Chapter 17 Heritage

This chapter describes the assessment that has been undertaken to evaluate the Aboriginal and historic heritage impacts of the project. While this assessment has informed the Greater Blue Mountains Area (GBMA) assessment, the full assessment for the GBMA is located in Chapter 23 (Matters of National Environmental Significance).

The assessment has been informed by desktop assessments alongside engagement with First Nations knowledge holders and stakeholders. Heritage sites and places considered have been identified through statutory lists compiled under Commonwealth and New South Wales (NSW) State legislation.

The refinements to the preliminary flight path design since the exhibition of the Draft EIS would not change the conclusions of the overall heritage assessment as presented in this chapter and supporting technical paper. However, the refinements would result in increased aircraft altitudes or reduced aircraft movements at night in Linden and Falconbridge when the refined flight paths or the RRO-NAP are in operation. This would provide some visual and noise amenity improvement at night for heritage sites located in Linden and Falconbridge, such as the emu rock engraving site at Ticehurst Park and the Linden Ridge sites. Further detail is provided in Section G2.9 of Appendix G (Assessment of the refinements to the project) of the EIS.

Existing environment

There are a significant number of items, places and areas within the heritage study area, with around 13,500 Aboriginal heritage sites/places and around 19,000 listed historical sites/areas. For Aboriginal heritage, this is likely to be an underestimate given the lack of systematic survey for sites within protected areas (such as the GBMA). As such, engagement with First Nations knowledge holders and stakeholders has assisted in identifying areas of particular high cultural value. For historic heritage, there are several World Heritage Areas (notably the GBMA), 19 National Heritage items, and numerous State and local heritage items. Of these places, most occur at a distance greater than 10 kilometres (km) from WSI.

Key findings

The preliminary flight paths would fly over a large number of significant sites and places, however in many cases existing flight paths already traverse the airspace above these sites and places. Many types of heritage places are also considered robust in the face of impacts such as air pollution, noise and visual impacts. In most cases aircraft would be at such a distance as to render the impact from these factors as minimal. However, the places closest to WSI are likely to experience higher impacts.

Aboriginal heritage

There is general acknowledgement that air pollution is likely to be detrimental to sandstone heritage buildings and Aboriginal rock art, however there has been little direct research on sites within or close to Sydney. It is impossible to evaluate the risk presented by these processes, or indeed to identify and quantify any resulting damage due to a lack of previous research and comparative data, as well as the difficulty in differentiating aircraft emission derived deterioration from other anthropogenic pollution sources via the same processes (such as acidity, nutrients and dust). However, there remains a potential impact that increased emissions to these environments may potentially result in some impact, though the likelihood of this is considered to be generally minimal.

The project would not physically impact or restrict use of an Aboriginal heritage site or place. However, it is acknowledged that noise and visual intrusion are factors that could potentially impact cultural values. In particular, noise does have the potential to disrupt cultural practices at a site, which could lead to its use being discontinued. Aircraft on WSI flight paths could potentially result in detrimental indirect impacts to the cultural values of sites connected to the Emu in the Sky constellation at Faulconbridge and Emu Cave Aboriginal Place.

Due to the position of flight paths, frequency of overflight and the predicted noise levels, the project would significantly impact the Aboriginal cultural values of Bents Basin, Linden Ridge sites and the Shaws Creek – Yellomundee Aboriginal Place, which are places of cultural importance with values associated with peace, tranquillity and connection to nature. Impacts to other key sites of cultural significance identified through engagement would have low to moderate impacts due to noise and/or visual intrusion.

Mitigation measures have been developed that require DITRDCA to ensure that the detailed design phase for flight paths considers Aboriginal places and values, where safe and feasible. There is the likelihood that many other Aboriginal sites are located in protected valleys within the GBMA that are overflown by WSI aircraft. Due to the complexity of terrain height and orientation of rock shelters in the rugged sandstone country, it is not possible to predict to what extent this will be an issue for many of the unknown sites.

Other mitigation measures include undertaking a research program to investigate the potential impact of aircraft emissions on Aboriginal heritage sites, and establishment of a Community Aviation Consultation Group (CACG) for WSI which will facilitate consultation with stakeholders and community on a range of matters including heritage matters.

Historic heritage

Many historic properties are located in town centres. The flight path design principles seek to avoid population centres and the flight paths design has sought to protect such places from significant impacts, although in some cases aircraft may still be visible in the distance or would be heard. It is inevitable that some properties would suffer some impact from noise, given that in many cases to the west and south-west of WSI the properties are located in rural contexts. This includes items within the towns of Mulgoa, Luddenham and Wallacia, noting that Luddenham is not directly overflown by the preliminary flight paths. Impacts to these items would depend on the lateral distance to the flight path corridor, aircraft altitude, aircraft noise impacts and the type of heritage values for which the items are listed.

Outside the GBMA, there is no discernible impact on the cultural values of nationally listed places. Of the 89 places on the Commonwealth Heritage list, only 2 are within close proximity to WSI and/or are likely to be adversely impacted by the flight paths; Orchard Hills Cumberland Plain Woodland, and Shale Woodland Llandilo.

At greater distances from WSI, noise and visibility of aircraft begins to diminish, and emissions are likely to disperse and be less concentrated. However, some cultural values remain sensitive to additional aircraft noise, while the frequency of flights can exacerbate this. This applies to the GBMA and those heritage places within it that are valued for their serenity and their ability to connect people to the spirituality of nature.

17.1 Introduction

This chapter considers the potential impacts of the project on Aboriginal and historic (non-Aboriginal) heritage. As the project would not directly impact heritage values, this assessment considers the potential for the project to negatively indirectly impact heritage values and/or cultural practices (e.g., due to noise). It also considers the potential for the project to physically exacerbate conservation issues that could result in a loss of value (due to air quality changes). The assessment has been informed by desktop assessments alongside engagement with First Nations knowledge holders and stakeholders.

The full assessment is provided in Technical paper 9: Heritage (Navin Officer Heritage Consultants Pty Ltd) (Technical paper 9).

17.2 Legislative and policy context

The heritage impact assessment was undertaken to address the EIS Guidelines and with reference to the following legislation, guidelines, strategies or standards:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The EPBC Act provides the legal framework for the protection and management of nationally and internationally important heritage places, including World Heritage properties. It also establishes:
  - the National Heritage List, which lists Indigenous, historic and natural heritage places of outstanding significance to Australia
  - the Commonwealth Heritage List, which lists Indigenous, historic and natural heritage places owned or controlled by the Australian Government.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth). This Act can protect areas and objects that are of particular significance to Aboriginal and/or Torres Strait Islander people. The Australian Minister for the Environment and Water also has powers under this Act to protect an area, object or class of objects that have been identified as being of particular significance and is under threat of injury or desecration.
- *National Parks and Wildlife Act 1974* (NSW) (the NPW Act). This Act provides the legal framework for the protection of Aboriginal cultural objects and places in NSW. All Aboriginal sites are protected in NSW whether they are known or not. The Act also provides for the declaration of Aboriginal Places, which are places of special significance with respect to Aboriginal culture. For the purposes of this assessment, Aboriginal Places are considered as places of demonstrable high cultural value to NSW First Nations people.
- *Heritage Act 1977* (NSW). This Act provides for the listing and protection of items of State heritage significance, as well as relics (archaeological items of local or state heritage significance) and for NSW Government agencies and State Owned Corporations to maintain a register of heritage assets (known as Section 170 heritage and conservation register).
- Local Environmental Plans (LEPs) that apply to local government areas within the study area. LEPs provide for the listing and protection of items of local heritage significance.
- *Australian National Heritage Strategy 2015* (Commonwealth of Australia, 2015b). This strategy applies to the identification, protection and management of heritage places across all jurisdictions.
- *Engage Early – Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act* (Department of the Environment, 2016). This guideline has been applied to the engagement completed for the project with First Nations knowledge holders and stakeholders.
- *Ask First: A guide to respecting Indigenous heritage places and values* (Australian Heritage Commission, 2002). This guideline has applied to the engagement completed for the project with First Nations knowledge holders and stakeholders. It complements the Burra Charter.
- Airservices Australia's Environmental management of changes to Aircraft Operations Standard (AA-NOS-ENV2.100) (Airservices Australia, 2022b).
- *The Burra Charter: The Australian ICOMOS charter for places of cultural significance* (Australia ICOMOS, 2013) (the Burra Charter). The Burra Charter and its associated practice notes provide best practice standards for managing cultural places in Australia. The Burra Charter has been adopted by the Australian Government, NSW Government and most local governments.

17.3 Methodology

17.3.1 Study area

The heritage study area (study area) for the assessment is shown in Figure 17.1. The boundaries broadly defining this area are:

- north – the Hawkesbury River in the vicinity of Pitt Town, Wilberforce and East Kurrajong
- north-east – the NSW coast in the vicinity of Palm Beach and Barrenjoey Headland
- east – the NSW coastline where aircraft on WSI flight paths operate at altitudes generally above aircraft from other Sydney Basin airports
- south-east and south – the Bargo River in the vicinity of Tahmoor
- south-west, north-west and west – the western boundary of the Greater Blue Mountains Area (as listed on the World Heritage List and National Heritage List).

When flying at altitudes above 10,000 feet (ft) (3 km), it is unlikely that aircraft noise levels heard on the ground would be above 60 dB(A). Nevertheless, there is potential for aircraft overflights to result in environmental effects between 10,000–20,000 ft in altitude above ground level (AGL). Aircraft could be audible and/or visible beyond these notional study area boundaries. Due to low ambient noise levels during night-time hours or in rural (residential) communities or non-residential areas under some flight paths, aircraft noise is likely to be noticeable and, combined with visual contact, could be a source of annoyance for some people. For this reason, the assessment considers the potential of such impacts to determine their materiality to the assessment.

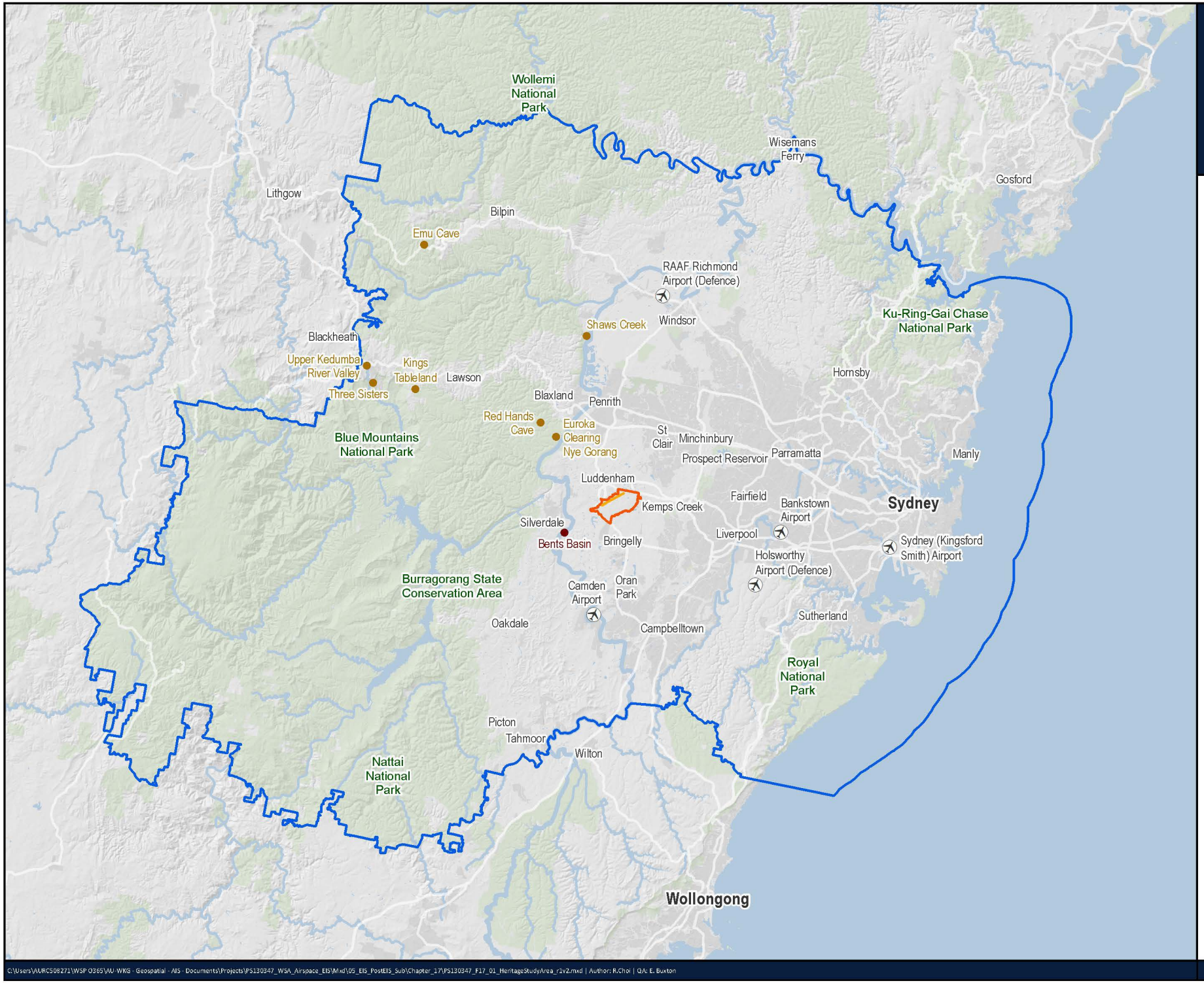


Figure 17.1

The Greater Sydney Study Area

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- WSI airspace study area
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:750,000 Date: 10/08/2023

Data sources: - DITRDC, DCS, Geoscience Australia
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus,USGS,NGA,NASA, CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community

17.3.2 Approach

The heritage impact assessment methodology generally involved:

- review of existing information in relation to Aboriginal and historic cultural heritage values within the study area to identify areas of high cultural value, including:
  - previous cultural heritage studies undertaken for WSI
  - previous cultural heritage studies related to the GBMA
  - selected heritage assessments and heritage values studies within the study area
  - existing databases such as the National Heritage List, Commonwealth Heritage List, State Heritage Register, State Heritage Inventory, Aboriginal Heritage and Information Management System (AHIMS) and National Trust (NSW) database to identify places with significant cultural values
  - local government area wide heritage studies
- engagement with First Nations knowledge holders and stakeholders to understand cultural values, the places associated within them and concerns about the potential impacts of the project. Direct engagement was focused on individuals and organisations amongst the Aboriginal Nations that are closest to the Airport Site, being the Dharug, Tharawal and Gundungurra nations (which is the equivalent of the combined lands of the Deerubbin, Gandangara and Tharawal Local Aboriginal Land Councils (LALCs)). This included:
  - Traditional Owners, Native Title claimants or Indigenous land use agreement parties
  - individual knowledge holders recognised as native title claimants with cultural heritage knowledge
  - knowledge holders (descended from other Nations, but who have lived in the area a long time and who have the cultural authority to speak)
  - Individuals recognised as holding cultural heritage knowledge from previous studies and who are accepted by at least one of the organisations listed below
  - LALCs – Deerubbin, Gandangara, Tharawal, Metropolitan and La Perouse LALCs
  - Local Government Advisory committees
  - other organisations – Murru Mittigar, Darug Tribal Aboriginal Corporation, Darug Custodian Aboriginal Corporation, Dharug Ngurra Aboriginal Corporation, Western Sydney Aboriginal Regional Alliance, Tharawal Aboriginal Corporation, Cubbitch Barta, Gundungurra Tribal Council Aboriginal Corporation, Gundungurra Aboriginal Heritage Association, and Blue Mountains Aboriginal Culture and Resource Centre.
- consideration of issues raised during engagement activities completed for the project, as well as engagement with heritage officers at the NSW Department of Planning and Environment (Environment and Heritage Group) concerning any relevant cultural values
- analysis of the results of the desktop assessment and engagement outcomes to identify:
  - places of high cultural value
  - risks to places of high cultural value and/or cultural practices (including perceived impacts) as a result of the project

  Sites of archaeological value were not carried forward for assessment as these would not be indirectly impacted by the project
- assessment of potential impacts with a focus on items located in areas that are more likely to be overflown by aircraft at lower altitudes, and/or places where cultural values might be more vulnerable to impacts due to air, noise and visual changes resulting from the project. For historic heritage, this was defined as an area within 10 kilometres (km) of the Airport Site. For Aboriginal heritage, this was defined as sites of cultural value (rock art sites, stone arrangements, burials, massacre sites, dreaming or spiritual sites, and places of contemporary use) within the boundaries of Deerubbin, Gandangara and Tharawal LALCs.
- identification of mitigation and/or management measures to address potential heritage impacts.

Chapter 9 (Community and stakeholder engagement) and Section 3.1.3 of Technical paper 9 provides further detail on the engagement activities completed for the heritage impact assessment and the project.

17.3.2.1 Significance assessment

Assessing impact on cultural values is somewhat easier when dealing with physical impacts that can be measured and seen. However, when considering intangible values, such as spirituality, wellbeing, connectedness with nature, a more qualitative approach is needed. A consideration of impact must consider what the tipping point might be in determining whether or not a place remains suitable for or can sustain the cultural practices and belief systems that are associated with that place.

For the purpose of this assessment the following terms have been used to describe the potential impacts:

- **Negligible to low** – an impact on the cultural value of a place is considered negligible to low where those impacts will not cause physical damage and are unlikely to affect the cultural practices undertaken at a place.
- **Moderate** – an impact is considered moderate where it may have an impact on the values of the place, or the cultural practices carried out at the place but where these impacts may be tolerated or mitigated in some way.
- **Severe** – an impact is considered severe where it would damage or compromise the values of the place or heritage item and/or render the cultural practices associated with the place no longer practical or possible.

For the purposes of this assessment a predicted noise level of 70 dB(A) and above is classed as a severe impact, particularly where those heritage places were otherwise located in a tranquil rural or bushland location. The N70 contour is typically used to assess day-time noise impacts. Other factors that may affect the severity of noise related impact relate to the frequency of flights (and therefore frequency of disturbance) and whether or not flights occur at night when background noise in rural areas is at its lowest. The assessment also took into consideration the predicted maximum noise levels (including those below 70 dB(A)) as well as other factors in addition to noise, such as visual intrusion.

17.3.3 Dependencies and interactions with other study areas

Technical paper 9 was informed by other technical papers as outlined in Table 17.1.

Table 17.1 Dependencies and interactions with other Technical Papers

Technical paper	Relevance
Technical paper 1: Aircraft noise	This assessment was used to understand the likely impact to cultural values caused by noise related to the preliminary flight paths.
Technical paper 2: Air quality	This assessment was used to understand the likely impact to cultural values caused by emissions related to aircraft using the preliminary flight paths.
Technical paper 4: Hazard and risk	This assessment was used to understand the likely incidence and potential impact to cultural values caused by fuel jettisoning related to aircraft using the preliminary flight paths.
Technical paper 10: Social	This heritage assessment was used to inform Technical paper 10.
Technical paper 11: Economic	This assessment provided context regarding the dependency between heritage values and the local economic drivers.
Technical paper 14: Greater Blue Mountains World Heritage Area	This heritage assessment was used to inform Technical paper 14.

17.3.4 Assumptions and limitations

Assumptions and limitations for the assessment are outlined in Table 17.2.

Table 17.2 Assumptions and limitations

Area	Assumptions and limitations
Engagement	Not all knowledge holders and stakeholders identified were available for interview within the project time frame. To address this, multiple opportunities were provided to the First Nation knowledge holders to connect with the study team and to provide input (see Technical paper 9 for details on the First Nations engagement). Multiple opportunities for engagement were provided to individuals regarding opportunities to meet and have input. Over the course of the project in excess of 120 phone calls, emails, virtual meetings and face to face meetings with First Nations people and organisations were held. Following the release of the online Aircraft Overflight Noise Tool, an online briefing of First Nations people was held and a demonstration of the tool was provided. Further contact was made following the release of the Draft EIS, providing information on the exhibition period, how the Draft EIS could be viewed and how submissions could be made.
Listing of heritage places	The process of identifying and assessing heritage places for listing on the National Heritage List, Commonwealth Heritage List, State Heritage Register and LEPs should result in all cultural values being identified and robustly substantiated. This depends on the quality and depth of the documentation and thoroughness of the original nomination dossier. Listings are also rarely updated.
Rock art sites	It should be assumed that the number of rock art sites overflown across the sandstone topographies of the GBMA are likely to be much greater than indicated by the current database of known sites. However, the distances to the nearest rock art sites from WSI (across the Cumberland Plain shale topographies) are likely to be accurate given the absence of suitable sandstone exposures for rock art in these areas.

17.4 Existing environment

17.4.1 Known heritage sites and places

There are a significant number of listed heritage sites within the study area (refer to Table 17.3), however the majority of these listed historic (non-Aboriginal) heritage items are located over 10 km from the Airport Site. Some items are listed on multiple registers.

Table 17.3 Listed heritage items within the study area

Nationally listed place	Number of items within study area	Items within 10 km of the Airport Site
World heritage	3	1
National heritage	19	1
Commonwealth heritage	89	1
State heritage	273	10
Local heritage	>18,800	63
Gazetted Aboriginal Places	21	0
Aboriginal sites (registered on AHIMS)	>13,500	3 culturally significant site types (note there are around 870 sites – mainly artefact scatters)

17.4.1.1 World Heritage sites

The 3 World Heritage sites located within the study area are:

- GBMA, located within 8 km of the Airport Site
- Sydney Opera House, located around 43 km to the east of the Airport Site
- The Australian Convict Sites, of which 4 of the 11 complementary sites are located within the study area (being the Old Government House and Domain (Parramatta), the Old Great North Road (Wiseman's Ferry), Cockatoo Island Convict Site and Hyde Park Barracks). The closest site is around 20 km to the north-east of the Airport Site.

As outlined in Chapter 23 (Matters of National Environmental Significance), the GBMA has been listed for its natural values. The Statement of Integrity for the listing recognises the conservation of the natural beauty of the area alongside the Aboriginal cultural associations with the area and the physical evidence of this connection. Aboriginal sites and values within this area is discussed further in Section 17.4.1.4.

The boundary of the GBMA excludes the existing townships and settlements, and the majority of the recorded significant historical heritage places lie outside the GBMA. However, there are also historic heritage places, many of which have not been formally recorded on lists and registers, which have cultural values. These include places connected with the early conservation movement in Australia such as the early network of cliff face walking tracks linking the east-west chain of Blue Mountains towns to their adjacent protected valleys and gorges, staircases and lookouts.

Given the size of the GBMA and the many hundreds of known Aboriginal and historic heritage places plus the understanding that there will be hundreds of others that exist but have not been recorded, this assessment does not claim to have assessed impacts on each site individually. Instead, this assessment has focused on understanding what sort of impacts flight paths could possibly have on heritage values of the range of heritage places that occur. These potential impacts are discussed in detail in Technical paper 9. Some types of heritage items are likely to be robust in the face of those impacts. For example, the heritage values of Aboriginal stone artefact scatters are unlikely to be impacted by the flight paths, unless those places also hold other values; whereas Aboriginal rock art sites often have a spiritual value and sometimes a ceremonial value that might be affected by noise, visual intrusion and/or physically by emissions.

Similarly historic heritage places range from places of memory and commemoration to heritage gardens and physical buildings some of which may be susceptible to emissions and some of which may not. While heritage items may be subjected to increased noise, they may or may not have current or proposed compatible uses that are sensitive to noise impacts.

A values-based approach is consistent with the Burra Charter (Australia ICOMOS, 2013).

Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. (Article 1.2).

Flight paths for the project do not fly directly over the Sydney Opera House or the Australia Convict Sites located within the study area. As such, these sites are not considered further in the assessment.

17.4.1.2 National and Commonwealth heritage items

Of the 19 National Heritage items within the study area, 16 are located over 40 km from the Airport Site. The closest items to the Airport Site are the GBMA, Old Government House and Domain (Parramatta), and the Parramatta Female Factory and Institutions.

Items on the Commonwealth Heritage List are places owned or controlled by the Commonwealth and are typically places that reflect Australia's development as a nation (such as places connected to defence, maritime, communications and customs). Items include indigenous, historic and natural heritage places. The majority of Commonwealth heritage items within the study area are located within eastern Sydney. The closest listed item is the Orchard Hills Cumberland Plain Woodland, located around 4 km to the north of the Airport Site.

17.4.1.3 State and local heritage items

The NSW State Heritage Register currently has 273 records of heritage places located within the study area for WSI, and 72 heritage items are located under the preliminary flight paths. The majority of State heritage listed items are located in the eastern areas of the study area (refer to Figure 17.2). The closest item (Kelvin, a historic rural estate) is located around 2 km to the south-east of the Airport Site. Within the Blue Mountains local government area (LGA), there are 28 State heritage items. These items include (but are not limited to) residences (and associated gardens), infrastructure (bridges, historic roads, railway stations and dams), an art gallery, bush walking tracks, educational establishments and places of worship. Some of these sites are now used for other purposes – such as accommodation, retail and museums purposes. Further information is provided in Section 4.1.4 of Technical paper 9.

More than 18,800 local heritage items are located within the study area (refer to Figure 17.3). Locally listed heritage places are significant within the context of a local area, contributing to the uniqueness of a streetscape, townscape or landscape of a region or community.

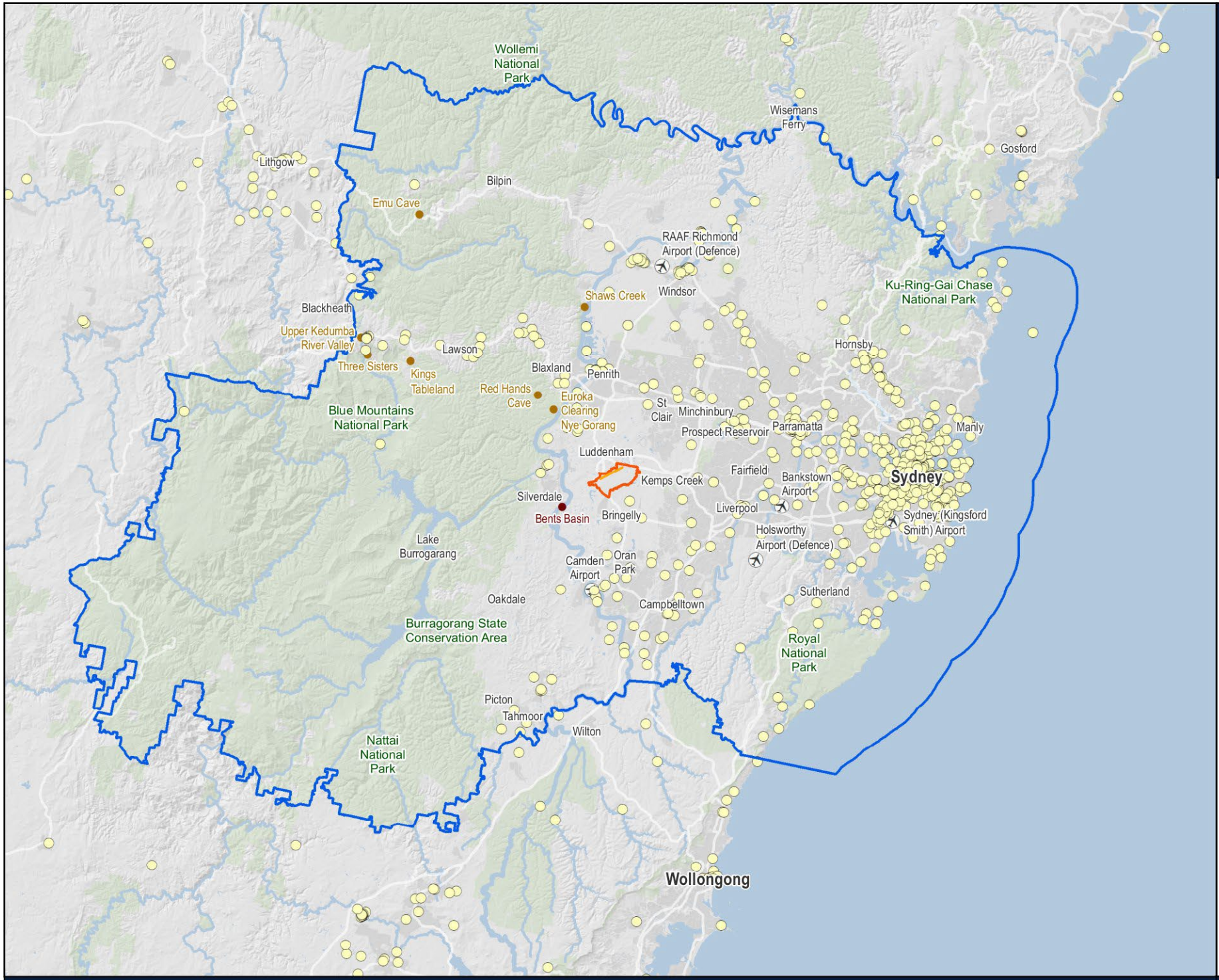


Figure 17.2

State Heritage Register Places

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- WSI study area boundary
- State Heritage Register places
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:750,000 Date: 29/08/2023

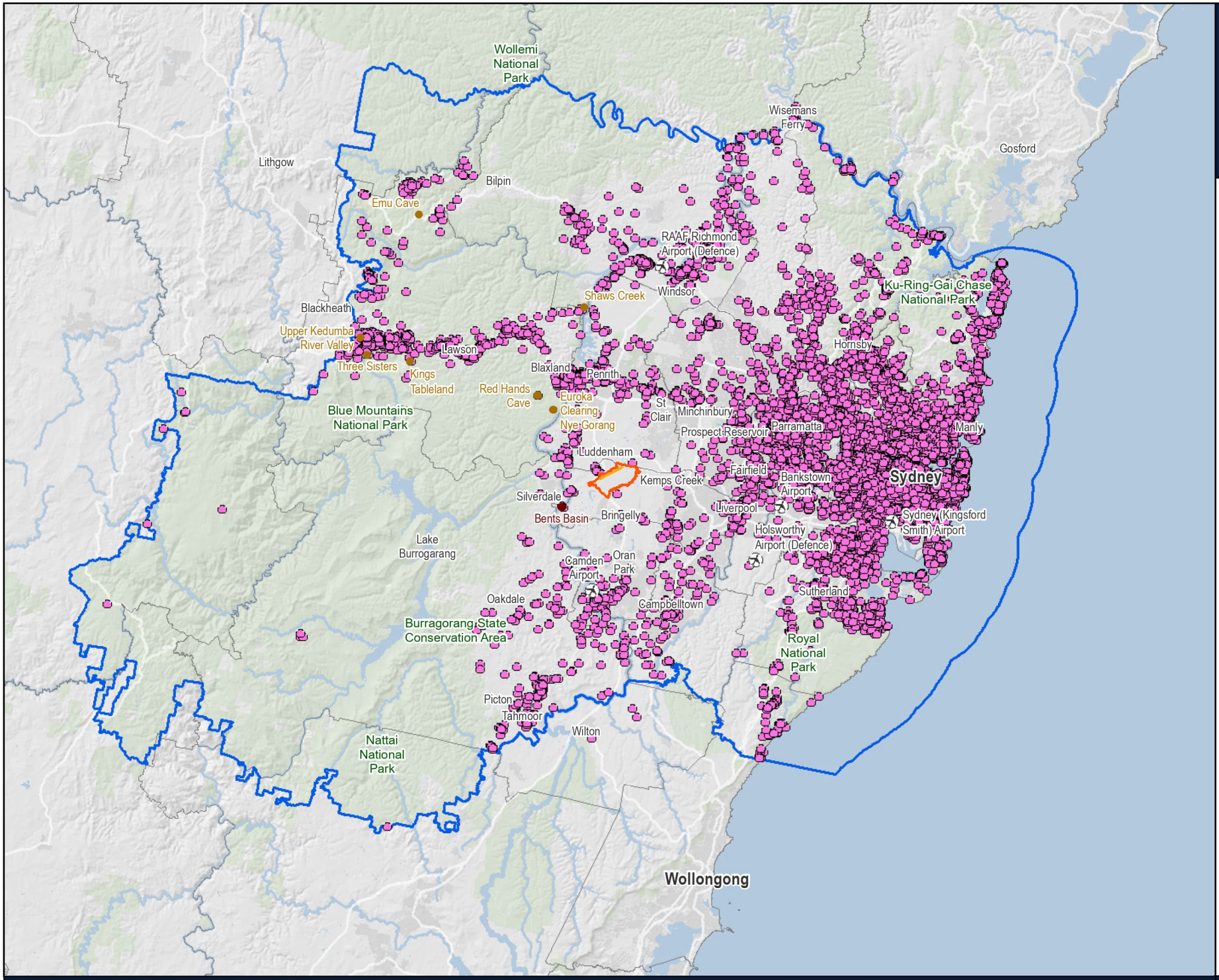


Figure 17.3

LEP Registered Items within WSI Airspace Study Area

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- WSI study area boundary
- NSW LGA boundaries
- Locally significant heritage items
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:750,000 Date: 13/08/2024

17.4.1.4 Aboriginal sites and gazetted Aboriginal Places

There are more than 13,500 sites recorded on AHIMS, which is a database maintained by the NSW Department of Planning and Environment. However, this database only has sites recorded through archaeological survey with concentrations of recorded sites in areas subject to urban or infrastructure development. It is likely that additional, unrecorded sites are present where surveys have not occurred. Many recorded sites have also since been destroyed and/or subject to archaeological salvage.

The majority of sites recorded on AHIMS comprise artefact scatters and isolated finds. Shell middens occur along the coastal area and occasional burial sites have been recorded. The Sydney Basin is surrounded on 3 sides by national parks which largely coincide with the distribution of Hawkesbury Sandstone. Areas associated with Hawkesbury Sandstone are known to contain a wide range of Aboriginal sites given the combination of food, fresh water and shelter (such as rock shelters) resources in these areas. These areas were also relatively undesirable by Europeans and provided refuge for First Nations people in the early years of European settlement.

The distribution of recorded rock art (pigmented and/or engraved) also coincides with sandstone-based topographies that support open sandstone platforms and overhangs. The closest rock art sites are located around 11 km to the west and south-west of the Airport Site. The distribution of rock art sites within areas up to 64 km of the Airport Site is shown in Figure 17.4.

The GBMA contains around 1,400 recorded Aboriginal sites, however the area has not been systematically surveyed. A wide range of site types have been identified where surveys have occurred, such as:

- sites associated with spiritual and/or ceremonial values
- shelters with pigment rock art, rock engravings, mythological sites or story places.

Some Aboriginal sites within the GBMA include landscape features of sacred or mythological significance.

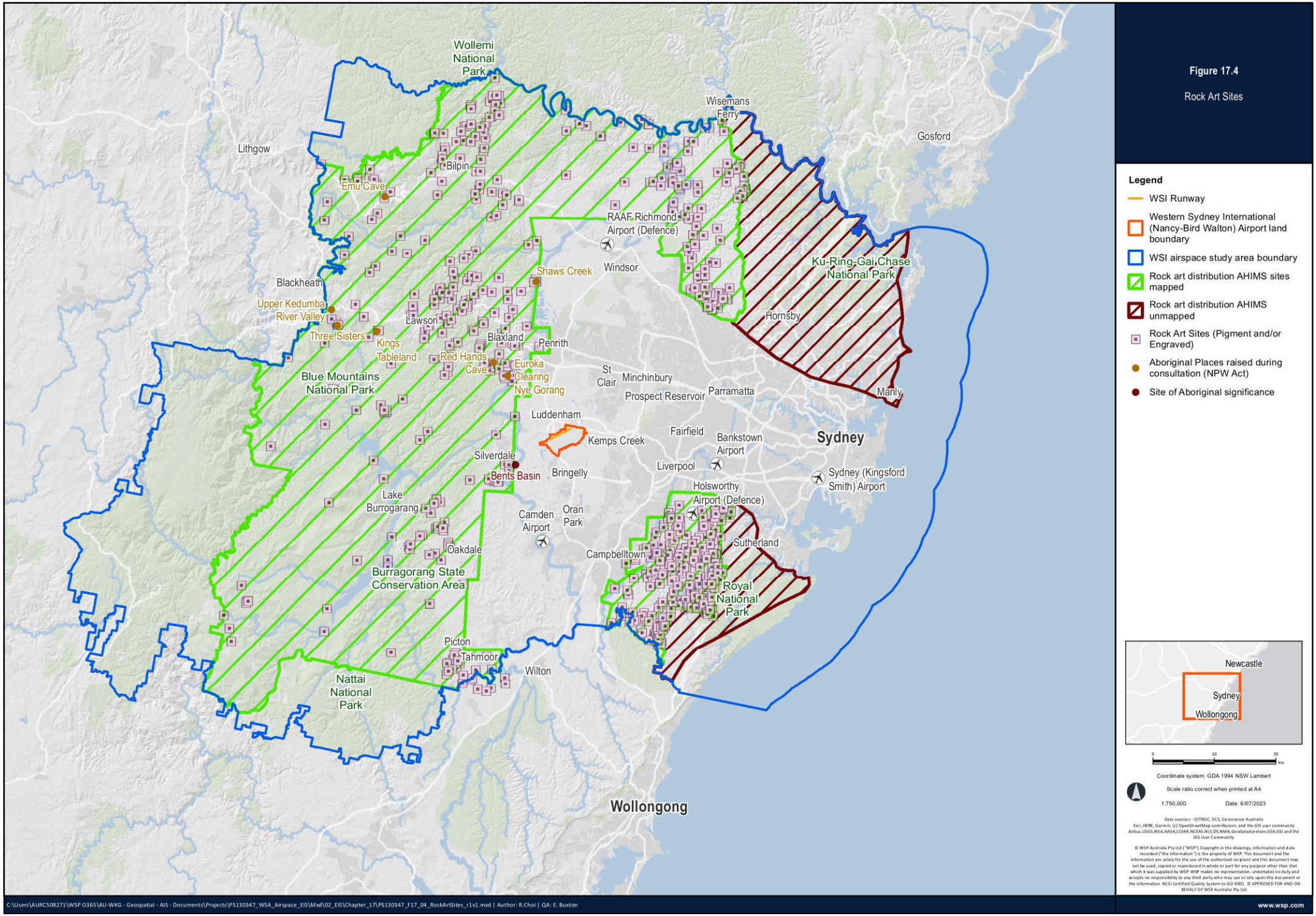


Figure 17.4

Rock Art Sites

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- WSI airspace study area boundary
- Rock art distribution AHIMS sites mapped
- Rock art distribution AHIMS unmapped
- Rock Art Sites (Pigment and/or Engraved)
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:750,000 Date: 6/07/2023

17.4.1.5 Gazetted Aboriginal Places

Gazetted Aboriginal Places are places that have received statutory recognition under the NPW Act and are places of state significance. There are 21 gazetted Aboriginal Places with the study area, ranging from small ceremonial sites to lagoons and mountains of spiritual significance. Seven (7) of the gazetted Aboriginal Places are located within the GBMA, these are:

- The Three Sisters at Katoomba, connected to Aboriginal spirituality and ceremony, and provides a visual testament to the dreamtime stories
- Emu Cave, an important rock art site that continues to be of special significance to First Nations people
- Euroka Clearing Nye Gorang, located at Glenbrook within the Blue Mountains National Park and of significance to the Darug people
- Kings Tableland near Wentworth Falls, a camping and meeting place of significance to Gundungurra people
- Red Hands Cave, near Glenbrook and situated within the Blue Mountains National Park. It was named because of red, orange and white First Nations people's hand stencils located within the cave
- Shaws Creek Aboriginal Place, located in Yellomundee Regional Park. Known for a number of Aboriginal engravings and significant cultural values associated with the rock engravings and significant rock shelters/occupation sites. In the past it was an important gathering and/or ceremonial place for First Nations people. Today it is an important place for connection with their ancestors. Yellomundee Regional Park is used as a contemporary place to camp, gather resources and teach younger generations about their culture
- Upper Kedumba River Valley – The Gully a former Aboriginal fringe settlement.

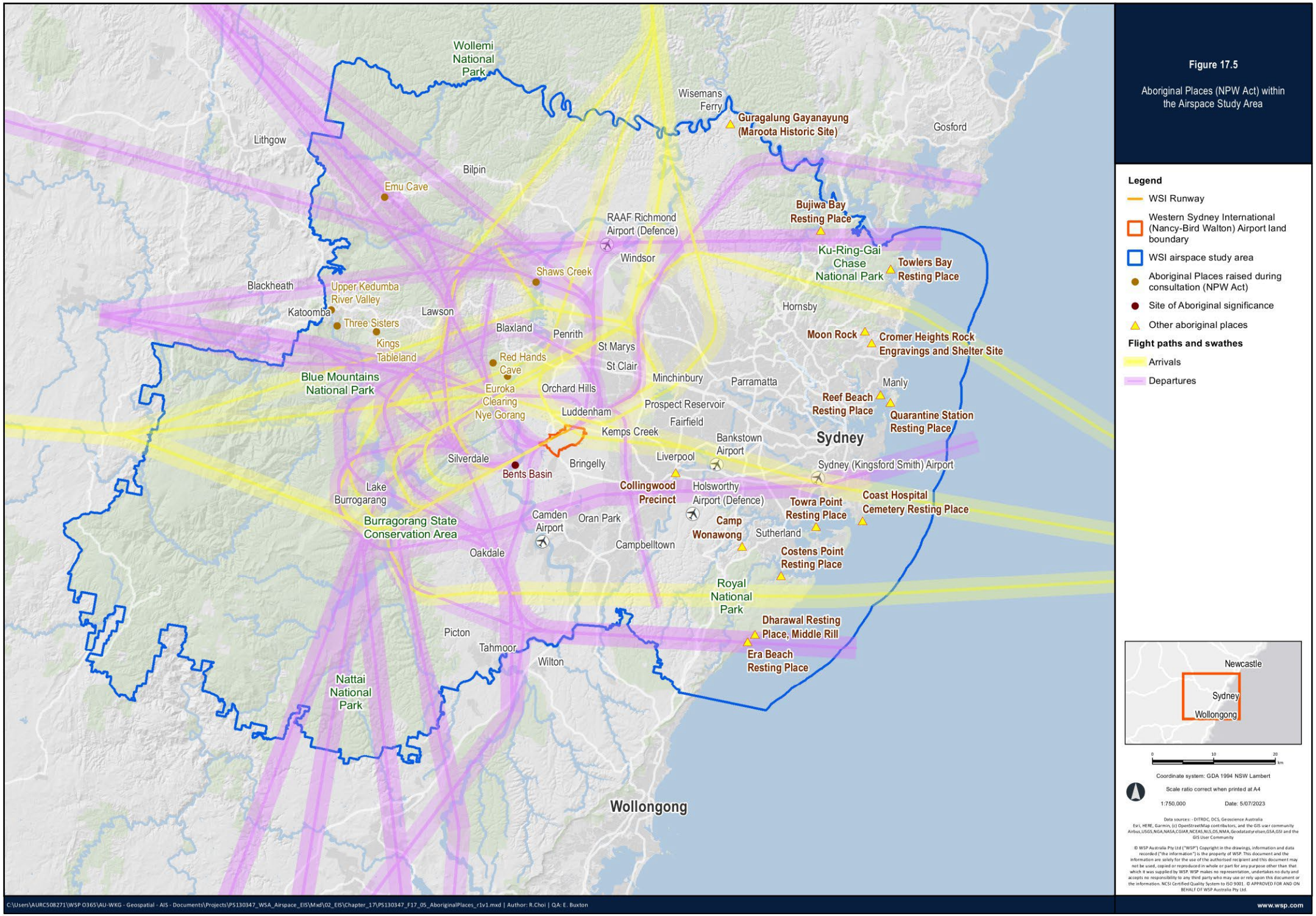


Figure 17.5

Aboriginal Places (NPW Act) within the Airspace Study Area

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- WSI airspace study area
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance
- Other aboriginal places

Flight paths and swathes

- Arrivals
- Departures

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:750,000 Date: 5/07/2023

17.4.2 Aboriginal community values

All Aboriginal sites have cultural value for First Nations people as tangible connections to their ancestors. These sites do not necessarily hold scientific or archaeological value or have elements such as artefacts. Types of sites that hold cultural value include:

- places of current or past ceremonial activity
- spiritually important places created during the Dreaming
- burial or massacre sites associated with spirits of ancestors
- places currently used by the Aboriginal community for resource gathering and culture camps to refresh and maintain cultural connections, are important for cultural revival and/or for intergenerational transmission of culture.

Through engagement with First Nations knowledge holders, the following places were identified as being of particular importance to the Aboriginal community. Some are located outside the study area. These are:

- Emu rock engraving site, Faulconbridge (AHIMS #45-9-4910) (a site with spiritual connections)
- Emu rock engraving site, Ticehurst Park, Faulconbridge (AHIMS #45-5-0015) (a site with spiritual connections)
- Yellomundee Aboriginal Place (this place is closely associated with the nearby Shaws Creek Aboriginal Place and has a number of important rock shelter sites with art and deposits)
- Shaws Creek Aboriginal Place
- Bents Basin. Clans are reported as coming together in the past at this location and is where Aboriginal families from Darug, Gandangarra and Tharawal people still gather today
- Linden Ridge (multiple sites)
- The Three Sisters (Seven sisters) Aboriginal Place, Katoomba (a place of spiritual/dreaming cultural value)
- Kings Tableland (rock art)
- Mt Yengo (outside the study area)
- Emu Cave Aboriginal Place
- Balgenny Farm – Koobawilla (a place where stars are reflected in the water)
- Walls Cave, Blackheath
- Red Hands Cave (AHIMS #45-5-0103) (a site with spiritual connections)
- Wianamatta (South Creek)
- the Nepean River
- traditional walking tracks (now roads, often connecting significant sites). Examples include Bells Line of Road and a ceremonial circuit encompassing this road, The Northern Road, Putty Road, Parramatta Road, Cowpastures Road, Blacktown Road, Queens Road, Lawson
- Possum dreaming site, Little Hartley
- The Mirror Shelter, Woodhouse Creek (where the sky is reflected in the water)
- Appin Massacre Site – now protected as the Appin Massacre Cultural Landscape (outside the study area)
- Thirlmere Lakes (outside the study area)
- Mermaid Pools.

Of these sites, some were identified by knowledge holders as being places where visual and/or noise intrusions were considered likely to impact the cultural values of a place. This includes Yellomundee, Bents Basin, the Three Sisters Dreaming site, Emu rock engraving sites, Emu Cave and Red Hands Cave.

For the Three Sisters Dreaming site, it was noted that the relatively unmarred view of the cultural landscape was important to an appreciation and understanding of the cultural values of the site. While aircraft are currently visible, knowledge holders noted that this was not a significant impact as flights were relatively infrequent, at a high altitude and at some distance. However, knowledge holders were of the view that increases in noise and visual intrusions would impact the cultural values of the site and were concerned to minimise these. Tourism activities at Echo Point are considered to be detrimental to the cultural values.

The Emu Rock engraving sites at Faulconbridge and the Emu Cave Aboriginal Place were identified by knowledge holders as important sites due to the association with the Emu in the sky constellation. Stories about the emu and the corresponding constellation are held by several First Nations peoples across Australia. The sites on the ground associated with these stories include engravings, stone arrangements and rock painting sites. The astronomical sites associated with Aboriginal cosmology have received renewed research attention in the past decade. Such sites have been and continue to be of high importance to First Nations people.

Some places are culturally significant because of the connection they provide to the recent historical past. Such connections can sometimes be traumatic or bittersweet. One example is the Upper Kedumba River Valley Aboriginal Place, also known as 'The Gully'. This is an example of a place that prior to invasion served as a popular camping place for First Nations people and there are sites that physically attest to this early occupation of the area. Post invasion it evolved into a place of refuge for First Nations people avoiding and resisting government control. It is a former fringe settlement of the Gundungurra people.

17.5 Assessment of impacts

The project would not have direct impacts on heritage items, however, there is the potential for indirect impacts. Potential indirect impacts that have been considered in this assessment (including perceived impacts identified through community engagement) are:

- noise and visual impacts on heritage or cultural values of heritage items or places. This would be dependent on the height of the aircraft above ground level and frequency of flights
- disruption of land – sky connection
- changes in air quality due to emissions from aircraft or physical impacts due to fuel jettisoning.

17.5.1 Aboriginal heritage

Many Aboriginal sites within the study area would not be negatively impacted by the preliminary flight paths, as they would not be overflown by aircraft on the preliminary flight paths, are archaeological sites that would not be indirectly impacted by the project and/or have potentially been salvaged or destroyed (in the case of sites registered on AHIMS).

However, a number of culturally significant places are located below the preliminary flight paths and have the potential to be indirectly impacted (refer to Figure 17.6) as:

- noise can impact cultural values including the need for peace, tranquillity, and spiritual connection. Noise can also impact the value of intergenerational cultural education sites (e.g., Shaws Creek Aboriginal Place, Yellomundee which is used as a venue for cultural education of Aboriginal youth)
- certain sites (rock engravings, painting sites, stone arrangements, ceremonial sites and natural mythological sites) may have intangible spiritual values that could be vulnerable to noise, visual intrusion and/or spiritual disruption
- Aboriginal rock engravings and paintings on sandstone surfaces may be affected physically through dust or chemical interaction of pollutants on rock surfaces.

Knowledge holders that were engaged during the preparation of the Draft EIS have acknowledged that designing flight paths to avoid flying over all Aboriginal sites of cultural value would be impossible, however this is not taken to imply that any impacts were acceptable to the knowledge holders consulted. Some places are significant for their spiritual values and were of particular concern to knowledge holders. For example, the Emu in the sky constellation which is associated with several places on the ground.

17.5.1.1 Impact of noise and visual intrusion

It is acknowledged that noise and visual intrusion can impact cultural values. In particular, noise does have the potential to disrupt cultural practices at site, which could lead to its use being discontinued. A key concern expressed by First Nations knowledge holders was the impact of aircraft noise on their spiritual connection with the landscape and/or the disruption on their continuing cultural practices. For example, at a camp for young people at Yellomundee, loud aircraft noise passing over would disrupt the connection between people and country and their ability to transmit culture to the younger generations. However, if cultural practices at a place are discontinued due to aircraft noise, this would be a profound impact on the cultural values associated with the place.

Visual intrusion can also have a negative impact, depending on the position of the flight path relative to the features on the ground and the frequency of use.

The estimated noise and visual intrusion at a selection of high cultural value sites is summarised in Table 17.4. The assessment of impacts is based on composite contours and reflect 3 different runway operating scenarios. Actual impacts at a given location may be lower, depending on the operating scenario that is ultimately adopted.

Due to the position of flight paths, frequency of overflight and the predicted noise levels, the project would significantly impact the Aboriginal cultural values of Bents Basin and the Shaws Creek – Yellomundee Aboriginal Place, which are places of cultural importance with values associated with peace, tranquillity and connection to nature. There are also many Aboriginal sites that are located along Linden Ridge. The expected frequency of flights varies between the various flight paths however most flights are expected during the day. The visual and noise disruption at these sites would be moderate, increasing to severe as the frequency overflight increases over time. Impacts to other key sites of cultural significance identified through engagement would have low to moderate impacts due to noise and/or visual intrusion. Mitigation measures have been included in Section 17.6 in response to these impacts.

Table 17.4 Estimated noise and visual intrusion at a selection of Aboriginal heritage sites of high cultural value[3]

Heritage item	Noise range L_{Amax} (dB(A))	Visual intrusion	N60 (24-hours) – number of movements (2055)	Comment
The Three Sisters	50–55 dB(A)	Aircraft would be visible in the distance less than 5 km away. They would be at an approximate height greater than 10,000 ft (3 km) (above runway).	No movements at or above 60 dB(A)	While the expected noise levels are low, given the sweeping views from the lookout the visual impact is likely to be more noticeable than for other parts of the Blue Mountains. First Nations participants were concerned about any increase in noise or visual intrusion. Impact on cultural values is expected to be low to moderate given expected altitude and noise projections.
Bents Basin	80–85 dB(A)	The area would be directly overflown. Aircraft would be relatively low. Aircraft arriving into WSI Runway 05 during the day – evening period and overnight will be descending between 2,500 ft (760 m) and 750 ft (230 m). Aircraft departing from WSI Runway 23 during the day-evening period and overnight will be climbing between 2,500 ft (760 m) and 5,000 ft (1.5 km). Some aircraft may fly at a lower altitude depending on weather and operational conditions.	>200 movements above 60 dB(A)	The impact on values is expected to be extremely high. The frequency of flights during peak hours (6–8 am and 4–6 pm) is expected to be every 3 minutes. Impact on cultural values is severe.

---

[3] The estimated noise and visual intrusion assessment does not account for off-procedure manoeuvring areas. Sites within a departure or arrival transition area may sometimes be overflown as runway modes of operation change.

Heritage item	Noise range L_{Amax} (dB(A))	Visual intrusion	N60 (24-hours) – number of movements (2055)	Comment
Shaws Creek Aboriginal Place, Yellomundee Regional Park	60–65 dB(A)	The place will be directly overflown when Runway 05 is in use. Aircraft would be frequent and visible (approx. 8,000 ft (2.4 km) to 10,500 ft (3.2 km) (above runway) and climbing). Overnight aircraft into WSI on Runway 23 will be descending between 8,000 ft (2.4 km) and 5,000 ft (1.5 km) above runway level at this location. Some aircraft may fly at a lower altitude depending on weather and operational conditions.	10–20 movements above 60 dB(A)	The main north south flight paths overfly Yellomundee. It is expected that only 1–2 overnight flights into Runway 23 would occur. Departing from Runway 05 an average of 23, up to a maximum of 55, departures could overfly this location during the day – evening period. The impact on cultural values is expected to be severe.
Emu Engraving, Ticehurst Park, Faulconbridge AHIMS #45-5-0015	60–65 dB(A)	An average of 18 departures up to a maximum of 36 departures could overfly this location during the day evening period using Runway 23 Departure north day (in 2033). Aircraft will be between 10,500 (3.2 km) and 13,300 ft (4 km) above the runway level. Several nighttime flight paths also over fly this location. During the night when Runway 05 is in use, an average of 3 arrivals up to a maximum of 8 arrivals could overfly this location (in 2033). Altitude of aircraft would range Runway 05 arrival north Night 13,300 ft (4 km) to 17,500 ft (5.3 km) and Runway 05 (RNP) North Night 8,000 ft (2.4 km) to 10,500 ft (3 km).	10- 19 movements above 60 dB(A) (day) 2-4 movements above 60 dB(A) (night)	Noise is likely to be a minor issue, however the link to the Emu in the Sky constellation is strongest in March–May, and likely to be impacted by flight during the night during this time. Expected impact is moderate. As discussed in Appendix G (Assessment of the refinements to the project) of this EIS, changes have been made to the preliminary flight path design which would reduce movements or increase the altitude of aircraft on certain flight paths at night.

Heritage item	Noise range L_{Amax} (dB(A))	Visual intrusion	N60 (24-hours) – number of movements (2055)	Comment
		When Runway 23 is in use – an average of 3 departures up to maximum of 6: Runway 23 departure Northeast Night and Runway 23 Departure North Night both at 10,500 ft (3.2 km) to 13,300 ft (4 km).		
Emu Engraving Faulconbridge (AHIMS #45-5-4910)	~42 dB(A)	Flight paths are 1.2 km – 2.1 km away and aircraft would be visible. Altitude of aircraft 8,000 ft AMSL (2.4 km) or more.	No movements at or above 60 dB(A)	Noise is likely to be a minor issue and the site is not directly overflown. Impact – low.
The Mermaid Pools	Under 60 dB(A)	Aircraft would be less than 5 km away but flying at greater than 10,000 ft (3 km) (AMSL).	No movements at or above 60 dB(A)	Aircraft may be visible but noise would be relatively low. The expected impact on cultural values is negligible to low.
Red Hands Cave Aboriginal Place	60 dB(A)	Flight path Runway 05 arrival North Night (RRO) overflies this location with an average of 4 arrivals up to a maximum of 8 during the overnight period (in 2033). Aircraft would be at 10,500 ft (3.2 km) to 13,300 ft (4 km) above runway level. Daytime flightpaths do not overfly these locations although when Runway 23 is in use (Runway 23 Departure North (Non-Jet) Day) is less than 1 km away so aircraft are likely to be visible.	No movements above 60 dB(A)	The park gates are closed during the evening and therefore the expected impact from noise and visibility is low to moderate. The long-term impact of emissions on pigment and engraved art is currently unable to be estimated.

Heritage item	Noise range L_{Amax} (dB(A))	Visual intrusion	N60 (24-hours) – number of movements (2055)	Comment
Euroka Clearing	~42 dB(A)	The site would be directly overflown with aircraft at an expected height ranging from 8,000 (2.4 km) to 13,300 ft (4 km) above runway. When Runway 23 Arrival West Day is in use an average of 24 arrivals up to a maximum of 51 arrivals could overfly this location during the day-evening period. At night when Runway 05 Arrival North Night (RRO) is in use, an average of 4 flights and up to 8 arrivals could overfly this location (in 2033).	No movements at or above 60 dB(A)	Even though noise levels are not expected to be high, overflight is expected to be relatively frequent and impact to the current First Nations cultural use of the site which includes mourning and smoking ceremonies is likely to be noticeable. Impact to cultural values is expected to be low to moderate.
Linden Ridge sites	60–65 dB(A)	Linden Ridge is overflown by the following flight paths Runway 23 Departure North Day; Runway 05 Arrival North Night, Runway 05 Arrival (RNP) North Night and Runway 23 Departure North Night. Aircraft on flight paths during the day would be at an altitude between 10,500 (3.2 km) and 13,300 ft (4 km) above runway. At night, aircraft would be at an altitude of 5,000 ft (1.5 km) to 13,300 ft (4 km). The expected frequency of flights varies between the various flight paths however most flights are expected during the day i.e. an average of 18 departures up to a maximum of 36 during the day – evening period when Runway 23 is used (in 2033).	10–19 movements above 60 dB(A)	There are many Aboriginal sites that are located along the Linden Ridge walking trail. There would be a visual and noise disruption at these sites, increasing over time. There are multiple rock shelters with pigment art e.g. AHIMS #45-04-0220, and AHIMS #45-4-0244; and ridge top engravings sites e.g. AHIMS #45-5-0008, and AHIMS #45-5-2272; stone arrangements e.g. AHIMS #45-4-0222, AHIMS #45-4-0223 as well as other site types including artefact scatters and axe grinding grove sites. Impact is expected to be moderate increasing to severe by 2055. The long-term impact of emissions on pigment and engraved art is currently unable to be estimated. As discussed in Appendix G (Assessment of the refinements to the project) of this EIS, changes have been made to the preliminary flight path design which would reduce movements or increase the altitude of aircraft on certain flight paths at night.

Heritage item	Noise range L_{Amax} (dB(A))	Visual intrusion	N60 (24-hours) – number of movements (2055)	Comment
Emu Cave Aboriginal Place. AHIMS #45-4-0018	60 dB(A)	The Aboriginal Place is directly overflown by aircraft on the following flight paths: Runway 05 Departure North Day, Runway 23 Departure North Day, Runway 23 Departure North Night. Aircraft would be visible but relatively high climbing between 13,300 ft (4 km) and 17,500 ft (5.3 km) above runway.	No movements above 60 dB(A)	This site is a deep rockshelter, with the engravings inside on the cave walls. There is no direct visual connection between the engraved emu tracks and the sky as is the case with the emu engraving. The site is of spiritual significance – and given the frequency of flights the impact is expected to be low to moderate. As discussed in Appendix G (Assessment of the refinements to the project) of this EIS, changes have been made to the preliminary flight path design to increase the lateral separation with this Aboriginal Place.
Kings Tableland Aboriginal Place	~42 dB(A)	Aircraft would be less than 5 km away and visible from this Aboriginal Place but do not fly overhead. Aircraft would be at an altitude of greater than 10,500 ft (3.2 km) above runway.	No movements at or above 60 dB(A)	Impact is expected to be negligible to low.
Mt Yengo sacred site	Negligible < 42 dB(A)	The nearest flight path (Runway 23 Arrival North Day) is 2.8 km away and aircraft will be high descending between 20,000 ft (6 km) and 17,500 ft (5.3 km) above runway.	No movements at or above 60 dB(A)	Aircraft may be visible but at high altitude, and noise will be negligible ~42 decibels. First Nations knowledge holders expressed concern over disruption of spiritual values if overflown – however the Aboriginal Place/sacred site is not overflown. There is expected to be no impact.
Thirlmere Lakes	~42 dB(A)	The lakes are not directly over flown. The closest flight path to the lakes is 3.1 km away Aircraft departing Runway 23 during the day – evening will also fly over this area at an altitude of between 13,300 ft (4 km) and 17,500 ft (5.3 km).	No movements at or above 60 dB(A)	The closest flight paths are Runway 23 Departure south (Hot) Day, and Runway 23 Departure south day. Aircraft may be visible but at a high altitude. Impact is expected to be no impact to cultural values.

17.5.1.2 Disruption of land-sky connection

Some Aboriginal sites are connected to the Dreaming and have spiritual value extending beyond their physical fabric. This is most clearly reflected in sites that are connected to stories that link places on the land with the constellations. They have always been of high importance to First Nations people as part of their complex cosmology and knowledge system. The Dreaming is not simply in the past, rather it continues to guide, influence and impact the day to day lives of First Nations people.

As discussed in Section 17.4.2, knowledge holders identified 3 sites that are associated with the Emu in the sky story, being:

- The emu rock engraving site at Ticehurst Park (AHIMS #45-5-0015). Knowledge holders noted that around March to May was the most important time for the connection between the emu in the sky and this site. Five (5) flight path corridors would pass over the site in Ticehurst Park (one day and 4 night flight paths) at altitudes between 10,500 ft to 17,500 ft. Aircraft movements would vary with an average of 18 aircraft and a maximum of 36 aircraft movements in 2033 during the day and evening, increasing to an average of 51 to a maximum of 97 aircraft by 2055. At night, an average of 3 aircraft and a maximum of 8 aircraft across the night period in 2033, increasing to an average of 10 and a maximum of 25 aircraft movements depending on the flight path. Given the altitudes the impact on cultural values is expected to vary seasonally. The maximum predicted noise levels would be around 60 decibels with around 10–19 movements across the day exceeding 60 decibels (N60 (day)) and around 2–4 movements across the night exceeding 60 decibels by 2055 (N60 (night)). Overall, the impact on cultural values is expected be moderate
- The emu rock engraving site at Faulconbridge (AHIMS #45-5-4910). Again, Knowledge holders noted that around March to May was the most important time for the connection between the emu in the sky and this site. No flight path corridors pass above this site, with flight paths around 1.2 km to 2.2 km away from the site with aircraft at altitudes between 8,000 ft and 13,300 ft. However the location is close to a proposed departure transition area for WSI which means that it could be overflown depending on conditions. Aircraft noise would be around 42 decibels. The impact on the cultural values is expected to be low.
- The Emu Cave Aboriginal Place (AHIMS #45-4-0018). Emu Cave is a deep sandstone shelter, part of a small sandstone formation covered in a fairly open eucalypt forest. The innermost recess and entire western wall is covered with track-like engravings. A recording of the site undertaken in 2003 recorded 172 engraved figures as well as 5 faint red hand stencils. Most engravings resemble bird tracks but there are also macropod tracks (kangaroo and wallaby), grooves, ovals, Y-shapes and a single U-shape. A 2007 study found that Emu Cave was one of 31 art sites within the GBMA evoking the emu, and that the cave's panel of mostly emu tracks is of a distinctive style of engraving, which contributes to the very diverse body of art sites within the GBMA – showing a long duration of art practice, and influences from a wide catchment of styles (Tacon et al., 2007). The Aboriginal Place would be overflown by aircraft departing from Runway 05 and Runway 23 during the day – evening period. Aircraft will be climbing between 13,300 ft and 17,500 ft above runway level at this location. Some aircraft may fly at a lower altitude depending on weather and operational conditions. There will be some, but less frequent flights overnight from Runway 23.

17.5.1.3 Impacts to Aboriginal rock art sites

Air quality

There has been little direct research on sites within or close to Sydney on the impacts to Aboriginal rock art sites from air pollution. International research findings (such as Giesen et al., 2014 and Tzanis et al., 2009) suggest that air pollution can accelerate the rate of stone deterioration in urban settings, by weakening the fabric of the stone and making it more susceptible to other stresses (such as physical weathering).

The majority of known rock art sites occurs in 3 major groupings relative to WSI:

- to the north-west and south-west within the GBMA, starting from a distance of around 18 and 11 km respectively
- to the south-east on the Woronora Ramp (south-east of Campbelltown), extending from around 36 km away
- to the north-east in the Lower Hawkesbury catchments, extending from around 55 km to the north.

The assessment has found:

- relatively high concentrations of atmospheric pollutants associated with WSI are most likely to occur within a 5 km radius and unlikely to extend into the proximity of the rock art sites
- winds are varied but predominantly occur from the south-west and the west-south-west. Winds of lesser speed predominantly occur from the east in summer. The prevailing trend is for potential airborne pollutants to be moved away from the closest rock art sites situated in the Blue Mountains
- the potential for WSI aircraft emissions to impact upon rock art sites is most likely under the more frequently flown sections of flight paths (especially close to WSI and to the west of WSI)
- to a much lesser extent, WSI emissions would contribute to the potential impact of accumulated air pollution within the Sydney Basin on rock art sites.

Aircraft emissions from the project would contribute to the general air quality of the Sydney Basin. International studies have shown that emissions from airport operations are small when compared to the regional context of emission inventories (Ratliff et al., 2009). This is supported by the air emissions inventory for the Greater Metropolitan Region in NSW (NSW EPA, 2012), which shows that emissions from existing airport operations in Sydney in 2008 were less than 3 per cent of total emissions for the region. On the western side of the study area there are large tracts of national park and minimal industrial development in the past. The evidence relating to potential emission effects on rock art, particularly pigment art, is considered in detail in Technical paper 9. It can be concluded that any potential for WSI aircraft emissions to impact upon rock art sites is probably situated:

- under the more frequently flown sections of flight paths, especially close to WSI, notably to the west of WSI
- to a lesser extent, WSI emissions will contribute to the potential impact of the net air pollution from the Sydney Metropolitan area on Sydney Basin art sites.

There is general acknowledgement that air pollution is likely to be detrimental to Aboriginal rock art, however, there has been little direct research on sites within or close to Sydney. It is not possible to quantify the cumulative long-term risk presented by these processes, or indeed to identify and quantify any resulting damage due to a lack of previous research and comparative data. There is also the difficulty in differentiating aircraft emission derived deterioration from other anthropogenic pollution sources via the same processes (such as acidity, nutrients and dust). While increased emissions may potentially result in some impact to these environments, the likelihood of this is generally considered to be minimal. As a precautionary approach the assessment recommends the identification of sample sites from which baseline condition data would be recorded and which would then be monitored over time (see mitigation measure H2).

Fuel jettisoning

Most jet fuel is highly volatile and when jettisoned readily breaks up into small droplets which subsequently vaporise.

The evaporation of unburnt fuel droplets releases volatile organic compounds (such as benzene and carbon dioxide) into the atmosphere, some of which can remain in a vapour phase with a residence time of 24-hours to 2 weeks (Pacific Environment Limited, 2016).

Fuel jettisoning would occur in accordance with the Aeronautical Information Publication Australia, Part 2 – En Route (AIP ENR) (Airservices Australia, 2022a). If required, fuel jettisoning would occur at an altitude of at least 6,000 ft (around 1.8 km) above ground level to ensure total dissipation into the atmosphere prior to contacting the ground, except in the case of emergencies (Airservices Australia, 2023). Most fuel evaporates within the first few hundred metres, and fuel jettisoning occurs only very rarely. The likelihood of fuel reaching the ground is very low and it is unlikely that cultural heritage values of Aboriginal rock art sites would be impacted.

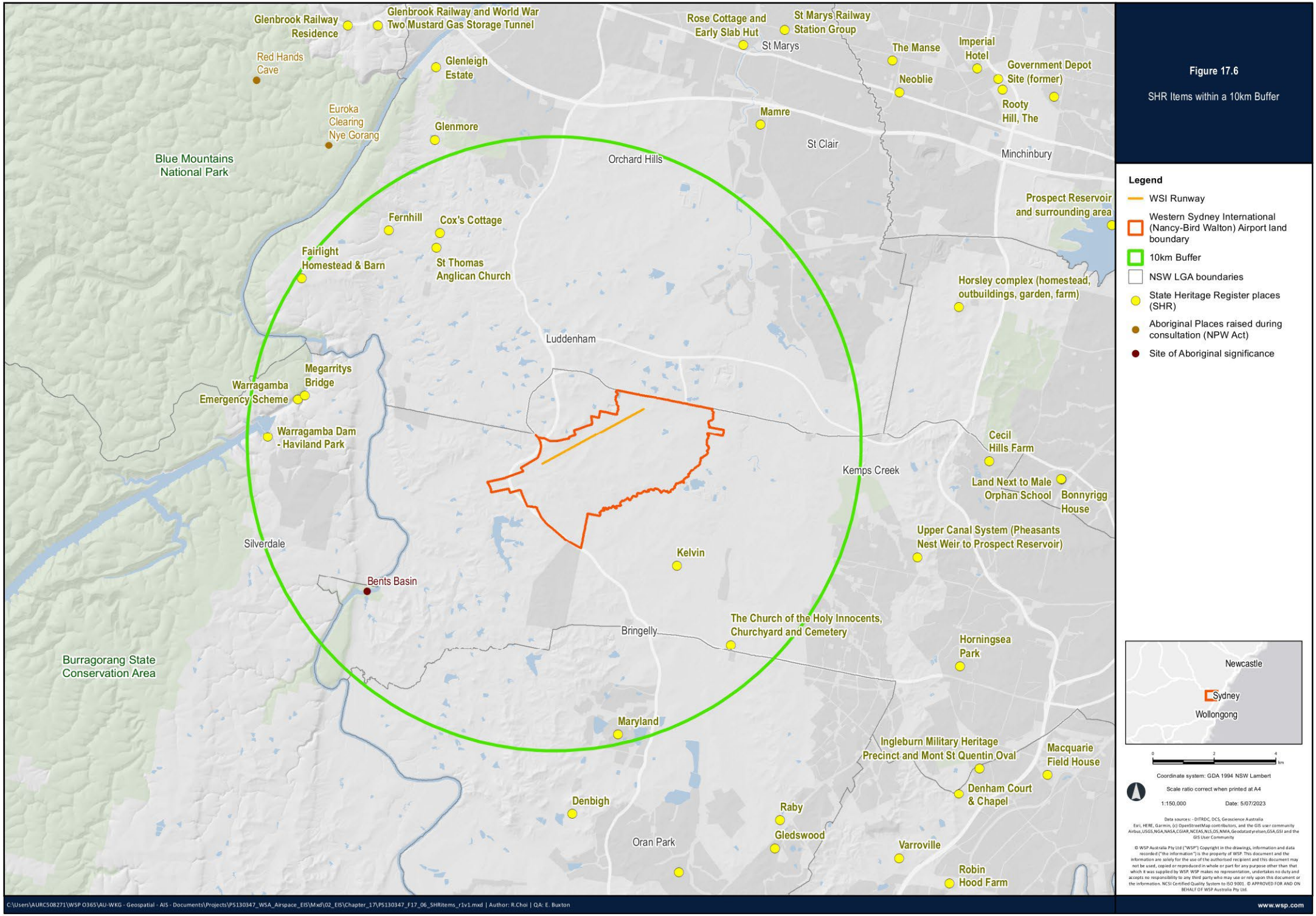
17.5.2 Historic heritage

As outlined in Section 17.4.1, there are a number of heritage items that are of world, national, state and/or local heritage significance within 10 km of the Airport Site (refer to Figure 17.6).

The project has the potential to impact the historic heritage items due to:

- noise and visual intrusion, which can diminish peace, serenity and wellbeing values, such as the GBMA and other rural and bushland sites. Noise from departing aircraft can be expected to be louder close to the Airport Site as they are climbing. For this reason, consideration was given to places that occurred within a 5 km radius of the Airport Site and then within a 10 km radius of the Airport Site
- changes in air quality
- contributions to greenhouse gas emissions and climate change and resulting impacts to historic gardens.

Many sites beyond 10 km from the Airport Site are already overflown by aircraft associated with Sydney (Kingsford Smith) Airport flight paths and are not considered further. Many types of heritage places are also considered robust in the face of impacts such as air pollution, noise and visual impacts.


Glenbrook Railway Residence
Glenbrook Railway and World War Two Mustard Gas Storage Tunnel
Red Hands Cave
Glenleigh Estate
Euroka Clearing Nye Gorang
Glenmore
Blue Mountains National Park
Rose Cottage and Early Slab Hut
St Marys Railway Station Group
St Marys
The Manse
Imperial Hotel
Government Depot Site (former)
Neoblie
Rooty Hill, The
Mamre
St Clair
Minchinbury
Orchard Hills
Prospect Reservoir and surrounding area
Fernhill
Cox's Cottage
Fairlight Homestead & Barn
St Thomas Anglican Church
Horsley complex (homestead, outbuildings, garden, farm)
Luddenham
Megarritys Bridge
Warragamba Emergency Scheme
Warragamba Dam - Haviland Park
Cecil Hills Farm
Kemps Creek
Land Next to Male Orphan School
Bonnyrigg House
Upper Canal System (Pheasants Nest Weir to Prospect Reservoir)
Silverdale
Kelvin
Bents Basin
The Church of the Holy Innocents, Churchyard and Cemetery
Bringelly
Horningsea Park
Burragorang State Conservation Area
Maryland
Ingleburn Military Heritage Precinct and Mont St Quentin Oval
Macquarie Field House
Denham Court & Chapel
Denbigh
Raby
Gledswood
Oran Park
Varroville
Robin Hood Farm
Figure 17.6
SHR Items within a 10km Buffer
Legend
WSI Runway
Western Sydney International (Nancy-Bird Walton) Airport land boundary
10km Buffer
NSW LGA boundaries
State Heritage Register places (SHR)
Aboriginal Places raised during consultation (NPW Act)
Site of Aboriginal significance
Newcastle
Sydney
Wollongong
0
2
4
km
Coordinate system: GDA 1994 NSW Lambert
Scale ratio correct when printed at A4
1:150,000
Date: 5/07/2023
Data sources: - DITRDC, DCS, Geoscience Australia
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community
© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.
C:\Users\AURC508271\WSP O365\AU-WKG - Geospatial - AIS - Documents\Projects\PS130347_WSA_Airspace_EIS\Mxd\02_EIS\Chapter_17\PS130347_F17_06_SHRitems_r1v1.mxd | Author: R.Choi | QA: E. Buxton
www.wsp.com

17.5.2.1 Impact of noise and visual intrusion

The preliminary flight paths avoid all World Heritage and National Heritage sites, except for:

- the GBMA
- Royal National Park, Garawarra State Conservation Area.

In relation to the Royal National Park – Garawarra State Conservation Area, while aircraft will be visible, they will be much higher than the current aircraft overflying the area to and from Sydney (Kingsford Smith) Airport and noise is not expected to be significant at 42 decibels or lower. While aircraft may still be visible from other sites, even though they are not directly overflown noise and visual intrusion to these places would be minimal and have a negligible impact on their values.

Of the 89 Commonwealth heritage sites, only 2 are within close proximity to WSI and/or are likely to be adversely impacted by the flight paths – Orchard Hills Cumberland Plain Woodland and the Shale Woodland Llandilo (beyond 10 km from WSI). Both of these places have been listed for their natural values including both flora and fauna and potential impact on these values are addressed elsewhere in Chapter 16 (Biodiversity). These properties have not formally been assessed by the Australian Heritage Council for their cultural values, but reference is made in the listings to the probability of historical and Aboriginal cultural values. However, the features noted in relation to possible cultural values are industrial features and archaeological sites which are robust in relation to any likely impacts from the preliminary flight paths.

The long-term impact on cultural values due to noise is difficult to determine. If the noise disrupts the cultural practices at a site to the extent that its use is discontinued, this would be considered a profound impact on the cultural values associated with the place. This can be particularly important to historic heritage items such as buildings and building complexes which have existing sympathetic uses that are noise sensitive.

At greater distances from WSI, noise and eventually the visibility of aircraft begins to diminish, and emissions are likely to disperse over a greater area and therefore be less concentrated. However, some cultural values remain sensitive to any additional noise and the frequency of flights can exacerbate this. This applies to the GBMA and those historical heritage places within it that are valued for their serenity and their ability to connect people to the spirituality of nature. The significant value of other heritage places lies primarily in the fabric of the building or structure and such values will not be impacted directly by noise. The degree to which the fabric of heritage places would be directly impacted by aircraft emissions is expected to be low as it is anticipated that few (if any) emissions would reach the ground surface. A long-term research program has been recommended to gather quantitative data on this possible impact (see mitigation measure H2).

The estimated noise and visual intrusion at a selection of historic heritage items of cultural value is summarised in Table 17.5. These heritage items were selected as exemplars either because they:

- occur in close proximity to other heritage items and the likely impact on the example item will be typical of likely impacts on the proximal items. For example, impact on Fernhill Estate will be similar to impacts on St Thomas Church and other heritage items in Mulgoa; or
- because they are a type of item on which the potential impacts will be similar to others of that type. For example, in the case of Everglades historic gardens. The assessment on the GBMA is presented in Chapter 23 (Matters of National Environmental Significance).

The fact that many historic heritage places occur in populated areas such as Katoomba means that the first principle of flight path design has served to protect them from direct overflight, although in some cases aircraft may still be visible in the distance and may be heard. Windsor and Richmond townships are the exception to this. While the Richmond township contains a number of locally significant heritage items, there are a range of factors such as the proximity of the RAAF base that restrains the flight path options in this area. Aircraft would be relatively high by this point, however, at greater than 10,000 ft (above MSL) and noise would be below 60 dB(A).

It is inevitable that some properties would suffer some impact from noise or visual impacts, given that in many cases to the west and south-west of WSI, the properties are located in rural contexts. This includes properties within Mulgoa, Luddenham and Wallacia. These towns contain several local heritage items, and in the case of Mulgoa, several significant historic heritage properties such as Fernhill Estate and St Thomas's Church. Impacts to these heritage properties would range from no impact to moderate impact, depending on the values for which the places are listed for, and the indirect visual and noise impacts from the project, noting that not all heritage properties are directly overflown. The exception is for heritage listed schools in Luddenham and Wallacia. The continuous use as a school forms part of its heritage value and noise disruptions during the day would be frequent and are expected to increase in frequency over time, noting the internal noise levels would be dependent on the condition of the building fabric and/or recent additions/modifications to the buildings. The impact of high noise events on the heritage value is assessed as moderate to severe, depending on any modifications that the asset owner may implement in response to aircraft noise. Any such modifications would be subject to heritage approvals.

Blue Mountains walking tracks

The impact on the heritage values of the walking tracks was considered collectively and generally in the assessment. Tracks (by their very nature) wind through the landscape and in certain areas could traverse exposed and elevated contexts or open valleys, some of which may be under flight paths. In other areas, they would be situated below ridges, under sandstone overhangs and/or in deep narrow valleys. Many tracks in the Blue Mountains connect Aboriginal sites such as engravings, spiritual sites and shelters with pigment art. A walker would likely need to be in an exposed or ridgetop area under a flight path at the specific time when an aircraft is overhead to experience any potential impact.

Walking tracks within the GBMA have been further considered in Technical paper 10: Social (Technical paper 10) and Technical paper 14: Greater Blue Mountains World Heritage Area (Technical paper 14), and these assessments found that visitors may experience some changes to the use and enjoyment of walking tracks within the Blue Mountains.

People who visit and use walking tracks in the N60 and N70 contours are likely to experience moderate changes to their use and enjoyment. The majority of the broader GBMA is largely outside the area predicted to experience aircraft noise at or above 60 and 70 dB(A) (as per Technical paper 1). There are no walking tracks in the GBMA within the N70 contours, however some tracks have been identified to be within N60 contours.

Table 17.5 Estimated noise and visual intrusion at a selection of historic heritage items of cultural value[4]

Item name	Sensitivity issues	Noise range L_{Amax} (dB(A))	N60 (24-hours) number of movements	Potential Impacts
Fernhill Mulgoa SHR 54	Sandstone buildings – possible impact of emissions on building fabric. Noise Visual Emissions – effect on sandstone	~70 dB(A)	10–20 movements per 24 hrs at or above 60 dB(A)	The homestead is currently in a quiet rural setting. The property would be directly overflown by some night-time departures when Runway 05 is in use. Altitude of departing aircraft is around 2,500–5,000 ft. There will be some day-evening incoming flights to Runway 05 descending from 8,000 ft to 5,000 ft. Some aircraft (overnight or day-evening) may fly lower altitude depending on weather and operations conditions. Likely impact of noise on the cultural values will be moderate given the tranquil rural setting. Impacts will be similar to St Thomas Church (SHR 426) and locally significant places in Mulgoa.
Lilianfels SHR 431	The maintenance is supported through its sympathetic reuse as a wellness spa. Noise Visual	50–55 dB(A)	No movements at or above 60 dB(A)	Not underneath the flight paths but less than 5 km away. The altitude of aircraft would be >10,000 ft (AMSL). Impact is low.
Everglades gardens SHR 1498	Air pollution/cumulative pressures added emissions and climate change	50–55 dB(A)	No movements at or above 60 dB(A)	Not underneath the flight paths but less than 5 km away. The altitude of aircraft would be >10,000 ft. Sydney (Kingsford Smith) Airport aircraft already overflies the property. Noise and visual impacts expected to be low.

---

[4] The estimated noise and visual intrusion assessment does not account for off-procedure manoeuvring areas. Sites within a departure or arrival transition area may sometimes be overflown as runway modes of operation change.

Item name	Sensitivity issues	Noise range L_{Amax} (dB(A))	N60 (24-hours) number of movements	Potential Impacts
Linden Observatory SHR 1807	Dark sky proposal; visual, sensitive to noise night-time flights	60–65 dB(A)	10–20 flights per 24 hrs at or above 60 dB(A)	Day and night flight path corridors pass over this heritage item. Aircraft will be visible. The altitude of aircraft will be 5,000–13,300 ft, depending on the flight path. Some aircraft may fly at a lower altitude depending on weather and operational conditions. Noise levels and visual impacts are expected to impact cultural values especially 'dark sky' and amateur astronomy. Impact expected to be moderate. Further assessment of the impacts to activities at this observatory has been completed since exhibition of the Draft EIS. This found that most of the activities at the Linden Observatory should still be able to occur, potentially at a reduced capacity. Most of the impacts of the project would require a temporary pause in activities on a given night and/or adaptation to activities conducted at the site. The light emitted by passing aircraft is short-term with the sky reverting to being dark once the aircraft passes. The entire sky would not be impacted. The project is not anticipated to result in the loss of the State Heritage listing for this item or significantly diminish the significant values for which the site is recognised.
Wynstay Estate 1875 SHR 1520	Significant buildings; combination of materials brick, sandstone, corrugated iron	Under 60 dB(A)	No movements at or above 60 dB(A)	Aircraft would be less than 2 km away to the south-west and flying at more than 10,000 ft. Noise and visual impact is expected to be low.
Kirkham Stables and Precinct c1816 SHR 1411	Building complex Masonry, iron roof, rough cast cement on stone foundations Effects of emissions on building fabric and treatments	Under 60 dB(A)	No movements at or above 60 dB(A)	Flight path avoids direct over flight but would be distantly visible less than 5 km away to the north. The altitude of aircraft would be greater than 10,000 ft (3 km). Likely impact is negligible.

Item name	Sensitivity issues	Noise range L_{Amax} (dB(A))	N60 (24-hours) number of movements	Potential Impacts
Thompson Square Windsor SHR 126	Cumulative impacts after major impact of TfNSW – Windsor Bridge	Under 60 dB(A)	No movements at or above 60 dB(A)	Thompson Square would be directly overflown. The expected altitude of aircraft would be greater than 10,000 ft (3 km). Proposal impact alone is likely to be minor but cumulative impact on liveability of historic homes may be significant given other recent impacts.
The Carrington, Katoomba SHR 00280	Building fabric – unknown impacts of emissions on building fabrics Noise sensitivity for patron/guests	50–55 dB(A)	No movements at or above 60 dB(A)	Katoomba would be avoided as a residential area. Flight path avoids direct over flight but would be distantly visible less than 5 km away to east and north. The altitude of aircraft will be greater than 10,000 ft (3 km). Impact is negligible to low.
Hobartville, Richmond SHR 00035	Complex of buildings from early colonial period. Sandstock brick mansion, slate roof, stone elements	Under 60 dB(A)	No movements at or above 60 dB(A)	Example for Richmond township. Due to restrictions posed by RAAF Base Richmond, the township would be overflown as main north–south flight path. Flight paths run above the RAAF flight paths. The property would be directly overflown. Aircraft are expected to be at an altitude of greater than 10,000 ft (3 km). Noise and visual impacts expected to be minor.
Camden Park Estate/ Belgenny Farm SHR 01697	Cultural landscape/cultural complex – any features. Camden Park house – stuccoed sandstock brick, local cut stone detail, sandstone Effects of emissions on building fabric and treatments Noise visual	Under 60 dB(A)	No movements at or above 60 dB(A)	Would not be overflown. Flight path avoids direct over flight but would be distantly visible less than 5 km. The altitude of aircraft will be greater than 10,000 ft (3 km). Low impact.

17.5.2.2 Impacts to historic heritage places from air pollution and climate change

There are few studies on the impact of air pollution on historic heritage places and its mitigation. While some studies have looked at air pollution generally, there is little specific information available regarding aviation pollution. Available information includes:

- anthropogenic air pollution (caused by humans or their activities) is a major cause of damage to heritage buildings, including 19th Century sandstone structures in Sydney
- Sydney (yellow block) sandstone (building material employed in many 19th Century buildings) is a highly porous and friable building material. It is vulnerable to weathering from natural and anthropogenic pollution
- main sources of anthropogenic ambient pollution in Sydney include emissions from motor vehicles and coal fired power stations (Paton-Walsh et al. 2019)
- air pollution is generally known to increase the rate of natural weathering by about one to 2 times (Varotsos et al. 2009)
- aircraft engines contribute to ambient air pollution in general, especially when flying at altitudes below one km (Masiol and Harrison, 2014)
- sulfuric and nitric acid (derived from sulfur dioxide and nitrogen oxides from motor vehicles and aircraft) decreases the pH of rain causing acid rain (Sesana et al. 2021)
- acid rain and secondary minerals (salts) are major contributors to the destruction of the outer layers of sandstone architecture in urban areas (Marszalek et al. 2014)
- recent changes in air pollution standards internationally have led to a shift in the causes of damage to stone heritage buildings away from traditional sources of air pollution to increased activity by algae (Smith et al. 2008)
- no known published studies have linked pollution from aircraft directly to the destruction of heritage items.

Emissions can have an impact on the physical fabric of buildings and are known to have an impact on sandstone (a material used in many significant historical buildings). It is likely that other fabrics and finishes are also affected over time. It is not currently possible from the available data to quantify that impact, as there have been no long-term baseline studies undertaken to monitor impacts of such industrial emissions.

It is not currently possible to provide any quantifiable assessment of the likely cumulative impact of any emission related to the project in addition to the existing and emerging climate change impacts on heritage gardens because no baseline data exists regarding the current climate change impacts. As such, the introduction of new or increased airborne pollutants would have an unknown impact on the ability of these gardens to cope and adapt to environmental changes. Further discussion is provided in Section 6.2 of Technical paper 9.

17.6 Mitigation and management

17.6.1 Project specific mitigation measures

The design of the flight paths has been an iterative process with consideration given to significant cultural places and the values which might be impacted by aircraft flying overhead. Further consideration has been given to avoid and minimise impacts on Aboriginal cultural heritage during detailed design and operation. Mitigation measures to address the key impacts identified in the assessment are summarised in Table 17.6.

Table 17.6 Proposed mitigation measures – heritage

ID No.	Issue	Mitigation measure	Owner	Timing
H1	Aboriginal heritage	DITRDCA will ensure that the detailed design phase considers Aboriginal cultural places and values, noting that safety is not negotiable and that capacity, environment and efficiency factors must also be considered in the flight path design.	DITRDCA	**Pre-operation** (Detailed design, 2024–2026)
H2	Heritage	A research program will be undertaken to investigate the potential impact of aircraft emissions on historic and Aboriginal heritage sites (including rock art sites), with a particular focus on sites within the Greater Blue Mountains Area. The research program will be designed and implemented in consultation with Heritage NSW and include participation of local First Nations stakeholders.	DITRDCA/ Airservices/ WSA Co	**Pre-operation** (Detailed design, 2024–2026) and **Operation** (Implementation, 2026–ongoing)
H3	Heritage consultation	WSA Co will establish a CACG for WSI which will facilitate consultation with stakeholders and community on a range of matters including heritage issues.	WSA Co	**Pre-operation** (Detailed design, 2024–2026)

Separate mitigation measures have been identified to manage risks of aircraft noise, wildlife strike and fuel jettisoning, and further detail on these measures can be found in Chapter 24 of the EIS.