Review of Environmental Factors

Kemps Creek Pressure Mains (July, 2023)

Sydney WATER

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Determination

This Review of Environmental Factors (REF) assesses potential environmental impacts of the construction and operation of the Kemps Creek Dual Pressure Mains and was prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Sydney Water both the proponent and determining authority.

The Sydney Water Project Manager is accountable to ensure the proposal is carried out as described in this REF. If the scope of work or work methods described in this REF change significantly following determination, additional environmental impact assessment may be required.

Decision Statement

During construction, the main potential environmental impacts of the proposal are typical construction impacts such as erosion and sedimentation, vegetation removal, noise and dust emissions, and traffic impacts. There is potential for the proposal to result in the spread of the soil pathogen *Phytophthora*. The proposal will also impact Aboriginal heritage which will require an Aboriginal Heritage Impact Permit under the *National Parks and Wildlife Act 1974*. During operation the potential impacts will be minor. The proposal will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats. Accordingly, a Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR) is not required.

It is considered that, given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this REF, the proposed work is unlikely to have a significant impact on the environment. Accordingly, we do not require an Environmental Impact Statement (EIS) and the proposal may proceed.

Certification

I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under section 170 of the EP&A Regulation and the information it contains is neither false nor misleading.

Prepared by:	Reviewed by:	Endorsed by:	Approved by:
[redacted]	[redacted]	[redacted]	[redacted]
James Hugo REF author/ Environmental Scientist Asset Lifecycle, Sydney Water Date: 24/07/2023	Jonathan Dowling Senior Environmental Scientist Sydney Water Date: 27/07/2023	Layla Hosseini Project Manager Sydney Water Date: 28/07/2023	Murray Johnson Environment and Heritage Manager Asset Lifecycle, Sydney Water Date: 28/07/2023

1 Executive summary

Sydney Water proposes to construct and operate the Kemps Creek Dual Pressure Mains Project (the proposal) in order to support future growth of the Western Sydney South West Growth Area and align with NSW Government commitments for the region. The main components of the proposal include:

- dual pressure mains connecting a new wastewater pumping station in Austral (SP1211) to the Upper South Creek Advanced Water Recycling Centre (AWRC) in Kemps Creek
- supporting infrastructure including a barometric loop at the AWRC.

The construction phase of the proposal includes connections to SP1211, constructing the dual pressure mains and the barometric loop. The dual pressure mains will be constructed by a combination of open trenching and trenchless methods. Construction is expected to start in early 2024 and take about 18 months to complete.

As part of this REF, several options were considered and subsequent refinements to the design and construction methodology were made in order to minimise the environmental impact of the proposal to the extent practicable. This process included the adoption of trenchless construction methods to avoid sensitive locations and disruptions to traffic on Elizabeth Drive. The construction footprint, including the location of construction compounds, was also optimised as far as practicable to reduce environmental impacts.

The proposal is situated in the suburbs of Austral and Kemps Creek within the local government areas of Liverpool City Council and Penrith City Council. The proposal generally follows road verges and property boundaries. The proposal also follows the alignment of the M12 Motorway, currently under construction.

The main construction impacts are vegetation clearing and potential spread of *Phytophthora*, impacts to Aboriginal heritage, noise and dust emissions, erosion and sedimentation. The proposal has been designed to avoid impacts to existing native vegetation within the South West Growth Area. The proposal will result in the clearing of about 0.47 ha of native vegetation (0.09 ha on certified land and 0.38 ha on non-certified land). An Aboriginal Heritage Impact Permit will be required for impact to one Aboriginal heritage site. Potential for noise and dust emissions, spread of invasive plants and pathogens, and erosion and sedimentation impacts will be minimised through the implementation of mitigation measures presented in this document.

A Construction Environmental Management Plan, including a Soil and Water Management Plan, Hygiene Management Plan, Noise Management Plan, and Traffic Control Plan will be prepared by the contractor to mitigate potential environmental impacts.

The proposal will operate under the future sewage treatment system environment protection licence (EPL) for the Upper South Creek catchment. Until the system EPL is established a scheduled development work licence will be required for construction of the proposal.

The proposal will result in positive long-term benefits by servicing future growth and is aligned with the principles of ecologically sustainable development.

2 Introduction

2.1 Context

Sydney Water provides water, wastewater, recycled water and some stormwater services to over five million people. We operate under the *Sydney Water Act 1994* and have three equal objectives to: protect public health, protect the environment and be a successful business.

We are a statutory State-owned corporation and are classified as a public authority, and a determining authority for the proposed work under Division 5.1 of the EP&A Act. This REF assesses the potential environmental impacts associated with construction and operation of the Kemps Creek Dual Pressure Mains and identifies mitigation measures to avoid or minimise potential impacts.

2.2 Proposal background and need

Sydney Water proposes to construct and operate the Kemps Creek Dual Pressure Mains (the proposal), which involves construction and operation of two parallel DN750 pressure wastewater pipelines and associated infrastructure, to service the South West Growth Area (SWGA). The pressure mains will pump wastewater from pumping station SP1211 to the Upper South Creek Advanced Water Recycling Centre (AWRC). SP1211 is currently under construction and the AWRC is approved critical State Significant Infrastructure (CSSI). The proposal is described in more detail in section 3.

The proposal will convey wastewater to the AWRC and will be operated under the future sewage treatment system EPL. Until the system EPL is established a scheduled development work licence will be required for construction of the proposal.

2.2.1 Proposal need

The SWGA has development progressing on two fronts, the Eastern Front and the Western Front. The Eastern Front, which has been named Kemps Creek catchment, includes the development precincts of Austral, Leppington, Kemps Creek and part of Rossmore. Most of the Eastern Front is not serviced and is experiencing substantial growth driven by government initiatives for a Western Sydney Parklands City activated by the new Western Sydney Airport. This growth is expected to continue until 2056, with dwelling numbers forecast to increase from about 2,300 in 2022 to about 37,800 in 2056 across this growth area.

The existing wastewater networks in the wider area do not have capacity to service the future growth in the Kemps Creek catchment and the proposal is needed to transfer wastewater from the catchment to the AWRC.

Additionally, the AWRC will need to receive a certain volume of wastewater to become operational. The proposal will transfer this wastewater and provide commissioning flows to the AWRC.

2.2.2 Proposal objectives

The proposal objectives are to:

- service growth in the SWGA
- provide commissioning flows to the AWRC
- provide a resilient and effective wastewater system to meet the needs of future populations.

2.2.3 Options assessment

An options assessment process informed the design of the proposal. The process identified several alignment options. Sydney Water assessed these options to determine their feasibility and ultimately select the most appropriate option. Options were assessed against their ability to deliver the proposal objectives, technical feasibility (ie whether it can feasibly be built and operated), potential environmental impacts and performance, social and community outcomes, and cost.

Do-nothing option

A 'do-nothing' option would have a number of consequences for both Sydney Water and customers. These include:

- limited service connections in the Austral-Leppington development area. This would limit the ability of the NSW Government's commitment to growth and development in south western Sydney to be met
- delayed commissioning of the AWRC, resulting in delayed service to customers and associated costs
- not meeting customer and community expectations
- extending the period of high load and potentially increasing wastewater flows to the Liverpool Water Recycling Plant, which is not sustainable.

For these reasons, the 'do-nothing' option was not considered viable and was not considered further.

Alignment options

SP1211 was designed to ultimately pump wastewater to the AWRC. The wastewater needs to be pumped because topography in the area means it is not possible to transport wastewater to the AWRC via gravity pipes. Two main alignment options were identified (Figure 2-1):

- Option 1 - pipeline following Gurner Avenue, Devonshire Road to Elizabeth Drive and continuing to the AWRC following an access road.
- Option 2 - pipeline under the Kemps Creek Nature Reserve (trenchless section) and following Kemps Creek riparian corridor and the 1 in 100-year flood zone.

An alignment on the eastern side of the Kemps Creek Nature Reserve was not considered due to the likely high impact to threatened vegetation communities in Western Sydney Parklands. Both options were evaluated against the proposal criteria (Table 2-1).

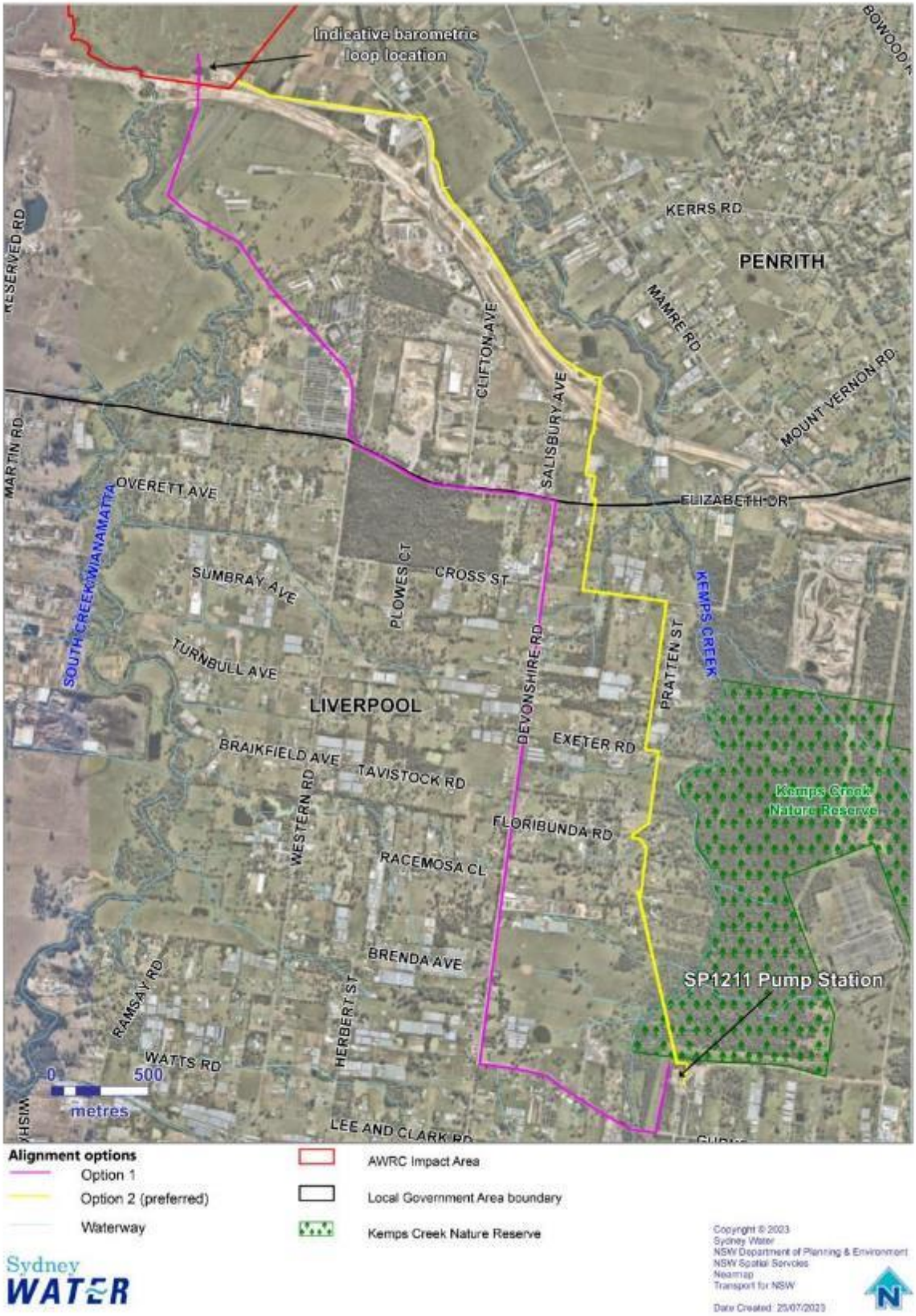


Figure 2-1 Options 1 and 2

Table 2-1 Evaluation of options against proposal criteria

Criteria	Option 1	Option 2
Project objectives	✓	✓
Technical feasibility	✗	✓
Environmental impact	✓	✓
Social and community	✓	✓
Cost	✗	✓

Option 1 avoids private property and is mostly contained within the road verge. However, the Option 1 alignment gains altitude as it moves west of Kemps Creek from SP1211. This would require a 45 m high barometric loop at the AWRC. The barometric loop is a tall, above ground section of pipe needed to artificially raise the high point of the pressure mains at the AWRC to avoid the system draining by gravity from the high point in the southern part of the project. Gravity inflows at the AWRC would be uncontrolled and would prevent the AWRC from operating efficiently. A barometric loop higher than 20 m is not feasible due to the supporting structure required. In addition, the pumping requirement and infrastructure to support the pumps at SP1211 for Option 1 are not feasible and this option was not considered further.

Option 2 maintains the alignment at a lower elevation and reduces the height of the barometric loop at the AWRC to less than 20 m. Additionally, as the elevation change is minimised, the pumping effort required is decreased. This reduces the size of the pumps at SP1211 and the energy needed to operate the pumps. Ongoing operational costs would also be lower due to the reduced maintenance requirements of the trenchless section. However, it was found that this option also had a number of issues including:

- The alignment would cross about 33 private properties and would require easements through the middle of properties, significantly impacting landowners.
- The alignment would pass through substantial amounts of vegetation.
- The alignment would have interfacing issues with the M12 Motorway currently under construction north of Elizabeth Drive.

Further alignment optimisation of Option 2 identified an opportunity to generally follow the 1 in 100-year flood zone along Kemps Creek. Sections of the alignment that are outside the flood zone would mostly be along the boundary of properties to avoid easements in the middle of properties. This shift also avoids much of the vegetation along the riparian corridor of Kemps Creek. Sydney Water in consultation with Transport for NSW (TfNSW) identified a suitable location for the alignment to pass under the M12 Motorway and follow the edge of the M12 Motorway road corridor to the AWRC access road.

The preferred option is Option 2.

2.3 Consideration of Ecologically Sustainable Development

The proposal has been considered against the principles of ecologically sustainable development (ESD) (Table 2-2).

Table 2-2 Consideration of principles of ecologically sustainable development (ESD)

Principle	Consideration in proposal
Precautionary principle - *if there are threats of serious or irreversible environmental damage, lack of scientific uncertainty should not be a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment where practicable, and an assessment of the risk-weighted consequences of various options.*	The proposal will not result in serious or irreversible environmental damage and there is no scientific uncertainty relating to the proposal. The proposal is designed to locate the pressure mains in disturbed road corridors where possible and avoid vegetation removal through alternative construction methods (such as trenchless installation) where possible to minimise environmental impact.
Inter-generational equity - *the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*	The proposal will help to meet the needs of future generations by providing a reliable wastewater service to an area of future growth.
Conservation of biological diversity and ecological integrity - *conservation of the biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes.*	The proposal will not significantly impact biological diversity or ecological integrity. The proposal design was developed to minimise biodiversity impacts such as using trenchless construction methods to avoid native vegetation clearing where possible.
Improved valuation, pricing and incentive mechanisms - *environmental factors should be included in the valuation of assets and services, such as 'polluter pays', the users of goods and services should pay prices based on the full life cycle costs (including use of natural resources and ultimate disposal of waste) and environmental goals*	The proposal will provide cost efficient use of resources and provide optimum outcomes for the community and environment.

3 Proposal description

3.1 Proposal details

Table 3-1 describes the proposal location and broadly describes the scope of work involved in the construction and operation of the proposal. Figure 3-1 shows an overview of the proposal.

Table 3-1 Description of proposal

Scope of work	Detailed description of work/ activity
Proposal description	The proposal will service current and future development in the SWGA and includes the following main components: • dual pressure mains connecting a new wastewater pumping station (SP1211) to the AWRC • a barometric loop, about 20 m high, at the AWRC. These major components are shown in Figure 3-1. The dual pressure mains will have a diameter of 750 mm and be about 7 km long. The pressure mains will primarily be constructed by open trenching. However, trenchless methods such as horizontal directional drilling (HDD) and micro-tunnelling will be used to minimise impacts to environmentally sensitive areas and major road crossings. A 300 m section of the HDD will pass through the Kemps Creek Nature Reserve and is the subject of a separate REF that is to be determined by NPWS. This section is not included in the scope of this REF (Figure 3-1). The pressure mains will have vent shafts, air valves and scour pits at various locations along the alignment. Wastewater released to scour pits would be pumped directly to tankers and there would be no release to the environment. The barometric loop is necessary to control the flow to the AWRC and will be about 20 m high. The barometric loop will form part of the inlet works and will likely be constructed by the AWRC contractor. The pressure mains will be connected to SP1211. This work will include excavation at SP1211, potentially reconfiguring existing infrastructure and commissioning work.
Location and land ownership	The proposal is located in the suburbs of Austral and Kemps Creek, in the local government areas (LGA) of Liverpool City Council (south of Elizabeth Drive) and Penrith City Council (north of Elizabeth Drive). The proposal is located in private properties, Sydney Water-owned land and road verges.

Scope of work	Detailed description of work/ activity
Site establishment and access tracks	Site establishment will include the installation of structures such as erosion and sedimentation controls, traffic controls, erection of signage and demarcation of no-go areas. Site establishment may also include surveys, service location, geotechnical investigations or other investigations required prior to construction. It may also include service relocation where services are identified that may be affected. Access to the alignment and construction sites will generally be via existing roads and along the pipeline construction footprint. Temporary access tracks may be established where necessary. The location of these will be chosen by the contractor, in consultation with the landowner(s) and approved by Sydney Water's Project Manager as described in the mitigation measures in section 6. Temporary access tracks will be removed at the completion of construction.
Ancillary facilities (compounds)	Construction compounds will be required for site sheds, construction amenities and materials laydown. The location of these will be chosen by the contractor, in consultation with the landowner(s) and approved by Sydney Water's Project Manager as described in the mitigation measures in section 6.
Scope of work	The construction phase of the proposal will include the dual pressure mains and associated fittings, and the barometric loop. Construction of the dual pressure mains will be by a combination of open trenching and trenchless methods. Open trenching will be used in areas that are accessible and have minimal environmental constraints. Trenchless methods will be used for difficult to access locations or environmentally sensitive areas. The location of open trenching and trenchless sections is shown in Figure 3-1. Open trenching construction will generally occur progressively where a section will be trenched, a section of the dual pressure mains will be installed, and that section will then be backfilled and restored to pre-existing conditions. It is expected that both pipelines will be installed in one trench at depths ranging from about 1.4 m to about 4 m. However, this will be confirmed by the contractor. A construction corridor of up to30 m wide will be used for open trench construction. The corridor may be narrowed further when constraints are present, where practicable. Construction by open trenching will involve: • stringing pipe sections along the construction corridor • excavating trenches, stockpiling spoil material beside the trench • benching or shoring up trenches, depending upon trench depths

Scope of work	Detailed description of work/ activity
	• spreading granular bedding material such as sand or gravel in the trench • installing a section of pipe in the trench • pressure/vacuum testing pipeline • backfilling trench with compacted bedding material and spoil • restoring disturbed areas and replace topsoil • reinstating any areas where the road surface has been disturbed in accordance with the requirements of local council. Trenchless construction will consist of HDD and micro-tunnelling. Micro-tunnelling will involve the excavation of pits at either end of each trenchless section that serve as launch and receival points for the pipeline. HDD involves drilling from the surface and does not require excavation of pits. Pipes installed using HDD would be up to about 21 m deep. Micro-tunnelled pipes will be at depths ranging from about 2 m to about 5 m. Construction by horizontal directional drilling will involve (Figure 3-2): • stringing pipe at the receival pit • positioning directional drilling plant at the launch pit • drilling pilot hole from the surface at the launch pit to the receival pit • pulling pipe back from the receival pit to the launch pit • grouting around the pipe. Construction by micro-tunnelling will involve (Figure 3-3): • excavating launch and receival pits to the depth of the pressure mains at either end of the micro-tunnelling sections (within the construction footprint) • shoring up pits using sheeting and bracing structures • lowering the micro-tunnelling plant into the launch pit • lowering sections of pipe into the launch pit • using the micro-tunnelling machine to push the cutting head, followed by the sections of pipe, to the receival pit. Construction of the barometric loop will involve: • earthworks to create a constructible surface • constructing a foundation for the barometric loop

Scope of work	Detailed description of work/ activity
	• fabricating barometric loop (if required) • installing the barometric loop. The construction footprint (pipeline construction corridors and launch/receival areas for trenchless construction) is shown in Figure 3-4 to Figure 3-8. Construction of the proposal will involve vegetation clearing and excavation. The areas to be disturbed will include a construction corridor for trenched areas, pits for trenchless sections, construction compounds and the site of the barometric loop. Cleared material will be temporarily stored within the construction footprint and ultimately removed from the site if not suitable for reuse during restoration. The excavated material will generally be stockpiled adjacent to excavations and used as backfill. Topsoil will be stockpiled separately and then backfilled.
Commissioning	Commissioning involves testing the new pressure mains to ensure the pipelines are working correctly and are integrated with the wastewater pumping station and AWRC operations. The exact commissioning steps depend on the type of the equipment, but typically include testing utilities, telemetry and monitoring systems, inspection and performance testing of the asset, joints and fittings, and testing of any emergency systems. Commissioning of the AWRC is covered by the AWRC EIS.
Restoration	As construction progresses, disturbed areas will be restored to a condition similar to that prior to the disturbance occurring. This will include backfilling and reinstatement of topsoil, restoration of groundcover, reuse of cleared vegetation as mulch, reinstatement of removed habitat such as hollow logs, and more substantial revegetation activities where appropriate. Revegetation will be carried out in accordance with Sydney Water procedure *SWEMS0025.11 Guideline for native revegetation following construction*. Restoration of roads and road surfaces will be in accordance with local council requirements.
Materials/ equipment	The materials required for the construction of the proposal will include general construction materials such as concrete, prefabricated sections of pressure mains, associated bedding materials, road restoration materials, and other materials as required.

Scope of work	Detailed description of work/ activity
	Construction of the proposal will involve the use of a range of vehicles, equipment and machinery, such as: • light and heavy vehicles • bobcats • compactors • cranes • dump trucks • dumpers • excavators • front end loaders • generators • horizontal directional drilling machines • micro-tunnelling machines • portable pumps • rock breakers • rollers • semi-trailers • water carts. Construction of the proposal will involve excavation, and while excavated material will generally be used as backfill, it is likely that there will be excess materials, including material generated from trenchless construction. The management of this and other waste material generated by construction is discussed in section 6.2.8. It is expected that the proposal will require a construction workforce of about 30 people at a given time across the alignment.
Work hours	Most work will be scheduled to occur during standard daytime hours: • 7am to 6pm, Monday to Friday • 8am to 1pm, Saturdays. Some out of hours work may be necessary for certain activities such as work in roads or delivery of oversized equipment. Sydney Water's Project Manager can approve work outside of standard daytime hours, following the approval process described in the mitigation measures in section 6.
Proposal timing	Construction is expected to start in early 2024 and take about 18 months to complete.
Operational/licensing requirements	The proposal will convey wastewater to the AWRC and will be operated under the future sewage treatment system EPL. Until the system EPL is established a scheduled development work licence will be required for construction of the proposal. Once operational, the proposal will be subject to standard and routine maintenance activities such as inspections, testing and repairs as necessary.

Figure 3-1 Overview of the proposal

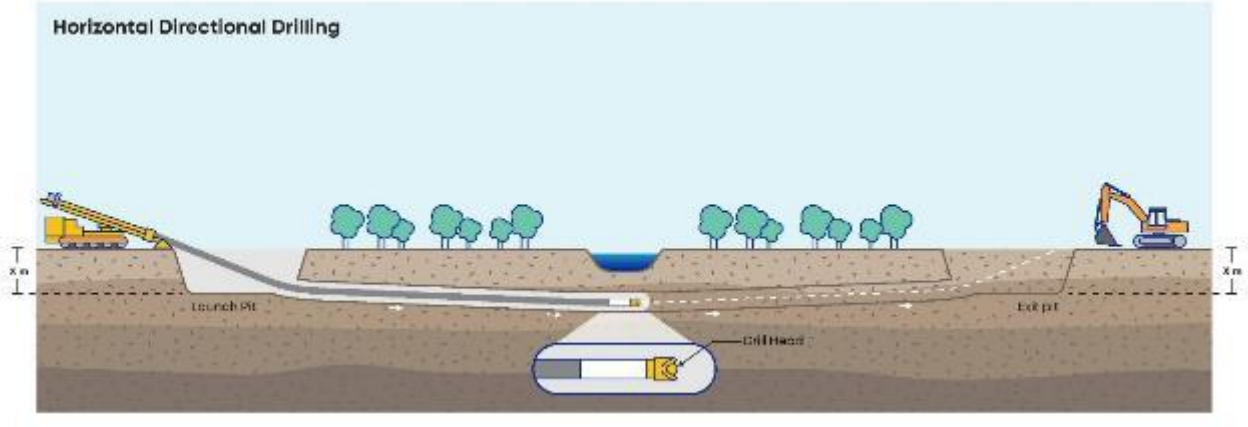


Figure 3-2 Illustration of HDD construction

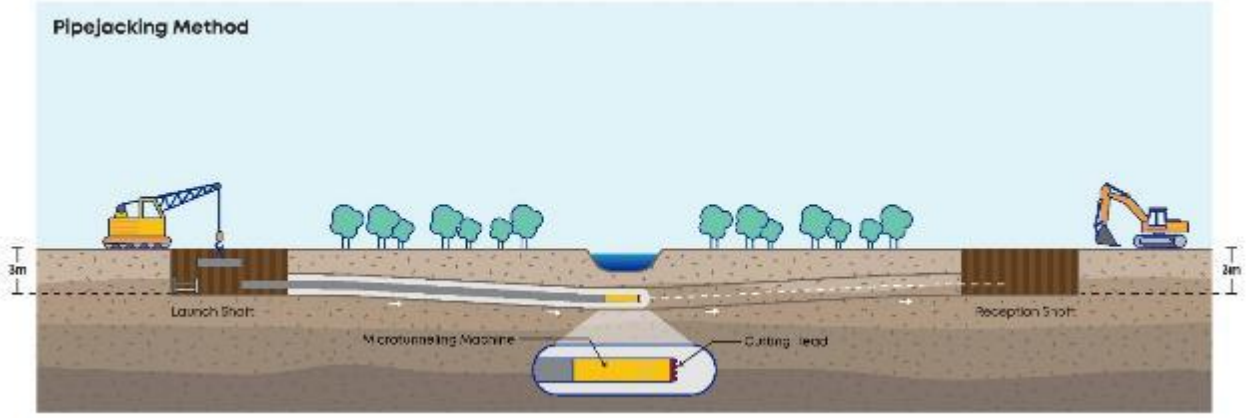


Figure 3-3 Illustration of micro-tunnelling construction

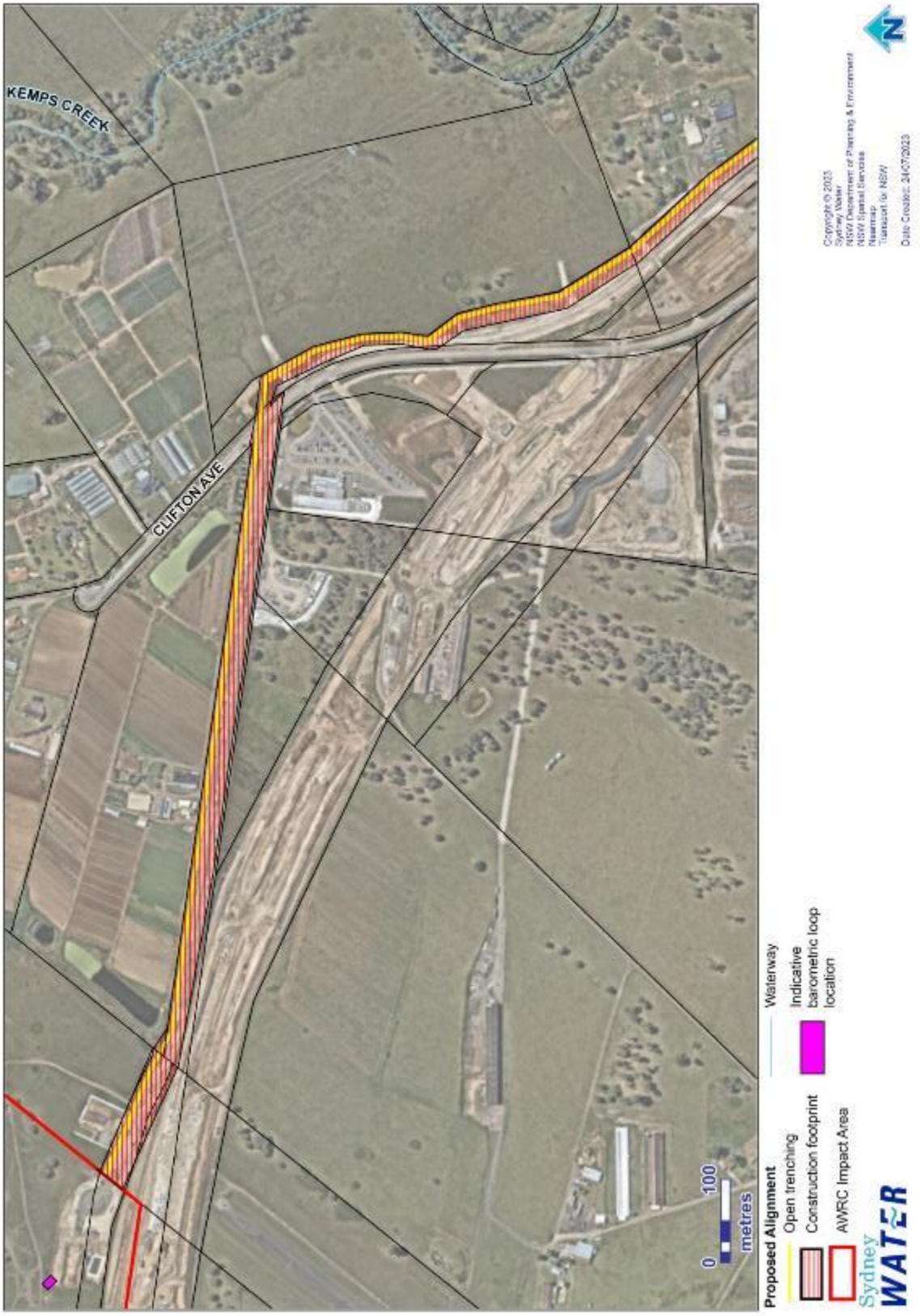


Figure 3-4 Construction footprint – northern section (AWRC)

Figure 3-5 Construction footprint – northern section (Elizabeth Drive)

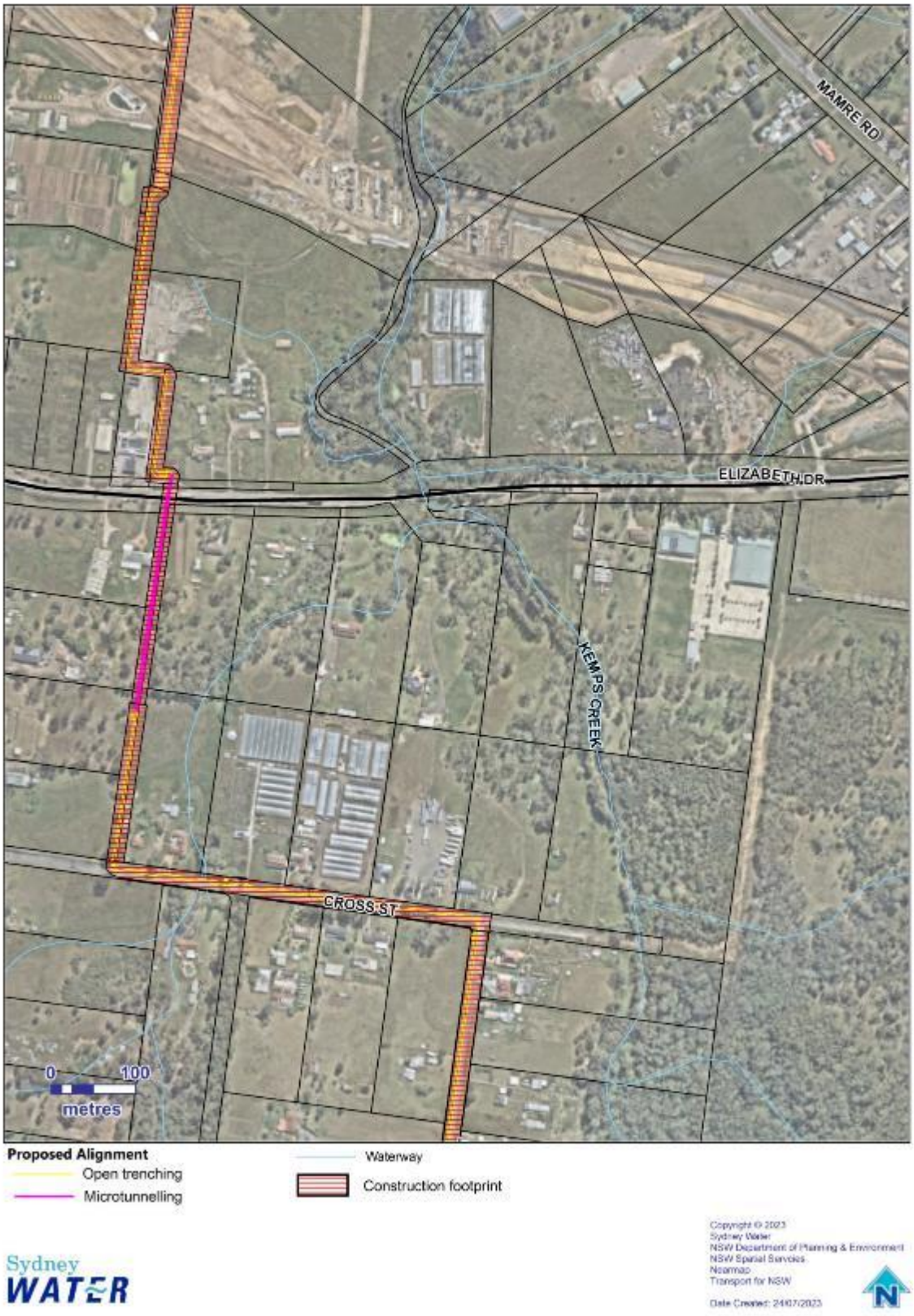


Figure 3-6 Construction footprint – southern section (Elizabeth Drive)

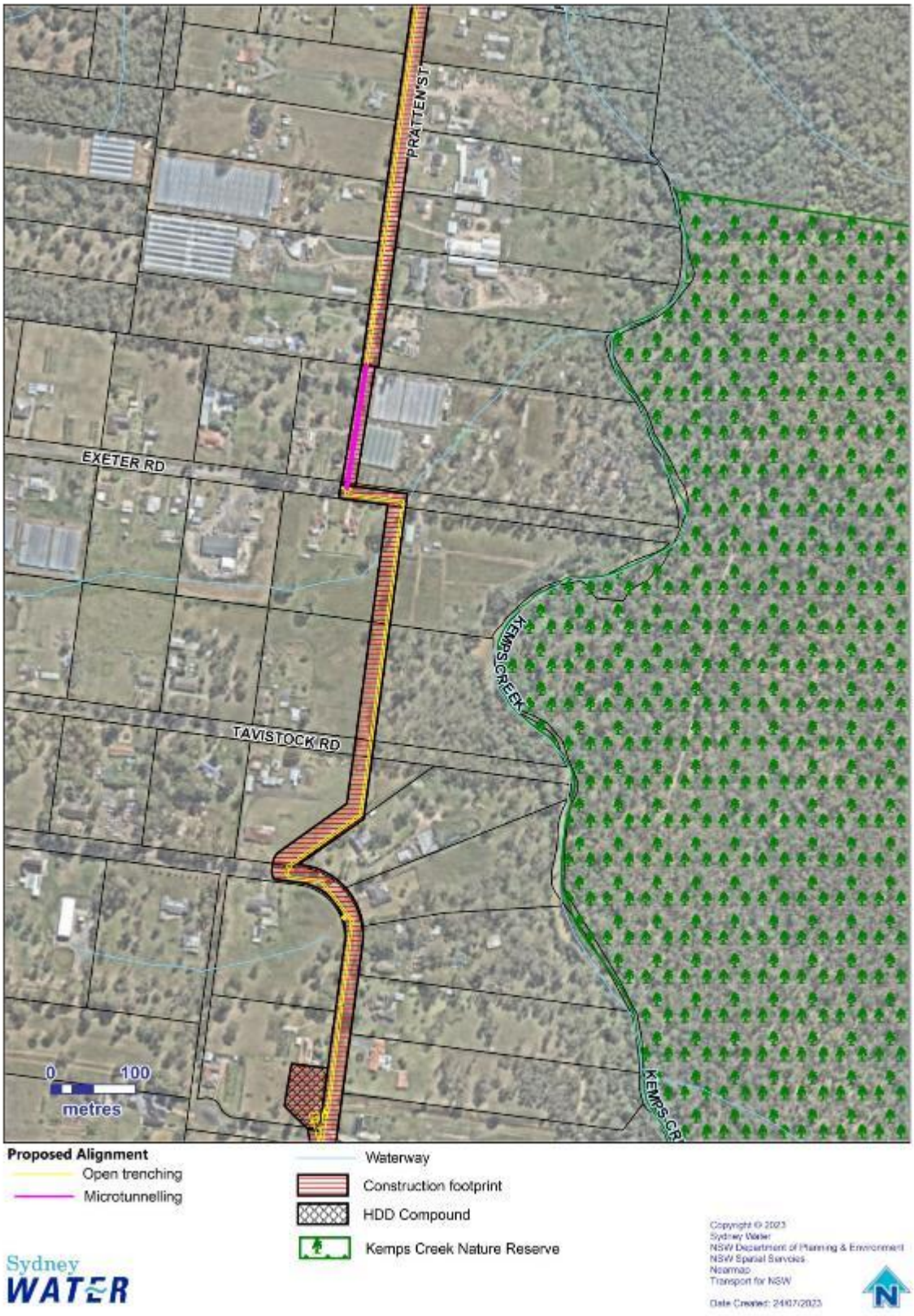


Figure 3-7 Construction footprint – southern section (adjacent Kemps Creek Nature Reserve)

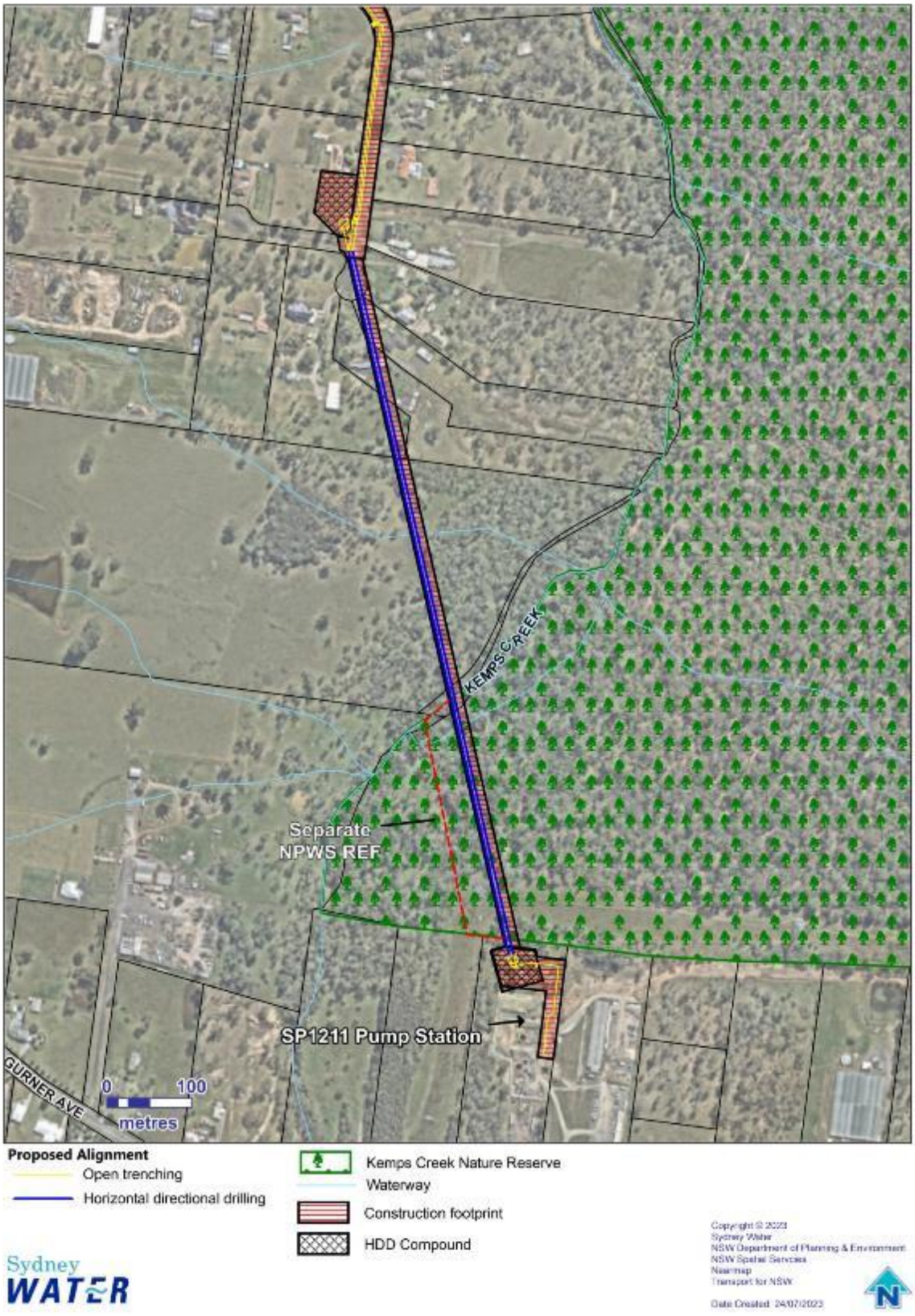


Figure 3-8 Construction footprint – southern section (SP1211)

3.2 Construction footprint and changes to the scope of work

The proposal design shown in this REF is indicative and based on concept design. The study area of the proposal consists of a 40 m wide corridor centred on the alignment, and narrowed along roads to only include the road reserve. The construction footprint consists of a corridor of up to to30 m in trenched sections and launch and receival pits of about 50 by 50 m for the trenchless sections. The final alignment, including the construction footprint and precise location of pits, may change based on further design or construction planning. The general mitigation measures outline when changes to the proposal trigger supplementary environmental impact assessment. If required, further assessment must be prepared in accordance with SWEMS0019.

4 Consultation

4.1 Community and stakeholder consultation

Our approach to community and stakeholder consultation is guided by Sydney Water's community and stakeholder engagement guidelines.

Stakeholder and community engagement is a planned process of initiating and maintaining relationships with external parties who have an interest in our activities. Community and stakeholder engagement:

- enables us to explain strategy, policy, proposals, projects or programs
- gives the community and stakeholders the opportunity to share their knowledge, issues and concerns
- enables us to understand community and stakeholder views in our decision-making processes alongside safety, environment, economic, technical and operational factors.

The nature, scale and extent of the proposal's potential impact has been evaluated in this REF. If our work impacts the community in some way, we will consult with affected groups throughout the proposal. This includes engaging the broader community and stakeholders during plan or strategy development or before making key decisions.

We will also provide local councils with reasonable notice when we would like to commence works. Local councils will be consulted about matters identified in environmental planning instruments (refer to section 4.2 below). This includes public safety issues, temporary works on council land, and full or partial road closures of council managed roads.

Sydney Water has consulted with a range of stakeholders to date about the proposal, including:

- Liverpool City Council – mainly concerning local roads and stormwater services
- Penrith City Council – mainly concerning local roads and stormwater services
- Transport for NSW – mainly concerning interfacing with construction of the M12 Motorway and the design and location of the micro-tunnelled section under Elizabeth Drive
- directly impacted landowners – concerning access.

Further consultation will be undertaken with council and property owners regarding construction activities, access and easements required for the proposal. The broader community will also be informed of the proposed infrastructure and construction activities.

4.2 Consultation required under State Environmental Planning Policies and other legislation

Sydney Water must consult with councils and other authorities for work in sensitive locations or where the work may impact other agencies infrastructure or land. This is specified in the State

Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP). Further detail is provided in Appendix B.

Consultation with Liverpool City Council is required under section 2.10(1)(f) of the TISEPP as the proposal involves excavation of roads for which the council is the roads authority. Liverpool City Council was consulted about the proposal, with feedback considered in the design of the proposal.

The proposal involves trenchless construction under Kemps Creek Nature Reserve, a nature reserve reserved under the *National Parks and Wildlife Act 1974* (NPW Act). The reserve is gazetted to a depth of 20 m and the trenchless construction will be at a shallower depth. Therefore, this section of the proposal resides within Kemps Creek Nature Reserve. Sydney Water has consulted with National Parks and Wildlife Service (NPWS) who indicated that an REF is required to be submitted for their approval (as the determining authority within land administered under the NPW Act). A separate REF has been prepared for this section of the proposal for determination by NPWS.

The proposal is also '*adjacent to a national park, nature reserve or other area reserved under the National Parks and Wildlife Act 1974*'. In accordance with section 2.15(2)(a) TISEPP we consulted NPWS about the proposal on 3 May 2023. No response was received from NPWS.

Section 2.15(2)(h) of the TISEPP states that consultation with the Western Parkland City Authority (WPCA) is required for a development within a Western City operational area as shown in Schedule 2 of the *Western Parkland City Authority Act 2018* that has a capital investment value of $30 million or more. As the proposal has a capital value of greater than $30 million, and is within a Western City operational area, the WPCA was consulted on 25 January 2023. Table 4-1 provides the comments received and Sydney Water's response.

Table 4-1 Comments received from WPCA

Comment	Sydney Water response
WPCA supports the delivery of the main which will service residential and enterprise development in the South West and Aerotropolis growth areas	Sydney Water notes WPCA's support for the proposal.
WPCA supports the intended avoidance of open trenching through areas of native vegetation and under critical road and infrastructure corridors.	Sydney Water notes WPCA's support for the efforts that have been made to avoid environmentally sensitive areas and infrastructure as far as practicable.
WPCA recommends that Sydney Water provides an adequate buffer to these corridors to ensure future widening and delivery of other utilities does not require the relocation or modification of your assets as the Parkland City develops.	Sydney Water notes this recommendation. Consideration has been given to future assets (such as reticulated networks and future road widening), and the proposal design has accounted for this where practicable.
Related to protecting transport corridors Sydney Water should consult the relevant divisions of Transport for NSW to determine any requirements	Consultation with TfNSW has been ongoing throughout planning and design of the proposal. Comments and any requirements of TfNSW have

Comment	Sydney Water response
related to road corridors and a potential fuel pipeline for the Airport.	been considered in the design of the proposal, such as agreement on a location for crossing the M12 Motorway and micro-tunnelling Elizabeth Drive to minimise disruption to traffic.
The REF could consider the potential for use of the same corridor to be used for the Kemps Creek main for a pipeline to supply highly treated water to development.	Consideration of future projects is beyond the scope of this REF.

Consultation with the Department of Planning and Environment (DPE) is required under SEPP (Precincts – Central River City) (2021) for clearing of native vegetation in non-certified land in the Sydney region growth centres. As the proposal involves clearing 0.38 ha of native vegetation, the Department was notified on 5 July 2023. DPE acknowledged the correspondence and noted that no existing native vegetation would be cleared and offsets are not required.

Sydney Water's Wastewater and Environment (WW&E) Custodians and Major Projects team consulted with the EPA regarding the AWRC and network EPL requirements under the POEO Act. The EPA confirmed that a scheduled development work licence will be required for construction of any network, where the works are not connecting to an existing licensed system. This REF must be provided to the EPA as part of the scheduled developed work licence application. Potential operational impacts to water quality are addressed in section 6.2.2.

5 Legislative requirements

5.1 Strategic context

5.1.1 Greater Sydney Region Plan

The Greater Sydney Region Plan – *A Metropolis of Three Cities* (Greater Sydney Commission, 2018) is a long-term strategic plan for the Greater Sydney area. The plan focuses on developing a more liveable, productive, and sustainable city by dividing the metropolitan area into three interconnected cities: the Western Parkland City, the Central River City, and the Eastern Harbour City.

The Plan sets a 40-year vision (to 2056) and establishes a 20-year plan to manage population growth and change for Greater Sydney in the context of social, economic and environmental matters. It aims to create new jobs, provide more housing choices, improve transport connectivity, and enhance the natural and built environment. The Plan is structured around the following key strategies:

- infrastructure and collaboration – including investing in water and wastewater infrastructure
- liveability
- productivity
- sustainability.

The proposal directly supports the first key strategy area by State government investment through Sydney Water's delivery of critical wastewater infrastructure in future growth areas. It also supports the other key strategies by improving and expanding wastewater servicing to enhance liveability for current and future populations, enables development and greater productivity opportunities, and improves sustainability of the region by connecting existing wastewater infrastructure to an integrated water cycle.

Specifically, the proposal is located within the Western Parkland City which is discussed further below.

Enabling development, home and job growth in the Western Parkland City

Greater Sydney's population is forecast to reach eight million people over the next 40 years, and about half of those people are expected to be living west of Parramatta. Much of this growth will occur in the Western Parkland City, driven by the new Western Sydney International Airport.

Over the coming years, the region is set to become the economic powerhouse of Greater Sydney. This area will need commercial and industrial developments to host the businesses, residential areas to house the workforce and infrastructure to service their access and utility needs.

The NSW Government's vision for the Western Parkland City is focused on creating jobs, a highly skilled workforce and an innovation economy. However, it also seeks to support a landscape-led approach to new urban communities that will create quality places for the community, keep water

resources in the catchment to protect the local climate from heat island effects, value Aboriginal and non-Aboriginal heritage and support the emerging circular economy. Development of the Western Parkland City presents a significant opportunity to maximise productivity, liveability and sustainability.

In the Western Parkland City, the Western Sydney Aerotropolis Growth Area (WSAGA) and SWGA are expected to be home to up to 650,000 people by 2056. Most of the WSAGA and SWGA are not serviced by Sydney Water and use on-site systems such as septic tanks. The proposed new urban communities require water and wastewater services to be established to ensure the anticipated population growth and economic productivity is realised, and to provide equitable servicing across Sydney's metropolitan areas.

New water and wastewater services also bring considerable opportunity to maintain treated water in the local context, enhance the quality of public spaces, the health of the community and environment, and be a focal point for a new circular economy.

In developing a new wastewater service for the region, the proposal is focused on achieving the best outcome for Western Sydney, and therefore for Greater Sydney more broadly. The proposal will enable growth and development of the region and offer wastewater services that our customers expect.

5.1.2 Greater Sydney Water Strategy

The NSW Government developed the Greater Sydney Water Strategy (DPE, 2022b), which establishes a direction for delivering sustainable and resilient water services to Greater Sydney for the next 20 to 40 years. The strategy sets out priorities and actions for the delivery of water infrastructure into the future to support a sustainable, liveable and productive Greater Sydney.

The Strategy recognises that wastewater management plays a crucial role in achieving a variety of outcomes for the region. Not only does it protect public and environmental health, and help keep our waterways healthy, but it also contains valuable resources that have previously gone unused. Only about 7% of wastewater in Greater Sydney is recycled. Most wastewater is directed to treatment plants and then discharged to the ocean. As Greater Sydney continues to become denser and extend into new areas of growth, the reuse and recycling of wastewater will be essential to support a more productive and sustainable region.

Sydney Water's AWRC will contribute to improving wastewater management and resource recovery from wastewater in Greater Sydney. The AWRC will recover high-quality treated water for environmental flows to waterways, organic material known as biosolids for use as an alternative to chemical fertilisers in farming and gardening, use industry-leading technology to harness renewable energy from co-generation processes, and enable other sustainable practices.

The proposal will enable the wastewater collected in the surrounding area to be directed to the AWRC where treatment and resource recovery can take place through an integrated water cycle process.

5.1.3 Local Strategic Planning Statements

The proposal is located within the local government areas of Liverpool City Council and Penrith City Council. Both councils have prepared a Local Strategic Planning Statement (LSPS) in accordance with section 3.9 of the EP&A Act. The LSPS guides land use planning in the LGA, taking into consideration economic, social, and environmental factors.

Each LSPS outlines a vision for the future of land use for their respective local government area, focusing on sustainability, liveability, and growth. The statements identify key directions, such as promoting sustainable development, enhancing community infrastructure, supporting economic development, and preserving the natural environment. The plans aim to provide a framework for future development and guide decision-making to ensure continued growth and prosperity while preserving the area's unique character and natural assets.

Penrith LSPS acknowledges the significant role Sydney Water has to ensure that the growth areas within the LGA can be adequately serviced. It also notes that some of the growth areas, such as the Western Sydney Aerotropolis, currently either lack the water-related infrastructure to cater for growth or are limited in their ability to provide additional capacity. Sydney Water is planning water and wastewater infrastructure throughout the region and is delivering critical assets to support the wider network that will service areas of growth. This includes the AWRC and the proposal that will unlock the potential to service a substantially greater population in Western Sydney.

Liverpool LSPS contains a number of planning priorities that relate to infrastructure and aligning with growth while being sustainable and protecting the natural environment. In particular, planning priority 15 aims for Liverpool to be a green, resilient and water-sensitive city. The proposal will support this priority, by providing a means for wastewater from the surrounding area to be transferred to the AWRC. The wastewater will then be treated to a high-quality that will be suitable for reuse in a range of applications.

Additionally, given the majority of the proposal will be located below ground, it is unlikely to affect a council's ability to implement any potential future land use plans.

5.2 Environmental legislation

Sydney Water is the proponent and determining authority under the EP&A Act. The proposal does not require development consent and is not classified as State significant infrastructure. We have assessed this proposal under Division 5.1 of the EP&A Act. This REF has concluded that the proposal is unlikely to have a significant impact on the environment.

The following environmental planning instruments (Table 5-1) and legislation (Table 5-2) are relevant to the proposal. Table 5-2 also documents any licences and permits, timing and responsibility for obtaining them.

Table 5-1 Environmental planning instruments relevant to the proposal

Environmental Planning Instrument	Relevance to proposal
State Environmental Planning Policy (Precincts—Western Parkland City) 2021 (Western Parkland City SEPP) Liverpool Local Environmental Plan 2008 Penrith Local Environmental Plan 2010	The proposal is situated on land zoned: • ENZ Environment and Recreation • RU4 Primary Production Small Lots • RU2 Rural Landscape • SP2 Infrastructure.
State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)	Section 2.126(6) of the TISEPP permits development by or on behalf of a public authority for sewage reticulation systems without consent on any land. Development of sewage reticulations systems can be carried out on land reserved under the *National Parks and wildlife Act 1974* only if authorised under that Act. A separate REF was prepared for the section of the alignment through the Kemps Creek Nature Reserve. This REF is to be determined by NPWS. The proposal involves development of a sewage reticulation system and as Sydney Water is a public authority, the proposal is permissible without consent.
State Environmental Planning Policy (Precincts—Western Parkland City) 2021 (Western Parkland City SEPP)	**Sydney region growth centres (Chapter 3)** The Western Parkland City SEPP coordinates the release of land for residential, employment and other urban development, in the Western Parkland City area. Chapter 3 applies to growth centres, including the SWGA. The southern portion of the proposal (south of Elizabeth Drive) is located within the SWGA and is subject to the conditions of the Biodiversity Certification Order (BCO) of the former *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*. The BCO establishes certified areas in which proponents of developments do not need to undertake assessment of impacts on threatened ecological communities, species and populations, or their habitats that would normally be required by the *Environmental Planning and Assessment Act 1979*. The BCO also identifies non-certified areas where impacts to existing native vegetation (ENV) (as defined in the BCO) must be assessed and offset in accordance with the BCO. Section 3.24 of the SEPP requires that native vegetation on non-certified land must not be cleared for the purpose of public utility undertakings unless notice has been given

Environmental Planning Instrument	Relevance to proposal
	to DPE and consideration given to any response received within 21 days of the notice. DPE was notified of proposed clearing of native vegetation on non-certified land. However, no ENV will be impacted and offsets are not required.
State Environmental Planning Policy (Biodiversity and Conservation) 2021	**Vegetation in non-rural areas (Chapter 2)** Chapter 2 of this SEPP aims to protect the biodiversity and amenity value of trees and other vegetation in non-rural areas of the State. Chapter 2 of this SEPP applies as the proposal is in a local government area and, in part, the zones listed in subsection 2.3(1). However, subsection 2.4(1) states: '*This Policy does not affect the provisions of any other SEPP….*', and as the works are permissible under the TISEPP a council permit to clear vegetation under this SEPP is not required. **Koala habitat protection 2021 (Chapter 4)** Chapter 4 of this SEPP applies to the local government area of Liverpool, however subsection 4.4(3) provides that the Chapter does not apply to land on which biodiversity certification is in force. As the proposal within the Liverpool local government area is on land to which a biodiversity certification is in force, this Chapter does not apply. **Water catchments (Chapter 6)** Chapter 6 of this SEPP applies as the proposal is within the Hawkesbury-Nepean Catchment, a regulated catchment area. Section 4.1 of this REF assessed potential environmental impacts on water quality and quantity, aquatic ecology, flooding, access, cultural heritage, flora and fauna, and scenic quality. The assessment confirmed that potential impacts are minimal and meet the requirements of part 6.2 of the SEPP. **Strategic conservation planning (Chapter 13)** Chapter 13 of this SEPP sets out planning controls to achieve the development and biodiversity outcomes of the Cumberland Plain Conservation Plan (CPCP) released by the DPE in August 2022. The CPCP establishes several land categories to which certain planning controls are applied:

Environmental Planning Instrument	Relevance to proposal
	• avoided land • certified-urban capable land • land in a strategic conservation area. The proposal is within the application area of the CPCP, and partially within certified-urban capable land. Sydney Water has taken into consideration the requirements of this Chapter. Refer to section 6.2.3 of the REF.

Table 5-2 Consideration of key environmental legislation

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Protection of the Environment Operations (POEO) Act 1997	Sewage treatment is a scheduled activity under the Act. The proposal involves construction of part of a new sewage treatment system which will convey wastewater to the AWRC and will be operated under a future sewage treatment system EPL. Until the system EPL is established a scheduled development work licence will be required for construction of the proposal. Part of the proposal will be located in the construction boundary of the M12 Motorway and is expected to be constructed concurrently. Construction of the M12 is a scheduled activity and subject to an EPL (no. 21596). While the proposal will not be subject to the conditions of EPL 21596, construction will be managed so it does not affect the ability of TfNSW and its contractors to comply with the licence conditions.	Scheduled Development Work (s47 licence) System EPL (s48 licence)	Pre-construction, Contractor Pre-operation, Sydney Water
Biodiversity Conservation (BC) Act 2016	Protection of listed species and ecological communities in NSW falls under the *Biodiversity Conservation Act 2016*. Threatened species and	REF	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	communities are listed in the Schedules of the Act. Assessment of impact to threatened species and communities in certified land within subject to the BCO or the CPCP is not required. The impact of the project on threatened species, communities and their habitats in non-certified land is described in section 6.2.3. Significant impacts to threatened species or communities are unlikely.		
National Parks and Wildlife (NPW) Act 1974	The proposal will involve trenchless construction through Kemps Creek Nature Reserve, established under the Act. The reserve is gazetted to a depth of 20 m and the trenchless construction will be carried out at a shallower depth. This section of the dual mains is assessed under a separate REF to be determined by National Parks and Wildlife Service. Under section 86 of this Act, it is an offence to harm or desecrate an Aboriginal place or object unless authorised by an Aboriginal heritage impact permit (AHIP), or where it is reasonably determined that no Aboriginal object will be harmed. The proposal will impact Aboriginal objects and an AHIP under section 90 of the Act will be required.	AHIP	Post REF, pre-construction, Sydney Water
Heritage Act 1977	A permit under section 60 of the Heritage Act 1977 is required for works that may impact a site listed on the State heritage register, except for works that comply with an exemption under section 57(2). Potential impacts of the proposal on non-Aboriginal heritage are assessed in	REF	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	section 6.2.5. The project will not require a permit under section 60 of the Act.		
Fisheries Management (FM) Act 1994	Part 7 of the Act establishes certain activities for which notification, or a permit is required including dredging and reclamation work, temporary or permanent obstruction of fish passage, or harming marine vegetation. The proposal has been designed to avoid waterways and waterbodies where possible such as underboring Kemps Creek and will not impact any key fish habitat. The proposal does not involve any dredging or reclamation, obstruction of fish passage or harm to marine vegetation.	REF	Pre-construction, Sydney Water
Water Management Act 2000	Section 60A of the *Water Management Act 2000* states that it is an offence to take water without a licence. A Water Access Licence (WAL) is required under section 61 of the Act where groundwater extraction will be greater than 3 ML. A water supply work (WSW) approval is required under section 90(2) of the Act to construct or use a water supply work. It is anticipated that more than 3 ML of groundwater may be extracted during construction. Accordingly, a WSW approval and a WAL is required with a temporary allocation of the estimated volume.	WSW Approval and WAL	Detailed design, pre-construction, Sydney Water
Roads Act 1993	Section 138 of the *Roads Act 1993* states a person must not carry out work in, on or over a public road without consent of the responsible roads authority, termed a road occupancy licence. Potential impacts of the proposal on traffic and access, including road works,	Road Occupancy Licence	Pre-construction, Contractor

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	are described in section 6.2.9. The proposal will involve work in, on or over a public road and will therefore require a road occupancy licence.		
Environment Protection and Biodiversity Conservation (EPBC) Act 1999	The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the principal environmental law administered by the Commonwealth. It provides for the protection of matters of national environmental significance. The proposal is not likely to have a significant impact on a matter of national environmental significant and a referral under this Act is not required.	N/A	N/A

6 Environmental assessment

Section 6 describes the existing environment and assesses direct and indirect impacts of construction and operation**.** It also identifies mitigation measures to minimise impacts. These will be incorporated into contract documents and a Construction Environmental Management Plan (or similar) prior to starting work.

6.1 Existing environment

The proposal is located in the suburbs of Austral and Kemps Creek in the local government areas of Liverpool City Council to the south and Penrith City Council to the north, divided by Elizabeth Drive. The southern portion of the proposal is generally characterised by bushland to the east including Kemps Creek Nature Reserve and low-density rural properties to the west. North of Elizabeth Drive, the proposal traverses more low-density rural properties and follows the M12 Motorway alignment.

The proposed alignment generally follows road verges and property boundaries where practicable, avoiding environmentally sensitive areas and minimising impacts to private property. Environmentally sensitive areas include nearby waterways and associated riparian areas such as Kemps Creek and areas of native vegetation including Kemps Creek Nature Reserve. Much of the remnant native vegetation in the surrounding area consists of threatened ecological communities including Cumberland Shale Plain Woodland, Castlereagh Ironbark Forest and Cumberland Red Gum Riverflat Forest.

Aboriginal heritage sites are found throughout south western Sydney, particularly around waterways such as Kemps Creek. Non-Aboriginal heritage items are also listed in the vicinity of the proposal but will not be directly affected by the work.

The existing environment is described further throughout section 6.2 below.

6.2 Environmental aspects, impacts and mitigation measures

6.2.1 Topography, geology and soils

Existing environment

The topography of the area is generally flat to undulating with a high point about midway along the alignment. Elevations range between about 41 m to 60 m Australian Height Datum (AHD).

The geology is predominantly characterised by Bringelly Shale of the Wianamatta Group of sedimentary rocks which comprises a shale-rich unit, but also contains sandstone lenses, carbonaceous claystone, and rare, minor coal deposits. In the vicinity of waterways, such as Kemps Creek, the geology transitions to younger alluvial floodplain deposits. This unit consists of silt, very fine- to medium-grained lithic to quartz-rich sand, and clays. Soil types are predominantly mapped as kurosols and hydrosols surrounding waterways (Department of Regional NSW, 2022).

The study area does not contain acid sulfate soils (NSW Government, 2022).

The map of salinity potential for Western Sydney (DIPNR, 2003) indicates that the study area has moderate salinity potential with areas of high salinity potential associated with waterways, such as Kemps Creek.

Current and historic land uses in the surrounding area include agriculture, low density rural residential, small business, public recreation, environmental conservation, and infrastructure. Evidence of uncontrolled dumping of waste materials (such as tyres, and commercial and domestic refuse) and filling was observed during field visits which suggests the potential for contamination of soil and/or groundwater in the area (refer to Figure 6-1). A search of the NSW Environment Protection Authority (EPA) list of contaminated sites identified one site within the suburbs of Kemps Creek and Austral, consisting of a service station. This site is located about 550 m east of the proposal and was determined by the EPA to not require regulation under the *Contaminated Land Management Act 1997*.

A Preliminary Site Investigation (PSI) was carried out by Aurecon-Arup (2022) for the proposal to identify areas of potential environmental concern (APECs) based on current and past land uses. The PSI identified several APECs in the vicinity of the proposal that warranted further investigation.

Figure 6-1 Examples of observed waste materials

A Detailed Site Investigation (DSI) was carried out by Aurecon-Arup (2023) at targeted locations with sampling conducted to determine if contaminants of potential concern (COPCs) are present in soils and groundwater within the APECs.

Soil samples were collected from 23 sampling locations and analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), total petroleum/recoverable hydrocarbons (TPH/TRH), benzene, toluene, ethylbenzene and xylene (BTEX) and organochlorine/organophosphate pesticides (OCPs/OPPs). Selected samples were analysed for per- and polyfluoroalkyl substances (PFAS) and asbestos containing materials (ACM).

Results of soil analysis indicated that concentrations of all COPCs in the areas investigated were either below the adopted human health and ecological investigation levels or did not exceed the laboratory limit of reporting.

Groundwater samples were collected from five groundwater wells established along the proposed alignment. Groundwater samples were analysed for TPH/TRH, BTEX, PAHs, heavy metals and PFAS.

Concentrations of copper, nickel and zinc exceeded the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 2013 groundwater investigation levels for freshwater in some sampled wells. All other COPCs were below the adopted investigation levels or laboratory limit of reporting.

Potential impacts

The main potential impact to topography, geology and soils during construction is erosion and sedimentation. Construction activities involve trenching, excavation and temporary stockpiling of excavated material. In the event of rainfall, stockpiled material has the potential to erode and lead to sedimentation on land and within waterways. Excavated material of trenched sections will generally be stockpiled adjacent to the trenches, while material from trenchless sections will be stockpiled within the setup area/compound for the trenchless plant and equipment. The total volume of spoil across the whole pipeline alignment is expected to be in the order of 40,000 to 50,000 m^3. The environmental risk will be greatest where trenching, excavating and stockpiling occurs close to waterways such as Kemps Creek. In these cases, excavated material will be stockpiled as far as practicable from waterways including, where feasible, in the construction corridor. The potential impacts of erosion and sedimentation are expected to be readily managed with implementation of the mitigation measures below.

Temporary access tracks for use during construction may be required. Large volumes of material may be required to construct access tracks in waterlogged ground. All temporary access tracks will be removed following the completion of construction and the pre-existing ground levels restored.

As areas are mapped as having moderate salinity potential, and some high potential near waterways, there is potential for the proposed infrastructure to be affected by corrosion. While primarily being a longer-term operational issue, the potential effects of salinity may increase maintenance requirements and reduce the assets lifespan while also causing associated environmental impacts. As such, the proposal should incorporate salt-resistant materials to minimise this potential impact.

While no significant soil or groundwater contamination has been identified, there remains the potential for contamination to be encountered during construction. The minor exceedances of copper, nickel and zinc are not considered to present a risk to human or ecological health as they

appear to be indicative of naturally occurring concentrations. Mitigation measures are provided below to avoid, mitigate and manage potential contamination impacts should it be encountered.

Construction activities, particularly trenching and stockpiling, will temporarily alter surface topography and drainage conditions. These excavations will be progressively backfilled using stockpiled material and imported fill (where necessary) and restored to a condition similar to that prior to disturbance. As such, the potential impacts of the proposal on topography following construction will be negligible.

Operational impacts on topography, geology and soils are not expected.

With the implementation of the mitigation measures below, impacts to topography, geology and soils can be adequately managed, and residual impacts are expected to be minor.

Table 6-1 Environmental mitigation measures — topography, geology and soils

Mitigation measures
Prevent sediment moving offsite in accordance with Managing Urban Stormwater, Soils and Construction, Volume 1 and 2A (Landcom 2004 and DECC 2008), including, but not limited to: • develop a Soil and Water Management Plan (SWMP) as part of the CEMP • divert surface runoff away from disturbed soil and stockpiles • install sediment and erosion controls before construction starts • reuse topsoil where possible and stockpile separately • inspect controls at least weekly and immediately after rainfall • rectify damaged controls immediately • remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.
Minimise ground disturbance and stabilise disturbed areas progressively.
All temporary access tracks will be removed following completion of construction and pre-existing ground levels restored.
Contractor to ensure imported material is Virgin Excavated Natural Materials (VENM) or meets a relevant NSW EPA Resource Recovery Order and Resource Recovery Exemption, or is a commercially supplied material that is not waste. If using materials that are subject to a NSW EPA Resource Recovery Order/Exemption the contractor must ensure the conditions in that Order/Exemption are strictly adhered to.
Stop work in the immediate vicinity of suspected contamination. Indicators of contamination include discoloured soil, anthropogenic material within fill, asbestos, chemical or petrol odours and leachate. Contain disturbed material on an impermeable surface and cordon areas off. Notify the Sydney Water Project Manager and the Environmental Representative (who will contact Property Environmental Services) to agree on proposed management approach.

Mitigation measures
Stop work during heavy rainfall or in waterlogged conditions when there is a risk of sediment loss off site.
Sweep up any sediment/soil transferred off site at least daily, or before rainfall.
Eliminate ponding and erosion by restoring natural landforms to the pre-works condition.
Adopt appropriate soil salinity mitigation measures in accordance with Western Sydney Salinity Code of Practice (Western Sydney Regional Organisation of Councils, 2003). This may include: • (if relevant) treat existing salinity with gypsum • (if relevant) establish salt tolerant species in existing or potential salinity problem areas after construction • stabilise existing areas of erosion • minimise water use on site • avoid rotation and vertical displacement of the original soil profile • backfill excavations deeper than one metre in the same order, or treat or use this material as fill at depths more than one metre from the finished level.

6.2.2 Water and drainage

Existing environment

The main waterways in the area are Kemps Creek and its tributaries. A number of small waterbodies in private property are also in the vicinity of the proposal. The locations of existing waterways and waterbodies are shown on Figure 6-2.

Most of the proposal is above the flood planning areas (NSW Government, 2022), and will likely not be flood affected by a 1% annual exceedance probability (AEP) event. Five sections of pipelines, each about 100 m long, will be located within the floodplain of Kemps Creek.

There is potential for groundwater to be encountered, particularly in the vicinity of waterways. A search of the Bureau of Meteorology Australian Groundwater Explorer returned no groundwater bores in the vicinity of the proposal. Several groundwater monitoring wells were established for the proposal along the alignment. Standing groundwater levels were recorded at depths ranging between about 0.4 and 2.6 m below ground level, tending to be encountered at shallower depths near waterways (Aurecon-Arup, 2023).

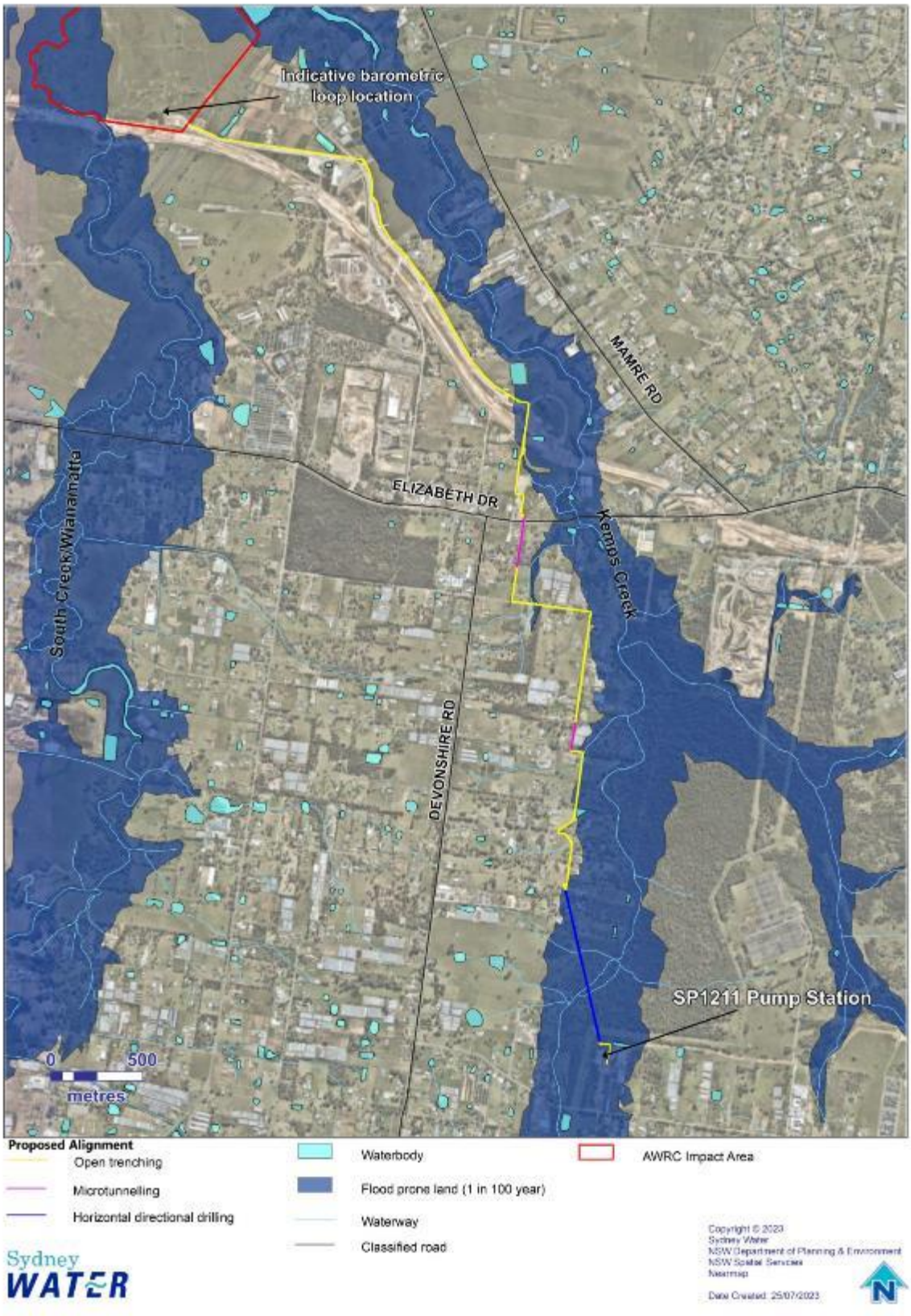


Figure 6-2 Water and drainage

Potential impacts

The main construction impacts on water and drainage include erosion and sedimentation and/or accidental spills and leaks. The potential impacts to waterways from erosion and sedimentation will be heightened where excavation and stockpiling occur on flood prone areas, including flood planning areas associated with Kemps Creek and its tributaries as shown on Figure 6-2.

In the event of flooding in these areas during construction, larger scale erosion and sedimentation could occur as work areas may be inundated. The risk of this occurring will be limited as most of the proposal is located above the flood planning level, as well as the progressive nature of construction and restoration activities. Additional mitigation measures to avoid and manage potential impacts in the event of a flood are provided below. Erosion and sedimentation impacts under normal (non-flood) conditions are discussed separately in section 6.2.1.

The proposal is not expected to affect flooding as it will be mostly below ground. There will be some small scale above ground structures in flood prone areas, such as scour pits. These structures will have a negligible impact on flood risk during operation.

Construction will involve the use of equipment and machinery that use hydrocarbon-based fuels and other chemicals that, in the event of an accidental spill or leak, have the potential to pollute water. In general, small quantities of fuels and other chemicals will be used on site and no bulk storage is proposed. By implementing the mitigation measures, such impacts are unlikely.

Construction activities will temporarily alter the surface topography and associated drainage patterns during trenching and stockpiling. The excavations will be progressively backfilled and restored to a condition similar to that prior to disturbance. As such, potential long-term impacts from the proposal on drainage patterns following construction will be negligible.

As shown in Figure 6-2, the crossing of Kemps Creek at the southern end of the proposal will be carried out by trenchless methods that will avoid potential impacts to the waterway and water quality. Open trenching construction will occur across, or in the vicinity of, some lower order tributaries of Kemps Creek. These tributaries are not mapped as key fish habitat. At these locations, the waterways are ephemeral with less well-defined channels. Open trenching across waterways will occur during dry conditions and the landforms will be restored to their prior condition following construction in accordance with the mitigation measures proposed below.

HDD has the potential for frac-outs, which is the temporary loss of drilling fluids into the soils or nearby waterways. Geotechnical investigations identified that at the depth of HDD, bedrock will be encountered consisting of the Bringelly Shale geological unit, minimising the rick of frac-out. At shallower depths topsoil transitions to alluvium associated with floodplain deposits. This alluvium layer is up to 6 m thick and the risk of frac-out is higher in these areas. The drilling contractor will be required to manage the drilling to minimise the risk of frac-out.

As the proposal generally follows Kemps Creek for much of the alignment, groundwater is expected to be relatively shallow and is likely to be encountered during construction. Groundwater dewatering of excavations is expected to be required. The expected groundwater volume to be extracted is about 4.11 megalitres (ML) and the maximum extraction volume is predicted to be 20.16 ML. As the extraction volume is likely to be greater than 3 ML a water access licence will be acquired for the extraction of groundwater.

Any groundwater and/or water captured in excavations that requires dewatering will be pumped out, treated and released on site in accordance with Sydney Water Discharge Protocols.

Potential drawdown of groundwater during construction of the proposal was calculated based on the expected volume of dewatering. It was determined that no groundwater dependent ecosystems (GDEs) are within the calculated radius of influence of the potential drawdown. As such, potential impacts to GDEs are anticipated to be minimal and will be appropriately managed through the implementation of the mitigation measures.

Operation of the proposal is not expected to materially affect water and drainage patterns. The mains are pressurised and there would be no release/overflow of wastewater to the environment during normal operation, or infiltration into the systems. Routine maintenance activities such as flushing sections of pipeline through scour valves will be relatively infrequent and the resulting wastewater and sediment will be captured in a tanker to be disposed of at an appropriate facility.

Table 6-2 Environmental mitigation measures — water and drainage

Mitigation measures
Sydney Water will obtain a groundwater Water Supply Works Approval and where dewatering is >3ML per water year (from 1 July) a Water Access Licence from the Department of Planning and Environment – Water will also be obtained. The contractor is responsible for: • preparing a Dewatering Management Plan prior to construction • complying with the approval conditions (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).
Environmental work method statements (EWMS) must be prepared for trenching across ephemeral creeks. The EWMS must include measures to restore the creek to pre-existing condition.
The contractor will minimise the risk of frac out by: • identifying the potential frac zone prior to the start of drilling • implementing measures to reduce the pressure on the drill head and minimising the risk of frac out.
Prepare Drilling Fluid Management plan to avoid impacts, including: • contain and monitor drilling fluids at entry/exit points • identify and manage frac-outs • re-use and/or disposal of drilling fluids (checking waste classification).
HDD methods will be appropriately managed by experienced drilling contractors to ensure no impacts to the surrounding environment occurs.
Locate portable site amenities, chemical storage and stockpiles of erodible materials away from watercourses, drainage lines and flood prone areas.

Mitigation measures
Install a flow monitor(s) as required and record the volume of dewatering.
Monitor the weather forecast and predicted rain in creek catchments. In advance of heavy rain: • remove all plant and equipment in the vicinity of creeks and flood zones • stabilise open excavations and remove or cover stockpiles.
Bund potential contaminants and store on robust waterproof membrane, away from drainage lines.
Store all chemicals and fuels in accordance with relevant Australian Standards and Safety Data Sheets. Record stored chemicals on site register. Bunded areas to have 110% capacity of stored liquid volume. Chemicals and fuels in vehicles must be tightly secured. All chemicals to be clearly labelled.
Keep functioning spill kit, including aquatic spill kit, on site for clean-up of accidental chemical/fuel spills. Keep the spill kits stocked and located for easy access.
During the works, stockpiles are to be kept to a minimum to ensure that off-site disposal or adequate mitigation measures to prevent sedimentation of waterways can be established in the event of a large flood warning.
Dewater excavations in accordance with the Program Delivery Guidance Standard 9.1 Excavation Dewatering (ENV-GS-001).
Discharge all water in accordance with Sydney Water's Water Quality Management During Operational Activities Policy (D0001667) including erosion controls, discharge rate, dechlorination, monitoring. Re-use potable / groundwater water where possible.
If discharge to the environment is not possible, seek approval and discharge criteria from the relevant Sydney Water Network Area Manager prior to discharge to the wastewater system. Otherwise tanker by a licensed waste contractor and dispose off-site to an appropriately licensed facility.
Conduct refuelling, fuel decanting and vehicle maintenance in compounds where possible. If field refuelling is necessary, designate an area away from waterways and drainage lines with functioning spill kits close by.
Conduct any equipment wash down within a designated washout area.
Ensure equipment is leak free. Repair oil/fuel leaks immediately or remove from site and replace with a leak-free item.

6.2.3 Flora and fauna

A specialist assessment of flora and fauna was undertaken by Arcadis Australia Pacific (Arcadis) and is summarised here. The flora and fauna assessment included:

- a desktop review including database searches for flora and fauna previously recorded

- a flora and fauna field survey
- likelihood of occurrence assessment for the identified and predicted flora and fauna
- assessments of significance for those species that were found to be likely to occur
- consideration of the relevant biodiversity certification orders in force for the study area
- discussion of the potential impacts of the proposal
- identification of site-specific mitigation measures to minimise and mitigate potential impacts of the proposal.

The complete assessment report is provided as Appendix C. It is also acknowledged that Transport for NSW provided flora and fauna data from the M12 Motorway Environmental Impact Statement studies (SSI-9364) to Sydney Water for use in this report.

Existing environment

Within the study area, most land has been historically cleared for development and agricultural purposes, including improved pastures and plantings along fences and roadsides. Vegetation in these areas consists mostly of exotic grassland. Most areas of native vegetation consist of small and discrete patches scattered within road reserves and adjacent to the M12 Motorway construction area. Most of this vegetation also exists in a highly modified and disturbed state. The proposal is located on land subject to either the BCO or the CPCP.

A flora and fauna field survey was carried out to ground truth and/or identify vegetation communities as well as identify any threatened species or their habitat in the study area.

The existing vegetation that was ground truthed following the field survey includes three plant community types (PCTs) consisting of Cumberland Shale Plain Woodland (PCT 3320), Cumberland Red Gum Riverflat Forest (PCT 4025) and Castlereagh Ironbark Forest (PCT 3448). These PCTs are also associated with threatened ecological communities (TECs) protected under the BC Act and/or EPBC Act (Table 6-3). The study area also contains extensive areas of non-remnant open paddock with dense weed coverage.

Table 6-3 TECs within the study area

Threatened ecological community	BC Act status	EPBC Act status	Associated PCTs in the study area
Cumberland Plain Woodland in the Sydney Basin Bioregion[1]	Critically Endangered	Critically Endangered	3320
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Critically Endangered	4025

Shale Gravel Transition Forest in the Sydney Basin Bioregion[1]	Endangered	Critically Endangered	3448

1. These TECs comprise the same listing under the EPBC Act, being the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest Critically Endangered Ecological Community.

A number of records for threatened species *Dillwynia tenuifolia* are located adjacent to the construction footprint at the northern extent of the proposal. While no threatened species were identified during the flora and fauna surveys, a number of threatened flora were considered to have the potential to occur including *Acacia pubescens*, *Dillwynia tenuifolia*, *Grevillea juniperina* subsp. *juniperina*, *Persoonia nutans*, and *Pultenaea parviflora*. The survey also identified a number of weed species including African olive, bridal creeper, asparagus fern, common prickly pear, lantana, blackberry and fireweed.

Targeted surveys for the Cumberland Plain Land Snail were undertaken in suitable habitat, however none were found. Cumberland Plain Land Snails have previously been identified in close proximity to the study area.

A Grey-headed Flying-fox was heard in the tree canopy along Kemps Creek towards the southern extent of the study area. Foraging habitat for the species is also widespread throughout the broader locality. The study area does not support suitable roosting or breeding habitat and no flying-fox camps have been recorded in the area. It is therefore considered highly unlikely that the Grey-headed Flying-fox roosts or breeds within the study area.

Threatened microbat species are likely to use the study area for aerial foraging, feeding on insects attracted by vegetation and water sources. However, there is limited roosting or breeding habitat for cave roosting species including Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis within the study area. Threatened species with potential to occur are:

- Australian Painted Snipe
- Australasian Bittern
- Barking Owl
- Black Bittern
- Black Falcon
- Black-chinned Honeyeater
- Brown Treecreeper (eastern subspecies)
- Cumberland Plain Land Snail
- Diamond Firetail
- Dusky Woodswallow
- Eastern Bent-wing Bat
- Grey-headed Flying Fox
- Greater Broad-nosed Bat
- Koala
- Large Bent-winged Bat
- Little Bent-winged Bat
- Little Eagle
- Little Lorikeet
- Masked Owl
- Powerful Owl
- Scarlet Robin
- Southern Myotis
- Spotted Harrier

- Eastern False Pipistrelle
- Eastern Freetail Bat
- Flame Robin
- Fork-tailed Swift
- Freckled Duck
- Gang-gang Cockatoo
- Square-tailed Kite
- Varied Sitella
- White-bellied Sea-Eagle
- White-throated Needletail
- Yellow-bellied Sheathtail-bat.

GDEs consist of ecological communities that are dependent, either entirely or in part, on the presence of groundwater for their health or survival.

The High Ecological Value Aquatic Ecosystems (HEVAE) high priority GDE mapping was reviewed to determine the occurrence of potential GDEs within and surrounding the study area. The review indicates that there is potential for GDEs to occur within the study area, particularly in the southern extent in the vicinity of Kemps Creek Nature Reserve.

Biodiversity certification orders

The proposal is located on land subject to the BCO and the CPCP. Table 6-4 identifies land categories and biodiversity assessment requirements under the BCO and the CPCP.

Table 6-4 Categories of land

Biodiversity certification order	Category of land	Description	Applicable to the proposal
BCO	Certified	Areas that have been certified for development and do not require further biodiversity assessment.	Most of the alignment is located on certified land.
	Non-certified	Areas that have not been certified for development and require assessment of impact threatened species and communities. Impacts to ENV must be offset.	Some sections of the alignment are on non-certified land. No vegetation meeting the definition of ENV will be impacted.
CPCP	Excluded land	Areas that have been excluded from the CPCP and biodiversity certification does not apply.	Sections of the alignment are on excluded land (previously cleared M12 corridor).

Biodiversity certification order	Category of land	Description	Applicable to the proposal
	Certified-urban capable land	Areas where future urban development is likely to occur and does not require further biodiversity assessment, if consistent with the CPCP.	Sections of the proposal are on certified land.
	Avoided land	Areas with high biodiversity values that are to be protected and are not certified for future urban development.	No part of the proposal is located on avoided land.
	Strategic conservation area	Areas that have strategic biodiversity value including important landscape connectivity and ecological restoration potential.	No part of the proposal is located in strategic conservation areas.

Potential impacts

The potential impacts of the proposal on flora and fauna will primarily be due to vegetation clearing with associated impacts on habitat for threatened flora and fauna species.

The proposal will result in the clearing of about 0.47 ha of native vegetation within the construction footprint (Figure 6-3 and Figure 6-4). Of that, 0.09 ha is on certified land (BCO) and certified-urban capable land (CPCP); and 0.38 ha is on non-certified land (BCO). All clearing on land subject to the CPCP is on certified-urban capable land. Clearing 0.47 ha is representative of a 'worst-case' scenario in which all vegetation would be cleared within the construction footprint. It is likely that actual impacts can be minimised on-site through reductions in the construction footprint where practicable and avoiding unnecessary clearing. The direct impact to native vegetation is summarised in Table 6-5. This impact is also the impact to BC Act-listed TECs. The impacts to EPBC Act-listed TECs is presented in Table 6-6.

Impact to vegetation on certified land or certified-urban capable land does not require further assessment. The proposal will result in a total removal of 0.36 ha of non-certified TEC Cumberland Plain Woodland in the Sydney Basin Bioregion listed as Critically Endangered under the BC Act. Of this vegetation, 0.3 ha conforms to the TEC Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest listed as Critically Endangered under the EPBC Act.

The proposal will result in a total removal of 0.02 ha of non-certified TEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions listed as Endangered under the BC Act. Of this area, a total of 0.004 ha of vegetation conforms to the TEC River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria listed as Critically Endangered under the EPBC Act.

Assessments against the test of significance under section 7.3 of the BC Act and the significant impact criteria under the EPBC Act were carried out to determine whether the proposal is likely to significantly impact these TECs.

In summary, the assessments of significance found that the small amount of vegetation removal required for the proposal is unlikely to result in a significant impact to these TECs under both the BC Act and EPBC Act.

Table 6-5 Direct impacts on native vegetation/BC Act TECs

PCT	TEC (BC Act)	Area within the study area (ha)	Area to be directly impacted (ha)	Impacted area in certified areas (BCO and CPCP) (ha)	Impacted area in non-certified areas (BCO and CPCP) (ha)
PCT 4025 Cumberland Red Gum Riverflat Forest	River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	2.77	0.02	0	0.02
PCT 3320 Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	1.84	0.45	0.09	0.36
PCT 3448 Castlereagh Ironbark Forest	Shale Gravel Transition Forest in the Sydney Basin Bioregion	2.36	0	0	0
Total		6.97	0.47	0.09	0.38

Table 6-6 Direct impacts on EPBC Act TECs

TEC	Area within the study area (ha)	Area to be directly impacted (ha)	Impacted area in certified areas (BCO and CPCP) (ha)	Impacted area in non-certified areas (BCO and CPCP) (ha)
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	2.75	0.04	0	0.004
Cumberland Plain Shale Woodland and Sale-Gravel Transition Forest	2.21	0.3	0	0.3
Total	4.96	0.304	0	0.304

Assessments of significance under the BC Act and EPBC Act were carried out for threatened flora species with a moderate or higher likelihood of occurrence. The assessments found that no significant impact to threatened flora species was likely.

Clearing of vegetation will result in the loss of potential habitat for threatened fauna species known or considered to have a moderate or higher likelihood to occur in the study area. Open woodland vegetation within the construction footprint may provide roosting and/or foraging habitat for threatened fauna species. Similar habitat is relatively widespread at a local and regional scale.

One hollow-bearing tree is proposed to be removed which could impact on threatened microbats and other hollow-dependent species. The removal of other vegetation will result in a minor loss of foraging trees. It is therefore unlikely that the potential habitat present within the construction footprint will provide critical habitat resources for threatened fauna species in the locality.

Assessments of significance under the BC Act and EPBC Act were carried out for threatened fauna species with a moderate or higher likelihood of occurrence. The assessments found that no significant impact to threatened fauna species were likely.

The proposal has the potential to increase the spread of pathogens that threaten native biodiversity values. In particular, the soil-borne pathogen Phytophthora (*Phytophthora cinnamomi*) is known to be present in the surrounding area, including Kemps Creek Nature Reserve which is closed to the public due to the risk of it spreading (NPWS, 2022). Phytophthora infects roots and is associated with damage and death to native plants. It may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site between infected roots to healthy roots of other plants. Phytophthora may also be dispersed by organic material attached to vehicles, animals, clothing such as footwear, and movement of soil.

A Phytophthora Management Plan was developed for Sydney Water's Austral Leppington wastewater project (Blue Tongue Ecosystems, 2022) due to the presence of Phytophthora in the construction footprint of that project. Construction works in the vicinity of pumping station SP1211 (ie HDD compound) will be carried out in accordance with that plan.

Potential drawdown of groundwater during construction of the proposal was calculated based on the expected volume of dewatering. It was determined that no GDEs are within the calculated radius of influence of the potential drawdown. As such, potential impacts to GDEs are anticipated to be minimal and will be appropriately managed through the implementation of the mitigation measures.

For areas of the proposal that are within certified-urban capable land, consideration must be given to the mitigation requirements specified in Table 1 of the Cumberland Plain Conservation Plan Guidelines for Infrastructure Development (DPE, 2022a). The guidelines aim to ensure infrastructure development is consistent with the CPCP's commitments and actions. The mitigation requirements have been considered and those that are relevant to the proposal are incorporated into the mitigation measures.

The proposal will not impact ENV and therefore offsets in accordance with the BCO are not required. There will be no clearing of vegetation in avoided land or strategic conservation area in the CPCP area and offsets are not required under the *Biodiversity Conservation Act 2016*. Statutory offsets are not required for the proposal.

Most of the clearing of native vegetation is on BCO non-certified land that is not mapped as ENV. Sydney Water provides non-statutory offsets for impacts to biodiversity in accordance with the *Biodiversity Offsets Guide* (Sydney Water, 2021a). Impact to native vegetation on non-certified land will be offset.

Some clearing will be required on land certified under the BCO and the CPCP. These areas are identified for future development and biodiversity impacts in these areas have already been offset under the BCO and the CPCP. Our approach is to not apply Sydney Water offset guide over the top of this, with exception of any impacts not covered by BCO or CPCP, such as offsetting the impact to hollows.

Most commonly, offsets comprise revegetation or restoration of the impacted area, or an area nearby with the same or similar native species. The amount or area rehabilitated consists of the area impacted plus a multiplier. Table 6-7 outlines the offsets to be applied for the proposal.

Biodiversity impacts associated with the operation of the proposal are not expected.

Table 6-7 Biodiversity offsets required for the proposal

Biodiversity value	Offset multiplier[1]	Impact area (ha)	Required offset
Threatened ecological communities	3	0.38	1.14
Tree hollows	2	1 hollow	2 nest boxes or salvaged hollows

1. Offset multipliers are derived from Sydney Water's *Biodiversity Offset Guide* (2021a)

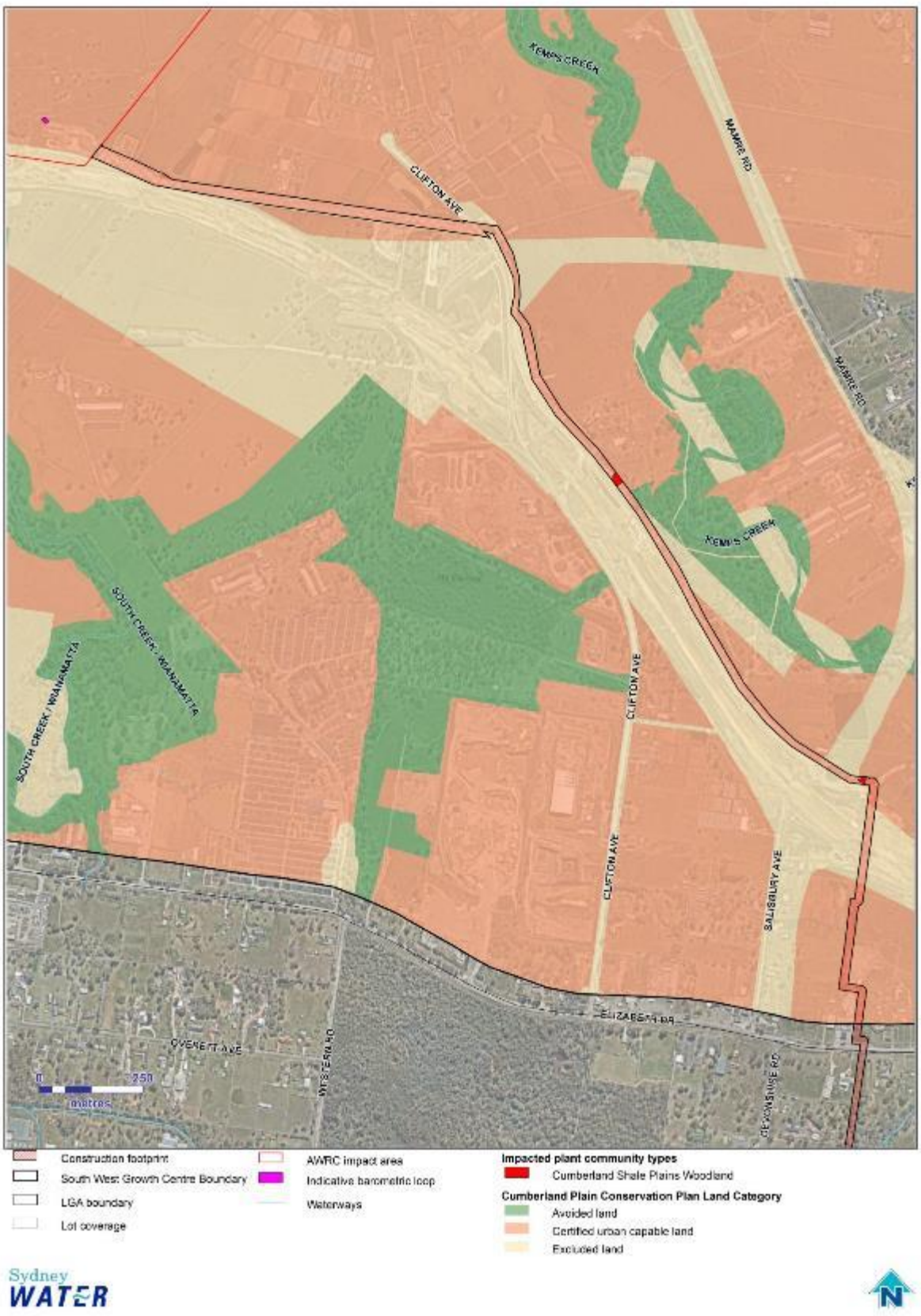


Figure 6-3 Impacted vegetation and CPCP land categories

Figure 6-4 Impacted vegetation and BCO land categories

Table 6-8 Environmental mitigation measures — flora and fauna

Mitigation measures

Provided it is essential for delivering the project, Sydney Water's Project Manager can approve the following vegetation removal and tree trimming, without additional environmental assessment (but only after consultation with the Environmental and Community Representatives and affected landowners). Sydney Water considers vegetation removal in these circumstances has minimal environmental impact.
• Any minor:
  ○ vegetation trimming or
  ○ removal of exotic vegetation or
  ○ removal of planted native vegetation
where the vegetation is not a threatened species (including a characteristic species of a threatened community or population), heritage listed, in declared critical habitat, in a declared area of outstanding biodiversity value, in areas mapped as ENV or RBM 12 under the Sydney Growth Centre Biodiversity Certification Order or in land mapped as avoided land or strategic conservation area under the Cumberland Plain Conservation Plan.
• Any removal of remnant vegetation where there is no net change to environmental impact (eg a different area of vegetation is removed but the total area is the same or less than assessed in the EIA).
Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided when seeking Project Manager approval. Any impacts to native vegetation and trees in non-certified land (with the exception of ENV) must be offset in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).

Vegetation trimming or clearing must not occur until the following are complete: • the area to be removed has been physically delineated • the contractor's Environmental Representative has confirmed consistency with approval documentation • pre-clearing surveys, if relevant and • written authorisation to commence clearing from Sydney Water Project Manager.
Potentially affected residents will be notified of any tree removal.
Test soils in areas potentially exposed to *Phytophthora* (excluding the area covered by the existing management plan) prior to construction works commencing and implement measures to control the spread. This must include the construction footprint within the Kemps Creek flood zone.
A Hygiene Management Plan must be developed to prevent the spread of the pathogens such as *Phytophthora* and myrtle rust. The plan must contain specific measures to manage *Phytophthora* in areas that test positive for the pathogen. Work at the HDD receival pit at SP1211 must be carried out in accordance with the Phytophthora Management Plan for Sydney Water's Austral Leppington project (Blue Tongue Ecosystems, 2022).

Mitigation measures
Vehicles, equipment, materials and footwear are to be clean on entry (free of soil, mud and/or seeds) to minimise the risk of introduction or spread of *Phytophthora cinnamomi*.
Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.
Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.
A suitably qualified ecologist will accompany the contractor to complete a pre-clearing assessment of the site prior to the start of works. If fauna is present, or ecological assessment has determined high likelihood of native fauna presence, including removal of hollow bearing trees, engage WIRES or a licensed ecologist to inspect and relocate fauna before works.
Pre-clearance surveys must identify any breeding or nesting activities by native fauna and as far as practical no breeding sites will be disrupted.
During the pre-clearance surveys, any hollow-bearing trees not previously identified in or near the proposed pipelines will be marked by an ecologist so that they are retained and avoided by contractors where possible.
Where fauna species are identified in vegetation to be cleared, animals will be removed and relocated to adjacent bushland prior to felling. If this is not possible, the tree will be sectionally dismantled or soft felled under the supervision of an ecologist or wildlife carer, before relocating the animal.
Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone.
Manage biosecurity in accordance with: • *Biosecurity Act 2015* (see NSW Weedwise), including reporting new weed infestations or invasive pests • contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility. Record Pesticides and Herbicides use in accordance with SWEMS0017.
Where practical, open trenches will be covered at the end of each work day to avoid potential for native fauna to become trapped in open trenches.
If native fauna is encountered on site, stop work and allow the fauna to move away unharassed. Engage WIRES or a licensed ecologist if assistance is required to move fauna.
In TOBAN period: 1. Check specific TOBAN notice to confirm whether the work can be carried out under standard exemptions (Govt Gazette No18 Feb 2018)

Mitigation measures
2. If not, apply to RFS for specific exemption.
Map and report native vegetation clearing greater than 0.01 ha in extent (and any associated rehabilitation) to the Sydney Water Environmental Representative. Track vegetation clearing as per SWEMS0015.26 Contractor Native Vegetation Clearing and Rehabilitation template.
Cleared areas must be restored to pre-existing condition, where practicable.
Restore areas cleared of native vegetation with native species of local provenance.
Residual impacts to native vegetation and trees in non-certified land (with the exception of ENV) will be offset in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).

6.2.4 Aboriginal heritage

An Aboriginal Cultural Heritage Assessment Report (ACHAR) was prepared for the proposal by Kelleher Nightingale Consulting and is summarised here. The full report is provided in Appendix D.

Existing environment

A search of the Aboriginal Heritage Information Management System (AHIMS) and review of prior Aboriginal heritage studies associated with nearby State significant infrastructure works was completed in 2022 and identified several Aboriginal heritage sites in the vicinity of the proposal. [redacted]

A field survey was carried out to investigate the level of previous disturbance and potential for areas to contain objects of Aboriginal cultural heritage significance within the study area. It found that in general, the study area had been previously disturbed by the construction of roads, utilities, property development, and other rural activities, while disturbance in areas of remnant native vegetation and pastures is relatively low. [redacted]

Potential impacts

The proposal will harm one Aboriginal site [redacted] (Figure 6-5). The remainder of the Aboriginal site outside the construction footprint will be a no-go area during construction. The AHIP will cover the construction footprint not already subject to an existing AHIP or approval (Figure 6-6), as well as site [redacted]. This ensures that Sydney Water can construct the proposal without the risk of impacting Aboriginal heritage without a permit.

[redacted]

[redacted] The proposal overlaps with existing permit areas and while the potential for impact in these areas is low to nil, Sydney Water will need to comply with the conditions of these permits/approvals (Figure 6-7):

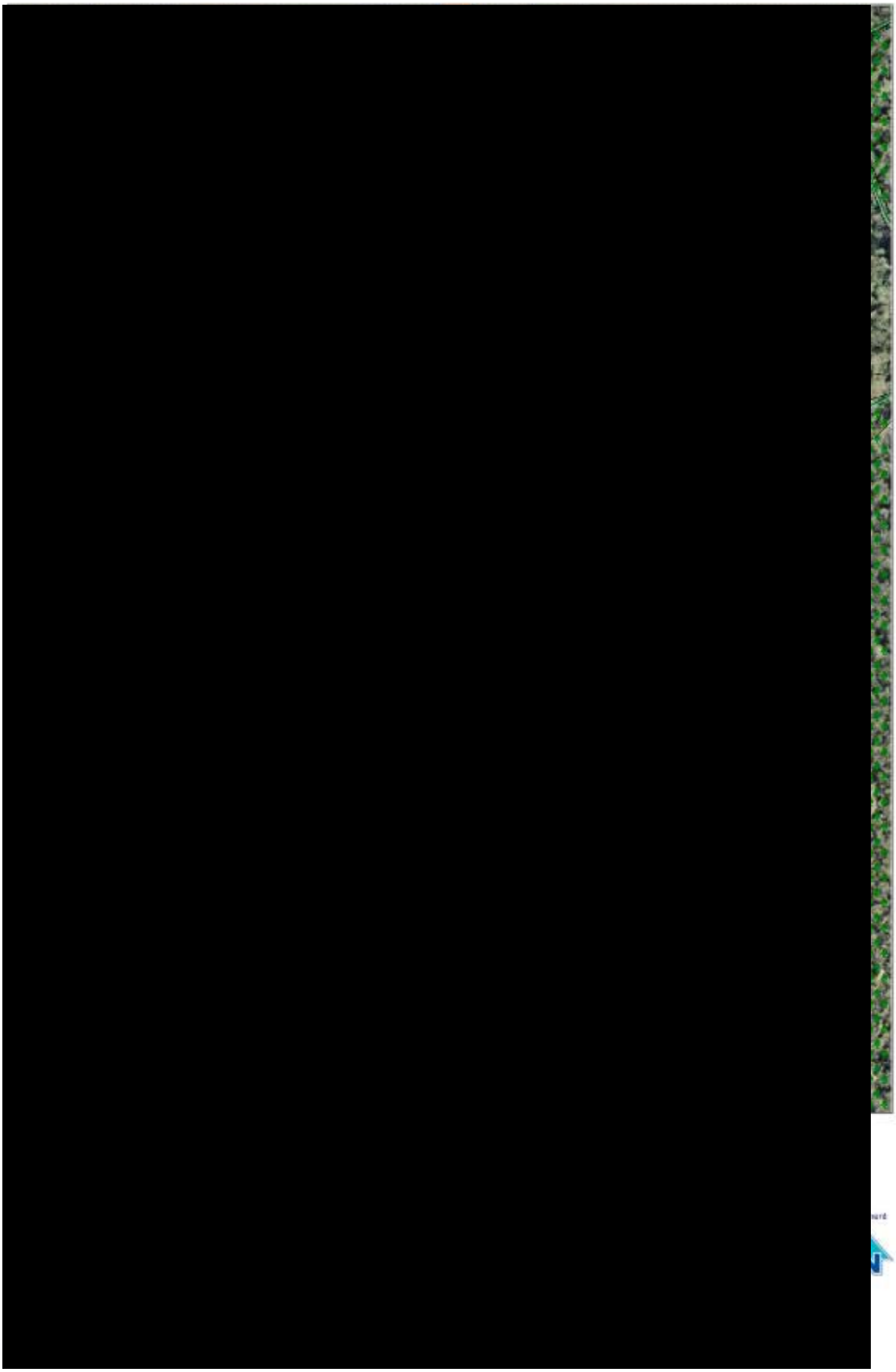
- [redacted]

[redacted]

[redacted]

[redacted]

There would be no impact to Aboriginal heritage during operation.



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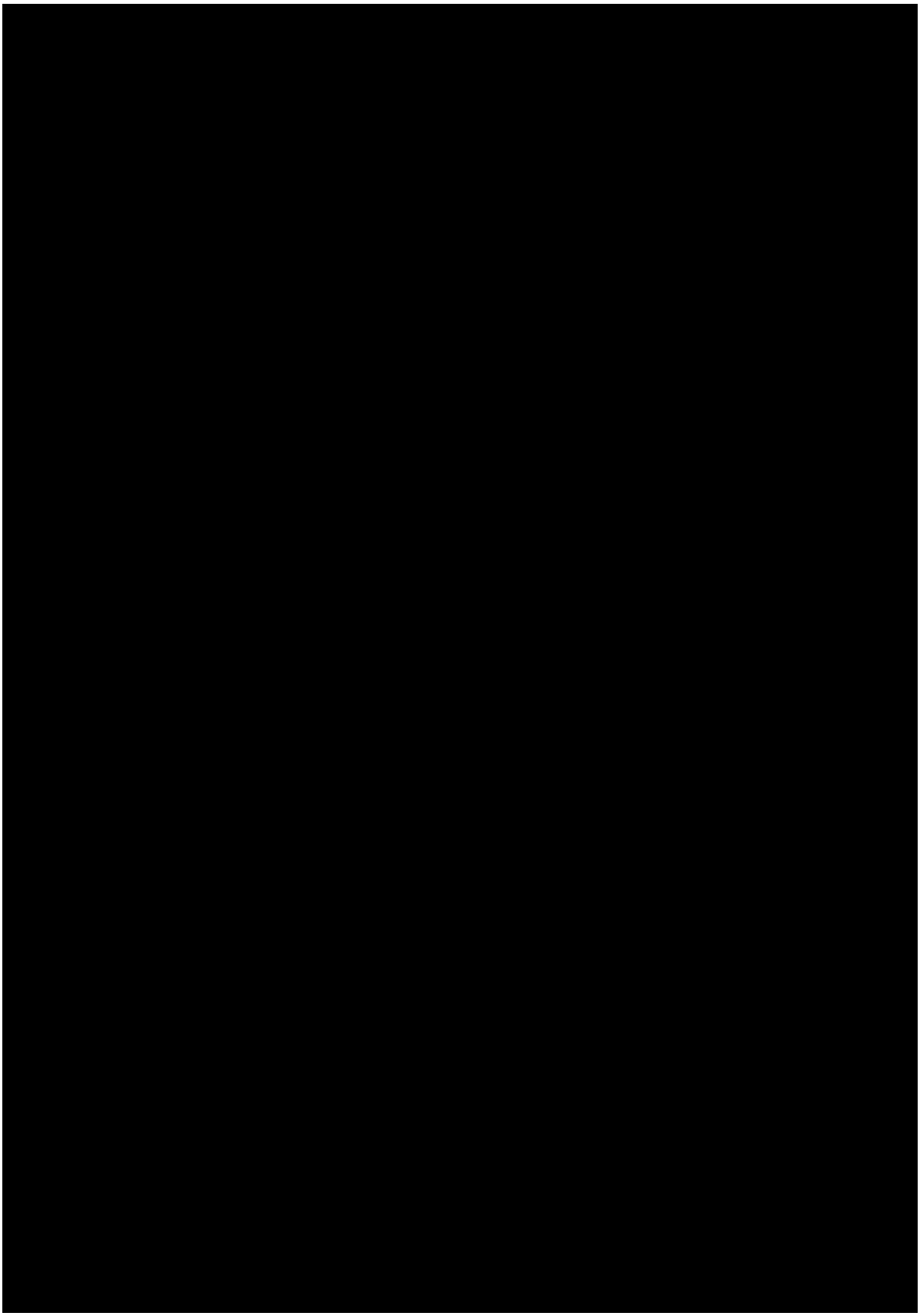

Figure 6-6 AHIP area

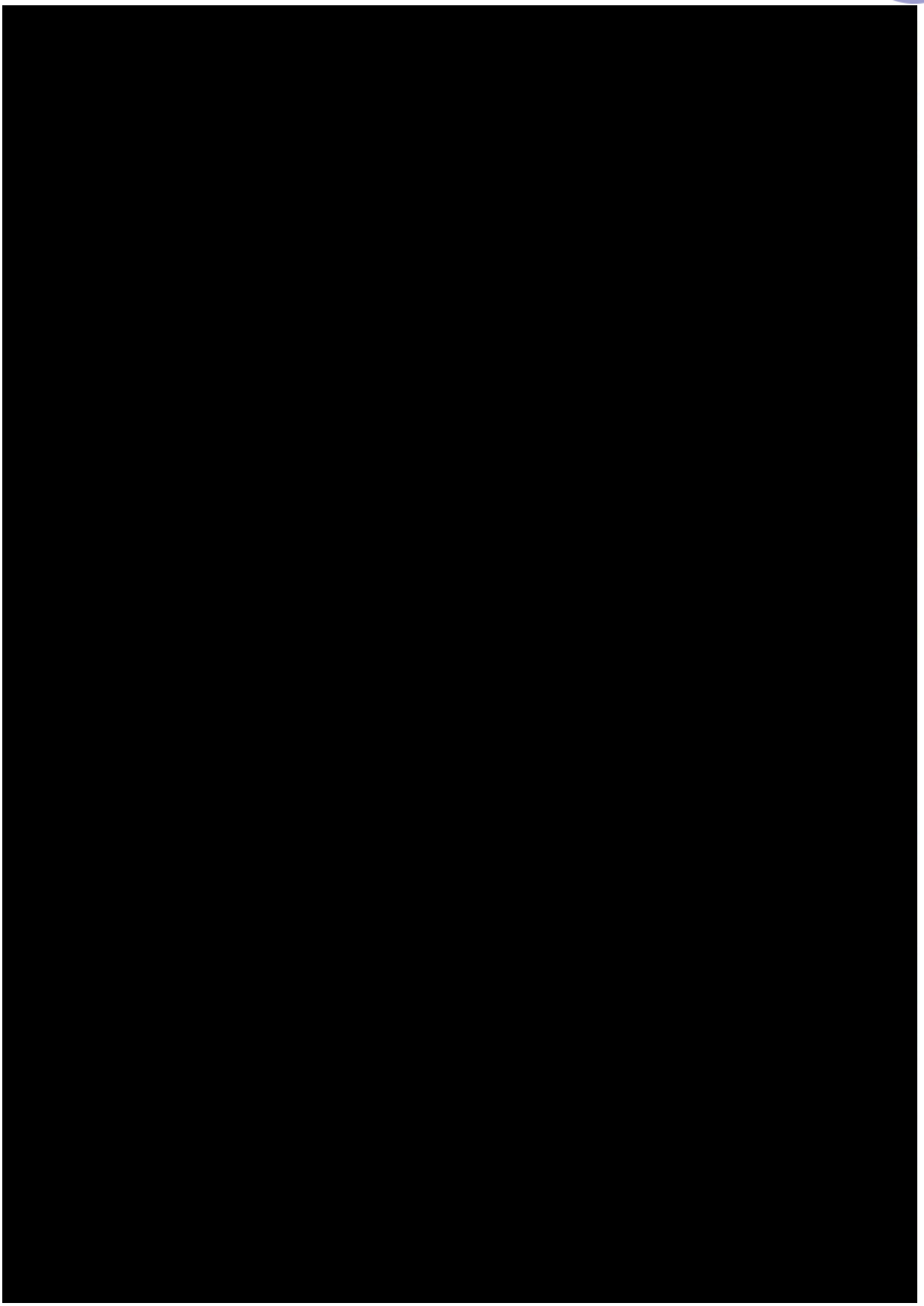

Figure 6-7 Existing AHIPs/approvals

Table 6-9 Environmental mitigation measures — Aboriginal heritage

Mitigation measures
Do not make publicly available or publish, in any form, Aboriginal heritage information on sites / potential archaeological deposits, particularly regarding location.
Impact to Aboriginal heritage sites can only occur when an Aboriginal Heritage Impact Permit (AHIP) is granted. Work must be in accordance with AHIP conditions. Include Aboriginal Heritage Management Plan (AHMP) in CEMP to address AHIP conditions.
All site personnel must be inducted by a heritage specialist before starting work on site. The induction should include clear explanation of heritage constraints, AHIP requirements, go and no-go areas, processes and measures to avoid impacts, stop work procedures, and contact details to obtain further heritage guidance if needed.
Work within existing approval areas, including AHIPs and SSI areas, must be undertaken in accordance with the conditions of those permits/approvals. As per the ACHAR, the following should be completed: • archaeological salvage excavation of impacted portion of site • community collection of surface artefacts within impact area.
Barrier fencing must be erected on the AHIP boundary to ensure that no construction impact extends into the portion of the site outside the impact/AHIP area. The portion of the Aboriginal site [redacted] outside of construction footprint must be identified in the CEMP as environmentally sensitive no-go zone to ensure no impact.
Detailed design will ensure the footprint of the proposal is not located within the mapped Aboriginal archaeological site / PADs that are outside of the AHIP.

6.2.5 Non-Aboriginal heritage

There are very few listed non-Aboriginal heritage items in the vicinity of the proposal. The non-Aboriginal heritage items identified within 500 m of the proposal are summarised in Table 6-10 and shown on Figure 6-8.

Table 6-10 Non-Aboriginal heritage items in the vicinity of the proposal

Item name	Listing	Item number	Significance
Kemps Creek Forest	*State Environmental Planning Policy (Precincts – Western Parkland City) 2021*	Schedule 11 – 1	Local
The Fleurs Radio Telescope Site	*State Environmental Planning Policy (Precincts – Western Parkland City) 2021*	Schedule 2 – I5	Local
	Penrith LEP 2010	832	Local

Item name	Listing	Item number	Significance
Fleurs Aerodrome	Nil – item of potential heritage significance	-	Local (potential)

Potential impacts

Construction of the barometric loop will be within the curtilage of Fleurs Radio Telescope Site. The exact location of the barometric loop is subject to the design of the AWRC. Construction of the AWRC will '… *see the last remaining evidence of the sites' use removed*' (Extent Heritage, 2021, p. 170). Construction activities associated with the AWRC within the curtilage of the Fleurs Radio Telescope site will start in late 2023.

The proposal is unlikely to impact any surface feature or remaining structure of the site. Photographic archival recording of the site in accordance with the *Photographic Recording of Heritage Items using Film or Digital Capture*, NSW Heritage Office, 2006 was completed as part of the AWRC project to record the history and heritage of the site.

Considering the above and the implementation of the mitigation measures proposed below, the potential impact on the Fleurs Radio Telescope Site during construction of the proposal is expected to be low.

The proposal will involve construction of the dual pressure mains via HDD below the surface in Kemps Creek Nature Reserve. This section of the alignment is subject to a separate REF to be determined by NPWS. Potential impacts to the heritage item are assessed in that REF. In any case, the potential impact to the item is considered to be negligible given the work will be entirely underground.

The Fleurs Aerodrome is a small airfield with one 25 m wide, relatively short (about 300 m) runway adjoining the eastern boundary of the Fleurs Radio Telescope Site, with the remaining sections of the airfield grassed. It was identified during the AWRC EIS (Sydney Water, 2021b) as a potential non-Aboriginal heritage item. It is not listed on any statutory heritage list but was considered to have potential heritage significance. The proposal follows the alignment of the AWRC access road. The road is under construction and the area is now disturbed. The potential impact of the proposal on this item of potential heritage significance is therefore considered negligible.

There would be no impact to non-Aboriginal heritage during operation.

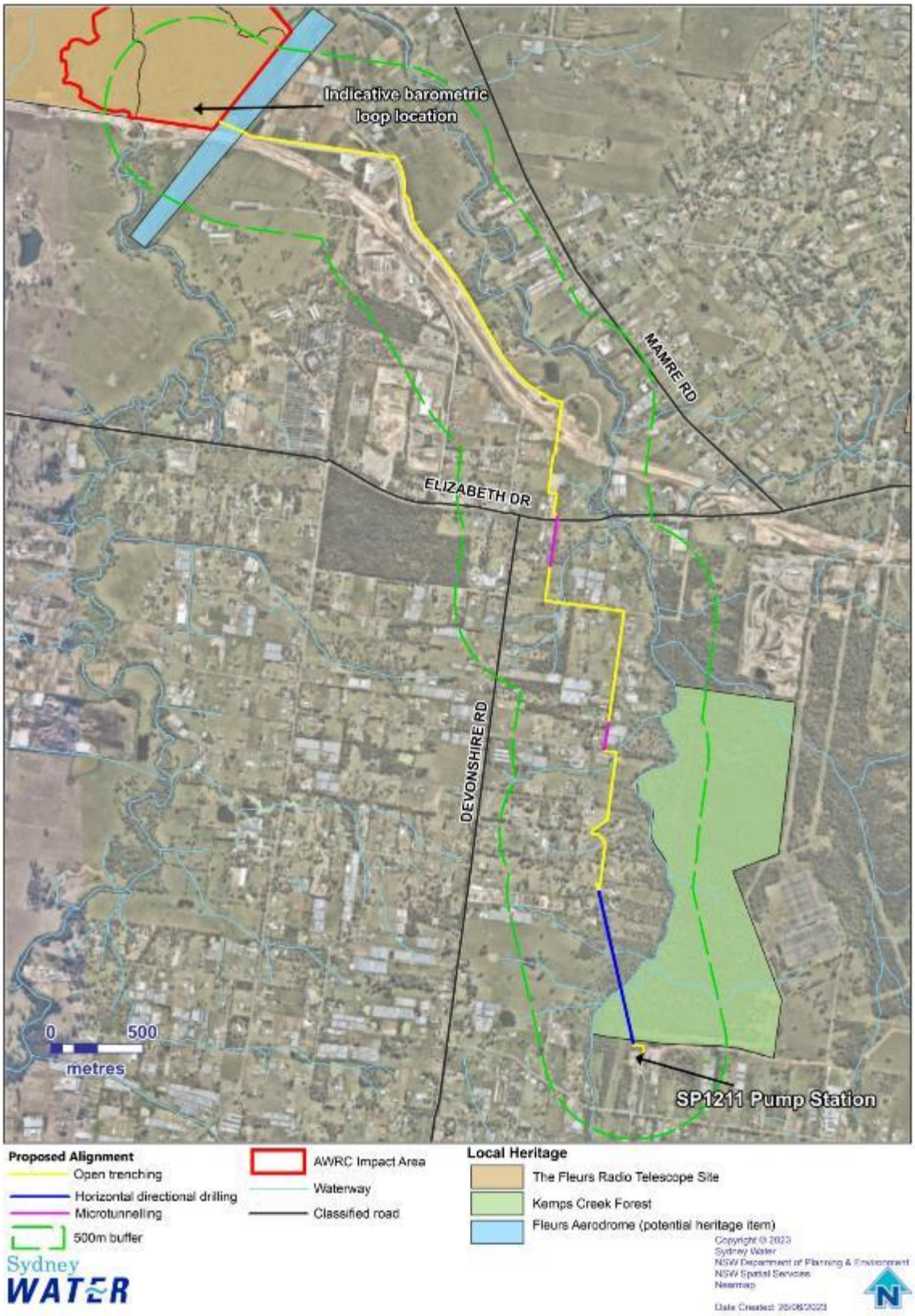

Figure 6-8 Non-Aboriginal heritage items

Table 6-11 Environmental mitigation measures — non-Aboriginal heritage

Mitigation measures
If any non-Aboriginal relic is found, cease all excavation or disturbance in the area and notify Sydney Water Project Manager in accordance with SWEMS0009.
All site personnel must be inducted by a heritage specialist (or delegate) before starting work on the AWRC site. The induction should include clear explanation of heritage constraints, go and no-go areas, processes and measures to avoid impacts, stop work procedures, and contact details to obtain further heritage guidance if needed.

6.2.6 Noise and vibration

A specialist noise and vibration assessment was prepared by GHD and has been summarised below. The complete specialist noise and vibration report is provided as Appendix E.

Existing environment

The sensitive receivers in the vicinity of the proposal are residences at low to medium density. Other sensitive receivers in the vicinity of the proposal include:

- MindChamps Early Learning and Preschool
- Heritage College Sydney
- Kemps Creek Public School
- Muhammadi Welfare Association of Australia.

The existing noise environment is predominantly comprised of rural land uses affected by road traffic noise, where residential dwellings are in close proximity to a road.

Background noise monitoring in the broader study area carried out for previous projects was used for the proposal, as it was considered relevant and representative of background noise levels for the area. This included background noise monitoring from projects including the *Austral to Leppington Wastewater Project Noise and Vibration Impact Assessment* (GHD, 2021) and the *M12 Motorway Environmental Impact Assessment – Appendix K Noise and Vibration Assessment Report* (Roads and Maritime Services, 2019). The adopted monitoring locations are shown on Figure 6-9 and the recorded background noise levels are summarised in Table 6-12.

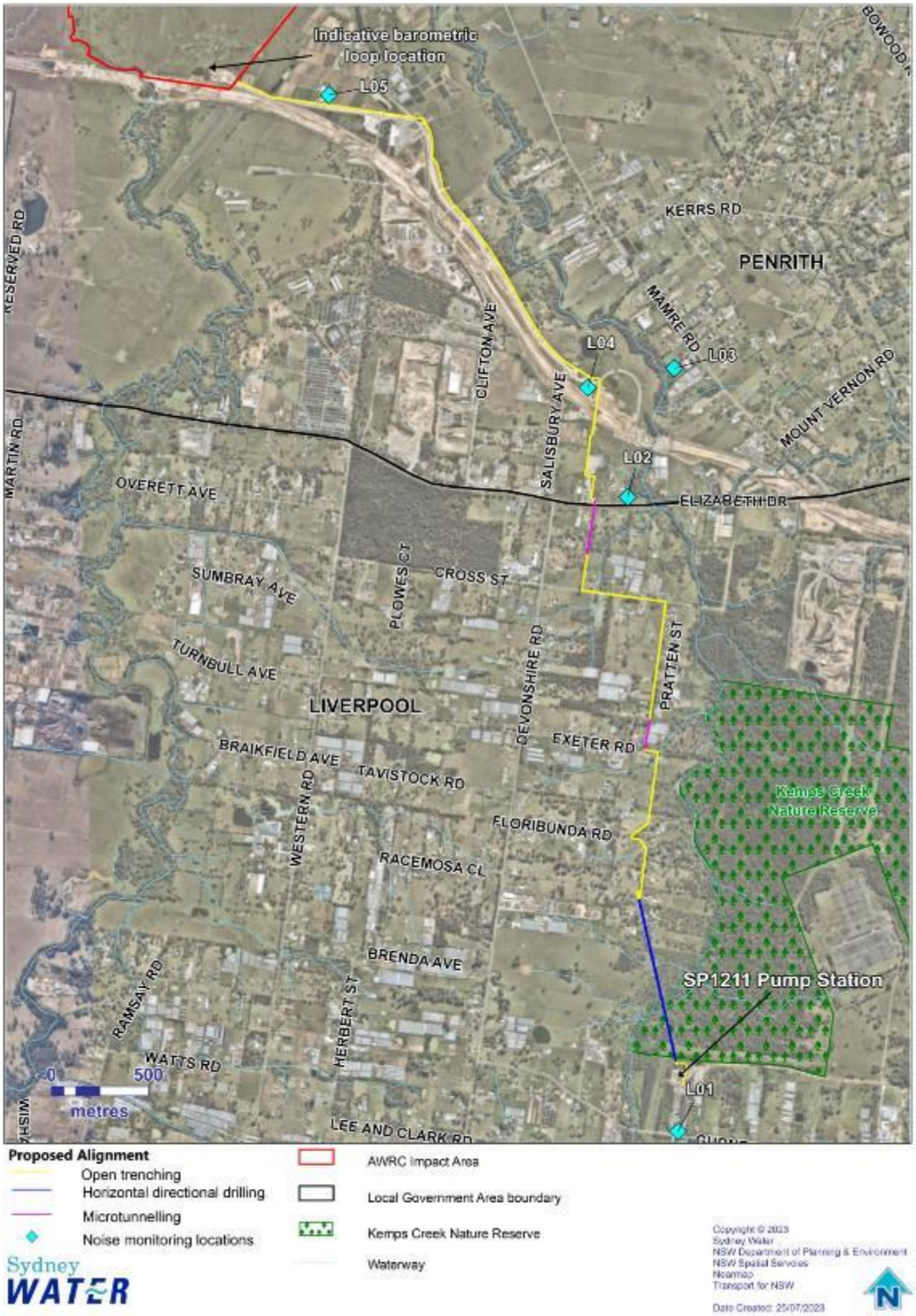

Figure 6-9 Adopted noise monitoring locations

Table 6-12 Noise monitoring

Location	Data source	Background noise $L_{A90(Period)}$			Ambient noise descriptors $L_{A90(Period)}$		
		Day	Evening	Night	Day	Evening	Night
L01 – 205 Gurner Avenue, Austral	Refer to Note 2	35[1] (33)	34	30[1] (29)	54	51	48
L02 – 1383 Elizabeth Drive, Kemps Creek	Refer to Note 3	54	48	37	-	-	-
L03 – 1219 Mamre Road, Kemps Creek	Refer to Note 3	48	46	37	-	-	-
L04 – 12-20 Salisbury Avenue, Kemps Creek	Refer to Note 3	39	42	35	-	-	-
L05 – 203 Clifton Avenue, Kemps Creek	Refer to Note 3	35[1] (34)	35	31	-	-	-

1. The minimum rating background levels (RBLs) have been adopted in accordance with the *Noise Policy for Industry* (*EPA, 2017*), being 35 dBA for the day period and 30 dBA for the evening and night periods.
2. Austral to Leppington Wastewater Project Noise and Vibration Impact Assessment (GHD, 2021)
3. M12 Motorway Environmental Impact Assessment Appendix K Noise and Vibration Assessment Report (Roads and Maritime Services, 2019)

The background noise levels indicate higher levels at monitoring locations closer to major roads (eg Elizabeth Drive) in the study area. At locations further away from major roads, noise levels are up to 20 dB lower, typical of a low-density rural setting. For the purposes of developing noise criteria for the proposal, the following background noise levels were adopted:

- Residences directly facing Elizabeth Drive – background noise levels measured at 1219 Mamre Road, Kemps Creek (L03). These levels are conservative in comparison to the measurements at 1383 Elizabeth Drive. However this is considered to be reasonable given the intrusive characteristics of construction noise in comparison to road traffic noise.
- All other sensitive receivers – background noise levels measured at 203 Clifton Avenue, Kemps Creek (L05). This is a conservative representation of the broader study area, noting that individual locations may have higher background noise levels depending on the proximity to roads and activities in the urban environment.

Compliance criteria

Construction noise criteria were developed in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and the *Noise Policy for Industry* (NPfI) (EPA, 2017). It is anticipated that the main construction activities will be carried out during standard recommended

construction hours, as defined by the ICNG. Some out of hours work may be necessary for certain activities such as work in roads or delivery of oversized equipment. These occurrences would be approved and managed in accordance with the mitigation measures. Criteria for outside standard construction hours and sleep disturbance criteria were not developed as no impacts are expected for most construction activities. The construction noise criteria for the proposal are summarised in Table 6-13.

Table 6-13 Proposal construction noise management levels

Receiver type	Standard hours construction noise management levels, $L_{Aeq(15min)}$	
	Noise affected (dB)	Highly noise affected (dB)
Residential (directly facing Elizabeth Drive)	58	75
Residential (all other areas)	45	75
Educational facility	55 (external)[1] or 45 (internal)	
Place of worship	55 (external)[1] or 45 (internal)	
Commercial	70 (external)	
Industrial	75 (external)	

1. External noise management level is based on a 10 dB noise reduction through an open window.

In addition to the above, noise compliance criteria for construction traffic were adopted in accordance with the NSW Road Noise Policy (EPA 2011), which states that the traffic noise level including the project should be limited to 2 dB increase on the traffic noise level without the project.

Construction vibration criteria were determined with reference to relevant guidelines and standards including *Assessing Vibration: a technical guideline* (DEC, 2006), *British Standard 6472 – 2008* and *German Standard DIN 4150-3: 1999*. The adopted construction vibration criteria are summarised in Table 6-14.

Table 6-14 Construction vibration criteria

Receiver type	Criteria type	Peak particle velocity (mm/s)
Residential (standard structures)	Human comfort	1
	Structural damage	5

Potential impacts

Construction activities have the potential to generate noise and vibration at sensitive receivers. The potential noise levels at sensitive receivers were predicted based on typical construction equipment and activities. The following three construction scenarios were assessed:

- CS1 – HDD, compound entry and exit
- CS2 – micro-tunnelling, dewatering pits
- CS3 – pipeline trenching.

The predicted construction noise contours for the above construction scenarios are provided in the noise and vibration assessment in Appendix E.

To quantify the intrusiveness of predicted noise levels, the following noise perception categories have been adopted:

- moderately intrusive – noise levels between 10 to 20 dB above the construction noise management level
- highly intrusive – noise levels are more than 20 dB above the construction noise management level.

The potential noise levels at sensitive receivers were predicted based on typical construction equipment and activities.

CS1 – HDD

Two hundred and fourteen sensitive receivers are predicted to experience exceedances of the standard hours noise management levels around the HDD compound locations. However, no sensitive receivers are predicted to experience exceedances of the highly noise affected noise level (75 dB). Thirty-three sensitive receivers are predicted to be potentially subjected to moderately intrusive noise levels and eight sensitive receivers potentially subjected to highly intrusive noise levels.

The sensitive receivers subject to moderately and highly intrusive noise levels are primarily located within 250 m of the HDD compound on the corner of Grant Close and Floribunda Road.

A noise barrier is recommended to reduce potential noise impacts from both HDD launch and receival pits.

CS2 – micro-tunnelling

Two hundred and forty-one sensitive receivers are predicted to experience exceedances of the standard hours noise management levels around the micro-tunnelling sites. No sensitive receivers are predicted to experience exceedances of the highly noise affected noise level (75 dB). Twenty-nine sensitive receivers are predicted to be potentially subjected to moderately intrusive noise levels and six sensitive receivers potentially subjected to highly intrusive noise levels.

A noise barrier is recommended to reduce potential noise impacts from both micro-tunnelling launch pits. General noise mitigation measures are presented below.

For most of the time, the micro-tunnelling will be located below the surface (in an excavated pit and along the alignment of tunnelling) and be less likely to result in exceedances of noise management levels. However, exceedances are likely to occur during construction activities at the surface.

CS3 – pipeline trenching

Two hundred and sixty-nine sensitive receivers are predicted to experience exceedances of the standard hours noise management levels around the trenching alignment. Noise levels at nine sensitive receivers are predicted to exceed the highly noise affected noise level. Ninety-three sensitive receivers are predicted to be potentially subjected to moderately intrusive noise levels and 57 sensitive receivers potentially subjected to highly intrusive noise levels.

The sensitive receivers predicted to exceed the highly noise affected noise level include the following properties:

- 203-229 Clifton Avenue, Kemps Creek (2 separate receivers at this address)
- 1383-1411 Elizabeth Drive, Kemps Creek
- 1413-1415 Elizabeth Drive, Kemps Creek
- 175-185 Exeter Road, Kemps Creek
- 80 Floribunda Road, Kemps Creek
- 10 Pratten Street, Kemps Creek
- 20 Pratten Street, Kemps Creek
- 80 Pratten Street, Kemps Creek.

The level of potential noise impact can also be quantified in terms of distance from the trenching alignment as follows:

- above noise management levels – up to 230 m from the trenching alignment
- moderately intrusive – up to 100 m from the trenching alignment
- highly intrusive – up to 35 m from the trenching alignment
- highly noise affected – up to 15 m from the trenching alignment.

The mitigation measures presented below will be implemented where feasible and reasonable. All potentially impacted residents will be informed of the nature of the works, expected noise levels, duration of works and a method of contacting Sydney Water to raise noise complaints.

Construction noise impacts will be minimised by carrying out works during standard construction hours. The progressive nature of the open trenching construction will also mean that impacts at a given sensitive receiver will be temporary and not occur for the entire duration of construction.

Construction traffic noise impacts

The following peak vehicle movements are anticipated for the proposal:

- at site compounds: up to 10 trucks per hour
- at tunnelling sites: up to 2-4 trucks per hour
- at trenching sites: up to 5-10 trucks per hour.

Construction traffic will use a mixture of arterial, sub-arterial and local roads. On major roads in the study area, such as Elizabeth Drive, the additional traffic movements will not be sufficient to result in an exceedance of the Road Noise Policy. On local roads, such as Floribunda Road, exceedances of the Road Noise Policy may occur during peak traffic movements. This will generally be limited to exceedances at sensitive receivers with a frontage to the local road.

Traffic noise impacts from construction vehicle movements will be managed in accordance with a traffic management plan prepared by the contractor. The plan will detail specific routes that construction traffic and local traffic would follow throughout the construction phase.

The community will also be informed of the proposal including traffic movements and duration of construction activities. Section 6.2.9 further discusses potential traffic and access impacts from the proposal.

Construction vibration impacts

Construction activities from the proposal have the potential to generate vibration at sensitive receivers. It was determined that excavation activities and use of a trench roller have the potential to exceed the human comfort vibration criteria for short periods of time when these activities are carried out within 15 m of a residential receiver. The structural damage criteria are not expected to be exceeded beyond a distance of 4 m from the source for standard dwellings.

Ten sensitive receivers have been identified within the 15 m human comfort buffer distance while two structures have been identified within the 4 m standard dwelling structural damage buffer distance. These receivers and structures are provided in Table 6-15, noting the distances are calculated from the edge of the construction footprint.

Table 6-15 Sensitive receivers within vibration buffer distances

Human comfort (15 m buffer)[1]	Standard structure damage (4 m buffer)[1]	Address[2]
R0009		1413-1415 Elizabeth Drive, Kemps Creek
R0086		80 Floribunda Road, Kemps Creek
R0102		80 Pratten Street, Kemps Creek
R0246	R0246	203-229 Clifton Avenue, Kemps Creek
R0328		1383-1411 Elizabeth Drive, Kemps Creek
R0549		20 Pratten Street, Kemps Creek
R0717		10 Pratten Street, Kemps Creek
R0749		155-165 Exeter Road, Kemps Creek
R0791		175-185 Exeter Road, Kemps Creek
R0832	R0832	203-229 Clifton Avenue, Kemps Creek

Human comfort (15 m buffer)[1]	Standard structure damage (4 m buffer)[1]	Address[2]

1. Receiver IDs are those assigned to individual structures in Appendix E
2. Each address reflects the location of the individual structure ID (refer to Note 1). It does not indicate that all structures and receivers at the address will experience vibration impacts.

Mitigation measures have been provided below to minimise the potential impacts of vibration during construction of the proposal.

Cumulative impacts

Potential cumulative impacts relating to noise and vibration are described in section 6.2.12.

Operational impacts

Air valves will be used occasionally during operation. However, they are not expected to be noisy. During operation of the proposal, the potential impact from noise and vibration would be negligible.

Table 6-16 Environmental mitigation measures — noise and vibration

Mitigation measures
Prepare a Noise Management Plan prior to the start of construction.
Works must comply with the Construction Noise Guideline (Draft, 2021), including scheduling work and deliveries during standard daytime working hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturday. No work to be scheduled on Sunday nights or public holidays. Any proposed work outside of these hours must be justified. The proposal will also be carried out in accordance with: • Sydney Water's Noise Management Procedure SWEMS0056 • Noise Policy for Industry (EPA, 2017). All reasonable and feasible noise mitigation measures should be justified, documented and implemented on-site to mitigate noise impacts.

Incorporate standard daytime hours noise management mitigation measures into the CEMP, including but not limited to:
• identify and consult with the potentially affected residents prior to the commencement:
  ○ describe the nature of works; the expected noise impacts; approved hours of work; duration, complaints handling and contact details.
  ○ determine need for, and appropriate timing of respite periods (eg times identified by the community that are less sensitive to noise such as mid-morning or mid-afternoon for works near residences)
• implement a noise complaints handling procedure

Mitigation measures

- plant or machinery will not be permitted to warm-up near residential dwellings before the nominated working hours
- appropriate plant will be selected for each task, to minimise the noise impact (eg all stationary and mobile plant will be fitted with residential type silencers)
- engine brakes will not be used when entering or leaving the work site(s) or within work areas.
- regularly inspect and maintain equipment in good working order
- arrange work sites where possible to minimise noise (eg generators away from sensitive receivers, site set up to minimise use of vehicle reversing alarms, site amenities and/ or entrances away from noise sensitive receivers)
- use natural landforms/ mounds or site sheds as noise barriers
- schedule noisy activities around times of surrounding high background noise (local road traffic or when other noise sources are active).

If works beyond standard daytime hours are needed, the contractor would:

- justify the need for out of standard hours work and why it is not possible to carry out the works during standard hours
- consider potential noise impacts and: implement the relevant standard daytime hours mitigation measures; Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01) and document all reasonable and feasible management measures to be implemented
- identify additional community notification requirements and outcomes of targeted community consultation
- seek approval from the Sydney Water Project Manager in consultation with the environment and communications representatives.

Conduct a dilapidation survey / asset condition assessment prior to works which have potential to damage existing structures.

Monitor compliance with the recommended vibration levels in DIN 4150-3 1999: Structural Vibration – Part 3; Effects of vibration on structures.

Consider less vibration intensive methodologies where practicable and use only the necessary sized and powered equipment.

The contractor must communicate with the impacted residents clearly explaining the duration and noise level of the works and inform the residents of any respite periods.

Temporary noise barriers (3 m high recommended) should be constructed around all compound sites and the HDD and micro-tunnelling compounds, or around noisy equipment.

6.2.7 Air and energy

Existing environment

Sensitive receivers in the vicinity of the proposal consist primarily of low density rural-residential properties in the suburb of Kemps Creek. The key local industries and activities near the proposal that may impact ambient air quality include:

- Cleanaway Kemps Creek Resource Recovery Park, about 1.5 km south west
- Brandown Waste and Recycling Services facility, about 750 m east
- Andreasens Green Wholesale Nurseries, about 1 km west
- various small-scale agriculture / farming activities.

A review of the National Pollutant Inventory indicates that there are limited facilities in the vicinity of the proposal. However, two facilities are within about 2 km. These are the Jemena Austral Main Line Valve, east of the proposal, and the SUEZ Elizabeth Drive Landfill Facility (now operated by Cleanaway), south west of the proposal.

Private residential properties are adjacent to the proposal, particularly south of Elizabeth Drive where the proposal generally follows road reserves and is within a small number of properties.

DPE operate a network of air quality monitoring stations across NSW, with the closest station to the proposal being at Bringelly about 3.5 km south west of the proposal. A review of the Bringelly station data monthly averages over the past 12 months indicates that the existing air quality conditions are typically good.

Potential impacts

During construction of the proposal, the primary potential impact to air quality will be dust generation during trenching and excavation activities as well as vehicle movements. The amount of dust generated will depend on the quantity of material handled, silt and moisture content of the soil, weather conditions, and the area of exposed soils. The progressive nature of construction along the alignment will mean that potential dust emission impacts at a single location will generally be limited and temporary. With the implementation of the mitigation measures, a material or noticeable effect on air quality from dust emissions is unlikely.

In addition to dust, construction activities will also generate minor exhaust emissions from plant and equipment. These emissions are unlikely to have any material or noticeable effect on air quality.

During operation, some odour may, at times, be emitted from vent shafts. Vent shafts will operate for short durations when the air valves are activated. The shafts are designed to disperse emissions and minimise impacts on receivers. The vent shafts may cause temporary, localised odours. Vent shafts will be located in existing road verges or in the M12 road corridor, limiting the impact on residential receivers.

Table 6-17 Environmental mitigation measures — air quality

Mitigation measures
Use alternatives to fossil fuels where practical and cost-effective.
Track energy use as per SWEMS0015.28 Contractor NGER template.
Maintain equipment in good working order, comply with the clean air regulations of the *Protection of the Environment Operations Act 1997*, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.
Switch off vehicles/machinery when not in use.
Implement measures to prevent offsite dust impacts, for example: • water exposed areas (using non-potable water source where possible such as water from excavation pits) • cover exposed areas with tarpaulins or geotextile fabric • modify or cease work in windy conditions • modify site layout (place stockpiles away from sensitive receivers) • vegetate exposed areas using appropriate seeding.
Cover all transported waste.

6.2.8 Waste and hazardous materials

Existing environment

Historic and current land uses such as rural industries (eg farming), storage yards, service stations, waste management, and uncontrolled dumping of materials and filling with unknown materials, has occurred in the study area. This presents construction risks should the waste be encountered. It is expected that much of the excavated material would be classified as general solid waste under the NSW EPA (2014a) *Waste Classification Guidelines*. However, there remains a risk that contaminated and/or hazardous materials are encountered during construction.

Potential impacts

Construction activities of the proposal will generate the following waste streams:

- general construction and demolition waste including excavated road material
- green waste, including potential weed waste, from vegetation clearing
- excess spoil from trenching or other excavations and earthworks
- general waste from the workforce such as food packaging waste
- wastewater from temporary/portable amenities.

All waste streams will be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014a) during construction.

As discussed in section 6.2.3, about 0.47 ha of native vegetation will be cleared for the proposal. It is expected that a portion of this green waste material will be reused or mulched for rehabilitation. Some of the waste will likely classify as weed waste and will be appropriately managed to avoid propagation of weed species around the construction footprint.

Trench excavations are likely to generate excess spoil, as some new replacement fill would be brought in for backfilling to meet Sydney Water's specifications. The volume of spoil to be disposed depends on the quality of material and whether it can be used for backfilling. The DSI carried out for the proposal identified that spoil will likely be classified as general solid waste (non-putrescible). Some material may also meet the criteria for classification as excavated natural material. However, this will be dependent on additional sampling and analysis of excavated material during construction.

Construction by trenchless methods will involve the use of drilling fluids. Drilling fluids will be an environmentally friendly substance such as bentonite. The drilling fluids will be circulated through the trenchless section and then screened to remove drill cuttings. Any waste drill cuttings and fluids will be classified, treated and disposed of appropriately.

General workforce waste including food packaging will be generated in minor quantities and will be classified as putrescible or non-putrescible general solid waste.

Wastewater from temporary amenities will be classified as liquid waste.

Our corporate objectives include being a resource recovery business with an increasing portfolio of circular economy products and services. This includes minimising waste in line with the waste management hierarchy established by the *Waste Avoidance and Resource Recovery Act 2001* (refer to Figure 6-10) and encouraging our suppliers to minimise waste. Opportunities to reduce, recycle and reuse materials will be sought with the contractor and documented in the Waste and Resource Recovery Plan. Sydney Water maintains a Material Stockpile and Material Receiver Dashboard and Register. This provides a centralised location for Sydney Water and its contractors to share real-time information regarding excess or wanted bulk civil material to increase reuse and reduce the disposal of otherwise suitable material for use by projects.

The proposal will not generate waste during normal operation. Maintenance activities may require sections of the pressure mains to be dewatered. All dewatered wastewater would be captured in scour pits and transferred directly to tankers. The wastewater would be put back into the wastewater system at another location.

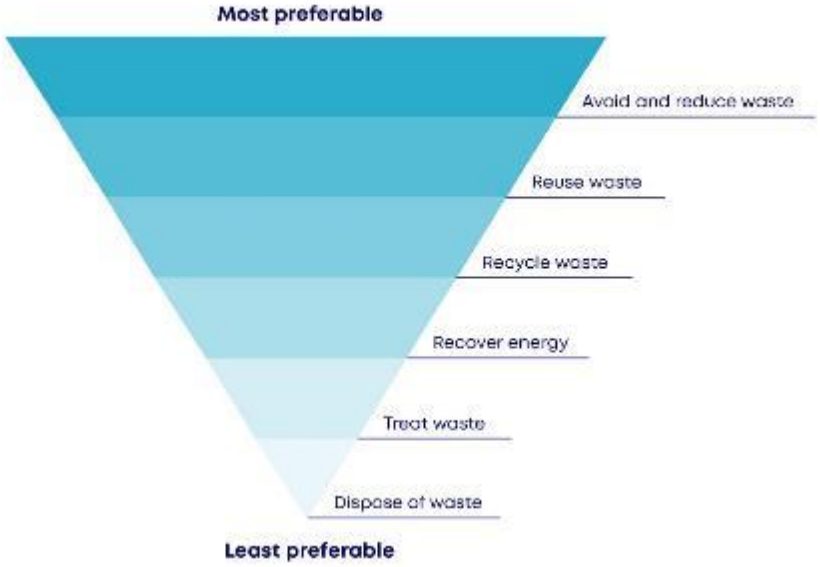

Figure 6-10 Waste hierarchy (Source: based on EPA, 2014b)

Table 6-18 Environmental mitigation measures — waste and hazardous materials

Mitigation measures
A Waste and Resource Recovery Plan (WRRP) must be prepared to appropriately manage and classify any materials including soils, construction/demolition wastes and associated stockpiles. The plan will be prepared by the contractor (or nominated environmental consultant) and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and Property Environmental Services.
Minimise stockpile size and ensure delineation between different stockpiled materials.
Manage waste in accordance with relevant legislation and maintain records to show compliance eg waste register, transport and disposal records. Record and submit SWEMS0015.27 Contractor Waste Report.
The contractor should use the Sydney Water Material Stockpile and Material Receiver Dashboard and Register to identify potential opportunities for spoil reuse between projects. The Material Receiver Dashboard can also be used to identify suitable waste facilities for material that cannot be reused. It can be accessed directly here, or via the SWDelivery Portal.
Provide adequate bins for general waste, hazardous waste and recyclable materials.
Minimise the generation of waste, sort waste streams to maximise reuse/recycling in accordance with the *Waste Avoidance and Resource Recovery Act 2001*.
Manage waste and excess spoil in accordance with the NSW EPA Resource Recovery Orders and Exemptions (if applicable) and / or Waste Classification Guidelines. Where materials are not suitable or cannot be reused onsite or offsite, recycle soils at a licensed soil recycling facility or dispose at an appropriately licenced landfill facility.

Mitigation measures
Prevent pollutants from escaping including covering skip bins.
Dispose excess vegetation (non-weed) that cannot be used for site stabilisation at an appropriate green waste disposal facility.
If fibro or other asbestos containing material is identified, restrict access and follow Sydney Water's Asbestos Management – Minor Works procedure, Document Number 746607 and SafeWork NSW requirements. Contact Sydney Water Project Manager (who will consult with Property Environmental Services propertyenvironmental@sydneywater.com.au).

6.2.9 Traffic and access

Existing environment

The existing environment surrounding the proposal includes numerous local and regional roads for which the local council is the roads authority, as well as a classified State road controlled by TfNSW. The identified roads in the vicinity of the proposal are listed in Table 6-19 and shown in Figure 6-11.

The existing traffic volumes on most local roads are generally expected to be low. However, on larger roads there may be greater traffic volumes, particularly while other projects are under construction in the area, such as the M12 Motorway and the AWRC.

There are no footpaths, bicycle routes or bus routes on the proposed alignment.

Table 6-19 Existing roads

Road	Type	Lanes	Speed limit (km/h)
Gurner Avenue	Local	Two	60
Devonshire Road	Regional	Two	70 (40 school zone)
Grant Close	Local	Two	50
Floribunda Road	Local	Two	50
Tavistock Road	Local	Two	50
Exeter Road	Local	Two	50
Pratten Street	Local	Two	50
Cross Street	Local	Two	60 (40 school zone)
Elizabeth Drive	State	Two	80 (reduced to 60 in built-up area)

Road	Type	Lanes	Speed limit (km/h)
Mamre Road	State	Two	80
Salisbury Avenue	Local	Two	50
Clifton Avenue	Local	Two	50

Figure 6-11 Road network

Potential impacts

As stated in section 3, it is expected that construction of the proposal will require a workforce of about 30 people at a given time across all construction areas. This will generate a proportionate volume of light vehicle movements for workforce transport.

Heavy vehicles will also be required for transport of material and equipment. The number of vehicles will depend on the site and activities being undertaken at any given time but will be distributed across the alignment. The following heavy vehicle movements during the day are anticipated:

- about 10 trucks per hour to/from compounds
- 2-4 trucks per hour to/from micro-tunnelling sites
- 5-10 trucks per hour from active trenching sites along the alignment.

Construction and worker vehicles will generally be parked within the construction footprint, adjacent land and/or street parking where appropriate. Traffic will be managed in accordance with the mitigation measures and is not expected to significantly affect road function or availability of parking.

The proposal will require trenching past several private property accesses. Access may be blocked for a short period of time. The contractor will notify all impacted property owners in advance of the work. Due to the progressive nature of the work and with advance notification, access impacts are expected to be minimal. The contractor will be required to access the M12 construction area to construct the northern sections of the proposal. There is potential for cumulative construction traffic impacts around the interface with the M12 construction work.

Based on the above, it is not expected that the traffic generated by the proposal will have a significant impact on the function, level of service or capacity of the existing road network. This is in part attributed to the progressive nature of construction and the proposal being carried out over a large area.

The proposal will involve construction on and around a number of roads. Trench excavation will occur along some local roads to install the dual pressure mains in the verge. A Traffic Management Plan will be prepared for road works to the requirements of the roads authority. Construction affecting the road surface will be staged and arranged to maintain traffic flow as far as reasonably practicable.

While there are no footpaths or bicycle paths along the roads where the alignment is proposed, there is potential for construction works to impact pedestrians and cyclists. Construction sites would be managed to ensure that pedestrians and cyclists can pass safely around construction sites.

During operation, there will be traffic movements associated with maintenance, such as operating air valves or scour pits. This would involve about 2-3 vehicles. Air valves and scour pits are generally located close in road verges to minimise impact to property access. Operational traffic and access impacts are expected to be minor.

Table 6-20 Environmental mitigation measures — traffic and access

Mitigation measures
Prepare a Traffic Management Plan (TMP) in consultation with the relevant traffic authority. Meet NSW Roads and Maritime Service's Traffic Control at Worksites Manual v5 requirements for TfNSW roads. The contractor will obtain a Road Occupancy Licence (ROL) from TfNSW, including if works are within 100 m of traffic signals when construction commences.
Minimise traffic impacts near residential properties, schools and businesses by consulting with them (eg no major materials deliveries at school drop off or pick up times etc.).
Manage sites to allow people to move safely past the works, including alternative pedestrian, bicycles, pram and wheelchair access.
Consult with the relevant traffic authority about managing impacts to pedestrian traffic, signposting, meters, parking, line-marking or if traffic control or pavement restoration is required.
Erect signs to inform road users of the proposed works and any temporary road closures.
Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway, public facility or business access unless necessary and only if appropriate notification has been provided.
The contractor must consult with the M12 constructor about traffic management in and around the M12 construction corridor.

6.2.10 Social and visual

Existing environment

The proposal is situated in the suburbs of Austral and Kemps Creek within the local government areas of Liverpool City Council and Penrith City Council.

The surrounding land uses in the area include Kemps Creek Nature Reserve, Kemps Creek riparian corridor and other smaller patches of remnant native vegetation, low density rural properties (primary production small lots) and small businesses.

The existing social values relevant to the proposal include surrounding social infrastructure such as:

- Kemps Creek Memorial Park
- Bill Anderson Reserve
- Kemps Creek Sporting and Bowling Club
- Kemps Creek Public School
- Wylde MTB and BMX mountain biking
- Sydney International Shooting Centre
- Sporting Target Pistol Club
- Christadelphian Heritage College Sydney.

A number of areas have recreational or aesthetic value to the local community including Kemps Creek Nature Reserve and other recreation or conservation areas.

As the proposal will connect to the AWRC and introduce a tall structure at the site (barometric loop), Conditions of Approval (CoA) for the project (SSI-8609189) with regards to visual impact and landscape character may apply.

Potential impacts

Potential social and visual impacts from the proposal will generally be limited to construction activities in or around residential and environmental areas. Visual impacts will include the construction works as well as the presence of the workforce, vehicles, machinery and equipment. Construction will occur progressively, with disturbed areas backfilled and rehabilitated as the works progress. Potential visual impacts will therefore be temporary and negligible in the longer term.

The majority of the proposal will be located below ground, with some valve or inspection shaft covers visible at the surface. The potential visual impact of these components is considered to be negligible as they will not be prominent in the landscape or modify the existing visual environment to an extent that could change the character of the location. While some vegetation clearing will be required to construct the proposal, the design has been developed to minimise clearing as far as practicable. A minor visual impact may be experienced due to vegetation removal in some locations.

The barometric loop will be a prominent visual element of the proposal. This will comprise a series of vertical pipes, standing about 20 m high, with a diameter of 750 mm. The barometric loop will be located within the AWRC site adjacent to the inlet works (subject to the design of the AWRC). The visual impact assessment for the AWRC Environmental Impact Statement (Aurecon-Arup, 2021) noted the AWRC would have an overall high-moderate impact on the rural character of surrounding landscape zones. It also identified a high-moderate visual impact given the AWRC will be prominent from various surrounding viewpoints, particularly those closest to the site. The barometric loop will be one of the tallest structures within the AWRC site (subject to design). However, it is a minor additional infrastructure component in the context of the whole AWRC site and will integrate with the built form of the AWRC, among other tall structures within the site. There are limited sensitive receivers in the vicinity of the AWRC site, with the nearest residential properties about 750 m east. The AWRC site will be architecturally designed and landscaped to minimise the visual impact and industrial character of the site, in line with a comprehensive Urban Design and Landscape Plan prepared for the AWRC project. The barometric loop will be incorporated into this plan and the overall design of the AWRC. An indicative design of the barometric loop and inlet works is shown on Figure 6-12.

About eight vent shafts would be located along the alignment, six in road verges and two in private property (M12 corridor). The height of the vent shafts would be decided in detailed design. The shafts would be unpainted stainless steel. The shafts are common throughout the wastewater network and are not expected to have a substantial visual impact.

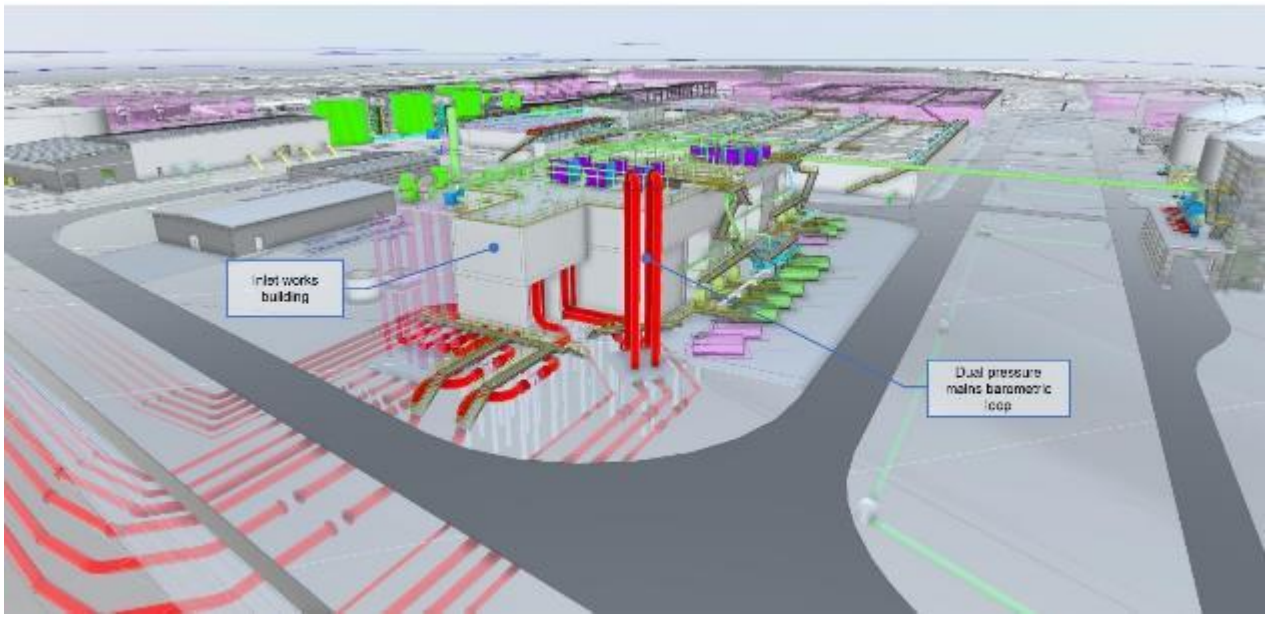

Figure 6-12 Indicative design of barometric loop and inlet works at the AWRC

A review of the CoA for the AWRC project (SSI-8609189) relevant to visual amenity and landscape character was carried out. A summary of the relevant CoA and the relationship with the proposal is provided in Table 6-21.

Table 6-21 AWRC conditions relevant to visual amenity and landscape character

Condition	Relationship with proposal
E61 The place making, design and landscape outcomes for the AWRC site of Stage 1 of the CSSI must be: (a) informed by and be consistent with the Upper South Creek Advanced Water Recycling Centre Urban Design Report, dated July 2021 (provided as Attachment A to RFI 1, dated 1 June 2022) and identified in the documents listed in Condition A1, including but not limited to the objectives and design principles, requirements, and opportunities; and (b) prepared in consultation with the community (including the affected landowners and businesses or a representative of the businesses), LALCs, RAPs and relevant council(s).	The proposal complies with this condition. The section of the proposal within the AWRC site will be designed and delivered by the AWRC contractor. This ensures that the barometric loop is considered during design decisions of the AWRC. The proposal is consistent with the Urban Design Report, such that it will not materially change objectives and design principles, requirements, and opportunities. The barometric loop will potentially be a prominent feature (with regards to height) within the AWRC but will be integrated into the design with consideration of potential visual screening or architectural elements to minimise the industrial aesthetic.
E63 An Urban Design and Landscape Plan (UDLP) must be prepared for the AWRC site to	The proposal complies with this condition.

Condition	Relationship with proposal
document and illustrate the permanent built works and landscape design of Stage 1 of the CSSI and how these works are to be maintained. The UDLP must be: (a) prepared by a suitably qualified and experienced person(s) in place, urban and landscape design and bush regeneration; (b) prepared in consultation with relevant council(s) and the community, including affected landowners and businesses; (c) submitted to the Planning Secretary for approval no later than one month before the construction of permanent built surface works and/or landscaping in the area to which the UDLP applies; and (d) implemented during construction and operation of Stage 1 of the CSSI.	The barometric loop will be a permanent built structure within the AWRC site, and as such will be incorporated into the AWRC UDLP in accordance with this condition.
E65 The UDLP must include descriptions and visualisations (as appropriate) of: (a) the design of the permanent built elements for the AWRC site including their form, materials and detail; (b) place, design and landscape outcomes for the proposed green space area, consistent with the Upper South Creek Advanced Water Recycling Centre Urban Design Report, dated July 2021 (provided as Attachment A to RFI 1, dated 1 June 2022) and identified in the documents listed in Condition A1; (c) the design of the project landform and landscaping elements; (d) the type and design of public and open space; (e) details of strategies to rehabilitate, regenerate or revegetate disturbed areas with local native species; and (f) management and routine maintenance standards and regimes for design elements and landscaping Work (including adequate	The proposal complies with this condition. The barometric loop, being a permanent built element, will be described and visually represented within the AWRC UDLP. Additionally, the barometric loop will not be constructed until the UDLP has been approved by the Planning Secretary, unless otherwise agreed with the Planning Secretary.

Condition	Relationship with proposal
watering of plants following planting depending on forecast weather conditions and weed management) to ensure the success of the design and landscape outcomes. Unless otherwise agreed with the Planning Secretary, construction of permanent built work or landscaping that are the subject of the UDLP must not be commenced (in the area to which the UDLP applies) until the UDLP has been approved by the Planning Secretary.	

Potential social amenity impacts including noise, vibration, air emissions, traffic and access have been assessed separately in section 6.2.6, section 6.2.7 and section 6.2.9 respectively. The proposed alignment follows local roads, the M12 corridor and private properties, and is unlikely to impact recreational activities, community events or social amenity generally.

Table 6-22 Environmental mitigation measures — social and visual

Mitigation measures
Undertake works in accordance with Sydney Water Communications policies and requirements including: • notify impacted residents and businesses • erect signs to inform the public on nature of work • personnel treat community enquiries appropriately.
Work sites will be restored to pre-existing condition or better.
Minimise visual impacts (eg retain existing vegetation where possible).
Direct artificial light away from sensitive receivers where possible (ie residents, fauna or roadways).
Maintain work areas in a clean and tidy condition.
The design and construction of the barometric loop must be in accordance with the AWRC conditions of approval. The barometric loop must be included in the UDLP.

6.2.11 Aviation and airport operations

Existing environment

The northern extent of the proposal is located about 3 km from the Western Sydney International (Nancy-Bird Walton) Airport (Airport) and under the future north-east flight path.

The proposal is located on land to which the Obstacle Limitation Surface (OLS) of the Airport applies. The OLS specifies protected airspace to ensure a safe operating environment for aircraft and sets height limits of objects before penetrating the protected airspace.

Potential impacts

During construction of the proposal cranes may be used, particularly during installation of the barometric loop. However, construction of the proposal is planned to be complete before the Airport is operational and therefore not impact the Airport or its flight paths. Additionally, during operation the dual pressure mains do not present a risk to airport operations as they will be located below ground.

The proposed barometric loop at the AWRC site will stand about 20 m high. The OLS height relative to ground level at the location of the barometric loop is about 100 m. Therefore, the barometric loop will not penetrate the OLS and will not impact Airport operations or pose a risk to aviation safety.

No mitigation measures are considered necessary for the proposal with regards to potential impacts to Airport operations and aviation safety.

6.2.12 Cumulative and future trends

Existing environment

It is expected that ongoing construction activities will occur in the region, particularly associated with the broader strategic release of land within the South West Growth Area and development of the Western Sydney Aerotropolis.

A number of projects have been identified in the vicinity of the proposal, at varying stages of development. Table 6-23 provides a summary of the nearby projects and how they might interact with the proposal.

Table 6-23 Nearby projects to the proposal

Proponent / Project	Stage	Distance	Details and proposal interaction
M12 Motorway	Approved – in construction	Adjacent	Construction began in August 2022 at the western and central sections of the project. The proposal is located adjacent to the central section, north of Elizabeth Drive. Construction of the proposal will coincide with construction of the M12. The proposal will

Proponent / Project	Stage	Distance	Details and proposal interaction
			also cross under the M12 at an location agreed with Transport for NSW.
Elizabeth Drive upgrade	Planning/assessment – REF in preparation	Adjacent	Construction is anticipated to start in 2026. The proposal will be constructed and operational before this time. No cumulative impacts are anticipated with this project.
Mamre Road upgrade	Detailed design – REF approved	4.5 km north	Construction timing of this project is not currently known. However, the proposal is unlikely to substantially contribute to cumulative impacts with this project due to the distance and the proposal will not require the use of Mamre Road.
Austral Leppington wastewater project[1]	Approved – in construction	Adjacent	Construction of phase 1 of this project has commenced which involves delivery of wastewater infrastructure to service up to 1,700 lots. Phase 1 is expected to be completed in 2024. The proposal will connect to the wastewater pumping station (SP1211) being delivered by the Austral Leppington project.
Upper South Creek Advanced Water Recycling Centre – access road[1]	Approved – in construction	Adjacent	Construction of the access road is almost complete. It is expected that construction will be complete before the start of construction of the pressure mains.
Upper South Creek Advanced Water Recycling Centre[1]	Approved – in construction	Adjacent	Construction of the AWRC is planned to start in late 2023, with commissioning anticipated to occur in 2025. Construction of the AWRC and the proposal are expected to occur simultaneously.
Redevelopment and expansion of Al-Faisal College, Liverpool	Response to Submissions	1 km south east	Construction timing of this project is not currently known. However, it is unlikely that construction will coincide with the proposal. In any case, potential cumulative impacts are expected to be minimal as once the southern HDD section of the proposal is completed, the remaining works will be further north of this project.

Proponent / Project	Stage	Distance	Details and proposal interaction
Brandown Resource Recovery Facility	Prepare EIS	700 m east	Construction timing of this project is not currently known. However, it is noted that this project relates to an existing operational facility, which is seeking to increase resource recovery and operational capacity. The proposal is separated from this project by bushland of Kemps Creek Nature Reserve.
Clifton Avenue Resource Recovery Facility	SEARs	Adjacent	Construction timing of this project is not currently known. Given this project is in its early stages (ie requesting the Secretary's Environmental Assessment Requirements), it is unlikely that the proposal will coincide with this project.

1. Sydney Water project

It should also be noted that, in general, the broader region of the proposal will be subject to a range of major developments such as the Western Sydney Airport and Sydney Metro West. As such, it will be necessary to continue to monitor for and identify any potential projects in the vicinity of the proposal and adapt as necessary if it becomes apparent that cumulative environmental impacts are occurring.

Potential impacts

Cumulative impacts

The main potential cumulative impacts of the proposal in combination with the above projects is for additional biodiversity, air quality, noise and vibration, and traffic and access impacts during construction.

Potential air quality impacts from the proposal are expected to be limited, localised and temporary, particularly with the implementation of the environmental mitigation measures identified in section 6.2. Accordingly, the potential for cumulative air quality impacts to occur with other projects is low.

Several other projects are either unlikely to be in construction at the same time as the proposal or are a sufficient distance away that cumulative noise and vibration impacts will not occur. The proposal has the potential to result in cumulative noise impacts with some projects, including the M12 Motorway and the Austral Leppington wastewater project. Short-term cumulative noise impacts from the M12 Motorway construction and the proposal trenching activities may occur at some sensitive receivers in the area. However, at a given time, it is likely that the M12 construction activities will be the dominant noise source at receivers in the area due to the significant construction works associated with the M12 in comparison to the proposal, as well as the progressive nature of trenching activities of the proposal.

Similarly, at the southern extent of the proposal the dominant noise source experienced by sensitive receivers will be from the Austral Leppington project, and additional cumulative noise from the proposal will be minimal due to the distance of most receivers. Overall, the potential for cumulative noise impacts is dependent on the specific activities carried out simultaneously in the vicinity of sensitive receivers. The potential for cumulative noise impacts from the proposal is generally considered to be low due to the lower intensity of noise-generating activities and the works being short-term in duration at any one receiver by moving progressively along the alignment. However, Sydney Water and the contractor will consult with the proponents (including separate Sydney Water delivery teams) and their contractors to minimise the potential for cumulative impacts where practicable through construction planning.

The proposal will generate a relatively small volume of traffic that will be managed in accordance with the environmental mitigation measures that are proposed in section 6.2.9, including implementation of a traffic management plan. Additionally, potential impacts to property access will be localised and temporary, which is unlikely to be compounded by other projects. Accordingly, the potential for significant cumulative traffic and access impacts is low.

Native vegetation impacts have been avoided where practicable through design development and interfacing with other projects' construction activities. For example, the design of the proposal follows the alignment of the M12 and the AWRC access road to reduce the cumulative clearing of native vegetation by taking advantage of disturbance that will occur or has already occurred. The proposal will remove 0.47 ha of native vegetation. Most of this clearing is beside SP1211 and there is potential for cumulative biodiversity impact with Sydney Water's Austral Leppington wastewater project. We will offset impacts for both projects in accordance with Sydney Water's Biodiversity Guideline to minimise cumulative impacts. The northern part of the proposal is located in the M12 construction corridor, in already cleared areas. This reduces potential cumulative impacts with other projects.

Sydney Water will also work with TfNSW and its construction contractor for the M12 to coordinate access and construction works for the section of the proposal adjacent to and within the M12 construction corridor. The AWRC site may also be used for construction compound activities which will be coordinated between Sydney Water project teams.

Sydney Water also recognises the large volume of construction activity that has occurred and is planned to occur in the near future within this region of Western Sydney. This prolonged exposure to disruptive activities can lead to fatigue, increased stress and other negative effects. Sydney Water will consult with potentially affected receivers and implement measures to minimise potential cumulative impacts where it is appropriate and practicable to do so.

Future trends

The proposal has considered future trends such as climate change throughout the design process. It is noted that construction and operation of the proposal will result in the consumption of fossil fuels, but this would be reduced as far as practicable. Optimisation of the design included minimising the length of the dual pressure mains between the two end points where practicable to reduce the quantity of materials required. This, along with positioning the alignment to reduce high

points as much as possible, also has the benefit of reducing the pump effort required to transfer wastewater to the AWRC, thereby decreasing energy consumption.

With climate change comes new challenges, such as increased frequency and intensity of natural events like storms, floods, bushfires, and extreme heat. The proposal will be below ground, protected from natural events. Ingress of water into the pipelines during storms and flooding is unlikely as there will be limited surface openings. The proposal will include a number of surface inspection shafts along the alignment, typically about 400 m apart.

Table 6-24 Environmental mitigation measures — cumulative and future trends

Mitigation measures
Monitor cumulative impacts and, as far as practicable, consult and liaise with the relevant parties of nearby projects in construction where potential cumulative impacts have been identified or are likely.

6.2.13 General Environmental Management

Mitigation measures
The contractor must obtain a Scheduled Development Work Licence prior to construction of the proposal from the EPA. This REF must be submitted to the EPA as part of the application.

Prepare a Construction Environmental Management Plan (CEMP) addressing the requirements of this environmental assessment. The CEMP should identify licence, approval and notification requirements. Prior to the start of work, all project staff and contractors will be inducted in the CEMP.

The CEMP must be readily available on site and include a site plan which shows:

- go/ no go areas and boundaries of the work area
- location of environmental controls (including erosion and sediment controls, any fences or other measures to protect vegetation or fauna, spill kits, stockpile areas)
- location and full extent of any vegetation disturbance.

Sydney Water's Project Manager (after consultation with the Project's environment and community representatives and affected landowners) can approve temporary ancillary construction facilities (such as compounds and access tracks), without additional environmental assessment or approval if the facilities meet the following principles:

- limit proximity to sensitive receivers
- no disruption to property access
- no impact to known items of non-Aboriginal and Aboriginal heritage
- outside high-risk areas for Aboriginal heritage
- use existing cleared areas and existing access tracks
- no impacts to remnant native vegetation or key habitat features

Mitigation measures

- no disturbance to waterways
- potential environmental impacts can be managed using the mitigation measures in this REF
- no disturbance of contaminated land or acid sulfate soils
- will be rehabilitated at the end of construction.

The contractor must demonstrate in writing how the proposed ancillary facilities meet these principles. Any facilities that do not meet these principles will require additional environmental impact assessment.

The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.

Should the proposal change from the EIA, no further environmental assessment is required provided the change:

- remains within the study area for the REF and has no net additional environmental impact; or
- is outside the study area for the REF but:
    - reduces impacts to biodiversity, heritage or human amenity; or
    - avoids engineering (for example, geological, topographical) constraints; and
    - after consultation with any potentially affected landowners and relevant agencies.

Prepare an Incident Management Plan (IMP) outlining actions and responsibilities during:

- predicted/ onset of heavy rain during works
- spills
- unexpected finds (eg heritage and contamination)
- other potential incidents relevant to the scope of works.

To ensure compliance with legislative requirements for incident notification (eg *Protection of the Environment Operations Act 1997*), Sydney Water's employees and contractors will follow SWEMS0009 Responding to incidents with an environmental impact procedure.

All site personnel should be inducted into the IMP.

Works within the M12 construction boundary and/or within the area subject to the M12 – Central Environment Protection Licence (EPL no. 21596) must not affect the ability of Transport for NSW and its contractors to comply with conditions of the EPL.

Where there is doubt, the contractor is to contact the Sydney Water Project Manager and Environment Representative for further advice. If an impact occurs to any control or monitoring instrument associated with EPL no. 21596, Transport for NSW and its principal construction contractor (or relevant site contact) must be notified. The EPA must be notified immediately (or as soon as it is safe to do so) on 131 555 if any such impact has or will cause material harm to the environment.

7 Conclusion

Sydney Water has prepared this REF to assess the potential environmental impacts of the Kemps Creek dual pressure mains proposal. The proposal is required to support planned growth in Western Sydney by providing a wastewater connection for the catchment area.

During construction, the main potential environmental impacts of the proposal are typical construction impacts such as erosion and sedimentation, vegetation removal, noise and dust emissions, Aboriginal heritage and traffic impacts. There is potential for the proposal to result in the spread of the soil pathogen *Phytophthora*. During operation, the potential impacts are generally minor. It is considered that, given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this REF, the proposed work is unlikely to have a significant impact on the environment and an environmental impact statement is not required under Division 5.1 of the EP&A Act.

The proposal has been considered in accordance with the principles of ESD. The proposal will result in positive long-term environmental improvements. The proposal will not result in the degradation of the quality of the environment and will not pose a risk to the safety of the environment.

8 References

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Appendices

Appendix A – Section 171 checklist

Section 171 checklist	REF finding
Any environmental impact on a community	There may be short-term impacts on the community from emissions of noise and dust as well as potential traffic and access impacts during construction. There will be environmental improvements by providing a reliable wastewater service to the local community.
Any transformation of a locality	The proposal will not result in the transformation of a locality. The dual pressure mains will be below ground during operation and therefore will not be visible. The main above ground structure is a barometric loop at the AWRC site which will be in keeping with the industrial nature of that facility.
Any environmental impact on the ecosystems of the locality	The proposal will have impacts on flora and fauna. As discussed in section 6.2.3, the potential impacts were assessed, and it was found that significant impacts are not likely.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposal will not result in a reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality.
Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	The proposal will result in harm to an Aboriginal heritage site. The significance of harm was assessed to be moderate. Construction will operate under the conditions of an AHIP. The remainder of the proposed work will not have any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations.
Any impact on the habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)	The proposal will impact flora and fauna. As discussed in section 6.2.3, the potential impacts were assessed, and it was found that significant impacts are not likely.
Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air	The proposal will impact flora and fauna. As discussed in section 6.2.3, the potential impacts were assessed, and it was found that the proposal will not endanger any species.

Section 171 checklist	REF finding
Any long-term effects on the environment	The proposal will have relatively limited effects on the environment. Impacts to vegetation on non-certified land (except for ENV) will be offset to minimise any potential long-term biodiversity impact. The proposal will have a long-term benefit by providing a reliable and modern wastewater service for the area.
Any degradation of the quality of the environment	The proposal is not expected to result in any degradation of the quality of the environment. Restoration activities and vegetation offsets for clearing on non-certified land (except for ENV) will be used to minimise the impact on the environment.
Any risk to the safety of the environment	The proposed work will not increase risk to the safety of the environment.
Any reduction in the range of beneficial uses of the environment	The proposal will not have any reduction in the range of beneficial uses of the environment.
Any pollution of the environment	During construction, the proposal has the potential to cause minor localised, noise and air pollution. These impacts would be of short duration, and would be mitigated through the implementation of the mitigation measures outlined in section 6. During operation, the proposal will operate in accordance with the conditions of the future Upper South Creek System EPL.
Any environmental problems associated with the disposal of waste	The disposal of wastes will be conducted in accordance with the environmental mitigation measures, and no environmental problems associated with the disposal of waste are expected.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The proposal will not increase demand on resources, that are, or are likely to become, in short supply.
Any cumulative environmental effect with other existing or likely future activities	The proposal has the potential to have cumulative impacts with other nearby construction activities. Proponents of other construction activities will be consulted to minimise potential cumulative impacts through construction planning.

Section 171 checklist	REF finding
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	The proposal is not coastal and will not have any impact on coastal processes or hazards. Coastal processes and coastal hazards will not have any impact on the proposed activity.
Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the EP&A Act, Division 3.1	The proposed works are to service growth and the applicable strategic planning statements or plans have been considered in section 5.1.
Any other relevant environmental factors.	The proposed work has been assessed against the factors listed above, and there are no other relevant environmental factors to consider.

Appendix B – Consideration of TISEPP consultation

TISEPP section	Yes	No
Section 2.10, council related infrastructure or services – consultation with council		
Will the work:		
Potentially have a substantial impact on stormwater management services provided by council?		X
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		X
Connect to, and have a substantial impact on, the capacity of a council owned sewerage system?		X
Connect to, and use a substantial volume of water from a council owned water supply system?		X
Require temporary structures on, or enclose, a public space under council's control that will disrupt pedestrian or vehicular traffic that is not minor or inconsequential?		X
Excavate a road, or a footpath adjacent to a road, for which the council is the roads authority, that is not minor or inconsequential?	X	
Section 2.11, local heritage – consultation with council		
Is the work likely to affect the heritage significance of a local heritage item, or of a heritage conservation area (not also a State heritage item) more than a minor or inconsequential amount?		X
Section 2.12, flood liable land – consultation with council		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and will works alter flood patterns other than to a minor extent?		X
Section 2.13, flood liable land – consultation with State Emergency Services		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and undertaken under a relevant provision*, but not the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? * (e) Div.14 (Public admin buildings), (g) Div.16 (Research/ monitoring stations), (i) Div.20 (Stormwater systems)?		X
Section 2.14, development with impacts on certain land within the coastal zone– council consultation		
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		X
Section 2.15, consultation with public authorities other than councils		
Will the proposal be on land adjacent to land reserved under the *National Parks and Wildlife Act 1974* or land acquired under Part 11 of that Act*? If so, consult with DPE (NPWS).*	X	
Will the proposal be on land in Zone C1 National Parks and Nature Reserves or on a land use zone that is equivalent to that zone? *If so, consult with DPE (NPWS).*		X
Will the proposal include a fixed or floating structure in or over navigable waters? *If so, consult TfNSW.*		X
Will the proposal be on land in a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017*? *If so, consult with Subsidence Advisory NSW.*		X
Will the proposal be on land in a Western City operational area specified in *the Western Parkland City Authority Act 2018,* Schedule 2 and have a capital investment value of $30 million or more? *If so, consult the Western Parkland City Authority*.	X	
Will the proposal clear native vegetation on land that is not subject land (ie non-certified land)? *If so, notify DPE at least 21 days prior to work commencing. (Requirement under s3.24 Chapter 3 Sydney Region Growth Centers - of the SEPP (Precincts – Central River City) 2021).*	X	

Appendix C – Biodiversity Assessment Report

Appendix D – Aboriginal Cultural Heritage Assessment Report

Aboriginal heritage information must not be made publicly available or be published in any form or by any means by Sydney Water or our contractors / joint ventures, unless written approval has been provided to Sydney Water from DPE's AHIMS Registrar .

For publicly displayed REFs, all Aboriginal heritage information that identifies individual sites must be removed.

Appendix E – Construction Noise and Vibration Impact Assessment

SWXXX XX/XX Insert a publication number. (*required if publicly displayed/published)*