people place heritage

CONTEXT

SIDING SPRING OBSERVATORY

Heritage Management Plan

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Prepared for
Australian National University

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Report Register

This report register documents the development and issue of the report entitled *Siding Spring Observatory: Heritage Management Plan* undertaken by Context Pty Ltd in accordance with our internal quality management system.

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EXECUTIVE SUMMARY

This Heritage Management Plan (HMP), prepared by Context Pty., is the first comprehensive and integrated assessment of the built, natural and Indigenous heritage values of the Siding Spring Observatory (SSO) against the Commonwealth Heritage List (CHL) criteria.

Located approximately 20km to the west of Coonabarabran in north east NSW, the Siding Spring Observatory is Australia's premier optical and infrared observatory. The site, which is owned and primarily managed by the Australian National University (ANU), is situated 1,165metres (3,822 ft.) above sea level in the Warrumbungle National Park on Mount Woorut, also known as Siding Spring Mountain.

The Commonwealth's *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), its accompanying regulations and the *Environment and Heritage Legislation Amendment Act* 2003 require all government agencies to conserve and manage the heritage values of places in their control. The ANU has committed to the identification, protection and conservation of the heritage values it manages through its Heritage Strategy. The ANU's commitment to managing its heritage values is illustrated by the range of heritage management tools it has developed and in the active role of the ANU Heritage Officer within the Facilities and Services Division.

The SSO was built in the early 1960s as a field station of the Mt Stromlo Observatory in a bid to distance Australia's astronomical research from the increased light pollution from Canberra. Since that time, the SSO has become Australia's principal centre for astronomical research and the facility continues to be used by scientists from around the world.

The Siding Spring Observatory occupies the prominent ridge of Mt Woorut, a place of natural significance for its landscape (aesthetic), geological and biodiversity values, many of which it shares with the adjacent National Heritage listed Warrumbungle National Park. This location has strong associations for Aboriginal people of the Gamilaroi language group, partly for dark skies and reasonable freedom from cloud, and this led to its selection as the location for what is now the foremost optical observatory in Australia, and one of the foremost in the southern hemisphere. Begun in the 1960s, the site retains a collection of telescopes and related structures (the largest in the country) from every decade of its existence, including the biggest and best in the country, many of which have been responsible for some of the most important astronomical programs and discoveries of modern times. The site of today as a whole is a product of significant historic relationships and political decisions, the historic and continuing development of Australian astronomy, use by astronomers from across the globe and increasingly now remote operators, as well as public visitation.

The heritage assessment contained within this HMP has identified that the SSO meets the threshold for Commonwealth Heritage listing against all of the listing criteria. The heritage values of the SSO are embodied in the layered cultural and natural landscape of the campus, and its various elements, none of which are currently subject to a heritage listing.

This HMP is one such tool and satisfies an obligation of the EPBC Act to identify and assess the heritage values of the whole of the SSO.

Policy for the management of the Siding Spring Observatory is founded on the historic and continuing role of the place in Australian and international astronomy, which has created a heritage place of historic, technical and associative value, at a site which also has natural values and is cumulatively of social, aesthetic and Indigenous value. The SSO site provides important evidence of the operations of the ANU Research School of Astronomy and Astrophysics (RSAA), the Australian Astronomical Observatory (AAO) and their predecessors. The policy vision is to conserve the significant attributes of heritage fabric, site form, views and associations whilst allowing that the site should continue to develop as an optical observatory and provide the public with access to appreciate this significance and interpretation that communicates both significance and stories of place. Policy will include strategies for short, medium and long term site changes and maintenance.

To conserve the ANU's heritage values, the Facilities and Services Division, in close cooperation with the Research School of Astronomy & Astrophysics (RSAA), the Australian Astronomical Observatory (AAO) and other site users, will continue to actively develop, revise and implement its heritage management tools which support the conservation of the array of heritage values and places.

This study acknowledges the obligations on the site's managers that arise from the heritage values of the SSO site and emphasises the need for rigorous internal self-assessment and peer-review processes in any future development proposals.

This report forms Volume 1 of the Heritage Management Plan. Volume 2, the Heritage Inventory, contains a series of entries relating to individual buildings and sites. This inventory includes descriptions, historical overviews and heritage assessments of the individual buildings and is linked to a GIS layer provided for incorporation into ANU management systems.

FIGURE INDEX

1 INTRODUCTION

1.1 Project Background

In March 2014 the Facilities and Services Division of the Australian National University (ANU) commissioned Context Pty to prepare a Heritage Management Plan (HMP) to identify and assess the heritage values of the Siding Spring Observatory (SSO) and to provide conservation and management guidance based on these findings.

The SSO was built in the early 1960s as a field station of the Mt Stromlo Observatory in a bid to distance Australia's astronomical research from the increased light pollution from Canberra. Since that time, the SSO has become Australia's principal centre for astronomical research and the facility continues to be used by scientists from around the world.

In 2012 ANU prepared a Preliminary Assessment of the 40 Inch Telescope Building at the SSO and identified at least historic, representative, creative/technical and associative values for the site. Previous to this, in 2006, a Community Based Heritage Study undertaken for the former Coonabarabran Shire assessed the Observatory as being of State level heritage significance, as well as being an important tourism icon for the region.

This HMP forms part of the continued ANU program to identify and assess the value of heritage places under its management in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) and in line with its Heritage Strategy. This HMP follows the production of studies for other ANU managed sites - Mt Stromlo Observatory and Acton Campus.

The HMP also provides direction for the Siding Spring Campus Master Plan 2030 which is currently in preparation. The Campus Master Plan is intended to act as the anchor document for the ANU's development processes, providing a coherent framework for future development.

In summary, the HMP conveys a full understanding of the heritage values attached to the SSO, in order to:

- provide inputs into masterplanning for the site
- inform possible nomination to the Commonwealth Heritage List (CHL)
- meet with best practice in site heritage conservation and management; and
- develop specific heritage policy and recommendations to guide future management.

1.2 Study Area

The Siding Spring Observatory site is in north east NSW, 20km to the west of Coonabarabran in the municipality of Warrumbungle Shire. Coonabarabran provides regional support services to the SSO site, and a number of staff travel from the town by bus on a daily basis. The site lies at the eastern edge of Warrumbungle National Park, and is surrounded by it on its northern, western and southern sides.

The site comprises Commonwealth Land owned by the ANU and is thus managed in line with the Commonwealth EPBC Act in addition to the NSW and local legislation, and through cooperation with Warrumbungle Shire Council and the NSW National Parks and Wildlife service

The site comprises a range of research structures extending along a ridge running east from Mt Woorut (Siding Spring Mountain). They now include almost 20 separate telescope facilities, together with tourist facilities, resident staff and visitor accommodation and infrastructure, totaling around 40 structures. In most directions the site is prominent from a distance owing to

the white domed telescope structures and in particular the massive Anglo-Australian Telescope (AAT) in the centre of the site. The site is shown on Plan 1.

1.3 Broad Project Methodology

This HMP has been prepared in line with the requirements of the ANU and of the EPBC Act, in particular Section 341s of the Act and Schedule 7A—10.03B and 10.03G of its regulations. It follows guidelines defined for such assessments in: *Management Plans for Places on the Commonwealth Heritage List: A guide for Commonwealth Agencies* (Department of Environment and Heritage, 2006) and *Working Together: Managing Commonwealth Heritage Places. A Guide for Commonwealth Agencie*s (Department of the Environment, Water, Heritage and the Arts 2008).

The HMP follows principles on assessing and managing heritage places and their values outlined in the Australia ICOMOS Burra Charter (2013), and it uses terminology defined by the Charter throughout.

Specific methodologies employed in the production of parts of this HMP are set out where relevant.

1.3.1 Stakeholder Consultation

Stakeholder consultation was undertaken in two phases in order to maximise its effectiveness within the confines of the project. It was informed by a stakeholder contact list which was formulated at the beginning of the project with the assistance of the ANU Heritage Officer.

Initial consultation via telephone and email was undertaken early in the project. This ensured that the consultants gained an initial overview of the SSO and its associated values to inform site research and analysis and enable early input to the masterplanning process, and that early contact was made with individuals and organisations from which additional information would be required later in the process.

The second phase of consultation comprised targeted and in-person meetings and conversations to draw out richer and more relevant information and focus on the identification of heritage values. This was complemented by the use of an online survey, circulated through the networks of stakeholders that had been identified at the beginning of the project and in the first consultation phase and through the wider community, and to which 244 replies were received.

An iterative approach was employed for gathering and building upon information, with additional stakeholder consultation employed as required to supplement and reinforce the site history and the various values assessments.

1.3.2 Site Investigation and Recording

Context's project team undertook a three day site visit to the SSO on the 19th -21st May 2014. During this time the site and each of the buildings and other structures within it was inspected and recorded externally and also internally for most, and a number of ANU and AAO staff members were questioned in relation to activities at the site.

At the same time off-site meetings and interviews were conducted with representatives of Warrumbungle Shire Council, including staff at the Coonabarabran Visitor Information Centre, local residents, including former staff and historical society members, and representatives of the relevant Traditional Owner groups.

1.3.3 Alignment with Site Masterplanning

The production of the Campus Master Plan will be informed by this HMP. But in order to provide early input to the masterplanning team, and ensure that the process has been adequately informed of preliminary aspects of the site's heritage, an Issues and Opportunities Paper was prepared by the consultants following initial research and the first phase of consultation. This was then revised following the site visit and its findings incorporated into the masterplan under the guidance of the ANU Heritage Officer.

1.3.4 GIS Based Inventory

Information presented in the site inventory (Volume 2), relating to each building or structure and its history, description, condition, heritage significance and relevant management recommendations, has been entered into a spreadsheet attached to a specially prepared GIS (Global Information System) layer.

It is intended that this can be aligned with ANU's current databases and mapping capabilities to provide a useful site management tool that can be viewed, searched and updated as appropriate. This will also enable individual components to be linked to relevant heritage listings in the event that the site or particular parts of it are designated. It will also enable illustrative maps to be produced quickly and easily and facilitate the export of data to other ANU departments and stakeholder organisations.

1.4 Structure of the Report

Volume 1 of the HMP comprises eight sections, as listed below. Volume 2 of the HMP then comprises a GIS referenced inventory of the buildings and structures on the site.

Aside from this introductory section (Section 1), Volume 1 of the Heritage Study includes:

Section 2 - This section sets out the history of the Siding Spring Observatory, as a foundation upon which to determine its heritage significance. It begins by describing the wider context within which the site was established, and then provides a historical account for the Siding Spring Observatory itself.

Section 3 - This section describes and analyses the physical place and its setting, including the structures, various discernable areas and other features within the site and its archaeological potential

Section 4 - This section responds to the previous sections and provides an analysis of the historic, social, community aesthetic, Indigenous and natural values of the SSO site

Section 5 - This section provides an assessment of the cultural heritage significance of the Siding Spring Observatory. It applies the Commonwealth Heritage Criteria to the SSO site and then presents a Statement of Significance for the place as a basis for the policy and management recommendations provided in the following section. It then identifies the attributes to which this significance is attached and discusses their relative significance.

Section 6 - This section discusses the current and future management situation at the site and identifies issues that should be considered in managing its heritage values.

Section 7 - This section contains the heritage management policy and implementation recommendations for conserving and managing the heritage values of the SSO site

Section 8 – This section sets out the references used in the production of this HMP.

A series of appendices to Volume 1 contain the following:

- Commonwealth Heritage List Criteria
- The results of the online survey conducted to inform this HMP
- Notes from interviews about the SSO
- A review of existing materials relating to aesthetic value:
  - Image examples of Aesthetic Value Expression in the Public Domain
  - Text Examples of Aesthetic Value Expression in the Public Domain
- A list of species recorded at the SSO
- Details of this HMP's compliance with the EPBC Act.

1.5 Acknowledgments

The consultants would like to thank the following for their assistance in the production of this HMP:

- Staff at ANU Facilities and Services Division, including Amy Jarvis (née Guthrie), Heritage Officer; Sarah O'Callaghan, Site Operations Manager (Acting); Amanda Wherrett, SSO Tour and Administration Officer; and Tim Yiu, Biodiversity Officer at ANUgreen Sustainability Office;
- Staff at ANU Research School of Astronomy & Astrophysics (RSAA); including Peter Verwayen, Senior Operations Officer; Dr Milica Symul, School Manager; and Professor Matthew Colless, Director;
- Staff at the Australian Astronomical Observatory (AAO); including Professor Warrick Couch, Director; and Professor Fred Watson, Astronomer in Charge;
- Steven Tucker, NSW National Parks and Wildlife Service Ranger at Warrumbungle National Park;
- Interviewees, including the following:
    - Aileen Bell, Manager Economic Development and Tourism at Warrumbungle Shire Council, and President of the Arts Council;
    - David Baker, owner and operator, and Cameron Wylie, astronomer in charge, at the Milroy Observatory;
    - Frank Freeman, ex AAO employee (UK Schmidt Telescope);
    - John Whitehead, current member of the Regional National Park Committee, local historian and author and Warrumbungle Shire Council Civil Engineer 1966-1994;
    - Joy Pickett, local Coonabarabran resident;
    - Judy Over, former long-term staff member at the SSO;
    - Nancy Wiese, President of Coonabarabran DPS Local and Family History Group Inc.;
    - Narelle Andrews, Chief Executive Officer of Coonabarabran Local Aboriginal Land Council (CLALC); and
    - Merv Sutherland CLALC member and Senior Team Leader NW, Repatriation and Conservation, Northern Region, Heritage Division, Office of Environment and Heritage NSW; and
- All of those who completed the online Siding Spring Observatory Heritage Survey.

2 HISTORICAL OVERVIEW

2.1 Introduction

This section sets out the history of the SSO, as a foundation upon which to determine its heritage significance.

It begins by describing the wider context within which the site was established, and then provides a historical account for the SSO itself. This site history is described in relation to that of its sister site, the Mount Stromlo Observatory in Canberra, and in terms of development phases, all of which remain visible in its physical fabric, as described in the following section.

2.2 Thematic Context

This contextual history is grouped according to a number of themes, beginning with the physical under-pinning provided by the geomorphology and the flora and fauna of this region, and then including the beliefs system of Australia's first inhabitants in relation to astronomy and the history of astronomy in an international context. The history of astronomy in Australian and the activities of various states are then discussed as a background to the establishment of the SSO.

2.2.1 The Warrumbungles Region

Geomorphology

The Siding Spring Observatory sits upon an ancient landscape within the Warrumbungle National Park which surrounds it to the north, west and south. The Warrumbungle National Park occupies a central region of the former Warrumbungle Volcano, an almost circular area of 223km^2 near Coonabarabran in central-western New South Wales (Whitehead 1993:1). In 2006 the Warrumbungle National Park was added to the National Heritage List on the basis of its extensive natural values (NHL ID 105853, File No: 1/03/201/0001).

The Park contains bold volcanic landforms and features that are unrivalled anywhere else in Australia. These features demonstrate a series of stages of the Warrumbungle central shield volcano; the inside of which is now exposed in addition to parts of its external surface and successive layers of lava (Whitehead 1993:1; Johnson 2004:47-49). A shield volcano is a type constructed almost entirely from fluid lava flows that are known for their low profile and expansive size (Johnson 2004:47). The now heavily eroded shield of the former Warrumbungle Volcano stands at 1,200metres above sea level, contrasting heavily with the lower surrounding plains (Whitehead 1993:8-14).

The former Warrumbungle Volcano is one of the larger examples that make up the main north-south volcanic line of eastern Australia, which stretches from northern Queensland to southern Victoria and ranges from 32 to 6 million years old in age (AHD place details). The Warrumbungle Volcano dates to between 13 and 17 million years ago, at which time the volcanic landscape of the Warrumbungle Range began to take shape. The Range was formed by lavas erupting from a number of vents of the Warrumbungle Volcano, rather than one central vent (Whitehead 1993:1). These vents covered a wide area and erupted at different stages of the volcano's lifespan; initially emitting thick trachyte lava, which was then layered by subsequent basalt lava flows as the volcano aged. In combination, this series of eruptions created a large cone that rose to approximately 1,000metres above sea level and had a diameter of almost 50kilometres, ninety percent of which has since eroded to produce the Range's current geomorphological landforms (AHD place details 2006:3).

The spectacular landscape of the Warrumbungle Range now consists of spires, domes, plugs and dykes that represent some of the best examples of exposed volcanic landforms along the north-south volcanic line of eastern Australia (Whitehead 2008:15-25). Notable site features include Mount Exmouth, Bluff Mountain, Crater Bluff, The Breadknife, Belougery Spire and Belougery Split Rock (Whitehead 2008:44). The topographical relief of the Warrumbungles

landscape is part of its distinct character and was also a deciding factor in its selection for what became the Siding Spring Observatory site.

Flora and fauna

The Warrumbungle Range is an important refuge for flora and fauna in inland southeast Australia, being located at the juncture of a number of distinct bioregions (as determined by the BBS Bioregional assessment, NPWS, 2002a). The Range supports exceptionally high numbers of plant and animal species due to its combination of ecosystems; the moist eastern plains and arid western plains elevated above the surrounding plains (NSW NPWS 1997, ANHAT 2005). In conjunction with the Warrumbungle's varied geology and habitats, its species wealth is also a reflection of the region's rainfall patterns and wide temperature ranges that foster a number of significant and rare plant specimens. A total of 779 plant species from 397 families and 111 genera are found within the Warrumbungle National Park, conferring it the greatest fertility yet found for a reserve on the North Western Slopes; a region that corresponds generally to the Bureau of Meteorology's *North West Slopes and Plains* forecast area (NSW NPWS 2012:7-8).

Vegetation groups of the Warrumbungle Mountains and national park reflect the relationship between the central-western plains to the west and the central-western slopes to the east (NSW NPWS 2012:7-8). Wide variations in vegetation type can largely be attributed to differences in soil parent material which are consistent either with the nutrient poor soils of the Pilliga sandstone – which fosters arid-adapted vegetation of lower elevations – or the less floristically varied vegetation characteristic of volcanic flows and deposits (NSW NPWS 2012:8-9; AHD place details 2006:4). These highly diverse vegetation types would typically be separated by considerable distances, but they occur in close proximity to one another within the Warrumbungles due to its range of geomorphic influences. The biological and ecological significance of the landscape also lies in its being minimally disturbed by agricultural development. Historically, prior to the reservation of the national park, mountainous areas of the region were grazed whilst valleys and some flat volcanic terraces which are now grassland had been cleared and cultivated (NSW NPWS 2012:8-9).

Figure 1 - The volcanic landscape of the Warrumbungle Range (Photograph by Wolfgang Bredereck & Crystal Kingdom, as cited in Whitehead 2008:50).

Figure 2 – The Siding Spring Observatory in 1965, one year after it officially opened, in the Warrumbungle landscape (ANU RSAA Archive, accessed August 2014).

2.2.2 Aboriginal Astronomy

Relationships between Australian Aboriginal and Torres Strait Islander peoples and their environment are complex and central to ongoing cultural and spiritual belief systems, which have evolved over what is understood to be at least 60,000 years of occupation. A central premise of Australian Indigenous cultural and spiritual belief systems is the emergence of ancestral beings from the earth and their creation of everything - including the land and all animals, plants, and people within it. At the conclusion of their creation journey these beings transitioned into features of the landscape including plants, animals and significant landmarks. The Dreaming and its tangible and intangible features are central to Aboriginal community members' ongoing wellbeing and provide important understanding and knowledge to the world.

The astronomical components of Indigenous belief systems can be understood as mirroring those of the landscape, but also inform understandings of social relations and kinship ties, cosmology, natural cycles and the stars, as well as associated traditions (Norris & Hamacher 2009:10). Although useful to separate landscape, sky, people and culture when analysing these components within western knowledge systems, these are inseparable forms of Indigenous life, health and knowledge.

It is well-documented that Indigenous Australian cultures are the oldest continuing Indigenous cultures in the world, and were therefore likely to be among the first human beings to incorporate celestial knowledge into their way of life (Bhathal 2006:27). Aboriginal astronomical knowledge is conceptually different from that of western astronomy but shares parallels. According to Haynes (1996 7-8):

> *both systems are an attempt to construct a view of the Universe as an ordered and unified system, but….[Aboriginal astronomical systems] are relational rather than mathematically-based, and … concerned with similarity rather than difference, with synthesis rather than analysis, with symbiosis rather than separation…[for Aboriginal communities] the stars not only evoked wonder, they predicted and explained natural occurrences and provided celestial parallels with tribal experiences and behavioural codes.*

This knowledge is typically described through songs or stories associated with the sky and constellations; termed 'socio-cultural astronomy' in western terms, in other words -

information that is absorbed into all aspects of daily religious, social and cultural life (Bhathal 2006:27).

According to Norris & Hamacher (2009) the focus of Aboriginal 'socio-cultural astronomy' is to identify representations of individuals or events that are connected to oral accounts of how the world was created. In addition to these narratives, observation of the stars, planets and the moon and sun are traditionally utilised as a means of navigation, food economics and time-keeping, which varied according to geographical location and the oral traditions of distinct cultural groups (Norris & Hamacher 2011:99).

Across Australia there are a countless ways in which the night sky has been used by Indigenous communities.

2.2.3 Astronomy on an International Scale

Astronomy is one of the oldest natural sciences practiced by the world's civilisations, who have methodically observed the moon, planets and stars for several millennia. Beyond the basic need to note seasonal markers in order to develop calendars and control and maintain food supplies, astronomy also represents a human desire to understand the world that we inhabit (Ruggles 2005:V). Prior to the invention of the telescope, the earliest systematic observations of the night sky were undertaken by the Babylonians from the fourth millennium BCE (Before Common Era), who combined astronomy with mathematics to understand the movement of planets and develop the zodiac as an important reference system (Decati 2013:19). Other ancient civilisations followed closely in this pursuit and incorporated astronomy into many aspects of their cultural traditions. Extant examples can be found in the many notable prehistoric monuments built facing directions determined by astronomical study, including Stonehenge in the United Kingdom, New Grange in the Republic of Ireland, an ancient observatory at Beijing, China, the Pyramids of Giza in Egypt and Chichen Itza in Mexico (Decati 2013:2&33).

Up until the end of the thirteenth century, landmark astronomical discoveries were made by Hellenic, Arabic and Islamic cultures, whilst the discipline remained largely stagnant in most of Europe (Decati 2013:20). At this time the Renaissance – a period spanning approximately the fourteenth to seventeenth centuries – began an era of cultural development that reverted back to the influence of classical sources, towards artistic, political, scientific and philosophical revival (Dunn 2009:44). Astronomy experienced a particular resurgence, as a practical solution to two critical needs of the period: navigation and time data control as Empirical expansion began in earnest. In 1540 a notable discovery was made by Polish astronomer Nicholas Copernicus that placed the sun – rather than the earth, as earlier thought – at the centre of the universe, around which all planets and their moons revolved (Anderson 2007:21). The early seventeenth century saw Italian scientist Galileo Galilei invent a refracting telescope, now known as the 'Galilean Telescope', which produced controversial discoveries; for instance, that the planets and sun were not perfect spheres (Anderson 2007:30-31). It was also during the Renaissance that Sir Isaac Newton invented the universal law of gravitation explaining the motions of the universe, as well as the first reflecting telescope in 1668 (Anderson 2007:33-34).

The history of the telescope is indeed marked by many significant discoveries due to its profound impact as the first instrument to extend one of the human senses (Dunn 2009:8). This continued well after the Renaissance into the Age of Enlightenment – a scientific revolution beginning in the 1690s and ending at around 1800 – and beyond, which saw the telescope continue to evolve in both form and function (Decati 2013:57).

The first State observatory was opened in Copenhagen, Denmark, in 1637 and was followed in subsequent decades by the Paris Observatory, France, in 1667 and the Royal Greenwich Observatory, England, in 1675 (Dunn 2009:42-43). Each of these facilities was established with the common purpose to solve the navigational problem of determining latitude through the production of accurate star tables; through this pursuit the observatories at Paris and Greenwich quickly emerged at the forefront of astronomical telescope construction and use (Dunn 2009:43). When the National Observatory of the Argentine Republic opened at

Cordoba in 1870, there were observatories in the three southern continents; but by Australia's Federation in 1901, the foremost observatories remained in the northern hemisphere (Frame & Faulkner 2003:12).

This remained true into the first decades of the twentieth century, in part as the First World War drained resources the world over. But many of the most interesting celestial objects could not be seen from the latitudes of Europe or the United States, and so the US began to make enquiries into founding its own southern observatory in Australia (Decati 2013:302). However, the establishment of the Commonwealth Solar Observatory at Mount Stromlo, Canberra, in 1924 thwarted America's efforts and cemented Australia's place as an international player in astronomy (Frame & Faulkner 2003:31). The facilities and equipment at Mount Stromlo were – at its inception – the most comprehensive in the southern hemisphere (Miller c1970:2). Together with the work of the CSIRO, Australia was at the forefront of radio astronomy (a field that had only existed since the 1930s) by the mid-twentieth century (Robertson 2007).

In 1960, there were only ten astronomical observatories in the southern hemisphere compared to the 88 that operated north of the equator (CTIAO). The decade after the end of the Second World War saw a dramatic increase in the expansion of astronomy with large optical and radio telescopes being developed around the world (Burton 2008:7). While the 1960s were dominated by great discoveries in radio and space astronomy, they also saw a resurgence of optical astronomy as new technology in powerful and sensitive telescopes emerged (Decati 2013:297). It was in 1961 that the US finally established its own southern observatory called the Inter-American Observatory at Cerra Tololo, Chile, followed closely by the European Southern Observatory – an international astronomical organisation – at La Silla, Chile in 1962 (Decati 2013:302). Contemporaneously with these sites, in the early 1960s, a new southern observatory was founded as a Field Station of Mount Stromlo in regional New South Wales, Australia at Siding Spring Mountain (Frame & Faulkner 2003:141), and in 1967 the decision was reached to build a major optical telescope at the site - the 150-inch Anglo-Australian Telescope (AAT) that would be the largest in the southern hemisphere (Gillespie 2011:34). The Siding Spring Observatory is now one of the foremost observatories in the world, having been responsible for a number of advances in modern astronomy, and it continues to be utilised by scientists the world over (NSW SHI, 'AAO').

The Siding Spring Observatory is comparable in location, equipment and potential with only a handful of other astronomical facilities worldwide. These include the European Southern Observatory at three sites in northern Chile (established 1960s) that build and operate some of the world's most advanced ground-based astronomical telescopes, the H.E.S.S. Site in Namibia (established 2002), which contains a stereoscopic telescope system, and the Las Campanas Observatory (established in 1969 replacing the earlier Wilson Observatory) in the Atacama Desert of Chile, which will be home to a new Giant Magellan Telescope by 2019 (European Southern Observatory; H.E.S.S.; Las Campanas).

2.2.4 Astronomy in Australia

State Government-run astronomical observatories were established in the colonies of Victoria, South Australia, New South Wales, Tasmania and Western Australia at different stages throughout the mid to late-nineteenth century (Gascoigne *et al.* 1990:5). As well as being literally uncharted territory, astronomy of the southern sky also became an arena in which the burgeoning Australian colonies could demonstrate their scientific capabilities to an international audience, especially in the context of the wave of international rivalry swelled by the London 'Great Exhibition' of 1851 (Gillespie 2011:40). Much like England's Royal Greenwich Observatory (established 1676); these facilities formed the scientific foundations of their respective governments and were highly valued. Being an island of colonies largely dependent on maritime transport, the State observatories performed an important function for marine navigation, as well as providing essential rainfall and climatic data for Australia's agricultural economy (Edwards 1993:350).

However, the 1890's economic depression in Australia saw state-run observatories lose many of their civil functions to other government departments by the turn of the century. The

Federation of Australia in 1901 exacerbated this issue, as the Australian Government adopted a constitutional responsibility to undertake 'astronomical and meteorological observations' by legislating the 1906 *Meteorology Act* (Frame & Faulkner 2003:17). With the authority of the Act, the Commonwealth Meteorological Bureau – now known as the Bureau of Meteorology – was established in 1908, and in the same year all State observatories formally handed over their meteorological responsibilities to the Commonwealth Bureau. One major work undertaken at State level after this date was part of an ambitious international program begun in 1887, called the *Carte du Ciel* or *Astrographic Catalogue*, an undertaking to photographically map the whole sky, of which Australia was accountable for a significant portion. The *Catalogue* was not completed until 1964, by scientists at the Sydney Observatory (Gascoigne *et al.* 1990:6). Aside from the *Catalogue*, the State observatories participated in general astronomical observations (Gascoigne *et al.* 1990:6).

Throughout the twentieth century the State observatories struggled to maintain the necessary funding to survive and have all since ceased their formal scientific and research functions; Perth ceased functioning as a research facility as recently as 2013 (Gascoigne *et al.* 1990:6). It was an evolution of the State observatories together with calls for a major southern observatory that led to the establishment of the first Commonwealth Solar Observatory at Mount Stromlo (1924), and subsequently that at the SSO (1965).

New South Wales

In 1821 Sir Thomas Brisbane, the Governor of New South Wales, established a private optical observatory at Parramatta just outside Parliament House. This Parramatta Observatory was the first successful attempt at an astronomical observatory in the southern hemisphere (Coonabarabran Tourist Centre information panel, viewed June 2014). Observations began at the Observatory the following year with achievements including the rediscovery of a periodic comet that orbits the earth every three years, called 'Encke's Comet', in 1822 (NSW State Records Archives: HRA Series I vol. XXV Note 109). The facility became disused upon Brisbane's retirement in 1825, at which date the Observatory's telescopic implements were sold to the Government, although they were retained at the facility (Gascoigne *et al.* 1990:5). Under control of the Colony of New South Wales, from 1826, the Parramatta Observatory was managed by a succession of Superintendents who maintained its equipment but neglected the building, and by 1847 this was in such a dilapidated state that it was closed and the instruments packed away for preservation (NSW State Records Archives: HRA Series I vol. XXV Note 109).

Following the closure of the Parramatta Observatory, in 1855 it was decided to re-establish a new building within the immediate vicinity of Sydney, with 'proper clocks and proper instruments for determining the time', and the site of this new observatory is now known as Observatory Hill (NSW State archives: Agency number 113). As described by then Governor of NSW, Sir William Denison, the new observatory would:

> *[Enable] captains of vessels to rate their chronometers … a practical example of the application of science … [for] the trigonometrical survey of the country … [and for] connecting this Colony with the Scientific Societies of Europe and America* (NSW State Records Archives: Agency number 113).

The main function of the Sydney Observatory was to provide a timekeeping service through its time-ball tower, and the time-ball, which historically dropped every day at 1pm, still operates today (NSW State archives: Agency number 113). The facility also played a key role in the ambitious international *Astrographic Catalogue* program, begun in 1887, which sought to photographically map the whole sky (NSW State archives: Agency number 113). Sydney Observatory was the final Australian institution to complete its part of the project in 1964 (Gascoigne et al. 1990:6). The Sydney Observatory's ongoing and significant contribution to astronomical research is the reason that it was one of the last State-managed facilities to close, this ultimately occurring due to a combination of issues, namely: light pollution, reduced need for electric telegraphy and radio that eliminated local time and navigational services, as well as the transfer of meteorology to the Commonwealth (NSW State archives: Agency number 113; Frame & Faulkner 2003:43). The Sydney Observatory formally ceased its scientific work in

1982 but retained much of its original astronomical equipment and built structures (NSW State archives: Agency number 113). The facility at Observatory Hill has since become an astronomical museum and public resource managed as part of the Powerhouse Museum.

Another independent NSW facility was Tebbutt's Observatory at Peninsula House in Windsor, named after astronomer John Tebbutt II who built the house (1842) and private observatory, and who appears on the Australian $100 note in commemoration of two comets discovered from the site. Tebbutt's first Observatory, which was built in 1863, has been demolished. But his second Observatory, which was built in 1874 to accommodate a larger telescope, remains and is open to the public in 2014, along with the two telescopes; the smaller of 1864 and larger dating to 1879 (HC NSW).

Victoria

In 1853, the first Victorian astronomical observatory was established at Williamstown, one of Melbourne's two ports at the time. Its primary function was as a timekeeping facility that enabled ships' captains to calculate the accuracy of their chronometers, which were essential for maritime navigation on long sea voyages (Gillespie 2011:33).

A minor observatory was also set up at Flagstaff Hill in Melbourne's northwest in 1857. After completing a magnetic survey of Victoria the observatory closed, to amalgamate with the newly opened Melbourne Observatory in 1862 (Gillespie 2011:33-34). The discovery of gold in Victoria in 1851 stimulated the economy of the State – and therefore of Melbourne – attracting professionals, artisans and merchants during a period of intense cultural and political development. The newfound wealth of the State of Victoria was met with calls for a major government-backed astronomical research institute that rivalled those of Edinburgh, Greenwich and Cape Town (Gillespie 2011:29). As a champion of this cause, Professor William Wilson of Melbourne University declared to Australia's Philosophical Institute in 1856:

> *The latitude of Melbourne is nearly the same as that of Cape Town. In transparency of atmosphere it can vie with any country in the world; as the metropolis of the great nation of the south, it possesses means and appliances, wealth and energy, with which no place on this side of the equator can enter into competition* (Cited in Gillespie 2011:30).

The Williamstown and Flagstaff Hill observatories were both closed and amalgamated into the new Melbourne Observatory, which was established in 1862 on a new site opposite the Botanic Gardens in South Yarra (Gillespie 2011:34). An amalgamation of resources from these two earlier institutions made it the leading observatory in Australia for the short period it operated. Regrettably light pollution from the growing Melbourne metropolis made observation increasingly difficult, and this was made worse by the floodlit Shrine of Remembrance which opened in parkland opposite the facility in 1934, and use of the Melbourne Observatory declined before its final closure in 1945 (Royal Botanic Gardens Melbourne website). Many of the Observatory's original buildings – dating between 1862 and 1902 – remain at the site, along with two of its telescopes, and the site is now managed by the Royal Botanic Gardens as a tourist attraction (Royal Botanic Gardens Melbourne website).

Notably, in 1869, the Melbourne Observatory became home to what was then the largest equatorially mounted telescope in the world, a 48-inch speculum metal reflector dubbed the 'Great Melbourne Telescope', which reflected Great Britain's pride in the achievement (Gillespie 2011:63-64). The telescope was used at the site for about twenty years to study southern nebulae until functionality issues forced it into disuse, and it was later sold to Mount Stromlo Observatory – established near Canberra in 1924 – when Melbourne Observatory closed (Frame & Faulkner 2003:222-230). The telescope was badly damaged in Canberra's 2003 bush fires but is now the subject of a significant restoration project between the Astronomical Society of Victoria, Museum Victoria and the Royal Botanic Gardens, where it will soon reside as an educational resource in its original building at the former Melbourne Observatory site (Great Melbourne Telescope Restoration Project website).

South Australia

A State Government-run optical observatory was founded at West Terrace, Adelaide in 1860 to establish a formal recording place of meteorological data (Edwards 1993:349). This was a timely addition to the colony's scientific capabilities, an Overland Telegraph Line connecting the state with Victoria, Western Australia and New South Wales having been completed in the preceding decade (Edwards 1993:350). The initial function of the Adelaide Observatory was to astronomically map the common boundary between New South Wales and South Australia. Equipment at the Observatory included an 8-inch equilateral telescope purchased in 1874 and a Simms transit telescope loaned from the Victorian Government (Edwards 1993:351). When the Commonwealth Bureau took over the meteorological duties of the Adelaide Observatory in 1908 its focus shifted to time data control and general astronomical observation (Edwards 1994:206). Ownership of the facility was transferred to the University of Adelaide in 1940, at which date the facility is generally considered to have closed, although it continued to perform public information services until the 1960s (Edwards 1994:209). The Observatory buildings, which dated to between 1860 and the 1880s, had been demolished by 1978 (Edwards 1993:351).

Western Australia

Western Australia was the final Australian colony to gain an astronomical facility when, in 1896, Perth Observatory was founded by the colonial government at Mount Eliza near Parliament House, overlooking the city of Perth (Frame & Faulkner 2003:11). The Observatory's two original instruments were the optical Transit Circle Meridian Telescope and the Astrographic Telescope (Perth Observatory), and its key responsibilities included weather and timekeeping services, as well as coordinating the survey and mapping of Western Australia. The Observatory also consistently reported seismologic readings between 1896 and 1966 (NHL ID 16656, File No: 5/11/020/0099). As early as 1902 the State Government made its first move to have the facility taken over by the Commonwealth, and this was a constant point of contention up until 1928 when the State made a definitive decision to retain it (NHL ID 16656, File No: 5/11/020/0099). The facility comprised a private residence for the Government Astronomer along with a purpose-built observatory which consisted of the telescope dome and support facilities. The latter is now the only extant feature of the building complex (NHL ID 16656, File No: 5/11/020/0099).

Much like other state institutions located near capital cities, Perth Observatory's effectiveness was impeded by light pollution from the nearby city, and this forced its closure at this location in 1966 (NHL ID 16656, File No: 5/11/020/0099). In the same year a new facility at Bickley in the Darling Range was opened in its stead. Both the former and current observatory sites are collectively known as Perth Observatory, being a continuation of one State Government-run facility at separate locations. The former Government Astronomer's residence at the original site is now the headquarters of the National Trust in Western Australia (NHL ID 16656, File No: 5/11/020/0099). The current Observatory at Bickley had the distinction of being the sole remaining and earliest continuing State astronomical observatory in Australia until 2013 when it was announced that all funding would cease and the facility would stop operating as a research facility to instead be opened to the public for education purposes (Heritage Council of WA: Database number 10551). Amongst its contemporary telescopic instruments the Observatory also has on display its two original telescopes (dating to c1890s) that are used as part of the facility's public programs (Department of Parks and Wildlife WA).

Australian Capital Territory

The need to establish a Solar Observatory in Australia was identified in 1905, but this was not actioned until 1909 when Dr WG Duffield (Adelaide born and later of the University of Manchester) championed the project. Delayed by the First World War, the Commonwealth Solar Observatory, located near the nation's capital at Mount Stromlo, opened in January 1924 (Miller c1970:6). In 1957, the Australian National University incorporated the Observatory, changing its name to Mount Stromlo Observatory. Mount Stromlo was foremost a research observatory and therefore did not share the limitations of its colonial predecessors that had a

mixture of responsibilities. Instead the Observatory focused on solar physics, spectroscopy and studies of the southern stars and became one of the foremost observatories in the southern hemisphere (Gillespie 2011:134). In the 1960s, light pollution from nearby Canberra and a push for a larger Australian telescope led to the establishment of the Siding Spring Observatory in April 1965 as a Field Station of Mount Stromlo Observatory.

The Canberra bushfires of January 2003 devastated Mount Stromlo, damaging much of the Observatory. As a result the site no longer retains any working telescopes which are owned or operated by ANU, and the Siding Spring Observatory became the Australian National University's main centre for astronomical research (Frame & Faulkner 2003:275). However, reconstruction at Mount Stromlo has seen the development of the Advanced Instrumentation and Technology Centre and the rebuilding of the original Commonwealth Solar Observatory building, and it remains the headquarters of the Research School of Astronomy and Astrophysics (ANU, 'Mount Stromlo Observatory').

Also located near Canberra is the Molonglo Observatory Synthesis Telescope (MOST), which is operated by the School of Physics of the University of Sydney. Begun in 1960, the original radio telescope was constructed by modification of the East-West arm of the former One-Mile Mills Cross telescope.

CSIRO Australia Telescope National Facility

Australia's Federal Government agency for scientific research, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), was established in 1926 and soon played a pioneering role in radioscopic research in Australia and internationally. The organisation's three radio astronomy observatories – collectively known as the Australia Telescope National Facility (ATNF) – are located in regional New South Wales, with a fourth currently being established in Western Australia: the Australian Square Kilometre Array Pathfinder (ATNF).

The first observatory built was Parkes Observatory, NSW, in 1961, which features the second largest movable disc telescope in the Southern Hemisphere; at 64-metres in diameter, which is known informally as 'The Dish'. Frequent upgrades have enabled the Parkes Observatory to continue in use since its completion and is has been responsible for a number of landmark discoveries in radio astronomy. The Parkes facility is regularly used in conjunction with the ATNF's other radio telescopes which include CSIRO's Australia Telescope Compact Array at the Paul Wild Observatory near Narrabri (an array of six radio antennas, each with a diameter of 22metres) and the CSIRO Mopra Telescope (a 22metre single dish radio telescope) located near to the Siding Spring Observatory. The three telescopes form a Very Long Baseline Interferometry array; a method where recordings of the same radio signal from each facility are combined to produce a single superior image (ATNF). The ATNF makes its facilities available to astronomical research programs both remotely and on-site, with the following goals:

- *To operate and develop the Australia Telescope [ATNF] as a national research facility for use by Australian and international researchers;*
- *To exploit the telescope's unique southern location and technological advantages*
- *To maintain its position as a world-class radio astronomy observatory, and;*
- *To further the advancement of knowledge (ATNF).*

Bureau of Meteorology

The Commonwealth Meteorological Bureau – now known as the Bureau of Meteorology – was established in 1906 under the *Meteorology Act* (Frame & Faulkner 2003:17), with the head office in Melbourne. From 1908 the Bureau took over all weather recording and meteorological capabilities from the State observatories, making it the main provider of weather warnings, forecasts and observations to the Australian public (Gascoigne *et al.* 1990:6). It operated as a deliverer of public service announcements rather than as a major research organisation, and as a result the Bureau was somewhat neglected as a remote sector of the

Public Services until the mid to late 1930s when the expanding aviation industry and the demands placed on the organisation by war forced an increase in personnel (Gardner 1997).

Throughout most of the twentieth century the Bureau had very little to do with university observatories or other research groups, even conflicting with the CSIRO over who was best placed to lead meteorological observation in Australia (Gardner 1997:795). However, since 1985 (after a structural change), the Bureau has been the administrator of Australian climatology and weather forecasting, as well as a leader both nationally and internationally in global meteorology (Gardner 1997:798). The Bureau has two major observatory facilities; the Culgoora Solar Observatory, near Narrabri NSW, and the Learmonth Solar Observatory in Western Australia which is jointly operated by IPS (Ionospheric Prediction Service) Radio and Space Services and the US Air Force Weather Agency. These sites operate both optical and radio telescopes, and both remain active in 2014 (Bureau of Meteorology website).

2.3 Site History

2.3.1 First People of the Land

Although a comprehensive exploration of Aboriginal community connection to the area known as the Warrumbungle Range is outside the scope of this study, some key known associations are outlined here to provide an understanding of the place.

The Siding Spring Observatory lies within the traditional country of the Gamilaroi language group. Neighboring language groups include those of Kawambarai and Weilwan communities, who are known to have occupied the Warrumbungle Range and surrounding plains for at least 20,000 years (NSW NWPS 2012:11-12). The NSW National Parks and Wildlife Service has legal responsibility for the park, but these organisations manage it jointly with the Coonabarabran Local Aboriginal Land Council and the Weilwan Local Aboriginal Land Council in order to protect its Aboriginal values.

The Warrumbungles are known by Aboriginal people as an area for teaching, meeting gathering and ceremony. Traditionally a travel route passes through the Warrumbungles for communities moving from west to east, using the mountainous high points for navigation (pers. comm. Coonabarabran Aboriginal Land Council, 21 May 2014).

In terms of tangible heritage, the identified archaeological evidence indicates that Aboriginal peoples have occupied the Warrumbungle region for at least the last 20,000 years (NSW NPWS 2012:11; Whitehead 2008:89). However, the whole of the Warrumbungle National Park has yet to be systematically surveyed, and archaeological findings do not reflect the full extent of Indigenous uses of the landscape.

The *Warrumbungle National Park Plan of Management* (2012:11-12) highlights that Aboriginal cultural material has been recorded at twenty-two sites within its boundaries. This material is predominantly flakes of quartz and less commonly chert, silcrete, silicified wood and quartzite used as implements, but other identified sites within the Park include scarred trees, burial sites, rock shelters with cultural deposits, axe grinding grooves, rock paintings and engravings, and a stone quarry (NHL ID 105853, File No: 1/03/201/0001:4-5).

Specific archaeological sites within the Park include those at Burbie Gap Cave, Crazy Man Cave, Kawambrai Cave, Greenbah Basin and Tara Cave, and two open-air sites along Wambelong Creek (Whitehead 2008:90-101; NHL ID 105853, File No: 1/03/201/0001:4-5). Notably the Tara Cave area was listed on the Register of the National Estate (which is now a statutory archive) as a place of cultural heritage significance (NHL ID 105853, File No: 1/03/201/0001:4-5). Stone tool assemblages are present in sites within the high country as well as on lower creek lines (NHL ID 105853, File No: 1/03/201/0001:4-5) and site density and use patterns point to concentrated occupation by communities at campsites along the river and creek flats of all of the watercourses flowing out from the range (Whitehead 2008:89). The artefact types and site locations are testament to the kind of subsistence strategies implemented by Aboriginal people to target food resources throughout seasonal and climatic changes, as

well as through monitoring the flow of rain-fed streams. This is discussed further in the National Heritage List citation (NHL ID 105853, File No: 1/03/201/0001:4) for the Warrumbungle National Park:

> *The pattern of occupation includes extensive Aboriginal campsites along major creeks such as Wambelong Creek [which lies north of the SSO]; artefact scatters at confluences on the branches of minor tributaries in the ranges; sites with stone tools associated with soaks and springs on mountain slopes; artefact scatters on ridge crests and mountain tops (including extensive scatters above 620ml above sea level); and occupation of scarce rock shelters and fissures in valley sides and cliffs (ERM Mitchell McCotter 1994). While permanent water is available in Wambelong Creek, it has been suggested that use of this area may have been focused on specific food resources for short periods of time* (Balme 1986:180).

As mentioned in Section 2.2.4 'Aboriginal Astronomy' of this report, the sky and the land are intrinsically linked, with the night sky also having an important role to play in travel routes, songlines and Dreaming tracks. Although an in-depth examination of specific Aboriginal night sky stories associated with the Warrumbungle region is outside the scope of this study, a recent article published in the Journal of Astronomical History and Heritage (Fuller et. al. 2014: 6-7) documents how Gamilaroi people have used night sky features for a range of reasons, from understanding when particular seasonal resources were available, to the teaching of travel routes linked to songlines of the land. It is also argued in this paper that the Gamilaroi community did not commonly travel at night and that the stars were thus not used as navigational tool, but rather (according to this paper, informed by Gamilaroi community elder and author Michael Anderson) patterns of stars were used to guide people between waypoints on the ground (for instance from a river, to a stone arrangement, to a marked tree or waterhole), and often these 'star maps' would lead to ceremonial grounds. One particular example given is a 'star map' used by Gamilaroi and neighboring Euahlayi people marking the way to a ceremonial Bora Ground at Carnarvon Gorge in Queensland.

2.3.2 European Settlement

Between 1817 and 1825 exploration of the Warrumbungle Range region was carried out by the Colonial Government, and in particular by surveyor John Oxley who explored the northern reaches of the Warrumbungles from Sydney in 1817 and 1818. The purpose of his 1818 exploration was to trace the Macquarie River and determine if it emptied into an inland sea or joined another large water course. Oxley originally named the Warrumbungle Ranges 'Arbuthnot's Range' but omitted to mention the condition of the landscape of the Warrumbungle area. In *The Warrumbungles, Dead Volcanoes, National Parks, telescopes and scrub,* John Whitehead (2008:141-4) suggests that this indicates that Oxley was not impressed with the general appearance of the land or soils, and that he subsequently did not recommend the area for occupation or future development (*Figure 6*). For this reason, land development occurred later than in other regions which were reported to be more conducive to settlement and agriculture (Whitehead 2008:4, 107).

Other early expeditions within the region were carried out by George and Henry Cox, and William Lawson, all of whom were in search for land for grazing purposes. Lawson's shepherds are known to have run sheep around the southern and western edges of the Warrumbungles (Whitehead 2008:141-4). In 1831, surveyor Robert Dixon sketched the western end of the Warrumbungle Range and annotated a peak 'Spiral Rock, called by the native Warrabungle' (sic.). Aboriginal names for topographical features were used, as provided by Aboriginal guides, under the direction of Surveyor General Mitchell. Following this, variations of the Aboriginal name were recorded, including the 'Wallambangle Range'. Whitehead's (2008:155-7) research concluded that correct interpretation of this Aboriginal name is 'short stumpy mountains', not 'crooked mountains' as referred to in recent tourism information (Whitehead 2007:155).

The earliest colonial occupation in the Warrumbungle area was by shepherds and squatters for grazing purposes from approximately 1830. Later that decade squatting was legalised by *The Waste Lands Act* 1839, by which date large squatting runs occupied the area which primarily supported sheep farming and wool production, and the town centre of Coonabarabran began

to develop nearby from 1846 (Whitehead 2008:4). Run maps from the 1830s and 1840s show no reference to a 'Wallambangle Range', and a map dating to 1848 shows the Range surrounded by a number of runs (occupied by leasehold) but suggests that the mountain range itself remained unoccupied. Prior to the 1860s any use of the Ranges was carried out with no land measurement or legal possession from the Crown. It was not until 1861 that the Robertson Land Acts opened up all Crown Land to free selection (Whitehead 2008:155-173).

Between 1860 and 1900, Land Selection increased in the area, with limited government control over the process. By 1900 much of the land in the Warrumbungle Range was held by leasehold, the primary Government requirement for land tenure being the clearing of vegetation. Sheep runs continued to dominate, with small numbers of cattle and some wheat production on the fertile plains (Whitehead 2008:4, 201).

As a result of the large properties and low population, the roads were poor and by 1900 only small towns had developed to serve the rural community. In the early twentieth century the railway became the main form of travel and communication before local telephone exchanges were established in the 1930s and 40s. The Warrumbungle Range was also being investigated as a National Monument or Park for conservation and recreational purposes during this period (Whitehead 2008:4).

Mount Woorut is the Indigenous name for a peak at the south end of the Warrumbungle Range, which is also now referred to as Siding Spring Mountain (*Figure 3* & *Figure 4*). This European name probably derives from Siding Spring, located approximately 500metres south of the mountain, as seen in *Figure 3*. Mount Woorut forms the junction of four parishes – Woorut, Whoeah, Elongery and Caraghnan. Parish of Elongery plans dating to 1881 and 1882 suggest that the portion of the Range within the Parish was occupied by a run called 'Caleriwi', which was reportedly first taken up by Andrew Brown (Whitehead 2008:192-3). Mount Woorut was located at the far eastern edge of this run.

In 1909, William Jonathon Goodrum Blackburn ('Old Bill') had taken up 'Mopra' which comprised 2,700 acres in the Parish of Woorut and contained a trigonometrical station which was reportedly named after Mopra Hill nearby. Current maps and maps dating to the 1970s indicate that 'Mopra Rock', or 'Mobara Rock', is directly east of Mount Woorut, within the original Blackburn property (Figure 3), and family histories suggest that the Siding Spring Observatory occupies land that was formerly part of Blackburn's 'Mopra'. This is confirmed by the 1900 Woorut Parish Plan which shows the extent of the land under WJG Blackburn's ownership (*Figure 5*) (Parish of Woorut Plan, 1900). In 1962, around 12 hectares of the high peaks around 'Mopra' was purchased by the Commonwealth Government for the construction of the Siding Spring Observatory (see Section 2.3.6), but Blackburn's continued ownership of the surrounding area is confirmed by an article in the *Australian Women's Weekly* on 5 July 1967 (provide by Joy Pickette) which reads 'a hot autumn sun was blazing down from a cloudless sky the day we went with William Blackburn up to the Observatory Field Station at Siding Spring, 18 miles out of Coonabarabran, NSW. Five years earlier [in 1962] he [William Blackburn] had sold 30 acres of his land to the Commonwealth Government, and now it has been picked as the site for an $11 million giant telescope'. However, rather than owning the land outright, Shire Engineer and historian John Whitehead suggests that Blackburn had tenure under a 99 year Crown Lease (Joy Pickette, pers. comm. 16 & 17 Jul 2014; Parish of Woorut Plan, 1900).

Owen Blackburn is noted on plans as a later owner of 'Mopra' (ANU plan 69/S/034; ANU plan N908/S/0006/1of1; Parish of Woorut Plan, 1900), and Blackburn's brother, Earnest Blackburn, had an abutting property to the north, in the Parish of Wheoh (Joy Pickette, pers. comm. 16 & 17 Jul 2014).

In the 1950s and 60s, the railway system was phased out, despite the area continuing its agricultural activity in regards to sheep, cattle and wheat production. Sleeper production and forestry occurred simultaneously, and by this time they were at their peak, with tourism also developing in the area. In 1964, the Siding Spring Observatory was established on the eastern edge of the Warrumbungle Range, incorporating Mount Woorut (or Siding Spring Mountain).

From the late 1970s, the roads throughout the Warrumbungle region were sealed and the railway system in the surrounding plains removed completely.

The Warrumbungles were reserved for public recreation and proclaimed the Warrumbungles National Park in 1953. Since that date, additional lands on the boundary of the park have been added, resulting in the park totaling 23,312 hectares in 2012 (Whitehead 2008:229, 418; NSW NPWS 2012:9). Today, the small urban townships and larger centres such as Coonabarabran remain in the area, surrounded by agriculture, tourism, conservation, forestry and astro-science (Whitehead 2008:4, 229).

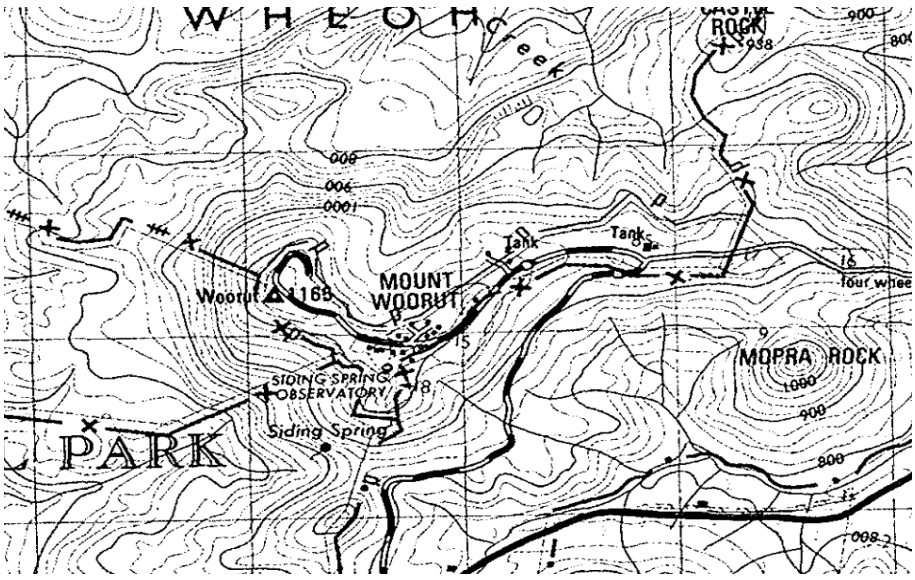

Figure 3 - A detail of a geographical 1979 map which illustrates the location of Mount Woorut (also known as Siding Spring Mountain), the location of the Siding Spring Observatory. Just to the south is Siding Spring and to the east is Mopra Rock (1979, ANU plan N908/S/023/1of1).

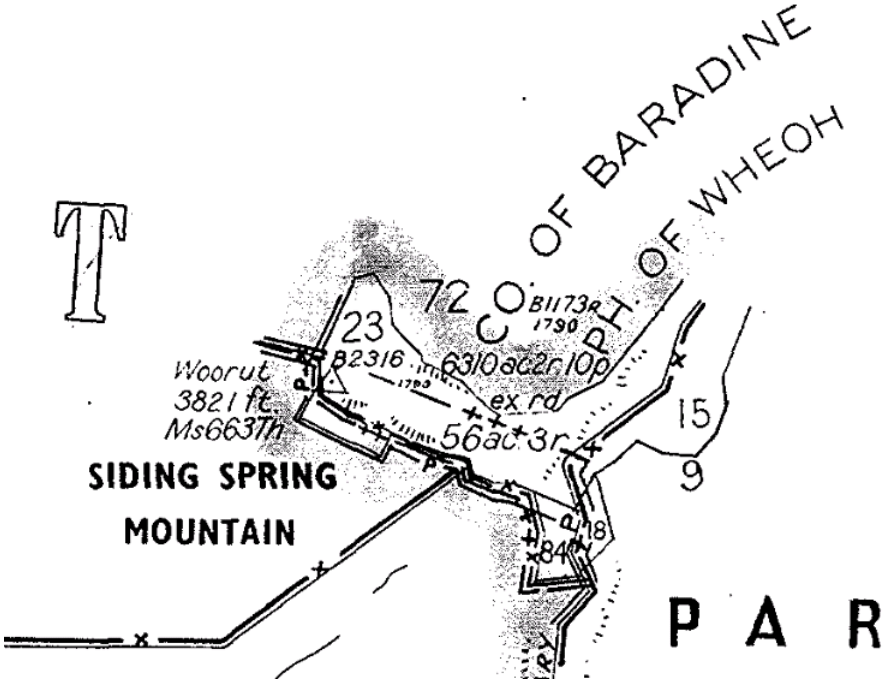

Figure 4 - A detail of the Caraghnan Parish Plan in 1969, showing Mount Woorut, also called Siding Spring Mountain (ANU plan B908/S/025/4of4).

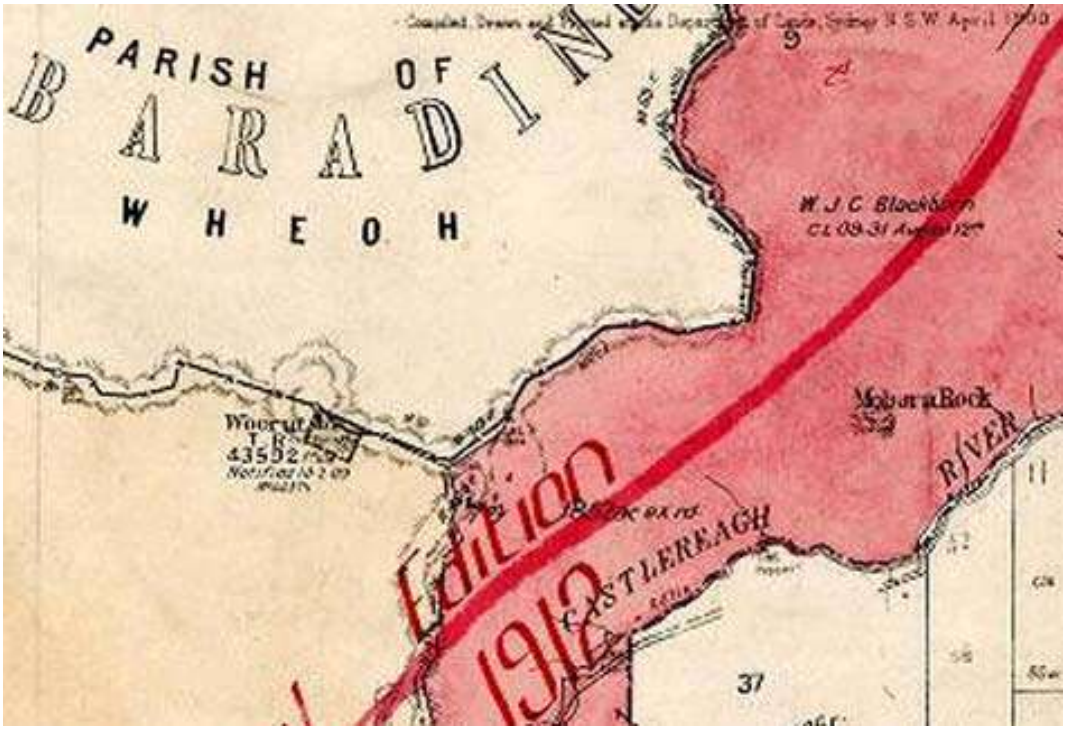

Figure 5 - A detail of the 1900 Woorut Parish Plan, showing Mount Woorut to the west. The Siding Spring Observatory would occupy the land continuing along the ridge to the east (following the Parish boundaries), which includes land owned by WJC Blackburn (1900 Woorut Parish Plan)

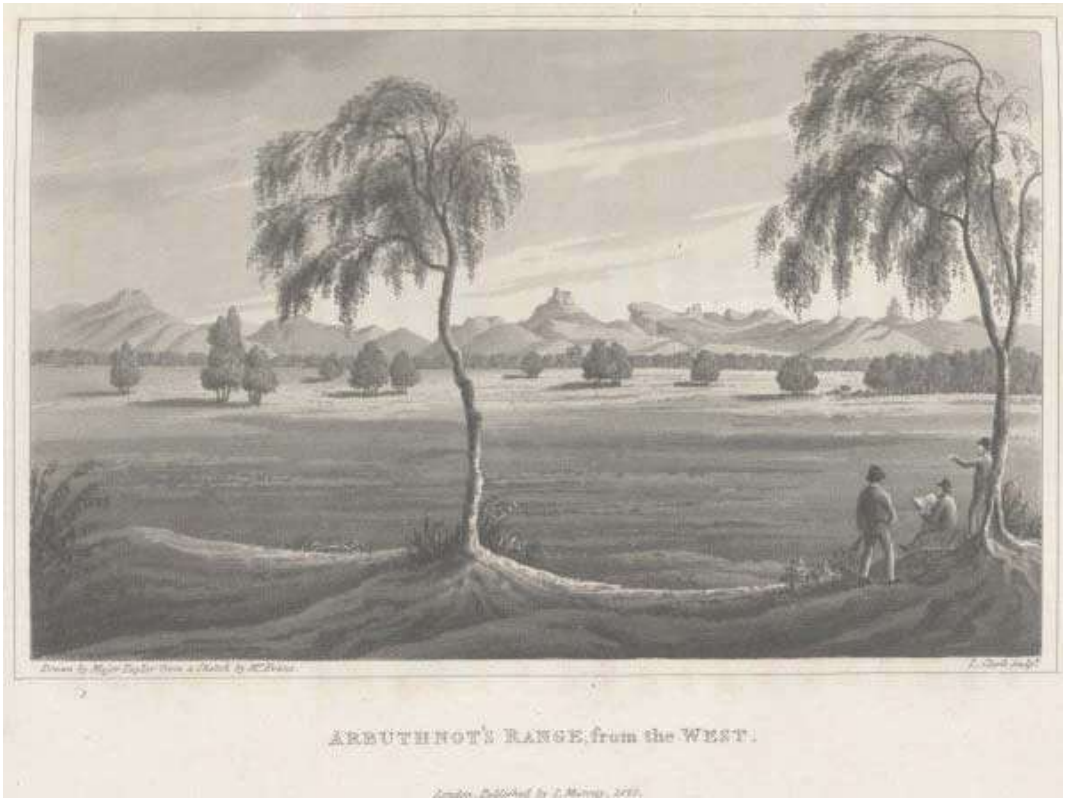

Figure 6 - The much published sketch of the Warrumbungle (Arbuthnot's) Range, looking south-east. Sketched by John Evans (part of Oxley's expedition team), it was first published in 1820 (NLA, picture no an11324187-v, cited in Whitehead 2008:191).

2.3.3 Commonwealth Solar Observatory at Mount Stromlo

The need to establish a Solar Observatory in Australia was raised as early as 1905, but was not actioned until 1909 when Dr WG Duffield (formerly of the University of Manchester) began to champion the project. This requirement was included in the brief to the planner of the new capital, and following extensive tests, Mount Stromlo (located just west of Canberra) was selected in 1911 as the site for the establishment of a Commonwealth Observatory. In the same year the first telescope on the site – a 9 inch Grubb Parsons refractor, was set up in the first permanent structure. However, The First World War interrupted development and it was not until 1st January 1924 that the Commonwealth Solar Observatory was officially opened, to study the sun and geophysics. Regular observational work would commence the following year under the Observatory's first Director, Dr WG Duffield, appointed in that opening month (Burton 2008:4-5; Miller c1970:6). After the death of Duffield, in 1929, William Rimmer was appointed Officer-in-Charge and the Observatory continued to develop without the official designation of a Director (Miller c1970:6). It was not until 1939 that Dr Richard van der Reit Woolley, from Cambridge and the Royal Greenwich observatories, was appointed and the new Director, in which capacity Woolley changed the direction of the Observatory from solar and geophysical research to galactic and stellar astronomy (Burton 2008:5-6).

The Observatory also assisted the war effort, serving as a large optical munitions factory during the Second World War, with staff computing designs for a number of instruments, including sighting telescopes and periscopes. The first optical munition to be manufactured in Australia was designed at the site, and by 1943 it had the capacity to engineer new optical instruments from idea conception to complete manufacture. The National Time Service was also established on the site during this period (Burton 2008:6).

After the Second World War the Australian National University was founded in Canberra and Dr Woolley, who was appointed an Honorary Professor, advocated the incorporation of the Observatory into the University (Miller c1970:6).

Figure 7 - The 74 inch Telescope at Mt Stromlo in 1961 (NAA, image no. A12111, 1/1961/8/6).

2.3.4 The Australian National University and Mount Stromlo Observatory

The Australian National University was founded in 1946, established by an Act of the Federal Parliament on 1st August 1946. Its founding mission was 'to be of enduring significance in the post-war life of the nation, to support the development of national unity and identity, to improve Australia's understanding of itself and its neighbors, and to contribute to economic development and social cohesion'. The University has a particular relationship with the Australian Federal Government, as its mandate was specifically to undertake postgraduate research and general study into subjects of national importance (undergraduate studies were offered from 1960) (ANU, 'History' & 'Timeline of ANU History').

In 1957, eleven years after it was founded, the ANU incorporated the Commonwealth Solar Observatory, following campaigning by Director Professor Woolley (Professor of Astronomy at ANU from 1949 to 1955). An Act of Parliament in 1957 allowed the transfer of the Observatory from the Department of the Interior to the ANU, to be associated with the Department of Astronomy in the Research School of Physical Sciences, and at that date the name was changed from 'Commonwealth Solar Observatory' to 'Mount Stromlo Observatory' (Miller c1970:6, 44-5; ANY 'Timeline of ANU History'). Senior staff of the Observatory held academic positions at the ANU and supervised postgraduate students completing their doctoral degrees and other visiting scholars (Miller c1970:6, 44-5).

At the end of 1955, Professor (by now also Sir Richard) Woolley was appointed Astronomer Royal and director of the Royal Greenwich Observatory. Key moments of Woolley's Directorship between 1939 and 1955 had included commissioning the 74 inch reflector telescope at Mount Stromlo Observatory (built and opened in 1955) which at that time shared the status of largest optical telescope in the southern hemisphere with a similar instrument in South Africa (*Figure 7*). Woolley also purchased the Great Melbourne Telescope from the Melbourne Observatory (Burton 2008:6; SSO info panel on site).

Following Woolley's departure, Arthur R Hogg was appointed Acting Commonwealth Astronomer in the interim from December 1955 to March 1957 at which date the Directorship was offered to American astronomer Bart Bok, of Harvard College Observatory. Bok took up his appointment in 1957 as Director of the Observatory and Head of the Department (Whitehead 2008:267; Gillespie 2011:147; Frame & Faulkner 2003:277). Public relations was a main focus of Bok's, who had realised that in order to acquire the funds necessary for the observatory's growth, he would have to educate the Australian public about the importance of astronomy and the contribution that an Australian observatory could make (Haynes *et al.* 1996:176). Under Bok's Directorship, the Siding Spring Observatory was founded.

Figure 8 - Mount Stromlo Observatory in c1958-62 (NLA, picture no. an24913979-v).

2.3.5 The Siding Spring Observatory Field Station

One of the most important considerations for an astronomical telescope is its location, which should have minimal cloud interruption and minimum interference from city and other lights, to allow for optimum 'seeing' for astronomers. When Bart Bok was appointed Director of Mount Stromlo Observatory (MSO) in March 1957 he saw how seriously the future of the observatory was threatened by the rapid growth of Canberra and the subsequent brightening of the night sky which reduced the visibility of the sky's best known features and seriously impaired astronomical observing efficiency. Bok soon began a site survey to look for a new site where a field station for future MSO telescopes could be established. Envisioning future development, it could also serve as the site for a larger telescope (Gascoigne *et al.* 1990:49-52l; Haynes *et al.* 1996:175).

Survey parties inspected and conducted numerous tests of potential sites throughout Australia. The survey parties included Bart Bok, and in north-western New South Wales also Ben Gascoigne (MSO) and Alex Rodgers, as well as NSW government astronomer Harley Wood (who originally suggested Siding Spring as a possible site) (Gascoigne *et al.* 1990:49-52l; Haynes *et al.* 1996:175). Arthur Hogg (Deputy Director of MSO) surveyed sites in South Australia and West Australia and later conducted further site testing at Siding Spring Mountain (also known as Mount Woorut) (Gascoigne *et al.* 1990:49-52l; Whitehead 2008:267-270). Initially Siding Spring was not a favored location due to the poor access and the belief, later proved wrong, that the site was only 800metres above the surrounding plane (Haynes *et al.* 1996:176). Two 8 inch Tinsley telescopes were used for site-testing and equipment was hauled to sites in a series of site testing trailers. In 2014, one of these trailers forms part of the ANU collection at the SSO, together with the 8 inch telescopes that it carried (see Section 3.7).

In 1960, Coonabarabran Shire Council constructed the first access track through nearby Owen Blackburn's property to provide access to Siding Spring Mountain. By late 1961, the choice for the new observatory had been narrowed to one of two options: Siding Spring Mountain or Mount Bingar, just north of the Murray Irrigation Area near Yenda (Gascoigne *et al.* 1990:49-52l; Whitehead 2008:267-270). A small Field Station was established at Mount Bingar during this initial testing phase, in the late 1950s. In May 1962, the final decision was made by the ANU Vice-Chancellor Leonard Huxley (informed by the staff members involved) that Siding Spring Mountain become the site for the field station. The site filled the criteria of 'good seeing', dark skies and reasonable freedom from cloud (Gascoigne *et al.* 1990:49; Whitehead 2008:272-2). Siding Spring Mountain is 1.17km above sea level and located along the east boundary of the Warrumbungle National Park (see map in Section 1), with its distinctive volcanic landscape of spires, domes, plugs and dykes that are uncommon in the Australian landscape. The mountain forms a ridge at its apex, which formed the site for the new observatory along the eastern boundary of the Warrumbungle National Park, which provided a light-free environment (NSW National Parks and Wildlife Service 2012:1).

From 1962 there was intense activity on the mountain and its approach. By 1963 the road to Siding Spring Mountain was constructed, mainly funded by Coonabarabran Shire Council (Whitehead 2008:275). Plans dating to the 1960s, describe the landscape of the site as 'very rough precipitous basaltic mountains, heavily timbered with stringybark, box, peppermint and some ironbark' (ANU Plan N908/S/011/1of1).

In 1964, the Siding Spring Observatory opened as Mount Stromlo's Field Station. The first building constructed on the site was the 40 inch Telescope, built in 1964 at the western end of the site, with the first observations occurring the same year (Gascoigne *et al.* 1990:49-52). A plaque on site commemorates the 1964 foundation of the site (plaque viewed 20 June 2014; Miller c1970:4). On 5 April 1965, the Siding Spring Observatory, Mont Stromlo's Field Station, was officially opened by ANU Vice-Chancellor Leonard Huxley of the Australian National University, with Bart Bok presenting the opening address (Figure 16) (Whitehead 2008:276).

2.3.6 Land Acquisition

A new Act of Parliament was needed to pass in order to allow the ANU to own land outside of the ACT. This was put forward by Prime Minister Menzies and was passed on 28 March 1963 (Burton 2008:9).The land at Siding Spring Mountain, believed to be formerly owned by W.J.G. Blackburn, was then reacquired by the Commonwealth who subsequently gave the Australian National University occupancy under a Special Lease from the Crown (LPI:V11822/F245). The ANU then acquired freehold of the land in stages, as discussed below.

In March 1963, the ANU submitted a plan outlining the proposed area for acquisition for the observatory, noting an additional area at the east end of the site (ANU plan, March 1963, N908/S/002/1of1). An early plan (with no date) delineated the proposed sections of land to be subdivided and acquired from William Jonathon Goodrum Blackburn (consisting of part of Portion 15, Parish of Woorut) (ANU plan 69/S/034). By October 1965, the ANU received the Crown Grant for part of Portion 15, which totaled 23 acres (and 3 roods) and currently forms the south-eastern part of the Observatory site (ANU plan, 26 October 1965).

A plan dating to December 1965 identifies the land occupied by the ANU at this date (seeFigure 9). The plan also shows that the 40 inch and 16 inch telescopes had been built by this date and a 'House' was located in the approximate location of Bingar Cottage (Figure 10) (ANU plan, 10 Dec 1965, N908/S/011/1of1), and the latter is labelled as 'Bingar Cottage' by 1969 (Figure 11). Figure 10 shows that the site boundary at this date is almost identical to the 2014 cadastral boundary (in 1965 it excluded the portions to the south, acquired at later dates).

The southern-most section of the current extent (projecting south below the Anglo-Australian Telescope) consists of parts of Portion 84 of the Parish of Caraghnan and Portion 18 of the Parish of Woorut, the latter of which was originally owned by Owen Bruce Blackburn. The area is described as a 'knoll' surrounded by a 'very steep fall' in May 1966, when the area was identified for acquisition. The land appears to have been acquired for occupation by the ANU in October 1968 (ANU plan, May 1966, N908/S/007/1of1; 17 October 1968). The ANU appears to have received the Crown Grant for Portion 18 by 1972 (see Figure 13 - The 1972 Crown Grant plan (CP1970/1), denoting the boundary of the land transferred to the Australian National University at this date, consisting of Portions 23, 84 and 85. Portions 15 and 18 (to the south-east with a fainter outline) had been granted to the ANU at an earlier date (LPI: V11822/F245).) (LPI:V11822/F245).

In February 1969, a General Site Plan shows the boundary of the Observatory and existing and proposed buildings and infrastructure at this date (Figure 11) (ANU plan, Feb 1969, ANU 69/S/025B).

Subdivision occurred in February 1972, prior to the construction of the Anglo-Australian Telescope. Four small lots were subdivided within Portions 15 and 23 in the Parish of Wheoh, creating small square parcels, which currently hold the UK Schmidt Telescope and Faulkes Telescope South (ANU PLAN N098/S/018/1of3). The UK Schmidt Telescope was built in 1972-3, which suggests that the subdivision occurred for this purpose.

On 15 May 1972, the University received the Crown Grant for the remainder of the site, the extent of which is shown in Figure 13. The land totaled just over 112 acres (112 acres, 1 rood, 20 perches), and consisted of Portions 23, 84 and 85 in the Parish of Wheoh, County of Baradine. Portion 84 in the Parish of Caraghnan and Portion 18 in the Parish of Woorut were excluded from the Crown Grant in 1972 (and the total acreage noted above), as the ANU was granted these parcels at an earlier date. The following year, the ANU submitted plans requesting additional land to the northern boundary of the site, which appears to have been provided in part by 1977 (ANU plan, 27 Sep 1973, N908/S/019/1of11; 5 Sep 1977, N908/S/021/1of1).

December 1965 plan

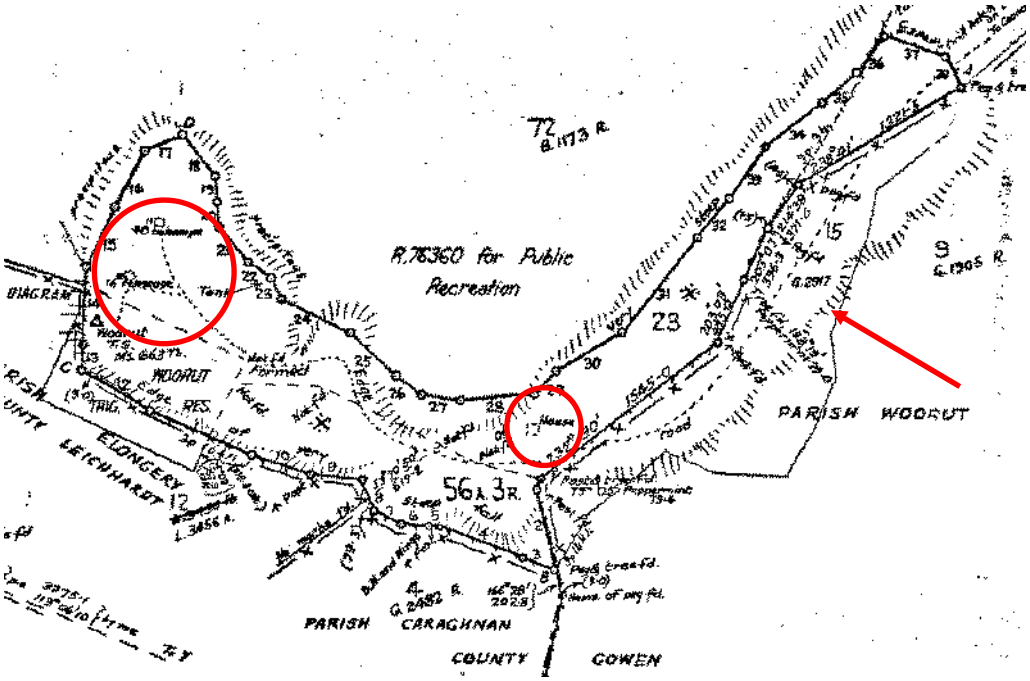

Figure 9 - The plan dating to December 1965 which shows the land occupied by the ANU at this date. The red circles highlight the buildings located on site at this date, which include the 40 inch and 16 inch telescopes at the west end, and a house in the position of Bingar Cottage (confirmed in Figure 10 below). The portion of the site in the Parish of Woorut (Portion 15; with a fainter outline) was granted to the ANU two months prior, in October 1965, (illustrated by red arrow) (ANU plan, 10 Dec 1965, N908/S/011/1of1).

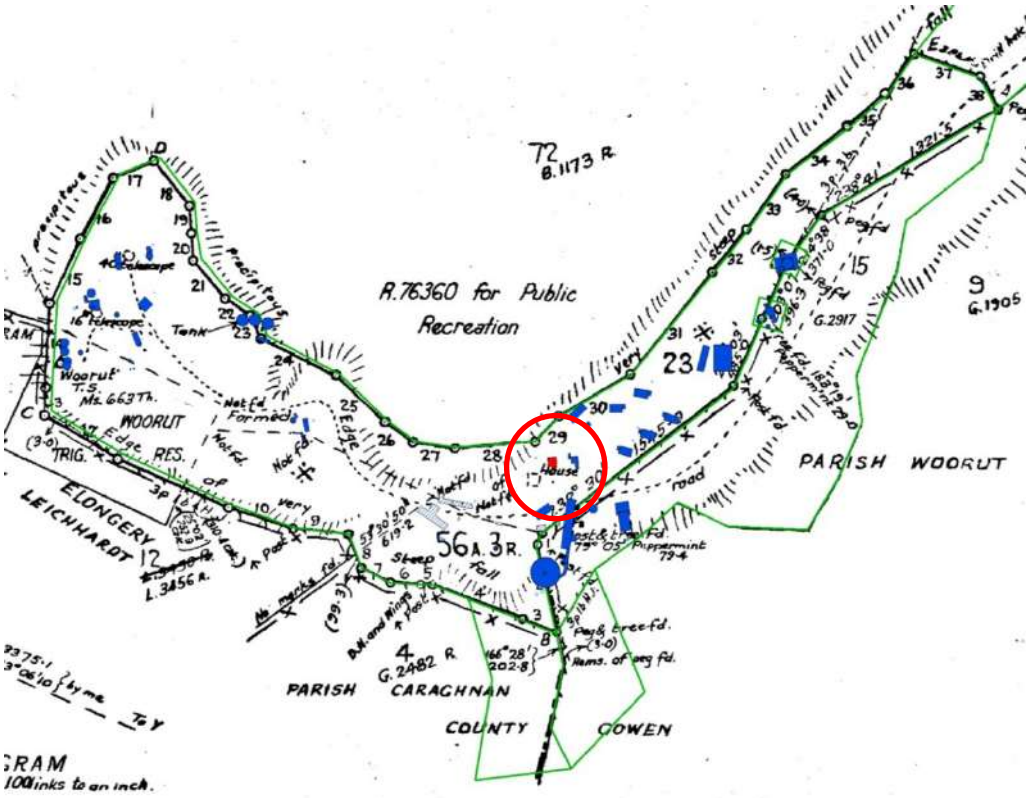

Figure 10 - The 1965 plan above, with the 2014 cadastral boundary overlaid in green. The existing buildings in 2014 are illustrated in blue, with Bingar Cottage in red, which is the closest building to the 'House' noted on the 1965 plan. This overlay of the two plans indicates that the Bingar Cottage was located on site by 1965.

February 1969 plan

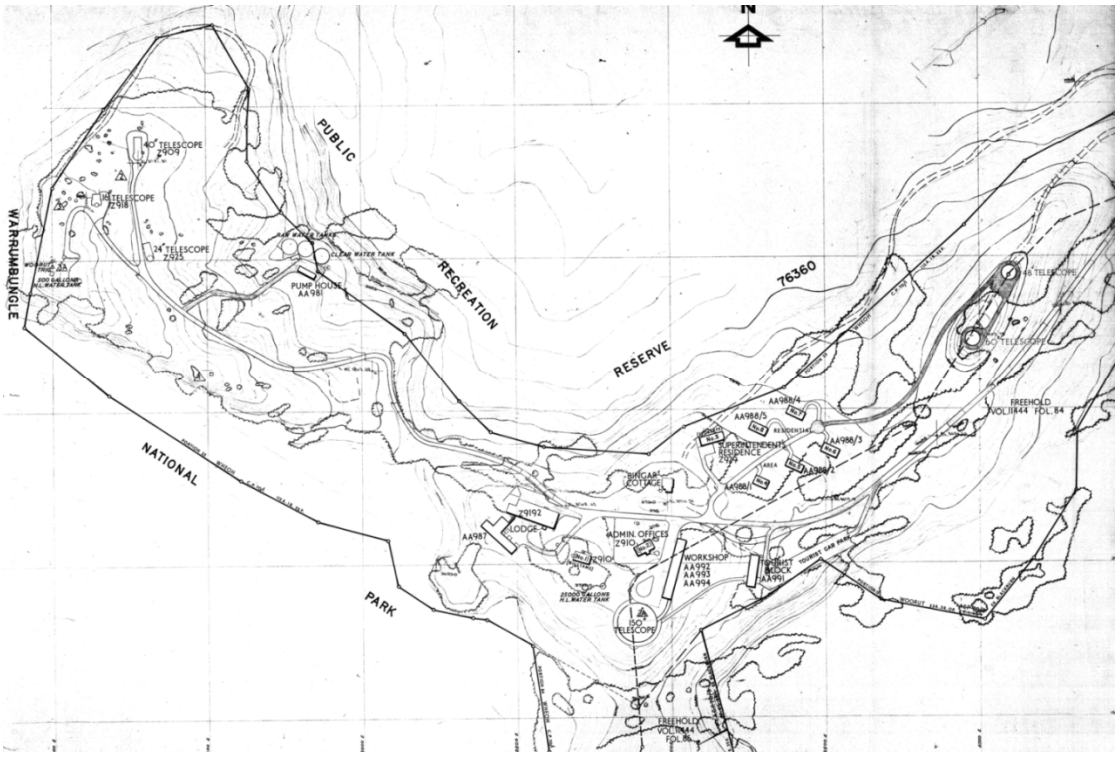

Figure 11 - A 'General site plan' dating to February 1969, showing existing and proposed buildings at this date (ANU plan 69/S/025B).

February 1972 plan

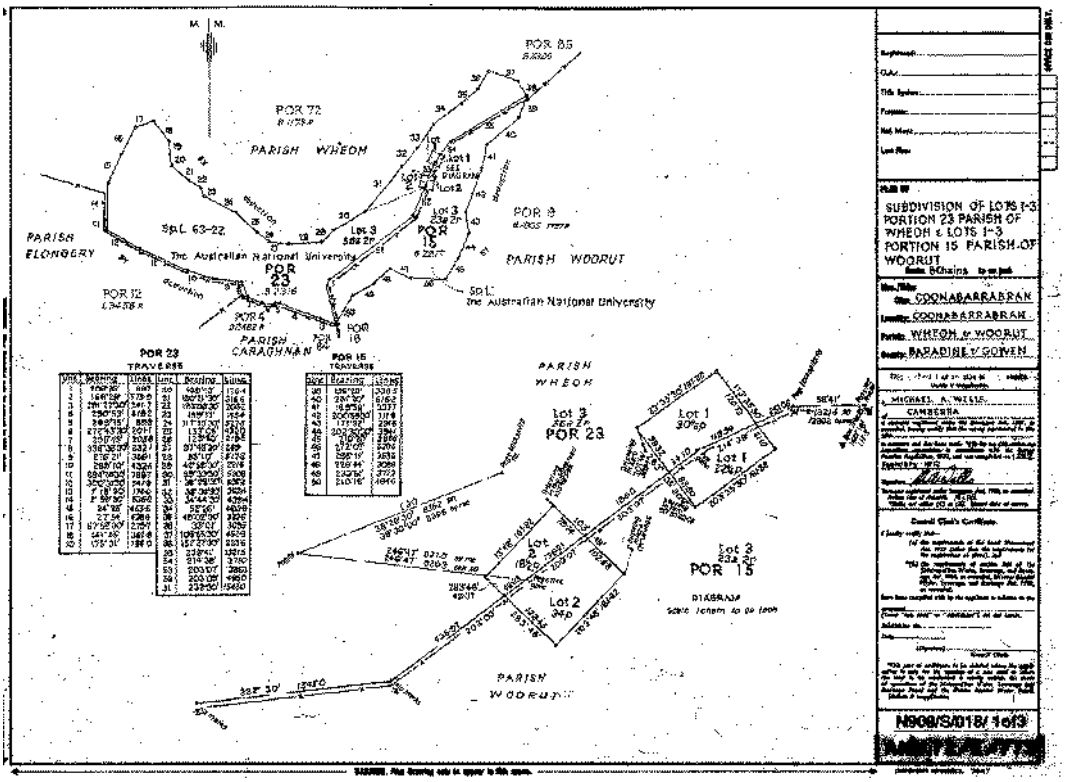

Figure 12 - The February 1972 subdivision plan, indicating the two newly subdivided lots at the east end of the site that now hold the UK Schmidt Telescope and Faulkes Telescope (ANU PLAN N098/S/018/1of3). This boundary map omits to draw the lots (Portions 18 and 84) at the southernmost point of the site.

May 1972, Crown Grant plan

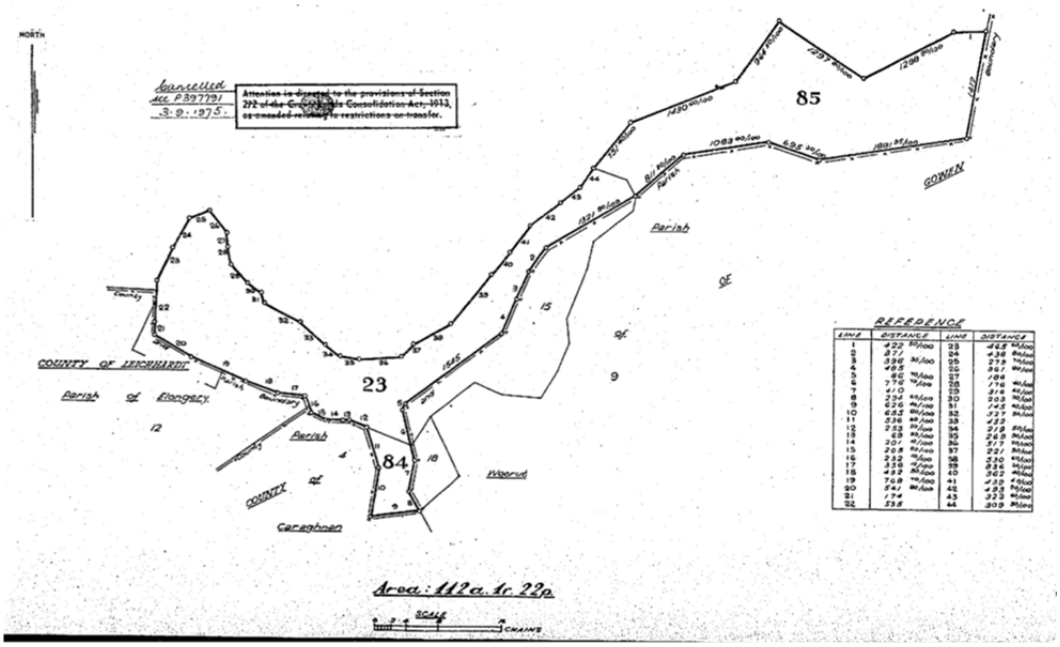

Figure 13 - The 1972 Crown Grant plan (CP1970/1), denoting the boundary of the land transferred to the Australian National University at this date, consisting of Portions 23, 84 and 85. Portions 15 and 18 (to the south-east with a fainter outline) had been granted to the ANU at an earlier date (LPI: V11822/F245).

2.3.7 Construction Begins at the Siding Spring Observatory

A plan dating to December 1965 (Figure 9) shows the extent of the site at this date. The 40 inch and 16 inch telescopes were located at the west end of the site, while a 'house' existed in the approximate location of Bingar Cottage (ANU Plan N908/S/011/1of1).

40 inch Telescope (1963-64)

The first telescope at the new site was the 40 inch telescope of advanced design, which was ordered from the American firm Boller and Chivens in 1961 after Bok had sent Engineer Hermann Wehner to America to inspect it. Prior to its expected delivery date of 1963 a road was constructed, utilities laid and the building and dome erected to house the telescope. Designed for photography or photoelectric work, the 40 inch telescope was used to undertake cutting-edge research work. The telescope was fitted with an optical corrector plate, a special device designed by Ben Gascoigne, an optical specialist. It was the most advanced telescope the MSO possessed (Gascoigne et *al.* 1990:49-52; ANU, '40 inch'; ANU preliminary heritage assessment). The building also contained living quarters and a library as well as a workshop area (ANU preliminary heritage assessment).

On 12 February 1964 the telescope was in place and the first images were taken at the Siding Spring Observatory, by Ben Gascoigne. The following month, the telescope was in full operation as a multi-use instrument. Within its first 14 months of operation, it was used by Professor Bart Bok and his wife, astronomer Priscilla Bok, to undertake their renowned research into the structure of the Milky Way and Magellanic Clouds. Later Director, Olin Eggen spent at least one week per month at the 40 inch telescope (Gascoigne *et al.* 1990:49-52; ANU, '40 inch').

In more recent years, CCD imagers and spectrographs were built for the telescope, which extended its capabilities. From 1999, a Wide Field Imager camera was used broadly. Research projects carried out using the 40 inch Telescope include those related to observational cosmology, the dynamics and evolution of galaxies, the structure and evolution of the Milky Way, stellar astrophysics, the search for extra-solar planets and the aforementioned project relating to Magellanic Clouds (ANU, '40 inch').

In 2009, the telescope and its original control panel were removed from the building and donated to a local astronomy group, the Milroy Observatory (approximately 12km to the north east of the SSO site), for commercial use (ANU preliminary heritage assessment, Tourist Centre info brochure). The telescope has been conserved and is used for visitor observations (see Sections 3.2.1 and 3.7).

16 inch Telescope (c1964-65)

The 16 inch telescope, also built for the Australian National University by the firm Boller and Chivens, was operational soon after to 40 inch telescope, c1964-65. It was designed as a photometric telescope to follow up observations made on the 40 inch telescope. It has a 20cm Schmidt camera mounted on it for photographic studies or very large nebulae (Gascoigne *et al.* 1990:49-52; ANU, '16 inch').

The building which houses the telescope was built to accommodate small electronic and mechanical workshops (ANU, '16 inch'). In more recent years, the telescope has not been used for scientific purposes but for observations (Whitehead 2008:365).

24 inch Telescope (1966)

The third telescope built on site was the 24 inch reflector, commissioned and built on site in 1966, under Director Olin Eggen. The third Boller & Chivens build, the telescope was an f/18 Cassegrain on an equatorial mount. The telescope building was constructed with an aluminising plant room and storage areas. In November 1966, RSAA (Research School of Astronomy and Astrophysics, of the ANU) astronomers Mathewson and Serkowski began taking polarimetric observations with its double channel polarimeter. Mathewson later completed a two year observation of 2,000 stars, using this telescope, and collected 'the most accurate polarization measures ever obtained'. Subsequently, he constructed the first consistent magnetic field chart of our local arm of the Milky Way (Gascoigne *et al.* 1990:49-52; ANU, '24 inch').

In recent years, the telescope was primarily fitted with instruments for photometry and imaging work, used mainly for photoelectric photometry. In 2014, the telescope has been decommissioned and the building serves as offices and work spaces (ANU, '24 inch').

Lodge and Residences

Between 1964-5, the first Observatory Lodge was constructed for staff and astronomers working at the site (Figure 27). The additional Lodge was constructed immediately to the south c1968, according to plan dating to December 1968 (ANU plans, 20 Dec 1968, Drawing No. 9436/5, 6). The motel-type lodge was constructed for visiting and commuting astronomers and residences for staff, with catering facilities and a library. The Lodges were damaged by the fires in January 2013 and have since been demolished (Gascoigne *et al.* 1990:49-52; SSO info panel on site).

According to contemporary plans (ANU plans), the individual residences were designed by Architects and Town Planners Bunning and Madden as 'technician's houses' in c1964-5. A photo which appears to date to the 1960s (Figure 20) indicates that Residence no. 3 was one of the first to be constructed, with its different floor plan and construction (in 2014 the residence is not occupied). The photo also shows that the Director's Cottage had been built by this date, and that the residences were under construction.

A photo dating to c1973 confirms that the residences were built by this date (Figure 21) (Judy Over photo collection, N.D.), while drawings dating to 1969 and the 1970s further confirm that the residential area (labelled 'Technicians Houses' on plans) was completed by this date (ANU plan, 14 April 1969; 75/A/1582).

As described above, plans dating to December 1965 show that a house in the approximate location of Bingar Cottage existed at this date (ANU plan N908/S/011/1of1), suggesting that Bingar Cottage was one of the earliest buildings located on the site, contemporary to the 16 inch and 40 inch telescopes, located at the SSO by 1965 (ANU Plan N908/S/011/1 of 1). Historic photos suggest that the weatherboard house, Bingar Cottage, was built in a residential

location and moved to the Mount Bingar Field Station in the late 1950s or early 1960s (Figure 17), before being relocated to the SSO where it was named in acknowledgement of this move. The cottage underwent alterations at a later date, with modifications to the cladding and window openings. It currently serves as the site manager's house. A bowser shed is located to the east of Bingar Cottage. This appears for the first time on a 1970 plan of the site, where it is described as a 'Flammable Liquids Store, Fire Hose and Compressor' (ANU plans).

2.3.8 Late 1960s and 1970s

In 1966, Bart Bok stepped down as Director of Mount Stromlo Observatory and the Field Station, taking a position as Professor of Astronomy at the Steward Observatory of the University of Arizona. During his

Directorship, the Mount Stromlo and Siding Spring observatories underwent vigorous development, with a significant increase in the number of PhD degrees completed in association with the Australian National University (Miller c1970:8; Haynes *et al.* 1996:176). He was revered for his public relation efforts within Coonabarabran and throughout Australia, but left with resentment that the Anglo-Australian 150 inch Telescope had not yet been constructed due to funding delays (see section below) (Whitehead 2008:277). On a return visit in 1978, Bok was revered as the 'Grandfather of Siding Spring' by the local *Coonabarabran Times* (Burton 2008:11).

In the three month interim, before a new Director was appointed, both Arthur R Hogg and SCB 'Ben' Gascoigne, stood as Acting Directors (Frame & Faulkner 2003:277-8). In July 1966, Olin Jeuck Eggen was appointed Professor of Astronomy at ANU and was the first Director of both Mount Stromlo Observatory and the Siding Spring Observatory (Miller c1970:8; Frame & Faulkner 2003:278)). Unlike Bok, who emphasised the importance of public relations, Eggen focussed on building a complementary theoretical group, with one of his first actions being the closure of the Visitors' Nights. One of his immediate objectives was to increase the number of research papers produced by the observatory and subsequently strengthen the international reputation of the graduate school (Haynes et al. 1996:180).

When Eggen took up the position in 1966, the discussions around the construction of the Anglo-Australian Telescope had stalled, but he was quick to resume, accelerate and complete the process (Burton 2008:13). In 1968, plans were approved for an improved access road to Blackburn's Hill, to be constructed by Coonabarabran Shire Council, and for a water supply to be directed from Timor Dam. The road was opened for public use in April 1969, which offered an alternative access route (Whitehead 2008:308).

Staff from ANU including Engineer Hermann Wehner were seconded to work on the design and construction of the AAT, and the Observatory was closed to the public for four years during works. The Anglo-Australian Telescope was completed in 1974, and late that year the observatory re-opened, with the newly built Visitor (or 'Tourist') Centre and 'Exploratory', which housed a permanent exhibition on astronomy, to encourage visitors to the place. The exhibition, titled 'Exploring the Universe', was officially opened on 6 December 1974 and aimed to introduce all visitors to contemporary astronomy (Figure 23). The exhibit included a scale version of the recently opened Anglo-Australian telescope (*ANU reporter*, Vol 5, No. 19, 22 Nov 1974, via Judy Over collection). This promotion for public visitation was supported by both the Coonabarabran Shire Council and the National Parks and Wildlife Services (John Whitehead, pers. comm. May 2014). An information shelter was later erected to the north-east of the Visitor Centre.

The water tower to the north-west of the Anglo-Australian Telescope was constructed by 1974 (Judy Over, photo collection). The pump house is located at the north-east end of the site, next to three large water tanks, and was constructed c1975. Olin Eggen resigned as Director in September 1977, following conflicts with the University over the Anglo-Australian Telescope. Don Mathewson, who had worked at Mount Stromlo, was appointed Acting Director in October 1977 and Director from 1979 to 1986. During his Directorship, the focus of research shifted from Mount Stromlo Observatory to the Siding Spring Observatory, which was

becoming a more prominent Australian site. A feature of his Directorship was an enthusiastic participation in a number of innovative international projects, which in turn engendered a new confidence in Australian technological and engineering capacity (Burton 2008:16; Haynes et al. 1996:182-5). Mathewson recognised the opportunity for bigger telescopes, to increase the ANU's profile in the field and in 1978 obtained funding for a revolutionary telescope project at the SSO – an altitude-azimuth ('altazimuth') mounted 2.3m diameter reflecting telescope with a Cassegrain configuration, to carry out a multitude of operations with interchangeable instrumentation. This was the Advanced Technology 2.3 metre Telescope (2.3m ATT) constructed in 1984.

2.3.9 Australian Astronomical Observatory

The Australian Astronomical Observatory (AAO) was originally named the 'Anglo-Australian Observatory' and is the managing body of the Anglo-Australian Telescope, and more recently, the UK Schmidt Telescope. In the mid-1960s, the Australian Academy of Science and Royal Society of London made representations to the Australian and British governments, proposing to a large optical telescope in the southern hemisphere. On 14 April 1967, the Australian Government notified the British Government, declaring that it was prepared to join them in equal partnership to build and operate a large optical telescope in Australia. The decision to locate the telescope on Siding Spring Mountain was decided and publicly announced in the local newspaper in May 1967 (AAO online; Whitehead 2008:301). The 'Anglo-Australian Telescope Agreement' was made in 1971, between the two governments, officially agreeing to joint construction and funding of the Anglo-Australian Telescope (AAO online; Visitor Centre info board). This was evidence of the post-war links between Australia and the United Kingdom, further influenced by then Australian Prime Minister Sir Robert Menzies and his strong alliance with the United Kingdom, established after many visits to England (Martin, 2000).

In 2010, now funded solely by the Australian government, the Anglo-Australian Observatory became the Australian Astronomical Observatory, which is a division of the Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (AAO online).

In 2014, at the SSO site the Australian Astronomical Observatory consists of the Anglo-Australian Telescope, the UK Schmidt telescope (incorporated as part of the Anglo-Australian Observatory in 1988) and offices and workshops, all of which were constructed between 1972 and 1974 (these AAO facilities are also supported by an office and laboratory in the Sydney suburb of North Ryde). The buildings are fine examples of Late Modern architecture (AAO online; NSW SHI form, 'AAO'). They include the large axial Workshop north of the Anglo-Australian Telescope (Figure 25) and the Administration Building, which also incorporates the site's Private Automatic Branch Exchange (PABX) telephone switching system, which were both built around the same time.

The AAO has pioneered the use of optical fibres in astronomy, and is currently the international leader in this work (NSW SHI form, 'AAO'). Further achievements include: observing the explosion of the Supernova 1987A, the brightest supernova since the invention of the telescope; discovering 'ultra-compact' dwarf galaxies; making the first detection of an isolated brown dwarf star in our Galaxy; measuring the Hubble Constant (the rate of expansion of the Universe) with unprecedented accuracy; discovering streams of stars in our Galaxy that are remnants of dwarf galaxies that have been absorbed into our own Galaxy; determining that 'dark matter' can't be made of neutrinos; and showing that 'dark energy' is real and not a mistake in Einstein's equations (AAO brochure).

UK Schmidt Telescope (1972-3)

The UK Schmidt telescope (UKST) was built by the British Science Research Council concurrently with the construction of the AAT. The construction the buildings to house the telescope began in 1972, and the telescope commissioned and opened in 1973. The telescope was built on site, 1km northeast of the AAT dome, but was not part of, or under the

management of, the Anglo-Australian Observatory at this date. The UKST formally opened in 1973. It was operated by the Royal Observatory, Edinburgh, until 1988, when it became part of the Anglo-Australian Observatory (ANU, 'UKST"; AAO, 'UK Schmidt'; High Ground Consulting 1006:43).

The UKST is a survey telescope with an aperture of 1.2m (48 inches) and a very wide-angle field of view; compared to the Anglo-Australian telescope which has a narrower field and view (Figure 30). The UKST surveys large areas of sky at a more rapid rate, leaving the more detailed study to the larger Anglo-Australian Telescope (ANU, 'UKST"). The telescope is one of three large Schmidt units operations in the world (Whitehead 2008:361). Later additions to the building included an office and laboratory to the north and east elevations, which are shown on Bunning and Madden drawings dating to December 1974 (ANU plans).

The telescope was commissioned in 1973 and until 1988 it was operated by the Royal Observatory, Edinburgh. From 1988, the UKST was operated by the Anglo-Australian Observatory on behalf of the ANU, funded by the 'Radial Velocity Experiment' (RAVE) project, which measured physical parameters for over 500,000 stars in the Milky Way galaxy. In 2014, the UKST is being refurbished in preparation to conduct the 'Taipan galaxy survey' and 'Funnelweb stellar survey', planned to begin in 2016 (ANU, 'UKST").

The UK Schmidt Telescope is located within its own small independent cadastral boundary, within the ANU site. This lot (along with the subdivided lot for the Faulkes Telescope South) was subdivided in 1972 (ANU plan, 'SSO plan boundary redefinition & survey of encroachments', c1970s; ANU plan N908/S/018/1of3).

Anglo-Australian Telescope (1972-74)

Construction of the building to house the Anglo-Australian 150 inch Telescope (AAT) began in 1972, while the telescope was commissioned and assembled in 1973-74. Council's engineering staff assisted with the project from conception in 1968 to completion in 1974, as the site was prepared and infrastructure installed or updated (AAO online; Whitehead 2008:312).

The telescope was inaugurated on 16 October 1974, officially opened by His Royal Highness Prince Charles (Figure 22) In addition to HRH Prince Charles, speeches were made by Sir Fred Hoyle, the Chairman of the Anglo-Australian Telescope Board, the British High Commissioner, Sir Morrice James and Prime Minister of Australia Gough Whitlam (Whitehead 2008:322-3). In the same year, the AAT won an 'Excellence Award' from the Association of Consulting Engineers Australia (NSW SHI, 'AAO'). Scientific work began in 1975 and regularly schedules observations began in June 1975 (AAO online).

It is an equatorially-mounted telescope with a 3.9m-diameter (150 inch) mirror, serving many uses. Equipped with a robotic spectrograph, it can simultaneously observe hundreds of stars and galaxies (AAO online). The domed building which houses the telescope has seven principal floors, which include a library, aluminising equipment, an electrical junction room, console room and the main floor with the telescope base and visitor's gallery, amongst other spaces (Whitehead 2008:315). The visitor's gallery was built under the direction of the Coonabarabran Shire Council, who wanted to encourage tourism to the site (John Whitehead, pers. comm. May 2014).

Externally, a catwalk extends around the base of the dome. The transport casing for the AAT mirror, its cradle and a dummy testing mirror have been retained and are on display immediately south of the AAT.

In 2009, the Anglo-Australian Telescope – 'the largest telescope in Australia' – celebrated its 35th birthday. To mark the occasion, the AAO presented a sundial to the town of Coonabarabran, positioned outside the Coonabarabran Courthouse. The sundial was intended to be 'a lasting reminder of the importance of astronomy in the life of Coonabarabran', and was presented in appreciation to the community for their hospitality and understanding of and compliance with the local light pollution controls (AAO Media Release, 13 October 2009).

The AAT has been used for several important southern sky surveys, such as the '2-degree-field Galaxy Redshift Survey' (final data released in 2003). The AAT remains the largest optical (visible light) telescope in Australia and one of the largest telescopes to be constructed using equatorial mounting (ANU, 'Siding Spring Observatory'; AAO online). Its optics, stability and precision make it 'one of the finest telescopes in the world' (AAO online; Whitehead 2008:365) and is celebrated as a highly significant accomplishment in Australian astronomy (Judy Over collection).

2.3.10 Controlling Development and Light Pollution

Upon completion of the Anglo-Australian Telescope, there were concerns regarding possible future light pollution and discussions of preventative measures. In 1975, ANU sent light pollution information to the local Council, who reportedly investigated the situation with the intention of including a form of regulation in Council's Planning instruments (Whitehead 2008:367). In August 1983, the ANU wrote to Coonabarabran Shire:

> *The University has recently asked the Land Board at Dubbo to oppose the conversion of leased land to freehold within a radius of 15km from the Observatory in order to prevent further subdivision. Changes of land use or subdivision of property into smaller areas could result in increased light, dust or smoke pollution with resultant harm to the Observatory's activities …Would your Council please consider restricting subdivision of land within 15km of the Observatory to a minimum block size of 40 hectares and making the creation of concessional allotments at all times subject to ANU's approval* (as cited in Whitehead 2008:367).

Subsequently, ANU engaged consultants to further study the light pollution affects and produce an 'Assessment of Protection Measures for Siding Spring Observatory', which was submitted to Council. Following a meeting with Council, the ANU provided a letter that outlined the desired land controls. The restrictions proposed by the ANU were denied in a further meeting with Council in August 1984, but it was resolved that the Shire would carry out further investigations (Whitehead 2008:367-8).

After this date, a 'Regional Environmental Plan' was completed which contained Local Development Control Plans which allowed controlled land use and development around the Observatory, for which the Anglo-Australian Telescope board and ANU were consulted. The 'Coonabarabran Shire Development Control Plan No. 1' was then drafted, determining control of subdivision and development around the Observatory (Whitehead 2008:368). The Plan also established a threshold of light emissions in the surrounding Warrumbungle National Park (NSW National Parks and Wildlife Service (2012:32).

2.3.11 1980s and 1990s

Matthewson's successor as Director of the observatories (Mount Stromlo and Siding Spring) was Alexander Rodgers, the first ANU graduate appointed; as Acting Director from May 1986 and Director from June 1987 (Frame & Faulkner 2003:278). As Director, Rodger spent considerable resources in support of one of the most exciting projects at the observatories, the search for Massive Astrophysical Compact Halo Objects (MACHOs) (Haynes *et al.* 1996:189).

There was a resurgence of public interest in optical astronomy in the 1980s, with the 1986 return of Halley's Comet and the supernova explosion in the Large Magellanic Cloud in February 1987 (Haynes *et al.* 1996:189). In 1987, methods of attracting public to the Visitor Centre were discussed at a Bicentennial Committee meeting. A decision was made to build a replica of the 2.3m ATT, recently constructed at the SSO (Whitehead 2008:369-70). This remains in the Visitor Centre at the SSO, in 2014. John Whitehead (2008:369-70) recalls that the replica was an analemnic sundial which defined the time of day and day of the year.

Rodgers stepped down as Director in June 1992, after which Donald J Faulkner was appointed Acting Director until December 1993. At this date a former student of the observatories, Jeremy Richard Mould, was appointed Director (Frame & Faulkner 2003:278). Mould aimed to 'forge a facilitating and collaborative role for the Observatory within the Australian astronomical community' (Haynes *et al.* 1996:191). His personal interested included reassessing

the Hubble Constant and the velocity field of local galaxies, topics which verge on both observational and theoretical astronomy. This complimented the Theory Centre for Astronomy, established during the same period by the ANU (Haynes *et al.* 1996:191).

On 9 October 1994, the Siding Spring Observatory was re-dedicated by the Chief Scientist of Australia, Professor Michael Pitman. As a commemorative plaque on site at the Siding Spring Observatory records, the date marked 30 years since the foundation of the site by the ANU, 21 years since the commissioning of the UK Schmidt telescope, 20 years since the Anglo-Australian telescope and 10 years since the opening of the ANU 2.3m ATT telescope (SSO plaque on site).

UPPSALA Telescope (1956; Moved to the SSO in 1982)

The Uppsala 0.5m Schmidt Telescope (also known as the Uppsala Southern Schmidt Telescope) was built in 1956 at the Uppsala Observatory in Sweden and moved to Mount Stromlo Observatory in 1957. In response to light pollution in Canberra the telescope was moved to the Siding Spring Observatory in 1982 (Figure 28), and played an important role in the further development of the Observatory. It has been used in photographic studies of the Milky Way in the southern hemisphere, asteroid and comet discovery and imagery for student projects (ANU, 'Uppsala').

It was built as a manually operated photographic telescope, and was refurbished in stages. It was computer controlled with dome pointing, a spherical mirror and 0.5m correcting plate to achieve a 6 degree field of view, with a CCD camera mounted at the Newton focus. It was used to discover and track near-Earth asteroids and comets (ANU, 'Uppsala'). The telescope was decommissioned in 2013 and the Southern Near Earth Object Survey closed down.

The Uppsala was the telescope with which Robert McNaught of the RSAA (Research School of Astronomy and Astrophysics, of the ANU) not only discovered over 400 potentially hazardous near-Earth asteroids, but also discovered the Great Daylight Comet of 2007 (aka C/2006 P1), which was the brightest comets seen in over 40 years. When located at Mount Stromlo Observatory this telescope also took the first known images of the Sputnik satellite – the first man-made satellite that was put into orbit around the Earth by Russia in 1957 – and map its orbit. 'In the political climate of the time, this achievement provided the opportunity for RSAA director Bart Bok to address a joint session of both houses of Parliament, which he ultimately used to obtain funding for a new observatory site and to gain political support for establishing to Anglo-Australian Telescope' (ANU, 'Uppsala').

Advanced Technology Telescope (1984)

The 2.3m Advanced Technology Telescope (ATT) was built for the ANU in 1984 (Figure 32) (Whitehead 2008:365; ANU, 'ANU 2.3m Telescope'). The construction of the ATT was an outstanding vision of Director Don Mathewson in the 1970s. It was described in the 1978 Annual Report of the MSSSO as 'a new telescope so novel in design that it belongs in the next generation of telescopes' (Haynes *et al.* 1996:184).

The project was managed by the observatory's technical staff and much of the smaller mechanics were carried out in-house at Mount Stromlo and the SSO. The telescope incorporated three radical features that were never before combined in a single instrument. These included an uncommonly thin mirror, an altitude-azimuth telescope mount and a rotating building (previously only the dome rotated) (ANU, 'ANU 2.3m Telescope'; John Hart, pers. comm. 20 May 2014).

The telescope was inaugurated by Prime Minister Bob Hawke on 16 May 1984 (Figure 31), which illustrates the importance of the technological achievement the construction was in Australia, increasing the profile of the Siding Spring Observatory in the field. In 1985 the ATT won the Excellence Award of the Institution of Engineers, Australia, Canberra Division (Haynes et al. 1996:184-5).

Eight pieces of interchangeable equipment can be fitted to the telescope, allowing direct imaging (TV), spectra and infra-red, allowing multiple operations. In May 2009, the telescope

was installed with a wide-field (WIFeS) spectrograph, updating the telescope with leading-edge technology (John Hart, pers. comm. 20 May 2014; ANU, 'Wide-Field Spectrograph'). In 2014, the telescope is widely used by students from the RSAA (Research School of Astronomy and Astrophysics, of the ANU) and other universities. It remains the ANU's primary active telescope at the Siding Spring Observatory (John Hart, pers. comm. 20 May 2014).

Automated Patrol Telescope (Moved to SSO in 1994)

The Automated Patrol Telescope (APT) was operated by the University of New South Wales until it was decommissioned in 2012. It is a 0.5metre, wide-field CCD imaging telescope that can be operated remotely from Sydney, or be fully automated. It was developed by modifying the optical, mechanical and electronic systems of a Baker-Nunn satellite tracking instrument, which was originally located at Woomera, South Australia, in the 1960s and later located at Orroral Valley near Canberra. In 1992, the camera was donated to the University of New South Wales by the Smithsonian Institute. The UNSW conducted most of the modifications to the camera, before the telescope was relocated to the Siding Spring Observatory. The telescope is housed in a 'roll-off' roof building, which allows rapid access to the sky. The optics were redesigned at UNSW, the telescope was installed at the SSO in 1993 and by 1994 the telescope was fully operational. It has played a key role in the UNSW's extra-solar planet search program (ANU, 'APT'; UNSW, 'APT').

2.3.12 2000s, the Era of Robotic Networks

In January 2001 John E Norris was appointed Interim Director of the Research School of Astronomy and Astrophysics – a new title coined at this date – managing both Mount Stromlo Observatory and the Siding Spring Observatory. Norris remained Interim Director until July 2002, at which date Penny D Sackett was appointed Director (Frame & Faulkner 2003:278). Following Sackett, was Director Harvey Butcher from 2007 to 2013, and Matthew Colless, who was appointed in January 2013 and remains in the position in 2014.

This phase of development, from 2000 onwards, is a period of increased international recognition and growth, with the Siding Spring Observatory recognised on an international platform as one of the key sites in the southern hemisphere, as demonstrated by the many international stations located at the site, consisting of state-of-the-art automated and robotic telescopes.

Mount Stromlo Observatory Fire

The Canberra bushfires of January 2003 devastated much of the Mount Stromlo Observatory. As a result Mount Stromlo no longer retains any working telescopes, with all of the telescopes located at the Siding Spring Observatory. As a result, the Siding Spring Observatory became the Australian National University's main centre for astronomical research (Frame & Faulkner 2003:275).

Reconstruction at Mount Stromlo has seen the development of the Advanced Instrument Technology Centre and the rebuilding of the original Commonwealth Solar Observatory building. It is the headquarters of the Research School of Astronomy and Astrophysics (ANU, 'Mount Stromlo Observatory').

ROTSE Telescope (2003)

The Robotic Optical Transient Search Experiment (ROTSE) 0.45metre telescope is located at the Siding Spring Observatory and was operated by the University of New South Wales until its decommissioning in 2011. It is one of four telescopes that were part of a collaborative project between astrophysicists from the University of New South Wales, the University of Michigan, Los Alamos National Laboratory, Lawrence Livermore National Laboratory and the Max Planck Institute for Nuclear Physics in Germany. The network of telescopes is located in Australia, Namibia, Turkey and Texas, USA. The primary goal of the ROTSE project was to achieve observations in optical light of the massive deep-space explosions called gamma-ray bursts (GRBs) (ANU, 'ROTSE'; ROTSE website).

The ROTSE telescope is a fully automated, 0.45metre, wide-view, 3rd generation robotic telescope which has detected the transient optical emission from several GRB events. The first ROTSE Telescope was installed at the Siding Spring Observatory, in March 2003 (Burton 2008:20).

Faulkes Telescope South (2004)

Located at the Siding Spring Observatory, the Faulkes Telescope South is operated by the Las Cumbres Observatory Global Telescope Network (LCOGT). It was installed by 2004 and began fully operating in 2006. Designed and built in Liverpool, United Kingdom, it is one of the largest robotic telescopes in the world, with a mirror with a 2metre aperture. Faulkes Telescope North is located in Maui, Hawaii, and together the two telescopes supply free resources for science education. There are over one thousand registered users world-wide, including students, community groups and professional astronomers (ANU, 'Faulkes Telescope South'; Faulkes Telescope Project online).

Faulkes Telescope South is part of the growing global network of robotic optical telescopes, which will provide continuous sky coverage and resources for innovative science in partnership with other international organisations. The network is deigned to be operated as a single instrument via an international control centre which operates the Faulkes Telescope automatically (ANU, 'Faulkes Telescope South').

Las Cumbres presence at the SSO site was recently expanded with the addition of the two Stellan A and Stellan B telescopes, immediately to the south-west of the Faulkes Telescope. The two 1-meter telescopes comprise a node of the southern hemisphere telescope network that Las Cumbres is currently deploying, with others at the Cerro Tololo Inter-American Observatory (CTIO) in central Chile and at the South African Astronomical Observatory in Sutherland, South Africa. The term 'Stellan', which is common to all of the telescopes in the network, applies to the Las Cumbres Observatory 1-meter enclosures. These are walls married to modified Ash-Dome (manufacturer) domes that are highly integrated with the telescope and electrical and software systems.

The Faulkes and Stellan telescopes lie within their own small independent cadastral boundary within the ANU site. This lot (and the lot for the UK Schmidt telescope) was subdivided in 1972 (ANU plan, 'SSO plan boundary redefinition & survey of encroachments', c1970s; ANU plan N908/S/018/1of3).

YSTAR-KAO Telescopes (2005)

The YSTAR-KAO telescopes at the Siding Spring Observatory were part of an international network, managed by both the Yonsei University Observatory and Korea Astronomy Observatory. The YSTAR-Kao Australian Station was installed at the SSO in January 2005 and consists of automated telescopes operated from Seoul, Korea (sign on site, viewed May 2014; UNOOSA; Burton 2008:20).

The YSTAR (Yonsei Survey Telescopes for Astronomical Research) program began in 1998 and aimed to detect and monitor optical brightness variations and moving objects. The first telescope of the network was installed in 2003 in Sutherland, South Africa, with others located in Korea and Cerro Tololo Inter-American Observatory in Chile (UNOOSA). As of 2015 the telescope is non-operational and is being dismantled.

SkyMapper Telescope (2007)

Built in 2007 (Whitehead 2008:365) and operated by ANU, the SkyMapper telescope is a state-of-the-art automated wide-field survey telescope with a 1.35m primary mirror. SkyMapper is intended to robotically create the first comprehensive digital survey of the entire southern sky in massive detail, to a sensitivity one billion times fainter than the human eye can see. The information obtained by the SkyMapper will be available for public access online (ANU, 'SkyMapper telescope').

HAT-South Telescopes (2009)

Operating since 2009, the HAT-South (Hungarian Automated Telescope) telescopes at the SSO (two 'HS4' units) are part of a network of fully automated, identical telescopes that are part of the HAT-South project. The network searches for and detects transiting extrasolar planets in the Southern Hemisphere and characterises their physical properties (ANU, 'The HAT-South Project'; info panel on site).

The network consists of two other telescopes, at evenly-spaced longitude, in Las Campanas Observatory in Chile and the Hess Site in Namibia. Each site holds two 'TH4' units. Each site is able to monitor 128 square degrees of sky, 24 hours per day. The project is a collaboration between the ANU, the Harvard/Smithsonian Centre for Astrophysics (CfA) and the Max Planck Institute for Astronomy (ANU, 'The HAT-South Project'; info panel on site).

iTelescope. Net Observatory (2013)

The iTelescope Observatory at the SSO is part of a global network of internet connected robotic telescopes, of small to medium-sized, which are designed to use by the public via the internet. iTelescope.net is a non-profit organisation that is in partnership with the RSAA, creating the world's first network of internet connected public telescopes, for the purposes of education, research and astro-photography (ANU, 'iTelescope.Net'; itelescope.net website).

The Siding Spring Observatory contains the southern hemispheric station for iTelescope and was the flagship Observatory, commissioned in January 2013 (ANU, 'iTelescope.Net'; itelescope.net website).

PROMPT Telescopes (2013)

The University of North Carolina operates 'Skynet', a control and scheduling software that operates an international network of robotic telescopes. PROMPT-Australia is located at the Siding Spring Observatory and consists of four 17 inch telescopes: PROMPT A1, A2, A3 and A4 which were built in 2013 (Skynet University).

The network has been operating since 2004 and consists of fully automated telescopes that are both University owned and otherwise, located at Cerro Tololo Inter-American Observatory in Chile, the National Radio Astronomy Observatory in West Virginia and Morehead Observatory in North Carolina and the Siding Spring Observatory. Skynet produces images for professional astronomers, students and the public (Skynet University).

Solaris Telescope (c2014)

The Solaris Telescope is owned and operated by the Nicolaus Copernicus Astronomical Centre in Torun, Poland, which is a branch of the Polish Academy of Sciences. Project Solaris operates from a network of three sites in the Southern Hemisphere – Australia, Argentina and South Africa (ANU, 'Solaris').

The Solaris Telescope at the SSO is a 20 inch Ritchy Chretien system, which will look for planets around eclipsing binary stars, using precision photometry (ANU, 'Solaris'; Solaris website). Technically speaking, the goal of the telescope is 'to detect circumbinary planets around a sample of up to 350 eclipsing binary stars using eclipse timing and precision radial velocities, and to characterize the binary stars with an unprecedented precision to test the stellar structure and evolution models' (Solaris website).

KMTNet Telescope (2014; under construction)

In 2014, a 1.6 metre telescope is being built at the SSO as part of the Korea Microlensing Telescope Network (KMTNet), owned by the Korea Astronomy and Space Sciences Institute (KASI). As part of the network, two other 1.6 metre telescopes are being built at Cerro Tololo Inter-American Observatory in Chile, and at the South Africa Astronomical Observatory in Sutherland, South Africa. A 340 megapixel camera – the largest ever made – will be attached to each of the 1.6 metre telescopes, built by Ohio State astronomers, funded by KASI (OSU.edu).

2.3.13 Fire at the Siding Spring Observatory

On 13 January 2013, fires swept through the Warrumbungle National Park, burning 40,000 hectares (Figure 36). The fire approached the Siding Spring Observatory and staff were evacuated (*ABC Science*, Mon 14 Jan 2013). Buildings affected and damaged included the Fire Station, Lodge, Director's Cottage and sheds, as the fire approached very rapidly from the south.

The Observatory reopened for site residents and observations in February 2013 and reopened to the public two months later in April, following extensive post-bushfire safety works, carried out by the Shire of Coonabarabran and ANU. The ANU ran an emergency relief fund that raised money for those affected by the fire at the Siding Spring Observatory, while also donating to the local community bushfire appeal (ANU website 'Siding Spring Observatory reopens').

2.3.14 The Siding Spring Observatory Today

Today the Siding Spring Observatory is the ANU's primary observing site and a primary location of Australian astronomical research and scientific advancement. It is associated with a range of Australian and international universities and research institutions and is one of the foremost optical observatories in the world, hosting telescopes for networks managed by institutions in countries including Korea, Hungary and Poland.

It is the country's largest optical astronomy research facility and has been responsible for a number of ground-breaking discoveries and advances in modern astronomy (ABC Science, 14 Jan 2013; High Ground Consulting 2006:43). These include the mapping and expansion of space and time, modelling and observing the formation of galaxies, designing cutting-edge astronomical instrumentation to work in conjunction with some of the world's largest telescopes – including those at the Siding Spring Observatory – studying the violent flows of gas around black holes and locating the oldest stars in the galaxy (SSO Visitor Centre brochure).

The AAO, located at the Siding Spring Observatory, has a reputation as one of the most productive observatories in the world, and a leader in many astronomical fields as the home of the southern hemisphere's most precise planet search program and comprehensive galaxy and quasar surveys (AAO brochure).

The SSO site continues to attract numerous visitors who are provided for by the Visitor Centre or 'Exploratory', by the viewing gallery in the AAT and by a dedicated Tour Officer who provides walking tours of the site by arrangement or regularly during school holidays. Each year the SSO hosts 'StarFest', a series of events over the October long weekend that forms part of the regional Festival of the Stars and includes Open Days at the SSO where visitors can meet the astronomers and discover more about the observatory and the science that is done at the site.

2.4 Associated people

The Siding Spring Observatory has associations with a number of eminent astronomers and academics, who have administered and advocated its establishment and development. These figures were highly influential in developing the capability and reputation of astronomy at the ANU, nationally and internationally, and are regarded for their research and contribution to the science.

2.4.1 Bart Bok, Director 1956-1966

Bartholomeus Jan 'Bart' Bok (1906-1983), astronomer, was born in the Netherlands and studied astronomy at Leiden and Groningen universities. In 1929, he was awarded a fellowship to Harvard College Observatory, Massachusetts, under astronomer Harlow Shapley. In the same year, Bok married Priscilla Fairfield, an astronomer who became his scientific collaborator. After completion of his PhD in 1931, Bok was employed at Harvard College Observatory and became a professor in 1947 (Robertson 2007, ADB).

Bok became an authority on the distribution and velocity of stars in the Galaxy in the 1930s, in an attempt to determine its structure, even though the true spiral shape of the Milky Way was not determined until the 1950s. In 1941, he and Priscilla published The Milky Way, proclaimed to be one of the most successful astronomical books ever published (Robertson 2007, ADB).

In 1956, Bok accepted the position of Director at Mount Stromlo Observatory and professor of astronomy at the ANU. At this date, Bok's experience included theoretical astronomy in Holland, optical studies of the Milky Way in both hemispheres, investigations of Magellanic Clouds from South Africa and the establishment of the radio telescope at Agassiz Station at Harvard Observatory (Miller c1970:8).

Bok's appointment had a significant impact on Australian astronomy, boosting the development of optical astronomy within the country. Bok connected with Sydney radio astronomers and attracted prominent international astronomers to Australia, who used the 74 inch optical telescope at Mount Stromlo Observatory, which subsequently became a major Australian astronomical instrument. By the 1960s, Mount Stromlo Observatory was the leading centre for optical astronomy in the Southern Hemisphere (Robertson 2007, ADB).

Bok helped establish the graduate program in astronomy at the ANU and also recognised the need for a better observing site than Mount Stromlo, before initiating and conducting the survey that resulted in the selection of Siding Spring Mountain for a field station. Bok secured government funding for the telescopes and instruments for the Siding Spring site, aided by his friendship with Prime Minister (Sir) Robert Menzies (Robertson 2007, ADB). It was under his Directorship that the Siding Spring Observatory officially opened in 1965.

In addition to his scientific achievements, as a teacher for ANU Bok popularised the field through public lectures, published articles and radio broadcasts. He also promoted scientific programs of the United National Educational, Scientific and Cultural Organisation in developing countries. In Australia, he became the public face of astronomy during this period. His contribution to the field of astronomy in Australia is commemorated by the Bok prize, awarded by the Society of Australia and the Australian Academy of Science (Robertson 2007, ADB).

In 1966, the Boks returned to America where he was appointed director of the Steward Observatory (until 1970) and Professor of Astronomy at the University of Arizona (until 1974 when he retired). Throughout his career he received many awards: in 1968, he was elected to the US National Academy of Sciences; in 1977, he was awarded the Catherine Wolfe Bruce gold medal of the Astronomical Society of the Pacific, of which he was a board member in 1977-80. Between 1970 and 1974 he served as Vice President of the International Astronomical Union and as president of the American Astronomical Society between 1972-74 (Robertson 2007, ADB).

2.4.3 S.C.B 'Ben' Gascoigne, Director 1966

Professor Sidney Charles Bartholomew 'Ben' Gascoigne completed his Bachelor of Science at the University College of Auckland before completing his PhD at the University of Bristol. In 1941, Gascoigne arrived to Australia to work in optical munitions at the Commonwealth Solar Observatory at Mount Stromlo. He continued working at the Observatory after the Second World War, now Mount Stromlo Observatory, conducting astronomical research in stellar evolution and faint star photometry, amongst other areas. Gascoigne also took the first photos with the Anglo-Australian Telescope, on 27 April 1974 (Burton 2008:11).

Gascoigne was an integral player in the establishment of the Anglo-Australian Telescope. In 1996 Gascoigne received the Order of Australia, 'in recognition of service to observational astronomy, specialising in the life history of stars, particularly in the Magellanic Clouds and for his contribution to astronomical optics and to the Anglo-Australian Telescope' (Australian Government online, 'Australian Honours').

2.4.3 O.J. Eggen, Director 1966-1977

Olin Jeuck Eggen was born in the United States of America, and had experience at Lick Observatory, California and was later a Visiting Fellow at Mount Stromlo Observatory in 1952 and 1955. He became Chief Assistant to the Astronomer Royal at the Royal Greenwich Observatory in 1956 and was appointed Professor of Astrophysics at the California Institute of Technology in 1961 (Miller c1970:8).

In 1966, Eggen was appointed Director of Mount Stromlo Observatory and Professor of Astronomy at ANU (Miller c1970:8). One of his immediate objectives was to increase the number of research papers produced by the observatory and subsequently strengthen the international reputation of the graduate school (Haynes *et al.* 1996:180). Eggen's priorities were research and observing, spending a week each month at the SSO observing on the 40 inch Telescope, gathering photoelectric data to research the evolution of the Milky Way. It was under Eggen's Directorship that the Anglo-Australian Observatory was finalised and completed.

After Eggen resigned as Director in September 1977, he moved to South America to work at the Cerro Tololo Inter-American Observatory in Chile. Eggen passed away on a visit to Mount Stromlo in 1998. His ashes were spread in the gardens near to 40 inch telescope at the Siding Spring Observatory (Whitehead 2008:362). A plaque at the lookout commemorates Eggen.

2.4.4 Chronology of Directors

Table 1 - Chronology of Directors

Names	Appointment	Date
W Geoffrey Duffield	Director Commonwealth Solar Observatory	1 Jan 1924 – 1 Aug 1929
William B Rimmer	Officer in Charge Commonwealth Solar Observatory	1 Aug 1929 – 4 Dec 1939
Richard v d R Woolley	Commonwealth Astronomer Director, Commonwealth Observatory	4 Dec 1939 – 7 Dec 1955
Arthur R Hogg	Acting Commonwealth Astronomer	8 Dec 1955 – 7 Mar 1957
Bart J Bok	Director Mount Stromlo Observatory	7 Mar 1957 – 19 Mar 1966
Arthur J Hogg	Acting Director Mount Stromlo Observatory	20 Mar 1966 – 31 Mar 1966
SCB 'Ben' Gascoigne	Acting Director Mount Stromlo Observatory	1 Apr 1966 – 10 June 1966
Olin J Eggen	Director Mount Stromlo and Siding Spring Observatories	1 Jul 1966 – 20 Sep 1977
Donald S Mathewson	Acting Director Director Mount Stromlo and Siding Spring	1 Oct 1977 – 4 Apr 1979 5 Apr 1979 – 4 May 1986

Names	Appointment	Date
	Observatories	
Alexander W Rodgers	Acting Director Director Mount Stromlo and Siding Spring Observatories	5 May 1986 – 11 Jun 1987 12 Jun 1987 – 11 Jun 1992
Donald J Faulkner	Acting Director Mount Stromlo and Siding Spring Observatories	12 Jun 1992 – 12 Dec 1993
Jeremy R Mould	Director Mount Stromlo and Siding Spring Observatories	13 Dec 1993 – 30 Jan 2001
John E Norris	Interim Director Research School of Astronomy and Astrophysics	1 Feb 2001 – 21 Jul 2002
Penny D Sackett	Director Mount Stromlo and Siding Spring Observatories	22 Jul 2002 – 14 May 2007
Harvey Butcher	Director Siding Spring Observatory	28 Sep 2007 – 6 Jan 2013
Matthew Colless	Director Siding Spring Observatory	7 January 2013 –

(Source: Frame & Faulkner 2003: 277-8; Australian National University).

Figure 14 - The construction of the building to house the 40 inch telescope – the first telescope installed on site, which was officially opened in 1964 (ANU RSAA Archive, accessed August 2014).

Figure 15 - The dome being installed on the 40 inch telescope building, in 1963-4 (ANU RSAA Archive, accessed August 2014).

Figure 16 - The opening ceremony of the Siding Spring Observatory on 5 April 1965. The ceremony was held in front of the 40 inch telescope, pictured (NAA: image no A1200, L50846, 1965).

Figure 17 - Bingar Cottage when it was located at the Mount Bingar Field Station (in the late 1950s or early 1960s), before it was moved to the Siding Spring Observatory by 1965 (ANU RSAA Archive, accessed August 2014).

Figure 18 - Looking north east at the west end of the site, at the 16 inch, 40 inch and 24 inch telescopes in an aerial dating to 1968 (ANU RSAA Archive, accessed August 2014).

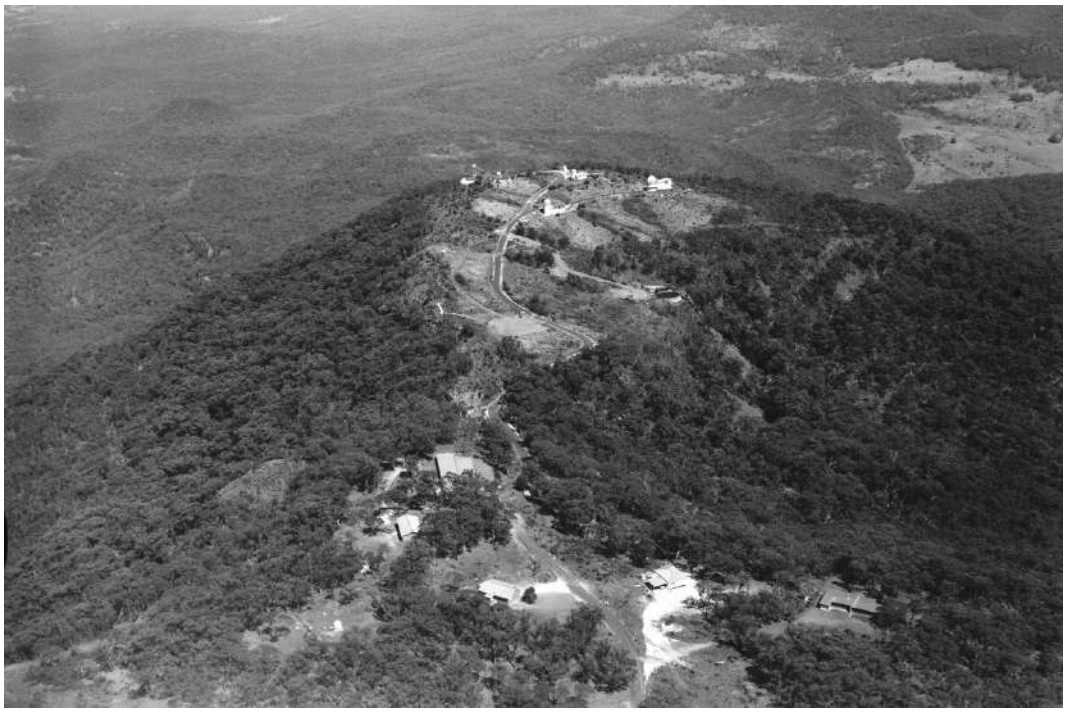

Figure 19 - An aerial of the Siding Spring Observatory, looking west, in 1968 (ANU RSAA Archive, accessed August 2014).

Figure 20 - The site looking south-west. The Directors Cottage is visible in the top right hand corner of the photo. Behind this is the future site of the Anglo-Australian 150 inch Telescope, not yet built. In the foreground five of the residences are being constructed. Right of the photo is Residence No. 3. The photo probably dates to the late 1960s (Judy Over photo collection, N.D.).

Figure 21 - A photo dating to c1973, looking south west to the Anglo-Australian 150 inch Telescope during construction, and showing the residences in the foreground (Judy Over photo collection).

Figure 22 - Prince Charles on the opening of the Anglo-Australian Telescope on 16 October 1974, shaking hands with then Australian Prime Minister Gough Whitlam. The water tower in the background, remains in 2014, located north-west of the Anglo-Australian Telescope. The additional Lodge is also visible in the background (Judy Over photo collection).

Figure 23 - The Siding Spring Exploratory at the Visitor Centre. The photo probably dates soon after it opened in 1974 (ANU RSAA Archive, accessed August 2014).

Figure 24 - Looking east, across the extent of the Siding Spring Observatory in 1974, showing its position in the Warrumbungle landscape (ANU RSAA Archive, accessed August 2014).

Figure 25 - The Anglo-Australian 150 inch telescope and workshop. Below this is the Visitor Centre and to the right of the image are the residences. Towards the background stands the Lodge. This photo dates to post-1974, after the construction of the AAT and Visitor Centre (Judy Over collection, N.D.).

Figure 26 - The 150 inch Anglo-Australian Telescope to the left of picture and the UK Schmidt Telescope stands to the right. The exact date of the photo is not known, but is probably the late 1970s or early 1980s (Judy Over collection, N.D.).

Figure 27 - The Observatory Lodge c1980, with the Administration Building in the background (Miller, c1981).

Figure 28 - The building for the Uppsala Telescope under construction at the Siding Spring Observatory, before the telescope was installed in 1982. The telescope was relocated from Mount Stromlo Observatory (ANU RSAA Archive, accessed August 2014).

Figure 29 – The *Siding Spring Observatory in 1981, looking north-east into the surrounding landscape. From left to right: the 16 inch, the 40 inch and the 24 inch telescopes. The 2.3 metre ATT had not been built at this date (NAA: image no A6135, K158133, 1981).*

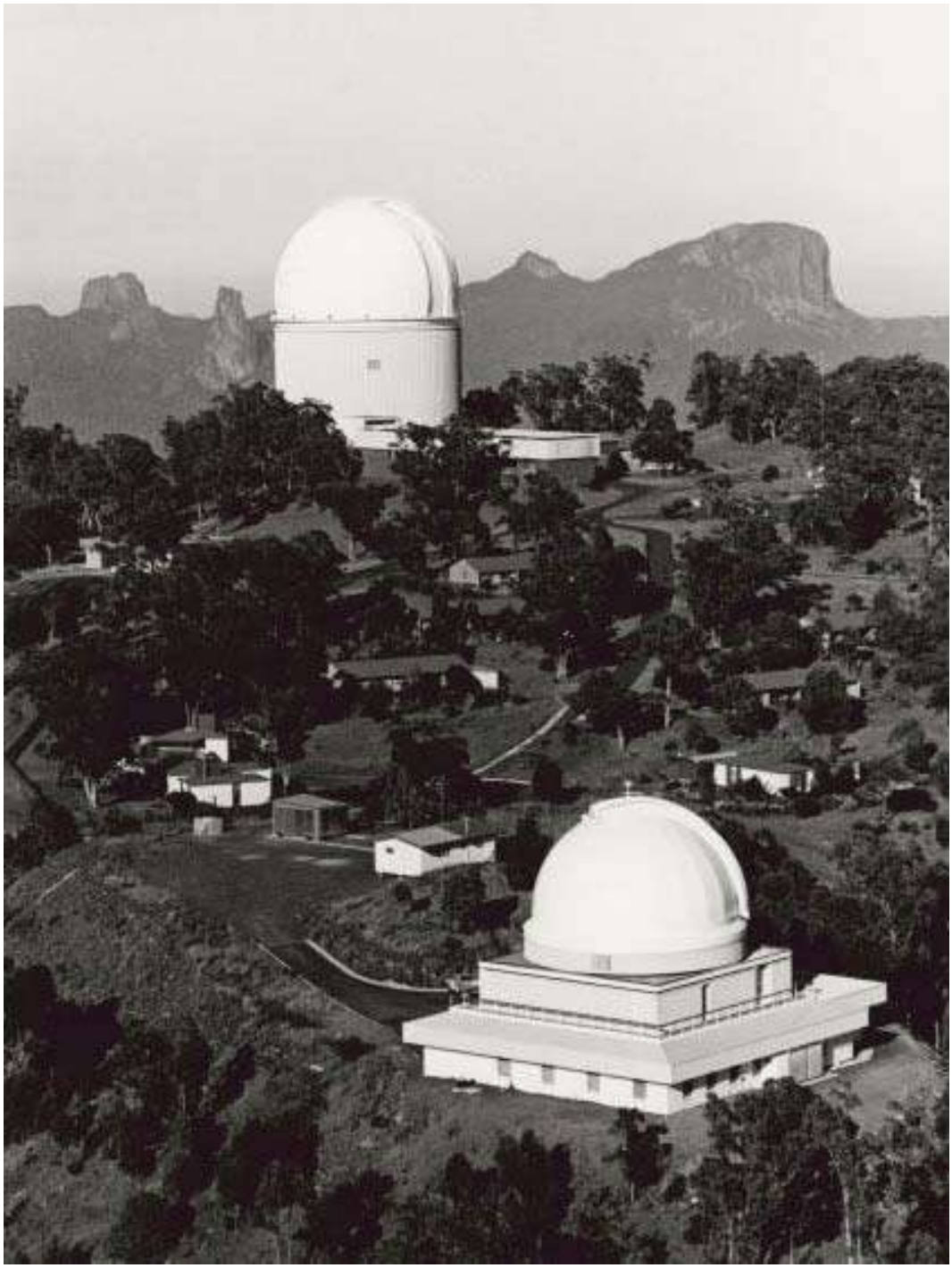

Figure 30 – The *Siding Spring Observatory in the early 1980s, looking north-west. In the foreground is the UK Schmidt Telescope, with the residential area in the middle ground, including a group of houses to the left of picture which have since been demolished. The Anglo-Australian Telescope (AAT) stands in the background (NLA: picture no vn-3642963-v, c1981-1985).*

Figure 31 - Then Prime Minister Bob Hawke speaking at the opening of the Advanced Technology Telescope on 16 May 1984 (ANU RSAA Archive, accessed August 2014).

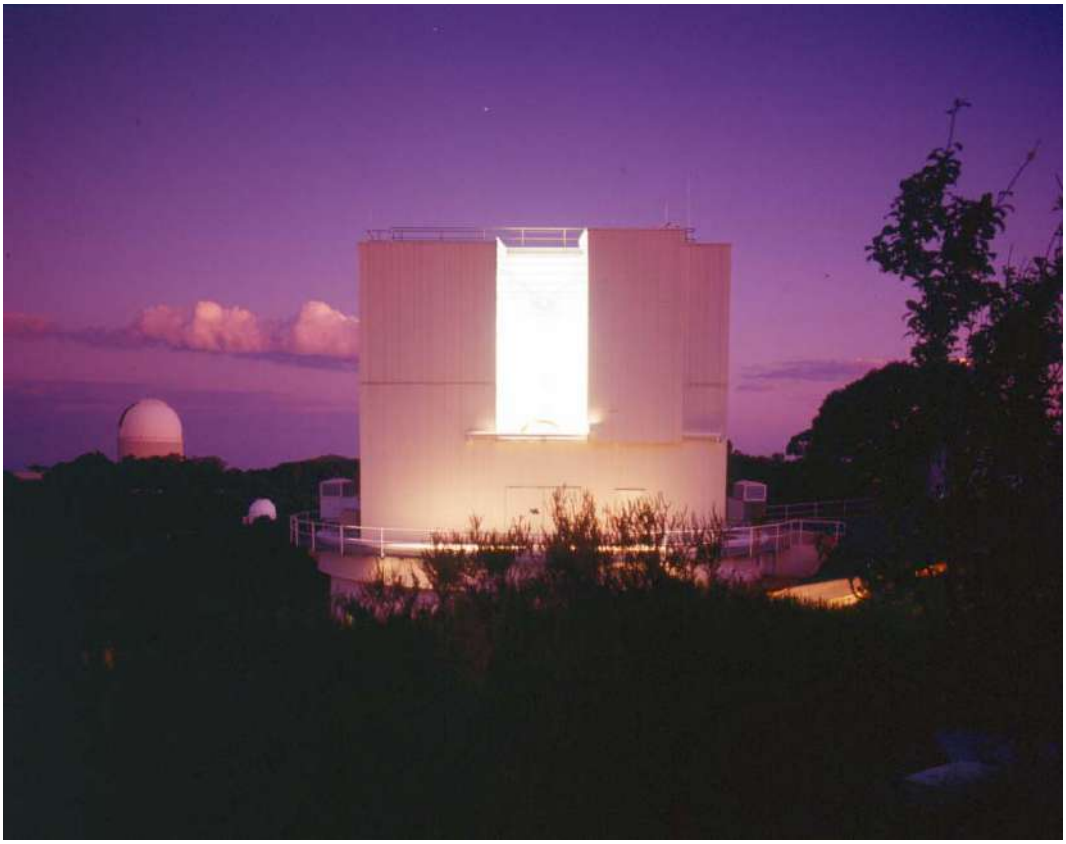

Figure 32 - The Advanced Technology Telescope in the year it was constructed, June 1984 (ANU RSAA Archive, accessed August 2014).

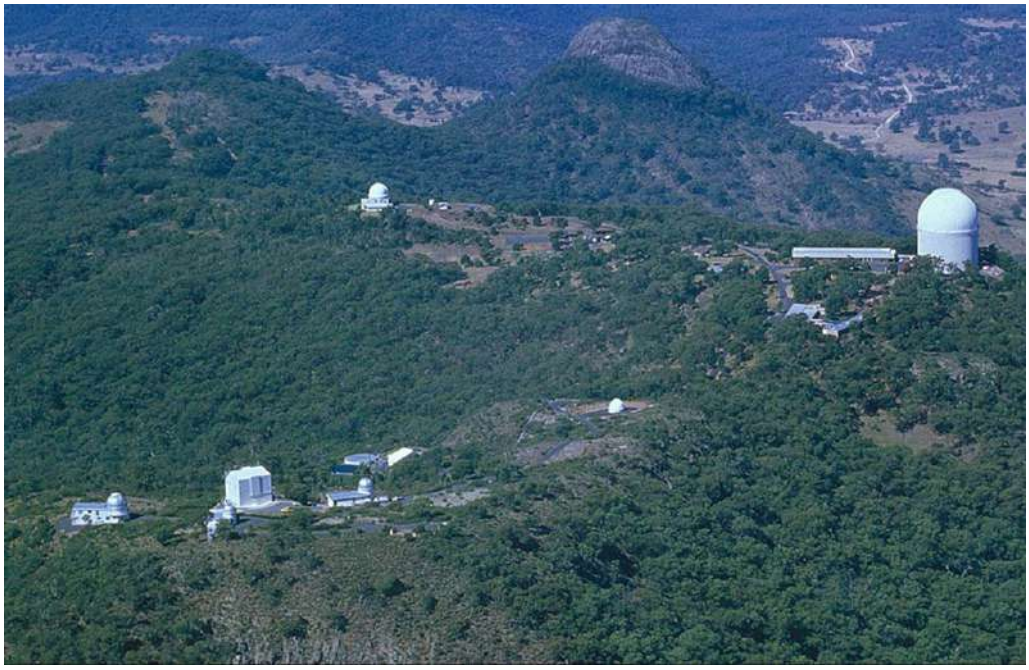

Figure 33 - An oblique aerial of the Siding Spring Observatory in 1984, looking east with the Anglo-Australian 150 inch Telescope to the far right of picture (ANU RSAA Archive, accessed August 2014).

Figure 34 - Photo dating to 1984, looking west from the Anglo-Australian Telescope, with the Lodge in the foreground, Uppsala telescope in the middle and Advanced Technology Telescope surrounded by the 16 inch, 40 inch and 24 inch telescopes in the background (ANU RSAA Archive, accessed August 2014).

Figure 35 - Looking south at the Administration Building at its current extent. To the left if the Anglo-Australian Workshop, with the Anglo-Australian Telescope in the background (exact date of photo not known) (ANU RSAA Archive, accessed August 2014).

Figure 36 - Bushfires approaching the Siding Spring Observatory on 13 January 2013 (Australian Geographic, 14 Jan 2013).

3 DESCRIPTION AND ANALYSIS OF THE PLACE

3.1 Introduction

This section describes and analyses the physical place and its setting, in their current state. Further description and analysis relevant to the place is also found in Section 4.4 that identifies community social and aesthetic values.

The SSO site is shown on Plan 1.

More information on the elements of the site can be found in the inventories contained in Volume 2 of the HMP.

3.2 Landscape Setting

3.2.1 The Broader Setting

The landscape setting of the Siding Spring Observatory is not only a key contributor to its visual character but also a key functional reason for its existence. The location was the subject of specific inquiry, and it was selected as suitable for an optical observatory site as a place of high elevation, frequent cloud-free nights and dark sky, but one that was not too remote.

The wider landscape context of the Siding Spring Observatory extends well beyond its visual setting as drivers on the Newell Highway. Drivers approaching the site pass signs such as that shown in Figure 37, which represent the planets in a scaled representation of the solar system - the World's largest 'virtual solar system drive', based around the dome of the AAT being the sun. Across the surrounding area, the astronomical theme permeates numerous other built landscape elements including commemorative signs and names (such as the Bart Bok Bridge on the road to the site from Coonabarabran) and more fanciful objects such as rocket-shaped letter boxes (see Figure 43).

Largely because of the prominence in the landscape of the AAT, attributable to its massive size and location near an escarpment edge, the visual setting of the Siding Spring Observatory incorporates a substantial rural area around the site itself (see Figure 45 and Figure 46). On closer approach other telescope buildings also become highly visible from outside the site.

The broader setting of the Siding Spring Observatory includes a number of telescopes located on properties on the road to the SSO and in the general area. These are either private or marketed at visitors to the region – the most prominent example of the latter is the Milroy Telescope, located in the Milroy Observatory approximately 12km to the north east of the SSO site, which is actually the SSO 40 inch telescope (the first installed at the site) that was disposed of in 2009 (see Figure 39 and Figure 40 and Section 3.7) and is now in commercial use. Closer to the site, several of these privately owned telescopes can be seen in the same visual envelope as the AAT (see Figure 44).

3.2.2 The Setting of the Site

The setting of the site comprises the built (cultural) and natural features within it and the natural landscape elements that surround it and are visible from within it.

Cultural features inside the site include clearings, landscaped areas and roads, infrastructure and buildings, and the natural elements inside the site include both native and introduced vegetation. At the western, more exposed, end of the site the rocky landscape includes native grass trees (Figure 47) whilst at its eastern end telescope buildings such as the UK Schmidt Telescope are positioned amongst stands of eucalypts (Figure 49).

A key aspect of the site is the very steep drop offs around its perimeter, which provide very impressive views to the peaks of the surrounding Warrumbungle National Park (Figure 50) and beyond to the rural lands that surround the Park (Figure 52).

Figure 37 - One of five 'Neptune' signs on routes of the 'World's Largest Virtual Solar System Drive' that all converge on the SSO site. This example is next to the Gilgandra Coo-ee Heritage Centre on the Newell Highway (Context 2014).

Figure 38 - The astronomically themed welcome sign at the approach to Coonabarabran, the 'Astronomy Capital of Australia' (Context 2014).

Figure 39 - The private Milroy Observatory which now houses the 40 Inch Telescope recovered from the SSO (Context 2014)

Figure 40 - ANU Heritage Officer Amy Jarvis siting through the 40 Inch Telescope at the Milroy Observatory (Context 2014)

Figure 41 - A private telescope on the western outskirts of Coonabarabran (Context 2014).

Figure 42 - Telescopes at the Warrumbungle Observatory, a private operation catering for tourists, school groups and amateur enthusiasts on Timor Road to the east of the SSO (Context 2014).

Figure 43 - A rocket-shaped mail box at a Coonabarabran property (Context 2014).

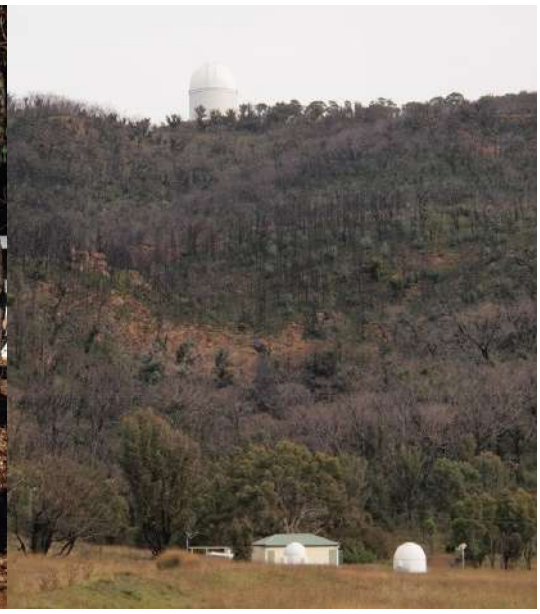

Figure 44 - Private telescopes at a property beneath the SSO (Context 2014).

Figure 45 - The Anglo-Australian Telescope (centre of picture) silhouetted amongst the Warrumbungles, from the Newell Highway, 15km to the south (Context 2014).

Figure 46 - The Anglo-Australian Telescope (centre of picture) and the row of smaller telescopes viewed from Timor Road to the east (Context 2014).

Figure 47 - Grass trees and low scrub landscape at the western exposed part of the site (Context 2014).

Figure 48 - Rocky ground and native regrowth following the 2013 fire at the edge of the escarpment around the SSO (Context 2014).

Figure 49 - Eucalypts located at the eastern end of the site near the UK Schmidt telescope (Context 2014).

Figure 50 - The Warrumbungles form a dramatic backdrop to the site, and this image also illustrates the steep drop offs around the perimeter of the site (Context 2014).

Figure 51 - The volcanic plug of Mt Mopra to the east of the SSO site (Context 2014).

Figure 52 - Pastoral rural lands near the approach road below and to the east of the SSO site (Context 2014).

3.3 Site Areas

The site of the Siding Spring Observatory is located along a narrow 'boomerang' shaped ridge running roughly east west, with the crown of the boomerang facing south. This central point is the hub of the site where the AAT building (owned and managed by AAO), the AAO Workshop and the Administration Building which contains the ANU site office are located.

The site can be described in terms of a number of landscape/topographic areas which are shown on Plan 2 and described below along with the buildings and structures within them. These areas could be more formally recognised as 'precincts' for management purposes.

3.3.1 Visitor Arrival Area

This area, which is the first to be reached on arrival at the site, is defined by an open park-like landscape of mature eucalypts alongside the approach road and the visitor parking area and grassed areas in front of the Siding Spring Exploratory/Visitor Centre. The building mass of the Workshop and large AAT building (see AAT Precinct) form a visually dominant western backdrop to this precinct.

Siding Spring Exploratory/Visitor Centre (N015) is a light brown face brick flat roofed building with distinctive deep metal eaves. Designed by Bunning and Madden architects the building was constructed in 1974 at the same time as the AAT to its south west. It includes an exhibition area, kiosk and retail sales and public amenities. A walkway climbs up the slope behind the building, providing visitor access to the AAT building and its public gallery.

Figure 53 - View of Visitor Arrival Area from the AAT, with the UK Schmidt and Faulkes telescopes in the background (Context 2014).

Figure 54 - Visitor car park and mature eucalypts, looking north east (Context 2014).

Figure 55 - The interior of the Exploratory today (compare with Figure 23 - many of the exhibits survive from its original 1974 design) (Context 2014)

Figure 56 - Plaque on the front wall of the Visitor Centre commemorating the re-dedication of the site in 1994 (Context 2014)

Figure 57 - The Siding Spring Exploratory/Visitor Centre from the south east (Context 2014).

Figure 58 - Information shelter in the grassed are to the north of the visitor car park (Context 2014).

3.3.2 AAT/Administration Area

This precinct is located on a high point in the middle of the ridge on which the site sits, and is formed around the service road and parking area that extends south to the AAT from the spinal Observatory Road. The area is dominated by the massive bulk of the AAT telescope building, the scale of which can only really be appreciated through the juxtaposition of more mundane objects, such as vehicles, because of its archetypal telescope building form. Other elements in the precinct include the Workshop (N017) managed by the AAO and the ANU Administration Building (PABX/Office N003). The distinctive form of the 'Golf Ball' water tower is located to the west of the AAT and prior to the fires of 2013 this precinct also included the Fire Station (N010), but now only its concrete foundation pad remains, along with the surviving hose mast. .

AAT (3.9m Telescope) owned by the Australian Astronomical Organisation (AAO) and located on land leased to the AAO by the ANU is 37m in diameter and 26 m high (to the base of the dome). The Anglo Australian Telescope building comprises a structurally independent central structure, which supports the telescope itself, built within an outer cylindrical concrete building which in turn supports the rotating dome. The main telescope floor, above which the telescope frame is suspended, is located some way up inside the structure where it is surrounded by office, control and amenity facilities and a visitor gallery reached by a visitor lift, an external viewing/gathering area and walkway from the Exploratory/Visitor Centre. Above the main floor are gantries and service levels which eventually provide access to an external walkway which runs around the building at the bottom of the dome. A large square central shaft descends from the main floor, through a series of massive hatches, to a loading dock and storage area at ground level. In so doing it passes floors containing laboratories/dark rooms, air conditioning plant and a facility to re-aluminise the telescope's mirrors. The latter is also used for the mirrors of the other larger telescopes on the site which cannot be accommodated in the smaller aluminiser in the 24" Telescope building (i.e. now only that of the ATT 2.3m Telescope).

Workshop and Workshop Equipment (N017) is located on the eastern side of the AAT service road and is connected to the AAT by a pedestrian tunnel that also conveys services to the AAT telescope building. The Workshop includes utility areas and facilities for maintenance and the fabrication of parts required at the site, together with offices and a staff lunch area. A Site Testing Trailer, one of those used to test the suitability of various sites during the period of investigation that led to the SSO establishment, is currently stored in a garage area within the Workshop.

Administration Building (N003) is a single level face brick gable roof construction to the north of the AAT. It may have been originally constructed as a residence and is certainly residential in design form, echoing the other residences on site that were also designed by the same architect Bunning and Madden. It has been added to twice – firstly at its west end to

accommodate PABX telephone equipment, and then at its eastern end to include a meeting area. It is used as the main ANU site office and provides a base for the site manager and the education officer.

Figure 59 - Administration Precinct with the Workshop on the right and the Administration Building on the left. The site of the Fire Station is in the left foreground and the Residential Area and Eastern Telescope Area in the background (Context 2014).

Figure 60 - The Workshop building with the AAT at the right of picture (Context 2014).

3.3.3 Eastern Telescopes Area

This area is located on a pronounced rocky promontory at the east end of the observatory site, as is dominated by the temple-like form of the UK Schmidt 48inch Telescope building as well as the more recent Faulkes Telescope. Although located near the entry road to the site, it is shielded from the road by the local topography and is actually more prominent from the west end of the site (see Figure 62).

UK Schmidt 48inch Telescope (N001) comprises a central domed telescope chamber atop two storeys of office and laboratories. Additions to the building were designed by Bunning and Madden in 1974 and, like both the Workshop and Visitor Centre by the same architects, the UK Schmidt building has deep metal eaves that define its form and represent part of an overall site design language. Early site photos indicate that the building's site was created through a substantial cut and fill exercise.

Faulkes South Telescope (N021), owned and managed by Las Cumbres Observatory Global Telescope Network (LCOGTN), is a robotic remote-controlled telescope that works in association with a similar facility in the UK. It is housed in a rectangular structure which is of a single storey but which supports and imposing segmented retracting roof which opens fully through the action of hydraulic rams.

To the south west of the Faulkes Telescope, between it and the majority of the site, stand two smaller classic domed telescope buildings which house the Stellan A and B 1m telescopes of the LCOGTN.

Figure 61 - The temple-like UK Schmidt 48inch Telescope at the east end of the observatory site (Context 2014).

Figure 62 - Looking north east from Observatory Road towards the Faulkes South Telescope atop the promontory at the east end of the site, with the Stellan A and B Telescopes in front of it. The UK Schmidt 48inch Telescope is beyond but not visible from this direction (Context 2014).

3.3.4 Residential Area

This precinct is defined by the forms of the six residences that facing north east step down the site to either side of a branch from the main Observatory Road, together with Bingar Cottage at the junction of the two, which appears to have been relocated to the site from elsewhere as an initial place of residence on the establishment of the site. A bowser shed is located near to Bingar Cottage and below the residences is a tennis court. A new structure not associated with the residences but located in this area is the iTelescope building.

In summary, the structures in this area are:

Residences 8 (N822), 7 (N823), 6 (N824), 5 (N825) 4 (N826) are very similar in form and are largely original to the design of Bunning and Madden in c1965 as 'Technicians Houses'.

Residence 3 (N821) is a larger house that was constructed shortly prior to the other houses and has been used as the site manager's residence.

Bingar Cottage (N019) is a weatherboard residence (now fibre cement in weatherboard profile).

Bowser Shed is a small flat roofed structure with an open covered area also located near the main road and Bingar Cottage.

iTelescope building is a fairly anonymous steel-clad hangar-type structure at the north eastern end of the area, immediately to the west of the tennis court. The structure has an arched roof, constructed over a series of steel frame trusses, which slides completely off onto an adjacent frame to permit observation from the several remotely operated telescopes contained within it.

Figure 63 - Looking south west from the Faulkes South Telescope towards the tennis court and iTelescope building and the Residential Area (Context 2014).

Figure 64 - Residences 4, 5 and 6 on the rise towards the centre of the site, with the AAT dominant in the background (Context 2014).

3.3.5 Lodges Area

This area is the site of two former staff lodges and the Director's Cottage that were destroyed in the fires of 2013 (see Figure 68 that shows the two Lodges and the Director's Cottage at the top of the image, and Figure 90 shows the site of the Director's Cottage today). There is currently demountable temporary lodge accommodation on these sites (Figure 67) and some concrete and brick footings of the former lodges remain (Figure 91).

Figure 65 - View north west from the external walkway around the dome of the AAT (Context 2014).

Figure 66 - Concrete bench and barbecue on the grassed area to the east of the lodge site, looking south west to the site of the Director's Cottage (Context 2014).

Figure 67 - The demountable temporary accommodation currently occupying the lodge site (Context 2014).

Figure 68 - Aerial view of the AAT / Administration Area and the Lodges Area (top of picture) taken before the 2013 fires (ANU unknown date).

3.3.6 Uppsala Area

This precinct is located in a landscape 'saddle' on the south side of the road between the central and western parts of the site. It includes a group comprising the Uppsala telescope and several other telescope structures, which have all been decommissioned in recent years. It also includes the Pump House and associated water tanks located down the slope to the north, on the other side of Observatory Road.

Uppsala Schmidt Telescope (N011) was first located at Mount Stromlo and moved to the SSO in 1982. The telescope itself was decommissioned in 2013 and there are some conservation issues relating to water ingress through the plywood dome.

UNSW APT (University of New South Wales Automated Patrol Telescope) (not ANU property) was originally located at Woomera in South Australia, and then later at Ororral Valley near Canberra before being moved to the Siding Spring Observatory in in 1994. The facility, which includes an imaging telescope that can be operated remotely, was decommissioned in 2012.

ROTSE (Robotic Optical Transient Search Experiment) (not ANU property) telescope is a small telescope which was managed by UNSW on behalf of a collaborative project that includes four other telescopes at other sites and institutions in Namibia, Turkey and the USA. It was constructed at the SSO in 2003 and decommissioned in 2011.

YStar Telescopes (not ANU property) were constructed at the SSO in 2005, are owned by an international network and managed by Korean institutions. As of 2015, this telescope is no longer operational.

Pump House (N020) and Water Tanks (N024). The Pump house dates to c1975 and is a rectangular skillion pitch concrete block structure with sheet metal roof.

Figure 69 - Looking north west from the middle of the site. The Uppsala Area is on the saddle in the middle distance – with the telescopes to the left of picture and the pump house down the slope to the right. The Western Telescope Area is in the background (Context 2014).

3.3.7 Western Telescope Area

This area comprises the highest part of the site (and contains a survey trig station) and was the first part of the site to accommodate telescope buildings. It is the least vegetated and most exposed part of the observatory site but commands spectacular views across Warrumbungle National Park and the rural lands to the north (see Figure 89) and thus is also the site for a visitor viewing platform. The original 40 inch telescope building was constructed here, with the 16 and 24 inch telescopes following soon after.

40 inch Telescope (N002) was constructed between 1963 and 1964 and was the first telescope building on site. In addition to housing a telescope the building contains living quarters and a workshop and its form thus reflects both scientific use and a domestic aspect (see Section 3.4.1 below). The telescope itself has been removed

16 inch Telescope (N005) and its adjacent shed were begun soon after the 40 inch telescope and completed by 1965. The building contains a small electric and mechanical workshop and has also been enlarged to accommodate offices. The telescope has been decommissioned and dismantled.

24 inch Telescope (N007) was built in 1966. In addition to the telescope, the building houses an aluminizing chamber for telescope mirror maintenance. The telescope has been decommissioned but remains in situ.

The Advanced Technology 2.3m Telescope (ATT) (N012) was constructed by the ANU in 1985 and still operates for research purposes. Unlike the other traditional telescope buildings the ATT is rectilinear in form and also unusual in that, rather than employ the rotating dome used by most other large telescopes on the site, the entire ATT building turns on its base.

SkyMapper (N004) is a state-of-the-art automated wide-field survey telescope with an ongoing role to robotically create the first comprehensive digital survey of the entire southern sky. The telescope is housed within a circular single-chamber structure, with a spherical dome. Although comparatively small, its relative height and position atop a rise at the western end of the site make it quite prominent.

Prompt Telescope comprises four 17 inch telescopes mounted in a single dome-shaped casing with a retractable roof. Installed in 2013, the facility forms part of the international 'Skynet' network of robotic telescopes developed by the University of North Carolina since 2004.

HAT South Telescope is one of three remotely operated sites of a project searching for transiting extra-solar planets in the Southern Hemisphere. The facility comprises two lidded modules each containing four 0.18m astrographs, which are screened on their opening sides by slatted fences, and provided with power and control via a converted shipping container.

KMTNet Microlensing Telescope, under construction at the time of the May 2014 site visit, on a newly prepared site to the east of the 40 Inch Telescope and north of the ATT, this structure represents something of a return to the format of the former and the other 1960s telescope buildings in this area. It comprises a large telescope enclosure (to be surmounted by a dome) together with an adjoining support annexe.

Solaris Telescope is similar in external design to the nearby Prompt Telescope, although slightly smaller. The retractable casing accommodates a 20 inch telescope on a direct-driven high precision mount that allows it to track through 355 degrees without the need to flip while passing the meridian.

Figure 70 - Looking west towards the Western Telescope Area, showing (from left to right) the SkyMapper, Solaris and HAT-South (obscured by trees), 24 inch, 16 inch, Prompt (obscured by tree), rectilinear ATT, 40 inch and KMTNet (under construction) telescopes (Context 2014).

Figure 71 - Looking north east from the SkyMapper Telescope, showing (left to right), the 16 inch, 40 inch KMTNet (under construction) and Prompt telescopes and the ATT (Context 2014).

Figure 72 - Looking east from the SkyMapper, showing (left to right) the 24 inch, HAT-South and Solaris telescope (Context 2014).

3.4 Building Forms and Types

The built forms of the Siding Spring Observatory reflect changes over time in the typologies of telescope technology, the built form of the telescope buildings and the 'language' of telescope and other building design and materials.

3.4.1 Telescope Building Forms

The forms of the telescope buildings at the Siding Spring Observatory have a functional aspect, in that they are each primarily designed around the need to provide an appropriate platform and enclosure for the instrument. The majority are constructed in the traditional form of a rotating dome sitting on top of another, often rectilinear, structure, with examples of this typology including the original 40 inch telescope, the 16 and 24 inch telescopes, the Uppsala, the UK Schmidt, the more recent SkyMapper and of course the largest structure on site - the AAT. The UK Schmidt is also distinctive, with its stepped two level office and laboratory sections giving the overall building a temple-like form.

As well as accommodating the instrument in a viewing chamber, these telescope structures often contain supporting facilities including offices, laboratories and workshops. In this respect the 40 inch telescope building (the first on the site) is unusual in that it also incorporates a pronounced residential section complete with a deck and adjacent kitchen on the upper level (see Figure 73). More recent buildings are relatively simple, often containing only a single office/laboratory attached to the viewing chamber/telescope enclosure – examples would include the Uppsala Schmidt and UNSW APT telescopes.

In addition to rotating domes, different telescope positions were accommodated in a number of the early telescope buildings through the use of hydraulic systems which raised or lowered the telescope platforms. In the case of the large 40 inch structure the extent to which this could be achieved required an unusual open staircase within the dome designed to provide access at various floor heights. Later structures incorporated a variety of methods for providing an optimum platform for their telescope. The AAT building comprises an internal telescope support core, in which the massive telescope mounting is sat, that is structurally independent of the external drum and the dome. In turn, the 2.3m ATT represents another new approach, developed in response to a need for greater economy and pragmatism, in which the entire lightweight structure revolves on its base.

Of some bearing on the structure of the buildings is that each of the earlier telescopes at the Siding Spring Observatory was built with an equatorial mount – the AAT was one of the last large telescopes built in this format (although it was also one of the very first telescopes to be fully computer-controlled). More recent telescopes have instead adopted more compact and mechanically stable altazimuth mounts which can now be controlled by computer with sufficient accuracy to make precise tracking possible.

More recent telescope building types are more compact and even more utilitarian, largely as a result of computerisation and the advent of remote control which has removed the need for additional support and amenity facilities in close proximity to the telescopes. At the SSO site, these buildings include the Faulkes South with its segmented fabric covered roof that folds down to expose the whole telescope enclosure (see Figure 78) and the iTelescope building, the roof of which slides off completely to expose the numerous small remote controlled telescopes contained within it (see Figure 79), although both have small control/maintenance areas. The YStar Telescope is an economical example of this type, being accommodated in a modified shipping container, and this minimalism is taken to a greater extent in the several individual telescopes whose enclosures are designed only to protect the telescopes themselves, providing no space for additional facilities and little or none for attending personnel. Examples of this latter type would include the Prompt and Solaris telescopes in the Western Telescope Area and the Stellan A and B telescopes alongside the Faulkes South structure. More extreme still are the ROTSE and HAT South telescope structures which each comprise only the telescope within a protective casing, although the latter is accompanied by an adapted shipping container which provides support facilities.

A slight break from this general trend is the KMTNet Telescope building which is currently under construction in the Western Telescope Area. This appears to represent something of a return to the format of the nearby 1960s telescope buildings with a larger enclosure (although this is partly necessitated by the size of a telescope with a 1.6m primary mirror) and also an adjoining support annex. However, rather than being a response to the particular site, this building is built to a standard design, identical to that of its sister sites in Chile and South Africa, all of which are based on a full scale prototype in Tucson, USA. The design is intended to maximise the autonomy of the facility, with the prototype concept being intended to allow functional assembly and testing for all three project telescopes to be undertaken in Arizona 'thus minimizing the expense of making changes in remote countries' (Kappler et al 2012). Thus this building can be viewed as functioning in an international rather than local or site-level context and to therefore further reflect the 'remote' nature of recent facilities at the site.

3.4.2 Site Structures in General

The other non-telescope structures on the site, along with those which were destroyed by the 2013 bushfires, are (or were) fairly generic in nature, being constructed to perform functions which are not specific to an observatory. All of the accommodation, administration and support structures have historically been fairly utilitarian, and although they were each architect-designed for the site and its conditions, their character is not very specific to the site. There is however some commonality of design language and materials between these buildings, largely deriving from their being approximately contemporaneous and from the common involvement in each of the designers Bunning and Madden. Examples include the similarities between the Administration Building and all of the residences, except Bingar Cottage, and the incorporation of deep eaves to the Workshop, Visitor Centre and UK Schmidt Telescope building.

Many of the buildings on the site have been extended to provide additional facilities, but whilst the telescopes that some contain have often been adapted and reused for new purposes, this has generally not been the case for the structures that contain them. Thus the structures, or parts of structures, whose telescopes are now out of use or have been removed entirely are all themselves redundant, and if parts of the buildings remain in use it is for a purpose essentially unrelated to the telescope.

Figure 73 - Looking south west at the 40 inch Telescope building, showing the mix of domestic (accommodation) and scientific (observatory) facilities contained within it (Context 2014).

Figure 74 - Staircase and barriers within the viewing chamber for the 40 inch Telescope, designed to enable access to the telescope and as a safety precaution when the floor was hydraulically raised (Context 2014).

Figure 75 - The 2.3m ATT structure, the whole of which can be revolved on its circular concrete base (Context 2014).

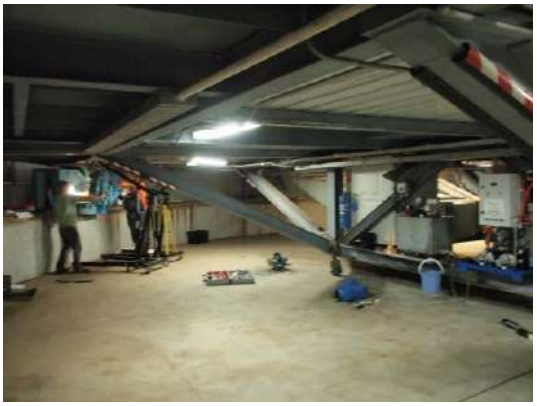

Figure 76 - Showing the truss floor and mechanised bogeys (under repair in the image) which enable the 2.3m ATT structure to be rotated (Context 2014).

Figure 77 - The segmented roof of the Faulkes South Telescope (Context 2014).

Figure 78 - The Faulkes South Telescope from within, with its segmented roof open (Context 2014).

Figure 79 - The utilitarian design of the iTelescope building, showing the frame onto which the roof slides when opening (Context 2014).

Figure 80 - The interior of the iTelescope building, showing the truss roof which slides off entirely to permit viewing through the remotely operated telescopes it contains (Context 2014).

Figure 81 - The basic telescope casings of the remotely operated HAT South Telescope structures (Context 2014).

Figure 82 - The KMTNet Telescope under construction, showing the central telescope enclosure and adjoining annex (Context 2014).

Figure 83 - The deep eaves of the Workshop buildings – compare with Figure 84. AAT in the background (Context 2014).

Figure 84 - The deep eaves of the UK Schmidt Telescope building – compare with Figure 83(Context 2014).

3.5 Other Landscape Features and Site Elements

3.5.1 Landscape Changes within the Site

The exacting requirements of the scientific structures on the site are such that their sites have been the subject of meticulous preparation works. For the majority of the large telescope buildings this has included precise levelling, but also substantial cut-and-fill exercises of the kind undertaken to prepare the UK Schmidt Telescope site. The siting of the administrative and residential buildings has not been as demanding, but each footprint has had to be cleared and levelled.

In this way the SSO site has been somewhat transformed from its original state as a wooded crest characterised by exposed rocky outcroppings. But, aside from the preparation of individual sites for each of the extant buildings, and those which were destroyed by the 2013 bushfires, the remainder of the site retains its rocky wooded character, albeit somewhat more cleared and open in the active areas – more recently areas of trees have been cleared, for example those on the grassy slope to the east of the AAO Workshop building, evidently as a fire management measure

Deeper soils in the eastern portion of the site are suggested by the grass ground cover and larger trees, whilst in the western portion of the site expanses of exposed rock are visible and

the shallow soils support only small bushes. Deliberate plantings within the site are restricted to a few examples around the residential area.

3.5.2 Infrastructure

The difficulties associated with supplying water to the elevated SSO site are documented in the site history above. To achieve this end, water pumped from Timor Dam via the pump house is stored in a number of raised water tanks, including most prominently the 'Golf Ball' water tower to the west of the AAT, to achieve the pressure necessary for it to be distributed across the site.

The lack of soil over the bedrock is such that the network of services extending across the western part of the site is above-ground. Some subterranean installations are present in this area, but these appear isolated and facility-specific. The primary mains, such as those running upslope to the west and south from the water tanks and Pump House on the northern slopes of the site, are on the surface, although these are generally connected by junction boxes which are partially buried. Attempts have been made in some cases to protect service pipes and cables with a concrete shell.

Services are installed below ground where this can be achieved, as illustrated in the man-holes and fully subterranean junction boxes that can be seen across the eastern part of the site, although power and telephone cables are still suspended on poles. Across the site, standalone generators provide supplementary power to the major facilities. Examples can currently be seen adjacent to the Pump House and AAO Workshop buildings.

A number of phone towers and radio masts are positioned around the site, as well as weather stations, some of which are now solar powered.

3.5.3 Built Features

Aside from roadways and asphalted service areas around the buildings, built landscaping features are fairly minimal within the site, with even the residential buildings largely devoid of garden elements. The majority of the roads and hard-standing areas have concrete curbing, but some are un-edged against the adjacent bare rock or grass verge. Examples of other treatments are limited to expanses of crazy paving revetment lining the slightly terraced roadways between the 24 inch Telescope building and the 2.3m ATT.

A retaining wall of wooden railway sleepers that defined the parking area at the front of the Lodge was destroyed by the 2013 fires.

The roads are generally fairly superficial constructions, as permitted by the underlying geology, and related structures are few. But a number of culverts facilitate the flow of small rivulets beneath the roadway, and one larger example in the east of the site, just before the road to the UK Schmidt Telescope branches from Observatory, incorporates a large concrete pipe surrounded by a built stone facing at either end.

The existence of the site within what was previously a pastoral estate is evidenced by the presence of a cattle grid where Observatory Road enters the SSO site proper.

A contemporary concrete slab pathway negotiates the rise between the 40 inch and 16 inch Telescope buildings. More recent concrete paths run from the Visitor Centre to the AAT, and from that building to the lodge site, but aside from along these examples, pedestrian movement around the site must follow the vehicular roads or follow informal routes across the landscape.

Figure 85 - Tree clearance to the north east of the Workshop of part of fire prevention works (Context 2014).

Figure 86 - Surface services to the north west of the Uppsala Area (Context 2014)

Figure 87 - Crazy paving between the 24 Inch Telescope and the ATT (Context 2014).

Figure 88 - Culvert under Observatory Road to the south of the Faulkes Telescope (Context 2014).

3.5.4 Memorials and Other Markers

Within the site are a number of features marking particular locations or attachments to the site.

The highest part of the site, at its western end near to the SkyMapper Telescope, is marked by the Mount Woorut trigonometrical point ('trig point') at 1,165m (3,821ft) above sea level.

The trig point overlooks a memorial plaque, mounted on a small boulder, which is dedicated to Olin Jeuck Eggen who was the first Director of both Mount Stromlo Observatory and the Siding Spring Observatory from 1966 to 1977.

Several plaques are displayed in the AAT visitor's gallery, including one to Michael Thomas Joseph Kinsela who lost his life during the construction of the AAT in December 1971.

3.6 Structural Remnants and Archaeological Potential

3.6.1 Pre-Contact and Early History – Before the Observatory

No pre-contact archaeological sites are recorded within the SSO site on the NSW Office of Environment and Heritage's (OEH's) Aboriginal Heritage Information Management System (AHIMS) (Estcourt 2005).

A previous archaeological assessment undertaken for the whole SSO site (Estcourt 2005) did not yield any Aboriginal artefactual material or record Aboriginal sites of any kind, despite the high visibility afforded by the exposed rocky terrain. The assessment concluded that the site has a low archaeological potential, although the presence of isolated artefacts cannot be completely discounted. The dearth of material has been attributed to the topography but also to the surface disturbance and modification that has occurred in the area in the development of the Siding Spring Observatory.

Following European settlement, the earliest colonial occupation in the Warrumbungle area was by shepherds and squatters for grazing purposes. The site became part of Andrew Brown's 'Caleriwi' run and then William Jonathon Goodrum Blackburn's 'Mopra' property, but there is no suggestion of any activity in the site that may have left an archaeological signature.

No non-Aboriginal archaeological sites are recorded within the SSO site on the NSW OEH's Historic Heritage Information Management System (HHIMS).

In this period it is possible that the elevated position was a focus for the camp sites of squatters, pastoralists or continual visitation by Aboriginal people, but no physical evidence of these activities is known within the site, and the potential for such remains is low, especially as there is a high chance that any evidence which did exist within the site has been disturbed by the development of the observatory.

3.6.2 Relating to the Observatory

Since its creation in the 1960s, the Siding Spring Observatory has expanded its footprint through the utilisation of additional sites across the available area, and it is only recently that development pressure has raised the question of reusing these previously developed sites. As such, the constructs at the site essentially represent a single 'generation' of development, with all remaining essentially as they were built. The main exception is the structures lost to the 2013 bushfires, and it is to these that the majority of the structural remnants on the site relate.

The remains of the Director's Cottage, which stood between the AAT and the Lodge before it was destroyed by the fires, comprise a single section of brick wall supporting a concrete verandah and steps built around a stone rubble core and with a crazy paving stone façade. This is approached from Observatory Road by a fragment of concrete path. The terrace on which the bulk of the brick veneer house sat remains open, although at the time of writing it was used as a storage area occupied by containers and other equipment. It is possible that some foundation elements survive but nothing is apparent on the surface.

Down a grass slope from the Director's Cottage site towards Observatory Road stand a large concrete bench and a brick barbecue. The latter is adjacent to a retaining wall built of un-mortared boulders encased in a concrete shell (see Figure 66).

The nearby site of the Lodge, which was of similar construction, is currently occupied by the temporary buildings which have been used as a replacement since their destruction, and it appears that the site was levelled in preparation for their installation. Some related features do survive, including a partly subterranean concrete and brick structure which probably supported a tank or generator.

To the rear of the Administration Building, between it and the AAT, is the concrete pad that represents the remains of the Fire Station. This form of construction is unlikely to have left much of a sub-surface component, other than perhaps related utilities.

Some other structures are known to have previously existed in the site. Two sheds are shown in Figure 30 on what is now the site of the Faulkes Telescope and a number of buildings are shown to the north of the AAT in Figure 25. These are probably all temporary or other light-weight structures – the latter probably relating to the construction of the AAT, and they are unlikely to have left any sub-surface remains. A group of additional houses, which are shown to the south of the Tennis Court in Figure 30, have since been demolished and are now represented by a series of concrete pads, and other since-removed buildings are shown in the vicinity of the current iTelescope building. These areas may contain some sub-surface remnants, but these are highly unlikely to be of any significance.

In summary, whilst there are some structural remnants of previous structures within the site, and there will also be sub-surface evidence in some cases, this material is of low significance and is unlikely to yield any information concerning the development and use of the site that cannot be derived from other sources.

Figure 89 - View south west from the trigonometrical point at the western end of the site, looking across the memorial plaque to Director Olin Jeuck Eggen (Context 2014)

Figure 90 - Concrete path and concrete verandah and steps representing the remains of the Director's Cottage burnt in the 2013 bushfires (Context 2014)

Figure 91 - Concrete and brick structure which probably supported a tank or generator relating to the Lodge destroyed by the 2013 bushfires (Context 2014)

Figure 92 - Concrete pads to the south of the Tennis Court representing the site of a group of now demolished houses

3.7 Moveable Heritage

Scattered around the site are numerous moveable items – i.e. which are not themselves structural or currently installed in a structure, yet which also relate equally to the site, its history and the discoveries made within it. These include items of scientific equipment, furniture and documentary materials.

The following items were identified during the site visit and in the production of this HMP, but it is certain that others exist within the site and perhaps elsewhere.

3.7.1 Scientific Equipment

Tinsley telescopes and test trailer

At the time of the site visit, a portable telescope was observed in the PABX room extension of the Administration Building (Figure 93).

This is one of a pair of 8 Inch Tinsley telescopes that were used in the original site-testing at the SSO, and also at Mt Serle. The other of the pair is at currently at the Mount Stromlo Observatory being refurbished for use at the ANU Kioloa campus.

One of the site testing trailers from which the Tinsley Telescopes would have been used is also retained on site (having been recovered from nearby). This is currently stored in a garage area within the Workshop.

Equipment in the AAT

A number of pieces of apparently redundant equipment continue to be stored in the Anglo-Australian Telescope (AAT) (and this is likely to be the case for all of the telescope buildings). They include the spectrometer shown in Figure 95.

40 Inch Telescope (Milroy Telescope)

Having been decommissioned at the SSO site, in 2009 the 40 Inch Telescope was removed from its building and, together with its original control panel, donated to a local astronomy group. It is now used at the private Milroy Observatory in a commercial capacity (Figure 97).

While the removal of the telescope from its original structure is a heritage impact, its continued use is a positive conservation result.

Interdata 70 minicomputer

The Interdata 70 minicomputer was the processor used for the computer control of the AAT from its opening in 1974 to 2008. It is now part of the collection of the Powerhouse Museum in Sydney (http://www.powerhousemuseum.com/collection/database/?irn=390790).

3.7.2 Other Items

ANU furniture

The 40 Inch building, now redundant, contains a large amount of material probably relating to its original construction and use, and thus probably of heritage significance.

This includes several items of furniture which appear to be designs by prominent modernist designer Fred Ward or his design team at ANU (Figure 96). Ward moved to Canberra in 1952 after winning a competition for the design of the furniture and furnishings of the ANU's University House. He became the first head of the ANU design unit and oversaw campus planning, and furniture and interior design until his retirement in 1961.

Historic documents

The Administration Building contains a series of plan filing cabinets containing a large quantity of architectural plans relating to the design and construction of the buildings on the site (Figure 98). From cursory inspection it is not clear whether these are in the main originals or facsimiles, although some do appear to be original. Given the loss in the Mt Stromlo fire of many documents relating to the ANU's activities at both the SSO and MSO, it may be that some of these documents represent sole copies, and they are thus of high significance.

Exhibition materials

Many of the materials contained within the Exploratory and AAT visitor's gallery date to the original creation of the displays, and so they are of heritage value in themselves (see Figure 55).

Figure 93 - One of a pair of 8 Inch Tinsley telescopes used in initial site testing at the SSO (now stored in the Administration Building (Context 2014)

Figure 94 - Site testing trailer now stored in the Workshop (Context 2014)

Figure 95 - Redundant spectrometer in the AAT (Context 2014)

Figure 96 - Chair likely by prominent modernist designer Fred Ward in the 40 Inch Telescope building (Context 2014)

Figure 97 - Plaque on what is now the Milroy Telescope, recalling its original title and creation for Mount Stromlo Observatory (of which the SSO was then a field station) (Context 2014)

Figure 98 - Plans for the AAT in draws now stored in the Administration Building (Context 2014)

4 ANALYSIS

4.1 Introduction

This section provides an analysis of the various heritage values which are exhibited by the Siding Spring Observatory site as a basis for an assessment of its heritage significance in the following section.

The values considered are Historical, Social, Community Aesthetic, Indigenous and Natural.

The analysis of historical values is supported by a comparative assessment, but comparative analysis is generally not valid in relation to social, aesthetic and Indigenous values (Australian Heritage Council 2009).

4.1.1 Consideration of Significance

The primary goal of this HMP is to identify, and thus enable the appropriate management of, the site's heritage values. Another is to determine whether the Siding Spring Observatory site warrants inclusion on the Commonwealth Heritage List.

According to the Australian Heritage Council's (AHC's) 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies*, the threshold for inclusion on the Commonwealth Heritage List is local heritage significance. The significance of the site needs to pass an initial, or base, threshold of local heritage significance in at least some respects to warrant inclusion on the CHL.

A full assessment of significance, and of the extent to which the site may qualify for higher level designation, is discussed in greater detail in the following section. This analysis establishes the evidence relating to the site's heritage values and thus provides a basis for assessment.

4.1.1 Terminology

As stated above, this HMP employs terminology defined by the Australia ICOMOS *Burra Charter* (2013) throughout.

The following terms are used throughout this section in particular:

Community: Criterion (e) and (g) refer to 'community or a cultural group'. In this report we use 'community' as short-hand to include both communities and cultural groups.

Further, this report adopts a broad definition of **communities** and **cultural groups** as those that are defined by shared culture, beliefs, ethnicity, activity or experience.

Associations: mean the connections that exist between people and a place (Burra Charter 2013, article 1.15)

Meanings: denote what a place signifies, indicates, evokes or expresses to people (Burra Charter 2013, article 1.16).

The HMP also employs terminology defined by the EPBC Act.

4.2 Historical Values

The historical values analysis summarises the key development phases that occurred at the Siding Spring Observatory, and thus provides a concise basis for the assessment of significance in the following section.

It also provides context for the analysis of other heritage values in the rest of this section.

4.2.1 Prior Phase

The Siding Spring Observatory lies within the traditional country of the Gamilaroi language group. Neighbouring language groups include those of Kawambarai and Weilwan communities, who are known from archaeological evidence to have occupied the

Warrumbungle Range and surrounding plains for at least 20,000 years. The Warrumbungles are known by Aboriginal people as an area for teaching, meeting gathering and ceremony. Traditionally a travel route passes through the Warrumbungles for communities moving from west to east, using the mountainous high points for navigation. Gamilaroi people have used night sky features for a range of reasons, from understanding when particular seasonal resources were available, to the teaching of travel routes linked to songlines of the land. It is believed that patterns of stars were used to guide people between waypoints on the ground, with these 'star maps' often leading to ceremonial grounds.

Between 1817 and 1825 exploration of the Warrumbungle Range region was carried out by the Colonial Government, and in particular by surveyor John Oxley who explored the northern reaches of the Warrumbungles to trace the Macquarie River and determine if it emptied into an inland sea or joined another large water course. Oxley did not recommend the area for occupation or future development and land development occurred later than in other regions, with the earliest colonial occupation in the Warrumbungle area by shepherds and squatters for grazing purposes from approximately 1830, although maps from the 1830s and 1840s suggest that the mountain range itself remained unoccupied. Between 1860 and 1900, Land Selection increased in the area, and by 1900 much of the land in the Warrumbungle Range was held by leasehold. In 1909, William Jonathon Goodrum Blackburn had taken up 'Mopra' which appears to have included the SSO site area.

The Warrumbungles were reserved for public recreation and proclaimed the Warrumbungles National Park in 1953.

4.2.1 First Development Phase

The **first development phase** occurred in the 1960s. This decade saw the Australian National University select the site, acquire the land and construct infrastructure for access. The first three telescopes were installed in buildings constructed at the western end of the site during this first phase. These included the 40 inch Telescope (1963-4), the 16 inch Telescope (c1964-5) and the 24 inch Telescope (1966). The 40 inch and 16 inch telescopes are functionally connected, as the 16 inch was designed as a photometric telescope to follow up observations made on the 40 inch telescope.

The Observatory Lodge (1964-5) and additional Lodge (c1968) were constructed to provide accommodation for staff and astronomers, as were the five individual residences and Director's Cottage, which were probably constructed during this phase (they were definitely built before 1974), and Bingar Cottage had been moved to the SSO from Mount Bingar Field Station by 1965. Under Director Bart Bok, optical astronomy was promoted throughout Australia and public interest grew. However, during this phase public visitation was more focused on Mount Stromlo Observatory rather than the Siding Spring Observatory and the latter had limited public access.

4.2.2 Second Development Phase

The **second development phase** occurred in the 1970s. It was centred around the creation of the internationally renowned Anglo-Australian Observatory (which in 2010 it became the Australian Astronomical Observatory) that occurred with the construction of the Anglo-Australian 150 inch Telescope (AAT, 1972-74) and the associated connection with the United Kingdom astronomy community. The project was a much-celebrated collaboration between the Australian and British Governments, who had officially agreed to jointly fund and construct a large optical telescope in the southern hemisphere in 1971, and HRH Prince Charles officially opened the telescope on 16 October 1974. This relationship is evidence of the strong ties between Australia and the United Kingdom in the post-war period, directly influenced by the then Australian Prime Minister Sir Robert Menzies and his strong affection for Britain. In 2014 it remains the largest telescope in Australia. Built concurrently was the UK Schmidt Telescope (1972-3), which was operated by the Royal Observatory, Edinburgh, until 1988 at which time it became part of the Anglo-Australian Observatory. The UK Schmidt Telescope is functionally connected to the Anglo-Australian Telescope, playing a

complimentary role. The UK Schmidt Telescope is a survey telescope with an aperture of 1.2m (48 inches) and a very wide-angle field of view; compared to the Anglo-Australian telescope which has a narrower field and view. The UKST surveys large areas of sky at a more rapid rate, leaving the more detailed study to the larger Anglo-Australian Telescope.

Following a four year closure, the Visitor Centre (and 'Exploratory') was opened in the same year as the AAT (1974) and the Observatory was reopened to the public. A new focus on tourism in this period, was highly supported by Coonabarabran Shire Council and the National Parks and Wildlife Service, is evident in this, and in the construction of a visitor's gallery on the interior of the AAT building. The large 'Golf Ball' water tower to the immediate north-west of the Anglo-Australian Telescope had also been constructed by 1974.

4.2.3 Third Development Phase

The **third development phase** at the Siding Spring Observatory saw the relocation of two telescopes to the site and the construction of one highly innovative large telescope for the Australian National University (ANU). In 1982, the UPPSALA 0.5m Schmidt Telescope (built 1956 at the Uppsala Observatory in Sweden) was relocated to the SSO from Mount Stromlo Observatory, and two years later the 2.3m ATT was built for the ANU at the SSO. Technically highly innovative, this was inaugurated by Prime Minister Bob Hawke on 16 May 1984 but remains the ANU's primary active telescope. The Automated Patrol Telescope, owned by the UNSW, was installed at the Siding Spring Observatory in 1994 following modification of the optical, mechanical and electronic systems of the Baker-Nunn satellite tracking instrument. Efforts to increase public interest and visitation to the site continued during this phase through small initiatives such as the installation of a replica of the recently constructed ATT, which remains at the Visitor's Centre in 2014.

4.2.4 Fourth Development Phase

The **fourth phase of development** saw the growth of the Siding Spring Observatory's international stature as, from 2003 international facilities were located at the site as parts of global networks. These consisted of telescopes operated by institutions and private interests, such as the Faulkes Telescope (2004).

In 2003, the Canberra bushfires devastated Mount Stromlo Observatory. As a result, Mount Stromlo no longer retained any working telescopes and the Siding Spring Observatory became the ANU's main centre for astronomical observation. This change ushered in a period of international development for the Siding Spring Observatory which became recognised on an international stage as one of the key sites in the southern hemisphere, as demonstrated by the many international stations located at the site. All bar one of the telescopes installed between 2003 and 2014 at the SSO are part of an automated or robotic international network, including; the ROTSE 0.45metre Telescope (2003), operated by the UNSW as part of a southern hemisphere network; the Faulkes Telescope South (2004), operated by the Las Cumbres Observatory Global Telescope Network (LCOGTN); the YSTAR-KAO station (2005), managed by the Yonsei University Observatory and Korea Astronomy Observatory; and the HAT-South telescopes (2009; Hungarian Automated Telescope), which is also part of a collaborative southern hemisphere network. In more recent years, the site has seen the installation of: iTelescope.Net Observatory (2013), the southern hemisphere station that is managed in partnership with the RSAA to create the world's first network of internet connected public telescopes for public access online; the Solaris Telescope (c2014), owned and operated by the Nicolaus Copernicus Astronomical Centre in Torun, Poland; and the KMTNet Telescope (under construction in 2014) which is part of the Korea Microlensing Telescope Network across the southern hemisphere. The SkyMapper telescope (2007) is the one telescope constructed at the SSO during this building phase that operates independently, as an automated wide-field survey telescope.

4.2.5 Summary of Development Phasing

In summary, the first development phase saw the selection of the site and first construction occur under the ANU in the 1960s. The second phase in the 1970s was focussed around the

post-war relationship with the United Kingdom manifest in the installation of the UK Schmidt Telescope (1972-3) and establishment of the Anglo-Australia Observatory who managed the Anglo-Australian Telescope completed in 1974. It was also a period of an increased interest in tourism and public visitation. The third phase saw the ANU build the highly innovative Advanced Technology Telescope (1984) and the installation of two smaller telescopes in the 1980s. The fourth phase of development, since the Canberra bush fires, has seen the installation of a high number of telescopes that are part of global automated networks, most operating independently of ANU management.

Each of the above historical phases has significance both in relation to the ANU and in relation to Australia's contribution to astronomy.

4.2.6 Relevant Australian Historic Themes

The following themes are based on the Australian Heritage Commission's 'Australian Historic Themes' (2001) and apply to the history of the site of the Siding Spring Observatory. They are based on historical information contained in the Thematic History and Site History (Section 2).

The themes each point to an area in which the SSO site exhibits historical heritage significance.

1 Tracing the evolution of the Australian environment

1.1 Tracing climatic and topographical change

1.4 Appreciating the natural wonders of Australia

2 Peopling Australia

2.1 Living as Australia's earliest inhabitants

3 Developing local, regional and national economies

3.3 Surveying the continent

3.3.1 Looking for inland seas and waterways

3.3.2 Looking for overland stock routes

3.3.4 Looking for land for agricultural purposes

3.5 Developing primary production

3.5.1 Grazing stock

3.23 Catering for tourists

6 Educating

6.2 Establishing schools

6.5 Educating people in remote places

7 Governing

7.6 Administering Australia

7.6.10 Conserving fragile environments

8 Developing Australia's Cultural Life

8.1 Organising recreation

8.1.2 Developing public parks and gardens

8.1.4 Enjoying the natural environment

8.10 Pursuing excellence in the arts and sciences

8.10.5 Advancing knowledge in science and technology

8.14 Living in the country and rural settlements.

4.2.6 Comparative Analysis

The following provides a brief comparative analysis of the historic heritage values of the SSO for the purpose of informing its assessment for inclusion on the CHL. More detailed comparative analysis is beyond the scope of this assessment.

The Siding Spring Observatory has been historically significant on an international scale, as a result of its findings and observations throughout its history. Although these are not comparative in a contemporary sense, the historical scientific findings remain significant.

At the time of Australia's Federation in 1901 the foremost observatories in the world were located in the northern hemisphere. But in 1924 the establishment of the Commonwealth Solar Observatory at Mount Stromlo (later Mount Stromlo Observatory), Canberra, saw Australia become a major player in the field of optical astronomy.

The decade after the end of the Second World War saw a dramatic increase in the expansion of astronomy with large optical and radio telescopes being developed around the world, but in 1960 there were still only ten major astronomical observatories in the southern hemisphere compared to the 88 that operated north of the equator (CTIAO). The 1960s were dominated by great discoveries in radio and space astronomy, but they also saw a resurgence of optical astronomy as new technology in powerful and sensitive telescopes emerged. Taking advantage of its position relative to the southern sky, Australia saw a huge boost in the interest of astronomy and the subsequent establishment of radio and optical observatories throughout the country, many of which remain active today. The Siding Spring Observatory opened in 1964 as an optical astronomy observatory, during this major period of expansion in the field.

Australian comparisons

The following comparative analysis compares medium to large scale observatories within Australia through a consideration of their type, management and size.

In relation to type, observatories can contain facilities for optical astronomy and/or radio astronomy. Optical astronomy observatories are typically located on elevated sites which provide clear skies and minimum light interference - optimum atmospheric conditions. In contrast, radio astronomy utilises radio telescopes or antenna which operate in the radio frequency portion of the electromagnetic spectrum, do not therefore require these atmospheric conditions and can be located at observatories located on flat ground, or even in depressions so as to avoid electromagnetic interference. The list below demonstrates that a similar number of active radio and optical astronomy observatories are currently active in Australia;

As concerns management and size, observatories can typically be Commonwealth owned, owned and managed by an institution, or privately owned, whilst it is evident from table that Australian observatories most commonly have between one and three telescopes, with very few complexes consisting of a higher number.

The Siding Spring Observatory is a complex of over a dozen active telescopes, managed by the ANU. While there are a number of optical observatories that are also managed by State institutions, none are comparable in size to the SSO.

Mount Stromlo Observatory was a comparative complex to the Siding Spring Observatory (both managed by the ANU), but the devastation caused by the 2003 fires at Mount Stromlo has meant that no active telescopes remain at MSO, a fact which has further boosted the relative prominence of the Siding Spring Observatory on a national and global scale.

Owned by the State Government, Perth Observatory is also an optical astronomy observatory with a complex of approximately seven active telescopes located on an elevated site within the bushland of the Perth hills. It does not incorporate technically comparable instruments to that of the SSO, nor does it house stations that are part of global automated networks. Despite this, it appears to be the closest comparison to the Siding Spring Observatory within Australia (Perth Observatory website).

In summary, the Siding Spring Observatory is the largest optical astronomy observatory in Australia, with the largest complex of over a dozen active telescopes, including highly advanced and innovative optical telescopes of a larger scale and many which form parts of high profile international networks. Amongst the longest established sites in use, the Siding Spring Observatory also appears to be unique in its size and for the technological innovation of the instruments it contains.

The SSO is also notable for its location within a unique Australian landscape (in the form of the Warrumbungle Range). Its elevated site on a peak in the exceptional volcanic landscape does not appear to have a comparison within observatories in Australia.

Table 2 sets out details of the other significant observatories in Australia for the purposes of comparison.

Table 2 - Observatories within Australia (by state and territory)

Name	Location	Type	Managed by	Date est.	Status	Approx. no. of active telescopes
Australian Capital Territory (ACT)						
Mount Stromlo Observatory	Mount Stromlo, ACT	**Former solar and optical astronomy**	Australian National University	1924	Not used for observing, but still active use by RSAA	No active telescopes
Molonglo Observatory	Molonglo (near Canberra), ACT	Radio astronomy	University of Sydney	1960	Active	1 telescope
Canberra Deep Space Communication Complex	Tidbinbilla, ACT	Radio astronomy	CSIRO, on behalf of NASA	1965	Active	3 telescopes
New South Wales (NSW)						
Parkes Observatory 'The Dish'	Parkes, NSW	Radio astronomy	CSIRO	1961	Active	1 telescope
Green Point Observatory	Oyster Bay, Sydney, NSW	**Optical astronomy**	Private Public education	1960s	Active	3 telescopes
Culgoora Solar Observatory	Culgoora (near Narrabri), NSW	**Optical and radio astronomy**	Bureau of Meteorology	1963	Active	3 telescopes/ instruments
Mopra Telescope	near Coonabarabran, NSW	Radio astronomy	CSIRO	Late 1960s	Active	1 telescope

Name	Location	Type	Managed by	Date est.	Status	Approx. no. of active telescopes
Australian Astronomical Observatory	Siding Spring Observatory, Coonabarabran, NSW	**Optical astronomy**	Australian Astronomical Observatory	1971	Active	2 telescopes
Paul Wild Observatory	near Narrabri, NSW	Radio astronomy	CSIRO	1988	Active	1 telescope, three other instruments
Northern Territory (NT)						
None						
Queensland (QLD)						
None						
South Australia (SA)						
Ceduna Radio Observatory	Ceduna, SA	Radio astronomy	University of Tasmania (inherited from Telstra in 1996)	1969 (1996)	Active	1 telescope
The Heights Observatory/ Adelaide Observatory	Modbury Heights, SA	**Optical astronomy**	The Heights School	1988/ 89	Active	2 telescopes
Tasmania (TAS)						
Mount Pleasant Radio Observatory	Cambridge, TAS	Radio astronomy	University of Tasmania	1986	Active	2 telescopes and museum
Greenhill Observatory	Bisdeer Teir, Spring Hill, TAS	**Optical astronomy**	University of Tasmania	2013	Active	1 telescope
Victoria (VIC)						
None						
Western Australia (WA)						

Name	Location	Type	Managed by	Date est.	Status	Approx. no. of active telescopes
Perth Observatory	Bickley, WA	**Optical astronomy**	State government	1966 curren t site)	Active Public education only	7 telescopes
Learmonth Solar Observatory	WA	**Optical and radio astronomy**	Bureau of Meteorology	1979	Active	1 telescope
Murchison Radio-astronomy Observatory	Murchison, WA	Radio astronomy	CSIRO	Being built in 2014	Active	2 telescopes

International comparison

The Siding Spring Observatory is an internationally renowned centre for optical astronomy. Its location in the southern hemisphere, and thus access to the southern skies, is a key part of this importance, and this international comparison therefore excludes observatories located within the northern hemisphere.

The SSO accommodates telescopes that are significant on an international scale, and have been responsible for a number of internationally significant discoveries.

The quality of the optics, stability and precision of the Anglo-Australian 150 inch Telescope (installed 1972-4) have caused it to be described 'one of the finest telescopes in the world' (ANU, 'Siding Spring Observatory'), and the Advanced Technology Telescope, built in 1984, is a highly innovative instrument which is also known to have increased the observatory's profile on an international scale.

The Anglo-Australian Near-Earth Asteroid Survey used the UK Schmidt Telescope between 1990 and 1996, and the same telescope was later dedicated for use by the Radial Velocity Experiment (RAVE) survey of the Milky Way. The 'Siding Spring Survey' near earth object search program used the Uppsala Southern Schmidt Telescope. The 2df Galaxy Redshift Survey, one of the largest surveys of galaxies ever undertaken, used the Anglo-Australian Telescope between 1995 and 2002.

In 1977, the Vela Pulsar was discovered at the SSO. Comet 103P/Hartley was discovered by Malcolm Hartley in 1986 using the UK Schmidt Telescope. On 8 August 2006 comet C/2006 P1 was discovered by Robert H. McNaught using the Uppsala Southern Schmidt Telescope, and the same telescope was used by Robert H. McNaught on 3 January 2013 to discover comet C/2013 A1 known as 'Siding Spring'. Very recently, on the 19 October 2014, International media reported on the latter comet's first known visit to the inner solar system when it passed extremely close to Mars, and closer to Earth than any other comet in recorded history, prompting NASA, the European Space Agency and the Indian Space Research Organisation to repurpose their orbiters and rovers to witness the event and to avoid damage from the particles in the comet's tail.

Following the Canberra bushfires in 2003, and the devastation of the Mount Stromlo Observatory, the SSO became the Australian National University's main observation facility. Since this date, many telescopes and stations have been installed at the observatory, which are part of global automated networks, managed by international teams of astronomers and astrophysicists.

The Siding Spring Observatory's participation in the growing global network of robotic optical telescopes has a direct correlation with the of the observatory's international recognition and status. Many of the stations or nodes (telescopes that are part of a network) at the SSO, are part of a network which also have telescopes at the observatories listed in the table below. Therefore, it is concluded that the SSO is comparable in status and recognition to the observatories within this list, many of which are institutionally owned and managed.

Table 3 lists the few comparable observatories in the southern hemisphere (by continent).

Table 3 - Comparable observatories in the southern hemisphere (by continent)

Name	Location	Type	Managed by	Date est.	Status
South America					
Cerro Tololo Inter-American Observatory	Near La Serena, Chile	Optical astronomy	National Optical Astronomy Observatory	1962	Active
Las Campanas Observatory	Atacama Desert, Chile	Optical astronomy	University of Chile & Ministry of Foreign Affairs, Chile	1969	Active
Africa					
South Africa Astronomical Observatory	Sutherland, South Africa.	Optical astronomy	Department of Science and Technology, SA	1972	Active
H.E.S.S. Site	Khomas Highland, Namibia	Stereoscopic telescope system	International collaboration	2002	Active

4.3 Social Values

4.3.1 Introduction

Social significance is a value attributed to a place by today's community. While historical research may be able to demonstrate considerable longevity and continuity of association, this is not enough to demonstrate social significance. Rather, the associated communities or cultural groups must hold these values. Therefore the task of social significance research is to understand the nature of the associations with a place and whether this gives rise to significance in the terms of the definition. It also involves understanding whether significance resides in the fabric of the place or in other aspects such as use, access to the place, or in the continuation of cultural traditions or activities for example.

The research undertaken into social values is documented in this section, the associated communities are defined, and evidence of social values associated with the Siding Spring Observatory is presented.

4.3.2 Approach

Framework

The Australian Heritage Council's (AHC's) 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies* was used to define

social significance threshold against Commonwealth Heritage criteria for this project (Appendix 1). The extent to which the place meets these criteria is indicated below and discussed further in Section 5.4.7.

In the absence of a specific assessment approach to social significance at a Commonwealth heritage level, the *Context PL 1994 Method Papers: East Gippsland and Central Highlands Joint Forest Projects. Volume 2 – Cultural Values, developed for the Australian Heritage Commission and Conservation and Natural Resources (Victoria)* were used for this project. This approach has subsequently been applied to many social value assessments across Australia.

The following **significance threshold** was used for this project (AHC 2010):

Local heritage significance is required for inclusion on the Commonwealth Heritage List.

The following **significance indicators** were applied for this project (Context PL 1994):

- *Importance to a community or cultural group as a landmark, marker or signature:* this indicator is about the associations and meanings that a place may have because of its role as a landmark or signature place (icon) for a community or cultural group, one that marks a community's or cultural group's place in the world physically and metaphorically.
- *Importance as a reference point in a community's or cultural group's identity or sense of itself:* this indicator is about associations and meanings that help create a sense of community or cultural group identity, such as places that help define collective, spiritual or traditional connections between past and present, that reflect important and shared meanings, that are associated with events having a profound effect on a community or cultural group, that symbolically represent the past in the present, or that represent attitudes, beliefs or behaviours fundamental to community or cultural group identity.
- *Strong or special attachment developed from long use and/or associations:* this indicator is designed to recognise that a place which provides an essential public or shared function can, over time, gain strong and special attachments through longevity of use or association, especially where that place serves as a shared meeting place (formally or informally).

And, the following three **significance tests** were used to establish this threshold for the project (Context 1994):

- That the identified associated community is in continued existence today as a definable entity;
- That there is a continuity of use or association, meanings or symbolic importance over a period of 25 years or more; and
- That there is evidence that the attachment or association between the community and the place has developed into a deeper attachment that goes beyond utility value.

Methodology

The methods used to understand social significance can be generally described as ethnographic research, that is qualitative social research that seeks to understand a 'community' (or society or culture); in this instance, the research is seeking to understand associations and meanings that may be embodied in a place.

The methodology used for this project was of an iterative nature, that is the testing of preliminary ideas through continuing 'rounds' of research to increase the reliability of the results. Although this approach does not aim to offer a statistically validated sample, it enables the emergence of a richer understanding of both associations and significance through layering of results. For this project, the specific techniques of desktop research, interviews, structured surveys and a site and local community visit were used to do this.

The following step-by-step methodological process was applied for this project:

Who are the communities or cultural groups with potential attachment to the Siding Spring Observatory for social, cultural or spiritual reasons?

Communities or cultural groups have been defined through:

- Historical and existing data review;
- Community profiling;
- Consultation; and
- Qualitative data collection and analysis.

What evidence is there of strong or special association or attachment, and by whom?

The existence of an association has been established through social research approaches of an online survey, interviews, participant observation and during a site and local community visit.

Is this evidence sufficient to demonstrate 'significant heritage value' as required for Commonwealth heritage listing?

The degree to which the association meets the significance threshold required for Commonwealth heritage listing, and that it is held collectively, has been established by working directly with the particular communities or cultural groups using techniques of direct questioning, participant observation of behaviours and an existing material review.

4.3.3 Techniques

Existing material review

A review of existing data on social values from previous studies, heritage assessments and other sources took place over May and June 2014. Through the review and the analysis of this material, the consultants were able to:

- Identify the communities and cultural groups that may value the Siding Spring Observatory highly because of its strong or special associations for their community; and
- Generate key questions for exploration with each community or with representatives of that group.

Sources are detailed in Section 8, 'References' of this report.

Social research

Using snowball sampling (in which knowledgeable individuals were consulted with then requested to recommend others who may hold pertinent information) the consultants contacted individuals and organisations in order to gain their participation in the investigation. A request for a short phone or in-person interview and for their contribution to the online survey was made to each of these people.

Using this technique, nine short interviews were conducted between 20 May and 30 August 2014. An online survey was developed and opened to the public between 2 June and 25 June 2014 and 244 online survey responses were received.

A site and community visit was conducted on 20 and 21 May 2014.

Due to the large amount of interview and survey responses, a full summary of each is detailed in Appendix 2; Online Survey Results and Appendix 3; Interview Data.

4.3.4 Analysis and Findings

Identifying Associated Communities

Central to assessing social value is defining the communities who hold those values. The communities identified as holding direct associations with the Siding Spring Observatory are listed in the following table.

Table 4 - Communities associated with the Siding Spring Observatory in terms of social values

Communities	Representatives
Local resident community	Local historians, residents and Warrumbungle Shire Council. 'Local' refers to the local region (Coonabarabran town, Warrumbungle Shire and outside of the shire, but in the region).
Specific site user community	SSO Site Manager, RSSA, AAO, I-Telescope; College of Physical and Mathematical Sciences; Research School of Earth Sciences; Research School of Engineering, Research School of Astronomy and Astrophysics.
Wider research community	Astronomy community Australia and worldwide. For example: Members of the 2dF Galaxy Redshift Survey Team are based at the following institutions: Anglo-Australian Observatory, Australian National University, California Institute of Technology, Johns Hopkins University, Liverpool John Moores University, University of Cambridge, University of Durham, University of Edinburgh, University of Leeds, University of New South Wales, University of Nottingham, University of Oxford, University of St Andrews.
Traditional Owner community	Coonabarabran Local Aboriginal Land Council other Traditional Owner community members from other Countries.
Tourism community	Manager Economic Development & Tourism, Warrumbungle Shire Council, SSO Accommodation and Tour Officer.
National Park community	Dept. Environment; NSW Office of Environment & Heritage; NSW NP and Wildlife Service.

The views of each of the associated communities listed above was reflected in every type of research employed – i.e. desktop research, interview and online survey.

General research observations

Drawing together results from all research methods – desktop research, interviews and online survey – and the site visit, it is clear that the Siding Spring Observatory holds social significance of at least the level required for Commonwealth Heritage Listing (see Section 5.4.7). This was noted in existing written material, palpably observed while visiting the local community and echoed in all consultation forms.

In the online survey, in which 244 people participated, the overwhelming majority agreed or strongly agreed with the statements that read:

- The SSO is really important for tourism in the local region;
- Maintenance of a dark night sky is important to astronomy research;
- The restriction of light pollution is a positive community move;
- The Observatory's physical research equipment and telescopes really interest me;
- The Siding Spring Observatory strongly enriches local community identity;
- The Siding Spring Observatory is an important part of Australia's history;
- The Siding Spring Observatory is a well-known part of Australia's history (not as strongly felt); and
- Continuing use of the Observatory for astronomy is important to me.

And the overwhelming majority disagreed or strongly disagreed that:

- I'd be happy if the Observatory closed down.

Of the questions posed in this section of the survey, only one received neutral answers, tending towards agreeing or neither agreeing or disagreeing:

- The Observatory is a popular meeting place for people.

Interestingly, in the survey there was not a great deal of difference between the strength of social value held by people who lived locally, regionally, in the state, Australia-wide or overseas. It must be remembered however that participants were self-selected and all therefore have some kind of connection to the Observatory.

Of the responses, a general locational sway exists as expected. For example, more people who live regionally feel that the Observatory is important to tourism locally than do those who live overseas; whilst people who live outside the region are more likely to agree that light pollution restrictions are a positive move.

When asked if the Siding Spring Observatory held heritage value, 99% of survey respondents answered yes.

The site visit and interviews that were conducted echoed this pattern of response. The Siding Spring Observatory is a much loved place by people who are associated with it.

Identifying social values

Based on our investigations, social values attributed to the Siding Spring Observatory for each of the associated communities can be summarised as shown in Table 5.

Table 5 - Social values attributed to the Siding Spring Observatory

Associated community	Attributes	Indicators	Threshold Met
Local resident community	The Siding Spring Observatory	A reference point and signature place for local identity. It creates a sense of belonging and grass roots participation in astronomy	Local
	Siding Spring Mountain	A place of special attachment developed through longevity of association and use connecting to before the Observatory was built	Local
	The vista of the AAT Dome from afar	A landmark associated to 'home' and connection to local identity	Local
	The views of the Warrumbungles from the SSO	A landscape that references 'home' and connection to place	Local
	Clear and dark night sky	Associated with the value of having the Observatory in the local community. Its maintenance is symbolic of a collective community effort and choice	Local
	The Observatory Visitor Centre	An important public interface people have formed attachment to over years of use	Local

Specific site user community	The Siding Spring Observatory	A reference point in the formation of a shared identity for those who use the site. As well as a place of strong attachment through integral and direct involvement in the site (work, research and social) over many years	Local
	The Observatory Visitor Centre	An important public interface people have formed attachment to over years of use	Local
	The Observatory research equipment and buildings	Strong and special attachment formed over a long period of use as well as associations with important achievements and events	Local
Wider research community	The Siding Spring Observatory	A place that embodies special attachment for those who have been involved in observatory research both nationally and internationally	Local (and above)
Tourism community	The Siding Spring Observatory	Connection to place developed over many years of repeat visitation	Local (and above)
	The view of the AAT Dome from afar	The dome seen from a distance is well known as a tourism icon	Local (regional)
National park community	The views of the Warrumbungles from the SSO	A landscape panorama that references the site's integral connection to the wider natural environment	Local (regional)
	Siding Spring Mountain	An important part of the Warrumbungles natural landscape that naturalists have formed strong attachment to over time to	Local (regional)

Traditional Owner community

Traditional Owner values that are specific to their Indigenous culture are expressed in Section 4.5 'Indigenous values'. Those social values that are shared by the Traditional Owner community and other local residents, tourists, site users etc. have though been condensed in the relevant sections of the above table.

4.4 Community Aesthetic Values

4.4.1 Introduction

Aesthetic value is the emotional response by individuals to a place, or natural or cultural elements within it (Ramsay 1993). While visual elements such as outstanding landforms, or compositional qualities are often preferenced in understanding aesthetic value, non-visual attributes (e.g. sound, smell or particular understandings about the place) which evoke response, feeling or sense of place can also be valued as aesthetic characteristics. Aesthetic value is, in essence, a response triggered by the experience of a place.

Emotional response to place can be either positive or negative, although the former is more commonly documented. Examples of responses which indicate aesthetic value might include awe, inspiration, and a sense of peace, mystery or fear.

In this section the research undertaken into community aesthetic values is documented, the associated communities are defined and evidence of community aesthetic values associated with the Siding Spring Observatory is presented. Understanding community-held values and associations is critical in the assessment of this criterion.

4.4.2 Approach

Framework

The Australian Heritage Council's (AHC's) 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies* was used to define Community aesthetic significance threshold against Commonwealth Heritage criteria for this report. The extent to which the place meets these criteria is indicated below and discussed further in Section 5.4.5.

The *Australian Heritage Council (AHC) 2009 Guidelines for the Assessment of Places for the National Heritage List* has also been referred to, because it provides a more in-depth understanding of this criterion, albeit at the level of national significance. For this project the guideline was therefore referred to for its content on indicators, but not its thresholds.

The following **significance threshold** was used for this project (AHC 2010):

- *Local heritage significance* is required for inclusion on the Commonwealth Heritage List.

The following **significance indicators** were applied for this project (AHC 2009):

- Features of beauty;
- Features that inspire;
- Features that emotionally move people; and
- Features that evoke a strong human response.

And, the following three **significance tests** were used for the project (AHC 2009):

- *That the community or cultural group is clearly identifiable (assessed on a case-by-case basis);*
- *That there is clear evidence of a community or cultural group valuing particular aesthetic characteristics of the place (meaning the characteristics can be considered separately, rather than being outstanding or special); and*
- *That the place is valued for its significance by the identifiable community or cultural group (with the strength of attachment being a factor that is assessed on a case-by-case basis).*

Methodology

A detailed methodology does not exist for defining aesthetic significance against Commonwealth Heritage criteria, however research into aesthetic responses can involve direct consultation (e.g. interviews, surveys), participant observation and/or research into the expression of aesthetic values through art, poetry, photography, and literature sources, and popular culture expressions such as community art and snapshot websites. Other examples of aesthetic qualities might include cultural and natural features or landscapes with evocative qualities and other symbolic or associated meanings, which are recognised, and regarded as significant, by community groups.

For this project, the methodology used is one that has previously been applied to the assessment of community aesthetic values by the present consultants. This involves seeking a variety of evidence from different sources, to increase the likelihood that the community associations and values can be clearly established.

For this project, the following step-by-step process was applied:

Who are the communities or cultural groups with potential attachment to the Siding Spring Observatory for aesthetic reasons?

Define communities or cultural groups through:

- historical and existing data review;
- community profiling;
- consultation; and
- qualitative data collection and analysis.

What evidence is there of strong or special association or attachment, and by whom?

Establish that an association exists, drawing from an online survey, interviews and participant observation during a site and local community visit.

Is this evidence sufficient to demonstrate 'significant heritage value' as required for Commonwealth heritage listing?

Establish that the association has resulted in aesthetic expressions and that at least locally significant values are held collectively; this is done by working with the particular communities or cultural groups and analysing their aesthetic responses. Use the techniques of interviewing, participant observation and an existing material review.

4.4.3 Techniques

Existing material review

A review of existing data on community aesthetic values from previous studies, heritage assessments and other public expressions of aesthetic value through events, actions, traditions, writing, stories, naming, images, took place over May and June 2014.

Through the review and the analysis of this material, the consultants were able to:

- Identify the communities and cultural groups that may value the Siding Spring Observatory highly because of its strong or special associations for their community; and
- Generate key questions for exploration with each community or with representatives of that group.

Due to the large number of sources, a full summary of each is detailed in Appendix 4; Existing Materials Review Data.

Social research

Using snowball sampling (in which knowledgeable individuals were consulted and then asked to recommend others who may hold pertinent information) the consultants contacted individuals and organisations in order to gain their participation in the study. A request for a short phone or in-person interview and/or their contribution to the online survey was made to each of these individuals.

Using this technique, nine short interviews were conducted between 20 May and 30 August 2014. An online survey was developed and opened to the public between 2 June and 25 June 2014, during which time 244 online survey responses were received.

A site and community visit was conducted on 20 and 21 May 2014.

Due to the large amount of survey and interview responses, these are included as Appendices (2 and 3).

4.4.4 Analysis and Findings

Identifying associated communities

Central to assessing community aesthetic values is defining the communities who hold those values. The range of communities identified as holding direct associations with the Siding Spring Observatory are listed in Table 6 below.

Table 6 - Communities associated with the Siding Spring Observatory in terms of aesthetic values

Communities	Representatives
Local resident community	Local historians, residents and Warrumbungle Shire Council. 'Local' refers to the local region (Coonabarabran town, Warrumbungle Shire and outside of the shire, but in the region).
Specific site user community	SSO Site Manager, RSSA, AAO, I-Telescope; College of Physical and Mathematical Sciences; Research School of Earth Sciences; Research School of Engineering, Research School of Astronomy and Astrophysics.
Wider research community	Astronomy community Australia and worldwide. For example: Members of the 2dF Galaxy Redshift Survey Team based at the following institutions: Anglo-Australian Observatory, Australian National University, California Institute of Technology, Johns Hopkins University, Liverpool John Moores University, University of Cambridge, University of Durham, University of Edinburgh, University of Leeds, University of New South Wales, University of Nottingham, University of Oxford, and University of St Andrews.
Traditional Owner community	Coonabarabran Local Aboriginal Land Council other Traditional Owner community members from other Countries.
Tourism community	Manager Economic Development & Tourism, Warrumbungle Shire Council, SSO Accommodation and Tour Officer.
National Park community	Commonwealth Department of Environment; NSW Office of Environment and Heritage; NSW National Parks and Wildlife Service.

General research observations

Drawing together results from all research methods – desktop research, research into the expression of aesthetic values, interviews, site visit and online survey – it is clear that the Siding Spring Observatory holds aesthetic significance which meets the threshold for Commonwealth Heritage Listing (see Section 5.4.5). This was noted in existing written material, as well as palpably observed while visiting the local community and echoed in all consultation forms.

When looking at the online survey results for example (in which 244 people participated), the overwhelming majority agreed or strongly agreed with the statements that read:

- The view to the Observatory dome from afar is an iconic landmark;
- The views from the Observatory to the Warrumbungles are incredibly beautiful;
- Being on top of the mountain at the Observatory is awe-inspiring;
- Visually the Observatory buildings are striking and distinctive;
- Seeing the Observatory buildings within the natural landscape of the Warrumbungles is a dramatic but pleasing contrast; and
- The scientific research carried out at the Observatory really intrigues me.

And the overwhelming majority disagreed or strongly disagreed that:

- The Observatory buildings dominate and detract from the beauty of the natural landscape.

Of the responses, a general locational sway exists as expected. For example people who live closer to the Observatory tend to have a stronger connection to the visual aesthetics of the

place compared to those who live further away. While the scientific community are more likely to associate the research carried out at the Observatory with intrigue.

The site visit, interviews and research into existing aesthetic expressions echoed the aesthetic importance of the place to its local and wider community. Of particular strength was the palpable existence of an astronomy aesthetic throughout the region, starting with the Solar System Drive and the view from a distance of the Dome nestled in the Warrumbungles (as you drive from Dubbo towards the Observatory for example) as well as a very strong visual presence of astronomy in the town of Coonabarabran which boasts many public streetscapes, shop interiors and private land areas proudly owning this aesthetic (Refer to Figure 37 to Figure 46).

The Siding Spring Observatory is definitely a place of much aesthetic importance to the local community and beyond.

Identifying community aesthetic values

Drawing from the investigations described above, the analysis set out in Table 7 has been made concerning community aesthetic values attributed to the Siding Spring Observatory.

Table 7 - Community aesthetic values attributed to the Siding Spring Observatory

Associated community	Attributes	Indicators	Threshold Met
Local resident community	The Siding Spring Observatory	Inspires a sense of pride and ownership and contributes to the region's aesthetic identity	Local (and above)
	Views of the Warrumbungles from Siding Spring	A beautiful and awe-inspiring panoramic view that adds great aesthetic value to the region's environmental setting	Local (and regional)
	View of the AAT Dome from afar	A landscape view that evokes a strong human response and familiarity	Local (and regional)
	Observatory research equipment	Inspires feelings of pride and ownership of remarkable and ongoing scientific achievement	Local
	Architecture of the Observatory buildings	Aesthetically striking and distinctive, offers a dramatic but pleasing contrast to the surrounding natural landscape	Local
	Clear and dark night sky	A visual feature that gives identity and character to the local community	Local
Specific site user community	Views of the Warrumbungles from Siding Spring	Beautiful and awe-inspiring views of the natural scenic landscape	Local
	Observatory research buildings and equipment	Inspires feelings of pride and ownership through continuing use of world-class research infrastructure	Local (and above)
	The Siding Spring Observatory	Inspires feelings of scientific ingenuity, passion and a sense of pride and achievement in national and international, interdisciplinary scientific collaboration	Local (and above)

	Clear and dark night sky	Inspires feelings of peace, tranquillity and uninterrupted observation	Local (and above)
Wider research community	The Siding Spring Observatory	Inspires feelings of scientific ingenuity, passion and a sense of pride and achievement in national and international, inter-disciplinary scientific collaboration	Local (and above)
	Observatory research buildings and equipment	Evokes strong feelings as a portal to understandings of the universe and pioneering astronomical research	Local (and above)
	Clear and dark night sky	Inspires feelings of peace, tranquillity and uninterrupted observation	Local (and above)
Tourism community	Views of the Warrumbungles from Siding Spring	A beautiful and inspiring outlook over spectacular landscape that evokes strong human response	Local (and above)
	View of the AAT Dome from afar	The view evokes a feeling of 'destination arrival' and anticipation of experience	Local (and regional)
	Site elevation and topography	Contributes to the aesthetic drama of the volcanic landscape that is a key visitor attraction	Local (and above)
	Architecture of the Observatory	A striking and pleasing contrast to the natural environment of the place	Local (and above)
	Observatory research buildings and equipment	Evokes strong feelings of 'experiencing' pioneering astronomical research	Local (and above)
	The Siding Spring Observatory	An important and evocative site in the region's tourism economy that inspires positive sense astronomical experience	Local (and above)
	Clear and dark night sky	Reinforces the integrity of the site's natural landscape for tourists and inspires feelings of peace, tranquillity and uninterrupted observation	Local (and above)
National park community	Siding Spring Mountain	A great visual example of the evolution of the Australian landscape that evokes a strong human response	Local (and above)

4.5 Indigenous Values

4.5.1 Introduction

Indigenous significance relates to values held by Aboriginal and Torres Straight Islander community/ies. According to the Australian Heritage Council (2010) the relevant assessment criterion applies generally to places that are important as part of Indigenous tradition, which is defined in the EPBC Act 1999 (s.201(4)) as, 'the body of traditions, observances, customs and beliefs of Indigenous persons generally or of a particular group of Indigenous persons'.

Indigenous values may be tangible or intangible and are often living, dynamic and evolving. Aboriginal people use the English word 'Country' in a special way which takes in everything within the landscape – including landforms, flora, fauna, foods, stories and special places, reflecting that for Aboriginal people culture, nature and land are all linked. Aboriginal community connections include cultural practices, knowledge, songs, stories and art, as well as all people: past, present and future. It is necessary to consult with the right Aboriginal people for Country as different custodial relationships may determine who can speak for particular areas, and to draw from a range of complimentary research methods, from bibliographic review to archaeological surveying in order to understand these values.

4.5.2 Approach

Framework

The Australian Heritage Council's (AHC's) 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies* was used to assess Indigenous values against Commonwealth Heritage criteria for this report (Appendix 1). The extent to which the place meets these criteria is indicated below and discussed further in Section 5.4.9.

The AHC's 2009 *Guidelines for the Assessment of Places for the National Heritage List* has also been referred to, because it provides a more in-depth understanding of this criterion, however to a National (not a Commonwealth) level. These guidelines were therefore referred to for their content on indicators, but not thresholds.

Best practice guidelines such as the *Australian Heritage Commission (AHC) 2002 Ask First, a guide to respecting Indigenous heritage places and values* have also been referred to in order to effectively and ethically consult with community.

The following **significance threshold** was used for this project (AHC 2010):

- *Local heritage significance* is required for inclusion on the Commonwealth Heritage List.

This project draws from the above mentioned documents for this assessment.

The following **significance indicators** were applied to this project (AHC 2009, adapted to a Commonwealth level):

- *Events that have resulted in changes to the political, economic or social fabric of Indigenous Australia;*
- *Economic, political or social processes characteristic of Indigenous Australia during different periods of its history. It covers the story of the development of Indigenous Australia from earliest times to the present; and*
- *Features that demonstrate a characteristic way of life in one or more periods of the history of Indigenous Australia.*

Methodology

The methodology for the assessment of Indigenous values in this report used a combined approach of desktop research, community consultation and a site visit.

Under the EPBC Regulations it is recognised that Indigenous people are the primary source of information on the significance of their heritage and their participation is necessary to identify and assess Indigenous heritage values (Regulations 10.03D). A full assessment of Indigenous values would therefore need to pass through the Coonabarabran Local Aboriginal Land Council (CLALC) Board, and be tabled at one of the three monthly members' meetings for discussion and consensus. The CLALC was established under the *Aboriginal Land Rights Act 1983* as the elected representatives for Aboriginal people in the Coonabarabran area.

4.5.3 Techniques

Existing material review

A review of existing data on Indigenous values from previous studies, heritage assessments and other sources took place between 15 May 2014 and 30 August 2014. Through the review and the analysis of this material, the consultants were able to take the first step in:

- Identifying the Indigenous communities that may value the Siding Spring Observatory; and
- Identifying the types of values that may be significant to these communities.

Sources are detailed in Section 8, 'References' of this report.

Social research

For a full exploration of Indigenous values linked to the Siding Spring Observatory, integral consultation with Aboriginal communities is central. The consultation undertaken for this project comprised:

- A CLALC office-based meeting with Narelle Andrews (CEO), Coonabarabran Local Aboriginal Land Council & Merv Sutherland (CLALC member & Senior Team Leader NW, Repatriation and Conservation, Northern Region, Heritage Division, Office of Environment and Heritage NSW) on 21 May 2014; and
- An online survey open to the public between 2 June and 25 June 2014. Of this survey, four respondents identified themselves as belonging to an Indigenous community, either as a Gamilaroi Traditional Owner or as a Traditional Owner from another area.

Due to the large amount of interview and survey responses, a full summary of each is detailed in Appendix 2; Online Survey Results and Appendix 3; Interview Data.

Site visit

A site visit was conducted on 20 and 21 May 2014. During the visit the consultants looked for evidence of values from an archaeological and anthropological viewpoint. For any future in-depth heritage values assessment of the place, it is recommended that Traditional Owner representatives from CLALC participate in a site visit to develop an understanding of Indigenous values from a Traditional Owner viewpoint on Country.

4.5.4 Analysis and Findings

Identifying Associated Communities

The Indigenous communities identified as holding associations with the Siding Spring Observatory, according to the parameters of the study, are listed in Table 8 below.

Table 8 - Indigenous communities identified as holding associations with the Siding Spring Observatory

Communities	Representatives
The Traditional Owner community (with traditional connections)	Gamilaroi people generally Coonabarabran Local Aboriginal Land Council board and members
The local Indigenous community (with contemporary connections)	Gamilaroi people who are part of the local resident, tourism or specific site user community Other Aboriginal and Torres Strait Islander people who form part of the local resident, tourism or specific site user community

Communities	Representatives
The Australian Indigenous community (with broad traditional & contemporary connections)	Aboriginal and Torres Strait Islander people from other Countries across Australia *(Assessing values held by a wider community is outside the scope of this project)*

General research observations

Drawing together results from all research methods – desktop research, interviews, site visit and the online survey – it is clear that the Siding Spring Observatory holds Indigenous significance which meets the threshold for Commonwealth Heritage Listing. Full consultation with the CLALC Board and membership base would further identify the possibilities of heritage significance beyond this level.

The Gamilaroi people are the Traditional Owners of the area known as the Warrumbungle Range, in which the Siding Spring Observatory sits. The area is traditionally a place of teaching, meeting, gathering and ceremony. A travelling route also passes through the range from east to west, with the high mountainous high points used for navigation (pers. comm. Coonabarabran Aboriginal Land Council, 21 May 2014). The Warrumbungles (meaning 'the crooked mountains') and Mount Woorut (also known as Siding Spring Mountain) originate from the Gamilaroi language.

The night sky is an important aspect of the site for Gamilaroi people for a number of reasons. For example, traditionally it is used to understand when particular seasonal resources are available and to teach of travel routes linked to songlines of the land. It is understood that star patterns in the sky have also been used to guide people between waypoints on the ground (for instance from a river, to a marked tree, to a ceremonial ground). These star patterns then act as memory triggers for future travel (Fuller et. al. 2014: 6-7). The night sky over the Siding Spring Observatory is also representative of the importance of the night sky to Indigenous communities in Australia generally.

The Warrumbungles have yet to be systematically surveyed for archaeological evidence of occupation, however current research points towards Aboriginal occupation of at least 20,000 years (NSW NPWS 2012:11; Whitehead 2008:89). Common types of Aboriginal sites in the Warrumbungles include campsites, scarred trees, caves, grinding grooves, rock engravings, ceremonial stone arrangements, and burial grounds (Whitehead 2008:89). During the site visit, no tangible evidence of traditional Aboriginal community use of the place was found within the property boundary of the Siding Spring Observatory, and a previous archaeological assessment of the site (Estcourt 2005) also failed to yield artefactual material or identify sites of any kind. Rather than indicating that the land has not been traditionally used by Aboriginal community, it is assumed that this either indicates that the site was less frequently used for activities which are more likely to result in artefact deposition (i.e. subsistence practices or camping) or, more likely, that the absence is a result of a long history of ground disturbance on the site.

During the site visit, it was observed that the elevation of Mount Woorut makes it an incredible place of viewing across the surrounding valleys and mountain peaks.

The online survey (6 respondents) and interview (2 people) results support these findings. Amongst the online survey results, Traditional Owners of the place and Traditional Owners of other areas echoed the sentiment of the general responses. In addition to this, the Indigenous community principally identified the views to and from Mount Woorut, the clear dark skies and the AAO telescope as holding the most heritage value of the place, and importance was placed on a future focus on interpretation of Aboriginal culture and related educational activities at the site.

As well as these values, the Siding Spring Observatory is also important to the Aboriginal community for contemporary reasons, due to the role it plays in Aboriginal community members' lives in terms of work, tourism and local and historical events.

Identifying Indigenous values

Based on our investigations, the Indigenous values attributed to the Siding Spring Observatory by each of the associated communities are described in Table 9.

Table 9 - Indigenous values attributed to the Siding Spring Observatory

Associated community	Attributes	Indicators	Threshold Met
The Traditional Owner community (Gamilaroi cultural and spiritual connection to Country) *(Also possibly the general Australian Indigenous community, although this is outside the scope of this study)*	The tangible and intangible values associated with the land upon which the Siding Spring Observatory has been built	The land's natural features are representative of a traditional way of life and ongoing cultural connection. The site sits within the Warrumbungles which is an Aboriginal place of teaching, meeting, gathering and ceremony.	Local (and above)
	The tangible and intangible values associated with views to and from Siding Spring Mountain	The views to and from Siding Spring Mountain are representative of a traditional way of life and ongoing cultural connection. Traditionally a travel route passes through the Warrumbungles for communities moving from west to east. Mountainous highpoints were used for navigation.	Local (and above)
	The tangible and intangible dark and clear night sky values above the Siding Spring Observatory	The night sky above the Siding Spring Observatory is an important part of a traditional way of life and ongoing cultural connection. The night sky is integral to Indigenous understandings of social relations and kinship ties, cosmology, natural cycles and the stars, as well as associated traditions.	Local (and perhaps above)
The local Indigenous community (contemporary connection)	The Siding Spring Observatory	The place has resulted in changes to the local Indigenous economic and social fabric due to ongoing community involvement with the Observatory of a more contemporary nature (work, tourism, events, etc.). *(Refer to the relevant Social and Community Aesthetic value sections of this report for further detail)*	Local

4.6 Natural Values

4.6.1 Introduction

Natural heritage comprises the components of the natural environment that have aesthetic, historic, scientific or social significance or other special value for future generations, as well as for the present community, and in this way it parallels all of the cultural values described above to some extent. In the natural sphere, these values may derive from exceptional species richness, they may form a unique snapshot in time (a well-known example of this would be the Dinosaur Stampede at Lark Quarry in Queensland), or they may show spectacular geological features.

The research undertaken into natural heritage values in the area is documented in this section, and evidence of natural values associated with the Siding Spring Observatory is presented.

4.6.1 Approach

Framework

The *Australian Heritage Council (AHC) 2010 Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies* was used to assess natural significance against Commonwealth Heritage criteria for this project (Appendix 1).

The following **significance threshold** was used for this project (AHC 2010):

- *Local heritage significance* is required for inclusion on the Commonwealth Heritage List.

Relation to Warrumbungles National Park National Heritage Place

The Siding Spring Observatory, and the boundaries within which it sits, are cultural constructions - the cultural aspects of the SSO's significance are analysed above. The natural values of the site essentially relate to wider area into which it was placed, and the extent to which the natural values of the undeveloped wider area persist within the more developed SSO site.

Warrumbungle National Park (NP), which surrounds the SSO on its northern, western and southern sides, was added to the National Heritage List in 2006 on the basis of its natural values (NHL ID 105853, File No: 1/03/201/0001).

The summary Statement of Significance for the place, as recorded on the Australian Heritage Database (http://www.environment.gov.au/cgi-bin/ahdb/search.pl) is as follows.

> *The Warrumbungle National Park forms an extensive and spectacular geomorphological site, and the bold volcanic landforms are unrivalled anywhere else in Australia. The landscape of spires, domes, plugs and dykes is uncommon in Australia, and the sharp rise of the landform from the surrounding plain to heights of more than 700 metres contributes to the aesthetic drama. The Warrumbungles represent one of the best examples of a number of central shield volcanoes along the east coast of Australia, and have a wide array of outstanding volcanic features, including domes, plugs, dykes, sills, lava-flows, tuff layers, and horizontal and vertical columns. Some of the spectacular and well known volcanic features of the Warrumbungles include the Breadknife, a narrow 90 metre high dyke that stretches for half a kilometre; Bluff Mountain, a trachyte dome with a near-vertical face 250 metres high, and Belougery Spire, a plug that illustrates horizontal trachyte columns. The Warrumbungles are in a transition zone between the arid western and wetter coastal zones, and are of significance as a refugium in inland south-east Australia that supports exceptionally high numbers of species when compared to most other inland places in southern Australia.*

Although the property is not technically included within the Warrumbungle NP, the SSO is essentially part of it – being surrounded by the park on three sides and forming an integral part of the broader landscape. The SSO thus obviously has the potential to share some of the natural values on which the NP's National Heritage Listing is based.

These values will be affected by the developed nature of the site, and at the same time it is possible that the SSO's natural values could vary slightly from those of the surrounding park for other reasons - for example because of the site's position on a relative eminence at the top

of Mt Woorut, or in relation to species which might be better suited to a more open or even a slightly developed environment.

More recently, the natural values of both the Warrumbungles National Park and the SSO have been impacted by the 2013 bushfires, although the majority of the latter survived the fire. This impact will have been on the ecological rather than geological values of the National Heritage Place.

4.6.2 Methodology

An understanding of the natural values of the site must be developed through comparison of information relating to the place with that relating to the wider Warrumbungles National Park, of which it essentially forms a part.

Within the confines of this study it has not been possible to undertake a detailed systematic survey of the site, and so the methodology used for this project has thus been largely desktop in nature, responding to existing citations and to the results of recent surveys, supplemented with observations made during the site visit and conversations with site users and residents. It is considered that the methodology employed has been sufficiently robust at least to determine whether the natural values of the site are of local significance sufficient to warrant its inclusion on the CHL.

The following questions have been asked of the available information to inform the Assessment of Significance in the next section:

To what extent are the natural values of the surrounding Warrumbungles shared by the site?

To what extent have these values, which the site footprint will almost certainly have previously shared, been reduced by its development for the observatory?

What role does the site play within the Warrumbungles landscape?

Although not included within the National Heritage place, is the SSO site an important element of the landscape that is represented by that designation?

Does the SSO site hold additional natural values?

What values of less than national heritage significance does the SSO share with the Warrumbungles (i.e. values held by the park which are not included in the NHL citation), and are there other natural values associated with the site that are not associated with the Warrumbungles?

4.6.3 Techniques

Existing material review

A review of existing citations and management plans has been undertaken to identify the natural values attributed to the Warrumbungles National Park.

This has then been compared with available information on the natural values of the site, including the results of an ecological study carried out for the SSO site in 2005 by ANU, and supplemented by information gathered by academics based at the SSO.

Site visit

The consultants conducted a site visit with ANU staff on 20 and 21 May 2014, during which site users were questioned on their observations of flora and fauna at the site. As part of this visit a flora and fauna assessment was undertaken by the Biodiversity Officer of the ANUgreen Sustainability Office.

The report for the assessment acknowledges that it was carried out at sub-optimal times (over two days during autumn-winter) and by one officer with insufficient local knowledge, and that it is thus an inaccurate and incomplete description of species normally found on-site. However,

the report does provide some confirmation of the species which continue to be present on the site following the 2013 fire event.

4.6.4 Analysis and Findings

Identifying already recognised values

The table below sets out the assessment against the National Heritage List (NHL) Criteria which support the inclusion of the Warrumbungles National Park on the NHL. These criteria essentially relate to the same values as do those for the CHL, although satisfying the NHL criteria requires the values to be demonstrated as 'outstanding' rather than 'significant', as is the case for the CHL.

Table 10 - Application of NHL Criteria for Warrumbungle National Park (from Australian Heritage Database)

NHL Criteria	Values
NHL criterion (a) The place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.	The Warrumbungles form an extensive and spectacular geomorphological site (Cochrane and Joyce 1986), and the bold volcanic landforms are unrivalled anywhere else in Australia (Yeates 2001). The volcanic features and landforms illustrate each of the stages in the development of the Warrumbungle volcano, and include an unusual opportunity to examine the inside of a volcano, in addition to parts of the original shield, or external surface, of the volcano, as well as successive layers of lava (Duggan & Knutson 1993, Johnson 2004). The Warrumbungle National Park displays a wide array of outstanding volcanic features, including plugs, domes, dykes, sills, lava-flows, tuff layers, and horizontal and vertical columns (Duggan & Knutson 1993, Ferrett 2005, Geoscience Australia website 2005, Johnson 2004, Percival 1979, Yeates 2001). The Warrumbungle National Park is in a transition zone between the arid western and wetter coastal zones, and is of significance as an important refugium in inland south-east Australia. The Warrumbungles support exceptionally high numbers of species, and the place is one of a small number of places in inland southern Australia that are centres of richness for plant and animal taxa (NSW NPWS 1997, ANHAT 2005).
NHL criterion (d) The place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments.	The Warrumbungles are one of the best examples of a number of central shield volcanoes along the east coast of Australia (Yeates 2001, Sutherland 2003 & 2005), and constitute the best representation of exposed volcanic features within the main north-south volcanic line in eastern Australia (Sutherland 2005). The site illustrates an outstanding diversity of volcanic features within a relatively small area that have high integrity.

NHL criterion (e) The place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.	The Warrumbungles form a distinctive and spectacular volcanic landscape of spires, domes, plugs and dykes that is uncommon in Australia (Context 2006, Crocker & Davies 2005b, Duggan & Knutson 1993), and the sharp rise of the landform from the surrounding plain to heights of more than 700m contributes to the aesthetic drama. The site beautifully exposes the inside of a shield volcano, and the bold volcanic landforms are unrivalled anywhere else in Australia (Yeates 2001). The integrity and scenic vistas of the features within the Warrumbungle National Park are of outstanding value to the community.

General research observations

Landscape and geology

The ridge on which the SSO site sits, with its apex in the 1,165m high Mt Woorut, is a major element located fairly centrally within the Warrumbungles range. As Figure 2 above demonstrates, the sharp rise to the site, particularly from the plains to its east, is utterly in keeping with the general landscape theme.

The NHL citation for the park recognises the integrity of the landscape, and that scenic vistas of the features within the Warrumbungle National Park are of outstanding value to the community (see above). The SSO site does form an island of development, albeit a relatively low-intensity one, within what is otherwise a natural landscape. But over 89% of respondents to the online survey disagreed with the statement that 'the Observatory buildings dominate and detract from the beauty of the natural landscape'.

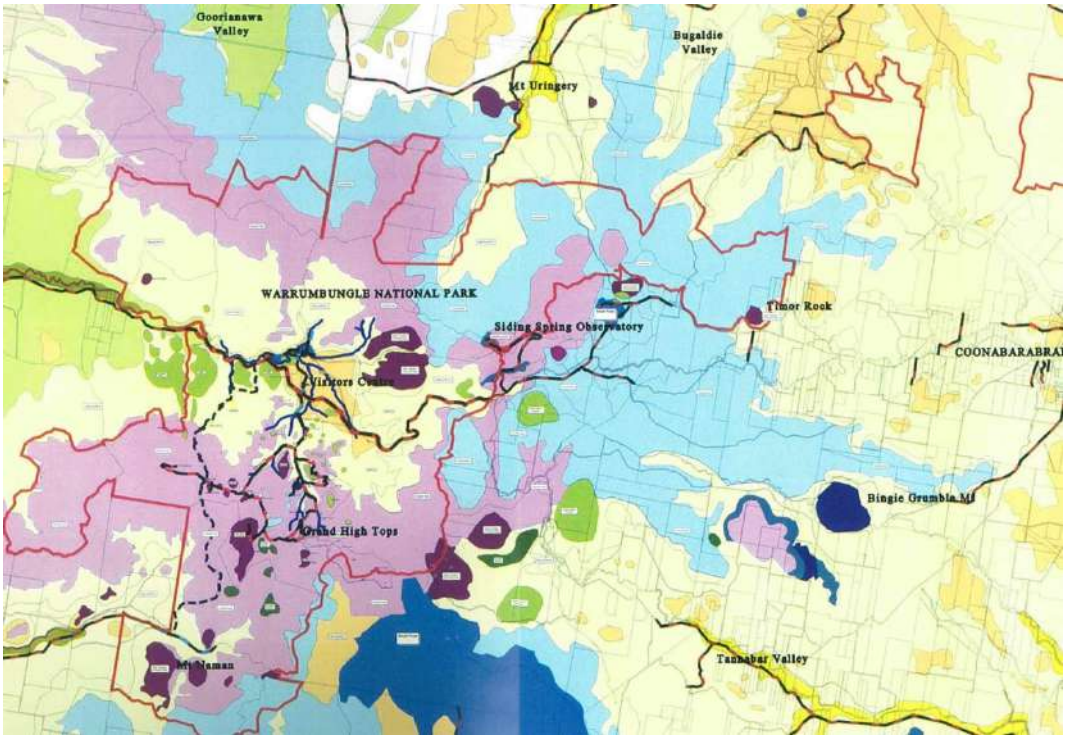

Figure 99 - Showing the geology of the former Warrumbungle Volcano and the location of the SSO site close to its centre (from Whitehead 1993)

The Warrumbungles comprise a fine example of a central shield volcano which exhibits the best representation on eastern Australia's main north-south volcanic line of exposed volcanic features illustrating each of the stages in its development. Even in this context the geology of the SSO is distinctive, with the western eminence comprising a remnant of the basaltic lava

which has eroded almost everywhere else within the range, overlying the trachyte ridge that forms part of the volcano's flank. The access road from Timor Road to the SSO site provides an opportunity to see a fine section through the volcanics which make up the edges of the volcano and radiate outwards from its centre to the west, and Mopra Rock, an outlying parcel of the SSO site, is a good example of a steep-sided sodic trachyte volcanic plug or lava dome.

Biodiversity

As a whole, the Warrumbungles support exceptionally high numbers of species, and the NHL citation reflects that the wide range of habitats and microclimates created by the unique geological history of the Warrumbungles allows for a rich biodiversity, with a much higher concentration of species recorded than its surrounds. The Warrumbungle National Park Management Plan (NSW OEH 2012) cites almost 780 species of plants, including over 520 native species, and 311 species of native animals, including 185 bird species, as having been recorded in the Park.

In 2005 an ecological study was carried out at the SSO by ANUgreen, and in recent years academics at the SSO also compiled a list of species observed at the site which includes nearly 100 flora and more than 50 fauna species, although this was not the product of systematic survey and was undertaken on an amateur basis. A number of species protected under the EPBC Act and/or threatened have been recorded within 5km of the SSO site and are known to move into and through it.

After the 2013 fires, the ecological community has been much impacted and changed. High intensity crown fires burnt through from the south leaving a rather bleak landscape of many dead standing trees. In the northern valleys, which were more sheltered from the fires, most of the larger trees retained their crowns but the under-storey was obliterated and the mid-storey killed off. Immediately after the fires the landscape began to regenerate and re-establish through secondary succession, and by the time of the most recent 2014 assessment, 16 months after the fire, the landscape had regenerated fairly well. New seedlings had emerged and established themselves, and the under-storey had recovered to include a great variety of grasses and forbs.

A full list of recorded species is provided in Appendix 5, but the following relays some of the assessments findings in relation to biodiversity regeneration:

- **Species diversity** is the measure of the richness and abundance of species at different trophic levels. It shows whether the landscape is hospitable for a range of species or only specialised species, and also gives an indirect measurement of ecosystem resilience and regeneration. Given their rare or limited nature, more detailed assessments would be required to capture the full list of threatened species that occur in the SSO and its surrounds.

  One threatened species was recorded during the 2014 assessment. Hoary Sunray (Leucochrysum albicans var. tricolor) is a threatened forb listed under the EPBC Act was recorded growing on the south-western slopes of the site. This species occurs in a wide variety of grasslands and woodlands, but requires bare ground to germinate. Major threats to it include competition and habitat loss. Several threatened fauna species have been recorded in the Warrumbungles which have a wide territory that encompass and/or are expected to occur at the SSO. These include the brush-tailed rock wallaby (Petrogale penicillata), koala (Phascolarctos cinereus) and regent honeyeater (Xanthomyza phrygia).

- **Structural Diversity** is a measure of flora structure (i.e. overstorey, midstorey, understorey) and spatial structures (e.g. creeks, rock boulders, woodland gaps). High structural diversity provides a range of conditions and habitats and allow for a complex ecological community with more species to occur.

  Varying fire intensities across the landscape have created greater heterogeneity in the flora structure with patches of burnt and less burnt woodland patches. The southern and western slopes were severely burnt and are now slowly recovering, while the more sheltered

northern slopes provided refuge as well as a nearby source for re-colonising the landscape. Most of the overstorey trees still stand and are regenerating through epicormic regrowth, and a midstorey of shrubs and new seedlings have become established. The fires have created gaps and thinned out the originally dense woodlands. A mosaic of new regrowth and woodland gaps have formed in amongst the standing trees which creates a range of new habitats for different fauna, with species overlapping at the woodland-grassland ecotone.

- **Ecological processes and functions** describe the interactions between species with other species and with their environment (e.g. pollination by insects, carnivores preying on herbivores or animals sheltering in tree hollows). A healthy ecosystem has a complex web of ecological processes and functions carried out by its inhabitants, and a high diversity of processes and functions is the result of high species and structural diversity.

  Ecological processes and functions were harder to determine as they require multiple assessments. Some processes and functions observed during the 2014 assessment include:

  - structure and shelter from still standing trees and shrubs;
  - soil cover and nitrogen fixing from pioneer species and cryptograms;
  - food resources such as nectar from grasstrees and other flowering species; and
  - breakdown of coarse woody debris and nutrient recycling by invertebrates and other fauna.

In conclusion, the SSO site does not perhaps exhibit the full extent of the biodiversity recognised to exist in the Warrumbungles as a whole. However, this would be unlikely in any event given the small size of the site. Despite an obvious reduction in flora and fauna resulting from the 2013 bushfires, the site does appear to play a role in supporting the high biodiversity values of the area, including of the surrounding Warrumbungles National Park.

5 ASSESSMENT OF HERITAGE VALUES

5.1 Introduction

This chapter provides an assessment of the cultural heritage significance of the Siding Spring Observatory.

The *Burra Charter* (Australia ICOMOS 2013) defines 'cultural significance' as:

> *'… aesthetic, historic, scientific, social or spiritual value for past, present or future generations'*

The Burra Charter further clarifies that:

> *'Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individual or groups'*

This section assesses the significance of the SSO by applying the Commonwealth Heritage Criteria (reproduced at Appendix 1) which are included in the Regulations which accompany the EPBC Act. It then presents a 'Statement of Significance' for the place. This Statement of Significance provides the heritage basis for the policy and management recommendations provided in the following chapters.

This discussion of 'significance' relates purely to heritage significance in the terms discussed below, and not to importance in relation to other considerations. For example, whilst heritage criteria set out below recognise scientific and technical achievements, they do not evaluate the actual scientific capabilities and relative functional importance of site elements.

5.2 Existing Heritage Status

The SSO is currently not subject to any heritage listing. To clarify, it is not currently listed on any of the following:

- Commonwealth Heritage List (CHL).
- Warrumbungle Shire Local Environmental Plan (LEP)
  (the ANU *Heritage Strategy 2010-2012* (2009) incorrectly records that the site is included on the LEP)
- NSW State Heritage Register (SHR)
- National Heritage List (NHL).

The Warrumbungle National Park NHL designation extends to meet the northern western and south western boundaries of the SSO, but the latter is not included in this designation.

5.2.1 Previous Heritage Assessments and Recommendations

As stated above, the SSO is currently not subject to any heritage designations. However, the report for the *Community-Based Heritage Study of the former Coonabarabran Shire* (Christison 2006), prepared on behalf of Warrumbungle Shire Council, states that that 'the Siding Springs Observatory that has been developed since 1965 is a significant site in the development of Australian astronomy' and recommends that the SSO be nominated for inclusion on the SHR as a place of State significance. The Heritage Study treats the Anglo-Australian Observatory (AAO, now called the Australia Astronomical Observatory) as a separate entity and recommends that it too be nominated for inclusion on the SHR.

State Heritage Inventory forms were completed for the two places as part of the Heritage Study. These contain the following Statements of Significance based on an assessment against the NSW Heritage Council Criteria (see below).

The Siding Spring Observatory: Statement of Significance

> *The Siding Spring Observatory is one of the foremost international optical observatories in the world and is a principal location of Australian astronomical research. The story of its development represents major*

advances in Australian science. It has associations with the astronomical work of a range of universities and research institutions including the Australian National University. It also has associations with an eminent range of astronomers and academics who have overseen its establishment and ongoing development. The Siding Spring Observatory is also an iconic element of the Coonabarabran region social and tourism landscape. The Observatory has a high level of state historical, historical association and technical/research significance, rarity, representativeness and integrity, and a moderate level of state aesthetic significance. It also has a high level of local social significance.

Anglo Australian Observatory: Statement of Significance

The Anglo Australian Observatory represents an historical agreement between the British and Australian governments to establish a major international observatory in the Southern Hemisphere. Its inauguration was also a major development of the nationally important Siding Spring Observatory site. The observatory was opened by HRH Prince Charles and has associations with a wide range of prominent astronomers from Australia, the United Kingdom and other parts of the world. The Anglo Australian Telescope building is the most visible element of the Siding Spring complex. Its prominent dome can be glimpsed from wide ranging areas of the Warrumbungle Shire and has become a tourism symbol for the region. This structure and the UK Schmidt telescope building are examples of Late 20th century Late Modern architecture. The Observatory has a high level of state historical, historical association and technical/research significance, rarity, representativeness and integrity, and a moderate level of state aesthetic significance.

5.2.2 Previous Applications of Heritage Criteria

Table 11 sets out an assessment of the site against the NSW State Heritage Register Criteria undertaken as part of the Coonabarabran Shire (former) Community Based Heritage Study in 2006 (Christison 2006). This was carried out separately for the AAO site and the rest of the SSO, reflecting the different management and discernible locales of the two institutions.

Table 11 - Application of NSW Heritage Council Criteria undertaken as part of the Coonabarabran Shire (former) Community Based Heritage Study the AAO and the rest of the SSO

Criterion	Siding Spring Observatory (SSO)	Anglo Australian Observatory (AAO)
Historical significance SHR criterion (a)	The Siding Spring Observatory is one of the foremost international optical observatories in the world and is a principal location of Australian astronomical research. The story of its development represents major advances in Australian science. The Siding Spring Observatory has a high level of state historical significance.	The Anglo Australian Observatory represents an historical agreement between the British and Australian governments to establish a major international observatory in the Southern Hemisphere. Its inauguration was also a major development of the nationally important Siding Spring Observatory site. The Anglo Australian Observatory has a high level of state historical significance.
Historical association significance SHR criterion (b)	The Siding Spring Observatory has associations with the astronomical work of a range of universities and research institutions including the Australian National University. It also has associations with an eminent range of astronomers and academics who have overseen its establishment and ongoing development. It has a high level of state historical association significance.	The Anglo Australian Observatory was opened by HRH Prince Charles and has associations with a wide range of prominent astronomers from Australia, the United Kingdom and other parts of the world. It has a high level of state historical association significance.

Aesthetic significance SHR criterion (c)	The Siding Spring Observatory complex ranges across the tops of Mount Woorut. Its can be glimpsed from wide ranging areas of the Warrumbungle Shire and has become a tourism symbol for the region. The buildings on the site are examples Late 20th century Modern architecture. The site and its buildings have a moderate level of state aesthetic significance.	The Anglo Australian Telescope building is the most visible element of the Siding Spring complex. Its prominent dome can be glimpsed from wide ranging areas of the Warrumbungle Shire and has become a tourism symbol for the region. This structure and the UK Schmidt telescope building are examples of Late 20th century Late Modern architecture. These buildings have a moderate level of state aesthetic significance.
Social significance SHR criterion (d)	The Siding Spring Observatory is an iconic element of the Coonabarabran region social and tourism landscape. It has a high level of local social significance.	The Anglo Australian Observatory is an iconic element of the Coonabarabran region landscape and is recognised as a tourist icon of the region. It has a high level of local social significance.
Technical/Research significance SHR criterion (e)	The Siding Spring Observatory is a major international research facility. The facilities and installations of the observatory have the ability to demonstrate the function of modern astronomy and have a high level of state technical/research significance.	The Anglo Australian Observatory is a major international research facility. The facilities and installations of the observatory have the ability to demonstrate the function of modern astronomy and have a high level of state technical/research significance.
Rarity SHR criterion (f)	The observatory has a high level of rarity.	The observatory has a high level of rarity.
Representativeness SHR criterion (g)	The Anglo Australian Observatory is representative of facilities constructed for the pursuit of modern astronomical science.	The Anglo Australian Observatory is representative of facilities constructed for the pursuit of modern astronomical science.
Integrity	The site has a high level of integrity.	The observatory has a high level of integrity.

5.2.3 Previous Assessment of Aboriginal Heritage

The SSO has been the subject of an *Archaeological Survey and Cultural Heritage Impact Assessment* (Estcourt 2005) which focussed on Aboriginal cultural heritage in and around the site.

A search of the NPWS Aboriginal Heritage Information Management System (AHIMS) was undertaken as a first stage of the investigation, but this showed that no sites had previously been recorded a within the SSO property or in areas adjacent to it. A subsequent field survey also failed to identify any archaeological material within the site.

On the basis of the AHIMS search and the survey, and given the level of ground disturbance through development of the site, it was concluded that the potential for sub-surface deposits within the site is low, and that it is thus of very low to negligible archaeological significance.

The site survey was undertaken following consultation with the Coonabarabran Aboriginal Land Council; specifically with Mr. Ken Dundas, then chairperson of the Land Council and Mr. Patrick Chatfield, and the field survey was undertaken with Mr Chatfield and other representatives. However, the focus of this work was archaeological and the assessment does not take account of intangible Aboriginal heritage values attributed to the site.

5.2.4 Other Heritage Designations in the Vicinity of the SSO

As described above, the Warrumbungle National Park, which surrounds the SSO on its northern, western and south western sides, was added to the National Heritage List in 2006 on the basis of its natural values (NHL ID 105853, File No: 1/03/201/0001).

5.3 Discussion of Heritage Values

This assessment has been undertaken by applying the CHL heritage criteria in relation to the analysis of the values presented in previous sections. The assessment has been undertaken in order to determine whether the SSO has 'significant' heritage values, as required for inclusion on the Commonwealth Heritage List (CHL).

The CHL is a list of the natural, cultural and historic heritage places on Commonwealth land or in Commonwealth waters, or owned or managed by the Commonwealth Government.

The application of criteria forms the basis for a Statement of Significance for the SSO site, and the following sections then identify the attributes which reflect the site's heritage values and their relative significance to the place as a whole.

5.3.1 Assessing Levels of Significance

Thresholds

In many jurisdictions, Commonwealth-owned places are not included in local or state heritage lists. The Commonwealth Heritage List is intended to provide protection for Commonwealth owned heritage places of local, state, national or world significance, whether or not they are included in other lists. This ensures that there is no gap in the coverage of heritage protection across the nation.

The Australian Heritage Council's 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register; A Guideline for Commonwealth Agencies* states that the threshold for inclusion on the Commonwealth Heritage List is local heritage significance.

The Commonwealth Department of the Environment information on Commonwealth listing (http://www.environment.gov.au/heritage/about/commonwealth-heritage/commonwealth-heritage-list-criteria) confirms this means that to be entered on the Commonwealth List a place must have 'significant' heritage value (whereas for inclusion on the National Heritage List, a place must have 'outstanding' heritage value to the nation).

The CHL is however an inclusive list and, unlike the World Heritage List, National Heritage List or state list (in NSW the State Heritage Register), inclusion on the CHL does not reflect a particular level of significance, although as stated a place must be significant to at least a local level to warrant inclusion. Thus, whilst this assessment has been undertaken primarily to determine whether the SSO should be included on the CHL, and therefore the 'bar has been set' at the local level, it can also form the basis for a future determination on whether the site warrants designation at a higher level.

In determining the threshold for local significance, an agency may follow a 'good neighbour' policy by being guided by the heritage requirements of the relevant jurisdiction. Thus, in this case, the NSW definitions of local heritage significance may also provide a helpful reference.

Commonwealth Heritage List criteria

In Australia, heritage criteria, thresholds, and statutory listings are the primary means by which the heritage values of places are articulated, and for guiding the management of these places.

When the Australian Heritage Council assesses whether a Commonwealth place has significant heritage values, it is required to advise the Minister for the Environment if the place meets one or more of the nine Commonwealth Heritage List criteria to at least a level of local heritage significance. Broadly paralleling the NSW State Heritage Register criteria listed in Table 11, the nine criteria, which are included in the Regulations which accompany the EPBC Act at Division 10.5 (Regulation 10.03A), are as follows:

a) the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history

b) the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

c) the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history

d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:

- a class of Australia's natural or cultural places; or
- a class of Australia's natural or cultural environments;

e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group

f) the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period

g) the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

h) the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history

i) the place has significant heritage value because of the place's importance as part of Indigenous tradition.

5.4 Application of CHL Criteria

The following section applies the nine CHL criteria in relation to the SSO site.

5.4.1 Criterion (a) History

The place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history

- Since it's creation in the 1960s, the Siding Spring Observatory (SSO) has been one of the foremost international optical observatories and a principal location of Australian astronomical research. The significance of its establishment is reflected in its being facilitated by the instigation of a new Act of Parliament (the Australian National University Act 1963) to allow the ANU to own land outside of the ACT.

- The development of the SSO site can be seen as spanning the third and fourth 'ages' of astronomy in Australia. Initial individual efforts by the States in the 19th century preceded the Commonwealth taking the lead for activities after Federation and the construction of the Mount Stromlo Observatory after the First World War. These later stages have reflected a new impetus after the Second World War and included Australian cooperation with the UK before cooperating closely with the US space program in the 1960s and 1970s and acting independently. More widely this can be seen to reflect Australia's post-Second World War desire for an individual national profile on the world stage.

- The Anglo Australian Observatory (now the Australian Astronomical Observatory) is the product of a historic agreement between the British and Australian governments to establish a major international observatory in the Southern Hemisphere. The construction of the UK Schmidt Telescope and AAT represented the resolution of a long-term issue and is evidence of the enduring post-war links between Australia and the United

Kingdom further influenced by then Australian Prime Minister Sir Robert Menzies. The importance of this development to the relationship is shown by the official opening of the AAT on 16 October 1974 having been conducted by His Royal Highness Prince Charles the Prince of Wales, with speeches made by Sir Fred Hoyle, the Chairman of the Anglo-Australian Telescope Board, the British High Commissioner, Sir Morrice James and Prime Minister of Australia Gough Whitlam.

- The story of the SSO's development reflects major advances in Australian science. Periodically the SSO site has contained elements which have represented cutting edge technology on a global scale. It continues to do so through the ongoing use of facilities such as the Anglo-Australian Telescope (AAT) operated by the Australian Astronomical Observatory (AAO) and the 2.3m ATT operated by the ANU in conjunction with complimentary technology and instrumentation manufactured specifically for these facilities by these organisations.
- The Western Telescope Area of the SSO, the first part to accommodate telescope facilities, can be viewed as something of a pioneer outpost in a remote and mountainous area, the foundation of which, in the 1960s, enabled the ANU to quickly establish its credentials as a major astronomical research organisation on the international stage.
- The SSO site contains part of one of the first networks of telescopes designed for remote public use.
- The site is one of the first observatories in Australia to be actively orientated towards tourist visitation, a trend which has occurred with the encouragement and support of local councils and the park service.
- The site's position around the top of Mt Woorut places it on the historic boundaries of several parishes.

The SSO meets the history criterion for Commonwealth Heritage Listing.

5.4.2 Criterion (b) Rarity

The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

- The SSO has a national and international profile and is the one optical observatory site in Australia that genuinely connects with, and operates within, a global network – both in terms of its academic and commercial operations. The SSO is one of only a few major government observatories in Australia, and the largest optical facility in terms of instruments. It contains the biggest and best optical telescopes in the country.
- The site was selected as the successor to Mount Stromlo for its atmospheric conditions – attributable primarily to its elevation but also its distance from large urban areas, and for the darkness of its skies due to an absence of residual artificial light. The site is still the best location in Australia in this regard, and one of the best in the southern hemisphere, and it is for this reason that it continues to be in demand as a site for new telescope facilities.
- With the destruction of Mount Stromlo Observatory by the 2003 bushfire the SSO became the single major optical observatory in Australia.
- As part of the Warrumbungle Range, and geographically if not administratively part of the Warrumbungle National Park, the SSO site has natural aspects which reflect the same unique combination of landscape, geology and biodiversity as exhibited by that National Heritage Listed place.
- The site contains pieces of now redundant equipment - telescopes and telescope mountings in particular, which were purpose built, either for this site or for others from

which they were subsequently moved to the SSO, that have been utilised for numerous significant astronomical programs and discoveries.

The SSO meets the rarity criterion for Commonwealth Heritage Listing.

5.4.3 Criterion (c) Research Potential

The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history

- The various structures at the SSO demonstrate changing trends in the design of astronomical and support structures. Major extant examples remain from almost every decade since the site's initial development - for example the 40 Inch Telescope building from the 1960s, the AAT from the 1970s, the ATT from the 1980s, and the Faulkes Telescope South from the 2000s and the KMTNet Telescope under construction. Together these clearly illustrate changes in the way the buildings were constructed and continue to be used.
- The various pieces of equipment housed at the SSO site; in particular the telescopes but also supporting scientific instrumentation such as the spectrometers housed in the AAT and infrastructure such as the PABX system in the Administration Building, demonstrate the development of technology utilised at the site. This equipment currently includes static examples such as these, but also portable items, for example the observation trailer used in the 1960s site selection process which is currently stored in the Workshop and the 8 Inch Tinsley telescope currently stored in the Administration Building. The items themselves are particularly important in instances where documentation relating to them may have been lost, for example during the fires which overtook the SSO's sister site at Mt Stromlo in 2003.
- The documentary archive stored at the site, for example the architectural and technical plans currently stored in the Administration Building, has research potential in relation to the design and development of the site.
- The history and physical fabric of the site illustrate Australia's changing role in global astronomy, but they also represent periods of investment and development which reflect broader trends concerning Australian society, the priorities of government and Australia's relationships with other countries.
- The SSO site provides great insights into the history of the organisations and people involved in its development and use. These include the ANU research schools, the AAO, in both its incarnations, and the directors and major decision makers. But the site also provides insights into the daily working lives of the individual astronomers and other operatives who have used the site since the 1960s.
- The SSO site contains several excellent geological exposures which provide opportunities for studying the Warrumbungles central shield volcano which is the best representation on eastern Australia's main north-south volcanic line of a collection of exposed volcanic features illustrating each of the stages in the development of such formations.
- On the basis of the previous survey of Aboriginal cultural heritage (Estcourt 2005) and the assessment of the structural remnants and sub-surface remains presented in Section 3.5 above, the site as a whole is deemed to have low potential to yield information through archaeological investigation. This is true also of the extant buildings on the site which each reflect a single episode of construction and would thus not in themselves yield information regarding the development of the site through archaeological investigation of their fabric.

The SSO meets the research potential criterion for Commonwealth Heritage Listing.

5.4.4 Criterion (d) Representativeness

The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:

- *a class of Australia's natural or cultural places; or*
- *a class of Australia's natural or cultural environments.*

- With the destruction of Mount Stromlo Observatory by the 2003 bushfire the SSO became the prime example of a class of sites - major optical observatories, in Australia. Even prior to the 2003 event, the SSO had become the major focus of Australian (and foreign sponsored) optical astronomical endeavours in Australia.
- The SSO site represents the fruits of Australia's post-war scientific endeavours and relationships in the field of astronomy.
- The site contains numerous examples of particular building and equipment typologies, many of which are the definitive examples of their type having been purpose built for the site.

The SSO meets the representativeness criterion for Commonwealth Heritage Listing.

5.4.5 Criterion (e) Community Aesthetics

The place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group

- The SSO is valued by the local resident and tourism communities as a central place in the region's aesthetic identity, which is strongly linked to astronomy (this is demonstrated through the strong visual presence of a general 'astronomy' aesthetic in regional business and tourism initiatives).
- The Siding Spring Observatory is valued by specific site user and wider research communities due to its ability to inspire feelings of scientific ingenuity and passion as well as a sense of pride and achievement through national and international, interdisciplinary collaboration.
- The Observatory research equipment and buildings inspires feelings of wonderment in the local resident, tourism, specific site user and wider research communities as portals to understanding the universe and experiences of pioneering astronomical research.
- The architecture of the domed Observatory buildings is valued by the local resident and tourism community as a dramatic but pleasing contrast to the surrounding natural volcanic landscape.
- The panoramic views of the Warrumbungles from the SSO are a beautiful and awe-inspiring. They evoke a strong human response, and add great aesthetic value to the region's environmental setting. These values are held by at least the local resident, specific site user, the national park and tourism communities.
- The view seen from afar of the AAT dome rising above the peak of Siding Spring Mountain evokes feelings of familiarity and 'being home' for the local resident community, and a feeling of 'arrival at destination' and the anticipation of experience for the tourism community.
- The site elevation and topography contributes to the aesthetic drama of the volcanic landscape, forming a key visitor attraction for the local resident, tourism and national park community. Its location evokes a strong human response.
- The clear and dark night skies are aesthetically valued for their ability to evoke feelings of peace, tranquillity and uninterrupted observation amongst the site user, tourism and wider research community.

The SSO meets the community aesthetic criterion for Commonwealth Heritage Listing.

5.4.6 Criterion (f) Creative and Technical Achievement

The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period

- The selection of the SSO site in the 1960s represented the culmination of an exhaustive nation-wide search for the best site for the new observatory which involved survey parties conducting numerous tests of potential sites throughout Australia. The validity of their choice of site continues to be proven in the development of new telescope facilities at the site today.
- Beginning with the construction of Observatory Road from the valley below, construction of the SSO site, and in particular the highly engineered and technologically advanced facilities that it contains, has been, and continues to be, a great challenge at this remote elevated site.
- From the point at which the 40 Inch Telescope - the most advanced telescope the Mount Stromlo Observatory possessed at that time, was installed at the SSO, the facilities for optical astronomy accommodated at the SSO site have included numerous examples which were, or are, cutting edge on a national and sometimes international level. Many of these facilities were designed and built at the site, or by the organisations that are based there which have also been responsible for designing cutting-edge astronomical instrumentation for use elsewhere in conjunction with some of the world's largest telescopes.
- A number of innovative designs have been created at the SSO site in response to new technological, and sometimes economic, requirements. A good example is the 2.3m ATT telescope whose innovative design continues to provide a world-class functionality despite being developed during a period of limited resources.
- Their level of technological development aside, the telescope facilities at the SSO are widely recognised for the quality of their engineering. On its completion in 1974 the AAT won an 'Excellence Award' from the Association of Consulting Engineers Australia and the optics, stability and precision of that telescope make it 'one of the finest telescopes in the world'.
- The design language visible across the SSO site represents a creative expression of the architects engaged by the ANU as well as a response to design requirements.
- Development of the SSO site has to some extent been the result of formal planning, but its form today appears to owe more to the pragmatic utilisation of successive areas over time than to a high level strategy. Site infrastructure has responded to this development in a fairly expedient manner although the provision of utilities to the remote site is itself an achievement - e.g. through pumping water from Timor Dam for storage in the numerous raised water tanks across the site.
- The AAO has a reputation as one of the most productive observatories in the world, and a leader in many astronomical fields as the home of the southern hemisphere's most precise planet search program and comprehensive galaxy and quasar surveys.
- The SSO site, and the buildings, equipment and associated material contained within it, stand as testimony to the discoveries made there, many of which are recognised to be of international significance. These included the mapping and expansion of space and time, modelling and observing the formation of galaxies, studying the violent flows of gas around black holes and locating the oldest stars in the galaxy. In 2009, the AAT alone was ranked as the fifth highest-impact of the world's optical telescopes in terms of the discoveries made with it.

The SSO meets the creative and technical achievement criterion for Commonwealth Heritage Listing.

5.4.7 Criterion (g) Social

The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

- Since the construction of the 40 Inch Telescope in 1964, the SSO has had a resident community, including the director in the house provided (burnt in the 2013 fires), resident ANU and then also AAO astronomers and technicians and ANU administration staff living in Bingar Cottage and the other residences, together with a more transient population of astronomers accommodated in the Lodge.
- The SSO as a whole is an important signature place for the local resident community and to specific site users. It creates a sense of identity and attachment linked to astronomy, international research and grass roots participation. The tourism community have also formed connections to the Observatory as a whole, developed over many years of visiting the place.
- Siding Spring Mountain holds value due to the special attachments to it developed by the local resident community over years of association to it going back before the Observatory was built. Attachment is also evident for the national park community who see the mountain as an important part of the natural landscape.
- The vista of the AAT dome seen from afar is an iconic landmark that references connection to place for the local resident community and the tourism community.
- The view of the Warrumbungles from the SSO also references connection to place for a number of communities. The views are important to the local resident community as a place of familiarity and 'home' and to the natural park community for its connection to the 'natural environment' of the surrounding National Park. In particular, this is linked to Trigg Point.
- The Observatory research equipment and buildings are valued by the specific site use community who have formed a strong and special attachment over long periods of use, covering important achievements and events.
- The Observatory Visitor Centre is an important public interface that local residents and specific site users have formed attachment to over years of use.
- The dark and clear night skies are associated by local residents with the importance of having the Observatory in the local community. Its maintenance is symbolic of a collective community effort and choice.

The SSO meets the social criterion for Commonwealth Heritage Listing.

5.4.8 Criterion (h) Associations

The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history

- The Siding Spring Observatory has associations with a number of figures who have administered and advocated its establishment and development and were highly influential in developing the capability and reputation of astronomy at the ANU, nationally and internationally. In particular the site has obvious associations with it successive directors, most significantly Bart Jan Bok (1956-1966) who became a public face of astronomy during the duration of his tenure, Olin Jeuck Eggen (1966-1977) and Sidney Charles Bartholomew 'Ben' Gascogne (1966).
- Numerous eminent astronomers and academics, highly regarded for their research and contribution to the science, have worked at the site, making significant discoveries. These

have included Malcolm Hartley's discovery of Comet 103P/Hartley in 1986 and Robert H. McNaught's 2006 discovery of Comet C/2013 A1, known as 'Siding Spring' using the Uppsala Southern Schmidt Telescope.

- The Australian Astronomical Observatory, located at the SSO has a reputation as one of the most productive observatories in the world, and a leader in many astronomical fields.

The SSO meets the 'associations' criterion for Commonwealth Heritage Listing.

5.4.9 Criterion (i) Indigenous Tradition

The place has significant heritage value because of the place's importance as part of indigenous tradition.

- The natural features of the land upon which the SSO sits (also known as Siding Spring Mountain or Mount Woorut) are valued by the Gamilaroi Traditional Owner community for their representation of a traditional way of life and ongoing cultural and spiritual connection to Country. The site sits within the Warrumbungles, which is an Aboriginal place of teaching, meeting, gathering and ceremony.
- The views from and to Siding Spring Mountain are valued by the Gamilaroi Traditional Owner community for their representation of a traditional way of life and ongoing cultural and spiritual connection to Country. Traditionally a travel route passes through the Warrumbungles for communities moving from west to east. Mountainous high-points were used for navigation.
- The clear and dark night sky above the SSO is valued by the Gamilaroi Traditional Owner communities for their representation of a traditional way of life and ongoing cultural and spiritual connection to Country. The night sky represents Aboriginal understandings of seasonal resources, travel routes, songlines and associated intangible traditions.
- The SSO is valued by the local contemporary Indigenous community due to the role it plays in community members' lives in terms of work, tourism and local and historical events.

The SSO meets the Indigenous tradition criterion for Commonwealth Heritage Listing.

Beyond those values explored in this report for Commonwealth Heritage Listing purposes, Indigenous community members may also hold other values relating to the SSO, however such an assessment is outside the scope of this report. A full assessment of Indigenous values would need to pass through the Coonabarabran Local Aboriginal Land Council (CLALC) Board, and then be tabled at a members' meeting for discussion and consensus.

5.5 Statement of Significance

A Statement of Significance is intended to briefly and clearly state the principal basis for the significance of the place. A statement of significance should be:

'*... a brief, pithy but comprehensive statement of all the ways in which the place is significant. It should not just be a list of every conceivable reason for significance that the assessor can think up, however, it must state clearly and unequivocally the major reasons why the place is important. It must be supported by the presentation of sufficient evidence to justify the assessment judgment.*' (Pearson & Sullivan 1995)

The statement of significance provides a description of:

- ***What*** is significant (in terms of the elements that hold significance);
- ***How*** it is significant (in terms of its historic/archaeological, aesthetic, technical, scientific or social values); and
- ***Why*** it is significant (in terms of how the SSO site demonstrates or reveals the values that make it a significant place within the local area, the region, the State and beyond).

The statement of significance below has been arranged according to these headings, but the material provided can be arranged as necessary, for example for inclusion in a citation to support nomination of the site to the CHL.

5.5.1 Statement of Significance for the Siding Spring Observatory

The following statement of significance has been prepared for the SSO site in response to the above application of the CHL criteria.

What is significant?

[Summary version]

The Siding Spring Observatory site as a whole, including its distinct areas and the identified component elements and natural aspects, is of significance.

[Expanded version]

The Siding Spring Observatory Site, located at the top of Mt Woorut along the east boundary of the Warrumbungle National Park in north eastern NSW, approximately 20km to the west of Coonabarabran, is of heritage significance.

Following an extensive nation-wide search at the beginning of the 1960s, the site was chosen by the Australian National University (ANU) to become a field station of the Commonwealth Solar Observatory at Mount Stromlo (MSO) in Canberra. It had become clear to Bart Bok, Director of the Observatory from March 1957, that the Mount Stromlo site was threatened by the rapid growth of Canberra and the subsequent brightening of the night sky which would seriously impair astronomical observing efficiency, and he had thus initiated the site survey to look for a new site where a field station for future MSO telescopes could be established. In May 1962, the final selection was made by the ANU Vice-Chancellor Leonard Huxley on the basis that the site on a ridge at the apex of the mountain filled the criteria of 'good seeing', dark skies and reasonable freedom from cloud, qualities which have long been recognised by the people of the Gamilaroi language group who are known to have occupied the Warrumbungle Range and surrounding plains for at least 20,000 years.

The first permanent structure on the site was the 40 Inch Telescope, the building for which also incorporated living facilities for the astronomers reflecting the remote nature of the location and the need for the astronomers to be in constant attendance during periods of observation. The 40 Inch began work in 1964, and over the next few years the 16 Inch and 24 Inch Telescopes were installed near to it at the western end whilst supporting facilities, in the form of a Director's Cottage, residences and a lodge for visiting astronomers, were constructed towards the centre of the site.

In the subsequent decades the site came to become the nation's principal optical observatory through a series of major developments. In the 1970s an official agreement between the Australian and UK governments led to the creation of the Anglo-Australian Observatory (AAO - now the Australian Astronomical Observatory) under the auspices of which were constructed the UK Schmidt Telescope and the Anglo-Australian 150 inch Telescope, still the largest optical telescope in Australia and at the time one of the largest in the world. The site continued to grow in the 1980s and 1990s with the construction of the 2.3m ATT for the Australian National University in 1984 and the transfer to the site from Mt Stromlo and elsewhere of other instruments, including the Uppsala 0.5 metre Schmidt Telescope University of New South Wales' Automated Patrol Telescope.

In the years since its creation, the countless discoveries made at the site have included many recognised to be of international significance. The devastation of the Mount Stromlo Observatory by bushfire in 2003 confirmed the SSO as the ANU's primary observing. It is now associated with a range of Australian and international universities and research institutions and is one of the foremost optical observatories in the world, hosting telescopes for networks managed by institutions in countries including Korea, Hungary and Poland. Most

recently, the geographic and atmospheric advantages of the site have led to its accommodation of telescopes remotely operated as part of publicly accessible global networks.

How it is significant?

The SSO is significant under each of the CHL criteria; i.e. in terms of its history, rarity, research potential, representativeness, community aesthetics, creative and technical achievement, social associations and Indigenous tradition, to at least the local level required for CHL listing.

Why it is significant?

The SSO is historically significant as one of the foremost international optical observatories in the world and a principal location of Australian astronomical and astrophysical research. Its development can be seen as reflecting a new post-war confidence and impetus to conduct research on the world stage, first through cooperation with the UK and then independently. The story of the SSO's development reflects major advances in Australian science as well as politics - a new Act of Parliament was required for its creation to allow the ANU to own land outside the capital, and the site contains elements which have represented cutting edge technology on a global scale, and it continues to do so. Development of the Western Telescope Area in the early 1960s established the ANU's credentials as a major astronomical research organisation on the international stage. The subsequent creation of the Australian Astronomical Observatory (formerly the Anglo Australian Observatory) was the product of a historic inter-governmental agreement to establish a major international observatory in the Southern Hemisphere at the site. The site has a long history of public interaction, and is one of the first observatories in Australia to be actively orientated towards tourist visitation. Now, in a global age, the SSO contain parts of some of the first networks of telescopes designed for remote public use. (Criterion a).

The SSO is significant in terms of its rarity as one of only a few major government observatories in Australia, and the largest optical facility in terms of instruments. The site was selected as the successor to Mt Stromlo for its particular atmospheric conditions and continues to be in demand as a site for new telescope facilities as the one optical observatory site in Australia that genuinely connects with, and operates within, a global network. It contains pieces of now redundant equipment which were purpose-built and have been utilised for numerous significant astronomical programs and discoveries. As part of the Warrumbungle Range, the SSO site has natural aspects which reflect the same unique combination of landscape, geology and biodiversity as exhibited by that National Heritage Listed place. (Criterion b).

The research potential of the SSO lies in the various structures and equipment at the SSO which demonstrate changing trends in the design of astronomical and support structures, illustrate the changing role of Australia in global astronomy and also represent periods of investment and development which reflect broader trends concerning Australian society, the priorities of government and Australia's relationships with other countries. These physical items are particularly important in instances where documentation relating to them may have been lost, for example during the fires which overtook the SSO's sister site at Mount Stromlo in 2003. The SSO site itself also stores a large archive of documents. The site provides great insights into the history of the organisations and the people involved in its development and use, including the ANU research schools, the AAO in both its incarnations, the directors and major decision makers and the individual astronomers and other operatives who have used the site since the 1960s. In terms of its natural values, the SSO site contains several excellent geological exposures which provide opportunities for studying the Warrumbungles central shield volcano. (Criterion c).

The SSO is the principal example of a major optical observatory in Australia and represents the fruits of Australia's post-war scientific endeavours and relationships in the field of astronomy. It is also representative in that it contains numerous examples of particular building and equipment typologies, many of which are the definitive examples of their type having been purpose built for the site. (Criterion d).

The SSO site is significant in terms of community aesthetics at a variety of levels. For the specific site users and wider research communities the site inspires feelings of scientific ingenuity and passion as well as a sense of pride and achievement around national and international, interdisciplinary collaboration, and its equipment and buildings are viewed as portals to understanding the universe and experiences of pioneering astronomical research. This translates into feelings of wonderment for the local resident and tourist communities who also value the SSO as central place to the region's aesthetic identity which is strongly linked to astronomy. The site elevation and topography contribute to the aesthetic drama of the volcanic landscape, which evokes a strong human response and the pleasing contrast between this landscape and the domed Observatory buildings together form a key visitor attraction for the local resident, tourism and national park community. This view of the AAT dome rising above the peak of Siding Spring Mountain evokes feelings of familiarity and 'being home' for the local resident community and of 'arrival' for visitors, whilst the views of the Warrumbungles from the SSO evoke a strong human response, augmented by the clear and dark night skies that evoke feelings of peace, tranquility and uninterrupted observation amongst the site user, tourism and wider research community. (Criterion e).

The SSO site itself is significant in terms of creative and technical achievement in that it represents the culmination of an exhaustive nation-wide search for the best site for the new observatory and the challenge of development at such a remote site which continues to be validated by the construction of new facilities. The SSO instruments include numerous cutting-edge and innovative designs conceived and built at the site, and the engineering quality of the instruments is recognised internationally. The buildings, equipment and associated material contained within the site stand as testimony to the discoveries made there, many of which are recognised to be of international significance - the AAT alone was ranked in 2009 as the fifth highest-impact of the world's optical telescopes in terms of the discoveries made with it. The design language of the buildings, and the manner in which the site and its infrastructure have developed, represent a considered and pragmatic response to the requirements of the site and its location. (Criterion f).

The SSO has social significance as an important signature place for those who live at the site and the local community and to specific site users that creates a sense of identity and attachment linked to astronomy, international research and grass roots participation, and these attachments have come to be shared by the tourism community over many years of visitation. The Observatory facilities are valued by the specific site user community who have formed a strong and special attachment over long periods of use, covering important achievements and events. The local resident community maintain attachments to the mountain site developed over years since before the Observatory was built, and these are shared by the tourist and national park community who see the mountain as an important part of the natural landscape but also regard the vista of the AAT dome from afar as an iconic landmark referencing connection to place. The view of the Warrumbungles from the SSO (and from the Trig Point in particular) also references connection to place for a number of communities as a place of familiarity and 'home' for locals and for its connection to the 'natural environment' of the surrounding National Park. The Observatory Visitor Centre is an important public interface with which local residents and specific site users have formed attachment over years of use, and the maintenance of the dark and clear night skies is seen as symbolic of a collective community effort and choice. (Criterion g).

The SSO is significant for its associations with a number of figures who advocated for its establishment and have promoted its development and reputation, including directors Bart Jan Bok, Olin Jeuck Eggen and 'Ben' Gascoigne in particular. It is also significant for its association with eminent astronomers who have made significant discoveries at the site, including Malcolm Hartley and Robert H. McNaught's, and with the internationally respected organisations who have administered the site, including the Australian Astronomical Observatory. (Criterion h).

The SSO is significant in relation to Indigenous tradition in that the natural features of the land upon which the SSO sits, and the views to and from it, are valued by the Gamilaroi Traditional

Owner community for their representation of a traditional way of life and ongoing cultural and spiritual connection to Country. The clear and dark night sky above it represents Aboriginal understandings of seasonal resources, travel routes, songlines and associated intangible traditions. The site sits within the Warrumbungles, an Aboriginal place of teaching, meeting, gathering and ceremony, through which a travel route passes for communities moving from west to east which employed mountainous high-points like the site for navigation. The SSO is valued by the local contemporary Indigenous community due to the role it plays in community members' lives in terms of work, tourism and local and historical events. (Criterion i).

5.6 Potential for Inclusion on Heritage Lists

5.6.1 Inclusion on the Commonwealth Heritage List

As stated, the application of the CHL criteria set out in Section 5.3 above has been geared to assessing the extent to which the site warrants inclusion on the CHL, and it has determined that the site meets each of the criterion to the level required for this listing.

It is thus recommended that the Siding Spring Observatory be nominated for inclusion on the Commonwealth Heritage List (see 6.3.1 for details of this process).

5.6.2 Potential for Inclusion on Other Heritage Lists

It being the case that the SSO site warrants inclusion on the CHL, the confirmed local significance of the place would also warrant its inclusion on the Warrumbungle Shire Local Environmental Plan (1990). However, as Commonwealth property the site does not fall within the jurisdiction of this municipality and so this has not occurred, although it may be appropriate if following the 'good neighbour' policy described under 5.2.1 above.

The comprehensive manner in which the site satisfies the CHL criteria makes it likely that the site qualifies for higher level designation, although further assessment is beyond the scope of this HMP.

Higher level listing could take the form of inclusion on the NSW State Heritage Register (SHR), although again a 'good neighbour' approach would need to be followed for this to be undertaken. The assessment against the NSW State Heritage Register Criteria set out under 5.2.2 indicates that the site would qualify, and a request was made by the NSW Heritage Council in 2009 that the SSO site be included on the SHR (Collet 2009) but, the ANU not being legally obliged to agree, this did not occur at that time.

It may be the case that the site qualifies for National Heritage listing. To determine whether this is the case, a further assessment would need to be undertaken against the National Heritage List Criteria and in line with the Australian Heritage Council's *Guidelines for the Assessment of Places for the National Heritage List* (2009).

5.7 Attributes of Heritage Values

Table 12 lists the attributes and features that express or embody the heritage values detailed above. Identification of these attributes will assist in the development of conservation policy and will be useful in ensuring protection for the values.

Table 12 - Attributes that express of embody the SSO heritage values

Criteria	Attributes
Criterion (a) History	The SSO site as a whole The site extent - the land parcel acquired in 1963 The Australian National University Act 1963 (which allowed the ANU to own land outside of the ACT) The facilities of the Australian Astronomical Observatory (the former Anglo-Australian Observatory) at the site, in particular the UK Schmidt Telescope and AAT The telescope buildings and the telescopes related equipment contained within them, in particular the 40 Inch Telescope building, the AAT, the UK Schmidt Telescope, the Uppsala Telescope and the ATT The Western Telescope Area - the earliest are to be developed, and Bingar Cottage The separate areas of the site which reflect its historic development The remotely operated telescopes at the SSO site The Exploratory and Visitor Centre The site's location, around the top of Mt Woorut.
Criterion (b) Rarity	The atmospheric conditions and clear and dark night sky The telescopes at the site, in particular the AAT, UK Schmidt and ATT The Indigenous flora and fauna of the site, and the geological sections visible along the site access road and at Mopra Rock. The redundant equipment within the site, including telescopes and telescope mountings in particular.
Criterion (c) Research potential	The telescope buildings at the site The telescopes and other scientific instruments stored at the site The data gathered at the site – both in recorded form and as the knowledge of those who have worked there The documentary archive stored at the site, and relating to it but stored elsewhere Geological exposures visible across the site, in particular the geological sections visible along Observatory Road.
Criterion (d) Representativeness	The site as a whole The various building designs and equipment typologies, particularly those which were purpose built for the site.
Criterion (e) Community Aesthetics	The 'astronomy' aesthetic of the SSO The Observatory research equipment and buildings in general The distinctive architecture of the domed Observatory buildings The views of the Warrumbungles from the Siding Spring Observatory The view seen from afar of the AAT dome The site elevation and topography The clear and dark night sky.

Criteria	Attributes
Criterion (f) Creative & technical achievement	The site testing trailer and 8" Tinsley telescope The scientific facilities at the sites, in particular those designed and built at the site The 40 Inch, AAT, UK Schmidt and 2.3m ATT telescopes All of the buildings at the site designed by the ANU architects Bunning and Madden, including the Administration Building, all of the residences except Bingar Cottage, and the Workshop, Visitor Centre and UK Schmidt Telescope building. The layout of the site The Observatory research equipment and buildings in general.
Criterion (g) Social	Bingar Cottage and the other residences SSO community participation Mount Woorut / Siding Spring Mountain The views of the Warrumbungles from the Siding Spring Observatory The view seen from afar of the AAT dome The Observatory research equipment and buildings in general The Observatory Visitor Centre The clear and dark night sky.
Criterion (h) Associations	The memorial dedicated to former MSO director Olin Jeuck Eggen The telescopes and other scientific instruments stored at the site Recognised connections between the site and important individuals and organisations.
Criterion (i) Indigenous Tradition	Mount Woorut / Siding Spring Mountain The landscape views from the Siding Spring Observatory The landscape views to the Siding Spring Observatory The clear and dark night sky The SSO as a place of contemporary memory/work/recreation.

5.8 Relative Significance of SSO Site Elements

On the basis of the above assessment and attributes, the Siding Spring Observatory site is deemed to be of heritage significance as a whole. Future management of the site should take a holistic approach to managing its heritage values.

However, future management actions may require that decisions be made in which elements must be prioritised, and the relative heritage significance of the elements should be a major consideration in these decisions.

The Australian Heritage Council's (AHC's) 2010 document *Identifying Commonwealth Heritage Values and Establishing a Heritage Register, a guideline for Commonwealth agencies* directs that:

> *If your agency owns or controls a precinct, campus or landscape containing multiple heritage places, you should complete a single assessment proforma for the entire site, grouping places with a similar or complementary history and/or purpose within a single boundary. The assessment should distinguish between the elements of the site that are above the Commonwealth Heritage List (CHL) threshold and the elements that are below threshold.*

To this end, the following section discusses the relative significance of the elements within, or aspects surrounding, the SSO site.

5.8.1 Elements and their Relative Significance

The SSO site as whole is deemed to meet the threshold for inclusion on the CHL.

As regards its constituent elements, each is deemed to have heritage significance at one of the following levels:

- **High significance** where the element is of high heritage significance in its own right and/or is a key attribute to the overall significance of the Siding Spring Observatory (including original or early attributes);
- **Moderate significance** where the element is of some individual heritage significance but this is not key to the significance of the site as a whole (it can be an early or recent element);

In line with the Australian Heritage Council guidance, the elements of High and Moderate heritage significance are deemed to be above the CHL threshold in their own right.

- **Low significance** where the element is of relatively little individual heritage significance but is contributory to the significance of the site as whole part, or as one of a collection of several places that together add to the site's significance;

In line with the Australian Heritage Council guidance, the elements of Low significance are deemed to be below the CHL threshold in their own right, but to be contributory to the whole site meeting the CHL threshold.

- **No significance** where the element is not of significance in its own right and does not contribute to the significance of the SSO site as a whole;
- **Intrusive** where a feature or element actively obscures or hides the attributes of significance. (The single generation of development which has occurred across the site - where no major re-development of a single footprint has occurred is such that none of the elements within the site is currently deemed intrusive.)

The following table shows the relative significance of the elements within the different areas of the SSO site.

These are accompanied by an explanation of the rationale for the assessed significance of each, setting out whether their significance is reflected in their contribution to the site as a whole, natural aspect, individual structures, or equipment or material contained within them.

Rationale

The relative significance of each element has been determined according to a number of factors, most importantly the extent to which they reflect the attributes listed in Table 12, but also the extent to which the element contributes to the significance of the site as a whole.

To reiterate, the following have been taken into consideration:

- The extent to which the element reflects the attributes listed in Table 12; and
- The extent to which the element reflects the significance of the site as a whole, or the individual areas within it (see Section 3.3).

Future management decisions should be made on in consideration of these same factors.

Table 13 lists the physical elements in which the heritage values of the Siding Spring Observatory are reflected. They include buildings/telescopes, other structures and remnants, infrastructure, infrastructure and other landscape elements, portable objects (both at the site and elsewhere) and natural aspects.

The relative significance of the buildings and structures on the SSO site is shown on Plan 3.

Table 13 - Relative significance of the various elements of the Siding Spring Observatory

Element	ANU Ref.	Relative significance	Rationale
Buildings/telescopes			
UK Schmidt Telescope (UKST)	N001	High	Developed with the AAT and often used in a complementary role in conjunction with the AAT. Defines the Eastern Telescope Area
40 Inch Telescope	N002	High	First building at the site, and designed to include accommodation facilities as well as the telescope. Was the most advanced telescope in Australia at the time of its construction. The building no longer contains telescope (now located at the Milroy Observatory – see below)
Administration Building (PABX extension)	N003 N014	Moderate Low	Part of the infrastructure of site. Representative of the role of the Facilities and Services Division of the ANU in the functioning of the site. Site infrastructure
SkyMapper Telescope	N004	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia, and for its contribution to the site's scientific achievement.
16 Inch Telescope	N005	High	One of the first telescopes constructed at the site. Designed to support work of 40 Inch Telescope. Forms a group with the 40 Inch and 24 Inch telescope buildings that define the Western Telescope Area. (The telescope itself is dismantled but retained in the building)
24 Inch Telescope	N007	High	One of the first telescopes constructed at the site. Forms a group with the 40 Inch and 16 Inch telescope buildings that define the Western Telescope Area. The telescope remains in situ.
UPPSALA Telescope	N011	High	Used for a number of significant discoveries. Its movement from the Mount Stromlo Observatory is representative of the relationship between the two sites and the SSO inheriting the role of the country's primary optical observatory. Defines the Uppsala Area.
Advanced Technology Telescope (ATT)	N012	High	A major development for the ANU and that organisation's main facility for the past three decades and years to

			come. Ground-breaking design, introducing several technological innovations not before seen together. Design provides a strong contrast with the other telescopes in the Western Telescope Area.
Siding Spring Exploratory / Visitor Centre	N015	Moderate	The focus of public visitation to the site and developed through a conscious decision to increase public outreach. Defines the Visitor Arrival Area.
AAO Workshop	N017	Moderate	Provides vital support function to the work of the AAT, with which it is contemporary, and other facilities at the site. The imposing structure, and its contrast with the AAT, plays a major role in the character and built form of this part of the site. Its design is representative of a prevailing ANU architectural style within the site.
Bingar Cottage	N019	High	The earliest dedicated accommodation at the site; its move from Mt Bingar is demonstrative of continuity with other observatory sites. Helps to define the Residential Area.
Faulkes Telescope South	N021	Moderate	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global publically accessible networks. Representative of new phase in the development of the SSO as the first and largest remotely operated telescope at the site and the first to be publically accessible. Innovative design suited to this new role.
Residential Area #3	N821	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.
Residential Area #8	N822	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.

Residential Area #7	N823	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.
Residential Area #6	N824	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.
Residential Area #5	N825	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.
Residential Area #4	N826	Moderate	Together with the other residences, defines the residential area and represent the remote nature of the site, and the nature of its work, which require on-site accommodation for operatives. Exhibits a prevailing ANU architectural style with the site.
ROTSE Telescope	None	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia, and for its contribution to the site's scientific achievement.
Automated Patrol Telescope (APT)	None	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia, and for its contribution to the site's scientific achievement.
Anglo-Australian Telescope (AAT)	None	High	The definitive and iconic image and landscape feature of the site since its construction. Largest optical telescope in Australia and one of the largest in the world at the time it was built. Still a major Australian astronomical facility and will be for a decade more. Defines the central area of site.
iTelescope.Net Observatory	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes

			which make the site the largest observatory in Australia. Reflects the role of the site in global publically accessible networks.
HAT-South Telescopes	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global research networks.
Solaris Telescope	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global research networks.
YSTAR-KAO Telescopes		Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global research networks.
KMTNet Telescope (aka Microlensing Telescope?)	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global research networks.
Prompt Telescopes	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global research networks.
Stellan A & B Telescopes	(TBC)	Low	Contributes to the significance of the site as a whole as one of the telescopes which make the site the largest observatory in Australia. Reflects the role of the site in global publically accessible networks.
Other structures and remnants			
Observatory Lodge (remains)	N006	Low	Reflects the need to accommodate astronomers at the site. Defines the Lodges Area.
Fire Station (remains)	N010	Low	Represents the vulnerability of the site and the need for appropriate infrastructure.
Pump House	N020	Low	Represents the necessary development of site infrastructure in difficult circumstances
Bowser Shed	N020	None	-
Water tanks (3)	N024	Low	Represents the necessary development of site infrastructure in difficult circumstances

Directors cottage (remains)	(TBC)	Low	Representative of the need to accommodate site managers. Represents the vulnerability of the site.
Golf ball water tower	(TBC)	Moderate	Represents the necessary development of site infrastructure in difficult circumstances. Iconic design.
Tennis Court	(TBC)	Low	Reflects the need for recreation facilities for residents.
Moveable objects			
8 inch Tinsley Telescope (in Administration Building) (Also other of pair currently soon to be at ANU Kioloa campus)	None	High	Representative of the site prospection process that led to the selection of the SSO site. Also a history of use by visitors and the public. Forms an important group with the site testing trailer (see below)
Site testing trailer (in Workshop)	None	High	Representative of the site prospection process that led to the selection of the SSO site.
Historic documents (stored in Administration Building)	None	High	Important as documentation of the site's development, and for research purposes. (Especially if sole copies).
Milroy Telescope (40 Inch Telescope, at Milroy Observatory) and associated control panel	None	High	The first telescope installed at the site (see above) and the most advanced telescope in Australia at the time of its installation. Now fulfilling a public education role.
Original ANU furniture by prominent modernist designer Fred Ward in 40 Inch Telescope building.	None	High	Representative of a modernist style common to contemporary ANU facilities as a result of Ward's tenure as head of its design unit from 1952-61.
Interdata 70 (AAT) telescope control computer (now in the Powerhouse Museum, Sydney)	None	High	The first control computer for the AAT, and still used until recently performing a task that was problematic even for modern computers.
Exploratory exhibition materials	None	Low - Moderate	Important visitor information role. Includes much original material, including models.
Transport casing and cradle for AAT mirror and dummy testing mirror	None	Moderate-High	Reflect the care and effort taken to transport the requisite equipment across the world. Also demonstrates the process of calibrating and fitting out the AAT.
Cattle grid at entrance to the Observatory	None	Low	Reflects the historic pastoral nature of the area prior to the observatory and the adjacent national park.
Infrastructure and other landscape elements			
Electricity supply	N902	None	-

Communications – Radio	N906	None	-
Roads and Services	N908 N913	Low	Construction of Observatory Road was an achievement that facilitated development of the SSO site. Defined the pattern along which the site developed.
Main pipeline water supply	N912	Low	Represents the necessary development of site infrastructure in difficult circumstances.
Road culverts	(TBC)	Low	Represents the necessary development of site infrastructure in difficult circumstances.
Paving	(TBC)	Low	Reflects localised attempts at site landscaping in what is otherwise a fairly utilitarian environment.
Site information panel	(TBC)	Low	Demonstrates the intention to inform visitors about the site.
Site organisation			
Differentiation between site areas (see Section 3.3)	None	High	Define the development and character of the SSO site.
Natural aspects			
Views from site	-	High	Much of the aesthetic value of the site rests with its spectacular presence in the Warrumbungles Range.
Views to site	-	High	Much of the aesthetic and social value of the SSO lies in its role in the landscape and the role of the AAT in distant views in particular.
Flora and fauna	-	High	The site hosts many of the species which contribute to the National Heritage Values of the adjacent Warrumbungle National Park.
Geological sections along Observatory Road	-	High	The SSO site and its approaches provide some of the best opportunities to view the unique geological formations of the Warrumbungle shield volcano.

6 DEVELOPMENT OF POLICY - CONSTRAINTS AND OPPORTUNITIES

6.1 Introduction

This section provides an overview of the factors that must be considered in relation to the future management of the Siding Spring Observatory's heritage values in addition to the implications arising from its heritage significance. These include:

- The site's current management and use;
- The condition of the various components of the Precinct and the related management issues;
- Legislative requirements, and the implications of proposed future heritage listings;
- Relevant authorities that administer the site, and their future aspirations; and
- The views of stakeholders, including Traditional Owners, on the site's management.

6.2 Implications Arising from Significance

The following is a summary of the implications for management arising from the heritage assessment presented in Section 5. These implications do not automatically lead to management policy as there are a range of other factors noted in the remainder of this section that should be considered in its development, as listed above.

Conservation

- The Siding Spring Observatory (SSO) site is of heritage significance and should be managed as such, with detailed aspects addressed as below.
- All of the heritage values identified in this HMP should be acknowledged and conserved.
- Within the SSO site, the significant elements ('high' and 'moderate' in Table 13) and contributory elements ('low' in Table 13) should be retained and interpreted.
- The differentiation of identified site areas should be maintained, as being characteristic of the site's historic development and use, i.e.:
  - Visitor Arrival Area - primarily visitor facilities
  - AAT/Administration Area - site support facilities dominated by the AAT
  - Eastern Telescopes Area - exclusively telescopes
  - Residential Area - primarily residential buildings
  - Lodges Area - primarily accommodation
  - Uppsala Area - smaller telescopes and infrastructure
  - Western Telescope Area - exclusively telescopes.
- Decisions regarding both the introduction of new elements and the retention of old elements should be made with the aim of maintaining the character of these site areas.
- Observatory Road should remain the main arterial route through the site.
- The physical fabric of elements of high and moderate significance should be retained in its current form.

- For telescope buildings of high significance, the telescopes themselves should be retained *in situ* if possible, allowing for upgrades that may be required to prolong their working lives.
- Where possible, elements of low significance should be retained in a recognisable form at their current site. Otherwise interpretation should be used to recall their presence, location and nature.
- Significant moveable heritage (as described in Section 3.7) should be retained, catalogued and conserved at the SSO site, and interpreted as part of its story.
- Archival materials should be retained, catalogued and conserved within ANU collections for research purposes, and interpreted at the SSO site or elsewhere as appropriate.
- Maintenance of the dark night sky is important for reasons of social, aesthetic and Indigenous heritage as well as for astronomical observation at the site.
- The site's natural values should be conserved and interpreted as part of the wider Warrumbungle landscape.
- Views to and from the site should be preserved.

Use

- The site should continue to be used as an optical observatory (this could be in its current scientific research capacity or in more of an educational or recreational capacity).
- The continuing use of the site, ideally as an observatory, is important to the local community
- The site should be permitted to evolve, but with the safeguarding of heritage values as a primary aim.
- Measures should be taken to ensure that organisations operating remotely operated facilities are aware of the heritage management requirements associated with occupation of the site.
- Public access to the site should continue, and should be increased as appropriate.
- Visitation to the site, but the local and wider community, by tourists and particularly by educational groups, should be actively encouraged.

Interpretation

- The history and significance of the Siding Spring Observatory should be recognised and interpreted.
- All of the heritage values of the site should be reflected in interpretation.
- Interpretation should complement, rather than replace, direct experience of the site and its observatory facilities.
- Interpretation should be in place in relation to all of the significant elements of the site.
- The contribution of the various organisations that occupy the site should be interpreted, as should that of prominent astronomers.
- All of the above would best be achieved by interpretation focussing on the Visitor Arrival Area and Western Telescope Area.
- Items of moveable heritage should be interpreted at the site where possible. Interpretation should also take account of items that are related to the site but no longer accommodated within it – for example the 40 Inch Telescope now located at the nearby private Milroy Observatory.

Connection to the community

- The site is of high social and aesthetic value to the local and wider community, including the Indigenous community, and they should be provided with opportunities to appreciate these values.
- The site and its elements are an excellent interpretation and educational resource, for which there is a clear demand and, in the case of the latter in particular, an identified need by the astronomy establishment.

6.3 Heritage Listing

The heritage significance of the SSO site should be reflected by its inclusion on appropriate heritage lists.

6.3.1 Commonwealth Heritage List

As described in Section 5, the Siding Spring Observatory meets all of the criteria for inclusion on the CHL and it is recommended that it be nominated for inclusion on this register.

The Commonwealth Heritage List (CHL) is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government and protected under the EPBC Act see below). These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. However, the CHL is an inclusive list and, unlike the above lists, inclusion on the CHL does not reflect a particular level of significance.

The legislative requirements of listing on the CHL are described in Section 6.4 below.

Nomination process for the CHL

Under the EPBC Act the Minister determines which places the Australian Heritage Council will assess for the National and Commonwealth Heritage Lists through the annual collation of nominated places in the 'finalised priority assessment lists' (FPAL). The Siding Spring Observatory is not on the current FPAL, or the preliminary 'proposed priority assessment list' (PPAL).

Anyone can nominate a place with significant heritage values to the Commonwealth Heritage List, including the Australian Government Environment, Minister and the Australian Heritage Council. Nominations must set out the qualities or values of the place that make it significant to the nation by indicating how the place meets one or more of the Commonwealth Heritage criteria. 'Ad hoc' nominations often require additional research in order to assess them within a context of their type and their role in the story of Australia.

In preparing its proposed priority assessment list for the coming financial year, the Heritage Council must consider:

- the new nominations from the most recent invitation period given to the Council by the Minister; and
- the nominations given to the Council for assessment for the previous year's PPAL.

The PPALs are provided to the Minister within the statutory timeframe set out in the EPBC Act. The Minister has 20 business days to consider the PPALs and has the power to change the lists proposed by the Council. After the 20 day period, the PPALs become FPALs with or without ministerial changes.

The Council must publish the FPALs and seek public comment on the places in the FPALs as part of its statutory assessment processes.

6.3.2 NSW Heritage Designations

The SSO site is Commonwealth land, and therefore not subject to NSW State legislation. However, it may still be the case that the site is added to a NSW heritage register, and a

consideration of NSW statutory heritage mechanisms is instructive in illustrating the various levels of heritage significance with which the SSO site could be attributed.

In NSW legal protection for heritage places generally comes from the *Heritage Act, 1977* (amended 1998) and more broadly under the *Environmental Planning and Assessment Act 1979* which governs land-use planning and development in the State (see below).

NSW Heritage Inventory – local significance

The NSW State Heritage Inventory lists over 25,000 heritage items which feature on statutory lists in the State but do not meet the threshold for State significance and so do not feature on the Heritage Register (see below) - most of these places are essentially of no more than local significance.

Information on these places is collated from the Local Environmental Plan (LEP) for each of the State's municipalities and the Section 170 heritage and conservation registers of State government agencies. The level of supporting information for each can range from basic identification such as name, address and listing to detailed descriptions, histories and statements of significance.

State Heritage Register – state significance

The NSW State Heritage Register is a list of over 1,650 places and objects, in both private and public ownership, which have been assessed as significant at a State level on the basis of criteria developed by the NSW Heritage Council.

The State Heritage Register lists a diverse range of places, buildings and objects including: Aboriginal places, buildings, objects, monuments, natural landscapes, archaeological sites, industrial structures, houses, conservation precincts and portable items.

Listing on the State Heritage Register means that the heritage item:

- is of particular importance to the people of NSW and enriches our understanding of our history and identity;
- is legally protected as a heritage item under the NSW Heritage Act 1977;
- requires approval from the Heritage Council of NSW for major changes; and
- is eligible for financial incentives from the NSW and Commonwealth governments.

Some places and items which do not meet the threshold for listing on the State Heritage Register may still be deemed of local heritage significance within a local government area (see above).

The report for the *Community-Based Heritage Study of the former Coonabarabran Shire* (Christison 2006), prepared on behalf of Warrumbungle Shire Council, recommends that the SSO be nominated for inclusion on the State Heritage Register as a place of State significance. The Heritage Study treats the Anglo-Australian Observatory (AAO) as a separate entity and recommends that it too be nominated for inclusion on the SHR. In addition a briefing on the heritage status of the SSO prepared by the ANU Heritage Office in 2009 records a request (by letter in May of that year) for the SSO to be added to the State Heritage Register as part of celebrations for the Year of Astronomy.

6.3.3 Possible Other Listings

It is likely that the SSO site qualifies for higher levels of listing, which could include the National Heritage List (NHL) and perhaps even World Heritage Listing.

In the event that the place was to be assessed for the NHL, the nomination process would be similar to that described above for the CHL (6.3.1).

6.3.4 Commonwealth Heritage Management Principles

The Commonwealth Department of the Environment sets out a series of heritage management principles to provide a guiding framework to set the standard and the scope for the way places should be managed in order to best protect heritage values.

The following principles should be used when preparing and implementing management plans and programs:

1. The objective in managing Commonwealth Heritage places is to identify, protect, conserve, present and transmit, to all generations, their Commonwealth Heritage values.
2. The management of Commonwealth Heritage places should use the best available knowledge, skills and standards for those places, and include ongoing technical and community input to decisions and actions that may have a significant impact on Commonwealth Heritage values.
3. The management of Commonwealth Heritage places should respect all heritage values of the place and seek to integrate, where appropriate, any Commonwealth, state and territory and local government responsibilities for those places.
4. The management of Commonwealth heritage places should ensure that their use and presentation is consistent with the conservation of their Commonwealth Heritage values.
5. The management of Commonwealth Heritage places should make timely and appropriate provision for community involvement, especially by people who:
   a) have a particular interest in, or associations with, the place, and
   b) may be affected by the management of the place.
6. Indigenous people are the primary source of information on the value of their heritage and the active participation of Indigenous people in identification, assessment and management is integral to the effective protection of Indigenous heritage values.
7. The management of Commonwealth Heritage places should provide for regular monitoring, review and reporting on the conservation of Commonwealth Heritage values.

The Department of Environment Heritage Division can provide advice and assistance on the way the Commonwealth Heritage management principles can be satisfied and when they apply.

The extent to which this HMP complies with these Principles is set out in Appendix 6.

6.4 Legislative Requirements

The management of the Siding Spring Observatory operates within a legislative and quasi-legislative framework which includes the:

- Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999;
- NSW *Environmental Planning and Assessment Act* 1979; and the
- Building Code of Australia.

These Acts and the Code and the relationship between these pieces of legislation are described below.

The ANU seeks advice from the Commonwealth Department of Environment to ensure that any planned activities do not affect heritage values. In addition, the University also consults other Commonwealth, State and Territory heritage bodies to ensure that any planned actions align with Commonwealth Heritage Management Principles and legislation.

In line with its statutory requirements under the EPBC Act (see below), the ANU has prepared a Heritage Strategy which directs the management of the heritage resources which it controls. This is described in Section 6.6.1.

6.4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) enhances the management and protection of Australia's heritage places, and provides for the listing of natural, historic or Indigenous places that are of outstanding national heritage value to the Australian nation.

In 2003 the EPBC act was amended by the *Environment and Heritage Legislation Amendment Act* to establish a Commonwealth heritage regime that will focus on matters of national significance and Commonwealth responsibility, including the: establishment of a National Heritage List and a Commonwealth Heritage List.

The EPBC Act establishes the National Heritage List (NHL) to include places that are of outstanding national heritage value, and the Act is the primary legislative vehicle for the management of Australia's World Heritage Areas (WHAs). The EPBC Act also establishes the Commonwealth Heritage List (CHL – see above) which is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government. These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. However, the CHL is an inclusive list and, unlike WHAs and NHL places, inclusion on the CHL does not reflect a particular level of significance, although it is generally accepted that a place must be significant to at least a local level to warrant inclusion.

The Act has certain relevant provisions relating to heritage places generally, and especially relating to places on the National Heritage List and the Commonwealth Heritage List. It requires approval from the Minister responsible for the environment for all actions likely to have a significant impact on matters protected under Part 3 of the Act. These include and actions on Commonwealth land (section 26) and actions by Commonwealth agencies (section 28). The onus is on the manager to refer actions which are likely to impact on these values to the Minister, for assessment by the DoE, or alternatively the Minister could decide to 'call in' any application which he feels may present such an impact. Actions will only be approved following environmental assessment or in the event that some other provision in the EPBC Act allows the action to be taken.

Environmental assessments required by the Act can be based on a variety of sources including preliminary documentation, public environment reports, environmental impact assessments or public inquiries, depending on the scale of the project. Approvals can take the form of bilateral agreements and declarations, Ministerial declarations or permits.

The Act also protects the wider environment when Commonwealth agencies are proposing to undertake an action that may affect it.

The Act provides that:

- Actions taken on Commonwealth land which are likely to have a significant impact on the environment will require the approval of the Minister responsible for the environment;
- Actions taken outside Commonwealth land which are likely to have a significant impact on the environment on Commonwealth land, will require the approval of the Minister; and
- Actions taken by the Commonwealth or its agencies which are likely to have a significant impact on the environment anywhere will require approval by the Minister.

Significant impact is defined as follows:

A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on the environment (DEH 2006, p. 5).

The definition of 'environment' in the EPBC Act includes the heritage values of places, and this is understood to include those identified in the Commonwealth Heritage List and possibly in other authoritative heritage lists. The definition of 'action' is also important. Actions include:

- a project;
- a development;
- an undertaking;
- an activity or series of activities; and
- an alteration of any of the above.

However, a decision by a government body to grant a governmental authorisation, however described, for another person to take an action is not an action for the purposes of the Act. It is generally considered that a government authorisation entails, but is not limited to, the issuing of a license or permit under a legislative instrument (Sections 523-4 of the EPBC Act).

If a proposed action on Commonwealth land or by a Commonwealth agency is likely to have a significant impact on the environment, it is necessary to make a referral under sections 68 or 71 of the EPBC Act. The Minister is then required to decide whether or not the action needs approval under the Act, and to notify the person proposing to take the action of his or her decision.

In deciding the question of significant impact, section 75(2) of the EPBC Act states that the Minister can only take into account the adverse impacts of an action, and must not consider the beneficial impacts. Accordingly, the benefits of a proposed action are not relevant in considering the question of significant impact and whether or not a referral should be made.

It is possible to obtain an exemption from seeking approval for an action if an accredited management plan is in place. This plan is not an accredited management plan.

Other specific heritage provisions under the Act include special provisions regarding Commonwealth Heritage, which are discussed below.

Requirements of Commonwealth Heritage Listing

As noted above, the CHL is established under the EPBC Act.

Commonwealth Heritage places are protected under provisions of the EPBC Act which are described above. In addition, all Commonwealth Government agencies that own heritage places are required to assist the Minister and the Australian Heritage Council to identify and assess the heritage values of these places. They are required to:

- develop heritage strategies;
- produce a register of places under their control;
- develop a management plan to manage these consistent with the Commonwealth Heritage Management Principles and Management Plan requirements prescribed in Regulations to the Act; and
- ask the Minister for advice about taking action, if the action has, will have or is likely to have significant impact on a Commonwealth Heritage place.

These Commonwealth Heritage obligations apply to the ANU in addition to the broader protective provisions for heritage places under the EPBC Act.

The ANU *Heritage Strategy 2010-2012* (2009) addresses a range of issues related to heritage places and asset management systems, and guidelines for the preparation of appropriate management plans have been used in the preparation of this plan. Appendix 6 records how this heritage management plan complies with the various EPBC Act requirements.

6.4.2 NSW Environmental Planning and Assessment Act 1979

The key planning law in NSW is the Environmental Planning and Assessment Act (EPA&A) 1979. This law is administered by the NSW Department of Planning and sets out how land in NSW is to be developed and managed; including the process for making environmental plans Heritage is broadly a consideration of the Act.

The objectives of this Act are:

a) to encourage:

i. the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment

ii. the promotion and co-ordination of the orderly and economic use and development of land

iii. the protection, provision and co-ordination of communication and utility services

iv. the provision of land for public purposes

v. the provision and co-ordination of community services and facilities

vi. the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats

vii. ecologically sustainable development and

viii. the provision and maintenance of affordable housing;

b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and

c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Proposed revision to the EPA&A Act

On 22 October 2013 the NSW Government introduced the Planning Bill 2013 and Planning Administration Bill 2013 into Parliament. These Bills followed the Government's Green and White Papers on a New Planning System for NSW to replace the current *Environmental Planning and Assessment Act 1979*.

It is understood that the Bills were rejected by the Upper House, but that future revisions are still intended.

6.4.3 Building Code of Australia

The Code is the definitive regulatory resource for building construction, providing a nationally accepted and uniform approach to technical requirements for the building industry. It specifies matters relating to building work in order to achieve a range of health and safety objectives, including fire safety.

All building work at the Siding Spring Observatory should comply with the Code. As far as possible, the ANU aims to achieve compliance with the Code, although this may not be entirely possible because of the nature of and constraints provided by the existing circumstances of some places. The ANU Heritage Manual (see below) states that 'any proposed modifications to locations with heritage values to comply with the Building Code of Australia and the Disability Discrimination Acts should be considered where necessary, though often a compromise must be sought to ensure that the heritage values are maintained'.

The specific nature and level of significance of the site elements affected should be considered in relation to any BCA compliance issue.

6.5 Management Organisations and Other Stakeholders

All other entities on the SSO site are subject to individual licence agreements with ANU. These include licences to use ANU buildings and 'ground licences' to construct buildings.

The SSO site is crown land vested in the ownership of the Australian National University (ANU). Management of the site as a whole is led by the ANU but involves partnership with the Australian Astronomical Observatory (AAO) as well as a number of other Australian and international scientific organisations.

These nature and activities of these organisations are described below in greater detail.

6.5.1 ANU Research School of Astronomy and Astrophysics

The Australian National University's Research School of Astronomy and Astrophysics (RSAA) is Australia's premier university centre for astronomical research. The school's mission is to advance the observational and theoretical frontiers of astronomy and its enabling technologies, provide national and international leadership and train outstanding scientists. The ANU has the largest group of astronomy researchers in Australia, as well as Australia's two largest optical observatories: Mount Stromlo Observatory in Canberra and the SSO. .

Since its creation, the site has been operated as an Observatory by the RSAA, but although the school continues to be responsible for scientific operations across the non-AAO parts of the site, its own operational research facilities now comprise only the 2.3m ATT and the SkyMapper Telescope.

But in addition to operating its own research telescopes, the RSAA now also hosts other institutions that hold leases from the ANU and operate their own telescopes at the SSO site (see below), taking advantage of its southern hemisphere location and viewing conditions.

6.5.2 ANU Facilities and Services Division

The ANU Facilities & Services (F&S) Division's role is to provide a physical environment that supports the University's teaching and research goals through comprehensive facilities management.

The day to day management of the SSO site is undertaken by a team of F&S Division staff, led by an Operations Manager, that with the assistance of contractors undertake site management, maintenance and visitor services in support of the scientific work of the Observatory that is overseen by the RSAA.

ANU Heritage, which is responsible for the day to day running of the ANU Heritage Program (see 6.6.1) is part of the F&S Division.

6.5.3 Australian Astronomical Observatory

The Australian Astronomical Observatory (AAO) is a division of the Commonwealth Department of Industry with the function to provide world-class observing facilities for Australian optical astronomers. To this end the AAO operates the Anglo-Australian Telescope (AAT), together with the adjacent Workshop, and the UK Schmidt Telescope (UKST), under a 'Licence and Site Services Agreement' with the ANU, on behalf of the astronomical community of Australia. The AAO is a world leader in astronomical research and in the development of innovative telescope instrumentation, and it also takes a leading role in the formulation of long-term plans for astronomy in Australia. It has defined set of functions, mandated by the *Australian Astronomical Observatory Act 2010*, creating it as Australia's national optical astronomy observatory and enabling research, facilities, instrumentation and outreach. The full list of functions of the AAO set out in the Act is as follows:

a) To operate, construct, develop and maintain national optical astronomy facilities;

b) to support optical astronomy facilities;

c) to consult and co-operate with other persons, organisations and governments on matters relating to optical astronomy;

d) to facilitate access to optical astronomy facilities;

e) to develop, manufacture and provide instrumentation for optical astronomy facilities;

f) to support the development, manufacture and provision of instrumentation for optical astronomy facilities;

g) to support, encourage, conduct and evaluate research about matters relating to optical astronomy;

h) to support, encourage, conduct and evaluate educational, promotional and community awareness programs that are relevant to optical astronomy;

i) to publish (whether on the internet or otherwise) reports, papers and information relating to optical astronomy;

j) to advise the Minister about matters relating to optical astronomy;

k) to implement Australia's international obligations in relation to optical astronomy; such other functions (if any) as are specified in the regulations;

l) anything incidental to or conducive to the performance of any of the above functions.

6.5.4 Research Organisations

The SSO site accommodates a number of facilities installed under licence/operating agreements with the ANU and operated remotely. Broadly speaking these include two groups:

- academic and research institutions with dedicated facilities; and
- organisations providing open-access viewing.

Academic and research organisations

The following academic institutions and research organisations are involved in projects which currently have operational facilities at the SSO site:

- Harvard/Smithsonian Center for Astrophysics, and the Max Planck Institute for Astronomy (in collaboration with the ANU) (HAT-South Telescopes)
- Nicolaus Copernicus Astronomical Center, Poland (Solaris Telescope)
- Korea Astronomy and Space Science Institute (KMTNet telescope)
- Yonsei University Observatory and Korea Astronomy Observatory (YSTAR-KAO Telescope) (recently decommissioned)
- The University of North Carolina (PROMPT Telescopes).

Organisations providing open-access viewing

- iTelescope

  The iTelescope.Net facility at the Siding Spring Observatory is the southern hemispheric station of a global network of small to medium sized robotic telescopes designed specifically for use by the public via the internet. It is its flagship observatory and was commissioned in January 2013. Operated from Australia and the USA as a service for amateur and semi-professional astronomers the world over, it provides Internet connected public telescopes which allow members to take astronomical images of the night sky for the purposes of education, scientific research and astro-photography.

- Las Cumbres Observatory Global Telescope Network (LCOGT.)

  Las Cumbres Observatory Global Telescope Network is a non-profit organisation building and operating a network of professional robotic telescopes, deployed worldwide, for science and education. Based in California, but with personnel in the UK, Australia and Hawaii, the network provides access to users which include professional astronomers, school children and interested members of the public.

6.5.5 Other Stakeholders

There are a range of other stakeholders with an interest in and concern for the SSO site. These include the following:

- **NSW National Parks and Wildlife Service** - The SSO site is immediately adjacent to, and largely surrounded by the Warrumbungle National Park, and the NPWS thus have a shared interest in its management, particularly with regards to the site's natural values.
- **Warrumbungle Shire Council** - The Shire Council work together with the SSO management organisations to preserve optimum conditions for the use of the site – for example in terms of infrastructure and the site's dark sky status. The council also directs tourism activities in the area, with the SSO site providing a major focus.
- **Scientific community** - Astronomers from across the country, and overseas, come to the SSO to undertake research.
- **Remote users** - Increasingly the SSO site is accommodating telescopes which are remotely operated. These are used by institutions of members of the wider public through not-for-profit or commercial organisations to engage in research, educational or recreational astronomy.
- **Visitors** - Including local people and tourists from further afield come to the site to see the scientific work and facilities and to experience the landscape. The site provides a sense of identity and belonging to the local community.
- **Traditional Owners** - Gamilaroi people who are part of the local resident, tourism or site user community, have connections to the site and the wider landscape.

6.6 Heritage Management Framework

A number of provisions support the conservation of heritage at the SSO site.

6.6.1 ANU Heritage Program

The Australian National University takes pride in its heritage and aims to identify the heritage values of its properties, conserve sites, buildings and significant landscapes and wherever possible to avoid or minimise significant impact on heritage values. As befitting its reputation as a world-class institution, the University seeks to be pro-active in its recognition of heritage values and the protection of these values.

Within the RSAA, the position of Operations Manager has the consideration of heritage at the SSO site within its remit. The holder of this position and the F&S Site Operations Manager are supported through ANU Heritage and thus kept aware of their respective responsibilities with regards to heritage listing etc.

The Heritage Program seeks to ensure that the conservation of heritage values is fully taken into consideration during the continued use of sites by the University community, is enacted by ANU Heritage and driven through a series of internal documents of direct relevance to this HMP.

ANU Heritage

ANU Heritage is responsible for the day to day running of the Heritage Program. This includes the preparation of Heritage Management Plans and other documents relating to

heritage management, recording of heritage assets, maintaining the ANU Heritage website and providing general advice for works or developments to sites with heritage values.

The Heritage Officer monitors the University's heritage assets and ensures that they are managed in accordance with legislation. Regular consultation with Federal, State or local government and community groups is also coordinated through ANU Heritage and is a vital part of heritage management at the University.

Heritage Strategy

The ANU prepared the *Australian National University Heritage Strategy 2010-2012* in 2009 to meet its obligations under the EPBC Act. The Act emphasises the importance of a written heritage strategy for managing places owned by a Commonwealth agency in order to protect and conserve their listed heritage values.

The aim of the ANU Heritage Strategy is to demonstrate how the University will meet its obligations under sections 341S, 341Z, 341ZA and 341ZB of the EPBC Act. In particular, the ANU Heritage Strategy aims to demonstrate how and when the ANU will:

- Assess all the places which the ANU owns or controls to identify potential Commonwealth and/or other heritage values;
- Protect and conserve heritage values;
- Integrate ANU policies and actions with those policies and/or actions of other agencies with heritage responsibilities at the Commonwealth, State or Territory level of administration; and
- Present and transmit all heritage values to future generations.

Heritage Management Manual

The Heritage Manual is a document that outlines the internal procedures to be undertaken by the ANU in the running of its Heritage Program. It presents a standardised set of heritage management practices that are designed to reflect 'best practice'. The Manual is updated regularly to account for changes in legislation and any issues that arise. The ANU Heritage Manual includes the following:

- Site Protection Protocols for Indigenous and European sites;
- References to the relevant legislation;
- Classifications for heritage places on ANU property;
- General guides for the following:
  - Heritage Management Planning
  - Strategic Planning
  - Capital Works and Redevelopment
  - Maintenance of heritage assets
  - Disposal of heritage assets
  - University research & heritage at ANU
  - Cultural objects and heritage items
  - Indigenous heritage management; and
- Contact lists for relevant government departments, nongovernment organisations and Indigenous groups.

ANU Heritage Administration Plan

The Heritage Administration Plan establishes expected timeframes and performance indicators for each of the tasks outlined in the ANU Heritage Strategy. Major objectives of the Plan include the annul update of the ANU Heritage Register and website and completion of Heritage Studies, Heritage Management Plans and Natural Heritage Assessments. It is used as a device to measure the success of the Heritage Program and is reviewed every three years.

6.6.2 AAO Heritage Mechanisms

The AAO is not guided by internal policies relating to heritage conservation, and this does not explicitly feature within the organisation's functions as out in the *Australian Astronomical Observatory Act.*

However, the AAO Directorship is very supportive of ensuring significant objects and equipment of heritage value are preserved and, if appropriate, made available to other astronomy institutions and museums for posterity and public awareness purposes.

As a Commonwealth agency, the AAO is bound by the requirements of the EPBC Act in relation to heritage management.

6.7 Current Management Context and Requirements

The following sets out the current wider management context through which the heritage values of the SSO will need to be managed.

Information concerning these matters was provided by the three main responsible organisations through consultation with the following people:

- Sarah O'Callaghan, Site Operations Manager (Acting) Siding Spring Observatory Campus, ANU F&S;
- Professor Warrick Couch, Director, and Professor Fred Watson, Astronomer in Charge, of the AAO; and
- Dr Milica Symul, School Manager, ANU RSAA.

Staff members from each of these organisations have completed the online Siding Spring Observatory Heritage Survey.

6.7.1 Communication and Decision Making

The RSAA asserts the importance of maintaining a harmonious relationship with F & S and all commercial tenants at SSO, and that good communication is essential in achieving this objective. Meeting the expectations of visiting astronomers, commercial tenants and external groups, is a high priority.

ANU and AAO

The ANU and AAO have a contract that governs their relationship. In addition ANU and AAO staff sit together on an SSO Site Committee whilst the organisations' respective Directors have a close working relationship and are in regular contact with a mutual agenda of maximising cooperation to benefit both institutions.

On a day to day basis staff from ANU RSAA, F&S and the AAO operate in close proximity to each other and communication can be achieved at short notice through face-to-face discussion, email, telephone or site meetings. The AAO is also frequently in direct contact with senior F&S staff in Canberra.

ANU and tenant organisations

Quarterly meetings are held at the SSO which tenant organisations, or their appointed agents, can attend. Alternatively external organisations can communicate directly with the RSAA, in relation to observing matters, or the F&S Division, in relation to site related matters.

Decisions regarding the lease of sites to external organisations are made by the RSAA Director who then submits a recommendation to F&S Director. Sites for new telescopes are chosen through consultation between the RSAA and the interested parties, ensuring primarily that any new facilities will not interfere with the observing programs of existing telescopes. New sites are expensive as they require connection to power, water, internet and other services on-site.

ANU and other external organisations

The ANU has a number of policies relating to maintaining good relations with local Council, and National Parks & Wildlife. Specific policies relate to preserving the SSO site's dark sky status - AAO and ANU have built a good working relationship with the NSW government in course of developing new building code guidelines for minimising light pollution from residential and commercial developments.

The F&S Division interacts with the managers of the Warrumbungle National Park, the Warrumbungle Shire Council and other organisations on an as needs basis, by phone, email or in person. But there is no established forum through which this occurs.

AAO and external organisations

The AAO has a policy of being very proactive in its interactions with the wider community.

This is particularly the case in regards to addressing possible lighting, dark sky and dust pollution issues, and involves regular communication with key stakeholders such as the Warrumbungle and Dubbo Shire Councils, the business community in Coonabarabran, all the companies that have mining and gas exploration interests within the vicinity of SSO, and the relevant sections of the State and Federal Governments.

6.7.2 Maintenance Activities – Operational Elements

ANU managed elements

All of the ANU-managed structures at the site – both telescopes and other buildings, that are currently in use are maintained in an operational state by ANU F&S and RSAA staff, employing contractors as necessary.

As regards infrastructure, mains electricity is supplied to two points on site by a mains provider (ACTEW/Essential Energy), after which point ANU manage distribution within the site. Water is supplied to the site via an 11km ANU pipeline from the public supply at Timor Dam and the ANU employs contractors to manage the treatment and site infrastructure. The phone system on the site is likewise managed by ANU, with the assistance of contractors.

In addition, some of the non-ANU managed operational telescopes are maintained, together with the structures in which they are contained, by ANU RSAA staff under contract. These include the following:

- HAT-South Telescopes;
- Solaris Telescope;
- YSTAR-KAO Telescope (recently decommissioned); and
- Prompt Telescope.

Non-ANU managed elements

The remainder of the non-ANU managed operational telescopes are maintained, together with the structures in which they are contained, by the organisations which operate them, or by third party contractors under their direction. These include the following:

- KMTNet (Korean Micro-lensing Telescope Network);
- Faulkes South Telescope (Las Cumbres Observatory Global Telescope Network); and
- iTelescope (iTelescope).

Landscaping and site management

ANU F&S staff and contractors are also responsible for landscaping works across the site, following an established works program.

As regards the management of flora and fauna at the site, to date ANU's informal approach has been to allow wildlife to pass into and through the site unhindered, and to only deliberately plant native Indigenous flora.

It is understood that policies for the management of flora and fauna at the site are being developed as part of the Campus Master Plan.

6.7.3 Maintenance Activities - Non-Operational Elements

ANU F&S staff monitor vacant structures for external damage and undertake minor repairs to keep them weather proof. Aside from this, the structures are currently left as they were vacated. This includes the following:

- 40 Inch Telescope building;
- 24 Inch Telescope dome (the aluminising plant room is still operational, as is the adjacent portion which has recently been refurbished and is now occupied by the KMTNet construction office);
- 16 Inch Telescope dome (the rest of the building is still in use as offices and a workshop); and
- Uppsala Telescope dome and adjacent office building.

ANU F&S Division may consider renovating these structures to accommodate new or refurbished telescopes. First steps would include examination of pricing and options to replace the various domes which are damaged or no longer usable. However, works to bring these buildings to standard will be expensive and no funds are currently available from RSAA for this purpose.

The remainder of the non-ANU managed non-operational telescopes are maintained, together with the structures in which they are contained, by the organisations which previously operate them, or by third party contractors under their direction. These include the following:

- UNSW APT telescope; and
- ROTSE Telescope.

6.7.4 Capital Works

It is understood that the AAO has no current proposals for new elements. The ANU, on the other hand, currently proposes to construct the following new structures at the SSO site.

Telescopes

The ANU have no firm plans for new telescope structures at present, but the RSAA has received expressions of interest from potential commercial tenants and is working with several international organisations that are looking to set up telescopes at the site from 2015.

The RSAA's preference would be for new telescope operators to use existing redundant telescope buildings (i.e. those listed above) if this can be achieved. Or they may require new structures.

Other structures

The following new non-telescope structures are currently proposed to be constructed at the SSO site by the ANU:

- A new lodge for visiting astronomers to replace that destroyed by the 2013 bush fire, and the temporary donga-style facility that is being used in the interim.
- Replacement for the fire shed that was destroyed by the 2013 bushfire, on the same concrete pad.

ANU F&S have confirmed that, aside from the lodge and fire shed, any new structures at the site will be for telescopes.

Other works

There are no current plans for any other physical alterations to the site – e.g. landscaping, major building alterations

6.7.5 Visitor Services

ANU currently encourages tourists and school groups to visit the site and inspect its facilities, but only during daylight hours. The ANU operates under a number of policies relating to public outreach. The RSAA identifies meeting the expectations of visiting school groups and visitors as a high priority.

The AAO does not have input into the content of the Visitor Centre and the exhibition at the SSO, but it would like to.

The SSO site provides a range of activities for visitors to the observatory, including:

- The Visitor Centre, including:
  - the Exploratory, accessed through the Visitor Centre; and
  - a cafe and shop.
- A stand-alone information shelter near to the car park (see Figure 58); and
- A smaller exhibition and telescope viewing gallery in the Anglo-Australian Telescope (run by the AAO), which is reached via a walkway from the Visitor Centre and a lookout which overlooks Warrumbungle National Park.

The Exploratory exhibition comprises information panels about the telescopes at the site, and astronomy in general, largely dating to the original construction, and this is also the case for the AAT exhibition, albeit more specific to that facility. The Exploratory also contains models, some hands-on activities and a theatre area in which a film about the site is shown on a loop.

The ANU site staff includes a dedicated Tour Officer who provides walking tours of the site by arrangement or regularly during school holidays when talks by local astronomers are also on offer. The tours cover 2km over an hour and a half and include normally restricted areas of the

site. They introduce the various telescopes and the activities of the organisations at the site and explain the importance of the area to astronomical research. They also cover the natural environment of the site and provide access to spectacular views of the Warrumbungles from locations which would otherwise be off-limits, particularly the trigonometric point at the west end of the site. One current issue is that these tours are not as well advertised as they could be (see 6.10.8).

Visitors to the ANU's Siding Spring Observatory web page are invited to email for information about school education programs, or to 'Ask an Astronomer' a question about astronomy or telescopes. However, visitor's attention is drawn to the fact that the SSO is a working research facility and as such it has no public star-gazing facilities and is not open at night for public viewing. The Observatory is closed to the general public after 4pm.

Information concerning the types of visitors who attend the SSO, and the site's role in local tourism, is contained in the interviews with Amanda Wherrett, ANU SSO Tour and Administration Officer and Aileen Bell, Manager Economic Development and Tourism at Warrumbungle Shire Council, which are included in Appendix 3.

Annual events

Supported by Warrumbungle Shire Council, the annual Warrumbungle Festival of the Stars commenced in 1994 in Coonabarabran, 'the Astronomy Capital of Australia'. The festival celebrates the community's attachment to astronomy and focuses on aspects of its melding with arts and culture, with events to encourage visitors to the area. The Festival includes events such as the Warrumbungle Arts Expo in conjunction with the annual Warrumbungle Arts and Crafts Inc (WAACI) exhibition, Science in the Pub, the Bok Lecture and the Coonabarabran Cup.

Each year during the Festival of the Stars, 'StarFest' is a series of events over the October long weekend that includes Open Days at the SSO where visitors can meet the astronomers and discover more about the observatory and the science that is done at the site.

6.8 Future Use of the Site

This section sets out the context for the future use, and thus management, of the SSO site.

6.8.1 Astronomy Context for Future Use of the Siding Spring Observatory

The developmental planning of the RSAA and AAO is shaped by the requirements of the organisations, but also the national and international contexts in which they operate, and their institutional situations.

A strength of Australian optical astronomy at a national level is the positive collaborative relationship between the ANU and AAO as the major providers of key capabilities such as telescopes and instrumentation (this is also the case with the CSIRO in relation to radio astronomy). In particular, there are strong synergies in the area of wide-field astronomy, with ANU's SkyMapper imaging the sky and the AAO's AAT and UKST providing complementary wide-field spectroscopy capabilities to enable the fullest scientific return on the investment in these major facilities.

The AAO's *Forward Look to 2015* document (2012) identifies the international context as more challenging, largely because in the present era the world's most powerful telescopes are mostly international facilities. This is due partly to their cost, and partly to the desire to optimise their extensive investment by locating them at the few locations worldwide that offer the best observing conditions – i.e. Hawaii, Chile, and in future perhaps Antarctica.

In this regard *Forward Look 2015* identifies that the AAO, and thus the SSO, has one major weakness in that it operates a 4metre telescope on a moderate site in competition with 8metre class telescopes on superb sites. This is even more the case for the RSAA who currently count the 2.3m ATT at the SSO as their largest facility.

The National Committee for Astronomy of the Australian Academy of Science prepared the document *New Horizons; a Decadal Plan for Australian Astronomy 2006–2015* in 2005, and in 2010 this was the subject of a Mid-Term Review which set out the current goals of the Australian astronomical community (the next Decadal Plan is due in 2016). The plan and review determined that Australian astronomers require an appropriate mix of facilities and that Australia should increase its access to large optical facilities, including an 8metre telescope and an 'extremely large telescope' (ELT). Australia became a partner in the consortium which operates the Gemini Observatory - two 8.19metre telescopes, one in Hawaii and the other in Chile, which began scientific operations in 2000. In addition, the ANU is a partner in the Giant Magellan Telescope (GMT) consortium that is expecting to complete a 25metre telescope at the Las Campanas Observatory in Chile by 2020. The GMT will meet Australia's goal of achieving 10% access to an ELT.

The effective lifetimes of the SSO telescopes depend on their scientific competitiveness with respect to such facilities, and this in turn depends on telescope capabilities, instrumentation suites, levels of access, scientific agendas, and the operational funding available to support Australia's portfolio of optical telescopes.

6.8.2 RSAA Plans for the SSO Site

Taking the above into account, the RSAA's long-term plans for the site as a whole are to maintain observing programs with the 2.3m ATT and SkyMapper telescopes for the next decade or so, until such time as the GMT in Chile becomes operational. After this time the use of the RSAA telescopes at the SSO will decrease.

In the longer term the RSAA intend for the SSO to become a teaching and public outreach facility.

6.8.3 AAO Plans for the SSO Site

The AAO's broad goals and strategies for the period to 2015, and beyond to the end of the decade, are set out in the *Forward Look*. It provides a framework for implementing the recommendations and priorities of the Mid-Term Review of the Australian Astronomy Decadal Plan for 2006-2015, along with specific actions for improving the performance, facilities and services of the AAO.

The *Forward Look* considers that the AAO will operate the AAT for about another decade, until the GMT comes online. With new instruments such as HERMES and upgrades to existing instruments the AAT remains scientifically competitive on the international stage because of its unique wide-field spectroscopic capabilities and instrumentation. Only when Giant Magellan Telescope comes online will the AAT be displaced as the dominant contributor to Australian optical/infrared astronomy, and even then the AAT will continue to be a valuable for smaller programs, brighter targets, wide-field surveys, student training and instrument development.

The AAO's plans for the UK Schmidt Telescope are to completely refurbish the telescope's drive/control systems and dome, and to install a completely new spectrograph and multi-object fibre positioner that will use the AAO's advanced "star bugs" technology. Once this work is completed, the UKST will be used for two major spectroscopic surveys called TAIPAN and FUNNELWEB which will run for approximately 5 years (2016-2020). The upgrade to the telescope will allow these surveys to be conducted largely semi-automatically and remotely and so the UKST may be able to continue operating in remote user-pays mode after this time.

There are opportunities: to use the AAO's telescopes at the SSO as test-beds for new in-house technologies for further development and exploitation on the next generation 8-10m and ELT-class telescopes.

In summary, the current outlook for AAO presence at the SSO is that the organisation expects to continue to operate the AAT for another decade and the UK Schmidt Telescope for at least another 5 years. Hence the AAO will maintain its presence at the SSO until at least 2025. This

assessment will though be reviewed by the Australian Astronomy community in the Decadal Plan for 2016-2025.

The Future Look predicts that over the next five to ten years the ANU is likely to be scaling back its level of support for operations at the SSO and identifies the need for an appropriate evolution of the operations model. It raises the possibility that the AAO might assume responsibility for the SSO operations and the Visitor Centre, in which case the ANU would continue to own the site, but become one of several organisations with facilities at the SSO supported by the AAO. The document acknowledges that there would be potentially significant infrastructure costs and legal issues that would need to be fully resolved before the AAO could contemplate this approach to future site management.

6.8.4 Visitation

The RSAA is open to the idea of increasing the extent of visitation, but recognising that the SSO site will remain a working observatory for the foreseeable future, night time visitors will need to remain limited as the spill of light from headlights affects night time sky viewing. Appropriate security protocols would also need to be established, including boom gates and fencing to limit access to restricted areas of the site, and changes to the site staff structure would be necessary to provide for visitors.

The RSAA and F&S have plans to redevelop the Visitor Centre and Exploratory and intend to work closely with the AAO to upgrade the exhibits.

It is anticipated that in the longer term the SSO will become a major attraction for people interested in the astronomy experience at Australia's largest telescope facility, exploiting the SSO's iconic location and "dark sky" status to expand its outreach and education activities. Hosted tours will enable people to stay in the new SSO Lodge, attend astronomy lectures and conferences and visit the telescopes.

6.9 Condition and Integrity

The continued use of the site as an observatory means that most of its elements are in operating condition, but some buildings, and parts of buildings, have been decommissioned, and their maintenance is not a priority.

Some information about condition and integrity is provided as part of the description in Section 3 and in Volume 2 of the HMP. This section reproduces Table 13 to provide a summary of the condition and integrity of the SSO site elements.

Table 14 – Integrity and condition of the SSO site elements (as surveyed in May 2014)

Element	ANU Ref.	Relative significance	Integrity	Condition
Buildings/telescopes				
UK Schmidt Telescope (UKST)	N001	High	High Original telescope structure and later office and laboratory additions	Good – near operational, although parts appear redundant To be refurbished for use 2015.
40 Inch Telescope	N002	High	High - as built	Fair. Structure is currently redundant
Administration Building	N003	Moderate	Moderate Later extensions to each end.	Good – operational
(PABX extension)	N014	Low	High	Good – operational

Element	ANU Ref.	Relative significance	Integrity	Condition
			(See above)	
SkyMapper Telescope	N004	Low	High - as built (not examined internally)	Good – operational
16 Inch Telescope	N005	High	High Original telescope structure and later office additions	Fair Telescope dome is currently redundant
24 Inch Telescope	N007	High	High - as built Part recently refurbished (and reconfigured?) as an office area	Fair Aluminising plant room and new office section operational Telescope dome is currently redundant
UPPSALA Telescope	N011	High	High (plus later office structure)	Poor and deteriorating Structure is currently redundant
Advanced Technology Telescope (ATT)	N012	High	High - as built	Good – operational
Siding Spring Exploratory / Visitor Centre	N015	Moderate	High - as built	Fair – operational
AAO Workshop	N017	Moderate	High - as built	Good – operational
Bingar Cottage	N019	High	High - as built (not examined internally)	Good – occupied
Faulkes Telescope South	N021	Moderate	High - as built	Good – operational
Residential Area #3	N821	Moderate	High - as built (not examined internally)	Good – unoccupied
Residential Area #8	N822	Moderate	High - as built (not examined internally)	Good – occupied
Residential Area #7	N823	Moderate	High - as built (not examined internally)	Good – occupied
Residential Area #6	N824	Moderate	High - as built (not examined internally)	Good – occupied
Residential Area #5	N825	Moderate	High - as built (not examined internally)	Good – occupied
Residential Area #4	N826	Moderate	High - as built (not examined	Good – occupied

Element	ANU Ref.	Relative significance	Integrity	Condition
			internally)	
ROTSE Telescope	None	Low	High - as built (not examined internally)	Good (externally) Decommissioned
Automated Patrol Telescope (APT)	None	Low	High - as built (not examined internally)	Good (externally) But decommissioned
Anglo-Australian Telescope (AAT)	None	High	High - as built	Good – operational
iTelescope.Net Observatory	(TBC)	Low	High - as built	Good – operational
HAT-South Telescopes	(TBC)	Low	High - as built (not examined internally)	Good (externally) – operational
Solaris Telescope	(TBC)	Low	High - as built (not examined internally)	Good (externally) – operational
YSTAR-KAO Telescopes	(TBC)	Low	High - as built (not examined internally)	Fair (externally) – operational
KMTNet Telescope (aka Microlensing Telescope?)	(TBC)	Low	High – under construction (not examined internally)	Good – under construction
Prompt Telescopes	(TBC)	Low	High - as built (not examined internally)	Good (externally) – operational
Stellan A & B Telescopes	(TBC)	Low	High - as built	Good – operational
Other structures and remnants				
Observatory Lodge (remains)	N006	Low	Low Some footings remain?	Foundations condition unclear as currently obscured by temporary lodge
Fire Station (remains)	N010	Low	Low Only foundations remain	Foundations in fair condition
Pump House	N020	Low	Moderate Some alterations	Good – operational
Bowser Shed	N020	None	High - as built	Fair – operational
Water tanks (3)	N024	Low	Moderate Some alterations	Good – operational
Director's cottage (remains)	(TBC)	Low	Low Only foundations	Foundations in poor condition

Element	ANU Ref.	Relative significance	Integrity	Condition
			remain	
Golf ball water tower	(TBC)	Moderate	Moderate	Fair – operational
Tennis Court	(TBC)	Low	High	Poor – unused
Cattle grid	(TBC)	Low	High	Fair – operational
Moveable objects				
8 inch Tinsley Telescope (in Administration Building) (Also other of pair currently soon to be at ANU Kioloa campus)	None	High	High	Good
Site testing trailer (in Workshop)	None	High	High	Fair – needs repair
Historic documents (stored in Administration Building and PBX Extension)	None	High	High (although mostly copies?)	Fair – stored in plan filing cabinets in Administration Building
Milroy Telescope (40 Inch Telescope, at Milroy Observatory) and associated control panel	None	High	High – telescope But relocated	Good – restored and operational
Original ANU furniture by prominent modernist designer Fred Ward in 40 Inch Telescope building	None	High	High	Good Currently redundant
Interdata 70 (AAT) telescope control computer (now in the Powerhouse Museum, Sydney)	None	High	High – computer But relocated	Good – museum exhibited
Exploratory exhibition materials	None	Low - Moderate	High – as installed (out of date)	Fair
AAT exhibition materials	None	Low - Moderate	High – as installed (out of date)	Fair
Transport casing and cradle for AAT mirror and dummy testing mirror	None	Moderate-High	High – as constructed	Good
Infrastructure and other landscape elements				
Electricity supply	N902	None	Moderate Some alterations	Good – operational

Element	ANU Ref.	Relative significance	Integrity	Condition
Communications – Radio	N906	None	Moderate Some alterations	Good – operational
Roads and Services	N908 N913	Low	High – as constructed	Good – operational
Main pipeline water supply	N912	Low	Moderate Some alterations	Good – operational
Road culverts	(TBC)	Low	High – as constructed	Good – operational
Paving	(TBC)	Low	High – as constructed	Good – operational
Site information shelter	(TBC)	Low	High – as constructed	Moderate Largely unused
Site organisation				
Differentiation between site areas (see Section 3.3)	None	High	High – as constructed Areas are well defined	Good – all areas are operational
Natural aspects				
Views from site	-	High	High – no obstructions	Good – uninterrupted
Views to site	-	High	High – no obstructions	Good – uninterrupted
Flora and fauna	-	High	Moderate - recent disruption from 2013 bushfire	Fair – recent disruption from 2013 bushfire
Geological sections along Observatory Road	-	High	High	Good – overgrown in parts

6.10 Current and Future Management Issues

There are a range of current and future management issues in the Siding Spring Observatory that the ANU and AAO recognise need to be addressed.

To inform development of the Campus Master Plan (CMP) for the site, an initial assessment of the heritage management constraints and opportunities at the SSO site was presented in a preliminary *Issues and Opportunities* report.

The following repeats the main issues identified by the *Issues and Opportunities* report, amended and supplemented through the completion of this full HMP.

These issues can be categorised under the following headings:

- Site management;
- Site (and future) use;
- New works;
- Conservation of heritage fabric;

- Setting and natural values;
- Connection to the community;
- Interpretation; and
- Visitation.

For ease of reference, the policy in Section 7 is arranged according to these headings.

6.10.1 Site Management Issues

These are issues that may affect the management of heritage values at the site.

- ANU has a responsibility to maintain its heritage places and their values.
- A lack of considered planning is more likely to imperil the site's heritage values.
- There are a range of different uses of the SSO site that reflect different aspects of heritage values. While the interaction between these uses and users does not appear to be in conflict this has set up an interesting 'dynamic' that will need to be addressed in heritage policy. These uses include:
  - ANU site presence and research;
  - AAO site presence and research;
  - Other tenant scientific organisations at the site;
  - Other public/private users via remote or robotic control use; and
  - Tourist visitation and services.
- The heritage values of the whole SSO site could be threatened by uncoordinated actions arising from differences in tenure, protocol and management regime or diverging aspirations.
- Bushfire is a major threat to the fabric of the site, and thus to most of its heritage values, and this must be managed effectively in the surrounding area.
- The isolation of the site is an important aspect in maintaining optimum dark sky and atmospheric conditions, but this has also been identified as a factor in the community's appreciation of the site, and this should be maintained.
- Whilst working relationships between the major management organisations are good, there is a consciousness that some of this good work is undone by the slow pace at which decisions are made and projects progressed. Construction of a new Lodge at the site is a current example.
- The management of the site's heritage places will likely need to occur in a context of significant budgetary and operational pressures and constraints.
- Heritage listing will result in the need for some additional approvals to accompany development in the site. Without clear explanation, the perception amongst site managers and users may therefore be that listing is a negative step and impedes progress at the site.
- Both the RSAA and AAO admit to currently not being fully aware of their responsibilities in the event that the SSO site is added to the Commonwealth Heritage List, as is recommended by this HMP.
- Most of the telescopes on the site are likely to become remotely operated and globally networked, increasing the proportion of the user/management base that is removed from the site. It is unlikely that the place will hold the same heritage values for these future users as it will no longer form part of their physical environment, and this may reduce the influence of these values on their decision making.

- It should be recognised that commercial operations, which are slated to become more prevalent at the site, are less likely to support heritage interests, except perhaps where these coincide with their economic interests.

6.10.2 Site Use Issues

These are issues relating to the continued use of the site, and the manner of this use, that may affect the management of its heritage values.

- The continued use of the SSO site for astronomical observation is an important element of its heritage significance.
- The site's most important function is currently research astronomy, and this should not be damaged by other functions (e.g. tourism or education). However, this may change in the future.
- The 2.3m ATT and SkyMapper are approaching the point at which they will no longer be competitive for scientific research, and the ANU's research interest is the site is thus decreasing. The AAO will continue to use the AAT and UK Schmidt Telescope for the next decade but then a similar situation will present itself for that organisation. Both of these progressions have implications for the manner in which the SSO and its heritage values will be managed in the future
- The removal of redundant equipment, and potentially structures, would likely have an adverse impact on heritage values.
- Related to its scientific importance, the site's dark sky status is of technological and historical heritage significance, and it is also significant aesthetically and socially as an important part of the place's character and in relation to Aboriginal cultural understandings and associated intangible traditions. However, given that the main driver of the site's development is academic research, management decisions could be made in relation to the technological and economic value of the dark sky status but ignoring these other values.
- Some of the telescopes at the site which have been identified as at, or close to, the end of their working life present an opportunity for adaptive reuse either for research or other facilities (see below), but their design and position may constrain this.
- There are significant mining developments planned or proposed for the region around the SSO, including coal seam gas exploration and drilling and open cast coal mining. These developments have the potential to significantly degrade the quality of the site conditions through increased light pollution from all-night mining operations and increased levels of dust in the atmosphere, which could increase the brightness of the night sky and reduce the atmospheric transparency.

6.10.3 New Works Issues

These are issues relating to the construction of new elements at the site, or additions to existing elements.

- The site is an evolving one, and its continued accommodation of different structures and technologies is an important part of its heritage – it should not be 'frozen in time'.
- There is limited capacity for continued development of the SSO site as the astronomical community is moving towards using large telescopes in Chile and the SSO has neither the space nor the viewing conditions to compete.
- Sites for new telescopes are at a premium and so the RSAA prefers that new telescope operators use existing facilities (see below).
- The campus is characterised by innovative and distinctive architecture expressive of the activities located at the site, and therefore of some of its heritage values. The generic and

anonymous architecture of some new structures (e.g. the iTelescope building) doesn't achieve this end.

- The infrastructure supporting the use of the site is in need of improvement. Several of the elements that enable the site to function – including the Lodge and the director's cottage, were lost through the 2013 bushfire, and some of the remaining elements do not meet the standards required under today's regulations. Significant investment and updates to the site's infrastructure are thus required.
- The ANU has guidelines to achieve environmental sustainability through reductions in carbon emissions, water usage and energy consumption across the campus. Structural changes, such as installed insulation, roof-top photovoltaics, or wind turbines, could detract from the heritage values of certain structures, especially where they make the purpose and function of a structure more difficult to 'read' or impact upon its aesthetics or setting.

6.10.4 Conservation of Heritage Fabric Issues

These are issues relating to the conservation of heritage fabric – i.e. structures, equipment, documents and other portable heritage.

- The ANU's 16 inch, 24 inch, 40 inch and UPPSALA telescope buildings, and the remnant equipment that they contain, are now redundant, as are the University of NSW's APT, PROMPT and YSTAR-KAO telescopes. Many of these structures, and the items of equipment that they contain, are of high heritage value and should be retained.
- Maintenance of redundant buildings is an increasing problem, with some structural elements deteriorating (e.g. the dome of the UPPSALA Telescope is deteriorating through water ingress) and rats are becoming an issue in some.
- Funding for the conservation of heritage fabric may be more difficult to obtain because it is no longer directly linked to the research function of the SSO site.
- These old facilities occupy prime locations which could be used for new facilities, in which case potentially significant fabric would be lost. The retention of unused heritage buildings could encourage infill development which would threaten the open character of the site, although the potential for infill may be limited as the RSAA ensure that new facilities must not interfere with the observing programs of existing telescopes.
- Some of the telescopes which continue in use – i.e. the ANU's 2.3m ATT and the AAO's AAT and UK Schmidt Telescope, are of heritage value. Their continued use may be dependent on alterations or upgrades that may impact on these heritage values.
- Retention in a bushfire zone of heritage buildings, objects and collections which do not need to be on site (other than for heritage purposes) may be considered an unnecessary risk.
- The ANU does not appear to have a firm grasp of the heritage value of the portable heritage items and documentary materials which are stored at the site, and these items are also not sufficiently recorded.
- The RSAA, AAO and other tenant organisations are not sufficiently aware of the ANU Heritage Program and its policy relating to the conservation of places and objects.

6.10.5 Setting and Natural Values Issues

These are issues relating to the natural values of the site – i.e. flora, fauna, geology and landscape.

- Although its flora appears to be recovering, the faunal population of the area seems to have been heavily impacted by the fire, and this may have reduced the site's natural values.

- The SSO site is closely related to the Warrumbungle National Park and shares some of the natural values on which the park's National Heritage Listing is based. Developments at the site or, to a lesser extent, in the two disconnected lots to the east that the University also holds, could potentially impact on these values within the site, and on the setting of the NP.
- Protection of the existing ecology from invasive weeds requires close management.
- Survey responses identified some untidy areas of the site, including patches of construction waste and the sites of buildings destroyed by the 2013 bushfire, which were thought somewhat detrimental to the natural setting.

6.10.6 Community Connection Issues

These are issues relating to the SSO's connections with the wider community, for whom it holds social and aesthetic values.

- The site is important to the regional and wider community, and generally people have expressed that it would be a loss to the community if the observatory were to close - the SSO has important community meaning and value.
- Community feedback is that there are good links between the site and its staff and the community, but this is not matched by visitor/tourist/education program services.
- Despite the presence of an ANU officer in a related role, the interaction between the site and the community is not what it could be.
- There is a perception that decisions are made from elsewhere with no local consultation.
- Maintenance of the buildings and the general appearance of the site are important for the local community's 'pride-of-place'.

6.10.7 Interpretation Issues

These are issues that relate to the way in which the heritage values of the SSO are interpreted and presented at the site.

- The SSO Visitor Centre and Exploratory are somewhat tired and run-down, with the displays and exhibits being very out of date. This does not reflect well on the advanced nature of the scientific work done at the site. Nor does it help the outreach and education efforts and responsibilities of the ANU or the AAO, especially as all visitors must pass through the Exploratory to access the AAT visitors' gallery.
- The display in the AAT visitors' gallery is also somewhat dated.
- The volume of material to be presented at the site can potentially be quite overwhelming, with text-heavy explanatory panels.
- In relation to the historic and technical values of the site the Exploratory does not fulfil the potential of a display showcasing astronomy, the history of development in optical astronomy and research achievements made at the site, or explaining current research and innovation in progress. It also makes little or no mention of the other identified aspects of the site's heritage – its social, aesthetic, associative and Indigenous value, and the interpretation of heritage values is therefore currently inadequate.
- Unsystematic and ad hoc development of materials has resulted in a disjointed interpretive provision. For example, the purpose served by the information board/shelter next to the visitor car park is unclear.
- Much information on the past use of the site is held by the astronomers and other staff who have worked there and is not otherwise recorded.

- The significance of the SSO site as part of the wider landscape, both prior to its development as an observatory and now is not currently recognised.
- There is currently no interpretation of Aboriginal culture at the site, and the Aboriginal Land Council would like to see this remedied. Any decisions on place value or policy made by the HMP will need to be submitted for discussion at a group meeting of the Land Council.

6.10.8 Visitation Issues

These are issues that relate to visitation to the site. They are less directly related to the purpose of this HMP than those listed above, being addressed more pertinently in the Campus Master Plan, and the HMP policies will therefore not respond to all of them. However, these issues are indirectly relevant in that they affect the ability of visitors to the SSO site to experience its heritage values.

- There is no overarching tourism strategy to determine how visitation can be effectively integrated into the activities of the site.
- The Visitor Centre and other existing visitor facilities, for example the provision of site tours, are under-utilised.
- The current arrangement of the Visitor Centre is confusing and it does not achieve its purpose of orientating visitors to the site.
- The Visitor Centre contains the only café and externally accessible toilets at the site, and this currently means that contractors and employees mix with the visitors.
- There is currently no marketing/advertising budget for the site.
- Visitors can be confused by the lack of a corporate identity for the site – for example there is confusing variation between AAO and ANU signs. If visitors miss the small sign to the AAT Gallery, they can easily think that there is nothing accessible to them apart from the shop and exhibition. This is compounded by the sign on the road makes it clear that there is no public access even to the AAT.
- Visitors are not permitted access to the site to the west of the Visitor Centre area, other than to visit the AAT via the defined walkway or on guided tours. However, the western area of the site contains the earliest buildings at the site and the Trig point at the west end of the site is a key viewing place from which the site as whole and the features of Warrumbungle NP can best be viewed.
- There is no visible advertising of the site tours that the ANU provides.
- The location and physical nature of the site is not particularly well suited to accommodating visitors. For example, caravans cannot reach the site and pedestrian routes across the site are hazardous.
- The physical rise and the positioning of the Workshop currently create a barrier across the middle of the site that dissuades movement beyond it. Currently this is welcome, but it may need to be addressed should the site become more open to visitors.
- The site infrastructure is currently not capable of supporting high visitation, but supporting scientific work of the site is currently the priority.
- Increased recognition and dissemination of the site's heritage values will increase visitor numbers placing greater emphasis on access and control of movement into and around the site, and likely increasing pressure on existing infrastructure.
- The campus environment as it stands does not provide a high level of amenity for users or tourists.

- The existing Visitor Centre is not sited or designed to take advantage of the unique location and spectacular views to the adjoining Warrumbungle's or internal views of the research facilities.
- The Visitor Centre lacks a commercial kitchen and cannot cater for large numbers of visitors.

7 MANAGEMENT POLICY AND IMPLEMENTATION STRATEGIES

7.1 Introduction

The objective of the policies and implementation strategies contained in this Heritage Management Plan is to achieve the conservation of the cultural heritage significance of the Siding Spring Observatory.

This section comprises two parts. The first sets out policies which will guide the future use and management of the SSO with respect to its heritage significance.

These fall under the policy topics set out in Table 15. The topics include those which respond to the implications arising from significance of the site and the management framework within which it must be managed that is set out in Section 6 above:

Table 15 - Policy headings and relevant policies

Policy heading	Policies
Lead policy	1
General policies	2 - 10
Site management	11 - 21
Site use	22 – 23
Conservation of heritage fabric	24 – 33
Setting and natural values	34 – 36
New works	37 – 38
Connection to the community	39 – 41
Interpretation	42 – 45
Visitation	46 - 47

The second part of the section sets out implementation actions through which to implement the policies. These identify:

- Further work required
- Places that should be considered for inclusion on statutory registers
- Urgent or priority conservation works, particularly where places are at risk
- Any elements that require more detailed management strategies to be developed
- A program of implementation actions
- Opportunities to seek financial assistance and advice
- Areas in which technical assistance will be required in the implementation of policies, and from where this can be provided.

7.1.1 Bodies Subject to the HMP Policy

The policy contained within this HMP is directed towards the principal managers of the SSO. As its commissioners, this policy is primarily directed to the Australian National University Facilities and Services Division, and it is to that organisation that it currently applies first and foremost. However, other relevant government bodies such as the ANU RSAA and AAO should also commit to follow the policy contained within this HMP.

The commissioners of the HMP must undertake to ensure that it is firmly associated with the management of the SSO site and that all organisations undertaking activities at the site are in compliance with it as appropriate. Furthermore, in the event that future transactions or management agreements transfer the site, or any part of it, into the control of another body, that body will be required to follow the relevant policy contained within the HMP in respect to that component, as far as is reasonable. This undertaking is encapsulated in Implementation Strategy 4c below.

7.2 Summary of Policy and Implementation Strategies

Table 16 below provides a summary in table form of all the policies and strategies that follow.

The suggested timetable for the implementation of each strategy is associated with the relevant priority level as follows:

- High - within two years;
- Medium - within five years; and
- Low - within ten years (or as the RSAA and AAO cease research operations at the site – see Section 6.8).

Where the priority is ongoing this is also noted.

Table 16 - Index to Policies and Implementation Strategies in this section

Policy Title/Sub Policy		Strategies		Priority
1	Policy Vision			High Ongoing
2	Significance the basis for planning and work			High Ongoing
3	Conservation in accordance with the Burra Charter			High Ongoing
4	Adoption of policies	4a	Adoption of priority and implementation timetable	High Ongoing
		4b	Update Heritage Program	Medium
		4c	Transfer of site ownership	Low
5	Planning documents for the SSO	5a	Consistency with the Campus Management Plan	Medium
6	Nomination for inclusion on the CHL	6a	ANU will nominate the SSO to the CHL	High
		6b	Assessment for NHL listing	Medium
7	Compliance with legislation	7a	EPBC Act requirements	High
		7b	HMP endorsement	Low
		7c	Department of Environment advice	Low
		7d	Level of compliance	Medium
		7e	Inclusion on ANU Heritage Register	High
8	Relationship with AHC and DoE			Medium Ongoing
9	ANU Heritage Program	9a	Review of ANU *Heritage Strategy*	High

Policy Title/Sub Policy		Strategies		Priority
10	Review of the management plan	10a	Review HMP every five years	Low
		10b	EPBC Act amendment requirements	Low
		10c	Review if out of date	Low
		10d	Changes reflected in other schedules and plans	Low
11	Site management staffing	11a	Input from other relevant ANU professional areas and staff	Low
		11b	Convening of working parties	Low
12	Relationship with the AAO			High
13	Relationship with external management organisations	13a	Attendance at the SSO Site Committee meetings	Medium Ongoing
		13b	Co-opting representatives for particular projects	Medium Ongoing
14	Relationship with external stakeholders	14a	Maintain stakeholder list and provide communication channels	Medium Ongoing
15	Conservation planning for adjacent areas			Medium Ongoing
16	Decision making process for works	16a	Standard decision making process	High
		16b	Review of HMP implementation	Medium
16.1	Establishing a decision making process			High
16.2	Referral to ANU Heritage Officer			High Ongoing
16.3	Unforeseen heritage impacts			Medium Ongoing
17	Expert advice and workers skills			High Ongoing
17.1	Expert advice on heritage conservation issues			Medium Ongoing
17.2	Expert advice on the management of flora and fauna			Medium Ongoing
17.3	Appropriately skilled staff			High Ongoing
17.4	Involvement of relevant experts in proposal development			Medium Ongoing
18	Awareness building at the SSO site			High Ongoing
18.1	Organisations aware of the site's heritage significance.			High Ongoing
18.2	Organisations aware of their heritage responsibilities.			High Ongoing

Policy Title/Sub Policy		Strategies		Priority
19	Training	19a	Heritage awareness in staff induction	High
		19b	Heritage training for staff	High
		19c	Specific heritage training package for maintenance contractors.	High
20	Awareness building in general			Medium Ongoing
21	Bushfire planning			High Ongoing
22	Primary uses of the Siding Spring Observatory			High
22.1	Continuation of research astronomy as the primary goal			High
22.2	Following the cessation of research astronomy - preservation of heritage the primary consideration.			Medium
23	Compatible uses	23a	Stressing the need for uses to respect heritage significance.	High Ongoing
23.1	New compatible uses			Medium Ongoing
23.2	Resourcing conservation works			Medium Ongoing
24	Prioritising works	24a	Prioritisation in response to resource constraints	Medium
		24b	Resolving conflicts between objectives	Medium
25	Conservation of general form and layout of the site			High
25.1	Conservation of the boundary, general layout and form of the SSO			Medium
25.2	The character of the SSO site will be conserved.			Medium
25.3	Maintenance of separation and distinction in character between the seven areas			Medium
25.4	Retention of historic lot boundaries			Medium
25.5	Maintenance of current road layout			Medium
26	Conservation of built fabric – general	26a	Flexible approach to the alteration of fabric	Medium
		26b	Review of policy when role as a major research facility ceases	Low
27	Maintenance planning and works	27a	Review existing maintenance planning	High
27.1	SSO Asset Management Plan	27b	Update Asset Management Plan and prepare a maintenance	High

Policy Title/Sub Policy		Strategies		Priority
			manual	
		27c	Ensure maintenance planning is informed by monitoring	High
27.2	Conservation 'catch-up' works	27d	Prepare list of conservation 'catch-up' works	High
28	Conservation of landscape elements			Medium Ongoing
28.1	Landscape to be managed to maintain character	28a	Landscape to be incorporated into Asset Management Plan	High
		28b	Overall review and adjustment of management activities.	Medium
28.2	Environmentally sustainable management			Medium Ongoing
28.3	Prioritisation of elements to maintain aesthetic and natural attributes			Medium
29	Condition monitoring	29a	Development of monitoring program	Medium
		29b	Change triggers a review of the condition of the heritage values	Medium Ongoing
		29c	Annual survey to assess condition and maintenance	Medium Ongoing
30	Standards of Maintenance	30a	Establishment of appropriate maintenance standards	High
		30b	Monitoring of maintenance and regular contractor performance assessment.	Medium Ongoing
31	Records of intervention and maintenance	31a	Retention of records relating to decisions	Low Ongoing
		31b	Retention of all maintenance plans and monitoring records	Low Ongoing
		31c	Substantial interventions and changes noted in ANU Heritage Register	Low Ongoing
32	Moveable heritage	32a	Register of moveable SSO heritage	High
		32b	Cataloguing and conservation in line with the ANU Heritage Manual.	Medium
		32c	Interpretation of SSO associated objects	Medium
		32d	Maintenance of items in context.	Medium
33	Removal of significant equipment			Medium
33.1	Significant equipment to be left in situ			Medium
33.2	Decisions regarding the retention			Medium

Policy Title/Sub Policy		Strategies		Priority
	of significant equipment			
33.3	Where in situ retention is not possible			Medium
33.4	Where retention on site not possible			Medium
34	Relationship to Warrumbungle National Park			Low
35	Relationship to the broader landscape			Low
36	Natural values	36a	Assessment of the ecological values	Medium
		36b	Biodiversity Management Plan	Low
37	New structures or major works to existing structures	37a	Installation of new telescopes	High
38	Minor new works to existing structures			Medium
39	Opportunities for community involvement with the SSO	39a	Establishment of community reference group	Medium
40	Maintaining links with former staff			Medium Ongoing
40.1	Former site operatives to record their stories			Low Ongoing
40.2	Commitment to recording stories of former operatives			Medium Ongoing
41	Public outreach	41a	Establish a formal outreach program	Medium
42	Interpretation planning			
	Development of Interpretation Plan.	42a	Major themes of interpretation	High
		42g	Provision for primary school children	Medium
42.1	Interpretation based on scientific activities and cultural heritage significance.	42b	Focus on the work at the SSO	Medium
		42c	Conveying the research status of the SSO	High
42.2	Encouragement of interpretation elsewhere	42f	Coordination with NSWNPWS	Medium
42.3	Interpretation should identify the elements of heritage significance	42d	Aboriginal cultural heritage	Medium
		42e	Inclusion of moveable heritage	Medium
43	Updating interpretation	43a	The Exploratory will be refurbished	High
43.1	Interpretation material regularly updated			

Policy Title/Sub Policy		Strategies		Priority
43.2	Interpretative displays innovative and engaging			
43.3	Visitor services staff fully cognisant of heritage values			
44	Resourcing interpretation			Medium
45	Supporting HMP conclusions	45a	Additional studies should be undertaken:	Low
46	Promoting visitation	46a	Development of corporate image	Medium
		46b	Commissioning of visitor survey	High
47	Visitor offering	47a	Renewing the café facility	High
47.1	Visitor offering at the SSO will be improved			High
47.2	More opportunities provided for the public to experience the SSO	47b	Improving pathway to the Trig point	Medium
47.3	Opportunities for greater night-time activities to be explored	47c	Night time access to the site	Low

7.3 Policies

7.3.1 Lead Conservation Policy

Policy 1 - Policy vision for the management of the Siding Spring Observatory

Significance as the basis for policy: the Siding Spring Observatory occupies the prominent ridge of Mt Woorut, a place of natural significance for its landscape (aesthetic), geological and biodiversity values, many of which it shares with the adjacent National Heritage listed Warrumbungle National Park. This location has strong associations for Aboriginal people of the Gamilaroi language group, partly for dark skies and reasonable freedom from cloud, and this led to its selection as the location for what is now the foremost optical observatory in Australia, and one of the foremost in the southern hemisphere. Begun in the 1960s, the site retains a collection of telescopes and related structures (the largest in the country) from every decade of its existence, including the biggest and best in the country, many of which have been responsible for some of the most important astronomical programs and discoveries of modern times. The site of today as a whole is a product of significant historic relationships and political decisions, the historic and continuing development of Australian astronomy, use by astronomers from across the globe and increasingly now remote operators, as well as public visitation.

Policy Vision: The vision for the management of the Siding Spring Observatory is founded on the historic and continuing role of the place in Australian and international astronomy, which has created a place of historic, technical and associative value, at a site which also has natural values and is cumulatively of social, aesthetic and Indigenous value. The SSO site provides important evidence of the operations of the ANU Research School of Astronomy and Astrophysics (RSAA), the Australian Astronomical Observatory (AAO) and their predecessors. The policy vision is to conserve the significant attributes of heritage fabric, site form, views and associations whilst allowing that the site should continue to develop as an optical observatory and provide the public with access to appreciate this significance and interpretation that communicates both significance and stories of place. Policy will include strategies for short, medium and long term site changes and maintenance.

7.3.2 General Policies

Policy 2 - Significance the basis for management, planning and work

The statement of significance set out in Section 5, including the significance attributes noted in Section 5.7 and relative significance of elements noted in Section 5.8, will be a major consideration in the management, future planning and work of the SSO site.

Policy 3 - Conservation in accordance with the Burra Charter

The conservation of the Siding Spring Observatory, its heritage fabric and associated values, will be carried out in accordance with the principles of the *Burra Charter* (Australia ICOMOS 2013) and any revisions of the charter that might occur in the future.

Policy 4 - Adoption of policies

The policies recommended in this management plan will be endorsed as a primary guide for management as well as future planning and work. Where this management plan is silent on an issue, or where issues arise outside of the scope of this plan, any proposal or action is to be considered in the light of the Commonwealth Heritage Management Principles arising from the EPBC Act.

Implementation Strategies

4a - The ANU will adopt the priority and implementation timetable for policies and strategies which is indicated in Table 16 above.

4b - The ANU will update aspects of its Heritage Program as required, to recognise this HMP.

4c - Should ownership or control of the SSO be transferred, this needs to be carefully planned and executed so as to conserve the place's significance.

The separation of significant elements into multiple disparate ownerships or management jurisdictions is to be avoided.

Prior to transferring management of the site, a condition will be included in the relevant documentation that requires the new manager to, as appropriate:

- adopt this HMP and comply with its requirements, or
- prepare a new management plan and submit it to the relevant authorities for endorsement within a reasonable timeframe after the transfer, and preferably prior to any physical changes that may be associated with the new management regime.

Policy 5 - Planning documents for the SSO

All planning documents developed for the Siding Spring Observatory, including the Campus Management Plan, will refer to this HMP as a primary guide for the conservation of heritage values.

The direction given in those documents and in this plan should be mutually compatible.

Implementation Strategies

5a - The ANU will ensure that there is an ongoing consistency of approach between other planning documents, including the Campus Masterplan, and the implementation of this HMP.

Policy 6 - Nomination for inclusion on the heritage lists

The ANU will consider nominating the Siding Spring Observatory for inclusion on the Commonwealth Heritage List, on the basis of the Statement of Significance presented in Section 5. The ANU will in future investigate the possibility that the site may qualify for higher level listing – e.g. on the National Heritage List.

Implementation Strategies

6a - The ANU will consider nominating the SSO for inclusion on the CHL.

6b - The ANU will assess the site for possible inclusion on the NHL in the future.

Policy 7 - Compliance with legislation

Subject to the inclusion of the SSO on the CHL (see Implementation Strategy 6a), the ANU will comply with all relevant legislation in relation to the heritage significance of the precinct, including the *Environment Protection and Biodiversity Conservation Act 1999,* and any future amendment of this Act, and will comply with relevant requirements arising from other heritage legislation.

Implementation Strategies

7a - The ANU will comply with the requirements of the EPBC Act, including the following requirements:

- to take no action that has, will have, or is likely to have an adverse impact Commonwealth Heritage values of a Commonwealth Heritage place, unless there is no feasible and prudent alternative to taking the action and all measures that can reasonably be taken to mitigate the impact of the action on those values are taken (s.341ZC);
- to seek approval from the Minister responsible for heritage before taking any action likely to have a significant impact on the environment, including a heritage place (s.28);
- to manage listed places consistent with the Commonwealth Heritage Management Principles, as relevant (s.341S(4));
- to seek the Minister's advice, and public comment, on any proposed management plan or revision of a plan (s.341S(6)); and
- to take all reasonable steps to assist the Minister and the Australian Heritage Council in the identification, assessment and monitoring of a place's Commonwealth Heritage values (s.341Z).

Commentary: It is noted this management plan fulfils the ANU's obligation to make a written plan to protect and manage the Commonwealth Heritage values of a Commonwealth Heritage place, called a management plan under the Act (s.341S) (refer to Appendix 6; EPBC Act Compliance).

7b - The ANU will consider seeking endorsement of this HMP under s341T of the EPBC Act.

7c - The ANU will consider seeking preliminary advice from the Department of the Environment regarding heritage issues affecting the place, noting that this is not formally required under the EPBC Act.

7d - Where the ANU is not able to achieve full compliance with relevant legislation (for example where pre-existing conditions do not allow full compliance), the non-complying aspect will be noted and the reasons for this situation appropriately documented. In any event the ANU should seek to satisfy the aims and intent of legislation to the full extent possible.

Commentary: At this time no such non-compliant issues are known to exist.

7e - The SSO site will be included on the ANU's heritage register maintained in accordance with the EPBC Act.

Policy 8 - Relationship with the Australian Heritage Council and the Department of the Environment

The ANU will maintain regular contact with the Department of the Environment and seek advice or refer any matter relating to the place to the AHC and the Department of the Environment as required by the EPBC Act, as outlined in **Policy 7**.

Policy 9 - ANU Heritage Program

The policies in this management plan should be consistent with the ANU's *Heritage Strategy 2010-2012*, and subsequent iterations.

Implementation Strategies

9a - The ANU will review its current *Heritage Strategy 2010-2012* to ensure that it is consistent with the management prescriptions of this HMP, and vice-versa.

Policy 10 - Review of the management plan

The management plan will be reviewed:

- to incorporate any new information and ensure consistency with current management circumstances at least every five years; and
- whenever major changes to the place are proposed or occur by accident (such as fire or natural disaster); or
- when the management environment changes to the degree that policies are not appropriate to or adequate for changed management circumstances; or
- it is found to be out of date with regard to significance assessment (for example when new information is located).

Implementation Strategies

10a - The ANU will review this management plan at least every five years, in compliance with the EPBC Act (s.341X). Performance in satisfying the policies will form part of that review.

10b - The ANU will comply with the processes required in the EPBC Act (s.341S(6)) for any amendment to the plan, which require it to ask the Minister for advice before making, amending or revoking a plan, and also for the ANU to seek public comments.

10c - The ANU will undertake a review and necessary amendment of the management plan at any other time if it is found to be out of date with regards to significance assessment, management obligations or policy direction.

10d - Conservation and maintenance schedules developed for ANU staff and/or contractors should also be updated to reflect any changes in this HMP.

Commentary: the need for and timing of reviews may be affected by the changing relationship between the ANU and AAO at the site – see ***Policy 12****.*

7.3.3 Site Management Policies

Policy 11 - Site management staffing

The ANU will maintain management staff at the site. This will include a Site Operations Manager or similar who's remit includes responsibility for the on-site management of all matters relating to the heritage of the SSO site. That person will have responsibly for liaison with other ANU departments and partner organisations (including the AAO in particular) and

the management of contracts in relation to all activities that have a heritage management implication as identified by this HMP.

Implementation Strategies

8a - The management of the SSO will also be guided by ongoing review and input from other relevant ANU professional areas and staff who have organisational wide responsibilities including but not limited to heritage conservation and interpretation/education.

8b - The responsible person may convene working parties of ANU, partner organisations and other relevant individuals and or agencies to as needed to assist in the management of heritage at the SSO site.

Policy 12 - Relationship with the Australian Astronomical Observatory

Regular contact will be maintained with the AAO to:

- Clarify future plans with regards to the use and management of the site and its elements;
- Encourage the exchange of information about development proposals or intended works within the site or affecting it, and coordinate activities;
- Encourage understanding of and respect for the heritage significance of the site;
- Develop partnerships for the provision of interpretation material (for the Exploratory in particular);
- Ensure mutual ongoing compatibility of management actions and proposals with this HMP.

Commentary: This contact is currently maintained through both organisations' sitting on the SSO Site Committee.

The changing relationship between the ANU and AAO at the site may have implications for the priority timescales set out in Table 16.

Policy 13 - Relationship with external management organisations

The ANU will liaise with all relevant management organisations on developments that might affect the heritage significance of the place. These should include:

- NSW National Parks and Wildlife Service;
- Warrumbungle Shire Council;
- Aboriginal community organisations.

Commentary: Communication with all stakeholders is already undertaken across the ANU estate to inform and interpret management responsibilities and foster good working relationships, on an as-needs basis.

Implementation Strategies

13a - The ANU will invite representatives from these organisations to attend meetings of the SSO Site Committee in an advisory/monitoring capacity.

13b - The ANU will arrange a mechanism whereby representatives of relevant organisations can be co-opted to the Site Committee to help oversee particular activities as required.

Policy 14 - Relationship with external stakeholders

The ANU will provide information and opportunities to comment to all interested community organisations on developments that might affect the heritage significance of the place. These should include:

- Local resident community;
- Australian astronomical community.

Commentary: Communication with all stakeholders is already undertaken across the ANU estate to inform and interpret management responsibilities and foster good working relationships, on an as-needs basis.

Implementation Strategies

14a - The ANU will maintain a list of relevant stakeholders and the scope of their interests and provide these groups with an established avenue through which to express their opinions and concerns on the management of the site.

(See also **Policy 39** and **Policy 41**)

Policy 15 - Conservation planning for adjacent areas

The ANU will seek to review and make comment on any proposed revision to the management of areas around the SSO that may have a significant impact on the heritage values of the SSO, including to that of the adjacent Warrumbungle National Park.

*Commentary: See also **Policy 13** in regard to consultation with external management organisations.*

Policy 16 - Decision making process for works

Policy 16.1 - The ANU will establish a process for making decisions about all heritage management works at the SSO site that are likely to relate to or impact on heritage significance (including positively) and maintain consistent documentation about such decisions. The decision making process should involve:

- consultation with internal and external stakeholders, including the community, if identified within the process as having an interest in a particular decision;
- input of staff with responsibilities for aspects of heritage conservation potentially affected by the proposed works;
- documentation of the design and subsequent changes in the area involved;
- documentation of the proposed use or operational requirements justifying the works;
- identification of relevant statutory obligations for consultation and approvals; and
- referral of proposed actions to the Minister responsible for heritage for those actions (assessed through self-assessment) that are likely to have a significant impact.

Policy 16.2 – A Heritage Impact Assessment will be undertaken for any physical works that affect significant elements. These can be undertaken by an ANU F&S Division or AAO operative but should be checked by the ANU Heritage Officer. In the event that an impact is anticipated, an assessment should be undertaken by the ANU Heritage Office who will make a judgement based on this HMP.

Policy 16.3 – Unforeseen heritage impacts are to be directly referred to the ANU Heritage Office to be managed in line with this HMP and with agency and expert advice as required (see **Policy 8** and **Policy 17**).

Implementation Strategies

16a - The ANU will adopt a standard decision making process and recording process for all heritage management related decisions for the site, and records of decisions will be maintained. (See **Policy 31** regarding records.)

16b - The implementation of this HMP will be reviewed annually, and the priorities re-assessed depending on resources or any other relevant factors. The review will consider the degree to which policies and strategies have been met or completed in accordance with the timetable, as

well as the actual condition of the place. The Criteria for Prioritising Work (Strategy 24a) will be used if resource constraints do not allow the implementation of actions as programmed.

Policy 17 - Expert advice and workers skills

Policy 17.1 - Advice will be sought from people with relevant experience in the management and/or conservation of heritage fabric in relation to complex heritage conservation issues and in the design and review of work affecting the significance of the place.

Policy 17.2 - Expert advice will be sought when required regarding the management of flora and fauna at the site

Policy 17.3 - Appropriately skilled people will be used to undertake works affecting the place, including maintenance.

Policy 17.4 - New proposals will be developed with the involvement of a range of relevant expert advice to ensure an integrated planning and design approach is adopted.

Policy 18 - Awareness building at the SSO site

Policy 18.1 - The ANU will ensure that all organisations who undertake activities at the site – either physically at the site or remotely, are aware of its heritage significance.

Policy 18.2 - The ANU will ensure that all organisations are aware of their responsibilities in relation to the heritage listings applicable to the site, and to heritage conservation more generally.

Policy 19 - Training

Training will be initiated within the ANU and other relevant organisations (e.g. the AAO), to raise awareness of the significance of the place, its key significant features, and the policies and practices for its appropriate management. Training will include staff, volunteers, and staff of lessees and contract personnel working at the SSO site.

Implementation Strategies

19a - The ANU will introduce a heritage awareness and information component in induction courses and periodic in-service training for staff, volunteers, lessee staff and contract personnel.

19b - The ANU will develop and implement, or otherwise provide heritage training for staff with specific detailed needs (such as the ANU managers responsible for the SSO site).

19c - The ANU will develop and implement a specific heritage training package for maintenance contractors – including both induction and in-service training.

Commentary: The development of these heritage training programs requires some expert heritage involvement. It is also a component of the ANU's Heritage Strategy as required under the EPBC Act.

Policy 20 - Awareness building in general

The ANU will seek to spread awareness of the recognised heritage significance of the SSO at every appropriate opportunity.

Policy 21 - Bushfire planning

All other considerations being equal, the protection of significant heritage elements will be a consideration of fire management programs for the SSO site.

7.3.4 Site Use Policies

Policy 22 - Primary uses of the Siding Spring Observatory

Policy 22.1 - During the period for which ANU and AAO intend to continue research astronomy at the site, this continuation will be the primary goal, and alterations to significant heritage fabric should be permitted to facilitate this aim. This should also be the case for each significant heritage element.

However, all such decisions will be made in line with **Policy 16** and in consultation with ANU Heritage, and alterations will be recorded in accordance with **Policy 31.**

Policy 22.2 - Following the cessation of research astronomy at the site, when it passes into more of an educational and recreational role, the preservation of heritage will become a primary consideration. This will also be the case for each significant element as each passes out of use for research astronomy.

Commentary: The term 'research astronomy' is here used to describe the use of the telescopes at the site as major research tools for the ANU and AAO. Based on the information presented in Section 6.8, this is currently anticipated to be until around 2025. After this time it may be that management of the site and its facilities remain with these organisations or that it passes to one or more others.

Policy 23 - New compatible uses

Policy 23.1 - Continuing uses and any new use proposed for the Siding Spring Observatory will need to be compatible with the significance of the place, and will be complimentary to the primary uses (Policy 22).

Policy 23.2 – Organisations that reuse significant heritage elements should be required to contribute to the conservation of that element (and the wider site).

Implementation Strategies

23a - All planning guidance for use of the SSO site will stress the significance of the heritage elements and the need for uses to respect this significance.

7.3.5 Conservation of Heritage Fabric Policies

These policies should all be followed in conjunction with **Policy 2 - Significance the basis for management, planning and work.**

Policy 24 - Prioritising works

Decisions about prioritising conservation works shall primarily be made on the basis of significance.

Implementation Strategies

24a - Where some heritage conservation work is not able to be undertaken because of resource constraints, work will be re-prioritised according to the following criteria:

- the descending order of priority for work should be maintenance, restoration, reconstruction. adaptation, new work;
- work related to alleviating a high level of threat to significant aspects, or poor condition should be given the highest priority followed by work related to medium threat/moderate condition then low threat/good condition; and
- the level of threat/condition will be considered in conjunction with the degree of significance (e.g. aspects in poor condition and of moderate significance might be given a higher priority compared to aspects of moderate condition and high significance).

24b - If a conflict arises between the achievement of different objectives, the process for resolving this conflict will involve:

- implementation of a decision-making process in accordance with **Policy 16**;
- consideration of the ANU's conflict resolution policy contained in its *Heritage Strategy*;
- compliance with the Burra Charter, in particular Articles 5.1 and 13;
- possibly involving heritage conservation experts in accordance with **Policy 17**;
- possibly seeking the advice of the Department of the Environment; and
- possibly seeking a decision from the Minister responsible for heritage under the EPBC Act.

In the last case, a decision under the EPBC Act may be necessary because of the nature of the action involved.

*Commentary: The decision making process might be about individual specific works or a program of works. Referral of proposed actions to the Minister responsible for heritage may also be necessary under the EPBC Act (see **Policy 7 - Compliance with Legislation**).*

*See also **Policy 31** regarding records about change.*

Policy 25 - Conservation of general form and layout of the site

Policy 25.1 - The boundary, general layout and form of the Siding Spring Observatory will be conserved.

Policy 25.2 - The character of the SSO site will be conserved. The aspects that support this character include a low density of structures, generally of a single storey except in the case of telescope domes. The AAT should remain the dominant structure on the site.

Policy 25.3 - The geographic separation and distinction in character between the seven Site Areas identified in the HMP will be maintained.

Policy 25.4 - The historic lot boundaries will be retained.

Policy 25.5 - The current road layout should be maintained.

Policy 26 - Conservation of built fabric – general

The conservation policy for built fabric in the SSO site will be based generally on significance.

Some flexibility should be allowed in regard to the maintenance, replacement and alteration of significant fabric such that research function of structures can be prolonged, rather than becoming compromised by strict conservation requirements, for example the need for 'like for like' replacements. Built fabric will be maintained but may be adapted or changed, subject to the overriding objective to achieve an appropriate balance between the conservation of the heritage values of the site and its continued use as an internationally important optical observatory.

This flexibility should decrease with more significant elements – i.e. there should be more flexibility on fabric replacement for less significant fabric.

Implementation Strategies

26a - This flexible approach to the alteration of fabric should be allowed provided the overall form of each structure is retained.

26b - This policy should be reviewed when the SSO site ceases its role as a major research facility.

Policy 27 - Maintenance planning and works

Policy 27.1 - The ANU's existing SSO Asset Management Plan will be updated to reflect the findings of this HMP in planning for the regular maintenance of structures, infrastructure and landscape elements in the site. Maintenance of will be based on a planned approach that is informed by:

- a sound knowledge of each part of the site, its materials and services, and their heritage significance; and
- regular inspection/monitoring.

It will also include provision for timely preventive maintenance and prompt repair in the event of breakdown or damage. High quality materials will be used in maintenance works.

Policy 27.2 – A list of high priority 'catch-up' maintenance works will be prepared and carried out. I

Implementation Strategies

27a - In updating the SSO Asset Management Plan, the ANU will review existing maintenance planning to ensure consistency with the HMP, and to achieve environmental sustainability. The adequacy of planning to deal with the needs of specific elements will be considered, with expert input as required (see **Policy 17**).

27b - The ANU will prepare a maintenance manual for the site (e.g. containing as built drawings, product specifications, paint colour details, etc.) and include this in the SSO Asset Management Plan

27c - The ANU will ensure maintenance planning is periodically informed by a monitoring program (refer to **Policy 29**).

27d – The ANU will prepare a list of specific conservation 'catch-up' works that should be undertaken urgently, to include:

- Uppsala dome

(list to be expanded as required)

Commentary: Maintenance planning and works will be subject to ***Policy 13 - Decision Making****.*

Policy 28 - Conservation of landscape elements

Policy 28.1 - The landscape of the SSO site will be managed in a manner that maintains the character of the place.

Policy 28.2 - Landscape elements in the site will be managed in an environmentally sustainable manner.

Policy 28.3 - The management of individual landscape elements will be prioritised in order to maintain the significant aesthetic and natural attributes of the site – namely views into and from the site, and its flora and fauna.

Implementation Strategies

28a – Landscape will be incorporated into the SSO Asset Management Plan – see **Policy 27**.

28b - The ANU and its landscape contractors will undertake an overall review (and adjustment if required) of management activities in line with this HMP.

Policy 29 - Condition monitoring

The SSO Asset Management Plan will be updated to include a program of monitoring of the condition of heritage values, particularly in areas subject to heavy use. This values monitoring program will be distinct from the maintenance program but should be linked to it for implementation. The information gained will identify areas experiencing deterioration, which will in turn inform maintenance planning.

Implementation Strategies

29a - The ANU will develop and implement a monitoring program as part of the updated SSO Asset Management Plan to identify changes in the condition of the place. Priority will be given to areas of high use, and identified problems such as the condition of redundant structures. The appropriate cycle for such monitoring will be considered as part of the program development, and be responsive to the nature of the possible changes. The site will be formally inspected at regular intervals identified in the SSO Asset Management Plan.

29b - The documentation of any change in condition or integrity of any component of the place will trigger a review of the condition of the heritage values, to determine if the heritage values as indicated in the statement of significance have been diminished by the changes. This will take place at least annually.

29c - The monitoring program will include an annual condition survey to assess condition and maintenance requirements. This will be undertaken on a six-to-twelve monthly basis, and in response to significant environmental impacts (e.g. bushfire or a severe storm).

Policy 30 - Standards of Maintenance

The SSO site will be maintained to a high standard consistent with its significance.

Implementation Strategies

30a - The ANU will establish the appropriate maintenance standards and benchmarks within the updated SSO Asset Management Plan, reflect this maintenance in contractor arrangements and confirm it through regular reviews.

30b - Condition monitoring (see **Policy 29**) will also consider the standard of maintenance undertaken by contractors and this aspect will form part of the regular contractor performance assessment.

Commentary: Where staff do not have the requisite skills to assess the condition of heritage elements, this will need to be addressed in line with ***Policy 19 - Training*** *or* ***Policy 17 - Expert advice and workers skills****.*

Policy 31 - Records of intervention and maintenance

The ANU will maintain records related to any substantial intervention or change to elements of heritage significance at the SSO, including records about maintenance.

Implementation Strategies

31a - The ANU will retain records relating to decisions taken in accordance with **Policy 16 - Decision making process for works.**

31b - The ANU will retain copies of all maintenance plans prepared for the SSO, including superseded plans, and records about monitoring (refer to **Policies 27-29**).

31c - A summary of substantial interventions, changes and maintenance will be included in the ANU Heritage Register entry for the SSO site, including a reference to where further details may be found.

Policy 32 - Moveable heritage

Moveable heritage associated with the Siding Spring Observatory will be conserved and managed in accordance with the ANU Heritage Manual.

Commentary: Details of known significant portable heritage items can be found at Section 3.7 (but this should not be viewed as exhaustive).

Implementation Strategies

32a - The ANU will maintain a register of moveable heritage associated with the SSO in all forms of ownership.

32b - If new moveable items associated with the SSO are located they will be catalogued and conserved in accordance with the ANU Heritage Manual.

32c - Any interpretation planning for the SSO will address the appropriate interpretation of the associated objects (see **Policy 42**).

32d - Where possible, items of moveable heritage will be maintained in context.

Policy 33 - Removal of significant equipment

Policy 33.1 - Significant equipment will be left in situ as far as possible, taking into account the use priorities of the site (see Policy 22).

Policy 33.2 - Decisions regarding the retention of significant equipment will be made in line with **Policy 16 - Decision making process for works**.

Policy 33.3 - Where in situ retention is not possible, the equipment will be retained and interpreted on site, in line with **Policy 42.**

Policy 33.4 - Where retention on site is not possible equipment will be treated as portable heritage in line with **Policy 32**.

7.3.6 Setting and Natural Values Policies

Policy 34 - Relationship to Warrumbungle National Park

The planning and management of the SSO will be carefully considered with regard to its important relationship with Warrumbungle National Park.

Through its stakeholder consultation the ANU will encourage NSW PWS to similarly respect the values of the Siding Spring Observatory (see also **Policy 13**).

Policy 35 - Relationship to the broader landscape

ANU will ensure that regional authorities recognise the importance of views to and from the SSO.

Through its stakeholder consultation the ANU will encourage Warrumbungle Shire Council to respect the values of the Siding Spring Observatory (see also **Policy 13**).

Policy 36 - Natural values

Future changes and uses of the site will be managed in a way that is sympathetic to landscape and natural heritage values of the site.

Implementation Strategies

36a - The ANU will commission a thorough assessment of the ecological values of the SSO site.

36b - The ecological assessment will be used to develop a Siding Spring Observatory Biodiversity Management Plan in cooperation with NSW PWS.

7.3.7 New Work Policies

Policy 37 - New structures or major works to existing structures

Notwithstanding **Policy 22 - Primary uses of the Siding Spring Observatory**, no new major works or structures (either of a temporary or permanent nature) that would adversely impact on the heritage values of the SSO site should be permitted.

New works or structures will:

- Respect the character and differentiation of the seven identified site areas;
- Maintain the open nature of the site;
- Be designed to be functionally recognisable;
- Comply with the SSO Asset Management Plan.

Implementation Strategies

37a - Planning for the installation of new telescopes should envisage their installation in existing structures where possible.

Commentary: It is likely that these steps will be achieved anyway through decision making around the operational requirements of new structures at the site - see Section 6.7.1.

Policy 38 - Minor new works to existing structures

Minor new works to existing structures should be consistent with the suite of conservation policies and may be permitted if they:

- Respect the significance of the SSO site;
- Use high quality materials;
- Are located to minimise their impact (including visual impacts);
- Are designed to have minimal impact (including visual impacts);
- Employ low-key, sympathetic design styles but not historically imitative styles;
- Do not obscure aspects of the structure in such that its function cannot be 'read'.

7.3.8 Connection to the Community Policies

Policy 39 – Opportunities for community involvement with the SSO

More opportunities for community involvement in the management of the site will be provided.

Implementation Strategies

39a - A community reference group will be established that will include individuals representing various sectors of the local community as well as representatives of the ANU and AAO at the site. The ANU will invite membership to this group on the basis of an Expression of Interest and may make direct appointments.

Policy 40 - Maintaining links with former staff

Policy 40.1 - The ANU will encourage former SSO site operatives to share and record their stories from their time at the site.

Policy 40.2 - The ANU will commit to recording the stories of previous site operatives.

Implementation Strategies

40a - The ANU and AAO will collaborate to undertake a program of interview and oral history recording for long-term ANU and AAO staff, or shorter-term staff who worked on significant programs, to gather their stories relating to the site and its activities.

Policy 41 - Public outreach

The ANU will establish a formal outreach program for the SSO site.

Implementation Strategies

41a - The ANU will establish a formal outreach program for the SSO site and circulate information concerning this to local schools and community organisations.

7.3.9 Interpretation Policies

Policy 42 - Interpretation planning

Policy 42.1 - The ANU, in consultation with the AAO, will develop and implement a Siding Spring Observatory Interpretation Plan.

Policy 42.2 - The interpretation of the SSO will be based on its scientific activities and cultural heritage significance.

Policy 42.3 - The ANU will encourage external organisations in the area – e.g. Warrumbungle Shire Council and NSWPWS, to present the stories of the SSO as a component of interpretation programs offered elsewhere in the region.

Policy 42.4 - The interpretation provided should identify the elements of heritage significance at the SSO.

Implementation Strategies

42a - Major themes of interpretation should include the following:

- Pre-contact Aboriginal activity in the area and enduring connections;
- Aboriginal astronomy;
- Pre-SSO history of the site;
- Selection of the SSO site and relationship with Mt Stromlo Observatory;
- Astronomical facilities at the SSO site, and the practice of optical astronomy vs radio astronomy;
- Significant programs and discoveries, and prominent individuals;
- The wider context of global astronomy, appropriate to the SSO's activities;
- Current activities of the site, organisations present at the site and future plans;
- Heritage values of the site, including natural and Aboriginal values.

42b - Interpretation will focus primarily on the work undertaken at the SSO, but placed in an appropriate astronomical context.

42c - Until such time as this is no longer the case, interpretation will clearly convey the research status of the site, and the implications in terms of site management. It will also provide information on the current programs being undertaken at the SSO.

42d - The Aboriginal cultural heritage significance of the place will be interpreted at the SSO. Interpretative material should be developed in consultation with the Gamilaroi Traditional Owner community and should include information about Aboriginal astronomy.

42e - Interpretation will include items of portable heritage from the site, including in particular examples of equipment used in astronomical research.

42f - The ANU (and AAO) will coordinate its interpretive offering with that provided by the NSW National Park and Wildlife Service in the Warrumbungle National Park to ensure that information relating to the pre-observatory history of the site and the area is provided to visitors to the area.

42g - A section of the Exploratory will be directed at children of primary school age.

Policy 43 - Updating interpretation

Policy 43.1 - Interpretation material across the site and in the Exploratory in particular, will be regularly updated to reflect the site's ongoing use for astronomical exploration and education in the context of current astronomical endeavours.

Policy 43.2 - Interpretative displays will be innovative and engaging, appropriate to the cutting-edge science practiced at the site.

Policy 43.3 - Visitor services staff will be fully cognisant of the heritage values of the site, as set out in this HMP.

Implementation Strategies

43a - As soon as the opportunity arises, the Exploratory will be refurbished. This should be undertaken in consultation with AAO (see **Policy 12**) and informed by the Siding Spring Observatory Interpretation Plan).

Policy 44 - Resourcing interpretation

In the event that sufficient resources are available to support interpretive facilities at the site in line with this policy, partnership with other museums or organisations will be sought to ensure that effective interpretation continues at the site.

Policy 45 - Supporting the conclusions of this management plan

Opportunities to gain further information concerning the heritage values identified by this HMP should be taken if possible, and the results used to revise the management plan.

Implementation Strategies

45a – Additional studies should be undertaken to support the findings of this HMP and inform future management decisions. These should include the following:

- assessment of the ecological values (see **Policy 36**);
- additional studies to determine the presence of national heritage values, including more extensive comparative analysis (see **Policy 6**).

7.3.10 Visitation Policies

It is anticipated that visitation will be addressed more fully in the Campus Masterplan (CMP), but the following policies will assist in public appreciation of the SSO's heritage values.

Policy 46 - Promoting visitation

The ANU will encourage and promote greater visitation of the SSO site.

Implementation Strategies

46a - The ANU, in collaboration with other site organisations, will develop a corporate image for the site. This will be employed to promote and market the site, and to clearly mark areas which can be accessed by visitors.

*Commentary: This policy might be best advanced through the Interpretation Plan (see **Policy 42**).*

46b - A visitor survey will be commissioned to gauge visitor desires and requirements for the site.

Policy 47 - Visitor offering

Policy 47.1 - The visitor offering at the SSO will be improved.

Policy 47.2 - More opportunities will be provided for the wider public to experience the practice of astronomy at the site.

Policy 47.3 - Where visitation might interfere with scientific activities at the site, opportunities should be provided in the daytime. But opportunities for greater night-time activities, including viewings, will be explored, especially when the site ceases to be used for research astronomy.

Implementation Strategies

47a - The ANU will investigate the opportunities for renewing the café facility at the site. This may include moving it to the southern end of the building to benefit from views across the Warrumbungles, and considering inviting an external franchise to take a lease.

47b - The pathway to the Trig point viewing platform at the western end of the site may be formalised and upgraded to avoid the need to walk along Observatory Road.

47c - Night time access to the site will be considered, initially for specialised tourists and later more widely.

7.4 Implementation Plan

7.4.1 Responsibility

The person with overall responsibility for implementing this HMP is the person holding the position of Director, Facilities and Services Division, Australian National University.

7.4.2 Commitment to Best Practice

The ANU is committed to achieving best practice in heritage conservation, in accordance with its legislative responsibilities and Government policy, and in the context of its other specific and general obligations and responsibilities. This is reflected in the preparation of this management plan and in the adoption of:

- **Policy 1 - Significance the basis for management, planning and work;**
- **Policy 2 - Conservation in accordance with the Burra Charter;**
- **Policy 9 - ANU Heritage Program; and**
- **Policy 16 - Expert advice and workers skills.**

7.4.3 Works Program

Refer to **Policy 16**, the Implementation Actions in Table 17 and the policies and strategies in Table 16.

7.4.4 Criteria for Prioritising Work

See **Policy 16** and **Policy 18.3**.

7.4.5 Resolving Conflicting Objectives

See Strategy 24b.

7.4.6 Annual Review

See Strategy 16b.

7.4.7 Resources for Implementation

The ANU will continue to allocate appropriate financial resources to the conservation of the Siding Spring Observatory. The actual budget for the maintenance of the SSO site is subject to normal budgetary processes which may include changes from year to year.

As noted in Section 6.7.2, the ANU has staff that oversee management and undertake some tasks, but otherwise it uses contractors to undertake actual works. These staff and contractors will, to some extent, be involved in implementing aspects of the plan.

7.4.8 SSO Asset Management Plan

As per Implementation Strategy 18.1, the SSO Asset Management Plan should be updated to guide the detailed conservation, replacement and maintenance of significant heritage elements within the site. Some of the suggested actions are included in Table 17 below.

7.4.9 Siding Spring Observatory Implementation Actions

Table 17 lists specific actions that are derived from the Implementation Strategies listed above. (Refer also to Table 12 and related Implementation Strategies).

Table 17 - Siding Spring Observatory Implementation Actions

No.	Action	Policy Ref.	Priority	Timing
A1	Review and update the ANU Heritage Register in line with the findings of this HMP	Policy 7	High	< 1 year
A2	Consider nomination of the SSO for inclusion on the CHL	Policy 6	High	< 2 years
A3	Determine appropriate maintenance standards and benchmarks for SSO site elements	Policy 30	High	< 1 year
A4	Update and implement the SSO Asset Management Plan to identify maintenance policy and priorities for significant heritage elements. The plan should address environmental sustainability issues and include a maintenance schedule.	Policy 27	High	< 1 year
A5	Undertake works to arrest the deterioration of redundant structures of heritage significance - in particular the 24 Inch, 16 Inch and Uppsala telescopes.	Policy 27	High	<1 year
A6	Commission a thorough assessment of the ecological values of the SSO site and develop a Siding Spring Observatory Biodiversity	Policy 36	Medium	< 2 years

No.	Action	Policy Ref.	Priority	Timing
	Management Plan in cooperation with NSWPWS.			
A7	Commission a formal visitor survey to determine visitor requirements at the site	Policy 46	High	<1 year
A8	Develop a Siding Spring Observatory Interpretation Plan	Policy 42	High	<1 year
A9	In line with the findings of the visitor survey and this HMP, review the internal arrangement of the Visitor Centre and redesign as necessary to provide an effective gateway to the site	Policy 47	Medium	< 2 years
A10	Create a corporate identity for the SSO site, to be used in all external publicity and marketing, as well as internal signage	Policy 46	Medium	< 2 years
A11	Review and renovate the Exploratory and other site interpretation in line with HMP policy and the Interpretation Plan	Policy 43	Medium	< 2 years

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PLANS

Plan 1 Site Plan

Plan 2 Site Elements and Areas

Plan 3 Significance of Buildings and Structures

APPENDICES

Appendix 1 Commonwealth Heritage List Criteria

In Australia, heritage criteria, thresholds, and statutory listings are the primary means by which the heritage values of places are articulated, and for guiding the management of these places.

When the Australian Heritage Council assesses whether a Commonwealth place has significant heritage values, it is required to advise the Minister for the Environment if the place meets one or more of the nine Commonwealth Heritage List criteria to at least a level of local heritage significance. The nine criteria, which are included in the Regulations which accompany the EPBC Act at Division 10.5 (Regulation 10.03A), are as follows:

a) the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history

b) the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

c) the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history

d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:

- a class of Australia's natural or cultural places; or
- a class of Australia's natural or cultural environments;

e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group

f) the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period

g) the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

h) the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history

i) the place has significant heritage value because of the place's importance as part of Indigenous tradition.

Appendix 2 Online Survey Results

Appendix 3 Interview Data

Aileen Bell

Manager Economic Development and Tourism, President of the Arts Council

20/05/2014 Georgia Melville spoke with Aileen at the Coonabarabran Visitor Information Centre

Community restrictions

There are light restrictions on the local community because of Siding Spring. "Our community has had to accept restrictions on development as it relates to light pollution and dust. We have always had the night sky to think about".

Warrumbungle Shire Council has a policy on protecting the night sky in the Regional Environmental Plan and the Orana Regional Lighting Plan also refers to ways in which the dark night .sky must be protected. For example, there was a hotel in Tamworth with a flashing light on its roof which was reflecting and seen from the mountain. It had to be taken down.

The road to the SSO is a Council road and is high maintenance.

Community benefits

There are 3,200 people in Coonabarabran and 9,000 in the wider Warrumbungle Shire. It would be a huge loss to the community if the observatory was to close.

Siding Spring has provided the community with employment, tourism, visitor/school programs.

"Astronomy has a huge affect on our lifestyle". There have been positive changes to the community's facilities, arts, sports and schools for example (the high school has very good academic results, especially in physics). Professional staff have utilised our community resources – schools etc. and this has been positive for the wider community

Many young people have gone through to become science professionals. There is one particular case of a young single mum who moved to Coonabarabran because her child was interested in astronomy. He later became an astronomer.

Siding Spring used to have its own little community living on the hill, but these people realised they instead wanted to be part of the wider community. There are always visiting staff and their families in Coonabarabran.

The "You're from Coonabarabran When" Facebook Page which was established about 3 months ago has more than 2800 likes.

There is a bridge named the "Bart Bok Bridge" acknowledging the astronomer who lived at SSO when it first became operational.

Coonabarabran was looking to make a sister city of Ibara City (home to the Bisei Observatory). Hank Sato was the interpreter/contact between the two councils.

Coonabarabran would love to develop school internships and Japanese exchange programs linking the observatories.

Tourism in the community

Warrumbungle Shire comprises six towns and three very different National Parks – Coolah Tops (folding hills, great dividing range), Pilliga (open plains country) and the Warrumbungles (volcanic).

The major attractions for the local area are:

1) National Park / Natural environment
2) Astronomy

The natural environment attraction is linked to its clear night skies. There are links between protecting the clarity of the night sky and the circadian rhythms of animals. Protecting these

things leads to increased tourism. Putting astronomy and the environment together makes sense (Aileen has presented at conferences about these linkages).

Warrumbungle Shire tries to capitalise on their point of difference. There are lots of places with National Parks, but for Coonabarabran – astronomy is the point of difference. Coonabarabran can offer a total immersion in astronomy.

Locals don't tend to regularly visit Siding Spring, it is mainly tourists, yet that doesn't mean it is not important to locals.

About a decade ago, previous Site Manager Penny Sacket announced the possible closure of the Visitor Centre because it wasn't central to the site's research aims. There was large community outcry. The local Mayor met with ANU and it was subsequently avoided.

On the Newell Hwy, Coonabarabran receives the 2nd highest number of overnight visitors after Dubbo.

Tourism is worth $37 million to the Shire's economy, and most of that funding would be Coonabarabran driven as the statistics are based on criteria that would include only the Coonabarabran accommodation operators. Its positive effects of the community's economy are great. For example Coonabarabran has a limited number of empty shops in the CBD and when a major chain wanted to establish here... there was no space within the CBD.

Coonabarabran's tourism also adds value to the rest of the Shire with tourists spending time in the region. Dubbo acknowledges that Coonabarabran is a destination in itself.

There is growing regional tourism to the area – mainly for quick breaks and weekends. Many families going to the national park for short camping breaks, for instance from Dubbo.

The Tamworth region values Coonabarabran for its astronomy (and visit because of that).

There are 30,000 to 40,000 visitors annually passing through the Coonabarabran Visitor Centre. There are around 63,000 visitors that go to the national parks annually.

Daily visitation to the Coonabarabran Visitor Centre is approx. 80 – 100 people. Early morning visitors tend to have arrived the evening before and have time to visit the area that day. Late afternoon visitors tend to want to know where they can stay and what can they do that evening.

Of those who come into the Visitor Centre, about 20 visitors a day probably visit Siding Spring. 50 probably go on to the national park. It would be useful for Siding Spring to have an effective way of counting visitors that arrive on site. We need to remember that the Visitor Centre is only one source of information for visitors to the area; many use websites etc. for their planning and do not need to visit the Centre at all.

Tourism numbers bottomed out after the fires and then went up again the following year.

Tourism to the area also justifies private observatories.

There was a huge influx of tourism in the town for Hayley's Comet. Thousands of Japanese people visited. There were people who remotely accessed the telescopes.

The Coonabarabran Visitor Centre has also displayed exhibitions in the past focused on Siding Spring.

People come into the Coonabarabran Visitor Centre talking about "The Dish", (they want "The Dome").

Programs and events

About 15 years ago Coonabarabran decided to embrace being an astronomy town. It was a community driven idea: The "Coonabarabran Astronomy Capital of Australia" Committee was formed, headed by John Shobrook.

The town adopted an astronomy theme and each business had a constellation or astronomy feature. A display board was created for each business and their staff became experts in that feature. Each business paid for its own display board.

The committee also developed the concept of a Virtual Solar System Drive. It was in the pipeline for ten years, and implemented in 2007. It was funded by the Shire Council and *AusIndustries*. It was subject to a Guinness Book of Records action. Along the DRIVE were large information boards with the planets. This was negotiated with the RTA for appropriate stops/rest areas. It gave people an understanding of the solar system (38million times to scale) and was all created locally, providing employment opportunities It also linked Coonabarabran and Siding Spring Observatory with regional towns as the drive commenced about 200kms from SSO... from Moree, Merriwa, Mudgee, Dubbo so that *all roads led to Siding Spring Observatory*.

The initial 'Science in the Pub' event was presented in about 1998. It featured astronomers putting forward their arguments on the universe and all things astronomical. In the early days the Arts Council worked closely with the AAO to bring this together. Over the years the event has outgrown two venues and draws people from all parts of Australia to visit Coonabarabran and SSO over the October long weekend.

'Warrumbungle Festival of the Stars' – used to go for 3-4 weeks, now it only spans two weekends and one week. The festival draws the Arts and Astronomy together and throws in a little local culture too. In 2014 the program includes: Star Fest (Open Day at SSO, Science in the Pub, Bok Lecture and celebrations around the 50th anniversary of SSO and 40th Anniversary of AAO), Spring Race Carnival themed as Racing with the Stars, Warrumbungle Arts & Crafts Art Exhibition and EXPO and several sporting events which promote with an astronomical name.

In 2014 Coolah also introduced a couple of astronomy activities as their part of the Festival of the Stars... these had limited support but in 2015 there is a stronger push for involvement and inclusion. "Astro Adventure Tours' - Donna Burton will provide telescope viewing and storytelling.

Some 15 years ago an Astronomy Tourism Trail was established... with Dr John Dawe (that time the Astronomer in Charge at SSO) as chairperson. The trail included astronomy tourism product – The Dish at Parkes (3hrs drive), the Compact Array at Narrabri (1.5 hrs), SSO at Coonabarabran, Darbies Falls Observatory at Cowra (4.5 hrs drive) and Tidbinbilla and Mt Stromlo at Canberra (6-6.5hrs drive). The group introduced a concept of a 'Passport to the Stars' to encourage visitors to each astronomy complex – there was also interest from Central Coast to participate.-

In 2014 a Melbourne based screenwriter proposed a television series with a storyline based around life at an isolated observatory – a little bit of romance, a little bit of drama and even some intrigue .. The story *Under the Milky Way* is set in several observatories – at Siding Spring, Coonabarabran, somewhere in Tasmania and also Arkaroola in SA... the filming for the on site astronomical storyline will commence early in 2015 at Siding Spring Observatory as this site is most accessible. Funding has been confirmed and casting complete – the show will feature 1960's pop icon Marty Rhone. Siding Spring staff have been most helpful with provision of resources for filming. At the time of writing, negotiations are underway to present the series on either ABC 2 or SBS.

Tourism at Siding Spring

The Siding Spring Visitor Centre – known as Siding Spring Exploratory is a little tired, however people really like it. Each panel is like a thesis. It can be a little overwhelming because there is so much information, but visitors may not want to admit it. ANU and Siding Spring should look to interpretation specialists to create the visitor experience, rather than scientists. It would be helpful to answer key questions in a simple way e.g. What is Deep Space? Why is Siding Spring important?

It would be helpful for visitors to have access to a scientist. For example Scott, a previous Siding Spring researcher used to give tours, he had a lot of personality and drive, visitors really appreciated this.

For us at the VIC it can be a problem explaining SSO to intending visitors – the fact that people are not going to be able to LOOK THOUGH A TELESCOPE when they are there is an issue. Explaining that it is a research facility and that researchers are looking at things much further into space than near planets and stars doesn't always satisfy the visitor. That they can go to a gallery and see the enormity of the 3.9metre telescope helps a little. It should be noted that visitors are wanting to see something SPECTACULAR or at least have questions answered in an informed manner.

It would be great to create a tour of the site that takes in telescopes that aren't open to the public, with the chance you might come by a 'real' astronomer. It could be say $10 per person, $25 a family of four, with the exhibition for free. People would really love that and would stay for lunch.

The Visitor Centre is under utilised. Locals may go more often if the café had a view. An idea could be to move the café forward to where the Exploratory currently is. A conference centre could be another option e.g. AMP or Credit Union of Australia meetings. This venue would be "out of this world".

The lodge was lost in the fires and now there are only temporary small rooms for the astronomers. What about building dormitories?

Another idea is school visits on full moon nights when there are no astronomers. There could also be a 'meet the astronomers' program/tour.

Open Day is the one day of the year when lots of locals go to Siding Spring. The mountain is 'alive'. Staff give their time to share what happens there, it is the one chance to speak to astronomers on site.

One issue for tourists to the site is that you can't tow a caravan for the last 4km up the mountain, making it difficult for many people to visit the site (families don't want to unhitch their caravan, leave it there, and return. Also there is a worry about the safety of caravans).

Major community observatories:

1. Warrumbungle Observatory (Peter Starr).
2. Milroy Observatory (David Baker and Cameron Wyllie). More for the specialized astronomy community. Its market is 'boutique' tourism. Milroy currently cater for many Japanese tourists who are amateur astronomers. This telescope is the original 40" telescope from SSO, gifted to Milroy.
3. Mobile telescopes (Donna Burton). An ex employee of the Siding Spring, runs "Astro Venture Tours". She'll take telescopes to where you are - school camps, paddocks, etc. She is located in the Main Street telescope shop.
4. Sky Watch Observatory was established as the first public access facility for tourists but the astronomy facility has now closed and is converted to "DomeStay" accommodation on the edge of town

Personal memories

Aileen remembers being at school when the mirrors came through the town. The school bell wasn't rung, allowing all the kids to stay and watch as they were driven by (the kids were hanging over the fence looking towards the road as the trucks went by).

Aileen also remember the road being built to Siding Spring. 'A Sunday drive each week showed us the progress of the road.'

Amanda Wherrett

SSO Tour and Administration Officer

21/05/2014 Georgia Melville spoke with Amanda onsite

19/06/2014 and then again via phone

What types of visitors go to Siding Spring Observatory?

- School Groups - High School groups Year 7-12, Primary groups Years 5 & 6.

  Most travelers of the Newell Highway heading north to Qld from Vic or south to Vic from QLD will pass through Coonabarabran and make a trip to Siding Spring at some time. Many come from the wider local region, and some from Sydney (all word of mouth and information distributed by the local visitor centres, with not much of a marketing budget). For example, Armidale High School Yr 12 Physics class visits regularly because the teacher is very familiar with SSO and has an interest in astronomical science. When schools come from Sydney, often it is the first time kids have been to 'the bush'. Most visitors are travelling up or down the Newell and stop by after having visited visitor centres, or have seen the big AAO dome from the distance a satisfied their curiosity.

  It is very easy to provide relevant content for schools. Themes that are commonly covered include seasons, the earth moon orbits, our solar system and planets, fundamental science and physics, geology, astrophysics, sometimes cosmology. Many boxes are ticked from the Australian Curriculum Science Domain / 'Earth and Space Science' strand. School trips often combine the National Park and Siding Spring Observatory and students love it. Teachers most often camp in the National Park, see Siding Spring during the day and look through telescopes at local public observatories at night and get the whole experience

- Random travelers (including caravan clubs) - this visitor type often 'stumble' upon SSO. They don't know what to expect, but leave impressed. Many see the AAT Dome from a distance on the Newell Hwy and come in for a visit. Also the 3D Solar System Drive panels list that AAO is the 'centre of the solar system' so people are informed about it ahead of time. People are drawn to visit if they follow the planets in order to the "Sun" which is the AAO dome.

- Social clubs i.e.: Motorcycle Clubs and Bicycle Clubs have trips or races (often part of the trip is riding up the hill to get there)

- Social Groups (Men's shed, rotary, scouts, senior citizens,)

- Coach Companies – e.g. 12 day east coast tour.

- Elderly – 'grey nomads' and camping and caravan travelers.

- Locals – particularly on Open Day

What do visitors experience / want to experience when they go on site?

Visitors want to see the telescopes, see them working and talk to people/staff about what it all means and why astronomers are using telescopes and how. Visitors want to walk the site or be driven through the site on a bus/car and see the landscape surrounding the site, the bigger picture seems to fall into place for people of all ages when they experience these aspects of SSO in a very effective way that people really enjoy.

Currently, visitors may see the 'Exploratory' exhibition space, go to the AAO telescope viewing gallery (and may be lucky to see the telescope move or have a chat to one of the engineers/scientists) or spend time in the café enjoying a meal or purchasing souvenirs. If visitors are on a tour they will be taken up to the Trig Station lookout with Amanda where most tour content is provided. Tour content covers a wide range of subjects – from the importance of the volcanic landscape and why Siding Spring was established within this region, plant and animal life (endemic species) too as the SSO site overlooks the National Heritage Listed Warrumbungle National Park, to the astronomical science carried out at each

observatory on site observing the night sky and universe. All topics are somehow related to the subject of astronomy and the site of Siding Spring Observatory.

There is something about the view from the Trig point lookout, looking from above and across the mountain top and indeed the regional landscape that surrounds SSO that people love. Together with the big domed telescopes surrounding the lookout and the heady topics of astronomical science, it seems to changes people's perception. It is a 'sensorial experience'. The Siding Spring experience touches people on another level – it takes them away from everyday life and provides them with the space to view their world from a different perspective, the big picture. It's the sensorial aspect that brings the different visitor elements together into one message. It is the trig point where this is cemented for people (hence it is effective to give most of the tour content there), and sometimes it is when seeing a large telescope move which Amanda sees time and time again but is still always impressed by people's reactions to this. Often people remain silent and stand in awe thinking, in a reflective mode. Others may ask about life on other planets. What is out there? How does it work? Where do we fit into the scheme of things? etc. It's about the human experience. SSO can provide people with a feeling they are 'one part of the universe, part of something larger than their daily life routines, in effect the evolution of the universe to a point of self-recognition. Humans are of the universe and observing the universe, so they are the universe looking at itself, which is astonishing '.

SSO is not advertised in many places (no marketing budget). For example, tours are advertised on the SSO website and posters in regional areas/ libraries, noticeboards etc. but not anywhere else. Bookings are made through a 'Tour Request Form') via email/telephone. Yet sometimes large groups show up unannounced. This places pressure on those members of staff working in the café (only one staff member) and providing tours. As well as groups, large numbers of people arrive individually and wander around.

What would you recommend to improve the visitor experience?

It's important to identity visitor types and develop products targeted to them. For example, the following are some ideas:

Boutique traveler / amateur astronomers/ science elective students and their teachers - About 1 in 50 visitors to SSO know something about telescopes and get frustrated with the small amount of content they can experience - they can't access a telescope or speak to the scientists). A specialised tour developed for them would corner a niche market. If that is not possible, some targeted interpretation material.

'A night of astronomy' package would be popular. Start with champagne on the balcony of the 40" with the northern views to the horizon, simple delicious food, telescope use "be an astronomer for a night" (perhaps in the 40inch building?), comfy bed, sunrise at the Trig Station, followed by simple delicious breakfast. Must be well chaperoned at night and must leave in the morning so not to disturb astronomers at night. People would pay good money for this experience and this experience would be like no other on offer.

'Star Parties' are another potential market. Star Parties are 'themed' amateur astronomy gatherings. For example, Donna Burton holds some of these - 'come and have a hot cocoa and view the lunar eclipse and learn about the cosmos'. These star parties would not be able to be held at SSO regularly but a rare event would be acceptable.

Astronomy Clubs would also be thrilled to have a tailored visit to SSO particularly if there was a behind the scenes tour. They occasionally come of their own interest imagine if they had a special invitation? .

People are disappointed to not be able to see through a telescope here at SSO, this is easily remedied by providing a small solar telescope to look at the sun and reflector telescope to look at the moon and Venus during the day when that is possible. The reflector MUST be handled by an expert only.

More and better interpretative material would really be valuable as tours are not always possible, and not all people want tours. Options could include brochures, signage and updated

technology. Most people are learning through computers and multimedia technology the Exploratory does not currently have this available.

Take away information is important and often requested (range of books, literature souvenirs for grandkids, for example). Site specific take away information is needed, a booklet on all functioning observatories and up to date information of what they are observing and projects undertaken.

Onsite accommodation would be worth considering for small groups of Year 12 students, university students, amateur astronomers or boutique travelers. This would need to be in a place that did not disturb astronomers during the day times . (As a side note, the design for the new guest astronomer's lodge has already begun).

The development of self guided tours would be really helpful using interpretative materials but need to be well planned (you can't have cars going up and down the road disturbing scientists and particularly with the narrow road breadth this could be hazardous too). An option could be to identify one particular hour, say 11am each day, when say 3-4 cars are escorted to Trig Station (or taken in a bus?). There would be interpretative information up there, and a member of staff/guide accompanying the visitors, for OHS reasons and to answer questions. Currently, on tours for example, many people attempt to walk outside the designated area to take a photo unaware of the potential danger around cliff edges, and have to be politely reminded to return.

The exhibition space 'The Exploratory' was developed around 40 years ago. The permanent information of the walls need updating because of its age and the way people prefer to absorb information these days has changed with multimedia tools etc. Temporary exhibitions are moved in and out of the space, so are not as urgent in terms of change. Generally visitors are overwhelmed by the amount of reading information to absorb, especially children or people with short attention spans. The SSO community is really keen to be involved and to contribute to an upgrade by providing current information from their observatories. Even if in the short term, a few thousand dollars were available to freshen up the aesthetics it would go a long way (such as a lick of paint, new ceiling art).

More than anything, what is missing at SSO is the personal experience of looking through a telescope. Presently the SSO visitor reads/learns about the universe in the Exploratory, they get to ponder it and have their 'world open up' in a sensorial way through the views of the land and the sky above. This is heightened by a visit to the Trig Station and interpretative guidance (currently given in the tour format). Visitors take in the domed observatories and a big telescope looking skyward, but they don't get to 'see' for themselves. That is the gap. To fill this gap they are currently directed off campus to use community telescopes at night time, which is great for local business, but the SSO site lacks a telescope for their own guest's enjoyment.

Ways around this may be by offering viewing through a solar telescope (so people can look up during the day), expert guided use of a regular telescope on the moon when it is up during the day, a planetarium (they are not as expensive as you would think!) or provide a 3D movie experience in the Exploratory auditorium. Involving the 40 inch Dome in this aspect of the experience would be optimal, being allowed to enter an observatory and get it going during the day would be wonderful for showing people what it would actually be like being a working observatory.

Why is making these improvements difficult?

Resourcing is currently the biggest issue to meet with these ideas, but achieving some ideas could have great flow on effects for SSO and the local community.

There is also the very real issue of sensitivity to the site's science mandate. There would be employee reservation about visitor site access during the night times, but well planned initiatives in consultation with site employees/residents may be really well received. It would also be important to consult with non ANU/AAO SSO community members, such as the Korean, Polish, Hungarian and American telescope operators for their permission and feedback.

The lack of external accommodation options for large groups on a budget also makes school visits difficult. There used to be a nearby dormitory style accommodation that slept 60 people, but this was badly burnt in the fires. This is where school groups would stay. It was not completely destroyed, but would need substantial investment to get up and running again. Amanda feels it would be well used by SSO visitors and would greatly increase marketability.

Now the only real option is tent camping or hotels/motels something that not all are so keen on organising or paying extra for with school groups.

Can you comment on how ANU Facilities, ANU Research, the AAO and any other organisations on site, work together to promote the visitor experience (or not)?

The AAO Director and Operations Manager are very supportive of educational outreach, to the point it is in the AAO official mandate. The AAO offers visitor gallery access, good staff numbers and are always happy to receive visitors with prior arrangement. The RSAA have outreach as part of their official mandate too, though they do not have as many staff as the AAO they are always very supportive and bend over backwards to help whenever possible with educational outreach (Peter Verwayen in particular is often there to help). When visitor groups are booked in, Amanda will liaise with either AAO or RSSA to ensure someone is available to receive them, give a presentation or support the tour however they can. Sometimes it is appropriate to provide a behind the scenes tour which is very special for visitors and provides the 'wow' factor.

There is an understanding amongst SSO site workers that gaining public awareness helps to support their work and give it relevance and encourage the next generation coming through. Employees want to get the message of astronomy out there, particularly in the light of budget cuts.

Any ideas for heritage partnership programs with local/regional communities?

Partnerships are already occurring with community telescope operators. Off campus telescope operators are recommended to visitors to visit depending on which is more suitable offering for the request involved. (all cater for big groups).

Warrumbungle Observatory (Peter Starr) – great equipment, ability to enable astrophotography with guest's own cameras, variety of telescopes to use and explore the night sky with.

Milroy Observatory (David Baker & Cameron Wylie) – boutique market, 40 inch telescope! And other smaller ones, glorious sunsets in bush surrounds.

Mobile telescopes (Donna Burton) – accessible to everyone, passionate about astronomy and very interactive.

Many local community members are either hot or cold for SSO – they love it and identify with it, or aren't bothered (it is just something in the background for some people. For example, a long term resident who Amanda spoke to in the supermarket recently said she had never visited SSO or the national park, ever, the lady remarked that "it's not like there is a shopping mall out there" Perhaps if she had been encouraged to visit SSO somehow, free entry free coffee and cake for locals?? She may have found something to relate to and her world may have opened up?) SSO goes to the community of Coonabarabran once a year with the Starfest event which engages the locals with fun and activities. Great time to invite locals up for a look to SSO, offer a special for locals day with tours and lunch?

A couple of decades ago astronomy in the local community was much more current, and people definitely associated with it. But people seem a little more apathetic now. This relationship could be reinvigorated. It wouldn't be difficult to entice locals up to the mountain. For instance, hold a special 'free local day', 'free tour if you bring a visitor up', or a 'free coffee with each visit', or special behind the scenes tour for locals with lunch at a budget price. Get them up here and wow them, let them feel connected to the site and discover something.

Fred Watson does a lot of community outreach work for astronomy (much more than onsite programs). He has his ABC radio show with a big fan base, he runs activities on open day, runs world tours of astronomical archaeology). His manager Marnie Ogg is very supportive of this.

Donna Burton is also an astronomy advocate within the Warrumbungle Shire community. She is very knowledgeable and is often developing community programs and events, along with her regular astronomy focused article in the local newspaper.

Interestingly the local school inherited a telescope. The principle was very enthusiastic to get the children using it. Perhaps a spring night event for a select amount of students from each year can meet with an SSO astronomer for a night? Open this idea up to regional schools too, this will get SSO on the map as a science education destination.

NSW tourism partnerships also hold a lot of potential. Dubbo, for instance, has a large tourism budget and would probably be happy to include SSO in their considerations, however SSO would need to present their product / approach them. The Dubbo Zoo and the SSO would be a great package for a weekend away. This is the same for Parkes. Parkes have done a great job at marketing and developing targeted visitor offerings, they send people right passed SSO on their way to Narrabri's ANTF radio facility . They have been very successful so far and would be happy to work with SSO, we have already met with the point of contact Glenn Nagle CSIRO.

People who live in small towns in the region would also be good to target. Many families are looking for things to do on the weekend, and it is exhausting travelling all the way to Dubbo or Tamworth for a fun kids activity. SSO could fill that gap if marketed in the right way.

Itelescope.net, an observatory at SSO, is interested in educational outreach as well. They would be happy to host an event with children in their classrooms during the day accessing their telescopes in the northern hemisphere during the night time there. Great for a classroom education exercise.

David Baker and Cameron Wylie

Owner/operator, and Astronomer in Charge of Milroy Observatory

20/05/2014 Geoff Ashley, Ian Travers and Georgia Melville spoke with David and Cameron while at Milroy and the Context team was given the opportunity to look through the telescope

Milroy Observatory started in 2010 when they received the 40inch telescope as a gift from Siding Spring.

Initially were going to build a little sliding roof observatory to house existing Japanese clients who leave their telescopes in Aust. Then ANU offered the 40".

The target market for Milroy is amateur astronomers and professionals from other others areas who are financially able to have this as a hobby.

This includes the Japanese market. Visitors from Japan who have come to Milroy have finished work on Friday, hopped on a plane, arrived to Sydney on Saturday morning, drove from Sydney to Coonabarabran, arriving at 4pm, to then return to Japan on Sunday.

The Bisei Observatory in Ibara City has a telescope that is one centimeter larger than the 40inch telescope at Milroy. Ibara City has a population of 30,000 people. The Japanese city faces similar issues locally, such as lighting restrictions. Hank Sarto has been a key driving figure for linkages between Milroy Observatory and the Japanese community.

Milroy Observatory is targeting the northern hemisphere market putting a package together having Coonabarabran the destination for a stand alone astronomical tour that would include Coona, Parkes and Narrabri.

The aim is to make Milroy Observatory the place to view in the local area through a powerful telescope. People can go to the Siding Spring Mountain site to see the Observatories, but cannot look through the telescopes. At Milroy you can. Milroy compliments Siding Spring and provides a rounded tourist experience.

Milroy has received a lot of support from the local community. There is a lot of collaboration between Siding Spring, Milroy and the local astronomical community. For instance, 'Science in

the Pub' will be held again this Saturday night. It will be a black tie event with a dinner for 100 people, and Brian Schmidt will present. Guests will spend one hour viewing at Milroy Observatory during this event. Another example is the local astronomy club that will visit Milroy tomorrow.

Frank Freeman

Ex AAO employee, Schmidt Telescope

20/5/2014 Georgia Melville spoke with Frank while at the local historical society

General information

Moved from UK to work with family in 1977 to work as a Telescope Night Assistant. Frank was responsible for aluminizing the 3.9metre diameter mirror, vacuum technology and cryogenics at the telescope

When Frank arrived, he felt it was "impressive", he was "awe inspired"… "that machine was so beautiful.. I thought, "Crikey, and I'm going to drive that!"

It was a joint venture. UK/Aust 50%/50% split in observing time – both wanted to look at the centre of our galaxy, the Milky Way.

The UK Science Research Council, acted as the British Partners of the AAT.

S C B Gascoigne (author of The Creation of the AAO) died when he fell off the Dome catwalk from 30ft when the Dome moved while he was outside. A second person died when scaffolding gave way.

Celebrated 40 yrs of AAO in 2010 with short lectures. A conference where oldies and newies came together to review the work, people and discoveries of the AAO

Fred Watson is a great character –involved in explaining the AAT's work and Astronomy.

A major instrument for SSO research was the 2dF (2 degree field), a multi fibre instrument.

Some people to speak to include Don Morton (2nd director of AAO), Russell Canon, Brian Boyle and Matthew Colless.

Lots of international collaboration with SSO. International visitors would stay in the lodge but destroyed in the fires. Astronomers would come out at different times of the year when their targets were visible in the Australian night skies. There were many multinational teams. Aussies wanted the collaboration and also in return could then use others' telescopes overseas. For example, the "Gemini Telescope" in Chile..

The Anglo Australian Telescope Project , AAT – British pulled funding so Aussies had to fund it, and it was renamed became the Anglo Australian Observatory, AAO.

There is lots of maintenance needed. The mirror needed to be aluminised once a year – "Aluminizing" –was done on the shortest night of the year and near the full moon in an effort to minimize loss of prime observing time.

What do you think of the SSO site?

"Lovely", "Beautiful", "Good employers and staff". Lots of Japanese interest.

Frank also likes the - Exploratory, coffee and the wonderful views over the Warrumbungles.

What about the interaction between astronomers and the local community?

"No division", lots of interaction with locals and local organisations – Lions Club, Rotary, etc.

Related events?

Astronomic tourism

Star Fest in October

Science in the Pub (last time it was hosted by Brian Schmidt (A recent Nobel Prize winner, and well attended)

Festival of the Stars – parade with floats down Main St (no longer happens)

In the local library there is the "Australian Sky and Telescope"

You can visit private telescopes– on and around the area of Timor Rd (with a lot of Japanese interest in telescopes).

Comments about community

The Newell Hwy is the premier road traffic route from Melbourne to Brisbane, and it passes through Coona. In the past there have been many debates about a bypass around Coonabarabaran to remove the large number of very big trucks from the town centre..

Tourism –Warrumbungles is a big draw card, so is astronomy. Farms have been subdivided up for farm stays.

It's the "Big white pimple".

Coona has a semi critical level of population (3000 when he arrived) Other similar sized towns struggle.

Used to have a railway, wheat board, airport – they are all gone now. Local stores are now being taken over with giants like Woolies and Subway, Coona is changing. And it is hard to get to Sydney on public transport now with no railway or airline – only a railway bus to Lithgow and onwards or a 105 Km drive to the nearest railway station in Gunnedah.

John Whitehead

Current member of the Regional National Park Committee, Warrumbungle Shire Council Civil Engineer 1966-1994

20/05/2014 Georgia Melville spoke with John at his home

Local lighting policy

The ANU requested restrictions to development within 15km of the Observatory to prevent further subdivisions and light pollution. This was met with some community angst. Action was taken by John Whitehead and Dr John Dawe (the ANU astronomer) in association with the then NSW Department of Planning to produce a Regional Environmental Plana and linked Local Development Control Plans. The local lighting policy started in 1983 as part of the plan'.

National Park

There are 173 National Parks in Australia.

The Warrumbungle National Park was established in 1953.

Warrumbungle National Park may now have around the third highest visitor rate for a national park in NSW (after Royal and Kosciusko - although coastal national parks are gaining popularity).

Coonabarabran has the highest number of National Parks and State Conservation Areas within a 100km radius in Australia.

John sits on the Regional Advisory Committee for North West Palins.

Siding Spring

There has been good integration of astronomers into the local community. A school bus would go and pick the kids up from the SSO and take them to school in town. While service staff generally lived in town and travelled up the mountain.

John witnessed first hand the AAT build. It was pragmatically built for astronomy.

The viewing gallery was great - it was the first of its kind in the world.

There was a push from both the national park and the local council to include visitor facilities in the Observatory site.

In the 1989 Local Environment Plan John listed the observatory as holding scientific significance.

Unfortunately the 2013 fire has brought the largest amount of publicity to Siding Spring to date. It has created a new interest in the facilities and the region.

Important people associated with Siding Spring can be found listed in the book authored by John Whitehead - *The Warrumbungles* (2008).

24inch telescope was given to the local school. Locals are invited up to use the smaller ones.

Donna Burton writes an article in the local paper about astronomy and Siding Spring.

Dubbo ABC radio segment by Fred Watson on astronomy and Siding Spring.

Visitation to Siding Spring

Tourism has been up and down to SSO over the years.

In reference to last year's SSO Open Day, "I had not seen as many people in my whole life in the Observatory than on that day".

What does Siding Spring mean to you?

"A cluster of white buildings on a mountain" "a reminder of where I live". It is a familiar place; "best panorama I have ever seen"- "I'm in awe of that".

If Siding Spring was to go, "…there would be a great big hole in community activity, and not just because of the astronomers, but because of everything that the Observatory, National Park and State Conservation Areas bring".

Recommendations

It would be good to have a walking path around the telescopes.

The exhibitions need renewal. Exhibitions should be complimentary to that being built by the National Park Visitor Centre (currently being developed).

The following excerpt was provided by John Whitehead, taken from the last page of the second edition of 'The Warrumbungles'.

The Warrumbungle National Park visitation has not increased much in the last few years. The peak periods of school holidays and Easter are nearly always the best for the Park's income figures, but there is very little visitation outside these periods. The NPWS always seem to spend most of their funds on improving visitor facilities in the hope it might attract more holidaymakers, but this has not worked.

I consider that the only way to get more tourists is to provide more attractions. The concerts that have been organized have been excellent in exposing our Park for visitors but these activities are a short term only. I have been pushing for many years for more trails but this suggestion is always ignored because of the perceived need for capital expenditure and additional maintenance. The NPWS hierarchy needs to consider other means of creating trails by using different establishment methods. Several long tracks could be located further away from the existing central system using the original Strom method of providing markers and maps only. Of course, there will be objections to this suggestion but unless something new is attempted, the Park will become what the greenies really want, a Park without any visitation whatsoever.

At Siding Spring Observatory there is much change. Old telescopes are being removed and new remote systems are being installed. Tours are being proposed and suggestions to the ANU to combine with the NPWS Visitor Centre Discovery Ranger programs, are being considered. If the NPWS were to establish a trail system on their land around the telescope complex together with day tours of the telescopes, it would make a very attractive feature for tourists. A new Heredity Plan is being prepared and much will come out of this

Coolah Tops National Park has always been low key and it is hoped that the Warrumbungle Shire will enhance its features by including and building its superb forest and highland attractions.

I have written much about the Brigalow Belt South Bio Region decision and with the development of the facilities and infrastructure in the Baradine district of the NPWS, it falls on the people of Baradine and Coonabarabran to get as much out of the State Government system as they can rather than knocking it all the time. Tourism in this area is going to be the major community earner for both towns; all it needs is suitable and sustainable promotion. The National Resource Commission report is investigating new forms of management for the State Conservation Areas.

The Garrawilla Volcanic area has not been treated in any manner whatsoever from the tourism point of view and I would suggest that the area is an untapped source for tourist drives and visitation and maybe some farm accommodation.

And finally, to answer the question posed earlier in this work as to who was responsible for the creation and establishment of the scientific, natural and tourist attractions of the Range area.

I acknowledge both Alec Gould and Roy Quinton as being the two people who provided more input of their time and effort to the creation of the Warrumbungle National Park. They worked tirelessly over a period of more than 30 years, under difficult financial and staff shortage conditions, to provide the community with the wonderful Park we now have. Dunphy may have been one of the original initiators of the Park in the 1930s, but the Park was only one of many interests that he and his NPPA Council had for conservation purposes. He actually did not visit the Park until 1955. Politician Jack Renshaw provided the government backup to the establishment.

Bart Bok is recognized as the founder of Siding Spring Observatory and justly so, but it must be kept in mind that he initially favoured the Griffith site over Coonabarabran. Once others had made the decision for the SSO site, he immediately adopted the Coonabarabran community to his heart and the project.

Ollen Eggin, who came after Bok, is equally, but not so obviously, mainly responsible (with others of the project committees) for the creation of the Anglo Australian Telescope.

To the establishment of the Coolah Tops N.P., I acknowledge both Roy Cameron and Gordon Bryant as being those mostly responsible.

The Community Conservation Areas and Nature Reserves of the Brigalow Belt South Bio-Region were created by many people of the past 30 years and there is no specific individual or organization that could claim responsibility. There is too much political influence in this area for any critical judgement.

Joy Pickett

Coonabarabran local resident

20/05/2014 Georgia Melville spoke with Joy while at the local family and history group

Joy arrived to Coonabarabran in 1966 as a teacher and would take any visiting relatives or friends up to the trig station at Siding Spring because it was the best place to get a fantastic view of the countryside.

Joy's husband's grandfather, W J G Blackburn (William Jonathan Goodrum or "old Bill") occupied the land on which the observatory is built.

Joy has a great affinity for the site's natural environment and heritage. She is interested in the land it sits on and the stories relating to it - rather than the Observatory itself. There are other people who also feel the same way in the community.

There is a sundial outside the Court House which was donated to the town by Anglo-Australian Observatory. It was presented on Friday 16th October, 2009, to mark the 35th birthday of the AAT.

Judy Over

SSO former long term staff member

20/05/2014 Georgia Melville spoke with Judy while at the local family and history group

Judy started in working at Siding Spring in 1974 as the contract cleaner. Judy participated in a range of tasks at Siding Spring with her colleagues over decades, from aluminizing the mirrors, to cooking a feast for 43 people! It was a tight knit community, a great place to work.

Judy confirmed that cooperation was really good between the ANU and the AAO while she worked there.

"Siding Spring provides the local community with pride". A sense of: "We've got the telescope. It has that 'wow' factor".

Astronomers move into the local community frequently and they be become part of it. It is not about 'us' and 'them'.

Other important astronomy sites in the region include the Parkes Dish and the Narrabri Radio Telescope.

Judy kindly provided a large photo album she had collated of Siding Spring Observatory. Context took photographs of these images and some are included in this report.

Nancy Wiese

President Coonabarabran DPS Local and Family History Group Inc.

20/5/2014 Georgia Melville spoke with Nancy at the local family and history group

What does SSO offer the local community?

It draws observatory staff to the area and this has a flow on effect – staff move with families and bring their children. The children go to the schools. The High School has won a national award for excellence. It has led to economic growth for the local communities, including local employment in SSO (in different services – office, canteen, tourism).

At one time the SSO employed the highest percentage of people in Coona (not 100% sure if this was a fact).

There are 13 motels in Coona – a very high no. for its size.

Solar System Virtual tour- a committee was formed for the 'Coonabarabran – Astronomy Capital of Australia' lead by John Shobbrook.

There is reciprocal learning with schools in the USA – including remote access to telescope.

SSO Tourism

The SSO is a great place to take visitors. The café could be improved, it is not over welcoming. Lots of souvenirs which is great. The displays hold kids interest to a degree but too technical for children generally. The milk container idea is great.

Pay for entry but locals are free.('Locals are free' is not true – but sometimes people are allowed through for free) Nancy and her family go 4+ times a year. Some locals are apathetic to the SSO as a visitor destination.

Tourists may cover the observatory and the NP in one.

The first thing you see entering Coona on the Newell is the Observatory.

There are five tours that Nancy takes visitors on:

- Baradine Discovery Centre, Dandry Gorge – Sculptures in the Scrub, Sandstone Caves, Pilliga Pottery

- SSO, NP (White Gum Lookout, Rangers Office [burnt in fire], Blackman's Camp, Walks along the creek from the Camp)
- Goorianawa Valley
- Pilliga Scrub
- Oxley's Crossing.

Community restrictions

About 3 decades ago SSO /AAO were complaining of light pollution from Coona.

There were big lights on the oval casting shadows on the Dome.

Special hoods were put on lights and upside down sodium lights installed.

The public can't go right up to Trig Point because it would wake up the residents during the day as you drive past.

The local roads had to be widened to transport the equipment and mirrors – but this is okay.

What would happen if SSO was removed?

Detract from tourism and employment - people would leave the town.

What do you think about it?

"I love it". "Its ours" "Everyone is glad it is there".

We tell stories to our visitors about how the roads had to be widened for example.

We used to have tours across the mountain, walking tours, with information about the volcanoes.

The site was chosen because of the % of clear nights and absence of light pollution, and mountain temperature stability.

What would you suggest?

Tours would be good, and if not, audio interpretation. If a tour included going to the Dome and then to the look out - at the very top of the mountain people would go. Say 11am and 2pm daily, and the word would get out. Visitors would know and could plan their days around that, and then have lunch before or after at the café.

A wider road up to Trig Point would be useful.

There are lots of people with private telescopes in town.

- ANU site van (mobile telescope)
- Kevin Cooper (AAO employee)
- David Allen (has since passed away)
- Steven Leigh (SSO employee)
- Malcolm Hartley
- Donna Burton
- Peter Starr

Narelle Andrews and Merv Sutherland

CEO Coonabarabran Local Aboriginal Land Council and CLALC member & Senior Team Leader NW, Repatriation and Conservation, Northern Region, Heritage Division, Office of Environment and Heritage NSW

21/5/2014 Georgia Melville spoke with Narelle and Merv at the CLALC office

General information about Aboriginal land and historical uses

Siding Spring Observatory sits on Gamilaroi land (correct terminology is 'Gamilaroi' language and people and 'Gomeroi' nation).

Kawambarai and Weilwani are the neighboring language groups to Gamilaroi.

The Warrumbungles means "The Crooked Mountains" in language.

Generally the Warrumbungles are known as an Aboriginal area for teaching, meeting gathering and ceremony.

Traditionally a travel route passes through the Warrumbungles for communities moving from west to east, using the mountainous high points for navigation.

Known Aboriginal sites of a tangible nature in the Warrumbungles include Bora Rings (a place of initiation for boys), burial sites, scarred trees, rock art, resource collection areas (including stone tool manufacturing), shelters and campsites. And of course bush tucker is everywhere.

The Castleraegh River starts in the Warrumbungle Mountains and flows through to Coonabarabran. It is thought the travel routes would have often followed the river's path. This water source would have been a common place for food and resource collection.

The Castleraegh River was explored by John Oxley who passed through the area *[in 1818]*, and probably was one of the first non Aboriginal people in the region.

The present day town of Coonabarabran sits on the river, and may have been an Aboriginal camp place before that.

Local Aboriginal women Mary Cain *[born 1840s]* is a well known and respected past citizen and ancestor for the local community. Her parents were Jinnie, an Aboriginal woman, and Eugene Griffin, an ex convict. Mary Jane was a goat herder from the flats of the Castleraegh River to Forky Mountains. She married George Cain and moved to the Forky Mountain where she successfully gained legal ownership of a large area of land. This land became the Burrabeedee Mission, and in 1909 Aboriginal people living in the area were forced to live there. The Mission closed down in the 1950s and many community members moved to Coonabarabran (including to Gunnedah Hill, White Street and to fringe camps like Happy Valley).

Siding Spring Observatory and the Aboriginal community

The local Aboriginal community hasn't had much to do with Siding Spring over the years, expect of a general type as with the wider Coonabarabran community. It is something that would be great to change.

Merv and Narelle know of two Aboriginal community members who have worked onsite – an Uncle involved in its construction and Merv's son, who works there as an Apprentice Electrician.

Merv has memories of waving to Prince Charles in 1976 when he paid a visit to Coonabarabran because of Siding Spring.

It is important to raise awareness of the Aboriginal values of the area.

Possible recommendations

The following preliminary ideas from Narelle and Merv are listed here. Any confirmation of Aboriginal value assessment or future work before implemented would need to pass through the CLALC community (to the Board first then tabled at one of the three monthly members' meetings for consensus).

- Contact by the Siding Spring Visitor Officer to Narelle or Sherrin to meet and greet, and talk about how they could work together. For instance it would be great to see:
  - Traditional knowledge relating to the stars (such as the Emu Dreaming) and Country (community history and present uses) displayed or shared through Siding Spring.

- Bilingual signage and Aboriginal community involvement in developing these signs. Currently CLALC are working with the local Council to develop signs for the Shire (the CLALC and the Local Council have a good working relationship).
- Guest speakers or specialized tours on Aboriginal values of the area/sky sourced through CLALC. This could include for example 'night time stories'.

- Coordination between the National Park and Siding Spring display centers in terms of presenting any Aboriginal community and place.

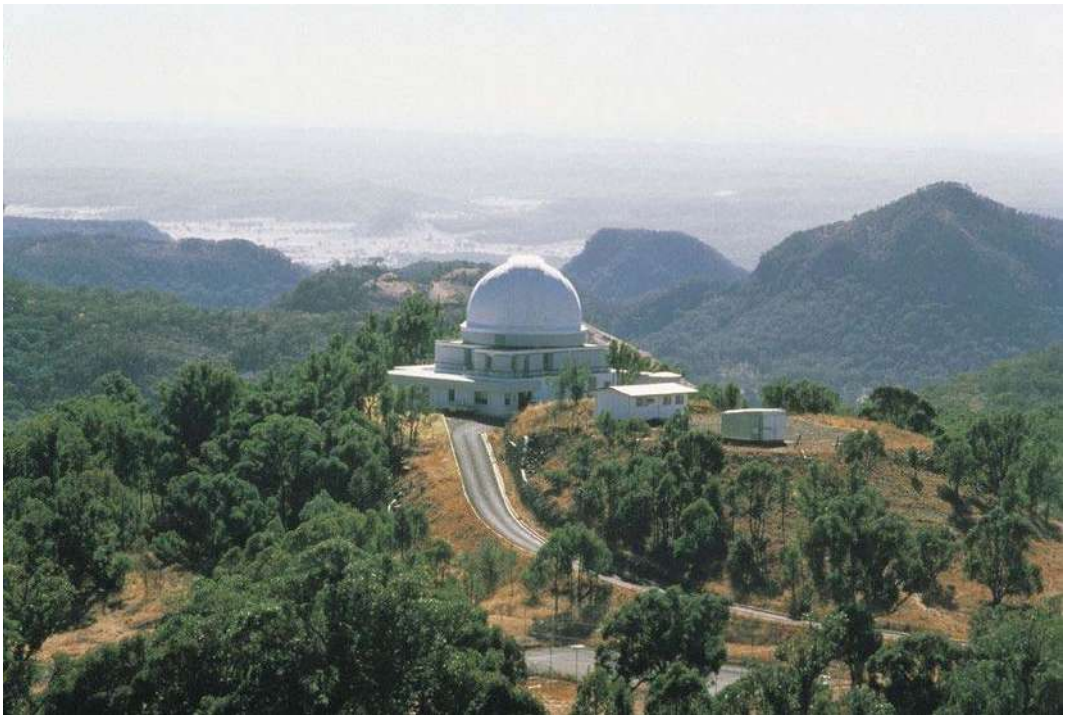
Appendix 4 Existing Materials Review Data

Image examples of Aesthetic Value Expression in the Public Domain

Source: http://hosting.itelescope.net/sso/

Source: http://rsaa.anu.edu.au/observatories/siding-spring-observatory

Source: http://www.dubbonsw.com/Warrumbungle_National_Park.html



Source: http://www.visitnsw.com/destinations/country-nsw/warrumbungle-area/coonabarabran

Source: http://woolgoolgaoffroad.blogspot.com.au/2012/08/pilliga-down-to-wurrumbungles.html

Source: https://www.flickr.com/photos/47932052@N03/5412605307/

Source: https://www.flickr.com/photos/abcnews_au/8379463336/

Source: http://www.starfest.org.au/

Text Examples of Aesthetic Value Expression in the Public Domain

The Warrumbungles form a distinctive and spectacular volcanic landscape of spires, domes, plugs and dykes that is uncommon in Australia (Context 2006, Crocker & Davies 2005b, Duggan & Knutson 1993), and the sharp rise of the landform from the surrounding plain to heights of more than 700m contributes to the aesthetic drama. The site beautifully exposes the inside of a shield volcano, and the bold volcanic landforms are unrivalled anywhere else in Australia (Yeates 2001). The integrity and scenic vistas of the features within the Warrumbungle National Park are of outstanding value to the community.

Source: NHL ID 105853, File No: 1/03/201/0001 2006: 2-3

Coonabarabran presents a picturesque and varied landscape from rolling hills, to the volcanic tors of the Warrumbungle Range, and the forests of the Pilliga.

Source: NHL ID 105853, File No: 1/03/201/0001 2006: 2-3

The spectacular volcanic outcrops of the Warrumbungle Range provide a backdrop to almost all of the district."

Source: Christison, R 2006: 28

The Siding Spring Observatory is also an iconic element of the Coonabarabran region social and tourism landscape. The Observatory has a high level of state historical, historical association and technical/research significance, rarity, representativeness and integrity, and a moderate level of state aesthetic significance. It also has a high level of local social significance.

Source: Christison, R 2006: 31

The majestic Warrumbungles, an area of forested ridges, barren spires, domes, vast plateaus, deep gorges and 43 kilometres of walking tracks are situated just a 50-minute drive (80 Kilometres) north of Gilgandra on the Newell/Oxley Highway to Coonabarabran.

Source: http://www.dubbonsw.com/Warrumbungle_National_Park.html

Inspiring the sandstone areas of the park often produce remarkable displays of wildflowers such as wattles, peas and heaths. You can see koalas, eastern grey kangaroos, wallaroos and emus. It is an ideal destination for bushwalkers, pack campers, photographers and birdwatchers, or those who simply enjoy watching sunlight change the colours on a cliff face.

Source: http://www.dubbonsw.com/Warrumbungle_National_Park.html

Warrumbungle National Park is popular for bushwalking, camping and encountering wildlife amid breathtaking scenery.

Source: http://www.visitnsw.com/destinations/country-nsw/warrumbungle-area/coonabarabran

A must do on the list is to visit the nearby Siding Spring Observatory, that was visible from our camp site. The drive to the Observatory rises to well over 1000 metres above sea level allowing you uninterrupted views across a majority of the Warrumbungle peaks that include The Breadknife, Febor & Macha Tor and more. The Observatory site is home to some 13 telescopes including the largest optical telescope in Australia which is an impressive 3.9 metres. Siding Springs Observatory is an ideal place for stargazing with its high altitude, low humidity, a non-turbulent atmosphere for viewing clarity, clean air and an average of 70% clear night skies, the kids and most adults will love this place and if timed right there are several tours into the Observatory allowing an amazing insight into the outer space.

Source: http://woolgoolgaoffroad.blogspot.com.au/2012/08/pilliga-down-to-wurrumbungles.html

The landscape of Warrumbungle National Park has been shaped by thousands of years of volcanic activity; spend some time looking at Crater Bluff and Belougery Spire and imagine the vents of magma that once erupted to create these formations. Old lava flows created at Mount Exmouth and Siding Spring Mountain, just outside the boundary of the park and Belougery Split Rock and Bluff Mountain are great examples of volcanic action. The most iconic feature in the park, The Breadknife, is a volcanic dyke which stands a massive 90m tall.

The park's big sky, amazing light and dramatic yet fragile rock formations make Warrumbungle National Park an outstanding place for amateur and professional photographers alike. The dramatic mix of volcanic spires and domes, plateaus, forested ridges and tall volcanic dykes are bound to make even the youngest of photographers look good, so whatever you do - don't forget your camera.

Source: http://www.nationalparks.nsw.gov.au/warrumbungle-national-park

Appendix 5 Species Recorded at Siding Spring Observatory

Appendix 6 EPBC ACT Compliance

Compliance with Commonwealth Heritage Management Principles and Requirements for Management Plans under the EPBC Regulations

The regulations under the EPBC Act 1999 provide a list of Commonwealth Heritage Management Principles as well as requirements for (conservation) management plans for Commonwealth Heritage places (*Environment Protection and Biodiversity Conservation Amendment Regulations 2003 (No. 1)*: Schedules 7A and 7B). The following tables provide a summary of compliance with these requirements.

Commonwealth Heritage Management Principles

No.	Requirement (Schedule 7B)	Compliance Comment
1.	The objective in managing Commonwealth Heritage places is to identify, protect, conserve, present and transmit, to all generations, their Commonwealth Heritage values.	Complies: Sections 4 and 5 Policies 1, 2, 3, 6 and 42
2.	The management of Commonwealth Heritage places should use the best available knowledge, skills and standards for those places, and include ongoing technical and community input to decisions and actions that may have a significant impact on their Commonwealth Heritage values.	Complies: Section 6 Policies 8, 9, 11, 17, 19, 30 and 39
3.	The management of Commonwealth Heritage places should respect all heritage values of the place and seek to integrate, where appropriate, any Commonwealth, State, Territory and local government responsibilities for those places.	Complies: Section 4, 5 and 6 Policies 7, 8 and 13
4.	The management of Commonwealth Heritage places should ensure that their use and presentation is consistent with the conservation of their Commonwealth Heritage values.	Complies: Policies 1, 2, 18, 22, 23, 36, 37, 38, 41 and 42
5.	The management of Commonwealth Heritage places should make timely and appropriate provision for community involvement, especially by people who: (a) have a particular interest in, or associations with, the place; and (b) may be affected by the management of the place;	Complies: Policies 14, 40 and 39
6.	Indigenous people are the primary source of information on the value of their heritage and that the active participation of indigenous people in identification, assessment and management is integral to the effective protection of indigenous heritage values.	Complies: Policies 14 and 42
7.	The management of Commonwealth Heritage places should provide for regular monitoring, review and reporting on the conservation of Commonwealth Heritage values.	Complies: Policies 10, 29 and 45

Management Plan Requirements

No.	Requirement (Schedule 7A)	Compliance Comments
(a)	Establish objectives for the identification, protection, conservation, presentation and transmission of the Commonwealth Heritage values of the place; and	Complies: Sections 5, 6 and 7 Policies 1, 2, 3, 6, 10 and in policies in general
(b)	Provide a management framework that includes reference to any statutory requirements and agency mechanisms for the protection of the Commonwealth Heritage values of the place; and	Complies: Section 6 Policies 7, 8 , 9 and 10
(c)	Provide a comprehensive description of the place, including information about its location, physical features, condition,	Complies: Sections 2, 3, 4 and 5 Appendices

	historical context and current uses; and	
(d)	Provide a description of the Commonwealth Heritage values and any other heritage values of the place; and	Complies: Section 5 Appendices
(e)	Describe the condition of the Commonwealth Heritage values of the place; and	Complies: Sections 5 and 6
(f)	Describe the method used to assess the Commonwealth Heritage values of the place; and	Complies: Section 4
(g)	Describe the current management requirements and goals, including proposals for change and any potential pressures on the Commonwealth Heritage values of the place; and	Complies: Section 6
(h)	Have policies to manage the Commonwealth Heritage values of a place, and include in those policies, guidance in relation to the following:	Complies: Section 5 and below
(i)	The management and conservation processes to be used;	Complies: Policies 2, 3, 4 and in general
(ii)	The access and security arrangements, including access to the area for indigenous people to maintain cultural traditions;	Complies to the extent necessary: Policy 46
(iii)	The stakeholder and community consultation and liaison arrangements;	Complies: Policies 12, 13, 14 and 39
(iv)	The policies and protocols to ensure that indigenous people participate in the management process;	Complies: Policy 14
(v)	The protocols for the management of sensitive information;	Not applicable
(vi)	The planning and management of works, development, adaptive reuse and property divestment proposals;	Complies: Policies 4, 11, 15, 16, 22 and 23
(vii)	How unforeseen discoveries or disturbance of heritage are to be managed;	Complies: Policy 16
(viii)	How, and under what circumstances, heritage advice is to be obtained;	Complies: Policies 16 and 17
(ix)	How the condition of Commonwealth Heritage values is to be monitored and reported;	Complies: Policies 10 and 29
(x)	How records of intervention and maintenance of a heritage places register are kept;	Complies: Policy 31
(xi)	The research, training and resources needed to improve management;	Complies: Section 6 Policies, 17, 18, 19 and 20
(xii)	How heritage values are to be interpreted and promoted; and	Complies: Policies 42 and 46
(i)	Include an implementation plan; and	Complies: Implementation Strategy generally and Implementation Actions Policy 42
(j)	Show how the implementation of policies will be monitored; and	Complies: Policies 10 and 16
(k)	Show how the management plan will be reviewed.	Complies: Policy 10