

Western Edge Investigation Area

Cultural Heritage Assessment

Report prepared for the Environment, Planning and Sustainable Development
Directorate, ACT Government

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CONFIDENTIAL



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Report Register

The following report register documents the development and issue of the report entitled ACT Western Edge Investigation Area—Cultural Heritage Assessment, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

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The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

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Abbreviations and Definitions

Abbreviations

The following table outlines a range of standard abbreviations used in the preparation of Cultural Heritage Assessments (CHAs) and specific abbreviations for this report.

Abbreviation	Definition
ACT	Australian Capital Territory
ACT Government	Environment, Planning and Sustainable Development Directorate, Australian Capital Territory Government
ASL	Above Sea Level
Burra Charter	<i>The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013</i>
CHA	Cultural Heritage Assessment
CHL	Commonwealth Heritage List
Cwth	Commonwealth
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwth)</i>
FCAC	Federal Capital Advisory Committee
FCC	Federal Capital Commission
FCT	Federal Capital Territory
GML	GML Heritage Pty Ltd
ICOMOS	International Council on Monuments and Sites
NCA	National Capital Authority
NCDC	National Capital Development Commission
NCOSS	National Capital Open Space System
NCP	National Capital Plan
NCPDC	National Capital Planning and Development Committee
NHL	National Heritage List
NSW	New South Wales
PAD	Potential Archaeological Deposit
RAO	Representative Aboriginal Organisation
RNE	Register of the National Estate
WEIA	Western Edge Investigation Area

Site Naming Codes

Key	Registration Status
AS	Artefact Scatter
C	Complex
CCA	Cultural Conservation Area
CMT	Culturally Modified Tree
IA	Isolated Artefact
PCMT	Possible Culturally Modified Tree
Q	Quarry

ACT Heritage Registration Key

Key	Registration Status
1	Nomination to the Heritage Register
2	Provisionally Registered
3	Registered Places or Objects
R1	Rejected from inclusion in the Provisional Register by the Heritage Council
R2	Removed from the Provisional Register by expiration of interim effect—all located on 'National Land' under the protection of the National Capital Authority
R3	Removed from the Provisional Register by the Administrative Appeals Tribunal
R4	Place or object has been combined into a new registration or precinct
R5	Cancellation of registration
R6	Final registration rejected
R7	Salvaged Aboriginal Heritage—no management implications; however, the place is still included in the list of places of Heritage Interest
R8	Nomination dismissed
▣	Damaged/Destroyed in January 2003 bushfires

Confidentiality Statement

The following report is intended for the Environment, Planning and Sustainable Development Directorate, ACT Government, and the ACT Heritage Council. It contains identifying and culturally sensitive information regarding Aboriginal heritage and heritage sites. It may be subject to a Section 54 *Declaration of restricted information* under the *Heritage Act 2004* (ACT), and, therefore, should not be publicly disclosed or distributed to other individuals or entities, leading to an adverse effect on the discussed Aboriginal heritage sites.

Cultural Sensitivity Warning

Indigenous Australian readers are advised that this report contains the names and images of people who have died.

Executive Summary

The Environment, Planning and Sustainable Development Directorate, Australian Capital Territory Government (ACT Government) has engaged GML Heritage Pty Ltd (GML) to undertake a Cultural Heritage Assessment (CHA) of the Western Edge Investigation Area (WEIA). The CHA will aid to inform a framework for development planning decisions for the ACT.

The landscape within the WEIA has been the location of numerous important events throughout Canberra's history, beginning at least 25,000 years ago. The area served as a key location for the Aboriginal communities who lived in the area; the open landscape provided a number of crucial resources and the Murrumbidgee and Molonglo Rivers acted as 'highways' through Country. When Europeans arrived in the area in 1820, within a few decades the land had been carved up into several landholdings. In 1908 the Canberra area was selected to be the Federal Capital Territory of the recently federated Australia. The first 50 years of development as the capital city was shaped by ambitious city design, the drive to establish a population and economy, and several technological feats. Following World War II, Canberra saw a surge in population, which led to the expansion of the city through the construction of new suburbs. The twentieth century has seen a period of continued growth.

A total of 210 Aboriginal and 104 historical heritage sites have been recorded previously within the WEIA. This CHA identified an additional 108 Aboriginal heritage sites. These sites comprised 81 artefact sites, 24 culturally modified trees, two cultural areas, and one possible quarry. No new historical heritage sites were identified.

Environmental data and Indigenous cultural values were used to inform a model for future investigations and the management of Aboriginal heritage values in the WEIA. This guiding model indicated that sites are not present as single entities in the landscape; their relationship with the surrounding physical and cultural landscape must be acknowledged.

- High density artefact sites and site complexes are more likely to be found in places that people returned to or remained in for longer periods of time. These include:
 - places with natural water soaks;
 - sheltered, level areas surrounding watercourses; and
 - gentle, sheltered hill slopes.
- Low density artefact sites are more likely to be found in areas that people were travelling through. These include:
 - pathways through the landscape formed by ridgelines or other landforms;
 - places with views across the landscape; and
 - areas where people were collecting resources away from the camp.
- Burials may be found anywhere in the landscape, but their location may not be strictly associated with environmental conditions—other intangible cultural factors may have influenced where burials were chosen to be placed, such as gendered business sites or the deceased's connection to the landscape.

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- Culturally modified trees once occurred across the entire landscape, as they had many different purposes and meanings. Due to landscape modifications and the reduction in stands of remnant old growth eucalypts, culturally modified trees may be present in all remaining areas of old growth vegetation. However, the types of culturally modified trees present may be related to other sites and landform units:
 - canoe trees may be found in proximity to watercourses suitable for watercraft, as they were used to travel the rivers;
 - Coolamon trees may be found near high density artefact sites or site complexes that represent camps, where the bark was processed and used; and
 - marker trees (both scarred and ring) may be found on pathways through the landscape, such as on ridgelines or in other prominent locations.
- Dreaming, ceremony, and business sites can be located anywhere in the landscape and may be identified through extensive appropriate community consultation. Due to the strong connection to intangible values, modelling is not an appropriate way in which to discuss these sites.
- Grinding groove sites are strongly influenced by environmental conditions, as water is a necessary component in the grinding process. However, grinding groove sites are likely to encompass intangible values in addition to the physical characteristics of the site—there are known sites that were also places for initiation ceremonies and other spiritual activities.
- Post-contact sites may occur anywhere in the landscape that Aboriginal people and Europeans came into contact, and these places may be identified through historical research and community consultation.

A sensitivity map for the WEIA was developed based on the results of the survey, the implications of the updated guiding model, and several other landscape elements. The sensitivity map divided the WEIA into three primary areas:

- areas of high sensitivity, considered unsuitable for future development;
- areas of moderate sensitivity, considered suitable for possible future development; and
- zones that require further investigation to determine their sensitivity.

Recommendations were then made according to these three primary areas to assist in the management of the heritage values of the WEIA as the planning for future land use and residential and commercial spaces progresses. The recommendations can be summarised as:

- Further Work Required—Three zones that require further investigation have been identified. These should be investigated to determine areas of sensitivity and to identify specific constraints and opportunities applicable to the zone. It is also recommended that an updated database of archived archaeological and heritage assessments and identified heritage sites be completed for the WEIA. This database would assist in informing the future planning and management and identifying sites or areas that require further assessment that have not been identified in this CHA.
- Opportunities—The areas of moderate sensitivity that have been identified are considered to be suitable for the early stages of land use management with the possibility of future development.

Prior to any detailed plans being developed, further heritage assessments should be undertaken to identify additional heritage sites and provide specific management plans and recommendations for these sites.

- Constraints—The areas of high sensitivity that have been identified are considered to be unsuitable for residential and commercial development. These areas represent a significant opportunity to conserve and celebrate parts of the long and diverse past of Canberra, and should be acknowledged as such in the future planning and land use management of the WEIA.

As an opportunity arising from these high sensitivity areas, it would be appropriate to plan for interpretation and presentation of the heritage values of these places in future development planning.

The implementation of these recommendations will assist in the management of the heritage values of the WEIA as the planning for future land use and residential, recreational, and commercial spaces progresses.

1.0 Introduction

1.1 Project Background and Methodology

The Environment, Planning and Sustainable Development Directorate, Australian Capital Territory Government (ACT Government), engaged GML Heritage Pty Ltd (GML) to undertake a Cultural Heritage Assessment (CHA) of the Western Edge Investigation Area (WEIA). The CHA—in combination with a Preliminary Ecological Review, Water Values and Environmental Hydrology assessment, and a landscape character value assessment—will help inform a framework for developing planning decisions for the ACT.

The methodology utilised in the CHA is designed to produce two outcomes: a guiding model of the likely occurrence and management of Aboriginal and historical heritage sites within the WEIA; and a discrete set of recommendations for future heritage management of the WEIA. The following steps have been undertaken in preparing this CHA:

- extensive review and assessment of background material, including historical, ethnographical, and archaeological records;
- analysis of the available data regarding recorded heritage sites in the WEIA to understand the types of sites present and their distribution through the landscape; and
- engagement with the Representative Aboriginal Organisations (RAOs) to prepare and undertake a targeted survey strategy for the WEIA.

1.2 Site Location

The WEIA comprises an area of 98.1 square kilometres (Figure 1.1 and Figure 1.2). It is located alongside the westernmost edge of the western suburbs of Canberra, extending to the Murrumbidgee River and bordered by Kambah Pool Road (southern boundary) and Stockdill Drive and Shepherds Lookout Walk (northern boundary). It encompasses numerous prominent features in the landscape, including: the confluence of the Murrumbidgee and Molonglo Rivers and the associated river corridors; Mount Stromlo and the Kama, Cooleman Ridge, and McQuoids Hill Nature Reserves; and the rolling plains of western Canberra.

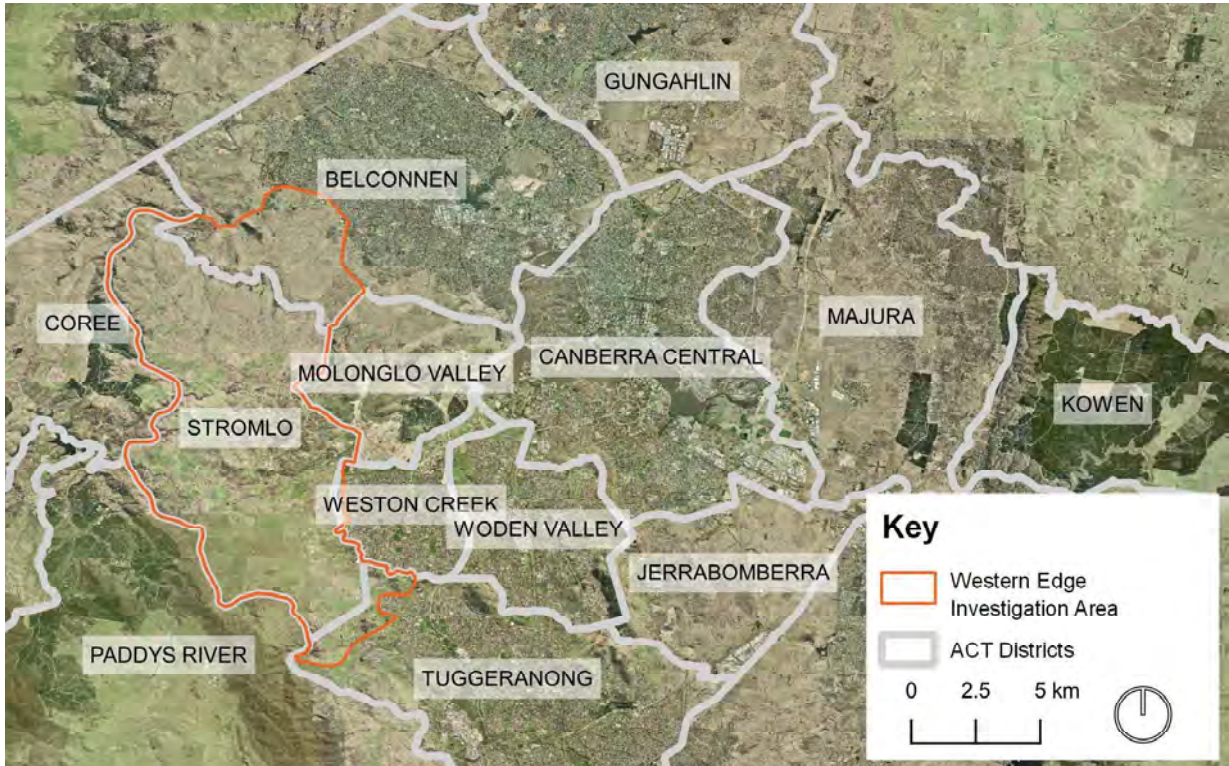


Figure 1.1 The WEIA is located alongside the westernmost edge of the western suburbs of Canberra extending to the Murrumbidgee River and bordered by Kambah Pool Road (southern boundary) and Stockdill Drive and Shepherds Lookout Walk (northern boundary). (Source: NSW Spatial Services aerial, ACTmapi districts, with GML overlay)

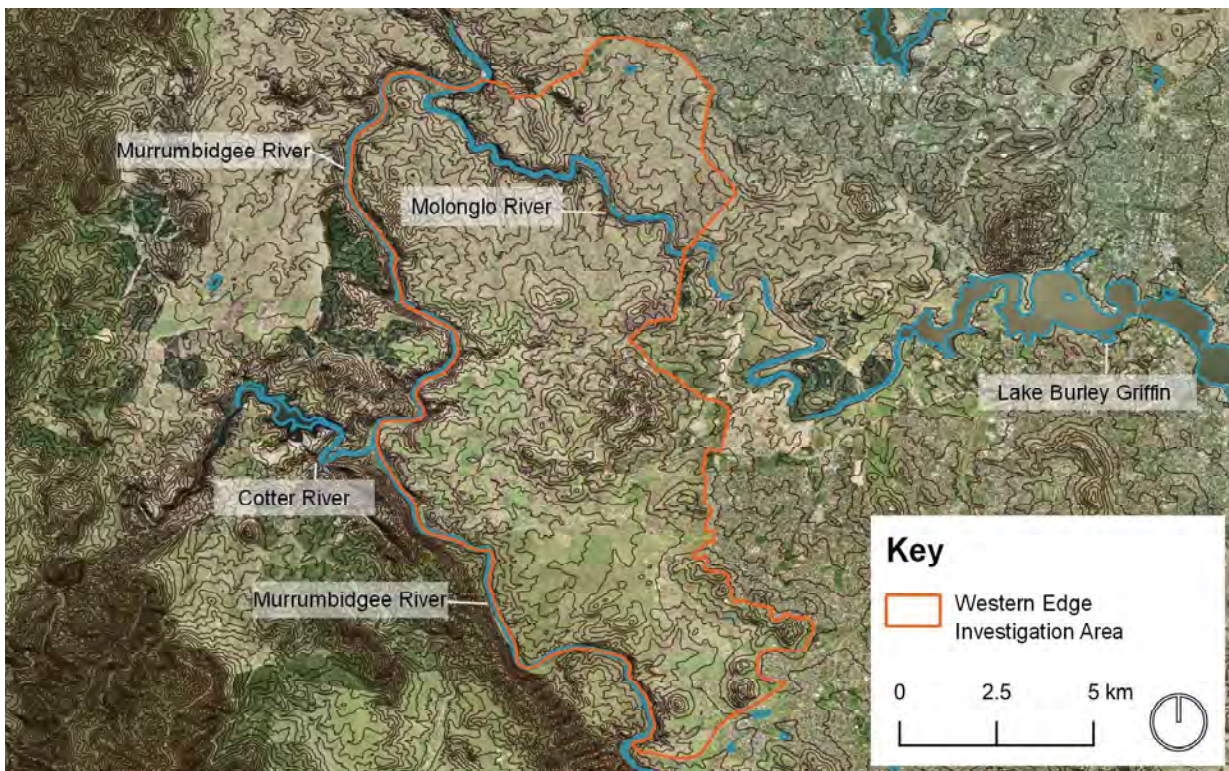


Figure 1.2 The WEIA encompasses numerous prominent features in the landscape, including: the confluence of the Murrumbidgee and Molonglo Rivers and the associated river corridors on its western border and northeastern extent; Mount Stromlo and the Kama, Cooleman Ridge, and McQuoids Hill Nature Reserves along its eastern border; and the rolling plains of western Canberra in between. (Source: NSW Spatial Services aerial, ACTmapi topography and hydrology, with GML overlay)

1.3 Legislative and Planning Framework

1.3.1 Statutory Considerations

Australian Capital Territory (Planning and Land Management) Act 1988 (Cwlth)

The *Australian Capital Territory (Planning and Land Management) Act 1988* (Cwlth) provides for the planning and development of the ACT and management of Territory land. It was established after the Commonwealth's bestowal of self-governance to the ACT and is provided for by the *Australian Capital Territory (Self Government) Act 1988* (Cwlth).

The Act is designed to ensure that the interests of the people of the ACT are represented and protected in planning within the ACT, whilst also continuing Commonwealth involvement in the development of the national capital. It is administered by the National Capital Authority (NCA) (previously the National Capital Planning Authority), whose functions include:

- preparing, administering, reviewing, and (as necessary) amending the National Capital Plan (NCP);
- fostering awareness of Canberra as the national capital and recommending to the Minister any works it considers desirable to maintain or enhance the national capital's character;
- commissioning works in designated areas in accordance with the NCP where no other state or Commonwealth department or authority has the responsibility to do so; and
- performing, with the approval of the Minister, planning services for any person or body, whether within Australia or overseas, and managing National Land designated in writing by the Minister as land required for the special purposes of Canberra as the national capital.

National Capital Plan

The NCP forms the strategic planning framework for Canberra and the ACT. In accordance with Section 10 of the *Australian Capital Territory (Planning and Land Management) Act 1988*, the NCP:

- a. shall define the planning principles and policies for giving effect to the object of the Plan and, in particular, shall set standards for the maintenance and enhancement of the character of the National Capital and set general standards and aesthetic principles to be adhered to in the development of the National Capital;
- b. shall set out the general policies to be implemented throughout the Territory, being policies of:
 - i. land use (including the range and nature of permitted land use); and
 - ii. the planning of national and arterial road systems.
- c. may set out the detailed conditions of planning, design, and development in Designated Areas and the priorities in carrying out such planning, design, and development; and
- d. may set out special requirements for the development of any area (not being a Designated Area), being requirements that are desirable in the interests of the National Capital.

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The NCP establishes the following matters of national significance in the planning and development of Canberra and the Territory:

- the pre-eminence of the role of Canberra and the Territory as the centre of National Capital functions, and as the symbol of Australian national life and values;
- conservation and enhancement of the landscape features which give the National Capital its character and setting, and which contribute to the integration of natural and urban environments;
- respect for the key elements of the Griffins' formally adopted plan for Canberra;
- creation, conservation, and enhancement of fitting sites, approaches, and backdrops for national institutions and ceremonies as well as National Capital uses; and
- the development of a city which both respects environmental values and reflects national concerns with the sustainability of Australia's urban areas.¹

The eastern and western boundaries of the WEIA are classified as 'Hills, Ridges, and Buffers' (east) and 'River Corridors' (west).² These are addressed under the NCP as part of the National Capital Open Space System (NCOSS). The NCOSS performs four different functions, each with its own planning and management requirements.³

The guiding principle for the Hills, Ridges, and Buffers is to 'remain substantially undeveloped in order to protect ... the Australian landscape character'.⁴ As such, the following key planning policies for the Hills, Ridges, and Buffers are relevant to the CHA:

- The Inner Hills will be protected as key symbolic and landscape elements in expressing the defined land, water, and municipal axes and providing the dominant backdrop feature to the city.
- The hill tops will continue to be used as key vantage points for viewing and understanding the National Capital. Development will be sited so as to minimise its visual impact on the Central National Area and any environmental impact on the hill tops.
- The environment and Australian landscape character of the hills and ridges will be protected and enhanced to provide a unified landscape setting for the National Capital.

The guiding principle for the River Corridors is to 'protect and enhance the environmental quality, landscape setting, and the natural and cultural resources of the Murrumbidgee and Molonglo River corridors'.⁵ As such, the following key planning policies for the River Corridors are relevant to the CHA:

- Corridors for the major rivers in the ACT will be protected from urban encroachment and inappropriate development.
- The ecological resources and environmental quality of the rivers should be conserved and the character of their landscapes retained and reinforced.
- Cultural heritage resources and their landscape context will be protected from inappropriate uses and development.

Heritage Act 2004 (ACT)

Aboriginal and non-Aboriginal heritage items in the ACT are protected under the *Heritage Act 2004* (ACT) (Heritage Act). The Heritage Act forms the basis for recognising, registering, and conserving natural and cultural heritage places and objects in the ACT. In addition, it:

- establishes the ACT Heritage Register and the ACT Heritage Council;
- establishes enforcement and offence provisions for heritage;
- seeks to integrate heritage with planning and development; and
- provides heritage guidelines to protect heritage significance.⁶

The ACT Heritage Register provides legal protection for those items listed on it, which includes places and objects which are of heritage significance to the people of the ACT through ‘enriching understanding of history and identity’.⁷ Developments that may have an impact on the heritage significance of a registered place or object are subject to advice from the ACT Heritage Council to help ensure that impacts are avoided or minimised.

Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

The *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) is the statutory instrument for the protection of heritage items located on Commonwealth owned land. The objectives of the EPBC Act with regards to heritage are to:

- provide for the protection of the environment, especially matters of National Environmental Significance (NES);
- provide a streamlined national environmental assessment and approvals process;
- enhance the protection and management of important natural and cultural places;
- recognise the role of Indigenous people in the conservation of Australia’s biodiversity and heritage; and
- promote the use of Indigenous peoples’ knowledge of biodiversity and heritage with the involvement of, and in cooperation with, the owners of the knowledge.

The EPBC Act establishes the Commonwealth Heritage List (CHL) and the National Heritage List (NHL). The CHL comprises places owned or controlled by the Commonwealth that have been assessed as having heritage values against the criteria established under the EPBC Act (Table 1.1). Places identified with outstanding heritage values for the nation are eligible for inclusion in the NHL. National Heritage places may be owned or controlled under any jurisdiction. National Heritage places are one of the nine ‘matters of national environmental significance’ under the EPBC Act, which are subject to particular provisions of the EPBC Act.

1.3.2 Non-statutory Considerations

The Burra Charter

The Burra Charter—The Australia ICOMOS Charter for Places of Cultural Significance 2013 (the Burra Charter) sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The Burra Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places.

Australian National Heritage Charter

The *Australian Natural Heritage Charter*, 2002, is a guideline for best practice conservation principles aimed at assisting in the identification, assessment, and management of places with natural heritage values.⁸ It can be applied to a wide range of places, whether terrestrial, marine, or freshwater. The charter defines natural heritage as comprising:

*...the natural living and non-living components, that is, the biodiversity and geodiversity, of the world that humans inherit. It incorporates a range of values, from existence value to socially-based values.*⁹

Places may have both natural and cultural heritage values—values that may be related and are sometimes difficult to separate. The concept of natural heritage used in this Charter recognises the role Indigenous people have played in using and shaping Australian landscapes for at least 60,000 years and possibly much longer. Conservation of a place should identify and take into consideration all aspects of natural and cultural heritage.¹⁰

This Charter provides a framework for making sound decisions for managing natural heritage places based on the ecological processes which occur in natural systems. It also provides a process that can be used to support and implement local, state/territory, national and international policies, agreements, strategies and plans. It does not replace statutory obligations.

Ask First: A Guide to Respecting Indigenous Heritage Places and Values

The *Ask First Guidelines* are generally referenced as the best practice guidelines for undertaking Indigenous community consultation. They were prepared by the Australian Heritage Commission in 2002 to provide guidance for Commonwealth agencies when engaging with Indigenous communities about heritage places and values.

The *Ask First Guidelines* require that the relevant Indigenous community is identified and consulted about the management of their heritage values. Indigenous community is defined as ‘traditional owners and any other Indigenous people with rights and interests in the area’.¹¹ Identifying the relevant Aboriginal community is a matter of contacting the Native Title Tribunal, land councils, local councils, government authorities and any other known group or authority that may provide relevant information. It is not a specifically prescriptive process.

The relevant Aboriginal community are invited to be actively involved in the process of identifying and assessing their heritage places and values and have meaningful input into the management of those places. In recognising the rights and interests of Indigenous peoples in their heritage, all parties engaged with Indigenous heritage values should conduct themselves in a manner that understands Indigenous people:

- are the primary source of information on the value of their heritage and how this is best conserved;

- must have an active role in any Indigenous heritage planning process;
- must have input into primary decision-making in relation to Indigenous heritage so they can continue to fulfil their obligations towards this heritage; and
- must control intellectual property and other information relating specifically to their heritage, as this may be an integral aspect of its heritage value.¹²

In identifying and managing this heritage:

- Uncertainty about Indigenous heritage values at a place should not be used to justify activities that might damage or desecrate this heritage.
- All parties having relevant interests should be consulted on Indigenous heritage matters.
- The process and outcomes of Indigenous heritage planning must abide by customary law, relevant Commonwealth and State/Territory laws, relevant international treaties and covenants and any other legally binding agreements.¹³

Engage Early Guidelines

The *Engage Early Guidelines* aim to improve engagement and consultation with Indigenous peoples during the environmental assessment process under the EPBC Act.¹⁴ It defines good engagement as:

*any process that involves the Aboriginal and Torres Strait Islander peoples in problem solving or decision making and uses community input to make better decisions.*¹⁵

The EPBC Act recognises that Indigenous people play a vital part in the conservation and sustainable use of Australia's heritage and the *Engage Early Guidelines* provide advice on consulting Indigenous communities and explains the expectations set out by the Department of the Environment on Indigenous engagement. It provides advice on legislative processes such as land rights and native title, Indigenous land use agreements, and environmental offsets.

The guidelines provide advice on identifying relevant Indigenous communities for engagement, the appropriate timeframes for engagement, cultural awareness, and advice on building relationships and positive forms of communication as well as tips for dealing with disputes. The *Engage Early Guidelines* are intended to be read and used in conjunction with the *Ask First Guidelines*.¹⁶

1.4 Heritage Listed Sites

Heritage items in the ACT can be protected under either the *Heritage Act 2004* (ACT) or the EPBC Act (Cwlth), dependent upon the status of the land on which the heritage item is located. To be nominated to either the ACT Heritage Register or the CHL, the heritage item must be demonstrated to meet certain significance criteria (Table 1.1). There are 216 places located within the WEIA that are registered on either the ACT Heritage Register or the Commonwealth Heritage List.

Table 1.2; see Abbreviations and Definitions for the ACT Heritage Register 'Status' Key.

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Table 1.1 Heritage Significance Criteria Used to Nominate Heritage Items to the ACT Heritage Register and the CHL. (Note that the ACT Heritage Register criteria are based on the Heritage Convention criteria developed by the National Heritage Convention, 1998).

HERCON Criteria (ACT Heritage Register)	CHL Criteria
<p>A heritage item can be included if it meets one or more of the following criteria:</p> <ul style="list-style-type: none"> a. Importance to the course or pattern of the ACT’s cultural or natural history; b. Has uncommon, rare, or endangered aspects of the ACT’s cultural or natural history; c. Potential to yield important information that will contribute to an understanding of the ACT’s cultural or natural history; d. Importance in demonstrating the principal characteristics of a class of cultural or natural places or objects; e. Importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT; f. Importance in demonstrating a high degree of creative or technical achievement for a particular period; g. Has a strong or special association with the ACT community or a cultural group within the ACT for social, cultural, or spiritual reasons; or h. Has a special association with the life or work of a person, or people, important to the history of the ACT. 	<p>A heritage item can be included if it is found to be significant at a local, state, or national level under one or more of the following criteria:</p> <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> i. A class of Australia’s natural or cultural places; or ii. A class of Australia’s natural or cultural environments. 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; f. The place has outstanding heritage value to the nation because of the place’s importance in demonstrating a high degree of creative or technical achievement at a particular period; g. The place has outstanding heritage value to the nation 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 outstanding heritage value to the nation because of the place’s special association with the life or works of a person, or a group of persons, of importance in Australia’s natural or cultural history; or i. The place has outstanding heritage value to the nation because of the place’s importance as part of Aboriginal tradition.

Table 1.2 Heritage Items Located within the Western Edge Investigation Area that have been Nominated to the ACT Heritage Register (under the Heritage Act 2004 [ACT]) and the CHL (under the EPBC Act [Cwlth]). (Please note that not all of the Aboriginal heritage sites identified in the 'Aboriginal Places' items are located within the WEIA; these listings are broad and encompass numerous heritage sites across a wide area).

Name	Status	Description
ACT Heritage Register		
Aboriginal Places along the Murrumbidgee River Corridor and in the District of Tuggeranong	3	The places comprise where Aboriginal stone artefacts (n=130), areas of potential archaeological deposit (n=3), areas of potential archaeological deposit associated with artefact scatters (n=5), quarries and stone sources (n=5), quarries and stone sources associated with artefact scatters (n=5), a stone arrangement with an artefact scatter and former artefact scatter locations (n=8) have been recorded.
Aboriginal Places along Urban and Rural Bushfire Containment Lines	3	The places comprise where Aboriginal stone artefacts (n=216) have been recorded.
Aboriginal Places in All Districts	3	The places comprise where Aboriginal stone artefacts (n=97), areas of potential archaeological deposit (n=3), areas of potential archaeological deposit associated with artefact scatters (n=2), quarries and stone sources (n=2), former sites (n=21), a ceremonial site, and a burial site have been recorded.
Aboriginal Places in Canberra Nature Park Fire Trails	3	The places comprise where Aboriginal stone artefacts (n=39), areas of potential archaeological deposit (n=2), and areas of archaeological deposit with artefact scatters (n=31) have been recorded.
Aboriginal Places in Stromlo and Kowen Forests	3	The places comprise where Aboriginal stone artefacts (n=150) have been recorded.
Casuarina Sands ¹⁷	1	A popular swimming and picnic spot throughout Canberra's history.
Cotter Pumping Station ¹⁸	3	<p>The Cotter Pumping Station with its original equipment, associated cottages, and the high-level bridge across the Murrumbidgee River are significant as a historical industrial landscape and a contemporary landmark as the 'gateway' to the Cotter Reserve and other areas of public recreation west of Canberra. The listing includes:</p> <ul style="list-style-type: none"> • the Pumping Station industrial buildings—consisting of the Pump House and Transformer House; • mechanical plant and equipment used in pumping operations—including pumps 1–8, plus associated electric motors, switchboards, and controls; • the salvaged Hydro Pump; • the ruin of the Blockhouse, in which the Hydro Pump was originally located; • the six Pumping Station Staff Cottages—built in 1927 (1), 1938 (2), 1957 (3 and 7), 1950 (5), and 1952 (6); and • the Cotter Bridge—including approach ramps and abutments.
Greenhill's House ¹⁹	3	<p>The ruins of Greenhill's House are remnants of a late nineteenth-century 'bush rock' building, representing the efforts of a small-scale, independent selector family (the Moores). The ruins represent an uncommon settler homestead, which was comparably large, and functioned as a post office and general store. The listing includes:</p> <ul style="list-style-type: none"> • the ruins—a standing stone arch with attached walls either side, extending approximately 10 metres in a southeast, northwest direction; • tumbled, partially dressed stones surrounding the ruin; and • an area of archaeological sensitivity—extending approximately 15 metres wide and 20 metres long surrounding the ruins.
Huntly ²⁰	3	Huntly has historic associations with the development of the Limestone Plains and has associational significance with local figures of the pastoral era, eg Francis Mowatt, Terence Aubrey Murray, and Robert Campbell. It is the largest

Name	Status	Description
		<p>surviving part of the Yarralumla property and is associated with the establishment of the Federal Capital Territory and the last phase of soldier settlement in Canberra. The listing includes:</p> <ul style="list-style-type: none"> • the main house; • the Lee House; • carports, garages, farm buildings, and garden sheds associated with the two houses; • the Manager's Cottage; • silos and stables associated with the Manager's Cottage; • the c1948 shearing shed and holding pens; • former Shearer's Accommodation, outhouses, and a meat house associated with the shearing shed; • stone ruins of a shepherd's hut adjacent to Cliffe Creek; and • plantings of native and exotic plants.
Travelling Stock Reserve (Uriarra Road) ²¹	1	<p>In the ACT, 15 travelling stock reserves (TSRs) were set apart from rural and urban development according to the provisions of the <i>Stock Ordinance 1934</i> for the use of travelling stock. The reserves and routes were developed to enable the movement of livestock locally and across larger tracts of land, often to distant markets. Nine TSRs remain, including one at Uriarra Road (Stromlo).</p>
Weetangera Cemetery ²²	3	<p>The Weetangera Cemetery is significant for its age, location, intact nature and for the composition of its burials. The cemetery is demonstrative of the strong Methodist movement in Ginninderra in the late nineteenth century and of the close-knit community that was active before the city of Canberra was built. The listing includes:</p> <ul style="list-style-type: none"> • the graves (including headstones and fencing); • two cypress trees; • the stone cairn marking the site of the former church; • the square-cut timber gate post; and • the rural setting.
CHL		
Mount Stromlo Observatory Precinct (ID 105309) ²³	Registered	<p>Mount Stromlo Observatory Precinct, an optical astronomical research complex arranged across the ridge of a mountain, is a significant cultural landscape with a surviving richness of features. Initially conceived in 1905 by the solar astronomer, Dr WG Duffield, to fill a solar recording gap in the Western Pacific, the observatory has incorporated phases of development that encompass structures dating from 1911. Despite serious damage by the January 2003 Canberra bushfires, significant elements continue to the heritage values of the place. The listing includes:</p> <ul style="list-style-type: none"> • the ruins and associated buildings of the Oddie Telescope, Reynolds Telescope, Coude Spectrograph, the Yale Columbia Telescope, the Great Melbourne Telescope, and the Uppsala Telescope; • the ruins of the Administration Building (formerly the Commonwealth Solar Observatory) and formal garden features; • the ruins of the Director's Residence, outbuildings, garden, and croquet lawn area; • extant and ruined staff houses; • the layout of the precinct, including all buildings, green spaces, and roads; and • the graves of Dr WG Duffield, the founder of the Mount Stromlo Observatory, and his wife and daughter, DT Duffield and JD Duffield.

1.5 Assumptions and Limitations

GML understands that the dataset used to conduct the following analyses may be incomplete (Section 4.2). Based on advice provided by ACT Heritage, the Geographic Information System (GIS) database is incomplete for a number of the archived reports held by ACT Heritage and some reports were unintentionally omitted from the initial release of data under GML's Section 57 application.

This assessment did not aim to locate or record any previously identified heritage sites. Rather, focus was placed on identifying previously unrecorded sites in order to provide a more informed approach to the predictive model and identification of recommendations for future heritage management. No updated condition assessments have therefore been provided for any previously recorded heritage site.

1.6 Authorship and Acknowledgements

This report has been prepared by [REDACTED], GML Heritage Consultant, and [REDACTED], GML Heritage Consultant, with oversight from [REDACTED], GML Principal.

GML gratefully acknowledges the assistance of the following people in the preparation of this report:

- Daniel Santosuoso, Director of Land Development Projects, Environment, Planning and Sustainable Development Directorate, ACT Government;
- Jane Overton, Environment, Planning, and Sustainable Development Directorate, ACT Government;
- Todd Nowack, Geographic Information System Specialist, ACT Government;
- members of the Buru Ngunawal Aboriginal Corporation (BNAC), [REDACTED];
- members of Mirrabee, [REDACTED]; and
- the landholders of the areas that were accessed during the survey.

1.7 Endnotes

- ¹ Australian Government National Capital Authority 2020, *The National Capital Plan*, p 8.
- ² Australian Government National Capital Authority 2020, *The National Capital Plan*, p 22.
- ³ Australian Government National Capital Authority 2020, *The National Capital Plan*, p 24.
- ⁴ Australian Government National Capital Authority 2020, *The National Capital Plan*, p 30.
- ⁵ Australian Government National Capital Authority 2020, *The National Capital Plan*, p 35.
- ⁶ ACT Government Environment and Sustainable Development, 'Information Sheet: Heritage in the ACT', January 2011, 20 June 2020 <http://www.environment.act.gov.au/heritage/heritage_reports,_projects_and_publications/heritage_fact_sheets>.
- ⁷ ACT Government Environment and Sustainable Development, 'Information Sheet: Heritage in the ACT', January 2011, 20 June 2020 <http://www.environment.act.gov.au/heritage/heritage_reports,_projects_and_publications/heritage_fact_sheets>.
- ⁸ Australian Heritage Commission 2002, *Australian Natural Heritage Charter for the conservation of places of natural heritage significance*, second edition, Environment Australia, Canberra.
- ⁹ Australian Heritage Commission 2002, *Australian Natural Heritage Charter for the conservation of places of natural heritage significance*, second edition, Environment Australia, Canberra, p 4.
- ¹⁰ Australian Heritage Commission 2002, *Australian Natural Heritage Charter for the conservation of places of natural heritage significance*, second edition, Environment Australia, Canberra, p 4.
- ¹¹ Australian Heritage Commission, *Ask First: a guide to respecting Indigenous heritage places and values*, 2002, p 6.

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- ¹² Australian Heritage Commission, *Ask First: a guide to respecting Indigenous heritage places and values*, 2002, p 6.
- ¹³ Australian Heritage Commission, *Ask First: a guide to respecting Indigenous heritage places and values*, 2002, p 6.
- ¹⁴ Department of the Environment 2016, *Engage Early*, Australian Government, p 3.
- ¹⁵ Department of the Environment 2016, *Engage Early*, Australian Government, p 7.
- ¹⁶ Department of the Environment 2016, *Engage Early*, Australian Government, p 3.
- ¹⁷ ACT Heritage Council, *Casuarina Sands STROMLO—Nomination to the ACT Heritage Register*.
- ¹⁸ ACT Heritage Council, *Cotter Pumping Station and Associated Housing STROMLO COREE—Nomination to the ACT Heritage Register*.
- ¹⁹ ACT Heritage Council, *Greenhills Ruin STROMLO—Registration*.
- ²⁰ ACT Heritage Council, *Huntly STROMLO—Entry to the ACT Heritage Register*.
- ²¹ ACT Heritage Council, *Travelling Stock Route HALL HUME KOWN PADDYS RIVER STROMLO TENNENT THARWA TUGGERANONG—Nomination to the ACT Heritage Register*.
- ²² ACT Heritage Council, *Weetangera Cemetery BELCONNEN—Entry to the ACT Heritage Register*.
- ²³ Commonwealth Heritage List, 'Mount Stromlo Observatory Precinct, Mt Stromlo Rd, Mt Stromlo, ACT, Australia', viewed 20 June 2020 <https://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=state%3DACT%3Blist_code%3DCHL%3Blegal_status%3D35%3Bkeyword_PD%3D0%3Bkeyword_SS%3D0%3Bkeyword_PH%3D0;place_id=105309>.

2.0 Canberra's Cultural Landscape

2.1 Introduction

The landscape within the WEIA has been the location of numerous important events throughout Canberra's history, beginning at least 25,000 years ago. The area served as a key location for the local Aboriginal communities; the open landscape provided a number of crucial resources and the Murrumbidgee and Molonglo Rivers acted as 'highways' through Country. When Europeans arrived in the area in 1820, within a few decades the land had been carved up into several landholdings.

In 1908 the Canberra area was selected to be the Federal Capital Territory of the recently federated nation of Australia. The first 50 years of development as the capital city was shaped by ambitious city design, the drive to establish a population and economy, and several technological feats. Following World War II, Canberra saw a surge in population, which led to the expansion of the city through the construction of new suburbs. The twentieth century has seen a period of continued growth.

The following section considers some of these key historical themes that occurred in the Canberra area and that effected the landscape and position of the WEIA in the city.

2.2 Aboriginal Country

Archaeological dates at Birrigai rock shelter in Tidbinbilla Nature Reserve demonstrate that when the first Europeans entered the region—now known as Canberra—in the 1820s, they were walking through a landscape that had been inhabited by Aboriginal Australians for at least 25,000 years.¹ This timing coincided with the Last Glacial Maximum (or 'ice age', approximately 22,000–18,000 years ago), part of the Pleistocene epoch. They would have been sharing the landscape with megafauna, such as the now-extinct giant kangaroos (*Macropus titan*).² The landscape of this period would have been starkly different today; Canberra would have been on the cusp of a glacial sheet extending from the Snowy Mountains to Tasmania. A deglacial period followed (approximately 18,000–12,000 years ago), with increased temperatures causing glacial sheets to melt and sea levels to rise. Climate change affected the vegetation of the landscape. Forest trees such as eucalypts began to populate the open landscape once dominated by herbs and shrubs (eg *Asteraceae*, *Chenopodiaceae*).³ Currently, there is little known about the lives of Aboriginal people during the Pleistocene epoch.

At the onset of the Holocene epoch (approximately 12,000 years ago to present), the climate of the region fluctuated between humid and arid climatic phases.⁴ Much of the recovered archaeological evidence in Canberra dates to the past 3,000 years, by which time the climate had become relatively stable.⁵ While the reasons for the increase in archaeological evidence are currently unverified, possible scenarios include higher preservation of archaeological evidence, a shift in technology uses, or an increase in population.

Today, the western landscape of Canberra is divided by the Murrumbidgee River. The river divides two major ecological zones: highlands to the west, such as around Tidbinbilla Nature Reserve and Namadgi National Park; and the rolling grassy woodlands to the east. The eastern landscape was dominated by rolling grassland peppered with old growth Eucalyptus trees, including red box (*Eucalyptus polyanthemos*), yellow box (*Eucalyptus melliodora*), and Blakely's red gum (*Eucalyptus blakelyi*). Prior to the introduction of European farming practices, the landscape also would have comprised large areas of grassy woodlands, tended to by Aboriginal people through the use of 'cool burning'. Cool burning or firestick farming was used to manage the landscape and though this was not fully understood by

Europeans, surveyors such as Robert Hoddle documented evidence of it. In May 1832, Hoddle noted that the mountainside had been blackened by fire. Burning at this time of year may have been performed to expose the ripe yams, remove saplings and encourage young grass to attract game.⁶ The grassy woodlands were a favourable location for the hunting of eastern grey kangaroos (*Macropus giganteus*), red-necked wallabies (*Macropus rufogriseus*), common wallaroos (*Macropus robustus*), common wombats (*Vombatus ursinus*), and short-beaked echidnas (*Tachyglossus aculeatus*). The pre-pastoralism grassland also would have included native grass species, such as wallaby grass (*Austrodanthonia spp.*) and kangaroo grass (*Themeda australis*). The seeds from these grasses were collected and ground into a flour to make a damper or biscuit, which was then dipped in native honey or emu fat.⁷

The native eucalyptus trees were used for many purposes. Bark was removed from trees for the purpose of creating carrying dishes (known as Coolamon), canoes, shelters, and other tools. Sometimes toe or hand holds were cut into trees, enabling them to be climbed in order to collect foods such as birds' eggs, honey, and possums (Figure 2.1). Moreover, prominent trees were often used to create markers to guide movement through the landscape. These markers generally comprised distinct scarring or the creation of 'rings'. Ring trees were created through manipulating—either by binding, weaving, or grafting—the branches of a young sapling into a specific shape (often a ring), so as they grew they merged into each other. Such marker trees could have dual purposes: some ring trees had the capacity to also be used as storage trees, where items such as heavy grinding stones could be kept safe for future use.⁸

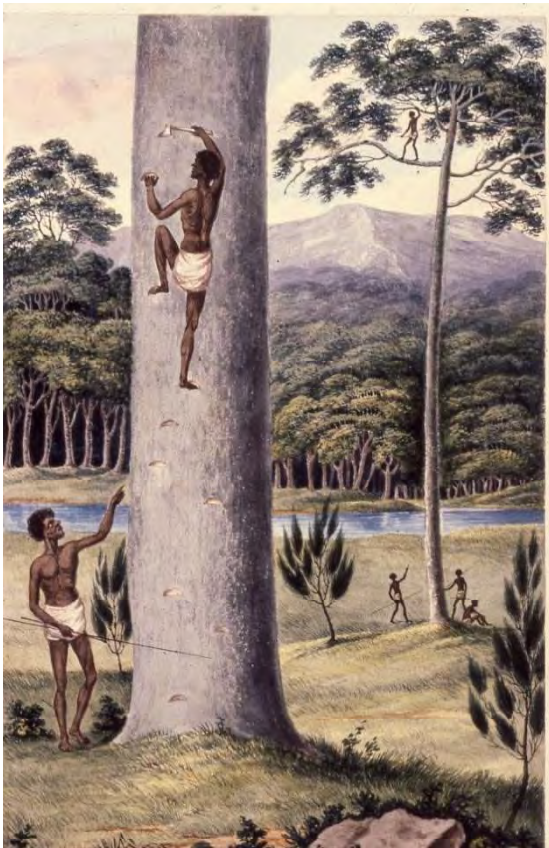


Figure 2.1 A circa 1820 watercolour painting by Joseph Lycett, showing two Aboriginal men cutting toe holds into a large tree in order to climb it. (Source: National Library of Australia, PIC MSR 12/1/4 #R5673–R5692, <<https://nla.gov.au/nla.obj-138498775/view>>)

There are indications that—at least at the time of European contact and ethnographic recording—the Aboriginal groups of Canberra had gendered division of labour. While men appeared to hunt most of the large game, women would gather seeds and vegetables, such as the daisy yam (*Microseris* sp.). The daisy yam, which was cultivated in large expanses of prepared grasslands, was eaten all year long.⁹ Daisy yams are largely extinct in the wild, due to introduced livestock and other animals consuming the seeds and flowers and destroying the sensitive soils favoured by the yams.

To the west of the Murrumbidgee River are the highlands where the renowned Bogong moth (*Agrotis infusa*) festivals or gatherings occurred. Between October and March, the moths would migrate to the highlands—including at Tidbinbilla Nature Reserve and the Brindabella Ranges—to shelter from the heat. The moths gathered in huge numbers; as many as 17,000 have been counted in one square metre. During the day, they would become dormant or 'aestivate', before reanimating at dusk to fly away for the night. Aboriginal people journeyed to the moths from areas as far as 300km away.¹⁰ The moths offered extremely high energy and protein yield, a delicious taste—not unlike roasted chestnuts—and sheer abundance. In the 1840s, anthropologist Alfred William Howitt recorded that congregations to feast on Bogong moths were organised using message sticks: peeled and notched sticks, each about 60 centimetres long, which reminded the envoy of the message.¹¹ Bogong gatherings provided opportunities for initiation ceremonies, marriages, corroborees, and exchanges of resources.¹²



Figure 2.2 Artwork representing the Bogong Moth Festival. Part of the artwork panels at Ribbon Gum Theatre at Tidbinbilla Nature Reserve showcasing Aboriginal artwork by Ngambri-Ngunawal artist Jim Williams and other local community artists. (Source: Kate Blackhurst 2012, <<https://weekimages.blogspot.com/2012/12/tidbinbilla.html>>).



Figure 2.3 Bogong moths aestivating during the summer months within a granite shelter. (Source: CC CSIRO 2002)

A common way for Aboriginal people to move through the landscape was via large rivers. Such rivers acted as pathways, and were sometimes so busy that they were akin to highways.¹³ Archaeological investigations have demonstrated that riverine environments were often a preferred place for extended or repeated occupation: high densities of artefacts have been identified along the banks of the Murrumbidgee and Molonglo Rivers, particularly near good fishing sites.¹⁴ From October to April, large fish such as the Murray cod (*Maccullochella peelii*), trout cod (*Maccullochella macquariensis*) and silver perch (*Bidyanus bidyanus*) were plentiful.¹⁵ Fish were hunted in a variety of methods, including 'fish drives', spearing from canoe or the river bank, and stupefying—tea tree or hickory added to the still waters of a small river or creek would have a narcotic effect on fish, resulting in them floating to the surface.¹⁶ The significance of rivers extends beyond subsistence: both major and minor watercourses have been identified as cultural areas with significant intangible values.

The Canberra landscape was undeniably fertile, which may have supported a large Aboriginal population. William Bluett—who drew information from John Blundell, one of the early European settlers in the Canberra region—recalled that in the nineteenth century Aboriginal people travelled around the area 'camping for a week or a month according to the available food and season of the year' before moving to another location.¹⁷ The ethnohistorical records suggest the following seasonal movement of people from the Western Plains areas:

- During winter, from March to October, groups of 20 to 30 people would remain around the lower plains regions along the river corridors, their movements pending on resource availability in groups.
- In the summer months, from November to February, groups would congregate in the mountains to escape the extreme heat and feast on Bogong moths.

2.3 The Arrival of European Settlers

The first official Europeans to visit the area of the present-day city of Canberra were James Vaughan, Joseph Wild, and Charles Throsby in December 1820, who were led by Aboriginal guides.¹⁸ They recorded seeing the fires of the Aboriginal people, but not the individuals themselves.¹⁹ Although the exploration party initially left the area, several subsequent return excursions were made in the following years. The area was dubbed the 'Kamberry Plains' or 'Limestone Plains' and, by 1823, cattle were being grazed on a nearby station at Bungendore.²⁰

In 1824, Joshua John Moore applied for a 'ticket-of-occupation' for 800 hectares on the site that would become Canberra. The name he selected for his property was 'Canberry', likely an Anglicised version of the local Aboriginal word *Kamberri*. In 1826, he applied to purchase a further 400 hectares that he was already occupying 'on the E. bank of the river which waters Limestone Plains, above its junction with the Murrumbeeja [sic], adjoining the grant of Mr Robert Campbell snr'.²¹ Campbell had claimed a vast portion of land for his estate Duntroon at Pialligo in 1825, the latter being named for the local Aboriginal word for 'meeting place' as it was a traditional campsite.²² Moore and Campbell were quickly followed by a steady stream of other settlers claiming land in the area, including George Thomas Palmer in 1826 with Ginninderra, Henry Donnison and Yarralumla (or Yarrowlumla) in 1828, along with Peter Murdoch's Waniassa in 1827 and John McLaren's Janevale in 1829, both in the Tuggeranong area.²³ The WEIA was not included in any of the initial land grants.

Despite the increasing number of land claims, the area continued to be sparsely inhabited by Europeans, and the few who did reside there were mostly convicts and workers who guarded their employers' stock.²⁴ These first settlers would have brought in European diseases such as smallpox, influenza, syphilis, and

gonorrhoea which—by the 1830s—had probably decimated the Aboriginal populations, although the extent of this pandemic has only been speculated.²⁵

In 1829, the 'Limits of Location' line was introduced to prevent unlicensed land claims and settlement; no settlers were to purchase land beyond it.²⁶ The Canberra area fell into the Murray County (Figure 2.4 and Figure 2.5), which was:

*Bounded on the North-East by Boro Creek from its Junction with the Shoal-Haven River, to its Source in the Hill of Wolowolar; by the Range thence to Alianoyonyiga Mountain between Lake George and Lake Bathurst, and by a Watercourse descending from that Mountain to Lake George; by Lake George to the Hollow in the Bight near the Western Shore; and thence by a Natural Line, to be surveyed, extending towards the Pic of Pabral. One the West by The Mountains of Warragong. On the South by a Range extending Eastward from Mount Murray by Tinderry or the Twins, and a Line East from these Pics to the Shoal-Haven River. On the East by the Shoal-Haven River to the Junction of Boro Creek above mentioned.*²⁷



Figure 2.4 An 1841 map of southeastern Australia, showing the 20 counties and associated grazing land of New South Wales. Present-day Canberra is located in the District of Murrumbidgee which, at the time the map was being prepared, had: '147 Stations; 1,795 Acres in Cultivation; 1,139 Population; 1,517 Horses; 62,348 Cattle; 180,654 Sheep'. (Source: W Baker, 1841, Sydney <<https://nla.gov.au/nla.obj-230691397/view>>)



Figure 2.5 An 1848 map of the County of Murray within the District of Murrumbidgee, showing the location of the towns of Queanbeyan and Bungendore and major watercourses. (Source: J Allan, 1848, Sydney <<https://nla.gov.au/nla.obj-230995084/view>>)

However, despite the efforts to contain the spread of settlement, squatters established large pastoral runs beyond the boundaries. In 1836, the Limits of Location was partially rolled back, with squatters occupying Crown Lands allowed to lease their claimed lots for £10 per year, and those found to be residing outside of the Limits of Location would also be fined £10.²⁸ Despite this, the land within the WEIA still appeared to be largely unclaimed. An 1837 map by Robert Dixon shows the land grants made in the Limestone Plains area (Figure 2.6). Two areas have been marked as potential Village Reserve ('V.R.') sites, one at the confluence of the Murrumbidgee and Molonglo Rivers, and the other along Bulgar Creek. Beyond this, however, the WEIA was only partially incorporated into other established landholdings, such as those owned by George Thomas Palmer (Ginninderra), Henry Donnison (Yarralumla), and George Edward Nicholas Weston (Figure 2.6).

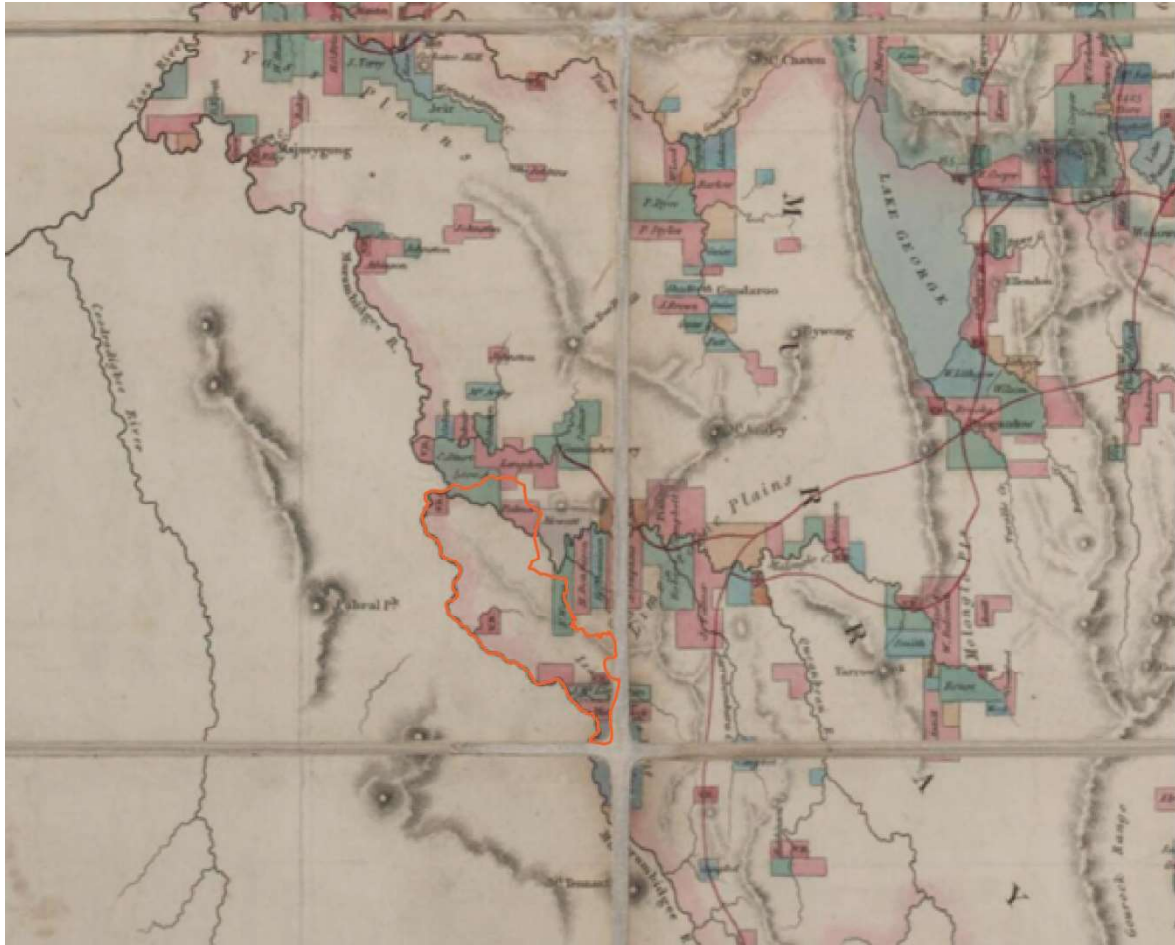


Figure 2.6 A portion of an 1837 map showing the land grants made in the Limestone Plains around the area of present-day Canberra. Although the Limits of Location had been partially rolled back in 1836, the land within the WEIA (GML overlay) remained relatively free of European land claims. Note: This image is not to scale due to the geographical inaccuracy of the original map. (Source: R Dixon, 1837, London <<https://nla.gov.au/nla.obj-231316713/view>>)

By 1847, leases for land beyond the Limits of Location were allowed for up to 14 years. Buoyed by the 1836 and 1847 alterations to the Limits of Location, squatters in the Canberra area quickly co-opted the land on the western side of the Murrumbidgee River.²⁹ In 1861, the Limits of Location were totally eradicated by the *Crown Lands Acts 1861*, which allowed the unlimited selection and sale of land in designated unsettled areas.

2.3.1 Early Contact Between Aboriginal People and Europeans

There are few records of Aboriginal people in the Canberra region in the 1820s or 1830s. This may be because of seasonal movement, or because they retreated from the encroaching settlers, moving to the hills.³⁰ The new settlers may also have simply failed to record their ongoing presence in any detail.

One of the first recorded contacts between the Aboriginal groups and Europeans occurred between Garrett Cotter and Aboriginal leader Onyong (also known as Jindoomung). In the 1820s, Garrett Cotter arrived in the Canberra district as a convict, working in the Lake George region. He was subsequently found guilty of stealing a mare and exiled to the west of the Murrumbidgee River, at a time when the area was uninhabited by Europeans and generally unexplored. Oral history handed down from Cotter to his descendants indicates that he befriended Onyong. Their friendship helped Cotter to survive his exile at the head of the river that now bears his name, located within the Tidbinbilla Nature Reserve and

Namadgi National Park and west of the WEIA.³¹ Onyong later emerged as a prominent figure in the Canberra region.

In the 1830s, two main families are known to have inhabited the Canberra region: Onyong's group, and Noolup's (Jimmy the Rover) group. Both men were designated 'chief' of their respective groups.³² They are recorded as living west of the Murrumbidgee River and Namadgi National Park, with lands spreading into the Brindabella Ranges and perhaps to Tumut.³³ They probably travelled through the WEIA when moving up and down the Murrumbidgee River or between the limestone plains and the mountains; the WEIA may have been an important staging post between major ecological zones in their territories.

Except for a few instances, most records indicate that the main reasons for violent clashes between Aboriginal groups and the early European settlers during the 1820s was over the settlers' abduction of Aboriginal women.³⁴ Ethnographers recorded Aboriginal men retaliating to these events by attacking settlers, or killing the Aboriginal children who had European fathers.³⁵ Not all the interactions between Aboriginal women and European men were violent: James Ainslie was said to have been guided to his land at Pialligo by an Aboriginal girl he met at Ginninderra, who later became his common law wife. The pair had a daughter, known as Nanny.³⁶

Several gatherings between different Aboriginal groups were recorded in the 1820s and 1830s, perhaps in response to the increase in European encroachment on their Country.³⁷ Not all gatherings between Aboriginal people were peaceful. Joseph Franklin, who held land in the Brindabella Ranges, recorded a battle fought between 1,000 Aboriginal men, 'the Queanbeyan, Monaro and Upper Murray Blacks [possibly including Onyong] and the Lachlan and Murrumbidgee Blacks [potentially Wiradjuri invaders]'.³⁸ A smaller conflict occurred on Donnison's Yarralumla, a few kilometres east of Mount Stromlo and the WEIA. Terrence Aubrey Murray recorded that Onyong and an Aboriginal man called Bondaroon—who were sheltering with their group a few miles from the Uriarra Station—were attacked overnight by an Aboriginal raiding party. The attack resulted in the death of Bondaroon and the kidnapping of two women. Murray was grieved by the news of Bondaroon's death as he considered him a close friend.³⁹

In 1842, John Blundell of Blundells Flat noted that there were two distinct Aboriginal communities living on the Limestone Plains—a group he called the 'Pialligo Blacks' based at Pialligo (the site of the present-day Royal Military College at Duntroon) and the 'Canberry or Nganbri Blacks' based on the lower slopes of Black Mountain.⁴⁰ It is unclear whether these were two discrete groups or one family moving around the valley: it is known that Onyong's and Noolup's groups merged in the 1840s.⁴¹ It is also probable that the nuances of group division and dynamics were indistinguishable by European observers. Regional boundaries and languages are not static or unchanging social practices; Aboriginal people were able to speak multiple languages and dialects, and borders between groups may have fluctuated based on prevailing social conditions.

William Davis Wright, who grew up with local Aboriginal children in the upper Murrumbidgee districts of Tharwa and Cuppacumbalong—south of the WEIA—stated that the group in this area referred to itself as the 'Kamberra'.⁴² He also described in detail the range of weapons Aboriginal men carried with them, including:

- spears—groups were said to have:

*anything between two to six spears, some of them with fearsome barbs quite an inch in length, so that, once driven into the flesh of a man or beast, extraction was only possible by driving the spear head through. As a rule, however, the spears were unbarbed, and with the "thrower", a contrivance for throwing the spear, with which considerable force and accuracy could be attained;*⁴³

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- nulla nulla—a hunting stick or club with a knob on one end and a smooth handle;
- shields—including ‘one for defence against the nulla nulla, a very solid affair, and a broader one to guard against spears’;
- boomerangs; and
- hand axes—manufactured from hard polished stone or, later, with metal.⁴⁴

Ethnohistorical accounts indicate that when Aboriginal men died they were buried with their weapons. An account of Onyong’s burial, which occurred in the 1850s, described:

*The men of the tribe ... tied (Onyong’s body) up in a complete ball ... His grave ... on the top of a rocky hill ... was about five or six feet in depth. A tunnel six feet in length was excavated and his body was inserted, with his spears (broken in half), his shield, his nulla nulla, boomerang, tomahawk, opossum rug and other effects. Then the hole was filled with stones and earth.*⁴⁵

As European settlement of the Canberra area increased following the removal of the Limits of Location in 1861, Aboriginal stockmen were employed to work the land.⁴⁶ Wright wrote:

*Some of the natives were splendid stockmen, and among them were several very fine roughriders, equal to tackling any buckjumper. Once at shearing time at Lanyon, there was known to be on the estate a very active plough-horse, known to be a bad buckjumper. Jacky, a native, was working with the shearers, and they chaffed him until it ended with him vowing he would ride the bucking plough-horse, and if he succeeded he would win a bottle of rum. Mr. Cunningham, fond of a bit of fun, agreed to the trial, and on Saturday the event came off. It was a bad horse and had to be blindfolded before it could be saddled. However, we had everything ready at last, the bandage pulled off the horse’s eyes. Jack was sent sky high almost immediately, and, of course, came down hard, but he was after that bottle of rum, and had another try, and yet another. Then the fourth time, and he held on like a burr. The horse plunged some, and did all in his power to get rid of his burden, but Jacky hung on and won his bottle. His hands cut about by the reins, with blood splashed over him and the horse, showed what a stern fight it had been. Jacky had truly earned his rum and the 10/- collected for him.*⁴⁷

Blanket distribution lists from the second half of the twentieth century show that the number of Aboriginal people living in the Canberra area was decreasing.⁴⁸ A key reason for this was the continuous epidemics of measles and influenza, which were common throughout the 1860s.⁴⁹ Aboriginal woman Nellie Hamilton (Figure 2.8) lost her husband to tuberculosis and their two children to measles in 1872.⁵⁰ Hamilton said:

*You come and take our land, kill our game and let us starve, and if we take a sheep or kill a calf, you shoot us or put us in gaol. You bring your disease and give it to us—we had nothing like that until you came and stole our land—you give us rotten blankets and bad rum.*⁵¹

Another cause of population loss was Aboriginal people leaving Canberra in response to being forcibly removed from their land. Many families from Lake George, Yass, and Canberra are known to have gone to missions, such as the Maloga Mission near Moama, the Warangesda Mission at Darlington Point, or the Brungle Aboriginal Station in the Tumut district.⁵² Other reserves were set up near Yass, including North Yass Camp, Rye Park, Edgerton Mission Station, Hollywood Aboriginal Reserve, and Oak Hill Aboriginal Reserve.⁵³

Despite the loss and forced removal from their land, descendants of the original Aboriginal groups of Canberra encountered by first settlers are still living in the area today and are actively engaged in their traditional customs.



Figure 2.7 Henry 'Black Harry' Williams worked on several stations in the Canberra area from the 1860s. Here he is photographed at Uriarra Station, c1903. (Source: The History of Ngambri Country, 'Holding onto Country in the 21st Century' <<http://www.ngambri.org/country.html#prettyPhoto>>)



Figure 2.8 Nellie Hamilton, photographed in the late nineteenth century. (Source: Hall Museum, 'Rediscovering Ginninderra: Queen Nellie Hamilton' <<https://museum.hall.act.au/display/1939/person/2188/nellie-hamilton.html>>)

2.4 Establishing the Federal Capital City

During the late 1890s, there was much debate over the location of the seat of government for the new Commonwealth of Australia. It was eventually decided that the future capital's location would be selected by the new Parliament following Federation in 1901.⁵⁴

Various sites for the Federal Capital Territory (FCT) were considered during the years leading up to Federation but it was not until 1908 that the final site selection was made, with the region of Yass-Canberra nominated for the federal capital by surveyor Charles Robert Scrivener. When Scrivener was sent out to examine and survey potentially suitable sites for the federal capital, he was directed by Hugh Mahon of the Commonwealth Parliament that:

*The Federal Capital should be a beautiful city, occupying a commanding position with extensive views, and embracing distinctive features which lend themselves to the evolution of a design worthy of the object, not for the present but for all time.*⁵⁵

Scrivener's choice was an elevated site straddling the Molonglo River with mountains and hills to the northwest, northeast and south. The shape of the territory was largely determined by access to water. The original surveying parties were instructed to be scrupulous about securing the best water catchment for the new capital.⁵⁶ Trigonometrical stations were already established at One Tree Hill, in northern

Gungahlin and at Mount Coree in Brindabella National Park, so out of convenience rather than geographic strategy, the straight northwest boundary was drawn.⁵⁷



Figure 2.9 PL Sheaffe, surveyor, determining the second peg on the survey line through Canberra, 1913. (Source: National Archives of Australia [NAA], Item. 8357551)



Figure 2.10 A group of surveyors, 1910. Seated, from left to right, are FJ Broinowski, A Percival, CR Scrivener, and PL Sheaffe. (Source: NAA, Item 11321847)

In 1909, *Seat of Government Surrender Acts (Surrender by NSW and Acceptance by the Commonwealth)* were passed for the transfer of an area of 911 square miles to the Commonwealth to form the Territory,⁵⁸ with approximately 35,500 hectares of land compulsorily acquired by the Commonwealth from NSW.⁵⁹

Over the next 30 years, Canberra sought to establish itself through innovative city design, economic production, increased population density, and technological feats.

2.4.1 The Griffins' Plan

An international competition to design the new city commenced in 1911. In May 1912, after considerable debate and 137 entries, two Chicago architects—Walter Burley Griffin and his wife and business partner Marion Mahony Griffin—won the competition. Walter Burley Griffin declared:

*I have planned a city not like any other city in the world. I have planned it not in a way that I expected any government authorities in the world would accept. I have planned the ideal city—a city that meets my ideal of the future.*⁶⁰

The Griffins were interested in urban design that integrated buildings, gardens, and the broader landscape, linking suburban communities and city centres. In their designs they aimed to draw references from the broader natural setting of the place. The 1911 international competition provided the Griffins with an opportunity to design a visionary ideal city set in an undeveloped, open, and largely pastoral site. The resulting design paid attention to the setting and the site's natural features: hills, watercourses and views.

Through integrating the topography of the physical site with their urban design, the city of Canberra complemented its landscape in a way that was lacking in the Griffins' hometown of Chicago. Chicago had developed over its surrounding natural and agricultural landscape through accelerated and largely unregulated urban and suburban expansion—led by speculation rather than considered foresight and attention to detail and quality. The Griffins saw a better way to develop a city. Canberra was conceived as a designed alternative which included topography and nature at its core and cultivated landscape in an idyllic setting.⁶¹ The Griffin plan for the national capital was based on a geometry dictated by the landscape rather than the principal points of the compass. The city was laid out with vistas, axes aligned

to the summits of four local mountains and a large central lake. A water axis formed from the flow of the Molonglo River was at right angles to a land axis between the summits of two hills. This central land axis ran from Mount Ainslie through Camp Hill (the site of Old Parliament House) to Capitol Hill (the site of new Parliament House) and then nearly 50 kilometres further inland to Mount Bimberi. A municipal axis lay just to the north of, and parallel to, the water axis. A main and straight approach road from the north was proposed to lead to the centre of the municipal area and through it to the central national area.

The Griffin plan also drew on two of the prominent town planning theories prevalent at the time:

- City Beautiful—a philosophy widely discussed and implemented in North American architecture and urban planning circles during the 1890s and 1900s. Its intent was to import European-style beautification and monumental grandeur into the city environment. The movement advocated the promotion of beauty, not only for its own sake but also as an uplifting moral and civic force for the betterment of the community. There was a belief that beautification could promote a harmonious social order and increase residents' quality of life.
- Garden City—an urban planning style initiated in 1898 by Sir Ebenezer Howard in Britain. The concept was that garden cities were planned as self-contained communities surrounded by green belts or parks with short commuting times and preservation of the surrounding countryside landscape. Canberra's older local residential areas that have their origins in this planning philosophy contain many parks, gardens and ample open space protected from through traffic.

By combining these two philosophies with their sensitivity to the existing landscape, the Griffins' design proposed a planned capital with unique purpose, symbolism and character. Relating closely to its natural setting, their vision for Canberra celebrated the creation of the Australian nation—with both monumental ceremonial national areas and attractive local residential precincts to provide people with places to celebrate, commemorate, work and live. Despite their differences, both the City Beautiful movement and the Garden City movement shared the physical planning ideas of circular and linear avenues, radiating boulevards and separated land uses that are evident in Canberra.⁶²

By 1918, the Griffins had developed their scheme into a practical plan that could be implemented. In 1920, the Commonwealth Government established a Federal Capital Advisory Committee (FCAC) to ensure the plan's timely execution. Griffin did not approve of the FCAC's appointment and this, along with ongoing tension between Griffin and other staff and governmental departments, led to him leaving Canberra in 1920 on the completion of his contract.⁶³



Figure 2.11 The Griffins' plan of design for the federal capital showing the land, water, and municipal axes, 1911. The three formal basins of the city centre and their flanking lakes are especially clear in this plan. (Source: NAA, A1, 1917/7242)

2.4.2 The Forestry Industry

Although present-day Canberra is often known as the 'bush capital', by the time it had been selected as the site of the FCT in 1908, nineteenth-century pastoralism had stripped much of the native vegetation and ravaged the landscape—including the extensive rolling plains and high ridgelines of the WEIA.⁶⁴ As a result, very little timber of commercial value remained, a major issue for the establishment of a new city.⁶⁵ Beyond this, however, was the burgeoning interest in horticulture and the natural environment, which was strongly connected to the Garden City approach to urban design. After the selection of the site for the FCT, several reports were commissioned on the nature of the existing landscape. The physiographical report, prepared by the geographer Griffith Taylor, drew attention to the damaged landscape and the need to conserve it:

*One of the most urgent matters ... is that of forest preservation. The suicidal cutting and clearing of every inch of timber is appalling ... After the trees have been cut down the roots decay, and there is nothing to prevent the loose soil washing down into the gullies ... The question of planting the Capital Site is under consideration, but the destruction of native timber should be stopped immediately on all high stony grounds unsuitable for pasture; and of these there are many in the territory.*⁶⁶

Scrivener, who was now the Director of Commonwealth Lands and Surveys and had been living in the Canberra area since 1908, was aware of the need for trees: his concerns about the exposed landscape permeated many of his reports.⁶⁷ In December 1910, it was decided that a nursery for the cultivation of trees and shrubs should be established. Little progress was made at the nursery initially. In May 1913, Charles Weston, the then Head Gardener of Federal Government House in Sydney, was appointed as Officer-in-Charge of Afforestation in Canberra and instructed to oversee the nursery and produce a program of afforestation.⁶⁸

The first stage of the program was to reintroduce forest cover on Mount Stromlo, located on the eastern edge of the WEIA; a large plantation of Monterey pine (*Pinus radiata*) was established in 1915, which would eventually surround the Commonwealth Solar Observatory (Section 2.4.4).⁶⁹ Following this, newly cultivated native vegetation was planted to replace what had been removed from Mount Pleasant and Mount Mugga Mugga, whilst remnant vegetation on Mount Majura was encouraged to regenerate.⁷⁰

Whilst these efforts aided in increasing the tree cover over Canberra, Weston was acutely aware that the afforestation program must incorporate a commercial dimension.⁷¹ However, it was not until the inception of the Federal Capital Commission (FCC) in January 1925 that a more ambitious commercial forestry program was kickstarted. Following a detailed survey of the FCT's forestry resources, two new Monterey pine plantations were established at Uriarra and Kowen in 1926 and Pierces Creek in 1928 (Figure 2.12).⁷² In addition to the long-term commercial purposes of the plantations, in the short term they aided to conserve soils and reduce erosion and, in the cases of the Uriarra and Pierces Creek plantations, protect the Cotter River Catchment.⁷³ Forestry settlements were established at each of the pine plantations to provide permanent housing, community facilities, and industrial storage facilities for those who managed and worked in the plantations.⁷⁴ Many of the forestry settlements were established in conjunction with the initial pine plantings, but the Mount Stromlo Forestry Settlement—located immediately adjacent to the eastern boundary of the WEIA at the base of Mount Stromlo—was not constructed until 1928.

2.4.3 Soldier Settlement

Following the end of World War I, state and federal governments initiated a 'Soldier Settlement Scheme' as a way to ensure Australia's economic and political security, military safety, and increase primary production.⁷⁵ South Australia was the first state to enact this scheme in 1915, with numerous other states following suit in 1916.

Federal Territory Lands			
<p>A PPLICATIONS from Returned Soldiers and Residents of the Federal Territory who volunteered for Active Service abroad, are invited and will be received by the Commonwealth Surveyor-General, 318 Post Office Place, Melbourne, until noon on Saturday, the 28th February, 1920, for the leasing of the following Blocks in the Federal Territory set apart for Soldier Settlement:—</p>			
Block.	Area, Acres	Term, Years	Rental per acre per annum.
4a	935	25	5/6
5a	645	5	6/9
8a	441	5	5/0
8b	373	5	3/6
8c	356	12	5/0
8d	241	25	4/0
8e	212	5	2/6
9a	350	12	4/6
10a	850	25	5/6
10b	870	25	5/6
11a	290	12	3/8
11b	412	12	4/0
12a	582	25	5/0
13a	880	5	3/9
14a	1055	5	3/9
14b	854	5	2/6
25	1006	25	4/0
30	1140	25	4/3
110a	240	12	5/0
110b	266	25	4/6
110c	210	25	5/0
110d	290	25	5/0
110e	307	25	5/0
110f	319	25	4/0
110g	372	25	4/6
110h	640	5	2/6
112a	900	5	3/0

Plans showing areas may be seen at Queanbeyan, Alinalie, and Hall Post Offices, where special application forms may be obtained.

Further particulars may be had upon application to the District Surveyor, Canberra.

A. POYNTON,
Minister of State for Home and Territories.

SETTLEMENT AT CANBERRA.
With a view to populating the Federal Capital territory, which is at present little better than a wilderness, notwithstanding all the efforts of New South Wales members in the Federal Parliament to advertise the district, arrangements have been made to make blocks of land available for soldier settlement upon leases varying in terms from five to twenty-five years. The blocks are from 210 to 1100 acres in size, and the yearly rental varies from 2/6 to 6/9 an acre. In most cases the land is intended for grazing purposes, and soldier settlers are being assisted to the amount of £625 for the purchase of stock and other developmental purposes.

SOLDIER SETTLEMENT AT CANBERRA.

For the 27 blocks recently made available for soldier settlement on the Federal Territory, there were 99 applicants. A board consisting of Messrs. Sheaffe, District Surveyor, A. M. Moriarty, of Goulburn, and W. O. Russell, sat this week in Queanbeyan, and the Minister has just approved of the blocks being granted as recommended by the board. The applicants are described as a very fine lot of men, chiefly locals or one-time locals, and there is every reason for believing that the new settlers will make good in every way. Efforts are now being made to prepare more land for soldiers at an early date.

Figure 2.13 Articles in regional newspapers concerning the second release of land for the Soldier Settlement Scheme in the Federal Capital Territory. Left: The 27 blocks in Jerrabomberra-Tuggeranong and their associated lease terms and costs. (Source: *Queanbeyan Age and Queanbeyan Observer*, 'Federal Territory Lands', 13 February 1920, p 5 <<https://trove.nla.gov.au/newspaper/article/31652673>>). Right, top: Advertisements of the released land were not confined to local newspapers, but were disseminated across Australia. (Source: *The Horsham Times*, 'Settlement At Canberra', 12 March 1920, p 5 <<https://trove.nla.gov.au/newspaper/page/7224619>>). Right, bottom: The second release of land was popular, with 99 applicants vying for 27 blocks. (Source: *Sydney Morning Herald*, 'Soldier Settlement At Canberra', 22 March 1920, p 5 <<https://trove.nla.gov.au/newspaper/page/1250436>>)

GML Heritage

The implementation of a Soldier Settlement Scheme was a good way for the FCT to both expand on the primary production capabilities of the Territory and establish a population—in 1911, the FCT had a population of just 1,714. Between 1918 and 1920, the Commonwealth Government assumed approximately 3,600 hectares of land in preparation for the scheme.⁷⁶ This land was surveyed and released as part of several packages:⁷⁷

- 24 blocks in Ainslie-Majura in the Gungahlin District—applications closed on 30 September 1919;
- 27 blocks in Jerrabomberra-Tuggeranong, which comprised parts of the Woden, Lanyon, Paddy's River, and Stromlo Districts—applications closed on 28 February 1920;
- 16 blocks in the Woden District—applications closed on 16 October 1920;
- an unknown number in the Belconnen District—applications closed on 17 February 1923; and
- an unknown number of blocks until the closure of the scheme in 1927.

Unlike the system being implemented in other states, the land in the FCT would not be sold to the successful applicants but leased for a period of time ranging from five years to 25 years.⁷⁸ Within the WEIA, a total of eight blocks were leased as part of the Soldier Settlement Scheme (Table 2.1 and Figure 2.14).

Table 2.1 An Overview of the Initial Occupancy of the Eight Blocks within the WEIA Leased during the Soldier Settlement Scheme in the FCT, 1920–1927. (Source: after ACT Government, 'ACT Soldier Settlers Guide', ACT Archives, viewed 18 September 2020 <<https://www.archives.act.gov.au/repataandrabbits/ww1-soldier-settlers-index>>)

Block	Size	Initial Lessee	Lease	Rate p/a	Duration of Occupation
Stromlo Block 6	454 hectares	Henry Tully	10 years	£323/8/9	1 January 1926–14 October 1930
Stromlo Block 7	389 hectares	Leslie Lee	–	–	November 1925–July 1930
Stromlo Block 9	511 hectares	Henry Brown	10 years	–	1926–January 1935
Stromlo Block 10	457 hectares	Harold Furner	–	–	1925–December 1926
Stromlo Block 12	598 hectares	Thomas Jamieson	–	£314/5/9	1926–March 1929
Stromlo Block 19	605 hectares	Hilton Clothier	10 years	£467/10	1 January 1926–September 1931
Stromlo Block 43	263 hectares	Hilton Clothier	5 years	£146/5	10 November 1920–9 November 1925
Belconnen Block 21	426 hectares	Oswald Dixon	25 years	£133/12	14 June 1923–1963

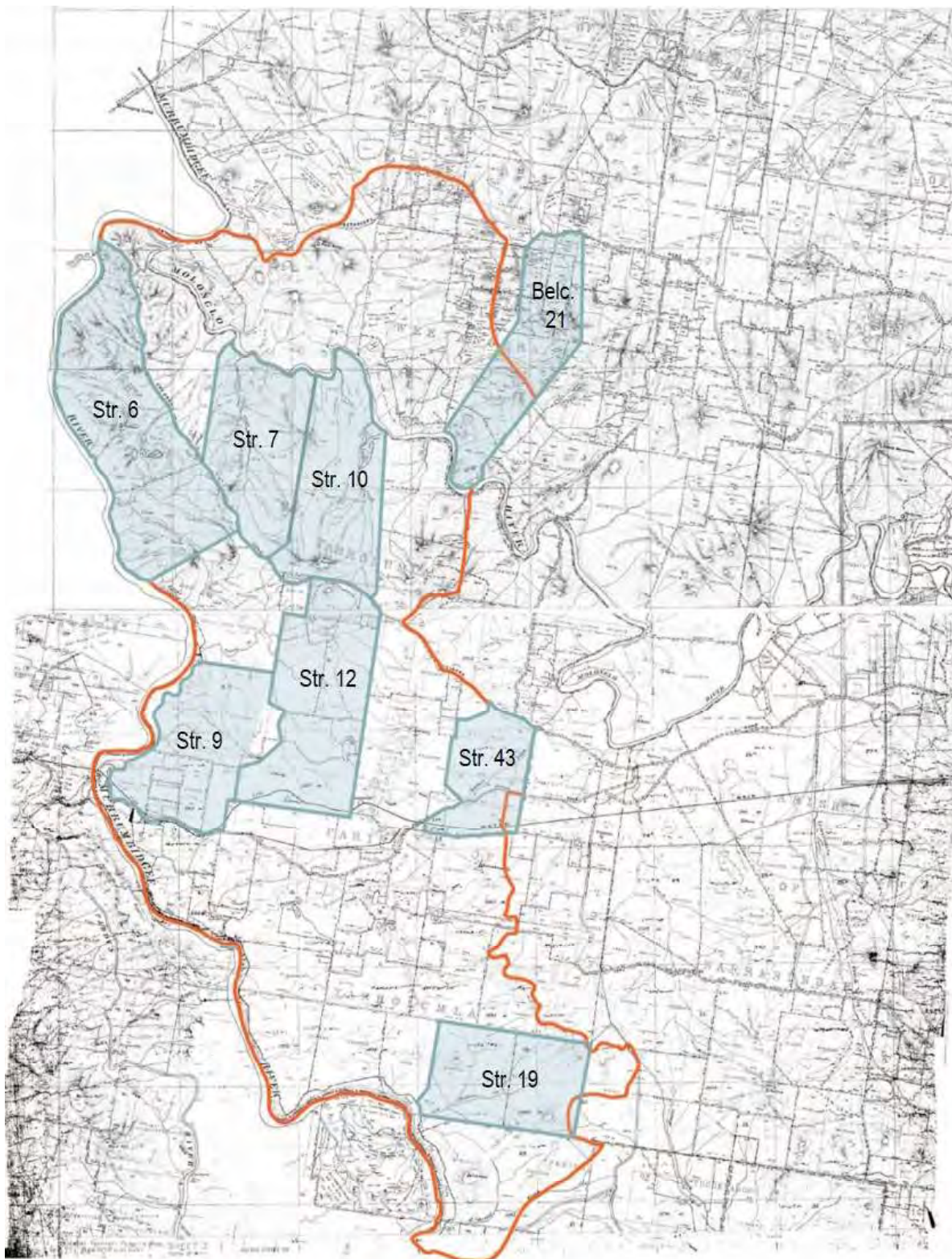


Figure 2.14 A total of eight blocks (shaded in blue) within the WEIA, in the Stromlo (Str.) and Belconnen (Belc.) Districts, were leased as part of the Soldier Settlement Scheme in the Federal Capital Territory, which lasted from 1920 to 1927. (Source: after ACT Government, 'ACT Soldier Settlers Guide', ACT Archives, viewed 18 September 2020 <<https://www.archives.act.gov.au/repatandrabbits/ww1-soldier-settlers-index>>, with GML overlay)

It is unknown how the candidates were assessed and selected.⁷⁹ It is likely that prior experience was a considerable factor in this process: all applicants were required to prove that they had the appropriate knowledge and skills to be a farmer.⁸⁰ The common opinion at the time, however, was that farming was a largely unskilled occupation and required little training. As a result, selection committees rarely screened applicants for their skill level or questioned the stated experience.⁸¹ Such was the case for Oswald Dixon, lessee of Belconnen Block 21. Dixon had specified in his application that he had ‘worked with stock and had recently been employed locally with sheep to study local conditions’.⁸² In reality, Dixon had no prior stock experience but had claimed so on the advice of a colleague to improve his chances of securing a block.⁸³ However, Dixon made good connections with local graziers and ultimately prospered out of his venture.

Those who were successful in their applications and granted leases did not always have similar luck in profiting from the land. Many of the soldier settlers struggled to meet the stringent requirements and supervision imposed by the conditions of the lease. The application forms indicate that many of the soldier settlers had few finances and intended on claiming the £625 advance to purchase stock, erect fences, construct dams, and build houses.⁸⁴ Those that took out the loans fell under the sharp scrutiny of officials:

It appears that decisions about when stock should be sold, when the wool clip should be sold or whether the herd should be increased were made by the stock inspector. There were also instructions for the destruction of timber attached to lease agreements. Every transaction proposed by a soldier settler had to be approved by the Lands and Survey Branch. Even if the lessee wanted to sink a dam, he had to ask permission.⁸⁵

At the time the Scheme was implemented, little thought was given to the quality of the land and sizes of the blocks.⁸⁶ Blocks were often between 1,000 and 1,350 acres, and there was concern that this would not be sufficient to support a family.⁸⁷ Ensuing drought, low stock prices, and small wool returns meant that many soldier settlers were unable to repay their loans and fell further into debt. During his five-year occupation of Stromlo Block 19, Hilton Clothier was unable to make ends meet. In November 1926, Clothier owed £346/17/6, which—despite repaying over £200 by November 1928—had increased to £424/18/1 in October 1929.⁸⁸ Due to these crippling debts and the decreasing economic security of the late 1920s, many of the soldier settlers sought to cancel their leases. Harold Furner, lessee of Stromlo Block 10, wrote to the Lands Officer, James Brackenreg:

The country carries little feed and is too rough and precipitous for any except very strong sheep and a clean muster is almost impossible ... I consider I have tested this paddock thoroughly and can find no means of making it pay rent.⁸⁹

2.4.4 Technological Feats

In addition to establishing itself physically and economically as a capital city, the FCT also sought to be recognised as a centre for technological innovation and success.

The Cotter Dam

During initial surveys of the Canberra area prior to its selection for the FCT, the Cotter River had been noted for its ‘capacity ... and the purity and quality of water’.⁹⁰ In 1907 EM De Burgh, Acting Chief Engineer Rivers Water Supply and Drainage for NSW, prepared a civil engineering assessment for the construction of a dam using a gravity scheme versus a pumped scheme.⁹¹ Detailed design for the dam was undertaken in 1911, which resulted in the proposal of a concrete gravity dam 28 metres wide and 32.9 metres high straight across a gorge in the lower Cotter River valley, immediately west of the WEIA.⁹² This final design had a dam wall lower than originally recommended by De Burgh—who had suggested a height of 48.1 metres—and the wishes of Col Percy Owen, the Director General for Works for the

Department of Home Affairs.⁹³ A popular urban myth suggested that the height was reduced as a result of war-time restrictions, but there are no official records to corroborate this.⁹⁴

After the blasting and removal of excess rock and earth and the construction of the timber formwork, concrete was progressively poured behind the formwork to create the dam wall.⁹⁵ The raw cement was brought by rail from Sydney to Queanbeyan, and then to the river by wagons towed by steam traction engines where it was mixed on site.⁹⁶

The water stored in the Cotter Dam was gravity-fed to the nearby pumping station on the eastern bank of the Murrumbidgee River, located immediately adjacent to the western boundary of the WEIA. The water travelled through a pipeline extending from the bed of the Cotter River to the western bank of the Murrumbidgee River, down a 20-metre deep shaft beneath the Murrumbidgee, and then through a concrete-lined tunnel to the station.⁹⁷ The pumping station comprised of a brick pumphouse with space to accommodate two electrical pumps and a smaller transformer house to supply the necessary power to transport the water along Cotter Road (across the width of the WEIA) to the city. The dam was completed in 1915, and the pumping station was functional by 1918. A third pump was added in 1935 and a fourth in 1942.⁹⁸

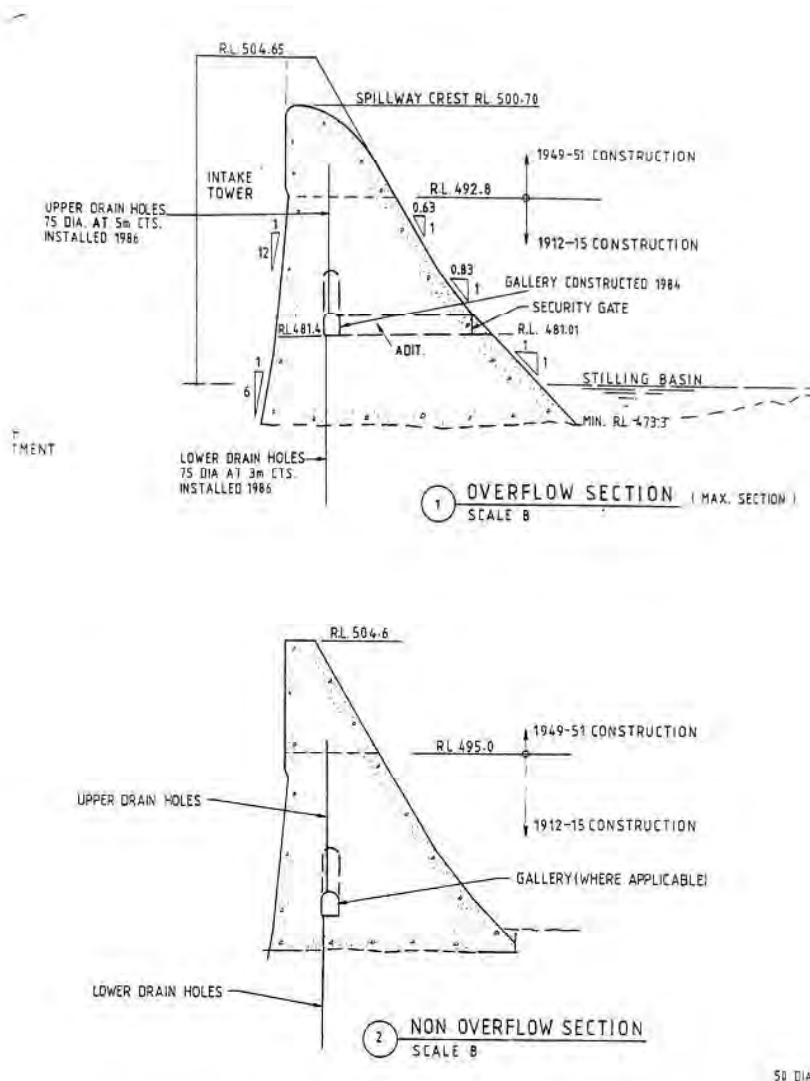


Figure 2.15 A diagram showing the alterations made when the Cotter Dam wall height was increased in 1951. (Source: ACTEW Drawing Cotter Dam General Arrangement, CD 87/190, June 1987)

The post-World War II population increase meant that Canberra required more water than the original dam could store.⁹⁹ In 1948, a decision was made to increase the height of the dam wall by 8 metres to increase the capacity of water storage.¹⁰⁰ At the completion of the works in 1951, the storage capabilities of the Cotter Dam had been increased from 1,850 megalitres to 4,700 megalitres.¹⁰¹ Four additional pumps were installed between 1955 and 1963.¹⁰²

The Cotter Dam was used as the sole supply for Canberra's water until 1968, when the Bendora Dam was constructed, higher on the Cotter River.

The Commonwealth Solar Observatory

In 1907, Walter Geoffrey Duffield, a research student from Adelaide, attended the conference of the International Union for Cooperation in Solar Research in Oxford.¹⁰³ During the conference, it was highlighted that the gap in observational facilities between India and the United States of America was having a detrimental impact on the observations that could be made of the sun.¹⁰⁴ Duffield noted that Australia was in the right location—both longitudinally and latitudinally—to rectify this.¹⁰⁵ Two years later, an excerpt from a letter written by Duffield to his mentor, William Bragg, appeared in the *Adelaide Advertiser*. In the excerpt of the letter, Duffield had written:

Two years ago I went to the Oxford meeting and was much disappointed to find no mention of solar work done in Australia. I was told none was done there. It seems that Australia loses a great opportunity of distinguishing herself, for with her clear skies and sunny weather she should produce results as magnificent as those of the great American observatories.¹⁰⁶

It appears that the editor agreed with Duffield, as the commentary below the letter excerpt read:

Mr Duffield is right in suggesting that it is quite time that Adelaide entered upon the work mentioned ... the Government may, of course, feel inclined to supply the needed equipment so that the full scientific advantage of the glorious Australian sunlight may be reaped.¹⁰⁷

Unfortunately for Adelaide, it was decided that the proposal to establish a Commonwealth solar observatory would be incorporated into the plans for the FCT. The site of the ridge on Mount Stromlo—in the eastern extent of the WEIA—was nominated as a site for the observatory, its main advantages being 'uninterrupted horizon, clear skies, transparency, and steadiness of the atmosphere and freedom from dust, smoke, and frequent atmospheric disturbances'.¹⁰⁸ In 1911, the Oddie cast iron nine inch refractor telescope—which had been donated to the Commonwealth by James Oddie in 1909—was set up in 1911 at Mount Stromlo for initial testing to determine the suitability of the site as an observatory. The building housing the telescope was one of the earliest Commonwealth buildings constructed in the newly established FCT. In 1914, Mount Stromlo was officially selected as the site of a permanent Commonwealth solar observatory;¹⁰⁹ however, the formal establishment was deferred due to the outbreak of World War I.

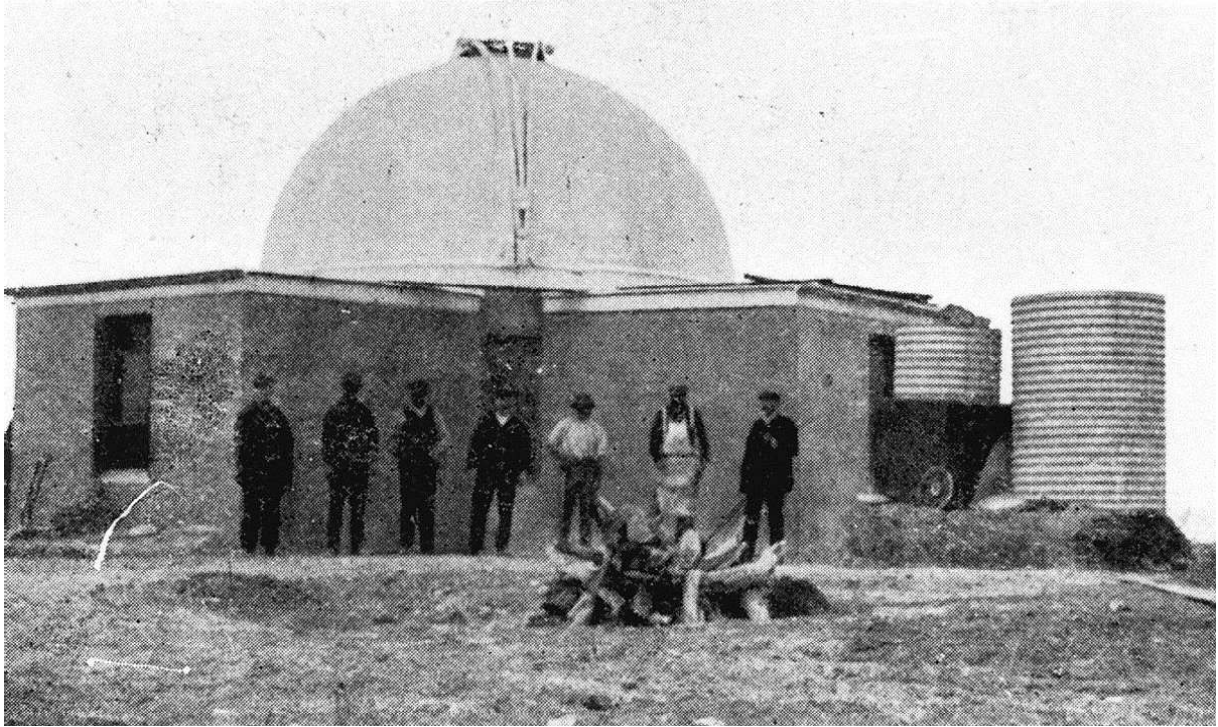


Figure 2.16 Oddie Telescope Dome, 1911. The earliest building constructed on the Mount Stromlo observatory site, it was also one of the first Commonwealth buildings in the newly established FCT. (Source: Mount Stromlo Observatory [MSO] Archives)

It was not until 1924 that the Observatory was formally established. Duffield was appointed as its first Director, with his primary task being to oversee the construction and development of the Observatory.

A park-like setting was created with the buildings and domed telescope structures surrounded by the extensive pine plantation that Weston had established in 1915 (Section 2.4.2). The planning of the site distinguished areas for different functions, which precincts for residences and research, and a series of roads leading to the formal gardens established in front of the Commonwealth Solar Observatory building.

Walter Duffield died unexpectedly in August 1929 and was buried at Mount Stromlo on a hill to the north of the site, overlooking the northeastern rolling landscape of the WEIA. Duffield's wife Doris was also buried at the site in 1956, and their daughter Joan was later interred in the Duffield Grave in 2015.

In 1939, Richard van der Riet Woolley was appointed as the second Director. During World War II, under his directorship, the Observatory greatly expanded its activity and devoted its resources to producing optical munitions for the war effort. Modifications were made to the Commonwealth Solar Observatory Building in 1941 to 1942 to manufacture precision instruments such as gun sights and artillery directors.¹¹⁰ To meet the demand, the accommodation facilities on Mount Stromlo—separate from the Forestry Settlement—were increased as the staff expanded from 10 to 70.

The 1950s was the greatest period of telescope acquisition for the Observatory, with four new instruments installed. This enlarged the research capabilities of the observatory, allowing it to enter into the new era of stellar astrophysics that was revolutionising the study of astronomy at this time. This development reflects scientific expansion in the postwar years. The newly acquired telescopes included the Great Melbourne Telescope (1944, installed 1955) purchased by the Commonwealth from the recently closed Melbourne Observatory, the 74inch Telescope (1955) housed in the largest dome building on site, and the Yale-Columbia Telescope (1954–1955). Woolley also arranged the acquisition

of the Schmidt camera from the University of Uppsala in Sweden to be moved to Mount Stromlo (installed in 1957).

In 1965, the Siding Spring Observatory at Warrumbungle Mountain Range near Coonabarabran was opened to provide a permanent dark sky site in response to the adverse light pollution from Canberra's growth. Since its opening, all new research telescopes have been located at Siding Spring Observatory. As a result, the work at Mount Stromlo began to shift from research and observation to the design and technology aspects of developing research equipment to assist in the field of observations.

2.5 Post-World War II Development

Little development and growth had occurred in the Australian Capital Territory (ACT)—as it became known in 1938—during the Great Depression and World War II; in 1938, the population comprised of approximately 7,000 people spread across a handful of suburbs.¹¹¹ The first decade of growth following the war was characterised by poor management. The National Capital Planning and Development Committee (NCPDC) was largely ignored; development occurred without reference to the Griffins' plan and predominantly comprised of cheap, temporary buildings.¹¹²

In 1957, the National Capital Development Commission (NCDC) was established to replace the ineffective NCPDC. In its first annual report, the NCDC identified four principal tasks:

1. To complete the establishment of Canberra as the Seat of Government by providing the facilities necessary for the smooth functioning of the Parliamentary body.
2. To further the development of Canberra as the Administrative Centre by seeing to a smooth conclusion the Defence transfers already approved, and by providing the necessary physical facilities to permit the early completion of Commonwealth Public Service personnel transfers from Melbourne.
3. To give Canberra an atmosphere and individuality worthy of the National Capital through provision of monumental buildings and suitable special features.
4. To further the growth of the National Capital as a place in which to live in comfort and dignity.¹¹³

Part of this plan involved the NCDC adopting the 'Y-Plan' in 1967. This key strategic plan provided for Canberra to grow with the creation of separate satellite town centres and districts in the form of the letter Y: the newly planned districts of Belconnen and Gungahlin would form the upper arms of the Y, whilst Tuggeranong would form the base. The WEIA is nestled against the western edge of the Y, comprising the landscape between suburbia and the Murrumbidgee River. The Y would be developed in stages: Woden Valley from 1964, Belconnen from 1966, Weston Creek from 1969, Tuggeranong from 1974, and Gungahlin from the early 1990s. In 1977 the National Capital Open Space System (NCOSS) was developed to address environmental concerns and the need to reserve natural areas for recreational purposes in a rapidly expanding population. By the end of the twentieth century, Canberra's population had grown from 1,700 in 1911 to 311,000 in 2000.

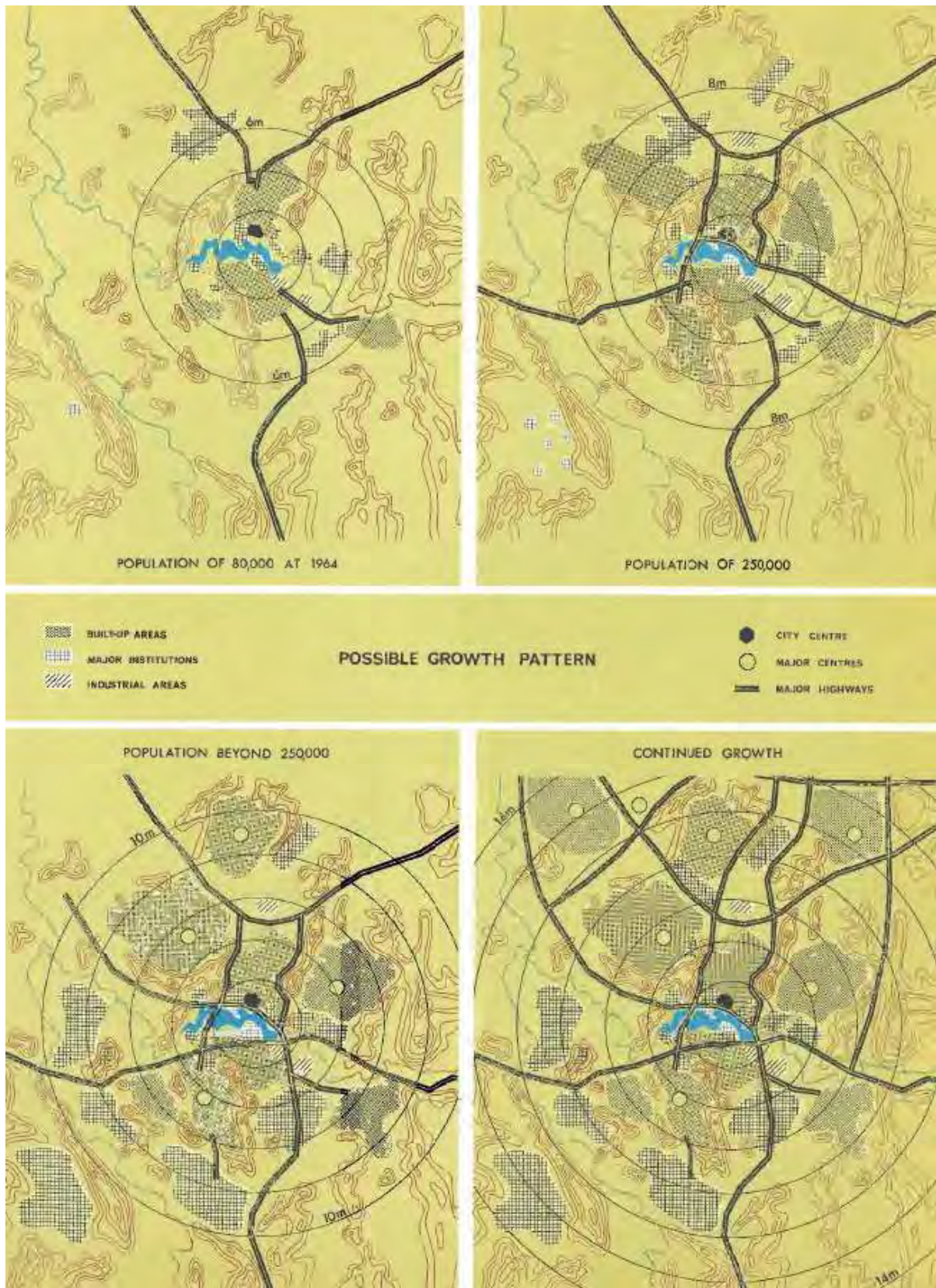


Figure 2.17 The Y-Plan was developed from an earlier predictive modelling exercise for Canberra's growth pattern. (Source: NCDC 1965, *The Future Canberra*, Canberra, p 51)

2.6 Canberra in the Twenty-First Century

2.6.1 Continued Growth

The districts and associated suburbs planned by the NCDC—Woden Valley, Belconnen, Weston Creek, Tuggeranong, and Gungahlin—continue to be developed through the early part of the twentieth century. In October 2010, a new district was gazetted—Molonglo Valley—which is the only district that has been created since 1966. The Molonglo Valley District and its planned suburbs are located immediately adjacent to the eastern border of the WEIA at the base of Mount Stromlo.

2.6.2 Bushfires

Bushfires are not a phenomenon unknown to Canberra and, being located between Canberra and several major national parks, the WEIA has been badly affected by several fires since the start of the twentieth century.

On Saturday 14 January 1939, a fire that had ignited approximately 60 kilometres west of Uriarra Station on Tuesday crossed the Murrumbidgee River at multiple points.¹¹⁴ Initially the fire had been considered ‘too far away to cause any danger’, but strong winds on the Friday pushed the fire ‘from mountain-top to mountain-top’.¹¹⁵ Approximately 31 homes were lost and 60,000 hectares of forest and grazing land and 1,000 hectares of pine plantation were destroyed.¹¹⁶ This included a portion of the Mount Stromlo plantation, the entirety of the Uriarra plantation, and the intervening rural plains.¹¹⁷

The Mount Stromlo plantation and Observatory were damaged again in February 1952 when—whilst approximately 100 fires were burning out of control in NSW¹¹⁸—electrical storms caused several fires to ignite in the northwest of the ACT.¹¹⁹ Two of the fires eventually converged and headed towards Mount Stromlo, where approximately 350 hectares of pines and £100,000 of Observatory equipment were destroyed.¹²⁰ An additional 3,000 hectares of rural land was also damaged during the 1952 fire season.

GML Heritage

To date, the worst bushfire to impact Canberra occurred in the early months of 2003. On 8 January 2003, lightning strikes ignited four fires in NSW along the western ACT border. Challenging fire-fighting conditions meant that, despite their low intensity and rate of growth, the fires were unable to be extinguished or contained. Weather conditions on 18 January, however, were detrimental to the situation: temperatures rose to as high as 40° Celsius, winds exceeded 80 kilometres per hour, and relative humidity dropped to very low levels. The first documented case of a fire tornado in Australia was recorded.¹²¹ The extreme winds caused the four fires to converge into one and travel towards the Canberra urban area; by mid-afternoon the fire had entered the western suburbs.

A total of 431 suburban properties in the western suburbs of Canberra (including Duffy, Chapman, Holder, and Kambah, and the Forest Settlements of Stromlo, Uriarra, and Pierces Creek) had sustained damage; 390 of these had been completely destroyed.¹²² Approximately 160,000 hectares of forest and rural land were burnt—almost 70 per cent of the ACT's grazing land, pine plantations (including all plantations west of Mount Stromlo), and native forests (including Tidbinbilla Nature Reserve and Namadji National Park).¹²³ Most of the buildings, workshops, research equipment, and records at the Mount Stromlo Observatory were decimated.



Figure 2.19 Photograph captured during the January 2003 Canberra bushfires. (Source: J Lafferty 2003, 'Canberra Bushfire 2003', 22 September 2020 <<https://www.flickr.com/photos/25223017@N00/3287155854/>>)

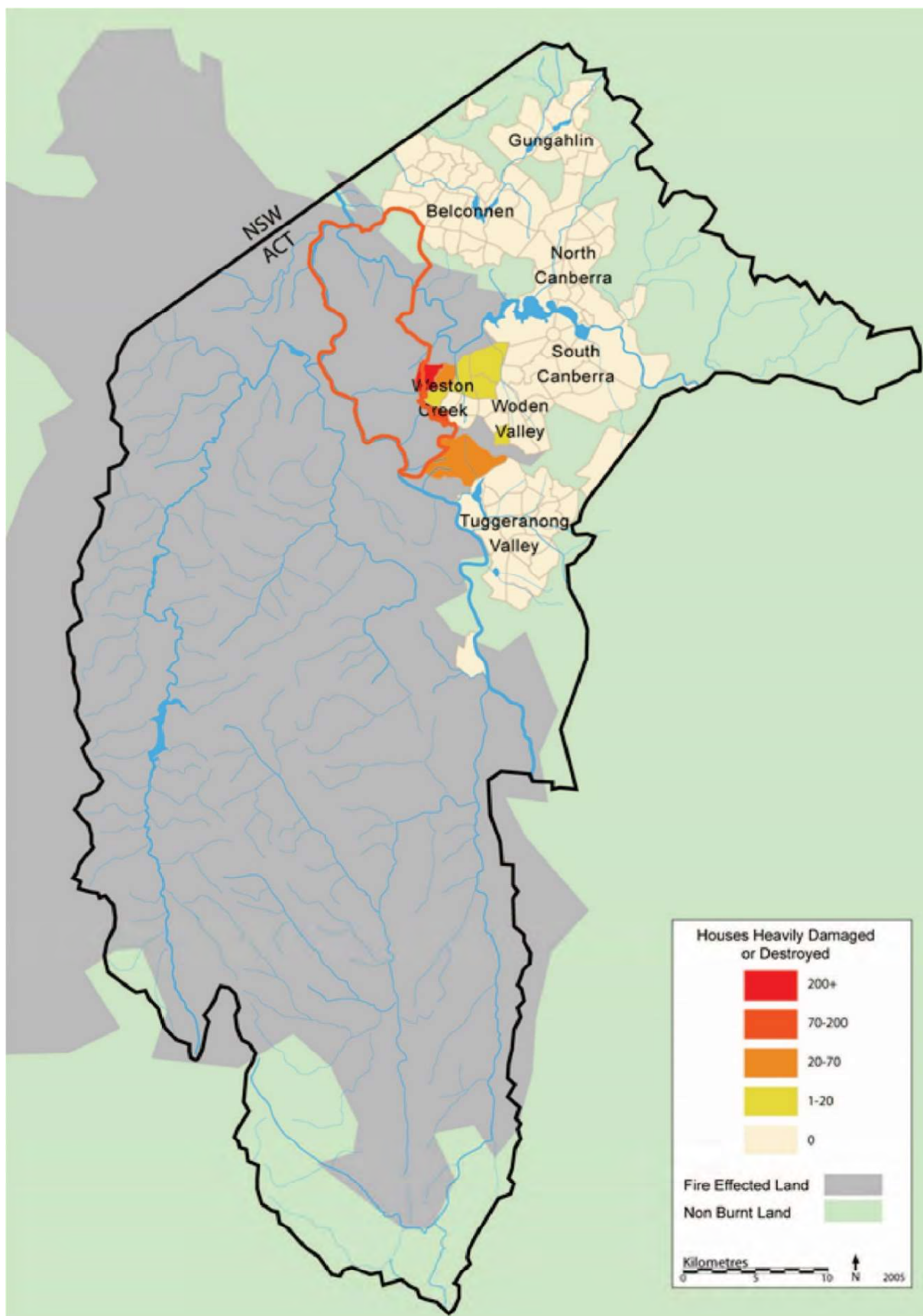


Figure 2.20 A map showing the fireground and extent of damage caused by the January 2003 Canberra bushfires. The landscape within the WEIA (GML overlay) was adjacent to the worst-affected suburbs and was almost completely burnt out. (Source: Wikipedia <https://commons.wikimedia.org/wiki/File:Canberra_bushfire_map-MJC.png>)

2.6.3 The Western Edge Investigation Area Today

Today, the landscape between the western suburbs of Canberra and the Murrumbidgee River remains largely unchanged since the first half of the twentieth century.

The natural border formed by the McQuoids Hill Nature Reserve, Coleman Ridge Nature Reserve, Narrabundah Hill, and Mount Stromlo stands as a distinct boundary between the undeveloped rolling rural plains and the southwestern suburbs. The ridgelines have largely been revegetated since they were cleared in the mid-nineteenth century for pastoral activities and timber resources and then damaged by fires in the twentieth century. As the rolling plains are still actively used for pastoral purposes little revegetation has occurred, although stands of natives do dot the landscape.

The infrastructure that exists in the WEIA is largely pastoral in nature: structures associated with equestrian agistment properties, cattle studs, and sheep runs dot the landscape. Many of the lot divisions established in the late nineteenth century and during the Soldier Settlement Scheme remain in place. However, due to the devastating bushfires in the twentieth century, many of the original pastoral structures and plantings have been lost. Moreover, the Mount Stromlo observatory telescopes and facilities that were damaged in the 2003 bushfires have been allowed to remain as ‘managed ruins’ and have not been reinstated.

Overall, the landscape of the WEIA is one of dramatic beauty, with sweeping views from the ridgelines down to the Murrumbidgee and Molonglo Rivers—which are present as deeply incised watercourses—and across to the ranges west of Canberra.

2.7 Abbreviated Timeline

Table 2.2 Timeline of the Key Events that have Shaped Canberra’s History.

Date	Event
Circa 25,000 years ago	Earliest evidence of human presence in Canberra 25,000 years, coinciding with the Last Glacial Maximum ice age, part of the Pleistocene Epoch.
Circa 12,000 years ago	Beginning of the Holocene epoch. At the onset of the Holocene epoch (approximately 12,000 years ago to present), the climate of the region fluctuated between humid and arid climatic phases. ¹²⁴
Circa 3,000 years ago	The age of most surviving Aboriginal archaeological evidence (such as stone artefact assemblages) in Canberra.
1820	The first Europeans—James Vaughan, Joseph Wild, and Charles Throsby—visited the Canberra area and dubbed it the ‘Kamberri Plains’ or ‘Limestone Plains’.
1824–1907	Large swathes of the Canberra area were divided into various pastoral and agricultural landholdings. Initial land grants included Joshua John Moore (Canberra), Robert Campbell senior (Duntroon), George Thomas Palmer (Ginninderra), Henry Donnison (Yarralumla), Peter Murdoch (Waniassa), and John McLaren (Janevale). Selection of the land within the WEIA was limited until the <i>Crown Lands Acts 1861</i> , which allowed the unlimited selection and sale of land in designated unsettled areas.
1908	The Kamberri Plains was selected as the site for the FCT.
May 1912	Walter Burley Griffin and Marion Mahony Griffin won the competition to design Canberra. Their plan drew on the ‘City Beautiful’ and ‘Garden City’ design movements, which advocated for European-style beautification and monumental grandeur, with self-contained communities surrounded by green belts or parks.
March 1913	Lady Gertrude Denman announced ‘Canberra’ as the name for the Australian capital.
May 1913	Charles Weston was appointed as Officer-in-Charge of Afforestation in Canberra and instructed to oversee the nursery and produce a program of afforestation. This led to the establishment of a Monterey pine (<i>Pinus radiata</i>) on Mount Stromlo in 1915.

Date	Event
1914	After a trial phase of three years, Mount Stromlo was officially selected to be the site of a permanent Commonwealth Solar Observatory.
1915	The Cotter Dam was completed, which supplied water to Canberra via a gravity dam and pumping station.
1919–1927	Soldier Settler Scheme was offered in the FCT. A total of eight blocks in the WEIA were allocated as part of this scheme.
1926–1928	Additional Monterey pine plantations were established at Uriarra and Kowen in 1926 and Pierces Creek in 1928. Forestry settlements were constructed to house the plantation works, including a belated settlement at Mount Stromlo.
January 1939	Severe bushfires destroyed large swathes of native forest, pine plantations, and rural grazing land west of Canberra.
February 1952	Severe bushfires destroyed large swathes of native forest, pine plantations, and rural grazing land west of Canberra and the Commonwealth Solar Observatory on Mount Stromlo.
1957	The NCDC was established to rectify the poor development that had occurred post-World War II. One of their principal tasks was to 'further the growth of the National Capital as a place in which to live in comfort and dignity'.
1967	The NCDC released the 'Y-Plan', which planned the development of Woden Valley, Belconnen, Weston Creek, Tuggeranong, and Gungahlin.
January 2003	Severe bushfires destroyed large swathes of native forest, pine plantations, and rural grazing land west of Canberra, the Commonwealth Solar Observatory on Mount Stromlo, and damaged the outer western suburbs of urban Canberra.
October 2010	The Molonglo Valley District was gazetted.

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3.0 Canberra's Physical Landscape

3.1 Introduction

The WEIA comprises an area of 98.1 square kilometres. It encompasses numerous prominent features in the landscape, including: the confluence of the Murrumbidgee and Molonglo Rivers and the associated river corridors; Mount Stromlo and the Kama, Cooleman, and McQuoids Nature Reserves; and the rolling plains between the hill ranges and river corridors. These features form the basis of three distinct landscapes, which have been used to contextualise the CHA (Figure 3.13):

- the River Corridor Landscape, comprising of land below 520 metres Above Sea Level (ASL) and associated with the Murrumbidgee and Molonglo Rivers;
- the Rolling Plains Landscape, comprising the undulating pastoral land between 520 and 620 metres ASL; and
- the Hills Landscape, comprising all land above 620 metres ASL.

The following section discusses the location and physical characteristics of each of the three landscapes. All three soil landscapes are covered with open forest (dry sclerophyll forest) interspersed with grasslands. A large portion of the study area has been cleared for pasture or thinned for livestock grazing.

All photographs below were taken by GML unless otherwise indicated.

3.2 The River Corridor Landscape

The landscape of the River Corridor Landscape is intersected by the Murrumbidgee and Molonglo Rivers, characterising the surrounding landscape. The Murrumbidgee River forms the northwestern and western boundary of the WEIA, whilst the Molonglo River travels southeast to northwest through the northern extent.

Both rivers are well incised in the landscape, often lying between 40 and 60 metres below the level of the surrounding slopes, although occasionally up to as much as 100 metres.¹ The Murrumbidgee and Molonglo River corridors are characterised by the three soil landscapes, described below:

- Lower Molonglo—Stream channels of moderate to high energy watercourses along the Murrumbidgee River, as well as adjacent floodplains. Well-drained quaternary alluvial soils, consisting of gravels, sands, loams, and clays. Depth of bedrock is highly variable ranging from exposed outcrops to several metres below the surface.²
- Lower Molonglo Variant B—Incised drainage channels with little or no sand bar development and extensive rock outcrops and rapids along the Molonglo River. Shallow deposition soils (consisting of gravels, sands, loams, and clays) in bedrock hollows.³
- Campbell Soil Landscape—Rounded, steep to rolling mountains and hills on Silurian volcanics in the Murrumbidgee Valley. Occurs on either side of the Murrumbidgee and Molonglo River corridors in the WEIA. Shallow (<59cm) colluvial soils underlain by dacitic ignimbrites, tuff, rhyolites and sporadic siltstone, sandstone, and limestone.⁴

The Lower Molonglo River group of soil landscapes was previously known as Paddys River (pd, pda, pdb, and pdc) in Jenkins (2000).⁵



Figure 3.1 View of the deeply incised river corridor associated with Stoney Creek (not visible), looking northwest.



Figure 3.2 View of the Murrumbidgee River and the Bullen Range from a level sandy watercourse beach north of Bulgar Creek, looking southwest.



Figure 3.3 View of the Murrumbidgee River from the watercourse banks immediately north of Kambah Pools, looking west.



Figure 3.4 View of the Murrumbidgee River (centre), the Bullen Range (distance), and Tidbinbilla National Park (far distance) from the eastern ridge overlooking the deeply incised river corridor, looking south.

3.3 The Rolling Plains Landscape

The Rolling Plains Landscape encompasses the undulating landscape situated between the River Corridor Landscape and the Hills Landscape. Much of the area has been historically cleared for pastoral activities; stands of remnant native vegetation are sparse and have been further altered by the introduction of exotic grasses for livestock fodder.⁶

Although it is characterised by the same soil landscapes as the Hills Landscape, the landscape of the Rolling Plains Landscape comprises a much gentler topography:⁷

- **Burra Soil Landscape**—Most common soil landscape across the study area, occurring along undulating to rolling low hills and alluvial fans. Shallow to moderately deep (<60cm) soils with podzolic and tenosols overlying various volcanic lithology.⁸
- **Williamsdale Soil Landscape**—Shallow (<50cm) to moderately deep (50–150cm) soils on undulating rises, fans, valley flats, and depressions with gently inclined slopes. Differentiates from the Burra Soil Landscape due to deeper soils.⁹

All four soil landscapes have an underlying geology of Silurian or Laidlaw volcanics, which include tuffs, siltstone, shale, sandstone, and limestone; this occasionally presents as outcrops on hills with steep slopes.¹⁰



Figure 3.5 View across the rolling plains to the Murrumbidgee River (not visible), looking southwest.



Figure 3.6 View across the rolling plains to Uriarra (distance) and the Brindabella National Park (far distance), looking west.



Figure 3.7 View across the rolling plains to the Bullen Range (right), looking southwest.



Figure 3.8 View across the rolling plains to the Murrumbidgee River (not visible) and the Bullen Range (distance), looking south.

3.4 The Hills Landscape

The Hills Landscape occupies the highest elevations in the WEIA, particularly around Mount Stromlo and the Kama, Coleman, and McQuoids Nature Reserves. Due to the general unsuitability of the landscape for pastoral activities, the remnant native vegetation tends to be more widespread. The notable exception to this is the Mount Stromlo area, which has been extensively cleared for the cultivation of pine plantations. The Hills Landscape also varies from the Rolling Plains Landscape by the presence of the Campbell Soil Landscape variant c (rolling to steep hills at Mount Stromlo, slopes between 10 and 30 per cent) and a pocket of Campbell Soil Landscape, which is also found in the river corridor landscape (see Figure 3.14).



Figure 3.9 View from McQuoids Hill across the Cooleman Ridge (foreground) to Black Mountain (distance) and the mountain ranges beyond Canberra (far distance), looking north.



Figure 3.10 View from Cooleman Ridge towards McQuoids Hill (left), the Bullen Range (right), and the peaks of Namadgi National Park (centre), looking south.



Figure 3.11 View from McQuoids Hill across the rolling plains to the Murrumbidgee River (not visible), the Bullen Range (distance), and the Brindabella National Park (far distance), aspect northwest.



Figure 3.12 View from Mount Arawang across the rolling plains to the Murrumbidgee River (not visible), the Bullen Range (distance), and the Tidbinbilla Nature Reserve (far distance), looking west.

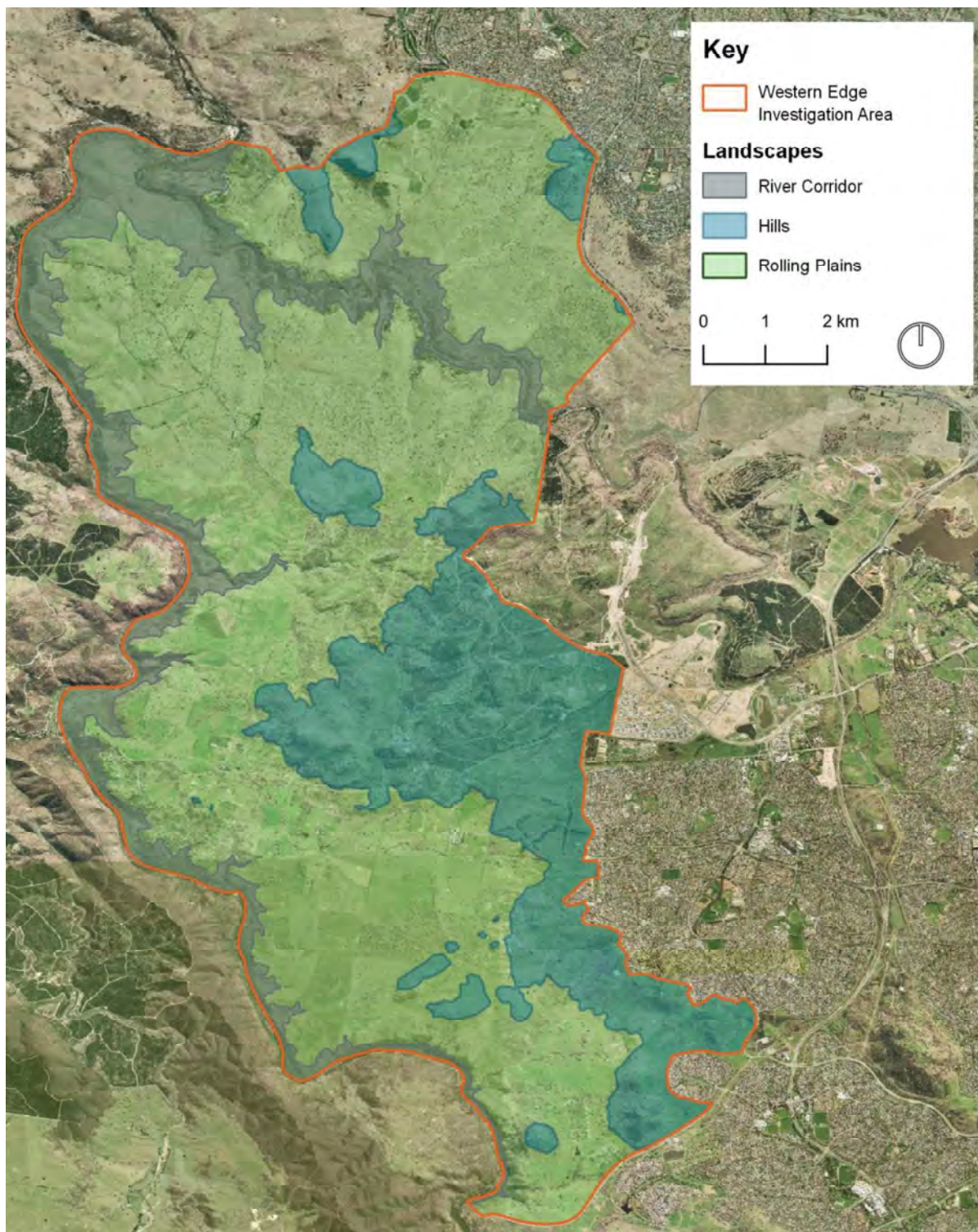


Figure 3.13 The topographical characteristics of the WEIA have been separated into three landscapes, which have been used to contextualise the CHA. (Source: NSW Spatial Services aerial with GML overlay)

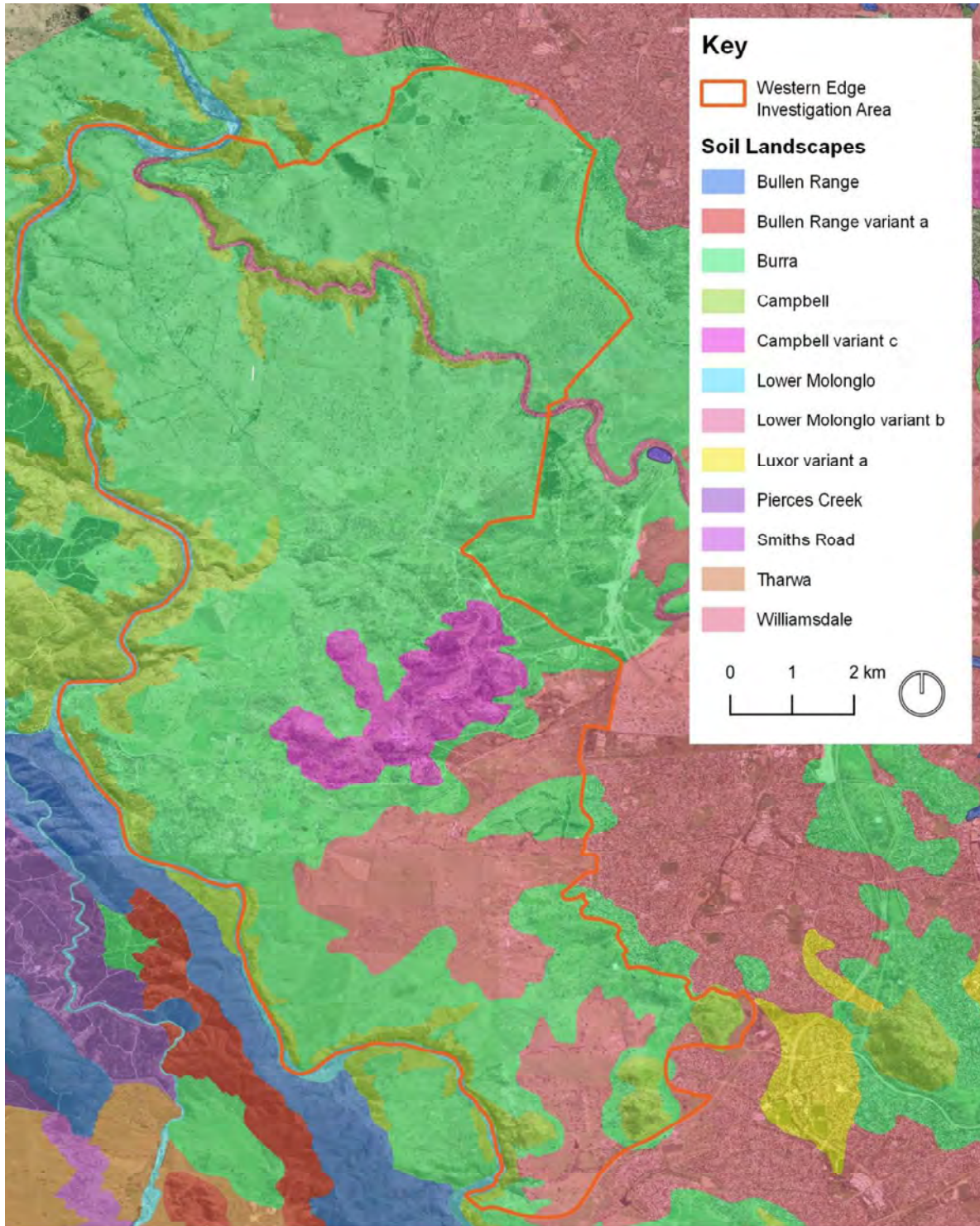


Figure 3.14 The soil landscapes present in the WEIA and the surrounding landscape. (Source: NSW Spatial Services aerial, ACTmapi soil landscapes with GML overlay)

3.5 Endnotes

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- ⁹ SLAM Soil Landscape Report for ACT v 1.0.1, 'Williamsdale', 25 August 2016.
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4.0 Existing Data—Collection and Analysis

4.1 Introduction

Archaeological and heritage assessments have been conducted across the western landscape of the ACT since the 1980s, culminating in the recording of several thousand heritage sites. Of these, a total of 210 Aboriginal and 104 historical heritage sites have been recorded in the WEIA.

The following section summarises and analyses the results of previous heritage assessments that have been undertaken in the WEIA and immediately to the west (predominantly around Mount Stromlo, Uriarra, and the confluence of the Murrumbidgee and Molonglo Rivers). It does not examine historical heritage sites that have been entered onto the ACT Heritage Register or the CHL. Subsequent analysis of the findings of the assessments is focused on the distribution pattern of sites across the landscapes identified in the WEIA.

Table 4.3 Historical Heritage Items Identified in the Murrumbidgee River Corridor. (Source: Barz and Winston-Gregson, 1982)

Site Name	Date
MRC 94—Michael Peter Morrison's Hut	c1894
MRC 95—Cemetery	1887
MRC 96—James O'Connor's Hut	c1876
MRC 97—Philip Hardy Jnr.'s Homestead	c1903
MRC 102—Shelton Smith's Homestead	c1880
MRC 120—Historical Route	c1837
MRC 124—Historical Route	c1835
MRC 134—William Webb's Woolshed and Yard	c1870
MRC 137—William Webb's Shearers Quarters and Selector's House	c1880
MRC 138—William Webb's Homestead	c1885–1890
MRC 162—Historical Route	c1837
MRC 169a–c—Mines	1890–1912
MRC 170—Greenhill's Homestead	1876
MRC 171—Richard Moore's Hut	c1880
MRC 172—Belconnen Homestead, Stock Yard, and Stables	c1880s–1895
MRC 173—Ruin	c1920s

The results of Barz and Winston-Gregson's survey of the Murrumbidgee River Corridor were supported by the survey conducted by Barz in 1980 for the Canberra–Royalla 330/130 transmission line.⁴ Barz assessed the proposed transmission line route, which traversed the confluence of the Murrumbidgee and Molonglo Rivers and the rural plains on the eastern side of the Murrumbidgee River, extending through the hills on the western side of the Murrumbidgee and its confluence with the Gudgenby River to Royalla.⁵ [REDACTED]

[REDACTED]



Table 4.6 Historical Heritage Items Identified in the Stromlo Hills. (Source: Bulbeck and Boot, 1990)

Site Name	Date
Pastoral Site	
Narrabundah Parish Hut and Yard	1871
William Rolfe's Hut and Humpy	1871
Henry Devilen's Hut and Garden	1871
James Rolfe's Hut and Yard	1872
Thomas Flynn's Humpy and Yard	1874
John Lawlor's Hut	1877
John McMahon's Humpy and Sheep Yard	c1877
Philip Hardy's Home and Sheep Yard	1877–1878
William Hardy's Hut	1880
Philip Hardy Jnr's Hut	1884
Bulgar Creek Public School	1887
Grosvenor Francis' Home, Paddock, and Yard	1880s
Suspected Hut near Stoney Creek	Late nineteenth–early twentieth century
Aubrey Bluett's Homestead and Sheep Yard	c1920
Suspected Sheep Yard	Circa twentieth century
Don Tully's Stockyard	Late 1960s
Old Telephone Pole, Brown Hill	Early twentieth century
Federal Public Works Site	
Stromlo Oddie Telescope	1911
Old House, Stromlo	c1920
The Duffield Graves	1929
Ionospheric Prediction Station	1953
The Pines	1931–1932
Harry Emerson's Place	1931–1932
Harry Gibbs' Cottage	1920s
Stromlo Forestry Overseer's House	1927

Site Name	Date
Stromlo Old Sawmill	Early twentieth century
Stromlo Sawmill Caretaker's Cottage	Early twentieth century
Stromlo Forestry Camp	1949
Stromlo Settlement	c1950

Following the devastating January 2003 bushfires (Section 2.6.2), numerous heritage studies were undertaken to ascertain the severity of the damage.

Several sustainability assessments of the decimated settlements to the west of Canberra were conducted to evaluate the remaining ecological and heritage values of damaged areas. The aim of the studies were to identify the values that could be retained and repaired, and propose recovery and redevelopment options for the communities.¹⁰ Prior to the bushfires, the Stromlo Forestry Settlement, Uriarra Forestry Settlement, and Pierces Creek Settlement were recognised for their role in the establishment and management of the forestry industry in Canberra (Section 2.4.2). Nominations to the ACT Heritage Register had been made for the Stromlo and Uriarra Forestry Settlements. The draft nomination for the Uriarra Forestry Settlement stated that:

*Uriarra ... has played a pivotal role in the establishment of the ACTs forestry industry in the north west of the Territory. The settlement provides an accessible and easily understood example of the village lifestyle practised by early ACT Forestry staff. It is a notable example of the village structure of the isolated worker communities servicing the forestry industry.*¹¹

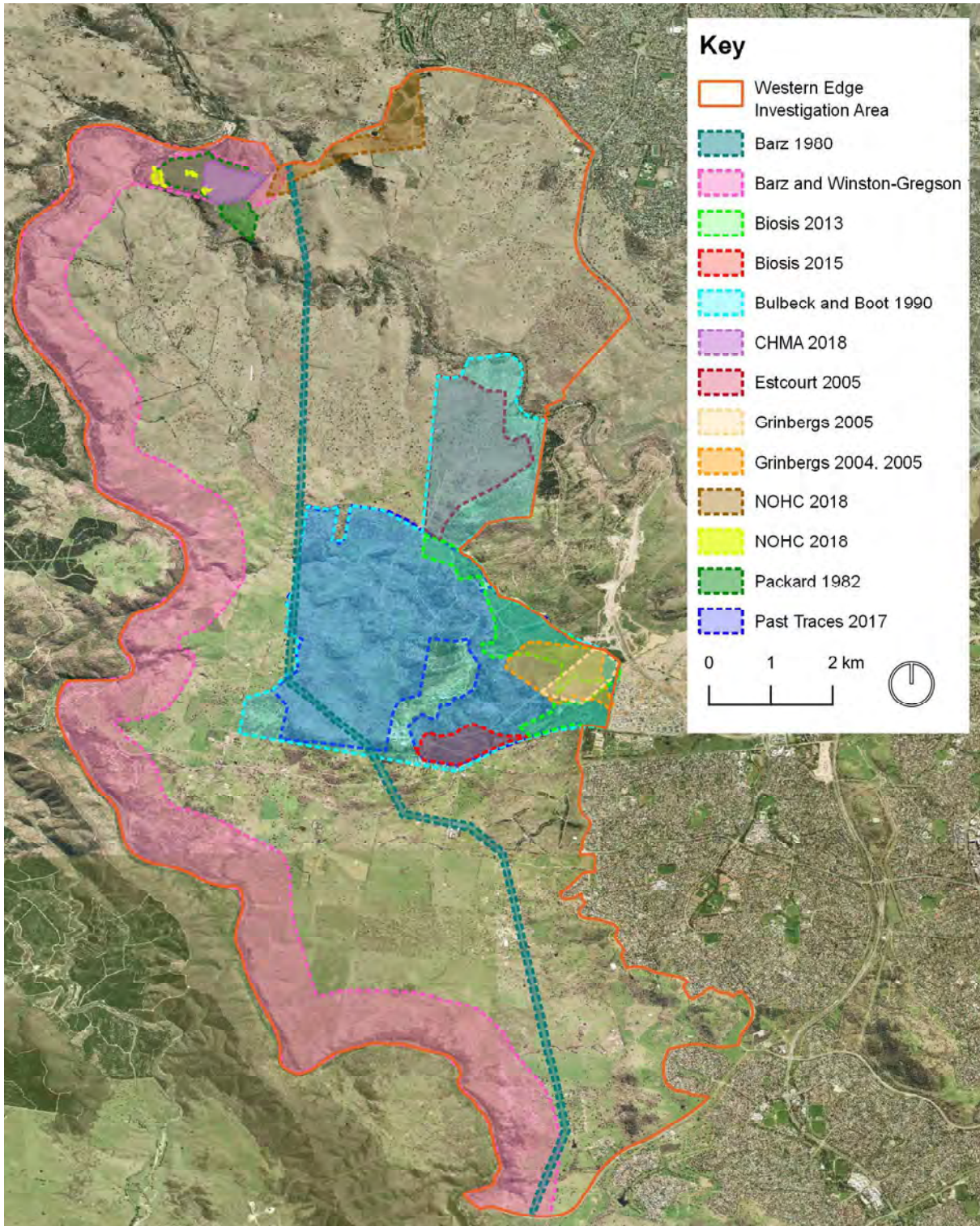


Figure 4.4 Map of the previous archaeological and heritage assessments that have previously occurred within the WEIA and are discussed below. Note: this is not inclusive of all assessments that have been undertaken within or in close proximity to the WEA. (Source: NSW Spatial Services aerial with GML overlay, data from ACT Heritage)

4.4.2 Historical Heritage Sites

There are few meaningful inferences that can be made regarding the distribution of historical sites throughout the WEIA. The area has predominantly been used for pastoral activities since the late nineteenth century, and remnants of this activity (such as abandoned machinery, stock shelters, and structure ruins) may be present anywhere.

4.5 Endnotes

- ¹ Barz, RK and Winston-Gregson, JH 1982, *Murrumbidgee River Corridor II—Archaeological Survey*, Part II, prepared for the National Capital Development Commission.
- ² Barz, RK and Winston-Gregson, JH 1982, *Murrumbidgee River Corridor II—Archaeological Survey*, Part II, prepared for the National Capital Development Commission, p 1.
- ³ Barz, RK and Winston-Gregson, JH 1982, *Murrumbidgee River Corridor II—Archaeological Survey*, Part II, prepared for the National Capital Development Commission, pp 20–21.
- ⁴ Barz, RK 1980, *The Route of the Canberra/Royalla 330/132 kv Transmission Line—Archaeological Survey*, prepared for NSW Electricity Commission.
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- ¹² Anonymous, 2004, *Stromlo Forestry Settlement—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p 2; Anonymous, 2004, *Uriarra Rural Village—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p 3; Anonymous, 2004, *Pierces Creek Settlement—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p 2.
- ¹³ Anonymous, 2004, *Stromlo Forestry Settlement—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p.68; Anonymous, 2004, *Uriarra Rural Village—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p 79; Anonymous, 2004, *Pierces Creek Settlement—Preliminary Assessment*, prepared for Shaping Our Territory Implementation Team, ACT Government, p 76.
- ¹⁴ ACT Heritage Council 2014, 'Nomination of Uriarra Village to the ACT Heritage Register', 23 September 2020 <https://www.environment.act.gov.au/_data/assets/pdf_file/0011/580592/ACT_Heritage_Councils_Dismissal_of_Nomination_for_Uriarra_Village_-_Reasons_for_decision.pdf>.
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- ¹⁹ House, P 2004, *Uriarra Moth Stone—A Ngambri Site of Significance*, Heritage Grant Number HG04/42, p 9.
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5.0 Survey

5.1 Introduction

Heritage assessments of Aboriginal heritage values within the WEIA have largely occurred in and around the Mount Stromlo hills and foothills the Molonglo River corridor, and the lower Murrumbidgee River corridor. Previous studies have found that the distribution of Aboriginal heritage sites across the landscape and associated landform units follows a distinct pattern, whilst historical heritage sites may be present anywhere in the landscape.

The following section presents the strategy identified for the survey of the WEIA, the conditions experienced, and the results and analyses.

5.2 Strategy

Due to the size of the WEIA, it was not deemed feasible to survey the entirety of the landscape. Instead, a targeted survey strategy was prepared with the combined aims of ground-truthing the known sites and testing the site distribution patterns indicated by analysis of previously recorded sites (Section 4.4).

5.3 Survey

5.3.1 Conditions

Canberra experienced an unusually wet and mild winter in 2020.¹ Whilst this meant that there was flowing water in many of the drainage lines and natural water soaks (Figure 5.2), it also resulted in increased grass growth (Figure 5.3). Accordingly, ground surface visibility was low across all survey areas except in exposures caused by stock, vehicle, dam construction, or other disturbances (Figure 5.4).



Figure 5.2 Natural soaks were common across the survey areas (left) and many of the drainage lines contained flowing water (right).



Figure 5.3 Ground surface visibility was generally poor, varying between low visibility (left) cropped grass and nil visibility (right) tall grass.



Figure 5.4 Areas of high visibility were generally confined to disturbance exposures, such as stock erosion (left) or dams (right).

5.3.2 Methodology

The survey was conducted entirely on foot and primarily undertaken along linear transects, although—due to the sizes of the study areas and generally poor ground surface visibility—preferential sampling of landform units more likely to contain archaeological material was also undertaken. Additionally, areas beyond the selected survey areas were examined when adjacent allotments were made available for inspection by the relevant landholder.

A track log of the route undertaken during the survey is provided in Appendix B.

When a heritage site or object was identified, it was photographed in situ, the location was recorded on a Garmin GPSMAP 64SX, and the landform unit on which it was located was noted. Brief descriptions of each object were made, although due to the preliminary nature of this CHA no in-depth field analysis was undertaken.

The survey aimed to sample an approximately equal proportion of each of the River Corridor, Rolling Plains, and Hills Landscapes. However, the western border of the WEIA adjacent to the Murrumbidgee River often comprised a steep ridgeline with no easy way to access the watercourse. The river corridor was only able to be approached through particular locations, such as Kambah Pools. As a result, the survey did not extensively examine the River Corridor Landscape.



5.5 Results—Historical Heritage Sites

No new historical sites were identified during the survey.

5.6 Endnotes

- ¹ Australian Government Bureau of Meteorology, 'Australian Capital Territory in Winter 2020', viewed 16 September 2020, <<http://www.bom.gov.au/climate/current/season/act/summary.shtml>>.

6.0 Predictive Modelling

6.1 Introduction

The survey of the WEIA identified 108 new Aboriginal heritage sites and no new historical heritage sites. Similarly to previous assessments in and around the WEIA, the distribution of the Aboriginal heritage sites through the landscape follow a distinct pattern. Recognising this, previous studies have often developed a predictive model to assist in the identification of and planning for the management of sites.

The following section examines how predictive models have traditionally been approached in heritage management and the associated constraints. In order to address these constraints, it suggests how environmental data and Aboriginal cultural knowledge may be partnered in order to develop a culturally sensitive predictive model. Using this approach, a ‘guiding’ model employing both environmental and cultural knowledge has been suggested for the WEIA.

6.2 Predictive Models—Theory and Practice

6.2.1 The Establishment of Predictive Models

Predictive modelling was developed as a tool for cultural heritage management in the late-twentieth century. It arose from an increased push for a scientific, or ‘processual’, approach to heritage, which aimed to provide a replicable, standardised methodology for the study of archaeological sites and materials. A defining feature of the processual approach was the theory that environmental constraints were the single driver of human behaviour: areas with increased natural resources and habitable terrain would be selected for extended occupation over areas that had less favourable conditions. Accordingly, it was proposed that the location of archaeological sites in the landscape could be estimated using:

- known patterns of site type, distribution, and density data; and
- mapping of available ecological resources, such as distance to water and vegetation type, and landform features.¹

By overlaying the two sets of information and establishing how the archaeological pattern correlated with the physical landscape, it was proposed that archaeologists could predict ‘site density in areas where no archaeological sites had yet been found’.²

This modelling approach has provided a valuable tool for the assessment of large and remote landscapes; where it is not feasible to physically survey an entire area, known site distribution trends can be overlaid to provide an estimation of the types and sizes of sites that may be present and where they might fall in the landscape. Additionally, by constructing and mapping predictive models, sensitive areas in the landscape can be identified to inform and design effective on-ground survey strategies.

6.2.2 Oversights in Traditional Predictive Models

Predictive modelling was adopted in Australian cultural heritage management practices in the late 1980s and has since formed a basis for both academic and commercial heritage investigations, particularly Aboriginal heritage. However, since the early 2000s there has been an increased recognition of the inherent oversights of the scientific model.

Following the rise of the processual approach in archaeology, there was considerable criticism that the theory neglected to consider the crucial role that human consciousness and symbolism played. Critique

centred on the argument that people were not solely beholden to environmental conditions and constraints, but that each person had the agency to create and choose their actions.³ Resultingly, the archaeological landscape should be considered as ‘a medium rather than a container’ for human behaviour: the individual influences the landscape as much as the landscape influences the individual.⁴ It was argued that sites could not be understood through pure scientific analysis, as they are bound by ‘personal and cultural identity’ that is ‘grounded in the limits of human consciousness’.⁵

The consideration of unique human behaviour and the landscape as a medium is crucial for effective heritage management, and is particularly key when engaging with Aboriginal heritage landscapes. Aboriginal cultural heritage is deeply complex and multifaceted: it comprises not only physical structures and objects, but also nuanced stories, memories, and traditions. It is these intangible elements that bond the physical sites to the landscape:

*... it is as if we carry around in our heads a map of the landscape which has all these places and their meanings detailed on it. When we walk through our landscapes the sight of a place will often trigger the memories and the feelings ... it is the landscape talking to us.*⁶

Moreover, traditional predictive models are reliant on the assumption that all human activity culminates in physical remains: that an absence of archaeological material is an indication of a lack of people. However, there are many activities that result in either reduced or no physical impact on the landscape and, occasionally, a site may also be purposefully ‘cleaned’ to remove occupational traces. As such, locations in the landscape that apparently have no archaeological remnants should not be assumed to have had no human activity and, thereby, no cultural value.

6.2.3 Developing Culturally Sensitive Predictive Models

As traditional predictive models are heavily reliant on spatial patterning according to the limitations of the physical environment, they leave little room for considerations of human agency. This does not mean that predictive models are entirely fallible; they can reveal important information regarding daily human activities that can then be linked to social customs.⁷

Due to its past uses, the term ‘predictive’ has numerous Eurocentric implications that are unhelpful when attempting to understand how culturally sensitive models may be constructed. As a result, the following section uses ‘predictive’ model when referring to non-culturally sensitive models and ‘guiding’ model when discussing models that consider both environmental data and the fluid nature of cultural heritage.

The key to establishing an effective guiding model that incorporates both tangible and intangible qualities of human behaviour lies in uniting the two to present a story about the landscape. There are five criteria for determining the quality of a guiding model:

- Explanatory framework—Guiding models should provide an explanation as to *why* the spatial distribution of sites throughout the landscape varies, rather than relying on simplistic ‘high/medium/low’ sensitivity ratings.
- Replicability—The steps to build the guiding model should be clearly specified and able to be reproduced.
- Accuracy—Guiding models should provide the best possible prediction with the available dataset.
- Future application—Guiding models should be exhaustively tested to ensure that they will continue to perform in future situations.

- Limitations—Guiding models should be transparent about factors that may influence the precision of the model.⁸

When designing a guiding model, in addition to gathering physical data regarding the landscape and site distribution, extensive consultation with Aboriginal knowledge holders should always be undertaken. Moreover, this should be done as early as possible to ensure that accurate representation of cultural values is being displayed alongside environmental data. To meet the above quality criteria, the below factors must be considered.

Table 6.1 Key Considerations for the Development of an Effective Guiding Model.

Criteria	Environmental Data	Aboriginal Cultural Values
Explanatory Framework	<p>The following questions may be considered to understand spatial distribution patterns:</p> <ul style="list-style-type: none"> • Were there seasonal variations in the kind of resources that were being used? • Was there different resource gathering techniques employed by different genders or social categories of people? • Was there resource competition occurring between different groups? • Do certain parts of the landscape show evidence for having been selected for reasons other than subsistence? 	<p>Aboriginal knowledge holders may choose to share that certain cultural practices determined which parts of the landscape were used at certain times, whether the way the landscape was used changed, or if there are key stories or cultural reasons that influenced how movement through the landscape occurred.</p>
Accuracy	<p>Accurate environmental data is reliant upon:</p> <ul style="list-style-type: none"> • a survey strategy that ensures a variety of landscape types are sampled, rather than focusing on areas considered to have a higher yield of results; • detailed recording of sites, their attributes, and how they interact with the environment; and • an accessible and up-to-date database of site information. 	<p>Accurate representation of Aboriginal cultural knowledge can only be achieved by engaging in effective, respectful community consultation at the earliest possible stage of developing a predictive model. This allows the opportunity for detailed incorporation of Aboriginal knowledge with other available information.</p>
Limitations	<p>Guiding models should recognise and acknowledge that all data is, by nature, incomplete: it is not possible to identify and record all cultural heritage sites in a landscape. This may be due to issues related to site preservation, archaeological visibility during survey, or survey bias. It should also be accepted that Aboriginal knowledge holders are under no obligation to share all or certain types of cultural knowledge to all individuals involved in developing a guiding model. In these circumstances, the respective parties should endeavour to ensure that the appropriate level of information is conveyed in order to maintain guiding model accuracy and representation.</p>	

6.3 Western Edge Investigation Area

6.3.1 Prior Predictive Models

Prior predictive modelling has predominantly been focused on patterning of the physical, archaeological evidence of Aboriginal heritage sites. Although there has been a general consensus regarding the predictive modelling used in the Canberra region as a whole, this does not always translate into robust predictive models specific to the multiple landscapes and discrete environmental pockets present within the ACT. A sample of the predictive models that have been applied to the WEIA in prior assessments demonstrates the variation in the level of detail and language used (Table 6.2). Moreover, the models

have focused predominantly on environmental data, with little indication of the consideration of Aboriginal cultural values.

Table 6.2 Sample of the Predictive Models that have been Applied to the WEIA. (Source: Saunders, 2005; Navin Officer Heritage Consultants, 2003; Biosis, 2013)

Site Type	Saunders, 1995	NOHC, 2003	Biosis, 2013
Artefact Sites	<p>Anywhere Aboriginal people have engaged in tool manufacture, food procurement, or domestic activities, particularly:</p> <ul style="list-style-type: none"> • West Belconnen—elevated ground within 100 metres of watercourses and major ridgelines within 400–500 metres of watercourses; • Stromlo Forest—low spurs overlooking watercourses and easily traversable land of intermediate slope; • Upper Molonglo, sharply defined gorges—watercourse terraces, ridges, and spurs; and • Upper Molonglo, away from gorges—watercourses and above river pools. 	<p>Level, well-drained landforms, particularly:</p> <ul style="list-style-type: none"> • valley floor context—spur crests, terraces, and elevated watercourse banks; • mid valley slope contexts—low gradient crests and watercourse banks; and • major ridgelines and spurs—level crests, shoulders, and saddles. 	<p>Level, well-drained landforms close to watercourses.</p>
Burials	–	–	<p>Within deep, soft sediments such as Aeolian sand or alluvial silts, or along hill crests within ranges.</p>
Culturally Modified Trees	<p>Only on mature trees.</p>	<p>Anywhere old-growth trees are present. In Canberra, trees must be 150–160 years old [for cultural scars].</p>	<p>Anywhere stands of mature trees are present.</p>
Dreaming, Ceremony, and Business Sites	–	–	<p>Places where spiritual connections and pathways manifest.</p>
Grinding Groove Site	<p>Anywhere suitable rock is exposed in the vicinity of a permanent or temporary watercourse, usually in sedimentary bedrock.</p>	–	<p>On outcrops in close proximity to watercourses.</p>
Post-contact Sites	–	–	<p>Anywhere in the landscape, usually indicated by community knowledge or historical records.</p>
Resource and Gathering Areas	<p>Anywhere stone suitable for tool manufacture was obtained or ochre was extracted.</p>	<p>Anywhere surface exposures of exploitable rock occur.</p>	<p>Anywhere suitable natural resources were available.</p>

Historical Heritage Sites

No new historical heritage sites were identified during the survey (Section 5.5).

Many of the unregistered historical sites previously recorded were identified during the surveys conducted by Barz in 1982 and Bulbeck and Boot in 1990 (Section 4.2). At the time of recording, it was noted that a majority of the sites were present as unstructured surface scatters or as recorded locations with little to no surface presence.

Since the recording of these sites in the late twentieth century, Canberra has experienced a severe bushfire (Section 2.6.2) that caused extensive damage to the landscape comprised within the WEIA. It is likely that—as a result of the fire—the visible surface presence of previously identified and currently unidentified historical sites has been greatly reduced.

Any historical sites that are present within the WEIA are unlikely to be identified through modelling or untargeted surface survey alone. When examining a particular section of land, extensive historical review of available documentation and records and non-invasive subsurface investigation should be undertaken to determine the likelihood or location of any historical sites.

6.5 Endnotes

- ¹ Verhagen, P and Whitley, TG 2012, 'Integrating Archaeological Theory and Predictive Modelling—A Live Report from the Scene', *Journal of Archaeological Method and Theory* 19, p 51.
- ² Verhagen, P and Whitley, TG 2012, 'Integrating Archaeological Theory and Predictive Modelling—A Live Report from the Scene', *Journal of Archaeological Method and Theory* 19, p 51.
- ³ Johnson, M 2010, *Archaeological Theory: An Introduction*, second edition, Wiley-Blackwell, Chichester, p 102.
- ⁴ Tilley, C 1994, *A Phenomenology of Landscape: Places, Paths, and Monuments*, Berg Publishers, Oxford, p 10.
- ⁵ Tilley, C 1994, *A Phenomenology of Landscape: Places, Paths, and Monuments*, Berg Publishers, Oxford, p 15.
- ⁶ Byrne, D, Brayshaw, H and Ireland, T 2003, *Social Significance—A Discussion Paper*, NSW National Parks and Wildlife Service, p 3.
- ⁷ Verhagen, P and Whitley, TG 2012, 'Integrating Archaeological Theory and Predictive Modelling—A Live Report from the Scene', *Journal of Archaeological Method and Theory* 19, p 79.

- ⁸ Verhagen, P 2008, 'Testing Archaeological Predictive Models: A Rough Guide', in Posluschny, A, Lambers, K and Herzog, I (eds.), *Layers of Perception—Proceedings of the 35th International Conference of Computer Applications and Quantitative Methods in Archaeology (CAA)*, Berlin, pp 285–286.

7.0 Assessment of Heritage Significance

7.1 Introduction

The following section examines the assessment of significance and the heritage significance criteria under the *Heritage Act 2004* (ACT). Due to the number of heritage sites identified in this CHA and its preliminary nature, individual assessments of significance for each site has not been undertaken. However, it does provide an indication of which types of sites and site characteristics may be assessed to be of 'low', 'moderate', and 'high' significance and example assessments.

7.2 Aboriginal Community Assessment of Significance



7.3 ACT Heritage Criteria for Significance

Under Section 10 of the *Heritage Act 2004* (amended 2014), a place or object has heritage significance based on whether it meets one or the more of the following criteria (the heritage significance criteria):

- a. *importance to the course or pattern of the ACT's cultural or natural history;*
- b. *has uncommon, rare, or endangered aspects of the ACT's cultural or natural history;*

- c. *potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history;*
- d. *importance in demonstrating the principal characteristics of a class of cultural or natural places or objects;*
- e. *importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT;*
- f. *importance in demonstrating a high degree of creative or technical achievement for a particular period;*
- g. *has a strong or special association with the ACT community, or a cultural group in the ACT for social, cultural, or spiritual reasons; or*
- h. *has a special association with the life or work of a person, or people, important to the history of the ACT.*

The following section will not assess the scientific and archaeological values of each site identified during this CHA (Appendix A). These require further detailed scientific assessment to be undertaken in order to provide an accurate significance assessment. Instead, the following table provides an indication of which types of sites and site characteristics may be assessed to be of 'low', 'moderate', and 'high' significance and example assessments.



8.0 Constraints, Opportunities, and Conclusions

8.1 Introduction

A total of 318 Aboriginal and 104 historical heritage sites have been identified in the WEIA. The Aboriginal heritage sites comprise predominantly of artefact sites and culturally modified trees, however, several cultural areas and quarries have also been identified. The historical heritage sites are dominated by dwellings—huts, cottages, and homesteads—and pastoral structures, representative of the early European settlement of Canberra. A guiding model has been developed in order to aid identifying further Aboriginal heritage sites within the WIEA, which incorporates both environmental data and cultural values.

The following section presents sensitivity mapping for the WEIA, which has informed the following recommendations for further investigation, opportunities, and constraints in the early stages of land use management with the possibility of future development.

8.3 Recommendations

The following recommendations have been made to guide the future of the WEIA. The recommendations have been ordered in the following categories:

- Further Work Required—These recommendations have been made regarding work that should be undertaken in order to further understand and inform the future planning and management of the WEIA;
- Opportunities—These recommendations have been made for the planning and management of the moderate sensitivity areas; and
- Constraints—The recommendations have been made for the understanding and ongoing management of cultural conservation areas and areas of high sensitivity.

8.3.2 Opportunities

The areas of moderate sensitivity that have been identified are considered to be suitable for the early stages of land use management with the possibility of future development.

Prior to any detailed plans being developed, further detailed heritage assessments should be undertaken to identify additional heritage sites and provide specific management plans and recommendations for these sites. Several Aboriginal heritage sites have been identified in the moderate sensitivity areas, and the RAOs should be involved and consulted in the identification and management of these sites and any newly identified sites. Moreover, several historical heritage sites have also been identified in the moderate sensitivity areas. As noted previously (Section 6.3.2), when these sites were recorded many consisted of unstructured surface scatters or as recorded locations with little or no surface presence. Detailed historical research should be undertaken to corroborate the original records and interpretations, and archaeological assessments should be conducted to determine if subsurface deposits are likely to be present.

8.3.4 Interpretation

The presence of these areas of higher sensitivity within the WEIA present an opportunity for future conservation and interpretation measures to be planned and enacted.

These sites—both Aboriginal and historical—represent a significant opportunity to conserve and celebrate parts of the long and diverse past of Canberra, and should be acknowledged as such in the future planning and land use management of the WEIA.

Opportunities for these areas include the development of interpretation strategies, the conservation of areas within public recreation zones or dedicated conservation areas, and the integration of their heritage values into future development planning and design stages.

8.4 Conclusion

The implementation of these recommendations will assist in the management of the heritage values of the WEIA as the planning for future land use and residential, recreational, and commercial spaces progresses.

8.5 Views of the Representative Aboriginal Corporations

The RAOs were provided the CHA report to review and comment on its discussion of Aboriginal cultural values. The following responses regarding the recommendations were received.



9.0 Appendices

Appendix A

This appendix contains the names, locations, and descriptions of new sites recorded in the WEIA.

Appendix B

This appendix contains a track log map of the area that was covered during the survey of the WEIA.

Appendix C

This appendix contains maps of the identified sensitivity zones and the new sites recorded in the WEIA.

Appendix D

This appendix contains a log of all communications undertaken between GML Heritage and the RAOs.



Western Edge Investigation Area

Capability and Suitability Assessment

prepared for Environment, Planning and Sustainable
Development Directorate – ACT Government

May 2023

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Executive Summary

The ACT Planning Strategy 2018 (the Planning Strategy) defines the Western Edge Investigation Area (WEIA) as an area for further investigation into its potential to accommodate future growth. Understanding the capacity of the Western Edge will enable strategic planning for the future distribution of population throughout the ACT, as well as future transport, road, nature conservation, education, social, community and recreation planning.

This study builds upon existing preliminary studies and publicly available data to understand areas within the WEIA that may be suitable for future urban development, noting that detailed field assessments for ecological values have not yet been undertaken across the entire study area. As the Western Edge has a 40 to 50 year development horizon, it is important to consider how additional development can be appropriately serviced by transport and infrastructure, protected from bushfire threat and future proofed for climate change, whilst balancing the conservation of important biodiversity values. Such triple bottom line values and wellbeing considerations underpin all development decisions in the ACT, and extend to this strategic planning analysis for the Western Edge.

This project was undertaken in three key parts, with each stage building upon the previous part, to analyse the characteristics and developability of the WEIA. Stage 1 provides a high level assessment of land which is suitable for urban development based on existing physical and environmental characteristics, Stage 2 analyses the suitability of the potentially urban capable land and Stage 3 proposes indicative development scenarios.

Stage 1 - Land Capability Assessment

The Land Capability Assessment was based on the physical and environmental characteristics of the study area, as extracted from previous studies, publicly available data and data obtained from utility owners. The intent of this assessment was to undertake an initial quantitative analysis of the capability of the WEIA, with more detailed qualitative considerations in the suitability assessment. The capability assessment used spatial mapping and Geographic Information Systems (GIS) to identify land that is suitable for urbanisation, based on assessment against a series of agreed and weighted criteria. This is presented as a traffic light system, ranking the capability of land in the WEIA based on the presence of different constraints. This analysis provided a form of Multi-Criteria Analysis (MCA) that used GIS to compare physical and environmental constraints to provide a high level appreciation of areas that can potentially be developed.

Six ratings were selected to give appropriate sensitivity to the analysis of each criteria, ranging from least constrained through to very highly constrained and land excluded for urban development. The key results of the capability assessment are broadly summarised in Table 1–1.

Table 1–1 | Summary of findings from the Land Capability Assessment

Criteria	Result
Interface with adjoining land uses	The WEIA includes significant nature reserves including the Molonglo and Murrumbidgee River Reserves and smaller suburban nature reserves such as McQuoid’s Hill and Cooleman Ridge. Other uses such as the Stromlo Recreational Area were excluded from development consideration due to the presence of community infrastructure and their inherent value to the wider community. Buffers were adopted around key Icon Water infrastructure at the Lower Molonglo Water Quality Control Centre (LMWQCC) and the Mount Stromlo Observatory. The land use capability assessment demonstrated that most urban capable land is located directly west of existing development in Weston Creek and south-east of development in West Belconnen.
Slopes and Soils	A slope analysis was developed using LiDAR data to build a digital elevation model (DEM) and provide approximate slope gradients. Areas with steep or waterlogged terrain and rock outcrops were rated as harder to develop in the analysis. Based on this alone, most urban capable land is directly west of existing development in the Molonglo Valley and Woden Valley and adjacent to Kambah.
Waterways and Waterbodies	There are a number of existing waterways within the WEIA and proximity to ecologically sensitive habitats in the Murrumbidgee and Molonglo River systems means that future development will need to be water cycle sensitive. The data used for the waterways and waterbodies criteria identifies areas within the river corridor as an area of restriction that has been ‘excluded’ and areas within the stormwater management buffer as very highly constrained. The remainder of the site is shown as ‘somewhat constrained’ but potentially suitable for future development.
Vegetation and Habitat	Maintaining habitat and biodiversity connectivity for all native flora and fauna and communities (not just those that are currently listed as threatened), including under climate change, is a key driver for considering land use capability and suitability across the

Criteria	Result
	WEIA. To understand habitat connectivity and linkages throughout the site, a baseline assessment was developed showing a layered assessment of previous studies and ACT Government connectivity layers. This analysis is preliminary given further detailed field assessments for ecological values will need to be undertaken. The raw data shows regional links of moderate value between McQuoid's Hill Nature Reserve and the Murrumbidgee River as well as clustering along Stony Creek and adjacent to the Kama Nature Reserve. The capability assessment shows that retaining habitat corridors will require further consideration as master planning for the Western Edge progresses.
Bushfire Risk	<p>The bushfire capability assessment adopts the bushfire risk categories from the Preliminary Assessment undertaken by Ecological (2020). Risk categories were developed based on slope and vegetation type; however, the analysis did not consider bushfire hazard, threat to life or property, or the potential to safely evacuate.</p> <p>The adopted assessment criteria demonstrates that much of the site is classified as being capable of future development, subject to appropriate management of risk through master planning.</p>
Road access and infrastructure	<p>Key infrastructure within the site includes the 330KV transmission (managed by Transgrid) which runs north-south through the WEIA, the Molonglo Valley Interceptor Sewer (MVIS) which discharges to the LMQCC and bulk water supply infrastructure.</p> <p>Land along the eastern side of the WEIA is shown as 'highly constrained' where potentially existing service reticulation could be augmented and extended. Where significant infrastructure would be costly to relocate, such as HV transmission and bulk water and sewer mains, this is shown as an area of restriction that has been 'Excluded'.</p>
Visual Impact	<p>By adopting the 'Scenic Priority Scores' from the visual impact assessment undertaken by Van Pelt and Allen (2020), SMEC undertook an analysis of the results to determine the visibility of future development areas from key viewpoints and existing urban development.</p> <p>The capability assessment shows that elevated areas within Central Molonglo are more highly constrained, and generally occur within NUZ3 Hills Ridges and Buffers zoning or on Designated Land.</p>

The results of the Land Capability Assessment are presented as individual thematic maps, and a consolidated capability assessment. The consolidated assessment was prepared in GIS adopting agreed weightings, to balance more important drivers of urban development (e.g., Vegetation and habitat slope and soils) with characteristics that can be managed (e.g., infrastructure, visual impact). The consolidated capability assessment classified land in the WEIA as 'constrained' through to 'very highly constrained'. Large areas with the lowest level of constraint generally occur in the southern half of the WEIA, along Uriarra Road and in the north, adjacent to Drake Brockman Drive.

Five 'investigation areas' were then drawn around potentially developable areas to provide key groupings for further investigation in the suitability assessment. For ease of discussion in this report, these five areas are the 'Central Molonglo Investigation Area', 'Uriarra Ridge Investigation Area', 'West Molonglo Investigation Area', 'Bulgar Creek Investigation Area' and 'Kambah Investigation Area'.

Stage 2 - Land Suitability Assessment

The Land Suitability Assessment provided a deeper, qualitative look into the characteristics, constraints and opportunities for each of the five investigation areas. A summary of the outcome of the assessment of each investigation area is provided in Table 1–2.

Table 1–2 | Summary of Land Suitability Assessment

Investigation Area	Description
Central Molonglo Investigation Area	<p>The Central Molonglo Investigation Area has an approximate size of 1,240 ha extending south of Drake-Brockman Drive and West of William Hovell Drive and the Kama Nature Reserve.</p> <p>The area contains significant environmental values within the Molonglo River Reserve, Kama Nature Reserve, and Pinnacle Nature Reserve providing habitat for species including threatened Little Eagle and Superb Parrot. As a result, there is a need to maintain habitat and connectivity in this area.</p> <p>It is noted that the Kama Nature Reserve is identified on the ACT Heritage Register with the heritage curtilage boundary bigger than the nature reserve boundary. Kama is not identified within the Investigation Area for Potential Development. The site also contains</p>

Investigation Area	Description
	<p>the Lands End property and the Old Weetangera Cemetery which is listed on the ACT Heritage Register. It is noted that Lands End is not a registered heritage place, however, this does not preclude Lands End from being conserved a place of historic interest in response to community views. Further investigation has been recommended to determine the presence of Indigenous heritage sites. The area includes 132KV HV lines and the MVIS which follows the northern banks of the Molonglo River and is considered readily serviceable by road and utility networks. It is noted that there may be heritage constraints within this area which require further investigation to better understand development potential.</p>
<p>Uriarra Ridge Investigation Area</p>	<p>The Uriarra Ridge Investigation Area has an approximate size of 1,798 ha and is located north and south of Uriarra Road mostly comprising land zoned NU22-Rural. The ACT Heritage Register lists the property known as Huntly as having heritage significance and covers the majority of the area requiring that it be preserved as a rural property. Development potential of this will need to be informed through further investigation of heritage constraints. The site is relatively isolated with access via Uriarra Road only which presents a significant constraint for urban development. As there is no reticulated wastewater infrastructure within the site, it is likely that an additional bridge over the Molonglo River would be required to provide a crossing for services and additional vehicle access. Given the area's location between the Molonglo and Murrumbidgee River corridors, there is the need to maintain or increase habitat connectivity to support biodiversity. The area is identified as suitable for peri-urban uses such as rural residential and lifestyle blocks with development possible on each side of Uriarra Road.</p>
<p>West Molonglo Investigation Area</p>	<p>The West Molonglo Investigation Area has an approximate size of 1,785 ha and extends west from Wright in the Molonglo Valley. A significant portion of this area is designated land identified as the Mount Stromlo Observatory and Mount Stromlo Forest Park and is therefore excluded. Remaining urban capable land lacks connectivity to services and steep topography makes the area difficult to service with reticulated wastewater. Vehicle movements are restricted along Cotter Road and there would be a need to provide additional vehicle connectivity to support transport planning and the movements of people to/from the area. The area may be suitable for tourism and farm uses, or as a recreation precinct. There may be heritage constraints within this area which require further investigation to better understand development potential.</p>
<p>Bulgar Creek Investigation Area</p>	<p>The Bulgar Creek Investigation Area has an approximate size of 1,500 ha extending west of existing development in Weston Creek and south of the Stromlo Forest Park. This area provides a relatively flat terrain and is suitable for a range of potential uses. The proximity to existing development means existing utility services could potentially be extended from adjoining suburbs. An area mapped as Box Gum Woodland in the south of the site is recommended to be retained, as this is potentially EPBC-listed Critically Endangered remnant woodland. It is also recommended that Bulgar Creek be enhanced as a blue-green corridor throughout the area to provide habitat connectivity, stormwater management and to help manage urban heat island impacts. There may be heritage constraints within this area which require further investigation to better understand development potential.</p>
<p>Kambah Investigation Area</p>	<p>The Kambah Investigation Area is approximately 668 ha in size with access primarily from Kambah Pool Road. The 330KV National Transmission line passes through this area along with a 132KV line. The area is surrounded by nature reserves including Coleman Ridge to the east, the Murrumbidgee River corridor to the west, and McQuoids Nature Reserve to the south. Connectivity between nature reserves in this area will need to be maintained to ensure they are not isolated because of development. There may be heritage constraints within this area which require further investigation to better understand development potential.</p>

Stage 3 Indicative Development Scenarios

Three indicative development scenarios were developed for each of the investigation areas, based on the outcomes of the capability and suitability assessment. The objective of the development scenarios is to provide the Territory with indicative footprints for future urban areas (subject to required detailed ecological investigations) as follows:

- Land use Scenario One** – a ‘low impact’ approach avoiding direct impacts on currently mapped areas of likely ACT- and EPBC-listed threatened species and communities and key corridors. This scenario demonstrates there are very few areas in the WEIA that do not have a considerable degree of ecological significance.

- **Land Use Scenario Two** – an approach that delivers higher potential development outcomes while seeking to minimise impacts on threatened species and communities and maintain habitat connectivity.
- **Land Use Scenario Three** – an approach driven by connectivity to infrastructure, roads and efficiency of land use, without considering nature conservation requirements.

The scenarios adopted the following classifications for land use within each investigation area:

- Nature Reserve shows existing gazetted nature reserves.
- Potential Conservation Area shows areas with identified ecological sensitivity that should be avoided, or where impacts would need to be mitigated/offset. These are indicative only, subject to further ecological survey.
- Potential Habitat Connectivity corridors show high level linkages between areas of ecological sensitivity. These are indicative only and would require further targeted ecological survey to confirm exact widths and configuration.
- Potential Future Development covers land that the land use capability and suitability assessment identified as potentially urban capable. These areas warrant further investigation.
- Further Investigation Needed provides an overlay where priority should be given to understanding biodiversity or heritage site constraints.

The Indicative Development Scenarios provide a basis for ongoing investigation and testing of the capability and suitability for urban development of the WEIA. Further targeted environmental, heritage, traffic, hydrology and infrastructure investigations are required as part of future feasibility studies for each investigation area. The outcomes of the potential development scenarios are summarised as follows:

- **Scenario One:** Scenario One was developed to present a “low impact” scenario. The ‘potential development area’ in this scenario is land which is not currently identified as having any listed threatened species or communities or key habitat corridors and is very limited. It is not considered feasible to develop solely on these areas, meaning all development scenarios will involve direct impacts on key conservation values and are likely to require offsets.

Central Molonglo Investigation Area: Areas of Central Molonglo have been highlighted as providing breeding habitat for the threatened Superb Parrot in the eastern portion of the investigation area. This is one of only two documented breeding sites nationally for this species. The ACT Action Plan for this species requires a 200m buffer around any Superb Parrot breeding location to avoid disturbance. In regard to potential future development, Scenario Two provides an area of 51% (630 ha) while Scenario Three provides significantly more at 75% (927ha). However, given the significant ecological values and the Heritage Listed Kama Nature Reserve and Weetangera Cemetery, additional studies are recommended in this area as a priority to understand developability.

It is noted that past government commitments removed a significant portion of this area from being considered as a future urban area. This will need to be reconsidered in light of further studies and based on evolving and changing needs.

- **Uriarra Ridge Investigation Area:** There are a number of challenges associated with this investigation area, including road access via Uriarra Road which does not provide sufficient redundancy for general traffic movements and emergency services. Steep topography presents infrastructure challenges, and a significant area is covered by the heritage listed Huntly property and there are known ecological constraints in the area. The capability and suitability assessments determined that priority should be given to the development of other investigation areas, and the development of Uriarra Ridge would be considered in the longer term. A total of 23% (420 ha) of the investigation area is identified as potential future development area in Scenario 2, compared to 85% (1,525 ha) in Scenario Three.
- **Bulgar Creek Investigation Area:** Scenario Two provides a reasonable amount of future development at 76% (1,342 ha), with good connectivity to existing suburbs in Weston Creek with access via Cotter Road, Eucumbene Drive, and Hindmarsh Drive. Scenario 3 identifies approximately 71% (1,036 ha) of land as potential development area. Further consideration of how to balance development with areas of ecological sensitivity, natural water courses and access to infrastructure should be prioritised for this area. Future studies should define a study boundary, noting that there may be potential economies of scale to include land north of Cotter Road and further south within this investigation area.
- **Kambah Investigation Area:** As this investigation area is bounded by several nature reserves and the Murrumbidgee River Reserve, access in and out is considered constrained. Kambah Pool Road provides connection from the south, however connectivity into the Bulgar Creek Investigation Area is required to provide access north. Limited access would impact staging and timing if development in this area were to be progressed in isolation. Scenarios Two and Three provide similar outcomes of 95% (633 ha) and 97% (645 ha), respectively. An area requiring further targeted ecological and heritage study is noted within this investigation area. Prioritisation of these investigations is recommended to provide further insight into potential developability.

Scoring and Prioritisation

To enable the comparison of urban development clusters and potential development scenarios, it was necessary to pass each investigation area through a decision framework. The use of a strategic merit test was considered an appropriate method to

analyse the indicative development scenarios. The strategic merit test was run utilising the Scenario Two indicative development option.

Each of the three investigation areas were assessed against how well they align with each of the design principles and scoring of High (3), Medium (2) or Low (1) with ratings then aggregated to confirm an overall score. The aggregated score rated Central Molonglo and Bulgar Creek Investigation Areas evenly at a total of 44 out of a possible score of 48. Kambah ranked lower at 29. As a result, it is recommended that further investigation be prioritised for the Central Molonglo and Bulgar Creek Investigation Areas, with recognition of previous government decisions relating to Central Molonglo.

Recommendations

This project takes a high-level appraisal of existing studies and data to determine the capability and suitability of land within the WEIA to accommodate future urban uses. It is noted that the work within this study is intended to be used as a benchmark for further studies and determination of urban viability, alongside further targeted environmental, heritage, traffic, hydrology and infrastructure investigations. It is further noted that due to the high ecological values across the Western Edge Investigation Area, development may likely impact significantly on listed threatened species and communities and/or connectivity.

Once the appropriate studies have been prepared, the indicative development scenarios can be altered to reflect the outcomes of these more detailed investigations and preliminary master planning / structure planning can be undertaken. Master planning should consider biodiversity and ecological connectivity needs (including under climate change), bushfire risks (likewise under climate change), how to incorporate Designing for Country principles and Aboriginal people, how to protect urban expansion from the impacts of climate change and how to efficiently connect into existing transport and infrastructure. The types and densities of land uses should also form part of the future structure planning, to define how these future communities will look, feel and best address the characteristics and challenges of the Western Edge.

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1. Introduction

The ACT Planning Strategy 2018 (the Planning Strategy) defined the Western Edge Investigation Area (WEIA) as an area for further investigation for future urban growth. The ACT Government has also established targets to achieve 70% of additional housing within established areas, to source 100% of ACT power from renewable sources, to phase out natural gas and to provide highly connected, accessible and vibrant urban areas that are supported by high frequency public transport. Based on recent Australian Government population projections, it is expected that the ACT will have a population of 550,000 by 2033 (Australian Centre for Population 2023), an increase of around 100,000 residents.

The Planning Strategy provides an indicative boundary for the WEIA, confirming the potential strategic direction of greenfield growth in Canberra through to 2050 and beyond. Understanding the capability, suitability and ultimately the population capacity of the Western Edge is critical to informing strategic planning for the future of Canberra, including resolving the appropriate densities of urban renewal areas within the existing urban footprint and along key growth corridors.

The WEIA project presents an opportunity to build community climate change resilience through climate sensitive urban design, water cycle management, habitat connectivity, and green and living infrastructure. Climate change is expected to increase the average annual number of hot days over 35°C, increase extreme fire weather and result in a change to rainfall patterns in the ACT. This will have implications for sensitive and threatened species within the Western Edge and will require thoughtful and climate sensitive development to support community wellbeing.

The ACT Government has goals to improve the liveability and adaptability of the Territory to the impacts of climate change by implementing Canberra's Living Infrastructure Plan. The Living Infrastructure Plan seeks to achieve climate resilience by adopting adequate and appropriate mature tree cover, accounting for the value of living infrastructure and addressing local needs for managing urban heat island effects. Strategic planning to ensure efficient and sustainable development that maintains and enhances community wellbeing and biodiversity will be integral to the successful growth of Canberra.

An objective of the Planning Strategy is to provide a 'compact and efficient city' and is a primary consideration in the early master planning of the Western Edge. It will be essential to ensure that any future development of this potential greenfield area is able to provide a high level of residential amenity and housing typology choice, provides containment of local trips through ensuring there are opportunities for recreation, employment and education within the local area with good active travel, public transport and appropriate road connections to the existing network within adjoining suburbs, while also responding to challenging geotechnical conditions, topography and escalating bushfire risk.

The WEIA is known to be of high ecological importance. It contains significant areas of natural habitat, populations of many threatened species and two Critically Endangered ecological communities. The study area also neighbours the ACT's major waterway, the Murrumbidgee River. Equally important is the conservation and protection of biodiversity and key habitat linkages consistent with the ACT's Nature Conservation Strategy, including creation of appropriate urban open space and nature reserves, retention and restoration of natural hydrology, and creation of a blue-green grid (which will also enhance urban cooling). Recognition of the Aboriginal cultural values and European heritage values is a further key value to be respected in this process.

The WEIA project presents an opportunity to promote best practice sustainability targets and climate change resilience, which may assist in infrastructure demand management and alleviate capacity issues. A proactive and considered approach to future proofing development in the ACT in this way, would align with existing Territory policies that are putting ACT at the forefront on the journey to a lower carbon future.

1.1 Project Context

This study is driven by the Strategic Directions of the Planning Strategy, which prompts the investigation of the capability and suitability of the Western Edge. This study has strategic importance in the consideration of planning reform in the ACT, as well as future transport, road, education, social, community and recreation planning. This study is also highly relevant to utilities master planning by Evo Energy and Icon Water, noting the five-year legislative planning horizons required for utility providers.

Understanding the capacity of the Western Edge is an enabler to considering the future distribution of population throughout the ACT, particularly noting the desire to provide 70% of new housing within the existing urban footprint. However, it is recognised that the WEIA contains varied and significant environment and heritage values that will require further and more detailed investigation in the next phase of strategic planning.

Noting the significant constraints across the WEIA, this study takes an initial 'first pass' approach to determining areas that may be better suited to future development. Future development of land within the WEIA would be subject to standard land development processes including the identification of specific sites, detailed estate and precinct planning, prior to eventual land release and development. It is expected that this study will assist the ACT Government to better understand the opportunities and constraints of the WEIA and options for future land use within the study area.

1.2 Project Objectives

This study seeks to assess the potential for development within the WEIA, including consideration of land use capability and suitability based on spatial analysis of existing constraints.

1.3 Project Overview

This project has seven key components, which build upon existing preliminary studies and publicly available data to understand areas within the WEIA that may be suitable for future urban development. The development horizon is 40 to 50 years, requiring future-proofing and consideration of appropriate transport, bushfire, biodiversity and infrastructure corridors that will service the needs of the future community, whilst addressing the triple bottom line values and wellbeing considerations underpinning all development in the ACT.

This project was undertaken in three key parts:

- Land Capability Assessment
- Land Suitability Assessment
- Scenario Testing.



Figure 1-1 | Overview of the key project phases

The methodology for each of these tasks is described in further detail in Section 6. The assessment uses spatial mapping and Geographic Information Systems (GIS) to identify land that is suitable for urbanisation. The assessment is based on a review of the following environmental and physical characteristics:

- Interface with adjoining land uses
- Slope and soils
- Waterways and waterbodies
- Vegetation and habitat
- Bushfire risk
- Road access and infrastructure
- Visual impact

An analysis of each of the above attributes was undertaken using a scoring system, based on Multi-Criteria Analysis (MCA) principles. These were then weighted and combined into the 'Consolidated Capability Assessment' (Section 6.4) which rates areas as follows:

- Somewhat constrained
- Constrained

- Highly constrained
- Very highly constrained
- Restricted

GIS was used for its ability to combine, overlay and analyse multiple spatial attributes across the WEIA. This enables a comparison of physical and environmental constraints to provide a high level indication of development potential.

The second part of the project was a Land Suitability Assessment, which clustered and compared parcels of urban capable land, to develop and understanding of the opportunities and challenges of each area. Based on the outcome of the land capability assessment, this assessment clustered geographic areas within the WEIA into five investigation areas: Central Molonglo, Uriarra Ridge, Bulgar Creek, West Molonglo and Kambah.

Three indicative development scenarios were developed for consideration:

- **Land Use Scenario One** – a ‘low impact’ approach acknowledging the presence of all ecological values (identified potential listed habitat, habit corridors, as well as listed vegetation under ACT and Commonwealth legislation). This scenario demonstrates that there are very few areas in the WEIA that do not have some degree of ecological significance.
- **Land Use Scenario Two** – an approach driven that delivers development outcomes while seeking to minimise impacts on threatened species and communities and maintain habitat connectivity.
- **Land Use Scenario Three** – an approach driven by connectivity to infrastructure, roads and efficiency of land use.

These scenarios and investigation areas were compared using a Strategic Merit Test, as a form of MCA, to prioritise areas for development. The logic and mathematic basis of the MCA process assisted with the qualitative nature of comparative assessment of each scenario, however it must be noted that there is a low degree of granularity to this assessment, due to the high level nature of this study. It is recommended that the next phase of the project include site specific investigations and master planning, which will enable more detailed consideration of potential development footprints and land uses.

Upon engagement, opportunities to collaborate with the Project Control Group (PCG) throughout the project were identified, and a consultation strategy was prepared (Chapter 5). A series of workshops were held throughout the project to establish the assessment criteria as the key framework for the project and to ensure the scenarios were responsive to identified ecological characteristics and development constraints.

2. Study Area

The WEIA project seeks to investigate land use capability and suitability for the potential urban expansion of Canberra into the ‘Western Edge’. The WEIA is approximately 9,800ha and is bounded by the Murrumbidgee River to the west and by the suburb of Kambah to the south, and existing suburban development to the east (Weston Creek and Molonglo Valley) and north (Belconnen and West Belconnen). Primarily the WEIA is within the district of Stromlo, however, also has some areas within the districts of Tuggeranong, Weston Creek and Belconnen. Figure 2-1 below shows the WEIA area in relation to the existing suburbs of Canberra.

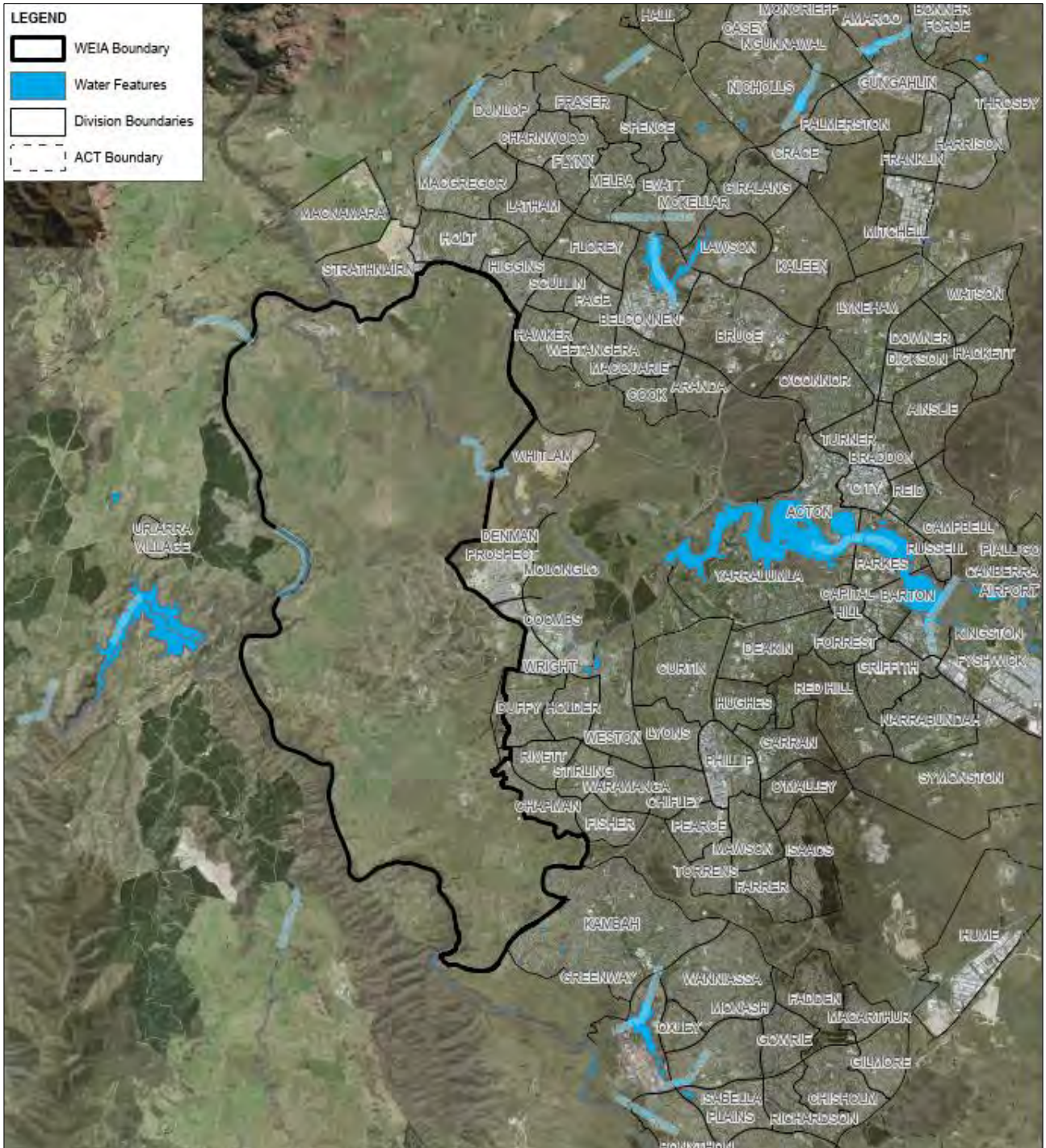


Figure 2-1 | Western Edge Investigation Area showing existing suburbs

2.1 Study limitations

Through undertaking a capability and suitability assessment, this study assesses a number of urban development scenarios for the WEIA. These scenarios are hypothetical only and are based on a wide range of assumptions to provide indicative development options. They are based on ecological data available at the time of writing. It is recognised that this data is still incomplete for the investigation area and that further ecological surveys and assessments will provide additional information into the future. The impacts of climate change have not been considered for individual urban development scenarios, noting that future development of the Western Edge should include measures to mitigate the possible effects of climate change, including, but limited to green and blue infrastructure to promote habitat connectivity and urban cooling.

The development scenarios have been prepared to provide a basis for consideration of potential development in the WEIA. They detail areas that may require further specific investigation to confirm their capacity for urban development. Additional studies into the feasibility of these scenarios, and detailed master planning of the infrastructure required to support population growth will be needed.

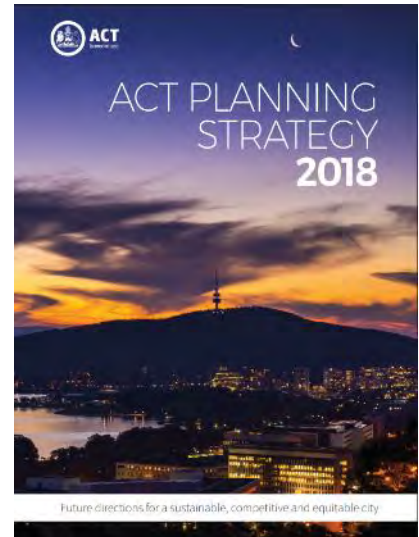
The extent to which these urban expansion areas are realised will depend on ACT Government policy and market demand for greenfield development over the course of the next 50 years. **The individual maps and information are highly indicative only and should not be relied on in isolation.**

3. Planning Context

3.1 ACT Planning Strategy 2018

The Planning Strategy identifies the need to investigate new residential areas to the west of the city to meet future expansion needs so that diversity in housing choice can continue to be provided. Action 1.2.1 of the Planning Strategy aims to undertake environmental, infrastructure and planning studies for the western edge of the city to identify suitable areas for:

- Potential urban areas (excluding Central Molonglo)
- Nature reserves
- Environmental offset and potential environmental offset areas
- The consideration of cultural and heritage values
- Other uses, for example rural, broadacre, major infrastructure, transport and services.



The Planning Strategy recognises that the options for urban expansion in the ACT are limited. To the east of the city, the airport and environmentally significant areas preclude residential development, and to the south, bushland and mountainous areas limit urban expansion. Similarly, to the north, land is constrained by the ACT/NSW border and nationally significant environmental areas.

The WEIA is identified as a Future Urban Intensification Area in ‘Map 6 Growth Map’ of the Planning Strategy (Figure 3-1). This study is intended to provide additional information to focus future strategic planning activities on land that is capable and suitable for urban development.

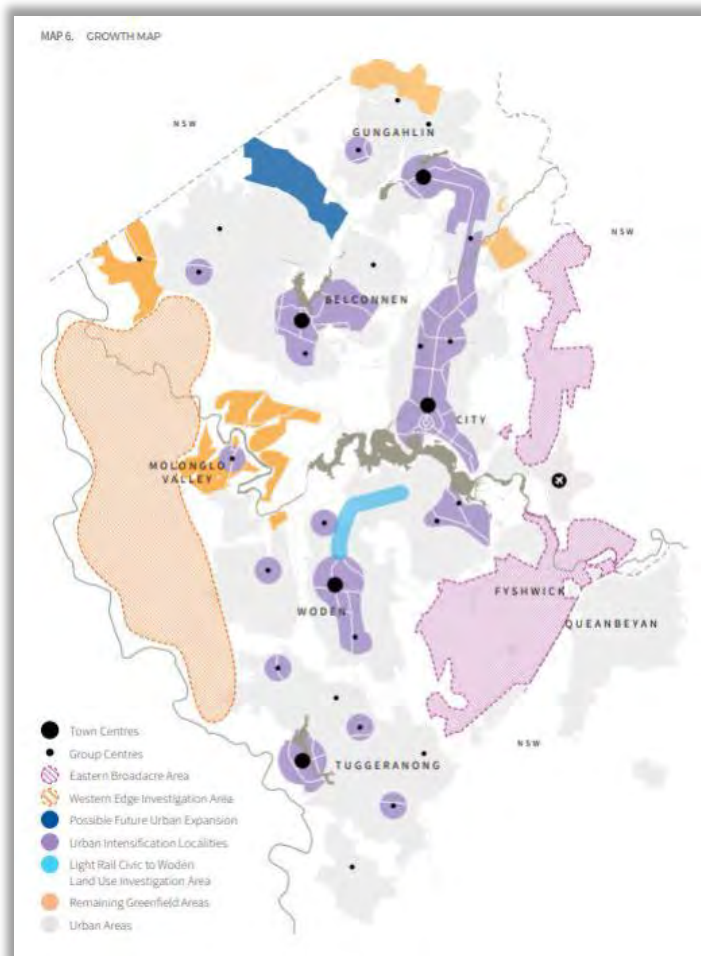


Figure 3-1 | The ACT Planning Strategy defines the WEIA as a Future Urban Investigation Area

3.2 ACT Territory Plan 2008

The land within the WEIA is predominately zoned NUZ2-Rural under the ACT Territory Plan 2008 (Territory Plan) and is the primary future urban area under consideration in this study. There is an area of ‘Designated Land’ under the National Capital Plan present within the site covering Mount Stromlo, Narrabundah Hill, Cooleman Ridge and McQuoid’s Hill Nature Reserve. Areas along the Murrumbidgee River and the Molonglo River are zoned NUZ4 River Corridor, with areas in the northern section of the study area zoned NUZ3 Hills Ridges and Buffers.

The Lower Molonglo Water Quality Control Centre (LMWQCC) is located to the north of the WEIA and the Mount Stromlo Water Treatment Plant is also located centrally within the WEIA area, to the south-west of the Mount Stromlo Observatory. Both treatment plants and the Observatory have buffers to residential development to avoid potentially conflicting land uses.

Publicly available mapping on ACTMapi indicates the presence of a number of critically endangered and ecologically diverse habitats throughout the WEIA. Other characteristics of the WEIA include bushfire risk, high degree of slope, presence of natural water ways and drainage lines, and the identified presence of cultural heritage artefacts and areas of European Heritage significance.

Concurrently with this study, the ACT Government is undertaking a review and reform of the planning system. The Planning and Reform Project will introduce a new Planning Bill, Territory Plan and District Strategies to facilitate the growth and development of Canberra.

3.3 Climate Change Strategy 2019

The ACT Climate Change Strategy 2019 sets out pathways for adapting to climate change and mitigating the associated impact in the ACT setting. Any future land use change in the WEIA will need to align with the actions identified in the Climate Change Strategy, including the goal to achieve “Net Zero Emissions” by 2045. This will require investment in zero emissions infrastructure, sustainable urban design and a substantial shift in travel habits from private car use towards active travel and public transport.

3.4 Canberra’s Living Infrastructure Plan: Cooling the City

The Canberra Living Infrastructure Plan sets a vision to achieve climate resilience by adopting adequate and appropriate mature tree cover, accounting for the value of living infrastructure and addressing local needs for managing urban heat island effect. Any future development in the WEIA will need to consider efficient and sustainable urban land use that maintains and enhances community wellbeing and biodiversity and is supported by living infrastructure.

3.5 ACT Transport Strategy 2020

In order to ensure Canberra is becoming a *compact, sustainable and vibrant city by 2040*, the ACT Transport Strategy 2020 (the Transport Strategy) concentrates on future planning and investment in the transport system in the ACT. A strong vision has been established for the Transport Strategy along with the ambitions outlined in the Planning Strategy and the Climate Change Strategy. The Transport Strategy aims to provide more attractive, flexible travel options that increase choices for residents in a high-quality, convenient, safe, and reliable environment.

3.6 ACT Housing Strategy 2018

The ACT Housing Strategy 2018 (Housing Strategy) puts in place policy interventions to meet the Territory’s diverse and changing housing needs and provide a sustainable supply of housing for households at all income levels. The Housing Strategy sets an objective to provide new land and housing development opportunities so that demand can continue to be met. The WEIA identifies land on the Western Edge of the city that is suitable for meeting the sustainable housing and growth needs of the city.

3.7 ACT Nature Conservation Strategy 2013-23

The ACT Nature Conservation Strategy (NC Strategy) sets out a vision for biodiversity rich, resilient landscapes stretching from the inner city to the mountains, where well-functioning ecosystems can meet the needs of people and the environment. The WEIA study contains many threatened species and two critically endangered ecological communities. Further investigation into maintaining habitat and connectivity and the functioning of natural ecosystems should be undertaken as part of any future planning of development in the WEIA.

4. Background Analysis

4.1 Previous Studies

The ACT Government has been investigating the potential for development of the Western Edge through a number of previous preliminary investigations. There are also a number of concurrent studies which have the potential to be influenced by this project, including the Parkes Way and Corridors Study, the Multi-Modal Network Plan and recalibration of the Canberra Strategic Transport Model. Existing Territory planning policies also provide relevant context to this project. This section provides a brief overview of current policies and previous investigations that have informed the scope of this assessment.

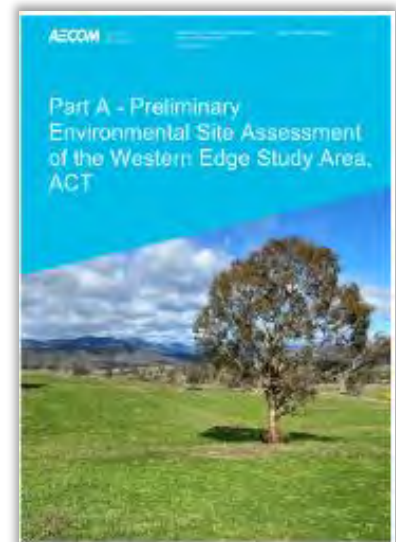
The previous studies undertaken seek to establish a series of baseline conditions of the environmental values of the study area to establish the capability, suitability and ultimately, the capacity of the Western Edge to accommodate future development. A summary of the previous studies that are relied upon in the WEIA Capability and Suitability Assessment is provided below.

Preliminary Environmental Site Assessment of the Western Edge Study Area, AECOM 2020

This was a desktop study and targeted field assessment of the WEIA study area to confirm potential sources of contamination and areas of concern associated with current and historical uses. Current and historical potentially contaminating activities were found to occur consistently across the study area as they are associated with the current and former rural land uses.

Contamination

- A select search of the ACT EPA Register of contaminated sites was undertaken and showed that there are 36 sites within the WEIA listed as being potentially contaminated. This is due to the presence of sheep dips or stick drenching activities, chemicals used for pest control or forestry plantations, underground storage tanks, plant and machinery facilities associated with the Mount Stromlo Observatory, asbestos sheeting and heavy metals associated with buildings destroyed by the 2003 bushfire, stockpiles, imported fill, animal burial pits, UXO/EOW associated with former Department of Defence activities, chemicals associated with grape cultivation, and sewage treatment at the Lower Molonglo Water Quality Control Centre and Mount Stromlo Water Treatment Plant.
- The study also identified the potential for contamination associated with the former Stromlo Landfill which was used for the disposal of Asbestos Containing Materials (ACM) following the 2003 bushfire. Whilst the former Stromlo Landfill is outside of the WEIA area, understanding its location is relevant to the land use capability and suitability assessment.
- The use of PFAS foams for firefighting during the 2003 bushfire was not found to be particularly widespread, and the study found that the risk of associated contamination is likely to be low.



Ground Water

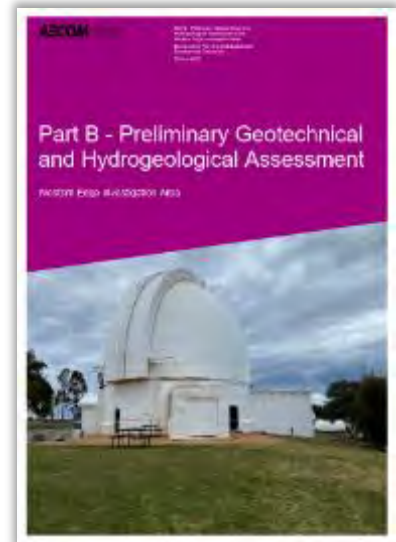
- Six groundwater abstraction bores were found within the WEIA area, with depths of between 7m and 72m below ground level, accessing both alluvial and deep rock aquifer sources.
- A primary matter highlighted in the report was the potential risk of Unexploded Explosive Ordnance (UXO) and Exploded Ordnance Waste (EOW) along the north eastern boundary of the WEIA area. Further investigation was recommended to confirm the actual risk, and to inform further detailed investigation into AECs.
- This study concluded that additional investigation into site contamination should be informed by master planning and the outcomes of the capability and suitability assessment.

Preliminary Geotechnical and Hydrogeological Assessment of the Western Edge Study Area, AECOM 2020

This preliminary assessment sought to identify existing geotechnical and geological conditions, groundwater environment and areas that may constrain future development.

The report found that the soil landscapes within the WEIA study area comprise both Campbell landscapes, surrounding Mount Stromlo and the eastern part of the site; Burra landscape through the undulating low hills; and Williamsdale throughout the remainder of the site.

- The Campbell soil landscape comprises steep erosional terrain, with extensive exposures of rock outcrop. The ability of these areas to support urban development is limited, due to soil mass movement potential, steep slopes and rocky outcrops.
- Areas of Burra landscape occur around the drainage lines that are steep with localised erosion where slope wash materials move to the Molonglo and Murrumbidgee River courses. Seasonal waterlogging in areas of Burra soils may constrain urban development.
- The remainder of the site is identified as Williamsdale soil landscape, and includes areas of undulating rises, fans, valley flats and depressions. These areas are known for seasonal waterlogging and high water tables, which can constrain urban development with high water retention in soils and problems with septic effluent disposal.
- In relation to groundwater, this preliminary assessment confirmed that there may be a need to undertake de-watering during excavation for construction in lower lying areas. There are assumed to be several groundwater dependent ecosystems within the WEIA area, including Murrumbidgee, Ginninderra and Molonglo Rivers. The study also indicated that there were 18 registered groundwater bores in the study area with depths of 15.6m to 86.3m. The productivity of these bores is not known.



The preliminary study developed a conceptual terrain model and determined that:

- Development of areas immediately adjacent to and upslope of the Murrumbidgee and Molonglo Rivers should be avoided as these areas present a risk to development due to the soil characteristics, potential for erosion and landslip;
- There are severe limitations for urban development of river flats due to rock outcrops, shallow soils and steep slopes. There is a potential foundation hazard due to moderate land slip potential;
- Development adjacent to incised drainage lines should be avoided due to erosion, potential for flooding and waterlogging. Master planning should consider an appropriate buffer from these identified drainage lines.
- Areas identified as Williamsdale soils present few constraints to urban development, as concerns relating to waterlogging and soil creep, appropriate effluent and surface water disposal can be appropriately managed in the future engineering subdivision design.

Western Edge Investigation Area – Air Quality Study, AECOM 2020

This study undertook a baseline assessment of air quality in the WEIA and confirmed that current air quality is good due to the lack of significant industry/urbanisation. As a result of the microclimate, prevailing winds and topography, there are some areas within the WEIA that could experience pollutant accumulation. As a result, the report recommends the banning of wood heaters within the future urban area.

Proximity to the Lower Molonglo Water Quality Control Centre (LMWQCC) was also considered, and the report recommends that further assessment be undertaken of land within the WEIA that is impacted by odours from sewage treatment processes, and if so, what appropriate mitigation measure should be considered. A buffer zone of 2.4km around the LMWQCC, similar to that provided to development in West Belconnen, is recommended to be adopted to the interface with the WEIA. It is noted that this buffer may be an overassessment given the extent and purpose of previous studies and the process upgrades currently planned for LMWQCC that are likely to improve the efficiency of treatment and reduce odour.

Changes to the management of odour along the Molonglo Valley Interceptor Sewer (MVIS) are being considered as urban development in the Molonglo Valley alters the way odour is managed in future urban areas. Similarly, if urban development were to occur within close proximity of existing vent stacks in the WEIA, upgraded odour mitigation may be needed.



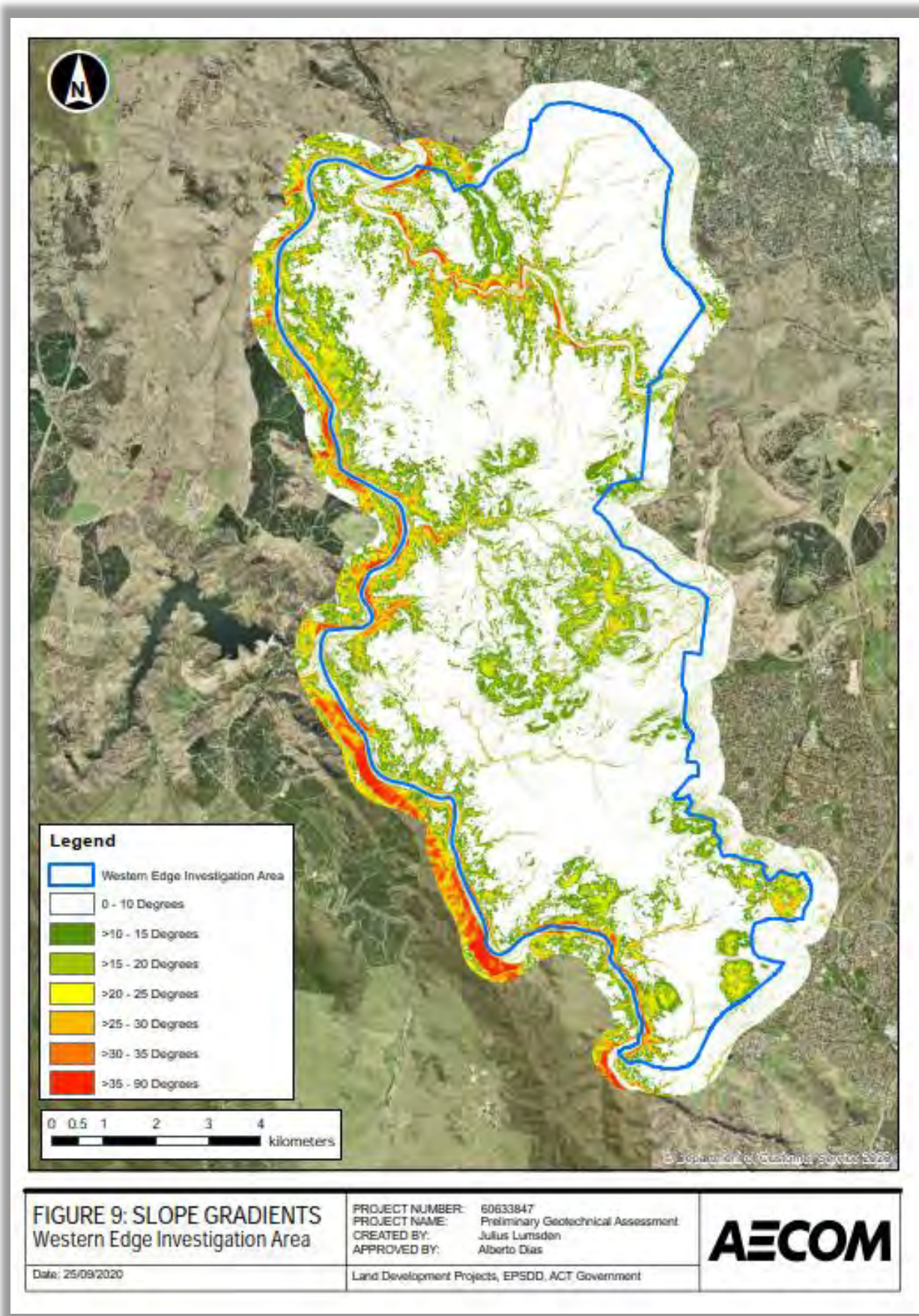


Figure 4-1 | Slope Gradients Identified in the AECOM Preliminary Assessment by AECOM 2020

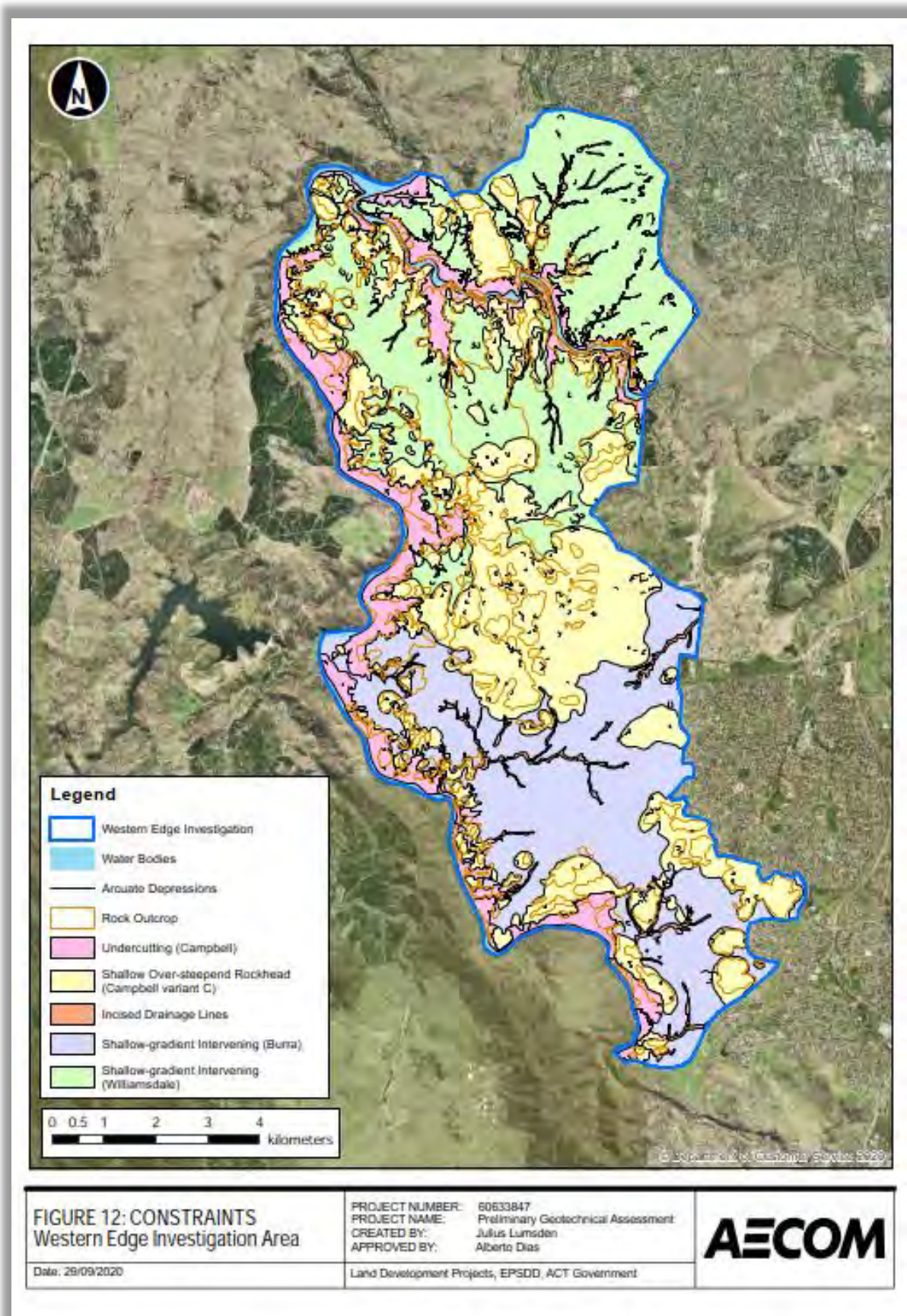


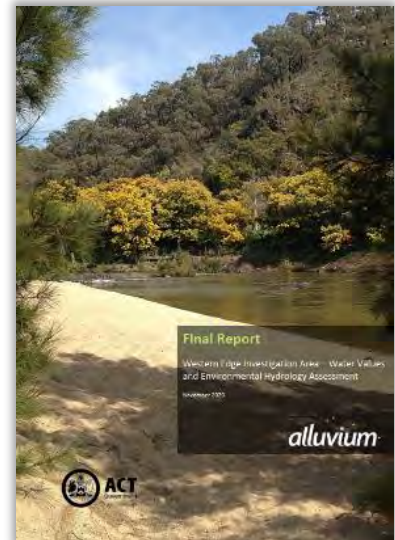
Figure 4-2 | Soil Landscapes identified in the Preliminary Geotechnical Assessment by AECOM 2020

Western Edge Investigation Area – Water Values and Environmental Hydrology Assessment – Alluvium 2020

This study sought to identify and describe the water-related values, catchment management issues and potential constraints for future development. Key findings of this study include:

- A MUSIC model was developed to describe the anticipated pollutant loads for a conceptual residential development, and found the potential for a tenfold increase in Total Suspended Solids, 5-6 times increase in Total Phosphorous and 3-4 times increase in Total Nitrogen. As a result of the land use change associated with urbanisation, Water Sensitive Urban Design (WSUD) measures would need to be incorporated to meet the regional and developer targets of the WSUD General Code.
- Opportunities for artificial lakes and wetlands to manage flashiness of storm flows, sediment and nutrient load associated with urbanisation. An initial suggestion is made for the location of large-scale stormwater treatment assets, based on terrain and catchments.
- There are opportunities for riparian revegetation to offset the potential impacts associated with the development of the WEIA.
- Recommendation to consider a maximum impervious area for urban blocks, to reduce surface runoff and overall environmental impact of urbanisation.
- Recommendation for a buffer around and including river corridors to allow sufficient space to treat stormwater, manage its flow down the escarpments and into the Murrumbidgee and Molonglo Rivers to avoid erosion.
- Control the depth and cut/fill of excavation to avoid disturbing areas of high salinity or interaction with the groundwater table.
- Opportunity for rehabilitation and protection of ephemeral creeks for recreation, amenity, education, water quality treatment and ecological restoration.

This study provided a suggestion for appropriate zoning, based on water values and hydrogeology. The findings of this assessment are incorporated into the Capability Assessment.



Western Edge Investigation Area Cultural Heritage Assessment, GML Heritage 2020

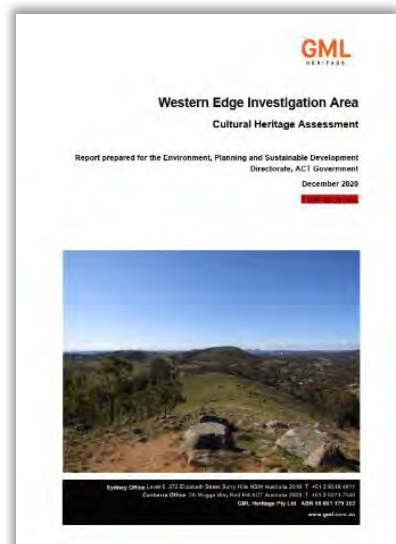
A Cultural Heritage Assessment (CHA) was prepared to assess how the landscape was previously used and occupied by Aboriginal communities. It notes that the Murrumbidgee and Molonglo Rivers acted as key transport corridors for communities and show a reasonable density of artefacts, culturally modified trees and cultural areas.

A guiding model was developed which assessed the potential for a range of soil types including sites with tangible and intangible cultural heritage values and noted limitations. This model did not assess the presence or absence of Potential Archaeological Deposits (PADs).

A number of registered historical sites were also identified including Huntly, Weetangera Cemetery, Travelling Stock Route, Cotter Pumping Station Precinct, Greenhills House Ruins and the Mt Stromlo Observatory Precinct.

The preliminary study divided the WEIA into areas of high and moderate sensitivity, and made a series of recommendations for additional work that would be required to understand the values of the landscape. In summary¹:

- Areas of high sensitivity were identified as unsuitable for residential and commercial development as they are areas of long-term or repeated occupation and social activity or are movement pathways through the landscape.
- Areas of moderate sensitivity may need to be subject to further consideration and investigation approval (i.e., for a Cultural Heritage Assessment relevant to the parcel(s) of land). Areas identified to be of moderate sensitivity may still be unsuitable for development depending on the results of further investigations.
- Areas for further investigation:



¹ It is noted the GML Heritage (2020) Cultural Heritage Assessment contains sensitive information pertaining to the presence of Aboriginal artefacts within the study area and as a result may need to be redacted from this document in the event this study is publicly released

- Zone 1 – potential for additional Aboriginal Heritage sites based on existing records
- Zone 2 – limited previous heritage assessment, however there is a potential for further sites based on finds

A shapefile of heritage items has been obtained. Focusing the capability and suitability assessment on the location of existing identified Aboriginal heritage places and values presents a biased assessment of the WEIA, as areas that have not been previously surveyed would appear as not having heritage values. In addition, focusing on artefact finds would not adequately consider intangible cultural values such as song lines and spiritually significant places. We understand that the ACT Government is currently undertaking additional studies into the cultural significance of the WEIA and suggest that the outcomes of the WEIA Land Use Capability and Suitability Assessment be revised in time to consider these findings.

Aboriginal places which have been registered on the ACT Heritage Register and sensitive information recorded by GML (2020) is mapped in restricted Appendix A. Additional Aboriginal places, which are not on the ACT Heritage Register may have been previously recorded in the WEIA. There is no spatial data available on these places so the number, extent and significance of these places is currently unknown. Future development planning will need to consider any information gaps, along with additional heritage assessment in accordance with the operating statutory framework at the time.

Western Edge Investigation Area – Preliminary Ecological Review

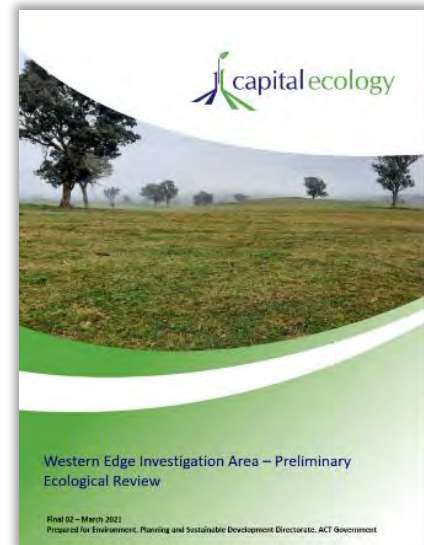
This study undertook an initial review of ecological and plant community types present across the WEIA study area. The report noted that current and historic land uses including rural agriculture and commercial plantations have substantially altered the ecological values of much of the area through clearing, cultivation, pasture improvement, grazing, pine plantations and the introduction of exotic flora and fauna.

The study notes that there are a number of significant ecological values that need to be considered and preserved where possible through master planning and land use designations. These areas predominantly occur along the Molonglo and Murrumbidgee River corridors and the central part of the WEIA study area which supports some mature remnant native vegetation with good floristic diversity. The study notes:

- The presence of Critically Endangered Natural Temperate Grassland (NTG) occurring in the northern part of the site.
- Presence of Box Gum Woodland, including potential Critically Endangered Blakely's Red Gum-Yellow Box Grassy Woodland, throughout the study area.
- Threatened flora species were recorded in the WEIA, predominantly clustered around river corridors and identified as Austral Toadflax, Hoary Sunray, Murrumbidgee Bossiaea, Pale Pomaderris, and Small Purple Pea.
- Habitat for threatened Gang-gang Cockatoo, Superb Parrot and Little Eagle is also present, mostly in the central part of the WEIA.
- Habitat for the endangered Rosenberg's Monitor and vulnerable Pink Tailed Worm Lizard (PTWL) were also identified throughout the site. Due to the presence of surface rock throughout the WEIA, PTWL is expected to be reasonably widespread however further survey is required to confirm the quality of habitat.
- Potential for threatened Striped Legless Lizard habitat, requiring further targeted surveys to confirm.
- Potential threatened Golden Sun Moth and Perunga Grasshopper, however further targeted surveys are recommended.
- Potential for Spotted-tailed Quoll and noted sightings in the ACT Wildlife Atlas of Brush-tailed Rock Wallaby, Grey-headed Flying-fox and Koala.
- Potential and confirmed habitat for threatened aquatic species including Murray River Crayfish, Macquarie Perch, Murray Cod and Trout Cod within the Murrumbidgee and Molonglo River systems.

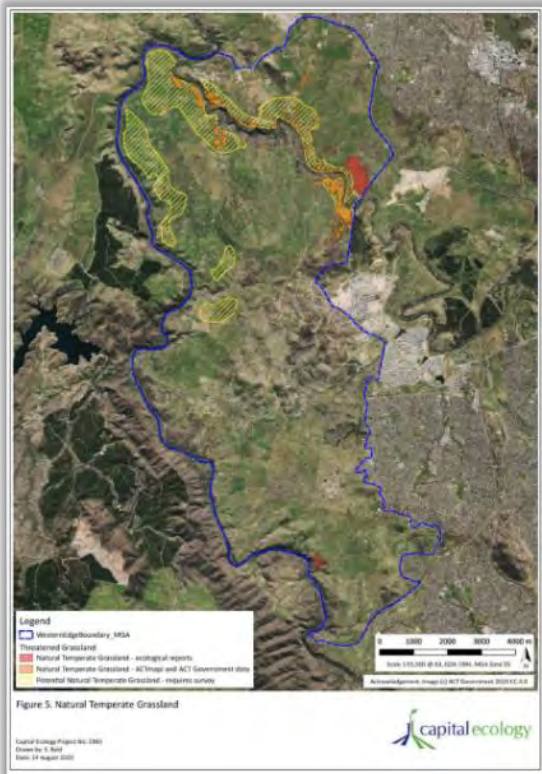
Due to the density of threatened flora and fauna occurring throughout the WEIA, the Capital Ecology report recommends a series of further studies including consideration of key habitat connectivity pathways throughout the site. The report notes that the WEIA is likely to hold both local and regional importance for habitat connectivity and recommends that significant corridors may include:

- Murrumbidgee and Molonglo River corridors
- Area south of the WEIA around McQuoid's Hill Nature Reserve
- South-west and north-west of Mt Stromlo
- Portions of Spring Valley Farm
- Portions of Kama Nature Reserve, Lands End, Pegasus Riding School and Pine Ridge



Based on the connectivity corridors and mapped presence of ecologically significant habitat, the report recommends four potential future conservation/offset sites with areas of EPBC and Nature Conservation Act listed Box-Gum Woodland, NTG and habitat for threatened birds, invertebrates, reptiles.

The mapping from the Capital Ecology report has been incorporated into the assessment undertaken as part of this study to help categorise land that is most suitable for urban development.



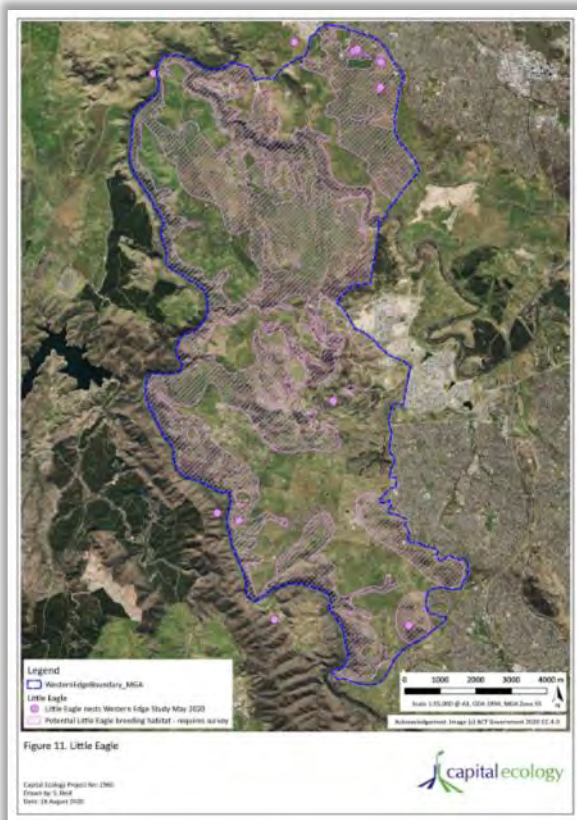


Figure 4-7 | Potential and known habitat for threatened Little Eagle

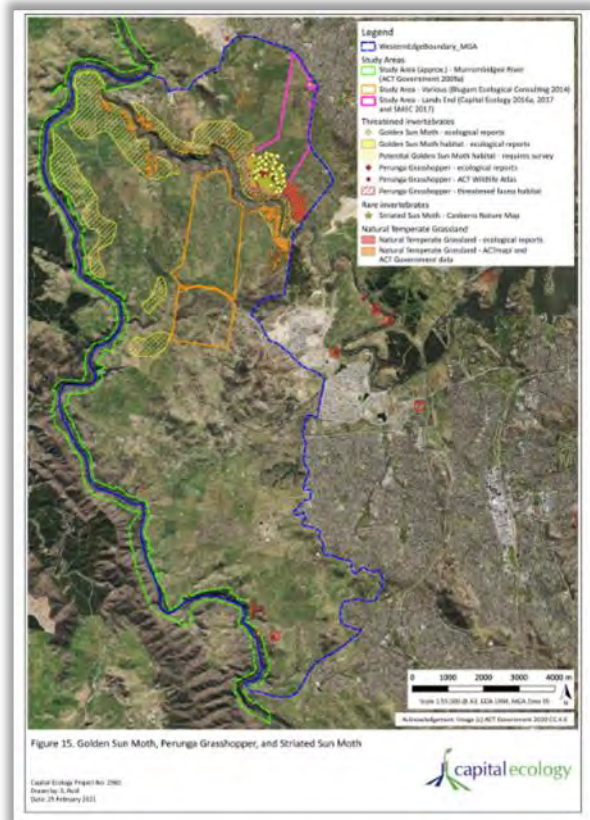


Figure 4-8 | Potential and known habitat for Golden Sun Moth

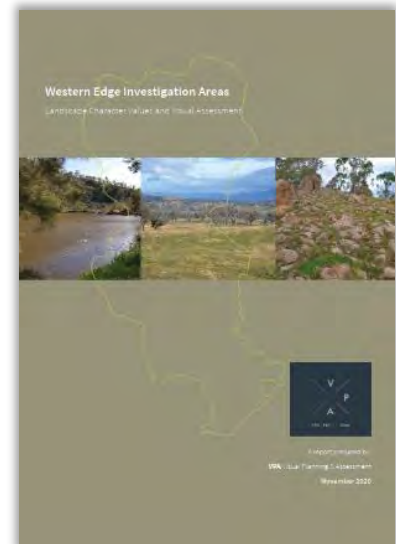
Western Edge Investigation Area – Landscape Character Values and Visual Assessment prepared by Van Pelt and Allen 2020

This assessment considered existing landscape values, key viewpoints and points of interest and existing road, river and infrastructure corridors. The report notes that the nature of Canberra’s topography has meant that the WEIA has formed a natural ‘edge’, being retained as rural lands and creating a buffer between urban development, and the rivers and mountains beyond.

The assessment produced two preliminary outputs, mapping ‘scenic amenity’ and ‘scenic priority’ throughout the WEIA. A series of ‘scenic values’ were then developed to provide a quantitative assessment denoting areas of higher rural landscape integrity due to the continuity of the landscape and extent of visibility from existing developed areas; and suggestions for areas which have a high visual absorption capability, due to topography and lower visibility.

Six options for potential development nodes were identified in the report, and have been considered in the Suitability assessment undertaken for this project. The mapping notes areas as having higher visual absorption capacity: Spring Valley Farm within the central part of the WEIA and to the west of Denman North; two areas in the south of the WEIA, west of Chapman toward Kambah Pool Road; an area adjacent to development in West Belconnen and two smaller areas located to the west of Mount Stromlo. The report notes that the visual absorption of the WEIA can be increased by screening new development with strategically located tree planting and filtering views through vegetation.

The capability assessment has drawn upon the scenic priority values shown in Figure 4-9 that were established in the visual impact assessment, to assess areas which offer better visual absorption (lower scores) and that may be more suited for urban development.



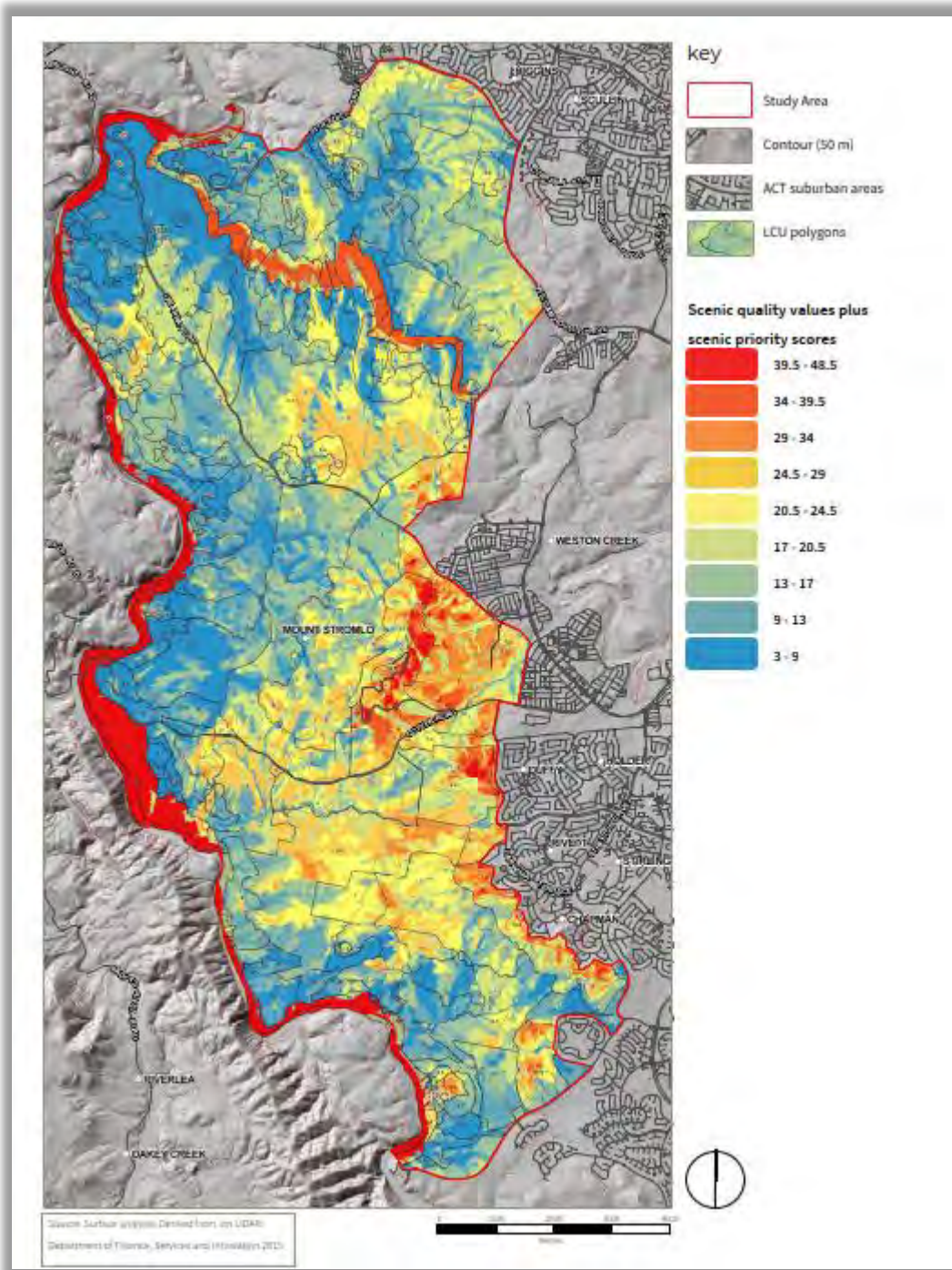
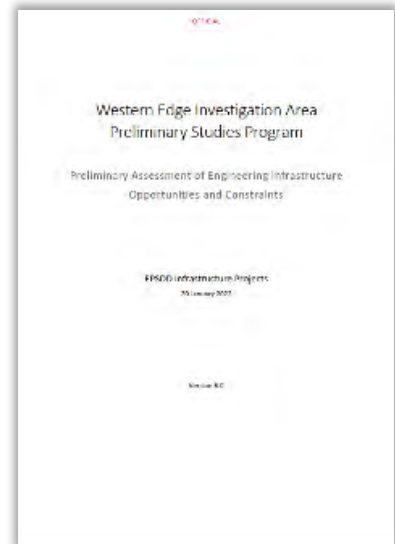


Figure 4-9 | Scenic Values (source: VPA 2020)

Western Edge Investigation Area – Preliminary Assessment of Engineering Infrastructure Opportunities and Constraints, EPSDD 2022

This preliminary report provides an assessment of the presence of existing infrastructure within the WEIA, confirming key areas of risk and uncertainty. Of particular note, the report confirms:

- The need to consider transport corridors east-west and north-south of the developable areas. There may be potential need to cross the Molonglo River and undertake substantial upgrades to existing roads to support additional density in the WEIA.
- Topography creates challenges for servicing the site, and suggestions of options such as an on-site sewerage treatment plant, pump station linking to LMWQCC and a new gravity sewer (via a bridge) to LMWQCC. Servicing costs may impact development feasibility.
- The need to manage sewer odours and noise from the Molonglo Valley Interceptor Sewer (MVIS) and LMWQCC and consider appropriate siting for future urban areas.
- The need to consider how stormwater flows are managed within the future urban areas, noting the need to manage both quality and quantity of flows before discharge into the Molonglo and Murrumbidgee River systems.
- The need to consider the potential to reuse stormwater to reduce potable water demand.
- The need to source appropriate locations for water reservoirs to service future development in the area.
- Consider the location of existing TransGrid infrastructure in the WEIA, and whether relocation may be needed.
- Note the five-year regulatory timeframe for Evo Energy to raise funds to plan for the construction of new infrastructure. The need to consider the availability of existing power supply and capacity, noting planned projects in the Molonglo Valley.



Western Edge Investigation Area – Preliminary Bushfire Risk Assessment, Ecological 2020

This bushfire risk assessment provides the level of bushfire risk and includes recommendations to inform land use considerations. Key considerations include:

- Assessment of bushfire risk
- Compliance with relevant ACT policies including the ACT Strategic Bushfire Management Plan Version 4 2019-2924
- Minimising reliance on performance based solutions
- Providing infrastructure to support evacuation and firefighting
- Facilitating ongoing land management practices.

The report notes that re-vegetation along river corridors will provide an additional fuel source that will need to be appropriately managed through urban form and asset protection zones (APZs). Grassland fires are most likely to come from the north, east and south, and provide a high risk to the WEIA, due to their higher ignition and rate of spread. Forested areas to the south-west of the WEIA area present the largest fuel load, however the downhill topography toward the Murrumbidgee River may slow the spread of fire. Overall, the report suggests that the 'perimeter to area' ratio of the WEIA is low, noting that about a quarter of the boundary of the WEIA does not interface with bushfire prone land. This means that bushfire risk is manageable and that over 95% of future development may be able to be classified as Bushfire Attack Level (BAL) LOW.

The capability assessment will utilise the bushfire risk category assessment, which considers slope and vegetation type to confirm the likely bushfire risk across the WEIA. It is important to note that this does not consider bushfire hazard, threat to life or property, or the potential to safely evacuate. These matters will be considered qualitatively in the suitability assessment, alongside climate change and resilience given the potential impact of extended and harsher bushfire seasons.



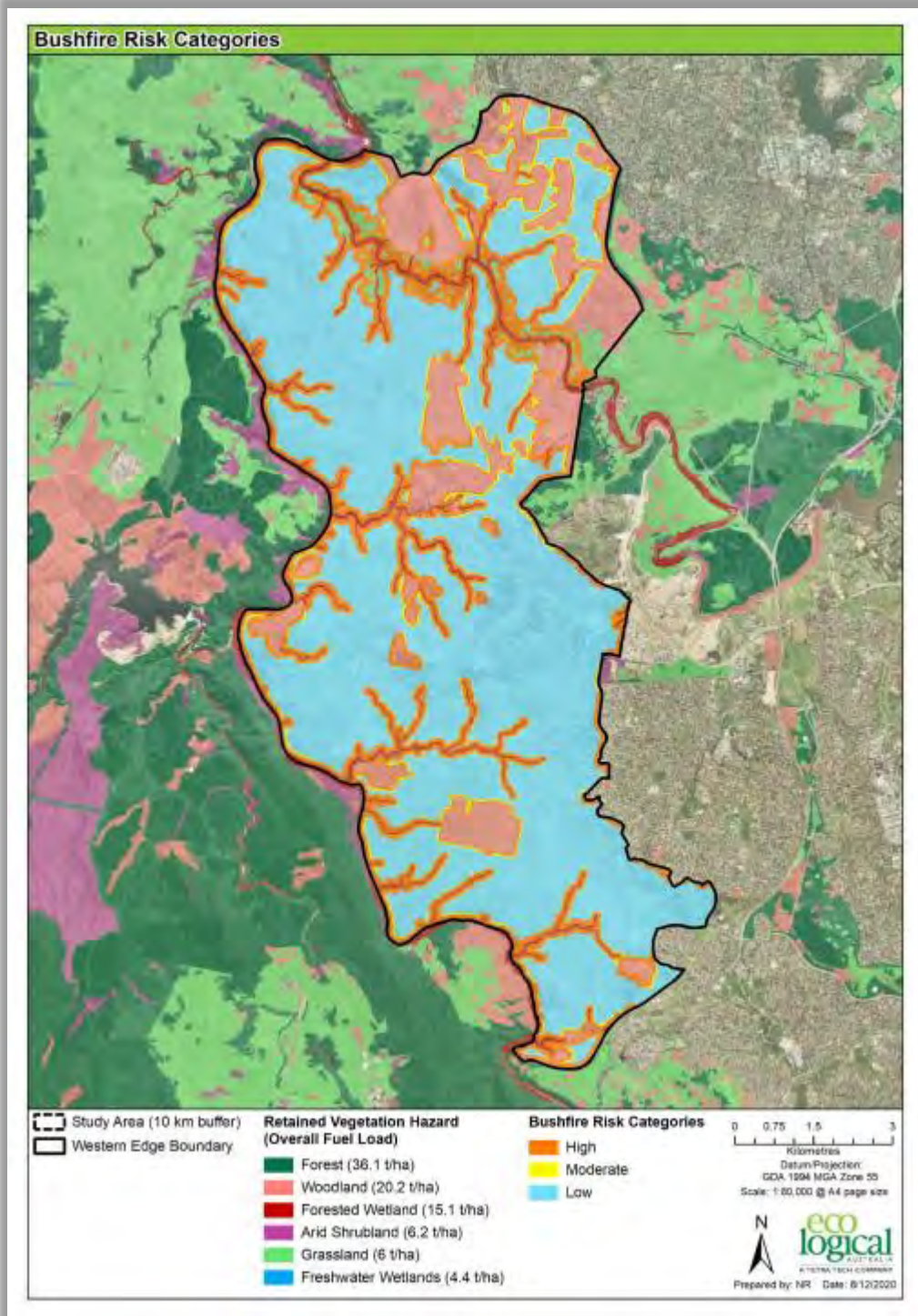


Figure 4-10 | Bushfire Risk Assessment (source: Ecological, 2020)

4.2 Constraints Analysis

The following figures provide an analysis of key infrastructure assets and networks within and surrounding the WEIA. These are intended to provide an overview of site constraints and opportunities, for further exploration in the Land Capability and Suitability Assessment.

Access into the WEIA from the existing road network presents a key consideration for servicing and extension of the road network, as well as connectivity into active travel and public transport networks. Uriarra Road provides a single carriageway connecting to the arterial network at John Gorton Drive. Cotter Road provides a single carriageway with

east-west connectivity to the WEIA, extending west from John Gorton Drive to Mount Stromlo and providing access to a number of rural properties and equestrian uses.

Kambah Pool Road provides access to the southern boundary, whilst the western extent of Hindmarsh Drive, Duffy, provides potential east-west connectivity through to the districts of Weston Creek and Woden. William Hovell Drive and Drake-Brockman Drive extend along the north-eastern portion of the WEIA, providing potential connectivity to Belconnen and recent development in West Belconnen.

Icon Water infrastructure in the WEIA comprises sewer infrastructure in the northern portion of the site, and bulk water supply along Cotter Road. The significant Icon Water potable water assets in the area include a 1350mm bulk water supply main which runs from the Cotter Dam intake to the Mount Stromlo Water Treatment Plant, and then pumps potable water via bulk mains to reservoirs throughout Canberra for reticulation. The Molonglo Valley Interceptor Sewer (MVIS), a 2500mm gravity main, connects southern Canberra with the LMWQCC. Reticulation networks for sewer and water are shown within adjoining suburban areas in developed Canberra however do not presently extend into the WEIA.

Energy supply infrastructure within the region includes a 330KV transmission line, part of the Transgrid operated national grid, which runs north-south through the WEIA. It is anticipated that this would be placed within a 60m wide easement in the future, if the WEIA were to be developed. There is no existing easement where the infrastructure is located on unleased land. This transmission line connects to the Canberra Substation in Holt (Block 1559 Belconnen). An Evo Energy owned 132Kv line extends from the Canberra Substation, and traverses through the northern portion of the site, parallel to Drake-Brockman Drive. Lower voltage infrastructure is also present within the WEIA, however could be relocated or undergrounded to accommodate future development.

Gas connections within the WEIA are present connecting to the Mount Stromlo Observatory, Mount Stromlo Water Treatment Plant and the LMWQCC. Whilst the ACT Government has committed to no new natural gas connections to greenfield residential development from 2021-2022, it is likely that these existing connections will need to be retained to service existing infrastructure uses.

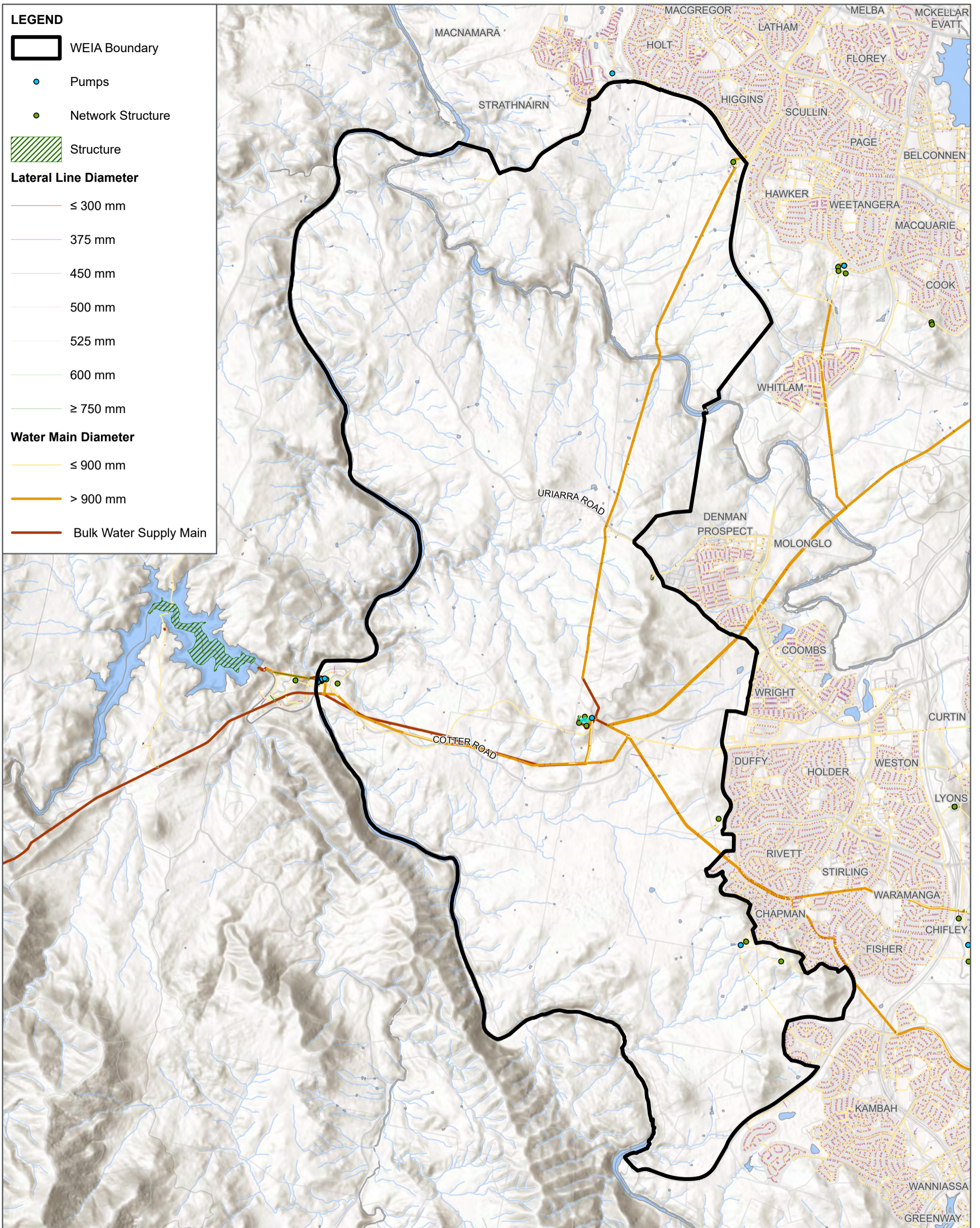
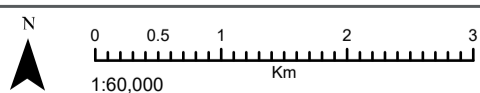


FIG NO. 4-11

FIGURE TITLE Icon Water Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



PAGE SIZE A3

SOURCES Icon Water, Base Layers: www.ACTmapi.act.gov.au © Australian Capital Territory.
World Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS

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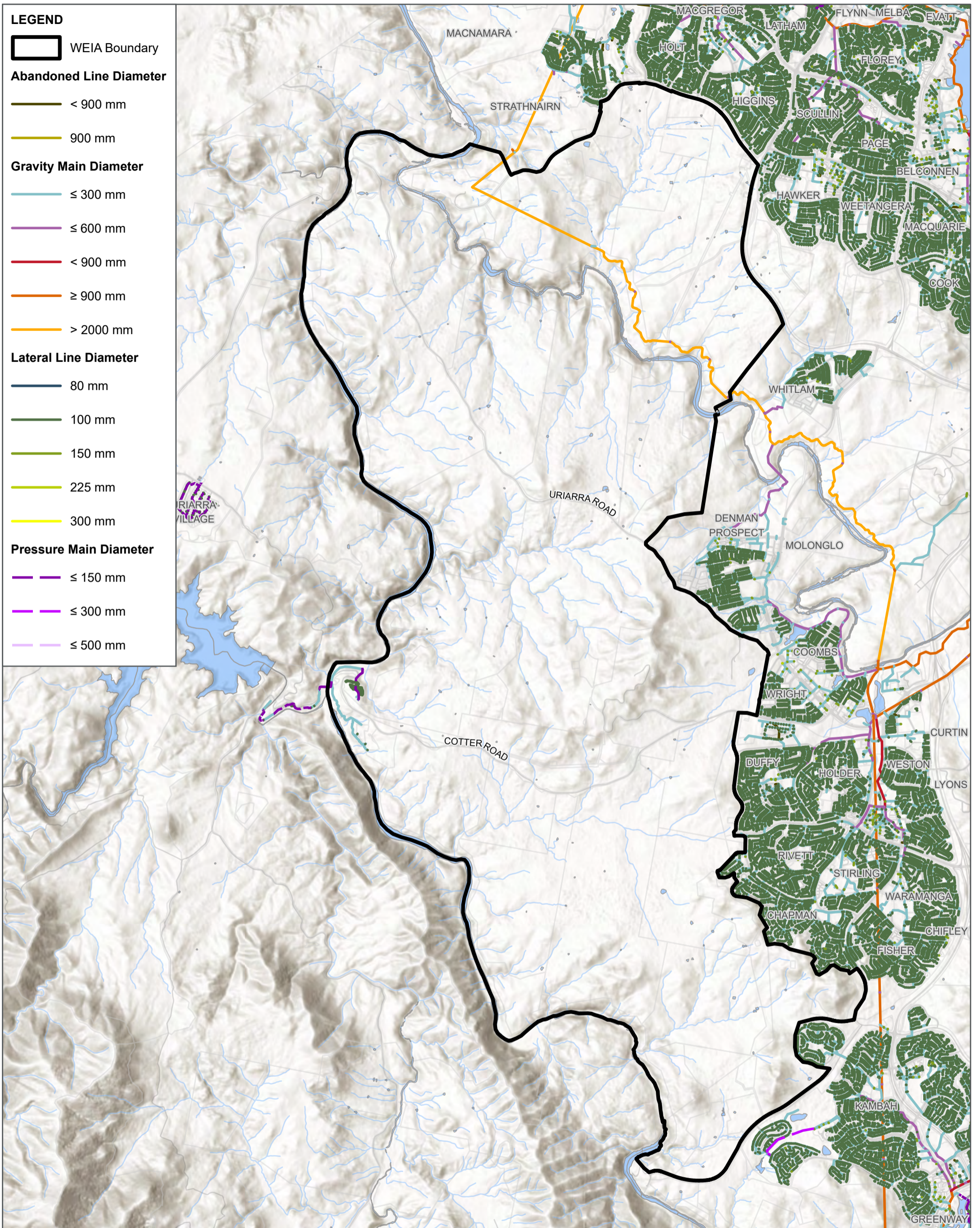


FIG NO. 4-12 **FIGURE TITLE** Sewer Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment

FIG NO. 4-12 **FIGURE TITLE** Sewer Infrastructure Constraint Overview



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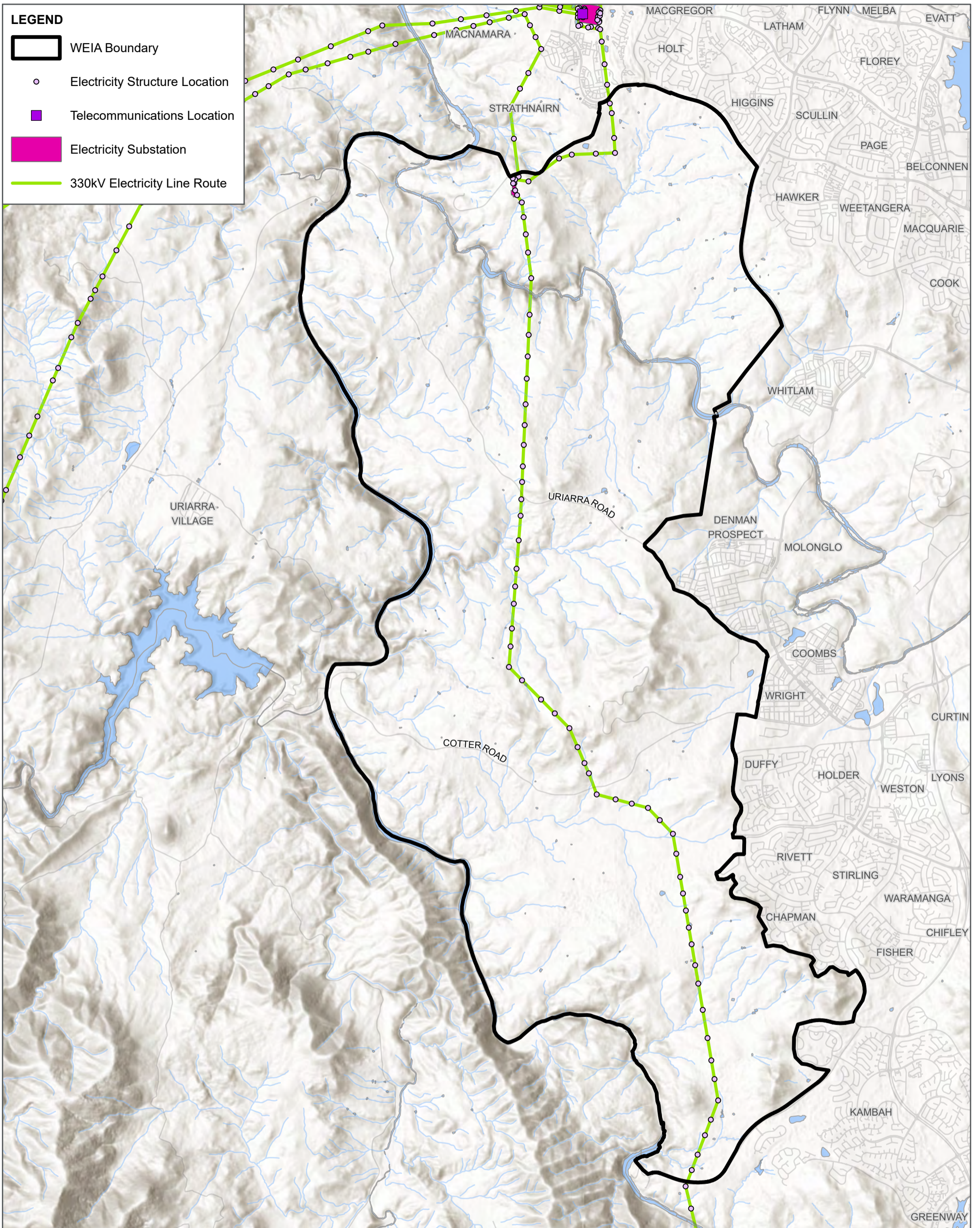


FIG NO. 4 -13 **FIGURE TITLE** Transgrid Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment

FIGURE DESCRIPTION This map illustrates the proposed 330kV electricity line route and associated infrastructure within the Western Edge Investigation Area (WEIA). The route is shown as a green line with structure locations marked by small circles. A telecommunications location is indicated by a purple square, and an electricity substation is shown as a pink square. The WEIA boundary is outlined in black. The map also shows topographic features, water bodies, and various suburbs including Macnamara, Strathairn, Uriarra Road, Cotter Road, Macgregor, Latham, Flynn, Melba, Evatt, Florey, Higgins, Scullin, Page, Belconnen, Weetangera, Macquarie, Cook, Whitlam, Denman Prospect, Molonglo, Coombs, Wright, Curtin, Duffy, Holder, Weston, Lyons, Rivett, Stirling, Waramanga, Chapman, Fisher, Chifley, Kambah, and Greenway.

FIGURE INFORMATION

FIGURE NO. 4 -13

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PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment

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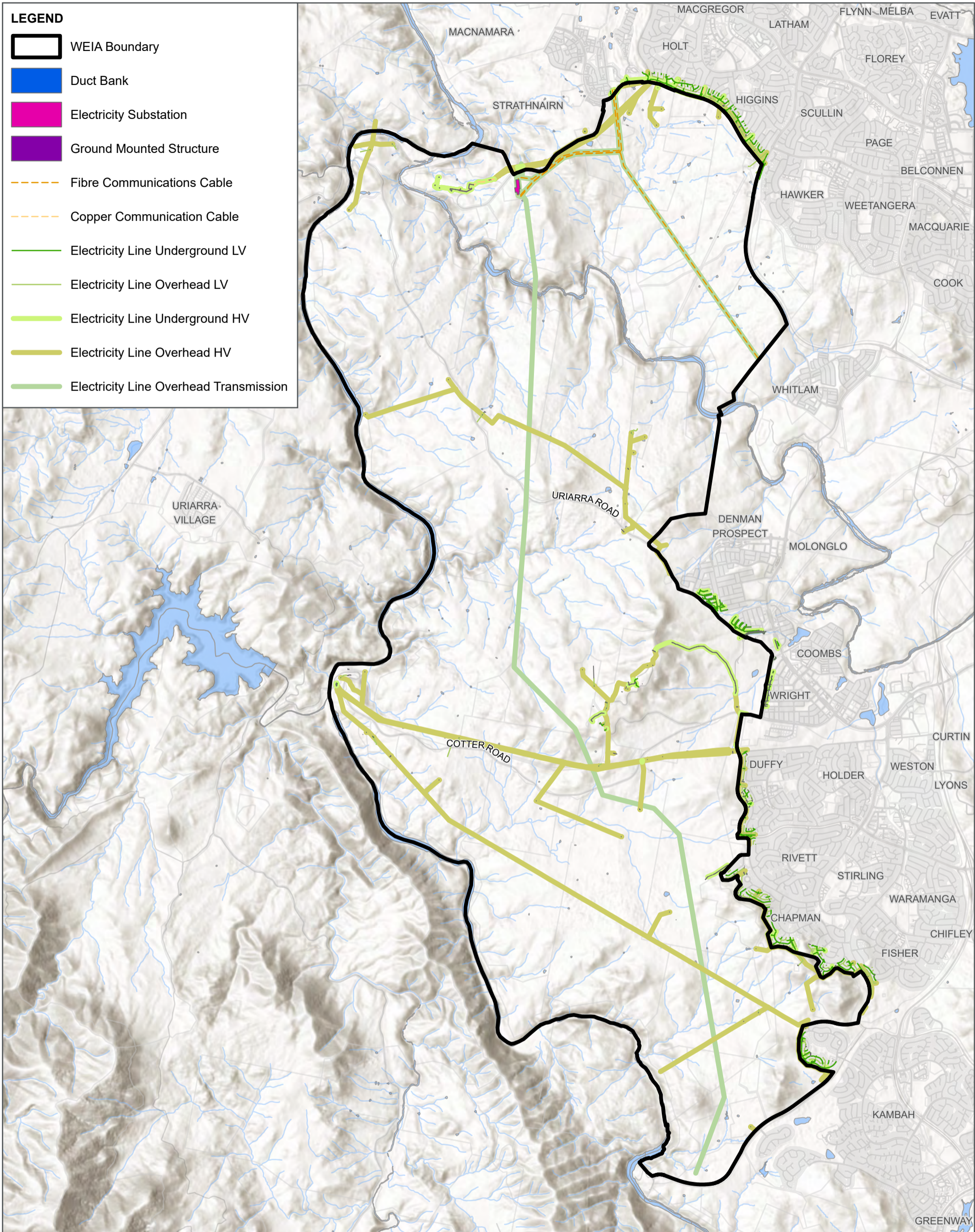
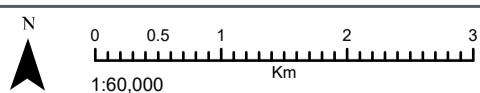


FIG NO. 4-14

FIGURE TITLE Evo Energy Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



PAGE SIZE A3

SOURCES Evo Energy, Base Layers: www.ACTmapi.act.gov.au © Australian Capital Territory.
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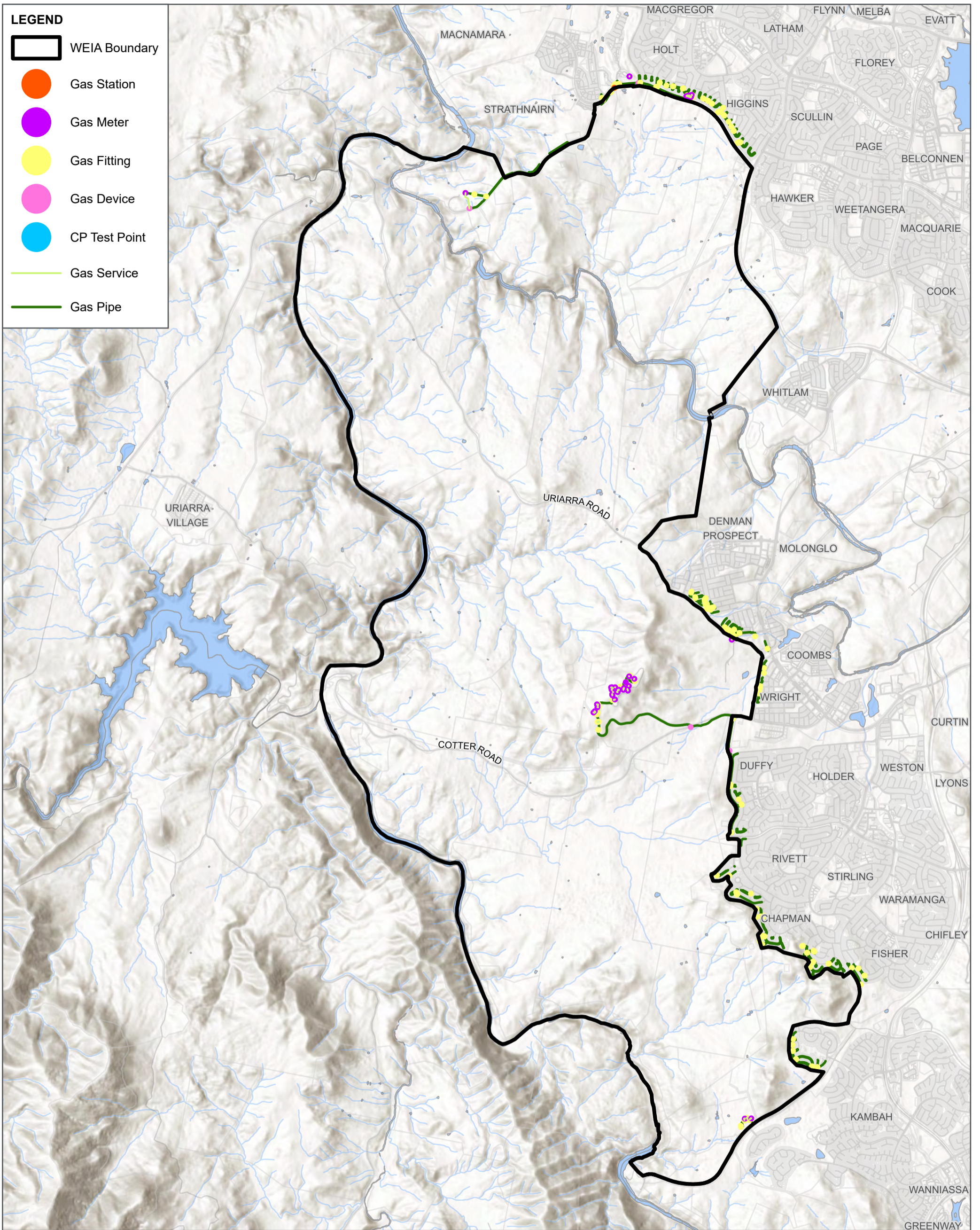
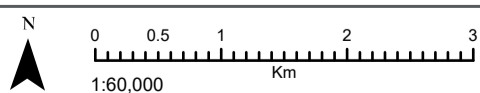


FIG NO. 4-15

FIGURE TITLE Gas Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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5. Stakeholder Engagement

The project’s engagement approach was underpinned by the International Association of Public Participation (IAP2) Spectrum of Public Participation. The IAP2 spectrum identifies the level of influence stakeholders can have on a project, with the spectrum extended from ‘inform’ through to ‘empower’. SMEC sought to ‘empower’ and ‘collaborate’ with key agency stakeholders (within EPSDD) during the course of the WEIA Land Capability and Suitability Assessment.

Table 5–1 | IAP2 Public Participation Spectrum

IAP2'S PUBLIC PARTICIPATION SPECTRUM

The IAP2 Federation has developed the Spectrum to help groups define the public's role in any public participation process. The IAP2 Spectrum is quickly becoming an international standard.

INCREASING IMPACT ON THE DECISION →

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

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5.1 Identified Stakeholders

Key internal stakeholders for the WEIA Project include key sections of EPSDD involved in the policy development, planning and delivery of future development in the ACT. These key sections of EPSDD are represented in the Project Control Group (PCG) who were invited to the four stakeholder engagement workshops and one field visit that were held throughout the project. Key contacts within EPSDD include:

- Steven Gianakis, Senior Director, Strategic Planning & Reform, Planning and Urban Policy
- Karen Wright, Director, Strategic Planning & Reform, Planning and Urban Policy
- Patrick Paynter, Senior Director, Development and Implementation
- Rosie Cooney, Senior Director, Conservation Research, Environment Heritage and Water
- Greg Baines, Senior Conservation Officer, Environment Heritage and Water
- Eliza Larson, Conservator Liaison, Environment Heritage and Water
- Daniel Santosuosso, Project Director, Development and Implementation
- Claire Adams, Planning Policy Officer, Strategic Planning & Reform, Planning and Urban Policy
- John Wildermuth, Infrastructure Officer, Infrastructure Projects

- Brett Howland, Senior Ecologist, Conservation Research
- Lisa Evans, Aquatic Ecologist, Conservation Research
- Julia Maskell, Conservation Officer, ACT Heritage

Key external stakeholders for the WEIA Project included utility asset owners such as Icon Water, Transgrid and Evo Energy. SMEC engaged with these stakeholders via email or MS Teams, as needed, throughout the project, to obtain an understanding of their existing utility networks. Key contacts within these external agencies include:

- Tim Elliot, Senior Technical Advisor, Icon Water
- Michael Platt, Development Assessment Control Advisor – Transgrid
- Rebecca Beasley, Development Coordination, Evo Energy

5.2 Potential engagement issues and risks

Table5–2 identifies potential project stakeholder engagement issues and risks, as well as the proposed measures the project team undertook to mitigate the risk.

Table5–2 | Engagement Risks and Mitigation Measures

Issue	Risk	Mitigation
Lack of stakeholder understanding about project benefits	Stakeholders do not support the WEIA Project or are disengaged during workshops. May delay delivery of project, or withhold key information on existing constraints.	Implement engagement approach that promotes the need for and benefits of the project. Tailor communication channels and adapt to different stakeholders depending on their needs. Managed expectations by closing the feedback loop and sharing results through project updates and communications. Invited technical involvement through PCG workshops.
Ineffective engagement with stakeholders.	Low levels of stakeholder engagement with project. Stakeholders unaware of project.	Confirmed engagement approach prior to planned sessions via a 'dry run' with the project team. Ensured engagement sessions were informative but also included key activities to provide opportunities for collaboration. Applied continuous improvement and regularly evaluated engagement activities/tools and their effectiveness.
Inconsistent project messaging and information.	Distrust or confusion amongst stakeholders. Negative reputational impact.	Sought technical input to complex technical aspects of communication material for accuracy. Involved key technical team members throughout the workshops, as appropriate, to facilitate technical discussions.
Lack of acceptance and stakeholder disapproval of the project.	Negative reputational impact. Stakeholders do not accept need for or outcomes of the WEIA Land Capability and Suitability Assessment.	Provided early and consistent engagement for stakeholders. Built trust and rapport with stakeholders through transparent and responsive engagement. Monitored and reported on issues raised and closed the feedback loop.
Stakeholder feedback not passed back to project team.	Stakeholders do not support the proposal and do not feel their input was valued.	Tracked stakeholder interactions and all issues raised in a Comments Register.

Issue	Risk	Mitigation
		<p>Provided regular updates and facilitated discussions with project team.</p> <p>Closed feedback loop by sharing outcomes with stakeholders.</p>
Negative political or media attention regarding the project.	<p>Reputational risk.</p> <p>Project delayed or outcomes modified during delivery due to political influences.</p>	<p>Maintained confidentiality of the project. Directed any media enquiries to EPSDD.</p> <p>Provided a clear English 'Snap Shot' at the conclusion of the project that can be used to brief political stakeholders and/or the public.</p>
Insufficient evidence, information or data	Stakeholders are unable to make well informed comments.	Identified gaps, or where more information was required, reassured stakeholders that future further investigations will be undertaken to fill in the gaps. A planning process is long term by its nature and there will be many years prior to confirming if any area could be developed.

5.3 Engagement Tools

Table 5–3 below outlines the communication and engagement tools that were used by SMEC during project delivery to consult with stakeholders and promote collaboration and engagement.

Table 5–3 | Proposed Engagement Tools

Activity	Purpose	Tool	Attendees	Timing
Stakeholder Workshop 1	Land Capability Assessment Establish MCA Criteria	Workshop GIS Mapping Group activity to establish MCA criteria	PCG and SMEC	26 May 2022
Stakeholder Workshop 2	Land Use Areas and Boundaries	Workshop GIS Mapping Group activity to confirm key parameters for suitability assessment	PCG and SMEC	28 June 2022
Field Visit	Site understanding	Use of georeferenced mapping program (Avenza) Site visit and discussions	PCG and SMEC	28 June 2022
Stakeholder Workshop 3	Land Suitability Assessment	Workshop and group activities to confirm zoning and vision	PCG and SMEC	28 July 2022
Stakeholder Workshop 4	Scenario development / Strategic Merit Test	Workshop and Strategic Merit Test of indicative development scenarios	PCG and SMEC	1 September 2022
Project Snapshot	Fact sheet will cover topics such as project need, findings and recommendations.	Fact Sheet	N/A	Conclusion of project

6. Land Capability Assessment

6.1 Methodology

The Land Capability Assessment was based on the physical and environmental characteristics of the study area, as extracted from previous studies and data obtained from utility owners. Table 6–2 confirms the criteria that was used in the capability assessment, which was based on the key desirable characteristics for urban development. The intent of this assessment was to undertake an initial quantitative analysis of the capability of the WEIA, with more detailed qualitative considerations in the suitability assessment. For each of the criteria, the following ranges of suitability (or “ratings”) were assigned as defined in Table 6–2. The spatial outputs of these ratings were displayed as:

- **Rating 1 – Least Constrained**

Land that is potentially developable with little or no intervention.

- **Rating 10 - Somewhat constrained – Pink**

Land that is potentially developable with minor intervention and investment. This land is characterised by some constraints that may feature some costs to mitigate or manage, or may impact the type of use possible.

- **Rating 20 – Constrained – Yellow**

Land that is potentially developable, however still has a number of physical constraints.

- **Rating 40 – Highly Constrained – Orange**

Land that may be more difficult to develop due to environmental or ecological constraints.

- **Rating 200 – Very Highly Constrained – Red**

Land that is potentially undevelopable or requires very significant intervention and investment. This land is characterised by significant constraints that may be costly to mitigate or manage.

- **Rating 9999 – Area of Restriction ‘Excluded’ - Grey**

Land that may be unsuitable for urban development, based on identified constraints. This is land that is within the river corridor or an existing or planned nature reserve. The Stromlo Observatory and Stromlo Forest Park were also areas of restriction that were excluded.

Six ratings were selected to give appropriate sensitivity to the rating of each criteria. A higher number of ratings would not give such a defined output, and fewer may oversimplify the impacts of constraints assessed.

6.2 Relative Weightings

The relative weightings adopted in the Capability Assessment were developed in consultation with the PCG at the first stakeholder workshop. Criteria were given a score out of ten, with a relative percentage weighting created. This is shown in Table 6–1. Adopting a relative weighting provided an opportunity to undertake a sensitivity assessment and ensured that some attributes that occur throughout the WEIA did not overly dominate the capability analysis from a mathematical perspective.

Table 6–1 | Raw and weighted scores for Capability Assessment

Criteria	Raw Score	Relative Weighting
Interface with adjoining land uses	6	13%
Slope and Soils	5.5	12%
Waterways and waterbodies	8	17%
Vegetation and Habitat	9.5	21%
Bushfire Hazard	7	15%
Road Access and Infrastructure	6	13%
Visual Impact	4	9%
TOTAL	46	100%

Table 6-2 | Assessment Criteria for Land Capability Assessment

Criteria	Justification	Rating					Relative Weighting	
		9999 Areas of Restriction 'Excluded'	200 Very Highly Constrained	40 Highly Constrained	20 Constrained	10 Somewhat Constrained		1 Least Constrained
Interface with adjoining land uses	<ul style="list-style-type: none"> To avoid incompatible adjacent uses Consideration of existing and future development approvals for conflicting land uses To ensure site is not within or adjacent to area designated for alternative incompatible use To avoid designated land 	NUZ4 – River Corridor Nature Reserve Overlay Stromlo Observatory Stromlo Forest Park LMWQCC Stromlo WTP		Designated Areas NUZ3 – Hills Ridges and Buffers Within 2.4km of LMWQCC Within ANU’s Stromlo Observatory Non-development Buffer	500m or further from land zoned FUA, RZ1/RZ2/RZ3 Within NCA’s Stromlo Observatory Light Limitation Zone (5km)	-	13	
Slope and Soils	<ul style="list-style-type: none"> To minimise risk of erosion and slope stability, cost of construction and low accessibility and serviceability To avoid areas that are identified in the geotechnical assessment as presenting a risk to development 	Water logged Highly Erodible soils	Rocky Outcrop	Burra soil landscape Slope 20%+	Slope 15% to 20%	-	Campbell soil landscape 12	
Waterways and waterbodies	<ul style="list-style-type: none"> To minimise impacts on water bodies and waterways and reduce flood impacts To protect key waterways and tributaries To appropriately manage interaction between hydrology, soils and slopes 	NUZ4 River Corridor	Stormwater Buffer (Alluvium Report)	-	-	Remainder of the site	-	17
Vegetation and Habitat	<ul style="list-style-type: none"> To maintain important biodiversity corridors (connectivity) To avoid and minimise impacts on biodiversity, including threatened species and ecological communities 	NUZ4 – River Corridor Nature Reserve Overlay Blocks 402 and 403 Stromlo	Critically Endangered Species	Concentration of multiple listed species in the same place Connectivity linkages between core habitat			21	
Bushfire Hazard	<ul style="list-style-type: none"> Minimise risk of bushfire hazard To protect assets (public and private) through appropriate management and maintenance To consider constraints of future climate To establish safe evacuation routes 		High Bushfire Risk	-	Moderate Bushfire Risk	Low Bushfire Risk	15	
Road Access and Infrastructure	<ul style="list-style-type: none"> To ensure access to site is possible via existing road network To note where the presence of large regional assets such as transmission lines may restrict development feasibility if augmentation or relocation is required To ensure future development is serviceable To consider the cost of infrastructure connections To provide and integrate efficient (cost-effective and responsive) infrastructure networks To establish Multi-use/flexible infrastructure corridors 	Icon Water Structures LMWQCC Stromlo WTP	> 2 kms from existing water / sewer / power pipe with diameter of < 900mm Transgrid HV 300Kv Transmission lines + 60m buffer MVIS sewer +10m buffer, bulk water supply main + 10m buffer	> 1km from a public road	-		13	
Visual Impact	<ul style="list-style-type: none"> To protect scenic amenity values (rural and heritage settings) To protect visual amenity from prominent vantage points, as described in the Preliminary Landscape Values and Visual Impact assessment undertaken To protect riparian zones To minimise clearing 	Scenic Priority Score from Visual Impact Assessment > 39.5		Scenic Priority Score from Visual Impact Assessment 29 to 39.5	Scenic Priority Score from Visual Impact Assessment 20.5 to 29	Scenic Priority Score from Visual Impact Assessment 13 to 20.5	Scenic Priority Score from Visual Impact Assessment 3 to 13 9	
TOTAL							100	

6.3 Capability Assessment Results

This section provides an analysis of the results of the Land Capability Assessment and is informed by the following outputs:

- A separate map of each criteria showing relevant data across the WEIA
- Individual assessments of each criteria classifying the data according to the ratings in the capability assessment
- A combined capability assessment, bringing together the individual assessments and analysing the data using the relative weightings.

6.3.1 Interface with adjoining land uses

Figure 6-1 provides the baseline assessment of current zonings, land uses and overlays under the Territory Plan and National Capital Plan. The WEIA includes significant nature reserves within the Molonglo and Murrumbidgee River Reserves and in nature reserves such as McQuoid's Hill and Coleman Ridge. It is also understood that Block 402/403 Stromlo (currently zoned NUZ3-Hills Ridges and Buffers) has significant ecological value as a future nature reserve. The assessment 'excludes' nature reserves as inappropriate areas for future development and extends this exclusion to Block 402 and 403 (also identified as Blewitts Block).

Stromlo Forest Park is a significant community asset and has been identified as an area of restriction and as such 'Excluded' in the capability assessment, owing to the presence of community infrastructure and its ongoing value to the wider community. The intended future use of Stromlo Forest Park is reflected in the Stromlo Forest Master Plan. Future compatible uses such as short-term commercial accommodation or further community infrastructure could be considered on the site, to support tourism and community needs.

The analysis adopts a 'highly constrained' rating in the 2.4km buffer around the LMWQCC and the two buffers which are present in the National Capital Plan around the Mount Stromlo Observatory: the "Non-Development Buffer" and the 5km "Stromlo Observatory light limitation zone". It is understood that Icon Water are currently investigating the management and processing of biosolids at the LMWQCC. Investment in infrastructure at LMWQCC may result in changes to impacts, and a reduced buffer being more appropriate. For this reason, it was determined not to exclude development within the buffer around the LMWQCC. As master planning progresses, further consultation with the Observatory and Icon Water is recommended to understand how impacts can be mitigated within these buffers, through design responses such as orientation, lighting luminance or land use.

Designated Land and land zoned as NUZ3 – Hills, Ridges and Buffers under the Territory Plan was identified as 'highly constrained'. This is indicative of the potential challenges of development in these areas due to high visibility, and/or areas which may have been zoned to provide open spaces and undeveloped vistas from the urban areas of Canberra. Whilst development of these areas is not impossible, consideration of appropriate urban development, scale and landscaping would be required to ensure the key elements of the Walter Burley Griffin plan are respected. The suitability assessment takes a qualitative approach and looks into such matters in further detail.

As shown in Figure 6-2, the capability assessment shows that the most urban capable land is located directly west of existing development in Weston Creek and south-east of development in West Belconnen. A pocket of less constrained land is also noted north of Kambah Pool Road, with an area in the north-west of the WEIA, extending along Uriarra Road.

6.3.2 Slope and soils

Figure 6-3 provides the baseline assessment of the soils present across the site. This has been informed by the previous geotechnical assessment undertaken by AECOM (2020). The slope analysis has been developed using LiDAR data, to build a digital elevation model (DEM) and provide approximate slope gradients. Areas with steep or waterlogged terrain and rocky outcrops were rated as harder to develop in the analysis.

Figure 6-4 provides the capability assessment for this criteria. This indicates that the most urban capable land, based on this thematic layer only, is isolated in the southern portion of the site, directly west of existing development in the Molonglo Valley and Woden Valley and adjacent to Kambah.

6.3.3 Waterways and waterbodies

As shown in Figure 6-5 and Figure 6-6, the data used for the waterways and waterbodies criteria designates areas within the river corridor as an area of restriction that has been excluded and areas within the stormwater management buffer (suggested in the Alluvium Report discussed in Section 4.1) as very highly constrained. The remainder of the site is shown as 'somewhat constrained', but potentially acceptable for future development. It is noted that many of these areas are also within nature reserves, so were also excluded in the land use assessment.

Given the number of existing waterways within the WEIA, and the proximity to ecologically sensitive habitats in the Murrumbidgee and Molonglo River systems, any form of future development will need to be water cycle sensitive. This could be managed through WSUD and at-source treatment systems, ensuring post development flow does not increase discharge volumes to receiving waterways, appropriately managing water quality in the urbanised catchments and ensuring ecologically important ephemeral waterways are retained as habitat areas, by basing urban development around naturally occurring waterways. Redevelopment of

the area also presents opportunities for improving the quality of receiving waterways by reducing erosion within the catchment and providing at-source treatment of runoff from urbanised areas.

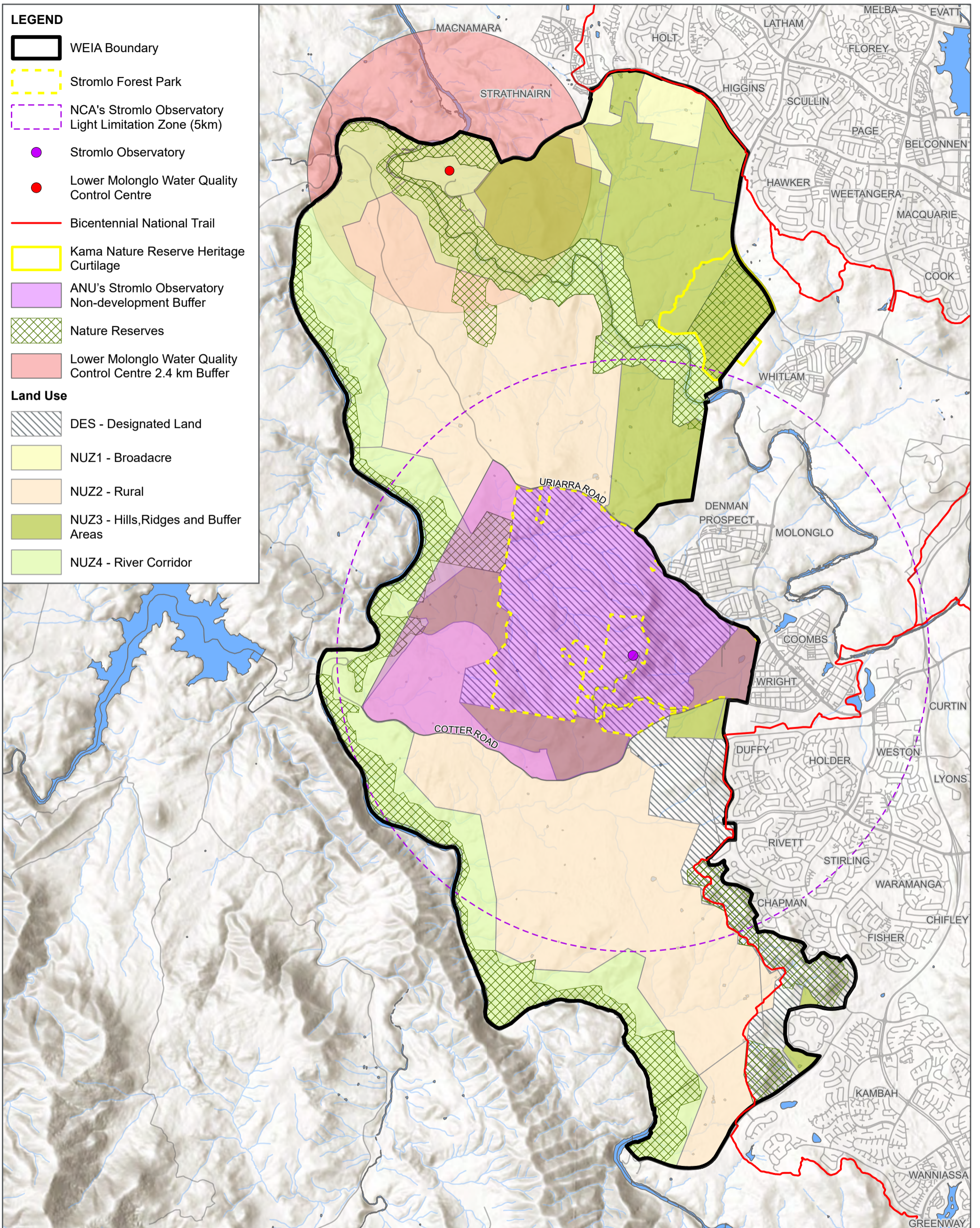
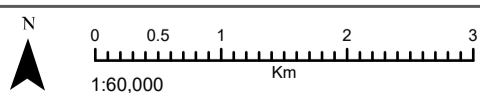


FIG NO. 6-1

FIGURE TITLE Interface With Adjoining Land Use Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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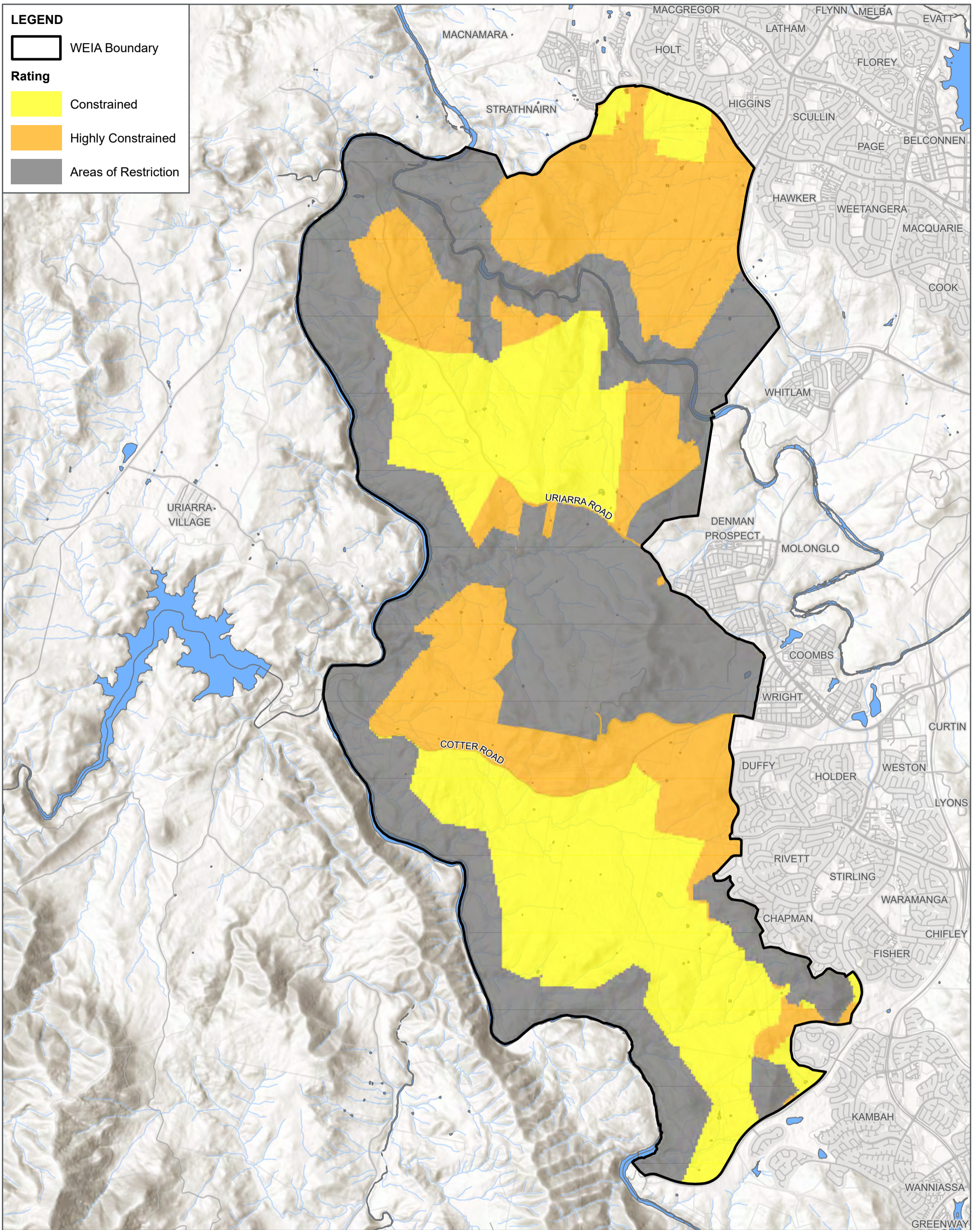
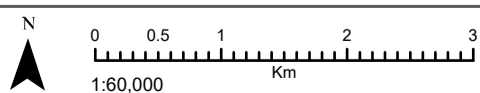


FIG NO. 6-2

FIGURE TITLE Interface With Adjoining Land Uses Capability Assessment

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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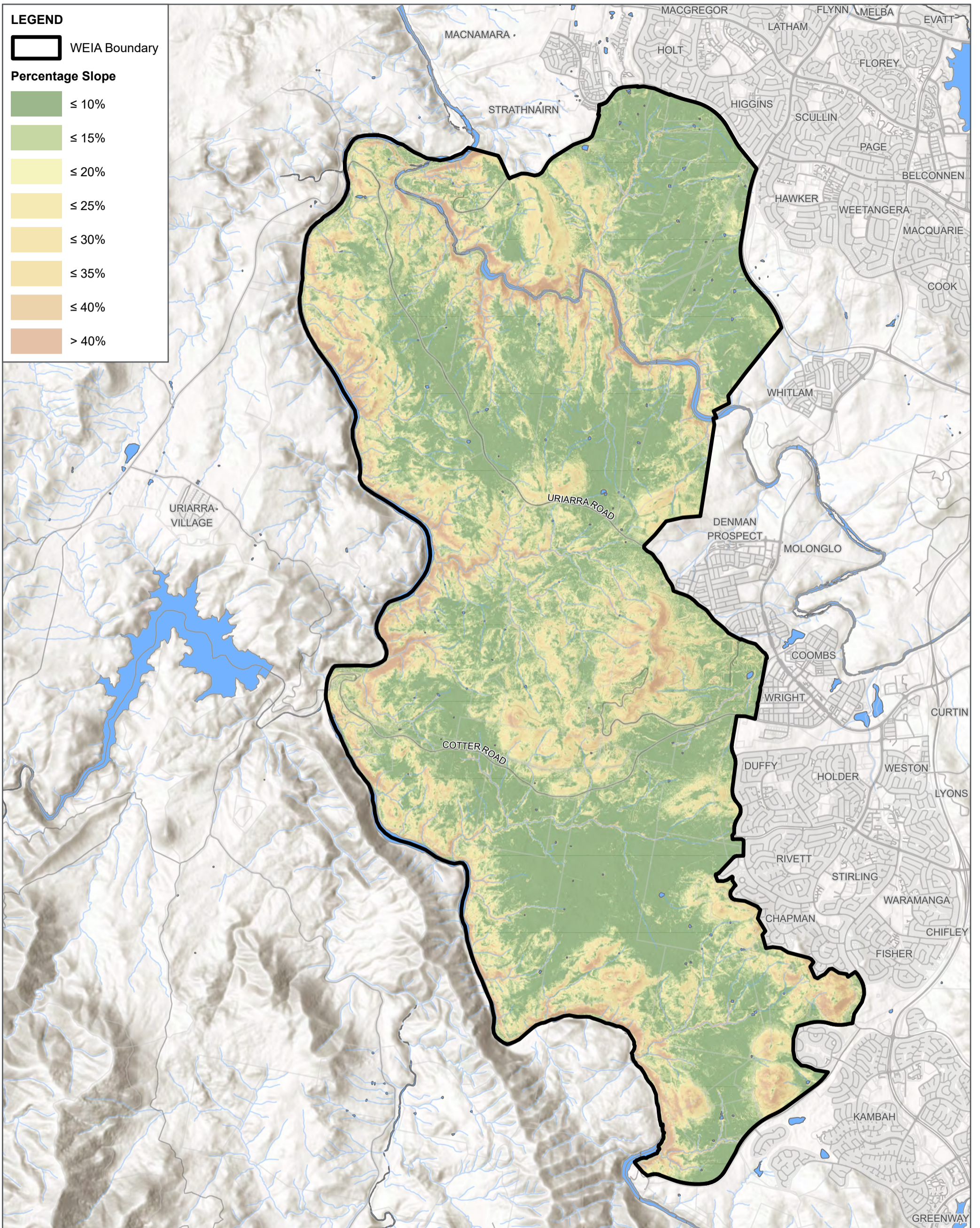
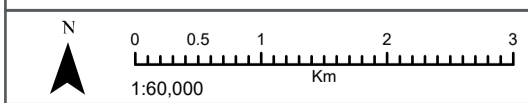


FIG NO. 6-3 **FIGURE TITLE** Slope Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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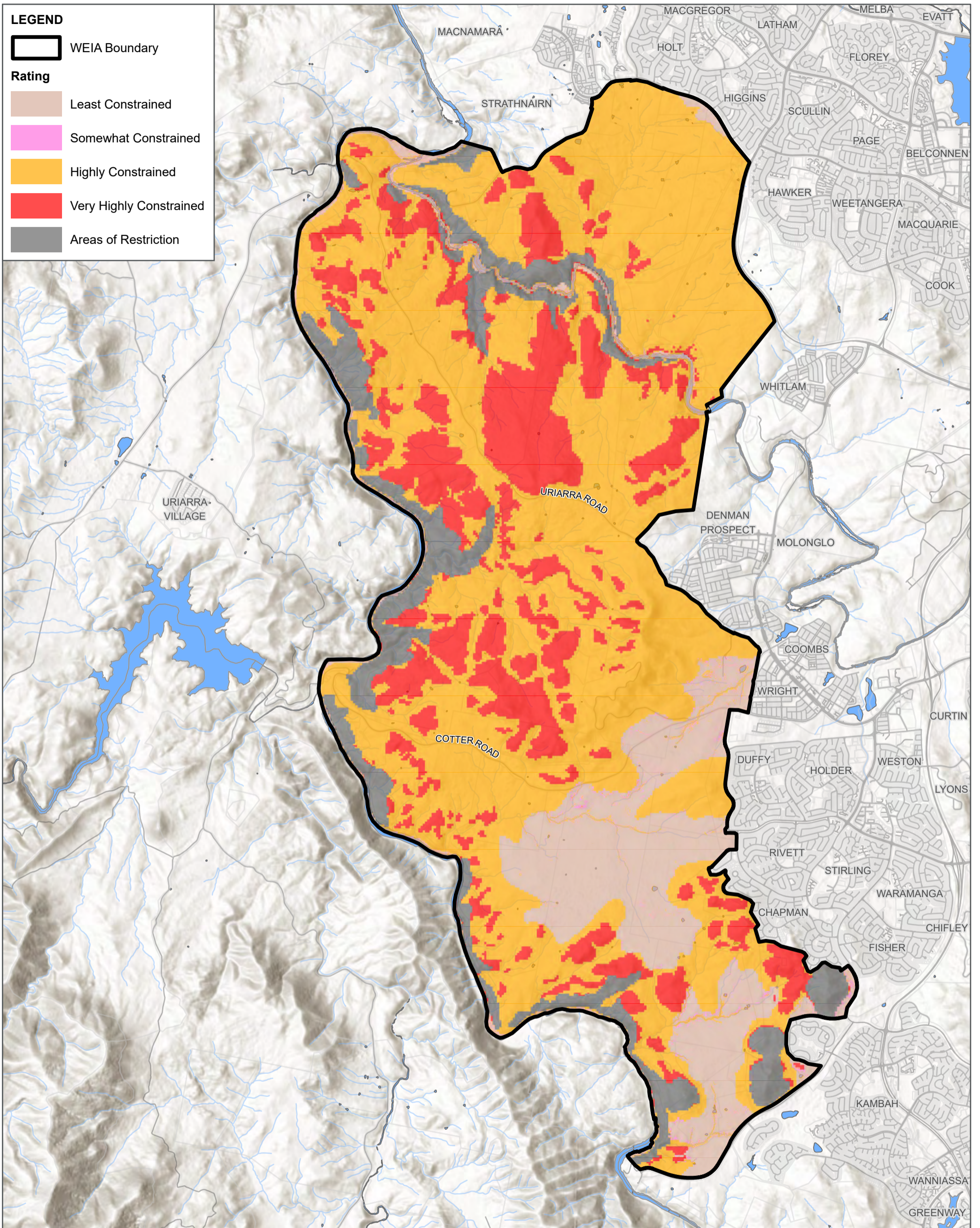
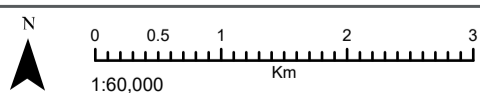


FIG NO. 6-4

FIGURE TITLE Slope and Soils Capability Assessment

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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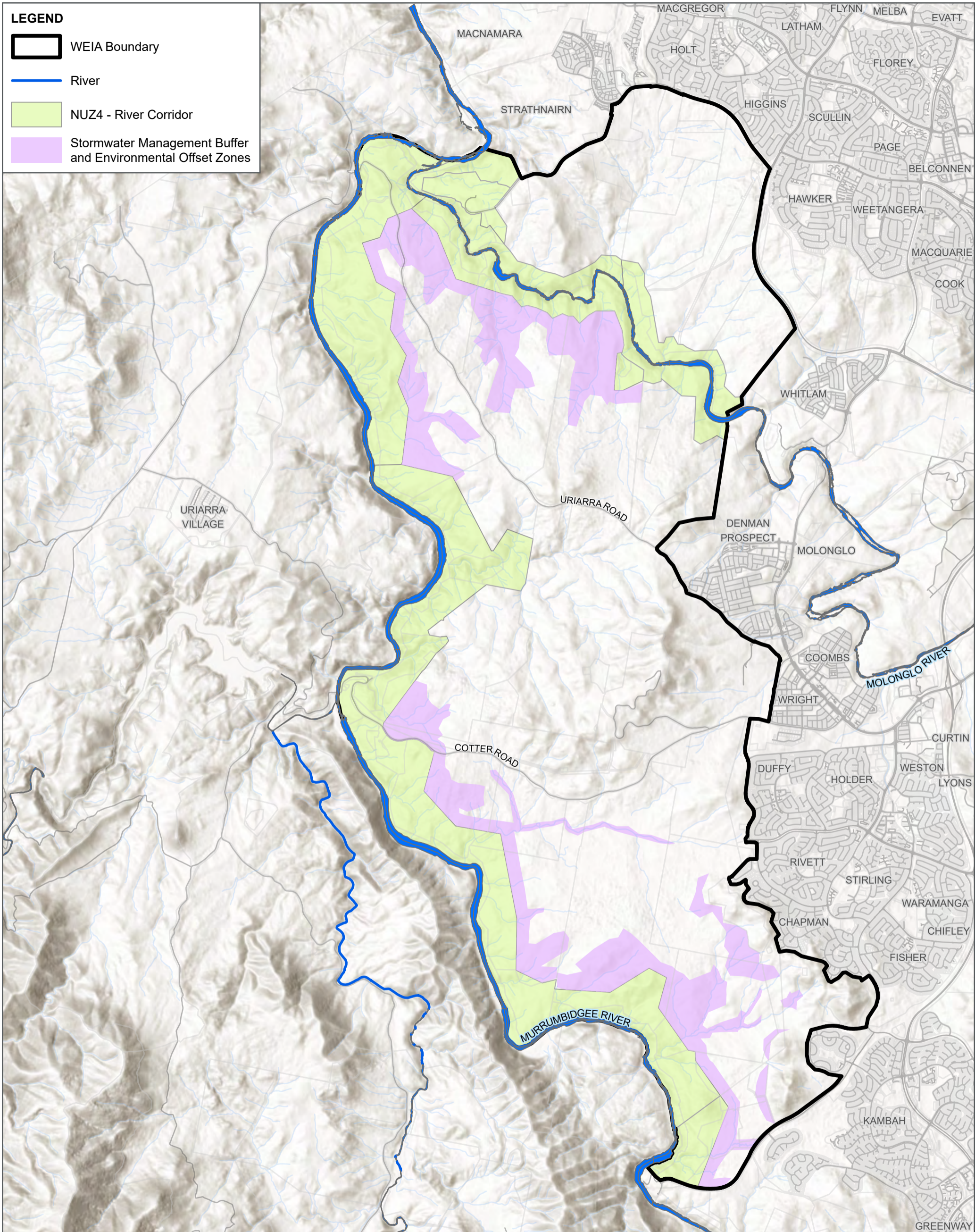
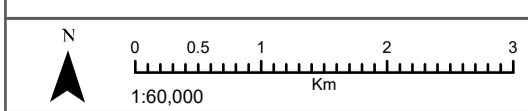


FIG NO. 6-5 **FIGURE TITLE** Waterways and Waterbodies Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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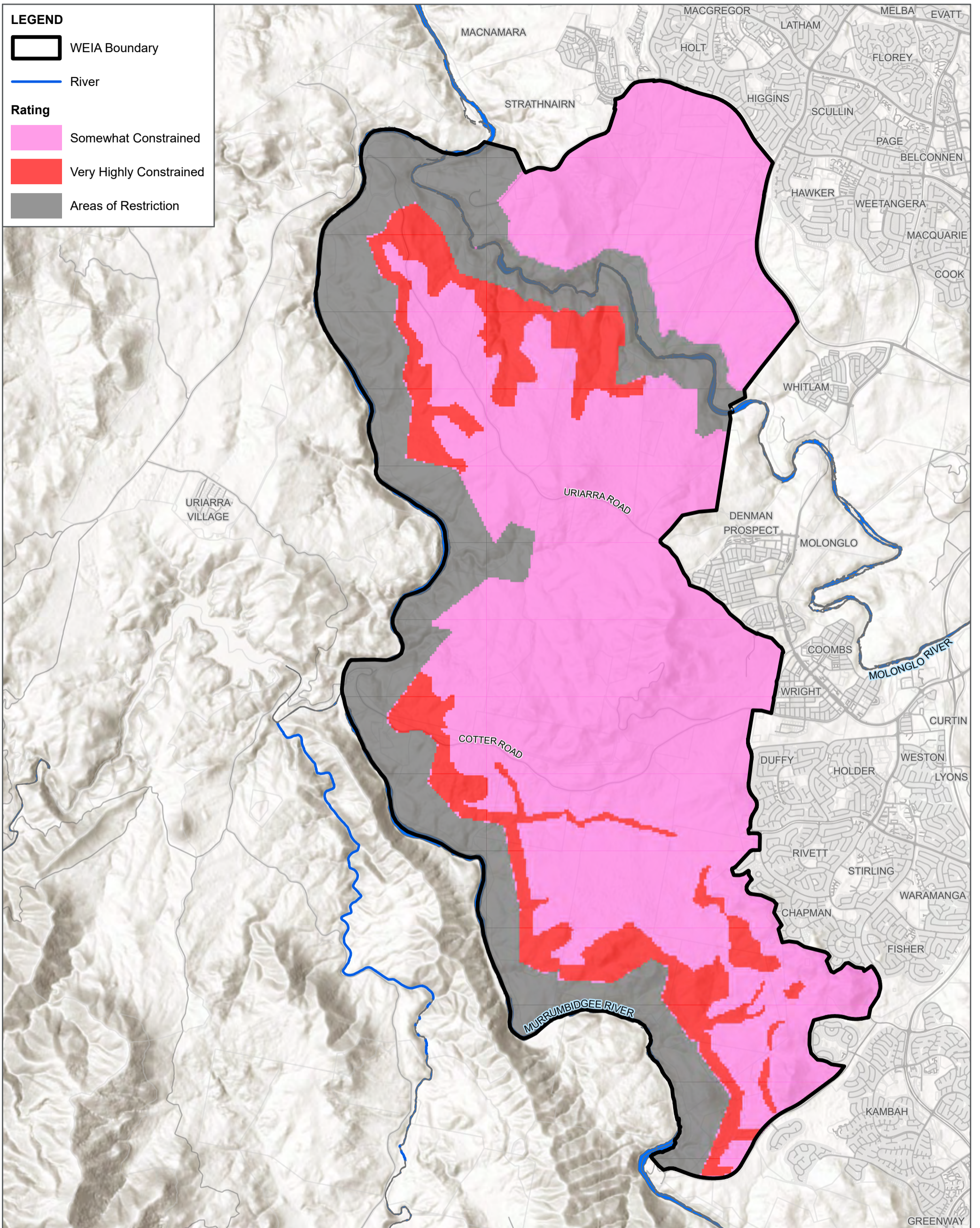


FIG NO. 6-6 **FIGURE TITLE** Waterways and Waterbodies Capability Assessment

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment

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6.3.4 Vegetation and habitat

Maintaining biodiversity connectivity for all native flora and fauna communities, not just those classified as vulnerable, threatened and endangered under the NC Act and EPBC Act, was a key driver for considering land use capability and suitability across the WEIA. This is particularly important considering the long-term planning horizon of the project, and the changing listing of species over time. Detailed field assessments for ecological values have not yet been undertaken for the WEIA, hence land use capability assessments cannot accurately reflect ecological constraints, including the need to avoid impacts on EPBC listed species and communities or native species and habitats more broadly, at this stage.

The baseline assessment in Figure 6-7 shows a layered assessment of the previous studies and surveys undertaken by Capital Ecology in 2020. The data also includes the ACT Government connectivity layers, which comprise the 'local links – functional canopy connection' and 'regional links' with a focus on woodland fauna, particularly birds. Connectivity modelling which includes grassland and aquatic-riparian habitats, and a broader suite of woodland species, is currently being developed by EPSDD and has not been considered in this study. The intent of including this data is to provide consideration of key habitat corridors through the site and understand how existing nature reserves are linked. The raw data shows potential regional links of moderate value between McQuoid's Hill Nature Reserve and the Murrumbidgee River. There is also a clustering along Stoney Creek and adjacent to the Kama Nature Reserve.

To avoid skewing the assessment based on current threatened species listings, SMEC developed a heat map for the capability assessment based on the clustering of identified sensitive species. The 'heat mapping' approach was considered appropriate to ensure that the current listing of specific species did not dominate the assessment results; recognising that species currently listed under the EPBC Act or NC Act may change over the course of the potential development horizon being considered for the WEIA. The results of the assessment are shown in Figure 6-8. This assumes that where the mapping confirms multiple habitats or recordings of identified listed species, a range of other biodiversity values are likely to be present.

Maintaining habitat connectivity and biodiversity will require a degree of qualitative consideration, which will be discussed further in the suitability assessment and will need to be supported by additional targeted ecological surveys. There may be options to improve ecological values across the site and additional opportunities to preserve land as nature reserves, to provide a mechanism for offsetting urban development in other areas. By understanding areas of ecologically sensitivity upfront in the capability assessment, there is an opportunity to take a conservation-led approach to development.

It is important to note that the high level nature of this assessment is not intended to provide a detailed analysis of ecological impact or to meet the buffer and offset areas for specific species that may be prescribed in management plans. More detailed studies would be required to determine feasibility of development options and structure planning in the future.

6.3.5 Bushfire Risk

The bushfire capability assessment adopts the bushfire risk categories from the Preliminary Assessment undertaken by Ecological (2020) and discussed in Section 4.1. The risk categories were developed based on slope and vegetation type, and are shown in Figure 6-9. It is important to differentiate that this does not consider bushfire hazard, threat to life or property, or the potential to safely evacuate. These matters will be considered qualitatively in the suitability assessment, alongside climate change and resilience given the potential impact on extended and harsher bushfire seasons. Such matters are often design-driven and would need to be considered during structure planning and preparation of estate development plans in the future.

Based on the assessment criteria adopted, and looking at this criteria in isolation, much of the site is classified as being capable of future development. This is shown in Figure 6-10. Areas that are shown as constrained (yellow) are located within the stormwater management buffers, so are undevelopable for other reasons. The interactions between the criteria and the layers will be demonstrated in the consolidated assessment, using the relative weightings adopted.

Given the increased frequency and severity of bushfires that is expected due to climate change, it was important to consider planning and development controls, building typologies, appropriate asset protection zones and hazard management, as well as environmental values, connectivity corridors and environmental offset and avoidance areas in the suitability assessment and scenario testing. Ensuring developable parcels are provided with good connectivity to the existing road network to meet the requirements of ACT Emergency Services in terms of evacuation and access will also be a critical consideration.

LEGEND	
WEIA Boundary	Thin-Clubbed Mantis Orchid
Vegetation	Water Plantain
Swainsona Serecia	White Box
Dianella Longifolia	Fauna
Bossiaea Grayi	Yellow-footed Antechinus
A Greenhood	Antechinus Approximate Location
A Mistletoe	Agile Antechinus
Annual Bitter Cress	Superb Parrot Nest Tree
Austral Mudwort	Coconut Ant
Austral Toadflax	Golden Sun Moth
Bearded Orchid	Little Eagle
Behr's Swainson-Pea	Perunga Grasshopper
Bertya	Pink-tailed Worm-lizard
Blanket Fern	Rosenberg's Monitor
Button Wrinklewort	Small Ant-blue Butterfly
Common Brookweed	Small Ant-blue Butterfly Approximate Location
Common Spleenwort	Striated Sun Moth
Corrugated Sida	Potential Small Ant-Blue Holltopping Site
Corrugated Sida, Variable Sida	Little Eagle Nests
Dwarf Milkwort	Uncommon, Protected and Threatened Vegetation
Grey Grass Tree	Cypress Pine
Grey Grass-Tree	NC Act Box Gum Woodlands
Gristle Fern	EPBC Act Box Gum Woodland
Hill Raspwort	Natural Temperate Grassland
Hoary Sunray	Threatened Plants
Late Mauve Doubletail	Protected Plants Rare and Uncommon
Leafy Flat Sedge	Protected Plants Rare
Little Dumpies	Aquatic Threatened Habitat
Loose-Flower Bush-Pea	Fauna Threatened Habitat
Medusa Bog-Sedge	Golden Sun Moth
Mountain Cress	Key's Matchstick Grasshopper
Mountain Swamp Gum	Perunga Grasshopper
Mudwort	Pink-tailed Worm-lizard
Murrumbidgee Bossiaea	Rosenberg's Monitor
Narrow Wing Daisy	Glossy Black Cockatoo Habitat
Needle-Point Rustyhood	Superb Parrot Breeding Habitat
Northern Water-Ribbons	Superb Parrot Habitat
Notched Swainson-Pea	Potential Little Eagle Breeding Habitat
Pale Flax Lily	Local Links - Functional Canopy Connection
Pale Flax Lily, Blue Flax Lily	Low
Pale Pomaderris	Moderate
Purple Diuris	High
Red Crumbweed	Very High
Red Water-Milfoil	Best Possible Regional Links - may require some restoration
Rough Maidenhair Fern	Low value
Rough Tree Fern	Moderate value
Rufous Midge Orchid	High value
Silky Swainson-Pea	Very high value
Small Crowea	
Small Knotweed	
Small Purple Pea	
Stiff Woodruff	
Swamp Millet	

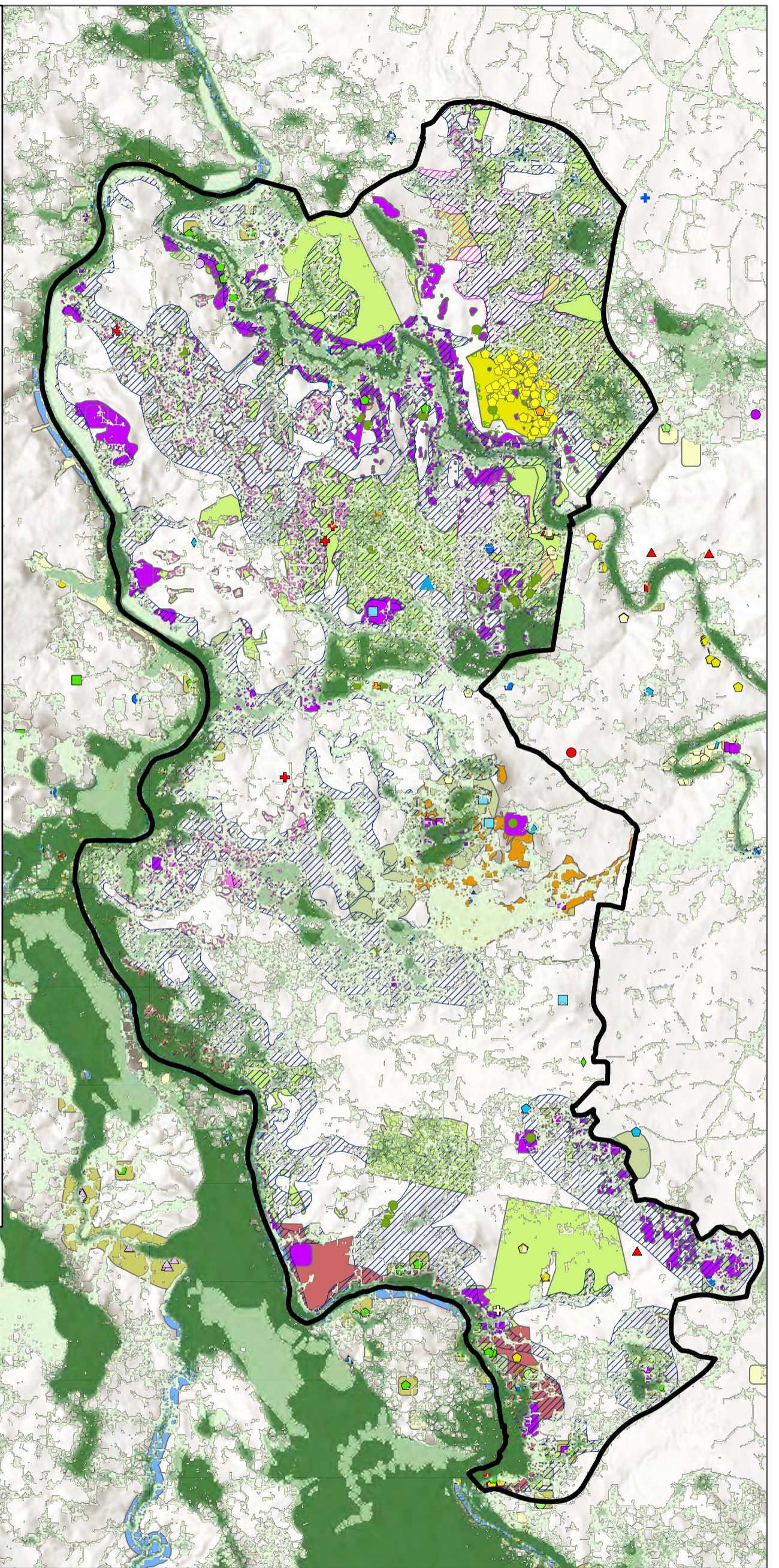
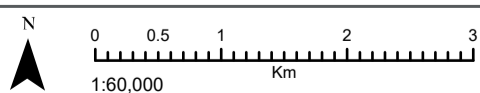


FIG NO. 6-7

FIGURE TITLE Vegetation and Habitat Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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SOURCES Base Layers and Fauna and Flora Data: www.ACTmapi.act.gov.au
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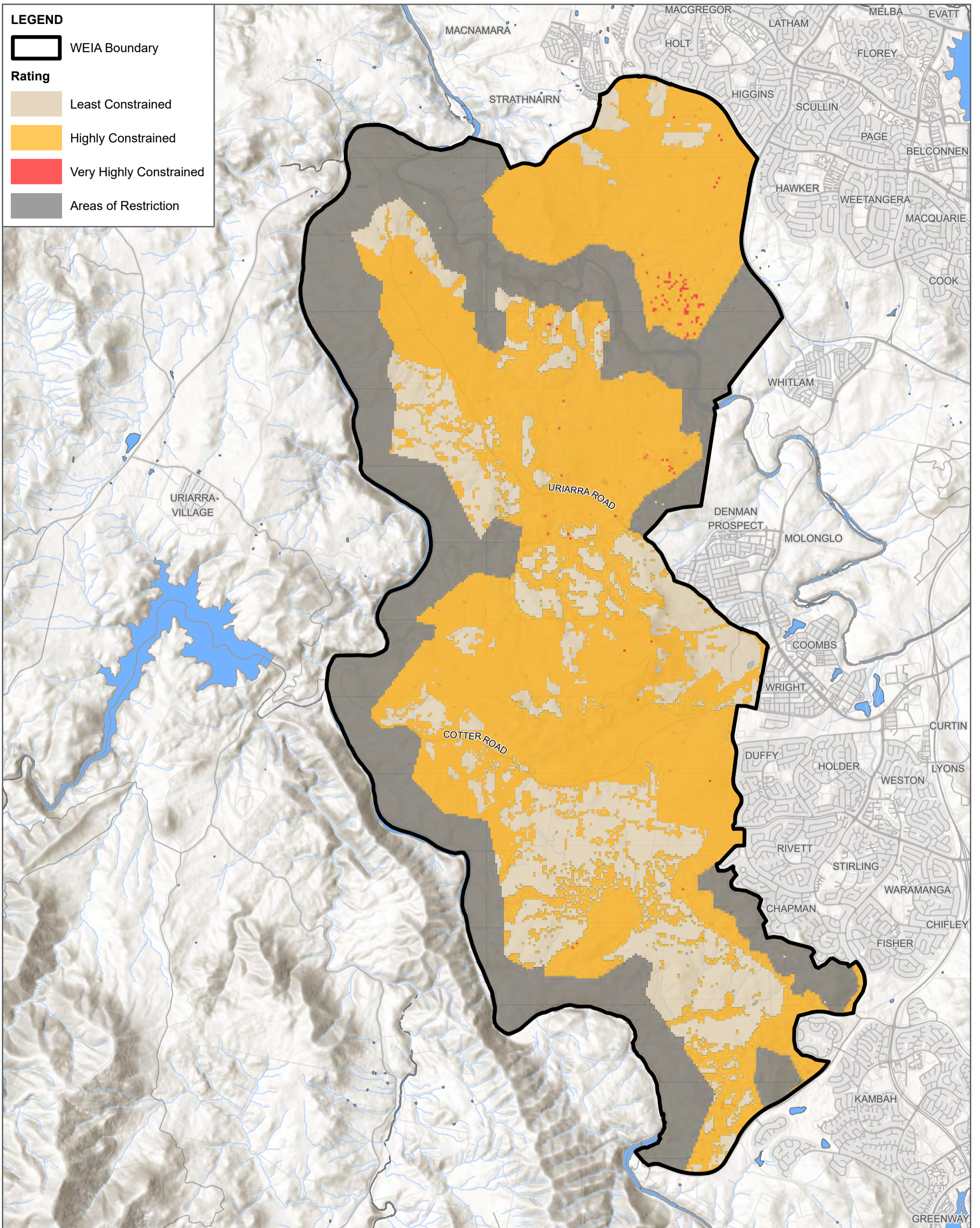
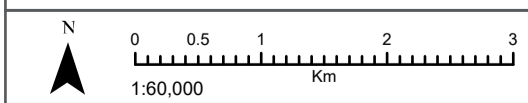


FIG NO. 6-8 **FIGURE TITLE** Vegetation and Habitat Capability Assessment

PROJECT TITLE Western Edge Investigation Area - Capability and Suitability Assessment



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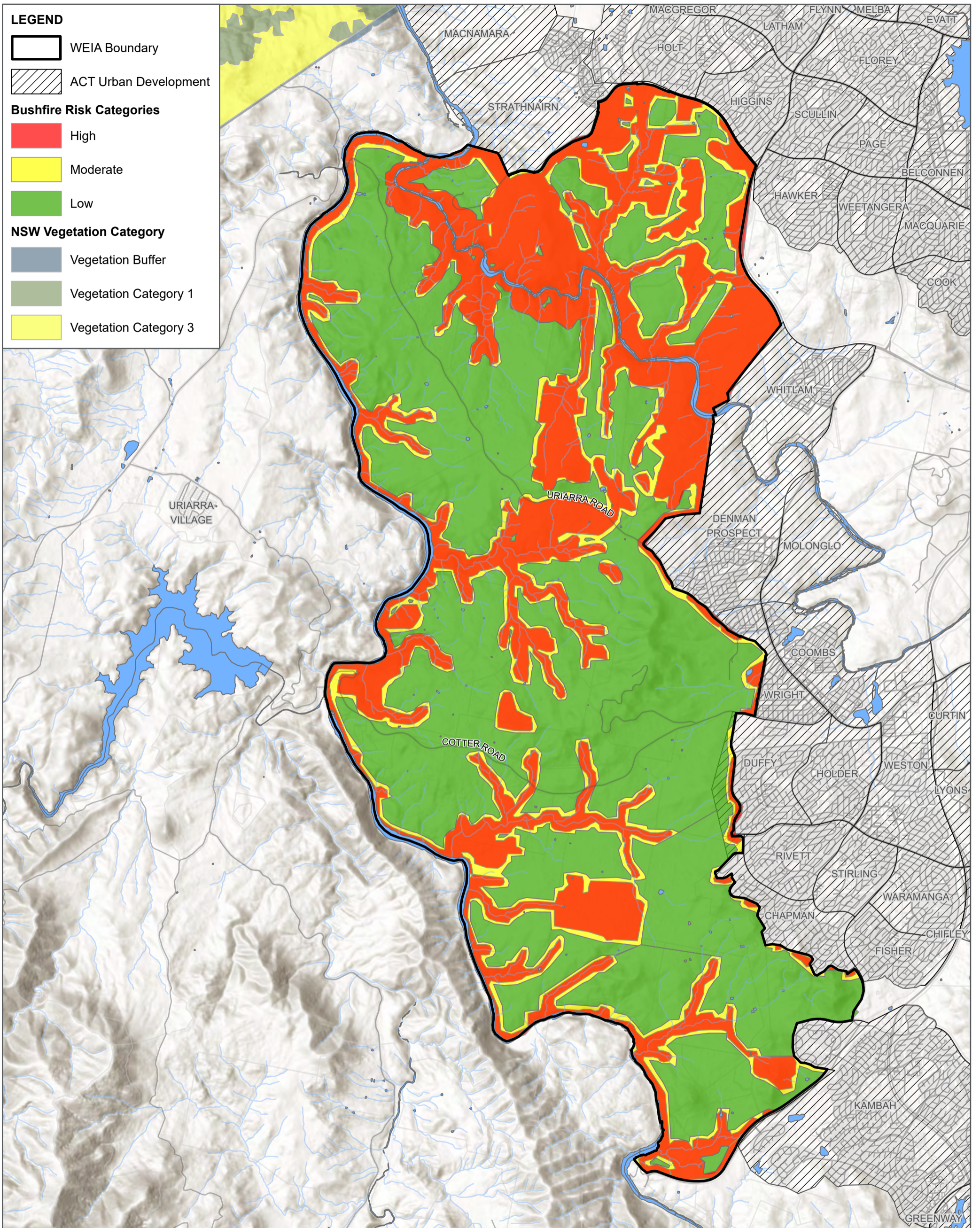
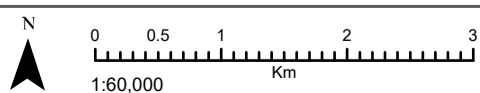


FIG NO. 6-9

FIGURE TITLE Bushfire Hazard Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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SOURCES Western Edge Investigation Area Preliminary Bushfire Risk Assessment, Eco Logical Australia 2020
Base Layers and Territory Plan: www.ACTmap. act. gov. au © Australian Capital Territory.
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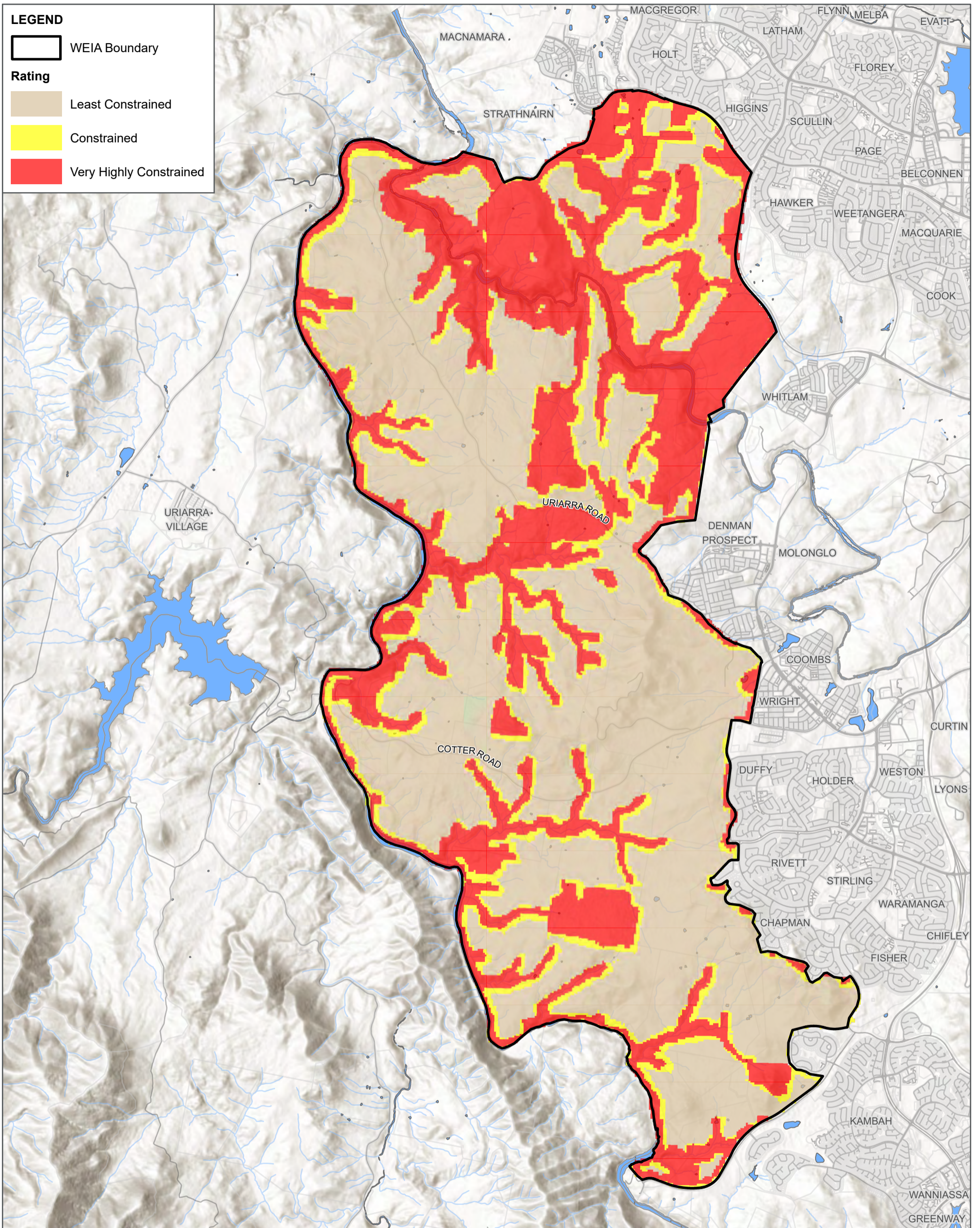
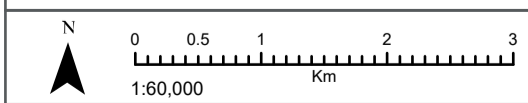


FIG NO. 6-10 **FIGURE TITLE** Bushfire Hazard Capability Assessment

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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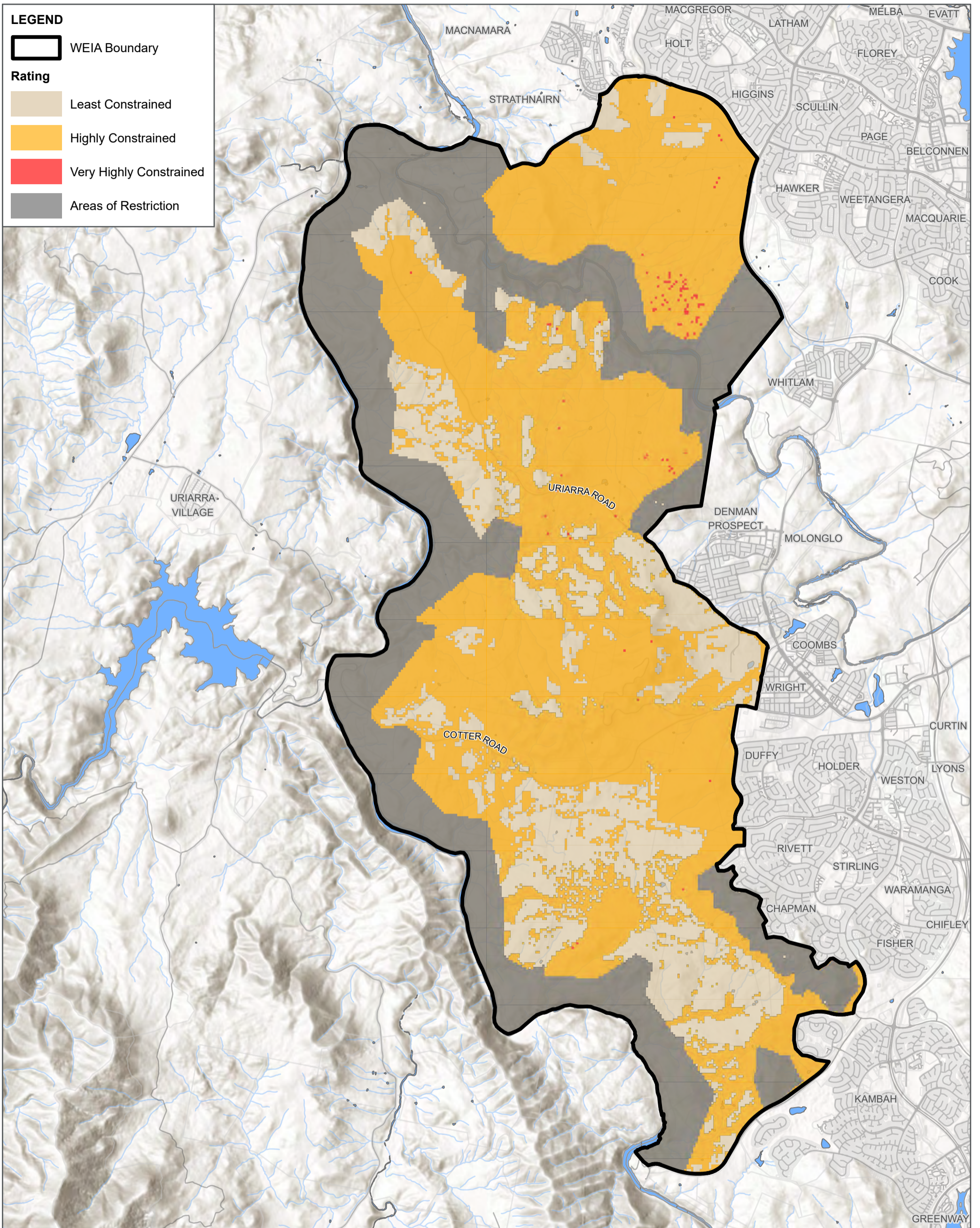
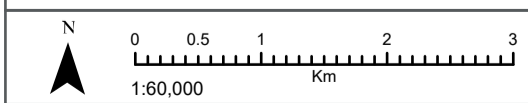


FIG NO. 6-8 **FIGURE TITLE** Vegetation and Habitat Capability Assessment

PROJECT TITLE Western Edge Investigation Area - Capability and Suitability Assessment



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6.3.6 Road access and infrastructure

The road access and infrastructure criteria is based on existing infrastructure assets for large trunk infrastructure. Key infrastructure includes the 330KV transmission line which is part of the National Grid managed by Transgrid and runs north-south through the WEIA, the MVIS which services the southern portion of Canberra and discharges to the LMWQCC and the bulk water supply infrastructure linking Canberra's potable water supply to the Cotter Dam and Mount Stromlo water treatment facility.

The baseline analysis in Figure 6-11 shows four roughly east-west alignments and a north-south electricity corridor. There are existing gas connections into the LMWQCC and the Mount Stromlo Observatory which will need to be protected in the northern part of the site.

The capability assessment in Figure 6-12 indicates that much of the site is very highly constrained, owing primarily to the lack of existing services within close proximity. Land along the eastern side of the WEIA, at the interface with existing suburban areas, is shown as 'highly constrained' where existing service reticulation could potentially be augmented and extended. Areas of restriction that are excluded (grey) areas are owing to the presence of significant infrastructure that would be costly to relocate, including water treatment facilities and bulk mains.

Siting of appropriate land uses and buffers to existing infrastructure are considered in the suitability assessment, where urban capable land is grouped together, and a qualitative assessment can take place regarding proximity to key utility assets and analysis of ease of connectivity to the existing road network. The work in this space is restricted as further feasibility assessments would be needed in the future to confirm capacity of existing infrastructure to accommodate increased demand from development in the WEIA.

6.3.7 Visual impact

By adopting the 'Scenic Priority Scores' from the visual impact assessment undertaken by VPA, SMEC prepared a capability assessment for the visual impact criteria. In isolation, this criteria shows that the most urban capable areas are present in the low lying land along the river corridor (Figure 6-13). This demonstrates the importance of the cumulative assessment of all criteria, as many of the areas that are preferred from a visual impact perspective, may have other physical, environmental and geotechnical constraints.

The capability assessment for this criteria in Figure 6-14 shows areas within Central Molonglo appear as the highest constrained, and generally occur within NUZ3 Hills Ridges and Buffers zoning or on Designated Land, in addition to an area of restriction identified as excluded land, which is highly visible and is located on the eastern side of the Mount Stromlo Observatory.

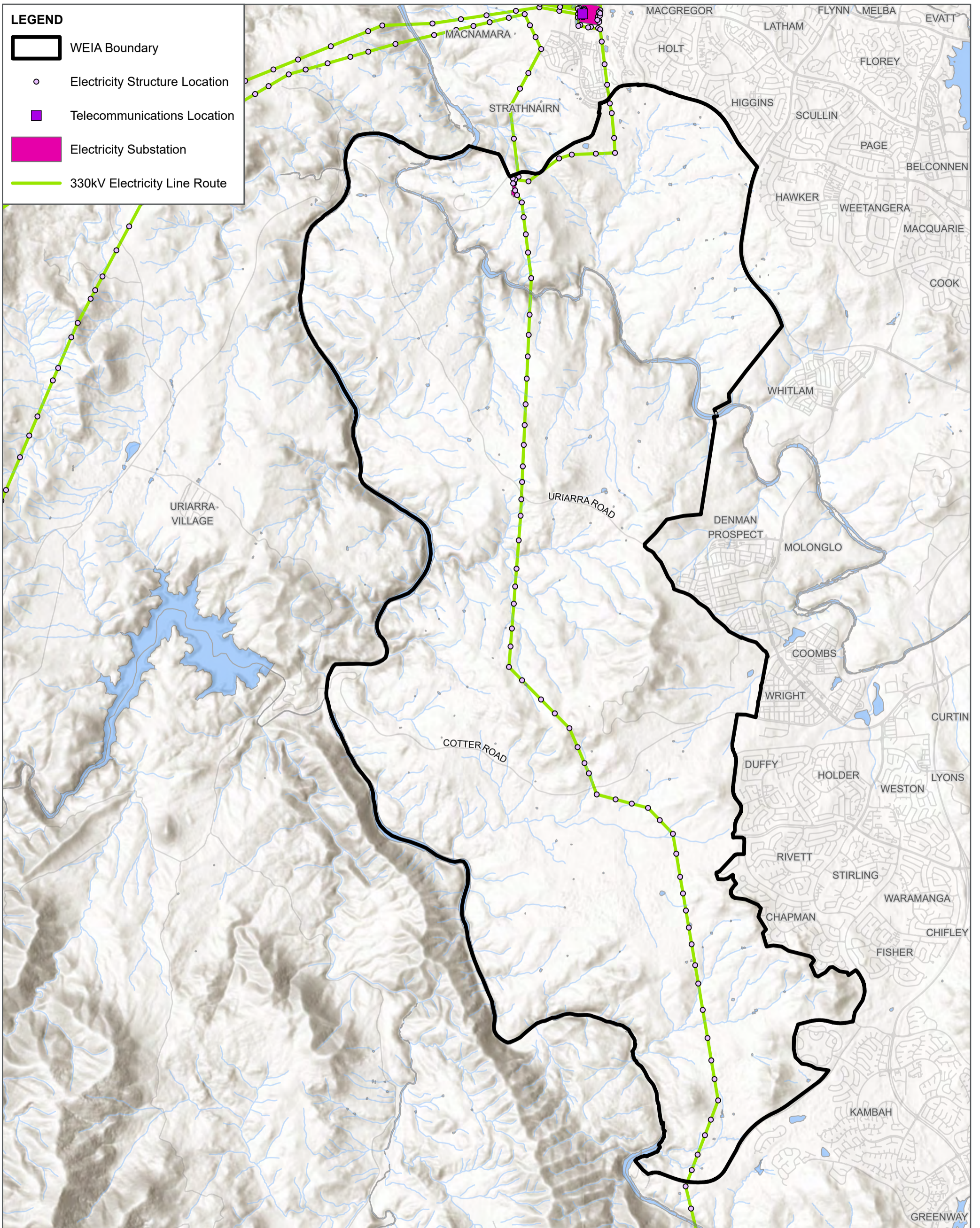
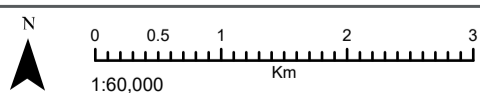


FIG NO. 6-11

FIGURE TITLE Transgrid Infrastructure Constraint Overview

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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SOURCES Transgrid, Base Layers: www.ACTmapi.act.gov.au © Australian Capital Territory.
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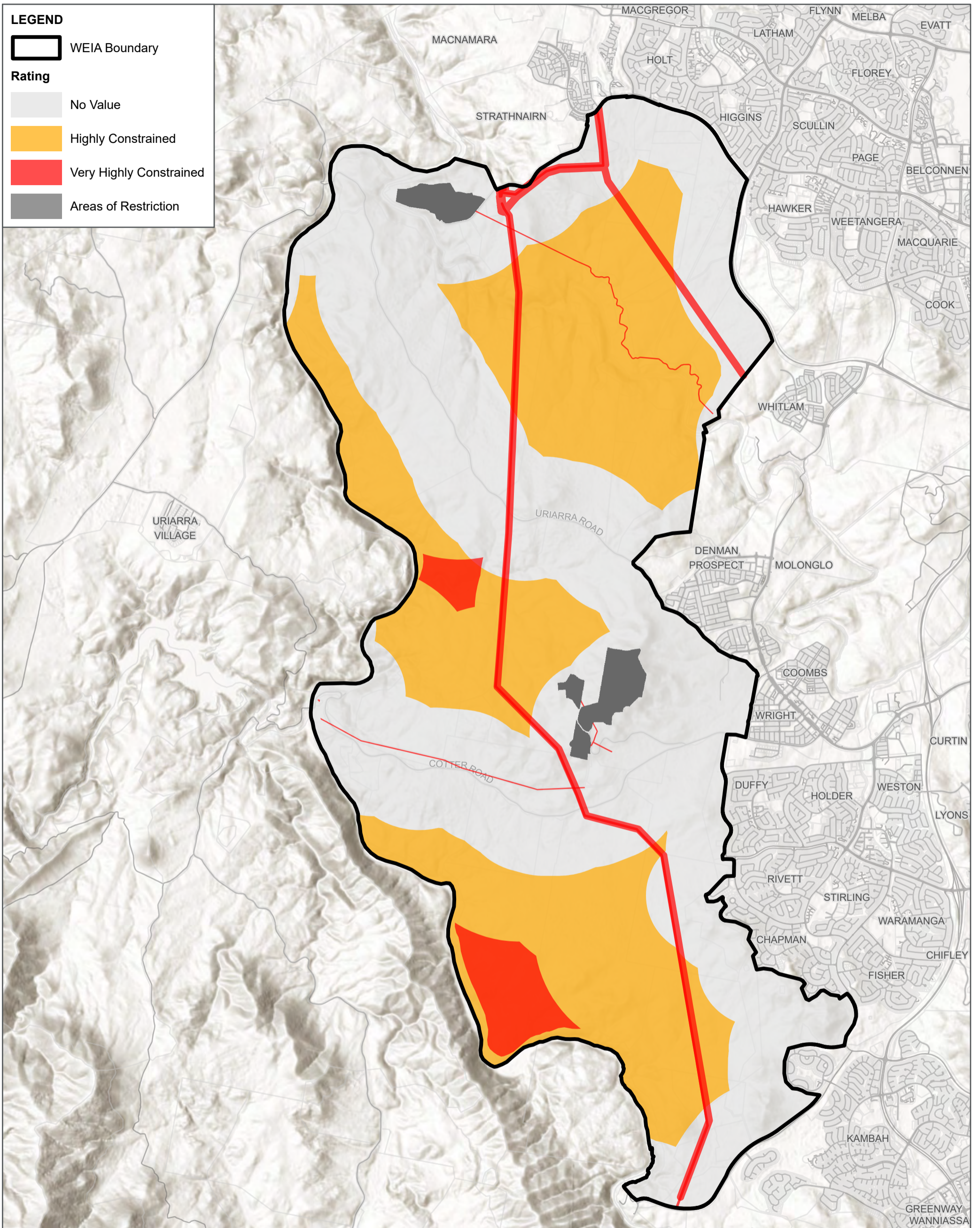
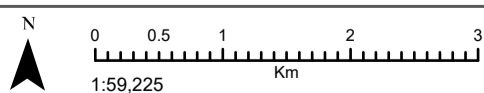


FIG NO. 6-12

FIGURE TITLE Road Access and Infrastructure Capability Assessment

PROJECT TITLE Western Edge Investigation Area – Capability and Suitability Assessment



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