed that precision approach capabilities will be realised. The PANSOPS surfaces associated with precision approaches will in all likelihood become the most restrictive surface with regards to the facility under assessment. Since the OLS approach surfaces are based on the ICAO Annex 14 surfaces and there is a direct linkage to these surfaces and the Basic ILS surfaces used for the design of precision approach procedures it is realistic to assume that should the OLS surfaces be prescribed and protected then the PANSOPS surface will also remain obstacle free. In light of the preceding OLS assessment, it is reasonable to assume that the PANSOPS surfaces will not be penetrated by the proposed Energy from Waste Facility however consideration of potential plume rise will require further assessment.

Other instrument approach procedures are also likely to be implemented for the Western Sydney Airport however, considering the proposed facilities position relative to the

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runway environment it is unlikely that these surfaces will be as restrictive as the precision approach surfaces.

8. OTHER AIRSPACE

8.1 Lower Safe Altitude (LSALT)

A number of published IFR routes exist in the vicinity of the proposed Energy from Waste Facility. Each route is specifically designed and a lower safe altitude calculated and published. The routes are;

- W430,
- W339,
- H44, and
- W144.

Lowest Safe Altitudes are calculated based on determining the highest obstacle within the obstacle inspection splay plus a minimum obstacle clearance allowance. The published west bound routes (H44 and W339) have LSALT of 5000ft AMSL. The applicable PANSOPS surface is therefore approximately 4000ft (1219m) AHD. The facility will not impact on these routes. The North / South bound routes (W430 and W144) have published LSALTs of 2100ft and 2400ft. The PANSOPS surface associated with these routes have been calculated at 335m and 426m AHD respectively. Since the proposed facility will have a maximum height of 162.5m AHD, the LSALT PANSOPS surfaces will not be penetrated by the facility.

8.2 Grid LSALT

Grid LSALTs are calculated for each degree of Latitude and Longitude. The proposed facility is located within the grid square delineated by the Latitude parallel of 33° and 34° South, and the meridians of longitude 150° and 151° East. The published grid LSALT within this square is 5900ft AMSL (1798m) and the corresponding PANSOPS surface is at 4900ft (1493m) AHD. The proposed facility will have no impact on the grid LSALT.

8.3 Designated Airspace (PRD)

Special use airspace, extending to varying heights, is defined on air navigation charts and identified as P (Prohibited), R (Restricted) or D (Danger). For safety reasons flight into this airspace may be prohibited or restricted or the airspace may be designated as a danger area to warn pilots to take additional care.

Assessment of aviation charting in the vicinity of the proposed facility indicates that the development will be located within a danger area (D566A) which extends from ground level to 2500ft (762m) AMSL. D566A is designated as a flying training area associated with Bankstown Airport. There is some potential for the proposed development to impact on flying training operations within this area.

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8.4 Radar Terrain Clearance Chart (RTCC)

Radar Terrain Clearance Charts (RTCC) are constructed so as to determine altitudes that aircraft can be safely vectored for air traffic control purposes. The introduction of new obstacles may reduce the effectiveness of radar information and impact on the available airspace in which to vector aircraft. Sydney Airport has prescribed the relevant RTCC so as to protect the airspace from future obstacle intrusion (Attached). An assessment of the proposed Energy from Waste Facility has been undertaken against the RTCC. Visual inspection indicates that the maximum obstacle height permitted without degrading radar performance is approximately 244m AHD. Since this height is greater than the proposed development height there should be no impact on the RTCC.

9. PLUME RISE

Aircraft operations in various stages of flight may be affected by an exhaust plume of significant vertical velocity.

CASA will conduct an assessment of all possible exhaust plumes in accordance with CASA Advisory Circular AC-139-5(1) *Plume Rise Assessments* (Attached). The proponent will need to complete form 1247 Application for Operational Assessment of a Proposed Plume Rise (Attached) with relevant details and submit to CASA's Office of Airspace Regulation (OAR) (oar@casa.gov.au) to commence the approval process.

Plume rises are treated in the same manner as physical obstacles when considering the protection of aircraft operations. A plume rise is considered to be an obstacle up to the point that the velocity of the exhaust plume reduces to a velocity of 4.3m/s. The client has advised that the current exit velocity is in the order of 21.7m/s. Independent modelling of the plume rise is currently being undertaken to determine at what vertical height the plume reduces to a velocity of 4.3m/s or less. Once determined the impacts should be reassessed against the prescribed airspace of Sydney, Bankstown and the proposed Western Sydney Airports. It is anticipated that the proposed Western Sydney Airport will be of greatest concern in this regard.

10. CONCLUSION

As a result of this desktop assessment the following conclusions are made.

- The proposed Waste from Energy Facility will not penetrate the prescribed airspace associated with Sydney and Bankstown Airports;
- Based on available information the facility will not penetrate airspace anticipated to be required for the proposed Western Sydney Airport;
- The proposed facility will not impact on published LSALT and Grid LSALT;
- The facility is located within designated airspace associated with flying training and may impact on these operations; and

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- Exit plume velocity is in excess of 4.3m/s. Further analysis and a plume rise assessment would be required to determine its effect on airspace and flight operations.

11. RECOMMENDATIONS

The following recommendations are made as a result of this assessment;

- More information is required with regard to planned operations, runway position and airspace requirements in relation to Western Sydney Airport;
- Reassessment of potential impacts should be undertaken once the outcomes of a plume rise assessment are known; and
- Stakeholder consultation should be undertaken as to the impacts the facility may have on Bankstown flight training activities.