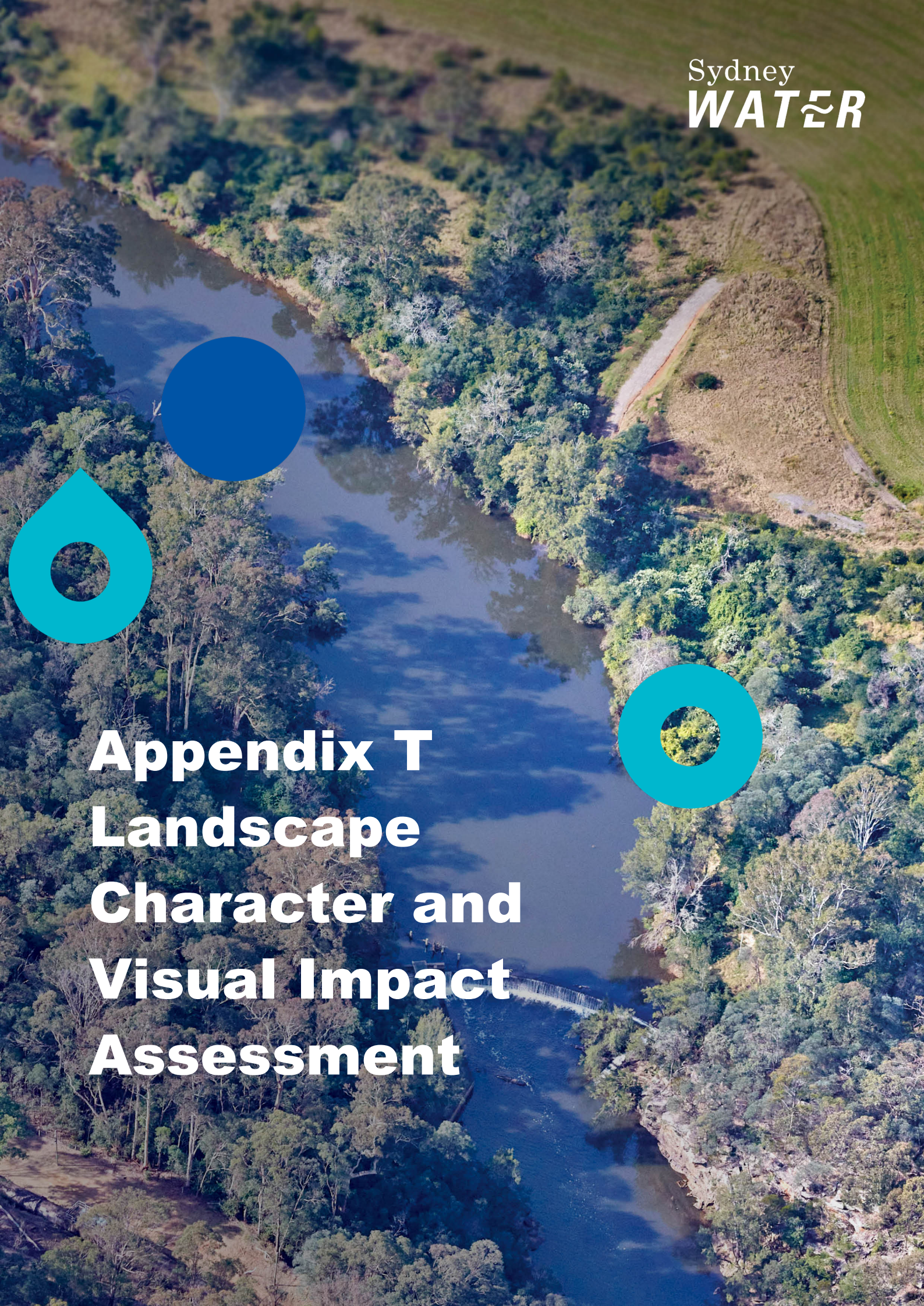

Sydney WATER

# Appendix T Landscape Character and Visual Impact Assessment

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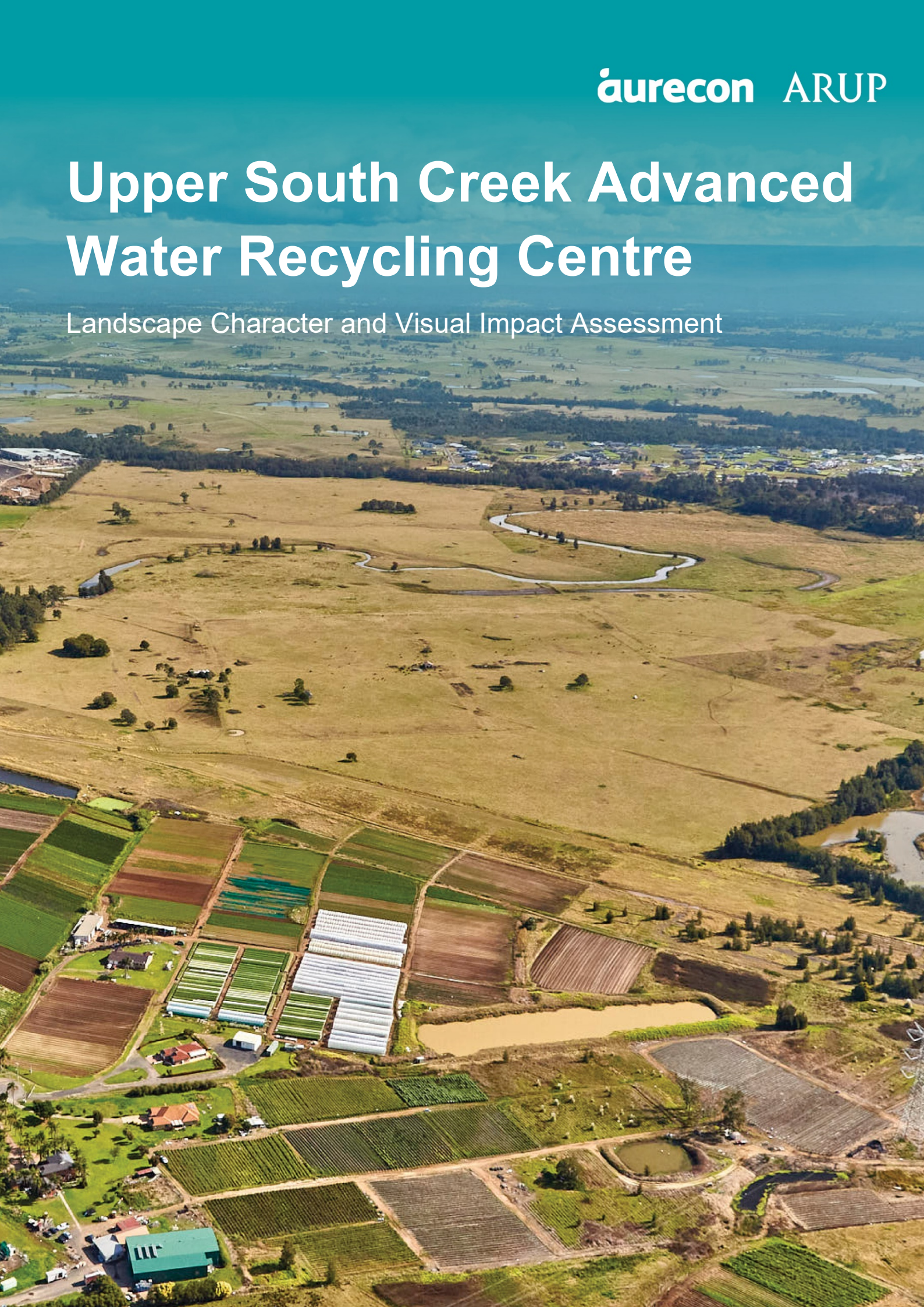
# Upper South Creek Advanced Water Recycling Centre

## Landscape Character and Visual Impact Assessment



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| **Job title** | Upper South Creek Water Advanced Recycling Centre | **Job number** 20036007 |
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| **Revision** | **Date** | **Description** | Landscape Character and Visual Impact Assessment | | |
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| 1 | 5/06/20 | | **Prepared by** | **Checked by** | **Approved by** |
| | | **Name** | Jack Rixon | Vivienne Albin | Carolyn McCallig |
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| | | **Name** | Natarsha Lamb | Heath Gledhill | Carolyn McCallig |
| | | **Signature** |  |  |  |
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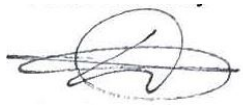
| | | **Signature** |  |  |  |
| 4 | 21/06/21 | **Filename** | Upper South Creek AWRC_LCVIA_FINAL.NL.docx | | |
| | | **Name** | Natarsha Lamb | Heath Gledhill | Carolyn McCallig |
| | | **Signature** |  |  |  |

**Issue Document Verification with Document** ✓

# Contents

## Tables

# Glossary and Abbreviations

| Term | Description |
|---|---|
| **AWRC** | Advanced Water Recycling Centre |
| **BMNP** | Blue Mountains National Park |
| **EIS** | Environmental impact Statement |
| **ESO** | Environmental Significance Overlay |
| **Foreground** | The area that immediately surrounds the Project up to a distance of 0.5 kilometres. |
| **HO** | Heritage Overlay |
| **Km** | kilometre |
| **LCVIA** | Landscape Character and Visual Impact Assessment: an assessment of the impacts of Project key elements on landscape and visual values. |
| **Landscape** | Its constituent elements, its character and the way this varies spatially, its geographic extent, its condition, the way the landscape is experienced, and the value attached to it. |
| **LCZ** | Landscape Character Zones |
| **LPPF** | Local planning policy framework: Local planning policies are tools used to implement the objectives and strategies of the Municipal Strategic Statement. |
| **m** | metre |
| **Magnitude** | The measurement of the scale, form and character of a development project when compared to the existing condition. This also relates to how far the project is from the viewer. Combined with sensitivity, magnitude provides a measurement of impact. |
| **SEARs** | Secretary's Environmental Assessment Requirements |
| **Study Area** | The area designated relevant for assessment of the Project - including a three kilometre radius around the Project site and a 50 m Study Area along the pipeline corridor. |
| **TfNSW** | Transport for New South Wales |
| **the Project** | The Upper South Creek Advanced Water Recycling Centre and the associated pipelines. |
| **The Site** | Proposed location for the Project |
| **Viewpoint** | Moderate or high sensitivity location from which views to the construction process or components of the project may be possible. |
| **Viewshed** | The area visible from a particular viewing location. |
| **Visual amenity** | The qualities of a landscape setting that are appreciated and valued by a viewer. |

| Term | Description |
|---|---|
| **Visual catchment** | The area over which an object can be seen within the landscape based on the line of sight. |
| **Visual impact** | The result of assessing the sensitivity level of a viewer and the modification level of a development. |
| **Visual sensitivity** | The degree to which various user groups would respond to change based on their expectation of a particular experience in a given setting for example the expectation of a high level of visual amenity in a national park. |
| **WSA** | Western Sydney Aerotropolis |
| **WSAP** | Western Sydney Aerotropolis Plan |

# 1 Introduction

The purpose of this report is to present findings of the Landscape Character and Visual Impact Assessment (LCVIA) associated with the Upper South Creek Advanced Water Recycling Centre (the Project) and associated pipelines. The assessment includes the Project during construction and operation, as well as considering further development to increase the Projects capacity at a future stage and cumulative effects.

## 1.1 Project overview

Sydney Water is planning to build and operate new wastewater infrastructure to service the South West and Western Sydney Aerotropolis (WSA) Growth Areas. The proposed development will include a wastewater treatment plant in Western Sydney, known as the *'Upper South Creek Advanced Water Recycling Centre'*. Together, this Water Recycling Centre and the associated treated water and Brine Pipelines, will be known as the 'Project'. An overview of the location of the proposed infrastructure is provided in Figure 1.1. Project Overview. Further details of the Project are provided in chapter 5.

### 1.1.1 Advanced Water Recycling Centre (AWRC)

- a wastewater treatment plant with the capacity to treat up to 50 ML of wastewater per day, with ultimate capacity of up to 100ML per day
- the AWRC will produce:
- high-quality treated water suitable for a range of uses including recycling and environmental flows
- renewable energy, including through the capturing of heat for cogeneration
- biosolids suitable for beneficial reuse
- brine, as a by-product of reverse osmosis treatment

### 1.1.2 Treated water pipelines

- A pipeline about 17 km long from the AWRC to the Nepean River at Wallacia Weir, for the release of treated water
- Infrastructure from the AWRC to South Creek to release excess treated water and wet weather flows
- A pipeline about 5 km long from the main treated water pipeline at Wallacia to a location between the Warragamba Dam and Warragamba Weir, to release high-quality treated water to the Warragamba River as environmental flows.

### 1.1.3 Brine Pipeline

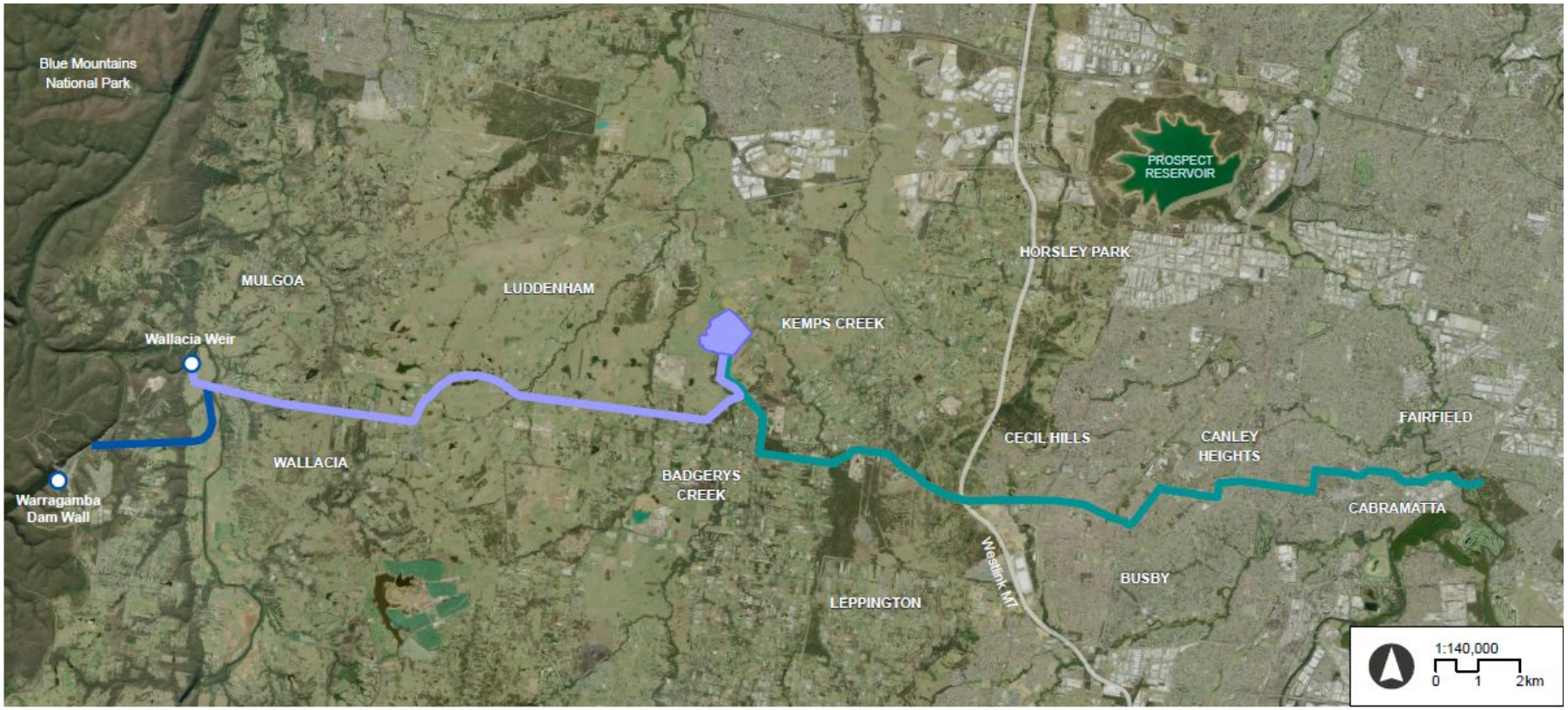
- A pipeline about 24 km long that transfers brine from the AWRC to Lansdowne, in south-west Sydney, where it connects to Sydney Water's existing Malabar wastewater network

Sydney Water is planning to deliver the Project in stages, with Stage 1 comprising:

- Building and operating the AWRC to treat an average dry weather flow of up to 50ML per day

- Building all pipelines to their ultimate capacity, but only operating them to transport and release volumes produced by the Stage 1 AWRC

The timing and scale of future stages would be phased to respond to drivers including population growth rate and the most efficient way for Sydney Water to optimise its wastewater systems.




Upper South Creek Advanced Water Recycling Centre

Treated Water Pipeline

Brine Pipeline

Environmental Flows Pipeline


**Projection:** GDA 1994 MGA Zone 56
Project infrastructure locations are indicative and will be refined during design

## 1.2 Study Context and Study Area

The proposed Upper South Creek Advanced Water Recycling Centre (AWRC) site is located within Western Sydney in the Local Government Area of Penrith, approximately 39 km west of Sydney Central Business District (CBD). Pipeline infrastructure associated with the AWRC are located across five local government areas including Wollondilly Shire, Penrith City, Liverpool City, Fairfield City and the City of Canterbury-Bankstown.

### 1.2.1 Future development assumptions

The AWRC and sections of the brine and treated water pipelines are located within the area covered by the draft Western Sydney Aerotropolis Plan (WSAP). The draft WSAP indicates significant development and therefore land use changes for the region, however the precise nature and timings of development are not confirmed.

The following assumptions on future development have been considered for this assessment.

- **Construction** – Construction of the AWRC and pipelines assumes existing land uses with no precinct development associated with Aerotropolis.
- **Stage 1 Operational (up to 50ML – around 2025)** – Stage 1 Operational assumes some changes to existing land uses with the M12 and Western Sydney Airport however it assumes no immediate precinct development associated with Aerotropolis as it is uncertain to what extent development outlined in WSAP will be underway or in place.
- **Future stages (up to 100ML – around 2034 and beyond)** – Future stages assume some precinct development associated with Aerotropolis including some of the surrounding parts of Kemps Creek precinct where the AWRC is located.

## 1.3 Secretary's Environmental Assessment Requirements (SEARs)

The following SEARs are relevant to and have been addressed in this landscape character and visual impact assessment for the Project.

## Table 1.1 Project SEARs requirements for environmental discipline

| SEARs matter to be addressed by study | Location SEARs addressed in the report |
|---|---|
| General Requirements:<br>(g) an assessment of the likely impacts of the Project on the biophysical and socio-economic environment, focusing on the specific issues identified below and any other significant issues identified, including:<br>A description of the existing environment likely to be affected by the Project using relevant and adequate data.<br>An assessment of the potential impacts of the Project, including any cumulative impacts, and taking into consideration relevant guidelines, policies, plans and industry codes of practice.<br>A description and details of how the Project has been designed to avoid, minimise and offset impacts (through design, or construction or operation methodologies).<br>A description of how any residual impacts will be managed or offset, and the approach and effectiveness of these measures. | Section **Error! Reference source not found. Error! Reference source not found.**,<br>Section 5 Landscape Character Zone descriptions.<br>Section 6.1.1 Key viewpoint descriptions<br>Sections 6.5 and 6.2 impact summaries and section 8 Cumulative Impacts<br>Sections 4.5 Avoidance through design and 0 Landscape and urban design<br>Section 8.2 Residual Impacts |
| 46. An assessment of the visual impact of the Project and any ancillary infrastructure during construction and operation on:<br>a) views and vistas;<br>b) key sites and buildings;<br>c) heritage items including Aboriginal places and non-Aboriginal heritage; and<br>d) the local community. | Section 6 Visual Impact Assessment |
| 47. Artist impressions, perspective drawings and view analysis of the Project to illustrate how the Project has minimised the visual impact through design and landscaping. | Section 6.1.1 |

# 2 Methodology

This section outlines the methodology used to define the baseline and undertake the assessment of potential impacts of the Project on landscape and visual, including definition of the Study Area used as the basis of the assessment. Figure 2.1 illustrates the key steps for the methodology of the assessment.

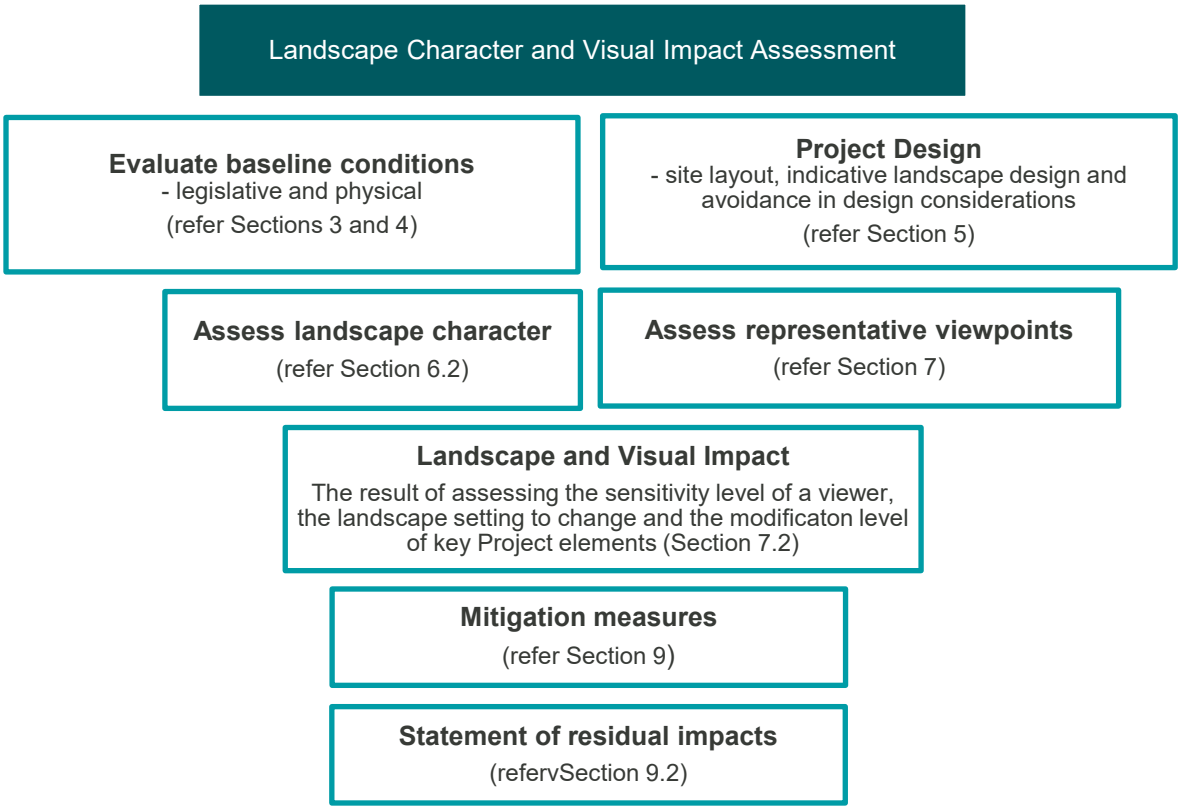



**Figure 2.1 LCVIA methodology diagram**

The below guidelines have been used as a basis for the methodology for this assessment:

- The Guidance for Landscape and Visual Impact Assessment (GLVIA), Third Edition (2013), prepared by Landscape Institute and Institute of Environmental Management & Assessment
(IEMA, UK)
- Guideline for Landscape Character and Visual Impact Assessment (TfNSW, 2020)
- Guidance Note for Landscape and Visual Assessment (June 2018), Australian Institute of Landscape Architects (Queensland chapter)
- AS4282-1997 Control of the obtrusive effects of outdoor lighting

## 2.1 Baseline conditions

### 2.1.1 Study Area

The LCVIA Study Area for the purpose of this assessment includes the Project extents, defined as the land within a 3 km radius of the AWRC site, and a 50 m buffer which forms Study Area along the length of the pipeline infrastructure. The Study Area is shown in Figure 2.2

The Study Area is determined by the distance at which it is considered that Project components will become either indiscernible to the human eye or will occupy such a small proportion of the visual field of view that impacts could be considered negligible. This distance is directly related to the scale and height of the Project components and the viewing properties of the typical human eye.

The extent the AWRC is potentially visible from a given viewing location was identified using topographical data in a visual envelope map (VEM). Potential viewpoints were identified within the visual envelope and validated during a field visit to account for potential screening and filtering effect on these views from topography, existing vegetation and built form. Viewpoints were also chosen in proximity to proposed construction compound locations.

### 2.1.2 Review of legislation and planning policy

A review was undertaken of the key planning designations, policies and guidance relating to landscape and visual amenity within the LCVIA Study Area at the national, state and local levels.

The discussion of relevance to the current assessment considers the following key issues:

- Whether the purpose of the designation is related to the protection/management of landscape and/or visual values.
- If the project has potential to directly or indirectly affect those landscape/visual values for which it has been designated - depending on the nature of the specific values this may be affected by factors such as proximity, the presence of intervening landform that may restrict inter-visibility, probable levels of recreation use etc.

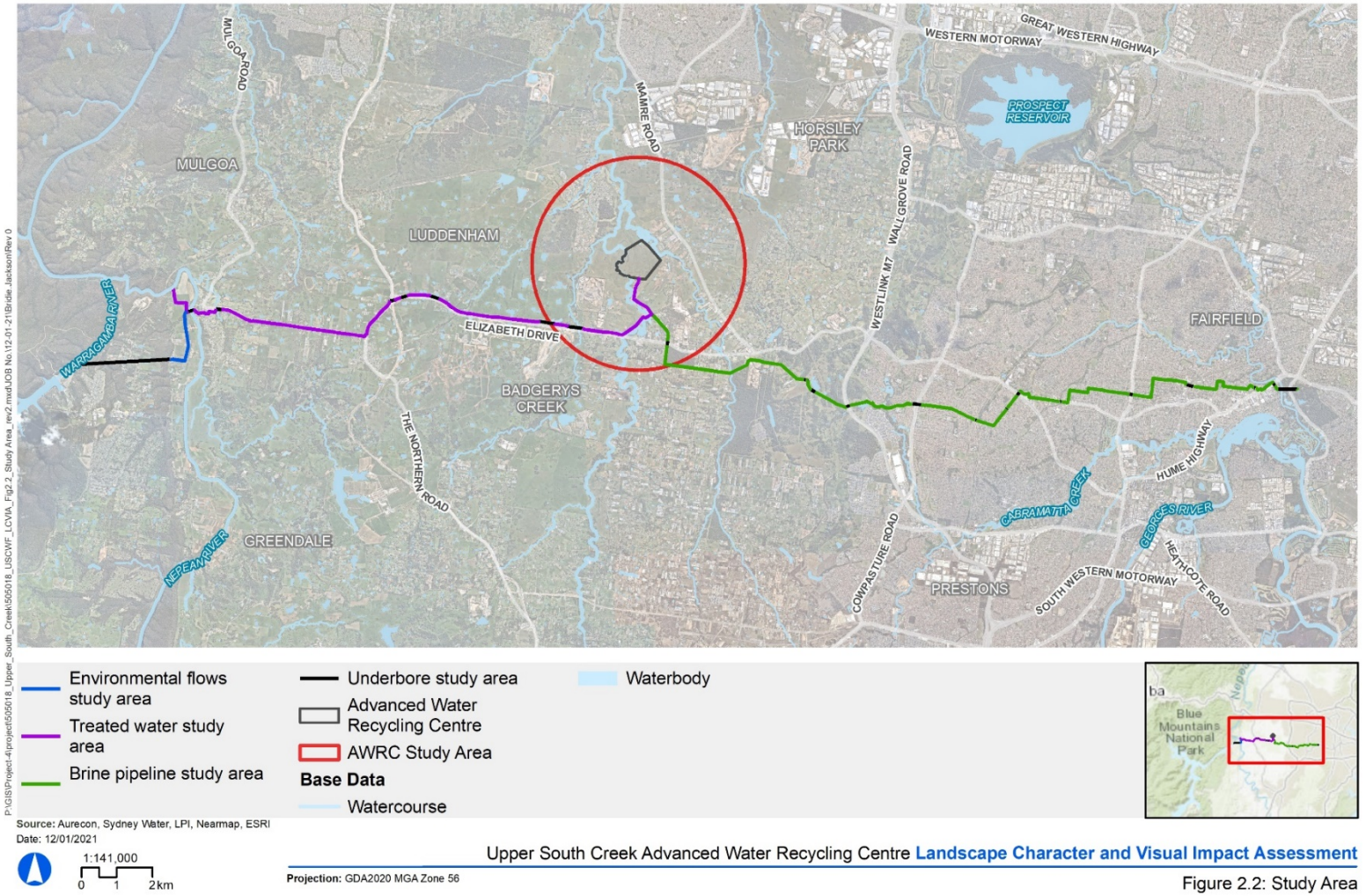



**Figure 2.2: Study Area**

### 2.1.3 Desktop analysis of the landscape and visual resource

The first task of this phase involved gathering existing data and other information for the landscape located within and adjacent to the Study Area. Key information sources include:

- Legislation and planning schemes from relevant local councils
- Digital aerial photography
- Cadastral data (showing roads and all major features, built areas, etc)
- GIS mapping, including hydrology/riparian corridors, land use, geology, vegetation and contour/topographical data
- State Heritage Inventory
- Other Project studies including ecology, heritage and hydrology assessments

Using this data, a preliminary assessment of the landscape and visual resource was undertaken and used to inform the field survey. This included analysis of the underlying landscape (hydrology and landform), land cover (e.g. vegetation, land use, settlement pattern etc.), landscape value (e.g. reflected in scenic routes/trails and landscape designations including national parks and conservation reserves), and desk-based site analysis (e.g. identification of recognised panoramas and views, key landmarks, and local peaks).

Where appropriate, Geographic Information System (GIS) analysis was undertaken to assist the assessment e.g. preparation of Digital Elevation Models (DEM) and landform analysis. Following this, draft landscape character types were created which formed the basis of field verification.

Sydney Water has developed an urban design approach to the AWRC. It considers both the operational and green space areas, the design will include architectural treatments for visual screening and potential to adopt a landscape-led approach by integrating aspects of the heritage and natural assets around infrastructure requirements.

## 2.2 Impact assessment methodology

The potential level of impacts associated with the Project on landscape character and visual amenity have been assessed based on themes of magnitude and sensitivity. The approach to assessment considers the construction and operational phases:

- Construction

**Identifies impacts associated with construction compounds, construction traffic and works further described in section 4.3.**

- Stage 1 Operational - Year 1

Viewpoints 1-10 relating to the AWRC, include an assessment of Year 1 with no landscape mitigation (refer section 4.1). This assists in determining the effectiveness of the indicative landscape mitigation design against Stage 1 Operational (+10years).

Pipelines: assumes a timeline of one year after construction where revegetation has established (refer section 4.2).

- Stage 1 Operational – Year 10

AWRC: assumed an indicative landscape mitigation, assuming a timeline of approximately 10 years after construction where vegetation has matured (refer section 4.5).

Pipelines: assumes a timeline of approximately 10 years after construction where revegetation has matured.

- Future Stages

AWRC (only): discussion of the future stage development of the AWRC have been assessed with assumptions on future land uses in the context of the Western Sydney Aerotropolis Plan (refer section 4.4).

### 2.2.1 Landscape Character identification

The landscape character has been identified within the Study Area determining unifying aspects of the landscape and to distinguish why one landscape is distinct from another (defined as landscape character zones). Landscape character zones have been determined through a desktop assessment and confirmed through a site visit. Each character zone identified is based on the consideration of the following attributes:

- Landscape value, i.e. landscape designated for their scenic or landscape importance or valued recreational function.
- Landscape elements that contribute to defining character, i.e. residential, commercial and landform.
- Landscape character attributes, including scale, grain, perceptual characteristics such as connection to natural landscape, industrial nature of the area.
- Observed land uses and current and future land use zones outlined in strategic planning documents and Local Environmental Plans.
- Topography and vegetation

### 2.2.2 Landscape Character impact assessment

Landscape character can be defined as the aggregate built, natural and cultural aspects that make up an area and give a sense of place. They are generally based on the Study Area's surrounding land use, ecological features, natural topography, and cultural and built features. Table 2.5 Landscape Character and Visual Impact Rating Matrix, defines the impact ratings based on sensitivity and magnitude.

#### Landscape Character Sensitivity

Landscape Character sensitivity refers to the value placed on the overall quality of a Landscape Character Zone (LCZ) based on a number of characteristics including amenity, vegetation, urban development and land use. Sensitivity is then rated on the extent to which the LCZ can absorb change as a result of the Project. 'For example, a pristine natural environment is likely to be more sensitive to a

change of the nature of a four-lane motorway than a built-up industrial area'[1]. Landscape sensitivity considers:

- Inherent landscape value in terms of condition, perceptual qualities, cultural importance, and any specific values that may apply, such as landscape planning designations.
- Whether the changes would fit-in with or the changes would be visually absorbed into the scale, landform, land use, pattern, texture of the existing landscape.

The following Table 2.1 describes the sensitivity attributes used in the assessment.

**Table 2.1 Landscape sensitivity ratings**

| Sensitivity | Description |
|---|---|
| High | Landscapes, which by nature of their character, would be unable to accommodate changes introduced by the Project. |
| | Typical characteristics and sensitivities are:<br>• Distinct elements and features making a positive contribution to character and sense of place.<br>• Likely to be designated under planning overlay or local council planning schemes, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale.<br>• Areas of special recognised value, through use, perception, or historic and cultural associations. |
| Moderate | Landscapes, which by nature of their character, would be partly able to accommodate changes introduced by the Project. |
| | Typical characteristics and sensitivities are:<br>• Comprising commonplace elements and features creating generally unremarkable character but with some sense of place.<br>• Locally designated, or their value may be expressed through non-statutory local publications.<br>• Containing some features of value through use, perception of historic and cultural associations.<br>• Likely to contain some features and elements that could not be replaced. |
| Low | Landscapes, which by nature of their characteristics, could accommodate changes introduced by the Project. |

[1] Roads and Maritime Services (2018) Guideline for landscape character and visual impact assessment. Environmental impact assessment practice note EIA-N04. NSW Government. pg9

| Sensitivity | Description |
|---|---|
| | Typical characteristics and sensitivities are:<br>• Comprising some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place.<br>• Not designated.<br>• Containing few, if any, features of value through use, perception, or historic and cultural associations.<br>• Likely to contain few, if any, features and elements that could not be replaced. |
| Negligible | A landscape which is not valued for its scenic quality or where its character, existing land use, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change. |

### Landscape magnitude of change

The magnitude of change refers to the nature, scale and duration of change that is would affect a landscape character. Magnitude considers the following factors:

- The scale of change, regarding the loss or addition of features in the view and changes in its composition
- Degree of contrast or integration based on scale and form, height, colour and texture
- Duration of the change: short, medium, long term permanent or temporary
- The angle and distance of the Project from the character zone

The following Table 2.2 describes the magnitude ratings considered in the assessment.

**Table 2.2 Landscape magnitude of change ratings**

| Magnitude | Description |
|---|---|
| High | Large scale change to existing character or distinctive features and elements, and/or the addition or removal of new features or elements. |
| Moderate | Noticeable change to existing character or distinctive features and elements, and/or the addition or removal of new features and elements. |
| Low | Slight change to existing character or features and elements, and/or the addition of new features or elements. |
| Negligible | Barely noticeable change to existing character or features and elements, and/or the addition of new features and elements. |

Impacts may be both direct and indirect within the Study Area and beyond and this assessment considers both.

### 2.2.3 Visual impact assessment

#### Viewpoint selection

Potential viewpoints were identified within a desktop study and then validated during a field visit to account for any potential screening and filtering effect on these views from topography, existing vegetation and built form. The viewpoints represent where the effects of the Project are most visible.

For the AWRC, viewpoints were selected using a visual envelop map (VEM) was created, applying the existing topography with the height of key elements, to determine from where they would be visible. The VEM does not include existing intervening built form or vegetation.

The pipeline viewpoints selected are representative of the whole alignment and indicative of the potential impacts that may be experienced because of pipeline construction and visibility of above ground infrastructure in sensitive areas.

Each viewpoint was selected as representative views of key and sensitive receivers surrounding the Project. Viewpoints were selected to illustrate:

- A range of:

**Receptor-types including public and private domain views**

**View-types including elevated, panoramic and filtered views**

**Viewing distance from the Project**

- Main or protected views in the Study Area such as identified lookouts or designated significant viewpoints.

Where the Project is likely to have a low magnitude of change to the existing conditions and/or visual receptors are unlikely to be sensitive to their surrounds (i.e. moving at speed), viewpoints have not been assessed. The relevance of some of these viewpoints has been discussed within section 6.2 Visual Impact Assessment

#### Visual Sensitivity

Viewpoint sensitivity is dependent on:

- Importance (scenic quality) of the view
- Duration of viewer activity
- Number of viewers exposed to the Project
- Nature of the visual receptor (type and volume of sensitive receptors or viewers) experiencing the view.

Table 2.3 describes the visual sensitivity aspects used in the assessment.

**Table 2.3 Visual Sensitivity ratings**

| Sensitivity | Description |
|---|---|
| High | **Large number** of viewers, or those with **proprietary interest and prolonged viewing opportunities** such as residents and users of attractive and/or well-used recreational facilities. |

| Sensitivity | Description |
|---|---|
| | Views from a regionally or locally important location such as a scenic lookout whose interest is specifically focussed on the landscape.<br>• Residential properties<br>• Users of community facilities and open spaces, where the purpose of that recreation is the enjoyment of the landscape<br>• Key tourist areas. |
| Moderate | **Medium number** of residents and **moderate numbers** of visitors with an interest in their environment. |
| | Larger number of travellers with an interest in their surroundings.<br>• Outdoor works<br>• Schools and other institutional buildings, and their outdoor areas |
| Low | **Small number** of visitors with a passing interest in their surroundings. |
| | Viewers whose interest is not specifically focussed on the landscape.<br>• Indoor workers<br>• Users of main roads or arterial roads<br>• Users of recreational facilities where the purpose of that recreation is not related to the views<br>• Commuters |
| Negligible | Very occasional numbers of viewers with a passing interest in their surroundings. |

### Magnitude of change

Magnitude refers to the scale, size and character of the Project and its proximity to the viewer and the degree to which its affect has been mitigated. For example, a development situated one kilometre from the viewpoint, will have a more reduced visual effect than one 100 metres away[2]. All elements of the Project have been considered including changes to landform, urban structure, vegetation patterns, as well as the nature scale and density of the Project within the landscape.

Magnitude is dependent on:

- Scale, regarding the loss of addition of features in the view and changes in its composition.
- Degree of contrast or integration based on scale and form, height, colour and texture.
- Nature of view in relation to the Project accounting for angle, distance and extent.
- Mitigation, accounting for its effectiveness at reducing impacts over time.

Table 2.4 below describes the magnitude aspects used in the assessment.

[2] Roads and Maritime Services (2018) Guideline for landscape character and visual impact assessment. Environmental impact assessment practice note EIA-N04. NSW Government. pg9

**Table 2.4 Viewpoint magnitude of change ratings**

| Magnitude | Description |
|---|---|
| High | The Project, or part of it, would become the dominant feature or focal point of the view. |
| Moderate | The Project, or part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor. |
| Low | The Project, or part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view. |
| Negligible | Only a very small part of the Project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view. |

### 2.2.4 Impact rating matrix

With all factors considered, an assessment of the Project on each landscape character zone and representative viewpoint. Table 2.5 presents the matrix of how the sensitivity and magnitude of impacts combine to provide an impact rating.

**Table 2.5 Landscape Character and Visual Impact Rating Matrix**

| | | Magnitude of Impact | | | |
|---|---|---|---|---|---|
| | | · High | · Moderate | · Low | · Negligible |
| Sensitivity | · High | High | High-Moderate | Moderate | Negligible |
| | · Moderate | High-Moderate | Moderate | Moderate-Low | Negligible |
| | · Low | Moderate | Moderate-Low | Low | Negligible |
| | · Negligible | Negligible | Negligible | Negligible | Negligible |

### 2.2.5 Residual Impacts

After the application of mitigation measures to address identified impacts there may remain some impacts to landscape and/or visual amenity. Impacts which are assessed as being moderate to high are those which should be given greatest consideration in decision making, relative to other levels of landscape and visual impacts. Minor to moderate levels of impact are of progressively reducing importance, but nonetheless requiring consideration especially near to sensitive receptors. Residual impacts resulting from construction are temporary.

The residual impacts are discussed in section 9.2.

# 3 Legislation and Policy

## 3.1 Strategic Planning Context

The project has considered the following relevant legislation and government policy, as described in Table 3.1.

**Table 3.1 Relevant legislation**

| Legislation/Policy | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **Commonwealth Legislation** | | |
| **Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)** | Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on MNES protected under the Act. | MNES relevant to pipeline outlet points which are in close vicinity to the Blue Mountains National Park.<br>The significance of the existing environment in relation to landscape character and visual amenity are assessed in VP19 and VP20. |
| **NSW Acts** | | |
| **Environmental Planning and Assessment Act 1979 (EP&A Act)** | THE EP&A Act provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments (EPIs). Relevant to landscape and visual amenity is Clause 1.3 (2017), including:<br>• Good design and amenity of the built environment › The sustainable management of built and cultural heritage (including Aboriginal cultural heritage).<br>• (b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment | There is a need for the Project to demonstrate how it contributes to the overarching objectives for planning and development as set out by the EP&A Act.<br>The landscape character and visual assessment assists determining the extent of environmental, social and cultural impacts as a result of the proposed design. |

| Legislation/Policy | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **National Parks and Wildlife Act 1974 (NPW Act)** | The intent of the NPW Act is to allow for conservation of the State's natural and cultural heritage; fostering public appreciation, understanding and enjoyment of the State's natural and cultural heritage; and managing any lands reserved for these purposes. | Land protected by the NPW Act include Blue Mountains National Park (BMNP), Burragorang State Conservation Area, Kemps Creek Nature Reserve and Western Sydney Parklands (WSP).<br>Potential impacts have been assessed for the Brine Pipeline traversing WSP area (refer section 7.3.3) and the Environmental flow outlets near to BMNP (refer section 7.3.2). |

### Table 3.2 NSW Environmental Planning Instruments (EPIs)

| Legislation/Policy | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **SEPP - Western Sydney Aerotropolis, 2020** | The aim of this policy is to facilitate sustainable, orderly and transformational development of the WSA growth area. This SEPP is relevant to pipelines which are in agribusiness, enterprise, heritage and environmental and recreation zones.<br>• Agribusiness Zone objectives:<br>– development consistent with the character of Luddenham Village<br>– maintain the rural landscape character<br>• Heritage Conservation:<br>– (b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views<br>• Enterprise objectives:<br>– LU09 - Promote the creation of allotments that maximise the opportunity for design excellence, the incorporation of landscape-led approach and promote sustainable and energy efficient use of land. | Agribusiness zone objectives are applicable to the Treated Water and Environmental Flows pipeline, located underground and therefore not expected to have long term impacts to the existing character. Potential landscape character impacts to Luddenham Village have been assessed in section 5.1.2 – LCZ 7.<br>Heritage sites within the Study Area have been identified, with potential impacts assessed for the Fleurs Radio Astronomy site, Blaxland's Farm and Warragamba Dam wall.<br>The SEPP is applicable to defining sensitivity ratings and consideration of appropriate development and landscape and visual impacts.<br>The landscape character and visual assessment assists determining the design excellence based on the impact levels as a result of the Project. |

| Legislation/Policy | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| | • 35. Consideration of design excellence<br>– (d) whether the development detrimentally impacts on view corridors. | |
| **SEPP - Western Sydney Parklands, 2020** | This SEPP aims to protect the WSP from development in areas near nature or environmental conservation areas. The following clauses are poignant to the LCVIA.<br>• 2 (c) whether the development has been designed and sited to minimise visual intrusion when viewed from vantage points in the nature reserve or environmental conservation area.<br>• 2. Aim of policy:<br>• (f) maintaining the rural character of parts of the Western Parklands by allowing sustainable extensive agriculture, horticulture, forestry and the like | The Brine Pipeline traverses areas within the Western Sydney Parklands which are areas of increased sensitivity. The pipeline is located underground, minimising visual intrusion and changes to rural character. |

### 3.1.1 Local Planning Policy

There are five local government areas (LGAs), within the Study Area as shown in Figure 3.1. Each has Local Environmental Plans (LEPs) and Development Control Plans (DCPs). There is also a Sydney Regional Environmental Plan (SREP) which is relevant to the Study Area. These plans contain aims and objectives for the protection of landscape and scenic values as summarised in the following Table 3.3.

**Table 3.3 Local Planning Policies and Plans**

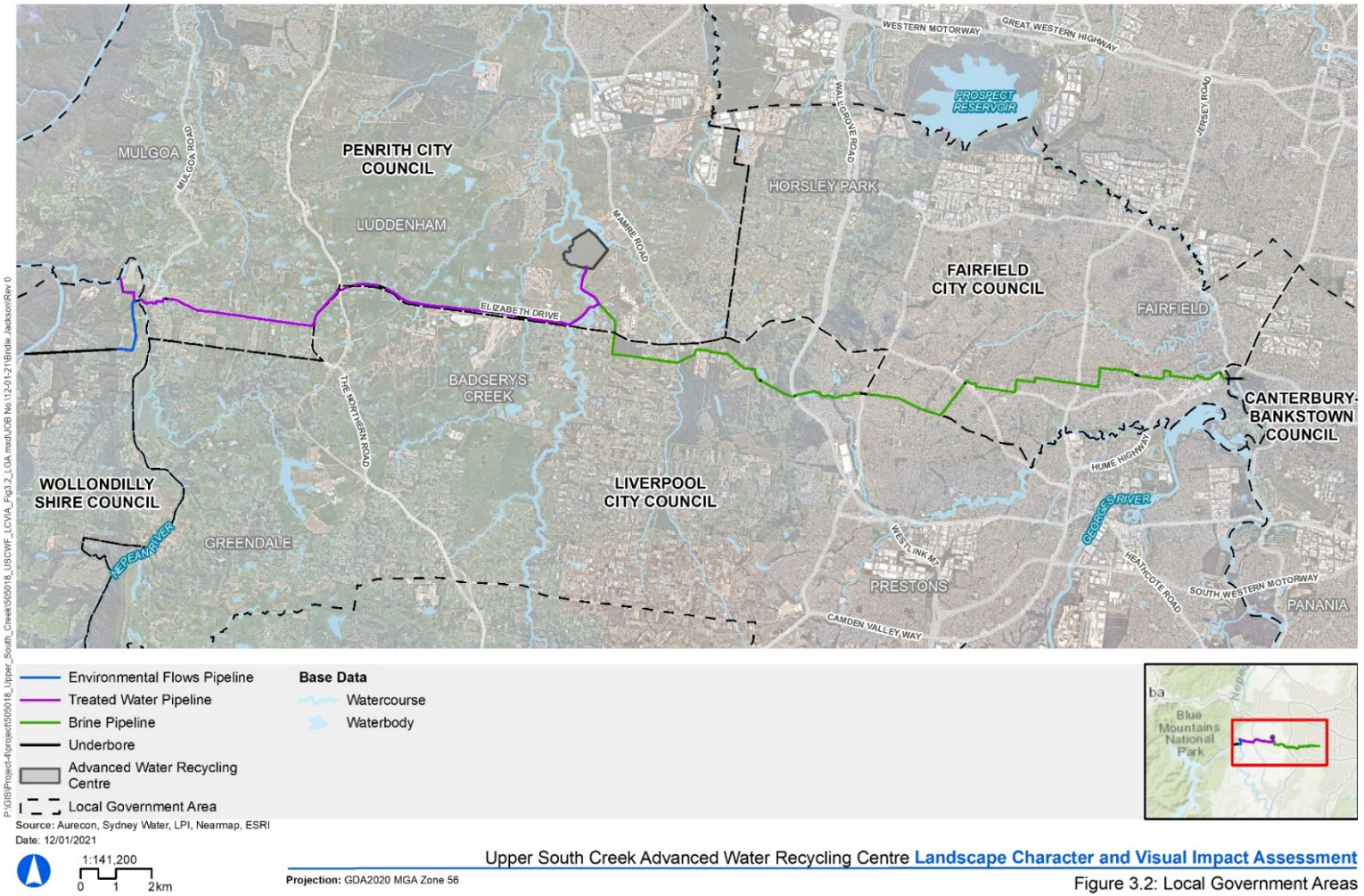
| Plans | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **Regional Environmental Plans** | | |
| **SREP No 20 – Hawkesbury-Nepean River (No 2 – 1997):** | The aim of this plan is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.<br>The plan identifies sites relative to the Project with Scenic Protection Land of significance and local significance including: | The LCVIA has considered the higher sensitivity of the sites, relative to the Project.<br>Visual impact assessments for the significant sites have been carried out in Section 6.1.3 including VP7 and VP19. |

| Plans | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| | • Blaxland's Farm site<br>• The northern section of the AWRC site at Kemps Creek. | |
| **District Plans** | | |
| **Western City District Plan (Greater Sydney Commission, 2018)** | The District Plan provides guidance for councils (Penrith, Fairfield, Liverpool and Wollondilly relevant to the Project) and developers to plan for and support growth and change and align their local planning strategies to place-based outcomes. Relevant plans include<br>• Development of the Western Sydney International Airport by 2031.<br>• Western Sydney business growth opportunities comprising global companies bringing engineering, robotics and agribusiness to the Western City.<br>• Housing development to South West Growth Area, located to the south of Elizabeth Drive and west of the M12. | The WSDP provides information on future development to assist in the LCVIA in identifying land use changes and growth areas. |
| **The Western Sydney Aerotropolis Plan (Western Sydney Planning Partnership, 2020) (WSAP)** | The Aerotropolis is a 11,200-hectare site surrounding the future airport site in Badgerys Creek within the Penrith and Liverpool Local Government Areas. The Aerotropolis aligns with the Greater Sydney Regional Plan towards a 30-minute city by accommodating high value jobs closer to where people live.<br>WSAP is outlined in **Error! Reference source not found.** providing a spatial representation of high-level land uses, transport infrastructure and Blue-Green grids. | The draft WSAP Plan (DPIE, 2020) provides information on future development to assist in the LCVIA, identifying land use changes, growth areas and timing.<br>The Project will be located within the Kemps Creek Precinct, a precinct not included in the initial precincts to be planned and released. Development of the Kemps Creek Precinct is likely to be developed in 5-10 years. As such, it is expected that land rezoning and land use surrounding the AWRC are unlikely to change during construction and/or early phase of Stage 1 Operational but are applicable to Future Stages. |

| Plans | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **Local Environmental Plans** | | |
| **Bankstown LEP 2015**<br>**Fairfield LEP 2013** | The LEPs provide the following requirements for planning approval relative and landscape and visual amenity.<br>• Zone W2 Recreational Waterways – To protect the ecological and scenic values of natural waterways.<br>• Zone RU2 Rural Landscape: To maintain the rural landscape character of the land.<br>• To ensure that development is compatible with the rural character of the land and maintains the feasibility of agricultural uses. | The LEP identifies landscape value within areas of proposed Brine Pipeline. As the pipeline is to be located underground, the impacts to zones W2 and RU2 are minimised and does not inhibit rural character or agricultural uses. |
| **Liverpool LEP 2008** | • Zone W1 Natural Waterways: to protect the ecological and scenic values of natural waterways. | Viewpoint selection has aimed to capture sensitive areas. The views of waterways, mostly small ephemeral creeks within the Liverpool LGA, are limited by intervening vegetation. |
| **Penrith LEP - amendment SEPP Western Sydney Employment Area, 2020** | The amendment (7.5) seeks protection of scenic character and landscape values in the Environmental Conservation (E2) and natural Waterway (W1) zones. | The LCVIA investigates the changes to scenic value to the existing conditions or loss of Landscape value in the following areas in vicinity of the Project.<br>• The Treated Water and Environmental Flows pipeline is expected to remove a strip of trees near to eastern bank of the Nepean River at Wallacia, as assessed in VP17.<br>• The northern section of the AWRC site (assessed in VP7) and a band of land to the north of Elizabeth Drive spanning from Clifton Avenue, Kemps Creek to the Northern Road, Luddenham.<br>• Land which has views to and from the Nepean River. |

| Plans | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **Wollondilly LEP 2011** | The LEP (1.2 (a)) aims to provide for the management of natural resources and the protection of the natural landscape character.<br>• Rural Landscape (RU2): To maintain the rural landscape character of the land.<br>• Large Lot Residential (R5): preserving, and minimising impacts on, environmentally sensitive locations and scenic quality. | The LEP is relevant to assigning landscape value in proposed alignment of the Treated Water and Environmental Flows pipeline. Impacts to the rural landscape character and scenic quality are likely to be minimised by underground pipelines. |
| **Development Control Plans** | | |
| **Penrith DCP 2014** | The DCP supports planning requirements and intends to protect the character of Penrith's rural lands. Rural character is primarily visual – it is the overall impression of our rural lands viewed by people visiting them or driving through them. Consequently, the provisions aimed at protecting rural character focus on ensuring that the visual impact of development is in keeping with rural areas and does not unnecessarily intrude on the landscape.<br>The key components that contribute to Penrith's rural character are the agricultural lands, native vegetation, biodiversity and riparian corridors, areas of mixed rural uses and rural living areas. | The AWRC sits within the Penrith City Council area. Areas mapped with 'scenic and landscape value' includes land adjacent Elizabeth Drive near to the AWRC site.<br>For the future development, this area of scenic and landscape value lies to the south of the proposed M12. |

| Plans | Brief description legislation, salient parts and intent | How legislation/policy is relevant to the study |
|---|---|---|
| **Local Strategic Planning Statements** | | |
| **Penrith Local Strategic Planning Statement (Penrith City Council, 2020) (LSPS)** | The LSPS provides a 20-year vision for Penrith LGA's environmental, economic and social land use needs, outlining opportunities presented by change and protects important values and characteristics of the community, including the following surrounding the AWRC site.<br>• growth opportunities in agribusiness, manufacturing, freight and logistics, high technology jobs, education, research and development and new transport connections.<br>• New housing for the next 20 years will be delivered in existing planned areas (Caddens, Glenmore Park and Jordan Springs); new release urban investigation areas at Orchard Hills, Luddenham and Mt Vernon, through changing housing types and mixed use/high density residential developments around town centres. | The LSPS provides information on future development to assist in the LCVIA, identifying land use changes, growth areas and timing.<br>It is recognised that the new urban area of Luddenham and urban investigation areas are within proximity of the AWRC. Impacts to these future residential areas will need to be considered through the design process. |




## Figure 3.1 Local Government Areas

The AWRC is situated north of Elizabeth Drive, southwest of Mamre Road and south east of Luddenham Road. The future M12 Motorway's planned alignment runs east to west near the southern extent of the AWRC. The AWRC is located in a rural landscape setting comprising a mix of agricultural land, rural residential living, industrial uses, and resource recovery facilities. The surrounding area is devoid of significant vegetation, having been modified for agricultural use with the exception of existing riparian corridors and fragmented woodland areas. Sensitive ecological communities have been identified to the south of the AWRC.

The Treated Water pipeline is located parallel with Elizabeth Drive and Park Road. The environmental flows pipeline splits from the treated water pipeline, west of the Wallacia township and releases into the Warragamba River further south.

The Brine Pipeline will run south of the AWRC before aligning along Cross Street, Kemps Creek where the pipeline will track east, link up with the existing Malabar wastewater system and connect to existing wastewater infrastructure near Lansdowne. The Brine Pipeline generally follows existing road formations through rural and residential areas, except in areas where the pipeline meets a road end. At road ends, the pipeline detours through vegetated areas before aligning back along defined road corridors. The Brine Pipeline traverses across residential, environmental, rural and rural residential localities.

The Draft Western Sydney Aerotropolis Plan (DPIE 2020) has identified a high-level structure plan with future land uses, transport infrastructure and blue-green grids within the Aerotropolis boundary. The structure plan identifies that existing rural land near the Brine Pipeline alignment is earmarked for future enterprise land.

## 3.2 Landscape and visual context

### Land use

The proposed facility and pipeline infrastructure corridors span across five local government areas in Western Sydney (refer Figure 3.1) including Wollondilly Shire, Penrith City, Liverpool City, Fairfield City and Canterbury-Bankstown Councils.

The AWRC is located in land currently zoned RU4 – Primary Production Small Lots, and ENZ – Environmental and Recreation. The draft WSAP plan (DPIE, 2020), identifies a high-level structure plan with changes to future land uses, transport infrastructure and Blue-Green grids within the aerotropolis boundary. RU4 zoned land is re-zoned as Enterprise land, within the draft WSAP plan.

The AWRC is to be located on the boundary of the suburbs of Badgerys' Creek and Kemps Creek in rurally zoned land. Current land use includes grazing and agriculture (Figure 3.2 and Figure 3.3). Kemps Creek is located to the east and South Creek directly to the west of the AWRC.

Rural lots and rural residential lots surround the AWRC with various riparian corridors traversing the locality, and dams dotted around the area. The Kemps Creek Resource Recovery Park (Figure 4.3) is a large land fill and resource recovery site located in proximity to the south west of the site and adjacent to Elizabeth Drive.

The Western Sydney Parklands (Figure 3.5) are located to the east of the AWRC, covering an area of 5,280 hectares. The parklands have over 60 km of tracks and trails which are used by the local and regional communities as well as several playgrounds, picnic areas, adventure parks, transport connections and Sydney Zoo. Part of the Brine Pipeline would however transverse through the Western Sydney Parklands area.

Wallacia, Mulgoa and Luddenham (Figure 3.6) are rural villages which are situated between the AWRC and Warragamba River in the west. These rural villages predominately contain low density and large rural residential lots with populations which range from 1,700-1,900 people (2016 census). The rural villages contain a number of parks and reserves, schools, childcare centres, places of worship and cafes/restaurants. Wallacia is the only village with an identifiable commercial strip which contains a hotel, bottle shop, takeaway foods, news agency, real estate agency and hair/beauty premises.

The Twin Creeks Estate (Figure 3.7) is a residential estate and golf country club located to the north west of the AWRC which contains newly developed high-quality detached dwellings (with many dwellings still under construction). The estate has architectural and landscape guidelines for new residential developments which encourage a high level of design and visual quality[3].

Warragamba and Silverdale are larger rural centres located adjacent to Warragamba River. The localities are predominately low density residential with additional community facilities including sporting facilities, parks, places of worship, schools and childcare centres.

The Brine Pipeline would generally align with existing streets and roads in rural and residential suburbs. Most of the pipeline will be located in residential suburban areas such as Cecil Hills, Bonny Riggs, Cabramatta West and Canley Heights. These areas contain predominately low density single and double storey detached dwellings with residential buildings located near commercial areas.

[3] https://www.twincreekscommunity.com.au/cms/residential/community-documents/

**Figure 3.2 Rural pasture near the AWRC site**

**Figure 3.3 Agricultural crops near to AWRC site**

**Figure 3.4 Suez Kemps Creek Resource Recovery Park** (image: Google street view August 2020)

**Figure 3.5 Wester Sydney Parklands recreation** (image: www.app.com.au/news - 'Project team for Western Sydney Parklands wins at AILA NSW awards')

**Figure 3.6 Luddenham Village on The Northern Road** (image: Google street view, January 2019)

**Figure 3.7 Twin Creeks drive residential area and golf club** (image: Google street view, January 2019)

### Vegetation

The Study Area is within the Sydney Basin IBRA bioregion and the Cumberland and Wollemi IBRA subregions.

- Cumberland IBRA subregion vegetation consists of dry and wet sclerophyll forests on sandstone and transitional slopes and hills, dry sclerophyll woodlands on plains and shale hills, alluvial forests on river flats and wetlands in lagoons, swamps and floodplains (DPIE 2016).
- Wollemi IBRA subregion vegetation consists of dry sclerophyll forests on exposed slopes and ridgetops, wet sclerophyll forests on protected slopes, within deep gorges and adjacent to waterways, upland swamps in soaks and drainage depressions and heaths on windswept ridges on skeletal soils (DPIE 2016). This subregion is located in the Blue Mountains and some river areas, relevant to pipeline discharge points only.

There is a draft Cumberland Plain Conservation Plan within Western Sydney, for protection of seven threatened species, four endangered populations and nine threatened ecological communities listed on the NSW Threatened Species Conservation Act 1995.

The AWRC proposed site is vegetated with low level grasses, however due to decades of clearing and farming and agricultural practices, the site's landscape has been significantly modified from its natural state Remnant native species generally exist along ephemeral creek lines (refer Figure 3.8).

For further information, refer to the '*Upper South Creek Advanced Water Recycling Centre - Biodiversity Development Assessment Report*' (October 2020).

### Topography and Hydrology

The Study Area has a gently undulating topography with small rises which generally slope towards the creek lines of Kemps Creek in the north east and South Creek to the west (refer Figure 3.8). The AWRC site sits at a low point, making it visible from higher points, though between vegetation. South Creek and Kemps Creek form around 80% of the Western Parklands City's catchment.

- Cumberland IBRA subregion is characterised by low rolling hills and wide valleys in the rain shadow area of the Blue Mountains.
- Wollemi IBRA subregion is characterised by a mountainous landscape comprising sandstone plateaus, steep cliff faces, benched rock outcrops and deep gorges (Blue Mountains area).

**Figure 3.8 Native vegetation along a riparian corridor on Elizabeth Drive**

**Figure 3.9 Undulating plains, with creeks and the Blue Mountains in the background**

## Cultural Heritage

### Aboriginal Heritage

An Aboriginal Heritage Assessment[4] has been carried out for the Project. The report findings discussed as following are of relevance to the landscape and visual values within the Study Area. Aboriginal archaeological investigations and background research have identified site and areas of potential archaeological deposits within the Project Study Area.

Within the AWRC site, archaeological investigations found surface artefact scatter and subsurface archaeological deposits situated on an elevated flat on the southern side of the confluence of Wianamatta/ South Creek and Kemps Creek.

The distribution of Aboriginal archaeological sites within the Study Area is influenced by the reliability and permanence of fresh water sources in addition to underlying geology. Investigations in the region have found higher stone artefact density and site frequency along the margins of major watercourses including Wianamatta/ South Creek, the Nepean River and the Georges River.

[4] AWRC Aboriginal Cultural Heritage Assessment Report, December 2020, Kelleher Nightingale Consulting Pty Ltd

The identified Aboriginal archaeological sites have contained predominantly surface artefact scatters, isolated artefacts and subsurface archaeological deposits. Culturally modified trees with bark removal scars, carved trees, rock shelters with deposit and/or art, areas of grinding grooves and areas of potential archaeological deposit (PAD) have also been recorded but in significantly lower numbers.

Surface and subsurface artefacts do not provide much visibility therefore are not relevant to visual impact assessment, however the historical association of the area with Aboriginal people are a consideration in the landscape character. Water bodies are often found to be areas of Aboriginal cultural significance, as they were traditionally used as places for ceremonies and food sources

Land use practices, including vegetation clearance, construction, trenching and bulk earthworks have variable effects on the preservation of archaeological deposits across the Study Area.

### European History

The AWRC site was formerly used as the Fleurs Radio-Astronomy field station (Figure 3.10 and Figure 4.10), as registered on the State Heritage Register and protected under the Penrith LEP 2010. It was used from 1954 until 1988[5]. Most of the equipment has been removed from the site, although some bases remain and some of the layout of the structures are still apparent.

**Figure 3.10 Fleurs radio astronomy field station**
(image: CSIRO)

**Figure 3.11 Fleurs radio-astronomy field station**
(image: NSW Office of Environment & Heritage)

The Blaxland's Farm near to the Wallacia Weir, contains ruins of a flour mill and brewery which operates from the 1830s until the 1860s. The Treated Water discharge point is located near Wallacia Weir. The site is on the NSW state heritage register and its significance stated as:

*'Blaxland's Farm is significant as a cultural landscape where the farm landscape together with the remains of the flour mill and the brewery provides important historical evidence of early agricultural processing activities in the colony and constitute an unusual survival of early farming technology.'*[6]

The Warragamba Dam is located in the Blue Mountains National Park, of World Heritage significance. The dam wall, part of the Warragamba Supply Scheme is of State Heritage

[5] NSW Office of Environment & Heritage – The Fleurs Radio Telescope Site https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=2260832, 27.10.2020

[6] https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2690021 27.10.2020

significance[7], an exemplar of large scale dam construction, built for Sydney's water supply in a setting characterised by forested hillsides and river valley. The Environmental Flows discharge point is located a short distance downstream of the dam wall and not within the Blue Mountains National Park.

**Figure 3.12 Warragamba Dam**
(image: NSW Office of Environment & Heritage)

[7] https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4580161 17.02.2021

# 4 Project design

This LCVIA is based on the reference design which includes the following:

- Upper South Creek Advanced Water Recycling Centre (AWRC)

**AWRC components outlined in section 4.1**

**Concept Urban Design including preliminary landscape design in section 4.5**

- Pipelines as outlined in section 4.2

**Treated water and Environmental flows pipeline**

**Brine Pipeline**

The assessment of AWRC impacts is based on the reference design produced for the AWRC site layout as demonstrated in Figure 4.1 and Figure 4.2, Stage 1 Operational – no landscape mitigation.

**To assess the effects of preliminary landscape mitigation measures, a further assessment for Stage 1 Operational, includes the landscape, urban design and architectural treatments described in Section 2 which assumes maturity of vegetation at approximately 10 years after construction has been completed.**

The assessment for the future stage assumes that the solar panels are removed and are replaced by an expansion to the facilities as demonstrated in Figure 5.4**.**

## 4.1 AWRC

Table 5.1 outlines the Stage 1 key project components of the Project relevant to landscape and visual amenity, as presented in the Stage 1 site layout in Figure 5.1 and Figure 4.2. The dimensions indicated are used for the purposes of this assessment and are subject to detailed design. The components have been modelled and used in the photomontages of the AWRC in section 6.1.2. Components identified from 1 to 14 in the below table are those anticipated to be most visible due to their approximate bulk and height.

**Table 4.1 Indicative Project Components**

| | Component | Description | Indicative dimensions |
|---|---|---|---|
| **ID** | **Buildings** | | **(*w* x *w* x *h*)** |
| **1** | Administration building | Assumed to be a brick building with architectural finishes located at the entry with car parking | 45 x 40 x 3-4 m |
| **2** | AWTP | Advanced Water Treatment Plant (AWTP) – a large equipment slab and a building of concrete, masonry or Colorbond construction | 70 x 30 x 10 m |
| **3** | Flow receival chamber | Elevated concrete building | 20 x 10 x 6-7 m |

| | Component | Description | Indicative dimensions |
|---|---|---|---|
| 4 | Inlet works and screening | The inlet works consists of a combination of concrete structures and mechanical equipment. It may be constructed at ground level or elevated several metres to provide gravity head to convey it to the next process. | 100 x 35 x 6-7 m |
| 5 | Biosolids treatment and outloading | Biosolids treatment and handling includes an outloading building that will likely be a steel and concrete building. | 15 x 50 x 30m |
| 6 | Transfer Pump Station | The pumping station building(s) will consist of concrete, masonry or Colorbond building(s), located on the boundary of the AWRC site with its own dedicated access to support after hours maintenance access. | 60 x 25 x 10 m |
| | Blower room | Concrete tilt up panel building | 30 x 10 x 4 m |
| | Fine and Sludge screens | Two elevated concrete box structures | 10 x 15 x 3.5 m |
| | Storage structures | Chemical storage: coloured corrugated steel | 70 x 20 x 4 m |
| | Switch rooms | Three concrete tilt up panel buildings | 20 x 10 x 4 m |
| | Screenings handling | Elevated concrete box structure | 40 x 24 x 6-7 m |
| | **Tanks** | | |
| 7 | AWTP balance tank | Steel tank coloured ‘environmental green’ | 16 Ø x 10 m |
| 8 | Brine storage | Two concrete 30ML tanks | 40 Ø x 15 m |
| 9 | Digesters and gas storage | The digesters will be round concrete or steel tanks (x4) constructed at ground level, two with a domed top which is the biogas holder. | 25 Ø x 20 m |
| 10 | Permeate | Steel tank coloured ‘environmental green’ | 15 Ø x 12 m |
| 11 | Odour Control | The OCU will consist of a concrete slab at ground level, housing operational equipment, ductwork and fibreglass tanks. Typically, the ductwork is ‘environmental green’ and up to 1.5 m diameter. It will connect 6 m in the air to the inlet works, PST and digester area. | 1.5 Ø x 10-15 m |
| 12 | Odour ventilation stack | Tall narrow stack, light coloured | 0.65 Ø x 15 m |
| | Chlorine Contact Tank (CCT) | Three concrete tanks with shade cloth cover | 28 x 16 x 3 m |
| | Feed Averaging Tank (FAT) | Steel tank coloured ‘environmental green’ | 10 Ø x 5 m |
| | MBR (membrane bio reactor) | Four concrete tanks (aerated). Partially buried and about 4-5m above ground surface. | 80 x 50 x 8 m |
| | First Flush | Two concrete tanks, potentially located underground | 15 x 25 x 2 m |

| | Component | Description | Indicative dimensions |
|---|---|---|---|
| | Primary Sedimentation Tank (PST) | Four covered concrete PST tanks, 3-4m off-ground | 50 x 50 x 5 m |
| | Storage | Underground methanol storage concrete tank | 25 x 15 x 4 m |
| | **Other** | | |
| **13** | OSD basins | Onsite Detention basins located to the to the north and west of the site, included planted filtration bed to the east OSD basin. | |
| **14** | Ground mounted solar Panels | Stage 1 photovoltaic solar panels located to the east of the site. Decommissioned when facility expands to 100ML capacity at future stage. | <3 m height |
| | Overflow channel | A vegetated swale consisting of an earth embankment construction, rip rap and scour structure within the creek. It also includes a discharge chamber, headwall, swale and a bridge across the swale in the form of box culverts. | |
| | Fencing | Perimeter mesh fencing | 1.8–2.2 m height |
| | Access roads | Asphalt/concrete access roads within the compound and a perimeter access road for fire and maintenance access. | |

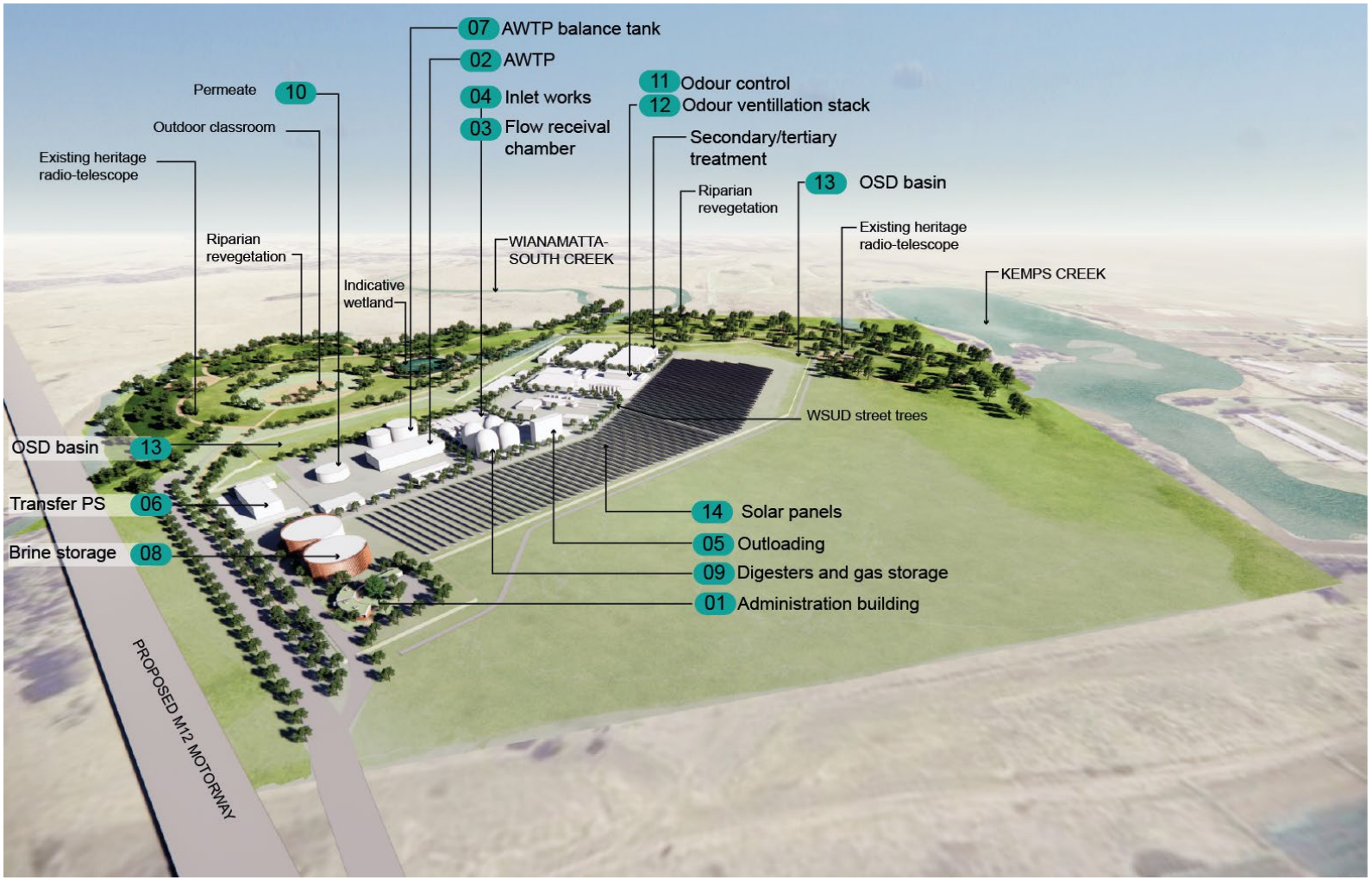



**Figure 4.1 Indicative 3d perspective of the AWRC Site Layout – Stage 1 (operational capacity up to 50ML/day). Refer Table 4.1 for component details.**

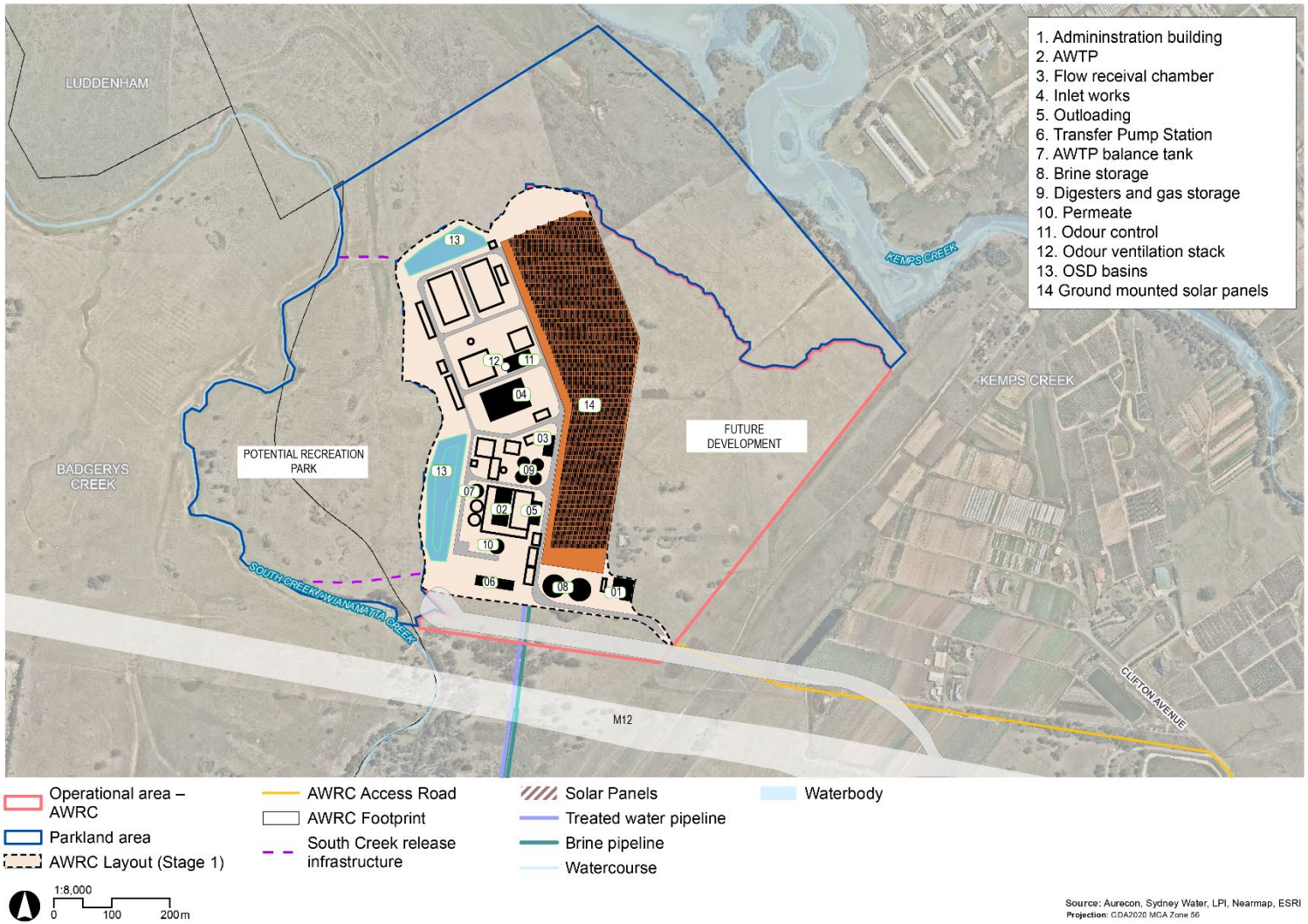



**Figure 4.2 Diagram of indicative AWRC Site Layout – Stage 1 (operational capacity up to 50ML/day). Refer Table 4.1 for component details.**

## 4.2 Pipelines

The proposed pipelines are mostly to be located underground, with above ground structures which may include low level ventilation structures (up to 300mm height). Underground pipelines will be installed by directional boring, set up within construction compounds sites (refer Figure 4.6), as further discussed in Section 4.3. The pipeline alignment and construction compounds have been located away from areas of significant vegetation, however there will be an impact to the ground conditions which may include the removal of vegetation.

At the Treated water flow splitter structure located between the Nepean River and Bents Basin Road, there will be a pipeline access point which comprises bitumen or concrete vehicle access area and low-level electrical cabinetry.

### Pipeline release structures

There are two pipeline outlets, one near to the Warragamba Dam spillway (environmental flows outlet) and the other at the Nepean River embankment near to the Wallacia weir (treated water outlet).

The structures as shown in Figure 4.3 and Figure 4.4 will be partially buried in the river embankments, with rock gabions to the front where the pipeline water will discharge. An access grate surrounded a safety railing will be visible on the surface.

Some rock riprap will be located on the river embankments from the outlet structures to the water level to mitigate scouring. Low planting (i.e. native grasses and ground covers) will be planted to impacted areas within 5 meters of the structures and other like for like revegetation planted in other construction impact areas.

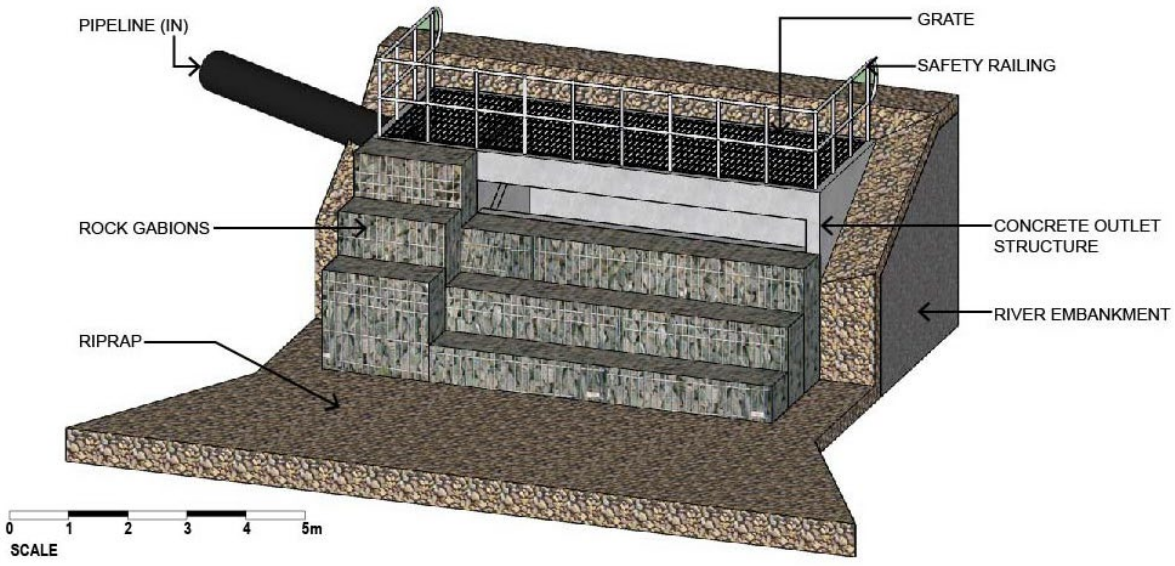



**Figure 4.3 Model image indicative of the Environmental Flows outlet structure (Warragamba River)**

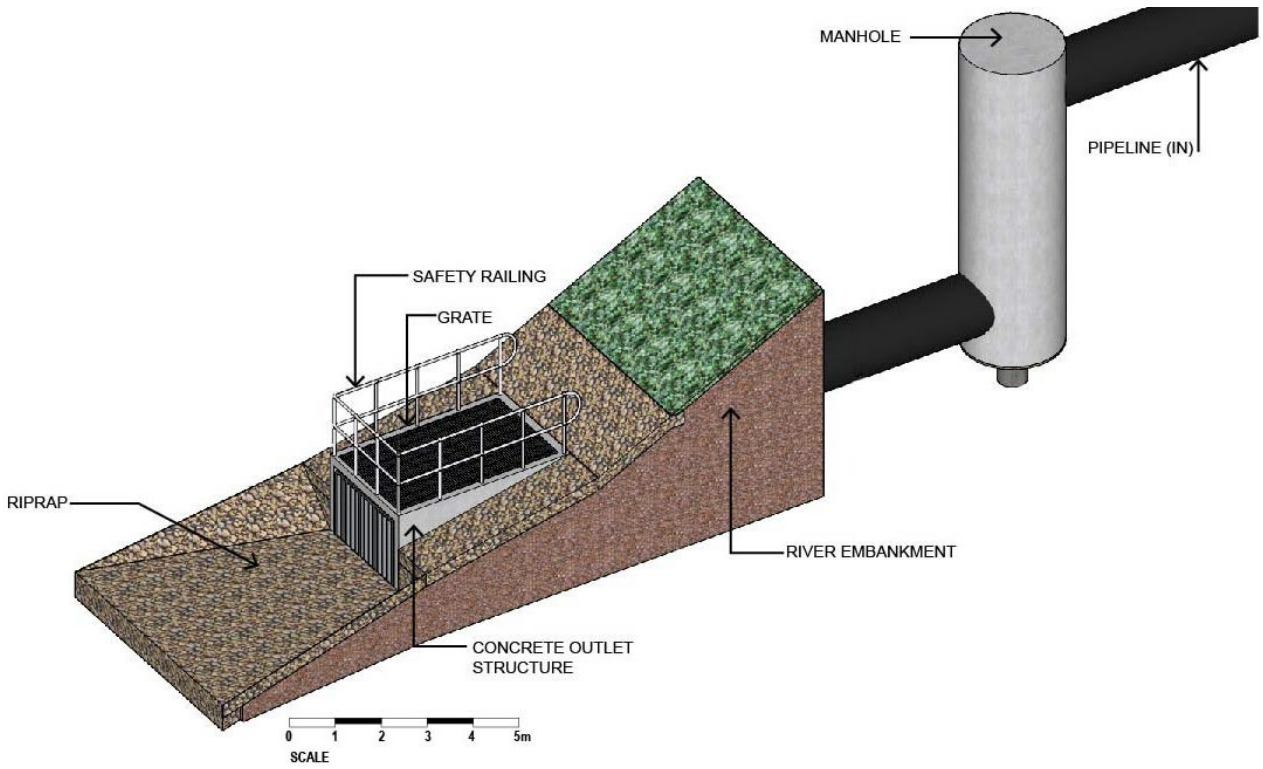



**Figure 4.4 Model image indicative of the Treated Water outlet structure (Nepean River)**

## 4.3 Construction

### Construction timing

Construction work is set to commence around mid-2022, lasting for a period of approximately 36 months. The duration of works vary between the work zones and compound sites, as provided in Table 4.2.

Key construction activities will be scheduled within standard work hours, Monday to Friday 7 am - 6 pm and Saturday 8am - 1pm as much as practically possible. There may be night works required at some of the construction compounds and along the alignment worksites, which may be subject to artificial lighting.

### Construction activity

Construction activities associated with the AWRC would consist of:

- site establishment including the installation of environmental controls, ancillary construction such as roads and fences, grubbing and removal of surface vegetation, demolition of existing buildings and contamination management
- earthworks including cut and fill, temporary drainage and soil management controls and excavation of detention basins and underground infrastructure
- civil works and structural construction including the construction of roads and stormwater infrastructure and landscaping

Due to the linear nature of the pipelines, construction may occur in segments, and occur in several locations at one time. Each segment will be served by compounds. The proposed compound locations are indicative and may change in the future as the detailed design develops.

Construction activities associated with pipeline construction include:

- compound site establishment including ground preparation for activity and pipeline boring (pipe jacking) works (refer Figure 4.5
- compound sites, including stockpiling of spoil material
- ancillary construction works including roads site compounds and fencing
- pipeline outlet structures civil construction
- landscaping (to restore construction compounds once complete)

The compounds will be temporary and are required for the Project to store plant and equipment, larger stockpiles, site offices and materials. These compound areas may be required for the time period of the construction build (up to 36 months). The compounds need to be located close to the Project to be effective, and where possible they have been located to minimise community and environmental impact. There is potential for short-term temporary visual impact from nearby viewpoints. Refer to Figure 4.6 for location of compound sites.

Construction of pipeline infrastructure will be incrementally evident along the length of the pipeline alignment where work sites will require temporary access. Active construction sites will move progressively along the alignment.

During construction of the Project, there may be some vegetation removal required to accommodate pipeline infrastructure and temporary compound sites.

The proposed site compounds are provided in Table 4.2.

**Table 4.2 Indicative construction compound locations and timing**

| Compound | Location | Indicative construction programme |
|---|---|---|
| C1 | Warragamba River via Core Park Road – Environmental flows pipeline drilling site | Q1 – Q3 2023 |
| C2 | Bent Basins Road – Environmental flows pipeline drilling site (compound may only be needed for 6 months within the 3 year period) | Q3 2022 – Q4 2025 |
| C3 | Treated Effluent release location near Wallacia Weir at Nepean River | Q3 2022 – Q1 2023 |
| C4 | West of Wallacia drilling site (Fowler Reserve) | Q4 2023 – Q2 2024 |
| C5 | 1 Park Rd, Wallacia – Effluent pipeline site office | Q3 2022 – Q1 2023 |
| C6 | 344 Park Rd, Wallacia – Main treated water construction compound (two options proposed) | Q1-Q3 2023 |
| C7 | Elizabeth Drive (between The Northern Road and Luddenham Road) | Q1-Q3 2023 |
| C8 | Water Recycling Centre site | Q3 2022 – Q4 2025 |
| C9 | Western Sydney Parklands, near Liverpool Offtake Reservoir – multiple small compounds, including M7 underbore | Q3 2023 – Q4 2025 |
| C10 | Liverpool reservoir, Cecil Hills – Brine Satellite Compound | Q3 2022 – Q4 2025 |
| C11 | Plan DP262454 Lot 419, Bonnyrigg – Brine Satellite Compound | Q3 2022 – Q4 2025 |
| C12 | East Parade, Fairfield – Brine Pipeline satellite compound Brine Pipeline deposit 2, west of Henry Lawson Drive and Prospect Creek | Q1-Q2 2023 |
| C13 | Cabravale Park – Cabramatta Rail underbore crossing | Q1-Q2 2023 |
| C14 | Lansvale Park, Lansdowne – west of Henry Lawson Drive and Prospect Creek | Q1-Q3 2023 |

| Compound | Location | Indicative construction programme |
|---|---|---|
| C15 | Lansdowne east of Henry Lawson Drive – NGRS connection location | Q1-Q3 2023 |

The below table indicates the activity proposed at each of the above compounds.

**Table 4.3 Construction compound activities**

| Activity | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Earthworks** | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ |
| **Site office** | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | |
| **Worker parking** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Spoil storage** | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Drilling** | ✓ | ✓ | | ✓ | | ✓ | ✓ | | ✓ | | | | ✓ | ✓ | ✓ |
| **Equipment storage** | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Materials laydown** | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Pipe welding** | ✓ | ✓ | | ✓ | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ |

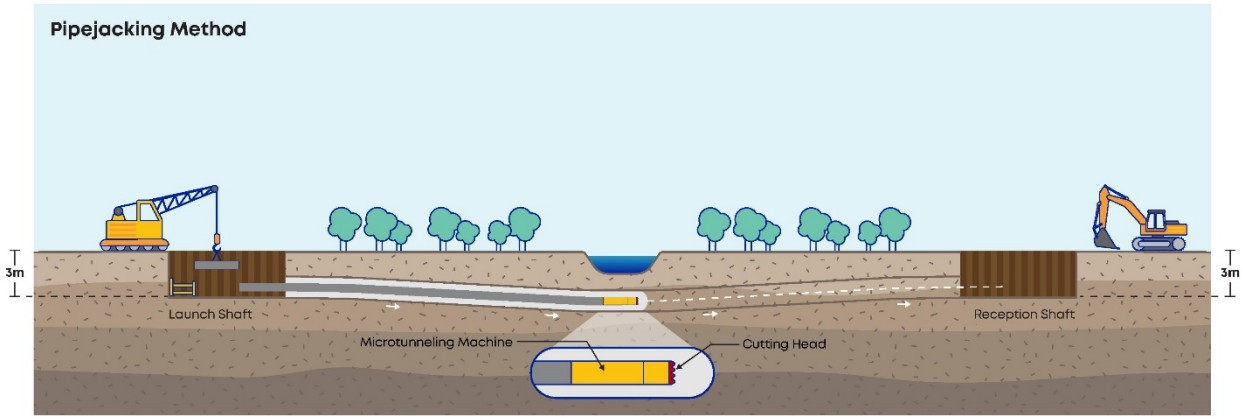
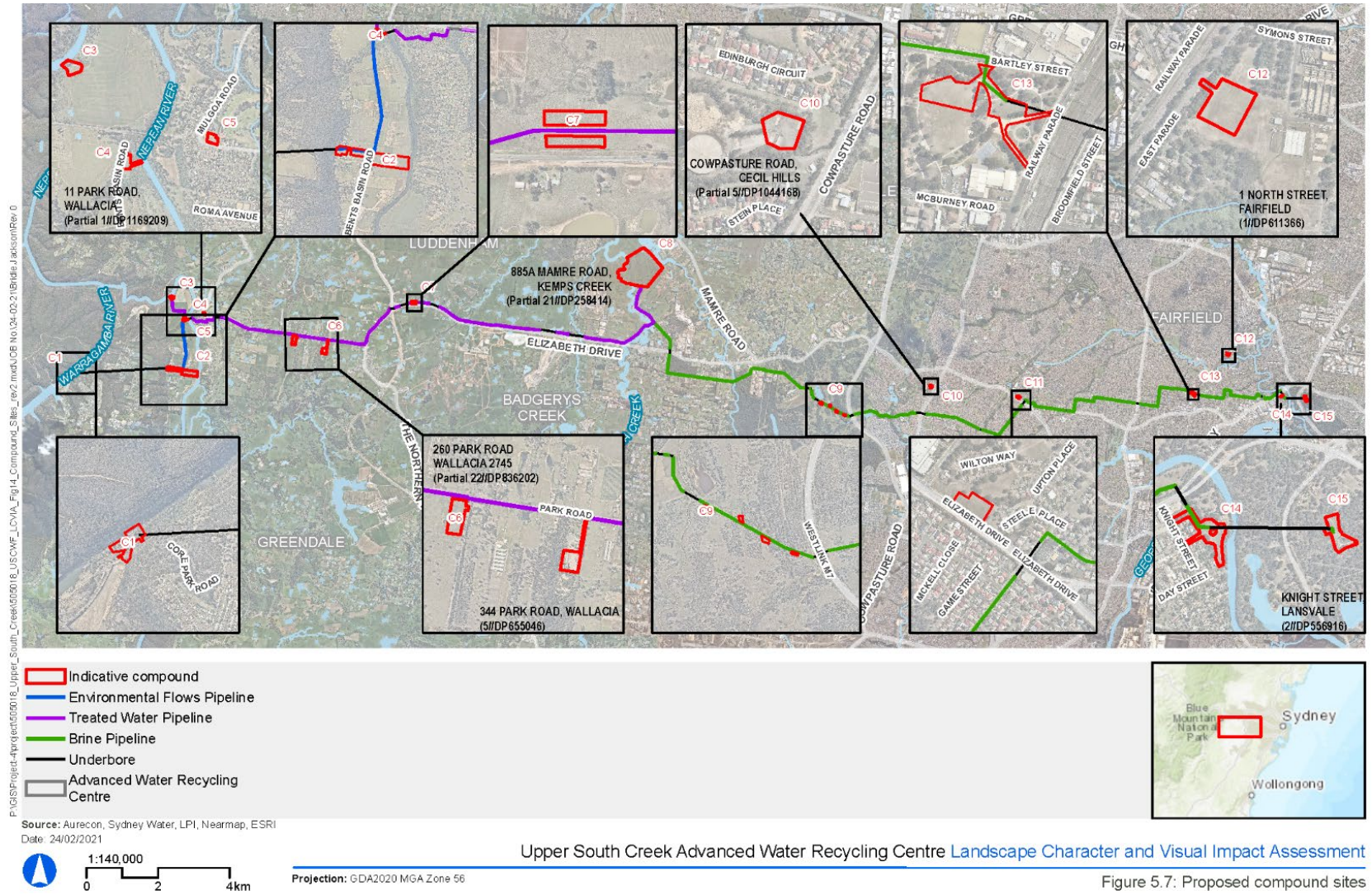



**Figure 4.5 Illustration of pipe jacking tunnelling construction**




## Figure 4.6: Indicative compound sites locations

## 4.4 Future Stages

The assessment in this LCVIA is for Stage 1 of the Upper South Creek AWRC for 50ML/day sized facility. Future stages of the Upper South Creek AWRC (subject to separate approvals) which will enable the ultimate capacity of the AWRC to increase up to 100ML/day (refer to Figure 4.6 on page 43).

The future stage site layout will be located alongside Stage 1 (Figure 5.2). The future stage indicative design mirrors Stage 1, as shown in Figure 4.7. The location of the future stages directly next to Stage 1 is favourable in terms of minimising further landscape character and visual impact for the future stages.

The Project is located within an area undergoing fundamental change in the short, medium and long term. The Draft Western Sydney Aerotropolis Plan (WSAP, DPIE, 2020) has identified a high-level structure plan with changes to future land uses, transport infrastructure and Blue-Green grids within the aerotropolis boundary.

The AWRC is located within the northern extent of the Kemps Creek Precinct identified as within the Structure Plan as 'Environmental and Recreation' (within flood zones) and 'Enterprise' (area for proposed built facilities). Land north, east and west of the of the AWRC has been earmarked as potential future parkland areas along the Wianamatta – South Creek Precinct identified primarily for biodiversity conservation and recreation. Future Enterprise land (expected to be industrial in land use) and the M12 Motorway and rail stabling yards will be located to the south of the proposed site.

In relation to landscape character impact, Stage 1 represents the introduction of new infrastructure to the visual context, however, future stages will only augment an existing visual character on the site. By the time future stages of the the AWRC are being built or operational it is likely some of the precincts outlined in the Western Sydney Aerotropolis (WSA) will have been developed, possibly including the surrounding parts of the Kemps Creek precinct.

There is no future stage works proposed for the pipelines, therefore an assessment of future stages is assessed for the AWRC only. The WSAP identifies that both treated water and environmental flows pipeline may transverse across Enterprise land (likely to be industrial/commercial), environmental and recreational land and land earmarked for continuing agribusiness.

Refer to Section 1.2.1 for future development assumptions that have been considered as part of this assessment

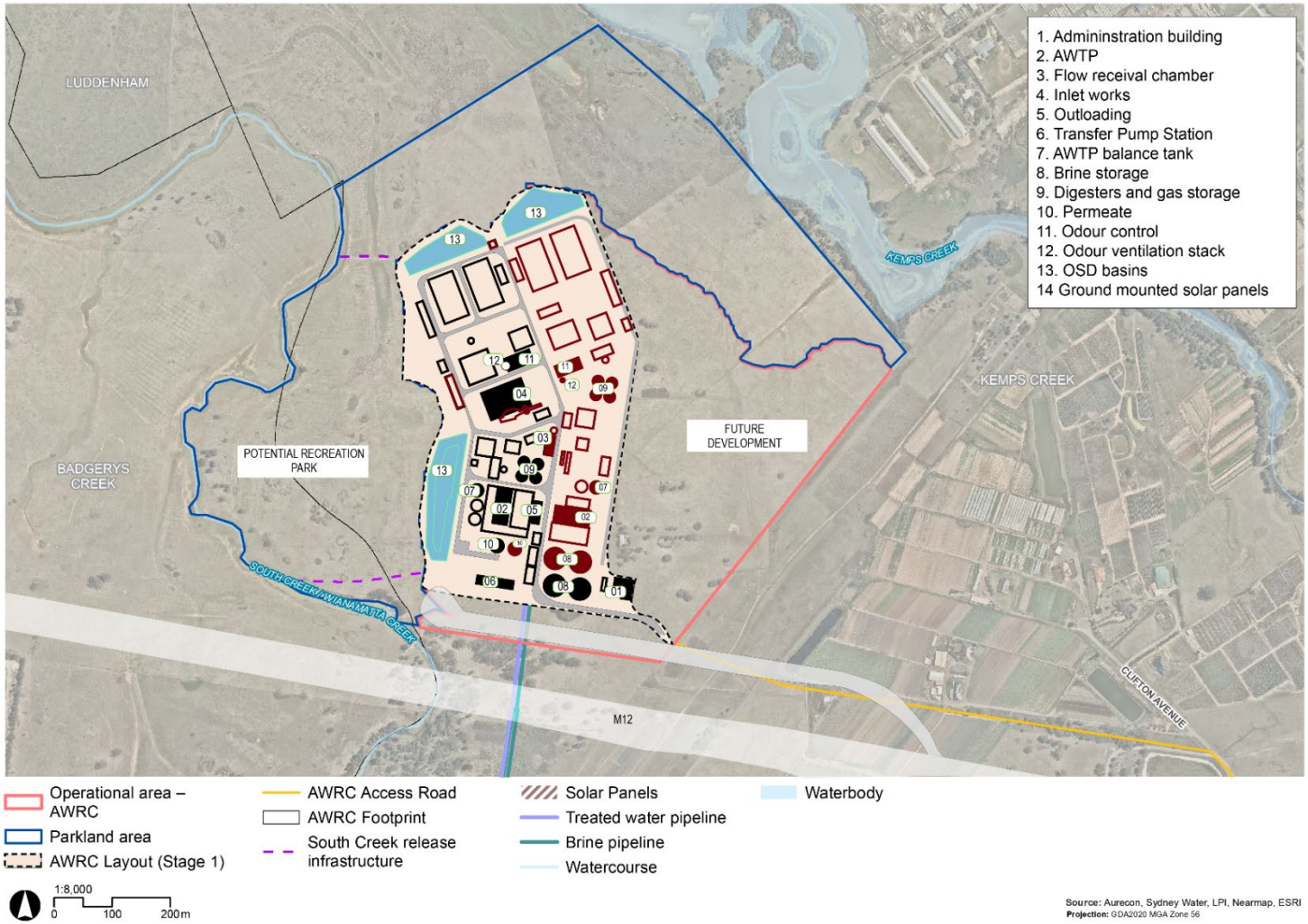



**Figure 4.7 Diagram of indicative AWRC site layout – Future Stages (operational capacity up to 100ML/day)**

## 4.5 Avoidance through design

Avoidance in design is the avoidance and minimisation of impacts achieved through the design process and a discussion of avoidance and minimisation for the project is found at Chapter 4 in the EIS. Avoidance in design for visual impact includes:

**Site selection AWRC** – whilst there are other considerations involved in the site selection process, the location of the AWRC minimises impact on public amenity because it provides some separation from residential localities and is set back from Elizabeth Drive meaning it cannot be seen by users of this road. It is also close to the existing Resource Recovery Park which is another existing industrial land use within the local area. The site will be close to other significant infrastructure projects such as the Western Sydney Airport and the proposed M12 Motorway, which means it will be consistent with future land uses in terms of visual impact.

**Pipeline alignment** –Sydney Water's standard preferred approach to pipeline design is to locate the pipelines in roads and road reserves avoiding disturbance to private property minimising vegetation removal. The Projects pipeline are located underground, the exception is low level above ground structures such as air ventilation structures, scour valves and flow splitter structures which will not have a significant visual impact.

**Vegetation removal during construction** – Where possible during construction, removal of vegetation will be avoided to minimise temporary and short term visual impacts.

### Landscape and urban design approach

The below landscape and urban design treatments have been considered in the assessment for Stage 1 and align with the urban design principles developed by Sydney Water for the AWRC site. They present opportunities to be considered as part of detailed design, Figure 5.9 below shows a concept for how these principles and opportunities could be implemented. Sydney Water will use these concepts to develop a more detailed design for the operational and green space area that aligns with technical design.

Landscaping treatment for the pipeline consists of revegetation.

Potential management measures to be considered as part of the impact assessment are listed below in Table 5.5.

**Table 4.4 Indicative treatments considered as part of the impact assessment**

| Potential impact | Indicative treatments and opportunities | Intent of treatment |
|---|---|---|
| **Visual impact of pipeline construction** | **1. Revegetation**<br>Surface works revegetation including:<br>• Like-for-like revegetation<br>• Low-level revegetation in areas where trees are unable to planted due to operational requirements. | Integrate the Project with the surrounding landscape (AWRC and pipelines) |

| Potential impact | Indicative treatments and opportunities | Intent of treatment |
|---|---|---|
| **Visual impact of AWRC** | **2. Vegetation screening**<br>Groups of trees placed to screen larger AWRC industrial components<br>Use of landform to integrate the facility components into the surrounding landscape, including planted embankments for additional visual screening. | Screen the AWRC in closer proximity to sensitive receptors. |
| **Visual impact of AWRC** | **3. Living walls**<br>Green walls or climbing plants to the façade of proposed AWRC buildings. | Soften the appearance of structures. |
| **Visual impact and character influence of AWRC** | **4. Architectural design**<br>Where possible, building techniques and materials will incorporate screens, facades and use a colour palette to soften their appearance within the landscape and create a unified palette.<br>• A unified architectural language for the treatment of buildings on site, including cladding and screening.<br>• Where key façades are exposed on buildings and tanks, vertical blades are applied to break up the form and to improve the appearance. | Enhance community perception of the facility by limiting the industrial aesthetics of structures and celebrating views of the AWRC. |
| **Loss of Site history and landscape character** | **5. Heritage preservation**<br>Two existing relic satellite dishes at the AWRC site, are incorporated as site features in a proposed walking trail, along with information signage. | Sensitive treatment of the AWRC Site and its heritage. |
| **Landscape character impact of AWRC** | **6. Heritage interpretation**<br>AWRC site outdoor classroom – provides an opportunity to engage with local community groups and businesses and provide pathways to knowledge sharing and research around environmental sustainability, Aboriginal culture, indigenous planting, water and land management practices and local heritage. | Sensitive treatment of the site and its heritage to educate community about the facility. |
| **Landscape character impact of AWRC** | **7. Public access (if the future recreational opportunity proceeds)**<br>Access to waterways and potential connections to WSP, with proposed walking trail within AWRC site. This provides opportunities to engage with local community groups and businesses and provide pathways to knowledge sharing and research around environmental sustainability, Aboriginal culture, water and land management practices and local heritage. | Enhance community perception of the facility. |

Sydney Water has developed an urban design approach for the AWRC site, illustrating the extent of proposed landscaping to manage potential visual and landscape impacts, comprising of the site in a parkland setting, the application of architectural treatments and consideration for its landscape, ecological and heritage context. The landscape and urban design plan (Figure 4.8 Stage 1 AWRC Illustrative Landscape Master Plan), includes potential components such as walking tracks, seating, shading and signage that could be incorporated if the future recreational opportunity proceeds.

### AWRC revegetation

Landscaping of the AWRC will be implemented to achieve outcomes guided by the urban design principles, comprising indicative treatments and opportunities indicated at Table 5.5.

As the AWRC is located within eight kilometres of the future international airport, as detailed design progresses the landscaping for the AWRC will factor in airport safeguarding approaches, including those in relation to wildlife attraction.

There will be operational and maintenance constraints associated with the AWRC which may place revegetation limitations on some areas.

### Pipeline landscape revegetation

In an effort to minimise the visual impacts associated with the removal of vegetation, replanting and rehabilitation will occur along the pipeline alignments and compound sites, restoring like-for-like where practical.

Within the pipeline impact areas like-for-like rehabilitation and/or restoration will occur, except where:

- like-for-like restoration is not compatible with underground infrastructure e.g. trees will not be planted where roots can interfere with the pipelines; or
- where other future infrastructure in the vicinity of the project, may not allow.

Vegetation species that are compatible with Sydney Water and local council guidelines, will be employed for replanting.

It is assumed that riparian and environmentally sensitive areas will be restored in accordance with restoration plans developed during detailed design, informed by the EIS specialist studies.

### Obtrusive lighting

Lighting for the AWRC will be considered at detailed design, however the impact assessment assumes that the following measures are implemented to reduce potential impacts:

- Use of downlighting to avoid light spill; and
- Layout of lighting is not to replicate airport runway, given the proximity of the WSA.


**Figure 4.8 Stage 1 AWRC Illustrative Landscape Master Plan**

# 5 Landscape Character Impact Assessment

Landscape Character Impact Assessment descriptions of each LCZ is contained in the following section along with the potential impacts in the following phases:

- Construction (refer section 4.3)
- Stage 1 Operational – Year 1 (refer section 4.1 and 4.2)
- Stage 1 Operational – Year 10 (refer section 4.5)
- Future Stages (section 4.4)

Given the scale of the Project and the associated pipelines, the landscape character assessment was split into three assessment areas:

1. AWRC
2. Treated water and environmental flows pipeline
3. Brine Pipeline

## 5.1 Landscape Character Zones

The landscape character of the area has been assessed through a process of desktop studies including the site context appraisal and land use zones identified in section **Error! Reference source not found.**. 11 LCZs have been identified within the Study Area. These have been defined in Table 5.1 below.

**Table 5.1 Landscape Character Zones**

| LCZ | Description | Relevant assessment area |
|---|---|---|
| **LCZ 1** | Rural land/future Enterprise land | AWRC, Treated water and environmental flows pipeline, Brine pipeline |
| **LCZ 2** | Mount Vernon and Kemps Creek rural residential | AWRC, Treated water and environmental flows pipeline |
| **LCZ 3** | Twin Creeks residential community and Golf Club | AWRC |
| **LCZ 4** | Environmental conservation and future environment/ recreational zones | AWRC, Treated water and environmental flows pipeline |
| **LCZ 5** | Western Sydney Airport | AWRC, Treated water and environmental flows pipeline |
| **LCZ 6** | Wallacia residential area | Treated water and environmental flows pipeline |
| **LCZ 7** | Luddenham residential area | Treated water and environmental flows pipeline |
| **LCZ 8** | Warragamba/Silverdale township | Treated water and environmental flows pipeline |
| **LCZ 9** | Resource Recovery and Quarrying | AWRC, Treated water and environmental flows pipeline |

| LCZ | Description | Relevant assessment area |
|---|---|---|
| **LCZ 10** | Western Sydney Parkland | Brine pipeline |
| **LCZ 11** | Residential localities | AWRC, Brine pipeline |

### 5.1.1 AWRC

There are five Landscape Character Zones (LCZs) identified within the AWRC Study Area (refer Figure 6.1).

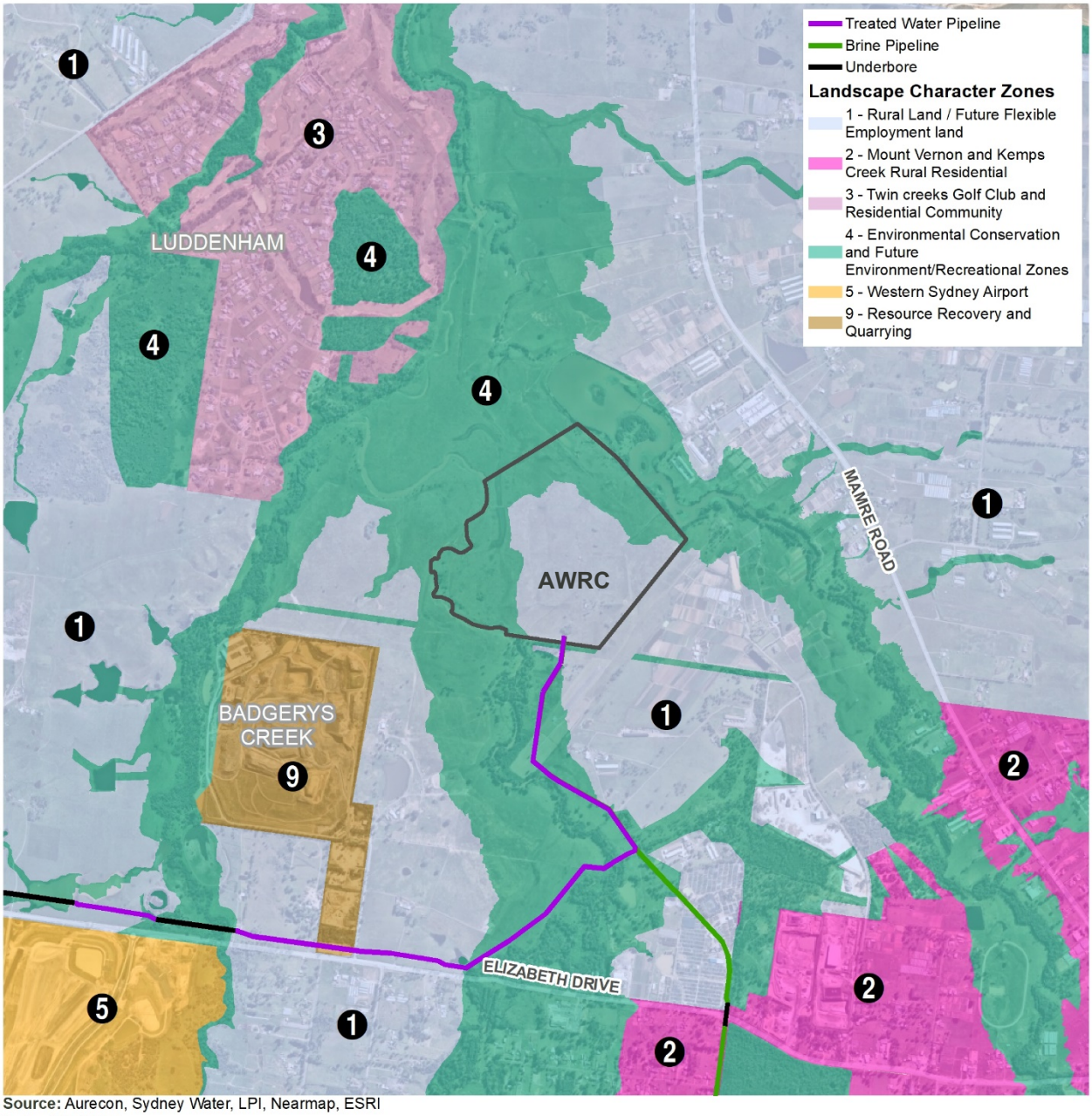



**Figure 5.1: Landscape Character Zones – AWRC**

**Table 5.2 LCZ 1 – AWRC: Landscape Character assessment**

| LCZ 1 | **Rural Land and** future Enterprise land | |
|---|---|---|
| **Description and Key Characteristics** | The AWRC is located within a rural locality with a mix of agricultural and rural living uses surrounding the site. The rural landscape contains a relatively flat topography overall, with some slight undulation across the terrain. The land area is largely cleared of vegetation, with the exception of grasses, following years of agricultural activities including crop growing, grazing and other farm related activities, with some extractive resource industries. Remnants of native vegetation, including stands of trees, occur along riparian corridors (creek and drainage lines) and scattered along road land boundaries and woodland areas. Residences are substantially set back from roadways and often partially shielded from street views. | |
| **Sensitivity** | The rural landscape is highly modified for pastural and grazing land. There are structures relating to farming activity spotted within the zone, however it remains largely undeveloped and has desirable characteristics comprising of natural features and paddocks. Existing agricultural and industrial buildings are present in the area including the Resource Recovery Park (LCZ 9). The LCZ is considered to have a **moderate sensitivity**, being able to partly accommodate changes. | |
| **Landscape Character magnitude of change** | | |
| **Construction** | The construction of the AWRC is considered to have a **high** magnitude of change from the existing rural character, with the introduction of a large construction site, machinery and building works. | |
| **Stage 1 Operational - Year 1** | The Project will introduce new large-scale elements which are not is the existing setting. The scale of the AWRC will be considerable and without landscape mitigation, will contrast to this landscape character. As such the magnitude of change is considered **high**. | |
| **Key mitigation measures** | 2-Vegetation screening, 4-Architectual design | |
| **Stage 1 Operational - Year 10** | Landscape mitigation including vegetation screening will assist in integrating the AWRC with surrounding vegetation water corridors within LCZ 4 (Environmental conservation and future environment/ recreational zones). Although sheds and tanks are a part of the existing rural elements, the AWRC is an industrial scale which the architectural façade treatments will help to change the industrial aesthetic to that which is more designed. The magnitude of change is considered **moderate**. | |
| **Future Stage** | Future land use will comprise of commercial and industrial buildings, along with large connector roads within the LCZ. The increased scale and elements of the Future Stage AWRC, will be commensurate will commercial and industrial typology, with a **low** level of contrast to future land use. | |
| **Landscape Character impact ratings** | | |
| **Construction** | | Moderate sensitivity + high magnitude of change = **high-moderate impact** |

| LCZ 1 | **Rural Land and** future Enterprise land |
|---|---|
| **Stage 1 Operational - Year 1** | Moderate sensitivity + high magnitude of change = **high-moderate impact** |
| **Stage 1 Operational - Year 10** | Moderate sensitivity + moderate magnitude of change = **moderate impact** |
| **Future Stage** | Moderate sensitivity + low magnitude of change = **moderate-low impact** |

### Table 5.3 LCZ 2 – AWRC: Landscape Character assessment

| LCZ 2 | Mount Vernon and Kemps Creek Rural Residential zone |
|---|---|
| **Description and Key Characteristics** | The AWRC is in near proximity to the Mount Vernon and Kemps Creek rural residential areas, which are zoned primary production small lots and environmental living. The area has an undulating topography with multiple hills and ridgelines which allow open sweeping outlooks across surrounding lower lying land.<br>Large residential dwellings are a common built form in rural residential areas with large residential lots. Native trees are prominent throughout the area particularly along flood way areas and exotic tree species within residential landscaping. |
| **Sensitivity** | The rural residential locality of Kemps Creek and Mount Vernon is considered to have a **high sensitivity** given the low density rural residential nature of the locality benefitting from the rural amenity of adjoining land uses. |
| **Landscape Character magnitude of change** | |
| **Construction** | The impacts to this LCZ are indirect with potential impacts to adjacent land use zones. The scale of the AWRC construction site will be barely noticeable from within LCZ 2, with construction activity including haulage trucks may be noticeable from some areas within this LCZ. The magnitude of the proposed facility's construction is considered **low**. |
| **Stage 1 Operational - Year 1** | The operational AWRC is not likely to be noticeable from within this LCZ, with intervening topography and vegetation, plus the built M12 Motorway screening its presence. The magnitude of change is deemed to be **negligible** to LCZ 2, |
| **Key mitigation measures** | No proposed mitigation |
| **Stage 1 Operational - Year 10** | Landscape mitigation effects will be **negligible** within LCZ 2 to this LCZ at Stage 1 operational. |

| LCZ 2 | Mount Vernon and Kemps Creek Rural Residential zone | |
|---|---|---|
| **Future Stage** | | The expansion of the AWRC to 100ML capacity, is not likely to have a noticeable change to LCZ2. The scale of the Project will be dwarfed by future development including Western Sydney Airport, upgraded road corridors and expansion to Kemps Creek residential and commercial areas. The magnitude of change is reasoned to be **negligible**. |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + negligible magnitude of change = **negligible** impact. |
| **Stage 1 Operational - Year 10** | | High sensitivity + negligible magnitude of change = **negligible** impact. |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible** impact. |

## Table 5.4 LCZ 3 – AWRC: Landscape Character assessment

| LCZ 3 | Twin Creeks residential community and Golf Club |
|---|---|
| **Description and Key Characteristics** | The Twin Creeks residential community and Golf Club is located north west of The AWRC and is zoned for environmental living and private recreation. The area is characterised by expansive high-quality detached dwellings within large landscaped lots, which are likely to have been built in recent times with some dwellings currently under construction. Strategic plans do not suggest any further development of the area at this time. Native trees are prominent throughout the area particularly along floodway areas and exotic tree species within residential landscaping. The surrounding rural and bushland areas are unique to this residential area. |
| **Sensitivity** | This landscape character zone is considered to have a **high sensitivity** to change given the low-density residential nature of the locality and recreational use, with a low ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | Impacts are indirect to this LCZ. Whilst the AWRC introduces an industrial site nearby, it does not propose changes to character surrounding the residential area. The magnitude of change during construction is considered **negligible** upon LCZ 3. |
| **Stage 1 Operational - Year 1** | Effects of the AWRC are indirect to this LCZ. Some views may be available from the periphery of the residential area; however these are expected to be somewhat limited, of short duration and not considered of central importance to the overriding character. The physical distance as well as intervening topography and vegetation within LCZ 4, results in a **negligible** magnitude of change for LCZ 3. |

| LCZ 3 | Twin Creeks residential community and Golf Club |
|---|---|
| **Key mitigation measures** | Mitigation is not expected to be noticeable within LCZ 3 |
| **Stage 1 Operational - Year 10** | Landscape mitigation to the AWRC are not expected to have any further effects to this LCZ. |
| **Future Stage** | The expansion of the AWRC to 100ML capacity, is not likely to have any further noticeable change to LCZ 3. The scale and character of the Project will be morphed by future development including Western Sydney Airport, upgraded road corridors and expansion to Kemps Creek residential and commercial areas. The magnitude of change of the Future Stage is reasoned to be **negligible** upon LCZ 3. |
| **Landscape Character impact ratings** | |
| **Construction** | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 1** | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Future Stage** | High sensitivity + negligible magnitude of change = **negligible impact** |

## Table 5.5 LCZ 4 – AWRC: Landscape Character assessment

| LCZ 4 | Environmental Conservation and Future environment/ recreational zones |
|---|---|
| **Description and Key Characteristics** | The existing and future environmental and recreational parkland areas surrounding the AWRC follow existing creek and riparian corridors. These areas comprise of native vegetation which provide tree canopy coverage in the area and add to the natural amenity of the landscape. There are highly modified areas near to the AWRC site including a landfill SUEZ Kemps Creek Resource Recovery Park (LCZ 9) and the West Sydney Sand and Soil supply site.<br>The Western Sydney Aerotropolis structure plan identifies this land for environment and recreation uses under the structure plans which are for purposes including regional parks, biodiversity conservation, and flood management/mitigation. |
| **Sensitivity** | The character zone is considered to be of **high sensitivity** due to the area being a parkland of environmental of recreational value, with a low ability to accommodate change proposed. |

| LCZ 4 | Environmental Conservation and Future environment/ recreational zones | |
|---|---|---|
| **Landscape Character magnitude of change** | | |
| **Construction** | During construction, the Project would introduce a large construction site in close proximity to this LCZ, however the site location is proposed to avoid environmental and recreational areas marked for enhancement and is indirect to LCZ 4. Construction will include earthworks to build swales and basins, as well as the AWRC site, providing a modified landform. The construction will avoid impacts within this LCZ, although there may be some limited areas which are accessed and a low-level of vegetation removal. The level of modification is considered to be **low.** | |
| **Stage 1 Operational - Year 1** | The AWRC site is being located to minimise the impacts on this LCZ including flood zone areas and existing vegetation. In close proximity to the AWRC will be a noticeable change, with new industrial-scaled elements including large buildings, tanks, pipes, solar panels, operated water ponds and a low-level modified landform; contrasting to the vegetated waterways. The level of modification is considered to be **moderate**. | |
| **Key mitigation measures** | 1-Low-level revegetation, 2-Vegetation screening, 7-Public access | |
| **Stage 1 Operational - Year 10** | Landscape mitigation including revegetation will assist in integrating the AWRC with surrounding vegetated water corridors and parkland recreation within LCZ 4 and LCZ 1 (rural land). Introduced industrial-sized elements will remain to be noticeable from although from limited areas within LCZ 4. The magnitude of change is considered **low**. | |
| **Future Stage** | The Future Stage of the AWRC, is not likely to have any further noticeable change to LCZ 4. The scale and character of the Project will be morphed by future development including Western Sydney Airport, upgraded road corridors and expansion to Kemps Creek residential and commercial areas. The magnitude of change is reasoned to be **low**. | |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + moderate magnitude of change = **high-moderate impact** |
| **Stage 1 Operational - Year 10** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Future Stage** | | High sensitivity + low magnitude of change = **moderate impact** |

### Table 5.6 LCZ 5 – AWRC: Landscape Character assessment

| LCZ 5 | Western Sydney Airport |
|---|---|
| **Description and Key Characteristics** | The future site of the Western Sydney International (Nancy-Bird Walton) Airport is located south west of the proposed facility where construction is currently underway. The Airport will be a highly modified, secured area comprising runways, terminals, freight buildings, control towers as well as other associated buildings with high levels of road traffic and visitors. The airport is expected to be completed in 2026 delivering international, domestic and freight services.<br>The Western Sydney Airport will have a substantial modification to the landscape with the introduction of its built environment. |
| **Sensitivity** | The sensitivity of the character zone is considered **moderate** as the airport will become a significant transport hub welcoming a host of domestic and international travellers and comprising mixed-use facilities, including roads, commercial and industrial sites. Once built, the LCZ is expected to have some ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | The construction and operation of the airport is anticipated to follow the completion of the AWRC. As such, the magnitude of change as a result of construction of the AWRC on this LCZ is considered **negligible.** |
| **Stage 1 Operational - Year 1** | The construction of the airport and the M12 is expected to have been completed at year 1. When viewed from afar, the AWRC will have much less visual mass relative to the surrounding rural and vegetated corridors which surround the airport. Views toward the AWRC are not expected to be visible from the airport environs, except for those experienced for a short duration from overhead planes. The magnitude of change to the LCZ is considered **negligible.** |
| **Key mitigation measures** | 1-Low-level revegetation, 2-Vegetation screening |
| **Stage 1 Operational - Year 10** | Landscape mitigation including revegetation will assist in integrating the AWRC with surrounding vegetation water corridors within LCZ 4 (Environmental conservation and future environment/ recreational zones). This is not expected to be noticeable within the airport environs, resulting in a **negligible** magnitude of change. |
| **Future Stage** | The future Stage of the AWRC, is not likely to have any further noticeable change to LCZ 5. Other commercial and residential developments would be surrounding the proposed facility, with the expansion of the AWRC providing a **negligible** magnitude of change. |
| **Landscape Character impact ratings** | |
| **Construction** | Moderate sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 1** | Moderate sensitivity + negligible magnitude of change = **negligible impact** |

| LCZ 5 | Western Sydney Airport | |
|---|---|---|
| **Stage 1 Operational - Year 10** | | Moderate sensitivity + negligible magnitude of change = **negligible impact** |
| **Future Stage** | | Moderate sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.7 LCZ 9 – AWRC: Landscape Character assessment

| LCZ 9 | Resource Recovery and Quarrying | |
|---|---|---|
| **Description and Key Characteristics** | | Resource recovery and quarrying sites are common within the locality which stem from historical uses and future demand for resource recovery facilities due to urban growth in Sydney.<br>The site is highly disturbed with considerable earthworks which includes piles of land fill on the site. The area also contains heavy machinery and vehicles which assist in the activities on site. |
| **Sensitivity** | | Given the constant change and lack of sensitive receptors associated with the LCZ, the sensitivity of the LCZ is considered **negligible**. These industrial land uses are considered to have a low sensitivity to change given the land use is already significantly disturbed and varied with earthworks and waste products. |
| **Landscape Character magnitude of change** | | |
| **Construction** | | The level of modification to this LCZ is considered negligible, given that this LCZ is a large industrial site. |
| **Stage 1 Operational - Year 1** | | The level of modification to this LCZ is considered negligible. |
| **Key mitigation measures** | | Mitigation not expected to be noticeable within LCZ 9 |
| **Stage 1 Operational - Year 10** | | The level of modification to this LCZ is considered negligible. |
| **Future Stage** | | There is no further modification proposed for the pipeline. |
| **Landscape Character impact ratings** | | |
| **Construction** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 1** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |
| **Future Stage** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |

### 5.1.2 Treated Water and Environmental flows pipelines

As shown in Figure 6.2, eight Landscape Character Zones (LCZ) have been identified within the Project area of the Treated Water and Environmental Flows pipelines:

Descriptions of each LCZ within the Study Area, is contained in the following section along with the potential impacts.

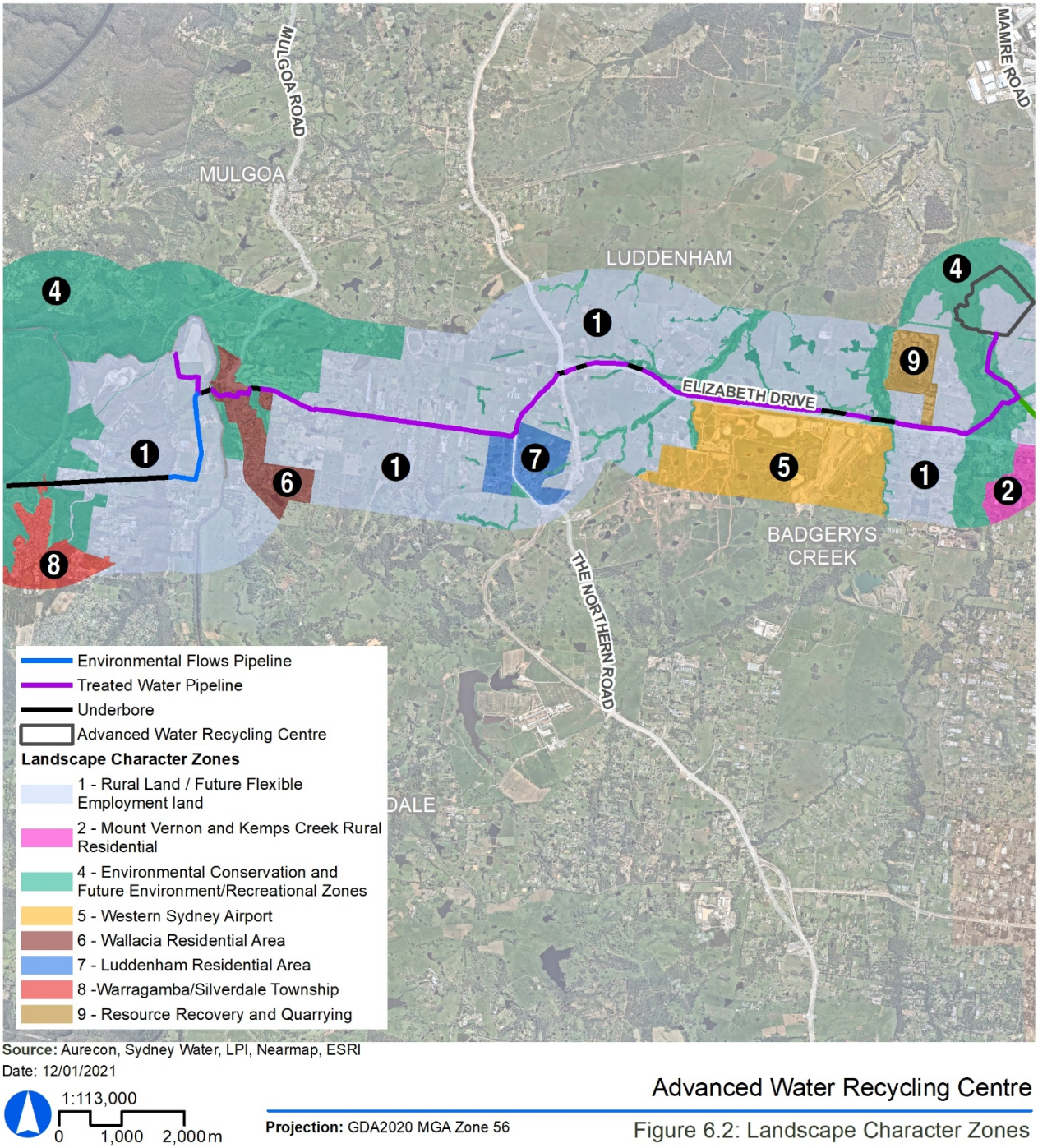



**Figure 5.2 Landscape Character Zones – Treated Water and Environmental Flows Pipeline**

### Table 5.8 LCZ 1 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 1 | Rural Land |
|---|---|
| **Description and Key Characteristics** | The Treated Water and Environmental Flows pipelines are located within a rural locality with a mix of agricultural and rural living land uses. Both corridors generally align along established roads (Elizabeth Drive, the Northern Road and Park Road) and/or infrastructure corridors from the AWRC, towards the Nepean River and Warragamba River. The land area is largely cleared of vegetation following years of agricultural activities including crop growing, grazing, other farm related activities and some extractive resource industries. Remnants of native vegetation occur along riparian corridors (creek and drainage lines) and scattered along road reserve boundaries and woodland areas. Residences are set back from roadways and often partially shielded from view.<br>Rural and agricultural landscapes within the Greater Sydney Region are limited due to the historic growth patterns of Sydney, placing increased pressure on these localities to cater for urban expansion. |
| **Sensitivity** | The rural landscape is highly modified for pastural and grazing land. There are structures relating to farming activity spotted within the zone, however it remains largely undeveloped and has desirable characteristics comprising of natural features and agricultural paddocks. LCZ 1 is considered to have a **moderate sensitivity**, with some ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | The Water Treatment pipeline option will align mostly along Elizabeth Drive and Park Road before navigating through the residential locality Wallacia and traversing towards the Nepean River. There will be some removal of roadside vegetation to accommodate the underground pipelines. This will be more apparent where there are larger groups of trees along Park Road. There are four construction compounds located near Bents Basin Road (C2-C5). The magnitude is considered to be **moderate** given the disruption and impact to the amenity in the area. |
| **Key mitigation measures** | 1-Low-level revegetation |
| **Stage 1 Operational - Year 1** | The presence of the underground pipeline is not likely to be noticeable in the LCZ. The low level of vegetation removal is considered commensurate with the scattered trees within the LCZ. The magnitude of change is considered **low**. |

| LCZ 1 | Rural Land | |
|---|---|---|
| **Stage 1 Operational - Year 10** | | The Western Sydney Aerotropolis Structure Plan identifies that much of the rural land areas in the character zone are proposed to accommodate Enterprise and or urban land in the future. It is likely that much of the rural land in the character zone will transition towards varying land uses (likely industrial) which will occur as the Aerotropolis develops. The permanent loss of roadside vegetation will be absorbed by other future land use, with an ensuing **negligible** level of modification and subsequent residual impact. |
| **Landscape Character impact ratings** | | |
| **Construction** | | Moderate sensitivity + moderate magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 1** | | Moderate sensitivity + low magnitude of change = **moderate-low** impact |
| **Stage 1 Operational - Year 100** | | Moderate sensitivity + negligible magnitude of change = n**egligible impact** |

**Table 5.9 LCZ 2 – Treated Water and Environmental Flows pipeline: Landscape Character assessment**

| LCZ 2 | Mount Vernon and Kemps Creek Rural Residential |
|---|---|
| **Description and Key Characteristics** | Large residential dwellings are a common built form in these rural residential areas within large residential lots, often set back from the road. Native and exotic tree species are prominent throughout the area particularly along floodway areas and residential landscaping. |
| **Sensitivity** | The rural residential locality of Kemps Creek and Mount Vernon is considered to have a high sensitivity to change given the low density rural residential nature of the locality benefitting from the rural amenity of adjoining land uses. |
| **Landscape Character magnitude of change** | |
| **Construction** | The magnitude of change is considered to be low during construction. The pipeline construction and some vegetation removal are not directly within this LCZ, therefore the magnitude of change is anticipated to be barely noticeable, from within this LCZ. |
| **Key mitigation measures** | 1-Low-level revegetation |
| **Stage 1 Operational - Year 1** | During operation, the pipeline would be located below ground apart from some low level civil structures such as pit holes. As such, the pipeline would have a negligible magnitude of change on this LCZ. |

| LCZ 2 | Mount Vernon and Kemps Creek Rural Residential | |
|---|---|---|
| **Stage 1 Operational - Year 10** | | The area has not experienced significant densification in recent years; however, the Penrith Local Strategic Planning Study identifies that the suburb of Mount Vernon will be investigated for increased housing densification. Kemps Creek however has been earmarked for Enterprise lands as a future land use. The character of the area will consequently be changing; however the pipeline will be mostly underground and of negligible impact to the LCZ. Established revegetation of the pipeline corridor is anticipated to be of **negligible** magnitude of change. |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | | High sensitivity + negligible magnitude of change = **negligible impact** |

Table 5.10 LCZ 4 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 4 | Environmental Conservation and Future environment/ recreational zones |
|---|---|
| **Description and Key Characteristics** | Although mostly zoned rural landscape and infrastructure under the Wollondilly LEP, the area contains native bushland vegetation. Existing pipeline and transmission line infrastructure are evident in the area already supporting nearby residents and the Warragamba water treatment plant amongst other land uses.<br>The Blue Mountains National Park, a world heritage site, is located predominantly to the west side of the Nepean-Hawkesbury River in vicinity of Wallacia. Public access to the BMNP, in the vicinity of the Project is limited due to steep embankments and thick vegetation cover. Views of the vast BMNP are visible from the surrounding area and provide an influence on the landscape character. |
| **Sensitivity** | The established environmental conservation areas contain vegetation that is of high ecological and habitat value. As such the sensitivity is considered **high**, with a low ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | Vegetation clearing and earthworks will be required to accommodate the infrastructure south of the proposed AWRC site (C8), and pipeline outlet works (C1 and C2). Construction machinery will be noticeable contrast within this LCZ, presenting a **moderate** level of modification. |

| LCZ 4 | Environmental Conservation and Future environment/ recreational zones |
|---|---|
| **Key mitigation measures** | 1-Low-level revegetation |
| **Stage 1 Operational - Year 1** | A wide strip over the pipeline will be replanted with low shrubs and grasses, with some areas that will result in permanent loss of trees. This is expected in few concentrated areas, presenting a **low** level of modification for LCZ 4. |
| **Stage 1 Operational - Year 10** | The LCZ will be conserved and no further modification is proposed for the pipeline. The magnitude of change is considered low, due to some permanent loss of vegetation barely noticeable at the future stage. |
| **Landscape Character impact ratings** | |
| **Construction** | High sensitivity + moderate magnitude of change = **high-moderate impact** |
| **Stage 1 Operational - Year 1** | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 10** | High sensitivity + low magnitude of change = **moderate impact** |

### Table 5.11 LCZ 5 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 5 | Western Sydney Airport |
|---|---|
| **Description and Key Characteristics** | The future site of the Western Sydney International (Nancy-Bird Walton) Airport is located south west of the proposed facility where construction is currently underway. The Airport will be a highly modified, secured place with runways, terminals, freight buildings, control towers as well as other associated buildings with high levels of road traffic. The airport is expected to be completed in 2026 delivering international, domestic and freight services. |
| **Sensitivity** | The sensitivity of the character zone is considered **moderate** as the airport will become a significant transport hub welcoming a host of domestic and international travellers and comprising of mixed-use facilities. Once built, it is expected to have some ability to accommodate the change. |
| **Landscape Character magnitude of change** | |
| **Construction** | The construction of the AWRC is likely to introduce new construction infrastructure however it is likely to be completed before 2026. As such, the future LCZ would not exist prior to the construction of the proposed pipeline infrastructure. Consequently, the magnitude is considered **negligible.** |
| **Key mitigation measures** | 1-Low-level revegetation |

| LCZ 5 | Western Sydney Airport |
|---|---|
| **Stage 1 Operational - Year 1** | During operation, the proposed pipeline is considered to have a **negligible** magnitude of change as the pipeline infrastructure would be located below ground is located at a distance that will not be directly noticeable. |
| **Stage 1 Operational - Year 10** | There is no further modification proposed for the pipeline. |
| **Landscape Character impact ratings** | |
| **Construction** | **Moderate sensitivity** + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 1** | **Moderate sensitivity** + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | **Moderate sensitivity** + negligible magnitude of change = **negligible impact** |

### Table 5.12 LCZ 6 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 6 | Wallacia residential area |
|---|---|
| **Description and Key Characteristics** | The Treated Water pipeline will navigate through the residential locality of Wallacia along Park Road and then through local streets (Green St, Eagle St and Byron Ave). The locality is predominately low density, single and double storey detached dwellings along with a handful of commercial and community facilities including places of worship, caravan park and a hotel. The street pattern follows a general suburban layout with a low number of street trees and grassed nature strips. Landscaping in this LCZ is mostly located within the private lots. |
| **Sensitivity** | The sensitivity to change is considered **high** in a residential area as people are familiar with and sensitive to their surrounds, with a low ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | The magnitude of change is considered **high** given the proximity of the pipeline corridor through the centre of the residential area and the introduction of heavy machinery and construction works. A construction compound (C5) is proposed to be located on Park Road, a short distance from residential housing. |
| **Key mitigation measures** | 1-Low-level revegetation |

| LCZ 6 | Wallacia residential area | |
|---|---|---|
| **Stage 1 Operational - Year 1** | The magnitude of change is considered **low**. There will be a low number of street trees that will be removed permanently to accommodate the pipeline infrastructure and trees opposition Byron Ave will be permanently removed. A wide strip above the underground pipeline will be barely noticeable, replanted with low shrubs and grasses, with only occasional low level air vents. Nature strips within residential streets will be re-grassed to provide a consistent treatment. | |
| **Stage 1 Operational - Year 10** | Nature strips within the LCZ will be restored to near its pre-existing condition and the wide strip above the pipeline opposite Byron Ave is likely to be less noticeable. No further modification is proposed for the pipeline. The magnitude of change is considered **negligible.** | |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + high magnitude of change = **high impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 10** | | High sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.13 LCZ 7 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 7 | Luddenham residential area |
|---|---|
| **Description and Key Characteristics** | The Treated Water pipeline will travel along Elizabeth Drive (within the road reserve) along the periphery of the Luddenham residential locality. The locality is predominately low density, single and double storey detached dwellings along with a handful of commercial and community facilities. The street pattern follows a general suburban layout with street trees and grassed nature strips. |
| **Sensitivity** | The sensitivity to change is considered **high** in a residential area as people are familiar with and sensitive to their surrounds, with a low ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |
| **Construction** | The magnitude of change is considered **moderate** as the localised changes would result in the introduction of construction compound (C11) and heavy machinery to the main point of access to Luddenham Village at the corner of Park Road and The Northern Road. |
| **Key mitigation measures** | 1-Low-level revegetation |

| LCZ 7 | Luddenham residential area |
|---|---|
| **Stage 1 Operational** | The magnitude of change is considered **negligible** as the pipeline will be underground with the grassed road reserve restored. The indirect impacts are unlikely to affect the existing residential character of the area. |
| **Future Stage** | There is no further modification proposed for the pipeline, with like-for -like vegetation established. |
| **Landscape Character impact ratings** | |
| **Construction** | High sensitivity + moderate magnitude of change = **high-moderate impact** |
| **Stage 1 Operational - Year 1** | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | High sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.14 LCZ 8 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 8 | Warragamba/ Silverdale township |
|---|---|
| **Description and Key Characteristics** | Warragamba/Silverdale is a larger rural centre than Luddenham and Wallacia located adjacent to the Warragamba River. The area is predominately low density residential with associated community facilities including sporting facilities, parks, places of worship, schools, childcare centres. The Silverdale shopping centre is located on Silverdale Road which also contains several commercial businesses such as a bakery, surgery, chemist, supermarket and post office. Community services such as the local Police station and Fire station are also located within Warragamba.<br>The Environmental Flows pipeline diverts from the Treated Water pipeline and travels through the northern part of the landscape character zone. |
| **Sensitivity** | The sensitivity to change is considered **high** in a residential area as people are familiar with and sensitive to their surrounds, which is dominated by a natural bushland area in close vicinity to the proposed pipeline location. |
| **Landscape Character magnitude of change** | |
| **Construction** | The magnitude of change is considered **low** as the localised changes would include underground boring, resulting in minimal changes to existing vegetated area in the proposed alignment. The introduction of construction machinery is located away from residential areas. |

| LCZ 8 | Warragamba/ Silverdale township |
|---|---|
| **Key mitigation measures** | 1-Low-level revegetation |
| **Stage 1 Operational - Year 1** | The magnitude of change is considered **negligible** during operation as the pipeline will be underground and will not be perceptible, following construction, from the existing residential character of the area. |
| **Stage 1 Operational - Year 10** | There is no further modification proposed for the pipeline, with like-for -like vegetation established. |
| **Landscape Character impact ratings** | |
| **Construction** | High sensitivity + low magnitude of change = **moderate** impact |
| **Stage 1 Operational - Year 1** | High sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | High sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.15 LCZ 9 – Treated Water and Environmental Flows pipeline: Landscape Character assessment

| LCZ 9 | Resource Recovery and Quarrying |
|---|---|
| **Description and Key Characteristics** | Resource recovery and quarrying sites are common within the locality which stem from historical uses and future demand for resource recovery facilities due to urban growth in Sydney.<br>The site is highly disturbed with considerable earthworks which includes piles of land fill on the site. The area also contains heavy machinery and vehicles which assist in the activities on site. |
| **Sensitivity** | Given the constant change and lack of sensitive receptors associated with the LCZ, the sensitivity of the LCZ is considered **negligible**. These industrial land uses are considered to have a low sensitivity to change given the land use is already significantly disturbed and varied with earthworks and waste products. |
| **Landscape Character magnitude of change** | |
| **Construction** | The level of modification to this LCZ is considered **negligible.** |
| **Key mitigation measures** | No noticeable mitigation from LCZ 9 |
| **Stage 1 Operational - Year 1** | The magnitude of change to this LCZ is considered **negligible**. |
| **Stage 1 Operational - Year 10** | There is no further modification proposed for the pipeline. |
| **Landscape Character impact ratings** | |
| **Construction** | Negligible sensitivity + negligible magnitude of change = **negligible impact** |

| LCZ 9 | | Resource Recovery and Quarrying |
|---|---|---|
| **Stage 1 Operational - Year 1** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |
| **Stage 1 Operational - Year 10** | | Negligible sensitivity + negligible magnitude of change = **negligible impact** |

### 5.1.3 The Brine Pipeline

As shown in Figure 6.3, the following three Landscape Character Zones (LCZ) have been identified within the Brine Pipeline Study Area:

- LCZ 1: Rural Land/ rural residential land
- LCZ 2: Mount Vernon and Kemps Creek rural residential
- LCZ 10: Western Sydney Parkland Area
- LCZ 11: Residential localities

Descriptions of each LCZ within the Study Area, are provided in the following landscape character assessments.

The assessment for LCZ 2 is covered is Section 5.1.2 Treated Water and Environmental flows pipelines and is expected to have similar impacts for the Brine Pipeline works.

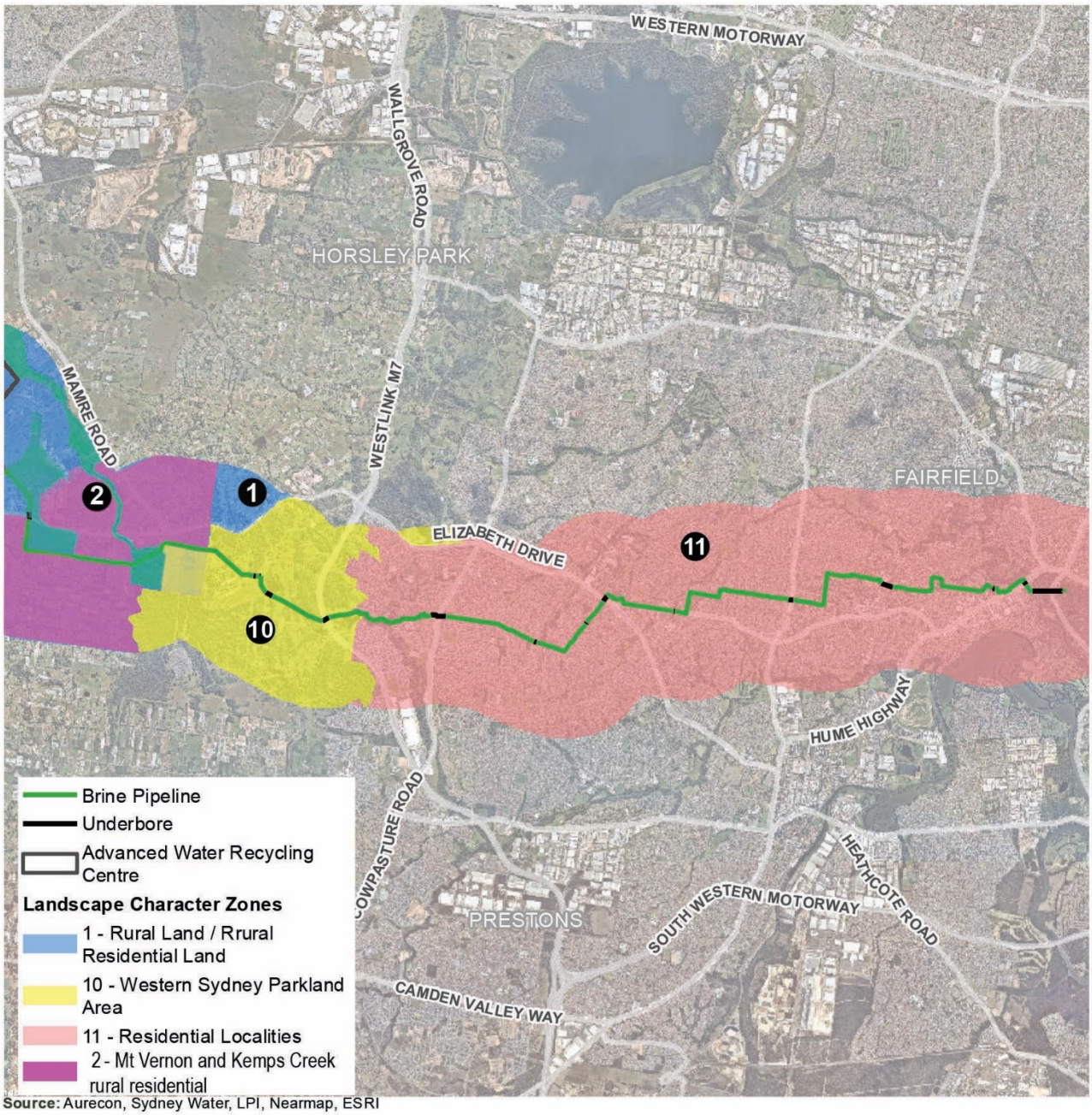



**Figure 5.3: Landscape Character Zones – Brine Pipeline**

### Table 5.16 LCZ 1 – Brine Pipeline: Landscape Character assessment

| LCZ 1 | Rural and Rural Residential Land |
|---|---|
| **Description and Key Characteristics** | The Brine Pipeline corridor are generally located within a rural locality with a mix of agricultural and rural living land uses. The proposed pipeline corridor crosses Elizabeth Drive down Western Road and then east along Cross Street towards the Georges River at Lansdowne.<br>The land area is largely cleared of native vegetation following years of agricultural activities including crop growing, grazing, other farm related activities and some extractive industry sites. Remnants of native vegetation occur along riparian corridors (creek and drainage lines) and scattered along road reserve boundaries and woodland areas. Residences are set back from roadways and often partially shielded from view.<br>Rural and agricultural landscapes within the Greater Sydney Region are limited due to the historic growth patterns of Sydney, placing increased pressure on these localities to cater for urban expansion.<br>Large residential dwellings are a common built form within large residential lots. |
| **Sensitivity** | The character zone is considered to be of **moderate** sensitivity given the rural amenity associated with the locality and the lack of dense development in the area, with some ability to accommodate proposed change. |
| **Landscape Character magnitude of change** | |
| **Construction** | During construction, the Project would introduce construction compound areas and heavy machinery within the LCZ. The magnitude of change is considered **moderate**, given there are existing extractive industry works in the zone. |
| **Key mitigation measures** | 1-Low-level revegetation |
| **Stage 1 Operational - Year 1** | The pipeline infrastructure would be located below ground with some low-level civil structures such as pit holes above ground. Some vegetation is likely to be permanently removed from microsites at the interface of Cross Street and Western Road at Kemps Creek, resulting in a wide strip above the pipeline, replanted with grasses and low-level shrubs. The magnitude of change is considered **low**. |

| LCZ 1 | Rural and Rural Residential Land | |
|---|---|---|
| **Stage 1 Operational - Year 10** | | The Western Sydney Aerotropolis Structure Plan identifies that much of the rural land areas in the character zone are proposed to accommodate Enterprise and or urban land in the future. It is likely that much of the rural land in the character zone will transition towards varying land uses (likely industrial) which will occur as the Aerotropolis develops.<br>The area has not experienced significant densification in recent years; however, the Penrith LSPS identifies an urban investigation area within the Mount Vernon locality. The loss of roadside vegetation will not be noticeable due to infill by other future land use, with an ensuing **negligible** magnitude of change. |
| **Landscape Character impact ratings** | | |
| **Construction** | | Moderate sensitivity + moderate magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 1** | | Moderate sensitivity + low magnitude of change = **moderate-low impact** |
| **Stage 1 Operational - Year 10** | | Moderate sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.17 LCZ 10 – Brine Pipeline: Landscape Character assessment

| LCZ 10 | Western Sydney Parkland Area |
|---|---|
| **Description and Key Characteristics** | The Brine Pipeline corridor will transverse through the Western Sydney Parkland area between Kemps Creek and Cecil Hills. This area comprises of ephemeral water bodies, with Kemps Creek being the larger one and large areas of native woodland. The parkland area is surrounded to the north by high levels of modification including Brandown Quarry to the north, an existing electrical substation, roads including the Westlink M7 to the east. Recreational facilities include the Wylde MTB Trail and Sydney International Shooting Centre. |
| **Sensitivity** | The character zone is of **high** sensitivity and is valued as a conservation and recreational area, with a low ability to accommodate change proposed. |
| **Landscape Character magnitude of change** | |

| LCZ 10 | Western Sydney Parkland Area | |
|---|---|---|
| **Construction** | | The proposed Brine Pipeline corridor aligns mostly within cleared parcels of land, minimising the clearing of bushland vegetation where possible, however vegetation would still be required to be removed and a wide strip above the underground pipeline containing low-level shrubs and grasses ensuing. The most noticeable vegetation removal is proposed in areas including east of Kemps Creek near the Brandown Quarry and to the north of Brandown Quarry, which is just outside of the Western Sydney Parkland area. The removal of vegetation and the construction work sites are considered to result in **moderate** magnitude of change to the existing setting. |
| **Key mitigation measures** | | 1-Low-level revegetation/ like-for-like revegetation |
| **Stage 1 Operational - Year 1** | | The magnitude of change is considered **low** during operation as like for like revegetation planting would minimise the adverse effects of the Project where practicable, however there are some small areas of permanent vegetation loss.<br>The inability to provide screening vegetation to the north of the Brandown Quarry in the place of the pipeline easement, adjacent the proposed M12 has the potential to result in higher impacts to the character of the surrounding area as a result of the large quarry being more noticeable, within a small area of the parkland with the quarry being an existing part of the setting. |
| **Stage 1 Operational - Year 10** | | No future works are proposed for the Brine Pipeline, with the works underground and not perceptible. The sensitivity of the LCZ would remain high, with a **negligible** magnitude of change from the existing parkland conditions with establishment of like-for-like planting replacing those near the quarry. |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + moderate magnitude of change = **high-moderate impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 10** | | High sensitivity + negligible magnitude of change = **negligible impact** |

### Table 5.18 LCZ 11 – Brine Pipeline: Landscape Character assessment

| LCZ 11 | Residential Localities | |
|---|---|---|
| **Description and Key Characteristics** | The Brine Pipeline will likely navigate through a number of residential localities within the Liverpool and Fairfield LGAs. The locality is predominately low density, single and double storey detached dwellings, some with views out to adjacent parkland within LCZ 10. The Brine Pipeline will border some commercial and recreational land uses such as neighbourhood shopping village, supermarkets, parks and reserves. | |
| **Sensitivity** | The sensitivity to change is considered **high** in a residential area as people are familiar with and sensitive to their surrounds, with a low ability to accommodate change proposed. | |
| **Landscape Character magnitude of change** | | |
| **Construction** | During construction, works are likely to introduce infrastructure and construction machinery into the locality impacting the residential amenity afforded to residents within public spaces. A large construction compound (C13) will be located in a public park, limiting access for recreational use. As such the magnitude of change is considered **high.** | |
| **Stage 1 Operational - Year 1** | During operation, the magnitude of change is considered **low** as the pipeline will be underground with exception of some low level civil structures such as pit holes and air vents which are small in scale. Permanent loss of trees may occur in areas where the alignment is close to the Western Sydney Parklands, although areas of vegetation surrounding will remain. | |
| **Stage 1 Operational - Year 10** | No future works are proposed for the Brine Pipeline, with the works underground and not perceptible. Areas of permanent tree loss will be minimal through the LCZ. The level of modification from the existing conditions is considered **negligible.** | |
| **Landscape Character impact ratings** | | |
| **Construction** | | High sensitivity + high magnitude of change = **high impact** |
| **Stage 1 Operational - Year 1** | | High sensitivity + low magnitude of change = **moderate impact** |
| **Stage 1 Operational - Year 10** | | High sensitivity + negligible magnitude of change = **negligible impact** |

## 5.2 Landscape Character Impact Assessment

### Overall impact

Given the size and scale of the AWRC, the overall impact for landscape character zones in proximity to the AWRC is **high to moderate**. Impacts are predominantly to the rural amenity and a small area of Environmental conservation and future environment/ recreational zones (LCZ 1 and LCZ 4), with new large industrial sized infrastructure within a cleared rural land area.

The pipeline infrastructure associated with the Treated Water, Environmental flows and Brine Pipelines would mostly be located below ground during operation which is not anticipated to have an ongoing impact to landscape character zones, except in areas where tree and vegetation removal is required and where revegetation is not limited by operations. This is particularly evident within environmental conservation zones where there is expected to be some areas which will have permanent loss of vegetation where replacement planting cannot occur due to the potential impact on operations of the pipeline. Replacement is proposed in some areas which is expected to reduce the magnitude of impacts following construction.

Construction compounds are expected to have an adverse impact to the landscape character particularly where located near sensitive landscape zones including residential suburban areas (C5 in LCZ 6 and C11 in LCZ 7), and public recreational areas (C1, C2 and C8 in LCZ 4 and C13 in LCZ 11), introducing new machinery elements and work zones. The high to moderate impact of pipeline infrastructure is temporary and is reduced during operation as the result of landscape remediation.

Table 6.1 provides a summary of the Landscape Character impacts of the Project based on the landscape character zone.

**Table 5.19 Summary of Landscape Character Impacts**

| Landscape Character Zone | | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - year 10 | Future Stage |
|---|---|---|---|---|---|
| **AWRC** | | | | | |
| **LCZ 1** | Rural Land/future Enterprise land | High-Moderate | High-Moderate | Moderate | Moderate-Low |
| **LCZ 2** | Mount Vernon and Kemps Creek Rural Residential | Moderate | Negligible | Negligible | Negligible |
| **LCZ 3** | Twin Creeks Golf Club | Negligible | Negligible | Negligible | Negligible |
| **LCZ 4** | Environmental Conservation and Future environment/ recreational zones | Moderate | High-Moderate | Moderate | Moderate |
| **LCZ 5** | Western Sydney Airport | Negligible | Negligible | Negligible | Negligible |
| **LCZ 9** | Resource Recovery and Quarrying | Negligible | Negligible | Negligible | Negligible |
| **Treater Water and Environmental flows pipeline** | | | | | |
| **LCZ 1** | Rural Land/future Enterprise land | Moderate | Moderate-Low | Negligible | n/a |

| | Landscape Character Zone | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - year 10 | Future Stage |
|---|---|---|---|---|---|
| **LCZ 2** | Mount Vernon and Kemps Creek Rural Residential | Moderate | Negligible | Negligible | n/a |
| **LCZ 4** | Environmental Conservation and Future environment/recreational zones | High-moderate | Moderate | Moderate | n/a |
| **LCZ 5** | Western Sydney Airport | Negligible | Negligible | Negligible | n/a |
| **LCZ 6** | Wallacia residential area | High | Moderate | Negligible | n/a |
| **LCZ 7** | Luddenham residential area | High-Moderate | Negligible | Negligible | n/a |
| **LCZ 8** | Warragamba/Silverdale township | Moderate | Negligible | Negligible | n/a |
| **LCZ 9** | Resource Recovery and Quarrying | Negligible | Negligible | Negligible | n/a |
| **Brine Pipeline** | | | | | |
| **LCZ 1** | Rural Land/future Enterprise land | Moderate | Moderate-Low | Negligible | n/a |
| **LCZ 10** | Western Sydney Parkland Area | High-Moderate | Moderate | Negligible | n/a |
| **LCZ 11** | Residential localities (C13) | High | Moderate | Negligible | n/a |

The impact assessment was based on consideration of both sensitivity of the context to change and the estimated magnitude of the change. Further details are provided below.

### Sensitivity to change

The AWRC is located within the rural and rural residential locality of Kemps Creek and Badgerys Creek. The land area has been modified over the years largely to historic agricultural use of the land which remains to be the main use of the land. In the area surrounding the AWRC are some large built elements and modified landscape including the Resource Recovery Park, however, there remains large areas of undeveloped land within the locality. Given the expanse of the Project, landscape character zones are considered to be sensitive to change within rural, residential, environmental corridors and parkland areas.

### Magnitude of change

The proposed development would introduce large scale water infrastructure to the rural locality of Kemps Creek/Badgerys Creek, including associated pipeline infrastructure which aligns to the west towards Warragamba River and the existing Malabar wastewater system in the east. Whilst some large agricultural and industrial built elements are evident within the surrounding area, the character of the rural setting comprises of grazing and agriculture which has been formed by farming cultivation over many years.

The AWRC occupies a cleared land area largely devoid of vegetation and built structures which is set within a typical rural landscape and near to vegetated waterways. Overall, the size and scale of the AWRC is recognised to have a high to moderate impact on the rural amenity of the area. Values linked to rural amenity among rural residential localities will also be impacted by this development, however, some landscape character zones, separated by existing vegetated corridors, will be less impacted by the AWRC.

Landscape character zones impacted by the pipeline are likely to be largely affected during construction by the introduction of construction compounds, machinery and the removal of vegetation. The pipeline infrastructure will be located underground and as such, the magnitude of change as the result of proposed pipeline infrastructure has a minimised long-term effect on the landscape character zones. The use of existing cleared areas and easements have been identified for the majority of the pipeline corridor, with some small localised areas likely to experience permanent loss of vegetation, particularly in environmental and parkland character zone areas. As such, Environmental Conservation and Parkland areas are considered to have a moderate magnitude to change as impacts to vegetation loss could not be avoided in some instances.

# 6 Visual Impact Assessment

## 6.1 Key Viewpoints

A total of 27 key viewpoints (VP) have been identified within the Study Area, as listed in Table 7.1 and shown in Figure 7.1, Figure 7.24 and Figure 6.39. The viewpoints relevant to SEARs are also listed.

**Table 6.1 Key Viewpoints**

| Viewpoint | Description | SEARs |
|---|---|---|
| **AWRC** | | |
| **VP1** | Rural Dwelling. 1669A Elizabeth Drive Badgerys Creek | 46a |
| **VP2** | Rural Dwellings. 230-234 Clifton Avenue Kemps Creek | 46a |
| **VP3** | Rural Dwellings. 203-229 Clifton Avenue Kemps Creek | 46a |
| **VP4** | M12 road corridor, Fleurs Farm | 46a, 46c |
| **VP5** | Large Lot residential dwelling, 30 Mount Vernon Road, Mount Vernon | 46a |
| **VP6** | Road reserve, Corner of Mamre Road and Abbey Road | 46a |
| **VP7** | Road reserve, Mamre Road | 46a |
| **VP8** | Large Lot residential dwelling, 141-143 Aldington Road, Kemps Creek | 46a |
| **VP9** | Undeveloped Bushland Area, 1 Ganton Way, Luddenham | 46a |
| **VP10** | Residential locality, near 16 Ganton Way, Luddenham | 46a |
| **Treated Water and Environmental Flows Pipeline** | | |
| **VP11** | Rural locality, Luddenham Road, near 889 Luddenham Road, Luddenham | 46a |
| **VP12** | Rural residential locality, Elizabeth Drive, Luddenham | 46a |
| **VP13** | Rural locality, Park Road, Luddenham | 46a |
| **VP14** | Rural locality, Park Road, Wallacia | 46a |
| **VP15** | Residents, Eagle Street, Wallacia | 46a |
| **VP16** | Residents, Byron Avenue, Wallacia, near Shelly Road | 46a |
| **VP17** | Wallacia rural village area, Wallacia, near Park Road | 46a, 46b |
| **VP18** | Rural locality, Bents Basin Road, Wallacia | 46a |
| **VP19** | Rural locality, Bents Basin Road | 46a |
| **VP20** | Nepean River – Wallacia Weir, Wallacia | 46a, 46c |
| **VP21** | Warragamba Dam spillway | 46a, 46b, 46c |
| **Brine Pipeline** | | |
| **VP22** | Rural locality, Cross Street Kemps Creek, near Pratten Street | 46a |
| **VP23** | Western Sydney Parklands, Cecil Hills | 46a, 46b |
| **VP24** | Feodore Drive, Cecil Hills/Elizabeth Hills, near Lascelles Street | 46a |

| Viewpoint | Description | SEARs |
|---|---|---|
| **VP25** | Public Open Space area, Bonnyrigg, near entry to Hebblewhite place | 46a |
| **VP26** | Residents John Street, Cabramatta, between Coventry Road and Gladstone Street | 46a |
| **VP27** | Cabravale Memorial Park, Cabramatta, near Bartley Street | 46a, 46b, 46c |
| **VP28** | Lansvale Park, Knight Street, Lansvale | 46a |
| **VP29** | Edith Street, Lansdowne | 46a |

### 6.1.1 Key Viewpoint Assessment

The following section includes the Visual Impact Assessment of the Project for the following phases:

- Construction (refer section 4.3)
- Stage 1 Operational – Year 1 (refer section 4.1and 4.2)
- Stage 1 Operational – Year 10 (refer section 4.5)
- Future Stages – AWRC only (section 4.4)

Descriptions of the existing visual conditions of each viewpoint is contained in the following section along with the potential impacts.

The potential impacts assessed are based on those proposed by the reference design (refer to section 5.1 and 4.2), the Landscape mitigation design and the proposed Urban Design (Section 0). The landscape and urban design have been an iterative design process with the LCVIA to mitigate landscape and visual effects.

Indicative photomontages have been produced for VPs 1-10, associated with the AWRC. The indicative photomontages have been generated based on methodology identified in section 2 as accurately as possible with the information that was available.

The VPs have been split into three assessment areas:

1. AWRC – Section 6.1.2
2. Treated water pipeline and Environmental flows pipeline – Section 6.1.3
3. Brine Pipeline – Section 6.1.4

## 6.1.2 AWRC

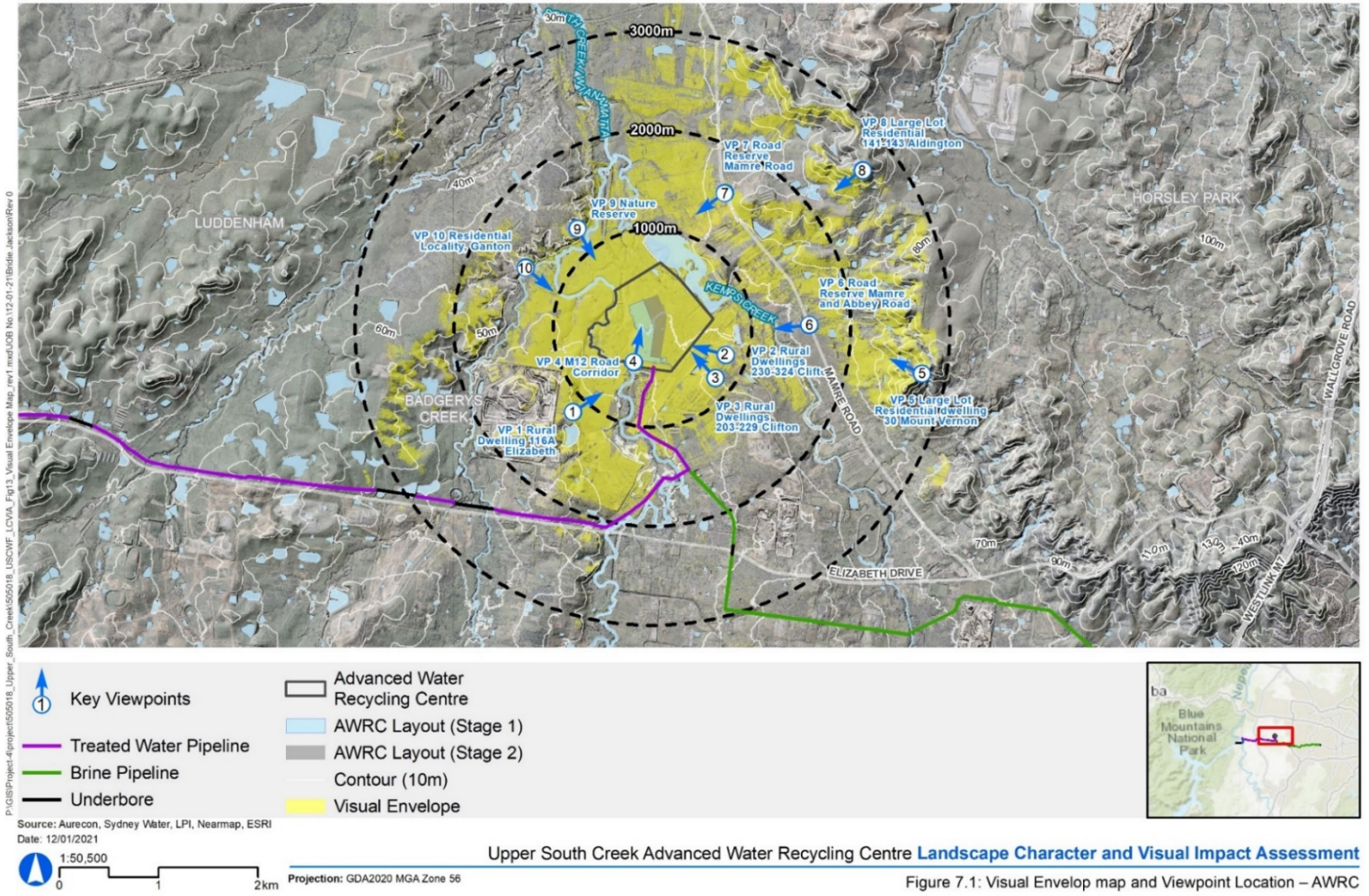



**Figure 6.1: Visual Envelope Map and Viewpoint Locations – AWRC (Arrows show general viewpoint direction to the area potentially impacted by the project)**

## Table 6.2 VP1 – AWRC: Visual Impact Assessment

| VP1 | Location: 1669A Elizabeth Drive Badgerys Creek – rural dwelling<br>Viewpoint direction: looking north-east towards proposed facility<br>Distance from AWRC: 800m |
|---|---|
| **Existing Setting** | VP1 is taken in proximity to the residential dwelling located at 1669a Elizabeth Drive, Badgerys Creek. This is the view of a resident located approximately 800m south west of the proposed facility. The view comprises cleared agricultural land containing horses and cattle. Native trees and vegetation are also prominent along the creek line. This viewpoint is representative of the view experienced by the private residents at 1669A Elizabeth Drive, Badgerys Creek. |
| **Sensitivity** | This view consists of a rural landscape with scattered mature native trees and large grassed fields in the foreground and middleground. An undulating hillside is evident in the background. Dense vegetation is apparent along the creek line of Badgerys Creek The view is largely free of built forms, with some built elements including an existing telecommunications tower, noticeable in the background. The field of view consist mostly of a natural setting with little built form, therefore the sensitivity to change from this viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | During construction, the Project site would undergo significant earth works and involve a number of construction vehicles, equipment and infrastructure which would be visible from this location, although would be small elements seen from a distance. The magnitude of change is considered **moderate**. |
| **Stage 1 Operational (year 1)** | The M12 Motorway will be located between this viewpoint and the proposed AWRC. The AWRC would be barely visible in the middleground of this viewpoint. The components of the facility that will potentially be visible will be the tallest elements including Digesters and Gas Storage tanks and odour control structures, although the M12 is expected to dominate this viewpoint. The magnitude of change, as a result of the Project is considered **low**. |
| **Key mitigation measures** | 2-Vegetation screening, 3-Living walls, 4-Architectural design |
| **Stage 1 Operational (year 10)** | The indicative landscape mitigation including tree screening, architectural cladding and living walls will help soften the appearance of the facility overall but are not likely to screen the tallest elements visible over the M12. The magnitude of change, as a result of the Project is considered **low**. |

| VP1 | Location: 1669A Elizabeth Drive Badgerys Creek – rural dwelling<br>Viewpoint direction: looking north-east towards proposed facility<br>Distance from AWRC: 800m | |
|---|---|---|
| **Future Stage** | The viewpoint is expected to have major changes including increased commercial development, as well as the M12 Motorway will be located between this viewpoint and the proposed AWRC, screening views towards the AWRC. Future stage works will be barely perceptible. The magnitude of change, as a result of the Project is considered **negligible**. Existing residents are likely to retain a high sensitivity to their surrounds, despite the degree of development proposed by the M12, Western Sydney Airport, as well as increased residential and commercial development. | |
| **Visual impact ratings** | | |
| **Construction** | | High sensitivity + moderate magnitude of change = high-**moderate visual impact** |
| **Stage 1 Operational (year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** |
| **Stage 1 Operational (year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact.** |

**Figure 6.2: VP1 existing view looking north east towards the proposed facility near rural swelling at 1669A Elizabeth Drive, Badgerys Creek**

**Figure 6.3: VP1 Stage 1 Operational – indicative photomontage (the M12 will be located between this viewpoint and the AWRC)**

### Table 6.3 VP2 – AWRC: Visual Impact Assessment

| VP2 | Location: 230-234 Clifton Avenue Kemps Creek – rural dwellings<br>Viewpoint direction: looking north-west towards proposed facility<br>Distance from AWRC: 400m |
|---|---|
| **Existing Setting** | VP2 is a view captured near the rear of residential dwellings at 230-234 Clifton Avenue, Kemps Creek, approximately 400m south east from the AWRC. The view comprises cultivated agricultural land in the foreground, cleared grazing land in the middle ground and a tree lined hill in the background. This viewpoint is representative of the view experienced by the private residents at 230-234 Clifton Avenue, Kemps Creek. |
| **Visual Sensitivity** | The view contains a typical rural setting with agricultural and natural landscapes evident within the view. The land has altered over time due to historic management of the land including grazing and cultivated land, however, is free from built forms. The sensitivity to change from this viewpoint is considered high. |
| **Magnitude of change** | |
| **Construction** | During construction, the Project site would undergo significant earth works and involve a number of construction vehicles, equipment and infrastructure which would be visible from this location. The magnitude of change is considered high. |
| **Stage 1 Operational (year 1)** | The existing far views towards vegetated hillsides and views over fields of crops would be disrupted by the AWRC from this viewpoint. The Digesters, Gas storage and Outloading structures in particular will be prominent from this viewpoint, rising above the horizon line in the background, and interrupting the long views, contrasting within the existing rural setting. The facility will be prominent within this view given its close proximity of 400m. The magnitude of change is considered high. |
| **Key mitigation measures** | 2-Vegetation screening, 3-Living walls, 4-Architectural design |
| **Stage 1 Operational (year 10)** | The proposed landscape mitigation including tree screening (trees to 10m high), architectural cladding and living walls will help soften the appearance of the facility overall but will not screen the tallest elements at up to 25m in height. The magnitude of change, as a result of the Project is considered high. |
| **Future Stage** | There will be increased development within this setting and  located between this viewpoint and the proposed AWRC. Future stage works including a proposed duplication of stage 1 element, will be barely perceptible, instead development of commercial sites with be prominent in this viewpoint. The magnitude of change is considered negligible.<br>Existing residents are likely to retain a high sensitivity to their surrounds, despite the increase in development. |

| VP2 | Location: 230-234 Clifton Avenue Kemps Creek – rural dwellings<br>Viewpoint direction: looking north-west towards proposed facility<br>Distance from AWRC: 400m | |
|---|---|---|
| **Visual impact ratings** | | |
| **Construction** | | High sensitivity + high magnitude of change = **high visual impact** |
| **Stage 1 Operational (year 1)** | | High sensitivity + high magnitude of change = **high visual impact** |
| **Stage 1 Operational (year 10)** | | High sensitivity + high magnitude of change = **high visual impact** |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact** |

**Figure 6.4: VP2 existing view looking north west towards the proposed facility near rural dwelling at 230-234 Clifton Avenue Kemps Creek**

**Figure 6.5: VP2 Stage 1 Operational – indicative photomontage**

**Figure 6.6 VP2 Future Stage – indicative photomontage (not including future stage developments by others)**

## Table 6.4 VP3 – AWRC: Visual Impact Assessment

| VP3 | Location: 203-229 Clifton Avenue Kemps Creek – rural dwelling<br>Viewpoint direction: looking north-west towards proposed facility<br>Distance from AWRC: 540m |
|---|---|
| **Existing Setting** | VP3 has been taken in proximity to the residential dwellings located 203-239 Clifton Avenue. The view comprises of long views over cropped fields in the foreground, cleared grazing land in the middle ground and tree-covered foothills in the background. The sensitive receivers considered are that of the private residents at 203-229 Clifton Avenue, Kemps Creek. |
| **Visual Sensitivity** | The view contains a typical rural setting with agricultural and natural landscapes evident within the view. The land has altered over time due to historic management of the land including grazing and cultivated land, however, is free from built forms. The sensitivity of this viewpoint is considered **high**. Existing residents are likely to retain a high sensitivity to their surrounds, despite the increase in development. |
| **Magnitude of change** | |
| **Construction** | During construction, the Project site would undergo significant earth works and involve a number of construction vehicles, equipment and infrastructure which would be visible from this location in the middle ground. The proposed construction elements would be a stark contrast to the existing rural setting. The magnitude of change is considered **high**. |
| **Stage 1 Operational (year 1)** | The M12 Motorway will be located between this viewpoint and the proposed AWRC. The tallest components of the facility will be visible in the middleground, rising above the horizon line in the background and contrasting within the existing rural setting. The magnitude of change is **moderate.** |
| **Key mitigation measures** | 2-Vegetation screening, 3-Living walls, 4-Architectural design |
| **Stage 1 Operational (year 10)** | The AWRC would be barely visible in the middleground of this viewpoint, screened by the M12. The components of the facility that will potentially be visible will be the tallest elements including Digesters and Gas Storage tanks and odour control structures, that will be visible above proposed vegetation screening. Vegetation screening will help soften the contrast, with architectural finishes expected to be barely visible from this distance. The magnitude of change, as a result of the Project is considered **moderate**. |
| **Future Stage** | There will be increased development within this setting and located between this viewpoint and the proposed AWRC. Future stage works will be barely perceptible, instead development of residential, commercial and industrial sites with be prominent in this viewpoint. The magnitude of change is considered **negligible.** |
| **Visual impact ratings** | |
| **Construction** | High sensitivity + high magnitude of change = high visual impact |

| VP3 | | Location: 203-229 Clifton Avenue Kemps Creek – rural dwelling<br>Viewpoint direction: looking north-west towards proposed facility<br>Distance from AWRC: 540m |
|---|---|---|
| **Stage 1 Operational (year 1)** | | High sensitivity + moderate magnitude of change = high-moderate visual impact |
| **Stage 1 Operational (year 10)** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** |
| **Future Stage** | | High sensitivity + negligible magnitude of change = negligible visual impact. |

**Figure 6.7: VP3 existing view looking north west towards the proposed facility near rural dwelling 203-229 Clifton Avenue Kemps Creek**

**Figure 6.8: VP3 Stage 1 Operational – indicative photomontage (the M12 will be located between this viewpoint and the AWRC)**

## Table 6.5 VP4 – AWRC: Visual Impact Assessment

| VP4 | Location: Fleurs Farm – M12 road corridor<br>Viewpoint direction: looking north towards proposed facility<br>Distance from AWRC: 60m |
|---|---|
| **Existing Setting** | VP4 has been taken in proximity to the planned alignment of the future M12 Motorway, approximately 60m from the site boundary, which dissects the southern boundary of Fleurs Farm, the subject lot for the AWRC. The sensitive receivers considered from this viewpoint are of future motorists on the M12 to be constructed in the future. It should be noted that the M12 Motorway would be raised on top of an embankment which is yet to be built and so the view aspect would vary. |
| **Sensitivity** | The viewpoint attempts to consider the visual impacts associated with the new planned M12 Motorway. The motorway will provide direct access to the Western Sydney International Airport and Sydney's motorway network. As the impact to road users would be short in duration due to the speed of the vehicles along the motors, the sensitivity for the proposed facility from this viewpoint is considered **low**. |
| **Magnitude of change** | |
| **Construction** | During construction, the construction compound area, vehicles and infrastructure would dominate views from this VP. The magnitude of change is considered **high**. |
| **Stage 1 Operational (year 1)** | The close proximity to the new M12 Motorway would make the AWRC largely prominent, particularly the various tanks, transfer PS and digester and gas storage structures evident in the photomontage below for VP4. The scale and proximity of the site would still result in a **high** magnitude of change. |
| **Key mitigation measures** | 2-Vegetation screening, 3-Living walls, 4-Architectural design |
| **Stage 1 Operational (year 10)** | Architectural buildings, specialised cladding and landscaping would provide some screening from the M12 Motorway, assisting with blending it into the views of adjacent of road-side vegetated areas. The scale and proximity of the Site would mean that it will remain prominent within the viewpoint, resulting in a **high** magnitude of change. |
| **Future Stage** | The future stage of the AWRC will be noticeable from this viewpoint, experience by motorists on the M12. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased residential, commercial and industrial development. The magnitude of change is considered **low.** |
| **Visual impact ratings** | |
| **Construction** | Low sensitivity + high magnitude of change = **moderate visual impact** at VP4 for motorists on the future M12 Motorway |

| VP4 | | Location: Fleurs Farm – M12 road corridor<br>Viewpoint direction: looking north towards proposed facility<br>Distance from AWRC: 60m |
|---|---|---|
| **Stage 1 Operational (year 1)** | | Low sensitivity + high magnitude of change = **moderate visual impact** at VP4 for motorists on the future M12 Motorway |
| **Stage 1 Operational (year 10)** | | Low sensitivity + high magnitude of change **= moderate visual impact** at VP4 for motorists on the future M12 Motorway |
| **Future Stage** | | Low sensitivity + low magnitude of change = **low visual impact**. |

**Figure 6.9: VP4 existing view looking north towards the proposed facility near M12 proposed road corridor**

**Figure 6.10: VP4 Stage 1 Operational – indicative photomontage**

## Table 6.6 VP5 – AWRC: Visual Impact Assessment

| VP5 | Location: 30 Mount Vernon Road, Mount Vernon – large lot residential dwelling<br>Viewpoint direction: looking west towards proposed facility<br>Distance from AWRC: 2.6 km |
|---|---|
| **Existing Setting** | VP5 is taken near to a residential property at 30 Mount Vernon Road overlooking undulating hills towards the AWRC. The view consists of cleared land in the foreground and middle ground, mature trees in the middleground and distant views towards the Blue Mountains in the background. The view is taken in proximity to a residential dwelling located on a ridgeline which overlooks the suburbs of Mount Vernon and Kemps Creek |
| **Sensitivity** | The view consists of a rural and rural residential landscape and contains a number of built elements including sheds, dwellings, green houses and high voltage powerline towers. The sensitivity from this view is **high**. |
| **Magnitude of change** | |
| **Construction** | The elevation of this viewpoint would make the proposed facility visible above existing tree canopies. The construction compound area, infrastructure would be visible from this viewpoint. The magnitude of change is considered **low**, given the distance from the proposed AWRC and the scale of the change within the field of view. |
| **Stage 1 Operational (year 1)** | The elevation of this viewpoint would make the proposed facility visible above existing tree canopies. The built facilities such as tanks and sheds are commensurate with the existing rural context, however the site scale and size of infrastructure such as the digesters and gas storage structures are prominent. The AWRC will be a small in the field of view, resulting in a **low** magnitude of change. |
| **Key mitigation measures** | 2-Vegetation screening, 3-Living walls, 4-Architectural design |
| **Stage 1 Operational (year 10)** | Landscape planting surrounding the site will assist in screening part of the AWRC, however larger structures and the large site will be visible from this viewpoint. Facades colouring to match the surrounding vegetation helps blend the site into the surrounds. The magnitude of change is considered **low,** as a result of the AWRC being visible though small in the field of view. |
| **Future Stage** | The future stage of the AWRC will be barely noticeable from this viewpoint. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased commercial and industrial development. The magnitude of change is considered **negligible.** |
| **Visual impact ratings** | |
| **Construction** | High sensitivity + low magnitude of change = **moderate visual impact** for VP5 from Mount Vernon. |

| VP5 | | Location: 30 Mount Vernon Road, Mount Vernon – large lot residential dwelling<br>Viewpoint direction: looking west towards proposed facility<br>Distance from AWRC: 2.6 km |
|---|---|---|
| **Stage 1 Operational (year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** for VP5 from Mount Vernon. |
| **Stage 1 Operational (year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** for VP5 from Mount Vernon. |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact** for VP5 from Mount Vernon |

**Figure 6.11: VP5 existing view looking north west towards the proposed facility from large lot residential dwelling at 30 Mount Vernon Road, Mount Vernon**

**Figure 6.12: VP5 Stage 1 Operational – indicative photomontage**

**Figure 6.13: VP5 Future Stage – indicative photomontage (not including future stage developments by others)**

## Table 6.7 VP6 – AWRC: Visual Impact Assessment

| VP6 | Location: corner of Mamre Road and Abbey Road – road reserve<br>Viewpoint direction: west towards proposed facility<br>Distance from AWRC: 1.4 km |
|---|---|
| **Existing Setting** | VP6 is taken near the intersection of Mamre Road and Abbey Road in Kemps Creek looking West towards the AWRC. The viewpoint overlooks an agricultural lot and trees screening views beyond the foreground views. The sensitive receivers considered from this viewpoint are of motorists travelling along Mamre road and Abbey Road. |
| **Sensitivity** | The view overlooks agricultural land which is currently used for grazing of cows. Large mature trees are prominent within this view providing shade and screening to the west. Scrap metal pieces to the rear of the residential property are also identified in this view. Given the significant screening provided by the mature trees along the creek line and the presence of scrap metal elements, the sensitivity to change is **low**. |
| **Magnitude of change** | |
| **Construction** | The existing vegetation screens the proposed facility from view from the corner of Mamre Road and Abbey Road. The magnitude of change is considered **negligible**. |
| **Stage 1 Operational (year 1)** | The existing vegetation screens the proposed facility from view from the corner of Mamre Road and Abbey Road. The magnitude of change is considered **negligible**. The yellow outline shown in the indicative photomontages below provide an outline of project if it were visible from this viewpoint. |
| **Key mitigation measures** | Not required |
| **Stage 1 Operational (year 10)** | No change from the above – the magnitude of change is considered **negligible**. |
| **Future Stage** | Existing screening vegetation is expected to remain, therefore future development changes will not be visible from this viewpoint. The magnitude of change is considered **negligible.** |
| **Visual impact ratings** | |
| **Construction** | Low sensitivity + negligible magnitude of change = **negligible visual impact** at VP6 for motorists near the intersection of Mamre Road and Abbey Road. |
| **Stage 1 Operational (year 1)** | Low sensitivity + negligible magnitude of change = **negligible visual impact** at VP6 for motorists near the intersection of Mamre Road and Abbey Road |

| VP6 | | Location: corner of Mamre Road and Abbey Road – road reserve<br>Viewpoint direction: west towards proposed facility<br>Distance from AWRC: 1.4 km |
|---|---|---|
| **Stage 1 Operational (year 10)** | | Low sensitivity + negligible magnitude of change = **negligible visual impact** at VP6 for motorists near the intersection of Mamre Road and Abbey Road |
| **Future Stage** | | Low sensitivity + negligible magnitude of change = **negligible visual impact** at VP6 |

**Figure 6.14: VP 6 – existing view looking west towards proposed facility near intersection of Mamre road and Abbots road**

**Figure 6.15: VP6 Stage 1 Operational – indicative outline of AWRC shown in yellow outline**

### Table 6.8 VP7 – AWRC: Visual Impact Assessment

| VP7 | Location: 845a Mamre Road – road reserve<br>Viewpoint direction: south west towards proposed facility<br>Distance from AWRC: 1.2 km |
|---|---|
| **Existing Setting** | The view contains tall grass and cultivated fields in the foreground which reflects the rural nature of the area. Large mature trees are also prominent in the middle ground located around the banks of Kemps Creek as too is a large high voltage transmission tower and high voltage lines. The Kemps Creek Resource Recovery Park is visible in the background of this viewpoint. The sensitive receivers considered from this viewpoint are of motorists travelling south along Mamre Road and rural residents located on Mamre Road. |
| **Sensitivity** | The view contains a typical rural setting with agricultural and natural landscapes evident within the view. The land has altered over time due to historic management of the land including grazing and cultivated land. The viewpoint consists of a highly modified environment with powerlines and towers, fenced agricultural land and the Resource Recovery Park located within the view. The few residents experiencing this view are already subject to a modified viewpoint, therefore the sensitivity of the viewpoint is considered to be **moderate.** |
| **Magnitude of change** | |
| **Construction** | The construction works would mostly be screened by existing infrastructure, with the introduction of large machinery and vehicles such as cranes would be barely visible above the existing vegetation. The magnitude of change is considered **low.** |
| **Stage 1 Operational (year 1)** | The size and scale of the proposed facility would be visible over the existing tree canopy, though not prominent in the middleground. It will be in a highly modified setting with the transmission lines visible to the front of the proposed facility and Kemps Creek Resource Recovery Park visible in the background. The large built structures including the digesters, gas storage and AWPT structures of the AWRC will detract to some extent from the rural setting evident within the viewpoint. The magnitude of change is considered **low.** |
| **Key mitigation measures** | 2-Vegetation screening |
| **Stage 1 Operational (year 10)** | Landscape mitigation planting surrounding the site is unlikely to be noticeable behind the existing vegetation within this viewpoint. The tall will remain visible, with structure facades colouring to match the surrounding vegetation barely noticeable from this distance. The magnitude of change is considered **low.** |
| **Future Stage** | The future stage of the AWRC will be barely noticeable from this viewpoint, experience by motorists on the upgraded Mamre Road. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased residential, commercial and industrial development. The magnitude of change is considered **negligible.** |

| VP7 | | Location: 845a Mamre Road – road reserve<br>Viewpoint direction: south west towards proposed facility<br>Distance from AWRC: 1.2 km |
|---|---|---|
| **Visual impact ratings** | | |
| **Construction** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP7 for residents located along Mamre Road |
| **Stage 1 Operational (year 1)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP7 for residents located along Mamre Road |
| **Stage 1 Operational (year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP7 for residents located along Mamre Road |
| **Future Stage** | | Moderate sensitivity + negligible magnitude of change = **negligible visual impact** at VP7 |

**Figure 6.16: VP7 existing view looking south west towards the proposed facility from road reserve off Mamre Road (near 845-857 Mamre Road, Kemps Creek)**

**Figure 6.17: VP7 Stage 1 Operational – indicative photomontage**

### Table 6.9 VP8 – AWRC: Visual Impact Assessment

| VP8 | Location: 141-143 Aldington Road, Kemps Creek – large lot residential dwelling<br>Viewpoint direction: south west towards proposed facility<br>Distance from AWRC: 2.4 km |
|---|---|
| **Existing Setting** | VP8 is taken from a residential property at 141-143 Aldington Road which looks south west towards the AWRC. The view is taken from an elevated height on a hill which looks down over the rural landscape. Large lot residential dwellings are located in the foreground with mostly cleared agricultural land in the middleground and distant views to the blue mountains in the background. The VP contains a number of built elements including sheds, dwellings, green houses and high voltage powerline towers. The sensitive receivers considered are that of the private residents at 30 Mount Vernon Road, Mount Vernon. |
| **Sensitivity** | The view consists of a rural and rural residential landscape and contains a number of built elements including sheds, dwellings, green houses and high voltage powerline towers. The sensitivity from this view is **high.** |
| **Magnitude of change** | |
| **Construction** | The construction works, machinery, vehicles and infrastructure would be visible from this viewpoint. The large scale and size of infrastructure associated with the AWRC particularly the digesters, outloading and bioreactor structures being prominent within the rural context despite the presence of other built infrastructure and rural dwellings within the view context. The magnitude of change is considered **moderate.** |
| **Stage 1 Operational (year 1)** | Given the higher elevation of this viewpoint, the proposed facility would be visible however not prominent in the field of view given the distance. The large scale and size of infrastructure associated with the AWRC particularly the digesters, outloading and bioreactor structures being prominent within the rural context despite the presence of other built infrastructure and rural dwellings within the view context. The M12 will visible to the right of the AWRC, providing a further cleared and built area. The magnitude of change is considered **moderate.** |
| **Key mitigation measures** | 2-Vegetation screening, 4- Architectural design |
| **Stage 1 Operational (year 10)** | Landscape planting surrounding the site will assist in screening part of the AWRC. Perimeter planting as well as architectural finishes to structures will assist the facility to integrated with the surrounding landscape including vegetation corridors. The tall structures would remain visible above tree canopy, within the mid-ground of this viewpoint. The magnitude of change is considered **low.** |

| VP8 | | Location: 141-143 Aldington Road, Kemps Creek – large lot residential dwelling<br>Viewpoint direction: south west towards proposed facility<br>Distance from AWRC: 2.4 km |
|---|---|---|
| **Future Stage** | | The future stage of the AWRC will be barely noticeable from this viewpoint due to the distance and scale of the change in the field of view. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased residential, commercial and industrial development. The magnitude of change is considered **negligible.** |
| **Visual Impact ratings** | | |
| **Construction** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP8 for the residents at 141-143 Aldington Road. |
| **Stage 1 Operational (year 1)** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP8 for the residents at 141-143 Aldington Road. |
| **Stage 1 Operational (year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP8 for the residents at 141-143 Aldington Road. |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact** |

**Figure 6.18: VP8 existing view looking south west towards proposed facility from large lot residential dwelling at 141-143 Aldington road, Kemps Creek**

**Figure 6.19: VP8 Stage 1 Operational – indicative photomontage**

### Table 6.10 VP9 – AWRC: Visual Impact Assessment

| VP9 | Location: 1 Ganton Way, Luddenham, Luddenham – undeveloped bushland<br>Viewpoint direction: looking south east towards proposed facility<br>Distance from AWRC: 1.1 km |
|---|---|
| **Existing Setting** | VP9 is taken from an undeveloped bushland area located at 1 Ganton Way in the suburb on Twin Creeks residential area. The view looks south over agricultural land and the AWRC. The view considers the future recreational land use identified in the Western Sydney Aerotropolis structure plan where the area is identified as environment and recreation land. The sensitive receivers considered are of the local community who may use the area for recreational walks. |
| **Sensitivity** | The view is taken in a bushland area identified for conservation in association with the Twin Creeks residential estate. The area contains long grassland with mature and newly planted trees which dominate this viewpoint. The view looks over the agricultural land to the south which contains some large built structures. The sensitivity from this view is **high.** |
| **Magnitude of change** | |
| **Construction** | Construction works would be largely screened from this VP. Depending on the construction requirements, some heavy vehicles may be visible to the left of established mature vegetation, however the magnitude of change is considered **low**. |
| **Stage 1 Operational (year 1)** | The existing native trees are evident within the viewpoint which screen most distant views. Whilst the AWRC is visible from this location, existing and planted native trees largely screen most of the proposed facility from this viewpoint with only a portion of the AWRC is visible from this viewpoint. As demonstrated by the yellow outline of the proposed Project in Figure 7.21, the large components of the AWRC would be screened from this viewpoint. The magnitude of change visible at the north end of the Site, will be small in the field of view at a 1 km distance, thus is considered **low**. |
| **Key mitigation measures** | 2-Vegetation screening |
| **Stage 1 Operational (year 10)** | Existing foreground vegetation will remain to screen the views of larger AWRC components. Landscape planting surrounding the site will assist in integrating the Site with the surrounding landscape. The Site will be barely noticeable, will a **low** magnitude of change. |
| **Future Stage** | Existing screening vegetation is expected to remain, therefore future development changes will not be visible from this viewpoint. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased residential, commercial and industrial development. The magnitude of change is considered **negligible.** |

| VP9 | Location: 1 Ganton Way, Luddenham, Luddenham – undeveloped bushland<br>Viewpoint direction: looking south east towards proposed facility<br>Distance from AWRC: 1.1 km | |
|---|---|---|
| **Visual impact rating** | | |
| **Construction** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP9 from the bushland locality by recreational users. |
| **Stage 1 Operational (year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP9 from the bushland locality by recreational users. |
| **Stage 1 Operational (year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP9 from the bushland locality by recreational users. |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact**. |

**Figure 6.20: VP9 existing view looking south east towards the proposed facility from Undeveloped Bushland Area at 1 Ganton Way, Luddenham**

**Figure 6.21: VP9 Stage 1 Operational – indicative outline of AWRC and landscape mitigation shown in yellow outline**

### Table 6.11 VP10 – AWRC: Visual Impact Assessment

| VP10 | Location: near 16 Ganton Way, Luddenham – residential area<br>Viewpoint direction: looking south east towards proposed facility<br>Distance from AWRC: 1.1 km |
|---|---|
| **Existing Setting** | VP10 is taken near the residential property of 16 Ganton Road, which is in a residential estate know as Twin Creeks. It consists of a filtered view through existing bushland towards the AWRC. The existing vegetation in the foreground mostly screens views to the agricultural lands in the middle and background. The sensitive receivers considered are that of the private located at the Twins Creek residential estate. |
| **Sensitivity** | The view is taken from the road reserve of Ganton Way, in front of 16 Ganton Way and looks south west. The view is filtered by large mature trees and bushland which screens majority of views towards the agricultural lands in Kemps Creek. The sensitivity of the viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The construction works will be mostly screened from view, with occasional views from a distance and construction elements taking up a small field of the viewpoint. The magnitude of change is considered **low**. |
| **Stage 1 Operational (year 1)** | Mature trees are evident within the foreground of this viewpoint which filter views towards the AWRC. The AWRC including the digesters and outloading structure will be partially visible from this viewpoint. These new elements are commensurate with existing rural and industrial elements in the area and whilst the built elements of the AWRC will contrast against the lack of development, the magnitude of the change is considered **low**, given components are only partially visible**.** The yellow outline shown in the indicative photomontage in Figure 7.23 below provides an outline of the Project from this viewpoint. |
| **Key mitigation measures** | 2-Vegetation screening, 4-Architectural design |
| **Stage 1 Operational (year 10)** | Landscape mitigation planting and architectural treatments will be barely visible from this viewpoint. The large, tall structures will remain partially visible. The magnitude of change is considered **low**. |
| **Future Stage** | Existing screening vegetation is expected to remain, therefore future development changes will be barely visible from this viewpoint. Future stage works will be commensurate with Stage 1, though will provide less of a contrast to the surrounding views which will have undergone a transformation with increased residential, commercial and industrial development. The magnitude of change is considered **negligible.** |

| VP10 | Location: near 16 Ganton Way, Luddenham – residential area<br>Viewpoint direction: looking south east towards proposed facility<br>Distance from AWRC: 1.1 km | |
|---|---|---|
| **Visual impact rating** | | |
| **Construction** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP10 from the residential locality. |
| **Stage 1 Operational (year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP10 from the residential locality. |
| **Stage 1 Operational (year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP10 from the residential locality. |
| **Future Stage** | | High sensitivity + negligible magnitude of change = **negligible visual impact.** |

**Figure 6.22: VP10 existing view looking south east towards proposed facility from road reserve near 16 Ganton way, Luddenham**

**Figure 6.23: VP10 Stage 1 Operational – indicative outline of AWRC shown in yellow outline**

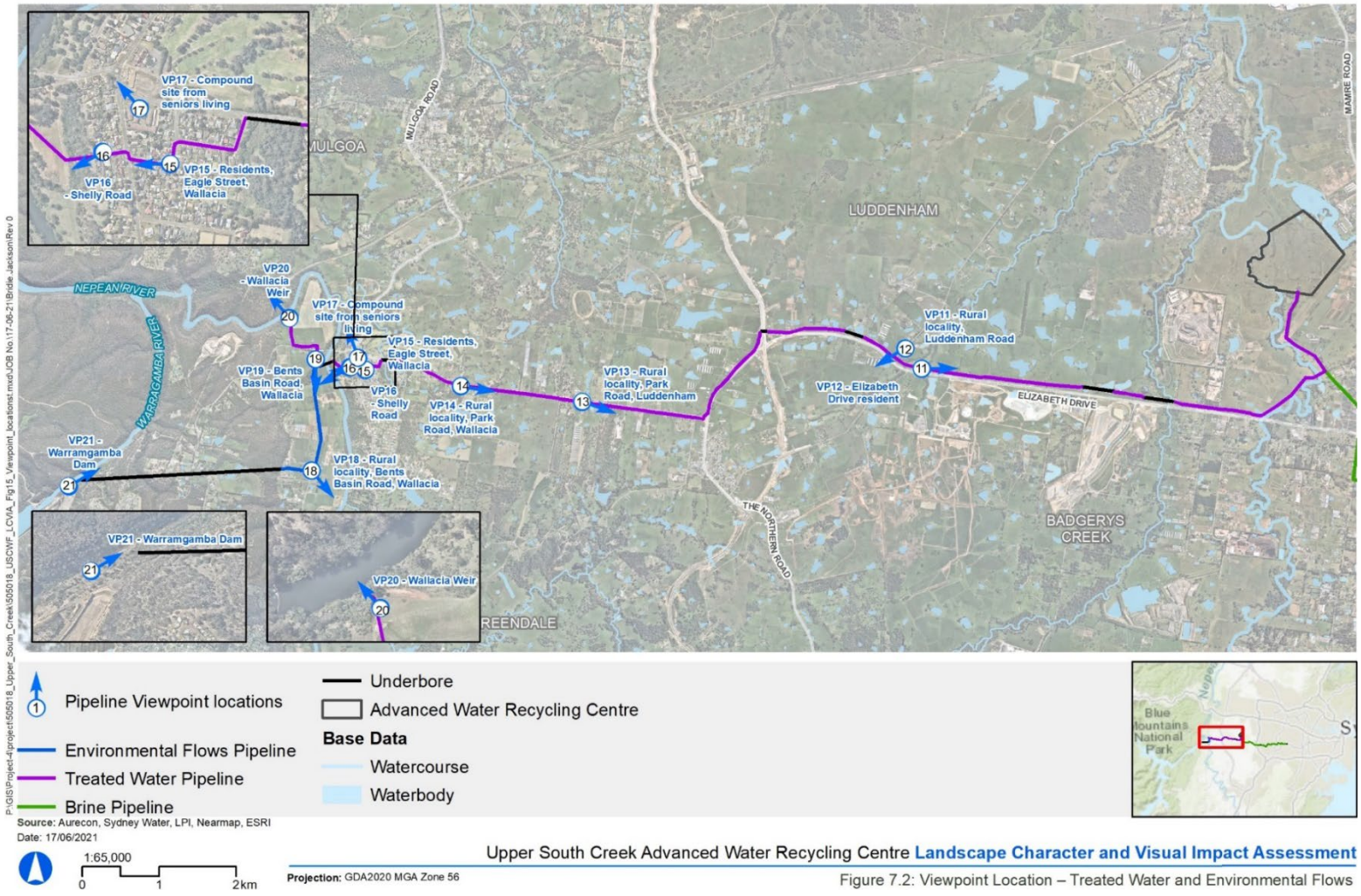



**Figure 6.24: Viewpoint Locations – Treated Water and Environmental flows ((Arrows show general viewpoint direction to the area potentially impacted by the project)**

### Table 6.12 VP11 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP11 | Location: near 889 Luddenham Road, Luddenham – rural locality<br>Viewpoint direction: looking south west towards access tracks proposed along pipeline corridor |
|---|---|
| **Existing Setting** | VP11 is taken from a rural locality within the suburb of Luddenham. The viewpoint consists of fenced rural properties and mature trees, Luddenham road and electrical infrastructure in the foreground and mature trees which surround the viewpoint in the background. The sensitive receivers considered are road users and rural residents. |
| **Sensitivity** | The viewpoint looks towards Elizabeth Drive and the proposed access roads for the construction and operation of the pipeline. The view consists of existing infrastructure (road, electricity, signage) and long grassed rural properties. The sensitivity of the viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The proposed access tracks point of entry will be from Luddenham road to the east and west of this viewpoint. Construction works associated with the pipeline would also be visible from the viewpoint as the pipeline crosses Luddenham road near Elizabeth Drive. The access tracks will occupy cleared land containing tall grasses and avoid removal of mature trees in the area. However, construction sites along the pipeline and construction vehicles will be prominent within this viewpoint during construction. As such the magnitude of the change is considered **high** during construction. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the viewpoint is considered to have **low** magnitude of change as the pipeline will be located below ground and the presence of construction sites/vehicles will no longer be prominent within the viewpoint. Revegetation over the pipeline easement including low shrubs and grasses is commensurate with the existing road reserve conditions. |
| **Stage 1 Operational (Year 10)** | Revegetation within the pipeline corridor would have established, though would comprise of low-lying vegetation instead of a few removed trees, providing a **low** change from the existing conditions. |
| **Visual Impact rating** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** at VP11 for road users and rural residents |
| **Stage 1 Operational (Year 1)** | High sensitivity + low magnitude of change = **moderate visual impact** at VP11 for road users and rural residents |

| VP11 | Location: near 889 Luddenham Road, Luddenham – rural locality<br>Viewpoint direction: looking south west towards access tracks proposed along pipeline corridor | |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP11 |

**Figure 6.25: VP11 existing view looking south east towards Elizabeth Drive from Luddenham Road near 889 Luddenham Road. The underground pipeline proposed location is within the grassed area to the left of the road.**

### Table 6.13 VP12 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP12 | Location: Elizabeth Drive, Luddenham – rural residential locality<br>Viewpoint direction: looking east |
|---|---|
| **Existing Setting** | VP12 is taken in front of a rural residential dwelling at 2141 Elizabeth Drive looking east. The view consists of a front garden driveway area in the foreground with large mature trees evident within the middle and background of the view towards Oaky Creek. The sensitive receivers are rural residents. |
| **Sensitivity** | The view is taken from a residential dwelling along Elizabeth Road looking east. The viewpoint includes large mature trees which are interspersed within the foreground and middle ground of the viewpoint. Mature trees are also seen to align along the edge of Oaky Creek. The sensitivity of the viewpoint to the proposed change is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The impact assessment area for the proposed treated water pipeline and scour valve would result in the removal of mature trees, including vegetation and trees located within the front garden of the residential property. The construction compound (C7 – refer to Figure 4.6: Indicative compound sites), would be located further west on Elizabeth Drive. As such the magnitude of the change during construction is considered **high.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, like for like planting will be provided along the pipeline corridor where possible, however, given the location of the pipeline through the property, re-planting is likely to be restricted to prevent future damage to the pipeline caused by tree roots resulting in a long-term impact to the vegetation in this viewpoint. A few mature trees will be removed, however other trees and shrubs can be replanted outside of the pipeline easement. The magnitude of change during operation is considered **moderate.** |
| **Stage 1 Operational (Year 10)** | Like-for-like revegetation within the pipeline corridor would have established, comprising of low-lying vegetation within the pipeline easement and other trees adjacent. The future stage magnitude of change is considered **low**. |
| **Visual Impact rating** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** for VP12 from the rural residential locality. |
| **Stage 1 Operational (Year 1)** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** for VP12 from the rural residential locality. |

| VP12 | Location: Elizabeth Drive, Luddenham – rural residential locality<br>Viewpoint direction: looking east | |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | moderate sensitivity + low magnitude of change = **moderate-low visual impact** |

**Figure 6.26: VP 12 existing view looking east from rural residential property parallel to Elizabeth Drive, Luddenham.**
**The underground pipeline proposed location is within the background of this view, besides Elizabeth Drive. C7 compound out of view.**

## Table 6.14 VP13 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP13 | Location: Park Road, Luddenham – rural locality<br>Viewpoint direction: looking east (construction compound C6) |
|---|---|
| **Existing Setting** | VP13 is taken from a rural locality within the suburb of Luddenham. The viewpoint consists of fenced rural properties and of mature trees, Park Road and electrical infrastructure. Farm animals are also identified in the middle ground. The sensitive receivers considered are rural residents and road users. |
| **Sensitivity** | The view is taken near a residential dwelling along Park Road looking east. The viewpoint includes large mature trees which align the edge of the road and provide some screening for rural residents from traffic using the road. The nature strip appears to be neatly maintained and positively adds to the rural amenity of the area. The sensitivity of the viewpoint is considered **moderate**. |
| **Magnitude of change** | |
| **Construction** | The impact area runs from the middle of Park Road and the property boundaries to the south, inclusive of the nature strip. As such, existing mature trees within the nature strip would require removal for the construction of the Treated Water pipeline. Temporary construction compound (C6 – refer to Figure 4.6: Indicative compound sites), would also be prominent along Park Road. As such the magnitude of the change is considered **high** during construction. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, like for like planting will be provided along the nature strip where possible, however, given the location of the pipeline will likely be located within the nature strip, re-planting is likely to be restricted to prevent future damage to the pipeline caused by tree roots resulting in a long-term impact to the vegetation in this viewpoint. The magnitude of change during operation is considered **moderate.** |
| **Stage 1 Operational (Year 10)** | Like-for-like revegetation within the pipeline corridor would have established, though would comprise of low-lying vegetation instead of a few removed trees, providing a **low** change from the existing conditions. |
| **Visual Impact rating** | |
| **Construction** | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** for VP13 from the rural residential locality. |
| **Stage 1 Operational (Year 1)** | Moderate sensitivity + Moderate magnitude of change = **moderate visual impact** for VP13 from the rural locality. |

| VP13 | Location: Park Road, Luddenham – rural locality<br>Viewpoint direction: looking east (construction compound C6) | |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact**. |

**Figure 6.27: VP13 existing view looking east along Park Road near rural residential dwelling, Luddenham. The underground pipeline proposed location is within the nature strip to the left side of this view.**

## Table 6.15 VP14 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP14 | Location: Park Road, Wallacia – rural locality<br>Viewpoint direction: looking west | |
|---|---|---|
| **Existing Setting** | | VP14 is taken from a rural locality within the suburb of Wallacia. The viewpoint consists of a typical rural roadside area with a large setback for rural properties. The grassed roadside area contains mature vegetation which aligns on both sides of the road. Electrical infrastructure is also visible from this view. The sensitive receivers considered are rural residents and road users. |
| **Sensitivity** | | The view is taken near a residential dwelling along Park Road looking west. The viewpoint includes large mature trees which align the edge of the road and provide some screening for rural residents from traffic along the road. Existing electrical infrastructure is evident within this viewpoint. The sensitivity of the viewpoint is considered **moderate**. |
| **Magnitude of change** | | |
| **Construction** | | The impact area runs from the middle of Park road and the property boundaries to the south, inclusive of the nature strip. Existing mature trees which are clumped together in proximity to the viewpoint location would require removal for the construction of the Treated Water pipeline. As such the magnitude of the change during construction is considered **high**. |
| **Key mitigation measures** | | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | | During operation, like for like planting will be provided along the nature strip where possible, however, given the location of the pipeline will likely be located within the nature strip, re-planting is likely to be restricted to low shrubs and grasses, extending the apparent road reserve area. The magnitude of change during operation is considered **low.** |
| **Stage 1 Operational (Year 10)** | | Like-for-like revegetation within the pipeline corridor would have established, though would comprise of low-lying vegetation instead of a few removed trees, providing a **low** change from the existing conditions which comprised scattered trees adjacent the road. |
| **Visual Impact rating** | | |
| **Construction** | | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** at VP14 for the rural locality |
| **Stage 1 Operational (Year 1)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** for VP14 from the rural locality |
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** |

**Figure 6.28: VP14 existing view looking west from Park Road near rural residential dwelling, Wallacia.**
**The underground pipeline proposed location is in the grassed area in the foreground and to the left of Park Road.**

### Table 6.16 VP15 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP15 | Location: Eagle Street, Wallacia – residential area<br>Viewpoint direction: looking west towards Greendale Road |
|---|---|
| **Existing Setting** | VP15 is taken from a residential locality within the suburb of Wallacia. Residential dwellings and mature tree vegetation within property boundaries and nature strips are prominent within the viewpoint. Existing powerlines and a local road are also evident within the viewpoint. The sensitive receivers considered are residents. |
| **Sensitivity** | The view consists of a typical residential locality with mature trees as a key feature of the locality. The mature trees and grassed nature strips screen much of the dwellings within the street which has visual amenity qualities. This viewpoint is considered to have a **high** sensitivity to change given the low-density residential nature of the locality. |
| **Magnitude of change** | |
| **Construction** | The proposed pipeline installation impact area primarily runs from the property boundaries on either side of Eagle Street which is inclusive of the nature strip. There will be a low number of street trees (on the left side of Figure 6.29) that will be removed permanently to accommodate the pipeline infrastructure. A construction site would also be required along Eagle Street which will be prominent within the viewpoint. As such, the magnitude of change from this viewpoint during construction is **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction site would be removed, and the pipeline would be located below ground. Like for like landscaping would also take place following construction which would compensate the loss of vegetation. Trees over the pipeline will be permanently lost, with a grassed nature strip. The magnitude of change at Stage 1 operation is considered **moderate.** |
| **Stage 1 Operational (Year 10)** | There will be permanent tree removal from nature strips. The magnitude of change is considered **moderate.** |
| **Visual Impact rating** | |
| **Construction** | High sensitivity + high magnitude of change = **high** visual impact for VP15 from the residential locality |
| **Stage 1 Operational (Year 1)** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** for VP15 from the residential locality. |

| VP15 | Location: Eagle Street, Wallacia – residential area<br>Viewpoint direction: looking west towards Greendale Road |
|---|---|
| **Stage 1 Operational (Year 10)** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** |

**Figure 6.29: VP15 existing view looking west towards Greendale Road from corner of Eagle street and Driver Road, Wallacia. The proposed underground pipeline is located on the left side within the nature strip.**

## Table 6.17 VP16 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP16 | Location: Byron Avenue, Wallacia, near Shelly Road – residential area<br>Viewpoint direction: looking west towards the Nepean River |
|---|---|
| **Existing Setting** | VP16 is taken from the end of Byron Avenue, Wallacia towards Shelly Road. The view contains existing road, signage and electrical infrastructure in front on a vegetated slope which falls away towards the Nepean River. The sensitive receivers considered are residents within proximity to the viewpoint. |
| **Sensitivity** | The view is taken from Byron Avenue which overlooks a perceived bushland setting which faces residential dwellings located on the opposite side of the Shelly road. There is a lack of development within the viewpoint, and as such the sensitivity of the viewpoint to the proposed change is considered **high.** |
| **Magnitude of change** | |
| **Construction** | The impact area of the proposed treated water pipeline will require the removal of mature trees for installation of the pipeline. The construction compound (C4), located on the other side of the river is not likely to be visible from this viewpoint. Considering the vegetation removal required for the proposed pipeline installation, which is significant to the existing visual amenity of the area, the magnitude of change from this viewpoint during construction is **moderate.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation the pipeline would not be visible (located below ground). Like for like landscaping would also take place following construction however would be restricted to areas within the impact area where it would not impact the pipeline in the future (i.e. root damage). In the existing group of trees, some will be permanently removed, exposed a strip above the pipeline where grass and shrubs will be planted. Surrounding trees will be retained therefore the magnitude of change over the long-term during operation is considered **moderate**. |
| **Stage 1 Operational (Year 10)** | No future pipeline works proposed. Revegetation within the pipeline corridor would have established, though would comprise of low-lying vegetation instead of the existing tall trees, providing a **low** change from the existing conditions in a small area. |
| **Visual Impact rating** | |
| **Construction** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP16 from the residential locality |
| **Stage 1 Operational (Year 1)** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP16 from the residential locality |

| VP16 | Location: Byron Avenue, Wallacia, near Shelly Road – residential area<br>Viewpoint direction: looking west towards the Nepean River | |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP16 |

**Figure 6.30: VP16 existing view looking west from Byron Avenue towards Shelly Road, Wallacia.**
**A compound site will be visible during construction, followed by an underground pipeline during operation.**

### Table 6.18 VP17 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP17 | Location: near Park Road, Wallacia – rural village area<br>Viewpoint direction: looking north west towards the proposed C2 compound area |
|---|---|
| **Existing Setting** | VP17 is taken from a public path in front of a seniors living site on Park Road. The area consists of an overflow car parking area behind the local shops of Wallacia which is surrounded by a security fence. The Wallacia hotel is located in the background as well as existing tree canopies. The sensitive receivers considered are local members of the community and community residing in adjoining living areas. |
| **Sensitivity** | The view consists of a relatively developed landscape which looks to the rear of commercial buildings facing Mulgoa Road. The land area in the foreground is cleared land area impacted by vehicle movements across the site. Considering the sensitive residential land use the viewpoint is taken from, the sensitivity of the viewpoint to the proposed change is considered **moderate**. |
| **Magnitude of change** | |
| **Construction** | The proposed compound area (C2 – refer to Figure 4.6: Indicative compound sites), will utilise the cleared land area behind the local village stores within the security fence. The compound area will contain equipment and vehicles during construction to support the installation of the pipeline. The compound area will include hording around the fence to restrict views within the compound, however, the compound area will introduce a number of built forms to the viewpoint. As such, the magnitude of change from this viewpoint during construction is **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction and compound site would be removed and the area will be quickly restored to its current state. There is no permanent removal of trees or changes to the existing conditions. The magnitude of change following the construction period (operation) is **negligible.** |
| **Stage 1 Operational (Year 10)** | No future stage works are proposed for the pipeline therefore the magnitude of change from existing conditions will be **negligible.** |
| **Visual Impact rating** | |
| **Construction** | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** for VP17 from the urban locality. |
| **Stage 1 Operational (Year 1)** | Moderate sensitivity + negligible magnitude of change = **negligible visual impact** for VP17 from the urban locality. |

| VP17 | | Location: near Park Road, Wallacia – rural village area<br>Viewpoint direction: looking north west towards the proposed C2 compound area |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + negligible magnitude of change = **negligible visual impact** for VP17 |

**Figure 6.31: VP17 existing view looking north west towards Compound C2 site area from Seniors Living opposite Park Road, Kemps Creek. The proposed compound area will utilise the cleared land area behind the local village stores within the security fence.**

### Table 6.19 VP18 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP18 | Location: Bents Basin Road, Wallacia – rural area<br>Viewpoint direction: looking south east from proposed C6 compound site location | |
|---|---|---|
| **Existing Setting** | VP18 is taken from a rural locality within the suburb of Wallacia. The viewpoint consists of fenced rural properties which is mostly cleared of vegetation in the foreground and middleground. Mature trees are located within the background of the viewpoint. The sensitive receivers considered are road users and rural residents. | |
| **Sensitivity** | The view looks towards the rural properties along Bents Basin Road which are largely cleared of vegetation most likely due to historic use of the land for agricultural purposes. Some infrastructure such as fence, a water trough and electrical infrastructure is visible from the viewpoint, however, the view is mostly without built structures. The sensitivity of the viewpoint to the proposed change is considered **moderate**. | |
| **Magnitude of change** | | |
| **Construction** | The proposed compound (C6– refer to Figure 4.6: Indicative compound sites), will utilise the rural land area adjacent to Bents Basin Road. The compound area will contain equipment and vehicles during construction to support the installation of the pipeline. The compound area will include hording around the fence to restrict views within the compound, however, the compound area will introduce a number of built forms to the viewpoint. As such, the magnitude of change from this viewpoint during construction is **high**. | |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) | |
| **Stage 1 Operational (Year 1)** | During operation, the construction and compound site would be removed, and the area will be quickly restored to its current state including like for like revegetation which is mostly grassing. The magnitude of change following the construction period (operation) is **negligible.** | |
| **Stage 1 Operational (Year 10)** | No future stage works are proposed for the pipe outlet, therefore the residual impact will be **negligible.** | |
| **Visual Impact ratings** | | |
| **Construction** | | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** at VP18 from the rural area |
| **Stage 1 Operational (Year 1)** | | Moderate sensitivity + negligible magnitude of change = **negligible visual impact** at VP18 from the rural area |

| VP18 | | Location: Bents Basin Road, Wallacia – rural area<br>Viewpoint direction: looking south east from proposed C6 compound site location |
|---|---|---|
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + negligible magnitude of change = **negligible visual impact** for VP18 |

**Figure 6.32: VP18 existing view from Bents Basin Road looking south east. C6 compound to left and behind this viewpoint. The proposed compound area will utilise the rural land area adjacent to the left of the road in this view.**

## Table 6.20 VP19 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP19 | Location: Bents Basin Road, Wallacia<br>Viewpoint direction: looking south towards proposed pipe outlet and C4 construction compound |
|---|---|
| **Existing Setting** | VP19 is taken from a rural locality within the suburb of Wallacia. It is near the Nepean River which is flanked by tall native trees and Fowler Reserve to the left of the view. The viewpoint consists of fenced rural properties which is mostly cleared of vegetation in the foreground and middleground. Vegetated hills are located within the background of the viewpoint. The sensitive receivers considered are road users and rural residents. |
| **Sensitivity** | The view looks towards the rural properties along Bents Basin Road which have rows of vegetation between paddocks and towards the river and hills. Some infrastructure such as fences and powerlines are visible, with a dwelling to the right, however the view is mostly without built structures. The sensitivity of the viewpoint to the proposed change is considered **moderate**. |
| **Magnitude of change** | |
| **Construction** | To the left of Bents Basin Road a construction compound comprising earthworks, spoil storage, materials laydown, equipment storage and worker carparking, will be located to support the boring of the underground pipeline (C4 – refer to Figure 4.6: Indicative compound sites). Low-level vegetation will be removed within the compound area with larger vegetation on the river embankments retained. As such, the magnitude of change from this viewpoint during construction is **moderate.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | In place of where the compound area was located, there will be a surface concrete/bitumen access road and pad in the area of the pipeline flow split. Pipeline infrastructure will be located underground with the exception of electrical kiosks and control panels at dimensions approximately<br>0.8m (w) x 2m (h) x 0.4m (d). The compound area, surrounding the concrete/bitumen will be quickly revegetated with low-level planting. These Project components will be barely noticeable to motorists and locals on Bents Basin Road, resulting in a **low** magnitude of change during operation. |
| **Stage 1 Operational (Year 10)** | No future stage works are proposed for the pipe outlet; therefore the residual impacts will remain with a l**ow** magnitude of change resulting from the inclusion of the access road and flow split pad. |
| **Visual Impact ratings** | |
| **Construction** | Moderate sensitivity + moderate magnitude of change = **moderate visual impact** at VP19 |

| VP19 | | Location: Bents Basin Road, Wallacia<br>Viewpoint direction: looking south towards proposed pipe outlet and C4 construction compound |
|---|---|---|
| **Stage 1 Operational (Year 1)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP19 |
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP19 |


**Figure 6.33 VP19 existing view looking south on Bents Basin Road, Wallacia – near proposed C4 compound (image: Google Street View, July 2020)**

### Table 6.21 VP20 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| VP20 | Location: Nepean River – Wallacia Weir, Wallacia<br>Viewpoint direction: looking south west towards proposed pipe outlet (Construction compound C3) |
|---|---|
| **Existing Setting** | The viewpoint is looking from farmland towards the Nepean River, a short distance from the Wallacia Weir. The river cannot be seen from this viewpoint though it can be accessed by an informal track on private farmland. In the foreground the exotic grass area is fringed by native shrubs. The river environs in this area have limited visibility due to the intervening vegetation including medium to large trees and understorey shrubs along the riverbanks. Access to the riverbanks is difficult due to the regular presence of thick vegetation to both sides of the river.<br>The historic Blaxland's Farm ruins is located further up-stream (west) from VP20, set back from the river. The historic structures are barely visible from this viewpoint, therefore it is assumed that this viewpoint is not visible from the historic site due to the intervening vegetation along the riverbank. |
| **Sensitivity** | There are a low number of sensitive receivers, with private access limitations, although it is occasional accessed for fishing. The sensitivity of the viewpoint is considered **moderate**. |
| **Magnitude of change** | |
| **Construction** | Construction will comprise of equipment and vehicles to support the installation of the underground pipeline, including drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking (C3 – refer to Figure 4.6: Indicative compound sites). It is likely that some low-level vegetation will be removed as seen in the middleground of Figure 6.34, and removal of significant trees avoided Vegetation between the Blaxland's Farm site and the construction compound will be retained, limiting visual impacts from the heritage site. As such, the magnitude of change from this viewpoint during construction is **moderate.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | The area will be quickly restored to its current state including like for like low level revegetation. The outlet structure (refer section 4.2) will be barely visible along the river embankment, screened by the existing vegetation along the riverbank. An area approximately 10-12m wide, where the underground pipeline leads to the outlet will be covered with low lying vegetation, with some medium sized trees permanently removed. Existing vegetation will be retained between publicly accessible areas such as the Blaxland's Farm site and the outlet structure, screening views of the outlet structure and areas of removed vegetation. The magnitude of change at year 1 is considered **low.** |
| **Stage 1 Operational (Year 10)** | No future stage works are proposed for the pipeline outlet, with like-for-like revegetation established. The residual impact will be **low.** |

| | | |
|---|---|---|
| | | Location: Nepean River – Wallacia Weir, Wallacia<br>Viewpoint direction: looking south west towards proposed pipe outlet (Construction compound C3) |
| **Visual Impact ratings** | | |
| **Construction** | | Moderate sensitivity + moderate magnitude of change = **moderate visual impact** at VP20 |
| **Stage 1 Operational (Year 1)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP20 |
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP20 |

**Figure 6.34: VP20 existing view looking southwest towards Wallacia Weir. Proposed pipeline outlet within the vegetated riverbank, to the centre.**

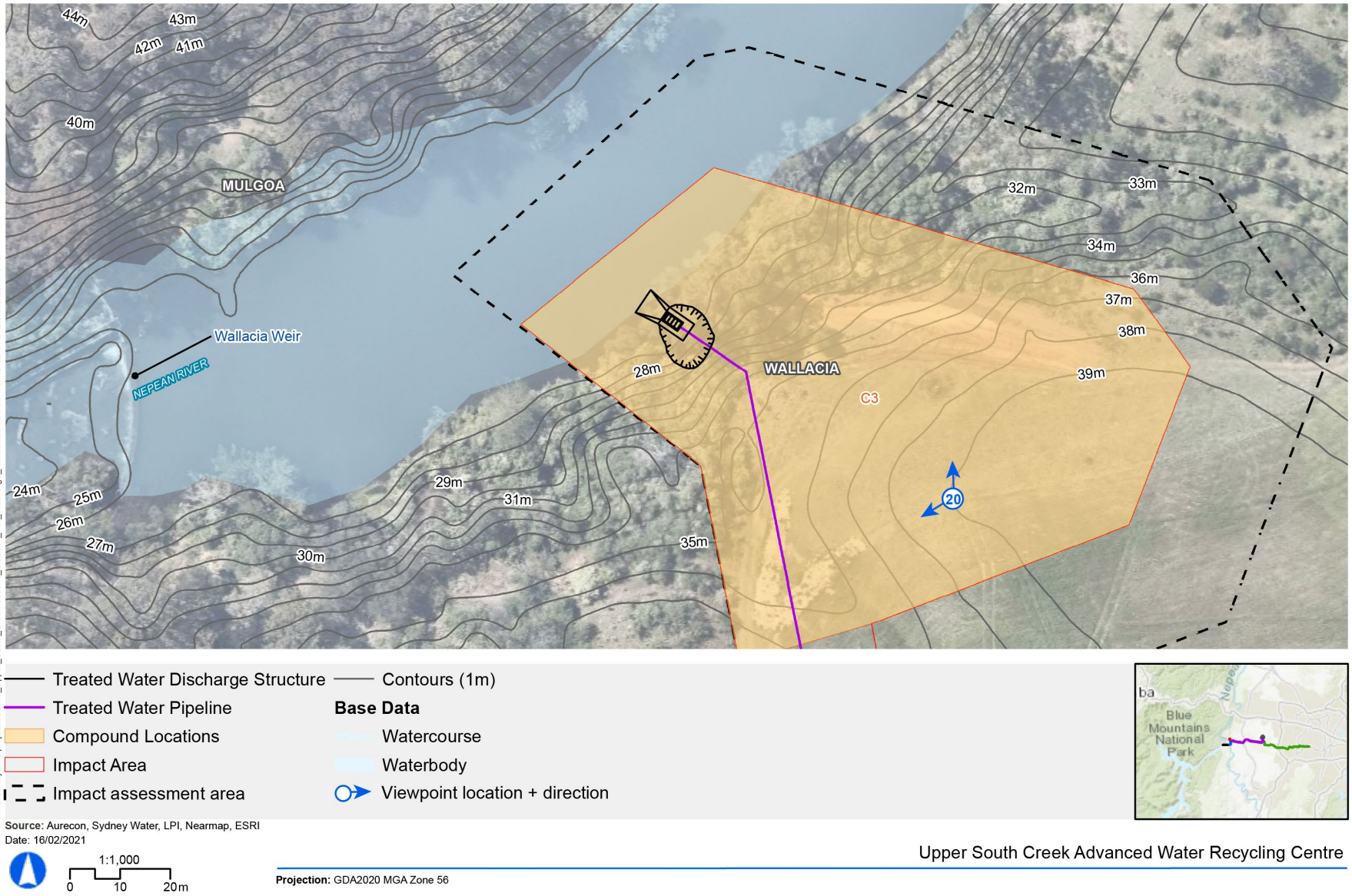



**Figure 6.35 VP20 plan of outlet (discharge) structure and construction impact area**

## Table 6.22 VP21 – Treated Water and Environmental Flows pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: Warragamba Dam spillway<br>Viewpoint direction: looking southwest towards proposed pipe outlet (construction compound C1) |
| **Existing Setting** | The viewpoint in Figure 6.36 is looking out onto the Warragamba River, a short distance (to the left of view) below the dam wall and spillway. The viewpoint is on a maintenance access track, which is part of the Warragamba Dam operational area. As such, this location is not publicly accessible. The viewpoint, although consisting of natural elements including trees and river gully, is a highly modified and controlled area. The dam wall and spillway are very large and tall concrete structures. The river has a controlled flow from the dam, with rocky areas around the bottom of the gully visible. Some juvenile Casuarina trees are growing between rocks in the river fully. Other rocks to the escarpment to the left of the view are both natural and placed rock, providing protection from dam spills. The opposite escarpment to the north, is covered in native vegetation with rocky outcrops, is a steep escarpment not easily accessible. Figure 6.37 view is looking northeast, where the pipeline outlet structure is proposed to be located. This view shows that the vegetated and rocky conditions continue within the river gully. The river environs in this area is only visible in close vicinity due to the intervening vegetation and the steep topography. |
| **Sensitivity** | There are a low number of sensitive receivers, with no public access and restricted access by Water NSW workers. The sensitivity of the viewpoint is considered **low.** |
| **Magnitude of change** | |
| **Construction** | A construction compound will be located below the spillway structure where there is an existing access road. The compound will include a site office, drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking (C1 – refer to Figure 4.6: Indicative compound sites). Vegetation will be removed within the compound impact area, however vegetation between the dam wall and the compound impact area will be retained (refer to Figure 6.38). As such, the magnitude of change from this viewpoint during construction is **high.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | The compound area will be revegetated including like for like revegetation and stabilisation of embankments. The outlet structure including gabions, tank grate and rail will be visible near to the river embankment, however viewing of the area is limited to within the river gully which is not publicly accessible. Existing vegetation will be retained between the publicly accessible dam wall and the outlet structure. The outlet will also include some riprap commensurate with existing rocky conditions along the river gully. The magnitude of change at year 1 is **low.** |

| | | |
|---|---|---|
| | | Location: Warragamba Dam spillway<br>Viewpoint direction: looking southwest towards proposed pipe outlet (construction compound C1) |
| **Stage 1 Operational (Year 10)** | | No future stage works are proposed for the pipeline outlet, with like-for-like revegetation established within the construction compound area and surrounding the pipe outl**et.** The magnitude of change at year 10 is **negligible.** |
| **Visual Impact ratings** | | |
| **Construction** | | Low sensitivity + high magnitude of change = **moderate visual impact** at VP21 |
| **Stage 1 Operational (Year 1)** | | Low sensitivity + low magnitude of change = **low visual impact** at VP21 |
| **Stage 1 Operational (Year 10)** | | Low sensitivity + negligible magnitude of change = **negligible visual impact** at VP21 |

**Figure 6.36: VP21 existing view from left towards the Warragamba Dam wall and Warragamba River at the bottom of the gully The pipeline outlet structure proposed location would be within the rocky embankment to the right of the view.**

**Figure 6.37 VP21b existing view northeast towards the location of the outlet structure**

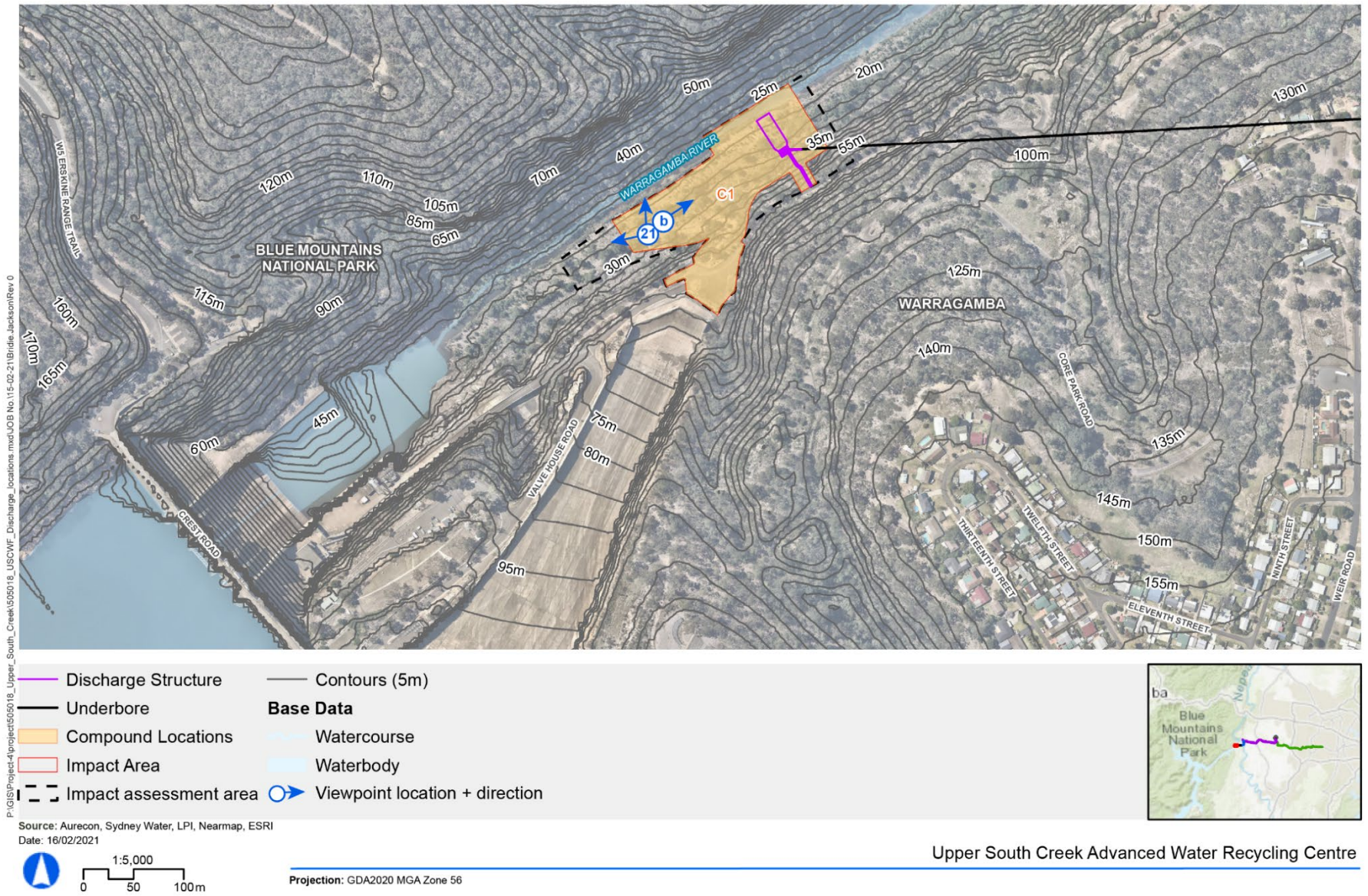



**Figure 6.38 VP21 plan of pipeline outlet (discharge) structure and construction impact area**

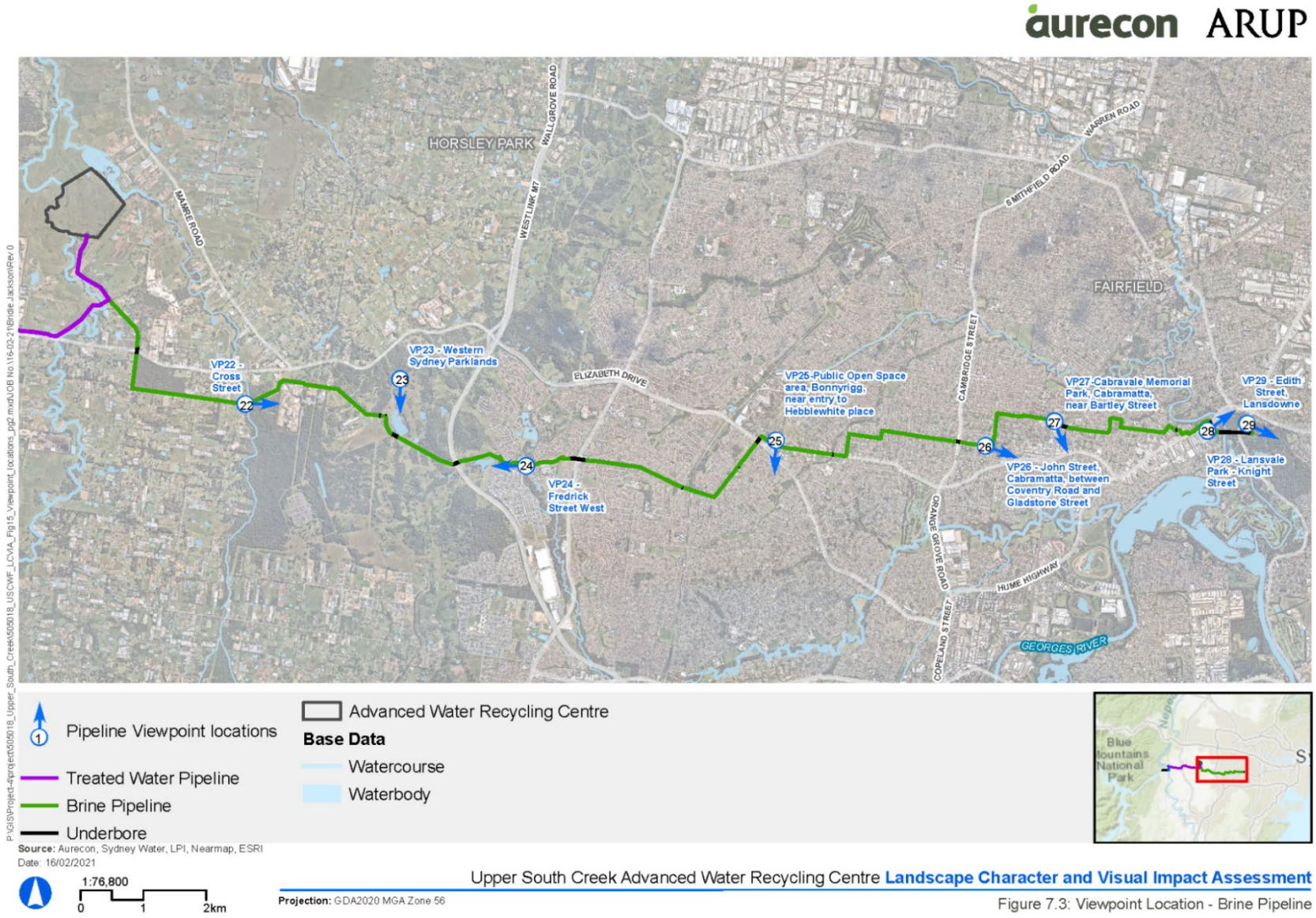



**Figure 6.39: Viewpoint Locations – Brine Pipeline (Arrows show general viewpoint direction to the area potentially impacted by the project)**

## Table 6.23 VP22 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: Cross Street Kemps Creek, near Pratten Street – rural area<br>Viewpoint direction: looking east towards Western Sydney Parklands boundary |
| **Existing Setting** | VP22 is taken from the end of Cross Street, Kemps Creek which is orientated towards the Western Sydney Parkland boundary. The view contains fenced rural property boundaries in the foreground to the south and north of the viewpoint and the end of Cross Street. Mature vegetation aligning Kemps Creek is particularly evident from this viewpoint screening views to the other side of Kemps Creek. The sensitive receivers considered are rural residents within proximity to the viewpoint. |
| **Sensitivity** | The view is taken from Cross street which adjoins a number of rural properties in the Kemps Creek locality. The view is dominated by the mature tree canopies which adjoin the western parklands boundary. The sensitivity of the viewpoint is considered **moderate**. |
| **Magnitude of change** | |
| **Construction** | The impact area of the proposed Brine Pipeline will require the removal of mature trees for installation of the pipeline. Considering the required vegetation removal for the proposed Brine Pipeline installation, which is significant to the existing visual amenity of the area, the magnitude of change from this viewpoint during construction is **high.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction site would be removed, and the pipeline would be located below ground and out of sight. Like for like landscaping would also take place following construction however would be restricted to low shrubs and grasses in a wide strip over the pipeline. The magnitude of change is considered **high** given the permanent removal of trees which cannot be replanted. |
| **Stage 1 Operational (Year 10)** | Like-for-like revegetation would have established, comprising trees and low-lying vegetation in a strip over the pipeline. This is considered a **low** change from the existing conditions as the low-lying vegetation will be a small area with trees to either side. |
| **Visual Impact ratings** | |
| **Construction** | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** at VP22 for the rural area |
| **Stage 1 Operational (Year 1)** | Moderate sensitivity + high magnitude of change = **high-moderate visual impact** at VP22 for the rural area |

| | | |
|---|---|---|
|  | | Location: Cross Street Kemps Creek, near Pratten Street – rural area<br>Viewpoint direction: looking east towards Western Sydney Parklands boundary |
| **Stage 1 Operational (Year 10)** | | Moderate sensitivity + low magnitude of change = **moderate-low visual impact** at VP22 for the rural area |

**Figure 6.40: VP22 existing view looking east towards Kemps Creek from Cross Road, Kemps Creek**

## Table 6.24 VP23 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
|  | Location: Western Sydney Parklands Cecil Hills – recreation area<br>Viewpoint direction: looking south from Wylde Mountain Biking park (construction compound C9) |
| **Existing Setting** | VP23 is representative of the view within Western Sydney Parkland near proposed construction compound sites. The parkland setting comprises open grassed spaces, scattered native trees, some small water bodies and an undulating topography. There are limited built structures, however there is a transmission easement near to the proposed compound sites and these transmission wires are seen to the right of Figure 6.41. |
| **Sensitivity** | The view is taken from the Wylde Mountain Biking trails and is representative of the view within the parklands experienced by recreational users. The sensitivity of the viewpoint is considered **high.** |
| **Magnitude of change** | |
| **Construction** | A few small construction compound areas will be located in areas of low-level vegetation between groups of scattered trees. These may be visible from but are not located on main recreational trails (Cecil Hills Walking Track or Wylde Mountain Biking trails). The compounds will include drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking (C9 – refer to Figure 4.6: Indicative compound sites). Considering the construction works, vehicles and removal of some vegetation contrasting to the existing visual amenity of the parklands, although in a small area relative to the park; the magnitude of change from this viewpoint during construction is **moderate.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction site would be removed, and the pipeline would be located below ground and out of sight. Like for like landscaping would also take place following construction however would be restricted to low shrubs and grasses in a wide strip over the pipeline. The magnitude of change is considered **negligible** given the limited effects in a large park. |
| **Stage 1 Operational (Year 10)** | Like-for-like revegetation would have established, comprising trees and low-lying vegetation in a strip over the pipeline. This is considered a **negligible** change as commensurate with existing conditions. |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP23 for WSP |

| | | |
|---|---|---|
|  | | Location: Western Sydney Parklands Cecil Hills – recreation area<br>Viewpoint direction: looking south from Wylde Mountain Biking park (construction compound C9) |
| **Stage 1 Operational (Year 1)** | | High sensitivity + negligible magnitude of change = **negligible visual impact** at VP23 for WSP |
| **Stage 1 Operational (Year 10)** | | High sensitivity + negligible magnitude of change = **negligible visual impact** at VP23 for WSP |


**Figure 6.41 Viewpoint 23: Existing view from Wylde Mountain biking park tracks in WSP, towards direction of C9 compounds**

### Table 6.25 VP24 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: Feodore Drive, Cecil Hills/Elizabeth Hills, near Lascelles Street – residential area<br>Viewpoint direction: looking west down Feodore Drive |
| **Existing Setting** | VP24 is taken from Feodore Drive Cecil Hills/Elizabeth Hills looking west. The view contains residential dwellings and public footpaths in the foreground and middle ground which run along both sides of Feodore Drive. Mature trees and maintained grass nature strips are also seen to align the edge of Feodore Drive. The sensitive receivers considered are residents within proximity to the viewpoint as well as road users and walkers. |
| **Sensitivity** | The view is taken from a residential/recreational locality adjacent to the local road of Cecil Hills/Elizabeth Hills. Mature trees within the viewpoint appear to have a rhythmic pattern forming a corridor along Feodore Drive. The low-density development is limited to one side of the street which is also hidden behind the tree corridor and maintain front gardens. The sensitivity of the viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The proposed Brine Pipeline is located within Feodore Drive, however the impact area extends out to the nature strip (to the right of view). As such, a number of mature trees within the reserve may require removal to support the installation of the pipeline. The magnitude of change from this viewpoint during construction is **moderate**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the pipeline would be located below ground and out of sight. The majority of the mature groups of trees will be retained, with replanting in the pipeline easement comprising of low shrubs and grass. The magnitude of change during operation is considered low. |
| **Stage 1 Operational (Year 10)** | Like-for-like revegetation would have established, resulting in a low change from the existing conditions at year 10. |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP24 for the residential area |

Location: Feodore Drive, Cecil Hills/Elizabeth Hills, near Lascelles Street – residential area

Viewpoint direction: looking west down Feodore Drive

| | | |
|---|---|---|
| **Stage 1 Operational (Year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP24 for the residential area |
| **Stage 1 Operational (Year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP24 for the residential area |

**Figure 6.42: VP24 existing view from Feodore Drive looking west near Lascelles Street, Cecil Hills/Elizabeth Hills. Underground pipeline location proposed to the nature strip at the right of view.**

## Table 6.26 VP25 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: Bonnyrigg, near entry to Hebblewhite Place – recreation reserve<br>Viewpoint direction: looking south towards Cabramatta Road W (Construction compound C10) |
| **Existing Setting** | VP25 is taken from a local a public open space within the suburb of Bonnyrigg. The viewpoint consists of maintained grass areas which run up to property boundaries as well as formalised public paths towards Cabramatta Road West and neighbouring residential streets. Mature trees are evident within the viewpoint as to are neighbouring residential properties and filtered views to commercial buildings in the background. The sensitive receivers considered are residents and local members of the community who occupy the open space and paths. |
| **Sensitivity** | The view is taken from a public open space area which adjoins residential dwellings. The view consists mostly of maintained grass areas and mature tress as well as existing buildings and infrastructure. The sensitivity of the viewpoint is considered **high** given the recreational space attracts a number of locals to the public viewpoint. |
| **Magnitude of change** | |
| **Construction** | The proposed pipeline installation impact area has identified the removal of mature trees within the public open space area is required for the installation of the Brine Pipeline. The construction compound will include a site office, spoil storage, materials laydown, equipment storage and worker car parking (C10 – refer to Figure 4.6: Indicative compound sites), would also occupy the public space area during construction which is likely to be prominent within the viewpoint. Access to the site may also be restricted during construction.<br>As such, the magnitude of change from this viewpoint during construction is **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction site would be removed, and the pipeline would be located below ground. Like for like landscaping would also take place following construction which would compensate the loss of vegetation. Tree plantings will take time to reach maturity, however, the magnitude of change over the long-term during operation is considered **low**. |
| **Stage 1 Operational (Year 10)** | Replanting of trees would have established, reinstating like-for-like vegetation with a negligible change from the existing conditions. The magnitude of change over the long-term during operation is considered **negligible.** |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** at VP25 from the recreational park |

Location: Bonnyrigg, near entry to Hebblewhite Place – recreation reserve

Viewpoint direction: looking south towards Cabramatta Road W (Construction compound C10)

| | | |
|---|---|---|
| **Stage 1 Operational (Year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP25 from the recreational park |
| **Stage 1 Operational (Year 10)** | | High sensitivity + negligible magnitude of change = **negligible** at VP25 from the recreational park |

**Figure 6.43: VP25 existing view looking south east towards Cabramatta Road W from public open space area near entry to Hebblewhite Place. C10 construction compound site location proposed within this view.**

## Table 6.27 VP26 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: John Street, Cabramatta, between Coventry Road and Gladstone Street – residential area<br>Viewpoint direction: looking south east towards John Street |
| **Existing Setting** | VP26 is taken from a public path along John Street in a residential locality of Cabramatta. Residential dwellings and property fences are evident within the viewpoint as too are existing infrastructure including John Street and electrical powerlines, as well as parked cars. Mature medium-sized trees and grassed nature strips are also visible from this viewpoint. There are occasional small trees beneath powerlines to the south side of the street/ The sensitive receivers considered are residents. |
| **Sensitivity** | The view consists of a typical residential locality. The mature trees and grassed nature strips assist in providing some visual relief to the built-up residential area and is a feature of the locality. The sensitivity of the viewpoint is considered **high.** |
| **Magnitude of change** | |
| **Construction** | The proposed pipeline installation impact area primarily runs from the property boundaries on either side of John Street which is inclusive of the nature strip. As such, impacts to existing street trees and grassed areas is anticipated. Construction would be required along John Street which will be prominent within the viewpoint. The magnitude of change from this viewpoint during construction is **high.** |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction site would be removed, and the pipeline would be located below ground. Small vent structures may also be located within this viewpoint, however, is not considered to be visually prominent. Revegetation would consist of grassing existing nature strips, however trees will not be able to be replanted in an area which where roots could interfere with the pipeline. This effect one side of the street, with trees to the other side remaining. The magnitude of change at year 1 is considered **moderate.** |
| **Stage 1 Operational (Year 10)** | Street trees would not be replanted as trees are restricted over the pipeline. Grassed nature strips would be re-established. The magnitude of change at year 10 remains **moderate.** |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** at VP26 from the residential locality |

Location: John Street, Cabramatta, between Coventry Road and Gladstone Street – residential area

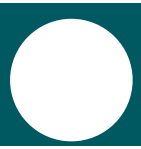
Viewpoint direction: looking south east towards John Street

| | | |
|---|---|---|
| **Stage 1 Operational (Year 1)** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP26 from the residential locality |
| **Stage 1 Operational (Year 10)** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP26 from the residential locality |

**Figure 6.44: VP26 existing view looking east towards John Street between Coventry Road and Gladstone Street. Underground pipeline location proposed within the nature strip.**

## Table 6.28 VP27 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
|  | Location: Cabramatta, near Bartley Street – recreation reserve<br>Viewpoint direction: looking south towards the proposed pipeline |
| **Existing Setting** | VP27 is taken from a public path on the northern boundary of the park. The area consists of maintained grass areas and groupings of mature trees which are scattered throughout the park. The rail line is visible in the background, as to are existing built structures including the heritage bandstand in the middle and background of the view. The sensitive receivers considered are local members of the community who use the park for recreational purposes or for foot travel. |
| **Sensitivity** | The view consists mostly of the recreational parkland known as Cabravale Memorial Park which includes a view towards the local heritage item 'bandstand'. The bandstand commemorates those who died in service or were killed in action during World War One. The area contains maintained grassed areas and mature trees which are scattered throughout the area. The is limited built forms within this viewpoint, and as such, the sensitivity of the viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The proposed pipeline installation impact area occupies a corner area to the north of the park. Whilst most of the area consists of cleared open spaces (maintained grass areas), a number of mature trees are likely to be affected within the impact area. The compound will include drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking (C13 – refer to Figure 4.6: Indicative compound sites), will also be situated within the park to the west of the viewpoint location. The magnitude of change from this viewpoint during construction is **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the construction and compound site would be removed, and the pipeline would be located below ground. Like for like landscaping would also take place following construction which would compensate the loss of vegetation. Tree plantings will take time to reach maturity, however, replanting works overtime would restore much of the trees which will require removal. The magnitude of change over the long-term during operation is considered **Moderate**. |
| **Stage 1 Operational (Year 10)** | Replanting of trees would have established, reinstating like-for-like vegetation with a **low** change from the existing conditions. |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** at VP27 from the residential locality |



Location: Cabramatta, near Bartley Street – recreation reserve

Viewpoint direction: looking south towards the proposed pipeline

| | | |
|---|---|---|
| **Stage 1 Operational (Year 1)** | | High sensitivity + moderate magnitude of change = **high-moderate visual impact** at VP27 from the residential locality |
| **Stage 1 Operational (Year 10)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP27 from the residential locality |

**Figure 6.45: VP27 existing view looking south from Cabravale Memorial Park near Bartley Street. The pipeline C13 compound area location is proposed within this view.**

### Table 6.29 VP28 – Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
| | Location: Lansvale Park, Knight Street, Lansvale – recreation reserve<br>Viewpoint direction: looking east towards the proposed pipeline (Construction compound C14) |
| **Existing Setting** | VP28 is taken from Knight street looking east towards Lansvale Park. The area consists of maintained grass land which is utilised as recreational open space. Large mature trees are featured in this viewpoint which extend towards the foreshore of Prospect Creek in the background. The sensitive receivers considered are local members of the community who use the park for recreational purposes. |
| **Sensitivity** | The view overlooks the recreational open space known as Lansvale Park which contains maintained grass areas which adjoins residential dwellings to the south and a petrol station to the north. Although the area adjoins industrial uses to the west, the viewpoint is considered to be of high visual amenity resulting in a **high sensitivity**. |
| **Magnitude of change** | |
| **Construction** | Lansvale Park will be occupied by during construction as a compound site (C14 – refer to Figure 4.6: Indicative compound sites), as well as for the Brine Pipeline installation. The compound will include drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking. The impact area covers a large portion of the Lansvale Park and looks to avoid major groupings of mature trees. It is recognised that a number of existing trees may require removal during the construction phase of the Project. The compound will include hording to restrict views to the compound area, however, the magnitude of change from this viewpoint during construction is considered **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | Following the construction phase, the compound site would be removed and the pipeline would be located below ground. Like for like landscaping would also take place following construction which would compensate the loss of vegetation where this would not interfere with the pipeline. Tree plantings will take time to reach maturity, however, replanting works overtime would restore and compensate for the loss of trees during construction. The magnitude of change over the long-term during operation is considered **low.** |
| **Stage 1 Operational (Year 10)** | Replanting of scattered trees would have established, reinstating like-for-like vegetation with a negligible change from the existing conditions. The magnitude of change over the long-term during operation is considered **negligible.** |
| **Visual Impact ratings** | |

Location: Lansvale Park, Knight Street, Lansvale – recreation reserve

Viewpoint direction: looking east towards the proposed pipeline (Construction compound C14)

| | | |
|---|---|---|
| **Construction** | | High sensitivity + high magnitude of change = **high visual impact** at VP28 from the recreation reserve |
| **Stage 1 Operational (Year 1)** | | High sensitivity + low magnitude of change = **moderate visual impact** at VP28 from the recreation reserve |
| **Stage 1 Operational (Year 10)** | | High sensitivity + negligible magnitude of change = **negligible visual impact** at VP28 |


**Figure 6.46: VP28 existing view looking east towards Lansvale Park from Knight Street**
**The pipeline C14 construction compound area location is proposed within the reserve area.**

## Table 6.30 VP29– Brine Pipeline: Visual Impact Assessment

| | |
|---|---|
|  | Location: Edith Street, Lansdowne – residential area<br>Viewpoint direction: looking south towards the proposed pipeline (construction compound C15) |
| **Existing Setting** | VP29 is taken from the road col-de-sac at Edith Street looking south towards Lansdowne Reserve. The area consists of maintained grass area in the foreground which adjoins a bushland area to the south and residential properties and Edith Street to the north in the middle ground. The area contains an existing power pole. The sensitive receivers considered are nearby residents. |
| **Sensitivity** | The view includes a grassed area which appears to be regularly maintained with a bushland setting in the middle ground of the view. Large mature trees are prominent within the view which screens views to the south. Residential dwellings including the local heritage item 'Lansdowne' are located to the east and west of the viewpoint (out of view) which back into the grassed area. The sensitivity of the viewpoint is considered **high**. |
| **Magnitude of change** | |
| **Construction** | The electrical works are proposed to be located within the maintained grassed area to support the Brine Pipeline. This will involve electrical conduits from the existing street pole to the site which will be under bored to the bottom of the site. The compound will include drilling, earthworks, spoil storage, pipe welding, materials laydown, equipment storage and worker car parking (C15 – refer to Figure 4.6: Indicative compound sites), required during the boring and electrical works during the construction phase. The magnitude of change from this viewpoint during construction is considered **high**. |
| **Key mitigation measures** | 1-Revegetation (low-planting over pipeline, like-for-like replacement elsewhere) |
| **Stage 1 Operational (Year 1)** | During operation, the electrical conduits will be located below ground and not visible from this viewpoint. No tree removal is proposed, and the construction compound site would have been grassed to match the pre-construction conditions. The magnitude of change at year 1 is therefore **negligible.** |
| **Stage 1 Operational (Year 10)** | Grassing would have established, reinstating like-for-like vegetation with a **negligible** change from the existing conditions. |
| **Visual Impact ratings** | |
| **Construction** | High sensitivity + high magnitude of change = **high visual impact** at VP29 from the residential area |

| | | |
|---|---|---|
| | | Location: Edith Street, Lansdowne – residential area<br>Viewpoint direction: looking south towards the proposed pipeline (construction compound C15) |
| **Stage 1 Operational (Year 1)** | | High sensitivity + negligible magnitude of change = **negligible visual impact** at VP29 from the residential area |
| **Stage 1 Operational (Year 10)** | | High sensitivity + negligible magnitude of change = **negligible visual impact** at VP29 from the residential area |

**Figure 6.47: VP29 existing view looking south from Edith Street towards Lansdowne Road. C15 construction compound is proposed to be located within the viewpoint.**

## 6.2 Visual Impact Assessment

### 6.2.1 AWRC

The visual impact assessment recognises that the proposed facility is likely to be prominent within the viewpoints of nearby receptors, namely from few local residential properties which have a high sensitivity to their surrounds. Existing trees will provide some screening of the proposed development however, given the size and scale of the proposed facility and limitation of tree height, the bulk and height of facility components are likely to remain prominent within its rural context during construction through to year 1.

The AWRC will be particularly prominent from viewpoints at nearby residents located in rural dwellings to the south and south east of the AWRC (VP2 and VP3). The presence of existing mature vegetation located to the north west of the AWRC, is recognised to restrict views towards the AWRC site with only filtered views possible from VP9 and VP10.

The existing topography of nearby high points make the AWRC noticeable from distant views which extend over existing tree canopies and built elements, however from a distance the AWRC does not contrast significantly from existing farm, industrial and residential built structures in the surrounding area.

The below table is a summary of the visual impacts expected as a result of the AWRC during construction, Stage 1 operational - year 1, Stage 1 operation – year 10 and at the future stage.

**Table 6.31 Key Viewpoint Visual Impact Summary for AWRC**

| Viewpoint | Receptor | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - Year 10 | Future Stage |
|---|---|---|---|---|---|
| VP1 | Rural dwelling – 1669A Elizabeth Drive Badgerys Creek | High-moderate | Moderate | Moderate | Negligible |
| VP2 | Rural Dwellings – 230-234 Clifton Avenue Kemps Creek | High | High | High | Negligible |
| VP3 | Rural Dwellings – 203-229 Clifton Avenue Kemps Creek | High | High-moderate | High-moderate | Negligible |
| VP4 | M12 road corridor, Fleurs Farm | Moderate | Moderate | Moderate | Low |
| VP5 | Residential dwellings – 30 Mount Vernon Road, Mount Vernon | Moderate | Moderate | Moderate | Negligible |

| Viewpoint | Receptor | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - Year 10 | Future Stage |
|---|---|---|---|---|---|
| VP6 | Road reserve – Corner of Mamre Road and Abbey Road | Negligible | Negligible | Negligible | Negligible |
| VP7 | Road reserve – Mamre Road | Moderate-low | Moderate-low | Moderate-low | Negligible |
| VP8 | Residential dwellings – 141-143 Aldington Road, Kemps Creek | High-moderate | High-moderate | Moderate | Negligible |
| VP9 | Undeveloped Bushland Area – 1 Ganton Way, Luddenham | Moderate | Moderate | Moderate | Negligible |
| VP10 | Residential dwellings – near 16 Ganton Way, Luddenham | Moderate | Moderate | Moderate | Negligible |

Visual impacts during construction are **high** for those viewpoints close to the AWRC, comprising of vegetation removal, the presence of the construction compound, machinery, sheds and vehicles. If the site construction can be seen, then the impacts are not reduced during operation with a view of large and tall facility components.

Viewpoints 2, 3 and 8 (VP2, VP3 and VP8) are likely to experience **moderate to moderate-high** impacts at Year 1 with no landscape mitigation. Consequently, impacts at Stage 1 Operational – year 10 which includes landscape mitigation design, does not lessen the impacts for VP2 or VP3. The landscape tree screening height and spacing has limited effect of screening the large and tall structures. Architectural façade treatments do assist in blending in with the landscape, however not for the taller structures. VP8 has a slightly reduced impact as the result of landscape mitigation design, as the site is seen from a higher elevation where the AWRC structures and tree canopies blend in with surrounding vegetation and built structures.

**Moderate** impacts at Year 1 with no landscape mitigation, have been assessed for viewpoints 4, 5, 9 and 10 (VP4, VP5, VP9 and VP10). The impacts are not reduced by the landscape mitigation design due to the limitations of vegetation to screen the bulk and height of the AWRC.

Future Stage visual impacts are reduced significantly as the result of the Western Sydney Aerotropolis Plan (WSAP), introducing intervening mixed-use development. Indicative views of Future Stage works have been demonstrated in VP2 and VP5 (see Figure 6.6 and Figure 6.13).

### 6.2.2 The Treated Water and Environmental Flows Pipeline

Overall, the proposed Treated Water and Environmental Flows pipeline infrastructure is expected to temporarily have a **high to moderate visual impact during construction**, primarily due to the presence of construction and compound sites, and removal of vegetation. The long-term visual impact of the proposed pipeline is reduced over time, with the establishment of replacement planting.

The below table is a summary of the visual impacts expected as a result of the Treated Water and Environmental Flows Pipeline during construction, Stage 1 operational - Year 1 and Stage 1 operational – year 10.

**Table 6.32 Key Viewpoint Visual Impact Summary– Treated Water Pipeline**

| Viewpoint | Receiver | Construction compounds | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - Year 10 |
|---|---|---|---|---|---|
| VP11 | **Rural locality, Luddenham Road, near 889 Luddenham Road, Luddenham** | | High | Moderate | Moderate |
| VP12 | **Rural residential locality, Elizabeth Drive, Luddenham** | C7 | High | High-moderate | Moderate-low |
| VP13 | **Rural locality, Park Road, Luddenham** | C6 | High-moderate | Moderate | Moderate-low |
| VP14 | **Rural locality, Park Road, Wallacia** | | High-moderate | Moderate-low | Moderate-low |
| VP15 | **Residents, Eagle Street, Wallacia** | | High | High-moderate | High-moderate |
| VP16 | **Residents, Byron Avenue, Wallacia** | | High-moderate | High-moderate | Moderate |
| VP17 | **Wallacia rural village area, Park Road, Wallacia** | C5 | High-moderate | Negligible | Negligible |
| VP18 | **Rural locality, Bents Basin Road, Wallacia** | C2 | High-moderate | Negligible | Negligible |
| VP19 | **Bents Basin Road drilling site** | C4 | Moderate | Moderate-low | Moderate-low |
| VP20 | **Nepean River – Wallacia Weir, Wallacia** | C3 | Moderate | Moderate-low | Moderate-low |
| VP21 | **Warragamba Dam spillway** | C1 | Moderate | Low | Negligible |

The visual impact assessment completed for the Treated Water and Environmental Flows Pipeline highlights that the proposed pipeline would have varied long-term impacts during operation. The viewpoints selected are representative of the whole alignment and indicative of the potential worst case conditions and impacts experienced because of pipeline construction and infrastructure in sensitive areas.

During construction, proposed works along the Treated Water and Environmental Flows pipeline is expected to result in a high level of visual impact associated with compound site areas, construction activity and vegetation removal (VP13-14, VP17 and VP19-21). In many cases, the visual impact is limited to the construction period, however like-for-like revegetation may not be possible in locations where the pipeline is planned through an established grouping of trees. Revegetation is to occur within all areas affected by the pipeline installation; however, trees cannot be replanted where roots may pose a threat to pipeline integrity. Revegetation within this easement will be restricted to small shrubs and grassing.

The impacts of viewpoints VP12, 15 and 16 remain high-moderate or moderate after construction where tree replacement is limited due to the location of the pipeline. The level of impact reflects both the sensitivity of the viewpoint and the contrast to the existing conditions.

Outlet structures placed at river embankments are likely to contrast to the existing vegetated conditions in a limited area. The location of the structures is not publicly accessible and vegetation is retained between publicly accessible areas and the structures.

It is recognised that during detailed design, the impact area for the installation of the pipeline may be reduced to lessen the number of trees and vegetation required for removal. As such, the visual impact experienced in these viewpoints, particularly in residential areas such as VP15, may be avoided.

Areas that can be restored ‘like for like’ will likely have a short to medium term visual impact due to the removal or disruption of vegetation, civil works and public domain areas. Areas that cannot be restored ‘like for like’ are expected to have a long-term visual impact.

### 6.2.3 The Brine Pipeline

Overall, the proposed Brine Pipeline infrastructure is expected to have a **high visual impact during construction,** primarily due to the presence of construction and compound sites and removal of vegetation within residential localities. The long-term visual impact of the proposed pipeline is reduced over time, with the establishment of replacement planting.

The below table is a summary of the visual impacts expected as a result of the Brine Pipeline during construction, Stage 1 operational - year 1 and Stage 1 operation – year 10.

### Table 6.33 Key Viewpoint Visual Impact Summary during operation – Brine Pipeline

| Viewpoint | Receiver | Construction compounds | Construction | Stage 1 Operational - Year 1 | Stage 1 Operational - Year 10 |
|---|---|---|---|---|---|
| **VP22** | **Rural locality, Cross Street Kemps Creek, near Pratten Street** | | High-moderate | High-moderate | Moderate-low |
| **VP23** | **Western Sydney Parklands, near Liverpool Offtake Reservoir** | C9 | High-moderate | Negligible | Negligible |
| **VP24** | **Feodore Drive, Cecil Hills/Elizabeth Hills, near Lascelles Street** | | High-moderate | Moderate | Moderate |
| **VP25** | **Public Open Space area, Bonnyrigg, near entry to Hebblewhite Place** | C10 | High | Moderate | Negligible |
| **VP26** | **Residents John Street, Cabramatta, between Coventry Road and Gladstone Street** | | High | High-moderate | High-moderate |
| **VP27** | **Cabravale Memorial Park, Cabramatta, near Bartley Street** | C13 | High | High-moderate | Moderate |
| **VP28** | **Lansvale Park, Knight Street, Lansvale** | C14 | High | Moderate | Negligible |
| **VP29** | **Edith Street, Lansdowne** | C15 | High | Negligible | Negligible |

The Brine Pipeline is mostly located within residential localities in the Fairfield City and Liverpool City LGAs which reflects the sensitive nature of the viewpoints assessed. The viewpoints generally have high number of viewers within mostly low residential localities.

During construction, proposed works along the Brine Pipeline is expected to result in a high level of visual impact associated with compound site areas, construction activity and vegetation removal. In many cases, the visual impact is limited to the construction period, however revegetation may not be possible in many locations particularly where the pipeline is planned through an established grouping of trees. Viewpoint VP26 is expected to have trees permanently removed due to the location of the pipeline through street trees. In VP22 and VP27, the high-moderate impacts at year 1 will be reduced with the maturation of replacement trees at year 10 within the impact area.

Revegetation is to occur within all areas affected by the pipeline installation; however, trees cannot be replanted where roots may pose a threat to pipeline integrity. Revegetation within this strip will be restricted to small shrubs and grassing. In areas with surrounding tall vegetation, this results in contrasting visual effects.

It is recognised that during detailed design, the impact area for the installation of the pipeline may be reduced to lessen the number of trees and vegetation required for removal. As such, it is recognised that the visual impact experienced in these viewpoints, particularly trees along nature strips in residential areas may be avoided.

### 6.2.4 Lighting impacts

The sensitivity of the local landscape to the introduction of more lighting has been considered for construction and operational stages of the AWRC and the pipelines. Sensitivity depends on visibility, remoteness and scenic quality with the degree of enclosure afforded by the key factors' landform and vegetation, along with patterns of land use and settlements. Three different environmental lighting zones have been identified within the visual catchment of the Project. These are:

- Environmental Zone E1: Dark natural areas – Blue Mountains National Park and Western Sydney Parklands.
- Environmental Zone E2: Rural low district brightness area – sparsely populated rural areas and Wallacia village.
- Environmental Zone E3: Medium district brightness area – Residential areas in Fairfield.
- Environmental Zone E4: High district brightness area – Westlink and M12 (proposed highway)

The main potential receptors of light include the residential properties, roads and commercial areas in vicinity of the Project Site which are currently affected by existing light sources. Existing sources of light adjoining or in the immediate area surrounding the Project include:

- The existing low number of residential properties surrounding the Project site;
- The existing industrial or commercial sites surrounding the Project site;
- Traffic and street lighting on the surrounding roads in particular Elizabeth Drive and the M12 (future works); and
- The Western Sydney Airport (in construction).

Downlighting for the AWRC, has the potential to result in a negative change to the night time setting of adjacent residents, albeit at a low level.

The existing setting of the Project site has limited lighting impacts due to the rural landscape setting. Accordingly, the lighting assessment demonstrates that the Project Site is sensitive to the introduction of new lighting. The operational lighting impacts for the AWRC is not expected to generate significant levels of lighting, given its distance from existing sensitive receptors and lighting assumed to be downlighting. Therefore, the lighting impacts for the Project are low.

Lighting in the vicinity of airports should not compromise airport operations, nor be distracting to pilots or configured of such a pattern that pilots could either be distracted or mistake such lighting as being ground lighting from the airport. Any significant lighting should be further assessed using ‘National Airports Safeguarding Framework Principles and Guidelines’ (NASF Guideline ‘E’), and then where required, referred to CASA for further assessment. The Project Site is located approximately four kilometres from the proposed WSA, therefore has the potential to be sensitive to pilots. The AWRC downlighting is not likely to be in an arrangement that it may be mistaken as airport lighting, therefore the lighting impacts are considered low. Additionally, construction lighting will be downlighting and stage 1 construction will be undertaken when the airport is still being constructed.

# 7 Cumulative effects

Cumulative effects are broadly defined as incremental effects that result from the accumulation of other approved projects or by the proposed Project. Where it is identified that other schemes are expected to be complete before completion of either Stage 1 Operational, or Future Stage; their effects will be considered through the extrapolation of the future baseline.

The south-western region of Sydney will experience transformational change in land use over the coming decades. This will be largely due to the future development of a 24-hour economy centred around the future Western Sydney Airport and Aerotropolis which will see much of the land area transition away from a mostly rural and semi-rural landscape towards a more industrial and commercial landscape. Significant development and projects planned in the south-western region will result in cumulative urban design, landscape and visual impacts which are also to be considered in the context of individual projects such as the subject project.

The Project is important for Sydney in terms of scale and its contribution providing sophisticated wastewater treatment and resource plant that will produce recycled water, renewable energy and bio resources to support growth in Western Sydney. Numerous projects in varying stages of delivery and planning are also currently underway or proposed in the vicinity of the Project. Table 8.1 identifies projects that are in the vicinity to the Water Recycling Centre recognising the significant changes to the surrounding landscape in the medium to long term.

**Table 7.1 Major Projects and Developments near project**

| Project | Description | Effects on Project |
|---|---|---|
| **The Western Sydney Aerotropolis Plan** | The Western Sydney Aerotropolis, planned by the Western Sydney Planning Partnership, will centre off the Western Sydney International Airport. The Aerotropolis is recognised as an economic catalyst for Western Sydney which aims to become home to global industries that will provide jobs of the future.<br>The plan highlights the importance of a holistic approach to water management in Western Sydney and consideration of the total water cycle.<br>The project is integral to the water needs of the area and this scheme is supported in the plan. | The future development proposed within the WSA structure plan will have cumulative impacts to the landscape and visual amenity of the area, with proposed buildings and infrastructure reducing the overall visual impact of the Project.<br>The landscape character will transform from rural land to mixed use, in which the Project would have a reduced contrast.<br>Assume existing sensitive receivers remain in place with potential new sensitive receivers. |

| Project | Description | Effects on Project |
|---|---|---|
| **Western Sydney International Airport** | The airport footprint is significantly larger than the Project which would substantially modify the landscape and existing rural amenity to a more urbanised and commercial landscape character. Additionally, planned precincts surrounding the airport will be developed over time to leverage and support the operations of the airport would lead to increased urbanisation over time. In general, this would reduce the impact of the Project as it becomes part of the changing urban character in the area. | Effects are applicable to the Future Stage when the airport is expected to be built and operational.<br>The construction of the airport will overlap with the construction of the AWRC. This is likely to have a cumulative effect on the Study Area with increased construction works and associated traffic. |
| **M12 Motorway** | M12 Motorway project will provide an east-west link between the M7 Motorway and The Northern Road, as well as a connection to the Western Sydney International Airport. The Project is currently in the planning stage, with construction expected to start in 2022 and be completed before the Western Sydney International Airport opening in 2026.<br>The16 km motorway stretches between the M7 motorway, Cecil Hills and the Northern Road. | Cumulative effects are applicable from Stage 1 Operational. The M12 is situated adjacent the AWRC and is expected to be dominant in several of the viewpoints, where it is intervening with views towards the AWRC.<br>The construction programme for the M12 aligns with the construction and operation of this Project, with a cumulative effect on the Study Area with increased construction works and associated traffic. |
| **Other existing road network upgrades**<br>**Elizabeth Drive upgrade and Mamre Road** | Other major transport projects such as the Outer Sydney Orbital, Elizabeth Drive upgrade and Mamre Road upgrade are currently under strategic development. | Depending on the final design outcomes, these projects may intensify the urban character of the area potentially changing the local character of the roads. |
| **The Northern Road Upgrade – Glenmore Road to Bringelly** | The NSW Department of Planning, Industry and Environment has assessed the Northern Road upgrade – Glenmore to Bringelly which includes upgrades to 16 km of existing road. | The upgrade is likely to result see an intensification to the existing rural road character. |
| **Warragamba Dam Raising** | Raising the dam would reduce flood risk by allowing the temporary hold and then controlled release of floodwaters coming from the large Warragamba Catchment. | Pipeline and outlet infrastructure near to the dam is not expected to be impacted by raising of the dam level. |

| Project | Description | Effects on Project |
|---|---|---|
| **AWRC Future Stage** | Future stages of the AWRC (subject to separate approvals) propose to double the capacity from Stage 1, to increase up to 100ML/day.<br>The orientation and site layout of the future stages has been designed to directly align with the Stage 1 layout in an effort to integrate the staged development and to reduce the Project footprint and scale as much as possible. Whilst the future staged development of the site would represent almost a doubling in size. | The proposed Future Stage has been assessed within this report and key views demonstrated by renders. It is expected that although the facilities will almost double, this is not likely to have any cumulative effects on future landscape character. The visual effects will be apparent from but intervening developments, will form intervening element in the landscape. |

# 8 Mitigation measures

The impact assessment in Section 7 considers the visual impacts associated with the construction and operational phases of the project. This section outlines management measures for the construction phase (Table 9.1) required to manage temporary construction impacts.

Following avoidance in design measures (Section 5.5), the impact assessment in Section 7 also considers the opportunities and measures outlined in Table 5.5, to reduce potential landscape and visual impacts during operation, however some residual impacts remain. This section also outlines management measures for the operational phase (Table 9.2) that the contractor should consider, to manage remaining residual impacts. The following presents opportunities that have the potential to further reduce visual impacts.

A discussion of residual impacts is found at Section 9.2.

### 8.1.1 Construction

Visual impact mitigation and management may be considered for both on-site and off-site situations so as to mitigate or eliminate the visual impact of the Project at any highly impacted location. Recommended on-site mitigation are outlined in Table 8.1 below.

**Table 8.1 Construction mitigation measures**

| Potential Impact | Mitigation measure | Intent of mitigation measure |
|---|---|---|
| **Visual impacts of construction compounds** | • Installation of temporary screens to minimise exposure of construction areas from local viewpoints along the pipeline corridors, including C4-7, C9-10, C13-15<br>• Where feasible and reasonable, the elements within construction sites would be located to minimise visual impact, for example materials and machinery would not be visible above temporary screens<br>• Avoid or minimise removal of mature trees especially those between receptors and construction compounds | Reduce visibility of construction areas in order to improve visual amenity. |
| **Light pollution** | Where possible, lights will be used at the lowest effective level and would be directed downwards to the work area and away from incoming viewpoints and oncoming traffic.<br>In accordance with AS4282-1997 and Airport Safety (CASA) requirements. | Reduce visual impacts associated with construction lighting at night which may impact drivers, the community, or residents. |

### 8.1.2 Operation

Table 8.4 indicates opportunities and treatments that could be implemented to manage impacts to visual amenity or create a positive impact by embracing the built form in the landscape. The assessment has shown that management measures proposed by the landscape and architectural design have limited capacity to significantly reduce the visual impacts owing to the scale of key AWRC elements. However, the contractor should consider implementing a range of management measures and opportunities to ensure that the urban design principles are considered in the detailed concept and aligns with their technical design.

**Table 8.2 Opportunities and treatments to manage residual visual impacts**

| Potential Impact | Mitigation measure | Intent of mitigation measure |
|---|---|---|
| **Visual impact to residential receptors near the AWRC** | Investigate potential for off-site landscape screening in closer proximity or to the perimeter of private properties. Off-site mitigation proposals would be considered in consultation with the local community. | Screen views of larger/taller AWRC components to nearby receptors. These are indicted by VP2 and VP3 in the visual impact assessment. |
| **Visual contrast of the AWRC** | A light colour/finish to tall (>8m height) components to blend in with the sky. | Reduce visual prominence of tall components |
| **Streetscape planting** | Where like-for-like planting cannot occur in these locations investigate opportunities for streetscape planting (trees or low-level planting) to opposite side of street or surrounding area, not restricted by underground pipelines. | Further reduce impacts to streetscape character and visual amenity |
| **Impacts to revegetation** | As part of the rehabilitation/vegetation strategy ensure:<br>• Selection of vegetation species suitable to site and environmental conditions.<br>• Maintained installation period for new plantings and revegetation. | Ensure success of mitigation planting and not impacted by operation activities, fauna species, environmental conditions or other activities |

## 8.2 Residual impacts

The assessment of residual impacts is based on the Project being operational, 10 years after construction has been completed and considers the effectiveness of mitigation measures.

Construction impacts are expected to be temporary, with construction activity limited and compound sites and the pipeline alignment revegetated with like-for-like at the completion of construction. The most effective mitigation measures during construction includes minimising tree removal around construction compounds, which provides screening and reduces contrast to baseline conditions. Additional temporary screening of construction compounds (C5, C9-10, C13-15) is effective near to sensitive receptors in public recreation and residential areas.

The implementation of measures in Tables 9.1 and 9.2 have the potential to further reduce residual impacts identified in Section 7.

The residual impacts of lighting is expected to remain low, provided these measures are implemented.

### 8.2.1 Landscape Character

Following landscape mitigation, residual impacts of a moderate or higher level are expected for the below LCZs during operation.

**Table 8.3 Summary of mitigation measures and residual Impacts**

| | Landscape Character Zone | Mitigation measures | Stage 1 Operational - year 10 | Future Stage |
|---|---|---|---|---|
| **AWRC** | | | | |
| **LCZ 1** | Rural Land/future Enterprise land | 2-Vegetation screening, 4-Architectual design | Moderate | Moderate-Low |
| **LCZ 4** | Environmental Conservation and Future environment/ recreational zones | 1-Low-level revegetation, 2-Vegetation screening, 7-Public access | Moderate | Moderate |
| **Treater Water and environmental flows pipeline** | | | | |
| **LCZ 4** | Environmental Conservation and Future environment/recreational zones | 1-Low-level revegetation | Moderate | n/a |

#### AWRC

The proposed landscape design and architectural facades (mitigation measures 1 and 4) serve to blend the AWRC with the surrounding environment, but due to its scale and the surrounding land use is still expected to have a moderate level of impact.

The landscape character impacts of the AWRC are likely to be less noticeable within LCZ 1 in the Future Stage as the rural character increasingly changes due to proposed developments that are a part of the Aerotropolis plan.

#### Pipelines

The residual impacts of the pipelines are the result of restrictions to revegetation with like for like species in the wide corridor over top of the pipelines. The residual impacts to landscape character occur within limited areas in LCZ's of high sensitivity.

The mitigation measure includes planting low-level vegetation that is not likely to compromise the pipeline structures or operations. This mitigation measure of low level planting has the potential provide a linear strip overtop of the pipeline which provides a modified area surrounded by tall scattered trees within LCZ 4.

### 8.2.2 Visual Impacts

Visual impacts that are assessed as having moderate or high residual impact ratings are summarised in Table 8.4. These viewpoints have a resulting impact rating above moderate, due to the height and scale of Project components remaining dominant during operation, after mitigation measures had been applied.

**Table 8.4 Residual Visual Impact Summary**

| Viewpoint | Receptor | Mitigation measure | Stage 1 Operational – year 10 | Future Stage |
|---|---|---|---|---|
| **AWRC** | | | | |
| VP1 | Rural dwelling – 1669A Elizabeth Drive Badgerys Creek (800m east) | 2-Vegetation screening, 3-Living walls, 4-Architectural design | Moderate | Negligible |
| VP2 | Rural Dwellings – 230-234 Clifton Avenue Kemps Creek (400m southeast) | 2-Vegetation screening, 3-Living walls, 4-Architectural design | High | Negligible |
| VP3 | Rural Dwellings – 203-229 Clifton Avenue Kemps Creek (540m southeast) | 2-Vegetation screening, 3-Living walls, 4-Architectural design | High-moderate | Negligible |
| VP4 | M12 road corridor, Fleurs Farm (60m south) | 2-Vegetation screening, 3-Living walls, 4-Architectural design | Moderate | Low |
| VP5 | Residential dwellings – 30 Mount Vernon Road, Mount Vernon (2.6 km east) | 2-Vegetation screening, 4-Architectural design | Moderate | Negligible |
| VP8 | Residential dwellings – 141-143 Aldington Road, Kemps Creek (2.4 km northeast) | 2-Vegetation screening, 4-Architectural design | Moderate | Negligible |
| VP9 | Undeveloped Bushland Area – 1 Ganton Way, Luddenham (1.1 km northwest) | 2-Vegetation screening | Moderate | Negligible |
| VP10 | Residential dwellings – near 16 Ganton Way, Luddenham (1.1 km northwest) | 2-Vegetation screening, 4-Architectural design | Moderate | Negligible |

| Viewpoint | Receptor | Mitigation measure | Stage 1 Operational – year 10 | Future Stage |
|---|---|---|---|---|
| **Treated Water and Environmental Flows pipeline** | | | | |
| VP11 | **Rural locality, Luddenham Road, near 889 Luddenham Road, Luddenham** | 1-Revegetation | Moderate | n/a |
| VP15 | **Residents, Eagle Street, Wallacia** | 1-Revegetation | Moderate | n/a |
| VP16 | **Residents, Byron Avenue, Wallacia** | 1-Revegetation | Moderate | n/a |
| **Brine Pipeline** | | | | |
| **VP24** | **Feodore Drive, Cecil Hills/Elizabeth Hills, near Lascelles Street** | 1-Revegetation | Moderate | n/a |
| **VP27** | **Cabravale Memorial Park, Cabramatta, near Bartley Street** | 1-Revegetation | Moderate | n/a |

### AWRC

Visual impacts are higher for those viewpoints closest to the AWRC (VP2 and VP3), with receptors of high sensitivity. Mitigation measures proposed by the landscape and urban design have limited capacity to reduce the visual impacts owing to the scale of key AWRC elements, together with operational and WSA flight path restrictions limiting tree height and placement.

Tree height is restricted to 10m height which does not screen taller components (refer to Table 4.1 Indicative Project Components) including:

- Advanced Water Treatment Plant (AWTP) Colourbond building at 10m height
- AWTP balance tank at 10m height (coloured '*environmental green*')
- Outloading building in Colourbond at 25m height
- Digesters and gas storage tanks with gas bubbles at 13-16m height above ground level
- Permeate tank at 12m height (coloured '*environmental green*')
- Odour ventilation stacks at 15m height (light coloured)

Placement of screening trees are restricted to limited grouping of trees and operational access; therefore, a consistent screening effect is not able to be achieved. However, vegetation screening assists in blending the AWRC into the surrounding landscape, as well as interrupting the view of the AWRC from those viewpoints which are further away (VPs 5-10).

Living walls, whilst providing a softening of structures, are also of limited placement and growth height. A proposed living wall is located near to the M12 corridor (VP4), assists in softening the appearance of buildings but does not have an effect on the magnitude of visibility. Architectural detail (materials and finishes) serves to provide a softening of the industrial aesthetic of buildings, which may provide visual interest and perception for receptors in close proximity.

Architectural design including the use of colour to match surrounding colours (vegetation or sky), assists with structures blending into the surrounding landscape, from viewpoints that are further away but do not reduce the visual contrast created by large industrial components spanning the Site. The colour finish of components in ‘environmental green’, specified to allow components to blend in with surrounding vegetation, is limited in reducing the apparent bulk of components in close proximity or in blending taller components with the skyline.

### Pipelines

The residual visual impacts of the pipeline construction and presence of ancillary structures; are typically resulting in limited areas where there is permanent removal of trees. Whilst like-for-like revegetation is proposed, tree planting is restricted where roots may compromise underground pipelines. In these areas low-lying vegetation will be used which has the potential to contrast to the existing setting, where there was either groups of trees (VP11, VP16 and VP24) or street trees (VP15 and VP26). The residual visual impacts occur within viewpoints which have a high sensitivity, either recreational park (VP27) or residential streets.

# 9 Conclusion

The Project is located within a mainly rural locality, mixed with industrial and residential land uses which are currently in a state of transition with the arrival of the future Western Sydney International Airport and the Western Sydney Aerotropolis.

The AWRC has been strategically located to sit well in the natural topography of the site and to provide separation to sensitive receptors and uses as much as practical in the Western Sydney area. Given the significant infrastructure requirements to meet the growing demand for water resources in Western Sydney and constraints associated with the Western Sydney International Airport, the AWRC has implemented relevant design and landscape measures to limit visual and landscape character impacts. The future development of the surrounding land is likely to lessen the visual contrast of the AWRC over time.

### Construction impacts

Active construction compounds are expected to have an adverse impact to landscape character particularly for high sensitivity areas including residential suburban and public recreation areas. The visual modification comprises compound sites with large construction equipment and may require the removal of vegetation for site establishment. However, construction impacts are typically temporary, with like-for-like and low-level revegetation providing limited visual contrast to baseline conditions.

There are a few sensitive viewpoints experienced by nearby rural-residential dwellings, where the AWRC is likely to be prominent and construction activity including removal of vegetation, noticeable. Therefore, high visual impacts are likely during construction from viewpoints VP1, VP2, VP3 and VP8.

Due to low-level revegetation limitations over pipelines, adverse impacts are expected to streetscape character and visual amenity where trees will permanently be removed in a limited locality at Eagle Street, Wallacia and John Street, Cabramatta (VP15 and VP26).

### Operational impacts

The scale, height and industrial typology of the AWRC would contrast to the existing landscape character and surrounding sensitive areas including rural residential and environmental/recreational areas. Existing trees will provide some screening of the proposed development however, given the size and scale of the proposed facility, it will remain prominent within its rural context.

There are moderate to high visual impacts expected from a low number of close sensitive receivers (VP2 and VP3). Distanced views do not contrast significantly from existing farm, industrial or residential structures.

Landscape and urban design measures to address visual impacts including landscape planting, vegetation screening and architectural finishes; assist with integrating it in within the existing setting comprising of scattered trees, occasional farm and industrial infrastructure, however do not effectively reduce the visual impact due the scale and extents of the AWRC.

Downlighting for the AWRC, is not expected to be significant change in night time lighting levels, given its distance from existing sensitive receptors. Additionally, downlighting is not likely to be in an arrangement that it may be mistaken as airport lighting, therefore the lighting impacts are considered low during construction and operation for the AWRC.

The pipeline infrastructure associated with the AWRC (Treated Water and Environmental Flows, and Brine Pipelines) will mostly be located below ground with occasional low-level surface infrastructure, typically reducing long term impacts for landscape character zones and visual amenity.

Pipeline outlet structures are located in areas of low visual sensitivity, screened by existing vegetation and intervening topography within river embankments. Whilst there will be vegetation removed within construction compounds surrounding these outlet structures, views from nearby heritage sites (Blaxland's Farm at Wallacia Weir, National Park or Warragamba Dam wall), are limited due to intervening vegetation. The moderate construction impacts are expected to be effectively mitigated through establishment of replacement planting, screening low-level and small outlet structures.

### Residual impacts

Avoidance of adverse impacts has been sought through the design process to propose elements that integrate with the surrounding landscape. Establishment of vegetation at the AWRC is not expected to significantly reduce visual impacts due to the limitations of vegetation to screen the bulk and height of the some key components (namely Biosolids treatment and outloading at 30m, Brine storage tanks at 15m, Digesters and gas storage tanks at 20m, Odour Control Unit at 10-15m, Odour ventilation stack at 15m and some other buildings around 10m in height), though has the potential to improve landscape amenity through breaking up the visual extents of the AWRC. Moderate to high visual impacts remain for a low number of residential receptors at VP2 and VP3.

Additionally, off-site landscape screening is likely to significantly reduce the impacts for VP3 by screening views of the AWRC, through tree planting to the boundary of the private property. Off-site mitigation is subject to consultation and detailed design.

Landscape revegetation of areas affected by pipeline construction, are effectively mitigated with the exception of permanent street tree removal (VP15 and VP26).

The landscape and urban design responds to the visual impacts of AWRC, but also mitigating adverse effects to the landscape character through:

- Integrating the site with the surrounding vegetated water corridors and parklands, through planting;
- Enabling public access and connections with recreational use; and
- Promoting benefits of water recycling through on-site education and interpretation facilities.

Visual impacts of the AWRC in the Future Stage are negligible, with the exception of the view from the M12 beside the Project (VP4) which has potential low visual impacts from low-sensitivity receivers. This is subsequent to WSAP future development intervening between the Project and the viewpoints.

### Cumulative effects

The surrounding locality is identified to undergo significant development over the coming decades which will see a transformational change in the land use surrounding the Project. Western Sydney International Airport and the Aerotropolis in particular, are significant developments which will see the area transition from a rural and semi-rural environment a more urban and industrial landscape. As such, the long-term landscape character and visual impacts associated with the Project are likely to be less significant due to the changing landscape character of the area. It is therefore expected that future development within the Study Area would reduce the Project's overall prominence.

# 10 Assumptions and Limitations

## Limitations

The Landscape Character and Visual Impact Assessment (LCVIA) is subject to the following limitations:

- The LCVIA process aims to be objective and, as such, seeks to describe any changes factually however, it is recognised that visual assessment can be highly subjective. Potential changes resulting from the Project have been defined with the significance of these changes requiring qualitative (subjective) judgements to be made. Therefore, the conclusions to this assessment combine both objective measurement and subjective professional interpretation.
- This LCVIA is based on the reference design prepared by the Aurecon-Arup partnership:

**'Upper South Creek Advanced Water Recycling Centre - Reference Design Report', October 2020. This is the civil design for the operational facilities only.**

- Further changes to the design are likely as it progresses but will not be captured in this assessment. Therefore, the assumption made are indicative and maybe refined in the detailed design.
- Night lighting has not been included in the design as the time of this report and therefore the potential impacts of lighting have not been assessed. However, these have been considered in Section 6.2.4 Lighting Impacts.
- Delivery of Future Stages is currently unknown therefore, the future development is based on an upgrade to the Stage 1 facilities to process up to 100ML per day. This assessment has assumed that there will be several developments that are currently planned, which will be completed at 'Future Stage' and thus the land use and sensitive receivers will have changed.
- All viewpoints have been photographed from publicly accessible locations and private properties to demonstrate and reflect as closely as possible, the potential visual impacts from a sample of sensitive receivers such residents.

## Assumptions

- The methodology adopted for this landscape and visual impact assessment assumes that if the works would not be seen, there is no impact.
- For the purpose of the assessment, an unobstructed viewpoint from a publicly accessible location has been used as a worst-case scenario of potential visual impacts.
- It is assumed that the solar panels placed in stage 1 of the AWRC are non-reflective and do not exceed a height of three metres, which is typical of solar farm developments currently in Australia.
- Is it assumed that any operational lighting within the Site will be directed downwards towards operations, minimising light spill and compatible with aviation guidelines (refer Appendix B: Guidance Notes for the Reduction of Obtrusive Light).
- Viewpoints not assessed:

A visual assessment was considered for the aerial view of the AWRC, as it is on the flight path to or from the future Western Sydney Airport. Whilst there may be a high number of receptors, flight passengers are not considered a sensitive receptor due to the duration of which they are able to see any particular structure while moving. The Project is not be significant in the field of view or contrasting to future development, when viewed from a

- A desktop analysis was done for the below construction compound sites (refer to Figure 4.6: Indicative compound sites). Viewpoint assessments were not done due to non-sensitive site conditions and potential impacts being temporary, described as follows:

C10 - Liverpool reservoir, Cecil Hill (Figure 10.1): the proposed location is within an existing Sydney Water civil maintenance depot, with limited views due to perimeter tree screening. Views likely to be experience by motorists along Cowpasture Road and some residents adjacent the site.

C12 - East Parade, Fairfield (Figure 10.2): the proposed location is within an existing Sydney Water wastewater treatment plant, with limited views due to existing tree screening. Views likely to be experienced by local motorists along East Parade.

**Figure 10.1 Existing view from Cowpasture Road**

**Figure 10.2 Existing view from East Parade**

### Primary production of renders

- The preliminary renders of the Project were prepared by Unsigned Studio. The renders are based on the Reference design and plans provided by Sydney Water which illustrate the nature and extent of the Project.
- The renders do not incorporate the design of other proposed infrastructure such as the M12 Motorway and Elizabeth Road upgrade, therefore these impacts are discussed in the assessment but not shown.
- Renders have been produced from selected viewpoints of the AWRC only. Renders have not been produced of the pipelines as these will be mostly located underground, with limited visibility of occasional low-lying infrastructure placed above ground.
- Renders are commensurate with the Stage 1 Operational phase including indicative vegetation based on landscaping and tree species at maturity identified in the Urban Design Report (draft, May 2020).
- Photomontages have not been included for ‘Year 1 – no landscape mitigation’ and the anticipated effects are discussed within the assessment.

# References


Biosis, March 2021, Upper South Creek Advanced Water Recycling Centre – Biodiversity Development Assessment Report Draft

Extent, May 2021, Upper South Creek Advanced Water Recycling Centre – Statement of Heritage Impact

Greater Sydney Commission (2018) Our Greater Sydney 2056; *Western Sydney District Plan – connecting communities*. NSW Government.

Guidance Notes for the Reduction of Obtrusive Light GN01:2011, Institution of Lighting Professionals

Kelleher Nightingale Consulting Pty Ltd, January 2021, Upper South Creek Advanced Water Recycling Centre –Aboriginal Cultural Heritage Assessment Report

NSW Office of Environment & Heritage – heritage database

Penrith City Council (2020) Penrith Local Strategic Planning Statement.

Roads and Maritime Services (2018) Guideline for landscape character and visual impact assessment. Environmental impact assessment practice note EIA-N04. NSW Government. pg9

State Environmental Planning Policy (Western Sydney Aerotropolis) 2020

State Environmental Planning Policy (Western Sydney Parklands) 2020

Western Sydney Planning Partnership (2020) Western Sydney Aerotropolis Plan. NSW Government.

National Airports Safeguarding Framework Principles - Guideline E: Managing the risk of distractions to pilots from lighting in the vicinity of airports (2012), Australian Government Department of Infrastructure, Transport, Regional Development and Communications

# Appendix A – Guidance Notes for the Reduction of Obtrusive Light

Guidance Note 01/20

# Guidance notes for the reduction of obtrusive light

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This guidance note has been revised to reflect the changes in international guidance regarding obtrusive light as detailed in CIE 150:2017 *Guide on the limitation of the effects of obtrusive light from outdoor lighting installations*.[1] It also considers industry comment regarding the assessment and definition of obtrusive lighting.

*Good lighting practice is the provision of the right light, at the right time, in the right place, controlled by the right system.*

Humanity's invention of artificial light and its application in the external environment has done much to safeguard and enhance our night-time environment but, if not properly controlled, *obtrusive light* (sometimes referred to as light pollution) can present serious physiological and ecological problems.

*Obtrusive light* – whether it keeps you awake through a bedroom window, impedes your view of the night sky or advisedly affects the performance of an adjacent lighting installation – is a form of pollution, which may also be a nuisance in law and which can be substantially mitigated without detriment to the lighting requirements of the task.

*Sky glow*, the brightening of the night sky, *glare* the uncomfortable brightness of a light source when viewed against a darker background, *light spill* the spilling of light beyond the boundary of the area being lit and *light intrusion* ("nuisance")[2] are all forms of obtrusive light which may cause nuisance to others, or adversely affect fauna and flora as well as waste money and energy.

# Considerations to be made

Think before you light. Is it necessary? What effect could it have on others? Has it the potential to cause a nuisance? How can you mitigate and manage any potential adverse effects from your lighting installation?

There are published standards and guidance for most lighting tasks, adherence to which will help mitigate obtrusive lighting aspects. Organisations from which full details of these standards can be obtained are given later in this Guidance Note.

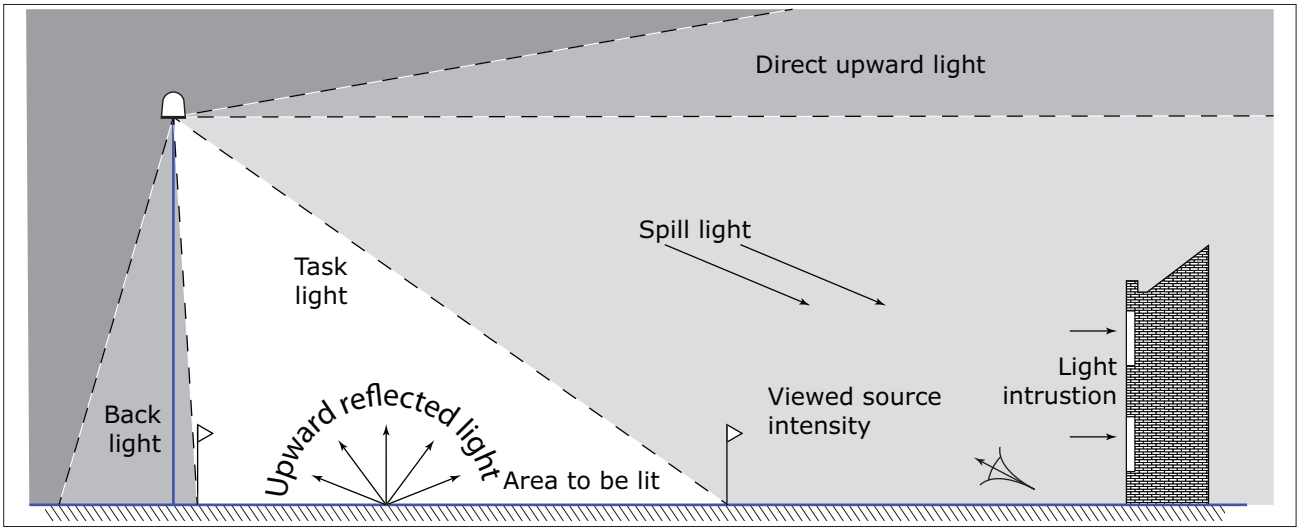



*Figure 1: Types of intrusive light*

1 The copyright of the data detailed within this guide belongs to CIE, email ciecb@cie.co.at
This document should be used in conjunction with CIE 150:2017 and CIE 126:1997 and not as a replacement for the procedures contained therein.
These documents can be obtained from https://www.techstreet.com/cie/pages/home and members of a National Committee of the CIE can purchase them with a discount of 66.7%.

2 The term light trespass is sometimes used, but trespass is to physically encroach on land and light can't do that, so the term nuisance should always be used.

For the purpose of this Guidance Note the following two Commission Internationale De L'Eclairage (CIE) documents are specifically referenced; they provide guidance to the mitigation of obtrusive light from exterior lighting installations:

- CIE 150:2017 Guide on the limitation of the effects of obtrusive light from outdoor lighting installations;
- CIE 126-1997 Guidelines for minimizing sky glow

When considering any lighting installation these two documents should be referenced.

Whilst this Guidance Note specifically considers the effects from external lighting installations, the considerations within it can be relevant when considering modern office blocks and shop fronts where the main external facing structure is transparent and light from within the buildings could become a source of illumination to the exterior environment.

*"Good Design Equals Good Lighting"*

It cannot be stressed sufficiently that employing a competent lighting designer with proven experience in the lighting application being considered will provide a suitable lighting installation where all obtrusive lighting aspects are mitigated[3].

Any lighting scheme consists of three basic elements: a light source, a luminaire (incorporating the optical control system) and a method of installation/mounting.

## Light sources (lamps/LEDs)

Remember that the light source output in lumens is not the same as the wattage and that it is the former that is important in combating the problems of obtrusive light.

Most night-time visual tasks are only dependent on light radiated within the visual spectrum. It is therefore not necessary for light sources to emit either ultra-violet or infra-red radiation unless specifically required to do so. The majority of light sources used in external lighting do not contain these wavelengths or where they are present their spectral power is very low.

Research indicates that light from the blue end of the spectrum could have important adverse effects on fauna and flora. The lighting designer should consider the blue light spectral power of the light source and try to balance the needs of the task to be lit with any impact on fauna and flora within the environment.

## Luminaires

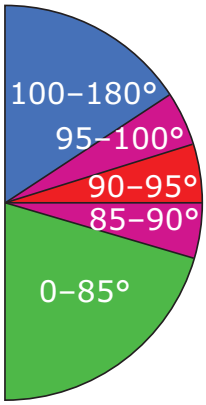
The choice of luminaire with the right optical distribution at the right mounting height is critical to minimising light spill and obtrusive light effects while providing the right lighting performance on the task area.

Sky glow is the general diffuse sheen that is visible in the direction of large cities, airports, and industrial complexes. It occurs from both natural and artificial light sources and does not depend exclusively on the lighting design. It also depends on the atmospheric conditions (humidity, aerosols, clouds, haze, atmospheric pollution, etc). Light propagating into the atmosphere either directly from upward directed or incompletely shielded sources, or after reflection from the ground or other surfaces, is partially scattered back towards observers on the ground; the impact being shown in Table 1.

It is therefore important to consider the luminaire, its light distribution, how it is installed, and how it is set up.

For most general sports and area lighting installations the use of luminaires with asymmetric optics designed so that the front glazing is kept at or near parallel to

3 Competency can be determined through membership of a professional lighting body supported by the appropriate qualifications and experience in the application of lighting required.



Indicative diagram

**Table 1: The effect on the ability to view the night sky at various angles**

| Angle of light emitted (degrees) | Sky glow effect | Glare effect |
|---|---|---|
| 100 – 180 | Local | Little |
| 95 – 100 | Significant | Some |
| 90 – 95 | High | High |
| 85 – 90 | Significant | High |
| 0 – 85 | Minimal | Some |

the surface being lit should, if correctly aimed, ensure minimum obtrusive light.

Appendices 1 and 2 in this Guidance Note give more details of how to choose luminaires, and if necessary modify them through the use of louvres and shields.

# Installation

In most cases it will be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation.

It should be noted that a lower mounting height is perhaps not better as can be seen from Figures 2a and 2b from CIE 150. A lower mounting height can create a higher level of light spill and require additional lighting points.

Keep glare to a minimum by ensuring that the main beam angle of all luminaires directed towards any potential observer is no greater than 70°. Higher mounting

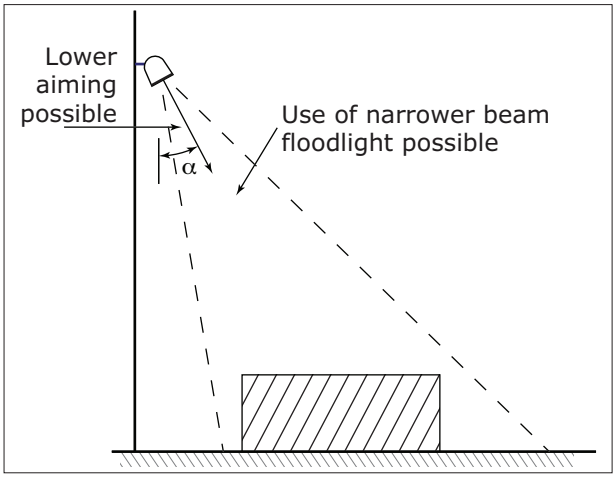


*Figure 2a: Higher mounting height – less spill light and glare*

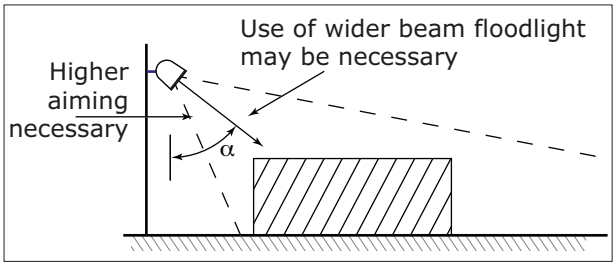


*Figure 2b: Lower mounting height – more spill light and glare*

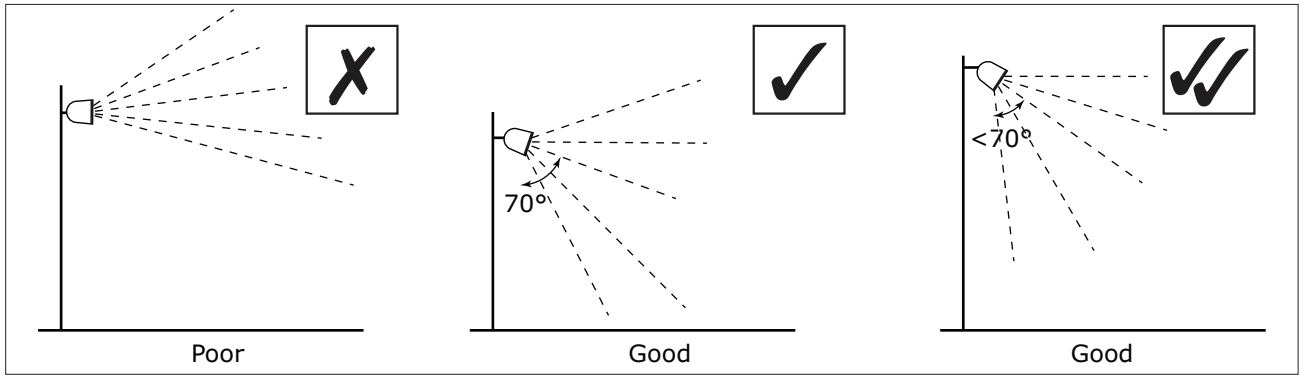


*Figure 3 Luminaire aiming angles*

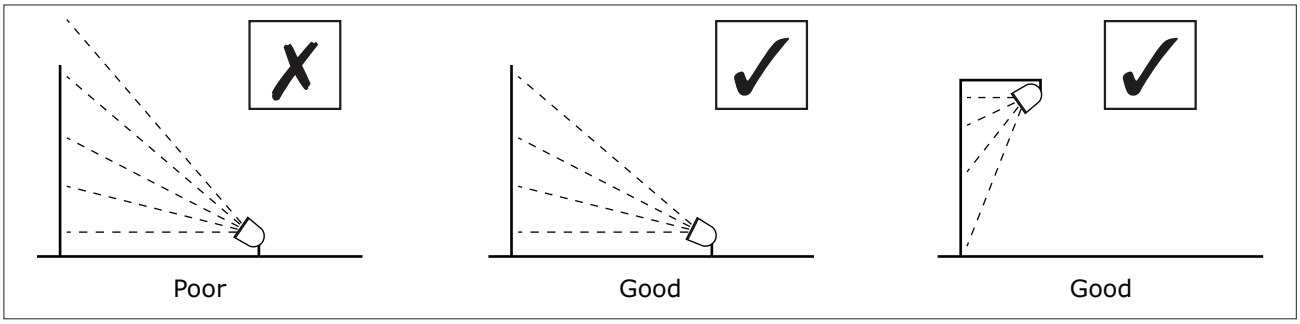



*Figure 4 Façade illumination*

heights allow lower main beam angles, which can assist in reducing glare.

In areas with low ambient light levels, glare can be very obtrusive, and extra care should be taken when positioning and aiming lighting equipment. With regard to domestic security lighting, the ILP produces an information leaflet GN09:2018 *Domestic exterior lighting: getting it right!* which is freely available from its website.

When lighting vertical structures such as advertising signs, direct light downwards wherever possible. If there is no alternative to up-lighting, as with much decorative lighting of buildings, then the use of luminaires with the correct optical distribution, coupled where required with shields, baffles and louvres, will help minimise spill light around and over the structure.

For road and amenity lighting installations, light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note the Upward Lighting Ratios (ULR's) advised in Tables 5 and 6). In rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, help to minimise visual intrusion within the open landscape. However, in some urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.

# Clean Neighbourhoods and Environment Act 2005 (CNEA)

The Clean Neighbourhoods and Environment Act 2005 (CNEA) gives local authorities and the Environment Agency additional powers to deal with a wide range of issues by classifying artificial light emitted from defined premises as a statutory nuisance.

The CNEA 2005 amended paragraph 79(1)(fb) of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light nuisance stating the following:

*'artificial light emitted from premises so as to be prejudicial to health or a nuisance'*.

Guidance produced on Sections 101 to 103 of the CNEA 2005 by DEFRA (DEFRA, April 2006) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80(2) of the Environmental Protection Act 1990), requiring that the nuisance cease or be abated within a set timescale.

# National Planning Policy Framework (NPPF)

The NPPF was introduced as a more concise and useable planning document to aid developers and designers in the design and construction of developments within the UK.

The National Planning Policy Framework 2019 makes little reference to lighting with regard to the control of obtrusive light with section being the only reference, which states:
*c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

With regard to the planning aspect, many local planning authorities (LPAs) have already produced, or are producing, policies that within the planning system will become part of their local development framework. For new developments there is an opportunity for LPAs to impose planning conditions related to external lighting, including curfew hours.

# National planning policy

The national on-line planning guidance resource looks at when lighting pollution concerns should be considered.

The guidance provides a high-level overview for planners, with links to appropriate documents looking at the subject through seven discussion points:

- What light pollution considerations does planning need to address?
- What factors can be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What factors are relevant when considering possible ecological impacts of lighting?
- What other information is available that could inform approaches to lighting and help reduce light pollution?

It is to be hoped that whilst the guide does not specifically require it planners will consider the application of artificial light and consult with lighting designers. The planners can then be advised on the planning conditions that might be applicable for each project and review any submissions to determine if the planning conditions have been met.

The Scottish Executive has published a design methodology document (March 2007) entitled "*Controlling Light Pollution and Reducing Lighting Energy Consumption*" to further assist in mitigating obtrusive light elements at the design stage.

# Environmental zones

It is recommended that local planning authorities specify the environmental zones given in Table 2 for exterior lighting control within their development plans.

# Design guidance

The following limitations based upon CIE150 may be supplemented or replaced by an LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a competent professional lighting designer when considering any exterior lighting.

**Table 2: Environmental zones**

| Zone | Surrounding | Lighting environment | Examples |
|---|---|---|---|
| E0 | Protected | Dark (SQM 20.5+) | Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places |
| E1 | Natural | Dark (SQM 20 to 20.5) | Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc. |
| E2 | Rural | Low district brightness (SQM ~15 to 20) | Sparsely inhabited rural areas, village or relatively dark outer suburban locations |
| E3 | Suburban | Medium district brightness | Well inhabited rural and urban settlements, small town centres of suburban locations |
| E4 | Urban | High district brightness | Town/city centres with high levels of night-time activity |

*Notes:*

1. Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.
2. Rural zones under protected designations should use a higher standard of policy.
3. Zone E0 must always be surrounded by an E1 Zone.
4. Zoning should be agreed with the local planning authority and due to local requirements a more stringent zone classification may be applied to protect special/specific areas.
5. SQM (Sky Quality Measurements) referenced by the International Dark-Sky Association (IDA), the criteria for E0 being revised in mid 2019 but not retrospective.
6. Astronomical observable dark skies will offer clearer views of the Milky Way and of other objects such as the Andromeda galaxy and the Orion Nebula.
7. Although values of SQM 20 to 20.5 may not offer clear views of astronomical dark sky objects such as the Milky Way, these skies will have their own relative intrinsic value in the UK.

**Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on properties.**

| Light technical parameter | Application conditions | Environmental zone | | | | |
|---|---|---|---|---|---|---|
| | | E0 | E1 | E2 | E3 | E4 |
| Illuminance in the vertical plane ($E_V$) | Pre-curfew | n/a | 2 lx | 5 lx | 10 lx | 25 lx |
| | Post-curfew | n/a | <0.1 lx* | 1 lx | 2 lx | 5 lx |

*Note:*

* If the installation is for public (road) lighting then this may be up to 1 lx.

# Recommended maximum values of light parameters for the control of obtrusive light

## Limitation of illumination on surrounding properties

### Light intrusion/nuisance

Limits apply to nearby dwellings/premises or potential dwellings/premises and specifically windows; the values are the summation of all lighting installations.

### Spill light

Table 3 can also be considered for the management of spill light; however, designers must consider the task performance requirements of any adjacent lit areas and ensure that any spill light does not adversely affect these performance parameters as this could affect their safe use. This may result in a need to minimise spill and intrusive lighting values to less that might be expected for the environmental zone within which the installation lies.

## Limitation of bright luminaires in the field of view.

The limits for the luminous intensity of bright luminaires are dependent on the viewing distance *d*, (between the observer and the bright luminaire(s)) and the projected area $A_p$, of the bright part of the luminaire in the direction of the observer.

Table 4 shows the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises or from positions where such views are likely to be maintained, that is, not momentary or short-term.

Considerations to aid the application of Table 4 and the assessment process.

a) The assessment of $A_p$ for observers can prove difficult and will vary for all observer positions and distances. To aid this assessment values of $A_p$ corresponding to the geometric mean diameter of each luminaire group have been extracted from CIE 150 Annex C and included within Table 4. These areas can be considered for an assessment of likely $A_p$ in the observer direction to calculate a maximum luminous intensity value.
b) The above information is applicable for the consideration of a single luminaire but where two or more luminaires are located in close proximity to each other that to the observer they appear as a single light source then the assessment shall be undertaken based upon the combined bright surfaces of luminaires ($A_p$) in the direction of the observer or, from positions where such views are likely to be maintained.
c) In installations that involve mast lighting the luminaires will often be viewed against the night sky. The contrast between the background sky and the bright surface areas of the luminaires can be considerable. In such installations the curfew levels set for each environmental zone shall be applied with the exception that such installations within an E4 zone will be designed to suit the curfew requirements of an E3 zone.

## Limitation of the effects on transport systems

Limits apply where users of road networks are subject to a reduction in the ability to see essential information. CIE 150 2017; Table 5 gives values that are for relevant positions and for viewing directions in the path of travel.

This assessment does not just apply to road lighting installations but to any installation where luminaires positioning falls under the above definition.

## Limitation of sky glow

See Tables 6 and 7

**Table 4 (CIE 150 table 3 (amended)): Limits for the luminous intensity of bright luminaires[4].**

| Light technical parameter | Application conditions | Luminaire group (projected area $A_P$ in $m^2$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | $0<A_P \leq 0.002$ | $0.002<A_P \leq 0.01$ | $0.01<A_P \leq 0.03$ | $0.03<A_P \leq 0.13$ | $0.13<A_P \leq 0.50$ | $A_p>0.5$ |
| Maximum luminous intensity emitted by luminaire (*I* in cd) | E0 | | | | | | |
| | Pre-curfew | 0 | 0 | 0 | 0 | 0 | 0 |
| | Post-curfew | 0 | 0 | 0 | 0 | 0 | 0 |
| | E1 | | | | | | |
| | Pre-curfew | 0.29 *d* | 0.63 *d* | 1.3 *d* | 2.5 *d* | 5.1 *d* | 2,500 |
| | Post-curfew | 0 | 0 | 0 | 0 | 0 | 0 |
| | E2 | | | | | | |
| | Pre-curfew | 0.57 *d* | 1.3 *d* | 2.5 *d* | 5.0 *d* | 10 *d* | 7,500 |
| | Post-curfew | 0.29 *d* | 0.63 *d* | 1.3 *d* | 2.5 *d* | 5.1 *d* | 500 |
| | E3 | | | | | | |
| | Pre-curfew | 0.86 *d* | 1.9 *d* | 3.8 *d* | 7.5 *d* | 15 *d* | 10.000 |
| | Post-curfew | 0.29 *d* | 0.63 *d* | 1.3 *d* | 2.5 *d* | 5.1 *d* | 1,000 |
| | E4 | | | | | | |
| | Pre-curfew | 1.4 *d* | 3.1 *d* | 6.3 *d* | 13 *d* | 26 *d* | 25,000 |
| | Post-curfew | 0.29 *d* | 0.63 *d* | 1.3 *d* | 2.5 *d* | 5.1 *d* | 2,500 |
| Aid to gauging $A_p$ | | 2 to 5cm | 5 to 10cm | 10 to 20cm | 20 to 40cm | 40 to 80cm | >80cm |
| Geometric mean of diameter (cm) | | 3.2 | 7.1 | 14.1 | 26.3 | 56.6 | >80 |
| Corresponding $A_p$ representative area ($m^2$) | | 0.0008 | 0.004 | 0.016 | 0.063 | 0.251 | >0.5 |

*Notes:*

1. d is the distance between the observer and the glare source in metres;
2. A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions;
3. $A_p$ is the apparent surface of the light source seen from the observer position
4. For further information refer to Annex C of CIE 150
5. Upper limits for each zone shall be taken as those with column $A_p>0.5$

## Limitations of the effect of over-lit building façades and signs

Table 8 provides recommendations regarding luminance values that provide visibility in order that a balanced urban lighting master plan can be considered and such lighting does not cause negative impacts such as a continuous increase in the lighting levels (ratcheting) between buildings and within areas and light pollution.

Illuminated advertising signage should be assessed as advised in the ILP's Professional Lighting Guide *The brightness of illuminated advertisements*, (PLG 05)

4 Amended based upon the approach taken by NSVV Nederlandse Stichting Voor Verlichtingskunde (Dutch: Dutch Foundation for Illumination; The Netherlands) and to consider CIE 150 Annex C Table C.2

**Table 5 (CIE 150 table 4): Maximum values of threshold increment and viewing direction in the path of travel.**

| Light technical parameter | Road classification* | | | |
|---|---|---|---|---|
| | No road lighting | M6/M5 | M4/M3 | M2/M1 |
| Veiling luminance† ($L_V$) | 0.037 cd/m$^2$ | 0.23 cd/m$^2$ | 0.40 cd/m$^2$ | 0.84 cd/m$^2$ |
| Threshold increment | 15% based on adaption luminance of 0.1 cd/m$^2$ | 15% based on adaption luminance of 1.0 cd/m$^2$ | 15% based on adaption luminance of 2.0 cd/m$^2$ | 15% based on adaption luminance of 5 cd/m$^2$ |

*Notes:*

* Road classifications as given in CIE 115:2010

† The veiling luminance values specified in this table are based upon on a permissible TI value of 15%

*Definitions:*

TI The measure of disability glare (the reduction in visibility caused by intense light sources in the field of view) expressed as the percentage increase in contrast required between an object and its background for it to be seen equally well with a source of glare present. Note: Higher values of TI correspond to greater disability glare.

$L_V$ The luminance that would need to be superimposed on a scene in object space to reduce the scene's contrast by an amount equal to the added retinal illuminance from scattered light on the scene's retinal image. It is most commonly used to describe the contrast-reducing effect of a glare source in the field of view.

**Table 6 (CIE 150 table 5): Maximum values of upward light ratio (ULR) of luminaires.**

| Light technical parameter | Environmental zones | | | | |
|---|---|---|---|---|---|
| | E0 | E1 | E2 | E3 | E4 |
| Upward light ratio (ULR)/% | 0 | 0 | 2.5 | 5 | 15 |

*Note:*

This does not take into account the effect of light reflected upwards from ground that also contributes to sky glow. This is the traditional method to limit sky glow and is suitable to compare different single luminaires.

For illuminated advertising signs the aim should be to achieve the limits advised in PLG05.

**Table 7 (CIE 150 table 6): Maximum values of upward flux ratio of installation (of four or more luminaires).**

| Light technical parameter | Type of installation | Environmental zones | | | | |
|---|---|---|---|---|---|---|
| | | E0 | E1 | E2 | E3 | E4 |
| Upward flux ratio (UFR)/% | Road | n/a | 2 | 5 | 8 | 12 |
| | Amenity | n/a | n/a | 6 | 12 | 35 |
| | Sports | n/a | n/a | 2 | 6 | 15 |

*Notes:*

Table 7 allows the effect of both direct and reflected upward components of a whole installation to be taken into account. The factor being the upward flux ratio (UFR) and CIE 150 suggests that table 7 is used for all installations consisting of four or more luminaires.

Clauses 6.4.2 and 6.4.3 of CIE 150:2017 describe the calculation methods for both ULP and UFR.

Light emitted just above the horizontal in a zone between 90o and 110o is extra critical for sky glow in large open areas around observatories. An additional measure in these areas limits the luminous intensities ($I_{90} - I_{110}$) as follows:

- between 90° and 100° < 0.5 cd/1000lm;
- between 100° and 110° 0 cd.

**Table 8 (CIE 150 table 7): Maximum permitted values of average surface luminance (cd/m$^2$).**

| Light technical parameter | Application conditions | Environmental zones | | | | |
|---|---|---|---|---|---|---|
| | | E0 | E1 | E2 | E3 | E4 |
| Building façade luminance ($L_b$) | Taken as the product of the design average illuminance and reflectance divided by π | < 0.1 | < 0.1 | 5 | 10 | 25 |
| Sign luminance ($L_s$) | Taken as the product of the design average illuminance and reflectance divided by π, or for self-luminous signs, its average luminance. | < 0.1 | 50 | 400 | 800 | 1.000 |

*Note:*
The values apply to both pre- and post-curfew, except that in zones 0 and 1 the values shall be zero post curfew. The values for signs do not apply to signs for traffic control purposes.

# Relevant publications and standards

## British Standards

- BS 5489-1:2013 *Code of practice for the design of road lighting – Part 1 Lighting of roads and public amenity areas*;
- BS EN 13201-2:2015 *Road lighting. Part 2: Performance requirements*;
- BS EN 13201-3:2015 *Road lighting. Part 3: Calculation of performance*;
- BS EN 13201-4:2015 *Road lighting. Part 4: Methods of measuring lighting performance*;
- BS EN 12193:2018 *Light and lighting. Sports lighting*;
- BS EN 12464-2:2014 *Lighting of work places. Outdoor work places*;
- PD CEN TR 13201-1:2014 *Road lighting. Guidelines on selection of lighting classes*.

## CIE publications

- CIE 001 *Guidelines for minimizing urban sky glow near astronomical observatories*;
- CIE 094-1993 *Guide for floodlighting*;
- CIE 112-1994 *Glare evaluation system for use within outdoor sport and area lighting*;
- CIE 115:2010 *Lighting of roads for motor and pedestrian traffic*;
- CIE 126:1997 *Guidelines for minimizing sky glow*;
- CIE 129:1998 *Guide for lighting exterior work areas*;
- CIE 136:2000 *Guide to the lighting of urban areas*;
- CIE 150:2017 *Guide on the limitation of the effects of obtrusive light from outdoor lighting installations*;
- CIE 169:2005 *Practical design guidelines for the lighting of sport events for colour*.

## ILP publications

- PLG04 *Guidance on undertaking environmental lighting impact assessments*;
- PLG05 *The brightness of illuminated advertisements*;
- PLG06 *Guidance on installation and maintenance of seasonal decorations and lighting column attachments*
- GN09 *Domestic exterior lighting: getting it right!*

## SLL/CIBSE Publications

- LG01 *The industrial environment* (2018);
- LG04 *Sports lighting*;
- LG06/16 *The exterior environment*;
- LGLOL *Guide to limiting obtrusive light*.

NB: These notes are intended as guidance only and the application of the values given in the various tables should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

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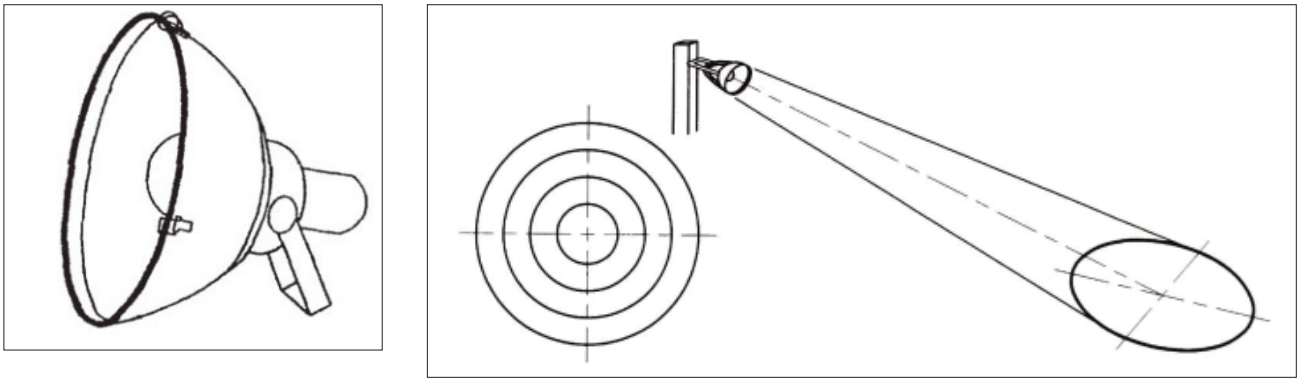
*Appendix 2 images – acdc*

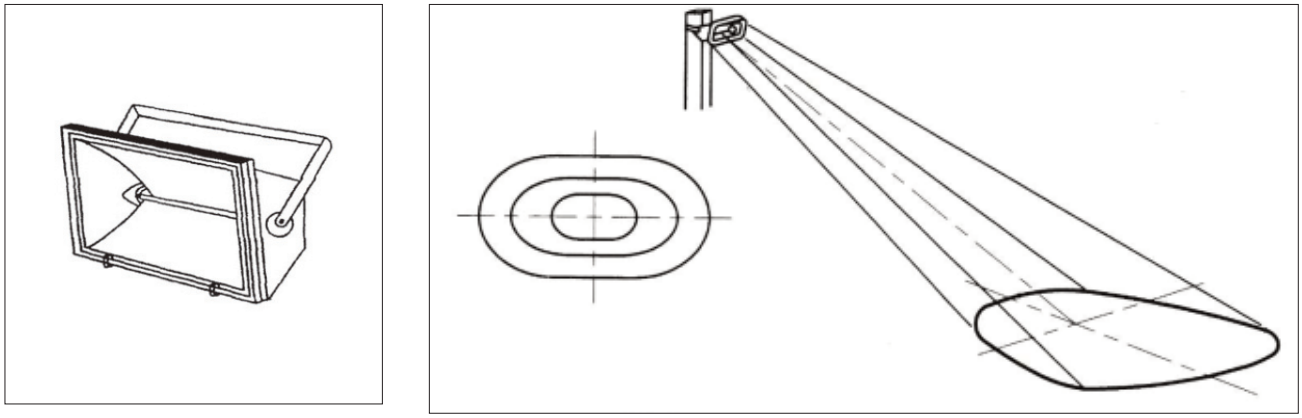
# Appendix 1

## Outdoor luminaire classification system

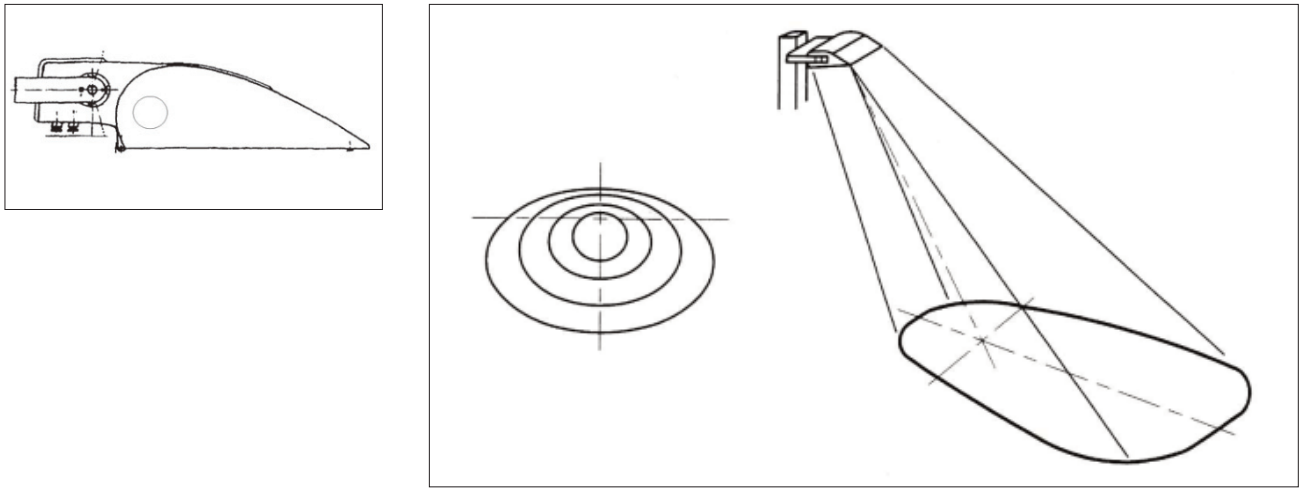
Based upon CIE 150:2017 and for the purpose of this and associated documents the following figures illustrate the luminaire classification (CIE 150:2017)



*Type A: Floodlight/projector producing a symmetrical beam*



*Type B: Floodlight/projector producing a fan-shaped beam*



*Type C: Floodlight/projector producing a double asymmetric distribution in the vertical plane*

# Appendix 2

## Illustrations of luminaire accessories for limiting obtrusive light

*Luminaire with cowl, hood and shield*

*With louvre*

*With cowl*