Kurri Kurri Lateral Pipeline Project

ENVIRONMENTAL IMPACT STATEMENT

MARCH 2022

Environmental & Social Consultants

KURRI KURRI LATERAL PIPELINE PROJECT

Environmental Impact Statement

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
APA Group

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Environmental & Social Consultants

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Executive Summary

Executive Summary

Snowy Hydro Limited (Snowy Hydro) is developing a gas-fired peaking power station, referred to as the Hunter Power Project (HPP), at the site of the former Hydro Australia Pty Ltd (Hydro) aluminium smelter at Kurri Kurri. The HPP will provide up to 750 megawatts (MW) of 'on-demand' electricity to supplement Snowy Hydro's generation portfolio with dispatchable capacity when the needs of electricity consumers are highest.

The HPP was approved, subject to conditions, by the Secretary of the Department of Planning, Industry and Environment (DPIE) on 17 December 2021 on the basis that:

> *The Department considers that the development of a gas-fired power station in the Hunter region would contribute to energy reliability and security in the NEM as it transitions away from coal-fired power station power generation over the next 10-15 years. The project is recognised as a committed project in the recent 2021 Electricity Statement of Opportunities as it would provide firming capacity to supplement the increasing supply of renewable energy and contribute to overall system reliability in the NEM* (DPIE, 2021c).

APA Transmission Pty Limited (ABN 84 603 054 404), a wholly owned subsidiary of APA Group (APA), has been engaged by Snowy Hydro to develop a gas supply solution for the HPP. Accordingly, APA has proposed the Kurri Kurri Lateral Pipeline (KKLP) Project (the Project) to supply gas for the Hunter Power Project from the existing Sydney to Newcastle Pipeline (formally referred to as the Jemena Gas Networks (JGN) Northern Trunk).

The Project

<u>Key Components of the Project</u>

The Project comprises the following primary components:

- A buried, steel, medium diameter (outer diameter of 355.6 mm), medium pressure (up to 6.9 megapascal (MPag)) transmission pipeline of approximately 20.1 km in length to provide a gas supply from the existing Sydney to Newcastle Pipeline, via offtake and delivery facilities, to the Hunter Power Project site.
- A compressor station at the termination of the transmission pipeline to boost gas pressure prior to transfer to a storage pipeline.
- A buried, steel, medium diameter (outer diameter of 355.6 mm), high pressure (up to 15.3 MPag) interconnect pipeline of approximately 1.3 km in total length, providing an interface between the compressor station, storage pipeline and delivery station.
- A buried, steel, large diameter (outer diameter of 1067mm), high pressure (up to 15.3 MPag) storage pipeline of approximately 24 km in total length downstream of the compressor station with approximately 70 terajoules (TJ) of useable gas storage ready to supply the Hunter Power Project.
- A delivery station to receive gas from the storage pipeline and control temperature, pressure and flow rate prior to delivery of gas to the Hunter Power Project.

A compressor station and storage pipeline are required as part of the Project as the Sydney to Newcastle Pipeline does not provide sufficient gas volumes or pressure to meet the supply requirements of the HPP. As such, a direct pipeline connection between the Sydney to Newcastle Pipeline and the Hunter Power Project is not a viable solution for gas supply to the Hunter Power Project.

The Project has also been designed to allow gas flow from the storage pipeline back into the Sydney to Newcastle Pipeline, which may ameliorate pipeline capacity constraints in the region by providing a significant gas source near the northern termination of the Sydney to Newcastle Pipeline.

APA will not own gas transferred between the Sydney to Newcastle Pipeline and the HPP but will own the infrastructure proposed for the Project that enables this transfer.

The Project will be designed, constructed, commissioned and operated in accordance with the requirements of *AS 2885 Pipelines – Gas and liquid petroleum*. The transmission pipeline will also be designed, constructed, commissioned and operated in accordance with the requirements of *ASME B31.12-ASME Design code for Hydrogen Piping and Pipelines*, in order to maintain readiness for potential use of hydrogen in the east coast gas network.

Environmental management for the Project will be in accordance with the Australian Pipelines and Gas Association *Code of Environmental Practice* (2017), which provides pipeline industry tested environmental standards for planning, design, construction, operation and decommissioning. The Code of Practice is recognised nationally by the various State and Territory Governments as a guide to environment and heritage management of gas pipeline projects.

<u>Location and Alignment</u>

The Project is situated in the Lower Hunter region of New South Wales (NSW), traversing the three Local Government Areas (LGAs) of Cessnock, Maitland and Newcastle.

The proposed alignment for the transmission pipeline will commence near Black Hill, approximately 15 km north-west of Newcastle and terminate at the Hunter Power Project, approximately 2 km north of Kurri Kurri. The storage pipeline is proposed to be located to the north of the Hunter Power Project within buffer zone land of the former Kurri Kurri aluminium smelter. The compressor station and delivery station would be located within the Hunter Power Project site boundary.

The transmission pipeline will connect to the Sydney to Newcastle Pipeline through co-located offtake and delivery facilities, referred to as the JGN offtake facility and JGN delivery facility, adjacent to Lenaghans Drive. The offtake facility will operate when gas is flowing from the storage pipeline back into the Sydney to Newcastle Pipeline via the transmission pipeline. The delivery facility will operate when gas is flowing from the Sydney to Newcastle Pipeline into the transmission pipeline. The design, approvals, construction and operation of the JGN delivery facility and the approximately 600 m of pipeline connection between this facility and the Sydney to Newcastle Pipeline will be the responsibility of Jemena. The Project and its regional context are shown on **Figure ES1.1**.

A schematic outlining the relationship of Project components is provided in **Figure ES1.2**.

Construction of the Project is anticipated to commence Q4 2022, with commissioning and operations indicatively scheduled for Q4 2023.

Timing and sequencing of construction and operations

The construction sequence for the pipeline components of the Project will use standard construction techniques including clearing and grading, pipe stringing, pipe bending, welding of pipe joints, trench excavation, lowering pipe into the trench, backfilling, and rehabilitation of the Right of Way.

The transmission, interconnect and storage pipelines will be buried for their entire length other than at surface facility locations. At locations where the pipelines are potentially exposed to increased erosional forces, such as watercourse crossings and floodplains, additional protection will be provided, typically by an increased depth of cover.

Horizontal Directional Drilling (HDD) will be used at six locations for the crossing of selected watercourses (Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek, Black Waterholes Creek), John Renshaw Drive and other features of high sensitivity, so that surface disturbance is avoided. Horizontal boring beneath sealed roads, the South Maitland Railway and Hunter Water Corporation trunk mains is proposed to be undertaken at 10 locations.

The transmission pipeline and storage pipeline will be pressure tested to confirm compliance with AS2885 prior to commissioning.

Construction of the offtake facility, compressor station and delivery station will be undertaken by specialist crews across several stages of works. These stages broadly comprise site set up, earthworks and civil construction, mechanical, electrical and instrumentation works and testing and commissioning.

A limited range of activities will be required to operate the Project.

The Project is expected to have an operational life of 30 years. Decommissioning of the Project will occur at the end of its useful life. A decommissioning plan for the Project and associated infrastructure will be prepared in advance of decommissioning in consultation with the relevant regulatory authorities and landholders.

Construction of the Project would require an estimated of 103 ha of land. During operations the Project would require an estimated 2 ha of land.

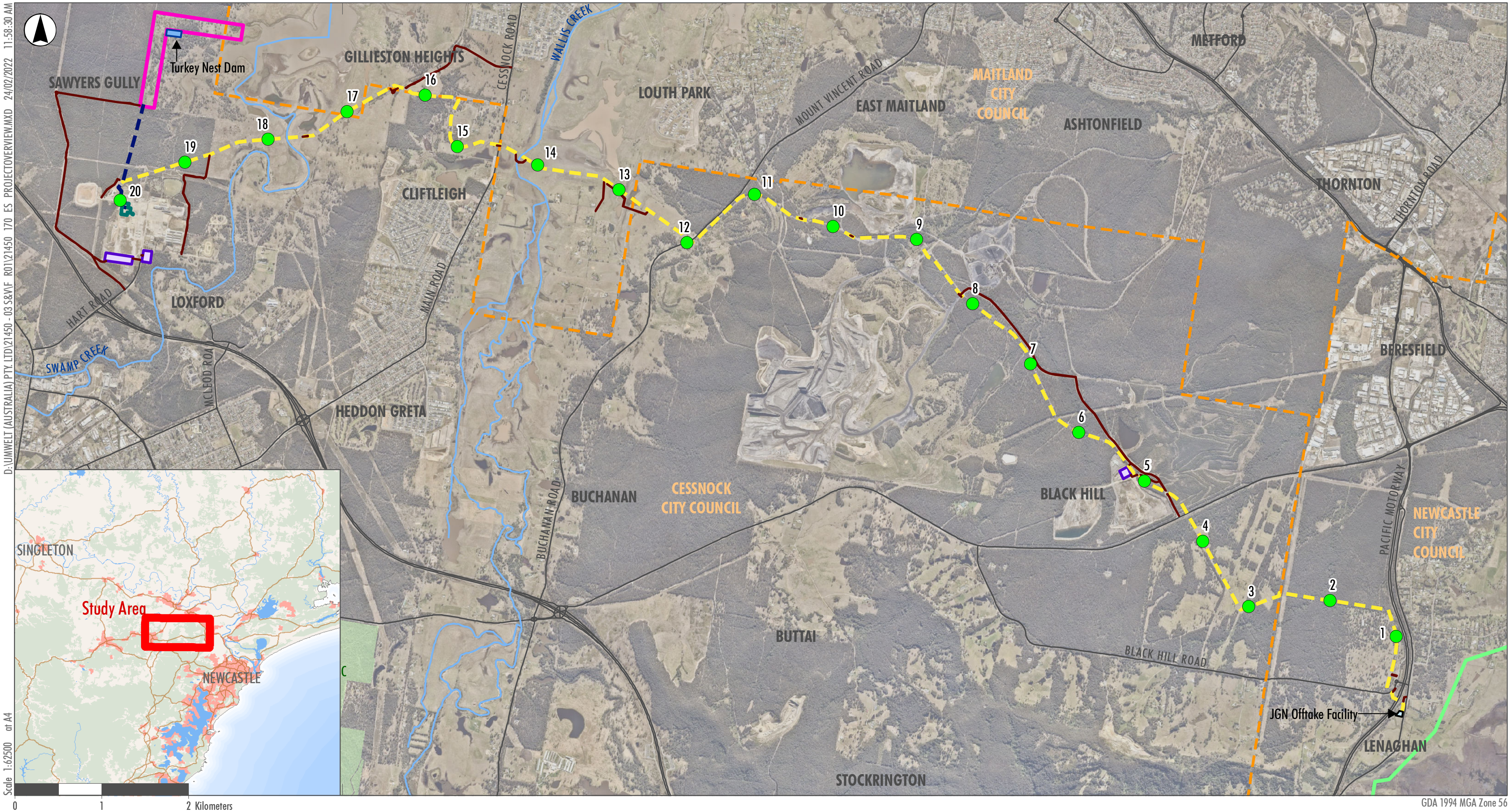
Economics and Employment

The estimated capital investment value for the Project is approximately $264 million. The Project will generate employment creating a peak of up to around 398 jobs during the construction phase with up to 5 full time equivalent (FTE) jobs during the operational phase.

The Proponent

APA is a leading Australian energy infrastructure business, with around 15,000 km of natural gas pipelines connecting sources of supply and markets across mainland Australia. APA operate and maintain networks connecting approximately 1.4 million Australian homes and businesses to the benefits of natural gas and own or have interests in gas storage facilities, gas-fired power stations and renewable energy generation. APA is one of Australia's largest owners and operators of renewable power generation assets, with wind and solar projects across Western Australia, South Australia and Queensland. In total, APA own or manage and operate around $21 billion of energy assets and deliver half the nation's natural gas usage.

APA is a business that is committed to delivering connected and sustainable energy solutions that are safe, reliable, innovative and cost-effective so that all of its stakeholders are better off as APA works together with its customers to create a better energy future for Australia.



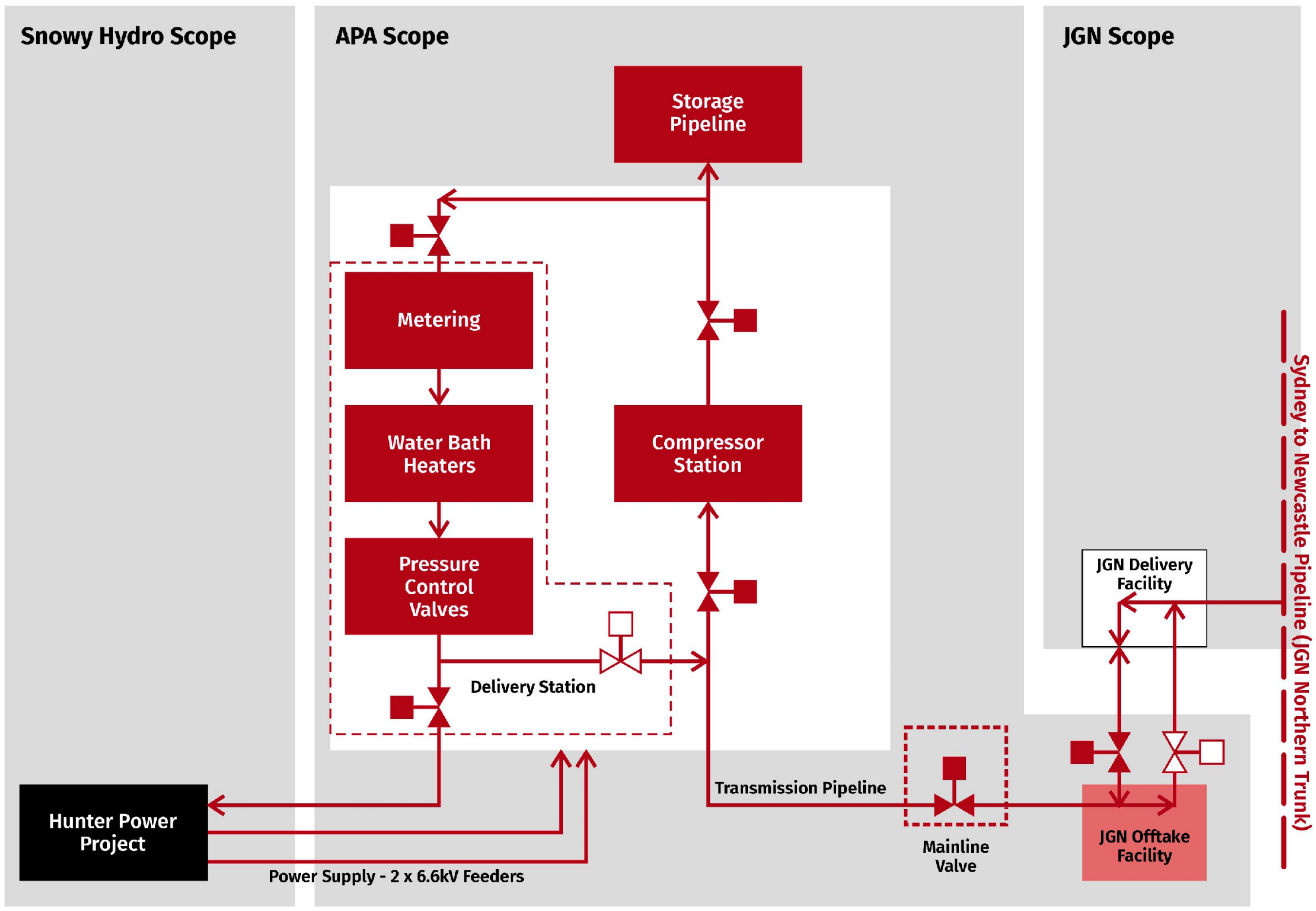
Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Local Government Area Boundary
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- Access Tracks
- Roads
- Watercourses

FIGURE ES1.1

Project Location

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Note: Not to Scale

FIGURE ES1.2

Relationship of Project Components

Project Objectives

The objectives of the Project are to:

- Provide infrastructure that enables gas to be supplied to the HPP to meet NSW's future energy security needs
- Select a Project design that is efficient and economically feasible for construction and operation whilst accounting for social, land use, heritage, environmental, geotechnical and topographical constraints
- Design and construct the Project to minimise social and environmental impacts.

Project Need and Function

The assessment of the HPP EIS conducted by DPIE concluded that the HPP would strengthen energy security in NSW, as it would:

- Contribute to closing the previously forecast reliability gap in 2023-2024 following the retirement of Liddell Power Station.
- Mitigate electricity supply scarcity for the Hunter, Sydney and Wollongong regions associated with the retirement of Vales Point Power Station in 2029.
- Mitigate reliability risks associated with the potential early exit of coal-fired power stations ahead of planned closure timeframes.
- Provide an ongoing source of synchronous energy to contribute to system security.
- Contribute to avoiding electricity price increases following the closure of Liddell Power Station for the scenario described in the Report of the Liddell Taskforce.
- Contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables.

These conclusions have been further confirmed by the announcement from Origin Energy during February 2022 of the potential early retirement of Eraring Power Station in August 2025. Eraring Power Station is Australia's largest power station and provides approximately 25% of NSW power requirements.

As such, the Project need and function is to provide infrastructure that enables gas to be supplied to the HPP in order that it may strengthen energy security in NSW.

Project Alternatives and Refinements

APA considered a range of design concepts to supply gas to the HPP from the Sydney to Newcastle Pipeline and assessed the following configurations in detail.

Compressor Station Location

- Locating a compressor station adjacent to the offtake point of the Sydney to Newcastle Pipeline. Connecting the compressor station and the HPP with a large diameter, high pressure transmission pipeline.
- Locating a compressor station mid-way between the Sydney to Newcastle Pipeline and the HPP. Connecting the Sydney to Newcastle Pipeline and the compressor station with a medium diameter medium pressure transmission pipeline. Connecting the compressor station and the HPP with a large diameter, high pressure storage pipeline.

- Locating a compressor station adjacent to the HPP. Connecting the Sydney to Newcastle Pipeline and the compressor station with medium diameter, medium pressure transmission pipeline. Locating a large diameter, high pressure storage pipeline downstream of the compressor station in the buffer zone land of the former Hydro aluminium smelter.

Transmission Pipeline Alignment

As part of the assessment of these concept alternatives, three potential corridors for a pipeline alignment between the Sydney to Newcastle Pipeline and the HPP were also identified. Each combination of design concept and pipeline corridor was assessed and compared using multi criteria analysis based on spatial analysis of publicly available data supplemented by field inspection. Early consultation with Cessnock City Council, Maitland City Council, City of Newcastle, Hunter Water, Ausgrid, Transport for NSW and Regrowth Kurri Kurri was also undertaken to inform Project design.

The design concept and transmission pipeline alignment that has been selected for the Project and assessed in this EIS was selected as it provides an acceptable degree of construction complexity, the greatest potential to minimise the environmental and social impacts, as well as providing an economic solution with the lowest cost of all feasible design concepts considered.

During the development of the EIS, several Project design refinements have been introduced to further minimise impacts. These have been undertaken as an outcome of ongoing consultation with directly affected landholders, targeted ecological and cultural heritage surveys conducted across the Project area, the findings of the detailed environmental assessments for the EIS and in response to community and agency feedback during the preparation of the EIS.

Design Refinements

As a result of this iterative approach, the Project has been designed so that:

- The transmission pipeline alignment impacts the lowest number of landholdings of all alignment options considered, avoids all conservation and forestry estate, is preferentially located on land that has been or is approved for clearing, minimises construction impacts (visual, noise and air quality) to residences due to the length of the alignment within mining leases, follows existing linear pipeline infrastructure for around 33% of its length, almost entirely avoids mapped 'important areas' for the critically endangered Regent Honeyeater and Swift Parrot, and avoids areas suitable for residential development as far as practicable.

- The compressor station, delivery station and laydown areas for storage pipeline pipe segments are proposed to be located on land which has supported industrial operations since 1969 and provides significant separation distances to the closest residences.

- The storage pipeline is proposed to be located in an area of the buffer zone of the former Hydro aluminium smelter that is remote from all surrounding development and has been previously subject to clearing across the majority of the area.

- Trenchless crossings are proposed to avoid surface impacts to all sealed roads, key biodiversity features (such as the proposed stewardship area for Regrowth Kurri Kurri and mapped important habitat for the regent honeyeater) and the main watercourses in the area.

Consultation

APA has undertaken, and is continuing, a comprehensive program of community and stakeholder consultation for the Project. Specific activities have included:

- Establishment of a Project website, 1800 information line and Project email address, including a mechanism for stakeholders to provide feedback regarding the Project
- Direct contact with landholders along the alignment of the transmission pipeline and storage pipeline followed by individual landholder briefings and ongoing contact
- Establishment of a Social Pinpoint page and distribution of an introductory Project information sheet
- Formal briefings with key stakeholders and government agencies
- Presentations to existing forums including Local Government Council meetings and special interest groups
- Random telephone survey of households within the social locality to gain broader community input to the Social Impact Assessment (SIA) process
- Consultation with interested Aboriginal Parties in accordance with the applicable laws and government guidelines
- Direct contact with a range of other stakeholders with a potential interest in the Project.

A stakeholder identification process was undertaken for the Project to support the planning and delivery of community and stakeholder consultation to inform the SIA and EIS. This process has also considered the interconnectivity of stakeholders with the Hunter Power Project, with some stakeholders having a mutual interest in both projects.

All issues raised during community consultation are summarised and responded to within this EIS in **Sections 6.5** and **7.14**.

Consultation will continue following the submission of the EIS, which will include public exhibition of the EIS for a minimum of 28 days. APA will undertake a range of direct stakeholder engagement activities on an ongoing basis. Subject to approval of the Project, APA will maintain communication activities in the lead up to, and during construction and operation.

Environmental Approval Process

Before proceeding, the Project requires approvals under applicable NSW and Commonwealth legislation. Regulators must be satisfied that potential environmental impacts associated with the Project have been examined and addressed. The EIS evaluates and assesses the environmental, social and economic impacts associated with the Project.

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (EPA Regulation) establishes the planning and approvals process in NSW. The EP&A Act provides for the making of Environmental Planning Instruments (EPI), including local environmental plans (LEPs) and State environmental planning policies (SEPPs), which set out requirements for particular localities and/or particular types of development.

The Project has been declared Critical State Significant Infrastructure (CSSI) under Section 5.13 of the EP&A Act. In this regard, the Project is considered to be “essential for the State for economic, environmental or social reasons”, and is listed under clause 16 and Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011*.

Therefore, the Project will require approval under Division 5.2 of the EP&A Act. As a result of this declaration, EPIs do not apply to the Project however all relevant EPIs to the Project have been considered as further described in the EIS.

The Planning Secretary’s Environmental Assessment Requirements (SEARs) for the Project were issued on 23 July 2021. The SEARs require the EIS to provide a full description of the Project, justification for the Project, relevant approvals required, and an assessment of the likely potential impacts of the Project on the environment including consideration of the following key issues:

- Land and soils
- Water
- Biodiversity
- Aboriginal Cultural Heritage
- Historic Heritage
- Air quality and Odour
- Noise and vibration
- Transport
- Hazards and risks
- Visual
- Social and economic
- Waste management.

The SEARs also require that consultation be undertaken with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, Registered Aboriginal Parties (RAPs), and affected landowners, including mine operators and written notification of the proposal to the titleholders including a map indicating the proposal area.

The EIS has been prepared in accordance with the requirements of the EP&A Act and the form and content requirements specified in Schedule 2 of the EPA Regulation, including the SEARs for the Project, and with regard to the *State Significant Infrastructure Guidelines*

Subject to approval under the EP&A Act, APA will also need to obtain a licence to construct and operate the Project under the *Pipelines Act 1967*.

Furthermore, the Project is subject to assessment requirements under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. A referral to the Department of Agriculture, Water and the Environment (DAWE) has been lodged on 6 December 2021 and the Project was determined to be a ‘controlled action’ under the EPBC Act during February 2022. The controlling provision was listed threatened species and ecological communities.

Assessment of Environmental and Social Impacts

The EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and identifies the management and mitigation measures that will be implemented. A summary of the key findings of the EIS is provided below.

Table ES1 Summary of Environmental and Social Findings

Environmental/ Social Issue	Overview of Key Outcomes
Land use	The Project will require approximately 103 ha of land during construction and 2 ha during operations. Potential land use conflicts have been mitigated as far as practicable during Project design, as informed by ongoing consultation with current and future land users where known. Key current and proposed land uses for which the Project has adopted design and mitigation measures are the M1 Pacific Motorway, Lower Hunter Freight Corridor, Emerging Black Hill Precinct, Donaldson and Bloomfield coal mining operations, Hunter Water Corporation trunk mains, Cliftleigh and Gillieston Heights housing release areas, the Kurri Kurri Regrowth Project, the Kurri Kurri smelter remediation project and the Hunter Power Project. Material adverse impacts to current and proposed land uses are not expected during construction or operation of the Project.
Soils and Contamination	The dominant soil landscapes traversed by the transmission pipeline and storage pipeline are the Beresfield and Shamrock Hill soil landscapes. The podzolic and solodic soils associated with these landscapes typically demonstrate low fertility and are acidic, though importantly the acidity is unrelated to iron sulphide sediments found in acid sulphate soils. These soils will require management when exposed or stockpiled during construction typically using standard techniques such as application of neutralising ameliorants (lime and gypsum). Erosion risks during construction can be effectively managed using standard pipeline construction techniques and relevant requirements of Managing Urban Stormwater: Soils and Construction – Volume 2A, Installation of services. Erosion and sediment control plans will be developed for the Project, informed by geotechnical assessments that are currently underway. A sampling program was undertaken to assess potential for acid sulphate soils at eight locations: seven on the transmission pipeline alignment where it traverses the Wallis Creek floodplain and adjacent to Swamp Creek, and one at the north eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp. Potential acid sulphate soils were identified at 2.4-2.5m depth at the storage pipeline construction footprint sampling location. Excavation to this depth will not occur at this location during construction. Sampling at the proposed HDD pad immediately east of Wallis Creek identified acid sulphate soil from 1.4m depth. APA has committed to extend the length of the HDD of Wallis Creek to avoid trenching in this area. Sampling at all other locations did not locate either actual or potential acid sulphate soil. Management of acid sulphate soils will be undertaken in accordance with Acid Sulphate Soil Manual (Acid Sulphate Soil Management Advisory Committee, 1998. A preliminary contamination assessment identified limited potential for contamination to be encountered within the Project construction footprint. Sites with known contamination are a former broiler farm traversed by the transmission pipeline between KP2.6 and KP4.3 and the former Kurri Kurri aluminium smelter. Both sites are subject to Remedial Action Plans to be implemented by the site owners prior to commercial and industrial use of the sites. The pipeline alignment avoids most known sites of contamination from buried demolition waste and organic material on the broiler farm but sits adjacent to one site. Construction of the Project at the site of the former Kurri Kurri aluminium smelter will not commence until a site audit statement has been prepared by a site auditor accredited by the NSW Environment Protection Authority. Soil sampling at locations where the transmission pipeline crosses Hunter Water Corporation trunk mains did not identify any lead contamination, which has been detected in other parts of the regional water network adjacent to older trunk mains. Measures proposed in the EIS will be implemented to appropriately manage soils and contamination risks during the various stages of the Project.

Environmental/ Social Issue	Overview of Key Outcomes
Water	The Project has been designed to mitigate potential impacts to watercourses by selection of appropriate crossing locations, implementation of trenchless crossing techniques (Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek, Black Waterholes Creek) or implementation of enhanced measures at special crossings (Viney Creek, Four Mile Creek). Construction of the transmission pipeline through the Wallis Creek floodplain and adjacent to Swamp Creek is the activity with the highest likelihood of intercepting shallow groundwater. Groundwater levels of the Wallis Creek floodplain recorded during soil sampling in January 2022, following significant flooding during late November and December 2021, were between 1.2 - 2.1 m beneath ground level at all sampled locations, other than immediately east of Wallis Creek (0.9m) where APA has committed to extend a HDD to avoid trenching. Groundwater levels west of Swamp Creek at KP 18.0 and KP 18.3 were 1.4 m and more than 2.5 m beneath ground level respectively when sampled during early December 2021. As such, there is limited potential to intercept groundwater during trenching for the transmission pipeline. Groundwater levels at the compressor station and delivery station location have been recorded at depths between 2.5 - 3.3m bgl during geotechnical investigations for the Hunter Power Project. Shallow foundations will not extend to this depth though piled foundations will. Water consumption during construction is estimated to be 33ML, which is a very small proportion of regional water availability. Water consumption during operations is expected to be negligible.
Biodiversity	Vegetation surveys confirmed the presence of 10 native plant community types encompassing around 65 ha of the project construction footprint. Of this native vegetation, 20.5 ha is considered to be in moderate to good condition with the remaining 44 ha classified as thinned/disturbed, poor quality or derived grassland. Four endangered ecological communities listed under the *NSW Biodiversity Conservation Act 2016* (BC Act) occur in various condition states over approximately 60 ha of the construction footprint being Hunter Lowland Redgum Forest (1.7 ha), Kurri sand swamp woodland (2.5 ha), Lower Hunter Spotted Gum Ironbark Forest (49.9 ha), and freshwater wetlands on coastal floodplains of the NSW North Coast (5.4 ha). One critically endangered ecological community listed under the EPBC Act (River-flat eucalypt forest) occurs across 1.1 ha of the storage pipeline construction footprint. Fifteen individuals of *Eucalyptus parramattensis* subsp. *decadensis* and four individuals of small-flower Grevillea (both listed as Vulnerable under the EPBC Act and BC Act), and 19 individuals of *Callistemon linearifolius* (listed as Vulnerable under the BC Act), were located within the construction footprint. Habitat for several species of threatened fauna is also present. The Project concept and construction footprint has been designed to avoid or minimise potential impacts to biodiversity as far as practicable, including use of existing industrial land for the compressor station and delivery station, positioning of the storage pipeline in previously cleared land in the former Kurri Kurri aluminium smelter buffer zone, and almost entirely avoiding mapped important habitat for the critically endangered Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*). Use of trenchless crossing techniques has enabled surface disturbance to be avoided for a proposed biodiversity stewardship area and for a population of 269 individual small-flower Grevillea. Measures proposed in the EIS will be implemented to appropriately manage potential impacts to biodiversity during the various stages of the Project. A biodiversity offsets strategy in accordance with the requirements of applicable state and Commonwealth polices and regulations will be developed and implemented.

Environmental/ Social Issue	Overview of Key Outcomes
Aboriginal Cultural Heritage	An Aboriginal Cultural Heritage assessment was undertaken for the Project in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). A predictive model, based on landforms present in the Project footprint and review of previous ACH investigations in the local area, indicated that stone artefact scatters/isolated artefacts may be present throughout the ACHA study area with presence of other site types (scarred trees, grinding grooves, burials) considered unlikely or rare. Field surveys located nine new archaeological sites (two artefact scatters and seven isolated artefacts), of which three are outside of the Project construction footprint and will not be impacted. Nine areas of potential archaeological deposit (PAD) were identified within the Project construction footprint for further investigation, should impacts be unavoidable. Measures for management of potential impacts to Aboriginal cultural heritage will be consolidated into a Cultural Heritage Management Plan (CHMP).
Historic Heritage	The Project does not impact on any heritage items listed on national or State heritage registers. One site of local heritage significance listed under the Cessnock LEP 2011, the 'South Maitland Railway System", is traversed by the transmission pipeline. A horizontal bore is proposed for the transmission pipeline crossing of the South Maitland Railway, which will avoid direct surface impacts to the railway. Overall, the Project would not result in any adverse physical or visual impacts to historic heritage in the vicinity of the Project area.
Air Quality and Odour	The air assessment identified dust (PM_{10}) during construction as the primary emission of concern for the Project. Modelling of PM_{10} emissions during construction activities, assuming worst case meteorological conditions, predicted that daily PM_{10} criteria could be met at all nearby sensitive receptors for the JGN offtake facility, compressor station, delivery station and storage pipeline. A small number of receptors in close proximity to the transmission pipeline were identified as exceeding daily PM_{10} criteria. When enhanced dust control measures (watering at >2 litres/m^2/h) are applied to construction activities near these residences the daily criteria is predicted to be met. Air quality impacts from the operation of the Project are expected to be minimal. The compressor station is electrically driven, so no combustion emissions will occur. Combustion of natural gas will occur during operation of water bath heaters for the delivery station, however emissions are assessed as minor and unlikely to lead to any cumulative air quality impacts when the Hunter Power Project is operating. Air quality control measures proposed in the EIS would effectively mitigate any potential air quality emissions from the Project during construction and operations.
Greenhouse Gas	The Project will generate GHG emissions during construction, primarily due to vegetation clearing and diesel combustion, and to a lesser extent during operations due to combustion of natural gas by the delivery station and small volumes of natural gas released during maintenance. Scope 1 and 2 GHG emissions for the 30 year life of the Project are calculated to be 71,102 t,CO2-e and 476,914 tCO2-e respectively. As noted by DIPE (2021b), the Hunter Power Project would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables. The Project is necessary to facilitate the Hunter Power Project.

Environmental/ Social Issue	Overview of Key Outcomes
Noise and Vibration	Modelling of noise generated by the Project indicates that pipeline and surface facility construction can generally be undertaken to meet noise guidelines and with minimal impacts to nearby sensitive receptors. Of the 13,627 sensitive receivers identified in noise catchments surrounding the Project construction footprint, the modelling of worst case construction noise impacts during standard hours predicts that one residential receiver will experience highly intrusive noise and 17 residential receivers may experience moderately intrusive noise. This is primarily due to the design of the Project, such that distances to residences have been maximised as far as practicable. Some construction activities which require continuous operations, notably the HDDs of Buttai Creek and Wallis Creek and the horizontal bore of Main Road, require careful management and mitigation to address potential noise impacts during night time periods. Vibration and construction traffic noise impacts are assessed as minor and well within guidelines. The compressor station and delivery station are main operational noise sources for the Project and have been strategically located adjacent to the Hunter Power Project, away from sensitive receivers. Electrically driven compressors have also been selected to minimise noise emissions. Modelling of cumulative noise emissions of these facilities with operation of the Hunter Power Project predicts that noise criteria are met at the nearest residences. Modelling of the JGN offtake facility indicates that night time noise impacts at the two closest sensitive receptors are marginally above guideline levels during worst case meteorological conditions. Further work undertaken will be during detailed design to reduce noise emissions from this facility in order to meet guideline levels.
Traffic and Transport	Modelling of traffic generated during the construction of the Project indicates that impacts to the local road network, road safety, public transport infrastructure or pedestrian facilities are generally not material. Use of Main Road by Project workers returning to accommodation in Maitland in the afternoon was identified as the most significant potential impact to the local traffic network, given this road is already approaching saturation during peak hours. The traffic assessment identified that the greatest percentage increase to existing traffic volumes on the local road network would likely occur for John Renshaw Drive during the morning peak. This assessment was based on a worst case scenario with pipe delivery from Port of Newcastle to laydown areas, pipe delivery from laydown areas to work areas, and peak construction workforce movements all occur simultaneously, which is highly unlikely. John Renshaw Drive was assessed to remain well within the recommended level of service during this period. With the traffic management measures proposed in the EIS, it is considered that the Project's minor traffic and transport impacts during construction would be effectively managed. Traffic impacts during operations are negligible.
Hazards, Risks and Bushfire	Results of the preliminary hazard analysis show that appropriate risk management measures can be applied to the Project to meet HIPAP 4 risk criteria for individual fatality, injury and propagation. Through the development and implementation of relevant bushfire management measures and identified hazard safeguards and controls, it is considered that potential bushfire risk associated with the Project can be appropriately managed.
Visual Amenity	The visual amenity assessment determined that impacts associated with the Project are primarily constrained to the construction phase, when land clearing and movement of construction equipment will occur. Visual impacts during operations are generally minor as pipelines are buried and surface infrastructure has been located in areas of compatible land use with low visibility from residences and roads. The JGN Offtake Facility will require landscape screening or other visual mitigation given its location in a rural setting adjacent to Lenaghans Drive.

Environmental/ Social Issue	Overview of Key Outcomes
Social Amenity	Community consultation undertaken to inform the social impact assessment undertaken for the Project identified potential impacts on surroundings (the natural environment, access to recreational areas and public safety) as key perceived negative impacts of the Project. The potential contribution of the Project to the local and regional economy and facilitation of the energy transition away from coal, were frequently noted as a benefit of the Project. Preferentially using disturbed land and following existing linear infrastructure wherever practicable as part of Project design was generally viewed favourably. While a number of potentially negative social impacts have been identified through the SIA process, measures proposed would adequately address these and contribute positively to the social locality.
Waste Management	The majority of waste generation for the Project will occur during construction and commissioning. Cuttings produced during HDD of key watercourses and environmentally sensitive features are the major waste generated during construction. Waste generation during operations will be minimal and largely limited to used products from maintenance activities. Mitigation measures listed in the EIS summarise APA commitments to avoid, re-use, recycle and dispose of waste where appropriate.

APA has applied an iterative approach through the development of the EIS responding to both environmental constraints and stakeholder concern through refinement of the Project design. This is demonstrated by APA's continued consideration of alternatives to the Project design based on ongoing consultation with affected landholders and other stakeholders.

Through the implementation of appropriate mitigation measures, the potential environmental impacts associated with the Project can be appropriately managed, including stakeholder concerns and associated social impacts identified during the stakeholder engagement process. Given the benefits of the Hunter Power Project that the Project facilitates, the significant economic benefits of the Project, and commitment from APA to appropriately manage, mitigate and offset the potential environmental impacts, it is considered the Project would result in a net benefit to the region and broader NSW community.

Conclusion

The EIS has addressed the requirements issued by the Secretary of the DPIE under Division 5.2 of Part 5 of the EP&A Act. The EIS confirms that the Project has a strong justification for proceeding as it provides infrastructure that enables gas to be supplied to the approved Hunter Power Project and demonstrates that environmental impacts are manageable. The Project is consistent with Australian and NSW government planning strategies and policies.

A range of specialist investigations were undertaken as part of the EIS and impacts and risks to the biophysical and socio-economic environment have been systematically assessed. A suite of management measures to mitigate the potential adverse impacts of the Project have been proposed. On balance and taking into account of all of the impacts and benefits, the Project favours the public interest and adverse impacts can be effectively managed by the proposed mitigation measures.

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SECTION 1.0

Introduction

1.0 Introduction

1.1 Background

Snowy Hydro Limited (Snowy Hydro) is developing a gas-fired peaking power station, referred to as the Hunter Power Project (HPP), at the site of the former Hydro Australia Pty Ltd (Hydro) aluminium smelter at Kurri Kurri. The HPP aims to provide up to 750 megawatts (MW) of 'on-demand' electricity to supplement Snowy Hydro's generation portfolio with dispatchable capacity when the needs of electricity consumers are highest.

The HPP was approved, subject to conditions, by the Secretary of the Department of Planning, Industry and Environment (DPIE) on 17 December 2021 and by the Commonwealth Minister for the Environment on 6 February 2022.

APA Transmission Pty Limited (ABN 84 603 054 404), a wholly owned subsidiary of APA Group (APA), has been engaged by Snowy Hydro to develop a gas supply solution for the HPP. Accordingly, APA has proposed the Kurri Kurri Lateral Pipeline (KKLP) Project (the Project) to supply gas for the HPP from the existing Sydney to Newcastle Pipeline (SNP - formally referred to as the Jemena Gas Networks (JGN) Northern Trunk). The Project would involve the construction, operation and maintenance of a medium pressure transmission pipeline, compressor station, high pressure storage pipeline, delivery station, and other ancillary surface facilities, as further discussed in **Section 2.0**.

APA will not own gas transferred between the SNP and the HPP but will own the infrastructure proposed for the Project that enables this transfer.

The Project has been declared Critical State Significant Infrastructure (CSSI) under Section 5.13 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). In this regard, the Project is considered to be "essential for the State for economic, environmental or social reasons", and is listed under clause 16 and Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011*. As CSSI, the Project requires approval under Part 5, Division 5.2 of the EP&A Act, as further discussed in **Section 1.6**.

The Project has a capital investment value (CIV) of approximately $264 million.

The construction workforce is estimated to peak at around 398 personnel over one month when core construction of the transmission pipeline, storage pipeline and compressor station overlaps. Workforce numbers are estimated to be below 330 personnel over the remainder of the 12-month construction period. An operational workforce of five personnel is anticipated.

Construction is planned to commence during Q4 2022 with a gas supply to the HPP provided during Q4 2023. The HPP has gained approval and is planned to be operational by the end of 2023.

The Project, including all associated facilities, will be designed, constructed, commissioned and operated in accordance with the *Australian Standard 2885 Pipelines – Gas and Liquid* Petroleum (AS 2885 - a suite of standards outlining requirements for gas and petroleum pipelines which are designed, constructed and operated in Australia) and licenced under the *Pipelines Act 1967* (refer to **Section 3.0**).

This Environmental Impact Statement (EIS) has been prepared by Umwelt Australia Pty Ltd (Umwelt) in accordance with the *Environmental Planning and Assessment Regulation, 2000* (refer to **Section 1.8**).

1.2 Project Overview

The Project comprises the following primary components:

- A buried, steel, medium diameter (up to DN350), medium pressure (up to 6.9 megapascal (MPag)) transmission pipeline of approximately 20.1 km in length to provide a gas supply from the existing Sydney to Newcastle Pipeline (SNP), via receipt and delivery facilities, to the HPP site.
- A compressor station at the termination of the transmission pipeline to boost gas pressure prior to transfer to a storage pipeline.
- A buried, steel, medium diameter (up to DN350), high pressure (up to 15.3 MPag) interconnect pipeline of approximately 1.3 km in total length, providing an interface between the compressor station, storage pipeline and delivery station.
- A buried, steel, large diameter (up to DN1050), high pressure (up to 15.3 MPag) storage pipeline of approximately 24 km in total length downstream of the compressor station with approximately 70 terajoules (TJ) of useable gas storage ready to supply the HPP.
- A delivery station to receive gas from the storage pipeline and control temperature, pressure and flow rate prior to delivery of gas to the HPP.

The compressor station and delivery station are located within the HPP project site boundary.

A compressor station and storage pipeline are required as part of the Project as the Sydney to Newcastle Pipeline (SNP) does not provide sufficient gas volumes or pressure to meet the supply requirements of the HPP. As such, a direct pipeline connection between the SNP and the HPP is not a viable solution for gas supply to the HPP. A more comprehensive and detailed description of the Project is provided in **Section 2.0**.

The proposed alignment for the transmission pipeline will commence at the offtake facility (referred to as the JGN offtake facility) near Black Hill, approximately 15 km northwest of Newcastle and terminate at the HPP, approximately 2 km north of Kurri Kurri. The Project and its regional context are shown on **Figure 1.1**.

The construction, operation, maintenance and decommissioning of the above listed project components are evaluated in this EIS. A schematic outlining the relationship of the project components is provided in **Figure 1.2**.

The Project area, for the purposes of the EIS, is defined as the Project's combined construction footprint which is located over approximately 103 ha as depicted in **Figure 1.1**. The Project area incorporates:

- The construction right of way (ROW) for the transmission, interconnect and storage pipelines
- Extra workspaces required for construction of the transmission, interconnect and storage pipelines for truck turnarounds, vegetation storage, HDD entry and exit locations, horizontal bore entry and exit locations, watercourse crossing workspaces and line pipe storage areas
- Access tracks to provide access to the construction footprint
- Construction footprints for the offtake facility, compressor station and delivery station.

1.3 Project Objectives

The objectives of the Project, as described further in **Section 4.1**, are to:

- Provide infrastructure that enables gas to be supplied to the HPP to meet NSW's future energy security needs
- Select a Project design that is efficient and economically feasible for construction and operation whilst accounting for social, land use, heritage, environmental, geotechnical and topographical constraints
- Design and construct the Project to minimise social and environmental impacts.

1.4 The Proponent

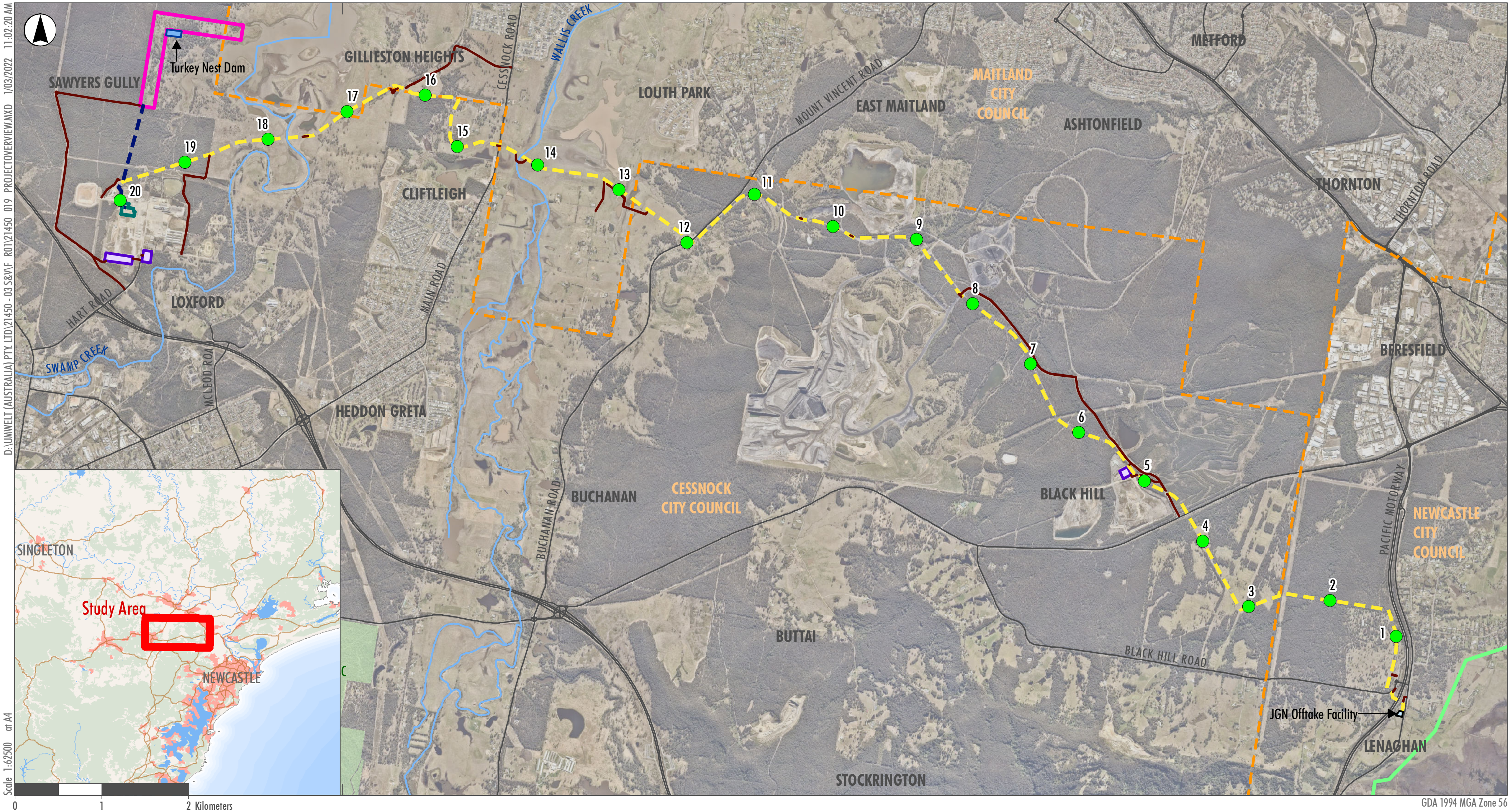
APA is a leading Australian energy infrastructure business, with around 15,000 kilometres (km) of natural gas pipelines connecting sources of supply and markets across mainland Australia. APA operate and maintain networks connecting approximately 1.4 million Australian homes and businesses to the benefits of natural gas and own or have interests in gas storage facilities, gas-fired power stations and renewable energy generation. APA is one of Australia's largest owners and operators of renewable power generation assets, with wind and solar projects across Western Australia, South Australia and Queensland. APA own or manage and operate a portfolio of assets of around $21 billion and deliver half the nation's natural gas usage. Further information on APA operations and activities is available on the APA website: https://www.apa.com.au/.

1.4.1 Sustainability

As described in the organisation's 2021 Sustainability Report, APA believes sustainability means standing up and being counted. It's about being responsible in the way we do business and contribute to society. APA prioritises sustainability so that we, our employees, stakeholders, customers and the communities in which we operate can all thrive – now, and into the future.

An assessment of the Project against the principles of ecologically sustainable development (ESD) is provided in **Section 10.5**.

umwelt



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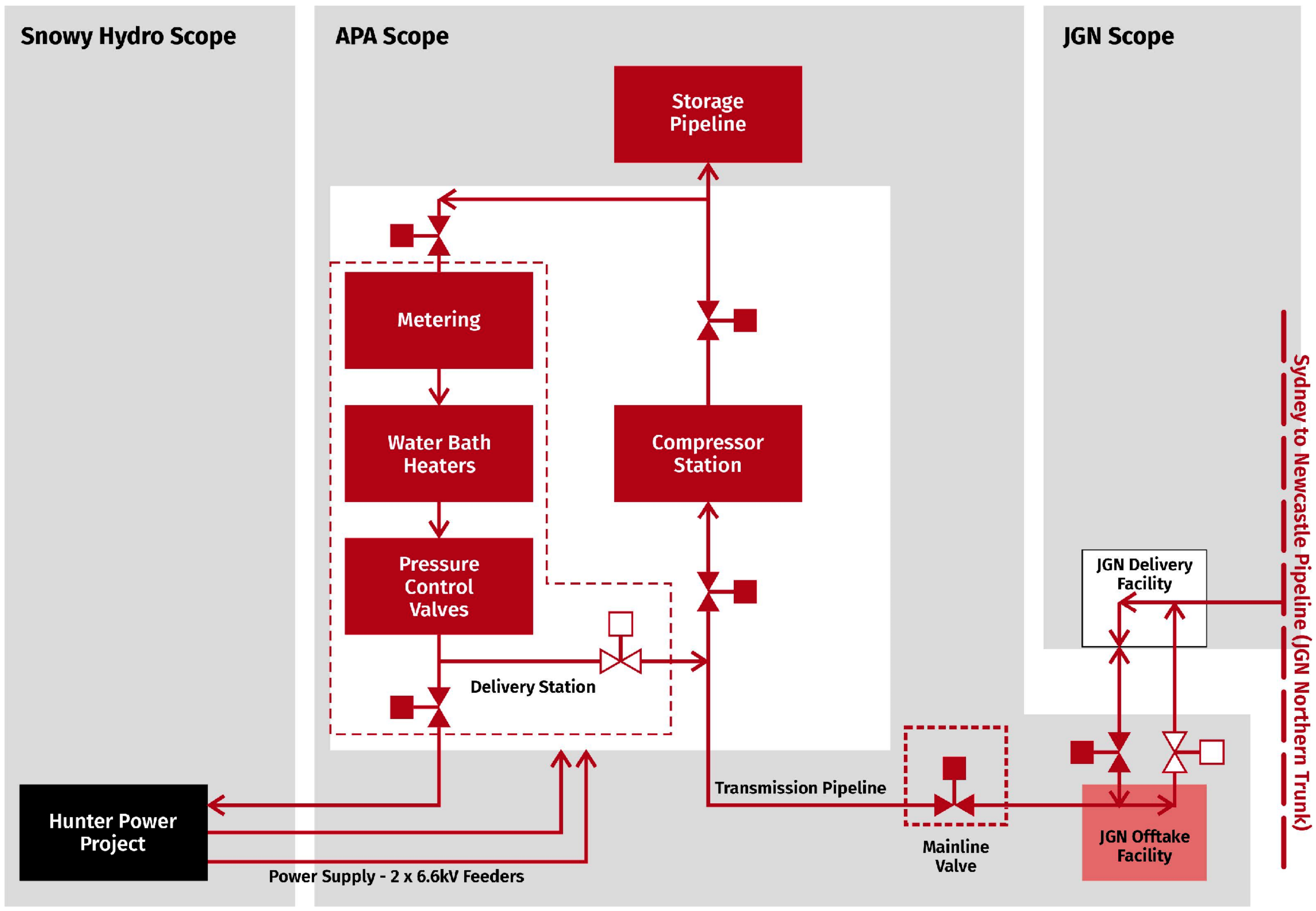
Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Local Government Area Boundary
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- Access Tracks
- Roads
- Watercourses

FIGURE 1.1

Project Location

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Note: Not to Scale

FIGURE 1.2

Relationship of Project Components

1.4.2 Climate Change Position Statement

APA recognises that climate change impacts the natural environment and community resilience, shifts domestic and export markets, and can impact the organisation's national reputation and policy settings. APA acknowledges that a low-carbon future may create new opportunities for the organisation's diversified business mix with investments in Australian pipelines, gas storage facilities, gas-fired and renewable energy generation. On the 23 February 2021, APA announced its ambition to achieve net zero operations (Scope 1 and 2) emissions by 2050.

APA's Climate Change Position Statement outlines four core principles that guide and inform the organisation's approach to climate change, as follows:

- APA takes the science of climate change seriously and supports a global transition to a lower carbon future
- APA takes steps to understand and manage the risks and opportunities presented by climate change to their business
- APA keeps stakeholders informed of their approach and performance
- APA collaborates and advocates for outcomes that they believe are in the best interests of their customers and the communities they serve.

The Project is consistent with these principles as it represents continued investment in natural gas assets to support a system-wide integration and transition to renewable energy mix.

1.5 Feasible Project Alternatives

During the planning and design phase of the Project, a range of alternatives were considered for the Project to minimise environmental, cultural and social impacts. These include:

- **The 'Do Nothing' Alternative** which involves not developing the Project as further described in **Section 5.1**.
- **Project design concept alternatives** which include three options for locating a compressor station between the SNP and HPP, and multiple combinations of pipeline diameters and pressures as further detailed in **Section 5.2**.
- **Pipeline alignment alternatives** which include three different alignment options for the transmission pipeline and storage pipeline as further detailed in **Section 5.2**.
- Alternative locations for the compressor station adjacent to the HPP which considered four different locations for the compressor station, as described in **Section 5.3**.

Following the lodgement of the Scoping Report to the Department of Planning, Industry and Environment (DPIE) in June 2021, a number of project refinements (as further described in **Section 5.3.1.1**) have been incorporated into the design of the Project. These have been undertaken as an outcome of ongoing consultation with involved landholders, targeted ecological and cultural heritage surveys conducted across the Project area, the findings of the detailed environmental assessments for the EIS and in response to community and agency feedback during the preparation of the EIS.

1.6 Relationship to Other Developments

Figure 1.2 illustrates the Project's relationship to other developments, namely the HPP (**Section 1.6.1**) the JGN Delivery Facility (**Section 1.6.2**) and the SNP (**Section 1.6.3**).

The Project is subject to a separate planning and environmental approvals process to the HPP. The design, approvals, construction and operation of the JGN delivery facility and the approximately 600m pipeline connection to the SNP pipeline is also subject to a separate planning and environmental approvals process and will be the responsibility of Jemena as further discussed below.

1.6.1 Hunter Power Project

The Hunter Power Project (HPP) will operate as a "peak load" generation facility supplying electricity at short notice when there is a requirement in the National Electricity Market (NEM). The HPP aims to provide up to 750 MW of electricity and is anticipated to be operational by the end of 2023. The HPP will have a capital cost of approximately $610 million and would supply up to 250 employment opportunities during the construction phase with approximately 10 full time equivalent employment opportunities during operation.

As discussed in **Section 4.1**, the key objective of the Project is to connect the HPP to the existing NSW gas transmission network, with the development of the HPP being undertaken as a separate project by Snowy Hydro. The EIS for the HPP was submitted to the DPIE in April 2021, with the environmental effects of the HPP assessed in the EIS for that project. A decision to approve the HPP under section 5.19 of the EP&A Act was made by the Minister for Planning and Public Spaces on 17 December 2021.

The scope of this EIS relates only to the project components outlined in **Section 1.2**. Potential cumulative impacts of the HPP development and the Project have been assessed in this EIS and are detailed in **Section 7.16**.

1.6.2 JGN Delivery Facility

The JGN delivery facility is proposed near the connection of the Project's transmission pipeline and the existing SNP. The purpose of this facility is to control the flow of gas between the east coast grid and the transmission pipeline. The JGN delivery facility will operate when gas is flowing from the SNP into the transmission pipeline.

Jemena, as the operator of the SNP, will be responsible for the design, planning approvals, construction and operation of the JGN delivery facility, as well as a short section of pipeline between the JGN delivery facility and the SNP. Based on the currently proposed location, the length of the connecting pipeline would be approximately 600 m. This facility will enable Jemena to meet regulatory obligations regarding transfer of gas between the SNP and the Project's transmission pipeline.

Potential cumulative impacts of the JGN delivery facility and the Project have been assessed and are detailed in **Section 7.16**.

1.6.3 Sydney to Newcastle Pipeline (JGN Northern Trunk)

The Project connects the HPP to the SNP, which is currently the only existing pipeline of the NSW gas transmission network that supplies the Lower Hunter region. The Planning Secretary's Environmental Assessment Requirements (SEARs) require consideration of any capacity constraints of pipelines that the Project would be connecting to for gas supply. Capacity constraints for supply of the HPP from the SNP are not anticipated given the following considerations:

- Snowy Hydro have advised that the capacity of the SNP provides sufficient gas supply to meet the design requirements of the HPP, noting that the HPP is restricted to operate on gas for up to 10% of the year.
- A compressor station and storage pipeline have been incorporated into project design, with approximately 70 terajoules (TJ) of useable gas storage ready to supply the HPP, providing flexibility for the timing of gas supply from the SNP.
- The Project has been designed to allow gas flow from the storage pipeline back into the SNP, which may ameliorate pipeline capacity constraints in the region by providing a significant gas source near the northern termination of the SNP.
- Pipeline access agreements are being negotiated between Snowy Hydro and the owner of the SNP asset.

1.7 Project Development Application

1.7.1 Approval Requirements

The Project is declared Critical State Significant Infrastructure (CSSI) under the provisions of *State Environmental Planning Policy (State and Regional Development) 2011*. The Project will therefore require development consent under Part 5, Division 5.2 of the EP&A Act. This Division outlines the environmental assessment and consultation requirements for SSI including the need for the proponent to prepare an Environmental Impact Statement (EIS). Subject to approval under the EP&A Act, APA will also need to obtain a licence to construct and operate the pipeline under the *Pipelines Act 1967* (**Section 3.2.2**).

Furthermore, the Project is subject to assessment requirements under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* (see **Section 3.1.1**).

Section 3.0 includes further details regarding the respective approval process and other approvals required under the Commonwealth and NSW Legislation.

1.7.2 Environmental Assessment of the Project

This EIS has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of APA to evaluate and assess the potential environmental impacts that may arise from the design, construction, operation and decommissioning of the Project. The EIS further considers the statutory context of the Project, and recommends measures to avoid, mitigate or manage any identified impacts.

The EIS was completed in accordance with the requirements of the EP&A Act and the form and content requirements specified in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, including the SEARs for the Project. SEARs for the Project were issued on 23 July 2021 and a copy is provided in **Appendix 1**. The SEARs are discussed further in **Section 3.2.1**.

Details of the project team responsible for preparation of this EIS are provided in **Appendix 2**.

1.8 Key Standards and Guidelines for Gas Pipelines

The overarching standard that applies to the pipeline industry in Australia is *AS 2885 Pipelines – Gas and liquid petroleum (AS2885)*. AS2885 relates to the design, construction, testing, operations and maintenance of gas and petroleum pipelines which operate at pressures in excess of 1,050 kilopascal (kPa) and is the primary standard applicable to design and operation of the Project.

AS2885 was developed by a working group from both industry and government. The Australian Pipeline and Gas Association (APGA) and its members continue to actively participate in the design, review and development of AS2885 by participating as members and associates on Standards Australia development committees. AS2885 is called up under the *Pipelines Act 1967* through the Pipelines Regulation 2013 making compliance with this standard a legal requirement.

The *APGA Code of Environmental Practice* (2017) is recognised nationally by the various State and Territory Governments as a guide to environment and heritage management of gas pipeline projects. The Code of Practice provides pipeline industry tested standards for planning, design, construction, operation and decommissioning. The Project will reference the Code of Practice as the industry standard for environmental management.

1.9 Structure of this EIS

An overview of the structure of this EIS is provided below.

The **Executive Summary** provides a brief overview of the Project and the major outcomes of the EIS.

Section 1.0 introduces the Project, outlines the background, outlines the environmental context for the Project including the physical and social context, provides a summary of the approval requirements and process, outlines the SEARs requirements, alternatives considered and outlines the EIS project team and the EIS structure.

Section 2.0 contains a detailed description of the Project as proposed.

Section 3.0 summarises the Commonwealth, State and local statutory context for the approval process and Project once operational.

Section 4.0 outlines the strategic policy context for the Project, describes the Project's need and the objectives of the Project.

Section 5.0 summarises the feasible alternatives that were considered and evaluated during the project design.

Section 6.0 describes the stakeholder consultation program and details the environment and community issues identified as part of this process for consideration in the EIS.

Section 7.0 contains a comprehensive analysis and assessment of the key environmental, social and economic issues relevant to the Project, including the Project specific and cumulative impacts.

Section 8.0 provides an assessment of the impacts of the Project on matters of national environmental significance.

Section 9.0 sets out a summary of the measures proposed to be adopted throughout the life of the Project to manage and mitigate impacts.

Section 10.0 provides a discussion on the evaluation of merits of the Project, justification for the Project and its consideration of ecologically sustainable development (ESD) as well as the key conclusions arising from the detailed environmental assessment process.

Section 11.0 lists references cited in the EIS.

Section 12.0 provides a list of abbreviations and glossary of technical terms.

SECTION 2.0

Project Description

2.0 Project Description

This section describes the layout, location, and function of all infrastructure to be constructed and operated as part of the Project. Descriptions of the construction, operation and decommissioning phases of the Project are also provided.

2.1 Project Summary

An overview of the Project, listing details of the development for which approval is sought, is summarised in **Table 2.1**.

Table 2.1 Project Summary

Project element	Summary	Section and Figure reference
The Project	The Project will involve the construction, operation and maintenance of: • a buried, medium diameter (up to DN350), medium pressure (up to 6.9 MPag) transmission pipeline of approximately 20.1 km long • a buried, medium diameter (up to DN350), high pressure (up to 15.3 MPag) interconnect pipeline of approximately 1.3 km. • a buried, large diameter (up to DN1050), high pressure (up to 15.3 MPag) storage pipeline of approximately 24 km • associated surface facilities such as a compressor station, delivery station and offtake station.	**Section 2.3, Figure 2.1A to 2.1F**
Location	The Project is located in the rural locality of Lenaghan, approximately 15 km northwest of Newcastle to approximately 2 km north of Kurri Kurri, NSW. The Project's transmission pipeline traverses the three Local Government Areas (LGAs) of Cessnock, Maitland and Newcastle.	**Section 2.2, Figure 1.1**
The Project area	The Project area is defined as the Project's combined construction footprint located over approximately 103 ha and incorporates: • the construction right of way (ROW) for the transmission, interconnect and storage pipelines • construction workspaces required for the transmission, interconnect and storage pipelines, truck turnarounds, vegetation storage, HDD entry and exit locations, horizontal bore entry and exit locations, watercourse crossing workspaces and line pipe storage areas • access tracks to provide access to the construction footprint • construction footprints for the offtake facility, compressor station and delivery station.	**Section 2.2, Figure 2.1A to 2.1F**
Operational footprint	Approximately 2 ha for the JGN offtake facility, compressor station and delivery station	**Section 2.4, Table 2.5**
Schedule of land	The Project is located across some 76 cadastral lots, with a full list of the parcel numbers provided in the Schedule of Lands.	**Appendix 3**
Construction footprint	Approximately 103 ha	**Section 2.4, Table 2.5**

Project element	Summary	Section and Figure reference
Construction water use and supply	The Project's estimated total water usage is 33 ML. Non potable water for dust control and hydrotesting will be sourced from non-potable water service providers or existing landholders with available allocations.	**Section 2.8.6**
Off-site supporting infrastructure	• Existing road network • Water supply (non-potable) • Waste and wastewater disposal facilities	**Section 2.8.5** **Section 2.8.6** **Section 2.8.8**
Construction hours	Transmission pipeline and JGN offtake facility: 7 am to 6 pm Monday to Friday and 8am to 1pm Saturdays Storage pipeline: 6 am to 6 pm seven days per week Compressor station and delivery station: 6am to 6pm weekdays and 8am to 1pm Saturdays • Limited construction activities outside standard hours.	**Section 2.8.4.2**
Construction workforce	Approximately 398 personnel during peak construction (around one month duration) Up to 330 personnel over the remainder of the 12-month construction period	**Section 2.8.4**
Construction duration	Approximately 12 months	**Section 2.8.4**
Commencement of operation	Anticipated in Q4 2023	**Section 2.8.4**
Operational workforce	Approximately 5 personnel	**Section 2.9.3**
Project life	Approximately 30 years	**Section 2.9**
Capital Investment Value	Approximately $264 million	**Section 2.5**

2.2 Project Area and Location

The Project area is situated in the Lower Hunter region of New South Wales, encompassing the Local Government Areas (LGAs) of Cessnock, Maitland and Newcastle.

The Project area encompasses an area of approximately 103 ha from the rural locality of Lenaghan, approximately 15 km northwest of Newcastle to approximately 2 km north of Kurri Kurri, as shown on **Figure 1.1**.

The Project area considered for this EIS comprises the following:

- The construction right of way (ROW) for the transmission, interconnect and storage pipelines
- Extra workspaces required for construction of the transmission interconnect and storage pipelines for truck turnarounds, vegetation storage, HDD entry and exit locations, horizontal bore entry and exit locations, watercourse crossing workspaces and line pipe storage areas
- Access tracks to provide access to the construction footprint
- Construction footprints for the offtake facility, compressor station and delivery station.
- The compressor station and delivery station are located within the HPP project site boundary.

A map series showing the alignments of the transmission and storage pipelines, and locations of the offtake facility, compressor station, and delivery station is provided in **Figure 2.1A to 2.1F**.

A schedule of all land parcels directly affected by the Project is included as **Appendix 3**.

2.2.1 Transmission Pipeline Alignment

The alignment of the transmission pipeline is approximately 20.1 km in length, extending from the proposed JGN offtake facility to the compressor station (refer to **Figure 2.1A to 2.1F**). The construction ROW for the transmission pipeline would generally be 25 m wide, with additional workspaces required for truck turnarounds, storage of cleared vegetation, HDD entry and exit locations, horizontal bore entry and exit locations, watercourse crossing workspaces and line pipe storage areas.

The local context of the transmission pipeline alignment is described in the following sections.

2.2.1.1 KP0 to KP12

The transmission pipeline alignment joins the JGN offtake facility near Lenaghan, on the western side of Lenaghans Drive, approximately 15 km north-west of Newcastle, at Kilometre Point (KP) 0 (**Photo 2.1**). The SNP pipeline is approximately 600 m east of the JGN offtake facility near the western edge of Hexham Swamp. The alignment initially traverses in a northerly direction from the JGN offtake facility, on the westerly side of Lenaghans Drive, to approximately KP0.1 where it turns west and crosses the Pacific Motorway (**Photo 2.2**). At approximately KP0.3 the alignment crosses Black Hill Road and traverses north within the lots to the west of Pacific Motorway road reserve to approximately KP1.3.

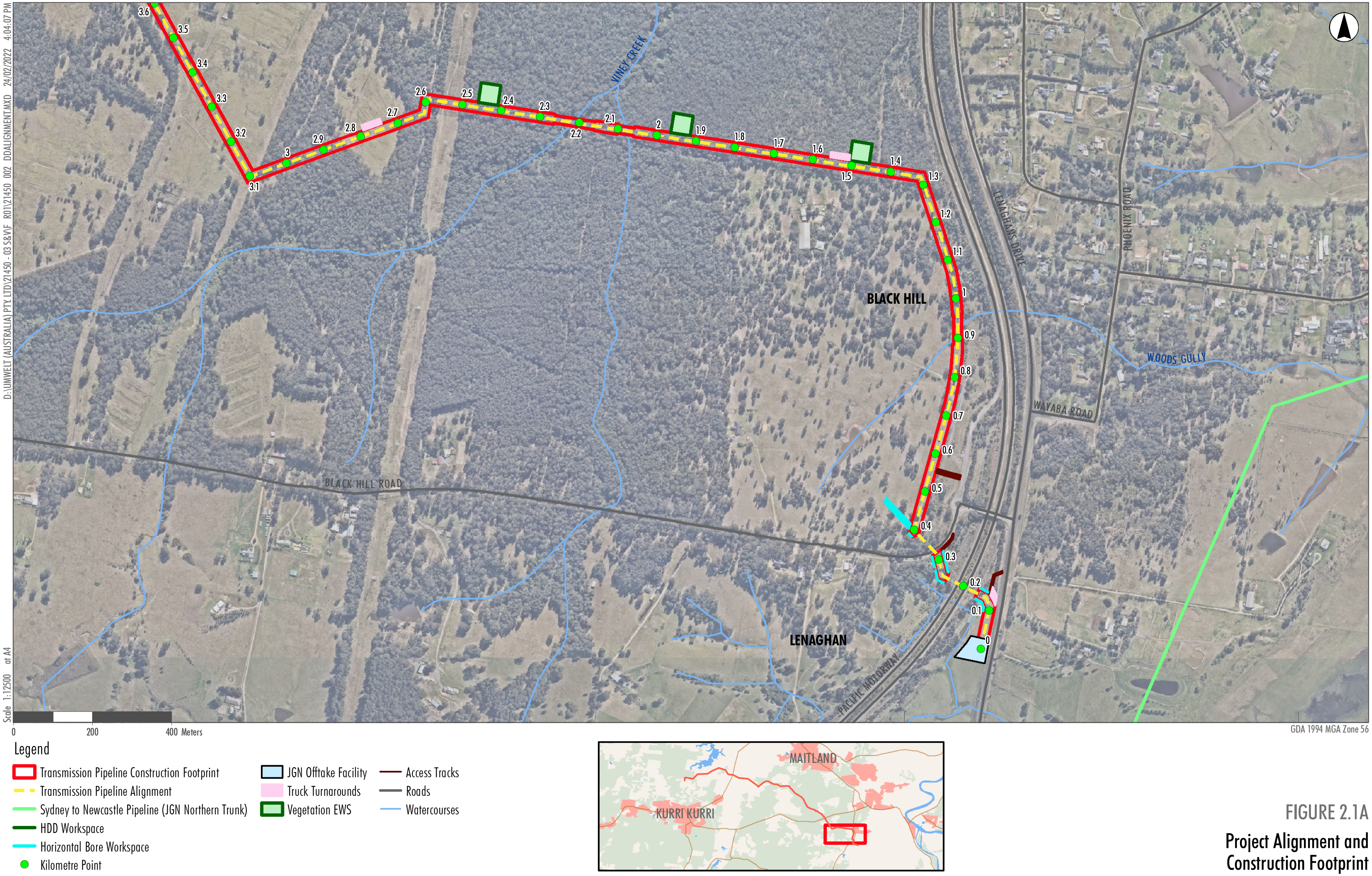
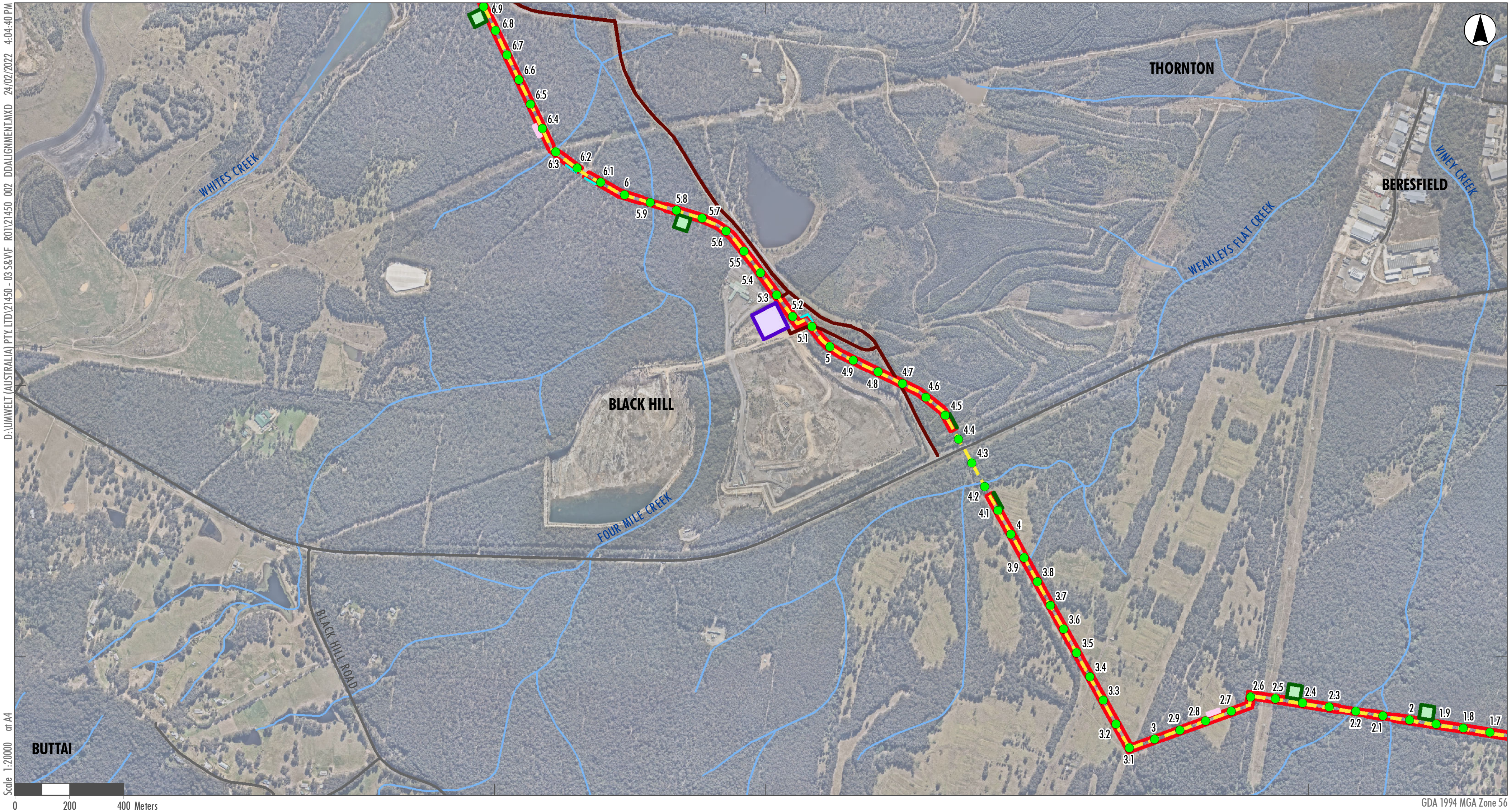


FIGURE 2.1A

Project Alignment and Construction Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



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Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- HDD Workspace
- Horizontal Bore Workspace
- Kilometre Point
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- Access Tracks
- Roads
- Watercourses

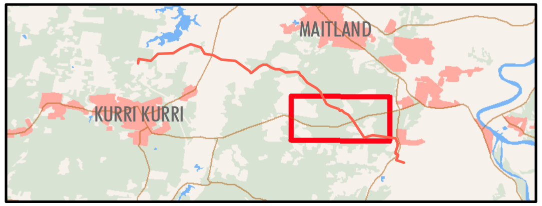
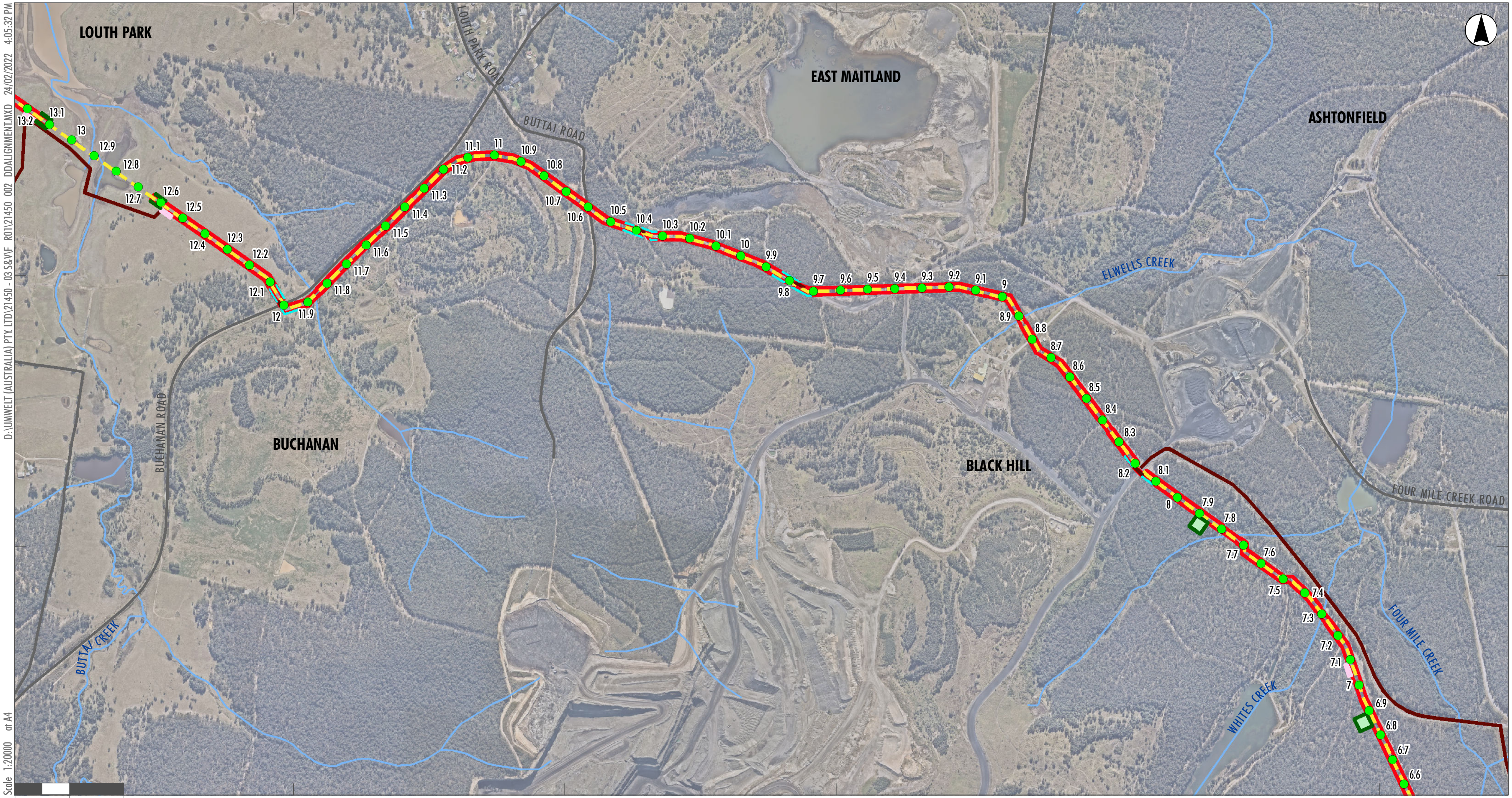


FIGURE 2.1B

Project Alignment and Construction Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



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Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- HDD Workspace
- Horizontal Bore Workspace
- Kilometre Point
- Truck Turnarounds
- Vegetation EWS
- Access Tracks
- Roads
- Watercourses

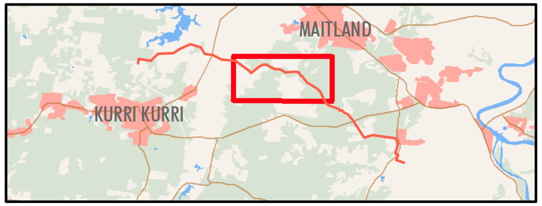
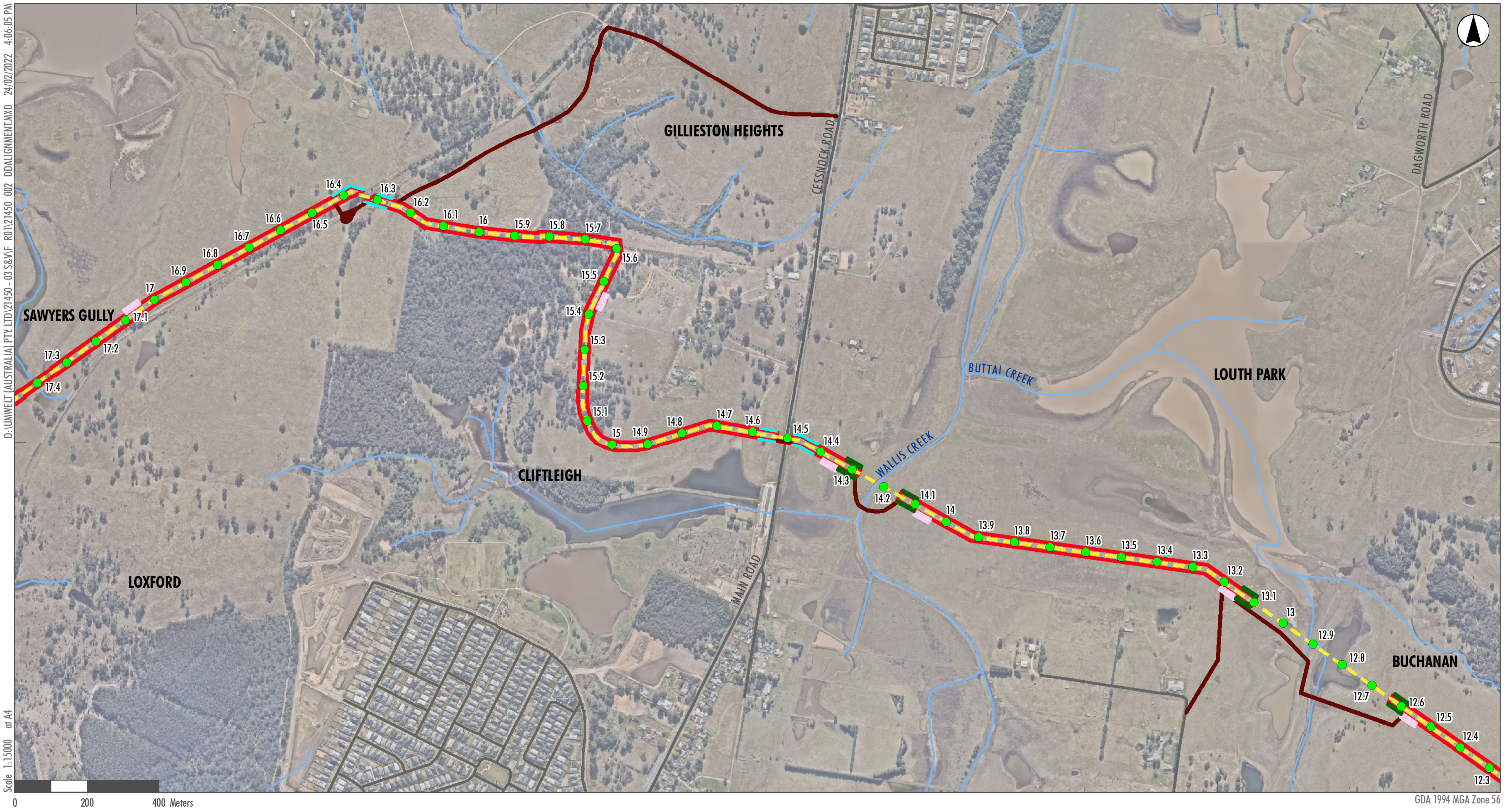


FIGURE 2.1C

Project Alignment and Construction Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



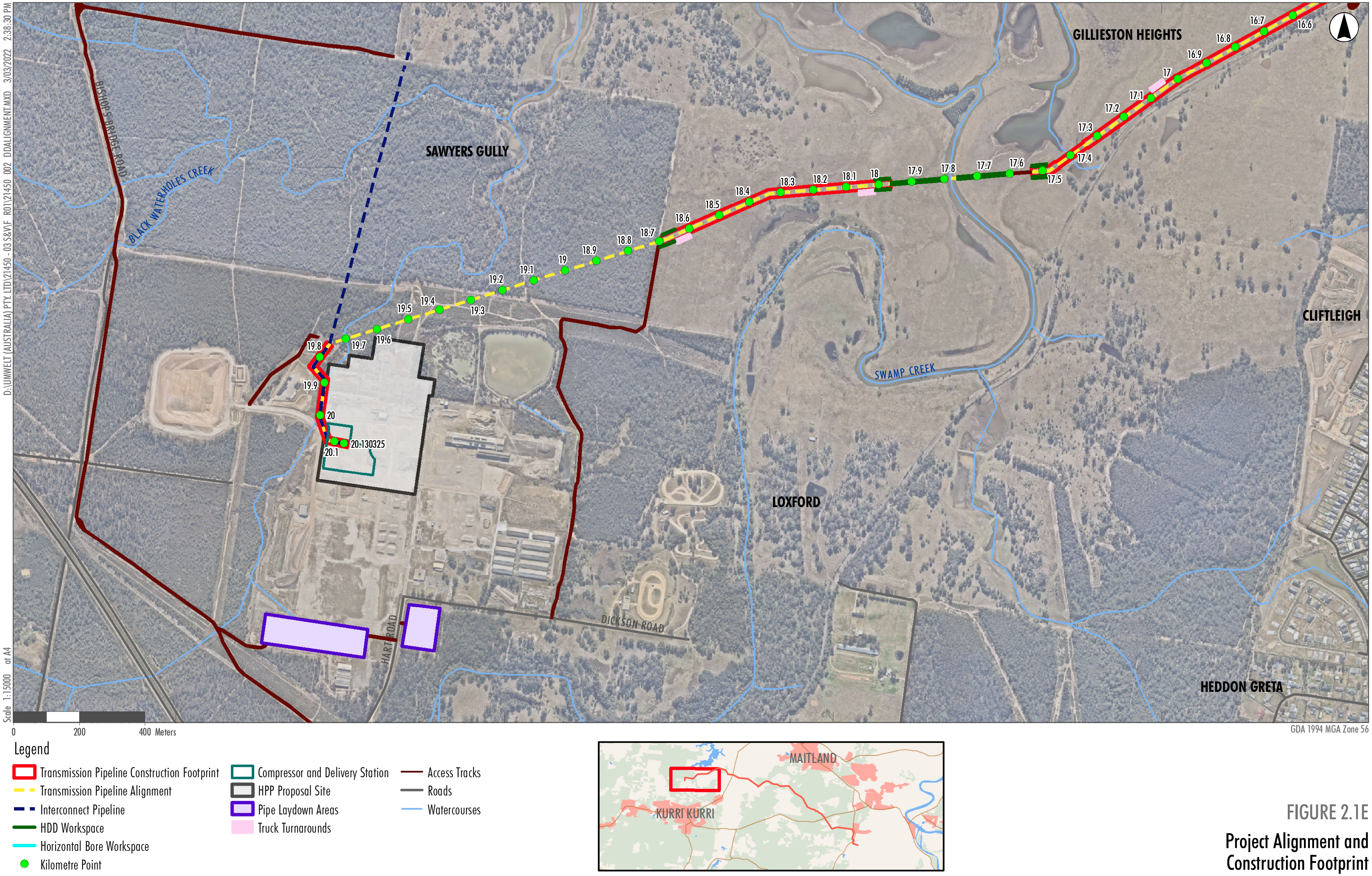
Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- HDD Workspace
- Horizontal Bore Workspace
- Kilometre Point
- Truck Turnarounds
- Access Tracks
- Roads
- Watercourses

FIGURE 2.1D

Project Alignment and Construction Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

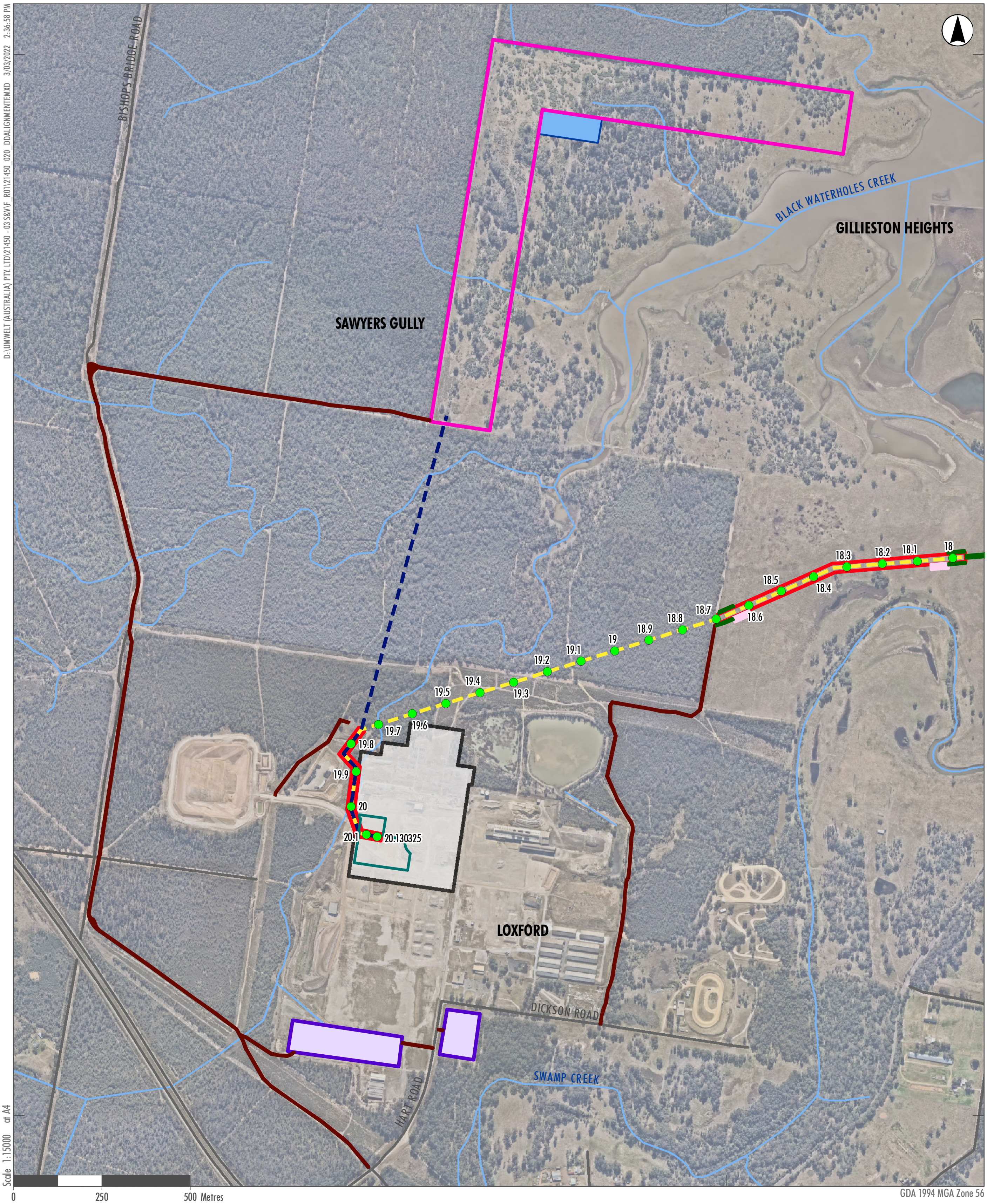


Legend
- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Horizontal Bore Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Access Tracks
- Roads
- Watercourses

FIGURE 2.1E

Project Alignment and Construction Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
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- Kilometre Point
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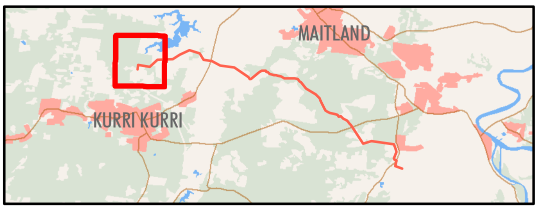


FIGURE 2.1F

Project Alignment and Construction Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

Photo 2.1 JGN Offtake Facility Location at KP0, view to the south

Photo 2.2 M1 crossing location at KP0.2, view to east

The alignment then turns west to traverse the southern boundary of the Stevens Group Hunter Business Park industrial development, crossing Viney Creek and a Transgrid easement hosting a 330kV overhead powerline, to approximately KP2.7.

Stages 1A and 1B of the Hunter Business Park have been approved under state (DA2020/01497) and Commonwealth (EPBC number 2008/4603) planning processes. These approvals provide for vegetation clearing for the footprint of the entire 183ha lot, excluding the riparian corridor of Viney Creek and 20m vegetated buffers of the eastern and southern lot boundaries.

The original Concept Approval (MP10_0093) for this site was issued on 19 November 2013, by the NSW Planning Assessment Commission, as delegates of the Minister for Planning, Infrastructure and Environment. The consent conditions for this concept approval required the dedication of 2,411ha of land at Stockrington and Tank Paddock to the NSW government for permanent conservation as an offset package, which is consistent with the EPBC Act 2008/4603 referral decision. This land transfer occurred during 2016. Subsequent to this, an order made by the NSW Department of Planning and Environment on 26 October 2018, pursuant to clause 34A(3) of the Biodiversity Conservation (Savings and Transitional) Regulation 2017, confirmed that conservation measures to offset residual impacts of the development have been secured.

The construction footprint of the transmission pipeline is sited within the approved clearing footprint of the industrial development, excluding crossings of Viney Creek and the 20m vegetated buffer on the eastern boundary of the lot. The construction footprint is offset from the southern boundary of the industrial development to maintain a vegetated buffer zone in accordance with the development consent.

From here the alignment continues southwest following the southern boundary of the proposed Broaden Management industrial development and former chicken broiler farm, crossing an Ausgrid easement hosting a 66kV overhead powerline to approximately KP3.1. The alignment then turns north-west and runs adjacent to a lot containing a Hunter Water Corporation reticulation main, through predominantly cleared land (**Photo 2.3**).

Photo 2.3 View from KP3.5 to northwest. Transmission pipeline alignment is sited to the east of a Hunter Water Corporation lot

John Renshaw Drive and Weakleys Flat Creek are crossed by HDD between approximately KP4.1 and 4.5. This HDD also crosses the Hunter Water Corporation Chichester Trunk Gravity Main (CTGM), a critical public water supply pipeline from the Chichester Dam, supplying the Stony Pinch Reservoir and, in turn, the city of Newcastle.

Between Viney Creek and John Renshaw Drive the alignment passes above previously mined sections of the Yancoal underground Abel Coal Mine, which is currently under care and maintenance. From John Renshaw Drive until KP12.8 the alignment traverses land managed as rehabilitated or active coal mining operations by Donaldson Coal Pty Limited (a subsidiary company of Yancoal) and The Bloomfield Group. The alignment generally traverses this land in a north westerly direction, located adjacent to a lot containing Hunter Water Corporation trunk mains (**Photo 2.4**). Four Mile Creek, Whites Creek and Elwells Creek are crossed in this section. Trunk mains that connect the CTGM to the Stony Pinch reservoir are also crossed in this section, as well as an Ausgrid easement with a 132kV overhead powerline. The alignment reaches Buchanan Road near KP12.0.

Photo 2.4 View to south-east from KP6.1. CTGM crossing the gully of Four Mile Creek. The transmission pipeline alignment is to the west (right) of the water pipeline

The alignment crosses the following roads in this section:

- M1 Pacific Motorway
- Black Hill Road
- John Renshaw Drive
- Buchanan Road.

The alignment crosses the following named watercourses in this section:

- Woods Gully
- Viney Creek
- Weakleys Flat Creek
- Four Mile Creek
- Whites Creek
- Elwell's Creek.

Five unnamed watercourses are also crossed in this section.

2.2.1.2 KP12 to KP20.1

After crossing Buchanan Road, the alignment continues west and crosses Buttai Creek by HDD at KP12.9, then entering the Wallis Creek floodplain (**Photo 2.5**) and crossing Wallis Creek by HDD at KP14.2.

A temporary culvert crossing is proposed to be installed at Wallis Creek during the transmission pipeline construction phase, at the site of an existing rubble weir. The temporary culvert crossing will enable heavy machinery to access both sides of Wallis Creek and eliminate a 14 km round trip on public roads between the Valley View Lane and Main Road adjacent to Testers Hollow.

Photo 2.5 KP13.3, Wallis Creek floodplain. View along the transmission pipeline alignment to west with Testers Hollow roadworks in distance

Photo 2.6 KP14.2, Wallis Creek. View upstream to existing rubble weir and proposed temporary culvert crossing location

Near KP14.4 the alignment exits the floodplain on the northern side of Testers Hollow, crossing Cessnock Road. From here the alignment curves to the north following the southern and western boundary of the proposed residential development on Lot 2 DP1249763 then turns west to follow the southern boundary of the Gillieston Heights South – Western Precinct residential development, prior to entering the buffer zone[1] of the former Hydro aluminium smelter. The South Maitland Railway is crossed at KP16.3 (**Photo 2.7**). **Photo 2.8** provides a view of the buffer zone of former Hydro aluminium smelter (looking southwest) from KP16.5. The alignment then turns to the south-west adjacent to the South Maitland Railway, prior to turning west and crossing Swamp Creek by HDD near KP17.8 (**Photo 2.9**).

[1] The Buffer Zone is land owned and managed by Hydro as part of the former smelter operations. The smelter closure was announced in May 2014 and Hydro is now preparing land for future divestment and redevelopment. The Buffer Zone has been segmented into Parcels for redevelopment. These Parcels are proposed to be rezoned for a range of uses, including residential, commercial/ industrial and environmental conservation, and remediation of the land for these purposes is required.

Photo 2.7 KP16.4, crossing location of the South Maitland Railway. View to south

Photo 2.8 View to southwest from KP16.5 of the buffer zone of former Hydro aluminium smelter. The South Maitland Railway is left (east) of the fence

Photo 2.9 KP17.9, HDD crossing location of Swamp Creek. View to the east

The HDD between KP18.7 and KP19.75 allows the alignment to traverse beneath remnant vegetation comprising the Kurri Sand Swamp Woodland endangered ecological community (**Photo 2.10**) and proposed as part of a stewardship area for the Regrowth Kurri Kurri development. This HDD also enables an Ausgrid easement containing multiple high voltage overhead power lines at KP19.3 (**Photo 2.11**) and an unnamed tributary of Black Waterholes Creek at KP19.7 to be crossed without surface disturbance prior to a short section of open trenched pipeline construction to reach the compressor station at KP20.1.

Photo 2.10 Remnant Kurri Sand Swamp Woodland west of the HDD workspace at KP18.7

Photo 2.11 KP19.4, easement hosting multiple overhead HV power lines. View to west

The alignment crosses the following roads and railway in this section:

- Main Road/Cessnock Road
- South Maitland Railway

The alignment crosses the following named watercourses in this section:

- Buttai Creek
- Wallis Creek
- Swamp Creek.

A single unnamed watercourse is crossed in this section.

2.2.2 Storage Pipeline Alignment

The storage pipeline is proposed to be located to the north of the HPP within buffer zone land of the former Hydro aluminium smelter. The proposed location of the storage pipeline is west of Wentworth Swamp, on land that has predominantly been previously cleared (**Photo 2.12**), as shown on **Figure 2.1F**. Review of historic aerial imagery indicates that the storage pipeline construction footprint was cleared by 1976 and maintained to be predominantly free of regrowth vegetation until at least 2001 (**Photo 2.13**).

Photo 2.12 Typical vegetation in the storage pipeline construction footprint. Predominantly cleared land, with areas of shrub regrowth and scattered mature trees

Photo 2.13 2001 aerial image of storage pipeline construction footprint, illustrating predominantly cleared land

The storage pipeline will require a total length of approximately 24 km. The final configuration of the storage pipeline is subject to detailed design, however the fundamental design concept being developed, and assessed in this EIS, comprises two primary storage pipeline loops each comprised of a series of internal sub-loops, as shown in **Figure 2.2**.

This design concept enables the length of the construction footprint to be significantly reduced, relative to a single pipeline, to approximately 2 km. The reduction in length allows surface disturbance impacts during construction to be concentrated into a localised area supporting primarily cleared and regrowth vegetation between Wentworth Swamp and large blocks of remnant vegetation to the west. The width of the construction footprint for the storage pipeline will depend on the final pipeline configuration and may be up to 175 m in width.

A single interconnect pipeline of DN350 diameter will provide a connection between the storage pipeline and compressor station and delivery station, a length of approximately 1.3 km. The DN350 interconnect pipeline will connect to the primary storage pipeline loops by an above ground connection header assembly comprised of above ground DN350 piping with individual loop isolation valves, and associated loading and venting arrangements.

The storage pipeline alignment crosses three unnamed watercourses and does not cross any roads or railways.

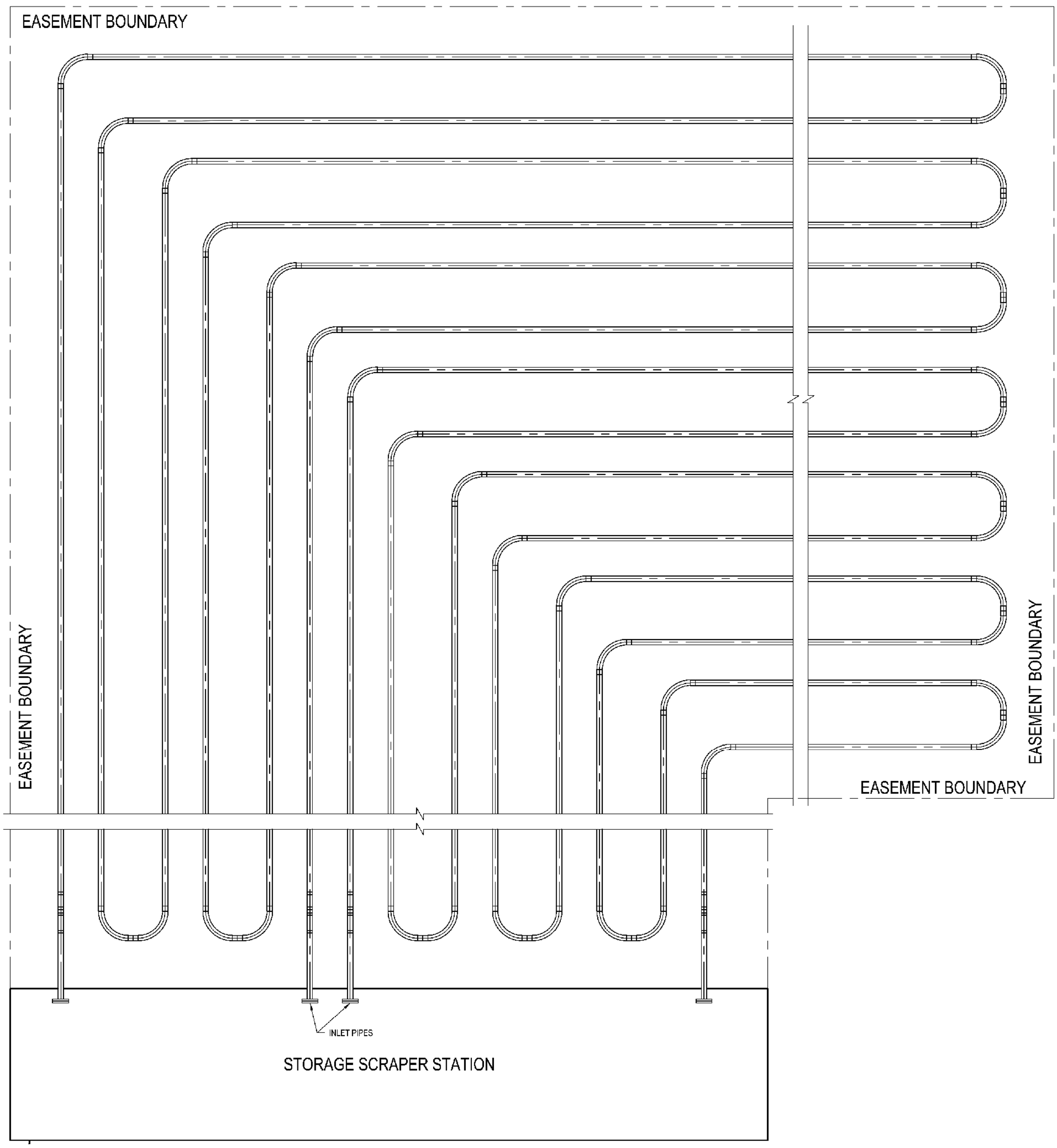
The DN350 interconnect pipeline crosses Black Waterholes Creek by HDD.

2.2.3 Associated surface facilities

The proposed locations of associated surface facilities are as follows, and as shown on **Figure 2.1A to 2.1F**:

- The JGN offtake facility is located on cleared grazing land at Lot 51 DP1158920, between Lenaghans Drive and the M1 Pacific Motorway (**Photo 2.1**).
- The compressor station and delivery station are located on the existing hard stand of the former Hydro aluminium smelter directly adjacent to, and within the project site of the HPP (**Photo 2.14**).

Photo 2.14 The former Hydro aluminium smelter site, where the compressor station and delivery station will be located



Note: Not to Scale

FIGURE 2.2

Storage Pipeline Design

Image Source: APA (2021) Data source:

2.3 Project Components

The transmission pipeline, interconnect pipeline and storage pipeline have varying characteristics required to fulfil separate functions, as described in the following sections. All pipelines, however, will be designed in accordance with the *Australian Standard (AS) 2885* and designed and constructed in accordance with the Australian Pipeline and Gas Association *Code of Environmental Practice 2017*. The AS 2885 series includes the following:

- AS 2885.0 Part 0 – Pipelines, Gas and liquid petroleum, General requirements
- AS 2885.1 Part 1 – Design and Construction
- AS 2885.2 Part 2 – Welding
- AS 2885.3 Part 3 – Operations and Maintenance
- AS 2885.5 Part 5 – Field Pressure Testing
- AS 2885.6 Part 6 – Safety Management Studies.

The design of the storage pipeline will also incorporate requirements of API 579-1:2016 Fitness-For-Service and BS 7910:2019 Guide to methods for assessing the acceptability of flaws in metallic structures to address stress intensity factors for fatigue design.

A summary of specifications for the transmission, interconnect and storage pipelines is provided in **Table 2.2**. Further details regarding pipeline design are outlined in the following sections. All specifications are subject to refinement during detailed design.

Table 2.2 Pipeline Specifications

	Transmission pipeline	Interconnect pipeline (compressor station to storage pipeline to delivery station)	Storage pipeline
Pipeline Length	Approximately 20.1 km	Approximately 1.3 km	Approximately 24 km
Nominal and outside diameter	DN350, 355.6 mm Outer Diameter (OD)	DN350, 355.6 mm OD	DN1050, 1067 mm OD
Material	High strength steel, Electric resistance welded (ERW)	High strength steel, Electric resistance welded (ERW)	High strength steel, submerged arc welded (SAWL)
Grade	Nominally API 5L PSL2 Grade X52	Nominally API 5L PSL2 Grade X52	Nominally API 5L PSL2 Grade X60
External coating	Fusion bonded epoxy, with abrasion resistant coating on pipe segments for HDD	Fusion bonded epoxy, with abrasion resistant coating on pipe segments for HDD	Fusion bonded epoxy
MAOP	6.9 MPag	15.3 MPag	15.3 MPag
Operational Capacity	Nominally up to 60 TJ per day	Included in 70TJ storage pipeline capacity	Approximately 70 TJ of useable gas storage
Wall-thickness	Standard wall 8.6 mm	Standard wall 12.7 mm	Standard wall 28 mm Heavy wall 31 mm
Pipe segment lengths	12 or 18 m	12 or 18 m	12 m

	Transmission pipeline	Interconnect pipeline (compressor station to storage pipeline to delivery station)	Storage pipeline
Number of pipe segments	Around 1,150 triple random lengths (18 m) and 15 pipe segments of double random lengths (12 m) for bends	Around 78 triple random (18m) pipe segments and 10 bend segments	Around 2,058 pipe segments and more than 50 bend segments
Typical construction footprint width	25 m	25 m	175 m
Typical easement width	Nominally 20 m	Nominally 20 m	Nominally 175 m

2.3.1 Transmission pipeline

The transmission pipeline will be constructed of high strength steel line pipe. The wall thickness of the pipe will be determined during detailed design and is likely to be 8.6 mm, as detailed in **Table 2.2**. This pipe wall thickness is considered suitable for road and river crossings, as per the requirements specified in AS 2885.

Pipe segments will be factory coated with fusion bonded epoxy or similar for corrosion protection purposes except at each end to allow welding. Post welding, the uncoated weld margins will be grit blasted and coated with spray applied epoxy.

2.3.1.1 Depth of Cover

The transmission pipeline will be buried for its entire length other than at surface facility locations.
At locations where the pipelines are potentially exposed to increased erosional forces, such as watercourse crossings and floodplains, additional protection will be provided by increased depth of cover. The transmission pipeline would also be buried deeper beneath roads and watercourses. Larger watercourses that are highly likely to hold water during construction will be crossed using horizontal directional drilling (**Section 2.8.1.8**).

Minimum depths of cover for the transmission pipeline, measured from top of pipe to ground level, are summarised in **Table 2.3**. These minimum depths are based on AS 2885 requirements, including location classification analysis.

Table 2.3 Minimum Depth of Cover (mm)

Location	Depth of Cover
Typical	900 mm
Road crossings	1,200 mm
Watercourse crossings	1,500 mm
Rail crossings	2,000 mm

2.3.1.2 Scraper Stations

The routine operation of gas pipelines requires the periodic running of a pipeline inspection gauge (PIG) to clean and/or inspect the internal wall surface. The PIG is loaded into an unpressurised launcher vessel at a scraper station, which is closed and pressurised to equal the pipeline pressure. The PIG is then sent down the pipeline using the flowing gas as the driving force. The PIG is collected by a receiver vessel at a downstream scraper station. The receiver vessel is isolated, depressurised and opened to retrieve the PIG.

Scraper stations with a PIG launcher/receiver will be located at the JGN offtake facility and the compressor station. Pipe work to enable connection of a portable or permanent PIG launcher/receiver at the storage pipeline above ground connection header assembly will also be considered during detailed design.

The final design configuration will enable the transmission pipeline and the DN350 interconnect pipeline to the storage pipeline to be inspected during its' operational life. A photograph of a typical scraper station is shown in **Photo 2.15**.

Photo 2.15 Photograph of a scraper station

2.3.1.3 Mainline Valve

A MLV is an above ground facility comprised of an in-line buried block valve that can be closed to isolate sections of the transmission pipeline for maintenance or during emergency conditions. MLVs are designed for either manual or remote activation depending on the outcomes of safety studies undertaken in accordance with AS 2885.

The Project will require one MLV, proposed to be located between KP10.5 and KP12.5. The exact location of the MLV is subject to confirming design requirements and consultation with landholders.

A maximum temporary disturbance footprint of 25 m x 40 m will be required for the construction of the MLV, contained within the construction footprint of the transmission pipeline. The final permanent footprint of the MLV will be approximately 12 m x 18 m and fully contained within the pipeline easement. The MLV would be located on a hardstand area with a chain wire fence on the perimeter. The MLV will have venting apparatus for emergency use.

A photograph of a typical MLV is shown in **Photo 2.16**.

Photo 2.16 Photograph of a typical MLV

2.3.1.4 Cathodic protection

The primary corrosion protection system for the transmission pipeline will be an external coating. Each pipe length will be coated with fusion bonded epoxy or similar for corrosion protection purposes except at each end to allow welding. Post welding, the uncoated weld margins will be cleaned and coated with spray applied epoxy.

One hundred percent integrity testing will be undertaken on the coating in both the factory and just prior to being installed in the trench to ensure the integrity of the coating. In addition, a Direct Current Voltage Gradient (DCVG) survey will also be completed following completion of construction to further verify coating integrity. DCVG involves traversing by foot over the top of the pipeline and measuring the voltage gradient in the soil using a pair of probes.

As a secondary protection against corrosion, a sacrificial anode cathodic protection system (SACP) or impressed current cathodic protection system (ICCP) will be used, depending on detailed design. A SACP system uses a sacrificial anode, connected by metallic conductors to the pipeline, as a source of electrons that are preferentially consumed to prevent corrosive reactions occurring on the pipeline surface. The ICCP system utilises an external source to apply an electrical current through the environment and on to the pipe. These current changes the environment around the pipe to prevent a corrosive reaction occurring on the pipeline surface.

If a SACP system is implemented, anode beds will be required at points along the alignment of the pipeline and will typically be located in proximity of the proposed associated surface facilities. Each anode bed would include a rectifier, buried sacrificial anodes and solar panel for power supply, and would need to be offset from the pipeline by around 100 m. Buried sacrificial anodes employed as part of the CP system are typically made of magnesium or zinc.

Upstands for monitoring of the CP system will be required at approximately 2 km spacing along the transmission pipeline. An upstand consists of a small metal box on a post which contains a terminal for monitoring the CP system. Upstands are typically located at sealed roads and fence crossings, or similar locations which provide access for monitoring.

Interfaces with existing infrastructure such as fences, pipes and HV towers are considered during the detailed design of the CP system to prevent any unintended interface issues. Inspection of the CP system will typically be undertaken annually in accordance with AS 2832 *Cathodic protection of metals Pipes and cables*. The effectiveness of the CP system will be monitored and supplementary measures, such as additional anode beds, may be required over the life of the pipelines.

2.3.1.5 Marker signs

Pipeline marker signs, as shown in **Photo 2.17**, will be installed along the length of the transmission pipeline, to indicate the pipeline location in accordance with AS 2885.1.

Photo 2.17 Typical pipeline marker sign

The markers will be placed at a frequency to ensure continual line of sight along the alignment and will also be located at any bends, at property boundary fences and either side of crossings such as roads or watercourses.

Text on the signs will describe the presence of a high-pressure gas pipeline and provide the name and contact details of the operator.

2.3.1.6 Mine subsidence considerations

The transmission pipeline traverses three mine subsidence districts, as follows:

- Black Hill, between KP1.4 and KP4.6
- Louth Park, between KP10.9 and KP14.4
- Maitland West, between KP14.6 and KP15.9

In these areas the transmission pipeline will be designed and constructed, in consultation with Subsidence Advisory NSW, to ensure the pipeline is capable of withstanding subsidence, strains and tilts associated with nearby planned and/or previous underground mining activities.

2.3.1.7 Electricity transmission easements

The transmission pipeline alignment crosses active high voltage electricity transmission easements in four locations. High voltage electrical transmission infrastructure has the potential to affect the safe construction, operation and maintenance of the transmission pipeline due to potential induction effects, and power line fault conditions. Appropriate pipeline cathodic protection and current mitigation measures would be provided as required to ensure the safety of the pipeline and maintenance staff. A detailed assessment would be conducted during the detailed design phase to ensure compliance with relevant Australian Standards and confirm whether the installation of discrete and/or continuous earthing points along the pipeline is necessary.

2.3.2 Storage Pipeline

The storage pipeline will provide around 70 TJ of useable gas storage, at operating pressures of between approximately 4,700 and 15,320 kPag. This will provide sufficient gas supply for the HPP to operate at full output for up to 10 hours. It is also proposed to configure the offtake facility and delivery station so that gas can flow from the storage pipeline back to the east coast grid via the JGN offtake facility and Sydney to Newcastle Pipeline.

The design concept being developed for the storage pipeline comprises two primary storage pipeline loops each comprised of a series of internal sub-loops, as shown in **Figure 2.2**. The total storage capacity of the storage pipeline will be shared between the two primary loops on an approximate 50% basis. This design concept allows for each primary loop to be constructed, commissioned and operated separately. The key benefits of this approach are as follows:

- Minimise requirements for above ground pipework to connect pipeline loops.
- Better align Project scheduling with the commencement of HPP operations, by requiring only the construction and commissioning of a single primary loop to prior to provision of a gas supply.
- Allow either primary loop to be isolated during operations, so that maintenance can occur whilst still maintaining a gas supply to the HPP.

Due to the nested nature of the pipeline loops, they need to be constructed in a specific planned sequence.

As with the transmission pipeline, the storage pipeline will be constructed of high strength steel line pipe and coated with fusion bonded epoxy or similar for corrosion protection. Wall thickness is likely to range from 28 mm to 31 mm, as detailed in **Table 2.2**.

2.3.2.1 Depth of cover

The storage pipeline will be buried for its entire length, other than at the above ground connection header assembly. At locations where the pipelines are potentially exposed to increased erosional forces, such as watercourses and floodplains, additional protection will be provided by increased depth of cover.

Minimum depths of cover for the storage pipeline, measured from top of pipe to natural ground level and based on AS 2885 requirements, are summarised in **Table 2.4**.

Table 2.4 Minimum Depth of Cover (mm)

Pipeline specifications	Storage Pipeline
Typical (per AS 2885)	900 mm
Watercourse crossings	1,500 mm

2.3.2.2 Cathodic protection

The storage pipeline will be protected from external corrosion by the external coating and an impressed current system. The system will also accommodate the need to mitigate stray currents from any parallel electricity transmission lines, in accordance with AS 4853 *Electrical hazards on metallic pipelines*.

Cathodic protection test points will be installed along the storage pipeline at approximately 1 km intervals, subject to detailed design. Insulated joint test points with reference electrodes will be installed at the pipeline insulating joints.

2.3.2.3 Integrity inspections

The routine cyclic operation of gas storage pipelines requires the periodic inspection by either a PIG or by hydrotesting to certify that the pipeline is fit for service. Integrity inspections during the operational life of the storage pipeline are proposed to be undertaken every 7 to 10 years.

2.3.2.4 Fencing and marker signs

The operational easement for the storage pipeline will encompass an area of approximately 34 ha. The operational easement may be fenced with a typical four strand wire stock fence or similar, based on consultation with the landholder.

The above ground connection header assembly will be fenced with ring lock mesh with multiple barbs type wire or similar security fencing.

Pipeline marker signs will also be installed in accordance with AS 2885.1.

2.3.3 Pipeline Design Considerations for Hydrogen

The transmission pipeline will be designed, constructed and commissioned in accordance with the requirements of *ASME B31.12-ASME Design code for Hydrogen Piping and Pipelines*, in order to maintain readiness for potential use of hydrogen in the east coast gas network. There is currently a high level of uncertainty with regard to means and the timeline in which the SNP and associated gas network would be able to convey hydrogen blended natural gas.

With regards to the gas storage pipeline, a significant increase in capital expenditure would be required to construct the storage pipeline for it to be capable of storing a hydrogen blended fuel. This is due to the dimensions of the gas storage pipeline, and construction materials and methods required to mitigate the increased embrittlement of pipeline material when storing a hydrogen blended fuel. Snowy Hydro have advised that the associated level of capital expenditure would be uneconomic, and consequently the storage pipeline will not be built to specifications that would enable it to store hydrogen blended fuel.

Snowy Hydro have also advised that the HPP will remain hydrogen ready through the allocation of sufficient land for the looping of the storage bottle using design and construction methods in accordance with the requirements of *ASME B31.12-ASME Design code for Hydrogen Piping and Pipelines*, together with the transmission pipeline already constructed to this standard. This modification to the storage bottle would be subject to a later submission for planning approval, initiated when the economics of delivering a hydrogen blended gas fuel allow, and when hydrogen blended fuel is received from the SNP.

2.3.4 Associated Surface Facilities

As noted in **Section 1.2**, the Project will require the construction of the following surface facilities to support the operation of gas transmission, interconnect and storage pipelines:

- JGN offtake facility — to control the flow of gas between the storage pipeline and the SNP via the delivery station and transmission pipeline.
- Compressor station – to increase gas pressure prior to delivery to the storage pipeline. Located at the termination of the transmission pipeline.
- Delivery station — to receive gas from the storage pipeline and control temperature, pressure and flow rate for delivery of gas to the HPP. Located adjacent to the HPP.

These facilities are further described in the sections below.

In addition to these facilities, a facility to control the flow of gas between the east coast grid and the transmission pipeline will be required, referred to as the JGN delivery facility. Located near the connection of the transmission pipeline and the existing SNP, the JGN delivery facility will be constructed and operated by Jemena. This facility will enable Jemena to meet regulatory obligations regarding transfer of gas between the SNP and the transmission pipeline. Jemena would be responsible for the design, planning approvals, construction and operation of this facility, as well as the approximately 600m section of piping to connect the facility to the SNP.

2.3.4.1 JGN offtake facility

The JGN offtake facility is an above ground facility that will provide an interface between the JGN delivery facility and the Project, and monitors and regulates the flow of gas from the Project back into the SNP. The JGN offtake facility will operate when gas is flowing from the storage pipeline back into the SNP via the transmission pipeline.

Infrastructure at the JGN offtake facility will include the following:

- PIG launcher/receiver
- Dry gas filters
- Gas chromatograph

- Flow metering
- Flow/pressure control and isolation valves
- Venting apparatus (for both maintenance and emergency use).
- Control hut, with Station Remote Terminal Unit (RTU) and associated communications.

The JGN offtake facility would be automated and designed so that it is capable of operating unmanned under normal operating conditions.

It is likely that that the site will be monitored by two technicians on-site during daylight hours, and available for 24 hour call out to site as required.

Lighting would be provided for security and emergencies at the facility as required.

The JGN offtake facility will require a construction disturbance footprint of 0.4 ha, and an operational area of approximately 0.2 ha. A schematic depicting the typical layout of the offtake station is provided in **Figure 2.3**.

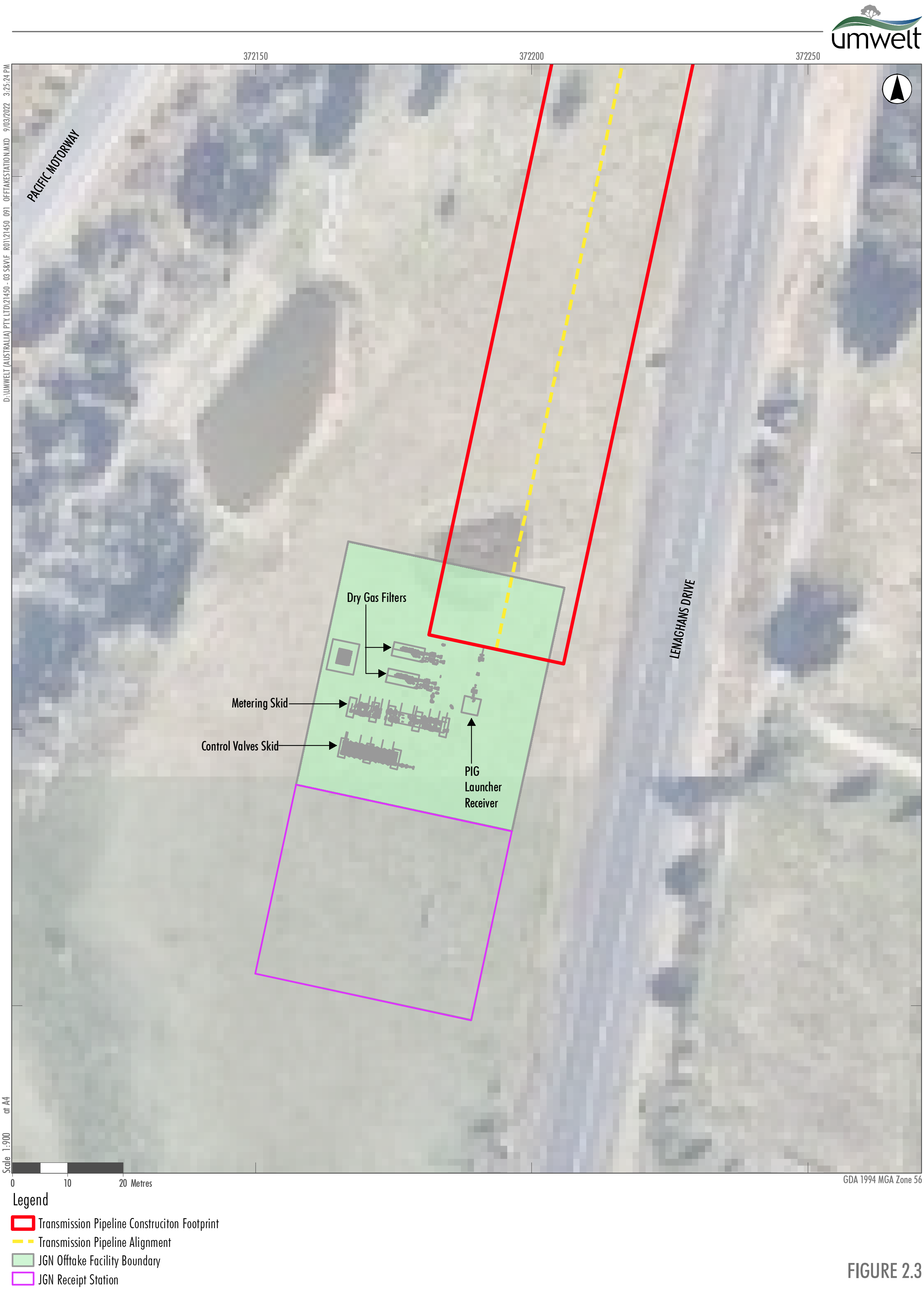


FIGURE 2.3

Schematic of a Typical Layout for the Offtake Station

Image Source: Nearmap (2021) Data source: APA (2021)

The total operational area required for the co-located APA and Jemena offtake and delivery facilities is estimated to be around 0.3 ha.

A combined APA and Jemena facility with capacity for bi-directional flow would reduce the overall disturbance footprint required for separate offtake and delivery facilities. Such a design was investigated and determined to be unsuitable for the Project. This was primarily because this configuration would not comply with receipt and metering requirements specified by the Australian Energy Regulator, as prescribed in the Access Arrangements for this section of the east coast grid. Modifications to the Retail Market Procedures published by AEMO would also be required to operate a combined facility with bi-directional flow.

2.3.4.2 Compressor station

The compressor station is an above ground facility that will receive and compress gas from the transmission pipeline, prior to transfer to the storage pipeline at a higher pressure. The compressor station will be located directly adjacent to the HPP.

The compressor station is proposed to consist of two reciprocating compressor units (which use pistons to compress the gas), operating on a 2 x 50% arrangement. The compressors station will receive gas from the transmission pipeline at pressures between 1,500 to 5,000 kPag and discharge gas to the storage pipeline at pressures between 4,700 to 15,320 kPag. The compressor station will enable the storage pipeline to be recharged with approximately 70 TJ of gas over a 33hour period.

The compressors will be electrically driven with a power demand of up to 7.5 MW. Electrically driven compressors are typically more efficient and reliable than gas driven compressors, as well as having significantly lower noise emissions and negligible air emissions.

The compressor station will require a high voltage power supply to provide the required power demand. This power supply is proposed to be supplied by connection to the HPP station services switchboards at 6.6kV by underground cable distribution feeders within the HPP building envelope. The high voltage supplies will be distributed internally within the compressor station by dedicated high voltage switchgear located within a high voltage substation building.

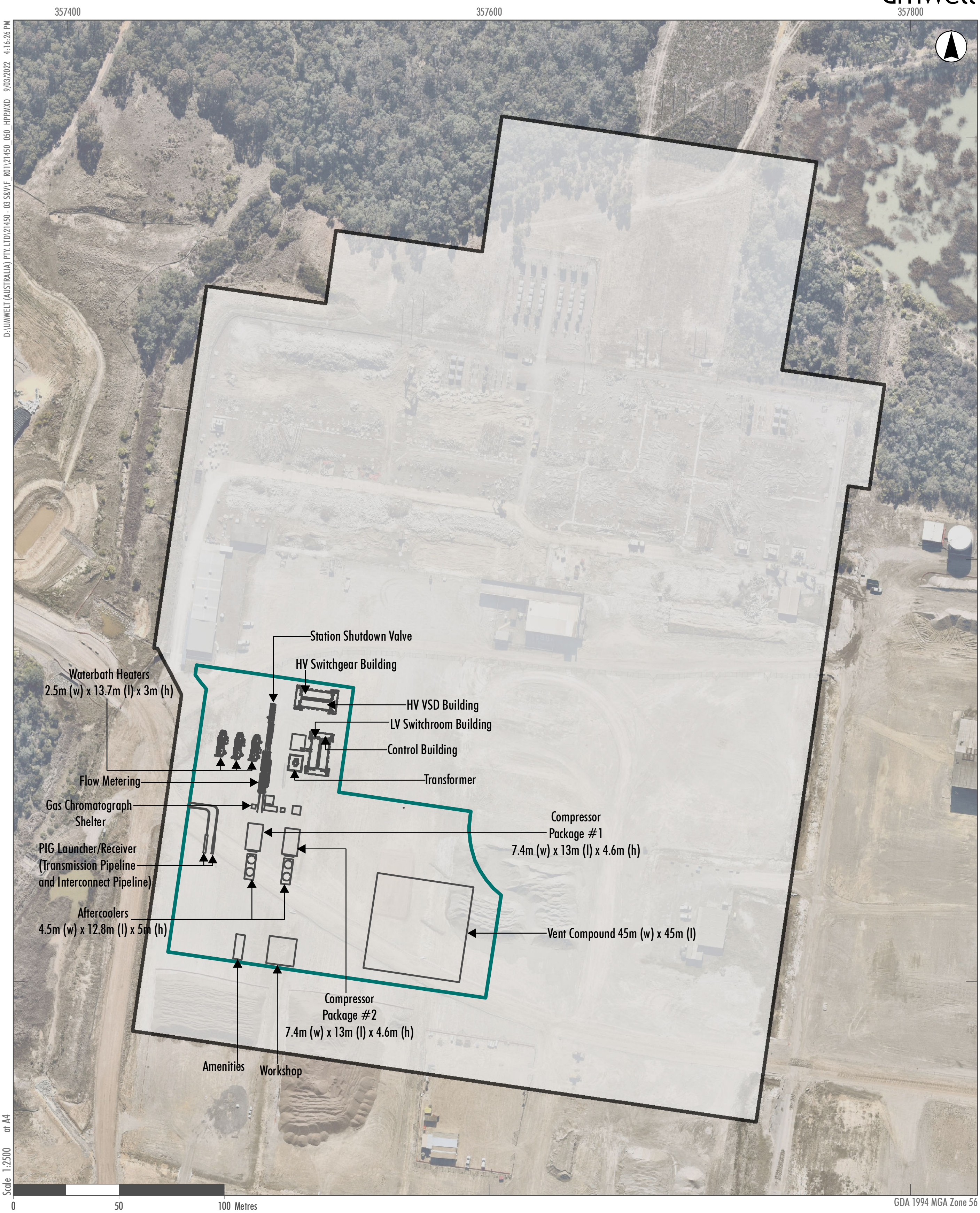
Low voltage equipment will be supplied by an internal distribution transformer, supplied from the high voltage switchgear. The low voltage switchgear and ancillaries will be located within switchrooms as required. An emergency low voltage supply will also be provided to the compressor station for critical loads from the HPP essential services supply.

The compressor station will be co-located with the delivery station within a site of approximately 1.6ha. A compound housing a cold vent stack will located adjacent to the compressor station. The vent stack will be available for use during operations, maintenance and emergency situations.

The compressor station would be automated and designed so that it is capable of operating unmanned under normal operating conditions.

It is likely that that the site will be monitored by two technicians on-site during daylight hours, and available for 24 hour call out to site as required.

Lighting would be provided for security and emergencies at the facility as required. The layout of the compressor station is provided in **Figure 2.4**.



Legend

HPP Proposal Site

Compressor and Delivery Station

FIGURE 2.4

Layout of the Compressor Station and Delivery Station

Image Source: Nearmap (August 2021) Data source: APA (2021)

2.3.4.3 Delivery Station

The delivery station is an above ground facility to control delivery of gas from the storage pipeline to the HPP. The delivery station monitors and regulates the temperature, pressure and flow rate of gas exiting the storage pipeline to meet the delivery specifications of the HPP. Note that the delivery station is referred to in the HPP EIS as the 'gas receiving station'.

Gas temperature is proposed to be controlled using three water bath heaters, in a 3 x 50% configuration, on 2 duty/1 standby arrangement. Each water bath heater would be approximately three metres high, excluding the vent outlets. The energy source for the water bath heaters is proposed to be process gas sourced from the storage pipeline.

Multiple parallel control valves would control the pressure and flow rate of gas from the water bath heaters into the HPP. The control valves would reduce the pressure from the storage pipeline operating pressure to the lower HPP operating pressure. In the event of an equipment failure, overpressure protection safeguards are in place.

Custody transfer metering would be installed as part of the delivery station to measure the energy flow of gas being delivered to the HPP.

A vent stack for use during operations, maintenance and emergency situations would be shared with the compressor station. The vent stack may also be used during occasional maintenance of the storage pipeline.

In addition to HPP supply, the delivery station would also connect to the transmission pipeline to enable flow of gas from the storage pipeline back into the SNP and therefore the east coast grid. Flow direction would be controlled by on/off switching. Currently, gas being supplied to the NSW load centres (spanning Newcastle to Wollongong) must be imported via the Eastern Pipeline or the Moomba to Sydney pipeline. During periods of tightness in the NSW gas market having a storage pipeline that can inject gas back into the network will help provide greater gas system security and will help with managing the peaks in NSW gas customer demand.

The delivery station would be automated and designed so that it is capable of operating unmanned under normal operating conditions. It is likely that that the site will be monitored by two technicians on-site during daylight hours, and available for 24 hour call out to site as required. Lighting would be provided for security and emergencies at the facility as required. The layout of the delivery station is provided in **Figure 2.4**.

2.3.4.4 Vent Compound

The vent compound adjacent to the compressor station and delivery station is proposed to comprise a 45 m x 45 m fenced area surrounding a vent stack. The vent stack is likely to comprise DN250 pipe (approximately 27 cm diameter) with a height of no greater than 30 m.

The primary purpose of the vent compound and vent stack is to provide a safe mechanism for depressurising the compressor station in the event of an emergency shutdown. The proposed dimensions of the vent compound and vent stack have been designed to meet safety requirements specified in AS2885 for this worst case emergency shutdown scenario. The vent stack may also be used during maintenance activities for the compressor station, delivery station, interconnect pipeline and storage pipeline, or during emergency venting of the transmission pipeline.

2.3.5 Oily water and stormwater management

Equipment and machinery at associated surface facilities that contain potential contaminants (such as fuel, oil, grease and chemicals) will be covered and/or bunded in accordance with relevant Australian Standards to prevent contaminated runoff leaving the site. Runoff captured in bunded areas will be disposed offsite at appropriately licenced facilities.

The hardstand footprint of associated surface facilities outside of covered and bunded areas will be designed to appropriately manage stormwater runoff in accordance with relevant standards as follows:

- Best Practice Erosion and Sediment Control (IECA 2008)
- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) (blue book)
- Managing Urban Stormwater, Soils and Construction Volume 2A Installation of Services (DECC 2008).

Typically, these hardstand areas will comprise an appropriately graded and stabilised sub-base covered with gravel sheeting. Erosion and pollution control principles that will be applied to hardstand areas will follow the “treatment train” approach and seek to avoid the additional disturbance and risks to shallow groundwater associated with sediment control basins, wherever practicable.

Basic stormwater control principles will include:

- separate oily water and stormwater catchments
- avoid changes to existing flow paths wherever practicable
- divert upslope runoff around hardstand areas
- minimise hardstand footprint
- minimise sediment generation by appropriately stabilising and sheeting hardstand areas
- implement scour protection where flow concentrations cannot be avoided
- appropriate primary treatment of stormwater prior to release, where required
- selection of appropriate stormwater release locations.

2.3.6 Temporary Ancillary Facilities

A range of temporary facilities will be required during the construction phase of the Project, as described in the following sections.

2.3.6.1 Pipe Laydown Areas

Laydown areas will be used to store pipe segments for the transmission pipeline, interconnect pipeline and storage pipeline following delivery to the Port of Newcastle and prior to delivery to construction areas. A single laydown area of 1 ha is proposed to store transmission pipeline pipe segments. Two laydown areas providing a total area of 4 ha are proposed to store storage pipeline pipe segments. Proposed laydown area locations are shown in **Figure 2.1A to 2.1F**.

Further information on the importation of pipes and transport to site is detailed in **Section 2.8.3.1**.

2.3.6.2 Access Tracks

Equipment and personnel will require daily access to the ROW and worksites during construction. Access to the ROW will generally be achieved through a combination of local roads and the ROW as a thoroughfare, where appropriate.

Use will also be made of access tracks across private property where suitable access to the ROW is constrained or there is a lack of public roads in the vicinity. The requirement for any additional access tracks will be assessed in consultation with landholders as site-specific access requirements along the alignment are identified.

Twelve access tracks are proposed for use during construction, located as described below and shown on **Figure 2.1A to 2.1F**.

- Construction of 70 m of access track from Lenaghans Drive to the transmission pipeline ROW north of the JGN Offtake Facility.
- Construction of 50 m of access track from Black Hill Road to the horizontal bore workspace on the southern side of Black Hill Road.
- Construction of 60 m of access track west from Black Hill Road to the transmission pipeline ROW across the M1 Pacific Motorway road reserve.
- Use of existing sealed haul roads associated with the Abel Coal Mine (under care and maintenance) and the rehabilitated Donaldson Coal Mine.
- Use of 600 m of existing access track at Buchanan Road entrance to the Bloomfield Coal Mine
- Construction of 660 m of access track at the Buttai Creek crossing.
- Construction of 400 m of access track from Valley View Lane to the western side of Buttai Creek.
- Construction of 200 m of access track and refurbished culvert crossing at the Wallis Creek crossing.
- Use and, where required, upgrade of 1,490 m of existing access tracks from Main Road to the crossing point of South Maitland Railway
- Upgrade of 940 m of existing access tracks between Dickson Road and the HDD entry and exit points directly north of the former aluminium smelter site.
- Upgrade of 170 m of existing access track to connect the storage pipe laydown area with the access track described below.
- Use and, where required, upgrade of 3,600 m of existing access tracks from Hart Road, along HV power easements and Bishops Bridge Road, to the storage pipeline construction footprint.

Construction or upgrade of the above access tracks will be undertaken to a suitable all-weather standard for heavy vehicles with typically a 6 m wide surface and where required gravel sheeting, such as in areas subject to ponding. Design of access tracks will be undertaken as necessary in consultation with the relevant landholder. APA will seek agreement from landholders to grant suitable access rights to these tracks for construction access and ongoing operational access where required.

2.3.6.3 Additional Workspaces

Construction laydown area adjacent to compressor station

A construction laydown area, or areas, of up to 5 ha will be required adjacent to the compressor station and delivery station during the construction of these facilities for storage of equipment and materials. The construction laydown area will be located on existing hardstand of the former Kurri Kurri aluminium smelter between the pipe laydown area and the compressor station. The exact location of the laydown area or areas is subject to ongoing discussions between APA and Snowy Hydro, Hydro Aluminium and the Regrowth Kurri Kurri project, as all of these stakeholders have an interest in the use of this land during the construction period. As the exact location of the construction laydown area has not been finalised it is not shown on maps of the Project construction footprint presented in this EIS. The 5 ha area, however, is accounted for as part of the compressor station and delivery station construction footprint in all area calculations throughout the EIS.

Cleared Vegetation Stockpiles

Additional workspaces are required adjacent to heavily vegetated sections of the alignment to store felled vegetation and/or mulch which cannot be accommodated on the ROW. These additional workspaces will require a footprint of 50 m x 50 m in addition to the ROW. Six locations for cleared vegetation stockpiles have been identified as shown in **Figure 2.1A to 2.1F**. Three of these locations are located on land approved for the Stevens Group Hunter Business Park industrial development, and so will be located on land that has been approved for clearing. These three vegetation stockpiles will not be required if clearing for the industrial estate occurs prior to pipeline construction.

Truck Turnarounds

Truck turnarounds are turning bays that are required along the ROW to allow trucks delivering pipe and other materials to be able to turn around and return to an appropriate exit point. Twelve truck turnarounds are proposed to be located approximately every 2 km along the alignment unless there are accessible intersecting roads, as indicated on **Figure 2.1A to 2.1F**. Truck turnarounds will be an additional 15 m width of the ROW for a length of about 50 m.

Horizontal Directional Drilling Entry and Exit Points

HDD is generally used for the crossing of watercourses with permanent water where standard open cut methods are less preferable due to width of crossing, volume of water present or other environmental considerations. HDD may also be used for road or railway crossings as an alternative to boring. Further details on HDD, including indicative locations, are contained in **Section 2.8.1.8**.

Work areas at the HDD entry (drill site) and exit points are required on either side of the feature being crossed. The entry and exit point of each HDD will generally require a disturbance footprint of approximately 20 m x 50 m and 15 m x 50 m respectively, in addition to the ROW.

Trenched/Bored Crossings

Crossings of watercourses and roads not requiring HDD will be constructed by open cut trenching or horizontal boring.

Unsealed roads and minor watercourses will typically be crossed using open cut trenching. Sealed bitumen roads and rail lines will typically be crossed by horizontal boring.

Horizontal boring involves construction of a bell hole either side of the crossing with a horizontal bore hole for installation of the pipeline beneath sensitive surface features. The additional disturbance footprint required for horizontal boring crossings would generally be an area of approximately 5 m x 50 m adjoining each side of the ROW.

2.3.6.4 Hydrotesting

Hydrotesting of the transmission, interconnect and storage pipelines, as further described in **Section 2.3.6.4**, will require water storages to be constructed near the break point of each hydrotest section. Water storages are likely to be break tanks located on the ROW near the centre of the transmission pipeline, near the compressor station if the existing reticulated water supply to the former Hydro smelter is used as a water source, and a turkeys nest dam located near the centre of the storage pipeline construction footprint. The turkeys nest dam may be retained following construction. The estimated area required for the turkeys nest storage is 1.2 ha.

2.4 Land Requirements

Construction of the Project would require an estimated of 103 ha of land. Of this, approximately 50 ha is required for construction of the transmission pipeline including extra workspaces, approximately 35 ha for construction of the storage pipeline and turkeys nest dam, approximately 7 ha for associated surface facilities **(including a laydown area of approximately 5 ha adjacent to the compressor station and delivery station)**, approximately 4 ha for pipeline laydown areas and approximately 8 ha for access tracks.

During operations the Project would require an estimated 2 ha of land.

The estimated land requirements for construction and operational phases of the Project are outlined in **Table 2.5**.

Table 2.5 Estimated Disturbance Area

Infrastructure	Disturbance Area (ha)	
	Construction	Operations
Transmission pipeline ROW	43.5	0
Mainline valve (MLV)	0.1[2]	0.02
Extra workspaces (truck turnarounds, vegetation storage, HDD and bore entry and exit workspaces, watercourse crossing workspaces)	6.0	0
Access Tracks	8.0[3]	0[4]
Pipeline Laydown Areas	4.0	0
Storage pipeline construction footprint	33.6	0
Turkeys Nest Dam	1.2	0
JGN Offtake facility	0.4	0.2
Compressor station and delivery station	1.6	1.6
Laydown area adjacent to compressor station and delivery station	5.0	0
Total	**103**	**2**

[2] MLV footprint contained within disturbance footprint of the transmission pipeline ROW

[3] Sealed mining haul roads are included in the construction footprint

[4] Access easements over temporary access tracks for permanent operational access may be sought following consultation and negotiation with landholders. Final operational footprint dependent on outcomes of negotiations

2.5 Expenditure

The estimated capital investment value for the Project is $ 264 million.

2.6 Project Schedule

The schedule provided in **Table 2.6** is indicative and will be confirmed based on a final investment decision.

Table 2.6 Indicative Project Schedule

Milestone	Target Date
Environmental assessment and approvals	Q2 2021-Q4 2022
Design and procurement	Q1 2021-Q3 2022
Project construction	Q4 2022 – Q3 2023
Project commissioning and operations	Q4 2023

2.7 Alignment Changes Post-EIS Approval

It is likely that minor changes to the transmission pipeline alignment and storage pipeline construction footprint would be required post-EIS approval as a result of both ongoing landholder negotiations and the outcomes of detailed design activities. These changes will be undertaken in accordance with the alignment refinement process as outlined in **Section 5.3.4**.

2.8 Construction Methodology

2.8.1 Transmission and storage pipelines

Construction of both the transmission, interconnect and storage pipelines will use typical methods for modern gas pipelines. Given the larger diameter pipe required for the storage pipeline, there will be some differences in construction methodology relative to the transmission pipeline. Notably construction equipment will be larger, the construction rate will be slower and welding and weld testing methods appropriate for the increased wall thickness will be implemented. The construction footprint for the storage pipeline will also be cleared and reinstated incrementally to match construction progress, and to minimise the area of exposed ground during construction.

The construction sequence is shown in **Photo 2.18**, and will involve the following key steps, which are described in greater detail in subsequent sections:

- Preliminary survey works (including geotechnical surveys, installation of temporary gates in fences)
- Clearing of vegetation and grading the ROW
- Stripping and stockpiling of topsoil
- Delivery of pipe segments to the ROW and welding into 'strings'
- Non-destructive testing (NDT) and coating of welds
- Excavating a trench and any necessary bell holes in which to lay the pipe
- Lowering the pipeline strings into the trench and welding strings together
- Backfilling the trench with excavated material

- Crossing watercourses and roads by open cut trench, horizontal boring or HDD methods
- Installing pipeline markers at fences, road crossings and other locations as required by AS 2885
- Testing the structural integrity of the pipeline by hydrostatic testing
- Installing permanent gates in fences, where required
- Rehabilitating the construction footprint.

A typical layout for the construction ROW is shown in **Photo 2.19**.

Photo 2.18 Typical construction sequence

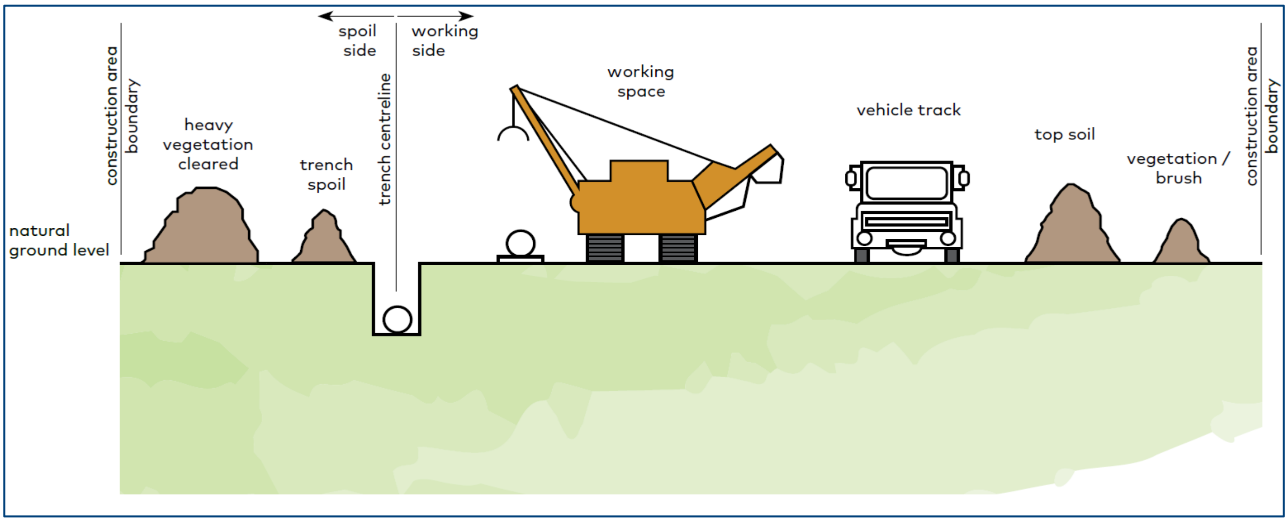


Photo 2.19 Typical layout for the construction Right of Way

2.8.1.1 Preliminary Survey Works

Preliminary survey works will be undertaken to mark the extent of approved work areas. Markers will be placed along the alignment to identify the pipeline centreline, the boundaries of the ROW, any additional workspaces and access roads, if required.

Fencing crossing the ROW will be strained and cut and temporary gates and fencing will be installed.

2.8.1.2 Clearing and Grading

Clearing and grading of the construction footprint will be undertaken to provide a safe and efficient area for construction activities. Clearing will be required to remove trees, shrubs and groundcover vegetation. Graders, bulldozers and excavators are generally used to clear and level the construction footprint. A ROW width of 25 m will generally be cleared and graded for the transmission pipeline, and up to 175 m for the storage pipeline.

In areas of woody vegetation, trees and shrubs will be mulched or stockpiled as cleared. The method will depend upon the type and density of the vegetation. Rootstock of trees will generally be removed. Large rocks, hollow bearing logs and large tree stems removed from areas of woody vegetation will generally be stockpiled for later respreading as part of the rehabilitation process.

Ground cover vegetation in areas supporting native or derived grasslands will generally be removed by bulldozers or graders. Cleared vegetation will be stockpiled on one or both sides of the ROW. Breaks will be left in stockpiled vegetation to allow continued access for stock, fence lines, tracks and drainage lines.

Topsoil will be stripped to depths defined by soil surveys, typically over the full width of the ROW. In soil types with topsoil depth of 30 cm or greater, the stripping depth may be reduced to ensure stockpiles can be accommodated within the ROW width. Topsoil will be stripped to the full depth above the trench to avoid mixing with subsoil. Stripped topsoil will be stockpiled on one or both sides of the ROW adjacent to vegetation stockpiles.

Access tracks, pipe laydown areas and extra workspaces will be constructed during the clear and grade phase.

Setting up temporary facilities such as work areas for equipment and pipe delivery and storage, borrow pits and access tracks, if required, would be undertaken during this phase.

The width of the construction ROW can be reduced in areas supporting sensitive environments and/or watercourses to minimise disturbance to these features. In some cases, due to the presence of areas of high ecological significance or other constraints, the pipeline will be constructed using alternative construction techniques such as HDD or horizontal boring, to avoid construction disturbance within the sensitive area.

The construction footprint for the storage pipeline will be cleared and reinstated in a number of discrete sections, as construction work progresses. This will enable the area of vegetation removal and exposed soil to be restricted to the current area of construction, with a subsequent reduction in erosion and sedimentation risks.

2.8.1.3 Pipe Stringing and Bending

Stringing involves distributing pipe segments along the ROW in preparation for welding.

Pipe segments will generally be transported to the ROW from pipe laydown areas by extendable semi-trailers. Pipe segments will be lifted from trucks by excavators, side-booms or cranes fitted with lifting hooks or vacuum lifters and laid adjacent to the marked trench location in a defined order. Pipe segments will be positioned on wooden skids and sandbags to protect the pipe coating from damage.

Where required, transmission pipeline pipe lengths will be bent using a hydraulic bending machine to match changes in either elevation or direction of the alignment.

Due to the large pipe diameter of the storage pipeline, bends will be manufactured at the manufacturing facility prior to sections being transported to site.

2.8.1.4 Welding

Specialised construction crews will weld pipe segments together manually or using an automated welding process. Manual welding will likely be used for the transmission pipeline whereas automated welding will primarily be used for the storage pipeline.

Pipe segments will be welded into strings of up to approximately 1,000 m in length for the transmission pipeline and approximately 200 m in length for the storage pipeline. Breaks in welded strings for stock and landholder will be provided where required.

All welds will be subjected to 100% NDT by x-ray analysis, ultrasonic testing or other methods to check structural integrity. Non-compliant welds will either be repaired or replaced.

Following welding, the weld joints will be cleaned by grit blasting with garnet. An external coating (compatible with the factory applied external coating) will be applied to the weld to prevent corrosion.

2.8.1.5 Trench Excavation

A wheel trencher, rocksaw or excavator will be used to dig the trench to lay the pipelines in. Trenches for the transmission pipeline will be excavated to a depth of approximately 1,350 mm to achieve a depth of cover of 900 mm and approximately 1,950 mm to achieve a depth of cover of 1,500 mm. Trenches for the storage pipeline will be excavated to a depth of approximately 2,100 mm to achieve a depth of cover of 900 mm and approximately 2,700 mm to achieve a depth of cover of 1,500 mm.

Spoil generated during trench excavation will be stockpiled on the nonworking side of the ROW, separate from vegetation and topsoil stockpiled earlier in the construction program.

Breaks in the open trench will be included to facilitate stock and wildlife crossings and agricultural vehicle movements. Breaks will also be included at fences and drainage lines as required.

Blasting of rock to excavate the trench will only be undertaken if conventional excavation, rock hammering or trenching equipment is found to be ineffective. This is considered unlikely to occur due to favourable geology across the transmission and storage pipeline alignments. In the case that blasting is required an operational procedure will be prepared in accordance with Australian Standards, detailing the proposed blasting method.

2.8.1.6 Lowering In and Backfilling

Following trench excavation, the welded pipe strings will be lifted off skids and lowered into the trench using side-boom tractors. The pipe coating is inspected and tested for defects as each welded pipe string is lifted. After lowering-in, the strings are welded together (a 'tie-in') in the trench.

In some areas, it may be necessary to protect the pipe coating from abrasion damage by placing a layer of padding material in the trench prior to lowering in of the pipeline as well as to cover the pipeline (shading). Padding machines are used to generate padding material by sieving the excavated trench subsoil to remove rocks and coarse materials and depositing the fine material in the base of the trench. This method minimises, but may not eliminate, the need for importing padding material from other locations.

Where required, trench blocks (also known as trench or sack breakers) will be installed prior to backfilling of the trench to control lateral water movement along the trench. Trench breakers are commonly installed for a number of environmental conditions, such as adjacent to watercourses and wetlands, on steep slopes or where drainage patterns change. Trench breakers are constructed typically from sacks of soil or sand, stabilised sand or spray applied polyurethane foam (**Photo 2.20**). The trench will then be backfilled with trench spoil and compacted to minimise the risk of settlement.

Tie-ins (i.e. the joining together of ‘strings’) is undertaken via the excavation of a bellhole of sufficient size to allow a welder into the trench to cut off overlapping pipe lengths and to weld the two strings together.

Photo 2.20 Trench breakers

2.8.1.7 Rehabilitation

Rehabilitation of the construction footprint will be undertaken in accordance with the current revision of the APGA Code of Environmental Practice and good pipeline construction principles with the aim of:

- Returning land to its previous productivity within a reasonable timeframe
- Re-establishing topsoil cover
- Returning all land and waterways to a stable condition
- Ameliorating construction impacts to soil texture, structure and chemical composition, where required
- Reinstating natural drainage patterns
- Spreading of mulch or timber, where appropriate
- Application of seed and fertiliser, where appropriate
- Installing permanent erosion control measures (such as contour banks, filter strips) in erosion prone areas
- Ensuring the pre-construction environment is reinstated and disturbed habitats recreated where they do not affect pipeline operation and integrity (trees and shrubs are discouraged over and near the pipeline to maintain integrity of the pipe coatings) and to enable operational access.

Given that the pipelines will be underground, land users will be able to continue regular land use activities above the pipeline provided that they do not undertake unapproved excavation activities or erect structures in the easement. Shallow-rooted vegetation can be re-established across the entire easement, although tall and deep-rooted vegetation and mature trees cannot be located close to the pipelines, due to the potential to damage the pipeline coating and impediments to operational access requirements.

Shallow-root grassland re-establishment is encouraged. Grass and pasture species, and seeding requirements, will be selected based on the desired final land use and in consultation with the landholder.

An example of an APA pipeline near Cootamundra in NSW during construction (January 2017) and 7 months after construction (July 2017) is shown in **Photo 2.21** and **Photo 2.22** respectively.

Photo 2.21 ROW during construction (Jan 2017)

Photo 2.22 ROW approximately 7 months after construction (July 2017)

2.8.1.8 Horizontal Directional Drilling (HDD)

HDD will be used for the crossing of selected watercourses, or other features of high sensitivity, where standard open cut methods are less desirable. HDD may also be used for road crossings as an alternative to boring.

The installation of a pipeline by HDD involves drilling a pilot hole, at a shallow angle beneath the surface, from an entry point on one side of the crossing to an exit point on the other side of the crossing. A schematic showing the typical layout of an HDD entry and exit point is presented in **Figure 2.5**. The hole is then enlarged by reaming to allow for the welded pipe string to be pulled back through the drill hole from the exit point to the entry point without damaging the coating. The pipeline string is then welded to adjoining sections of the pipeline. Once the pipe string is installed and tied into the main section of the pipeline, the entry and exit points are remediated. Refer to **Figure 2.6** for an illustration of the typical process for HDD.

Drilling is conducted by a specific HDD rig, operated by a specialist contractor. The size of the HDD rig and its associated footprint depends upon the size of the pipe, the nature of the subsurface geology and the length of the drill. Drilling mud (typically bentonite) is used to hydraulically drive the drilling head, as a coolant, to wash in-situ material (cuttings) from the drilled hole and to seal and line the hole to facilitate insertion of the pipe. Additives are also sometimes used in the drilling mud to aid in the drilling process depending on the geologic formation or substrate being drilled through. These additives may include soda ash (sodium carbonate) for pH control and surfactants to disperse clay particles.

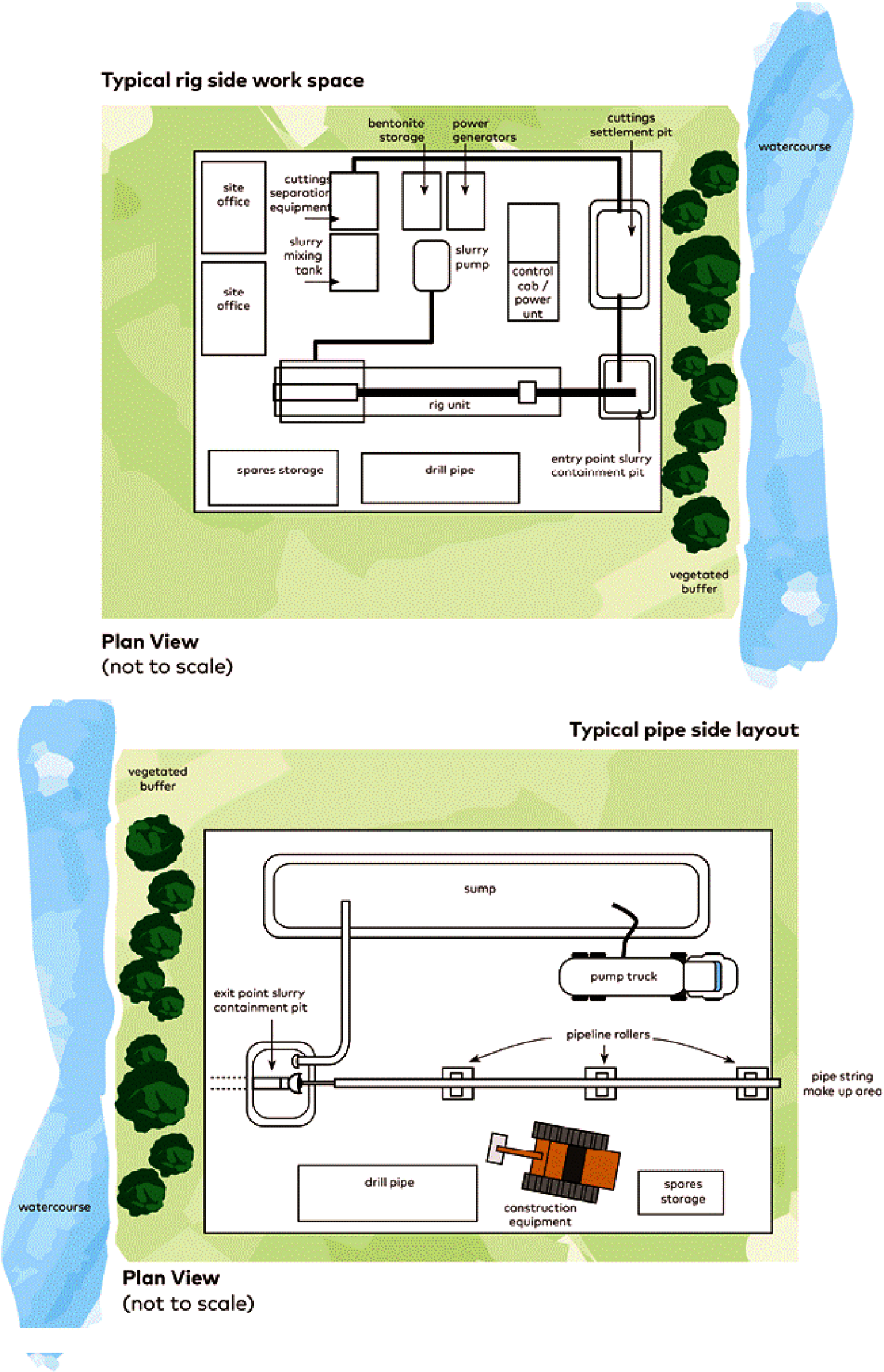
Cuttings are screened at the HDD rig to remove drilling mud, which is recycled. Screened cuttings are typically diverted to skip bins, though settlement pits may also be used, prior to disposal in landfill.

The preferred method of circulating drilling mud between the HDD exit and entry point is though return lines made of small diameter high density polyethylene pipe. No clearing or ground disturbance is required for surface return lines as they will be laid on the ground surface within existing cleared areas and along access tracks. Surface return lines will be removed once the HDD is complete.

Where laying return lines on the surface is not practicable, such as the proposed HDD of John Renshaw Drive, drilling mud can either be transported between the exit point and entry point by vacuum truck or an additional pilot hole can be drilled between the exit point and entry point to house the return line.

The HDDs of Wallis Creek, Swamp Creek and Black Waterholes Creek may intercept acid sulfate soils during drilling and reaming of the borehole. Drilling fluids are monitored and adjusted to a mildly alkaline state around pH 9 by addition of sodium carbonate to ensure correct efficiency and effectiveness. Maintenance of pH of the drilling fluid effectively neutralises any acid sulfate soils produced as cuttings.

HDD avoids surface disturbance to the relevant feature, but introduces other technical and environmental risks which must be managed. HDD activities typically have to be undertaken continuously, so noise impacts during night periods can be increased and require careful management. Geotechnical constraints (fissures and cracks, unconsolidated substrata and subsurface scour potential) may prevent this method being suitable for application at all locations due to the risk of inadvertent release of drilling mud from the drill bore to the ground surface. Where HDD is proposed, the open trenching method is generally maintained as a contingency until geotechnical studies have demonstrated feasibility of HDD.

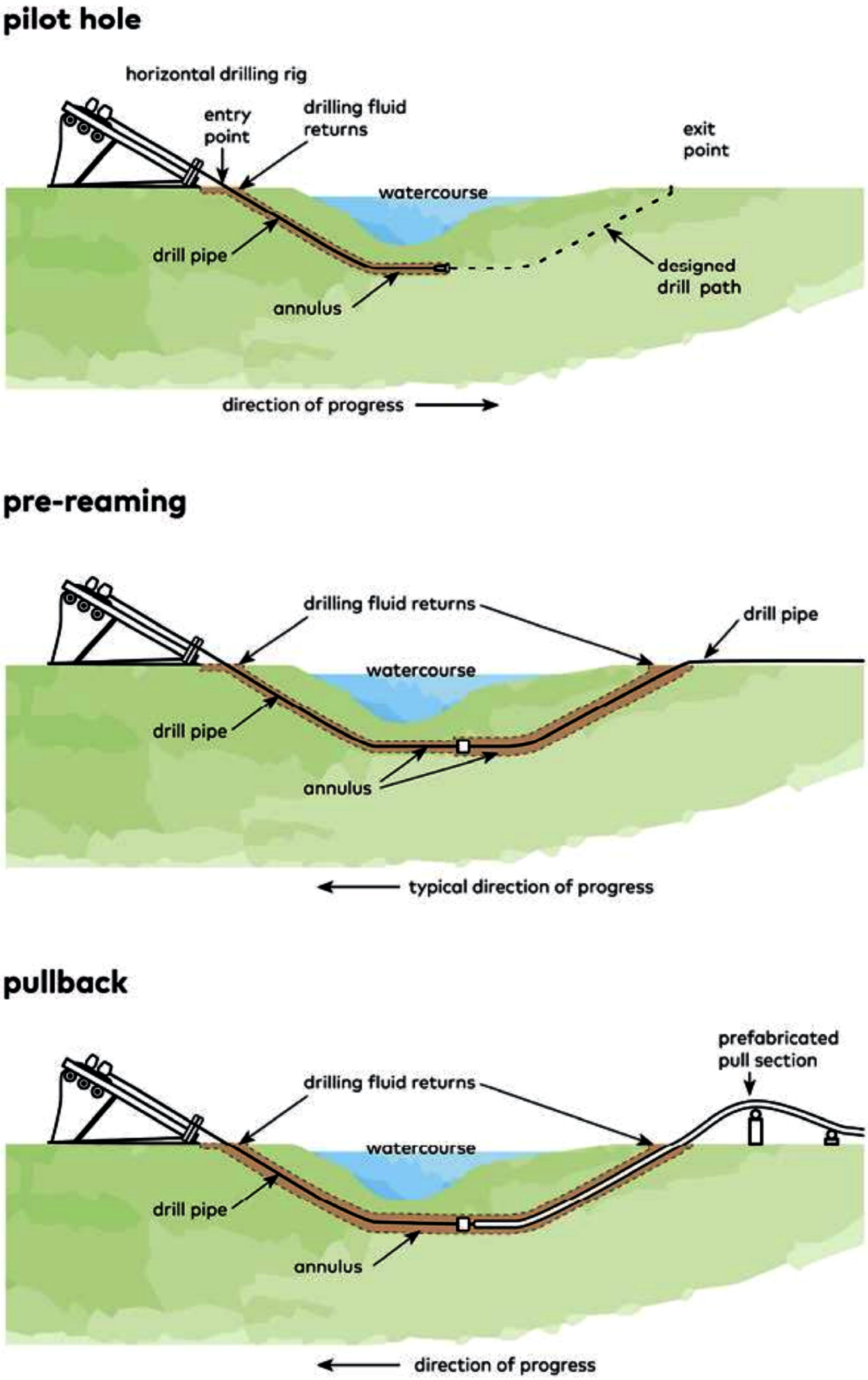


Note: Not to Scale

FIGURE 2.5

HDD Entry and Exit Point Schematic

Image Source: APA (2021)



Note: Not to Scale

FIGURE 2.6

Illustration of Typical HDD Process

Image Source: APA (2021)

HDD is proposed to be undertaken at the following six locations, with approximate HDD lengths listed. The total length of HDD proposed for the Project is approximately 3,200 m:

- KP 4.4, John Renshaw Drive, including Weakleys Flat Creek, 270 m.
- KP 12.9, Buttai Creek, 460 m.
- KP 14.2, Wallis Creek, 140 m.
- KP 17.8 Swamp Creek, 430 m.
- KP 18.7, Entry to the compressor station to avoid disturbance to remnant vegetation forming part of the proposed stewardship area for the Regrowth Kurri Kurri development and HV overhead power lines, 1,000 m.
- Section of the DN350 interconnect pipeline between the compressor station and storage pipeline, to avoid disturbance to remnant vegetation forming part of the proposed stewardship area for the Regrowth Kurri Kurri development, HV overhead power lines and Black Waterholes Creek, 900m.

Final locations will be dependent upon the type and nature of the crossing, and geotechnical conditions.

The alignment of the HDD and circulation of drilling muds are monitored throughout the HDD operation for indications of an inadvertent drilling mud release.

2.8.1.9 Horizontal boring

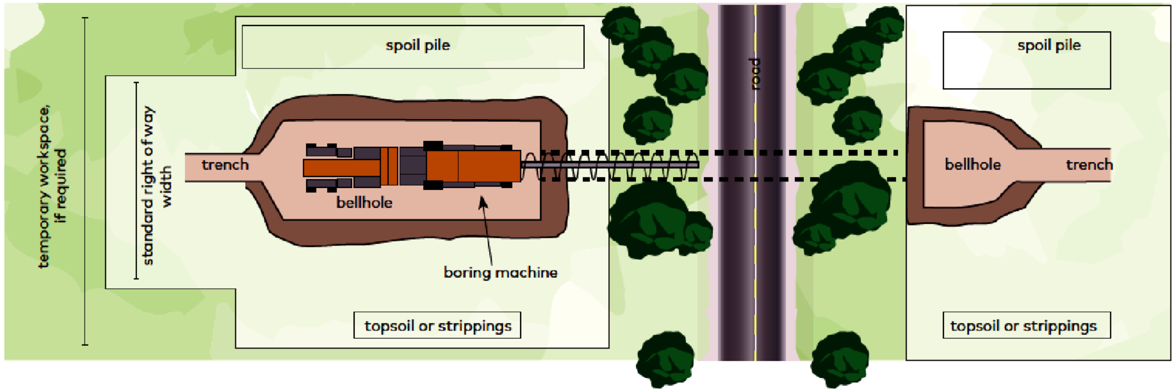
Horizontal boring (also referred to as thrust boring or micro-tunnelling) involves construction of a horizontal bore hole for installation of the pipeline beneath surface features which typically cannot be open cut, such as sealed roads and underground services. A typical set up for a thrust bored crossing is shown in **Figure 2.7**.

Bell holes are excavated on both sides of the feature to the depth of the adjacent trench and graded to match the proposed slope of the pipeline. A bell hole is an enlarged hole allowing a boring machine wider than the width of the trench to operate within it to tunnel under the relevant constraint. Entry bell holes will be approximately 10 metres long, four metres wide, and up to four metres deep. The exit bell hole will typically be seven metres long, four metres wide and up to four metres deep.

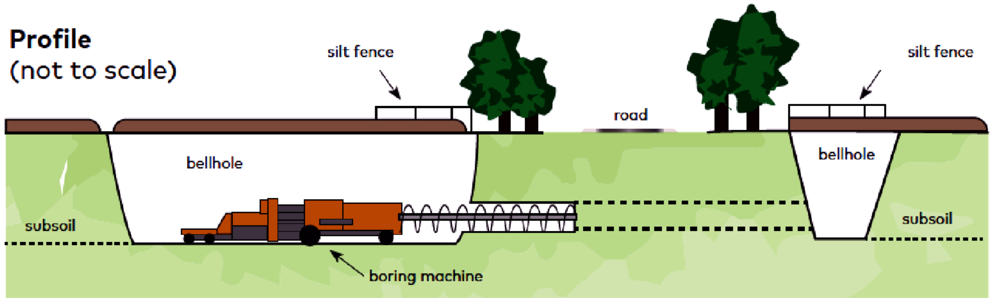
Horizontal boring is proposed to be undertaken at the following eight locations:

- KP 5.1, CTGM
- KP 6.1, Connecting pipe between the CTGM and Stony Pinch Reservoir
- KP8.2, Haul road of the Bloomfield Coal Mine
- KP 9.8, Hunter Water Corporation trunk main
- KP 10.4, Hunter Water Corporation trunk main
- KP 12.0, Buchanan Road
- KP14.5, Main Road (a mini HDD may be used at this location)
- KP16.3, South Maitland Railway (with concrete casing and grouting of bore).

Plan View
(not to scale)



Profile
(not to scale)



Note: Not to Scale

FIGURE 2.7

Typical Horizontal Boring Schematic

Image Source: APA (2021)

2.8.1.10 Pipe jacking and microtunneling

Pipe jacking and microtunneling is a non-disruptive method of installing tunnels for housing gas pipelines. This construction method is typically used for pipeline crossings of highways and railways.

A launch pit and receiver pit are excavated either side of the feature to be crossed at the required depth. A microtunneling boring machine with hydraulic jack is placed in the launch pit. As the boring progresses, sections of concrete pipe are progressively inserted into the bore by the hydraulic jack. The microtunneling machine is recovered through the receiver pit and the full bore is filled with concrete jacking pipe. The annulus between the bored rock tunnel and the concrete jacking pipe is then grouted.

After the grout cures, the gas pipeline is inserted through the tunnel of jacked pipe and kept in place with spacers. The annulus between the exterior of the pipe and the concrete jacked pipe is then also be grouted.

The bore pits are backfilled with excavated material and compacted in layers to a level consistent with surrounding soils and to a relative density sufficient to prevent further settlement under natural moisture and load conditions. Either side of the crossing is then rehabilitated to pre-construction condition or as otherwise agreed with the relevant landholder(s). A schematic of a typical pipe jacking arrangement is provided in **Photo 2.23**.

Pipe jacking is proposed to be undertaken at the following two locations:

- KP 0.2, M1 Pacific Motorway
- KP 0.3, Black Hill Road and Lower Hunter Freight Corridor.

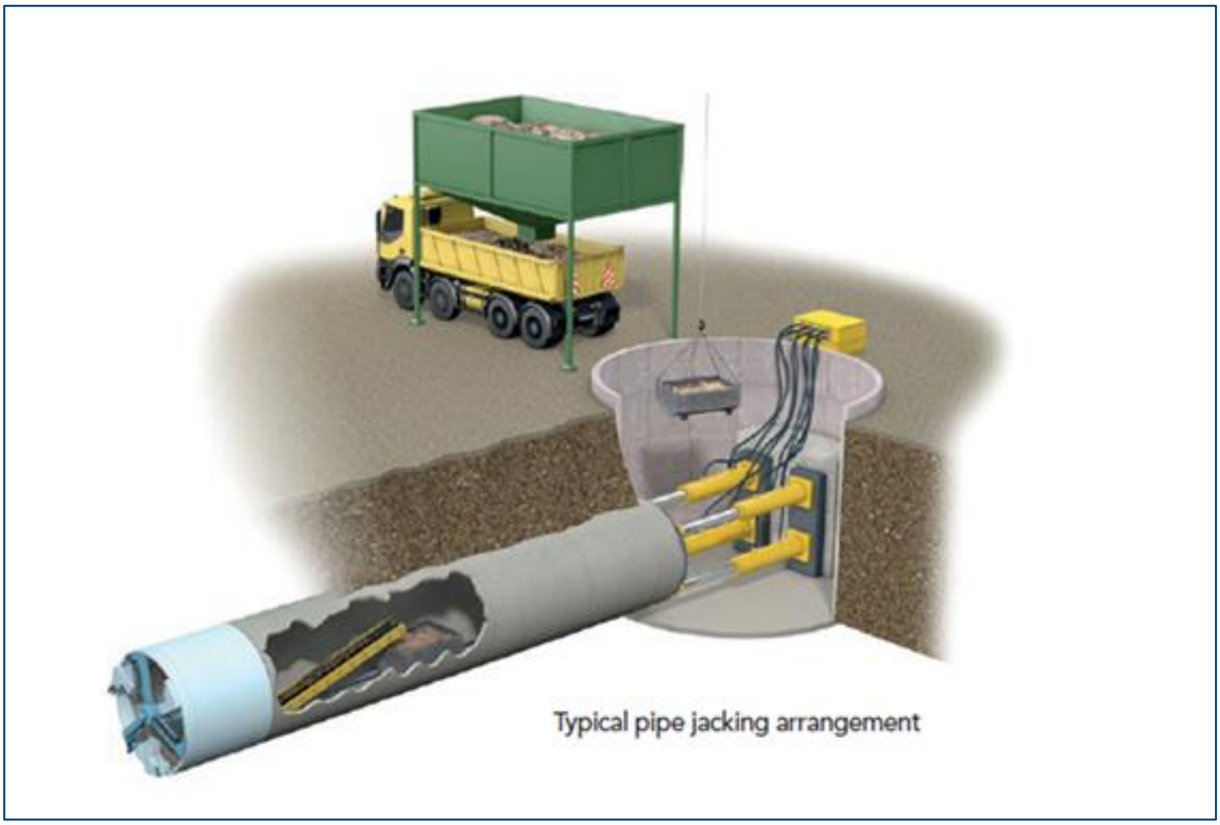


Photo 2.23 Typical pipe jacking arrangement

2.8.1.11 Watercourse Crossings

The transmission pipeline alignment will cross 18 watercourses the interconnect pipeline will cross two watercourses and the storage pipeline will cross two watercourses.

Watercourse crossings will be constructed by open cut trenching or HDD depending upon the geomorphic and environmental characteristics and sensitivity of the watercourses, and geotechnical conditions. HDD is proposed for crossings of six watercourses as described below.

- KP4.2, Weakleys Flat Creek, as part of the HDD of John Renshaw Drive
- KP12.9, Buttai Creek
- KP14.2, Wallis Creek
- KP17.8, Swamp Creek
- KP 18.7, an unnamed tributary of Black Waterholes Creek,
- DN350 interconnect pipeline between the compressor station and the storage pipeline, Black Waterholes Creek

Open trenching is proposed for all other watercourses however watercourses with steep banks will be characterised as special crossings and specific construction techniques applied. The remaining ephemeral watercourses will typically be crossed using open cut trenching using standard pipeline construction methods.

The decision framework used to determine the crossing methodology for watercourses, and the standard mitigation measures for each crossing type, is shown in **Figure 2.9**.

Open Trenching with Flow Diversion

Flow diversion will need to be undertaken for trenched crossings where there is water (standing or flowing) in the watercourse (**Figure 2.10**). Flow diversion techniques may include:

- Diverting the flow through a pipe to prevent siltation problems that may be created during trenching, lowering in and backfilling. This technique is not suitable for watercourses with broad channels, low gradients or permeable substrates.
- Pumping of water around the construction area. This is appropriate for low gradient streams, with discharges less than 1,000 L per second. Barrier dykes or head wells are constructed above and below the construction area which is pumped dry.
- Controlling water running into the watercourse from the surrounding catchment by contour banks may be required to protect the creek banks from erosion.

Special crossings

Watercourse crossings with steeper banks that are proposed to be open trenched will require banks to be battered to a suitable angle to enable access to and across the watercourse for construction machinery. These watercourses will be treated as special crossings (**Figure 2.11**).

Two such watercourses have been identified being Viney Creek (KP2.9) and Four Mile Creek (KP6.5).
A range of mitigation measures will be applied at these watercourses to mitigate impacts associated with increased disturbance of banks or wetlands, given the greater potential for erosion of the bank or sedimentation of the watercourse.

Initially, disturbance within these watercourses will be restricted to all weather running track with a maximum disturbance width of 10 m wide. Construction of the pipeline crossing will not occur as part of the standard pipeline construction sequence of separate tasks described above. Rather, clearing of the ROW, trenching, installation of the pipeline and reshaping to stable landform will be undertaken as a consolidated construction project in order to reduce the duration of activities within the watercourse, within a restricted time period of 20 days.

The access track will be removed and reinstatement completed within five days of the access track no longer being required. The access track may remain in place until all pipeline construction activities are completed.

Specific erosion and sediment control plans will to be developed for each special crossing.

Wallis Creek temporary crossing

A temporary vehicle crossing of Wallis Creek is proposed to be installed near KP 14.2 of the transmission pipeline for the duration of the construction period. The crossing location is adjacent to an existing rubble weir as shown in **Figure 2.5**. The temporary crossing will enable construction staff, vehicles and machinery the access either side of Wallis Creek without undertaking a 14 km round trip on public roads between Valley View Lane and Main Road adjacent to Testers Hollow with subsequent efficiency, amenity and traffic impacts. The crossing would be removed at the conclusion of the construction period.

The location of the proposed temporary crossing is located in a reasonably straight stretch of Wallis Creek, where the channel width is narrow at approximately 10m. The site assessment undertaken for the water technical report (as described in **Section 7.4**) identified that this section of Wallis Creek has a defined channel with incised banks and gentle bank slopes on the adjoining flats.

Structural integrity of any crossing design at this location during flood conditions is a key consideration. Flood extent and velocity modelling indicates that the crossing and tracks either side would be submerged during a 50% AEP event though flood velocities are low at less than 0.5 m/s (WMAwater 2019).

These morphology and flooding conditions indicate use of multi-cell box culverts may be the most feasible crossing design at this location. Multi-cell box culverts can closely replicate the shape and area of the natural channel, minimise bank damage during construction and removal, provide greater structural integrity during flooding and enable passage of fauna through the waterway. Pipe culverts and temporary bridges are also options, however structural integrity during flooding would be reduced and hydraulic capacity may be insufficient for pipe culverts.

Access tracks connecting to the temporary crossing would be designed to minimise generation of sediment and sheeted with appropriately sized aggregate. Additional sediment controls required for the crossing would be determined as part of detailed design. The design and construction method for the proposed temporary crossing is subject to detailed design in consultation with the DPIE water group.

Storage Pipeline Watercourse Crossings

The storage pipeline traverses two minor unnamed watercourses which have formed reasonably steep sided gullies within the construction footprint. These gullies have been formed by 1st order streams with very small upstream catchments, which extend to a maximum distance of around 250m upstream (west) of the storage pipeline construction footprint. Site survey data demonstrates that height differences between the top of bank and gully bases are variable, with the greatest difference being approximately 6 m of fall across 18m of horizontal distance

Given the larger diameter and thicker wall diameter of the storage pipeline, the ability to bend pipe segments to match natural contours is limited relative to the smaller diameter transmission pipeline. Given this, it is likely that battering of some areas of gullies to achieve a reduction in slope to match bending limits will be required where the crossed by the storage pipeline.

In one area of the construction footprint the storage pipeline runs parallel to a gully. In this area side slope benching will be required using cut and fill method to provide a level area for trenching, then benched again to provide a level area for pipe stringing, welding and lower in. An illustration of side slope benching is provided in **Figure 2.8**.

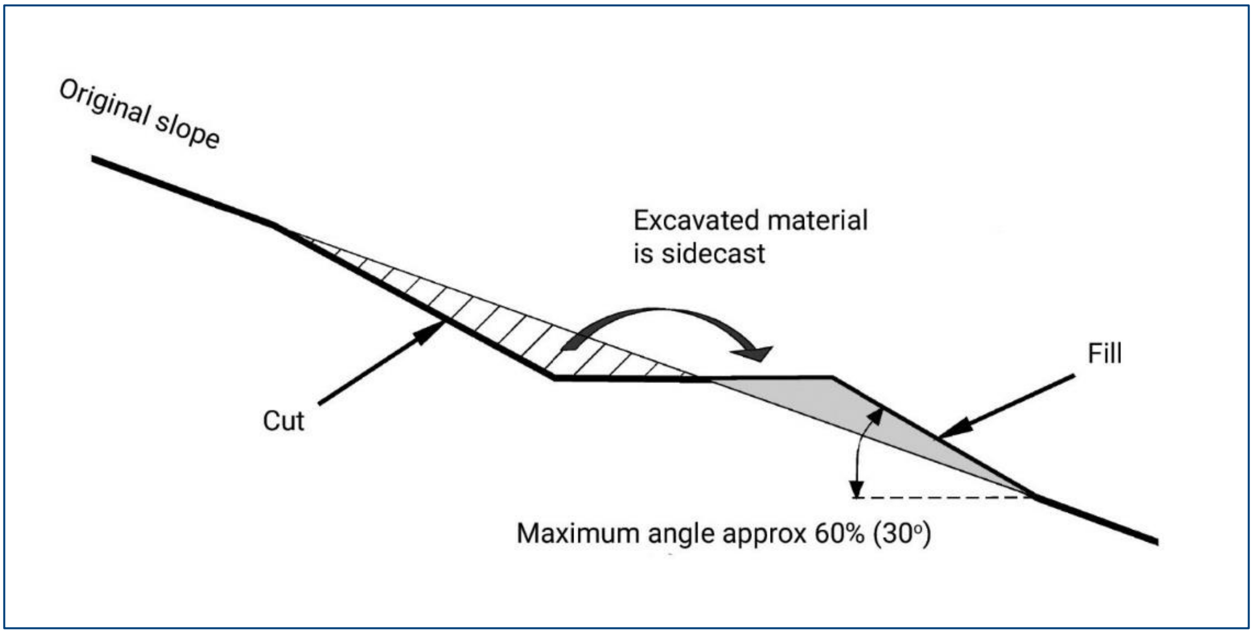
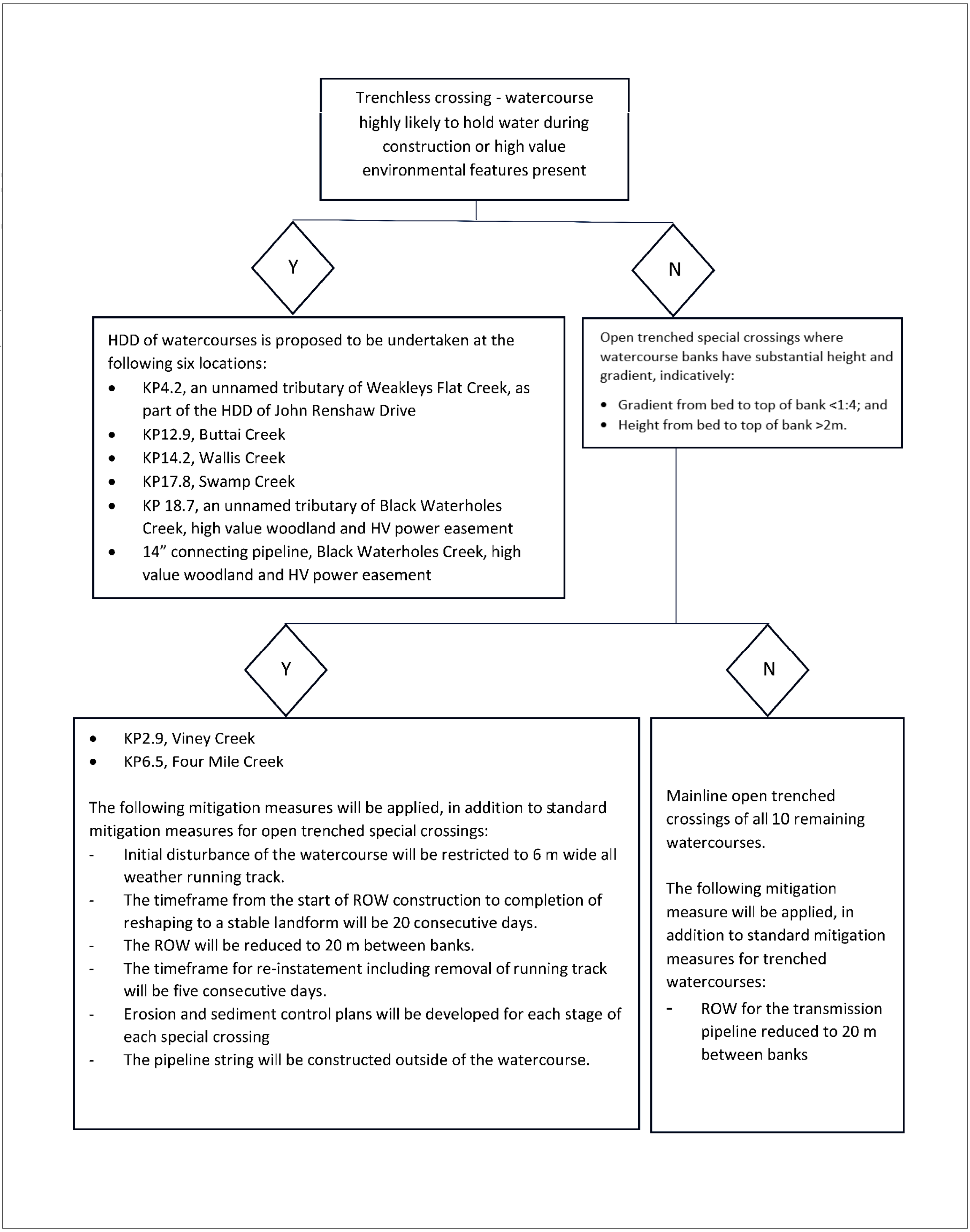


Figure 2.8 Side slope benching

Reinstatement to a stable landform of any sections of gullies that have been battered or side slope benched will be undertaken post construction. This stabilisation may include geofabric and rock placement, rock chutes in areas of concentrated flow, wing banks to direct runoff, erosion matting, seeding with a cover crop and suitable permanent perennial pasture mix and management of grazing access.

Implementation of a monitoring and maintenance program will be undertaken during Project operations.

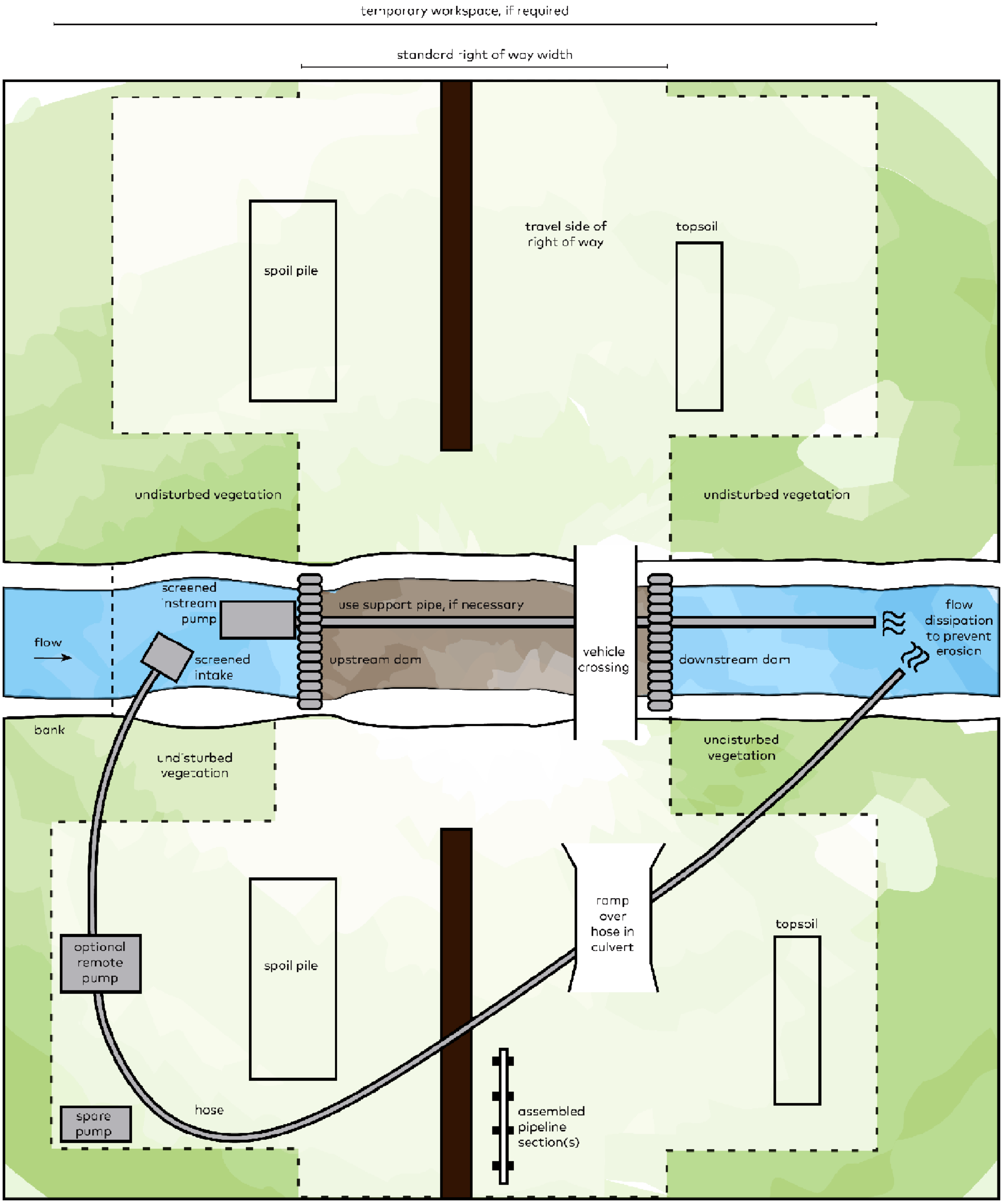


Note: Not to Scale

FIGURE 2.9

Decision Framework for Watercourse Crossings

Image Source: APA (2021) Data source:

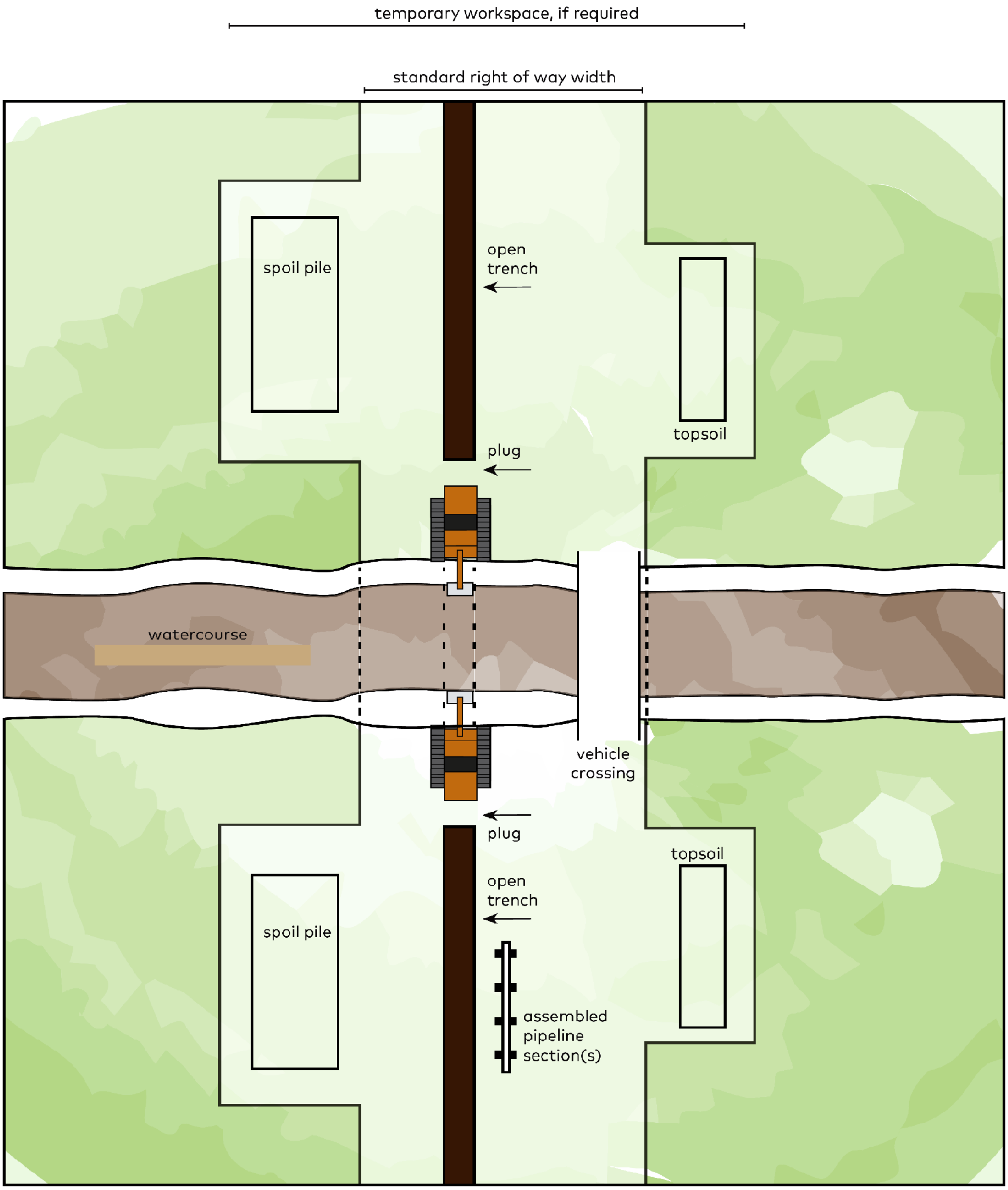


Note: Not to Scale

FIGURE 2.10

Typical Open Trenching with Flow Diversion Schematic

Image Source: APA (2021)



Note: Not to Scale

FIGURE 2.11

Schematic of Typical Special Crossing

Image Source: APA (2021)

2.8.1.12 Road and Rail Crossings

The transmission pipeline alignment crosses five sealed public roads and one railway line.

Crossings of sealed public roads will be constructed by horizontal boring or HDD depending upon the type and nature of the crossing, and geotechnical conditions. Crossing methodology will also take into account any technical requirements, such as design requirements of the infrastructure owner, for example, local council.

Unsealed private roads will typically be crossed using open cut trenching, as described in **Section 2.8.1.5**. The primary haul road for the Bloomfield Coal Mine will be crossed by horizontal boring to avoid impacting mining operations.

Horizontal boring is proposed for the following road and rail crossings:

- KP 0.2, M1 Pacific Motorway (pipe-jacking)
- KP 0.3, Black Hill Road and Lower Hunter Freight Corridor (pipe-jacking)
- KP 8.2, Main haul road for the Bloomfield Coal Mine
- KP 12.0, Buchanan Road
- KP 14.5, Main Road (mini-HDD may be used at this location)
- KP 16.3, South Maitland Railway.

2.8.1.13 Water pipeline crossings

The transmission pipeline alignment crosses existing water pipelines owned and operated by the Hunter Water Corporation at six locations, as described below.

- KP4.4 – 900 mm trunk main (CTGM) adjacent to John Renshaw Drive
- KP5.1 – 900 mm trunk main (CTGM), 500 mm and 375 mm trunk mains
- KP6.2 – 900 mm and 750 mm trunk mains connecting the CTGM to the Stony Pinch reservoir
- KP 9.8 – 600 mm, 500mm, 500 mm, and 375 mm trunk mains
- KP10.4 – 375 mm and 375 mm trunk mains connecting to the Buttai Reservoir
- KP14.5 – 200 mm reticulation main adjacent to Cessnock Road.

Trunk mains will be crossed by horizontal boring, except for the crossing at KP4.4, which is by HDD. Small diameter (200 mm) reticulation mains will be crossed by open trenching with hand or vacuum excavation around the water pipeline. All water pipelines crossed by the transmission pipeline alignment will remain operational during pipeline construction. Mitigation measures to protect the water pipelines during construction will be determined in consultation with Hunter Water Corporation.

2.8.1.14 Testing and Commissioning

Gas transmission pipelines in Australia are required to be designed strictly in accordance with AS 2885, which requires that, “every pipeline shall be leak tight and have the necessary capability to safely withstand all reasonably predictable influences to which it may be exposed during the whole of its design life”.

Hydrostatic Testing

The transmission pipeline and storage pipeline will be pressure tested prior to commissioning to ensure that the pipeline passes strength and leak tests. This is done through a process called hydrostatic testing whereby sections of the pipelines (test sections) are filled with water and then pressurised to a minimum of 1.25 times the maximum allowable operating pressure (MAOP) for the storage pipeline and 1.5 times the MAOP for the transmission pipeline.

Temporary manifolds are welded to each end of the pipeline test section, which is cleaned internally by PIGs propelled by compressed air. The test section is then filled with water and pressurised. Pressure is then increased above the MAOP for approximately four hours to assess the strength of the test section. The pipeline is then subjected to a leak test for a minimum of 24-hours to determine that the section is leak free. The hydrostatic testing process will take approximately eight days for a single test section, with the majority of that time required to fill the test section with water.

It is anticipated that the transmission pipeline will be hydrostatically tested as a two test sections, requiring approximately 2 ML of water in total.

The storage pipeline will be tested as two or more sections. If the storage pipeline is tested as two sections approximately 10.51 ML of water would be required if water was reused between test sections, or 21 ML if water could not be reused. The exact number of test sections, test sequence and timing of hydrostatic testing is subject to change based on the final schedule for construction, availability of water and the final hydraulic design of the pipeline.

A water storage to transfer water between test sections of the storage pipeline will be required and a turkeys nest storage adjacent to the storage pipeline construction footprint is proposed to provide for water transfer. Depending on the final configuration of hydrotest sections and the availability of water, it is possible that chemicals to control biological growth and corrosion may be added to the hydrotest water.

Potential sources of water for hydrostatic testing are described in **Section 2.3.6.4** and include clean water dams associated with the Bloomfield Mine, the Stony Pinch and Buttai reservoirs operated by Hunter Water Corporation, reticulated municipal supplies to the former Hydro Aluminium site or local watercourses. All water use would occur under agreements and/or licences/permits with relevant landholders and authorities.

Following testing of the transmission pipeline, the water will be released onto adjoining land with appropriate slope, soil and groundcover characteristics. Water release will occur through a dewatering structure designed to slow the flow of water.

Disposal of water from the storage pipeline will be dependent on design of the pipeline. Specifically, if the pipeline is internally unlined then mill scale (iron oxide) will be removed from the internal pipeline wall during the hydrotesting process. Water from the hydrotest in this scenario would be returned to the turkeys nest for storage and evaporation. Mill scale and in-situ material at the base of the pond would then be excavated and disposed to an appropriately licensed landfill. If the storage pipeline was internally lined, then hydrotest water would be released to adjoining land through an appropriate dewatering structure.

Drying and Calliper Pigging

When the dewatering process is complete the pipelines will be dried using compressed air.

Following pipeline testing and drying, the pipelines will be gauged using an approved geometry PIG capable of measuring the internal surface of the pipe and inspecting the internal diameter for ovality and dents. Any defects will be located, removed as a cylinder, and replaced with a length of pretested pipe.

Pipeline Commissioning

The transmission and storage pipelines will be commissioned following completion of hydrostatic testing. Commissioning will proceed sequentially from the point where commissioning gas is available and subsequently on completion of the nominated sections.

Commissioning will be in accordance with a procedure prepared during the detailed design and construction phase of the Project and will include the following activities:

- Instrument calibration
- Gas filling
- Testing and commissioning of the pipelines, stations and valves.

2.8.2 Associated surface facilities

Construction of the JGN offtake facility, compressor station and delivery station will be undertaken by specialist crews across several stages of works. These stages broadly comprise site set up, earthworks and civil construction, mechanical, electrical and instrumentation works and testing and commissioning.

Site set up within the construction footprint of each associated surface facility is required to provide a safe and efficient area for construction activities. This includes constructing temporary access to the construction sites, clearing vegetation, installation of temporary fencing and site offices, set up of lay down areas, and relocating existing services if required.

A construction laydown area of up to 5 ha will be required adjacent to the compressor station and delivery station during the construction of these facilities for storage of equipment and materials. The construction laydown area will be located on existing hardstand of the former Kurri Kurri aluminium smelter between the pipe laydown area and the compressor station. The exact location of the laydown area is subject to ongoing discussions between APA and Snowy Hydro, Hydro Aluminium and the RKK project, as all of these stakeholders have an interest in the use of this land during the construction period. As the exact location of the construction laydown area has not been finalised it is not shown on maps of the Project construction footprint presented in this EIS. The 5 ha area, however, is accounted for as part of the compressor station and delivery station construction footprint in all area calculations throughout the EIS.

Earthworks will then be undertaken to modify existing ground levels to the required design levels. The topsoil may be required to be replaced with engineered fill or pilings installed to minimise ground settlement. Steel reinforced concrete foundations and piled steel footings will then be installed for fixing surface facility equipment and supports on to.

Following installation of foundations and footings, work to install structural, mechanical, piping, electrical and instrumentation (SMPEI) components can be undertaken. Specialist crews will install structural supports, mechanical equipment, piping spools, electrical equipment, cabinets and panels, cabling, instrumentation, buildings, and walkways.

The majority of major equipment and SMPEI components will be manufactured outside of Australia, although fabrication of skids and installation of equipment will be undertaken within Australia where equipment is shipped as separate components. The major equipment and SMPEI components will be transported to the Port of Newcastle by ship, then transported by semi-trailer to the relevant associated surface facility site for installation.

Testing and commissioning of the associated surface facilities may involve hydrostatic testing of pipework, as well as testing of mechanical and electrical equipment to make sure they have been installed correctly and are ready for commissioning. Commissioning involves fine tuning of equipment and instrumentation by running the facilities through various operating ranges. Once each facility passes all checks following a commissioning plan, it is ready to commence operations.

Construction and commissioning of the associated surface facilities to completion is estimated take approximately 9 months and five months respectively. Note that commissioning will occur sequentially and overlap with the construction phase, such that construction and commissioning of associated surface facilities is estimated to require 11 months in total.

2.8.3 Logistics

Logistics considered as part of construction activities for the project include:

- Pipe importation, transport to site and transport to the ROW
- Delivery of construction plant and equipment
- Delivery of infrastructure for associated surface facilities
- Transport of construction crew.

2.8.3.1 Pipe Importation, Transport to the Project area and Transport to the ROW

Line pipe of the size and specification required for the transmission and storage pipelines, and storage pipeline bend sections, is not manufactured by any existing Australian steel mill. As such, the line pipe for the Project will be manufactured overseas, imported into Australia by ship (HandyMax Class or similar) and unloaded at a suitable port. The Port of Newcastle is likely to be the most suitable option and has been adopted for the purposes of assessment in this EIS. Although a single ship will have sufficient capacity to deliver all transmission and storage pipeline pipe segments to the port, it is likely that transmission and storage pipe will be delivered on separate ships as manufacturing is likely to occur at different steel mills.

Some temporary stockpiling of pipe may be required at the port prior to transportation to site. Pipe could be transported from port to the Project site by one of two possible scenarios as described below.

Truck Straight to ROW

Pipe could be transported by truck on roads from the port straight to the construction ROW as required. This may occur opportunistically, however, due to the logistics involved it is considered necessary to stockpile the majority of line pipe at laydowns within vicinity of the alignment.

Truck to Laydown Areas and Trucked to ROW When Required

The most likely pipe transport method is road transport by truck from the port to centralised laydown areas, then trucked to the ROW when required.

Laydown areas are proposed for the transmission pipeline on existing cleared hardstand near KP5 and for the storage pipeline near the compressor facility.

The most likely road transport route from the port would follow Selwyn Street, Industrial Drive (A43), Maitland Road/Pacific Highway (A43), New England Highway (A1), John Renshaw Drive (B68) for both transmission and storage pipeline segments. Transmission pipeline segments are then proposed to be stored on an existing hardstand associated with the former Donaldson Open Cut Coal Mine, with access off John Renshaw Drive. Storage pipeline segments would be transported further along John Renshaw Drive, then the Hunter Expressway (M15) and Hart Road to the proposed laydown areas at the site of the former Hydro aluminium smelter.

Approximately 1,062 truck movements would be required to transport pipe segments from the Port to the laydown areas for the storage pipeline (including the DN350 interconnect pipeline and pipe bends) and 60 truck deliveries for the transmission pipeline. The significantly higher number of truck movements for the storage pipeline is primarily due to only two large diameter pipe segments to be transported on a single truck. Deliveries for the transmission pipeline and storage pipeline to laydown areas are likely to require approximately three and 43 days of pipe delivery operations respectively, assuming 25 truck deliveries for each pipeline per day.

Pipe will be transported from each laydown area to the required location on the ROW by extendable semi-trailers. Approximately three round trips per day by extendable semi-trailers will be required to deliver 56 pipe lengths from the laydown area to the transmission pipeline ROW, based on a construction rate of 1 km/day. Approximately six round trips per day by extendable semi-trailers will be required to deliver 12 pipe lengths from laydown areas to the storage pipeline construction footprint, based on a construction rate of 200 m/day.

Transport by truck from the port to centralised laydown is the most likely pipe delivery scenario to be adopted and is assessed in this EIS given that it also has the potential to have the greatest impact on road users and the road network within and surrounding the Project. Adoption of direct delivery to the ROW would result in reduced impacts on the road network.

2.8.3.2 Delivery of pipeline construction plant and equipment

Construction equipment and heavy machinery for the transmission and storage pipelines will be mobilised directly to the construction footprint, once initial clearing and grading operations have commenced and sufficient space is available. It is estimated that 140 pieces of heavy construction equipment would be required during the construction phase of the pipelines. To enable a conservative assessment of traffic impact, it is assumed that heavy construction equipment will be transported over a three to four week period from either Queensland (via the Pacific Highway), Sydney (via the M1 Pacific Motorway), Dubbo (via the Golden Highway) or Victoria (via the Hume Highway). It is likely, however, that some common earthmoving equipment such as graders and dozers would be sourced and mobilised from the local area.

Construction equipment would be mobilised by 50-tonne floats and would generate approximately five heavy vehicle trips per day over four weeks. Equipment will be demobilised progressively following core construction.

2.8.3.3 Delivery of associated surface facilities plant, equipment and materials

As with pipeline construction, associated surface facility construction equipment and heavy machinery will be mobilised directly to the relevant construction site. It is estimated that around 24 pieces of heavy construction equipment will be required for the construction phase of associated surface facilities.

Estimated deliveries by heavy vehicles to associated surface facilities during the construction phase is summarised below:

- 50-tonne floats: 12 deliveries of large heavy machinery during mobilisation, and the same during demobilisation.
- Cranes: Five Franna cranes distributed across the associated surface facility construction sites, one 150 t crane servicing both the compressor station and delivery station and one pile driving crane, all self-mobilised.

- Semi-trailers (2 and 3-axle): 133 deliveries of structural, mechanical and electrical equipment, temporary offices and lunchrooms, and major equipment skids. The majority of these deliveries (94) are for the compressor station and delivery station and would generally use the same transport route as storage pipeline deliveries from the Port of Newcastle.
- Heavy rigid trucks: 72 deliveries of bulk materials including gravel and concrete.

2.8.3.4 Transport of construction crew

Daily travel by construction crews between accommodation in the region surrounding the Project and the relevant work area will typically be undertaken by light vehicles. During work shifts, light vehicles will be parked on the construction footprint at the relevant work area. Use of buses to transport construction crews between accommodation and the work area is not considered practicable due to the proposed use of a range of accommodation providers in the region, the number and geographic spread of work areas that will be active at any one time, and the use of light vehicles to transport tools and equipment required to undertake various pipeline and facility construction tasks.

It is estimated that around 248 daily light vehicle movements will be required to transport construction crews between accommodation and work areas for both pipelines and 156 daily light vehicle movements for associated surface facilities, during peak construction periods.

2.8.4 Scheduling and Resourcing

The core construction phase for each Project component is expected to require approximately 10 months for associated surface infrastructure, 10 months for the storage pipeline and 6 months for the transmission pipeline. Mobilisation, demobilisation and commissioning activities will be completed prior to and following core construction respectively. The full construction and commissioning of the Project will require approximately 12 months.

Exact timing of the commencement of construction is contingent on receipt of environmental approvals, pipeline licensing, completion of design and procurement and progress of the HPP.

Construction activities for the transmission pipeline will typically be undertaken from 7 am to 6 pm Monday to Friday on a 5 days on 2 days off basis. To mitigate noise impacts to residential areas in proximity to the transmission pipeline construction footprint, work will not typically be undertaken during weekends unless noise limits can be met or continuous work is required as described below. Should construction activities be required over weekends, these would typically be within the standard hours for weekends which is 8 am to 1 pm Saturdays.

Construction activities for the storage pipeline are proposed to be undertaken between 6 am and 6 pm, seven days per week, given the much larger separation distances to residential areas. Construction crews will typically work a rostered cycle of 21 days on/7 days off, as per the pipeline industry standard, with 10 cycles likely to be required during the construction phase.

Construction shifts for the compressor station and delivery station are likely to comprise 6 days/week, with no work Sundays. Typical working hours are 6 am to 6 pm weekdays and 8 am to 1 pm Saturdays. Construction shifts for the JGN offtake facility will be the same as the transmission pipeline, given the proximity of residences.

Activities which may require construction outside the hours of 6 am and 6 pm are listed in **Table 2.7** below. In addition, extended construction hours may be worked where an agreement is reached with the affected landholder in order to reduce the duration of construction activities and/or manage other disturbances.

Table 2.7 Activities Which May Require Extended Construction Hours

Activity	Justification
Construction of road crossings	Extended construction hours for road crossings will minimise the time that roads are closed.
Horizontal Directional Drilling (HDD)	Drilling of a HDD bore is required to be completed without interruption in order to maintain the integrity of the bore. This may require extended work hours and 24-hour operations.
Horizontal Boring	As with HDD, boring may need to be continued uninterrupted until completion to ensure the integrity of the bore.
Hydrostatic testing and drying	Hydrostatic testing must be completed as a single process and cannot cease midway as it is imperative that the pipeline is maintained at pressure during the testing procedures.
Non-destructive testing	Some NDT works including Ultrasonic Testing (UT) and Radiographic Testing (RT) may be completed outside standard construction hours to minimise the duration that the trench remains open.
Transportation by oversized trucks	The transportation of plant, equipment and pipe by oversized trucks as required for safety reasons.
Unexpected circumstances	In the unlikely event of an emergency, extended hours may be required.

2.8.4.1 Pipeline construction spreads

The pipeline construction activities set out in the sections above would each be undertaken by a different crew. The series of crews are referred to as a 'spread'. For the purpose of the EIS assessment, two spreads have been assumed for construction. The first construction spread would construct the transmission pipeline, commencing at KP0 and continuing in a generally north-western direction to KP21. The second construction spread would simultaneously construct the storage pipeline.

Additional small work teams will be required for areas involving specialised construction techniques such as HDD, hard rock extraction and surface facility installation.

The general rate of construction for the transmission pipeline and storage pipeline will be approximately 1 km/day and 200 m/day respectively. Some crews will move at a faster rate, such as survey at approximately 4 km/day, fencing at approximately 5 km/day and vegetation clearing at approximately 1.5 km/day.

Periods of wet weather may reduce this rate and continuation of construction during wet weather will depend on the severity of the weather event, site conditions and the nature of the activity being undertaken.

The length of the spread for the transmission pipeline will be at around 14 km with approximate distances between the main crews of 2 km.

2.8.4.2 Construction Workforce

The construction workforce is estimated to peak at around 398 personnel over one month when core construction of the transmission pipeline, storage pipeline and compressor station overlaps. Workforce numbers are estimated to be below 330 personnel over the remainder of the 12 month construction period. Estimated construction workforce numbers for each month of the construction phase are shown in the workforce histogram below (**Figure 2.12**).

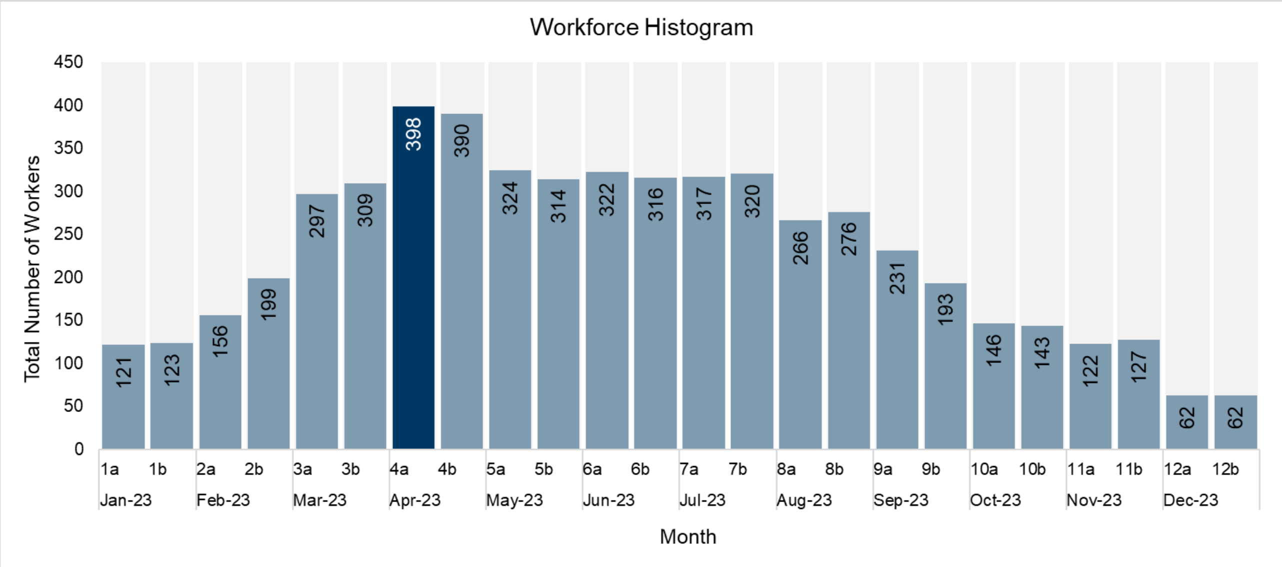


Figure 2.12 Workforce histogram

2.8.5 Roads and Transport

Access to the ROW for will be achieved using the ROW as the primary thoroughfare, with local roads and access tracks used where necessary, such as transporting equipment across HDD locations.

Upgrades of some existing access tracks and construction of some new access tracks will be required.

2.8.6 Water Use and Supply

Water will be required during the construction phase. Non-potable water will be required for dust control of the construction ROW and access tracks (with the quantity dependent on conditions and proximity to sensitive receivers), as well as for hydrostatic testing of both pipelines during construction. Water supply will be obtained from a non-potable water service provider or existing landholders with available allocations. Existing clean water dams on the Bloomfield Mine leases, Hunter Water reservoirs and the existing reticulated supply to the HPP site are the most likely sources.

It is estimated that dust control will require 110 kL/km for each pipeline, or approximately 5 ML in total.

Hydrotesting is estimated to require a maximum of 23 ML of non-potable water if water cannot be reused between test sections (**Section 2.8.1.14**).

Approximately 5 ML of water will be required during HDD operations for mixing of drilling fluids. This estimate is based on pipeline construction experience of 0.146 ML per 100 m of HDD and a total HDD length of approximately 3,200 m.

The total estimated water volume required for the construction phase of the Project is 33 ML.

In the event of construction occurring during severe drought, measures will be employed to avoid increasing demands on local water supplies. Alternative sources of water may include transport from non-drought affected areas, groundwater or other supplies of non-rainfall dependent water.

2.8.7 Energy Use and Supply

Electricity for construction activities such as welding, and HDD equipment would be supplied by diesel generators.

Based on similar scale projects undertaken by APA, approximately 2.6 ML of diesel (including vehicle and equipment fuel) is estimated to be required for the construction of both pipelines and associated surface facilities. A fuel tank of approximately 60 kL capacity will be installed at a central location, likely to be near the compressor station, and used for the duration of the construction period. Fuel trucks will transport diesel from the 60 kL fuel tank to work crews and construction machinery on the transmission and storage pipelines and surface facility construction sites.

2.8.8 Waste management

The Project would generate a range of wastes, mainly through the construction phase.

2.8.8.1 Construction waste management

A range of wastes would be generated during construction activities for the Project, mainly during pipeline construction, which include:

- General wastes from transportation and storage of pipe (packaging, pallets, ropes, bevel protectors)
- Wastes from clearing the construction area (vegetation)
- Pipeline coating waste
- HDD drilling cuttings
- Excess soil and rock from pipeline trench excavation
- Laying, welding and grinding waste (for example, scrap metal, spent welding rods)
- Water from dewatering and stormwater
- Machinery waste.

Cleared vegetation, topsoil and subsoil would be generated during construction of both pipelines and the JGN Offtake Facility. Subsoil and topsoil materials generated during pipeline construction are generally returned to the trench or used for rehabilitation of the construction footprint as a fundamental part of backfilling and rehabilitation they are not considered to be wastes.

Excavated sub-soils would be stockpiled to be re-used in backfilling. The volume of material reused would vary location to location based on soil profile and quality. In the event that the excavated material cannot be reused, the spoil would be disposed of according to the requirements of the CEMP.

Project construction wastes would be reused or recycled where practicable or collected and transported by licensed waste contractors for disposal at appropriately licensed facilities. Any contaminated or hazard materials identified on site would be disposed in accordance with NSW EPA waste classification and transport requirements.

Dewatering of trenches and bellholes due to rainfall or groundwater ingress would be collected and treated, if required, prior to discharge to land or reused where appropriate such as for dust suppression. Dewatering of excavated trenches or bell holes would be managed to minimise sedimentation, including the use of sediment control devices to remove suspended solids and dissipate flow. Sediment control devices would be listed in the CEMP.

2.8.8.2 Operation waste management

During operation of the Project, wastes would include:

- Small volumes of waste oils and grease
- Dust and mill scale (steel flakes) from infrequent maintenance or pigging activities.

Waste generated from pigging is typically dust and mill scale from inside the pipe and volumes are expected to be less than one cubic metre for the transmission pipeline and approximately three cubic metres for the storage pipeline. This waste would be collected at scraper station locations approximately every 10 years as part of maintenance activities. Pigging waste would be tested for waste classification before disposal at a suitable general solid waste or hazardous waste management facility. Pigging waste management would be undertaken in accordance with EPA waste classification and transport requirements in place at the time of generation.

Project operation wastes would be reused or recycled where practicable or collected and transported by licensed waste contractors for disposal at appropriately licensed facilities in accordance with EPA waste classification and transport requirements.

2.9 Operation and Maintenance

The Project is expected to have an operational life of 30 years. A limited range of activities will be required to operate the Project, as described in the following sections.

2.9.1 Pipeline Inspections and Maintenance

A routine inspection and maintenance program will be implemented for the transmission and storage pipelines during the operation of the Project. Inspection of the easements for issues such as erosion, weeds, subsidence, revegetation and unauthorised third party activity will be undertaken on a regular basis by ground and aerial patrols.

Aerial patrols of the pipelines will typically be undertaken monthly with ground patrols conducted annually. Frequency of inspections may vary depending upon the particular issue being inspected, or in response to specific conditions such as major rainfall events. Ground patrols of the easement will be generally undertaken by travelling along accessible sections of the easement in light vehicles. Landholder issues will be factored into planning and scheduling of ground patrols including consideration of sensitive periods such as lambing and harvest.

Ongoing activities to maintain pipeline integrity will include mainline valve and scraper station inspection and maintenance, cathodic protection surveys and scheduled internal pipeline inspections. Monitoring of the mainline valve and scraper stations will typically occur monthly, or more frequently where required, where they will be tested to ensure they operate correctly, and the fenced compound maintained.

Inspection of the CP system will typically be undertaken annually in accordance with AS 2832.

Pigging of the transmission pipeline will be undertaken at a low frequency of approximately every 10 years. Minor amounts of gas will be vented during pigging activities to depressurise the PIG launcher/receiver.

Testing of the storage pipeline will be undertaken approximately every seven to 10 years. Prior to testing, gas held in the storage pipeline will be transferred to the HPP or into the SNP. The subsequent reduction in storage pipeline pressure will prevent all stored gas from being transferred, and approximately 5TJ of residual gas will remain in the storage pipeline. The residual gas is proposed to be vented at the vent compound adjacent to the compressor station or at a vent located at the above ground connection header assembly. During detailed design APA will also investigate the option of flaring the residual gas using a temporary flare at the above ground connection header assembly. Once venting is completed, testing of the storage pipeline will occur.

Regular contact will be maintained with landholders of all properties traversed by the transmission and storage pipelines during operation in accordance with the requirements of AS 2885.

2.9.2 Associated Surface Facilities Inspections and Maintenance

The associated surface facilities are designed to be automated and will be operated unmanned under normal operating conditions. Site inspections would typically be undertaken on a monthly basis.

2.9.3 General Operations Resourcing

Operation of the pipelines and associated surface facilities would require an incremental increase in APA's existing operational workforce consisting of five field and control room staff.

Field staff will be responsible for day-to-day operations and maintenance activities, ground patrols, communication with local stakeholders and facilitation of third-party access to the easement.

Contractors operating under APA's supervision would be responsible for activities including:

- Easement maintenance, such as vegetation control, weed management, erosion and subsidence monitoring
- Specialist pigging operations, if required
- CP surveys.

Field staff will access the pipelines to conduct operations and maintenance activities as required, in consultation with relevant landholders. Field staff are likely to be based in the lower Hunter Valley.

Both pipelines and all associated surface facilities will be monitored from APA's Integrated Operations Centre currently located at the APA office at Spring Hill, Brisbane. Control room staff will also coordinate maintenance and management activities.

2.10 Decommissioning

Decommissioning of the Project will occur at the end of its useful life. A decommissioning plan for the Project and associated infrastructure will be prepared in advance of decommissioning in consultation with the relevant regulatory authorities and landholders. The basis of the plan will be that the Project and associated infrastructure are to be decommissioned in line with the applicable legislative requirements and best practice guidelines existing at that time, including any current version of the APGA Code.

The following options for the transmission and storage pipelines will be considered as part of this process, although other options may also be identified:

- Suspension – The transmission and storage pipelines would be depressurised, capped and filled with an inert gas such as nitrogen, or water with corrosion inhibitors. The cathodic protection system would be maintained to prevent the pipeline corroding. Surface facilities would be removed or left in place if further service is envisaged.

- Abandonment – The pipelines would be disconnected from all sources of hydrocarbons and surface facilities. All remaining natural gas would be purged from the pipelines with a non-flammable liquid. Sections of the pipelines may then be filled with water, filled with cementitious mud, or removed. All surface facilities would be removed.

Both identified decommissioning options would result in small scale disturbance and environmental impacts. It is anticipated that relinquishment of the applicable Pipeline Licence (and associated easement) would not be possible until such time as any decommissioning issues are resolved.

Removal of the pipelines as part of abandonment would result in significant disturbance and environmental impacts and is therefore not preferred.

SECTION 3.0

Statutory Context

3.0 Statutory Context

This section provides a detailed description of the statutory provisions applying to the Project with respect to environmental assessment and planning approval at Federal, State and local level, as well as the roles that these play in the Project's assessment and determination.

3.1 Commonwealth Legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in the environmental assessment of impact, management and protection of areas of national significance and biodiversity conservation. The EPBC Act is administered by Department of Agriculture, Water and the Environment (DAWE).

The EPBC Act aims to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as Matters of National Environmental Significance (MNES). There are nine MNES listed under the EPBC Act as being protected:

- World heritage properties
- National heritage places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- Water resources in relation to coal seam gas development and large coal mining development

The Commonwealth Minister for the Environment is the approval authority for any actions which:

- Would have or are likely to have a significant impact on MNES
- Would have or are likely to have a significant impact on the environment on Commonwealth land or an action by a Commonwealth agency which has, would have, or is likely to have significant impact on the environment.

Under the EPBC Act, a referral is required to be submitted to the Department of Agriculture, Water and the Environment (DAWE) for any 'action' that is considered likely to have a significant impact on any MNES. If DAWE determines the action to be a 'controlled activity' approval is required from the Minister of the Environment.

A search of protected matters under the EPBC Act for the Project was undertaken on 6 June 2021 using the EPBC Act Protected Matters Search Tool (PMST) with a 10 km radius. The report is provided as part of the BDAR (refer to **Appendix 4**).

The Project area is not within or adjacent to a world heritage property or national heritage place, a Commonwealth marine area or the Great Barrier Reef Marine Park. The Project is not a nuclear action, coal seam gas or coal mining development. The Project is not considered to have potential to cause direct or indirect impacts to the nearest Ramsar wetland site (the Hunter estuary wetlands), which is 5.8 km south-east of KP 0. However, the Project has potential to impact some listed threatened ecological communities and threatened species and migratory species that may occur within the Project area.

A referral has been submitted to the DAWE on 6 December 2021 to confirm whether the Project requires assessment and approval under the EPBC Act. On 9 February 2022, the Project was determined to be a controlled action, requiring approval under the EPBC Act from the Commonwealth Minister for the Environment due to its potential impact on the following MNES:

- Listed Threatened Species and Communities.

A copy of the determination of the Project as a Controlled Action is provided in **Appendix 1**. The assessment path for the Project is under the bilateral agreement between the Commonwealth and NSW Governments and DAWE has issued its assessment requirements which have been incorporated into the SEARs for the Project (refer to **Appendix 1**). This EIS addresses the assessment requirements, with a summary of the assessment findings related to MNES included in **Section 8.0**.

3.1.2 Native Title Act 1993

The Native Title Act 1993 provides a legislative framework for the recognition and protection of native title rights that in certain circumstances allow Indigenous people to continue to hold rights to land and water, which come from their traditional laws and customs.

A search of the Register of Native Title claims on 30 July 2021 did not identify Native Title applications or determinations that affect the Project area.

3.2 NSW Legislation and Policies

There are a substantial number of legislative instruments in NSW which regulate the environmental impact of development. The primary instrument is the EP&A Act which regulates the planning and environmental assessment and approval process for development in NSW. The Application of the EP&A Act and relevant subordinate legislation to the Project is discussed in **Sections 3.2.1** and **3.2.3**.

In addition to the policies discussed in **Section 3.2.4**, there are a large number of impact specific guidance documents and policies that have been considered as part of the environmental assessment of the Project, these are identified and discussed in the relevant impact assessment sections in **Section 7.0**.

3.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EPA Regulation) establishes the planning and approvals process in NSW. The EP&A Act provides for the making of Environmental Planning Instruments (EPI), including local environmental plans (LEPs) and State environmental planning policies (SEPPs), which set out requirements for particular localities and/or particular types of development. The applicable EPIs and the EP&A Regulation made under the EP&A Act, collectively determine the relevant planning approval pathway and the associated environmental assessment requirements for proposed development activities.

3.2.1.1 Approval Pathway

Critical State Significant Infrastructure

Clause 24(2)(b) of Schedule 5 of the *State Environmental Planning Policy (State and Regional Development)* (SRD SEPP) provides for *"the construction and operation of a new gas transmission and storage pipeline, compressor station and delivery station,"* as part of the Kurri Kurri Gas-fired Power Station development as being declared Critical State Significant Infrastructure (CSSI). Therefore, the Project will require approval under Division 5.2 of the EP&A Act.

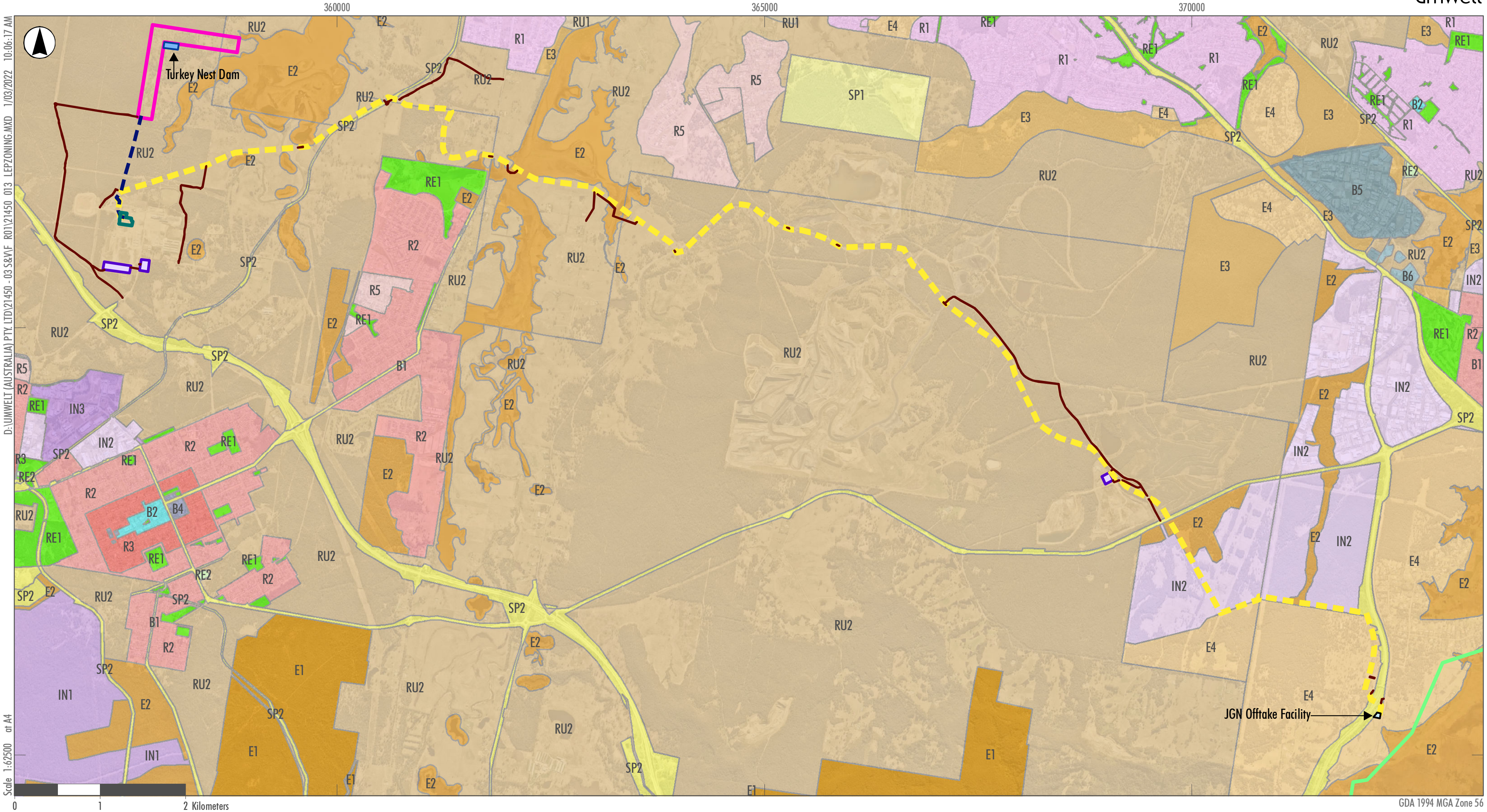
As a result of this declaration, EPIs do not apply to the Project. However, **Section 3.2.3** outlines applicable EPIs which have been considered as part of the environmental assessment in conjunction with the SEARs. Further implications for the Project due to the declaration as CSSI are:

- Community participation is essential to the process for assessing and determining a CSSI project, and this EIS will be exhibited publicly for at least 28 days
- A CSSI project requires the approval of the Minister for Planning and Public Spaces before it may proceed
- Approval authorities must evaluate the merits of the CSSI project against matters in Section 5.19 of the EP&A Act, and may approve the carrying out of the project, subject to modifications or conditions, or disapprove of it
- After the Minister's determination has been given, the Department of Planning, Infrastructure and the Environment will publish the decision online, and give public notice of the reasons for the decision and how community views were taken into account in making the decision
- A CSSI project approval cannot be subject to a merit appeal
- CSSI projects may only be subject to judicial review with the approval of the Minister for Planning and Public Spaces
- Any person may commence judicial proceedings within three months of the public notice of the determination (subject to the Minister's approval)
- CSSI projects are exempt from public hearing processes through the Independent Planning Commission (IPC).

Permissibility

The Project is located within the Cessnock, Maitland and Newcastle local government areas (LGA). Hence, the *Cessnock Local Environment Plan 2011* (Cessnock LEP), *Maitland Local Environment Plan 2011* (Maitland LEP) and the *Newcastle Local Environmental Plan 2012* (Newcastle LEP) are relevant to the permissibility of the Project. Relevant land zonings under each of the LEPs are shown in **Figure 3.1**.

The majority of the Project area falls within the Cessnock LGA with the subject land being located within land zoned as RU2 - Rural Landscape, E2 - Environmental Conservation, IN2 - Light Industrial and SP2 – Infrastructure under the Cessnock LEP. A small portion of the Project area falls within the Maitland LGA and is subject to RU2 - Rural Landscape and E2 - Environmental Conservation under the Maitland LEP.



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks

EPI Land Zoning

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- B5 Business Development
- B6 Enterprise Corridor
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

FIGURE 3.1

LEP Land Zoning Map

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021), NSW DPIE (2020)

The remaining portion of the Project area is within the Newcastle LGA and is subject to E2 - Environmental Conservation, E4 – Environmental Living, IN2 - Light Industrial and SP2 – Infrastructure under the Newcastle LEP. The Project is generally consistent with the objectives of zonings within these LEP. As discussed in **Section 3.2.3.2**, the Project is not considered to be inconsistent with the objectives of each of the identified zones.

Under these LEPs, the development for the purpose of a pipeline is prohibited within parts of the Project area, as outlined in **Section 3.2.3.2**. However, as the Project is declared CSSI, the provisions of the SRD SEPP override the LEPs and the land use and permissibility requirements under these LEPs do not apply to the Project. The Project is to be assessed and determined under Division 5.2 of the EP&A Act.

Secretary's Environmental Assessment Requirements (SEARs)

This EIS has addressed the SEARs provided for the Project which were issued by Department of Planning, Industry and Environment (DPIE) on 23 July 2021. A copy of the SEARs is contained in **Appendix 1**.

A checklist of the SEARs and where they have been addressed in the EIS is outlined in **Table 3.1**. The specific government agency requirements included as an attachment to the SEARs have been considered and addressed where relevant, throughout the EIS and the relevant specialist studies.

Table 3.1 Secretary's Environmental Assessment Requirements for the EIS

Secretary's Environmental Assessment Requirements	Relevant EIS Section
General Requirements	
The Environmental Impact Statement (EIS) for the project must comply with the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000 (the Regulation)*.	**Section 3.2.1.2**
In particular, the EIS must include, but not necessarily be limited to, the following:	
• a stand-alone executive summary;	Refer to Executive Summary
• a full description of the project, including: ○ details of construction, operation and decommissioning for the proposed pipeline route(s), including any proposed staging of the project or refurbishing of infrastructure over time;	**Section 2.0**
○ all components, infrastructure, materials and activities required to construct the project, such as mainline valves, scraper and meter stations, construction compounds, access roads, and road upgrades (including any infrastructure that would be required for the project, but the subject of a separate approvals process);	**Section 2.0**
• site plans and maps at an adequate scale showing: ○ the location and dimensions of project components; ○ existing infrastructure, land use, and environmental features in the vicinity of the project (including any other existing, approved or proposed infrastructure in the region); and ○ the project corridor that has been assessed, including any allowance for micro-siting and identification of the key environmental constraints that have been considered in the design of the project;	**Section 2.0** **Section 7.2**
• details of the progressive rehabilitation of the site during and following construction and decommissioning of the pipeline infrastructure;	**Section 2.0**

Secretary's Environmental Assessment Requirements	Relevant EIS Section
• the likely interactions between the project and any other existing, approved or proposed major resource or infrastructure projects in the vicinity of the site including and not limited to the assets owned by the Hunter Water Corporation, residential developments surrounding the proposed pipeline route(s), the Hunter Power (Kurri Kurri Power Station) and Hydro Kurri Kurri Aluminium Smelter Remediation projects; and	**Sections 1.4.1 and 7.16**
• workforce requirements during all phases of the project;	**Sections 2.0**
• a general description of any infrastructure that would be required for, or linked to, the project that is the subject of a separate approval process;	**Section 1.4.1**
• strategic context of the project in regard to supplying gas to the Hunter Power (Kurri Kurri Power Station);	**Section 4.3**
• consideration of any capacity constraints of pipelines that this project would be connecting to for gas supply;	**Section 1.6.3**
• a list of any approvals that must be obtained before the project may commence;	**Section 3.2.4.1**
• an assessment of the likely impacts of the project on the environment, focusing on the specific issues identified below, including:	
• a description of the existing environment likely to be affected by the project, using sufficient baseline data;	**Sections 7.2 to 7.16**
• an assessment of the likely impacts of all stages of the project, including any cumulative impacts, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;	**Sections 7.2 to 7.16**
• a description of the measures that would be implemented to avoid, mitigate and/or offset residual impacts of the project, and the likely effectiveness of these measures; and	**Sections 7.0 and 10.0**
• a description of the measures that would be implemented to monitor and report on the environmental performance of the project if it is approved;	**Sections 7.0 and 10.0**
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS;	**Section 10.0**
• consideration of the project against all relevant environmental planning instruments;	**Section 3.2.1**
• an evaluation of the project as a whole having regard to: ○ relevant matters for consideration under the *Environmental Planning and Assessment Act 1979*, including ecologically sustainable development;	**Sections 10.4 and 10.5**
• the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses, significant mineral resources, coal exploration licences and mining leases;	**Section 10.2**
• the strategic need and justification for the project, in regard to its role in supplying gas to the Hunter Power (Kurri Kurri Power Station), relevant NSW and national policies and guidelines on electricity and gas supply and security including the NSW Future of Gas Statement, Australia's National Hydrogen Strategy, and NSW Government policy development on use of hydrogen;	**Sections 4.0 and 10.1**
• feasible alternatives to the project (and its key components), including the consequences of not carrying out the project; and	**Section 5.0**
• the biophysical, economic and social costs and benefits of the project	**Section 10.3**
• a signed statement from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	**Appendix 2**

Secretary's Environmental Assessment Requirements	Relevant EIS Section
The EIS must also be accompanied by a report from a qualified quantity surveyor providing: • a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived. The report must be prepared on company letterhead and indicate applicable GST component of the CIV; • an estimate of jobs that will be created during the construction and operational phases of the proposed infrastructure; and • certification that the information provided is accurate at the date of preparation.	To be provided to DPIE separately
Key issues	
The EIS must address the following specific issues with the level of assessment of likely impacts proportionate to the significance of, or degree, of impact on, the issue, within the context of the project location and the surrounding environment and having regard to applicable NSW Government policies and guidelines.	
Land and Soils – including:	
• an assessment of the potential impacts of proposed pipeline route(s) for the project on existing and future land uses and developments on the site and adjacent land, including the Blackhill industrial land, consideration of agricultural land, biosecurity and soil resources, flood prone land, Crown lands, mining, quarries, or mineral or petroleum rights or resources, and water supply pipelines and assets owned by the Hunter Water Corporation; • details of the legislative functions to authorise access, use or occupy any affected land and compliance with the relevant legislation; • an assessment of the compatibility of the project with existing and proposed land uses, including consideration of zoning provisions applying to the land and location of any future potential biodiversity offset areas (if required) in relation to potential resource sterilisation; and • a description of construction erosion and sediment controls including how the project, on areas of erosion, salinity or acid-sulphate risk, including steep gradient land or erodible soils types, would be managed and any contingency requirements to address residual impacts, having regard to the Hydro Kurri Kurri Aluminium Smelter Remediation project and any other contamination assessments relevant to the site;	**Sections 7.2 and 7.3**
Water – including:	
• a detailed and consolidated site water balance, including a description of water demand, a breakdown of authorised and reliable water supplies and assessment of the available water entitlements for the project (if required), and the measures to minimise water use; • details of water requirements and supply arrangements for the project; • an assessment of the likely impacts of the project on groundwater aquifers and groundwater dependent ecosystems, having regard to the NSW Aquifer Interference Policy and relevant Water Sharing Plans; • an assessment of the impacts of the project on the quantity and/or quality of the region's surface and groundwater resources, having regard to the Guidelines for Controlled Activities on Waterfront Land, NSW Water Quality and River Flow Objectives (DECCW, 2006), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) and ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006c); • an assessment of flooding and the hydrological impacts of the project; • identification of any licensing requirements or other approvals under the WM Act; • an assessment of the likely impacts of the project on watercourses, riparian land, water related infrastructure and other water users, including use and discharge of water during construction, commissioning and maintenance of the pipeline infrastructure, and measure to mitigate the impacts;	**Section 7.4**

Secretary's Environmental Assessment Requirements	Relevant EIS Section
Biodiversity – including:	
• an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM 2020) and documented in a Biodiversity Development Assessment Report (BDAR); • the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; and • an assessment of the likely impacts of the project on aquatic ecology and key fisheries issues, including creek crossing and access tracks for construction and maintenance, aquatic biodiversity and key fish habitats;	**Section 7.5**
Aboriginal Cultural Heritage - including	
• an assessment of the Aboriginal heritage values and likely Aboriginal heritage (cultural and archaeological) impacts of the project in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010), and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). The ACHAR must: document the significance of cultural heritage values for Aboriginal people who have a cultural association with the land and be prepared in consultation with the local Aboriginal community in accordance with Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010); include results of a surface survey (and test excavations, if required) undertaken by a qualified archaeologist to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record; and demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes, including mitigation measures and procedures for accidental finds at any stage of the project;	**Section 7.6**
Historic Heritage – including:	
• an assessment of the impact on historic heritage in accordance with the NSW Heritage Manual, prepared by a suitably qualified consultant, including: o heritage conservation areas and State and local heritage items within and near the site, and detailed mapping of the items and mitigation measures for potential impacts on heritage values; and o if identified, an historical archaeological assessment, in accordance with the Archaeological Assessment (1996) and Assessing Significance for Historical Archaeological Sites and Relics (2009), including significance of the relics and mitigation strategy. If harm cannot avoided, a Research Design and Excavation Methodology must outline the proposed excavations or salvage programme;	**Section 7.7**
Air Quality and Odour – including:	
• identification of all sources or potential sources of air emissions (point or fugitive) and odour from the project; • an assessment of the likely air quality and odour impacts of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA), Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006b); Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006b); • demonstrated ability to comply with the relevant regulatory framework, specifically the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Clean Air) Regulation 2010; and • an assessment of the likely greenhouse gas (GHG) impacts of the project, including measures to minimise GHG emissions;	**Sections 7.8 and 7.9**

Secretary's Environmental Assessment Requirements	Relevant EIS Section
Noise and Vibration – including:	
• an assessment of the likely construction noise impacts of the project under the Interim Construction Noise Guideline (DECCW, 2009); • an assessment of the likely operational noise impacts of the project under the NSW Noise Policy for Industry (EPA, 2017); • an assessment of the likely road noise impacts of the project under the NSW Road Noise Policy (EPA, 2011); and • an assessment of the likely vibration amenity and structural impacts of the project under Assessing Vibration: A Technical Guideline (DEC. 2006a), German Standard DIN 4150-3 Structural Vibration – effects of vibration on structures, and Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990);	**Section 7.10**
Transport – including:	
• an assessment of the likely transport impacts of the project on the capacity, condition, safety and efficiency of the local and State road network, documented in a Traffic Impact Assessment, including: o details of traffic types and volumes likely to be generated by the project, including all relevant vehicular traffic routes and intersections for access to/from the site along the proposed pipeline route option(s); o any crossings or utility installation, any potential interactions with Hunter Expressway (6011), the Pacific Motorway (6003), John Renshaw Drive (MR588) and Main Road (MR195 Maitland – Kurri Kurri) and any planned projects (including M1 Motorway to Raymond Terrance, Black Hill Development MR588 intersection works, MR195 Testers Hollow); o details of measures to mitigate and/or manage potential impacts including a schedule of all required road upgrades, road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road authorities; and o details of measures to mitigate and/or manage potential impacts of the project on rail infrastructure;	**Section 7.11**
Hazards and Risks – including:	
• a Preliminary Hazard Analysis (PHA), covering an assessment of the hazards and risk impacts likely to be associated with the project, including gas leaks and transport, handling and management of dangerous goods. The assessment must be prepared consistent with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines of Hazard Analysis (Department of Planning, 2011d) and Multi-level Risk Assessment. The PHA must: o be a quantitative risk assessment (QRA) to estimate the risks from the pipeline to the surrounding land uses, including ground movement or subsidence within or close to the Black Hill mine site, and with reference to applicable Australian Standards (including AS2885 Pipelines – Gas and Liquid Petroleum - Operation and Maintenance) and licensing requirements under the Pipelines Act 1967; o demonstrate that the pipeline corridors and designs to which approval is sought can comply with the Department's Hazardous Industry Planning Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning' (Department of Planning, 2011c); and o consider the PHA prepared for the proposed Hunter Power Project (Kurri Kurri Power Station (SSI-12590060), particularly in relation to safeguards against accident propagation or escalation between the two projects; and o on-going maintenance and safety management of the project, including potential impacts on and from bushfires and floods;	**Section 7.12**

Secretary's Environmental Assessment Requirements	Relevant EIS Section
Visual - including:	
• an assessment of the likely visual and landscape character impacts of the project on the amenity of the surrounding area and private landowners in the vicinity of the project;	**Section 7.13**
Social & Economic – including:	
• an assessment of the likely social impacts and benefits of the project, including the likely impacts of the project on the local community, demands on Council infrastructure and services and cumulative impacts (considering other developments in the locality) (note that the Department's Social Impact Assessment Guideline For State Significant Developments July 2021 may apply, subject to transitional arrangements); and	**Section 7.14**
Waste Management - including	
• identification, quantification and classification of the likely waste streams, including discharges with potential for water impacts, likely to be generated during construction and operation, and description of the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.	**Section 7.15**
Plans and Documents	
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Regulation. Provide these as part of the EIS rather than as separate documents. In addition, the EIS must include high quality files of maps and figures of the subject site and proposal.	Figures included throughout the EIS
Consultation	
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, Registered Aboriginal Parties (RAPs), and affected landowners, including mine operators and written notification of the proposal to the titleholders including a map indicating the proposal area. The EIS must describe the consultation process and the issues raised and identify where the design of the infrastructure has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	**Section 6.0**

3.2.1.2 Environmental Planning and Assessment Regulations 2000

The *Environmental Planning and Assessment Regulations 2000* (EP&A Regulation) was made to support the EP&A Act, which establishes the land use planning and development assessment framework for NSW. The EP&A Regulation includes the procedures for the making of Environmental Planning Instruments (EPIs), assessment of development proposals, the levying of development contributions, and compliance and enforcement powers.

Clause 193 (1) of the EP&A Regulation requires that the consent of the owner of the land on which State significant infrastructure is to be carried out is required for an infrastructure unless the application or request relates to, amongst other things, critical State significant infrastructure or utility infrastructure. As the Project is both critical State significant infrastructure and utility infrastructure consent of the landowner is not required. Nonetheless APA will employ all reasonable steps to enter into an agreement with each landholder on fair and reasonable terms.

Clause 191 (3) requires the consent of the New South Wales Aboriginal Land Council for an infrastructure application or modification request relating to land owned by a Local Aboriginal Land Council if the application requires the consent of the Local Aboriginal Land Council as owner of the land. The Project is not proposed on land owned by a Local Aboriginal Land Council.

Clause 193A of the *Environmental Planning and Assessment Regulations 2000* (EP&A Regulation) requires consideration of the *Dark Sky Planning Guideline* if the State significant infrastructure is on land within 200km of Siding Spring Observatory. The Project is approximately 280km south west of Siding Spring Observatory at its closest point. As such, the *Dark Sky Planning Guideline* does not require consideration.

Clause 256P of the EP&A Regulation requires an accurate estimate of the Capital Investment Value (CIV) of the development. CIV is defined in Clause 3. A copy of the CIV report was provided to DPIE.

Clause 228 of the EP&A Regulation lists the factors that must be taken into account concerning the impact of an activity on the environment. These factors have been considered during preparation of the EIS.

Schedule 2 of the EP&A Regulation provides the requirements of EIS documents, which provide the basis for the SEARs issued for proposals. The relevant sections in the EIS are referenced against each of the SEARs in **Table 3.1**. Clause 6 and 7 of Schedule 2 specifies the form and content requirements of the EIS.

3.2.2 Pipelines Act 1967

The *Pipelines Act 1967* (Pipelines Act) establishes the framework for the construction, licencing and operation of pipelines over land in NSW, but does not contain provisions for the planning and development approvals in relation to construction of pipelines. These provisions are made under the EP&A Act and its subordinate environmental planning instruments (EPI). The Pipelines Act does however provide for 'Authority to Survey' where a proponent requires access to private land in order to survey possible pipeline routes or conduct geotechnical or other testing, including taking of samples.

Part 3 of the Pipelines Act outlines licensing requirements for pipelines. Under Part 3 (excluding exempt items) a licence is required to:

- Commence, or continue, the construction of a pipeline
- Alter or reconstruct a pipeline
- Operate a pipeline.

As the Project will involve the construction and operation of a pipeline, a licence will be required.

Section 7.2.4 provides further information on how easements are vested under the Pipelines Act and the obligations and compensation that is associated with the easements.

3.2.3 Environmental Planning Instruments

There are a number of EPIs that are potentially applicable to the Project. These are discussed in the following sections.

3.2.3.1 State Environmental Planning Policies

The following SEPPs are relevant to the consideration of the development application for the Project.

State Environmental Planning Policy (State and Regional Development) 2011

The SRD SEPP identifies development that is of regional or State significance, which includes development that has been declared State Significant Development, State Significant Infrastructure, or CSSI. Development specified in Clause 16 of the SRD SEPP provides that development specified in Schedule 5 (of the SEPP):

- May be carried out without development consent under Part 4 of the Act, and

- Is declared to be State significant infrastructure for the purposes of the Act if it is not otherwise so declared, and
- Is declared to be critical State significant infrastructure for the purposes of the Act.

Clause 24 of Schedule 5 refers to the Kurri Kurri Gas-fired Power Station Project, including *“the construction and operation of a new gas transmission and storage pipeline, compression station and delivery station”* as being critical State Significant Infrastructure (SSI). Therefore, the Project will require approval under Division 5.2 of the EP&A Act.

As a result of this declaration planning instruments do not apply to the Project. However, the following planning instruments have been considered as part of the environmental assessment in conjunction with the SEARs.

State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP aims to facilitate the effective delivery of infrastructure across the State.

Clause 66A(1) of the Infrastructure SEPP states that “d*evelopment for the purpose of a pipeline may be carried out by any person without consent on any land if the pipeline is subject to a licence under the Pipelines Act 1967 or a licence or authorisation under the Gas Supply Act 1996.”*. The Project would be subject to a licence under the Pipelines Act (refer **Section 3.2.2**) and therefore is permissible without consent under the Infrastructure SEPP.

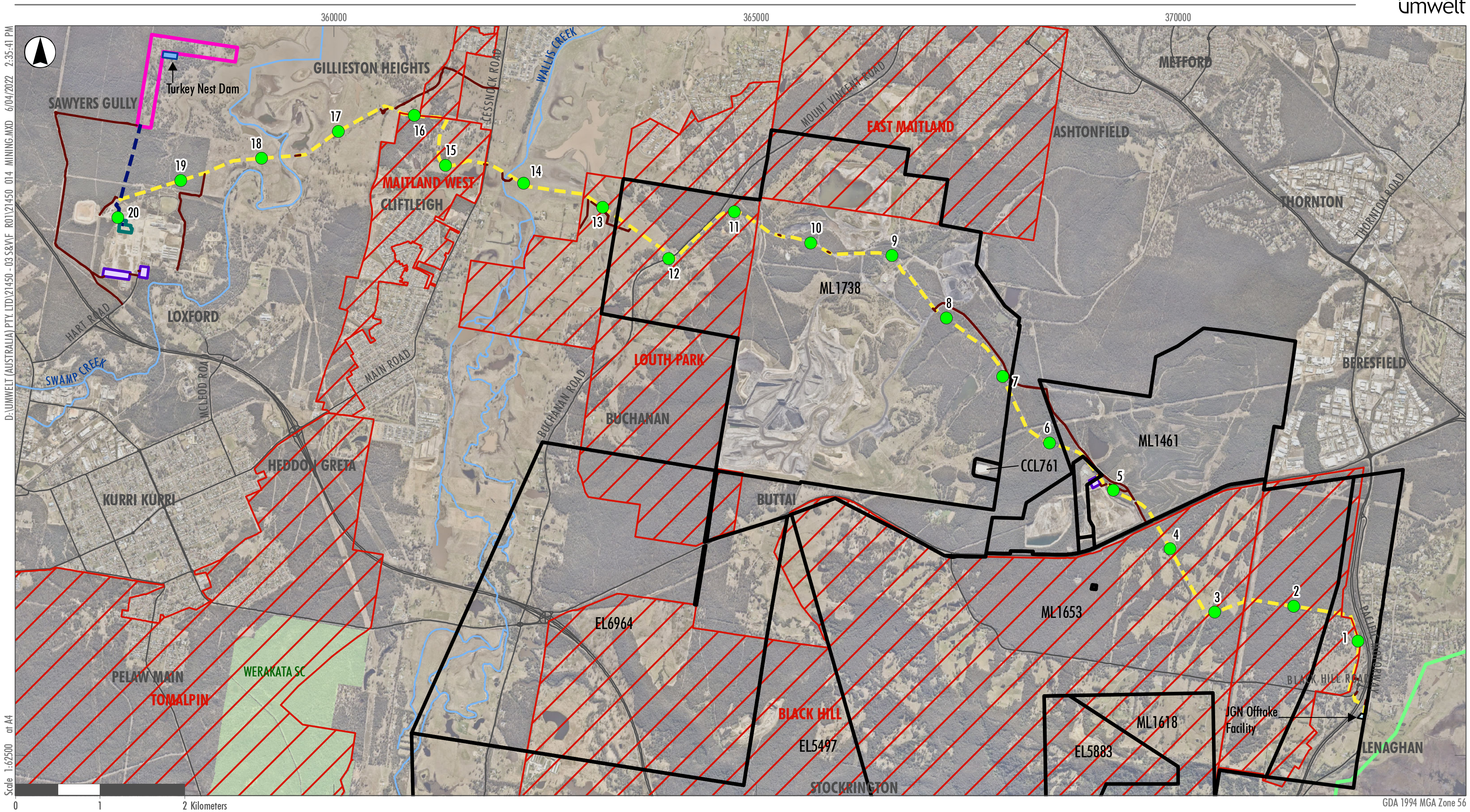
In addition, under clause 66B(2) of the Infrastructure SEPP, a range of installation, maintenance and replacement works are exempt development if the development is in connection with a gas pipeline that is the subject of a licence under the Pipelines Act and complies with certain controls in clause 20 of the Infrastructure SEPP.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The Mining SEPP recognises the importance of mining, petroleum production and extractive industries to NSW.

The Project area is not mapped as being located within State or regionally significant resources of minerals, petroleum, or extractive materials. Although the Project area will traverse current mining operations, no extraction related activities will be affected by the Project, as outlined in **Section 7.2**. Parts of the Project area is subject to a mineral exploration license and mining/production lease held by Donaldson Coal Pty Limited and Ashtonfields Pty Limited, as shown on **Figure 3.2**. The impact on mining operations has been addressed in **Section 7.2**.

A small portion (0.6ha) of the Project area at the north-eastern boundary of the storage pipeline construction footprint adjacent to Wentworth Swamp, is mapped as BSAL. According to the NSW Strategic Regional Land Use Policy, BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. The NSW Strategic Regional Land Use Policy is made under the Mining SEPP, which does apply to the Project as it requires licensing under the Pipelines Act. Nevertheless, an assessment of impacts to the mapped area of BSAL is provided in **Section 7.2**.



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Mining Leases and Licences
- Mine Subsidence District
- NSW Conservation Estates
- Access Tracks
- Roads
- Watercourses

FIGURE 3.2

Mining Leases and Licenses Applicable to the Project

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

State Environmental Planning Policy (Koala Habitat Protection) 2020/2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala Habitat SEPP 2021) commenced on 17 March 2021. The Koala Habitat SEPP 2021 applies across all zones in the 8 Sydney Metropolitan Councils and Central Coast and to zones other than RU1, RU2 and RU3 for the remaining 74 councils. *State Environmental Planning Policy (Koala Habitat Protection) 2020* (Koala Habitat SEPP 2020) applies to the RU1, RU2 and RU3 zones in the 73 LGAs, including the Cessnock, Maitland and Newcastle LGAs.

Koala Habitat SEPP 2020 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. The Koala Habitat SEPP 2020 replicates the objectives and provisions of the previous *SEPP No. 44 - Koala Habitat protection* (SEPP 44), which was in force from 1995 through to 2019.

The Koala Habitat SEPP 2020 applies to the extent that the Project is located within an LGA listed in the SEPP, and a consent authority is restricted from granting development consent for proposals on land identified as core koala habitat without the preparation of a plan of management.

An extensive biodiversity assessment (refer to **Section 7.5**) has been completed for the Project and includes a koala habitat assessment. The Project area contains areas of Potential Koala Habitat, in accordance with the Koala Habitat SEPP 2020. Neither the Cessnock, Maitland or Newcastle LGAs have a Koala Plan of Management, and they are not the determining authority, therefore the provisions of the Koala Habitat SEPP 2020 do not apply to the Project.

Impact avoidance, mitigation and management measures have been applied to the Project as described in **Section 7.5**.

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)

The *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP) gives effect to the objectives of the *Coastal Management Act 2016* (refer to **Section 3.2.4**) from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone which are divided into the following four management areas:

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

The Project area is not mapped as being within coastal wetlands area or a proximity area for coastal wetlands (which is land up to 100 m around all mapped coastal wetlands). It is considered that the Project would not directly impact on the coastal wetlands as detailed in **Sections 7.4** and **7.5**.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)

Under *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) developers and consent authorities are required to assess the hazards and risks associated with a proposed development before approval is given for construction and operation. A potentially hazardous industry under SEPP 33 is defined as "*development for the purposes of any industry where, if the development were to operate without employing any measures to reduce or minimise its impact the development would pose a significant risk to human health, life or property or to the biophysical environment*".

Developments that are classified as potentially hazardous under SEPP 33 are required by Clause 12 to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls.

Under section 5.22 of the EP&A Act, SEPP 33 does not formally apply to the Project. However, a PHA has been prepared in respect of the Project as required by the SEARs. The outcomes from the PHA are summarised in **Section 7.12** of this EIS.

State Environmental Planning Policy No. 55 – Remediation of land

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by consideration of contaminated land as part of the planning process. Under SEPP 55, a consent authority must not consent to the carrying out of development on land unless it has considered any potential contamination issues.

Under section 5.22 of the EP&A Act, SEPP 55 does not formally apply to the Project. The potential for disturbance of existing land or groundwater contamination or contamination of land or groundwater due to construction activities were investigated in the EIS (see **Sections 7.3** and **7.4**). A Preliminary Site Contamination Assessment was undertaken as part of the EIS and is provided in full in **Appendix 8** with the key findings of the assessment summarised in **Section 7.3**. The management of contamination risks as part of the Project is discussed further in **Section 7.3.5** and **7.4.4**.

A contamination assessment was undertaken for the HPP EIS in accordance with its SEARs. This investigation was undertaken in the context of a wider Remedial Action Plan (RAP) (Ramboll, 2016), prepared in support of an EIS for remediation of the former Kurri Kurri Aluminium Smelter site. The details of the RAP and its outcomes are described in Chapter 11 of the HPP EIS, including the timelines, and an outline of remediation responsibilities and liabilities.

3.2.3.2 Local Government Legislation

The Project area traverses three Local Government Areas (LGAs), with the relevant Local Environmental Plans (LEPs) set out below.

Cessnock Local Environmental Plan 2011

The majority of the Project falls within the Cessnock LGA, which is subject to the *Cessnock Local Environmental Plan 2011* (Cessnock LEP). The Project area is located within land zoned RU2 Rural Landscape, E2 - Environmental Conservation, IN2 - Light Industrial and SP2 - Infrastructure. Current land zoning of the Project area and surrounds is shown in **Figure 3.1**.

As noted previously, the Project is declared CSSI and the provisions of the SRD SEPP override LEPs. As such the land use and permissibility requirements under the Cessnock LEP do not apply to the Project. Clause 16 of the SRD SEPP states:

Development specified in Schedule 5—

may be carried out without development consent under Part 4 of the Act, and

is declared to be State significant infrastructure for the purposes of the Act if it is not otherwise so declared, and

is declared to be critical State significant infrastructure for the purposes of the Act.

Table 3.2 summarises the objectives for land use and development in these zones under the Cessnock LEP.

Table 3.2 Objectives for land use development in applicable land zones under Cessnock LEP

Land Zone	Objective
RU2 Rural Landscape	• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To maintain the rural landscape character of the land. • To provide for a range of compatible land uses, including extensive agriculture. • To enable other forms of development that are associated with rural activity and require an isolated location or support tourism and recreation. • To ensure that the type and intensity of development is appropriate in relation to the rural capability and suitability of the land, the preservation of the agricultural, mineral and extractive production potential of the land, the rural environment (including scenic resources) and the costs of providing services and amenities. • To maintain and enhance the scenic character of the land. • To ensure that development does not create unreasonable or uneconomic demands for the provision or extension of services. • To minimise the visual impact of vegetation clearing in order to be consistent with the rural character of the locality. • To minimise disturbance to the landscape from development through clearing, earthworks, access roads and construction of buildings. • To ensure development does not intrude into the skyline when viewed from a road or other public place.
E2 Environmental Conservation	• To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
IN2 Light Industrial	• To provide a wide range of light industrial, warehouse and related land uses. • To encourage employment opportunities and to support the viability of centres. • To minimise any adverse effect of industry on other land uses. • To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area. • To support and protect industrial land for industrial uses.
SP2 Infrastructure	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.

Maitland Local Environmental Plan 2011

A portion of the Project falls within the Maitland LGA and is therefore subject to the *Maitland Local Environmental Plan 2011* (Maitland LEP). The subject land is located within land zoned RU2 Rural Landscape and E2 - Environmental Conservation. **Table 3.3** summarises the objectives for land use and development in these zones under the Maitland LEP.

As noted previously, the Project is declared CSSI and the provisions of the SRD SEPP override LEPs. As such the land use and permissibility requirements under the Maitland LEP do not apply to the Project.

Table 3.3 Objectives for land use development in applicable land zones under Maitland LEP

Land Zone	Objective
RU2 Rural Landscape	• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To maintain the rural landscape character of the land. • To provide for a range of compatible land uses, including extensive agriculture. • To provide for a range of non-agricultural uses where infrastructure is adequate to support the uses and conflict between different land uses is minimised.
E2 Environmental Conservation	• To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage or otherwise have an adverse effect on those values. • To ensure that development and management of the land has minimal impact on water quality and environmental flows of receiving waters. • To permit limited extensive agricultural uses where such uses do not compromise the ecological values of the wetland.

Newcastle Local Environmental Plan 2012

The remainder of the Project falls within the Newcastle LGA and is therefore subject to the *Newcastle Local Environmental Plan 2012* (Newcastle LEP). This part of the Project area is subject to E2 - Environmental Conservation, E4 - Environment Living, SP2 - Infrastructure and IN2 - Light Industrial under the Newcastle LEP.

As noted previously, the Project is declared CSSI and the provisions of the SRD SEPP override LEPs. As such the land use and permissibility requirements under the Newcastle LEP do not apply to the Project.

Table 3.4 summarises the objectives for land use and development in these zones under the Newcastle LEP.

Table 3.4 Objectives for land use development in applicable land zones under Newcastle LEP

Land Zone	Objective
E2 Environmental Conservation	• To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage or otherwise have an adverse effect on those values. • To provide for the management of the majority of the Hunter River floodplain by restricting the type and intensity of development to that compatible with the anticipated risk to life and property. • To provide for the conservation, enhancement and protection of the Hexham Wetlands.
E4 Environment Living	• To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values. • To ensure that residential development does not have an adverse effect on those values. • To conserve the rural or bushland character and the biodiversity or other conservation values of the land. • To provide for the development of land for purposes that will not, or will be unlikely to, prejudice its possible future development for urban purposes or its environmental conservation.
SP2 Infrastructure	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.

Land Zone	Objective
IN2 Light Industrial	• To provide a wide range of light industrial, warehouse and related land uses. • To encourage employment opportunities and to support the viability of centres. • To minimise any adverse effect of industry on other land uses. • To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area. • To support and protect industrial land for industrial uses.

3.2.4 Other State Legislation

In addition to requiring development consent under the EP&A Act, the Project will require a number of separate regulatory planning and environmental approvals.

Division 5.2 section 5.24 of the EP&A Act requires that a number of approvals, if required for a SSI, cannot be refused if a development consent is granted and must be substantially consistent with the terms of any development consent granted for the development. Insofar as these approvals apply to the Project, they are discussed in **Section 3.2.4.1** below. Section 5.23 of the EP&A Act removes the requirement for a number of approvals for approved SSI projects; these approvals are discussed further in **Section 3.2.4.2**.

A summary of other relevant environmental and planning legislation that applies to the Project that are not subject to sections 5.23 and 5.24 of the EP&A Act are discussed in **Section 7.0**.

3.2.4.1 Approvals that must be applied consistently

Section 5.24 of the EP&A Act specifies certain authorisations that cannot be refused, if necessary, for the carrying out of approved SSI. Those authorisations which may be required for the Project are:

- A licence granted under Section 14 of the *Pipelines Act*, to construct and/or operate a pipeline.
- A Works Consent under Section 138 of the *Roads Act 1993*, to impact on public roads.
- An approval under section 15 of the *Mine Subsidence Compensation Act 196*1.

3.2.4.2 Approvals that do not apply

Section 5.23 of the EP&A Act specifies authorisations which are not required for approved SSI. Those authorisations that may otherwise have been relevant to the Project but are not required due to section 5.23 are set out in **Table 3.5**.

Table 3.5 NSW Legislation not relevant for State significant infrastructure

Legislation	Relevant section
Fisheries Management Act 1994	A permit under Section 201, 205 or 219.
Heritage Act 1977	An approval under Part 4, or an excavation permit under section 139. Division 8 of Part 6 does not apply to prevent or interfere with the carrying out of approved State significant infrastructure.
National Parks and Wildlife Act 1974	Aboriginal heritage impact permits under section 90.
Rural Fires Act 1997	A bushfire safety authority under section 100B.
Water Management Act 2000	Water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.

3.2.4.3 Other Relevant State Legislation

Biodiversity Conservation Act 2016

The general purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development (ESD).

Part 7 of the BC Act requires that an application for CSSI approval under the EP&A Act be accompanied by a biodiversity development assessment report (BDAR) unless *"the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values"*.

Biodiversity values are defined in the BC Act as:

- **Vegetation integrity** – being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state
- **Habitat suitability** – being the degree to which the habitat needs of threatened species are present at a particular site
- **Biodiversity values, or biodiversity** – related values, prescribed by the regulations.

The *Biodiversity Conservation Regulation 2017* (BC Regulation) further defines the following as biodiversity values:

- **Threatened species abundance** – being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site
- **Vegetation abundance** – being the occurrence and abundance of vegetation at a particular site
- **Habitat connectivity** – being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range
- **Threatened species movement** – being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle
- **Flight path integrity** – being the degree to which the flight paths of protected animals over a particular site are free from interference
- **Water sustainability** – being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.

A BDAR was prepared for the Project consistent with the requirements of the BC Act, given the proximity of the Project area to locally and regionally sensitive areas of vegetation and potential wildlife habitat. The BDAR is summarised in **Section 7.5** with the full report provided in **Appendix 4**.

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. The Department of Primary Industry (DPI) manages the majority of the FM Act, although DPIE has some responsibilities relating to endangered species and habitats. The FM Act applies in relation to all waters that are within the limits of the State and regulates certain activities that have the potential to impact on aquatic habitats.

The objects of the FM Act are:

- To conserve fish stocks and key fish habitats.
- To conserve threatened species, populations and ecological communities of fish and marine vegetation.
- To promote ecologically sustainable development, including the conservation of biological diversity.

Under the FM Act, development proponents are required to provide notification of proposals to DPI. Permits issued under the Act are required for:

- Works that would block the passage of fish in a bay, inlet, river or creek.
- Dredging or reclamation works.
- The construction of structures within aquatic habitats (e.g. bridges, roads, causeways, pipelines).
- Works that would cause harm to marine vegetation.

As the Project is CSSI permits under the FM Act are not required. Potential impacts on aquatic ecology are assessed in **Section 7.5**.

Local Land Services Act 2013

Under the 2016 amendments to the *Local Land Services Act 2013* (LLS Act), all rural land will be classified as either:

- **Category 1 (exempt land):** clearing of native vegetation without authorisation under the LLS Act is permitted; or
- **Category 2 (regulated land):** clearing of native vegetation is regulated under the LLS Act and some authorisation is required. Vulnerable land under this category will also be provided additional protection (e.g. riparian land).

Under section 60O of the LLS Act, approval is not required for the clearing of native vegetation on regulated land authorised by an SSI approval under Part 5 of the EP&A Act.

Under s60Q and Schedule 5A of the LLS Act, clearing native vegetation for the maintenance of public utilities associated with water supply infrastructure and gas supply infrastructure is authorised if carried out by or on behalf of the owner of the infrastructure or by or on behalf of the landholder.

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides for the identification, registration and protection of items of State heritage significance. Under Part 4 of the Heritage Act, approval is required to undertake a range of activities relating to a listed an item listed on the State Heritage Register. Under Part 6, an excavation permit is required for any activity that is likely to disturb a relic of State or local heritage significance.

Division 5.2 section 5.23(1)(c) of the EP&A Act provides that an approval under Part 4 or an excavation permit under section 139 of the Heritage Act are not required for approved SSI. However, this does not exempt the Project from requiring heritage assessment, which may identify heritage/archaeological sites and provide recommendations for their management, and the consideration of the provisions of the relevant statutory controls.

An assessment of heritage issues has been completed for the Project. The heritage assessment is provided in **Appendix 5** and a summary of the findings of the assessment is provided in **Section 7.7**.

National Parks and Wildlife Act 1974

The object of the *National Parks and Wildlife Act 1974* (NPW Act) relate to conserving their State's natural and cultural heritage; fostering public appreciation, understanding and enjoyment of their State's natural and cultural heritage; and managing any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of the State's natural and/or cultural heritage.

Under section 86 of the NPW Act, it is an offence to harm an Aboriginal object, except where authorised by an Aboriginal heritage impact permit issues under section 90 of the Act.

Under Division 5.2, Section 5.23 of the EP&A Act, an Aboriginal heritage impact permit under section 90 of the NPW Act is not required for an approved CSSI. However, an Aboriginal cultural heritage assessment (ACHA) has been completed for the Project, as required by the Project SEARs. The ACHA is provided in **Appendix 6** and a summary of the findings of the assessment is provided in **Section 7.6**.

Aboriginal Land Rights Act 1983

The *Aboriginal Land Rights Act 1983* (Aboriginal Land Rights Act) was established to return land in NSW to Aboriginal peoples through a process of lodging claim for certain Crown lands. Should it be identified that the final pipeline alignment crosses any areas of Aboriginal land under the Aboriginal Land Rights Act, or any areas currently the subject of claims under that Act, steps will be taken, including seeking to reach an agreement with the relevant land council, so that the grant of an easement can take place.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the principal legislation regulating pollution and waste management in NSW. All scheduled activities as listed in Schedule 1 of the POEO Act require an environment protection licence (EPL).

The construction and operation of the Project is not, of itself, a scheduled activity that requires an EPL. While there is an EPL requirement for certain petroleum production facilities, the EPL requirement is triggered by the "production" of petroleum above a certain threshold. The Project will transport gas however it will not "produce" petroleum.

The Project will be conducted in accordance with the general environment protection requirements of the POEO Act and will be the subject of detailed Environmental Management Plans (EMPs) for both construction (Construction EMP) and operations (Operations EMP).

Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates the carrying out of various activities on public roads and provides for the declaration of Transport for NSW and other public authorities, including councils, as a roads authority for different types of roads (classified and unclassified).

Under section 138 of the Roads Act, the consent of the appropriate roads authority is required before a person can erect a structure, carry out work in, on or over a public road or dig up or disturb the surface of a public road.

Construction of the Project within public road reserves will therefore require works consent of the appropriate roads authority under Section 138 of the Roads Act.

However, under section 5.24 of the EP&A Act, any permit required under Section 138 of the Roads Act from the appropriate roads authority cannot be refused if it is necessary for carrying out approved SSI, and is substantially consistent with the approval under Division 5.2.

Rural Fires Act 1997

The *Rural Fires Act 1997* facilitates the prevention, mitigation and suppression of bush and other fires in local government areas and parts of the State considered to be rural fire districts. The Project is considered to be located on bushfire prone land. As the Project is CSSI, under section 5.23 of the EP&A Act there is no requirement for a bush fire safety authority to authorise the Project under section 100B of the Rural Fires Act 1997.

The risks to the Project associated with its location in the vicinity of bushfire-prone land have been assessed as part of this EIS, in **Section 7.12**.

Water Act 1912 and Water Management Act 2000

The *Water Act 1912* (Water Act) identifies water management authorities (such as the Hunter Water Corporation) and governs the issue of new water licences and the trading of water licences and allocations. The application of the Water Act is limited in circumstances where the *Water Management Act 2000* applies.

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated use and management of water resources in NSW. The WM Act controls the extraction of water, its use, and the carrying out of activities on or near water sources. Under the WM Act, certain approvals are required in order to extract from a water source defined in a water sharing plan.

Section 5.23(1)(g) of Division 5.2 of the EP&A Act provides that a water use approval under section 89, a water management work approval under section 90, or an activity approval (other than an aquifer interference approval) under section 91 is not required for approved SSI (including CSSI).

There a number of guidelines for Controlled Activities under the WM Act, developed by the former NSW Office of Water (now NSW Department of Planning, Industry and Environment - Water). As noted above, the Project is a SSI and sections of the WM Act are not relevant. Furthermore, pipelines are exempt from controlled activities on waterfront land. The following guidelines have never-the-less been considered in the Water Resources Assessment undertaken as part of this EIS as they are related to good management practices for activities that the Project will undertake:

- • Guidelines for laying pipes and cables in watercourses. State of New South Wales through the Department of Environment, Climate Change and Water.
- • Guidelines for riparian corridors on waterfront land. Department of Primary Industries: Office of Water – through the Department of Trade and Investment, Regional Infrastructure and Services.
- • Guidelines for instream works on waterfront land. State of New South Wales through the Department of Trade and Investment, Regional Infrastructure and Investment.
- • Guidelines for vegetation management plans on waterfront land. State of New South Wales through the Department of Trade and Investment, Regional Infrastructure and Investment.
- • Guidelines for watercourse crossings on waterfront land. State of New South Wales through the Department of Trade and Investment, Regional Infrastructure and Investment.
- • Controlled Activities on Waterfront Land: Controlled activity exemptions on waterfront land. State of New South Wales through the Department of Trade and Investment, Regional Infrastructure and Investment.

Hunter Water Regulation 2015

The *Hunter Water Regulation 2015* provides for the regulation of activities within certain areas in the Hunter Region, as defined in Division 2 of the Regulation as 'special areas'.

The Regulation describes restrictions to works in special areas. Clause 8(1) provides that the owner or occupier of land in a special area must not erect, install or operate any onsite sewage management facility. Clause 10(1) provides that a person must not pollute waters on the land in a special area.

The Project is not in a defined special area, and would not involve any treatment of sewage, or pollution of waters.

Sections of the transmission pipeline are located next to the CTGM and other Hunter Water (HWC) Corporation trunk mains. Consultation with HWC undertaken as part of the EIS development are discussed in **Section 6.4**.

Coal Mine Subsidence Compensation Act 2017

The object of the *Coal Mine Subsidence Compensation Act 2017* is to provide for a fair, efficient and sustainable compensation framework for dealing with the impacts of coal mine subsidence.

Where development is proposed in a mine subsidence district, approval from Subsidence Advisory NSW is required under section 15 of the *Mine Subsidence Compensation Act 1961*.

The Project is located, in parts, within mine subsidence districts. APA have consulted with Subsidence Advisory NSW, as discussed in **Section 6.4**.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* provides for the assessment, management and use of land that is vested in the Crown and managed for the benefit of the people of NSW. Approvals are required under this Act for temporary use or permanent impact to Crown land.

The construction footprint for the Project is within parcels of land mapped Crown land (i.e. Wallis Creek) and Crown road reserves ('paper roads'). Under Part 3 of the *Crown Land Management Act*, the Minister for Lands must be satisfied that the land has been assessed in accordance with the principles of Crown land management by (amongst other matters) including an assessment of the capabilities of Crown land and the identification of suitable land uses. The Project's impact to Wallis Creek has been assessed as discussed in **Section 7.4**. Consultation with Crown Land has been undertaken during the EIS development, as detailed further in **Section 6.4**.

Biosecurity Act 2015

The *Biosecurity Act 2015* provides the framework for managing diseases and pests that may cause harm to human, animal or plant health or the environment. Biosecurity will be considered in the Project design and operation in consultation with landowners to ensure appropriate management of weeds and pests.

SECTION 4.0

Strategic Context and Project Need

4.0 Strategic Context and Project Need

4.1 Project Objectives

Based on the strategic context and need for the Project, the objectives focus on providing an efficient and economically feasible pipeline to connect the existing NSW gas transmission network to the proposed HPP in order to assist in meeting NSW's future energy supply needs, whilst minimising impacts on the environment. The manner in which the Project satisfies these objectives is presented in **Table 4.1**.

Table 4.1 Project Objectives

Objective	How this is met
Provide infrastructure that enables gas to be supplied to the HPP to meet NSW's future energy security needs	The Project will provide infrastructure that enables gas to be supplied to the HPP, which has the overall objective of providing dispatchable capacity and other network services to the National Electricity Market (NEM) which can be used by the Australian Energy Market Operator (AEMO) to meet the requirements of the NEM, and to supplement Snowy Hydro's generation portfolio with dispatchable capacity when the needs of electricity consumers are highest.
Select a Project design that is efficient and economically feasible for construction and operation whilst accounting for social, land use, heritage, environmental, geotechnical and topographical constraints	A number of potential concepts and alignments for the Project were considered, as described in **Section 5.0**. Balancing cost, constructability, and operability whilst minimising environmental and social impacts was central to selection of the preferred concept and subsequent design process.
Design and construct the Project to minimise social and environmental impacts.	The Project is being designed in accordance with Australian Standard 2885-2008 Pipeline – Gas and liquid petroleum. The APGA Code of Environmental Practice 2017 has been used to guide both identification of environmental impacts associated with the Project and selection of appropriate industry standard mitigation measures. Further project specific management and mitigation measures have been outlined in **Section 10.0**.

4.2 Project Need

The HPP EIS states that the Australian Energy Market Operator (AEMO) has advised the Australian Government that due to the planned closure of Liddell Power Station in 2023, there will be a gap in dispatchable capacity that will need to be filled through the addition of firming capacity (Jacobs, 2021a).

Open cycle gas fired generation capacity, as planned for with the HPP, provides firming of renewable generation projects' intermittent electricity supply to the NEM. Without dispatchable and firming generation or storage, a power system that is solely reliant on intermittent renewable generation will have unacceptable levels of customer supply failure.

The assessment of the HPP EIS conducted by DPIE confirms the need for the HPP, and therefore for a gas supply solution as proposed by the Project. The Notice of Decision for the HPP outlines how that project would strengthen energy security in NSW, as it would:

- Contribute to closing the previously forecast reliability gap in 2023-2024 following the retirement of Liddell Power Station.
- Mitigate electricity supply scarcity for the Hunter, Sydney and Wollongong regions associated with the retirement of Vales Point Power Station in 2029.

- Mitigate reliability risks associated with the potential early exit of coal-fired power stations ahead of planned closure timeframes.
- Provide an ongoing source of synchronous energy to contribute to system security.
- Contribute to avoiding electricity price increases following the closure of Liddell Power Station for the scenario described in the Report of the Liddell Taskforce.

These conclusions have been further confirmed by the announcement from Origin Energy during February 2022 of the potential early retirement of Eraring Power Station in August 2025. Eraring Power Station is Australia's largest power station, and provides approximately 25% of New South Wales' power requirements.

As such, the need for the Project is driven by the fundamental requirement to provide infrastructure that enables gas to be supplied to the approved HPP in order that it may strengthen energy security in NSW.

The Notice of Decision also identifies that the HPP would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables.

Furthermore, the Project's transmission pipeline would operate bi-directionally with an operational capacity in the region of 60 TJ per day. This will enable gas stored in the storage pipeline to be transferred to the SNP, and therefore the east coast gas grid. Currently, gas being supplied to the NSW load centres (spanning Newcastle to Wollongong) must be imported via the Eastern Pipeline or the Moomba to Sydney pipeline. During periods of tightness in the NSW gas market having a storage pipeline that can inject gas back into the network will help provide greater gas system security and will help with managing the peakiness in NSW gas customer loads.

4.3 Strategic Policy Context

This section outlines the State, Federal and international agreements and strategic planning policies that provide the context and support for why the development of the Project is justified.

4.3.1 National Context

4.3.1.1 Australian Energy Policy

In 2019, the Australian Government announced the energy policy blueprint, '*A Fair Deal on Energy*', which sets clear objectives and detailed policies to ensure a better energy future for Australia. The policy is aimed to put downward pressure on electricity and gas prices and ensure energy markets are well regulated and transparent.

The policy has the following three pillars:

1. Delivering an affordable and reliable energy system.
2. Putting energy consumers first.
3. Taking real and practical action to reduce emissions and meet our international commitments.

The first pillar outlines four key objectives, two of which directly support and underpin the justification for the HPP, including the Project. These are:

Maintaining and increasing the supply of reliable electricity:

Underwriting New Generation Investments (UNGI) program - The UNGI program will support investment in new reliable electricity generation projects. This will increase competition and reliability in the system, putting downward pressure on prices and helping ensure the lights stay on.

Supporting Reliable Energy Infrastructure program – The Australian Government is providing $10 million over two years to address supply and affordability issues. The program will develop a detailed roadmap and identify viable locations for firm generation, including coal, gas, pumped hydro and biomass opportunities.

Liddell Taskforce - AGL's planned closure of its coal-fired Liddell Power Station in 2023 could mean higher prices and less reliable electricity. The Australian Government, with the NSW Government, has set up the Liddell Taskforce to look at how closing Liddell will change NSW's power supply, options for extensions or like-for-like replacement, and how to ensure affordable and reliable energy for NSW businesses and families.

Promoting efficient investment in energy infrastructure:

Gas pipeline regulation reforms - Ensuring gas pipelines operate effectively is essential for the secure delivery of domestic gas supplies at affordable prices.

On 15 September 2020, the Commonwealth Minster for Energy and Emissions Reduction and the Prime Minister issued a joint media release stating that the Government's aim is: "Ensuring affordable, reliable and secure electricity supply". This release announced the Government's target for the electricity sector to deliver 1,000 MW of new dispatchable energy to replace the Liddell power station before it closes down in 2023. To this end, Snowy Hydro is developing options to build the HPP should the market not deliver. The HPP, with supply ensured by the Project, is therefore aligned with the Government's target to provide the new dispatchable energy by 2023 and is supported by this release in the event that other electricity industry participants do not step in at the required time frame.

The HPP and the Project (as an interlinked component of the HPP) is aligned with the Australian Government's energy policy, through its key objectives of supporting the NEM to provide reliable electricity, developing energy infrastructure that is efficient, and contributing to net reductions in greenhouse gas emissions.

4.3.1.2 The National Energy Market

All electricity consumers in NSW receive electricity from the National Energy Market (NEM) (unless they have an off-grid supply), which is an interconnected electricity system that serves NSW, Queensland, Victoria, South Australia, Tasmania and the Australian Capital Territory (ACT). The NEM is operated by Australian Energy Market Operator (AEMO). AEMO evaluates the expected supply and demand balance of electricity in the NEM and publishes advice to stakeholders in the:

- Integrated System Plan (ISP), most recently published by AEMO in July 2020
- Electricity Statement of Opportunities (ESOO), most recently published by AEMO in August 2020.

AEMO's assessment of forecast reliability over the next decade has identified that there is a need in NSW for 1,480 MW of generation to meet the reliability standard and to meet a more stringent Interim Reliability Measure (IRM) capacity, which is expected to be called for from 2023-24. This corresponds to the announced timing for the closure of the Liddell Power Station, which has a capacity of approximately 2,000 MW.

As the Project would supply gas to the HPP, the Project would assist in maintaining the supply-demand balance and in satisfying the reliability standard and the IRM.

Furthermore, the ISP has been prepared by AEMO to guide governments, industry and consumers on investments needed for an affordable, secure and reliable energy future, while meeting prescribed emissions trajectories. The ISP has identified that 6-19 gigawatts (GW) of new dispatchable resources are needed in the NEM to firm up the inherently variable nature of distributed and large-scale renewable generation. The Project would provide gas to the HPP, which in turn would provide dispatchable generation to provide a portion of the required additional resources into the system.

4.3.1.3 Australia's National Hydrogen Strategy

Australia's National Hydrogen Strategy (Australia's Strategy) sets a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians and position Australia as a major global player by 2030. In summary, Australia's Strategy:

- explores Australia's clean hydrogen potential
- considers future scenarios with wide ranging growth possibilities
- outlines an adaptive approach that equips Australia to scale up quickly
- includes showcases from each state and territory
- details nationally coordinated actions involving governments, industry and communities

Australia's Strategy will follow an adaptive approach. It will focus on actions that remove market barriers, efficiently build supply and demand, and accelerate global cost-competitiveness. These will equip Australia to scale up quickly as markets develop.

A key element of Australia's approach will be to create hydrogen hubs – clusters of large-scale demand. These may be at ports, in cities, or in regional or remote areas, and will provide the industry with its springboard to scale. Hubs will make the development of infrastructure more cost-effective, promote efficiencies from economies of scale, foster innovation, and promote synergies from sector coupling. These will be complemented and enhanced by other early steps to use hydrogen in transport, industry and gas distribution networks, and integrate hydrogen technologies into our electricity systems in a way that enhances reliability.

The Australian Government is investing $1.2 billion into building Australia's hydrogen industry.

Hydrogen design considerations for components of the Project are described in **Section 2.3.3**.

4.3.2 State Context

4.3.2.1 NSW Energy Policy

The objectives of the *NSW Electricity Strategy* (DPIE 2019) are to:

- Improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, process driven delays and by ensuring investment in new energy saving, demand response and generation technologies.
- Take action to address any resulting capacity gaps in a way which also financially protects taxpayers and consumers and does not encourage market participants to delay investment decisions to take advantage of government action.

- Ensure the NSW Government has the powers it needs to deal with electricity emergencies, if they arise.

In announcing the strategy, the NSW Energy Minister highlighted the need for low-cost alternative sources of energy to replace the generating capacity that will be lost as existing assets are retired.

This Project, as part of the HPP, is consistent with the NSW Energy Strategy as it builds essential efficiency and reliability into the network, which will be needed during the transition period as existing assets are retired. Together, gas peaking and renewable energy generation are part of a group of technologies that will achieve emissions reduction while meeting generation capacity, reliability and cost-effectiveness requirements.

4.3.2.2 NSW Energy Infrastructure Roadmap

The Electricity Infrastructure Roadmap is a framework to deliver a modern electricity system for NSW. Within 15 years, three quarters of NSW's electricity supply is expected to reach the end of its technical life. Replacing these energy sources and building the infrastructure needed to connect them to users will take a considerable amount of time.

By supporting the coordinated build out of energy infrastructure, the Roadmap will help drive growth and long term jobs, infrastructure construction and the delivery of low-cost energy in regions throughout NSW.

By contributing to construction jobs, employment and generation capacity related to the HPP, the Project aligns with the NSW Electricity Infrastructure Roadmap.

4.3.2.3 NSW Hydrogen Strategy

The *NSW Hydrogen Strategy* (the Strategy) brings together the NSW Government's existing and new policies into a framework to support the development of a commercial hydrogen industry in NSW.

The Strategy is built on three strategic pillars, namely:

- enable industry development
- lay industry foundations
- drive rapid scale.

The NSW Government is committed to delivering a total of 60 actions across these pillars that are designed to support development of the full hydrogen value chain. This includes support for initial industry development and deployment of hydrogen technologies and infrastructure through to commercial-scale operations.

The actions set out in the Strategy are expected to considerably reduce the cost of green hydrogen production. Further cost reductions can also be achieved through technology innovations and the falling cost of renewable energy to put the state within reach of $2 per kg by the end of the decade. Delivering this cost of green hydrogen will make NSW one of the cheapest suppliers of hydrogen in the region and position the state to capture early domestic and international market share.

Hydrogen design considerations for components of the Project are described in **Section 2.3.3**.

4.3.3 Local Context

4.3.3.1 Hunter Regional Plan 2036 and Greater Newcastle Metropolitan Plan 2036

The *Hunter Regional Plan 2036* (Department of Planning and Environment, 2016) is a 20-year blueprint for the future of the Hunter region. The Hunter Regional Plan works in concert with the Greater Newcastle Metropolitan Plan 2036 (Department of Planning and Environment, 2018) sets out strategies and actions that will drive sustainable growth across Cessnock City, Lake Macquarie City, Maitland City, Newcastle City and Port Stephens communities, which together make up Greater Newcastle. The overall vision for the region is to be the leading regional economy in Australia with a vibrant new metropolitan city at its heart.

This vision is supported by a range of goals, directions and actions. Relevant to the Project is the direction to 'diversify and grow the energy sector' by among other things, promoting 'new opportunities arising from the closure of coal-fired power stations that enable long term sustainable economic and employment growth in the region'.

With the imminent closure of Liddell Power Station, significant local energy generation will be withdrawn from the Hunter Region. The HPP is aimed at firming this loss of generating capacity in the region by providing up to 750 MW of additional generation capacity.

The Hunter Regional Plan further acknowledges the role of the Hunter region as the principal location for the State's power generation. Additionally, gas fired generation, approved for the HPP and supported by the Project, aligns with the objectives of the Plan by further diversifying the energy sector in the Hunter Valley.

It is therefore considered that the Project is consistent with the Hunter Regional Plan by supporting the development of the HPP.

Furthermore, the Project interacts with two corridor areas identified in the Hunter Regional Plan, namely the Maitland Growth Corridor and the Watagans to Stockton biodiversity corridor. The design of the Project has avoided these areas by positioning the preferred transmission pipeline alignment and associated construction footprint to:

- follow property boundaries or existing linear infrastructure (such as the CTGM)
- utilise flood prone land adjacent to Buttai Creek and Wallis Creek that is not suitable for residential or industrial development
- traverse between the existing and proposed extents of the Cliftleigh Meadows and Gillieston Heights residential developments
- traverse between development stages of the northern residential area of the proposed Regrowth Kurri Kurri development.

4.3.3.2 Cessnock Community Strategic Plan 2027

The *Cessnock Community Strategic Plan 2027 (CCSP)* (Cessnock City Council, 2017) identifies the community's main priorities and goals for the future and outlines strategies for achieving these goals. The CCSP outlines the vision for the City of Cessnock to be a cohesive and welcoming community living in an attractive and sustainable rural environment with a diversity of business and employment opportunities supported by accessible infrastructure and services which effectively meet community needs.

The CCSP recognises the gradual shift away from a reliance on coal mining as a foundation of the region's economic base, and this is reflected in the main economic and environmental objectives under the CCSP.

The following goals are outlined in the CSSP:

- *'A prosperous and sustainable economy'* – this will be achieved by the following:
  - Diversifying local business options
  - Achieving more sustainable employment opportunities
  - Increasing tourism opportunities and visitation in the area.
- 'A sustainable & healthy environment' – this will be achieved by:
  - Protecting & enhancing the natural environment & the rural character of the area
  - Better utilisation of existing open space
  - Better waste management and recycling.

Consultation with the Cessnock community during the development of the CCSP emphasised the community's concerns regarding the natural environment, highlighting the importance of a healthy and sustainable environment. The CCSP also discusses the need for improved monitoring of pollution levels by industry, and investment in alternative energy sources.

Job creation and security were identified in the CCSP as key economic issues for Cessnock, with increased local employment identified as important by residents.

As the Project is essential for the operation of the HPP, it supports the CSSP's desired outcome for alternative energy sources. Furthermore, the Project would generate direct and indirect employment opportunities during the construction period which would contribute to offsetting the reduction in coal mining employment.

4.3.3.3 Newcastle 2030 Community Strategic Plan

The *Newcastle 2030 Community Strategic Plan (CSP)* (City of Newcastle, undated) is based on the aspirations, knowledge and values of the Newcastle community. The CSP is a shared community vision to inform actions over the next 10 years. This plan is reviewed every four years to ensure it still meets the community's needs.

The guiding principles of the CSP are to:

- Recognise diverse local community needs and interests
- Consider social justice principles of equity, access, participation and rights
- Consider long term and cumulative effects of actions on future generations
- Consider principles of ecologically sustainable development.

Of relevance to the Project, the CSP identifies a 'protected environment' as a key strategic direction, with a key action to achieve this being to investigate and implement renewable energy technologies.

4.3.3.4 Maitland Local Strategic Planning Statement 2040+

The *Maitland Local Strategic Planning Statement 2040+* (the Statement) (Maitland City Council, 2020) sets out a 20-year plan integrating land use, transport and infrastructure planning for the future of Maitland LGA. The Strategy identifies the challenges that the local area will face in coming years and outlines how growth and change will be managed into the future, working with the community and other stakeholders.

It explains how state and regional plans such as the *Hunter Regional Plan 2036* (Department of Planning and Environment, 2016), the *Greater Newcastle Metropolitan Plan 2036* (Department of Planning and Environment, 2018), and council's strategic plans will be implemented in the Maitland local government area (LGA).

One of the 18 planning priorities identified in the Statement is to:

- Manage energy, water and waste efficiently to support sustainability.

The Project would assist Council to achieve this as the Project is essential for the operation of the HPP to provide an alternative energy source.

Additionally, the Project interacts with a future transport corridor between Kurri Kurri and Maitland identified in the Strategy. As outlined in **Section 4.3.3.1**, the design of the Project has avoided and minimised interactions with existing and future development as far as practicable areas by locating the preferred transmission pipeline alignment and associated construction footprint along property boundaries, within flood prone land that is not suitable for residential or industrial development and following existing linear infrastructure (such as the CTGM).

SECTION 5.0

Project Alternatives Considered

5.0 Project Alternatives Considered

This section provides an overview of the alternatives that were considered during the development of the Project, including the 'Do nothing' option. The process that was applied to identify, select and refine the project design concept and the transmission and storage pipeline alignments that are assessed in this EIS is outlined.

5.1 The 'Do Nothing' Option

Under the 'Do nothing' alternative the Project would not be constructed, and any potential negative environmental and social impacts would not occur. However, the 'Do nothing' alternative would also imply that the objectives of the Project would not be met.

The Project is to provide infrastructure that enables gas to be supplied to the approved HPP. In the absence of a gas supply, the HPP would be restricted to operate on diesel. The approval conditions for the HPP limit diesel fuel use to 175 cumulative hours per year, which is an annual availability of 2 per cent.

Such a restricted availability would not enable the HPP to meet its primary role of providing electricity supply when renewable generation is low. As such, a gas supply is necessary for the HPP to operate effectively and provide the benefits to NSW and the NEM outlined in **Section 10.1**.

The 'Do nothing' alternative is not considered to be a viable alternative to carrying out the Project.

5.2 Concept alternatives

APA has considered a range of design concepts to supply gas to the HPP from the SNP, and has assessed the following configurations in detail:

- Locating a compressor station adjacent to the offtake point of the SNP. Connecting the compressor station and the HPP with a large diameter, high pressure transmission pipeline.
- Locating a compressor station mid-way between the SNP and the HPP. Connecting the SNP and the compressor station with a medium diameter medium pressure transmission pipeline. Connecting the compressor station and the HPP with a large diameter, high pressure storage pipeline.
- Locating a compressor station adjacent to the HPP. Connecting the SNP and the compressor station with medium diameter, medium pressure transmission pipeline. Locating a large diameter, high pressure storage pipeline downstream of the compressor station in the buffer zone land of the former Hydro aluminium smelter.

As part of the assessment of these concept alternatives, three potential corridors for a pipeline alignment between the SNP and the HPP were also identified. These corridors are referred to as northern, central and southern) and described further in **Section 5.3** below.

Each combination of design concept and pipeline alignment corridor was assessed and compared using multi criteria analysis (MCA (refer **Table 5.1**)). The MCA used spatial analysis of publicly available data supplemented by field inspection undertaken from publicly accessible areas. The MCA considered more than 40 criteria, arranged into groupings for capital cost, relative length, constructability, operability, infrastructure, approvals, land and environment/heritage.

Table 5.1 Criteria used for Multi Criteria Analysis of pipeline corridor options

Grouping	Criteria
Environment, heritage and community	Special biodiversity values (Ramsar sites, World Heritage areas), conservation areas, threatened ecological communities, extent of remnant vegetation, watercourses, wetlands, floodplains, registered heritage sites, cultural heritage sensitivity, native title claims, amenity impacts (noise, dust, visual), community safety, impacts to known areas of high value to the community
Land	Variation in number of parcels intersected between options, residential tenure (current or zoned), industrial tenure, resource tenure (production), resource tenure (exploration), forestry tenure, conservation tenure, future land use conflicts
Capital cost	Approvals cost, offset cost, labour costs, land procurement costs and capital costs
Relative length	Relative length of each pipeline option
Constructability	Design and engineering complexity, terrain and geology risks, complex crossings, space for efficient construction, logistics and access for construction, worker safety
Operability	Operational complexity, easement access, pipeline third party damage risk, worker safety, soil types, rehabilitation and easement maintenance risks
Infrastructure	Number of State and Federal roads, local roads and railways intersected
Approvals	Complexity of approval pathway, length of existing or proposed infrastructure easements followed, schedule impact of approval pathway

The MCA provided a comparison of benefits and trade-offs between the cost, constructability/operability, and social/environmental considerations for each combination of design concept pipeline alignment corridor. The MCA provided a robust semi-quantitative method for comparing concept alternatives and was used as a decision support tool for selecting a preferred design concept and pipeline alignment corridor. Limitations on the MCA include the quality of publicly available data, and subjectivity when applying values for non-numerical criteria such as community values and construction worker safety.

Based on field inspections and the findings of the MCA and stakeholder consultation, APA and Snowy Hydro selected the concept of locating the compressor station adjacent to the HPP, supplied by a medium diameter, medium pressure transmission pipeline from the SNP following the northern corridor, and a large diameter high pressure storage pipeline located within the buffer zone land. This concept was assessed to provide an acceptable degree of construction complexity, the greatest potential to minimise the environmental and social impacts, as well as providing an economic solution with the lowest cost of all feasible design concepts considered.

The medium diameter transmission pipeline has a significantly smaller construction footprint than large diameter pipelines, and therefore less impact to existing or proposed land uses. Use of a medium diameter pipeline also increases the ability to design the alignment to avoid sensitive environmental features, including use of trenchless crossings. Construction complexity is significantly reduced as pipe bends can be manufactured on site and steeper gradients can be traversed without significant cut and fill. During operations a medium diameter medium pressure pipeline presents a lower risk profile (as discussed in **Section 5.3.1.1**), and more effectively addresses mine subsidence risks.

Locating the compressor station on, or adjacent to, industrial land at the former Hydro aluminium smelter enables co-location of compatible industrial land uses, provides significant separation distances to sensitive receivers, and allows disturbance of remnant vegetation to be avoided.

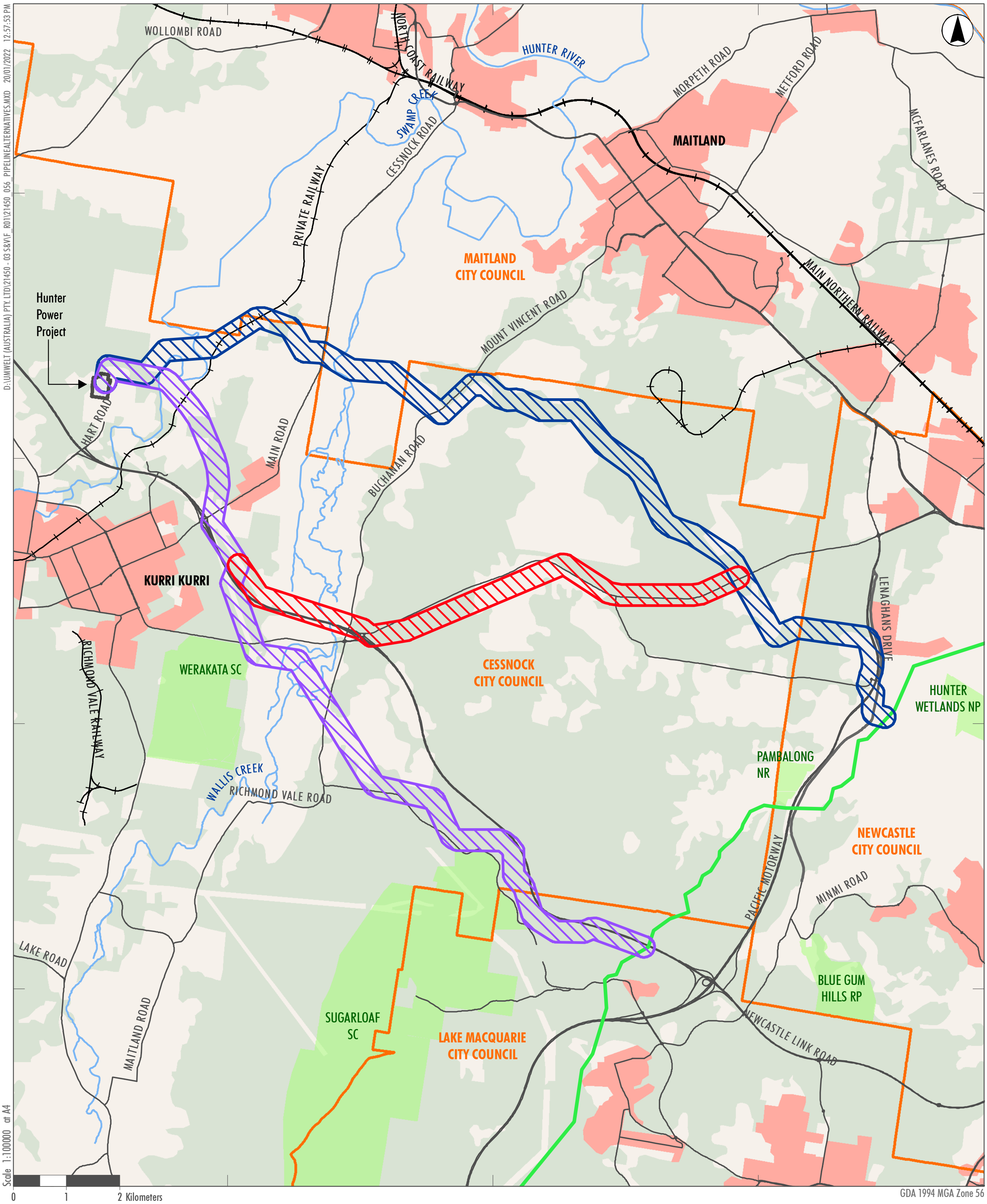
Similarly, locating the large diameter high pressure storage pipeline in areas of the buffer zone land that are primarily cleared or support regrowth vegetation also enables impacts on remnant vegetation to be minimised and provides significant separation distance to sensitive receivers.

Costs were also assessed to be lower than other concepts due to comparatively lower pipeline steel tonnage and simplified compressor station requirements.

The benefits of the northern corridor relative to other potential alignment corridors are discussed below

5.3 Transmission Pipeline Alignment alternatives

Three corridors of 400m width between the SNP and the HPP were identified by APA as potentially suitable for locating the transmission pipeline alignment and associated construction footprint (**Figure 5.1**). These corridors (referred to as northern, central and southern) were identified based on spatial analysis of publicly available data representing existing environmental conditions, supplemented by field inspections undertaken from publicly accessible areas. Corridor options were chosen to align with existing infrastructure wherever possible.



Legend

Alternative Pipeline Routes

- Corridor - Central
- Corridor - Northern
- Corridor - Southern
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Local Government Area Boundary
- Roads
- Railway
- Watercourses
- HPP Proposal Site
- Urban Area
- NPWS Reserves
- Native Vegetation

FIGURE 5.1

Transmission Pipeline Alignment Alternatives

Image Source: ESRI Basemap (2021) Data source: GHD Scoping Report (2021)

The northern corridor, which is approximately 21 km in length, commences on the eastern side of the Pacific Motorway near Black Hill. The corridor crosses Lenaghans Drive and the Pacific Motorway prior to turning north and crossing Black Hill Road to predominantly avoid unmined areas of the underground Yancoal Abel Mine. The corridor then turns west to traverse the approved Stevens Group Hunter Business Park and crosses Viney Creek, after which the proposed Broaden industrial estates are traversed by following southern boundaries or existing linear infrastructure. A Hunter Water distribution main is then followed to the north-west, prior to crossing beneath John Renshaw Drive.

Between John Renshaw Drive and Buchanan Road the alignment primarily follows water trunk mains owned and operated by Hunter Water, including the CTGM. Land traversed between John Renshaw Drive and Buchanan Road is owned and/or managed by Donaldson Coal (a subsidiary company of Yancoal), Ashtonfields/Bloomfield Group and Rathvale Pty Ltd. This land supports coal mining operations that are either in care and maintenance (the underground Abel Mine), undergoing rehabilitation (the open cut Donaldson Mine) or active (the open cut Bloomfield Mine).

West of Buchanan Road, the northern corridor crosses Buttai Creek and the Wallis Creek floodplain, exiting on the northern verge of Testers Hollow at Main Road. The corridor traverses between the existing and proposed extents of the Cliftleigh Meadows and Gillieston Heights residential developments, and between development stages of the northern residential area of the proposed Regrowth Kurri Kurri development. The South Maitland Railway is crossed then followed to the south-west, prior to crossing Swamp Creek and following the existing Ausgrid high voltage overhead power line easements to the HPP.

The central corridor is approximately 21 km in length and follows the northern corridor until John Renshaw Drive. The corridor then follows John Renshaw Drive to the west, crossing Four Mile Creek The corridor then turns south-west adjacent to the Ausgrid high voltage overhead power line easement through Buttai, crossing Lings Road and Buttai Creek, until approaching the Hunter Expressway at the Buchanan Interchange. The corridor then crosses George Booth Drive and the Wallis Creek floodplain following the Hunter Expressway.

From the western bank of Wallis Creek, the corridor follows the Ausgrid high voltage overhead power line easements, between the Kurri Kurri Golf Club and the Hunter Expressway, and crosses Main Road east of the Kurri Kurri interchange. The corridor continues to follow the high voltage overhead power line easements to the north of the Kurri Kurri TAFE campus, and between the central and southern residential areas proposed for the Regrowth Kurri Kurri development, prior to turning west to cross the South Maitland Railway and Swamp Creek to reach the HPP.

The southern corridor, which is approximately 17 km in length, commences near Seahampton on the western side of the Hunter Expressway. The corridor follows the Hunter Expressway to the north-west, through the heavily vegetated foothills of the Sugarloaf Range, crossing Blue Gum Creek. In this area the corridor is sited adjacent to a disused rail siding that formed part of the Richmond Vale Railway network, to the east of George Booth Drive. Leaving the foothills, the corridor continues north-west adjacent to an Ausgrid high voltage overhead power line easement past the Pace egg farm, crossing George Booth Drive and the Wallis Creek floodplain. On the western side of Wallis Creek, the high voltage overhead power easements continue to be followed until the Hunter Expressway is crossed. The central corridor is then joined and followed to the HPP.

The above discussed corridors are shown in **Figure 5.1**.

Selection of a preferred corridor for detailed assessment in the EIS was informed by consultation with key stakeholders. Specifically, consultation with Cessnock City Council, Maitland City Council, City of Newcastle, Hunter Water, Ausgrid, Transport for NSW and Regrowth Kurri Kurri was undertaken to assess the viability of each corridor. This consultation indicated that the southern corridor may not be a viable option due to potential impacts to the following values:

- Heritage values of the rail siding which forms part of the Richmond Vale Railway.
- Community values of the proposed Richmond Vale Rail Trail.
- Biodiversity values of the Watagans to Stockton Biodiversity Corridor, including land between George Booth Drive and the Hunter Expressway that has been transferred to the NSW Minister for Energy and Environment as an offset for residential development in the region, and gazetted as Stockrington State Conservation Area.

The southern corridor also presents significant constructability risks due to steep topography, shallow rock and mine subsidence areas for the initial seven km of the corridor. Based on all of these considerations APA has determined that the southern corridor is not viable for the transmission pipeline and this option was not considered further.

Further assessments, including field inspections and MCA was then undertaken of the northern and central corridors. These assessments indicated that the northern corridor is preferable to the central corridor on the basis of impacting significantly fewer landholders, reduced impacts to the local and State road network, and minimisation of construction impacts (visual, noise and air quality) to residences due to the length of the alignment within the Donaldson and Bloomfield mining leases. The northern corridor also impacts fewer locations where threatened species have previously been recorded and, unlike the alternative corridors, almost entirely avoids mapped 'important areas' for the critically endangered Regent Honeyeater and Swift Parrot.

On this basis the northern corridor was selected as the preferred corridor for locating the transmission pipeline alignment, with the centreline of the corridor taken as the initial alignment for further assessment.

Key areas and issues that were considered during design and consultation for a transmission pipeline following the northern corridor include the following:

- Crossing of the M1 Pacific Motorway and positioning relative to the Lower Hunter Freight Corridor.
- Traversing the Black Hill, Louth Park and Maitland West mine subsidence districts, with potential for shallow mine workings to be present. Note that the central and southern corridors must cross the Black Hill and Tomalpin mine subsidence district. The southern corridor also crosses the Killingworth-Wallsend mine subsidence district.
- Traversing the operational Bloomfield Colliery, and potential post mining land uses.
- Interaction with Hunter Water assets, notably the CTGM.
- Crossing of the Wallis Creek floodplain, including the potential for shallow groundwater, acid sulfate soils and flood conditions.
- Approved and proposed industrial and residential development at Black Hill, west of Wallis Creek and for the Regrowth Kurri Kurri project.

A summary of the key advantages and disadvantages of each corridor is provided in **Table 5.2** below.

Table 5.2 Key advantages and disadvantages of each corridor

Corridor	Key advantages	Key disadvantages
Northern	• Lowest number of directly affected landholders. • Reduced amenity impacts (noise, dust and visual) and traffic impacts during construction due to length of corridor within mining leases between John Renshaw Drive and Buchanan Road. • Almost entirely avoids mapped 'important areas' for critically endangered Regent Honeyeater and Swift Parrot. • Impacts fewer locations where other threatened species have been recorded.	• Interaction with Lower Hunter Fright Corridor. • Traverses three mine subsidence districts. • Traverses through the mining lease of the operational Bloomfield Mine. • Wallis Creek floodplain crossing location is further downstream then central and southern corridors with increased flood risk. • Traverses an area proposed for further residential development between Cliftleigh and Gillieston Heights.
Central	• Avoids mining leases with mining currently occurring. • One less mine subsidence district crossed.	• Interaction with Lower Hunter Fright Corridor. • Highest number of directly affected landholders. • Potential for increased impacts to the public road network due to corridor following John Renshaw Drive. • Traverses two mine subsidence districts. • Highly constrained crossing location of Wallis Creek due to residences, Hunter Expressway, John Renshaw Drive, high voltage power lines, wetlands and steep topography on western side of floodplain • Increased length of co-location with HV power lines. • Intersects substantial areas of mapped 'important areas' for critically endangered Swift Parrot.
Southern	• Shortest corridor length • No interaction with the M1 or Lower Hunter Freight Corridor	• Impacts heritage values of the Richmond Vale Railway and community values of the proposed Richmond Vale Rail Trail. • Impacts biodiversity values of the Watagans to Stockton Biodiversity Corridor including offset land between George Booth Drive and the Hunter Expressway. • Difficult construction conditions for the southern half of the corridor, including steep terrain and shallow rock. • Traverses three mine subsidence districts. • Increased length of co-location with HV power lines. • Highly constrained crossing location of Wallis Creek, as for Central corridor. • Intersects substantial areas of mapped 'important areas' for critically endangered Swift Parrot.

5.3.1.1 Refinement of the preferred alignment

Following selection of the preferred northern corridor and initial alignment, APA has refined the alignment and designed a construction footprint for the transmission pipeline. This refinement and design have been informed by consultation with landholders directly affected by the alignment, further consultation with stakeholders, project engineering studies, as well as findings of field surveys and technical studies undertaken for the EIS. A detailed description of the transmission pipeline alignment along the northern corridor assessed in this EIS is provided in **Section 2.0**.

The most significant changes made to the transmission pipeline alignment as a result of ongoing project design, consultation, engineering and EIS studies are as follows:

- KP0 - A revised start point, with the transmission pipeline commencing at the JGN offtake facility, rather than connecting directly to the SNP, as described in **Section 2.2.1**.
- KP 0.4 to KP 1.3 - Realignment to sit adjacent to the western boundary of the Lower Hunter Freight Corridor and outside of the M1 road reserve.
- KP 4.7 to KP 5.5 - Realignment at the entry to the Donaldson Open Cut Mine to stay adjacent to the CTGM rather than traversing an area of mine rehabilitation east of the access road.
- KP 12.6 to 13.1 – HDD of Buttai Creek to avoid open trenching of flood plain wetlands and minimise construction scheduling risks associated with flooding during wet conditions.
- KP14.7 to 15.6 - Realignment to accommodate potential residential developments west of Main Road (Lot 2 DP1249763 and Lot 22 DP1181574), whilst minimising interaction with shallow historic mines in the Maitland West Mine Subsidence District.
- KP18.3 to 15.6 – Revised alignment and increased length of HDD at entry to the compressor station, to avoid the transmission pipeline traversing a constrained area between the HPP and the eastern boundary of the proposed lot containing the HPP.

As a result of these refinements, the overall length of the transmission pipeline alignment has reduced slightly to approximately 20.1 km, and the total number of landholders affected by the alignment has increased by one.

The outcome of this refinement process is the transmission pipeline alignment assessed in detail in this EIS. Refinement of this alignment will be ongoing as consultation with relevant stakeholders continues following the process described in **Section 5.3.1.2**.

5.3.1.2 Alignment alternatives under consideration

Transmission pipeline alignment alternatives that are currently subject to further consideration are described below.

M1 crossing location and Lower Hunter Freight Corridor

The Lower Hunter Freight Corridor (LHFC) is a NSW State Government project that is at the conceptual stage of development with community consultation only recently undertaken. As described above, the base case for the transmission pipeline alignment is adjacent and to the west of the LHFC, within two large rural residential lots, each around 45 ha.

It is possible that further changes to the transmission pipeline alignment may need to be considered as the design of the LHFC evolves. In particular, the elevations required for the proposed freight corridor will need to be considered during detailed design for the transmission pipeline crossing location to maintain a sufficient depth of cover beneath the base of the proposed freight corridor. Consideration of a different crossing location or crossing methodology may be required, which may impact on the M1 crossing location.

APA has considered two alternative alignments for the transmission pipeline in consideration of the proposed LHFC (as illustrated in **Figure 5.2**), in addition to the base case, as discussed below.

<u>Option 1 alignment</u>

The Option 1 alignment stays east and outside of the M1 road reserve for around 1.2 km prior to turning west and crossing the M1 and LHFC by a horizontal bore at a close to perpendicular angle. This alignment is required to be located in private landholdings east of the road reserve for Lenaghans Drive given there is insufficient width for construction between the sealed surface of Lenaghans Drive and the eastern boundary of the road reserve, compounded by the presence of overhead power lines. Pipeline construction between Lenaghans Drive and the M1 is not feasible as this area supports either a steeply sloping batter or a large bund providing visual mitigation and noise attenuation of the freeway for residential areas to the east.

The primary constraint for this option is the presence of large lot (around 1ha) residential holdings and associated residences east of Lenaghans Drive. Six such residential holdings would need to be traversed by the transmission pipeline alignment, in addition to three larger landholdings excluding roads. The construction footprint would approach within 50m of residences in some locations and amenity impacts (noise, air emissions, visual) during construction would be significant. Land use constraints to existing residential lots associated with granting of a pipeline easement may also be material relative to larger rural residential lots. It is unlikely that this alignment would be supported by residents in the area.

This alternative is not considered to be viable by APA due to the proximity of existing residences and construction and operational impacts on existing occupied residential land.

<u>Option 2 alignment</u>

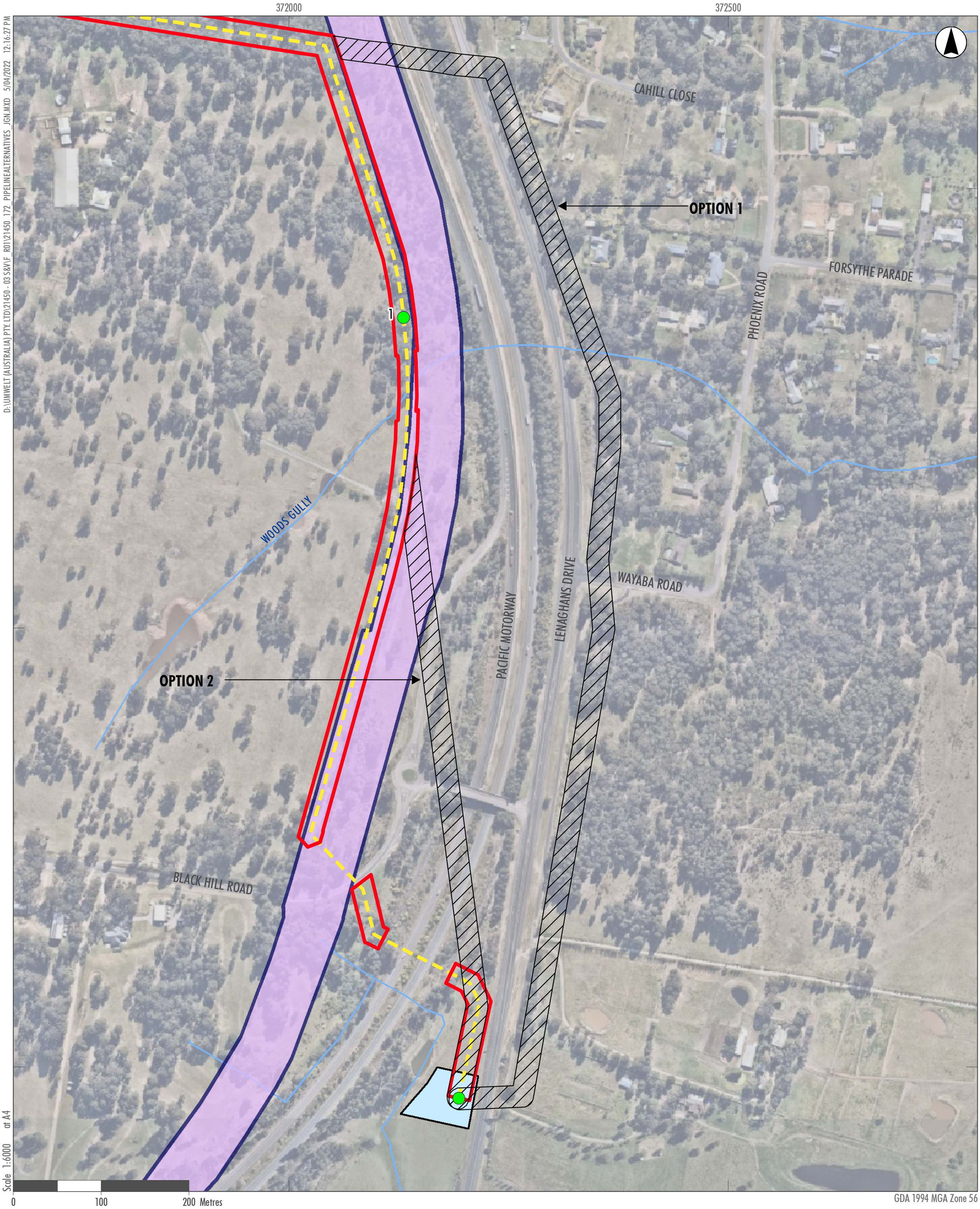
The Option 2 alignment involves a HDD of approximately 700 m between KP 0.1 and KP 0.8 on Lot 51 DP1158920. This option significantly minimises surface disturbance within the M1 road reserve, enables sufficient depth of cover to be achieved and reduces the number of lots impacted by one relative to the base case. A potential constraint with this option is the extended length beneath both the M1 and LHFC. Perpendicular crossings are preferable to minimise the pipeline length within the road and rail corridors. An additional linear area of disturbance on Lot 10 DP829154 for stringing and welding the pipe string prior to pullback through the HDD is also likely to be required if the angle between the HDD and the construction footprint north of the HDD exit point is too great. Additionally, the HDD rig located at the KP 0.1 entry point is likely to have greater noise impacts to nearby residences than the horizontal bore proposed for the base case.

APA considers that Option 2 is a viable option for transmission pipeline construction. Preliminary discussions with Transport for NSW suggest that Option 2 may be able to be supported, subject to detailed design. Consultation between APA, Transport for NSW and the LHFC project will be ongoing to determine the optimal crossing option for the transmission pipeline.

A comparison of impacts for the base case and two alternatives is presented in **Table 5.3** below.

Table 5.3 Comparison of options for crossing the M1 and LHFC

Option	Base Case	Option 1	Option 2
Length (from KP 0 to KP 1.3 of base case	1.31 km	1.47 km	1.12
Landholdings traversed (excluding lot at KP 0 and road reserves)	2	9	1
Construction amenity impacts (noise, dust and visual)	Relatively minor, four residences within 250m of construction footprint. Limited number of residences with visibility of construction, given length of alignment to west of M1 road reserve. Air quality criteria (PM10) likely to be met at all residences. No highly intrusive or moderately intrusive noise impacts are likely.	Around 20 residences within 250m of construction footprint. Highly visible construction activities for at least eight residences. Air quality criteria (PM10) are highly unlikely to be met at closest residences. Noise impacts would be considered as highly intrusive at several residences.	Relatively minor, four residences within 250m of construction footprint. Lowest number of residences with visibility of construction, given length of HDD and length of alignment to west of M1 road reserve. Air quality criteria (PM10) likely to be met at all residences. No highly intrusive noise impacts are likely however the HDD entry pad is likely to have greater noise impacts to nearby residences than the base case.
Biodiversity	Impacts spotted gum ironbark open forest in thinned/disturbed condition, mainly west of Black Hill Road.	Similar to base case, impacts some areas of spotted gum ironbark open forest likely to be in thinned/disturbed condition.	Overall lower impact given HDD avoids 700m of surface impacts, however stringing area for pipe pullback will impact spotted gum ironbark open forest in thinned/disturbed condition.
Traffic	No additional road crossings required.	Additional crossings of Lenaghans Drive and Wyaba Road required. However crossings are likely to be horizontal bores with minimal traffic disruption.	No additional road crossings required.
Cultural Heritage	Adjacent to significant ACH site in M1 road reserve near KP 1.0	Avoids significant ACH site in M1 road reserve near KP 1.0.	Adjacent to significant ACH site in M1 road reserve near KP 1.0
Hydrology	Crossing of Woods Gully required for all options.		
Hazard and risk	All options likely to comply with the criteria of Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning (NSW, 2011)		
Social impacts	Minimal, due to fewer larger landholdings impacted.	Potentially significant due to number of large lot residential holdings traversed.	Minimal, due to fewer larger landholdings impacted.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Transmission Pipeline Alternatives
- JGN Offtake Facility Boundary
- Lower Hunter Freight Corridor

FIGURE 5.2

Transmission Pipeline Alternatives from the Offtake Station

Stevens Group Hunter Business Park

The transmission pipeline alignment traverses the Stevens Group Hunter Business Park adjacent to the southern boundary, maintaining a 20m vegetated boundary buffer as per consent conditions for that development. The proposed crossing method for Viney Creek, an ephemeral watercourse which flows through the Hunter Business Park from south to north, is by standard open trenching. During consultation, Newcastle City Council expressed a desire for Viney Creek to be crossed by HDD, as the riparian zone of this watercourse is excluded from the industrial subdivision footprint as a drainage reserve.

Studies undertaken for this EIS indicate that Viney Creek supports a heavily weed infested understorey at the crossing location and the additional cost, time and risk of HDD is not considered to be justified based on the limited potential for biodiversity impacts. The morphology and catchment position of the watercourse is also suitable for standard open trenched construction. Rehabilitation following trenched construction, has the potential to significantly reduce weed infestation at the crossing location whilst maintaining habitat connectivity, through the implementation of appropriate weed control and replanting techniques.

APA will hold further discussions with Newcastle City Council on the crossing design at this location. If HDD is the selected option, an access track that crosses Viney Creek at the proposed southern road crossing for the Hunter Business Park will be required to enable construction machinery to access to the transmission pipeline alignment between Viney Creek and John Renshaw Drive.

Broaden Management Industrial Estate

Consultation with Broaden Management has identified a potential alternative alignment that may reduce impacts on the proposed industrial estate directly west of the Stevens Group Hunter Business Park (see **Figure 5.3**. This alternative follows the southern boundary of the proposed industrial estate but extends past the Hunter Water lot prior to turning north and then back to the east to cross the Hunter Water lot a second time. Whilst this alternative is feasible, the preference of APA is to retain the proposed alignment along the southern boundary and stay adjacent to the eastern side existing Hunter Water Corporation lot, rather than twice crossing the buried water pipelines, though discussions between APA and the Hunter Water Corporation have indicated that the existing water pipeline assets are likely to be moved as part of the estate development. Consultation with Broaden Management will be ongoing.

Louth Park Mine Subsidence District

The transmission pipeline alignment traverses a section of the Louth Park Mine Subsidence District between approximately KP10.5 and Buttai Creek (KP13.0). Underground mining in this area targeted the Donaldson, Big Ben Upper and Rathluba coal seams.

At KP11.0, a minor refinement to move the alignment approximately 30m to the south and away from the zone of influence of the Donaldson Seam workings may be required, pending results of geotechnical investigations. In addition, an area of fill adjacent to a mining haul road is traversed at KP 9.5. Movement of the alignment approximately 30m south may be required pending geotechnical investigations into the stability of the fill area.

Buchanan Road

Consultation with operator of ML1738 has indicated that the transmission pipeline alignment adjacent to Buchanan Road may interact with some areas subject to mine closure requirements at this part of the ML. APA will continue consultation with Bloomfield to determine if refinement to this section of alignment is required to maintain consistency with mine closure responsibilities.

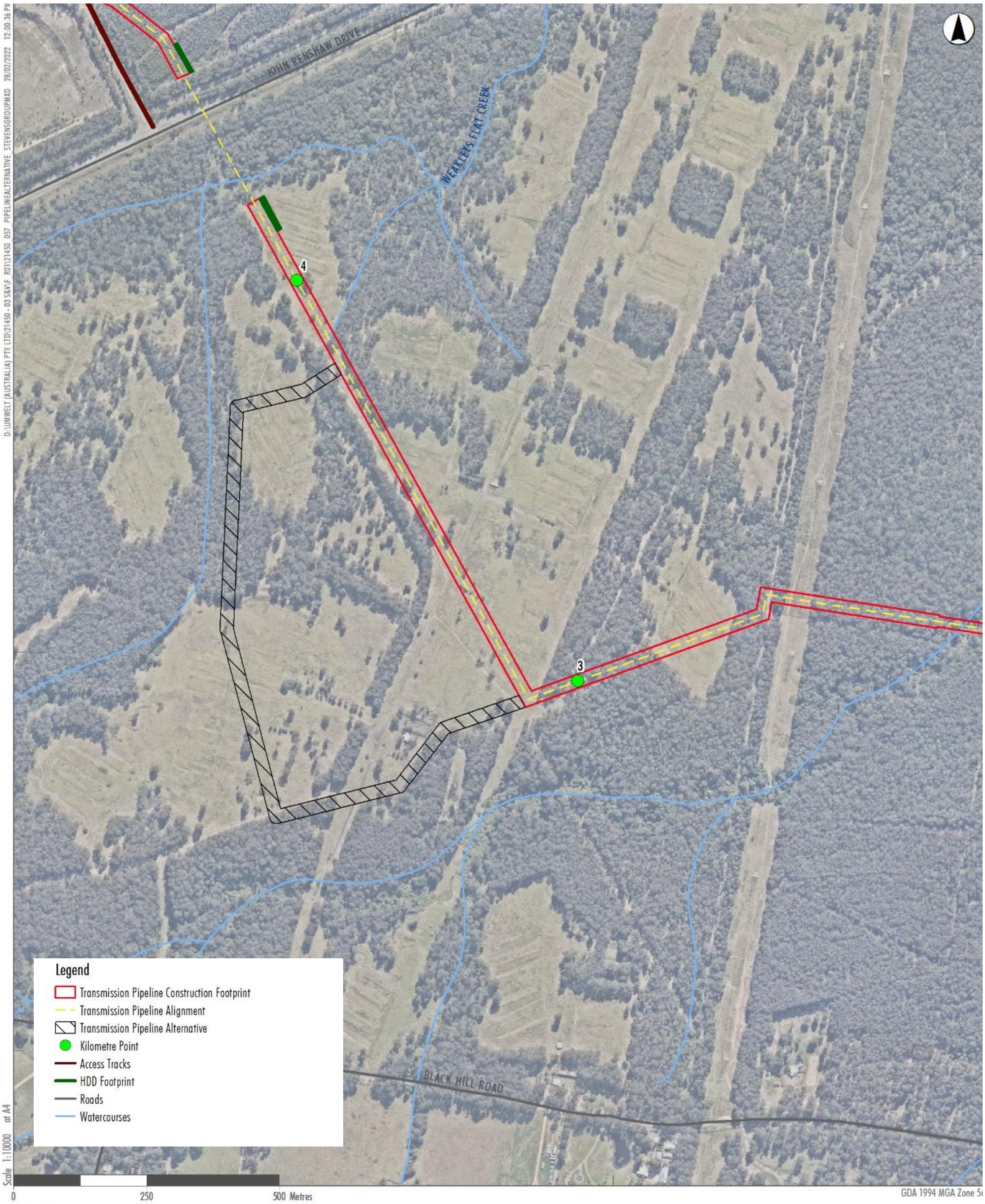


Figure 5.3 Transmission pipeline alternative west of Stevens Group Hunter Business Park

Maitland West Mine Subsidence District

The Maitland West Mine Subsidence District extends from Maitland to the Hunter Expressway. Extensive underground mining of the Greta top seam and the Homeville (or Greta bottom) seam occurred in this area from the late 1800s to around 1960. Mining of these coal seams extended to the south-west of Cessnock around Paxton, which is an area now regulated by the Tomalpin and Bellbird-Millfield mine subsidence districts. In totality, mining of these coal seams between Maitland and Paxton formed the South Maitland Coalfields, which during the 1920's was one of the largest coalfields in the southern hemisphere.

The coal seams outcrop to the west and typically dip steeply to the east. This has resulted in the mine workings of the South Maitland Coalfield usually being narrow in width in the horizontal plane due to the economics and mining engineering complexities of working seams that rapidly increase in depth. Historic mine subsidence is common along the line of workings, usually close to the western sub-crop where workings are closest to the surface.

As the mine workings of the South Maitland Coalfields form a linear feature between Maitland and south west of Cessnock, any pipeline alignment between Black Hill and the HPP must traverse them. Extending the transmission pipeline alignment to the north of Maitland or south west of Paxton to avoid mine subsidence districts associated with the South Maitland Coalfields is not considered feasible given the significant additional length this would entail and numerous other significant constraints that would need to be addressed. These constraints include, for example, Maitland, Cessnock, the Hunter River and floodplain and the Toomalpin Woodlands.

The transmission pipeline alignment location within the Maitland West Mine Subsidence District was initially selected on the basis of historic record tracings indicating the absence of surface connected mine infrastructure (shafts and tunnels) and mining of only the Homeville seam. Record tracings, however, may not provide a complete or accurate record of mine workings, and detailed geotechnical investigations are underway to inform fine scale positioning of an appropriate alignment crossing location, as well as any design treatments to mitigate subsidence risks. APA is working with Subsidence Advisory NSW to undertake this geotechnical study.

Given this ongoing work, the alignment may be subject to change in this area, with movement further to the north possible within the approximate area shown in **Figure 5.4**. Moving the alignment to the south is not considered likely due to near surface workings and known subsidence associated with the former Glen Ayr and Ayrfield No. 1 collieries.

South Maitland Railway

The transmission pipeline alignment lies adjacent to the western side of the South Maitland Railway from the crossing location, in part to minimise interactions with a residential area proposed on the eastern side of the railway as part of the Regrowth Kurri Kurri project. An alternative alignment has also been considered that follows the eastern side of the railway and the western boundary of the proposed residential area, then crosses the railway at a more southerly location as shown in **Figure 5.5**. Consultation with the South Maitland Railway has indicated that the eastern alternative is not likely to be feasible given potential future uses of the railway. Consultation with Regrowth Kurri Kurri and the South Maitland Railway on a preferred alignment option is ongoing. A final alignment location may also be influenced by the outcomes of mine subsidence investigations described above.

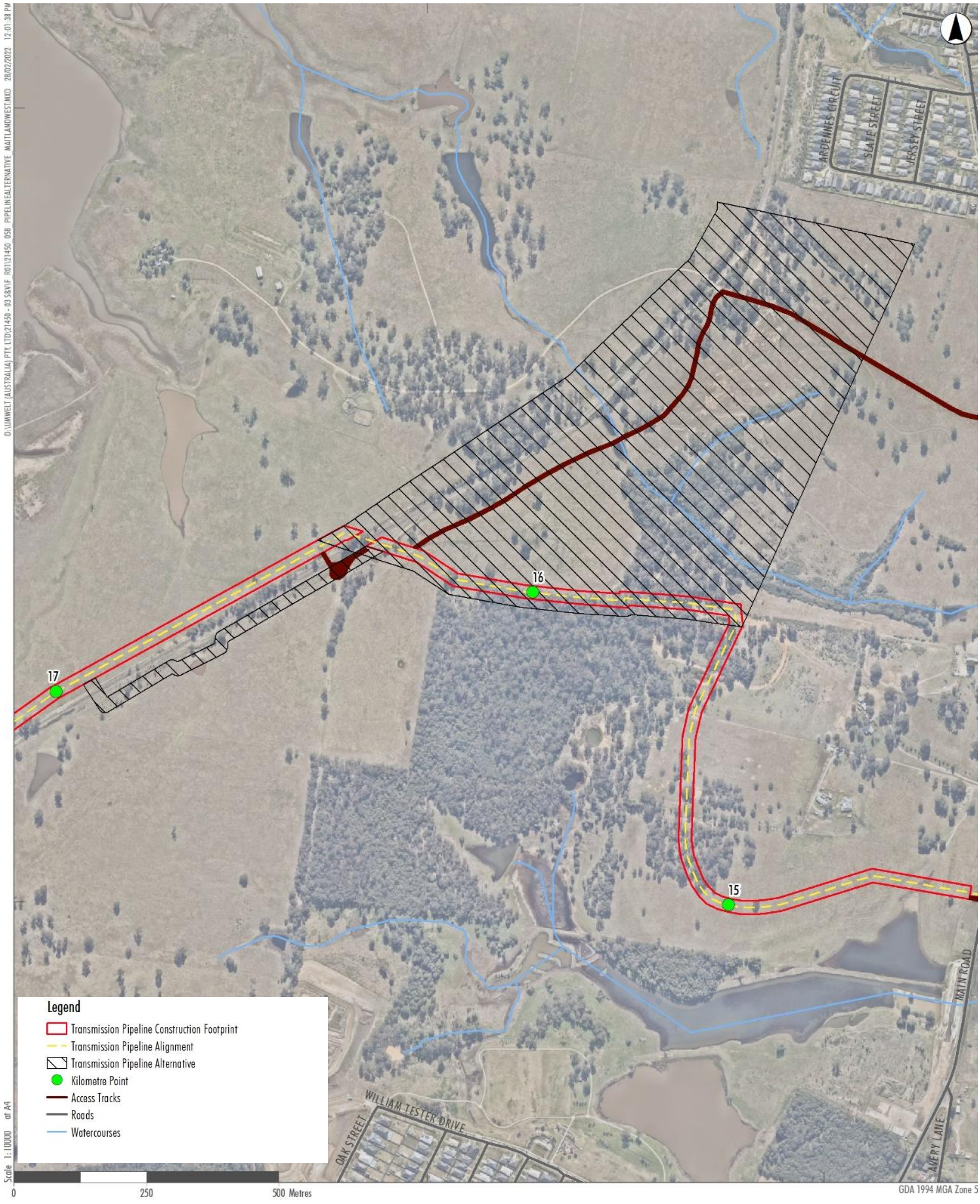


Figure 5.4 Transmission pipeline alternative in Maitland West Mine Subsidence District

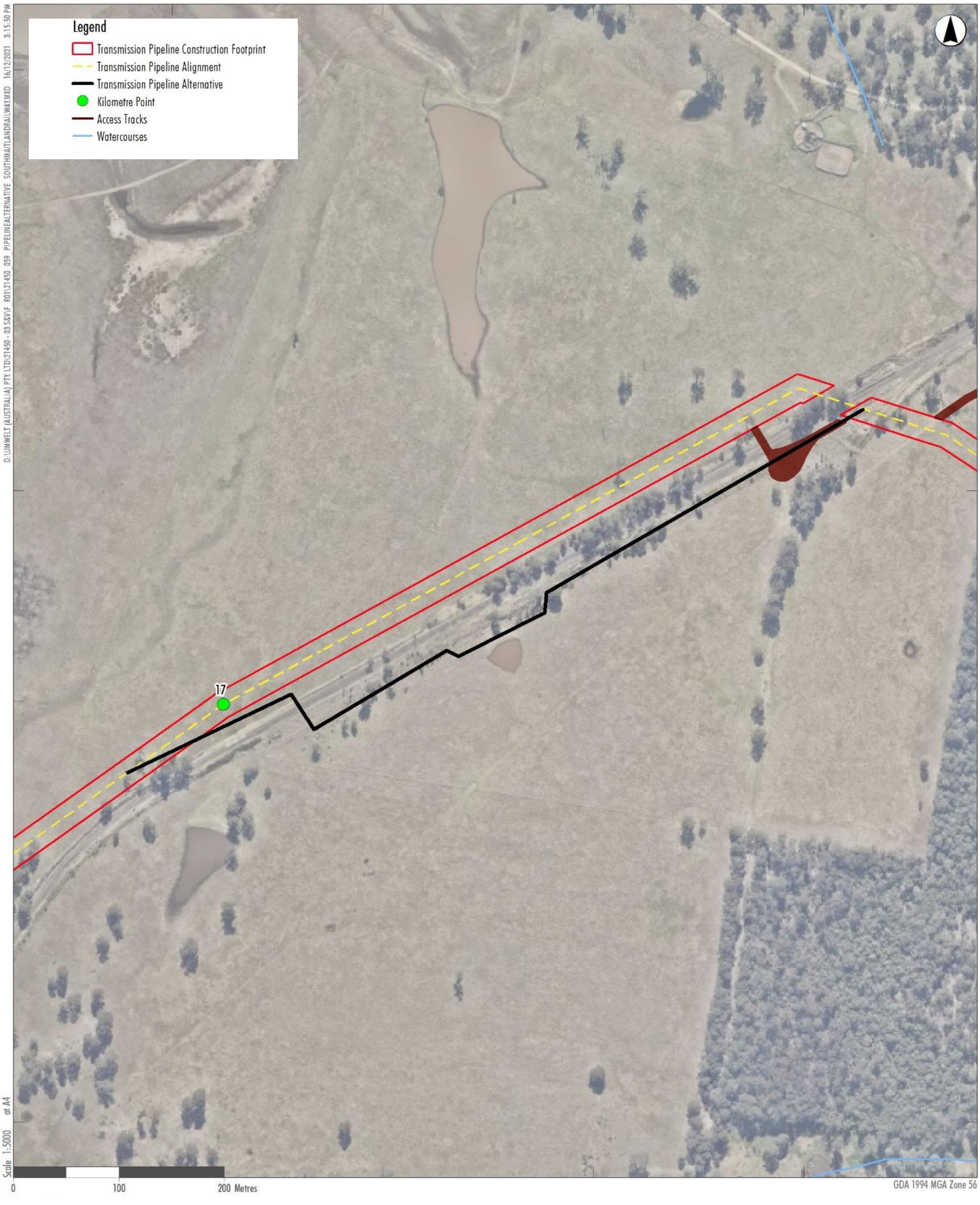


Figure 5.5 Transmission pipeline alternative south of South Maitland Railway

5.3.2 Compressor station alternatives

Four options for locating the compressor station in proximity to the HPP were investigated, in consultation with Snowy Hydro and the proponents of the Kurri Kurri Regrowth project. Options are described in **Table 5.4** below and shown in **Figure 5.6**.

Table 5.4 Options assessed for location of the compressor station

Option	Location	Advantages	Constraints
1	Directly south of the HPP on land to be purchased by Snowy Hydro within the Regrowth Kurri Kurri industrial precinct.	• Directly adjacent to HPP, on land subject to option by Snowy Hydro. • Shared use of utilities, power, electrical and control equipment with the delivery facility. • Direct connection between compressor station and delivery facility provides greater operational flexibility.	• Potential for ongoing interaction with smelter remediation works during construction. • Transmission pipeline must traverse land subject to various constraints.
2	Between Swamp Creek and HPP	• No use of lots proposed for Regrowth Kurri Kurri industrial precinct for the compressor station or transmission pipeline. • No or minimal impact to smelter remediation works • Reduction in length of the transmission pipeline.	• May conflict with future land uses for area. • Additional noise attenuation may be required as closer to proposed Regrowth Kurri Kurri residential areas west of Kurri Kurri TAFE. • Provision of power to site is required. • Unable to share common facilities and equipment with the delivery facility. • May require increased footprint, and civil and construction costs likely to be higher than Option 1.
3	West of HPP on laydown area currently used for remediation works	• Adjacent to HPP • No use of lots proposed for Regrowth Kurri Kurri industrial precinct from compressor station. • Reduction in noise attenuation requirements.	• Likely that use of laydown area for smelter remediation works is required until June 2023, which is later than compressor station construction must start. • Potential for ongoing interaction during construction with smelter remediation works. • Unlikely to be able to share common facilities and equipment with the delivery facility.

Option	Location	Advantages	Constraints
4	Start of storage pipeline	• No use of lots proposed for Regrowth Kurri Kurri industrial precinct from compressor station or transmission pipeline. • No or minimal impact to smelter remediation works. • Significant reduction, or none required, in noise attenuation requirements. • Reduction in length of transmission pipeline. • More efficient compressor operation as located directly adjacent to storage pipeline.	• Distant from HPP • May conflict with proposed land uses for area. • Provision of power to site required. • Transmission pipeline would be required to cross Black Waterholes Creek. • Access track upgrade required. • Possible visual impact to proposed Regrowth Kurri Kurri residential areas. • Unable to share common facilities and equipment with the delivery facility. • May require increased footprint, and civil and construction costs likely to be higher than Option 1.

Option 1 was selected as the preferred option, with key benefits being use of an existing hard stand area previously used for industrial activity, the potential for shared use of utilities, power, electrical and control equipment with the delivery station, and the greater operational flexibility provided by the direct connection between the compressor station and delivery station.

Gas and electric drives options were also considered for the compressor station. Electric drive compressors are typically more efficient and reliable than gas drive compressors, as well as having significantly lower noise emissions and negligible air emissions. Noise assessments of both gas and electric drive options indicated that gas driven compression would be unlikely to comply with noise compliance limits at the nearest residences. Given these considerations, electric drive was chosen as the compressor power supply option.

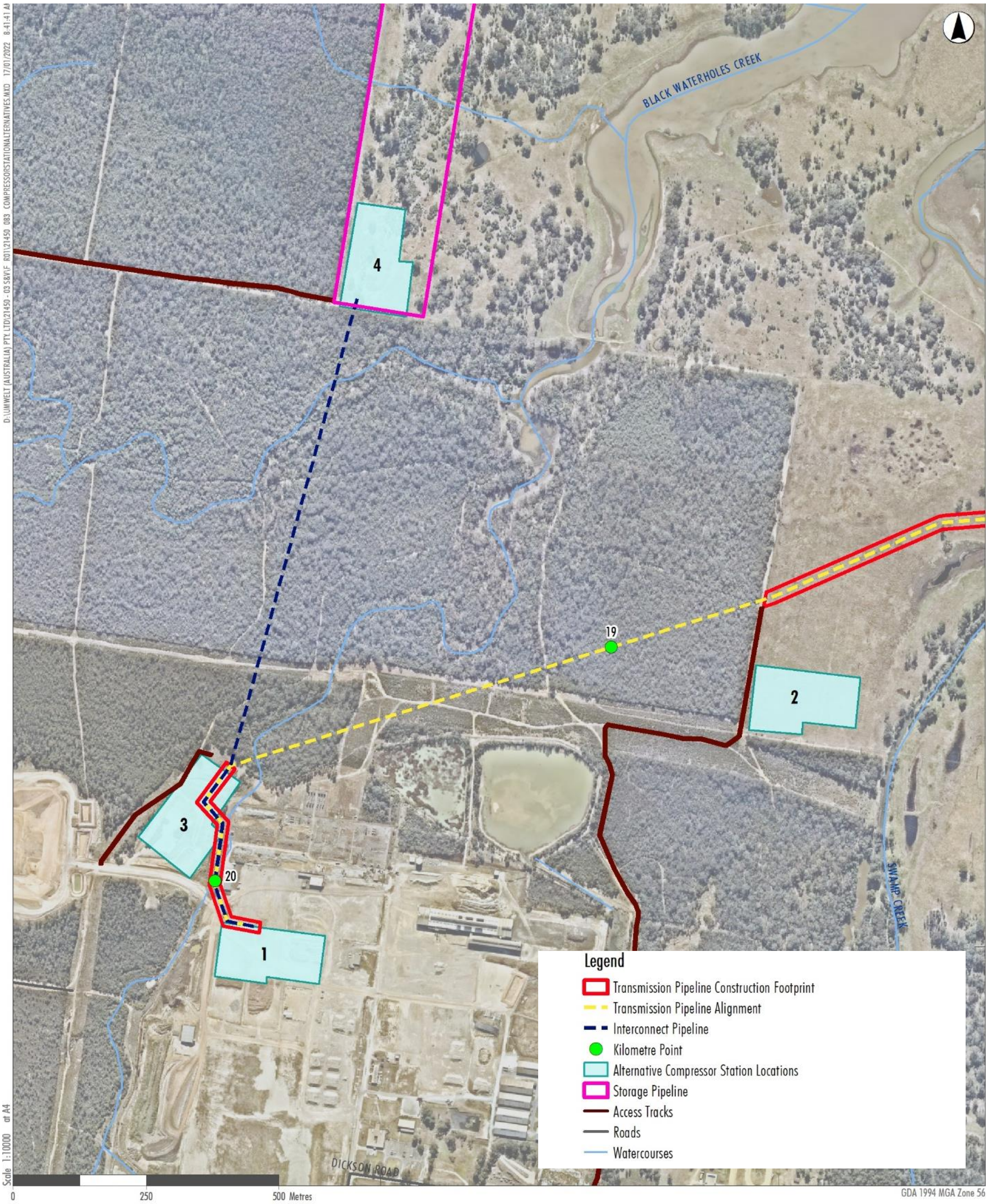


Figure 5.6 Alternatives for the location of the compressor station

5.3.3 Storage pipeline alternatives

Options considered for locating the storage pipeline adjacent to the HPP have comprised a single pipeline loop to the west of Wentworth Swamp (shown in **Figure 5.7**), a single pipeline loop following Bishops Bridge Road (shown in **Figure 5.7**), and the selected option of multiple pipeline loops in the area west of Wentworth Swamp previously subject to broadscale vegetation clearing.

Both single pipeline loop options (as illustrated in **Figure 5.7**) were initially considered when the proposed capacity for the storage pipeline was 43TJ, and therefore a shorter total storage pipeline length was required. The single loop adjacent to Wentworth Swamp was constrained by being sited adjacent to HV overhead power lines immediately north of the HPP, crossing Black Waterholes Creek and traversing a significant distance within the 1% AEP of the Hunter River. The single loop following Bishops Bridge Road was constrained by two 33kV high voltage overhead power lines within the road easement, which would require the construction footprint to be placed within remnant vegetation to the east. This remnant vegetation is mapped as important habitat for the Regent Honeyeater and forms part of the proposed stewardship are for the Regrowth Kurri Kurri project.

Increasing the useable pipeline storage to 70TJ introduces further significant constraints for both of these options.

The selected option of multiple loops with a DN350 interconnect pipeline provides a superior solution for all major constraints. Specifically this option enables the HV overhead power lines immediately north of the HPP and Black Waterholes Creek to be crossed by HDD, avoids impacting the proposed stewardship area for the Regrowth Kurri Kurri project and associated important habitat for the Regent Honeyeater, and minimises extent within the Hunter River 1% AEP.

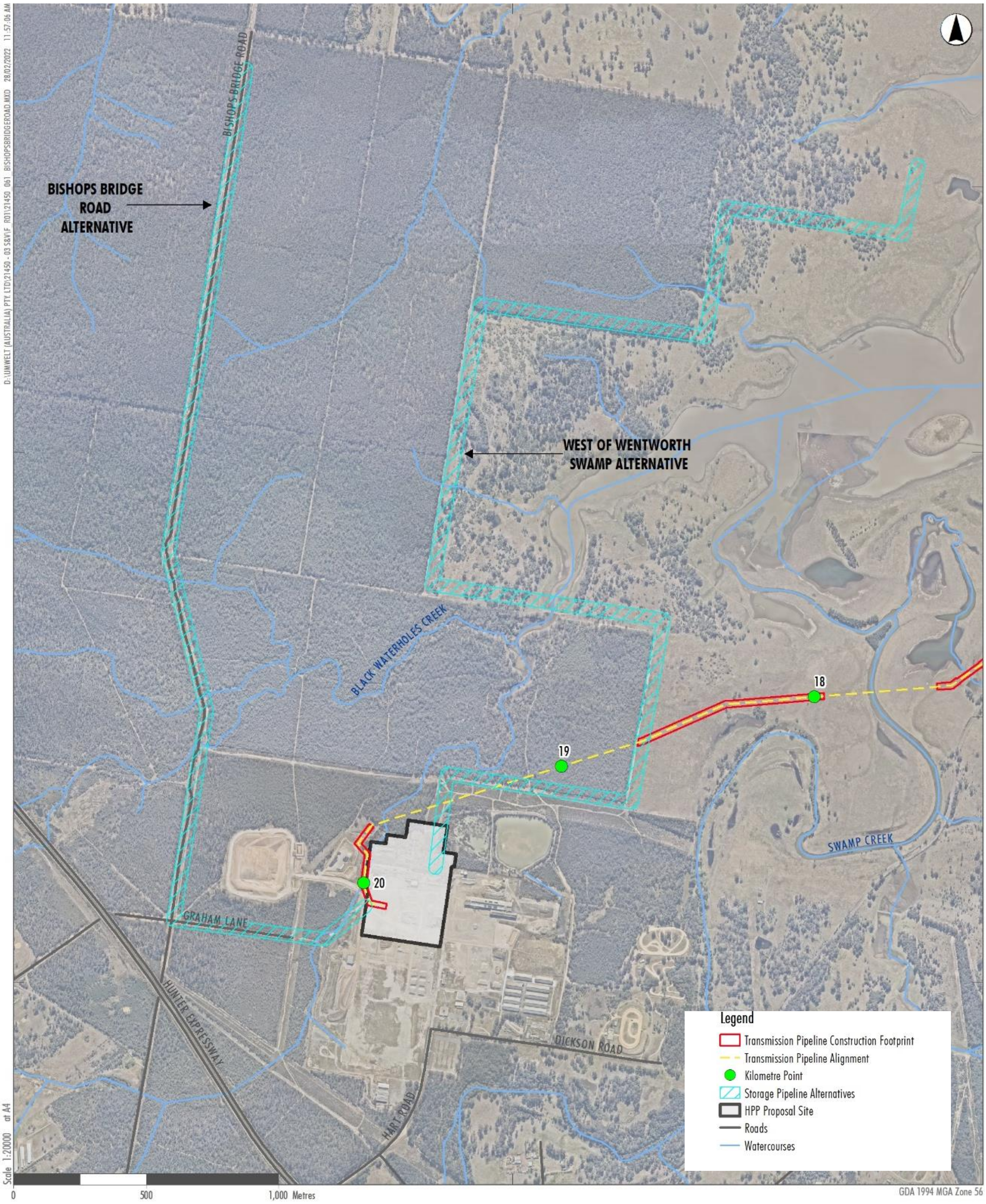


Figure 5.7 Storage pipeline alternatives

Hydrotesting alternatives

Hydrotesting involves filling a pipeline with water, which is then pressurised above the intended pipeline operating pressure and monitored for leaks or pressure loss over a specified time period. Hydrotesting of both the transmission pipeline and storage pipeline will be required at the conclusion of construction as part of the commissioning process.

Approximately 2 ML and 21 ML of suitable quality water will be required for hydrotesting of the transmission pipeline and storage pipeline respectively. The quality of water that can be used for hydrotesting depends on the time of residence within the pipeline and water disposal requirements. Typically, a water source with neutral pH, low electrical conductivity (EC) and low levels of micro-organisms and contaminants that is close to the construction area is sought.

A range of water sources were investigated for hydrotesting suitability as summarised in **Table 5.5** below. Of these sources, the Buttai and Four Mile Creek reservoirs, water held in clean water dams on the Bloomfield Mine, notably Possums Puddle, and the existing reticulated water supply to the HPP site were determined to be most suitable based on location, volume and quality.

Table 5.5 Potential water sources for hydrotesting

Source	Water volume and quality	Advantages	Disadvantages
Bloomfield Mine and Abel Mine dams	Several dams form part of the water management system for the Bloomfield Mine and Abel Mine. Most of these dams hold pit, underground or mine runoff water with high EC and sediment loads. Some dams hold much cleaner water from undisturbed or rehabilitated catchments, notably the 90ML Possums Puddle dam. Regular sampling of this waterbody demonstrates neutral pH, low EC and low sediment content (AECOM 2020).	• Proximal to the transmission pipeline. • Located close to midway along transmission pipeline • Large volume of good quality water in some dams • No extraction from a natural waterbody required. • Limited competing uses	• Some pipeline infrastructure required to transfer water from Possums Puddle to the transmission pipeline alignment
Buttai Reservoir and Four Mile Creek reservoirs	Brick reservoirs which hold water delivered by the CTGM and other Hunter Water trunk mains. Water is treated prior to storage in reservoirs.	• Proximal to the transmission pipeline. • Located close to midway along transmission pipeline • Good quality and large volume. • No extraction from a natural waterbody required.	• Water is designated for Newcastle, Maitland and Cessnock potable water supply.

Source	Water volume and quality	Advantages	Disadvantages
Wentworth Swamp	Natural waterbody directly adjacent to the storage pipeline. Receives inflows from Swamp Creek and, during flood events, the Hunter River.	• Directly adjacent to storage pipeline • Large volume of water.	• Natural waterbody with potentially significant biodiversity values • High sediment load. • Elevated nutrient concentrations may require the addition of biocide prior to hydrotesting. • Licencing required for extraction.
Recycled water	Kurri Kurri Waste Water Treatment Works, Kurri Kurri Golf Course and Kurri Kurri TAFE	• Beneficial use of a water source that would otherwise be discharged to Swamp Creek.	• Located at the western end of the transmission pipeline. • Limited volumes available (400kl/day) • Competing use with Kurri Kurri Golf Club. • Elevated nutrient concentrations may require the addition of biocide prior to hydrotesting.
Municipal water supply to former Hydro smelter site	200mm reticulation main supplying potable water.	• Water supply is available at a major construction area for the Project. • Significant volume available.	• Use of potable water where non-potable quality would be sufficient.

Several alternatives for the implementation of hydrotesting were also considered. All alternatives assume that the transmission pipeline will be tested as two sections with no reuse of water between sections and the storage pipeline will be tested as two sections with water reused between sections. A turkeys nest dam is required to store water for transfer between storage pipeline test sections, and store water at the completion of hydrotesting. The storage pipeline is assumed to be unlined, necessitating the storage and management of water containing millscale (iron oxide) after hydrotesting.

The alternatives considered are as follows:

- A single water source near the centre of the transmission pipeline is used for testing of both the transmission pipeline and storage pipeline. The transmission pipeline is tested first. The western section of transmission pipeline is then used to transfer water to the storage pipeline. After testing of the transmission pipeline, water is released to grade in a controlled manner through suitable velocity control device. After testing of the storage pipeline, water is stored in the turkeys nest dam for evaporation prior to disposal of millscale and sediments at the base of the dam to landfill.

- Separate water sources are used for testing of the transmission pipeline and storage pipeline. Hunter Water reservoirs or clean water mine dams are the water source for the transmission pipeline. The reticulated water supply to the HPP is used for hydrotesting the storage pipeline, requiring a storage tank on the compressor station footprint to store water prior to transfer to the storage pipeline. Water release and disposal options are the same as for option 1.

Option 2 is preferred, as it enables the transmission pipeline to be dewatered, tied-in and dried rapidly. This approach minimises the potential for surface corrosion of internal joints.

The storage pipeline may also be internally lined. In this scenario, water for hydrotesting would not entrain millscale from the internal wall, and water could be released to grade through a suitable velocity control device following hydrotesting.

5.3.4 Assessing impacts of changes to Project design

It is likely that refinement and optimisation of the Project design, such as the transmission pipeline alignment or storage pipeline construction footprint, will be required prior to and following EIS approval. Examples of the types of changes envisaged include:

- Minor refinements to avoid or reduce impacts on environmental values identified after EIS submission, such as Aboriginal Cultural Heritage Sites identified during additional field surveys.
- Minor refinements to address landholder feedback based on ongoing consultation.
- Adjustment of infrastructure or watercourse crossing locations or approach angles to address specific design requirements, including from 3rd party asset owners.
- Modifications of the transmission pipeline alignment to address cadastral inaccuracies.
- Refinement of the construction footprint such as the location, dimensions and number of access tracks, additional work spaces, hydrotest water storages and truck turnarounds, based on detailed construction planning.

As such a mechanism is required to enable the environmental impacts of Project design modifications to be assessed. The proposed approach to assess such modifications prior to and following EIS approval are discussed below.

5.3.4.1 Changes prior to EIS approval

Under section 5.17 of the EP&A Act, APA may be required to provide a response to submissions addressing issues raised in submissions on the EIS or provide a preferred infrastructure report (PIR). The response to submission or PIR, if required, must outline any proposed changes to the Project to minimise its environmental impact or to deal with any other issue raised during the assessment process.

After exhibition of the Project EIS, careful consideration of all submissions made will be undertaken. Responses to issues raised in submissions, or during ongoing consultation, may include changes to the transmission pipeline alignment or other Project design changes. Environmental impacts associated with any such realignments or design changes will be assessed and described in the response to submissions and/or a PIR.

5.3.4.2 Changes post EIS approval

If the EIS was to obtain planning approval, further refinement and optimisation of the transmission pipeline alignment, construction footprint or design may be required as a result of both ongoing landholder negotiations and the outcomes of detailed design activities. For each realignment or design change, it is proposed to undertake the following environmental assessments, where relevant:

- Vegetation mapping and field surveys for threatened species, if suitable habitat is present, and threatened ecological communities, if presence cannot be determined without on-ground investigations.

- Aboriginal cultural heritage surveys in areas of cultural heritage sensitivity, unless the proposed realignment or design change is already authorised through an appropriate agreement.
- Noise and air quality assessments to ascertain if there would be any changes to the noise impacts identified in the EIS, typically using existing modelling.
- Assessments of visual amenity, historical heritage, traffic and transport and land use and agriculture, where design refinements may increase adverse impacts for these issues.

If surveys and assessments demonstrate that effects to environmental values as a result of the realignment or design change are the same or less as assessed in the EIS, then it is proposed to document the proposed design change and supporting assessments and undertake the change, on the basis that the modification is considered to be consistent with the existing approval.

If the realignment or design change is likely to result in a material increase in adverse environmental impacts relative to assessments in the EIS then options will be discussed with the DPIE. A formal application to modify the SSI approval under Section 5.25 of the EP&A Act may be required.

SECTION 6.0

Stakeholder Engagement and Identification of Environmental and Community Issues

6.0 Stakeholder Engagement and Identification of Environmental and Community Issues

This section provides an overview of the engagement undertaken with key stakeholders during the preparation of the EIS in accordance with the SEARs, as presented in **Table 6.1**. The outcomes of the stakeholder engagement have formed an integral part of the development of the Project as well as informing investigations for the Social Impact Assessment (SIA) process and this EIS.

6.1 Community Engagement

Early community and stakeholder identification and engagement has been undertaken by APA and Snowy Hydro to build relationships with near neighbours and key stakeholders in relation to the KKLP and HPP Projects respectively. A coordinated approach to community and stakeholder engagement has been adopted as the HPP and KKLP projects are related, adjacent to each other and in the same social locality.

This common approach sought to streamline the two projects' consultation programs, aiming to:

- ensure that the implementation of engagement was transparent and provided clear and consistent information across both projects
- establish and develop trust with key stakeholders
- better identify cumulative impacts associated with the two projects
- afford the opportunity for meaningful participation in the assessment phases for both projects, and
- avoid engagement fatigue, particularly for stakeholders potentially affected, or with an interest, across both projects.

6.1.1 Engagement Overview and Approach

Community engagement for the Project to date has been implemented in two phases as outlined below and will be ongoing post EIS lodgement (**Section 6.6**):

- **Phase 1** – Project announcement and scoping activities commenced Q2 2021 (refer to **Section 6.1.3**)
- **Phase 2** – EIS preparation and field survey activities commenced Q3 2021 (refer to **Section 6.1.4**).

This allowed for community engagement to be undertaken during two key stages of the assessment process: during the project design phase to allow for scoping of key issues related to social and environmental impacts; and during the environmental assessment and SIA process to inform the technical studies and appropriate environmental management strategies to seek to further minimise potential social and environmental impacts and enhance community benefits.

Following the scoping phase of the Project, Umwelt was commissioned to work with APA to undertake a social impact assessment and community engagement program that meets the NSW *Social Impact Assessment Guideline for State Significant Projects* (DPIE, 2021f) and SEARs requirements for the Project. It is noted that a separate socio-economic assessment has been conducted by Snowy Hydro in relation to the HPP, and is provided within the supporting EIS (Jacobs, 2021a).

A comprehensive stakeholder engagement program has been designed as part of the development of the SIA process for the Project. The stakeholder engagement program aimed to:

- facilitate the genuine involvement of stakeholders in the planning and approvals process as well as in developing responses to impacts
- support understanding of the project context, including identification of stakeholders and their expectations and aspirations, including identification of any vulnerable or at-risk groups that may be impacted by the Project
- guide and support a strategic and coordinated approach to engagement, including specific mechanisms, timeframes and responsibilities during the planning and assessment phase of the Project
- ensure that community and stakeholder inputs are effectively integrated into the technical assessments within the EIS and inform refinements to project design and plans
- meet regulatory requirements for public, stakeholder and community consultation
- collaborate with local stakeholders on local benefit sharing strategies to ensure they are co-designed, targeted, and appropriate to the Project's operating context
- align with APA's values and principles around timely, open, inclusive, and meaningful engagement.

6.1.2 Stakeholder Identification and Engagement Mechanisms

A stakeholder identification process was undertaken and involved identifying stakeholders with an interest, or those directly and indirectly affected by the Project, including any potentially vulnerable or marginalised groups in the community.

This process considered the interconnectivity of stakeholders with the HPP, with some stakeholders having a mutual interest in both Projects. Further definition of the stakeholder identification process is outlined in the Community and Stakeholder Engagement Plan (CSEP) in **Appendix 9**.

Key stakeholder groups that have been consulted or engaged through the SIA and EIS process, and whose engagement outcomes have been incorporated into the SIA, are illustrated in **Graph 6.1**.

Graph 6.1 Key Stakeholder Groups

A range of mechanisms were used to engage with local landholders, key stakeholders and the wider community during the consultation program, as set out in **Table 6.1** below.

Table 6.1 Engagement Mechanisms

Method	Description	Timing	No. consulted
Information provision			
Website	APA have a dedicated project website to provide project information and updates on the project	Ongoing	NA
Project phone number/email	APA have a dedicated project phone number and email address to enable community members to obtain information and/or provide feedback on the project	Ongoing	Over 100 external emails have been received to the KKLP inbox
Social Pinpoint	APA have developed a Social Pinpoint page for the project that gives the community the opportunity to provide feedback via an interactive map with key project features illustrated	Ongoing	1,823 total visits and 653 unique user visitations, with 14 individual comments made from 4 unique stakeholders (as at the end of January 2022)
Door knocking	Door knocking campaign undertaken by Snowy Hydro to discuss the KKLP and APA projects	February 2021	38 residences

Method	Description	Timing	No. consulted
Project briefings	Formal briefings to key stakeholders and government agencies. Slide deck used to formally introduce the project and provide project updates. Project Briefings have been undertaken by APA with the Hunter Power Project Community Working Group on a regular basis, with briefings also offered to the Kurri Kurri Regrowth Community Reference Group.	August 2021 – February 2022	134 formal briefings and engagements
Engagement			
Email and telephone contact	Local business and service providers, community and development groups, Local and State Government representatives, and environmental groups were also contacted by Umwelt (via email and telephone) to offer participation in the SIA consultation. Contact attempts were made at different times during the week to maximise response, with up to three call backs attempted.	September-October 2021	47 Stakeholders
Personal meetings/ interviews	Semi-structured meetings to introduce the Project and project team members and to listen and gather community feedback relating to the Project – social impacts and opportunities and relevant mitigation/enhancement strategies.	November 2021	12 Organisations
General community survey	Random telephone survey of households within the social locality to gain broader community input to the SIA. Households within the sample area (including Sawyers Gully, Loxford, Kurri Kurri, Heddon Greta, Cliftleigh, Gillieston Heights, Louth Park, Buchanan, Buttai, Black Hill, and Lenaghan) were consulted via a random telephone survey undertaken by Taverner Research from 11 November to 23 November 2021. Random sampling was used to contact households in the area – 4,693 numbers were supplied from proximal suburbs (comprising 2,830 mobiles and 1,863 landline numbers sourced from SamplePages, a leading supplier of residential phone records to the market and social research industry). Randomly selected numbers were called up to five times at different hours of the afternoon/evening on weekdays and on weekends. A response rate (the number of surveys completed) of 17.7% was obtained. Further details on the survey are provided in Appendix C of the SIA (refer to **Appendix 9**).	November 2021	402 households
Business and Service Provider Surveys	Surveys undertaken via phone and video-teleconferencing by Umwelt to understand community values, concerns, needs, and the capacity and demand for services and businesses in the area.	November 2021	7 Organisations

Table 6.2 provides a summary of the stakeholder groups that have participated in the Project's broader planning and assessment process to date, as well as those who have informed the development of the SIA Report.

Table 6.2 Stakeholders consulted

Stakeholder Category	Organisation	Consultation Responsibility	No. Contacted	No. Consulted
Host Landholder/Near Neighbours	N/A	APA	23	23
Community Members residing in the defined social locality	N/A	Umwelt	402	402
Aboriginal Stakeholders	Barkuma Neighbourhood Centre Mindarriba LALC	Umwelt	3	0
Local Businesses and Service Providers	Best Western Endeavour Motel Joblink Plus Kurri Kurri Kurri Kurri Hospital Kurri Motor Inn Mercure Maitland Monte Pio Molly Morgan Motor Inn Station Hotel, Kurri Kurri	Umwelt	16	7
Community and Development Groups	Business Hunter Kurri Kurri Business Chamber Inc Towns With Heart	Umwelt	10	3
Local Government	Maitland City Council City of Newcastle Cessnock City Council	Umwelt	3	3
State Government Agencies	Local Land Services Hunter and Central Coast Development Corporation Kurri Kurri TAFE	Umwelt	3	3
Environmental Groups	Black Hill Environment Protection Group Kurri Kurri Landcare Group	Umwelt	2	2
		Total	**462**	**443**

6.1.3 Phase 1 – Project Announcement and Scoping Activities

The purpose of this phase was to:

- introduce the Project to relevant local and State government agencies, key stakeholders and affected landholders
- gain an understanding of the key issues and opportunities that would inform selection and development of proposal concepts and pipeline corridors.

6.1.3.1 Project Announcement

Engagement commenced with the public announcement of the Project in March 2021. This involved meetings with the DPIE and the three affected LGAs as outlined in **Section 6.4**.

The following communication materials were made available:

- Project website – https://www.apa.com.au/about-apa/our-projects/kurri-kurri-lateral-pipeline-project/
- Project email address – kklp@apa.com.au
- Social Pinpoint page - https://apa.mysocialpinpoint.com/kurri-kurri-lateral-pipeline#/sidebar/tab/the_project
- Free call contact number – 1800 804 893
- Introductory Project information sheet - https://www.apa.com.au/globalassets/about-apa/our-projects/kurri-kurri-lateral-pipeline-project/kurri-kurri-lateral-pipeline-project-information-sheet.pdf
- Tailored PowerPoint presentations.

6.1.3.2 Initial landholder contact

Landholder contact commenced in June 2021 with the priority of making initial contact with all directly affected landholders on the preferred transmission pipeline alignment.

Individual landholders were identified by completing title searches for all parcels directly affected by the preliminary design for the Project. Contact details for individuals were then obtained from publicly available sources.

Topics discussed during initial contact included:

- an introduction to APA and the Project
- confirmation of property ownership arrangements
- confirmation of nominated point of contact and preferred method of contact
- arrangements for a face-to-face briefing regarding the Project.

Following initial phone calls, meetings or more detailed briefings were held with individual landholders in order to brief them regarding the Project and the proposed alignment of the transmission pipeline as it related to their property. At these meetings, APA's land access representative presented the following information:

- an introductory letter providing an overview of the Project.
- A fact sheet providing key information regarding APA and the Project including the environmental assessment and consultation processes, frequently asked questions and contact details.
- an overall map of the preliminary transmission pipeline alignment.
- A map of the preliminary transmission pipeline alignment as it related to the landholder's property.

During these meetings the APA land access representative introduced the key aspects of the Project, addressed any initial questions and sought feedback from the landholder regarding the preliminary alignment including proposed changes to avoid specific features.

In addition to individual landholders, the following landholder groups were also consulted:

- Developers of the Kurri Kurri Regrowth project - regarding the alignment of the proposed transmission pipeline, location of the proposed compressor station and delivery station, and feasibility of, and options for, the proposed storage pipeline in the buffer zone of the former Kurri Kurri aluminium smelter.
- Companies with land ownership and mining interests between John Renshaw Drive and KP 13 of the transmission pipeline who form part of the Stony Pinch Consortium. APA offered consultation to members both jointly and individually regarding the transmission pipeline alignment, and interfaces with past, current and potential future land uses associated with the Stony Pinch land.

6.1.4 Phase 2 – EIS Preparation and Field Survey Activities

Extensive engagement has taken place with relevant stakeholders and communities throughout the Project's EIS preparation and field survey activities, which commenced in Q3 2021. APA continued to conduct community engagement and information sharing activities as part of broader engagement and design activities.

6.1.4.1 Ongoing landholder contact

Engagement with directly affected landholders continued throughout the preparation of the EIS and has consisted of meetings, telephone calls and written correspondence. Feedback received from landholders during this process is summarised in **Section 6.5**.

6.1.4.2 Field survey

A key item for discussion with landholders was the need to access properties for the completion of field survey activities to inform the EIS. APA's preference was to undertake field surveys under voluntary agreement with landholders. All but one of the directly affected landholders agreed to voluntary access for APA to undertake surveys.

Field survey activities were undertaken from August 2021 through February 2022 with the key activities that required access to private land being cultural heritage, biodiversity, hydrology and land surveys.

6.2 Aboriginal Community Engagement

A comprehensive engagement process was undertaken with the Aboriginal community in regard to the Project in accordance with:

- the National Parks and Wildlife Act 1974 (NPW Act)
- the National Parks and Wildlife Regulation 2009 (NPW Regulation)
- principles of *The Burra Charter* (Australia ICOMOS 2013)
- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010)
- key elements of the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010).

Throughout the course of the Project consultation was undertaken with 16 Aboriginal parties who registered an interest in the Project. Further discussion regarding the consultation process with the Registered Aboriginal Parties (RAPs) for the Project is provided in **Section 7.6**.

As noted in **Table 6.2**, engagement with Aboriginal stakeholders, groups and service providers in the three LGAs were also undertaken as part of the SIA for the Project and outcomes are included in **Section 7.13** and **Appendix 9**.

6.3 Infrastructure/Service Provider Engagement

Service providers that have infrastructure located within proximity to the Project area, or who may provide services for the Project, have been consulted by APA during the project design and environmental assessment process. Consultation has been undertaken with these service providers so that relevant design or management issues could be identified and addressed proactively.

Key service providers consulted include Hunter Water Corporation, Ausgrid and Transport for NSW. Further consultation will be undertaken with these asset owners and managers as part of the detailed design and implementation phases of the Project.

6.4 Government and Agency Engagement

APA has undertaken ongoing engagement with local, State and Federal government representatives throughout the planning and environmental assessment process for the Project. A summary of ongoing government consultation undertaken is provided in **Table 6.3** below.

Table 6.3 Summary of Agency Engagement During Preparation of the EIS

Agency name	Date	Description and purpose of contact
Commonwealth Government		
DAWE	16 September 2021	Pre-referral meeting to introduce the proponent, give a brief overview of the project, to discuss any concerns or feedback the Department may have in terms of the Project.
	19 January 2021	Detailed overview of Project components and construction footprint for DAWE officers undertaking the assessment of the referral.
State Government		
DPIE	March 2021	Telephone call to advise of upcoming environmental approvals application for the Project.
	10 March 2021	Meeting to introduce the Project and anticipated approvals pathway, pipeline licensing, land access.
	During March to September 2021	Ongoing liaison with the DPIE Environment, Energy and Science (EES) Group and the Planning and Assessment group by means of telephone calls and meetings.
	April 2021	Scoping meeting held to discuss the SEARS development, a site inspection for the EIS phase, timing for adequacy review and response to submissions phase.
	April 2021 – Feb 2022	Ongoing liaison to provide updates on EIS progress.
DPIE – Pipeline Licensing Team	April to May 2021	Ongoing liaison with the DPIE pipeline licensing officers by means of telephone and meetings to discuss the Project, pipeline licensing and land access as well as providing project updates.

Agency name	Date	Description and purpose of contact
Transport for NSW	31 March 2021	Meeting at Transport for NSW's offices in Newcastle to introduce the Project and discuss proposed pipeline alignment options and any potential constraints, i.e. regarding interfaces with state-controlled roads and any planned upgrade projects.
	4 August 2021	Discussion of requirements of SEARS that relate to Transport for NSW infrastructure, and APA request for information on the proposed Lower Hunter Freight Corridor (LHFC).
	15 September 2021	Discussion of LHFC timing, consultation status and the process to finalise a corridor. Initial discussion regarding interactions between the Project and the LHFC.
	14 October 2021	Ongoing discussions regarding interactions and potential design options between the Project and the LHFC.
	24 Jan 2022	Meeting with Transport for NSW staff and DPIE planning team to outline consultation outcomes to date, and review of options assessed to manage interactions between KKLP and HPP.
Hunter Water Corporation	March 2021	Meeting at Hunter Water's offices in Newcastle to introduce the Project and discuss proposed pipeline alignment options and any potential constraints, i.e. regarding interfaces with existing water assets and any planned upgrade projects.
	31 Jan 2022	Meeting to discuss crossing locations and construction methods where the transmission pipeline interfaces with the CTGM and other Hunter Water trunk mains.
Ausgrid	March 2021	Meeting to introduce the Project and discuss proposed pipeline alignment options and any potential constraints, i.e. regarding interfaces with existing Ausgrid infrastructure and any planned upgrade projects.
Subsidence Advisory NSW	During April to September 2021	Initial face to face meeting, followed by phone calls and meetings where possible to introduce the project, discuss results of geotechnical assessment, any potential constraints and resolve mitigation measures for mine subsidence areas.
DPIE Hazards	22 November 2021	Project briefing meeting, to introduce proponent, provide an overview of the project, discuss the hazards assessment methodology and inputs/assumptions built into the hazards model, present draft results and discuss any questions, concerns or feedback DPIE Hazards may have.
	4 Feb 2022	Meeting to review outcomes of the preliminary hazard analysis
Heritage NSW	7 December 2021	Sought advice from Heritage NSW on a proposed approach to the management of areas of archaeological potential within the Project Area.
BCD	13 December 2021	Project briefing meeting, to introduce proponent, provide an overview of the Project, discuss the biodiversity work completed so far including proposed methodology for the BDAR process, present draft results and to discuss any concerns or feedback BCD may have on the Project or the biodiversity assessment.
DPIE Water	21 December 2021	Project briefing meeting, to introduce proponent, provide an overview of the project, discuss the potential interaction between the project and relevant surface water and groundwater resources with the project area, provide draft results from the water resources assessment, and to discuss any concerns or feedback DPIE Water may have in terms of water resources.

Agency name	Date	Description and purpose of contact
Local Government		
Cessnock City Council	March to April 2021	Meetings were held with the directly affected LGAs to introduce the Project and seek feedback from the respective local governments, in particular on land use and development, environmental, heritage, infrastructure and other community values.
Newcastle City Council		
Maitland City Council		

6.5 Key Community Issues

Issues raised during the engagement process have been recorded and have informed investigations undertaken as part of this EIS and the ongoing development of the Project.

Table 6.4 summarises the key community and affected landholder issues raised during the engagement process, how these have been responded to during the EIS phase and where these have been addressed in the EIS.

Table 6.4 Key community and landholder issues

Issue	Response/Assessment outcome	Where addressed in this EIS
Key issues		
Local employment, procurement and capacity development opportunities	A Project-specific Local Industry and Indigenous Participation Plan will be developed with the intention of promoting local, regional and Indigenous business and employment opportunities associated with the Project. APA will require the appointed construction contractor to implement a workforce management strategy, including strategies for accommodation, employment and procurement.	**Section 7.14 and Appendix 9**
Disruptions to road infrastructure and traffic concerns	Key traffic impacts occur during the construction phase of the Project. The traffic assessment identified that use of Main Road by Project workers returning to accommodation in Maitland in the afternoon is the most significant potential impact to the local traffic network, given this road is already approaching saturation during peak hours. The most significant increase to existing traffic volumes on the local road network is estimated to occur for John Renshaw Drive for around 6 weeks when pipe segments are being delivered from the Port of Newcastle to laydown areas. John Renshaw Drive will remain well within recommended level of service during this period. Disruptions to road infrastructure and traffic concerns (including safety issues) will be mitigated and managed through the implementation of a Construction Traffic Management Plan (CTMP).	**Section 7.11**
Intergenerational equity and the Project's effect on climate change	This issues primarily relates to the use of fossil fuels at the HPP, which the Project facilitates. The DPIE assessment of the HPP (DPIE 2021b) concluded that the project would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables. Continued communication and engagement in relation to the Project and the broader policy context with residents in the social locality will be undertaken to address perceived concerns around intergenerational equity and climate change.	**Section 7.14 and Appendix 9**

Issue	Response/Assessment outcome	Where addressed in this EIS
Secondary issues		
Local community investment	APA will continue to implement a Community Grants Program that targets proximal communities within the social locality and prioritises investments directly related to identified community needs.	**Section 7.14 and Appendix 9**
Changing land use of the properties the pipeline traverses	Extensive consultation with affected landholders has been undertaken and will continue throughout the various stages of the Project. APA is committed to undertake all reasonable steps to enter into an agreement with each landholder on fair and reasonable terms. Agreements will include commitments to agreed measures to minimise the impact of the Project on landholder activities which will be managed in a central database.	**Section 7.2**
Perceived decrease in property value in proximity to the transmission pipeline	Large housing sales price increases are evident across the local area, with an annual increase in the median value exceeding 22% for all localities. These price increases suggest a high demand for property. It is anticipated that the Project will not significantly alter these trends.	**Section 7.14 and Appendix 9**
Population change as a result of the construction workforce	The impact of population change during construction is likely to cause only minimal change to population across the relevant LGAs. The social impacts associated with the presence of the operational workforce are also considered to be minor.	**Section 7.14 and Appendix 9**
Pressure on short-term accommodation	The Project is within a 35-minute drive of Newcastle, meaning accommodation may be distributed across a larger geography than the local area with greater capacity to manage fluctuations in accommodation requirements.	**Section 7.14 and Appendix 9**
Pressure on existing housing markets	While housing pressures across the local area are likely to be significant, the individual contribution of the Project is restricted to the construction phase and is likely to be moderate.	**Section 7.14 and Appendix 9**
Pressure on health services and infrastructure	A temporary increase of around 400 people during construction is likely to have a low social impact on health services, especially as temporary workforces are unlikely to seek elective surgery or other longer-term treatment while in the area.	**Section 7.14 and Appendix 9**
Concern relating to increased energy prices	The Project facilitates the HPP but does not of itself generate energy for grid distribution.	**Section 7.14 and Appendix 9**
Cumulative effects of other projects underway within the social locality and the broader region	See **Section 7.16** for a detailed discussion of cumulative impacts.	**Section 7.16**
Impact to ecosystems and loss of habitat	The social impact of loss of values associated with the natural environment due to the Project's impact on environmental ecosystems is addressed as far as practicable by Project design and mitigation measures to reduce biodiversity impacts. As outlined in 7.5, the selection and refinement of the Project area has to minimised impacts on natural habitat and native vegetation	**Section 7.5 and Appendix 4** **Section 7.14 and Appendix 9**
Safety and perception of risk or damage to land and property	Various measures will be put in place to manage safety and risk, and potential damage to land and property. The Project complies with NSW hazard planning requirements.	**Sections 7.2 and 7.12**

Issue	Response/Assessment outcome	Where addressed in this EIS
Loss of visual amenity and rural character	Pipelines require for the Project will be installed underground, and the compressor station and delivery station are co-located with the HPP and other proposed industrial land uses. The only component that would be visible to surrounding properties is the JGN offtake facility. As outlined in **Section 7.13**, landscape screening (planting) will be established at this facility to mitigate visual impacts.	**Section 7.13**
Loss of social amenity due to traffic, noise, and dust	Traffic, noise and dust management measures will be implemented throughout Project construction to mitigate potential impacts.	**Sections 7.8, 7.10 and 7.11**
Community participation and information provision	A stakeholder engagement plan will be implemented to facilitate ongoing consultation with relevant stakeholders throughout the Project so that stakeholders have access to information regarding the nature of the proposed Project activities and their likely impacts.	**Section 6.6**
Insufficient Project justification	The Project is justified on the basis of the requirement to supply gas to the HPP. An assessment of the merits of the HPP is available in the DPIE assessment of that project.	**Section 10.1**
Disruption to place attachment and community character	The social impact of the Project on people's attachment to place has been ranked as a low social impact (unlikely to occur and of minimal magnitude).	**Section 7.14 and Appendix 9**
Conflicting views and impacts on community cohesion	The social impact of the Project on community cohesion has been ranked as a low social impact (unlikely to occur and of minimal magnitude).	**Section 7.14 and Appendix 9**
Air pollution	Standard control measures will be implemented to minimise dust generation during construction as outlined in **Section 7.8**. Minimal air emissions will occur during operations	**Sections 7.8 and 7.9**
Potential contamination of drinking water	There is no real chance or possibility of the Project contaminating drinking water during construction or operations.	**Sections 2.0 and 7.3**
Effects on local culture and heritage	A Cultural Heritage Management Plan will be developed and implemented for the Project in consultation with Heritage NSW, relevant Indigenous stakeholders and DPIE to minimise potential impacts on Aboriginal heritage during the planning, construction and operations phases of the Project. Although the Project is not anticipated to result in any adverse impacts on historic heritage items, the CEMP for the Project will include measures to mitigate against any unexpected finds of historical significance.	**Sections 7.6 and 7.7**

6.6 Future Engagement

6.6.1 Engagement After Submission of the EIS

Consultation activities to be undertaken after the submission of the EIS will involve:

- public exhibition of the EIS on the DPIE's major projects website for 28 days
- ongoing discussions with landholders and negotiations regarding grant of an easement to accommodate the Project
- maintenance of the Project website (https://apa.mysocialpinpoint.com/kurri-kurri-lateral-pipeline#/), email address and 1800 number.

6.6.2 Engagement During Future Stages

Subject to approval of the Project, APA would continue to engage with key stakeholders in the lead up to and during construction by maintaining the following key engagement activities:

- regular updates to the project website (https://apa.mysocialpinpoint.com/kurri-kurri-lateral-pipeline#/)
- distribution of newsletters of information sheets
- operation of the community enquiry line
- operation of a complaints line and recording in a complaints register.

The Project email address and hotline will remain in place, and APA representatives will continue to take responsibility for addressing feedback and concerns as and when they arise.

Additional activities that would be undertaken during detailed design and in the lead up to construction include:

- ongoing easement negotiations with landholders
- engagement with local businesses, industry representative groups and Aboriginal stakeholders to support the preparation of the Project-specific Local Industry and Indigenous Participation Plan
- briefings for local suppliers and contractors with the potential to be involved in the delivery of the Project
- ongoing government agency and other stakeholder consultation regarding the development of management plans outlined as commitments in this EIS
- detailed consultation with local governments regarding the management of impacts on local roads during construction (both traffic and dilapidation)
- detailed consultation with other infrastructure and utility owners regarding crossing specifications including Transport for NSW (major highways), Hunter Water (CTGM), Ausgrid (powerlines) and any other relevant utility providers
- further stakeholder consultation regarding implementation of community benefit initiatives
- distribution of communications such as fact sheets and media.

SECTION 7.0

Environmental Assessment

7.0 Environmental Assessment

7.1 Impact Assessment Methodology

The environmental impact assessment methodology adopted for this EIS is a systematic, transparent and reproducible process for the identification and evaluation of the potential impacts (both beneficial and adverse) that the Project may have on the biophysical and socio-economic environment. The adopted EIA methodology is generally in accordance with the NSW Government *State Significant Infrastructure Guidelines* (July 2021) and incorporates the identification of mitigation measures to avoid, minimise or reduce adverse impacts and enhance beneficial impacts, and assesses the effectiveness of such mitigation measures.

A high-level preliminary impact assessment of the likely key issues for the Project was initially undertaken as part of the Scoping Report (GHD, 2021b). Environmental and social matters were assessed considering the:

- scale and nature of likely impacts and the sensitivity of the site and surrounds
- potential for cumulative impacts with other relevant future projects in the area
- ability to avoid, mitigate and offset impacts
- complexity of technical assessment.

Environmental impacts of pipeline construction are well understood. In the Australian context such impacts are described in the *APGA Code of Environmental Practice* (Revision 4, 2017), which provides industry and government accepted guidance on environmental management through the lifecycle of a pipeline.

7.1.1 Identification of Key Environmental and Community Issues

Based on the results of the preliminary impact assessment, the SEARs issued by DPIE on 23 July 2021 (refer to **Table 6.1**) and other issues identified through stakeholder engagement processes (described in **Section 6.0**), matters requiring further assessment in the EIS were identified as follows:

- Land use, refer to **Section 7.2**
- Soils and contamination, refer to **Section 7.3**
- Water, refer to **Section 7.4**
- Biodiversity, refer to **Section 7.5**
- Aboriginal cultural heritage, refer to **Section 7.6**
- Historic heritage, refer to **Section 7.7**
- Air quality and odour, refer to **Section 7.8**
- Greenhouse gas, refer to **Section 7.9**
- Noise and vibration, refer to **Section 7.10**
- Transport, refer to **Section 7.11**
- Hazards and risks, refer to **Section 7.12**

- Visual, refer to **Section 7.13**
- Social and economic, refer to **Section 7.14**
- Waste management, refer to **Section 7.15**
- Cumulative impacts, refer to **Section 7.16**.

Following scoping, detailed specialist studies, including stakeholder consultation and fieldwork, were undertaken to inform the EIS. Specialist studies were undertaken in accordance with government legislation, plans, policies and guidelines in a manner proportionate to the scale and impacts of the Project. The methodologies and results of the technical studies are provided in the reports supplied as appendices to this EIS with findings summarised in the relevant chapters.

7.2 Land Use

This section provides an assessment of land use impacts associated with the construction and operation of the Project, and outlines measures to be implemented to mitigate any impacts on land use in accordance with the SEARs as outlined in **Table 3.1**. The details and outcomes of the land use assessment are provided in full in this section.

7.2.1 Existing Environment

The Project area is situated in the Lower Hunter region of NSW, between the rural localities of Black Hill and Kurri Kurri.

As described in **Section 3.2.1.1**, the Project area is located within the Cessnock, Maitland and Newcastle LGAs. The majority of the Project area falls within the Cessnock LGA and within land zoned as RU2 - Rural Landscape, E2 - Environmental Conservation, IN2 - Light Industrial and SP2 – Infrastructure under the Cessnock LEP. Small portions of the Project area fall within the Maitland LGA within RU2 - Rural Landscape and E2 - Environmental Conservation zones and the Newcastle LGA within E2 - Environmental Conservation, E4 – Environment Living, SP2 – Infrastructure and IN2 – Light Industrial zones. The LEP zoning map in provided in **Figure 3.1**. The land use of land traversed by the Project is illustrated in **Figure 7.1**.

The Project area is predominantly within a rural landscape, with the nearest residential suburbs (current extents of Cliftleigh and Gillieston Heights) located approximately 600 m away from the transmission pipeline alignment at the closest point (KP 15.0).

The primary current land uses within the Project Area currently consist of undeveloped land within mining leases of the former Donaldson open cut mine (ML1461) and operational Bloomfield open cut mine (ML1738), and small holding agriculture (including equestrian farming and stock grazing) with associated rural residential living (**Figure 3.2**). The compressor station and delivery station are located on industrial land used for the former Kurri Kurri aluminium smelter between 1969 and 2014 and the storage pipeline is located on land used for livestock grazing in the buffer zone of the former smelter.

Portions of Project area cross state-owned corporation land (Hunter Water Corporation) and areas of public road. Existing infrastructure within the Project area includes state and local roads, private and public unsealed roads, the South Maitland rail line, water trunk and reticulation mains and overhead transmission lines.

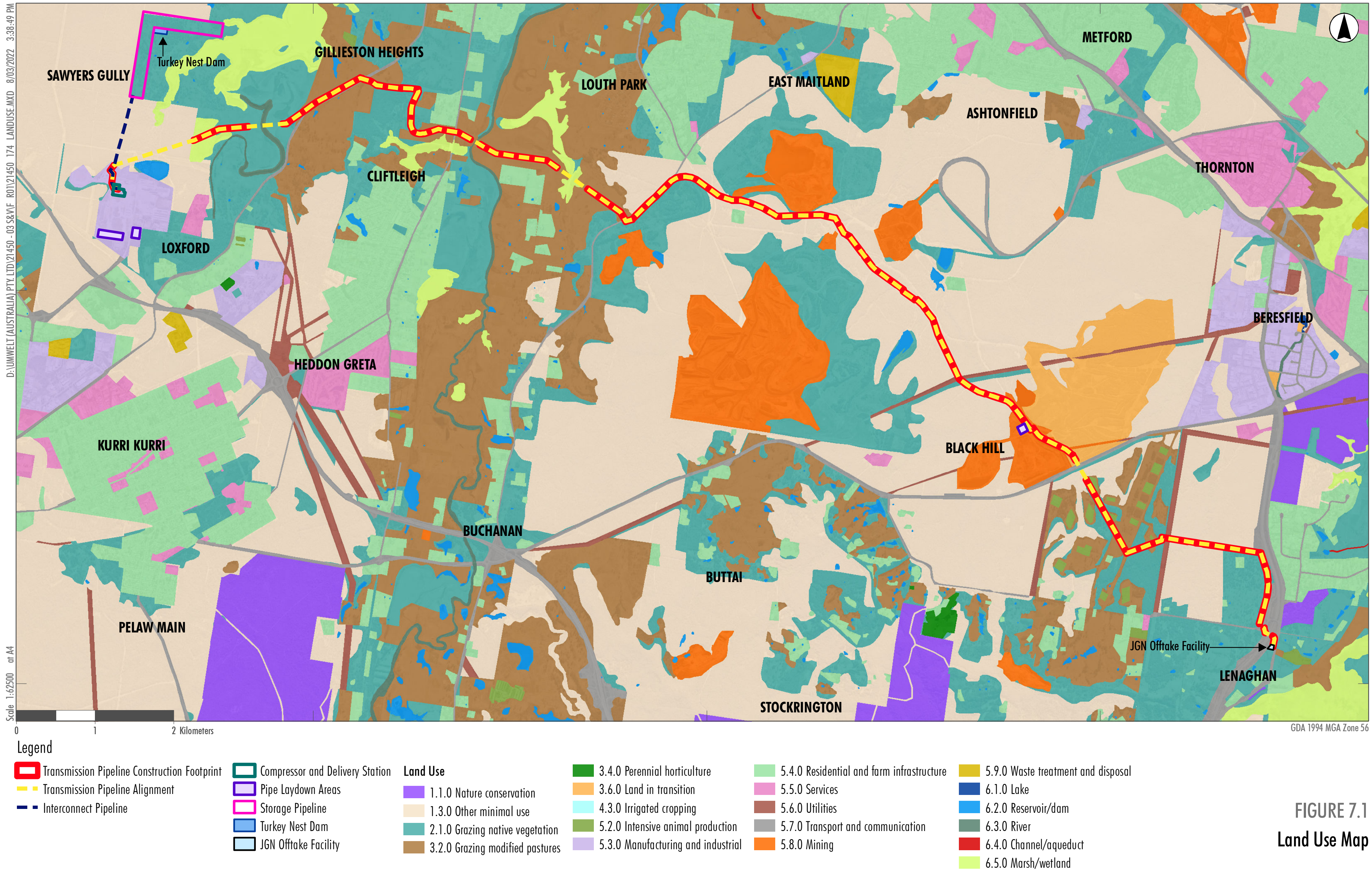


FIGURE 7.1
Land Use Map

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021); NSW DPIE (2020)

No conservation or forestry estate is intersected by the Project area. The closest conservation reserves are Hunter Wetlands National Park (1.24 km east of KP 0.1 of the transmission pipeline alignment) and Pambalong Nature Reserve (1.7 km south west of the JGN offtake facility). The closest forestry estate is Heaton State Forest, which is more than 10km south east of KP 3.0 of the transmission pipeline.

The Project area does not intersect any land listed under the NSW Strategic Regional Land Use Policy as a critical industry cluster, a future residential growth area, or rural village land. A small area (0.6ha) of land intersected at the north-eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp is mapped as biophysical strategic agricultural land (BSAL). According to the NSW Strategic Regional Land Use Policy, BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. The NSW Strategic Regional Land Use Policy is made under the Mining SEPP, which does not apply to the Project as it requires licensing under the *Pipelines Act* 1967. Nevertheless, an assessment of impacts to the mapped area of BSAL is provided in **Section 7.2.4**.

7.2.2 Assessment Methodology

Desktop review of the following sources were undertaken to gain an understanding of the current and future land use setting for the Project area and surrounding areas:

- Cessnock City Council, Maitland City Council, and City of Newcastle development application registers.
- SSD & SSI register.

As detailed in **Section 6.0**, APA has undertaken extensive consultation with directly affected landholders regarding route option interfaces with past, current and potential future land uses associated with their properties.

7.2.3 Assessment of Impacts

7.2.3.1 Construction

Private Property Access and Agricultural Activities

Private landowners may be impacted while construction activities are underway on or in proximity to their property, through the temporary loss of access to parts of their property, a potential loss of privacy and amenity (dust/noise/visual) impacts. Given the short duration of construction works, these potential impacts will be of limited duration. It is also expected that no residents would be required to relocate during the construction phase of the Project. All construction works along the transmission pipeline alignment will take place within the proposed construction footprint.

Locating the compressor station, delivery station and storage pipeline on industrial land of the former Kurri Kurri aluminium smelter and associated buffer zone significantly reduces the potential for private landholders to be impacted during construction of these components of the Project. Use is also proposed to be made of access tracks across private property where suitable access to the proposed ROW is constrained or there is a lack of public roads in the vicinity. The requirement for any additional access tracks will be assessed in consultation with landholders as site-specific access requirements along the alignment are identified.

There is the potential for conflicts with agricultural activities while construction is underway on the property, especially near paddocks holding stock. APA will continue engagement with the affected landholders to identify and discuss site specific issues and requirements and where disturbances to agricultural land use may occur.

There is unlikely to be a need to remove cattle from paddocks traversed by the transmission and storage pipelines for stock safety purposes, such as becoming trapped in an open trench. Whilst open, the trench is generally not accessible to cattle due to barriers created on each side of the ROW by topsoil and subsoil stockpiles, and the welded pipe string. Where access is required across the ROW, such as for access to watering points or pasture, backfilled plugs will be provided across the trench for stock movement. Whilst there is some risk of cattle entering the ROW or trench adjacent to stock crossing locations, experience on numerous pipeline construction projects in Australia indicates that such events are rare.

Temporary fencing of the transmission pipeline ROW during construction will be considered for paddocks actively used for horses, in consultation with the landholder.

Large areas of BSAL are mapped in the region on the floodplains of the Hunter River and its tributaries. Given the small area of BSAL affected by the storage pipeline construction footprint, the location in a remote section of the buffer zone of the former Kurri Kurri aluminium smelter and the presence in this area of a critically endangered ecological community listed under the EPBC Act (**Section 7.5.4.5**) the likelihood of this area of BSAL being developed for intensive agriculture is remote. No material impacts to BSAL are likely.

Progressive rehabilitation of all disturbed areas would be undertaken in consultation with landholders. Based on the outcomes of the land use assessment and with implementation of measures outlined in **Table 7.2** it is expected that impacts to private properties and agricultural activities would be minor.

Mining Operations

Mining leases traversed by the Project area are shown in **Figure 3.2**. Project equipment and personnel would need to access the ROW and worksites located on the mine sites during construction. This is proposed to involve the use of existing but currently unused sealed haul roads associated with the Abel Coal Mine (under care and maintenance) and the rehabilitated former Donaldson Coal Mine, as well as the use of 600 m of existing access track at the Buchanan Road entrance to the Bloomfield Coal Mine. The transmission pipeline alignment crosses the active haul road for the Bloomfield Coal Mine at KP8.2. Horizontal boring is proposed for the crossing of this haul road so that use can continue during pipeline construction. No coal extraction areas or related activities are expected to be adversely affected by construction the Project.

With the implementation of measures outlined in **Table 7.2** it is expected that construction of the Project would not have any significant adverse impact on the ongoing operation of the mine sites.

Crown Land

The Crown Land parcel that encapsulates Wallis Creek and Crown road reserves (‘paper roads’) will be traversed for the Project. The Project’s impact to Wallis Creek has been assessed as discussed in **Section 7.4**. Consultation with Crown Land has been undertaken during the EIS development, as detailed further in **Section 6.4**.

Existing Services and Infrastructure

Table 7.1 outlines the potential impacts to existing infrastructure as a result of the construction of the Project.

Table 7.1 Assessment of Impacts to Existing Infrastructure within the Project area

Infrastructure	Interaction with the Project	Design and construction response
Sealed Roads	KP0.2 - M1 Pacific Motorway KP0.3 - Black Hill Road KP12.0 - Buchanan Road KP14.5 - Cessnock Road	The proposed crossings of sealed roads by the transmission pipeline will be undertaken by horizontal boring, pipe jacking or HDD depending upon the type and nature of the crossing, and geotechnical conditions. The crossing methodology will also take into account any technical requirements, such as design requirements of the infrastructure owner, for example, local council. Further consultation will be required with the asset owners and managers as part of the detailed design and implementation phases of the Project. As trenchless crossings are proposed it is expected that the construction of the Project would have minimal impacts to traffic operations on these sealed roads as road and/or traffic lane closures would not be required.
Unsealed Roads	KP8.2 - Main haul road for the Bloomfield Coal Mine Various private landholder access tracks	No unsealed public roads are crossed by either the transmission pipeline or storage pipeline. The primary haul road for the Bloomfield Coal Mine, which is unsealed, will be crossed by horizontal boring to avoid potential delays to mining haul truck operations. Crossings of private landholder access tracks by the transmission pipeline will be undertaken in consultation with the landholder to minimise disruption to access track use. The unsealed road within the Bishops Bridge Road reserve is proposed to be used to access the storage pipeline during construction and operations. This road reserve is not publicly accessible and is subject to occasional use by staff of Ausgrid and the Regrowth Kurri Kurri project. Use of this road reserve is expected to have minimal impacts to existing users.
South Maitland Railway	KP16.3 - The Project ROW crosses a section of South Maitland Railway (SMR) system located west of Main Road.	Although the rail line is not currently operational, construction of the ROW would involve horizontal boring to avoid any disturbance of the rail line.
Water mains	KP4.4 – 900 mm trunk main (CTGM) adjacent to John Renshaw Drive KP5.1 – 900 mm (CTGM), 500 mm and 375 mm trunk mains KP6.2 – 900 mm and 750 mm trunk mains connecting the CTGM to the Stony Pinch reservoir KP 9.8 – 600 mm, 500 mm, 500 mm, and 375 mm trunk mains KP10.4 – 375 mm and 375 mm trunk mains connecting to the Buttai Reservoir KP14.5 – 200 mm reticulation main adjacent to Cessnock Road	Trunk mains will be crossed by horizontal boring, except for the crossing at KP4.4, which will be undertaken by HDD. Small diameter (100 mm and 200 mm) reticulation mains will be crossed by open trenching with hand excavation or vacuum extraction around the water pipeline. All water pipelines crossed by the transmission pipeline alignment will remain operational during pipeline construction. Further consultation will be undertaken with the asset owners and managers as part of the detailed design and implementation phases of the Project. No impacts are expected to operations of these water mains due to the construction and operation of the Project.
Transmission lines	KP2.7 (approximate) - Transgrid easement hosting a 330kV overhead powerline	Four areas traversed with multiple high voltage overhead transmission lines. The design has avoided all intersections with transmission towers that hold the high voltage overhead power lines.

Infrastructure	Interaction with the Project	Design and construction response
	KP3.1 (approximate) - Ausgrid easement hosting a 66kV overhead powerline KP 12.0 (approximate) - Ausgrid easement hosting a 132kV overhead powerline KP19.4 – Ausgrid easement hosting multiple overhead HV power lines	Further consultation will be required with the asset owners and managers as part of the detailed design and implementation phases of the Project. It is not expected that the construction or operation of the Project would impact on any transmission lines.

7.2.3.2 Operation

An easement will be registered over the transmission and storage pipeline once construction has been completed. Further information on how easements are vested under the Pipelines Act and obligations and compensation that comes with them are provided below. As no structures can be built on the easement there would be constraints on future land development over the operational footprint of the Project. Consultation with landholders have been ongoing through the design and planning of the Project and their feedback has been considered in the Project design as outlined in **Section 7.2.5**.

Given that the transmission pipeline will be underground, land users will be able to continue regular land use activities above the pipeline provided that they do not undertake excavation activities or erect structures in the easement. Further context for land use planning in the vicinity of gas transmission pipelines is provided in **Section 3.2.2**.

Regular contact will be maintained with landholders of all properties traversed by the transmission and storage pipelines during operation in accordance with the requirements of AS 2885.

Due to the limited range of activities required during the operational phase and measures proposed in **Table 7.2**, it is anticipated that the operation of the Project would have a minor impact on land use activities associated with the affected properties.

The preliminary hazard analysis (PHA) (refer to **Section 7.12** and **Appendix 13**) has demonstrated that the Project complies with the criteria of Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning (Department of Planning, 2011c) in regard to the safety of adjacent properties. A discussion of land use planning implications adjacent to the transmission and storage pipelines is provided in **Section 7.2.4**.

7.2.4 Land use planning and gas transmission pipelines

Gas transmission pipelines in Australia are designed in accordance with Australian Standard AS2885 Pipelines – Gas and liquid petroleum (AS2885). AS2885 requires APA to take account of the current and reasonably foreseeable land uses adjacent to any proposed pipeline corridor, for the design life of the pipeline, as a central input to the pipeline design.

In reviewing reasonably foreseeable land use, APA typically undertakes the following investigations:

- Review land zoning
- Review planning scheme provisions
- Review longer term land use plans held by State and local governments
- Meet with State and Local government planning authorities

- Meet with impacted landowners to understand both current land use and any future plans they may hold.

AS2885 sets out land use classifications. The above research underpins what land use classification is applicable to any given area within a proposed pipeline corridor. These land use classifications include:

- R– Rural
- R1 – Rural Residential
- T1– Suburban
- T2 – High Density Urban.

In addition to the primary land use classifications above, AS2885 sets out subclasses including:

- I – Industrial
- S – Sensitive.

A core process to inform the design of the pipeline is a Safety Management Study (SMS). This study uses the above land use classifications applied within the pipeline Measurement Length (ML) to inform both direct threats to the pipeline and the consequence of a pipeline failure to adjacent existing and foreseeable land uses.

7.2.4.1 Pipeline Measurement Length (ML)

The area of land around the pipeline where APA must consider the existing and reasonably foreseeable land uses is referred to as the Measurement Length (ML). It is the area where risks associated with the pipeline are assessed and consequently designed out to be as low as reasonably practical.

The ML defines the geographical extent of risk considerations in the typically non-credible scenario of a full loss of containment of the gas (full-bore rupture of the pipeline) plus the gas being ignited. The ML can be described as both:

- The Area of Consequence in the event of an absolute worst case pipeline failure; and
- It is the area of land around the pipeline where APA must consider the existing and reasonably foreseeable land uses for the purpose of assessing risks associated with the pipeline.

As such, the ML is not a buffer or exclusion zone for other land uses. It is the area of study and assessment for the proposed pipeline, which is then used to inform pipeline engineering design.

As an illustration of the practical application of this principle, the following transmission pipelines operated by APA traverse areas of high population density:

- Moomba to Sydney Ethane Pipeline, which traverses numerous inner western suburbs of Sydney between East Hills and Botany, including a crossing of Kingsford Smith Airport.
- Roma to Brisbane Pipeline, which traverses numerous southern suburbs of Brisbane between Redbank Plains and Murarrie.

The ML is determined primarily by the maximum allowable operating pressure and the pipeline diameter. As such, larger diameter pipelines operating at higher pressures have larger MLs.

The MLs each side of the transmission and storage pipelines proposed for the Project are as follows. As the storage pipeline has a significantly larger diameter and higher pressure, the ML is larger than the transmission pipeline.

- Transmission pipeline: 213 m
- Storage pipeline 1,434 m

7.2.4.2 Pipeline Area of Consequence

When planning a gas transmission pipeline, APA is required to review credible threats and design a pipeline to respond to the existing and reasonably foreseeable environments identified in the ML. As a result of this, an event resulting in the full loss of containment (a full bore rupture) is not typically a credible scenario.

Pipelines are often designed to withstand the worst-case credible third party strikes, such as drilling works to installing power or light poles, without rupturing. Pipelines are designed so that if a hole were caused by these activities, the pipeline would not crack and the full rupture of the pipeline is not possible. In this circumstance, the worst case scenario is a puncture.

In a similar way to establishing the ML for a full bore rupture, an assessment is done on a likely puncture size, gas escaping and igniting. The area potentially impacted in this scenario is known as the Area of Consequence and is typically significantly smaller than the ML.

Calculations of the Area of Consequence for both the transmission pipeline and storage pipeline provide distances of 37m and 57m respectively on each side of each pipeline.

The proposed transmission and storage pipelines will have no ongoing impact on land use within the ML and outside the Area of Consequence. This is because the proposed pipelines will be designed to respond to reasonably foreseeable land uses – so that those land uses can proceed unimpeded.

The only scenario in which there is potential for the proposed pipeline to influence a future land use Development Application is the case of Sensitive land uses proposed within the Area of Consequence.

AS2885 defines a Sensitive land use as one that may increase the consequence of a pipeline failure due to its use by members of the community that may be unable to protect themselves from the consequence of a pipeline failure. AS2885 requires the pipeline alignment and the associated ML to avoid Sensitive land uses in the first instance. If avoidance cannot be achieved, the proponent must design the pipeline appropriately.

APA would view the types of land uses listed below as typically not suitable for locating within the Area of Consequence on account of being 'Sensitive':

- Aged Care Facilities
- Retirement villages
- Child care/family day care centres
- Cinema based entertainment facility
- Schools or other educational establishments
- Prisons/corrective institutions
- Hospitals and medical centres
- Place of assembly or worship
- Higher density residential uses (above 50 dwellings per hectare).

The assessment and determination of such Sensitive land uses within the Area of Consequence would be undertaken on a case by case basis. Proposals for Sensitive land uses within the Area of Consequence are likely to require an SMS to be undertaken at the time.

7.2.4.3 Implications for proposed land uses within the Area of Consequence

In summary, APA does not anticipate any significant compatibility issues between the storage and transmission pipelines and land uses proposed in their vicinity, other than if a Sensitive land use was proposed to be located within 57m of the storage pipeline or 37m of the transmission pipeline. The alignment of the transmission pipeline and position of the storage pipeline and its associated construction footprint have been designed to provide the greatest practicable separation to current and proposed residential and industrial land uses, and no Sensitive land uses currently occur or are known to be proposed within the Area of Consequence.

7.2.4.4 Pipeline easements and landholder compensation

In addition to issues of land use compatibility within the Area of Consequence, the process for obtaining pipeline easements once a final alignment has been determined is also a relevant consideration.

When a final alignment for the transmission and storage pipelines have been selected, APA will seek to negotiate the purchase of an easement or an option for purchase of an easement with affected landowners. An easement provides a pipeline operator with a legal right to enter land for the purpose of constructing, operating and maintaining the pipeline. An easement is registered on the underlying land title and will remain on title following any future changes in land ownership. The nominal easement width for the transmission pipeline is proposed to be 20m.

APA will make all practicable endeavours to purchase an easement through a mutually satisfactory agreement with landowners. APA commits to dealing with all impacted stakeholders in an open and respectful manner to provide fair, adequate and equitable compensation in reaching agreement on a pipeline easement.

APA fairly compensates all landholders for agreeing to grant an easement to accommodate a pipeline. The compensation offered by APA is based on fair market value and includes consideration of the value of the easement area and anticipated loss of production or use during construction. The compensation offered will also reflect the general disturbance to landowners as a result of dealing with APA. Landowners will be paid an upfront fee for entering into an agreement, and APA will meet the reasonable legal and valuation costs incurred in reviewing the proposed easement agreement.

7.2.4.5 Summary

APA is responsible for designing proposed pipelines to account for existing and foreseeable land uses. Whilst new pipelines and their associated Measurement Lengths will not sterilise land for urban development purposes, it may influence the ability to establish Sensitive uses within the Area of Consequence after the pipeline has been constructed.

7.2.5 Compatibility with Existing, Approved or Proposed Resource and Infrastructure Projects

The potential for the Project to generate land use conflict is unlikely to be entirely eliminated through design and consultation given the range and extent of existing and proposed land use development in the area of the construction footprint. Key areas with potential for existing or future land use conflicts, and measures that have been undertaken to avoid or minimise conflict, are summarised below.

7.2.5.1 Lower Hunter Freight Corridor

The Lower Hunter Freight Corridor (LHFC) is a rail corridor preservation project which is proposed to provide for a future dedicated freight rail line between Fassifern and Hexham. The LHFC is at a conceptual stage of development with community consultation recently undertaken. The proposed LHFC is generally 60m wide and interacts with the transmission pipeline alignment between KP 0.3 and KP 1.3, on the western side of the M1 Pacific Motorway. As the transmission pipeline alignment must cross the LHFC, the cut and fill requirements for the rail corridor are a critical consideration for the transmission pipeline design to ensure the sufficient depth of cover is maintained and any requirement to move the pipeline in several decades should the LHFC proceed is avoided.

Multiple options for positioning the transmission pipeline alignment in the vicinity of the LHFC have been considered in consultation with Transport for NSW and the LHFC project team, as described in **Section 5.3.1.2**. APA has sought to minimise interactions between the Project and the LHFC by refining the transmission pipeline alignment between KP 0.4 to KP 1.3 to sit adjacent to the western boundary of the LHFC and outside of the M1 road reserve, with horizontal boring proposed for the crossing of the LHFC at KP 0.4.

An option suggested by the LHFC project team was to place the transmission pipeline alignment east of the M1 for around 1.1 km prior to a perpendicular crossing of both the M1 and the LHFC. This has been assessed by APA and discounted because of significant construction complexity and the increased number of landholders affected. Consideration is also being given to a HDD between KP0.3 and KP0.8 to cross both the M1 and the LHFC, with depth beneath the M1 foundations being a key consideration.

Consultation is ongoing between APA, Transport for NSW and the LHFC project team to seek agreement on the design and siting of the transmission pipeline when crossing and sitting adjacent to the LHFC.

7.2.5.2 Emerging Black Hill Precinct industrial estates

The transmission pipeline traverses both the Stevens Group Hunter Business Park (200 lots, Stage 1 approved) on Lot 30 DP870411, and the adjacent proposed Broaden Management Industrial Estate on Lot 1 DP1260203 (39 lots, currently subject to ongoing planning assessment). These light industrial developments form the ‘Emerging Black Hill Precinct’ at the junction of the M1 Pacific Motorway and John Renshaw Drive, as described in the Greater Newcastle Metropolitan Plan 2036 (Department of Planning and Environment 2018). This precinct has strategic importance as it is located where national road and rail trade routes intersect and is in proximity to an international trade port.

The transmission pipeline alignment has been positioned to follow the southern boundary of the Hunter Business Park, adjacent to a 20 m vegetated buffer prescribed by consent conditions for that project. Consultation with Stevens Group has confirmed that this is the preferred location for the transmission pipeline, subject to detailed design and further consultation.

The transmission pipeline also follows the southern boundary of the proposed Broaden Management estate, prior to turning north-west and following the eastern boundary of Lot 119 DP1154904, owned by Hunter Water Corporation and hosting buried water pipeline infrastructure.

Consultation with Broaden Management has identified an alternative alignment through the proposed estate that is preferred by the developer, as discussed in Section **5.3.1.2**.

Consultation with Broaden Management and Hunter Water Corporation will be ongoing to resolve the final alignment of the transmission pipeline in this area.

7.2.5.3 Hunter Water Corporation Infrastructure

The transmission pipeline has been positioned adjacent to linear lots that are owned by Hunter Water Corporation between KP 3.1 and KP 9.8, or around 33% of the total length of the transmission pipeline. These lots hold trunk and reticulation water mains, including the CTGM, which is a critical public water supply pipeline from the Chichester Dam, supplying the Stony Pinch Reservoir and subsequently the city of Newcastle. The transmission pipeline is located adjacent to the CTGM between KP 4.4 and KP 6.2.

Co-location of compatible linear infrastructure is a common approach that can reduce the magnitude and extent of infrastructure impacts to surrounding land uses, biodiversity and cultural heritage. The potential benefits of co-locating linear infrastructure are recognised by NSW planning guidelines, such as the *Planning Guideline for Major Infrastructure Corridors* (DPE, no date). Examples of co-location of linear infrastructure in the local area include the CTGM running adjacent to John Renshaw Drive and the proposed co-location of the LHFC with the M1 Pacific Motorway.

Hunter Water Corporation trunk mains are crossed at five locations by the transmission pipeline, with crossings required due to either the presence of existing infrastructure or topography that cannot be traversed by the transmission pipeline, or trunk mains being perpendicular to the transmission pipeline alignment. Trunk mains including the CTGM are typically above ground at proposed transmission pipeline crossing locations, however decommissioned and active buried water pipelines may also be present. The interconnect pipeline and storage pipeline do not cross any Hunter Water infrastructure. Proposed transmission pipeline crossing locations of Hunter Water Corporation lots and trunk mains are as follows:

- KP4.4 – 900 mm trunk main (CTGM) adjacent to John Renshaw Drive and perpendicular to the transmission pipeline alignment
- KP5.1 – a 400ML mining water storage (Big Kahuna dam) and sealed mine haul road necessitate crossing Lot 1392 DP1126633 with 900 mm (CTGM), 500 mm and 375 mm trunk mains.
- KP6.2 – 900 mm and 750 mm trunk mains within Lot 2 DP1129888 connecting the CTGM to the Stony Pinch reservoir are perpendicular to the transmission pipeline alignment.
- KP 9.8 – topographical constraints due to steep side slope and the Buttai Reservoir No. 1 and No. 2 necessitate crossing of Lot 1 DP724270 with 600 mm, 500mm, 500 mm, and 375 mm trunk mains
- KP10.4 – 375 mm and 375 mm trunk mains within Lot 1 DP724270 connecting to the Buttai Reservoir No. 1 and No. 2 are perpendicular to the transmission pipeline alignment.

Crossings of trunk mains are proposed to be by HDD at KP4.4 and by horizontal boring at all other crossing locations. Horizontal boring is one of the oldest forms of trenchless technology and is commonly used in the Australian pipeline industry for crossings of existing roads and pipeline infrastructure.

No interruption to operation of Hunter Water Corporation trunk mains is required during horizontal boring or general construction of the transmission pipeline.

No new heavy machinery crossing locations of Hunter Water Corporation trunk mains are required during pipeline construction. Existing heavy vehicle crossings used for current operations on the Bloomfield open cut mine or previous operations on the Donaldson open cut mine will be used. These heavy vehicle crossing locations are at KP5.1, KP8.2 and KP9.8. Heavy vehicles are not proposed to cross the trunk main connecting the CTGM to the Stony Pinch Reservoir at KP 6.2, but will instead use existing sealed mining haul roads to provide access between KP 5.1 and KP 8.2.

APA will continue to consult with Hunter Water on horizontal boring deigns for crossings of water pipeline infrastructure, and will formally submit crossing designs for assessment by Hunter Water Corporation if Project approval is granted.

7.2.5.4 Mining leases and mining operations

Between KP 1.6 and KP 12.8 the transmission pipeline traverses coal mining leases associated with the Abel underground mine (ML1618, EL5497), Donaldson open cut mine (ML1461) and the Bloomfield open cut mine (ML1738) (shown on **Figure 3.2**).

The Abel underground mine received planning approvals during 2007, commenced coal production during 2008 and has been in care and maintenance since June 2016. Within ML1618 and EL5497 the transmission pipeline has been located to be above areas where underground mining has been completed and subsidence has occurred (Donaldson Coal 2021), or in areas where there is no approval for mining and existing and proposed land uses will materially limit the possibility of further underground mining. These land uses are the M1 Pacific Motorway, the proposed LHFC, and light industrial developments that form the 'Emerging Black Hill Precinct'. EL5497 is scheduled to expire on 22 August 2022. No material conflicts during construction or operation of the transmission pipeline are anticipated should the Abel Mine be brought back into production.

The Donaldson open cut mine ceased operations during 2013 and majority of disturbed land has been rehabilitated. At the request of the owner of the Donaldson open cut mine, the transmission pipeline has been positioned directly adjacent to the Hunter Water Corporation owned Lot 119 DP1154904, which holds the CTGM, to traverse through ML1461. A temporary stockpile for transmission pipeline pipe segments is also proposed in ML1461, occupying 1ha within a former mining laydown area that is yet to be rehabilitated. No material conflicts with ongoing rehabilitation activities for the Donaldson open cut mine are anticipated during construction or operation of the transmission pipeline.

The Bloomfield open cut mine is approved under NSW planning laws as state significant development (SSD) 07_0087, with approval granted in 2008 for the continued operation and closure of the mine. This approval provides for extraction of 1.3 Mt of ROM coal per annum, operating 24 hours per day, seven days per week. The mining technique is a multi-seam, multi bench system, mining up to 13 seams or splits, utilising a range of heavy earthmoving equipment to deliver the run-of-mine coal to the onsite washery.

Modification 4 of SSD 07_0087, granted 16 August 2018, approved the continuation of mining operations until 31 December 2030. This aligns the Bloomfield mining operations consent limit to the Abel underground mine consent limit, under which approval for the coal handling and preparation plant, rail loading infrastructure and tailings dams used by the Bloomfield open cut mine is granted. Modification 4 provides for further development of the Creek Cut and S-Cut open pits and extends the previously approved final landform by moving the final void approximately 200m to the west. No plans for mining beyond that approved by Modification 4 are in the public domain or known by APA.

As with the Donaldson open cut mine, the transmission pipeline has been positioned to follow Hunter Water Corporation owned lots and trunk mains through the majority of ML1738. As well as consolidating the location of linear infrastructure through ML1738, the proposed alignment avoids almost all of the project area defined under Modification 4, including all current and approved mining areas, final voids of Creek Cut and S-Cut, current and potential tailings emplacements, workshops, and processing plants.

The transmission pipeline alignment crosses the Modification 4 project area at two locations, as follows:

- KP 8.1 to KP 8.2, crossing of the haul road which is used to transport coal by truck from the open cuts to the coal handling and processing plant.

- KP 8.8 to KP9.0, crossing of the project area adjacent to the mine workshop.

To mitigate impacts to operation of the haul road during transmission pipeline construction a horizontal bore is proposed. The crossing will be designed to enable continued use of the haul road by haul trucks and other heavy machinery, similar to the adjacent water pipeline infrastructure crossed by the haul road. Construction of the crossing of the project area adjacent to the mine workshop will be undertaken with reasonable mitigation measures in place as determined in consultation with the mine operator and landowner. The same approach will be undertaken for all areas of ML1738 and ML1461 that are traversed by the transmission pipeline.

Neither the environmental assessment for the 2008 Bloomfield open cut planning approval (Business Environment 2008), the Modification 4 environmental assessment (AECOM 2018a) or the Modification 4 response to submissions (AECOM 2018b) discuss existing Hunter Water Corporation trunk mains on ML1738. Similarly, Hunter Water Corporation did not make a submission during the 2008 assessment or the Modification 4 application. This likely indicates that material interactions between the existing Hunter Water Corporation trunk mains, and therefore the proposed transmission pipeline alignment, and ongoing mining operations of the Bloomfield Mine are unlikely to occur.

Indicative final land use plans for the Donaldson and Bloomfield mining leases are discussed at Section 4.4.4 of the Modification 4 environmental assessment. Potential post mining land uses are noted to include residential, industrial, open forest/bushland or undulating grazing land/rural landscape. The Modification 4 environmental assessment also notes that should no such future development eventuate, the site would remain as a stable, rural landscape. The mining leases are not identified by the *Hunter Regional Plan 2036* or the *Greater Newcastle Metropolitan Plan 2036* as a housing release area or strategic centre.

Currently no detailed designs, rezoning approvals or development applications for post mining land uses are available. Hunter Water Corporation infrastructure will be operating post mine closure, as noted by the current mining operations plan (Bloomfield Group 2021) for the Bloomfield open cut mine. Positioning of the transmission pipeline alignment adjacent to existing linear infrastructure that will need to be accommodated by post mining land uses provides a sensible approach to minimising constraints on post mining land uses that currently have no detailed definition and are unapproved. Consultation with the ML holders and landholders will be ongoing, and will include approaches to minimise impacts to post mining land use.

No other mining operations, developable significant mineral resources or coal exploration licences and mining leases are within or adjacent to the footprint of the Project.

Biodiversity offsets for the Project are likely to be acquitted by payment into the Biodiversity Conservation Trust, as described in Section 7.5.5. This method of acquitting offset obligations will avoid sterilisation of productive land, including land prospective for mineral exploration, for offset sites

7.2.5.5 Gillieston Heights and Cliftleigh housing release areas

The area between Heddon Greta and Maitland, adjacent to Main Road, is identified by both the *Hunter Regional Plan 2036* and *Greater Newcastle Metropolitan Plan 2036* as a housing release area. Significant residential development has occurred in this area in recent years and further residential development is proposed to occur.

Development in this area is predominantly comprised of several sub-divisions that form part of the Gillieston Heights urban release area and the Cliftleigh urban precinct. Gillieston Heights is located to the north of Testers Hollow within both the Maitland and Cessnock LGAs. Cliftleigh is south of Testers Hollow and entirely within the Cessnock LGA.

The transmission pipeline alignment has been designed with consideration for current and future residential development in this area. The alignment has been positioned to be within the 1% Annual Exceedance Probability (AEP) flood level where the Wallis Creek floodplain is crossed, and therefore on land unsuitable for residential development. Around 200m separation is maintained to the southern residential development extent of the proposed Gillieston Heights South - Eastern Precinct, north of KP 14.4. Similarly, by staying north of Testers Hollow, around 600m of separation is maintained from KP 15 of the transmission pipeline to the northernmost Cliftleigh subdivisions.

Landholder consultation has indicated that residential development is also envisaged for Lot 2 DP1249763 and possibly Lot 22 DP1181574, both of which are north of Testers Hollow and immediately west of Main Road. The transmission pipeline alignment has considered these potential developments by following the proposed southern and western boundaries between KP14.7 and KP15.6. Moving the alignment further west in this location is not considered feasible because of mine subsidence considerations.

Between KP 15.6 and 16.4 the transmission pipeline follows the southern boundary of the Gillieston Heights South – Western Precinct residential development area. This subdivision forms part of the Regrowth Kurri Kurri project, as discussed further below. The alignment has been positioned in consultation with the proponents of Regrowth Kurri Kurri to cross between development stages of the northern residential area of that development.

Residential developments proposed for the Gillieston Heights South precincts, Lot 2 DP1249763 and possibly Lot 22 DP1181574 will not be completed, and are unlikely to be undergoing construction, during the proposed construction timeframe for the transmission pipeline. As such, there will be no amenity impacts during pipeline construction as any future residents will not be occupying these areas at the time. Cumulative amenity impacts to nearby existing residential areas due to simultaneous construction are not anticipated. The PHA (refer to **Section 7.12** and **Appendix 13**) has demonstrated that the Project complies with the criteria of Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning (Department of Planning, 2011c) in regard to the safety of adjacent properties.

7.2.5.6 Regrowth Kurri Kurri

The Regrowth Kurri Kurri project (RKK) proposes to rezone and develop the lands owned by Hydro Aluminium Kurri Kurri Pty Ltd that formed the industrial site and buffer zone of the former Kurri Kurri aluminium smelter. The RKK project encompasses around 1,900 ha, predominantly zoned as rural land. The rezoning application incorporates around 215 ha for employment activities (including heavy and general industrial land), around 180 ha for residential development, and around 1250 ha for conservation purposes. The remaining 235 ha would remain as rural land. The HPP and the Project's compressor station and delivery station are sited within the proposed heavy industrial precinct on the site of the former aluminium smelter.

The rezoning proposals were endorsed by both Cessnock City Council and Maitland City Council in 2015. A Gateway Determination supporting the rezoning proposals was granted by the former Department of Planning and Environment on 23 March 2016. Alterations to the Gateway Determination were made on 10 September 2019 and 23 December 2021, ultimately extending the timeframe for completing the local environmental plan to reflect the rezoning proposals to 1 December 2022. Certification of a proposed stewardship area to offset biodiversity impacts related to the rezoning is required to be resolved prior to a final decision on the rezoning proposals.

APA has been engaged in detailed consultation with the proponents of the RKK project regarding Project design and management of interactions between the projects since mid 2021. Project design features which specifically integrate with the RKK project include:

- Positioning of the transmission pipeline alignment so that it traverses a break in the proposed northern residential precinct (Gillieston Heights South – Western Precinct), crosses the buffer zone between the South Maitland Railway and northeast of the former smelter site on an alignment that is acceptable to the RKK project, and enters the heavy industrial precinct from the west to avoid interacting with industrial lots proposed to be located east of the compressor station and HPP.
- Consideration of a number of options for locating the compressor station and delivery station, prior to agreeing to locate this infrastructure within the heavy industrial precinct, adjacent to the HPP.
- Designing the interconnect pipeline to avoid surface impacts on the proposed stewardship area though use of HDD.
- Positioning the storage pipeline to avoid the proposed stewardship area and within a section of the buffer zone that is acceptable to the RKK project.

Consultation and commercial negotiations will be ongoing between APA and the RKK project proponents.

7.2.5.7 Hydro smelter remediation

Remediation of the former Kurri Kurri aluminium smelter is being undertaken by Hydro Aluminium Kurri Kurri Pty Ltd in accordance with approvals granted under State Significant Development SSD-6666. The remediation entails excavation of hazardous wastes from the site and placement in a purpose-built containment cell immediately west of the former smelter site. The works are required to make the land suitable for future industrial uses.

Consultation has been undertaken with Hydro Aluminium Kurri Kurri Pty Ltd regarding the alignment of the transmission pipeline and interconnect pipeline to the west of the HPP, with the intention of avoiding impacts to ongoing remediation activities.

Remediation work is likely to be ongoing during construction activities for the compressor station, delivery station, interconnect pipeline and storage pipeline. Management of simultaneous construction activities will require ongoing consultation and planning to reduce potential for land use and construction inefficiencies. Design measures taken for the Project to minimise impacts on the remediation project include a transmission pipeline alignment that enables entry to the former smelter site from the west and proposed use of HV power easements and Bishops Bridge Road to transport materials and personnel to the storage pipeline construction footprint, both of which enable the majority of the smelter site to be avoided.

7.2.6 Management and Mitigation Measures

Measures outlined in **Table 7.2** will be implemented to manage and mitigate land use impacts during various stages of the Project.

Table 7.2 Land use (LU) and existing infrastructure (EI) management measures

No	Measure	Timing
LU01	All reasonable steps will be undertaken to provide landholders with a dedicated point of contact to provide continuity for the duration of the Project.	Planning Construction Operations
LU02	All reasonable steps will be undertaken to enter into an agreement with each landholder on fair and reasonable terms with compensation to be paid as required under the *Pipelines Act 1967* and the *Land Acquisition (Just Terms Compensation) Act 1991.* Agreements will include commitments to agreed measures to minimise the impact of the Project on landholder activities which will be managed in a central database.	Planning Construction

No	Measure	Timing
LU03	APA will fund the reasonable pre-agreed costs of legal, valuation and other advisory services incurred in negotiating with APA such that landholders can access appropriate independent advice without facing out of pocket costs.	Planning Construction
LU04	A Schedule of Landholder Agreements will be compiled and maintained, documenting actions to be carried out on each property.	Planning Construction
LU05	Prior to any construction works commencing on a property, consultation will be undertaken with relevant landholders regarding property-specific measures to implement during construction and operations, including where relevant: • Access during construction. • Ongoing mining operations. • Stock management. • Management of overland flow. • Biosecurity. • Reinstatement.	Planning Construction
LU06	A Biosecurity Management Plan will be developed for the construction phase of the Project and incorporated into the CEMP for the Project.	Construction
LU07	A Biosecurity Management Plan will be developed for the operations phase of the Project and incorporated into the OEMP for the Project.	Operations
LU08	The approved construction footprint will be clearly demarcated and identified during the construction stage with survey pegs and at some locations with flagging, bunting or similar. Environmental features to be retained within the construction footprint will be similarly demarcated and identified.	Construction
LU9	All third-party services within the Project construction footprint will be identified and marked on the ground in advance of trenching activities.	Construction
LU10	All identified third party services and water lines will be managed so that their operation can continue during pipeline construction, wherever practicable.	Construction
EI01	APA will undertake a detailed dial before you dig and site investigation regime to define exact locations of services.	Planning
EI02	Further consultation with service providers will occur to agree to any required protective measures during construction.	Planning
EI03	Searching for services will be conducted by hand or using service location devices. Once services are located, these will be flagged with signage or coloured tape to ensure they are easily identified for the duration of works in that area. In the event of any unforeseen service discovery, the appropriate utility provider will be contacted and appropriate remedial actions taken.	Construction

7.3 Soils and Contamination

An assessment of soils, geology and contamination has been undertaken for the Project, in accordance with the SEARs (refer **Table 3.1**) and is presented in this section. This assessment involved a desktop review of regional mapping for soils landscapes and geology, as well as a preliminary site (contamination) assessment completed by RCA Australia (provided in **Appendix 8**).

7.3.1 Existing Environment

This section describes the existing landform and soil context as well as any known contamination within or near the Project area. It presents information from published regional scale land and soil mapping and more detailed project specific soil mapping and testing.

7.3.1.1 Geology

The Project Area is situated within a permo-triassic basin and is characterised by flat landscapes with localised undulations in the vicinity of creeks. The surface geology of the Project area primarily consists of the Rutherford formation (siltstone, marl, minor sandstone) and Branxton Formation (conglomerate, sandstone, siltstone) west of Wallis Creek and the Tomago Coal Measures (siltstone, sandstone, coal, tuff, claystone) to the east. The floodplains of Wallis Creek and Wentworth Swamp are comprised of quaternary alluvial deposits as shown in **Figure 7.2**.

7.3.1.2 Topography

The topography of the Project area is generally characterised by undulating low rises and rolling low hills to substantial areas of low inclination slopes and gentle spurs bordering key water courses and swamps such as the Wallis Creek floodplain and Woods Gully/Hexham Swamp level. The local catchment topography is shown in **Figure 7.3**.

7.3.1.3 Soil Landscapes

The soil types occurring within the Project Area are mapped on the Newcastle 1:100,000 Soil Landscapes Map Sheet and Singleton 1:100,000 Soil Landscapes Map Sheet. Soil landscapes identified as being present in the Project area include:

- **Beresfield (be)**: undulating low hills and rises on Permian sediments in the East Maitland Hills region with Yellow Podzolic Soils, Brown Podzolic Soils and brown Soloths occurring on crests with Red Podzolic Soils and red Soloths on upper slopes, brown Soloths and yellow Soloths on sideslopes and Yellow Podzolic Soils, yellow Soloths and Gleyed Podzolic Soils on lower slopes. Geology: Permian Tomago Coal Measures – shale, mudstone, sandstone, coal, tuff and clay; Permian Mulbring Siltstone – siltstone, claystone, thin sandstone and limestone.

- **Shamrock Hill (sh)**: rolling low hills on Permian sediments in the East Maitland Hills region with Yellow Podzolic Soils and Red Podzolic Soils, some yellow Soloth on midslopes and some Bleached Loams. Geology: Permian Tomago Coal Measures – shale, mudstone, sandstone, coal, tuff, clay.

- **Neath (SC-nh)**: undulating low rises and swamps to the east of Cessnock on Branxton Formation with the main soils Grey Solodic Soils and Yellow Solodic Soils. Geology: Branxton Formation - Sandstone, mudstone, siltstone, shale, tuff, coal, conglomerate and limestone.

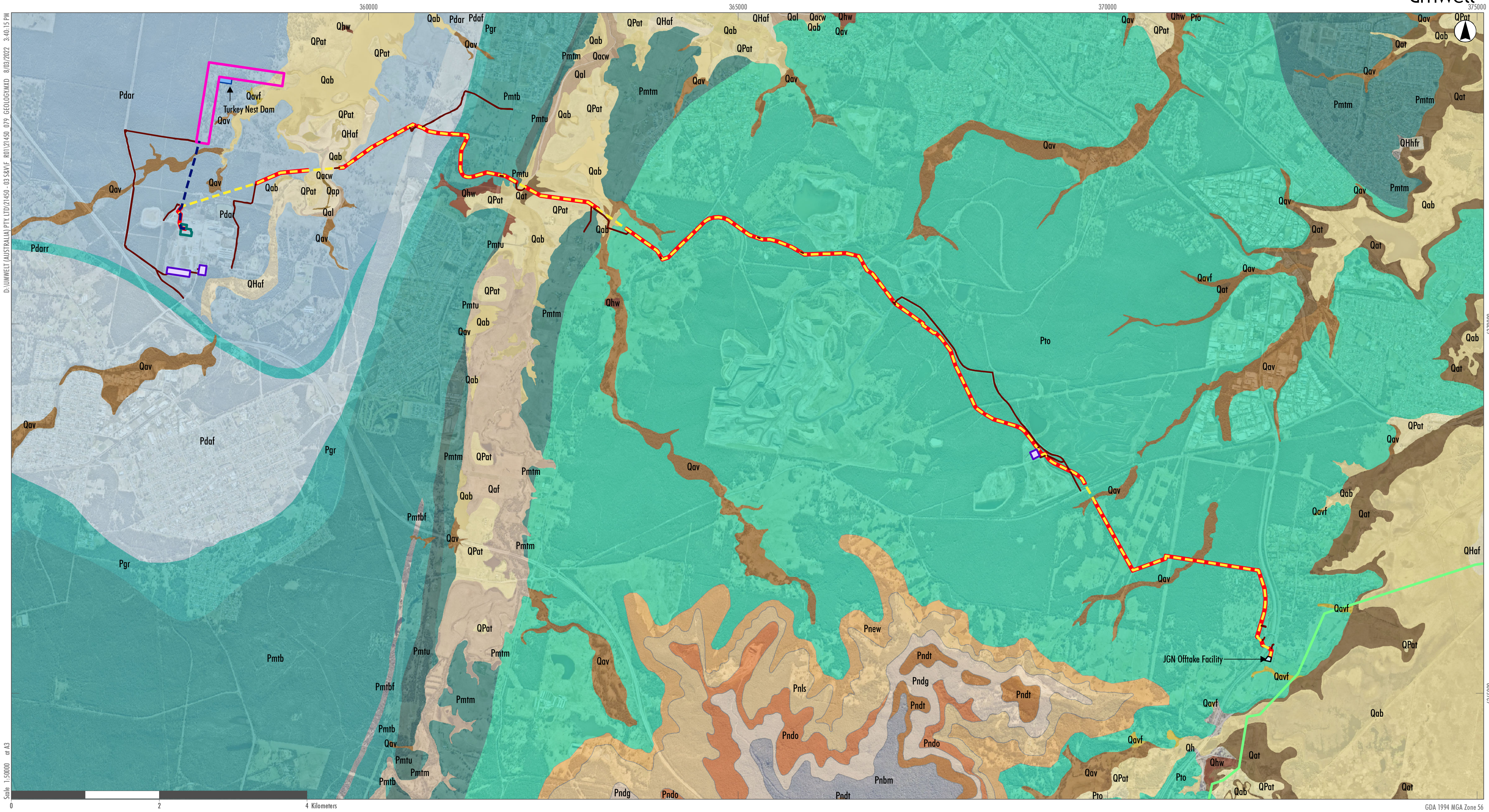
- **Hunter (hu)**: covering the floodplains of the Hunter River and its tributaries with soils including Brown Clays, Black Earths, Chernozems, Alluvial Soils, Red Podzolic Soils, Lateritic Podzolic Soils. Geology: Quaternary alluvium

- **Bolwarra Heights (bh)**: rolling low hills on Permian sediments in the East Maitland Hills region with Yellow Podzolic Soils, Red Podzolic Soils and Brown Podzolic Soils and some Lithosols on crests and yellow Soloths on lower slopes. Geology: Branxton Formation – sandstone, conglomerate, erratics

- **Wallis Creek (wc)**: level to gently undulating floodplains on Quaternary alluvium with Alluvial Soils and Siliceous Sands. Geology: Quaternary alluvium

- **Branxton (bx)**: soil landscape described as undulating low hills and rises and creek flats with Yellow Podzolic Soils on midslopes, Red Podzolic Soils on crests, Yellow Soloths on lower slopes and in drainage lines, and Alluvial Soils in some creeks with Siliceous Sands on flats. Geology: Farley, Rutherford and Branxton Formations - Sandstone, mudstone, siltstone, shale, tuff, coal, conglomerate and limestone.

The location of these soil landscapes and their relationship with the Project area is shown on **Figure 7.4**.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks

Cenozoic Sedimentary Province

- Pndg - Glebe Formation
- Pnls - Shepherds Hill Formation
- Pnew - Waratah Sandstone
- Pndo - Kotara Formation
- Pndt - Tickhole Formation
- QHaf - Alluvial Floodplain Deposits
- QPat - Alluvial Terrace Deposits
- Qab - Alluvial Backswamp Deposits
- Qacw - Alluvial Channel Deposits (Subaqueous)
- Qaf - Alluvial Floodplain Deposits
- Qal - Alluvial Levee/Overbank Deposits
- Qap - Alluvial Palaeochannel Deposits
- Qat - Alluvial Terrace Deposits
- Qav - Alluvial Valley Deposits
- Qavf - Alluvial Fan Deposits
- Qhw - Anthropogenic Stored Water, Pondage, Reservoirs, Canals

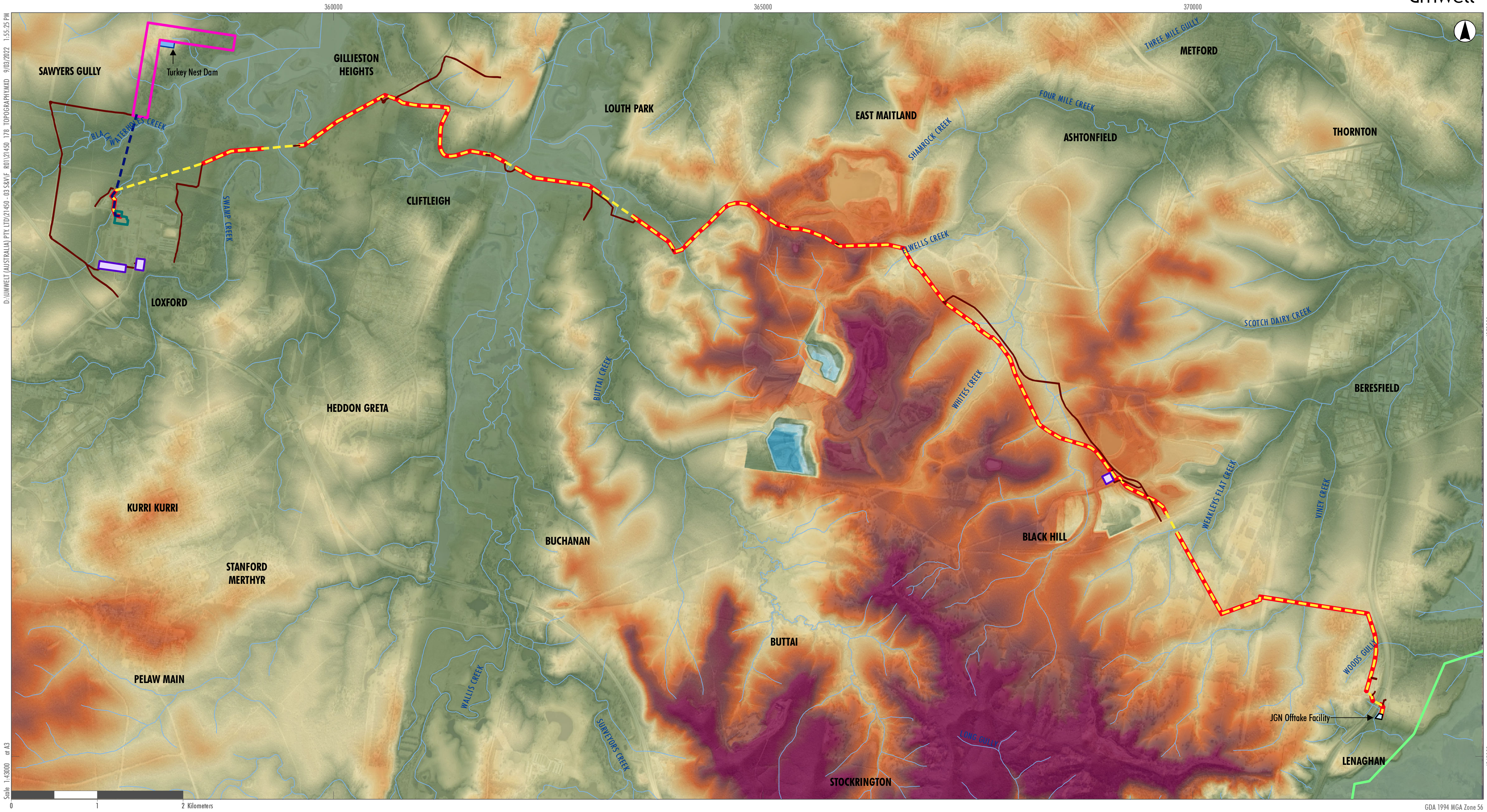
Permo-Triassic Basins

- Pdaf - Farley Formation
- Pdar - Rutherford Formation
- Pdarr - Ravensfield Sandstone Member
- Pgr - Greta Coal Measures
- Pmtb - Branxton Formation
- Pmtm - Mulbring Siltstone
- Pmtu - Muree Sandstone
- Pto - Tomago Coal Measures

FIGURE 7.2

Geology

Image Source: Nearmap (Aug 2021) Data source: NSW DPIE (2020); Umwelt (2021)



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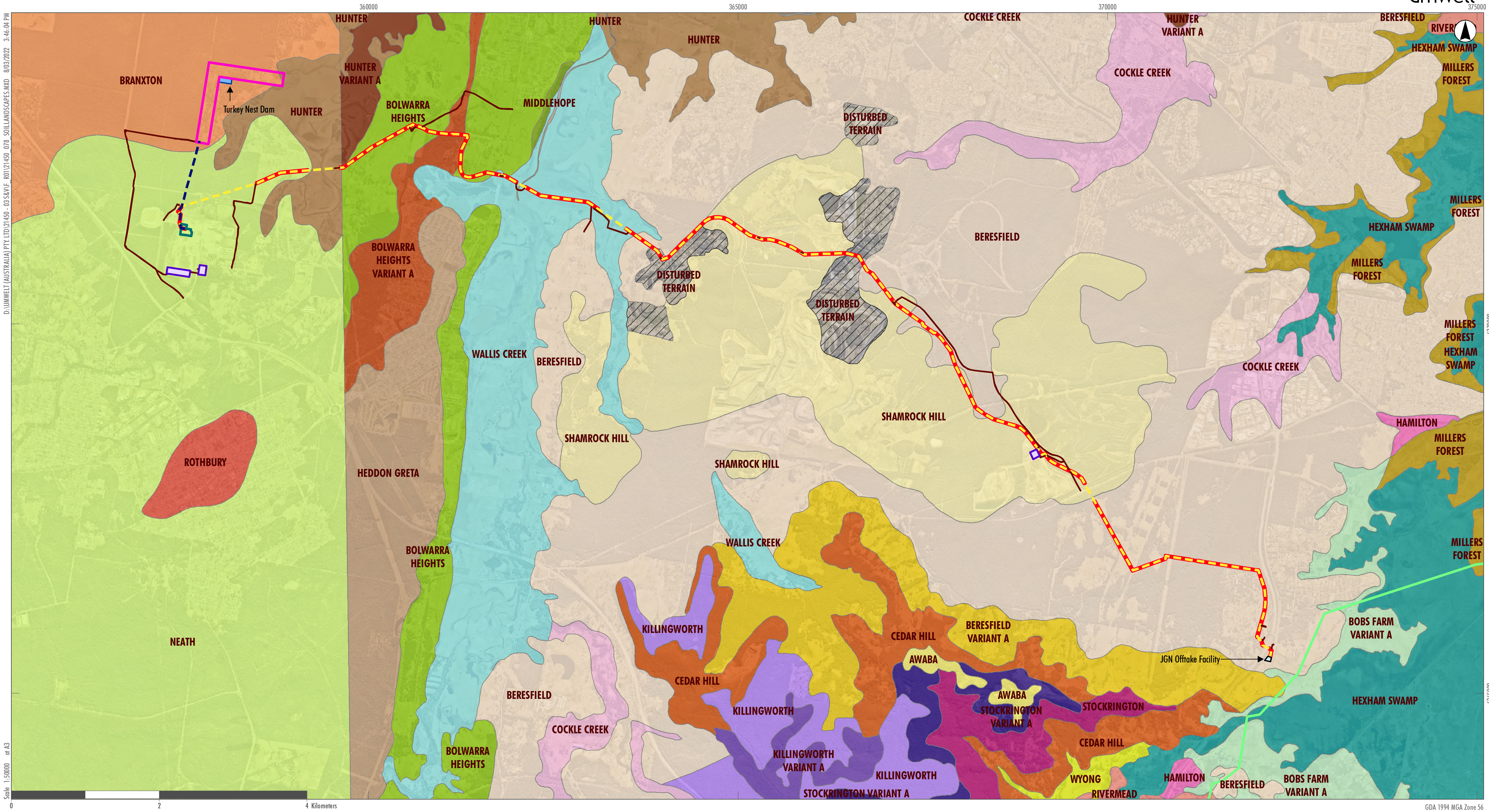
- Access Tracks
- Watercourses

Elevation (mAHD)
High : 213.072
Low : -63.573

FIGURE 7.3

Topography

Image Source: Nearmap (Aug 2021) Data source: NSW DPI (2013); Umwelt (2021)



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- Access Tracks

Soil Landscape

- Awaba
- Beresfield
- Beresfield variant a
- Bobs Farm variant a
- Bolwarra Heights
- Bolwarra Heights variant a
- Branxton
- Cedar Hill
- Cockle Creek
- Disturbed Terrain
- Hamilton
- Heddon Greta
- Hexham Swamp
- Hunter
- Hunter variant a
- Killingworth
- Killingworth variant a
- Middlehope
- Millers Forest
- Neath
- Rivermead
- Rothbury
- Shamrock Hill
- Stockrington
- Stockrington variant a
- Wallis Creek
- Wyong

FIGURE 7.4

Soil Landscapes

Image Source: Nearmap (Aug 2021) Data source: NSW DPIE (2020); Umwelt (2021)

As can be seen from **Figure 7.4**, the JGN offtake facility is located on the Beresfield soil landscape and the transmission pipeline is located on the Beresfield and Shamrock Hill soil landscapes until the Wallis Creek floodplain where the Wallis Creek soil landscape is intersected. West of Testers Hollow the transmission pipeline traverses the Bolwarra Heights, Hunter and Neath soil landscapes. The interconnect pipeline is predominantly within the Neath soil landscape and the storage pipeline is within the Branxton soil landscape.

The soil landscapes of the Project area are generally texture contrast profiles of varying depths and have low fertility. The podzolic and solodic soils associated with the Beresfield and Shamrock Hill soil landscapes typically demonstrate low fertility and are acidic, though importantly the acidity is unrelated to iron sulphide sediments found in acid sulfate soils. They are subject to a number of hazards including high erodibility, strong acidity, localised stoniness, hardsetting and brittle when dry and potential for poor drainage. Following further review of regional mapping, no saline soils are located within the Project area.

7.3.1.4 Land and Soil Capability

Land and Soil Capability (LSC) is the land classification system used in NSW to assess the capacity and ability of the land to sustain a range of predominantly agricultural land uses and land management practices in the long term without degradation of soil, land, air and water resources (OEH 2012, drawing on Dent and Young 1981, Emery 1986 and Sonter and Lawrie 2007).

The NSW LSC assessment scheme (OEH, 2012) gives an indication of the land management practices that can be applied to a parcel of land without causing degradation to the land and soil at the site and to the off-site environment. High impact practices require good quality, high capability land, such as LSC classes 1 to 3, while low impact practices can be sustainable on poorer quality, lower capability land, such as LSC classes 5 to 8.

The LSC classification for the Project area is shown in **Figure 7.5**, which identifies the majority of the Project area as class 4 land. This means the land has moderate capability, with moderate to high limitations for regular high impact land uses such as cropping, high intensity grazing and horticulture. No extremely high (class 1) or very high (class 2) capability land is mapped within the Project area. The absence of any class 1 or class 2 capability land within the Project area indicates that no high value agricultural land is likely to be impacted.

7.3.1.5 Potential Acid Sulfate Soils

The majority of the Project area is classified by the Beresfield and Cessnock acid sulfate soil risk maps as having no known occurrence of acid sulfate soils. There are, however, isolated sections of the Project area where there is a higher probably of acid sulfate soils associated with quaternary alluvial sediments as shown in **Figure 7.6**. These sections are:

- Transmission pipeline crossing of Buttai Creek and the Wallis Creek Floodplain – An area of high probability of acid sulfate soils between 1m and 3m of the surface directly adjacent to Wallis Creek, and an area of high probability of acid sulfate soils between 1m and 3m of the surface east of the high probability area of Wallis Creek and in floodplain wetlands of Buttai Creek.

- Transmission pipeline crossing of Swamp Creek – An area of high probability of acid sulfate soils between 1m and 3m of the surface from the eastern bank of Swamp Creek extending west over the inner floodplain. An area of low probability of acid sulfate soils at depths of greater than 3m below the surface extending west from the western edge of the inner floodplain.

- Interconnect pipeline crossing of Black Waterholes Creek. An area of high probability of acid sulfate soils less than 1 m below the ground surface.

The storage pipeline construction footprint is shown as having no known occurrence of acid sulfate soils.

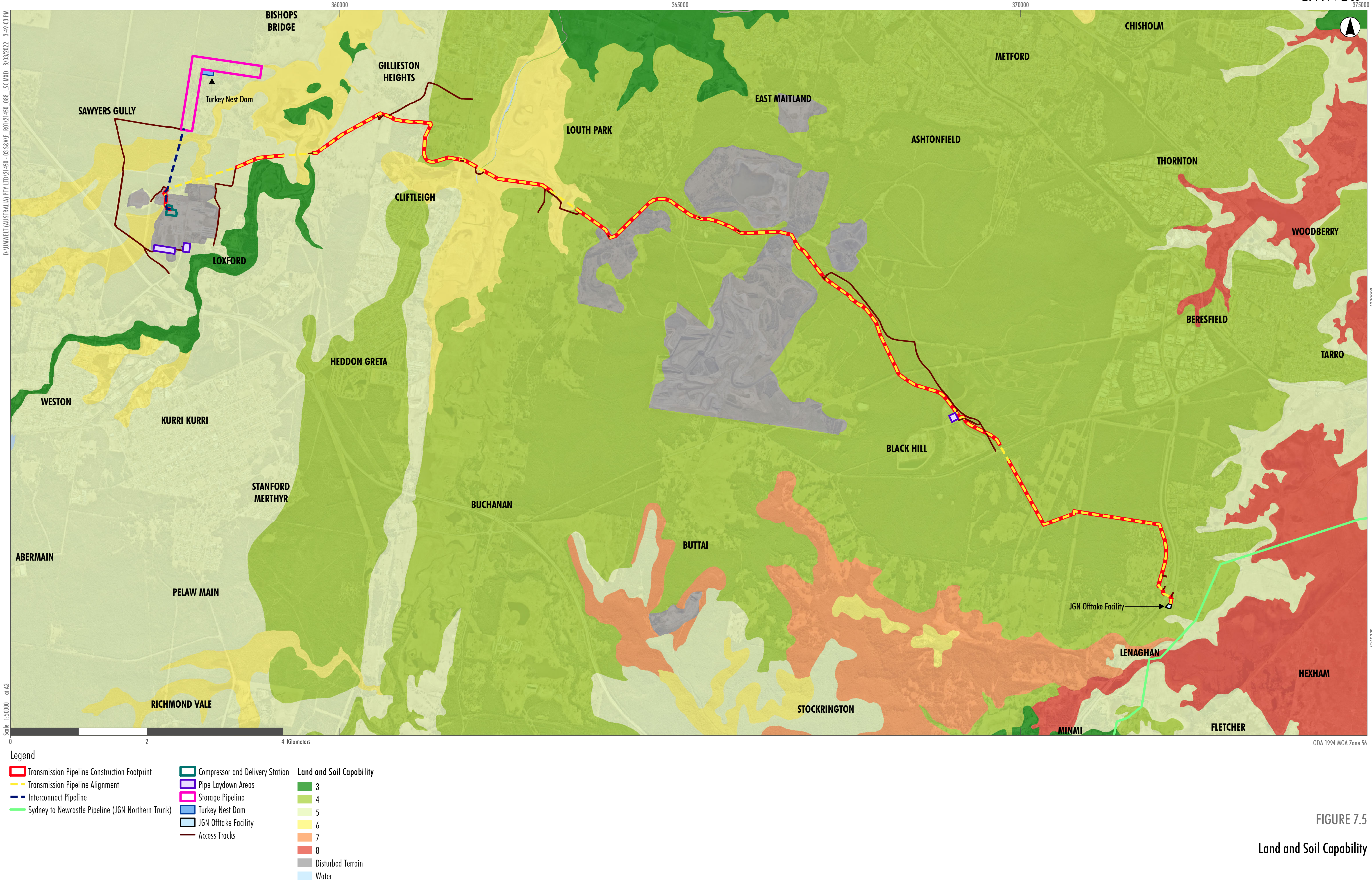
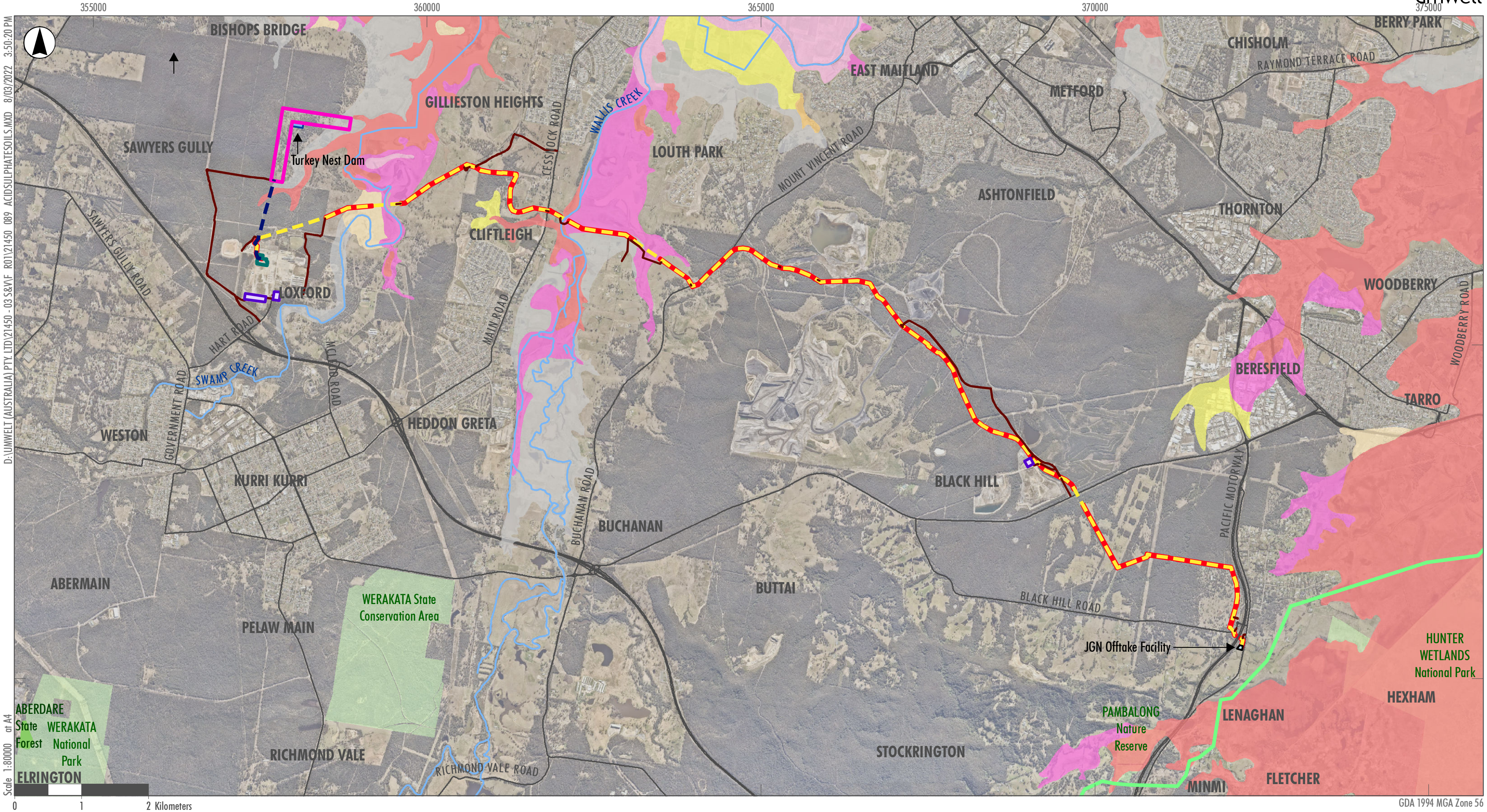


FIGURE 7.5

Land and Soil Capability

Image Source: Nearmap (Aug 2021) Data source: NSW DPIE (2020); Umwelt (2021)



Legend

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- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

Acid Sulfate Soil Risk

- High Risk 1-2m
- High Risk 2-4m
- High Risk above 4m
- Low Risk 1-2m
- Low Risk 2-4m
- Low Risk above 4m
- Low Risk Sediments
- No Risk

FIGURE 7.6

Acid Sulphate Soils Mapping

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

7.3.1.6 Contamination

A search of the NSW EPA public lands register was completed to review the Environment Protection licences, applications, notices, audits or pollution studies and reduction programmes within the suburbs surrounding the Project. A total of 16 sites were recorded and are listed in **Table 7.3**.

Table 7.3 Sites listed on the NSW EPA Public Lands Register

Owner	Address	Proximity to Project area
Royce Pearce trading as AAA Earthworks and Property Maintenance	67 – 75 Lenaghans Drive, Lenaghan	Approx. 2 km southwest of the JGN offtake facility
Bitupave	Boral Asphalt Lenaghans Drive, Black Hill	Approx. 1.5 km north of transmission pipeline KP 1.5
Donaldson Coal	1132 John Renshaw Drive, Black Hill	Located within the Project area
Enviroking Investments	843 John Renshaw Drive, Black Hill	Approx. 1.4 km southwest of transmission pipeline KP 6.3
Woodbury Civil	Blackhill Quarry, Blackhill Road, Black Hill	Approx. 2 km southwest of transmission pipeline KP 3.0
Thiess Pty Ltd	1416 George Booth Drive, Buchanan	Approx. 7 km south of transmission pipeline KP 15.0
Lend lease Engineering Pty Limited	1056 Old Maitland Road, Sawyers Gully	Approx. 4.7 km northwest of the compressor station
Hydro Aluminium	Hart Road, Loxford	The compressor station, delivery station and short sections of the interconnect and transmission pipelines are located within the former Hydro Aluminium site
Regain Services Pty Ltd	146 Mitchell Avenue, Kurri Kurri	Approx. 2.4 km south of the compressor station
Alfabs Engineering Group Pty Ltd	146 Mitchell Avenue, Kurri Kurri	Approx. 2.4 km south of the compressor station
Central Waste Plant Pty Ltd	8 Styles Street, Kurri Kurri	Approx. 2 km south of the compressor station
Weston Aluminium Pty Ltd	129 Mitchell Avenue, Kurri Kurri	Approx. 2 km south of the compressor station
Tox Free Australia Pty Ltd	126 Mitchell Avenue, Kurri Kurri	Approx. 2 km south of the compressor station
Hunter and New England Health Service	Kurri Kurri Hospital, Lang Street, Kurri Kurri	Approx. 4.4 km south of the compressor station
Hunter Water Corporation	Kurri Kurri Wastewater Treatment Works, MCleod Road, Kurri Kurri	Approx. 1.6 km south of the compressor station
Worth Recycling Pty Ltd	47 Wermol Street, Kurri Kurri	Approx. 2.6 km south Approx. 2km south of the compressor station

In addition, soils within 10 m of the CTGM near Woodberry, approximately 6.5 km north of the JGN offtake facility, are known to have been contaminated with lead as a result of the use and maintenance of lead in the collars of pipe joints (Harvey,Taylor & Handley, 2015). The transmission pipeline alignment is positioned adjacent to the CTGM between KP 4.4 and KP 6.2, and adjacent to a similar large diameter water pipeline to KP 10.4.

Within the Project area, there are two areas where contamination is known to be present. These areas are the former poultry farm and the former Hydro Aluminium Kurri Kurri smelter, as shown on **Figure 7.7** and discussed below. Remediation Action Plans (RAPs) have been prepared for these areas by others. Details of the previous investigations and a review of the RAPs have been undertaken for the contamination assessment, as further discussed in **Appendix 8**.

- The former poultry farm on Lot 1 DP1260203 is traversed by the transmission pipeline between KP 2.6 and KP 4.3. Extensive previous assessments of this site have identified localised areas of contamination by buried waste in the form of dead pits, asbestos and other demolition waste and may further include hydrocarbons and pesticides. The transmission pipeline alignment is in proximity to but does not intersect three suspected waste burial areas. Perched groundwater (considered to be around 6m below the ground surface) in the area of the former poultry farm is understood to have some metals, nutrient and microbiological contamination (JBS&G, 2018).
- The Former Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition Project EIS (Ramboll, 2016) summarises extensive previous site investigations and indicates that there are contaminated soils and materials across the Kurri Kurri aluminium smelter site that have arisen during the operation of the smelter. Groundwater beneath the site has also been impacted (Ramboll, 2016) by fluoride, aluminium, cyanide and sodium. Groundwater contamination is concentrated to the east of the smelter site, down gradient of a capped waste stockpile.
- Remediation works for the smelter site are currently underway, approved as State Significant Development SSD 6666. After the remediation has been validated, a Site Audit Statement and a Site Audit Report will be issued by an NSW EPA accredited site auditor that states that the land is suitable for the intended industrial land use.
- Recent additional contamination investigations of the former smelter site (Rambol, 2021) have been undertaken to support a proposed modification to the SSD 6666 approval. These investigations have demonstrated that the area north west of the smelter site, including the area proposed for a Project HDD pad at KP 19.8 of the transmission pipeline, were significantly disturbed by earthworks (excavation and filling) in the early 1980s, and that earthworks are now proposed to remove the fill material, including areas of waste and contaminated materials. The modification, which is currently under assessment, proposes to include this area within remediation activities approved under SSD 6666.

Although groundwater quality is unknown across much of the Project area, gross contamination is not considered likely outside of the two sites specifically discussed above. There may be contamination by microbiological compounds due to the use of septic systems for waste management.

Shallow groundwater table levels were encountered in Swamp Creek (at 1.4 m below the surface) and Wallis Creek (between 0.9 m and 2.1 m below the surface) during acid sulfate soil sampling (**Section 7.3.3**).

FIGURE 7.7

Areas of Known Contamination

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

7.3.2 Assessment Methodology

7.3.2.1 Desktop Analysis

Regional mapping was accessed using the NSW Government eSPADE information system and SEED web-based portals. Desktop reviews were undertaken of:

- Australian Soil Classification (ASC) system soil type mapping of NSW
- Great Soil Group mapping of NSW
- Land and Soil Capability classes mapping
- Inherent Soil Fertility
- Soil Landscapes.

7.3.2.2 Preliminary site (contamination) assessment

A preliminary site (contamination) assessment (**Appendix 8**) of the Project area was completed by RCA Australia in accordance with:

- NSW EPA Guidelines for Consultants Reporting on Contaminated Sites
- NSW Department of Urban Affairs and Planning Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land.

In summary, the scope of works comprised:

- Assessment of site history utilising Council, State Government and Federal Government resources.
- Conducting site inspections during October 2021, December 2021 and January 2022, noting that negotiations with some landowners were ongoing at the time and not all areas of the Project area could be accessed.
- Collection of 11 shallow soil samples at four locations during October 2021 where the transmission pipeline crosses the CTGM and other large diameter water pipelines. Samples were collected at the surface, and at 0.1m and 0.2m below the surface. Soil samples at all depths at these locations were analysed for lead due to publicised history of contamination from lead solder on the CTGM. Surface soil samples were also submitted for analysis of moisture content, total metals, phenoxy acetic acid herbicides, organochlorine pesticides and organophosphorus pesticides. Sampling locations are shown on **Figure 7.8**.
- Collection of hand augured soil samples at eight floodplain locations during December 2021 and January 2022: seven on the transmission pipeline alignment where it traverses the Wallis Creek floodplain (BH4 to BH8) and adjacent to Swamp Creek (BH2 and BH3), and one at the north eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp (BH1). Soil samples were collected at each location from the surface and at 50cm intervals to a depth of around 2.5 m. Samples were analysed for acid sulfate soil properties through screening via peroxide oxidisation and further assessment on selected samples by chromium reducible sulfur (CRS) analysis. All surface soil samples were analysed of for pesticides and metals, and selected surface samples were analysed for hydrocarbons. Sampling locations are shown on **Figure 7.8**.

- Measurement of groundwater depth was undertaken at all eight floodplain soil sampling locations (BH1 to BH8), with water samples taken from two locations (BH3 and BH5) and analysed for pH, chloride, sulfate and electrical conductivity.
- Laboratory analysis of all collected soil and water samples was conducted by NATA accredited methodologies that comply with international standard methods.

The construction footprint of the compressor station, delivery station and interconnect pipeline between the HDD pad and the compressor station were not assessed in the field. These Project components are primarily located within the area subject to contamination assessment and remediation works approved under SSD6666.

Results from the sampling and laboratory analysis program is summarised below, with the full report available in **Appendix 8**.

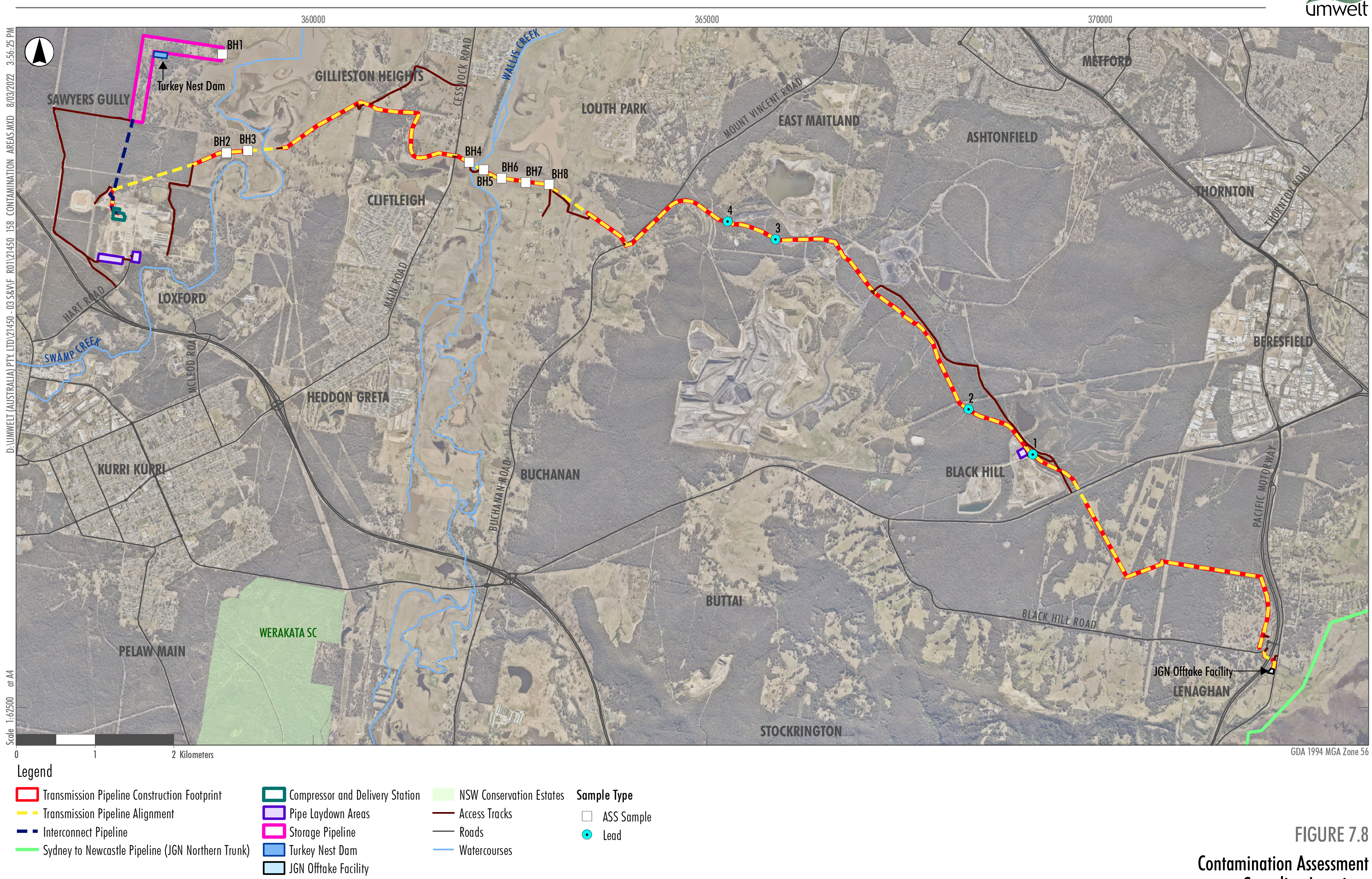


FIGURE 7.8

Contamination Assessment Sampling Locations

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

7.3.3 Results

7.3.3.1 Chichester Trunk Gravity Main (CTGM)

Lead concentrations in all soil samples taken adjacent to the CTGM ranged from not detected (<5mg/kg) to a maximum of 26mg/kg, which is around the natural background concentration and significantly below the health investigation level for commercial and industrial sites of 1,500mg/kg. It is noted that with the exception of one sample, the surface samples did not have the highest lead concentration. Lead contamination was not detected in soils adjacent to the CTGM and other large diameter water pipelines at crossing locations of the transmission pipeline.

No pesticides or herbicides were detected in the analysed samples.

7.3.3.2 Soils on floodplains

Actual or potential acid sulfate soils were identified at the following locations within the Project area (refer to **Figure 7.8**):

- Potential acid sulfate soils were identified at 2.4-2.5m depth at the storage pipeline construction footprint sampling location (BH1)
- Actual acid sulfate soil was identified from 1.4m depth at the proposed HDD pad immediately east of Wallis Creek (BH5).

Sampling at all other locations did not locate either actual or potential acid sulfate soil.

Pesticides, herbicides, metals or hydrocarbons in the floodplain soil samples were either not detected or were detected at concentrations below the relevant criteria.

7.3.3.3 Groundwater

Groundwater was not encountered in BH1 or BH2. Groundwater was encountered at BH 3 adjacent to Swamp Creek at approximately 1.4 m below the surface.

Groundwater was encountered at all five borehole locations on the Wallis Creek floodplain at 1.4 m (BH4), 0.9 m (BH5), 1.6 m (BH6), 1.2 m (BH7) and 2.1 m (BH8) below the surface. Free water was observed at BH8 on the tip of the hand auger at 1.7m depth with the groundwater table measured to be 2.1 m below the surface post drilling, potentially indicating the presence of a slightly perched groundwater table in the vicinity of this borehole location.

7.3.4 Assessment of Impacts

7.3.4.1 Contamination

As discussed in **Section 7.3.1.6** and illustrated on **Figure 7.7**, there are two known areas of contamination within the Project area associated with the former poultry farm and smelter site.

Construction of the transmission pipeline within the former poultry farm have the potential to encounter buried hazardous waste and contaminated soils within these areas. Depending on the extent of remedial works undertaken on the former poultry farm at the time of construction, specific management measures as outlined in **Table 7.4** may be required during construction and some excavated soil may not be suitable to replace within the trench.

Project construction activities within the former smelter site will not commence until remediation work under SSD6666, including the proposed modification, is completed for the relevant areas and a site audit certificate issued. Measures in **Table 7.4** would be implemented during construction.

Minor issues associated with waste deposition have been identified along a section of the transmission pipeline alignment (**Figure 7.7**) and may be encountered. These are considered able to be appropriately managed during construction through the measures outlined in **Table 7.4**. An unexpected contaminated lands procedure will be developed and implemented as a contingency should unexpected contamination be discovered during construction.

Soil sampling at transmission pipeline crossing locations of the CTGM and other large diameter water pipelines has demonstrated that lead contamination is not likely to be encountered.

For the majority of the Project area, there is a low probability that construction activities would encounter contaminated groundwater. However, groundwater at, and in the vicinity of the former Hydro aluminium smelter, has been identified to be contaminated and all groundwater in this area is to be considered as contaminated for the purpose of management. Groundwater within the low-lying areas of the smelter site is to also be considered as acidic and be managed as outlined in **Table 7.4**.

Groundwater impacts have been further considered in **Section 7.4**.

7.3.4.2 Acid Sulphate Soils

Without mitigation, ASS exposed to the atmosphere will generate sulphuric acid through oxidation, which may runoff into the surrounding environment with potential to pollute soils, surface water and groundwater.

Results from soil sampling has indicated that there is potential to encounter and disturb potential or actual ASS if:

- Excavating deeper than 2.4 m below the surface in the north-eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp, and
- Excavating deeper than 1.4 m below the surface immediately east of Wallis Creek.

Excavation to 2.4 m depth or more will not occur within the vicinity of BH1 as this location is immediately adjacent to north eastern boundary of the storage pipeline construction footprint. Trenching for the storage pipeline cannot be undertaken up to the footprint boundary given space requirements for heavy machinery, string of pipe segments, welding of pipe bends and stockpiling of topsoils subsoils. As such it is considered unlikely that potential or actual ASS will be encountered during construction of the storage pipeline.

For the Wallis Creek floodplain, APA has committed to move the HDD exit pad on the east of Wallis Creek further to the east and outside of the 50% AEP flood level as far as practicable, which is close to BH6. This measure is primarily designed to reduce the risk of flooding delays during construction, but will also eliminate the requirement to undertake trenching within the area of actual ASS immediately east of Wallis Creek near BH5. Given actual or potential ASS was not detected at any other sampling location on the Wallis Creek floodplain it is considered highly unlikely that ASS will be exposed during trenching for the transmission pipeline in this area.

Nevertheless, the potential for exposure of undetected ASS in the Wallis Creek floodplain during trenching for the transmission pipeline is acknowledged, and will be mitigated by treating subsoil stockpiles with ameliorants (typically lime or gypsum) at a rate sufficient to effectively neutralise the acid generating capacity of the subsoils detected at BH5. Effective mixing of lime with trenched subsoil can be achieved by laying lime above the trench line prior to trenching, as well as application to stockpiles.

The time of exposure of trenched subsoils between Buttai Creek and Wallis Creek will also be limited, with time between commencement of trench excavation and completion of trench backfilling to be three days or less. This measure is achievable given the length of trenching within the Wallis Creek floodplain will be reduced to around 800 m following movement of the HDD exit pad east of Wallis Creek to outside the 50% AEP flood level.

The HDDs of Wallis Creek, Swamp Creek and Black Waterholes Creek may intercept ASS during drilling and reaming of the borehole. Drilling fluids are adjusted to a mildly alkaline state around pH 9 by addition of sodium carbonate to ensure correct efficiency and effectiveness. When ASS soil is introduced to the drilling solution in the bore hole the pH of the drilling fluid is reduced. This change is then detected by continuous sampling of drilling returns, and is further corrected by the addition of sodium carbonate. This treatment and the separation of drilling fluids from cuttings by the mud system results in a consistently monitored closed system where drilling fluids are mildly alkaline and cuttings maintain as consistent pH of between 6 and 8. Cuttings will be controlled and disposed to an appropriate landfill, as described on **Section 7.15**, therefore mitigating potential adverse impacts of HDDs intersecting ASS.

More broadly, management of acid sulfate soils for the Project will be undertaken in accordance with *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998).

With the implementation of measures outlined in **Table 7.4**, potential ASS exposure risks would be appropriately managed.

7.3.4.3 Erosion and sedimentation

Exposure of soils during the clearing and grading of the construction footprint and excavation of pipeline trenches have the potential to result in erosion of soils and increase sedimentation to receiving waterways. Due to the high erodibility of some soils within the Project area, and evidence of erosion along some areas of the Project area, the risk of erosion requires careful management during construction. Stockpiling of soil, vegetation and materials would also pose a risk of being washed away during a heavy rainfall event should suitable management measures not be in place.

In particular, exposure of soils in the storage pipeline construction footprint requires careful management to mitigate potential erosion and sedimentation impacts. Factors that increase erosion and sedimentation risks for this component of the Project are the relatively large area of disturbance, the timeframe over which soils will be exposed due to the slower speed of construction, presence of gently inclined slopes and the proximity to Wentworth Swamp.

To minimise the area of soil disturbed and exposed to erosion the storage pipeline will be constructed so that ground disturbance and reinstatement occur progressively.

Geotechnical studies are currently underway to assess soil characteristics across the entire Project construction footprint. Specific erosion and sediment control plans will be developed for each project component (JGN offtake facility, transmission pipeline, storage pipeline, compressor station and delivery station) following completion of geotechnical studies. Erosion and sediment control plans will be prepared in accordance with the APGA Code of Practice and relevant requirements of Managing Urban Stormwater: Soils and Construction – Volume 2A, Installation of services.

Measures outlined in **Table 7.4** will be implemented to appropriately manage erosion and sedimentation risks.

7.3.5 Management and Mitigation Measures

Measures presented in **Table 7.4** will be implemented to manage and mitigate soils and contamination risks during various stages of the Project.

Table 7.4 Soils and Contamination Management Measures

No	Measure	Timing
SC01	Soil management measures consistent with the APGA Code of Environmental Practice (2017) will be employed during the construction of the Project.	Construction
SC02	Specific erosion and sediment control plans will be developed for each project component (JGN offtake facility, transmission pipeline, storage pipeline, compressor station and delivery station) following completion of geotechnical studies. Erosion and sediment control plans will be prepared in accordance with the APGA Code and will include: • Minimising the area and duration of soil disturbance. • Progressively rehabilitating disturbed areas. • Maintaining sheet flow conditions to the maximum possible extent. • Water velocity reduction measures and redirection of runoff to stable ground. • Transfer of overland flow through the ROW. • Diversion banks at the crest of steep areas such as stream banks to divert flow away from backfilled trenches. • Trench blocks (i.e. trench/sack breakers) and compaction of backfilled soils to be used to prevent subsurface erosion and subsidence along backfilled trench.	Construction
SC03	Construction activities between Buttai Creek and Wallis Creek (KP13.1 to KP14.15), and the HDD workspace at the western side of Swamp Creek (KP 18.0), will be undertaken in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998), unless soil surveys demonstrate potential acid sulfate soils are not present.	Construction
SC04	A trench and lay methodology will be applied at areas with potential for shallow groundwater and acid sulfate soils between Buttai Creek and Wallis Creek (KP13.1 to KP14.15) to limit the time between commencement of trench excavation and completion of trench backfilling to three days or less, excluding bellholes at HDD and tie-in locations.	Construction
SC05	If sumps and cuttings settlement pits are required at HDD workspaces between Buttai Creek and Wallis Creek (KP13.1 to KP14.15), or at the western side of Swamp Creek (KP18.0), they will be constructed above ground with no ground disturbance other than stripping of topsoil.	Construction
SC06	The following measures will be implemented to manage topsoil: • Soil management measures will be appropriate to the soil type at each location. • Vegetation will be cleared prior to stripping of topsoil. • Topsoil will not be stripped when saturated. • Topsoil will be stripped across the Project construction footprint, typically to maximum depths determined during pre-construction surveys. In soil types with topsoil depth of 30 cm or greater, the stripping depth may be reduced to ensure stockpiles can be accommodated within the transmission pipeline and storage pipeline ROW widths. Above the trench, topsoil will generally be stripped to the full depth, but to a maximum of 30 cm, to mitigate mixing with subsoil. • Stripped topsoil will be stockpiled separately from woody material and subsoil stockpiles. • Topsoil stockpile heights will not exceed 2 m. • Gaps in the linear topsoil stockpiles will be left at appropriate intervals for drainage and for the movement of vehicles and fauna through the site.	Construction

No	Measure	Timing
	• Any topsoils stockpiles to be maintained for an extended period of time (i.e. >4 months) will have the surface left in a rough state and protected with a soil stabilising polymer or seeded with appropriate species and monitored for weed management. • Topsoil stockpiles, other than linear stockpiles on the transmission pipeline ROW, will be clearly signposted. • Topsoil will not be used as a padding material. • Stockpiled topsoil will be respread over the construction footprint to a minimum depth of 100 mm, or to the depth that topsoil was stripped if this was less than 100 mm. • Topsoil will not be respread for rehabilitation when saturated.	
SC07	The following measures will be implemented to manage subsoil: • Subsoil will be excavated and stockpiled separately from topsoil. • The trenches will be compacted to an appropriate density following backfilling with subsoil. • Excess displaced subsoil will be prevented from mixing with topsoil. • Excess subsoil will be stockpiled separately for disposal by appropriate methods, which may include placement elsewhere on the subject property in consultation with the relevant landholder. Monitoring for dispersion and erosion of subsoil stockpiles will be undertaken, particularly for sodic soils. The installation of further ESC or addition of ameliorants, such as gypsum or lime, based on the pH of the soil, will be undertaken as required.	Construction
SC08	Where padding material cannot be provided from trench spoil, clean borrow material of an appropriate quality will be sourced from an established supplier.	Construction
SC09	Any topsoil imported for reinstatement or easement maintenance will be of an appropriate quality and agreed with the landholder.	Construction
SC10	Prior to construction commencing on a property, discussions will be held with the landholder or manager to identify any potentially contaminated sites.	Planning
SC11	Construction of the compressor station and delivery station will not commence until a site audit statement has been prepared by a site auditor accredited by the NSW Environment Protection Authority. Note: This condition has been included because the remediation of the former aluminium smelter site is being carried out under a separate consent.	Planning
SC12	In the event that contaminated sites are uncovered during construction the following measures will be undertaken: Cessation of ground disturbance at the location and within the immediate vicinity. Assessment of the site contamination and determination of appropriate remedial action in consultation with the EPA where required.	Construction
SC13	• Spills of hazardous materials will be rendered safe (unable to further contaminate) and, where required, collected for treatment and disposal at a designated site, including cleaning materials, absorbents and contaminated soils.	Construction Operations

7.4 Water

An assessment of the potential surface water, groundwater and flooding/hydrological impacts associated with the construction and operation of the Project was undertaken by Umwelt in accordance with the SEARs and relevant guidelines and legislative requirements. The full report is provided in **Appendix 7** and a summary of key outcomes is provided in the sections below.

7.4.1 Existing Environment

7.4.1.1 Surface water

The Project is situated in the Hunter River catchment in NSW, which drains a total area of about 22,000 km^2. The Hunter River flows in a south-westerly direction from Glenbawn Dam in the Liverpool Ranges to meet Goulburn River near Denman. From Denman, the river flows generally in a south easterly direction through Maitland (approximately 6 km north of the Project area) before reaching the Tasman Sea at Newcastle.

The principal watercourses relevant to the Project area are:

- Wood's Gully – The eastern end of the transmission pipeline alignment (KP0.9) traverses Wood's Gully which discharges to Hexham Swamp on the Hunter River floodplain.
- Viney Creek - The eastern section of the transmission pipeline alignment (KP2.2) traverses Viney Creek and associated tributaries which discharge through Woodberry Swamp prior to joining the Hunter River
- Weakleys Flat Creek – The eastern section of the transmission pipeline alignment (KP4.2) traverses Weakleys Flat Creek associated tributaries which discharge through Tenambit wetlands prior to joining the Hunter River.
- Four Mile Creek - The mid-section of the transmission pipeline alignment (KP5.9) traverses Four Mile Creek and associated tributaries which include Whites Creek (KP7) and Elwells Creek (KP8.9). Four Mile Creek discharges through Tenambit wetlands prior to joining the Hunter River.
- Swamp, Wallis and Buttai Creek - the central and western sections of the transmission pipeline alignment extends across the Buttai (KP12.9), Wallis (KP14.2) and Swamp (KP17.8) Creek systems. The Wallis Creek catchment is a tributary of the Hunter River, is approximately 400 km^2 (40,000 ha) and has a confluence with the Hunter River approximately 6.5 km northeast of the Project Area. Named tributaries of Wallis Creek include Swamp Creek, Deep Creek, Sawyers Creek, Black Waterholes Creek, Buttai Creek and Bishops Creek. Swamp Creek, a perennial waterway that flows south to north, has a confluence with Wallis Creek approximately 4.2 km north east of the Project Area at its nearest point. Black Waterholes Creek and Swamp Creek converge approximately 2.25 km north-east of the Project Area into Wentworth Swamp. Downstream of Wentworth Swamp, Swamp Creek subsequently discharges into Wallis Creek approximately 1.5 km south of South Maitland. The downstream reaches of the Wallis and Swamp Creek system comprises numerous low-lying and shallow wetlands and surface water storages including the broad Wentworth Swamp. The catchment area upstream of the pipeline alignment is approximately 280 km^2 for the Swamp, Wallis and Buttai Creek catchments.
- An unnamed tributary of Black Waterholes Creek, which is an ephemeral waterway that flows generally south west to north east, is located immediately adjacent to the Project area on the western boundary. Black Waterholes Creek is also crossed by the interconnect pipeline between the compressor station and storage pipeline.

While all watercourses and drainage lines within the catchments traversed by the Project are ephemeral, the lower reaches of Wallis Creek are located on the extensive Hunter River floodplain and are subject to tidal influence from the Hunter River. The transmission pipeline crossing location of Wallis Creek is not subject to tidal influence.

The hydrological features in the vicinity of the Project are shown on **Figure 7.9** and details of the waterway crossings and catchments are tabulated in **Table 7.5**.

Table 7.5 Waterways and catchments summary

Kilometre point (KP)	Watercourse	Crossing method	Landholder	Contributing catchment area (km^2)
0.9	Woods Gully	Open cut	Transport for NSW	0.46
2.1	Viney Creek (east arm)	Open cut - special crossing	Stevens Group	1.46
2.2	Viney Creek (west arm)	Open cut - special crossing	Stevens Group	2.98
3.9	Unnamed watercourse (tributary of Weakleys Flat Creek)	Open cut	Catholic Diocese	0.26
4.2	Unnamed watercourse (tributary of Weakleys Flat Creek)	HDD (John Renshaw Drive)	Catholic Diocese	1.71
5.9	Four Mile Creek	Open cut - special crossing	Hunter Water Corporation	1.79
7.2	Unnamed watercourse, constructed channel from Lake Kennerson to Four Mile Creek	Open cut	Ashtonfields and Bloomfield	0.40
7.3	White's Creek	Open cut	Ashtonfields and Bloomfield	2.44
7.5	Unnamed watercourse, constructed channel from Lake Kennerson to unnamed watercourse flowing to Lake Forster	Open cut	Ashtonfields and Bloomfield	1.06
7.7	Unnamed watercourse, constructed channel from Lake Kennerson to unnamed watercourse flowing to Lake Forster	Open cut	Ashtonfields and Bloomfield	-
7.8	Unnamed watercourse	Open Cut	Ashtonfields and Bloomfield	-
8.9	Elwell's Creek	Open Cut	Ashtonfields and Bloomfield	2.79
11.9	Unnamed watercourse	Open Cut	Ashtonfields and Bloomfield	1.04
12.9	Buttai Creek	HDD	Gavan	19.84
14.2	Wallis Creek	HDD	Boundary watercourse	160.73
17.4	Unnamed watercourse	Open Cut	Regrowth Kurri Kurri	
17.8	Swamp Creek	HDD	Regrowth Kurri Kurri	100.1

Kilometre point (KP)	Watercourse	Crossing method	Landholder	Contributing catchment area (km^2)
Transmission pipeline **Interconnect pipeline**	Unnamed watercourse (constructed channel)	Open Cut	Regrowth Kurri Kurri	-
Interconnect pipeline	Black Waterholes Creek and proposed stewardship area	HDD	Regrowth Kurri Kurri	-
Storage pipeline	Unnamed watercourse	Open Cut	Regrowth Kurri Kurri	-
Storage pipeline	Unnamed watercourse	Open Cut	Regrowth Kurri Kurri	-

While all watercourses and drainage lines within the catchments traversed by the Project are ephemeral, the lower reaches of Wallis Creek are located on the extensive Hunter River floodplain and are subject to tidal influence from the Hunter River. The transmission pipeline crossing location of Wallis Creek is not subject to tidal influence.

The Project is located with the Wallis Creek and Hunter River Tidal Pool Water Sources of the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.

7.4.1.2 Groundwater

The hydrogeology underlying the Project area is understood to comprise of two groundwater systems: an upper aquifer within alluvium and a lower aquifer of sedimentary rocks (BOM, 2021a).

WaterNSW registered groundwater monitoring bores located in the vicinity of the Project do not have recorded water level data available, however sampling from previous studies has shown that groundwater depths are shallow in the area between Buttai Creek and Wallis Creek but deeper across the majority of the Project area (up to 34.58 m below surface level within the Donaldson and Abel Mines).

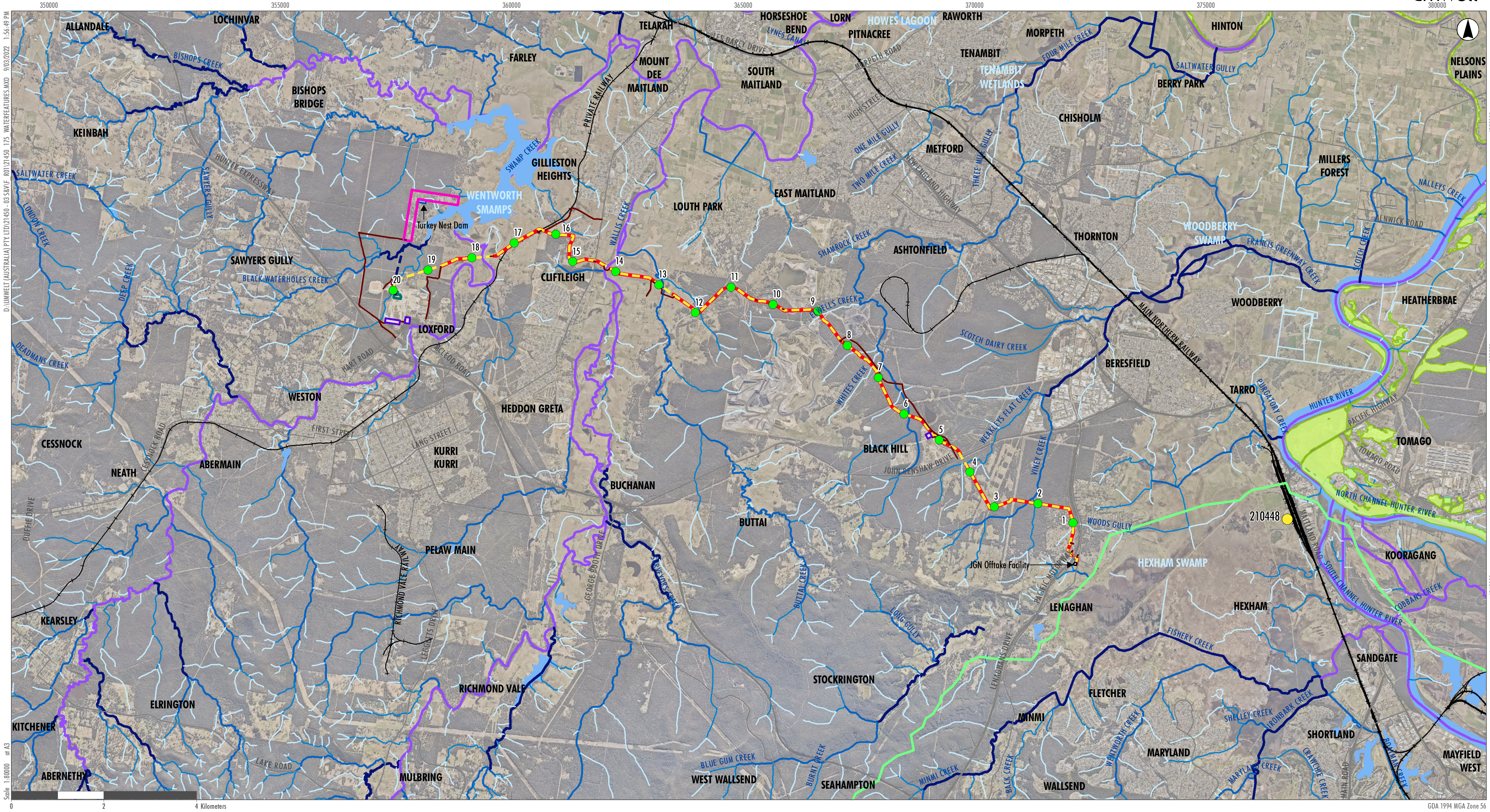
Measurement of groundwater depths on floodplains crossed by the transmission pipeline and adjacent to Wentworth Swamp in the storage pipeline construction footprint was undertaken by RCA as part of the Preliminary Site Contamination Assessment (**Appendix 8**), as outlined in **Sections 7.3.3** and **7.3.4**. Measurements were taken at eight floodplain locations: seven on the transmission pipeline alignment where it traverses the Wallis Creek floodplain (BH4 to BH8) and adjacent to Swamp Creek (BH2 and BH3), and one at the north eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp (BH1). Measurements were taken during December 2021 and January 2022 following significant flooding during November 2021, and so could be expected to reflect elevated groundwater levels.

Groundwater was not encountered in BH1 or BH2 to a depth of 2.5 m below the surface. Groundwater was encountered at BH 3 adjacent to Swamp Creek at approximately 1.4 m below the surface. Groundwater was encountered at all five borehole locations on the Wallis Creek floodplain at 1.4 m (BH4), 0.9 m (BH5), 1.6 m (BH6), 1.2 m (BH7) and 2.1 m (BH8) below the surface. Free water was observed at BH8 on the tip of the hand auger at 1.7m depth with the groundwater table measured to be 2.1 m below the surface post drilling, potentially indicating the presence of a slightly perched groundwater table in the vicinity of this borehole location.

Analysis of groundwater samples taken from BH3 and BH5 found differing groundwater characteristics. Groundwater at BH3 demonstrated low electrical conductivity (136 uS/cm), chloride (17 mg/kg) and sulfate as SO_4^{2-} (28 mg/kg) whereas groundwater at BH5 demonstrated elevated electrical conductivity (4580 uS/cm), chloride (761 mg/kg) and sulfate as SO_4^{2-} (1350 mg/kg).

A bore census was undertaken in November 2020 by Jacobs as part of the Hunter Power Project EIS – Groundwater Assessment (Jacobs, 2021a) and the bores in the vicinity of the Hunter Power Plant had groundwater levels ranging from approximately 1.0 m below the surface to 8.0 m below the surface. Geotechnical investigations undertaken for the HPP found groundwater at depths between 2.5 m below the surface and 3.3m below the surface at the compressor station and delivery station locations (Jacobs, 2021b).

Groundwater Dependent Ecosystems (GDEs) are discussed in **Section 7.5** of this EIS.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- BOM Rainfall Gauges
- Wetlands
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- JGN Offtake Facility
- Access Tracks
- Railway
- Roads

Strahler Stream Ordering

- 1
- 2
- 3
- 4
- ≥ 5

FIGURE 7.9

Surface Water Features and Catchments

Image Source: ESRI Basemap (2021) Data source: NSW DPI (2013); Umwelt (2021)

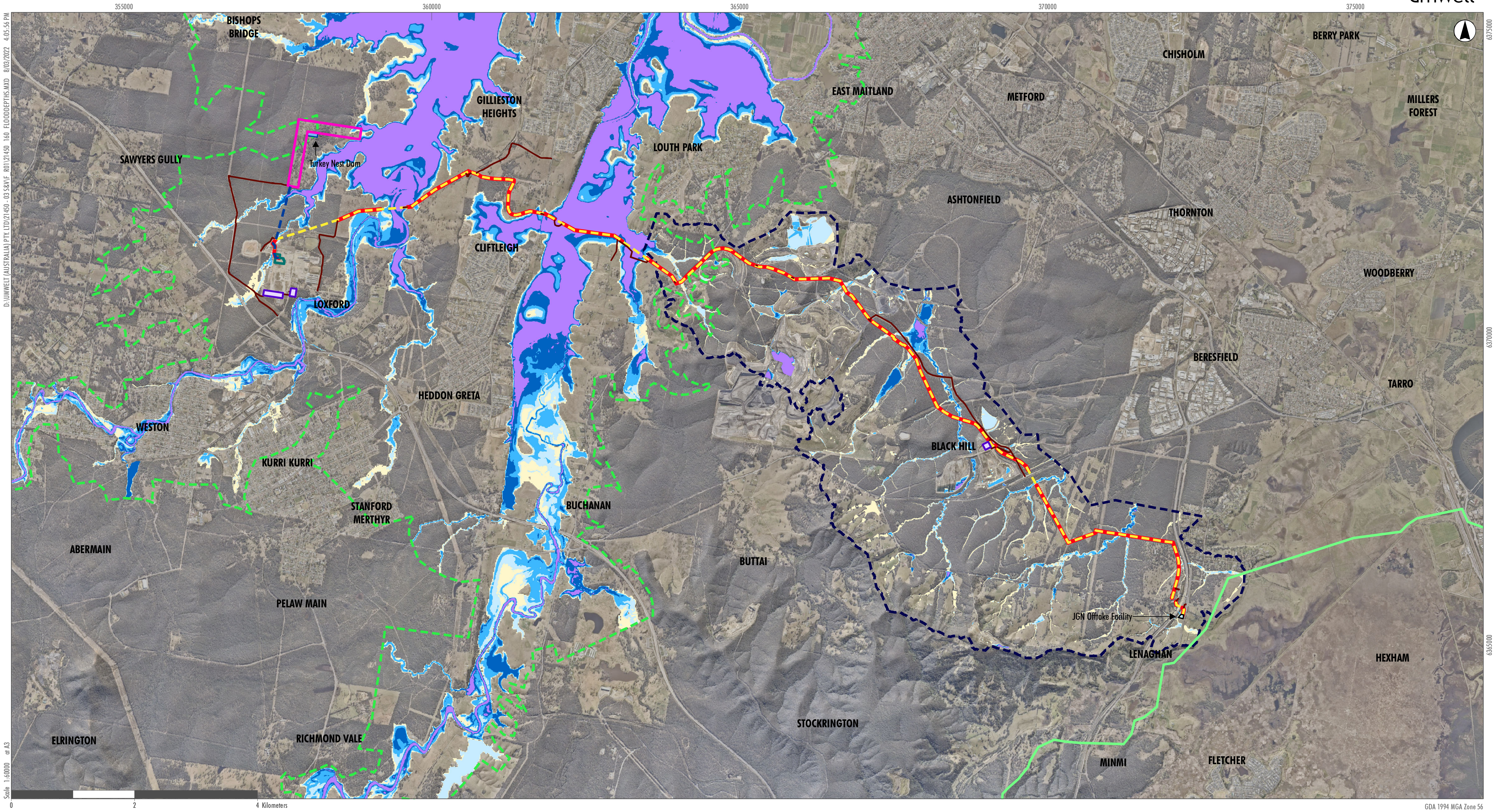
7.4.1.3 Flooding

The 1% AEP flood depths for existing conditions are shown in **Figure 7.10** with the peak 1% AEP flood velocities for existing flooding conditions are shown in **Figure 7.11**.

The greater extent of flood inundation across the Project area is associated with Buttai Creek, Wallis Creek and Swamp Creek. These watercourses have significantly greater contributing catchment areas than the eastern watercourses. The greatest width of continuous inundation at the 1% AEP level is at the Buttai Creek – Wallis Creek floodplain crossing, where the Project alignment traverses approximately 2,050 m of inundated floodplain. Swamp Creek is located at a narrower section of inundated floodplain just upstream of the broader Wentworth Swamp water body.

Typical peak flood velocity within the watercourses is in the range of 1-2 m/s, with typically lower flood velocity on the floodplain area beyond the riparian corridor. In the lower floodplain areas of Buttai Creek, Wallis Creek and Swamp Creek flood velocities are typically lower associated with the broader extent of flooding and higher flood depths.

The majority of flood inundation in the eastern section of the Project area is typically confined within narrow extents along the minor watercourse alignments. This may be expected given the relatively steep topography for these streams, generally located in the upper reaches of the catchment.



umwelt

Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Wallis and Swamp-Fishery Creek Flood Study Model Domain
- Umwelt Model Domain
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks

Water Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- > 3.0

FIGURE 7.10

1% AEP Flood Depths for Existing Conditions

Image Source: Nearmap (Aug 2021) Data source: WMAwater (2019), Umwelt (2021

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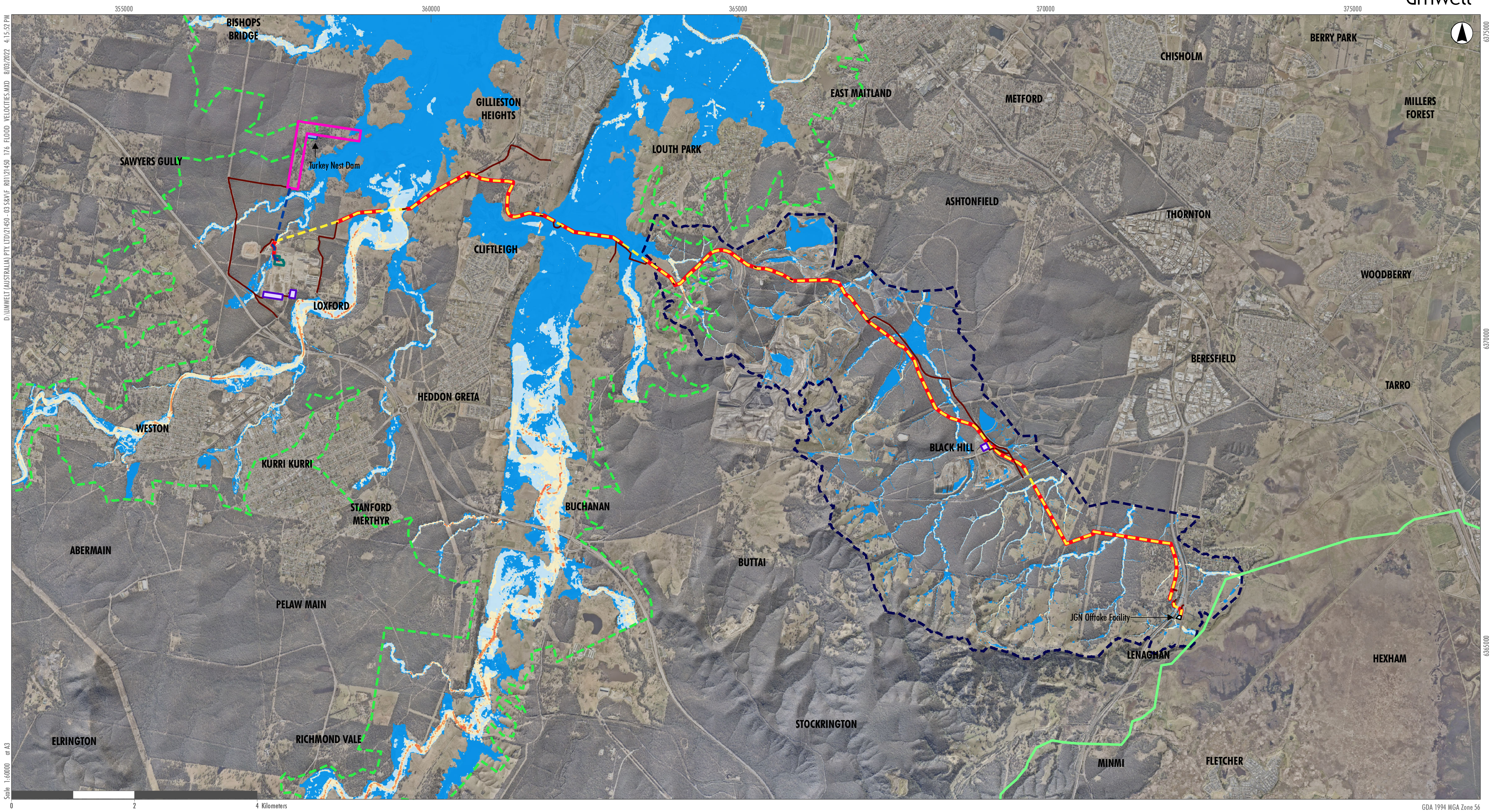


Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Wallis and Swamp-Fishery Creek Flood Study Model Domain
- Umwelt Model Domain
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks

Water Velocity (m/s)

- 0 - 0.5
- 0.5 - 1.0
- 1.0- 2.0
- 2.0 - 3.0
- > 3.0

FIGURE 7.11

1% AEP Flood Velocities for Existing Conditions

Image Source: Nearmap (Aug 2021) Data source: WMAwater (2019), Umwelt (2021

7.4.2 Methodology

The methodology for the Water and Hydrology Assessment involved:

- desktop review and analysis of existing information to enable an understanding of the current hydrological environment and to identify potential waterway-specific risks, within the context of existing statutory procedures and protocols that may influence the project design, construction and operation
- qualitative assessment of the quality and quantity of pollutants that may be introduced during construction and operation of the Project, and the impact that this may have on surface water quality (with reference to the ANZG (2018) Water Quality Guidelines and with regard to relevant environment values as identified in the DECCW (2006) NSW Water Quality and River Flow Objectives)
- fieldwork during October 2021 to assess the condition of the proposed waterway crossings and to inform the parameters adopted in the flood modelling
- high-level flood modelling to define existing flood conditions in watercourses traversed by the Project corridor where no existing flood studies have previously been undertaken (i.e. the alignment east of KP 11.2)
- qualitative assessment of potential impacts to flooding and hydrology as a result of construction and operation of the Project
- recommendations for appropriate mitigation and management measures.

Further detail regarding the methodology can be found in **Appendix 7**.

7.4.3 Assessment of Impacts

7.4.3.1 Water supply and storage

Non-potable water will be required during the construction phase for dust control of the construction ROW and access tracks (with the quantity dependent on conditions and proximity to sensitive receptors), as well as for hydrostatic testing of both pipelines during construction.

The estimated Project water usage is:

- Dust control – approximately 110 kL/km for each pipeline, or approximately 5 ML in total
- Hydrotesting – approximately 23 ML, if water cannot be reused between test sections of the storage pipeline
- HDD operations for mixing of drilling fluids – approximately 0.146 ML per 100 m of HDD (total HDD length 3,200m) or approximately 5 ML in total.

The total estimated water volume required for the construction phase of the Project is 33 ML.

Water will be obtained from a non-potable water service provider or existing landholders with available allocations. Existing clean water supplies include dams on the Bloomfield Mine leases, the Stony Pinch and Buttai reservoirs operated by Hunter Water Corporation, reticulated municipal supplies to the former Hydro Aluminium site or local watercourses. All water use would occur under agreements and/or licences/permits with relevant landholders and authorities.

Hydrotesting of the transmission, interconnect and storage pipelines, will require water storages to be constructed near the break point of each hydrotest section. Water storages are likely to be break tanks located on the ROW near the centre of the transmission pipeline, near the compressor station (if the existing reticulated water supply to the former Hydro smelter is used as a water source), and a 1.2 ha turkeys nest dam to be located near the centre of the storage pipeline construction footprint. The turkeys nest dam may be retained following construction.

In the event of construction occurring during severe drought, measures will be employed to avoid increasing demands on local water supplies. Alternative sources of water may include transport from non-drought affected areas, groundwater or other supplies of non-rainfall-dependent water.

No water use or storage will be required during the operation of the Project.

7.4.3.2 Water Quality

Construction activities have the potential to result in soil erosion and sedimentation of downstream waterways and impact the surface water quality of watercourses within the Project area if management measures are not implemented, monitored and maintained. More specifically, water quality impacts may occur as a result of:

- soil erosion and sedimentation caused by vegetation removal and earthworks which increases sediment load in downstream waterways negatively impacting habitat quality for aquatic life and organisms, and increasing turbidity and decreasing water clarity
- disturbance of acid sulfate soils which can lead to significant impacts downstream including adverse effects on downstream aquatic ecosystems and water quality, and damage to structures
- open trenching of ephemeral watercourses, including establishment of temporary flow diversions
- movement and use of heavy vehicles resulting in generation of dust and an increase in ground disturbance
- potential spills and runoff of ‘drilling mud’ from HDD at creek crossings which can increase sediment load in downstream waterways
- release or discharge of water used for hydrostatic testing, potentially releasing contaminants or increasing erosion
- direct disturbance to the bed and banks of Wallis Creek during construction of the proposed culvert crossing.

These potential impacts are considered unlikely and/or temporary and would be managed through the implementation of proposed erosion and sediment controls and other identified management measures (refer to **Section 7.4.4**). A surface water quality monitoring plan has been recommended for implementation during construction and operation of the Project to monitor water quality and confirm that controls are working effectively.

Water from hydrotesting will be released onto adjoining land with appropriate slope, soil and groundcover characteristics to minimise erosion and sedimentation. Water release will occur through a dewatering structure designed to slow the flow of water. As the Project design assumes that the storage pipeline will be unlined, a turkeys nest dam is proposed adjacent to the storage pipeline construction footprint to provide for water transfer between the storage pipeline test sections and to allow for the storage and management of water containing millscale (iron oxide) at the completion of hydrotesting.

Operational impacts on surface water would be minimal as there will be no ongoing ground disturbance and all exposed areas would be rehabilitated and landscaped following construction. There will be no water discharged during the operation of the Project.

7.4.3.3 Groundwater

Impacts to groundwater resources including bore users are not expected for most of the Project area as the groundwater table is deep and unlikely to be intercepted during construction. However, shallow groundwater in the vicinity of Wallis Creek and Swamp Creek (**Section 7.3.3**) increases the risk for groundwater impacts to occur, particularly associated with contamination caused by spills and leaks from machinery during construction.

The potential to intercept the groundwater table during construction is primarily limited to trenching for the transmission pipeline between Wallis Creek and Buttai Creek. APA has advised that the depth of cover for the transmission pipeline between Wallis Creek and Buttai Creek is likely to be between 900mm and 1,200 mm, given the slow velocity of floodwaters would not justify a greater depth of cover. As such, trench excavation to a depth of around 1.6m is plausible between Buttai Creek and Wallis Creek to allow for bedding material and the diameter of the transmission pipeline. If groundwater levels are elevated at the time of trenching, similar to those recorded by RCA during January 2022, then some inflow of groundwater into the trench is plausible.

APA have further advised that shallow concrete pad foundations for the JGN offtake facility, compressor station and delivery station are not expected to be deeper than 1.8m, which will be above known groundwater depths in the vicinity of these sites. Similar to HPP infrastructure, deep piling up to 18m depths for the heaviest components of the compressor station and delivery station is likely to be required given the presence of alluvial sands beneath the former Kurri Kurri aluminium smelter site.

To mitigate the contingency that shallow groundwater is encountered during construction works, a controlled dewatering procedure will be implemented as part of the CEMP. This procedure will address testing and, if required, treatment of trench water to ensure water quality standards are met, applying inlet filters or screens on water uptake hoses, supporting inlet hoses above the sediment layer in the water to minimise sediment uptake and discharge directly to stable, low gradient areas. With implementation of this procedure the risks to groundwater quality from the Project are expected to be low and unlikely to cause significant or long-term impact to groundwater resources, including bore users.

All trenching and backfilling between Buttai Creek and Wallis Creek has been proposed to be completed within three days which will minimize the time for both shallow groundwater influx into the trench and exposure of potential acid sulfate soils.

Given the typically elevated groundwater salinity and low permeability of the sediments within the Project area, the alluvial water source is considered locally as a less productive water source based on the *NSW Aquifer Interference Policy* classification (Department of Primary Industries, 2012). Notably, shallow groundwater associated with the Wallis Creek floodplain demonstrated elevated conductivity, chloride and sulphate when sampled during January 2022. During both the construction and operational phases, the Level 1 minimal impact considerations of the NSW Aquifer Interference Policy are met.

No impacts to groundwater are expected during operation and therefore the Project meets the Level 1 minimal impact considerations of the *NSW Aquifer Interference Policy*.

7.4.3.4 Flooding and hydrology

Potential impacts on flooding regimes are typically related to changes to existing flow distributions and/or loss of temporary flood storage. The Project is expected to have no significant impact on existing flooding given that:

- the transmission, interconnect and storage pipelines are buried with surface disturbance reinstated to pre-existing contours across almost the entire disturbance footprint
- no permanent surface infrastructure will be located within the mapped 1% AEP flood inundation extents, providing for no obstruction to existing instream and overland flow
- there will be no material changes to existing surface topography/ground levels and therefore no change to existing flow distribution or loss of flood storage (through floodplain filling).

Accordingly, there would be no changes to flood behaviour affecting existing developments, infrastructure or flood emergency evacuation routes.

During the construction phase, minor earthworks associated with access road construction, temporary waterway crossings and diversions, pipeline construction and trenching, site construction facilities and materials storage have the potential to interact with surface water in the event that a flood occurs. Given the scale of potential temporary works in the riparian corridors relative to the broader floodplain at each waterway crossing, impacts of temporary works would be localised to within or in near the vicinity of the construction footprint.

The CEMP to be implemented as part of the Project would consider the extent and nature of temporary works, including equipment storage, with respect to the flood risk described by the mapped inundation extents, flood depth, velocity and hazard. In addition, the HDD pad on the eastern bank of Wallis Creek is proposed to be relocated outside of the 50% AEP to reduce the risk of flooding impacting on construction works.

Given that very minor changes to vegetation cover, impervious surfaces and drainage channels are proposed relative to the size of the overall catchments, the potential impacts to hydrology as a result of the Project are considered to be negligible.

Furthermore, no impacts from changed flood conditions are anticipated as most infrastructure required for the Project is buried and surface infrastructure has been positioned significantly above the 1% AEP flood level.

7.4.4 Management Measures

Measures presented in **Table 7.6** will be implemented to manage and mitigate water resources impacts during various stages of the Project.

Table 7.6 Water resources management measures

No	Measure	Timing
WA01	Water management measures consistent with the APGA Code of Environmental Practice (2017) will be employed during the construction of the Project.	Planning Construction
WA02	Records will be maintained of the source and volume of water used during construction.	Construction
WA03	The following measures will be applied to all open trenched watercourse crossings, including special crossings: • Where practicable, crossings will be perpendicular to the watercourse. • The transmission pipeline ROW width for open trenched watercourses, including special crossings, will be reduced to 20 m between the banks of the watercourse.	Construction

No	Measure	Timing
	• Where practicable, crossings will be constructed during no or low flow conditions. • Crossings will maintain a minimum vertical clearance between the hard invert of the watercourse and the top of the pipeline of 1.5 m. • Flow diversion measures will be installed where construction of crossings during no flow conditions is not feasible. Flow diversion measures may include pumps to enable water to be moved from one side of trench to the other, screened inlets to minimise the entrapment of aquatic fauna and outlet structures that are designed to avoid scouring of the channel. • Trenches between banks will be backfilled within 5 days of excavation. • All obstructions within watercourses that are installed or generated during construction will be removed as soon as practicable after the pipe has been laid and backfilled and use of any access track across the watercourse has ceased. • Material excavated from the bed of watercourses during establishment of the ROW will be stockpiled separately from other materials, outside the active channel and avoiding riparian vegetation wherever practicable and returned to the watercourse bed during reinstatement. Crossings will be reinstated such that bank stability at the crossing location is the same or better than prior to construction. Stabilising materials such as rock armouring, hydro mulch, jute matting, or other suitable geotextile materials will be applied to watercourse banks where necessary.	
WA04	The following mitigation measures will be applied to special crossings of Viney Creek and Four Mile Creek, in addition to standard mitigation measures for all open trenched watercourses: • Initial disturbance of the watercourse will be restricted to 6 m wide all weather running track. • The timeframe from the start of ROW construction to completion of reshaping to a stable landform will be 20 consecutive days. • The ROW will be reduced to 20 m between banks. • The timeframe for re-instatement including removal of running track will be five consecutive days. • Erosion and sediment control plans will be developed for each stage of each special crossing The pipeline string will be constructed outside of the watercourse.	Construction
WA05	Any large woody debris or boulders located within the construction footprint of watercourses to be trenched are to be temporarily relocated during construction and returned to the watercourse during reinstatement, at locations where scour risk to the pipeline can be avoided.	Construction
WA06	The following measures will be applied to management of trench water or bell hole water: • Discharge of trench water or bell hole water to land will only be undertaken where water meets relevant water quality guidelines and after consultation (if appropriate) with the relevant landholder. • Trench water or bell hole water will not be discharged into or within 50m of watercourses. Discharge will be to low gradient, stable, grassed areas and be undertaken in accordance with landholder requirements and so as not to cause scour or erosion. • Release of trench water or bell hole water to land will be undertaken to avoid soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids and dissipate flow will be used where required.	Construction
WA07	A Site Dewatering Procedure (to include pipeline trenches) will be prepared and incorporated into the Project CEMP, in the event that ephemeral or temporary groundwater is encountered during construction works.	Planning Construction

No	Measure	Timing
WA08	HDD will be used to mitigate impacts to Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek and Black Waterholes Creek. The final extent of HDD will be informed by further investigation of available entry and exit points.	Construction
WA09	Geotechnical analysis of crossings proposed for trenchless technology (HDD or boring) will be undertaken to inform the design of the trenchless crossing.	Construction
WA10	Potential for lateral flow of water along pipeline trenches shall be mitigated by use of appropriate means such as trench blocks (i.e. trench/sack breakers) and/or by compaction of backfilled soils. Areas with potential for lateral water flow include slopes, watercourses and floodplain areas such as Swamp Creek and Wallis Creek.	Construction
WA11	Backfilling of the trench through floodplain areas will use material excavated from the floodplain to maintain hydraulic conductivity.	Construction
WA12	A Soil and Water Management Plan (SWMP) will be prepared and incorporated into the Project CEMP.	Planning Construction
WA13	The access track crossing of Wallis Creek will be designed, constructed and decommissioned in accordance with relevant NSW guidelines and in consultation with DPIE Water.	Planning

7.5 Biodiversity

The NSW *Biodiversity Conservation Act 2016* (BC Act) aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. It establishes a framework for assessment of, and offsetting for, biodiversity impacts, as well as for investment in biodiversity conservation. The Biodiversity Assessment Method (BAM) is established under Section 6.7 of the BC Act. The purpose of the BAM is to assess impacts on threatened species and threatened ecological communities, and their habitats, and the impact on biodiversity values, where required under the BC Act.

As required by the SEARs and section 7.9 of the BC Act, a Biodiversity Development Assessment Report (BDAR) has been prepared for the Project. The BDAR assessed the biodiversity values of the Project area, the potential biodiversity impacts of the Project and documented the application of the avoid, minimise and offset framework in accordance with the BAM. The BDAR also addresses potential impacts to MNES, as identified in the EPBC Act. A full copy of the BDAR is contained in **Appendix 4** and a summary of the key findings is provided in the sections below.

To provide a conservative assessment of potential impacts on biodiversity, the predicted impacts associated with the Project represent worst-case conservative estimates and opportunities to further reduce biodiversity impacts will be explored during detailed design. APA is committed to managing biodiversity impacts during the construction and operations phase of the Project through implementation of management plans that will include controls to minimise impacts on biodiversity, refer to **Section 7.5.6**.

7.5.1 Existing Environment

7.5.1.1 Development Footprint

The Development Footprint for the Project assessed in the BDAR is consistent with the Project area as described in **Section 2.2** of this EIS which covers an area of approximately 103 ha. Much of the Development Footprint has been subject to historical disturbance by industrial development, mining and agricultural activities. The Development Footprint is intersected at several locations by connectivity barriers including the Sydney to Newcastle Motorway (M1), John Renshaw Drive and Buchanan Road.

7.5.1.2 Local Ecological Context

The lower Hunter Valley has been largely cleared of native vegetation, primarily for agriculture and other land uses such as mining and urban development. Similar land uses occur within the vicinity of the Development Footprint, which is surrounded primarily by agricultural land, coal mining operations, and some areas of urban development.

Some large tracts of vegetation remain within and surrounding the Development Footprint, notably on Lot 30 DP870411 (approved for clearing as part of the Hunter Business Park), within mining leases between John Renshaw Drive and Buchanan Road and within the buffer zone of the former Kurri Kurri aluminium smelter. Remaining remnant vegetation provides an important link in the movement of highly mobile species, from other sizeable remnants in the south and north-east of the Development Footprint. Several watercourses occur within the Development Footprint including Swamp Creek, Wallis Creek and Viney Creek and several other unnamed creeks. The Hunter Estuary occurs outside the Development Footprint, approximately 6 km to the east.

7.5.2 Methodology

The methods executed in this BDAR were undertaken in accordance with the BAM and the Biodiversity Assessment Method Operational Manual - Stage 1 (DPIE, 2020b). Further details on the methodologies used to complete this assessment are outlined in Appendix A of the BDAR (refer to **Appendix 4**).

Broadly, the methods undertaken in preparing the BDAR were:

Landscape features and site context

- desktop review of appropriate data sources in accordance with section 3.1 of the BAM

Native vegetation assessment

- literature and database review –to inform survey design and to assist in the assessment of potentially occurring threatened and migratory species, endangered populations and communities
- floristic and vegetation integrity surveys – undertaken during August, October and December 2021 and February 2022, with a total of 36 BAM plots conducted within, or in proximity to, the Development Footprint
- meandering transects – surveys on foot across the entirety of the Development Footprint other than approximately 1.14 ha at the eastern edge of the Development Footprint by Umwelt Ecologists during October 2021, conducted generally in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016)
- digital aerial photo interpretation prior to and after vegetation survey to identify spatial patterns in vegetation, land use and landscape features and used to inform field survey design and implementation, ecological assessment and vegetation community mapping
- plant identification and nomenclature standards – all vascular plants recorded or collected within plots and on meandering transects were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002). Where known, changes to nomenclature and classification have been incorporated into the results. Updated taxonomy has been derived from PlantNET (Botanic Gardens Trust 2020).

- vegetation mapping – vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata using best-practice techniques including review of digital aerial imagery and previous mapping, prediction based on an understanding of the distribution of communities and ground truthing
- Threatened Ecological Community (TEC) delineation – vegetation communities identified in the Development Footprint were compared to TECs listed under the Commonwealth EPBC Act and NSW BC Act and an assessment of similarity with the NSW Scientific Committee Final Determinations and the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice, based on full floristic plot assessments
- Plant Community Type (PCT) allocation – each of the vegetation communities described within the Development Footprint were aligned with an equivalent PCT as detailed in the VIS Classification Database (DPIE, 2021g) based on floristic, structure, soil, landform and distribution details

Threatened species assessment

- literature and database review – to inform survey design (where required) and to assist in the assessment of potentially occurring ecosystem-credit and species-credit species
- ecosystem-credit species assessment – for those threatened species that can be predicted by vegetation surrogates and landscape features and are not required to be specifically targeted during field surveys, an assessment of the suitability of habitat in the Development Footprint was undertaken to determine the species presence or otherwise in the vegetation zones identified
- species-credit species assessment – targeted and opportunistic surveys for species-credit species were undertaken across the Development Footprint during flora surveys as listed in Table A2 of Appendix A of the BDAR (refer to **Appendix 4**).

Weather conditions assessment

- using data derived from the Maitland Airport weather station (061428) from the Bureau of Meteorology (BOM) (2022).

Property access was restricted for approximately 1.14 ha at the eastern edge of the Development Footprint and in other areas by current property owners. Consequently, seasonal targeted surveys, the use of call playback and nocturnal spotlighting methods, and vegetation mapping could not be completed in some areas. In these instances, vegetation mapping was completed using the best available data from regional vegetation databases. For species-credit species that were not adequately surveyed within the appropriate seasonal period, the BDAR has assumed their presence under the BAM for the purposes of generating offset liability despite the low likelihood of these species occurring. Areas that were not subject to any surveys and those that were partially surveyed are shown in Figure 1.4A to H in **Appendix 4**.

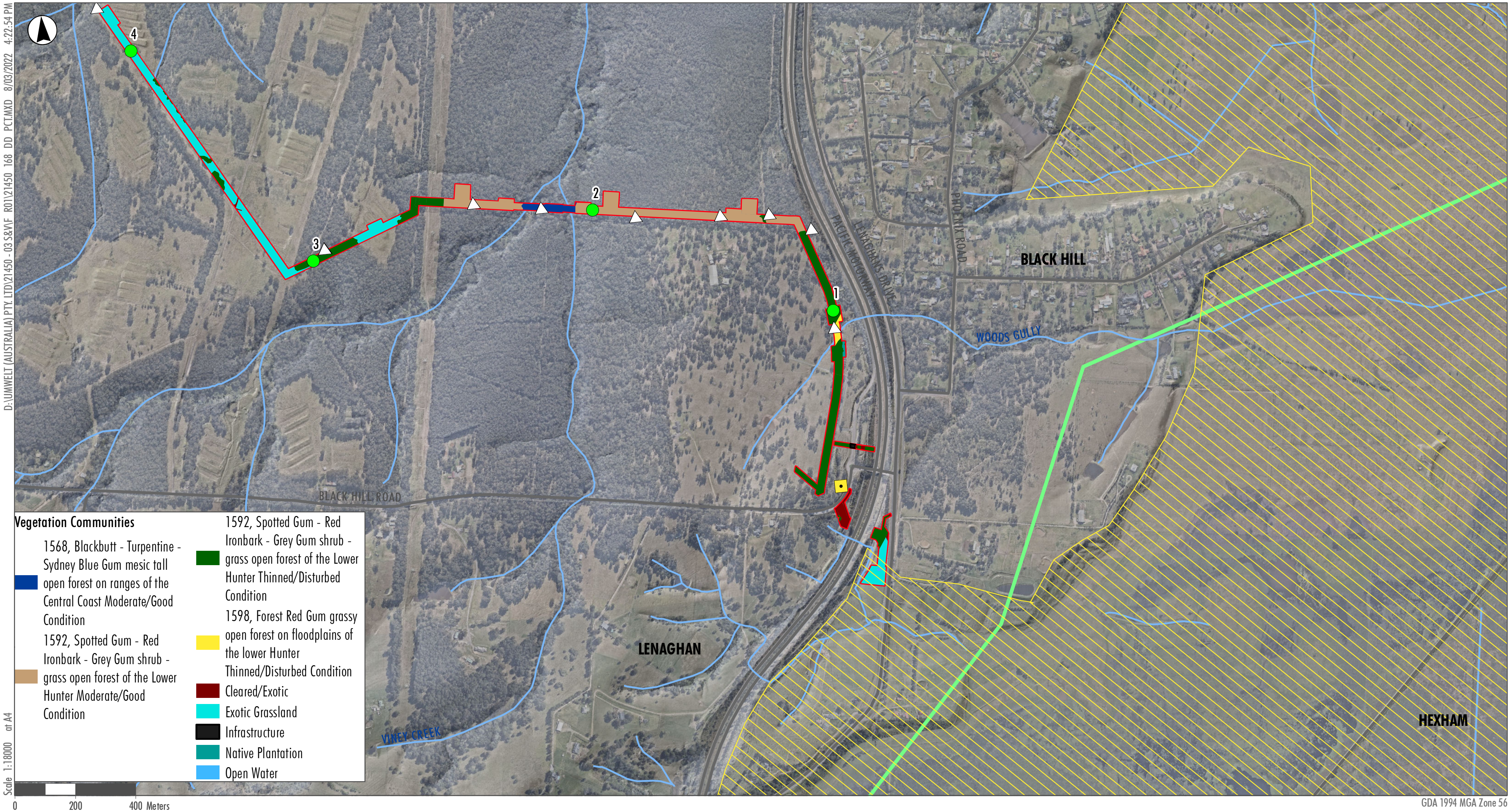
7.5.3 Biodiversity Assessment Results

7.5.3.1 Landscape Features

In accordance with the requirements of the BAM, landscape features within a 1,500 m buffer of the Development Footprint have been mapped surrounding the Development Footprint. This 1,500 m buffer area contains a mixture of forested areas from regrowth to intact, as well as infrastructure and residential and mining areas. These landscape features are outlined in relation to the Development Footprint in **Table 7.7** below and shown on **Figure 7.12A to 7.12H**.

Table 7.7 Landscape features

Feature	Description
IBRA Bioregion	Sydney Basin
IBRA Subregion	Hunter
Mitchell Landscape	Lower Hunter Channels and Floodplains Newcastle Coastal Ramp
Rivers, Streams, Estuaries	The Development Footprint intersects eight named streams being Woods Gully, Viney Creek, Four Mile Creek, Whites Creek, Elwells Creek, Buttai Creek, Wallis Creek and Swamp Creek
Wetlands (within, adjacent to and downstream)	The Development Footprint intersects Wentworth Swamps wetlands and Testers Hollow wetlands Hexham Swamp wetlands occurs approximately 2 km to the east of the Development Footprint
Native Vegetation Extent	Approximately 3,951 ha within a 1,500 m buffer of the Development Footprint (50%) – predominantly comprised of woodland areas in various conditions from regrowth to intact
Areas of Geological Significance and Soil Hazard Features	No geologically significant features identified High probability of Acid Sulfate Soils around Testers Hollow and Swamp Creek
Areas of Outstanding Biodiversity Value	None
Exotic/Disturbed Areas	Cleared areas exist within the Development Footprint, largely used for livestock grazing and supporting exotic vegetation. There are also tracks and disturbance associated with mining operations, and areas of exotic vegetation. The compressor station and delivery station are located on hardstand at the site of the former Kurri Kurri aluminium smelter.
Connectivity Features	The Development Footprint contains tracts of vegetation that may facilitate fauna movement. These have been identified in connectivity mapping. The Development Footprint is not within a Priority Investment Area or an important flyway for migratory species.



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Legend

- Transmission Pipeline Development Footprint
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Important Habitat Area - Migratory Shorebird
- Hollow-bearing Trees

Threatened Species

- Grey-crowned babbler

- Roads
- Watercourses

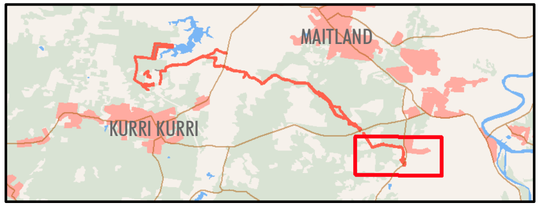

FIGURE 7.12A

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

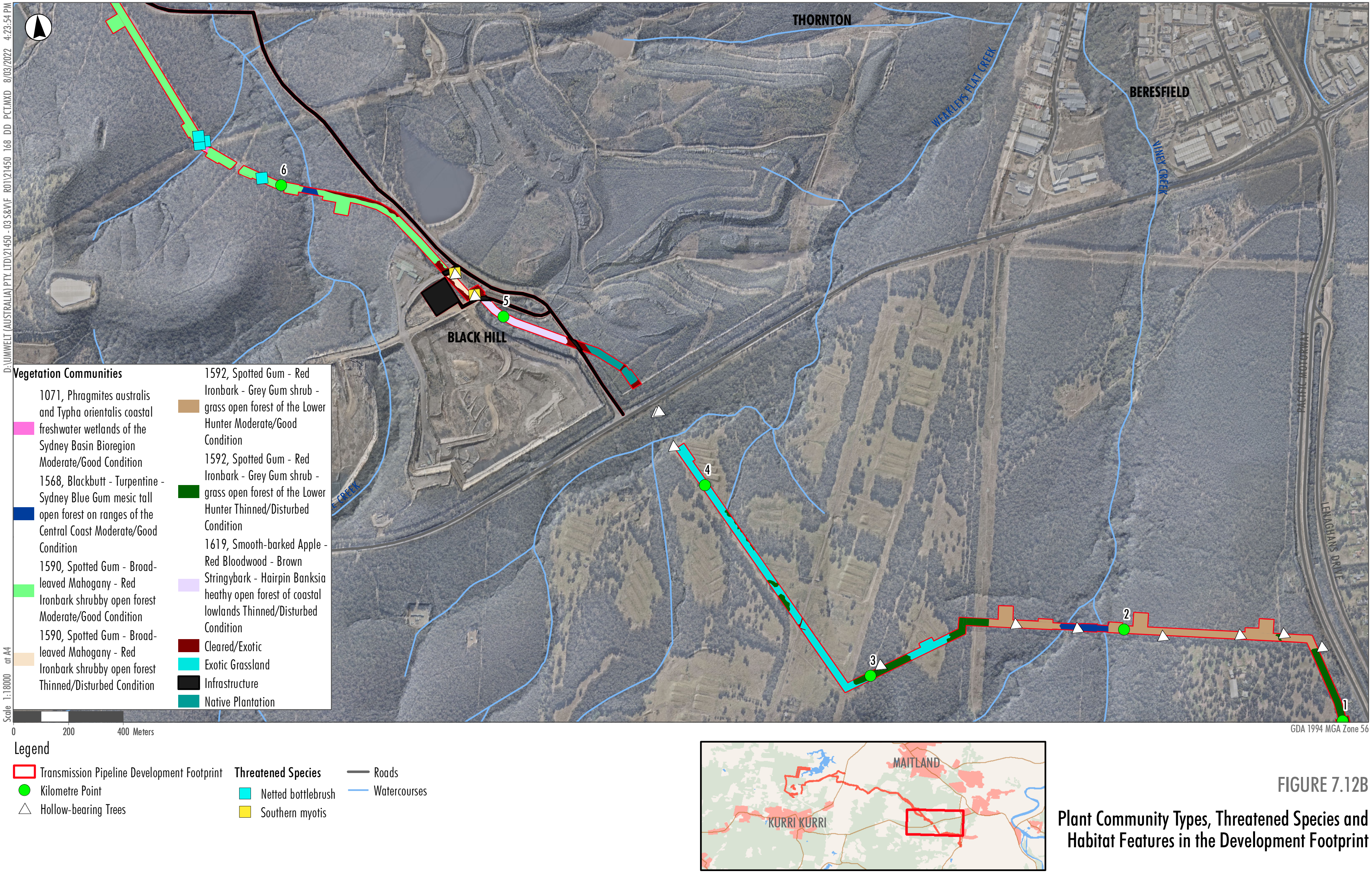

FIGURE 7.12B

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

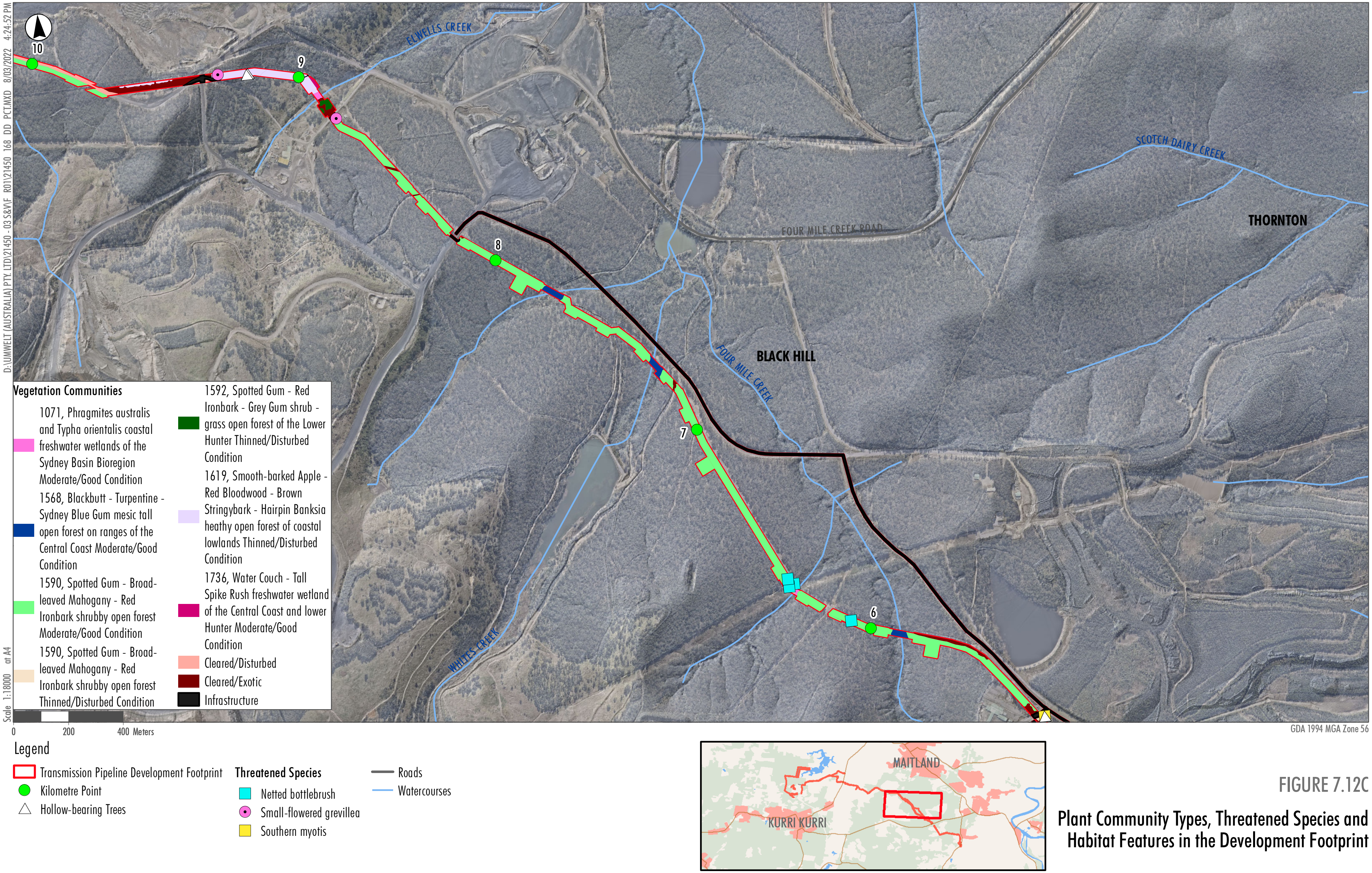

FIGURE 7.12C

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

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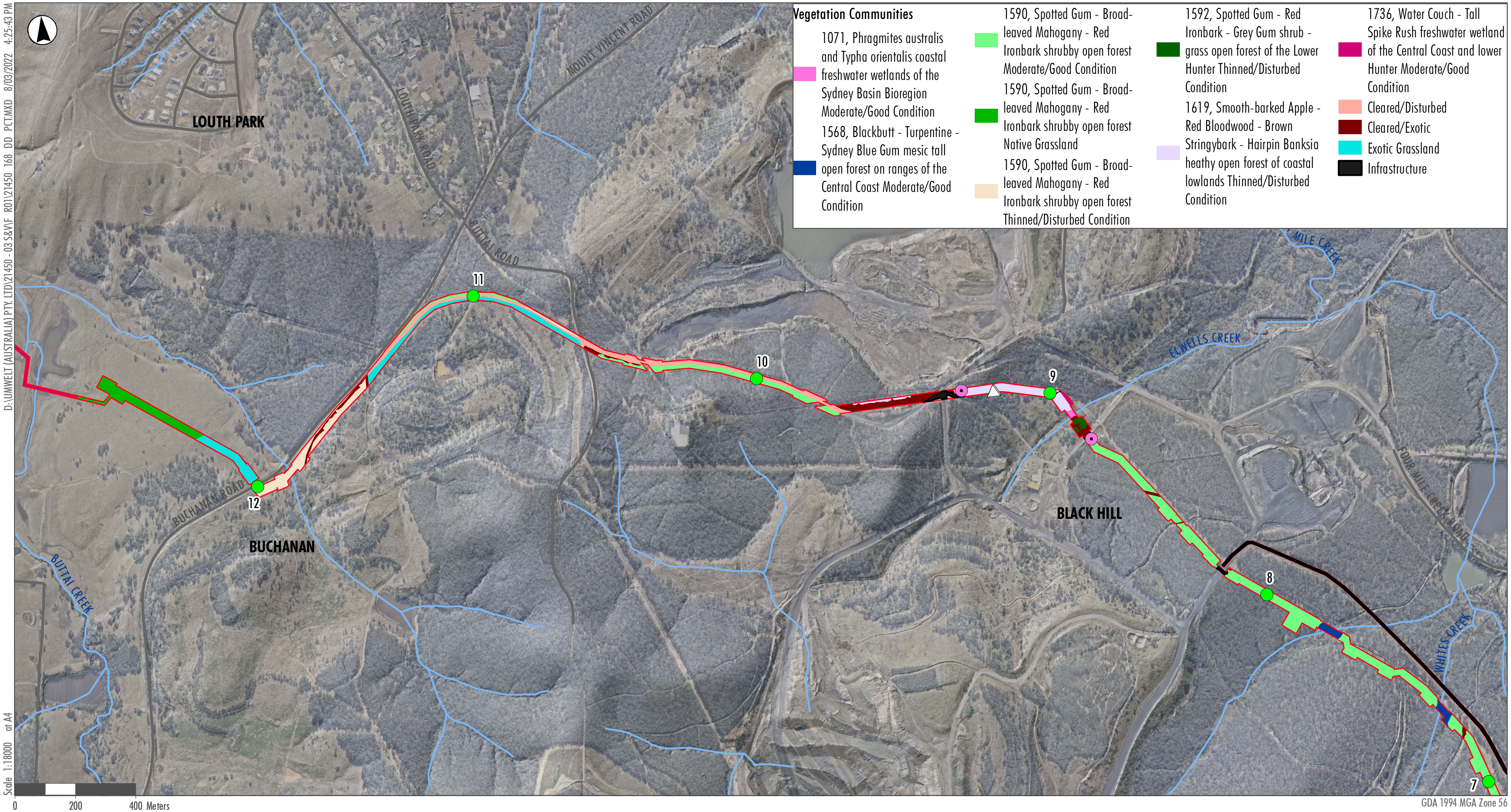

Legend

- Transmission Pipeline Development Footprint
- Kilometre Point
- Hollow-bearing Trees

Threatened Species

- Small-flowered grevillea

- Roads
- Watercourses

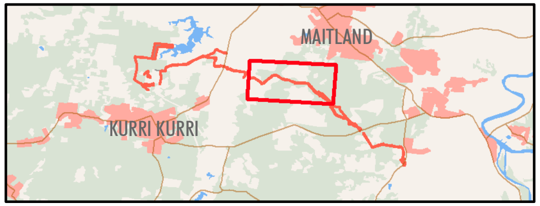

FIGURE 7.12D

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

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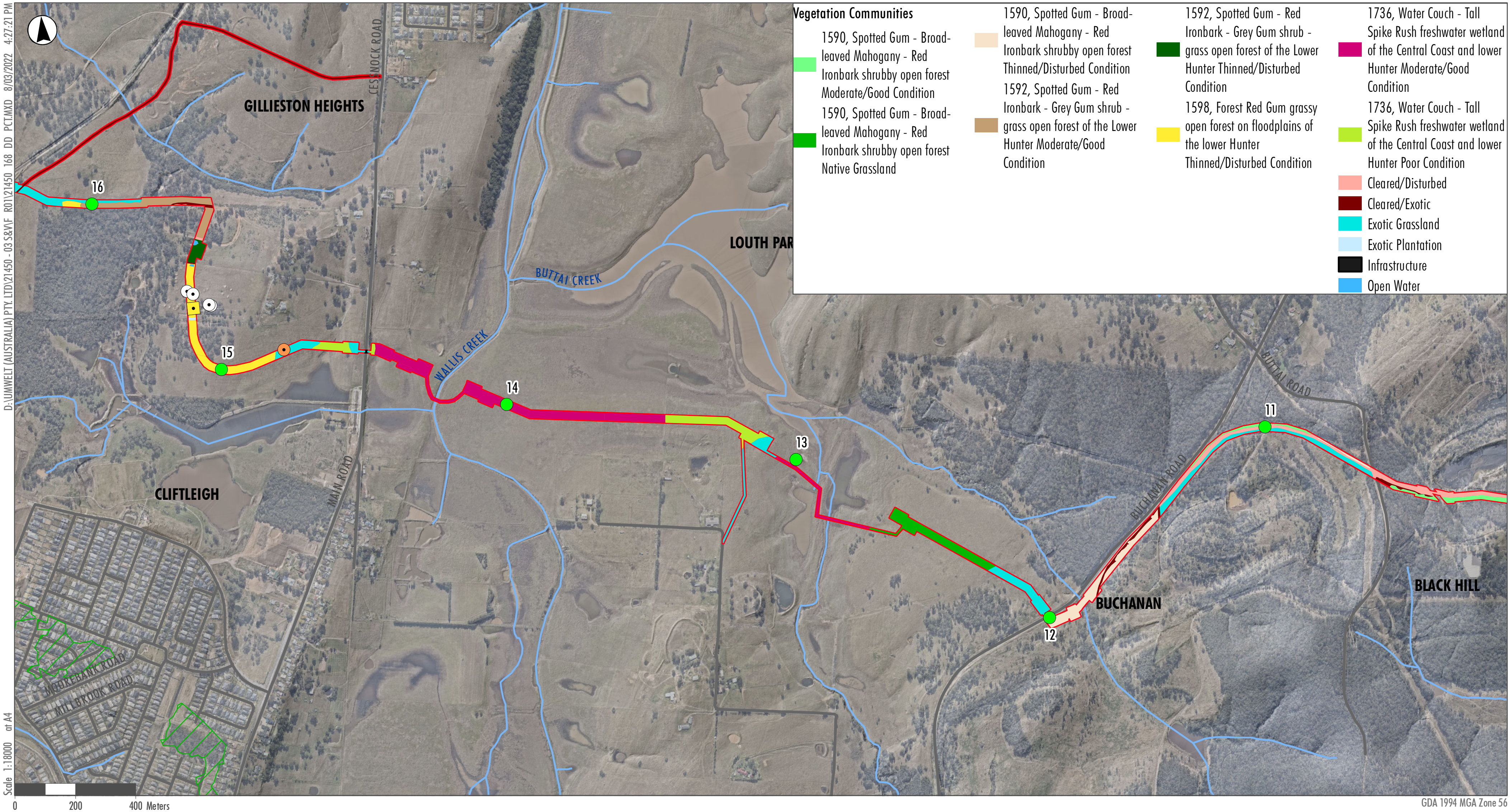

Scale 1:18000 at A4

GDA 1994 MGA Zone 56

Legend

- Transmission Pipeline Development Footprint
- Kilometre Point
- Important Habitat Area - Swift Parrot

Threatened Species

- Eucalyptus parramattensis subsp. decadens
- Grey-crowned babbler
- White-bellied Sea-eagle

- Roads
- Watercourses

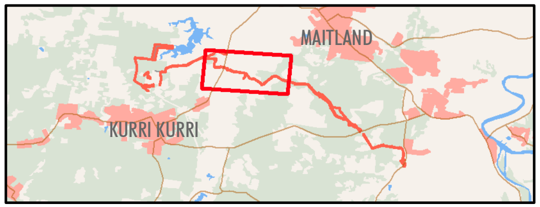

FIGURE 7.12E

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

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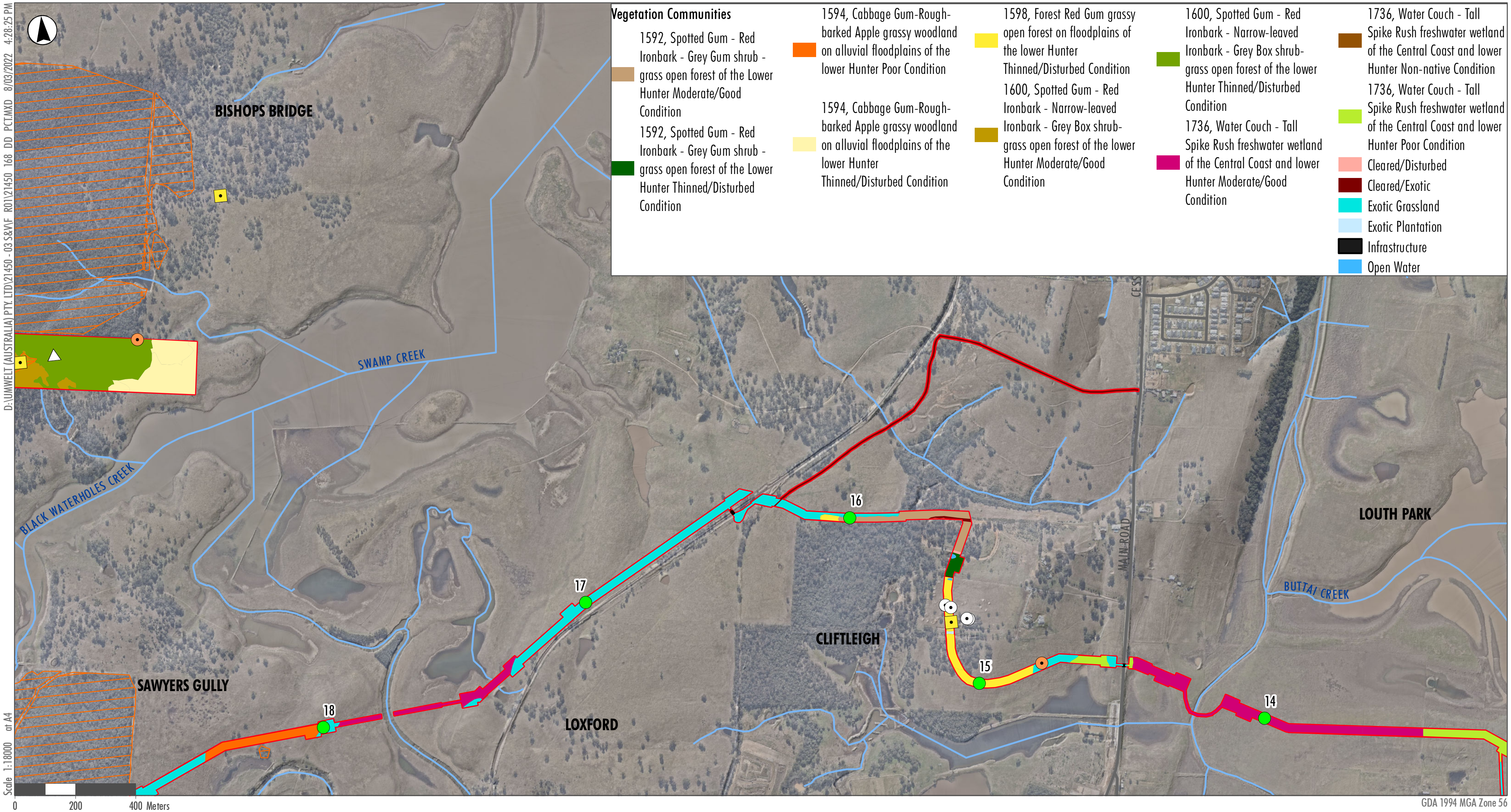


Scale 1:18000 at A4

GDA 1994 MGA Zone 56

Legend

- Transmission Pipeline Development Footprint
- Kilometre Point
- Important Habitat Area - Regent Honeyeater
- Hollow-bearing Trees

Threatened Species

- Eucalyptus parramattensis subsp. decadens
- Grey-crowned babbler
- White-bellied Sea-eagle

- Roads
- Watercourses

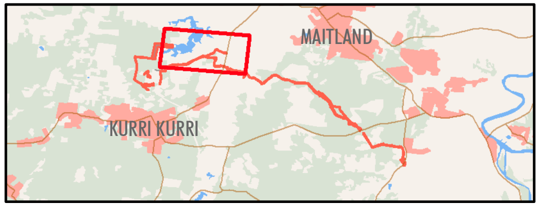
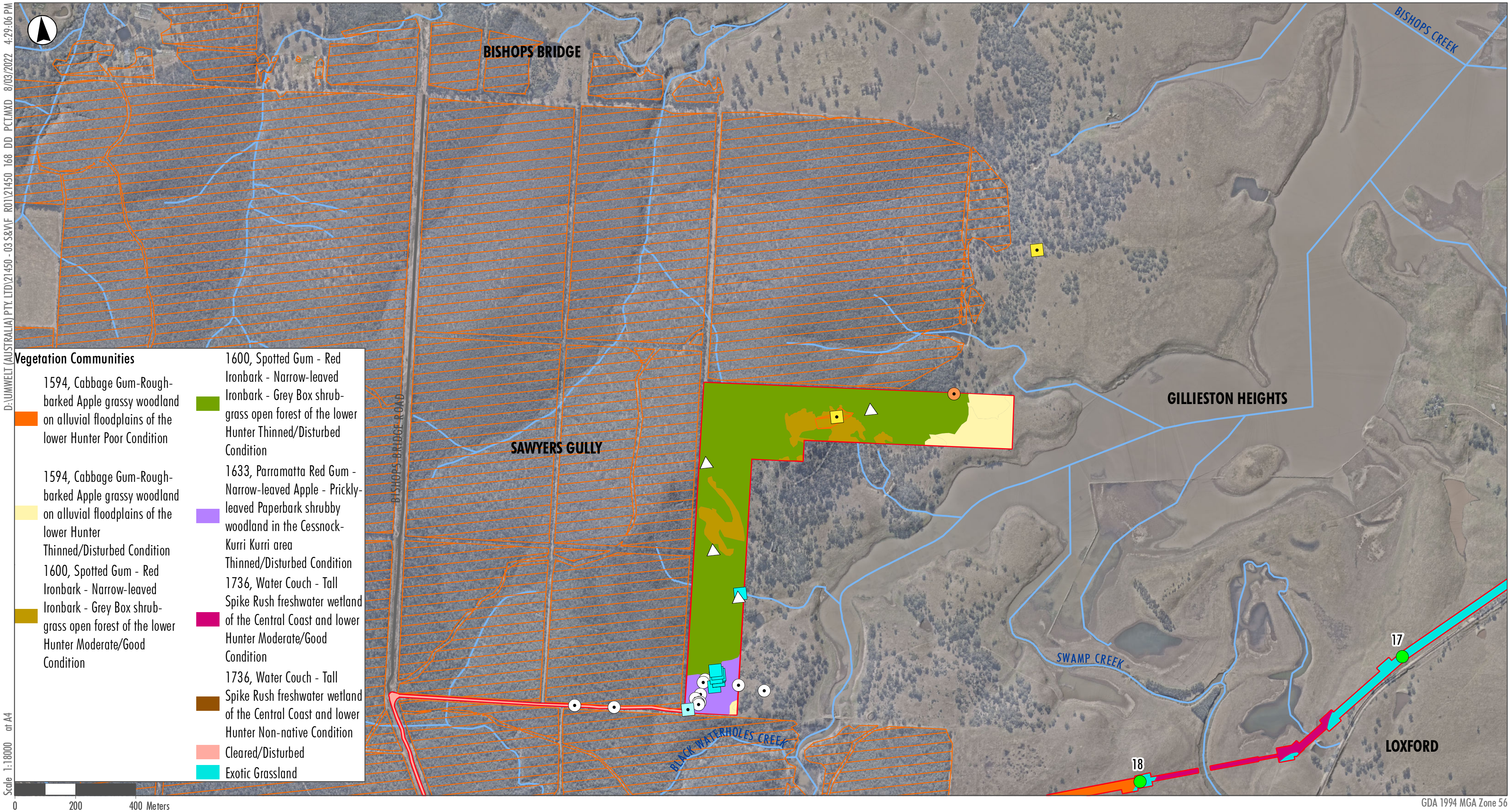


FIGURE 7.12F

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Development Footprint
- Kilometre Point
- Important Habitat Area - Regent Honeyeater
- Hollow-bearing Trees

Threatened Species

- Eucalyptus parramattensis subsp. decadens
- Grey-crowned babbler
- Little lorikeet
- Netted bottlebrush
- White-bellied Sea-eagle

- Roads
- Watercourses

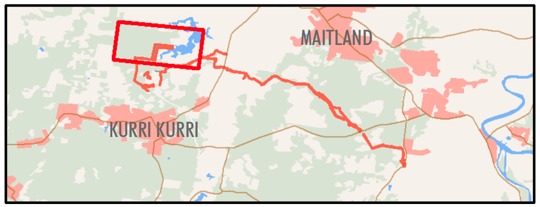


FIGURE 7.12G

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

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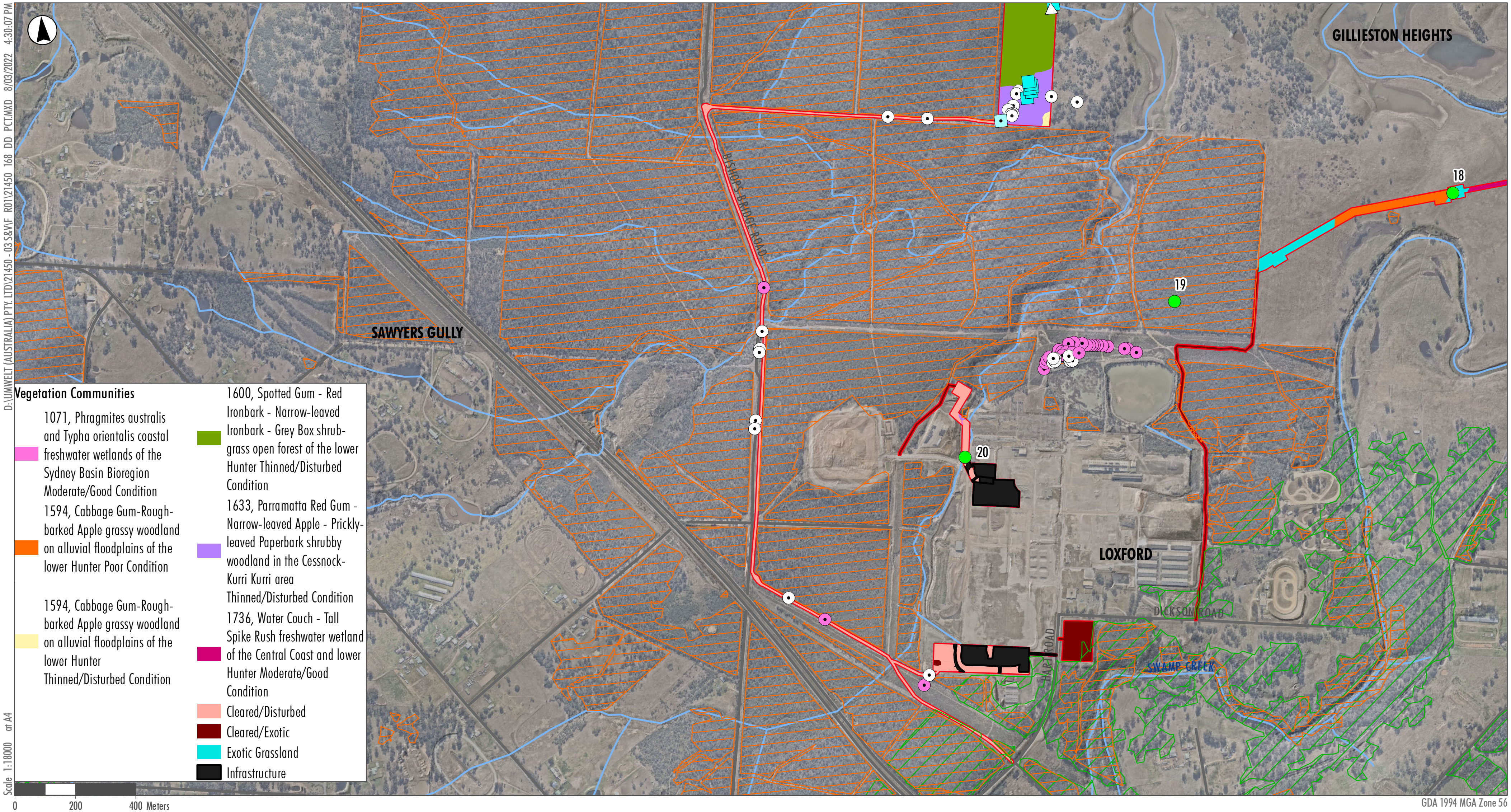


Scale 1:18000 at A4

GDA 1994 MGA Zone 56

Legend

- Transmission Pipeline Development Footprint
- Kilometre Point
- Important Habitat Area - Regent Honeyeater
- Important Habitat Area - Swift Parrot
- Hollow-bearing Trees

Threatened Species

- Eucalyptus parramattensis subsp. decadens
- Little lorikeet
- Netted bottlebrush
- Small-flowered grevillea

- Roads
- Watercourses

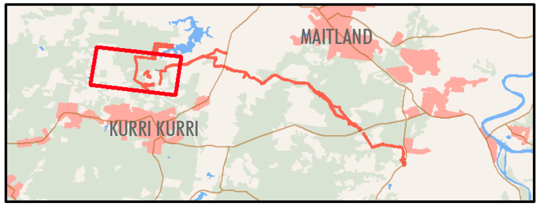


FIGURE 7.12H

Plant Community Types, Threatened Species and Habitat Features in the Development Footprint

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

7.5.3.2 Native Vegetation Assessment

Surveys of the Development Footprint identified ten PCTs, occurring in various condition states, as well as planted native vegetation. PCTs recorded within the Development Footprint are listed in **Table 7.8** below and shown on **Figure 7.12A to 7.12H**.

Table 7.8 Plant Community Types

PCT	Name	Condition	Area
1071	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	moderate/good	0.08 ha
1568	Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast	moderate/good	0.82 ha
1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	thinned/disturbed	1.62 ha
		moderate/good	10.3 ha
		derived native grassland	1.17 ha
1592	Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	moderate/good	4.57 ha
		thinned/disturbed	4.34 ha
1594	Cabbage Gum - Rough-barked Apple grassy woodland on alluvial floodplains of the lower Hunter	thinned/disturbed	3.33 ha
		poor	1.08 ha
1598	Forest Red Gum grassy open forest on floodplains of the lower Hunter	thinned/disturbed	1.53 ha
1600	Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	moderate/good	3.77 ha
		thinned/disturbed	25.27 ha
1619	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	thinned/disturbed	1.99 ha
1633	Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area	thinned/disturbed	2.48 ha
1736	Water Couch - Tall Spike Rush freshwater wetland of the Central Coast and lower Hunter	moderate/good	3.99 ha
		poor	1.28 ha
-	Planted native vegetation	-	0.59 ha

A further 10.95 ha of non-native vegetation was also recorded within the Development Footprint.

The most common PCT recorded within the Development Footprint is PCT 1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, with 25.27 ha mapped as occurring as thinned/disturbed condition and 3.77 ha as moderate/good condition. This PCT only occurs within the storage pipeline construction footprint.

Historical aerial imagery collated for the Preliminary Site Contamination Assessment (**Appendix 8**) indicates that the storage pipeline construction footprint was almost entirely cleared of vegetation between 1954 and 1976 as shown in **Photo 7.1** with grassland maintained and regrowth controlled until around 2002. As such, the most common PCT in the Development Footprint occurs primarily as regrowth and derived grassland vegetation within the storage pipeline construction footprint.

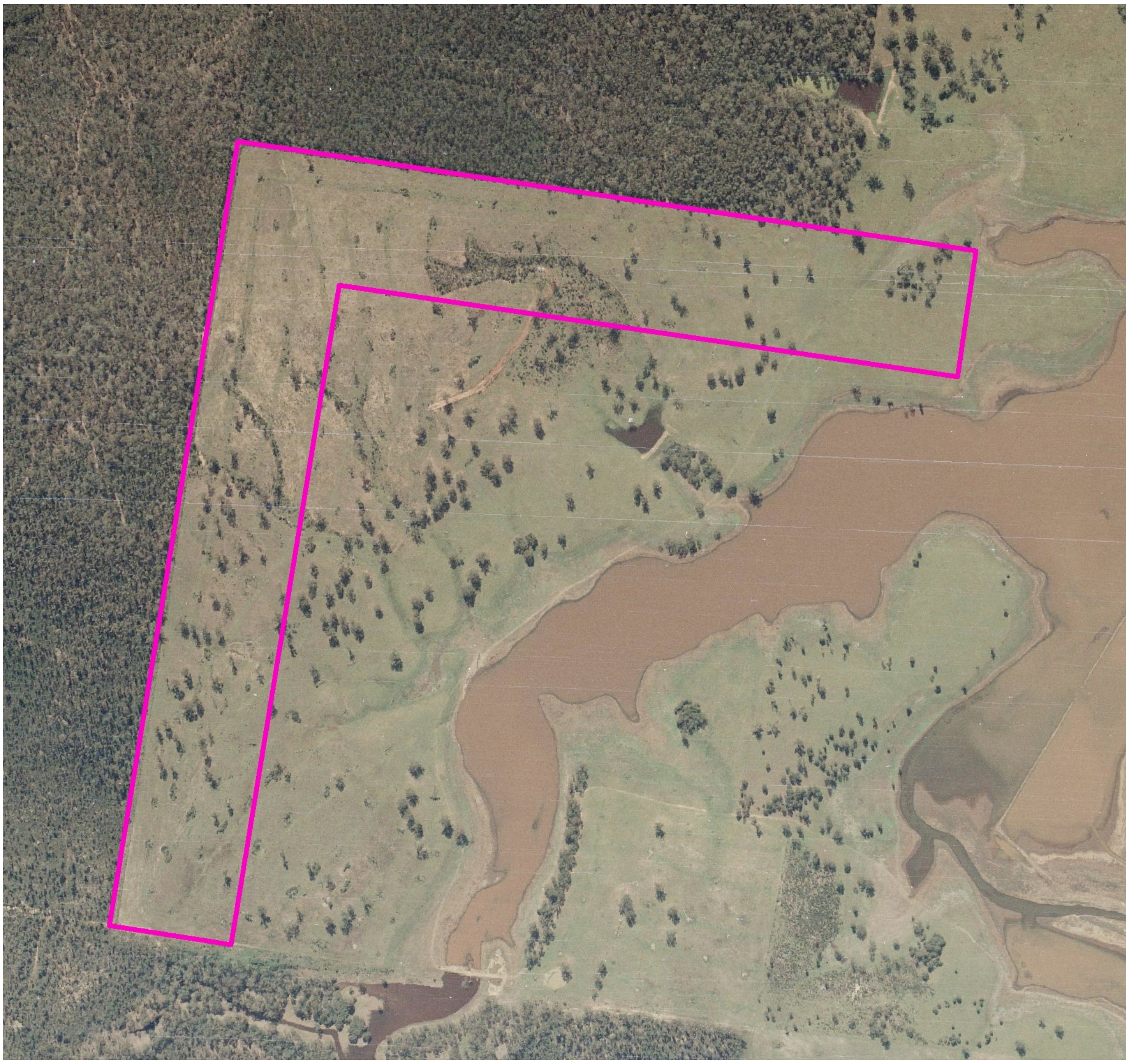


Photo 7.1 1976 aerial image showing area of storage pipeline construction footprint

Five threatened ecological communities listed under the BC Act and one threatened ecological community listed under the EPBC Act were recorded within the Development Footprint. The communities are listed in **Table 7.9** below, along with the corresponding PCTs.

Table 7.9 Threatened Ecological Communities

Act	Threatened Ecological Community	Corresponding PCTs	Area
BC Act	Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions EEC	1598	1.7 ha
	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions EEC	1590 (excluding derived native grassland) 1592 1600	49.9 ha
	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion EEC	1633	2.48

Act	Threatened Ecological Community	Corresponding PCTs	Area
	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC	1594 (excluding low quality grassland, which is not commensurate with the EEC)	1.08
	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC.	1736 (moderate/good only)	3.99 ha
EPBC Act	River-Flat Eucalypt Forest on Coastal Floodplains of southern NSW and eastern Victoria Critically Endangered Ecological Community (CEEC)	1594 (excluding areas without a canopy, which is not commensurate with the CEEC)	1.08

The majority of Lower Hunter Spotted Gum Ironbark Forest EEC is regrowth and derived grassland vegetation associated with PCT 1600 within the storage pipeline construction footprint. The Kurri Sand Swamp Woodland EEC is also located in the south-west corner of the storage pipeline construction footprint, and as such is also a regrowth community (**Photo 7.1**). The Freshwater Wetlands on Coastal Floodplains EEC predominantly occurs as common couch (*Cynodon dactylon*) grassland in grazed paddocks between Buttai Creek and Main Road.

7.5.3.3 Threatened Species Assessment

Small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) was detected within the Development Footprint with four individuals present at three locations along within the Development Footprint. A further 269 individuals of this species were recorded adjacent to an existing access track, however subsequent design refinement of the Project has avoided these individuals. This species is listed as Vulnerable under the EPBC Act and BC Act.

Netted bottlebrush (*Callistemon linearifolious*) was detected within the Development Footprint with 19 individuals recorded at two broad locations. This species is listed as Vulnerable under the BC Act.

Eucalyptus parramattensis subsp. *decadens* was detected within the Development Footprint with 15 individuals recorded at three broad locations. A further 18 individuals of this species were recorded within an earlier revision of the Development Footprint, however subsequent design refinement of the Project has avoided these individuals. This species is listed as Vulnerable under the EPBC Act and BC Act

Two woodland birds (grey-crowned babbler and little lorrikeet) and a raptor (white-bellied sea-eagle), listed as Vulnerable under the BC Act, were also recorded at several locations within or adjacent to the Development Footprint. Habitat for several species of threatened fauna is also present, as described in section 3.3 of the BDAR, including some hollow bearing trees within PCTs 1568, 1588, 1592, 1600 and 1619.

Locations of threatened species recorded in the Development Footprint are shown in **Figure 7.12A to 7.12H**.

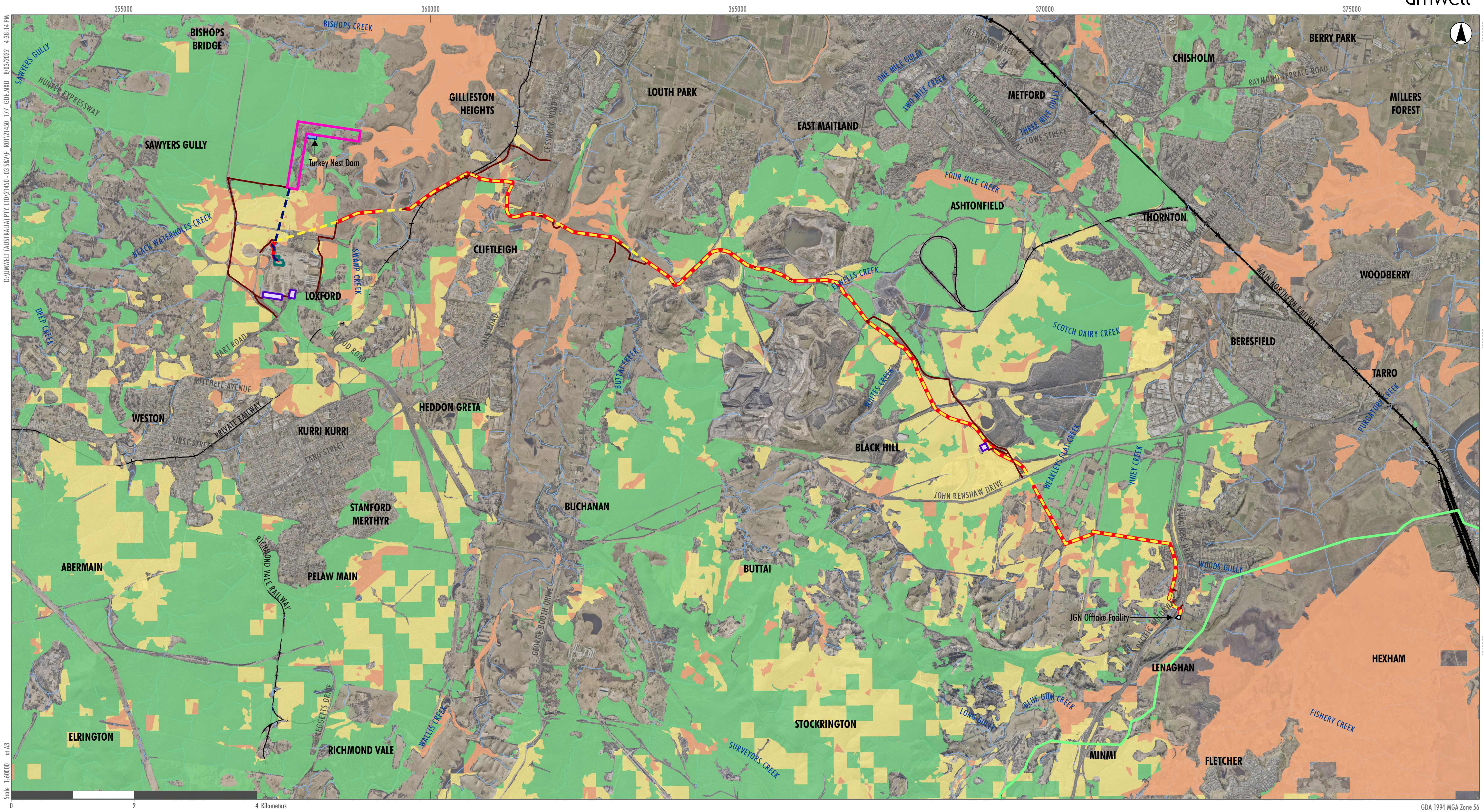
7.5.3.4 Groundwater Dependent Ecosystems

Terrestrial Groundwater Dependent Ecosystems (GDEs) mapped within the Development Footprint are situated within floodplains within the Development Footprint. The GDEs Atlas (BOM 2022) indicates that Terrestrial GDEs are associated with the following PCTs:

- PCT 1568 – moderate potential; IDE Score 10
- PCT 1590 – moderate-low potential; IDE Score 4-6
- PCT 1592 – low potential; IDE Score 6

- PCT 1594 – moderate potential; IDE Score 8-10
- PCT 1598 – moderate-low; IDE Score 3-6
- PCT 1600 – low potential GDE; IDE Score 10
- PCT 1633 – low potential GDE; IDE Score 5-7
- PCT 1736 – high potential GDE; IDE Score 5-10.

The GDE Atlas shows only one high probability GDE, being PCT 1736 Water Couch - Tall Spike Rush freshwater wetland of the Central Coast and lower Hunter, occurring within the construction footprint, as illustrated in **Figure 7.13**. This GDE predominantly occurs directly adjacent to Wallis Creek and Buttai Creek.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks
- Roads
- Railway
- Watercourses

Terrestrial GDEs

- High potential GDE - from regional studies
- Moderate potential GDE - from regional studies
- Low potential GDE - from regional studies

FIGURE 7.13

Groundwater Dependent Ecosystems (GDE)

Image Source: ESRI Basemap (2021) Data source: Bureau of Meteorology (2017); Umwelt (2021)

7.5.4 Assessment of Impacts

APA has sought to avoid and minimise biodiversity impacts through Project design by strategically locating Project components on land that has been cleared and/or disturbed, is lawfully approved for clearing for other projects, or is adjacent to existing linear infrastructure, wherever practicable. Remnant woodlands and forests within the Project area have been preferentially avoided as far as practicable, minimising the impact on biodiversity values and habitat for many of the threatened flora and fauna that have the potential to occur in the local area. Trenchless crossing techniques have been used to avoid direct impacts to key biodiversity features (such as the proposed stewardship area for Regrowth Kurri Kurri, a large population of small-flower Grevillea and mapped important habitat for the regent honeyeater) and main watercourses (Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek, Black Waterholes Creek).

The Development Footprint was also refined following threatened species searches and broad-scale PCT mapping undertaken for the BDAR to further reduce, as far as practicable, impacts on biodiversity. Further details on impact avoidance measures are provided in Section 4.0 of the BDAR (refer to **Appendix 4**).

Nevertheless, due to the nature of land-based pipeline construction, impacts to biodiversity cannot be entirely avoided, and are discussed in the following sections.

7.5.4.1 Direct impacts to native vegetation

Direct impacts of the Project include the loss of vegetation and fauna habitat as a result of clearance works and pipeline installation. The Development Footprint generally contains a low abundance of important habitat features such as fallen logs and hollow-bearing trees, due to the majority of the Development Footprint being historically cleared or disturbed for the industrial, mining and/or grazing activities.

Direct impacts to approximately 65.3 ha of native vegetation (of which 0.59 ha consists of planted native vegetation) that qualify as PCTs under the BAM are anticipated within the Development Footprint, as outlined in **Table 7.10** below. Of this vegetation, 20.49 ha is classified as moderate to good condition. This excludes 3.07 ha of moderate to good condition native vegetation (PCT 1592) on Lot 30 DP870411 that is approved for clearing and lawfully offset as part of the Stevens Group Hunter Business Park, which has been omitted from the total impact area.

The remaining 44.24 ha of native vegetation is classified as thinned/disturbed, low condition grassland, poor condition, or derived grassland. This includes 25.27 ha of thinned/disturbed PCT1600, which as described above, occurs as predominantly regrowth or derived grassland vegetation within the storage pipeline construction footprint. A further 0.59 ha of planted native vegetation associated with mining rehabilitation and 10.95 ha of non-native vegetation will be directly impacted within the Development Footprint. Approximately 17.28 ha of disturbed/cleared areas and 11.56 ha of existing infrastructure occur within the Development Footprint.

Table 7.10 Direct impacts

Biodiversity feature	Area within Development Footprint (ha)
Plant Community Type	
1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion *moderate/good*	0.08
1568 Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast *moderate/good*	0.82
1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest *moderate/good*	10.33

Biodiversity feature	Area within Development Footprint (ha)
1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest *derived native grassland*	1.62
1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest *thinned/disturbed*	1.17
1592 Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter *moderate/good*	1.5
1592 Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter *thinned/disturbed*	4.34
1594 Cabbage Gum-Rough-barked Apple grassy woodland on alluvial floodplains of the lower Hunter *poor*	1.08
1594 Cabbage Gum-Rough-barked Apple grassy woodland on alluvial floodplains of the lower Hunter *thinned/disturbed*	3.33
1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter *thinned/disturbed*	1.68
1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter *moderate/good*	3.77
1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter *thinned/disturbed*	25.27
1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands *thinned/disturbed*	1.99
1633 Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area *thinned/disturbed*	2.48
1736 Water Couch - Tall Spike Rush freshwater wetland of the Central Coast and lower Hunter *moderate/good*	3.99
1736 Water Couch - Tall Spike Rush freshwater wetland of the Central Coast and lower Hunter *poor*	1.28
Species-credit species	
regent honeyeater (*Anthochaera phrygia*)	0.46
squirrel glider (Petaurus norfolcensis)	4.5
small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)	0.35
Eucalyptus parramattensis subsp. decadens	1.15
netted bottlebrush (Callistemon linearifolious)	1.53

7.5.4.2 Indirect impacts

The Project has the potential to result in additional indirect impacts on biodiversity values of surrounding lands. Minor indirect impacts associated with noise, dust and weeds may occur during construction.

These potential impacts on biodiversity will vary depending on the type of impact, the duration and frequency of the impact and the ability of the biodiversity features to respond to these changes. However, these indirect impacts are considered to be manageable with appropriate management and mitigation measures that would be formalised through the required management plans.

No indirect impacts are expected to occur in relation to surrounding connectivity, corridors or habitat fragmentation, considering the generally narrow construction footprint, the already disturbed nature of the majority of the Development Footprint and the pipeline alignment being strategically located adjacent to existing linear infrastructure. No indirect impact zones have been identified for this assessment.

7.5.4.3 Prescribed impacts

Prescribed impacts are listed under the Biodiversity Conservation Regulation 2017 (BC Regulation) and detailed in Sections 4.1.2 and 5.2 of the BDAR.

A summary of prescribed impacts associated with the Project is provided in **Table7.11** below. No threatened entities are considered likely to be dependent upon, or may use, habitat features associated with any of the prescribed impacts.

Table 7.11 Prescribed impacts

Prescribed Impact	Potential for Impact	Justification
Impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation	Yes	Two culverts were recorded in proximity to the Development Footprint where micro-bats were detected using the structures as habitat. Targeted species surveys of these culverts will be completed in March 2022 to determine the species using these culverts and the extent of use (e.g. roosting/breeding habitat). The Project has the potential to result in indirect impacts to micro-bats using these structures in the form of excessive noise and vibration during the construction phase. Other features that have potential to provide habitat for threatened species such as karst, caves, crevices, cliffs and other geological features of significance or rocks have not been located within, or in proximity to, the Development Footprint. A 10.95 ha area of non-native vegetation is proposed to be impacted, though the area is not considered to be habitat for any threatened species or ecological communities.
Impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	No	Important connectivity and movement habitat is unlikely to be impacted by the proposed development. While the Development Footprint is largely vegetated, its current disturbed state does not provide any high-quality habitat or substantial movement habitat for terrestrial, arboreal or aquatic threatened species. The Development Footprint's location in the landscape is not conducive for fauna movement given the poor quality of much of the vegetation, and because the entirety of the Development Footprint is surrounded by tracks, roads and waterways. The development footprint is typically narrow and will be strategically rehabilitated following construction, mitigating potential connectivity impacts.

Prescribed Impact	Potential for Impact	Justification
Impacts on movement of threatened species that maintains their life cycle	No	The habitat present in the Development Footprint is largely marginal due to the relatively disturbed state of surrounding lands (agricultural, mining, industrial, urban development) and the likelihood of importance to the movement of threatened species is low. It may support the occasional movement of more mobile species such as large forest owls and micro-bats.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	No	Changes to hydrology are considered unlikely given that the transmission pipeline and storage pipeline are buried and trenchless crossings will be implemented for the most significant watercourses. Medium to long term impacts to water quality, water bodies and hydrological processes are therefore not expected to be of any level of significance in relation to threatened species, populations and communities.
Impacts of wind turbine strikes on protected animals	No	The impacts of wind turbines are not applicable to this proposed development.
Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	No	While the frequency of vehicular activity into the Development Footprint may be increased during construction, it is not considered likely that this would result in vehicle strikes on threatened species or animals part of a TEC. Once the Project has been constructed, vehicle movements will be minimal.
Uncertain prescribed impacts - unable to be reliably predicted during the assessment process or are infrequent in nature. Associated with caves, cliffs, mine subsidence and wind turbine/increased vehicle strikes	No	Based on the nature of the Project and location of the Development Footprint it is unlikely that any uncertain prescribed impacts will occur.

7.5.4.4 Serious and irreversible impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles prescribed in the BC Regulation. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW. These are impacts that:

- will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or
- will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or
- impact on the habitat of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or
- impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

An assessment of impacts to the regent honeyeater against the principles of SAII is provided in Section 5.3.1 of the BDAR (refer to **Appendix 4**) on the basis that a small area (0.46 ha) of mapped important habitat for the species occurs within the disturbance footprint of the storage pipeline.

The vegetation currently mapped in the Development Footprint as regent honeyeater important habitat consists of a small, isolated patch of remnant PCT 1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter in a moderate/good condition. The vegetation patch is surrounded by regrowth and derived grassland vegetation that comprises the majority of the storage pipeline construction footprint. Adjacent to the storage pipeline construction footprint are large areas of remnant vegetation predominantly of the same PCT, which have been deliberately avoided through Project design.

Due to the lower quality of this mapped important habitat compared to the larger areas of remnant vegetation adjacent to the Development Footprint, it is unlikely to be regularly relied upon by any population of regent honeyeater that may occur in the locality. Even though winter-flowering species such as spotted gum (*Corymbia maculata*) and red ironbark (*Eucalyptus fibrosa*) are dominant species in the patch, it is unlikely that this small area of habitat would be relied upon annually by the regent honeyeater as a foraging resource.

The species has not been recorded within the Development Footprint (DPIE 2021). The closest record of the species occurs approximately 1.5 km north-west from the Development Footprint with the majority of records occurring within the Tomalpin woodlands near Kurri Kurri, which represents the largest block of remaining natural woodland on the Hunter Valley floor. This species is known to breed in specific areas of NSW including the Tomalpin woodlands and Capertee Valley. The removal of any potential nest sites, therefore causing further population declines in a short period, is unlikely to apply to the Project.

Furthermore, given that the Project is avoiding large areas of intact, higher quality habitat within the surrounding area of the Development Footprint, known to provide winter foraging resources for the regent honeyeater, it is unlikely that the removal of 0.46 hectares of marginal habitat would be significant to the survival of the regent honeyeater, or impede its recovery.

7.5.4.5 Impacts to Groundwater Dependent Ecosystems

High probability GDEs within the Project Area are predominantly located on floodplains directly adjacent to Wallis Creek and Buttai Creek and mapped as Water Couch - Tall Spike Rush freshwater wetland. It is likely that these GDEs meet some of their water requirement from shallow alluvial groundwater within a few metres of the surface. Given the natural regime of variable surface water flows and groundwater levels in this locality, some tolerance of ground water level fluctuation by these high probability GDEs could reasonably be expected.

Crossings of Wallis Creek and Buttai Creek will be undertaken by HDD, and so surface trenching directly through these GDEs will be avoided. There is, however, some possibility of a temporary reduction in shallow groundwater levels if nearby trench excavation is undertaken during wet conditions, shallow groundwater is intercepted, and dewatering is required.

APA have committed to a reduced duration of trench excavation works in this area, with trenching and backfilling between Buttai Creek and Wallis Creek to be completed within three days. Groundwater depths recorded during January 2022 following significant flooding are also below or not significantly higher the proposed depth of the excavated trench. Therefore, it is unlikely that significant volumes of groundwater will require dewatering in this area. If dewatering is required, it is unlikely any subsequent groundwater drawdown will be ecologically significant for high probability GDEs adjacent to trenching activities given the short duration of trenching and backfilling activities.

The construction footprint also intercepts several low to moderate potential GDEs associated with open forest vegetation which may be intermittently groundwater dependent. These GDEs are typically located outside of floodplains in areas where groundwater levels are considered to be significantly deeper than construction activities, and no groundwater drawdown is expected. There is unlikely to be any impact on the groundwater resources that may be intermittently used by low and moderate potential GDEs.

Changes to surface water run-off patterns during construction that may locally affect GDEs due to changing distribution of recharge to surficial deposits and flows to alluvial aquifers and creek lines are unlikely to occur given available standard measures to transfer flows across the construction footprint. Following construction, almost all disturbed areas will be reinstated to natural contours and no significant impacts to surface water run-off patterns that may locally affect GDEs are expected.

7.5.4.6 Aquatic impacts

Aquatic habitats within the Development Footprint consist of floodplain features of Black Waterholes Creek, Swamp Creek and Wallis Creek, as well as the smaller intersecting creeks. The potential impacts on water quality are anticipated to be limited, given the nature and scale of the construction works and the avoidance and control measures implemented including HDD under significant floodplains and creek crossings.

Standard environmental management measures will be implemented and are expected to sufficiently manage any impacts. Water quality and erosion management controls will be employed to minimise the discharge of sediment and other pollutants during construction.

7.5.5 Biodiversity Offsets

A comprehensive Biodiversity Offset Strategy (BOS) will be developed for the Project in accordance with relevant NSW state legislation and/or policies, in accordance with the *Biodiversity Conservation Act 2016*. Accordingly, the offset strategy for the Project will be developed in consultation with the DPIE.

The NSW and Australian governments agree that endorsement of the NSW BOS to avoid, minimise and offset biodiversity impacts on both NSW and Commonwealth listed entities provides for the best biodiversity and streamlining outcomes. The Australian Government supports the use of the Biodiversity Assessment Method as the underpinning methodology for calculating biodiversity credit requirements.

On 22 November 2019, NSW passed an amendment to the NSW Biodiversity Conservation Regulation 2017. The amendment aligns the BOS offset rules to Australian Government requirements. The NSW BOS has requirements for retiring like-for-like credits or funding conservation actions that directly benefit the species or community impacted, and these meet the Australian Government's offsetting requirements. The NSW BOS also allows for variation rules to be used after reasonable steps have been taken to source like-for-like credits. NSW amended the Biodiversity Conservation Regulation 2017 so the variation rules do not apply to offsets required for Commonwealth listed entities for controlled actions. If the NSW approval requires biodiversity offsets for NSW only listed entities, proponents will still be able to use the variation rules for these.

To meet offsets required for Commonwealth listed entities for controlled actions under the NSW BOS, APA retains the ability to:

- retire biodiversity credits based on the like-for-like provisions in the Biodiversity Conservation Regulation 2017
- fund biodiversity conservation actions that are listed in the Ancillary rules: Biodiversity conservation actions and directly benefit the threatened entity impacted

- pay into the Biodiversity Conservation Fund, noting it is the proponent's responsibility to notify the Biodiversity Conservation Trust that their payment is for a controlled action.

The Biodiversity Conservation Trust is required to meet the Commonwealth offset requirement component in a like-for-like manner. This is by retiring like-for-like credits, by funding conservation actions that are listed in the Ancillary rules: Biodiversity conservation actions and benefit the threatened entity impacted or by funding other conservation measures approved by the NSW Minister for Energy and Environment that directly benefit the entity impacted.

It is likely that APA will acquit the majority of or all offset obligations by payment into the Biodiversity Conservation Trust.

A full Biodiversity Credit Report is included in Appendix D of the BDAR (refer to **Appendix 4**). It should be noted that a final credit report will be updated following completion of seasonal floristic surveys and targeted species-credit species surveys.

Further threatened species surveys will be conducted in areas that have been subject to access restrictions and seasonal limitations to ascertain whether additional species credits are required to offset the impacts of the Project. Until these surveys have been completed, it will be assumed that these species are present for the purposes of generating offset calculations, despite the high unlikelihood that they occur in the Development Footprint. Species that are highly unlikely to occur within the Development Footprint are discussed in the BDAR.

A summary of the key offset requirements for PCTs and species credit species recorded in the Development Footprint or assumed present (as they are highly likely to occur or mapped important habitat is present) is provided in **Table 7.12**.

Table 7.12 Biodiversity offset credit summary for PCTs and species credit species

PCT/Species-credit	Credits Required
Ecosystem Credits	
1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion *moderate/good*	1
1568 Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast *moderate/good*	12
1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest *moderate/good*	100
1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest *thinned/disturbed*	18
1592 Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter *moderate/good*	45
1592 Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter *thinned/disturbed*	75
1594 Cabbage Gum-Rough-barked Apple grassy woodland on alluvial floodplains of the lower Hunter *thinned/disturbed*	80
1594 Cabbage Gum-Rough-barked Apple grassy woodland on alluvial floodplains of the lower Hunter *poor*	9
1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter *thinned/disturbed*	31
1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter *moderate/good*	47

PCT/Species-credit	Credits Required
1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands *thinned/disturbed*	15
1736 Water Couch - Tall Spike Rush freshwater wetland of the Central Coast and lower Hunter *moderate/good*	69
Species-credit species credits – Known Impacts	
regent honeyeater (*Anthochaera phrygia*)	9
squirrel glider (*Petaurus norfolcensis*)	37
small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)	120
Eucalyptus *parramattensis subsp. decadens*	30
netted bottlebrush (*Callistemon linearifolious*)	32
Species-credit species credits – Assumed Presence	
bush-stone curlew (*Burhinus grallarius*)	371
eastern pygmy possum (*Cercartetus nanus*)	591
red helmet orchid (*Corybas dowlingii*)	676
wallum froglet (*Crinia tinnula*)	60
leafless tongue orchid (*Cryptostylis huntariana*)	450
pale-headed snake (*Hoplocephalus bitorquatus*)	680
green and golden bell frog (*Litoria aurea*)	79
green-thighed frog (*Litoria brevipalmata*)	511
Maundia triglochinoides	7
southern myotis (*Myotis macropus*)	680
barking owl (*Ninox connivens*)	81
powerful owl (*Ninox strenua*)	81
tall knotweed (*Persicaria elatior*)	79
brush-tailed phascogale (*Phascogale tapoatafa*)	601
koala (*Phascolarctos cinereus*)	302
common planigale (*Planigale maculata*)	689
austral toadflax (*Thesium australe*)	505
masked owl (*Tyto novaehollandiae*)	81
Mahony’s toadlet (*Uperoleia mahonyi*)	9
eastern cave bat (*Vespadelus troughtoni*)	900
Total	**8,163**

7.5.6 Management Measures

Measures presented in **Table 7.13** will be implemented to manage and mitigate biodiversity impacts during various stages of the Project.

Table 7.13 Biodiversity management measures

No	Measure	Timing
B01	Offsets will be secured to compensate for unavoidable impacts to biodiversity resulting from the construction and operation of the Project, in accordance with relevant offset guidelines.	Planning Construction Operations
B02	Clearing of woody vegetation will be undertaken with a suitably qualified wildlife handler present to: • Inspect habitat in advance of clearing and relocate fauna. • Advise on clearing techniques that will minimise fauna impact. Keep records of fauna interactions, as far as practicable, listing the species concerned, the nature of the interaction and its GPS coordinates.	Construction
B03	Native fauna that are to be relocated must be relocated by suitably qualified and authorised fauna handlers only. Records of all relocations will be retained in accordance with requirements of the CEMP.	Construction
B04	Cleared vegetation, which may be mulched or stored as is depending on the rehabilitation requirements for specific areas, will be: • Stockpiled separately from topsoil in windrows in a manner which facilitates respreading or salvaging, avoids damage to adjacent live vegetation and does not unreasonably impede stock or wildlife. • Stockpiled away from watercourses and not stored or felled so as to land in watercourse, where practicable. • Stockpiles will have breaks as required by the landholder for access.	Construction
B05	Welded pipe strings will be end capped to prevent fauna entry.	Construction
B06	Potential for fauna entrapment within the pipeline trenches will be minimised by: • Minimising to the extent practicable the period of time the trench is open. • Provide opportunities for fauna to exit the trench such as trench plugs or other appropriate measures, at a minimum of every 500 m. • Installation of fauna shelter devices, such as sawdust filled bags, at 250 m intervals along the trench. • Daily pre-start inspections of the open trench, and removal of trapped fauna by suitably qualified personnel as required.	Construction
B07	In the event that Koala or Grey-headed Flying-fox are discovered within the construction footprint, all mobile construction equipment in the surrounding area will cease work, excluding use of light vehicles to move staff to and from the area. Mobile construction equipment will not recommence work until a wildlife handler has removed the individual or it has been confirmed that the individual has left the workspace. Any captured individuals will be removed and relocated to nearby adjacent habitat away from the construction area.	Construction
B08	Understorey vegetation to 1.5 m high will be allowed to regenerate across the transmission pipeline ROW between Four Mile Creek and Elwells Creek, but not within 4m of the pipeline, to improve connectivity for ground-dwelling mammals, reptiles and small birds.	Operations
B09	Options for avoiding or reducing impacts to the River-flat eucalypt forest vegetation community at the north-eastern extent of the storage pipeline footprint will be investigate and implemented if feasible. Any reduction in length of the storage pipeline construction footprint may require an increase in width.	Construction

7.6 Aboriginal Cultural Heritage

The Project area is located within the traditional homelands of the Awabakal and Wonnarua people, whose history extends from the present day back many thousands of years. The Project area is also within the Mindaribba Local Aboriginal Land Council (Mindaribba LALC) boundary.

An Aboriginal Cultural Heritage Assessment (ACHA) has been prepared for the Project by Umwelt in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and in collaboration with the Registered Aboriginal Parties (RAPs). The Aboriginal heritage values (cultural and archaeological) of the Project area and surrounds was assessed (refer to **Appendix 6**) in accordance with the SEARs.

The ACHA process has involved consultation with 16 RAPs. Throughout all stages of the assessment process, the RAPs were invited to identify how they would like to participate in the Project's Aboriginal cultural heritage assessment process, including what cultural information they wanted to share to inform the assessment process, and what information (if any) should remain non-disclosed in the assessment and reporting process. Further details of the consultation process are provided in **Section 7.6.2**. The understanding of significance and the management recommendations provided by the RAPs have informed APA in its development of cultural heritage management recommendations for the Project.

A summary of the key findings of the ACHA is presented in this section with the full report provided in **Appendix 6**.

7.6.1 Existing Environment

A detailed review of the Aboriginal cultural context of the Project area and surrounds was undertaken to gain an understanding of the potential Aboriginal cultural resource that may occur within and surrounding the Project area. A full description of the Aboriginal cultural context of the Project area is included in **Appendix 6** with a summary provided below.

7.6.1.1 Archaeological Context

Based on Aboriginal Heritage Information Management System (AHIMS) data and review of previous assessments undertaken in the Project area, there are 28 previous recorded Aboriginal archaeological sites within 25 m of the study area of the ACHA. The study area defined for the ACHA is defined in **Section 7.6.2.2**. Of these sites, 26 are listed as stone artefacts and two are Potential Archaeological Deposits (PADs). Twelve of the 28 sites have either been subject to salvage and are no longer extant or can be demonstrated to be outside the Project area and therefore will not be subject to impact.

A review of previous archaeological investigations in the local area, combined with the AHIMS database results, established the following predictive archaeological model for the Project area:

- Stone artefact scatters/isolated artefacts may be present throughout the study area and are considered most likely to occur on elevated landforms and/or near level lower slopes with direct access to key water resources.

- Scarred trees may occur anywhere within the study area where mature trees exceeding 150-200 years in age remain extant, however based on the level of historical land use across the study area, it is predicted that scarred trees will be rare.
- Grinding groove sites may be present along creek lines where suitable sandstone outcrops are present, however, based on the distribution of sites of this type in the local area, this is considered unlikely.
- Burials may occur within the study area, particularly in alluvial deposits, however, based on the lack of evidence for burials in the local area, this is highly unlikely.

7.6.2 Assessment Approach

The ACHA has been prepared to satisfy the requirements of the:

- SEARs for the Project (refer to **Table 3.1**)
- *National Parks and Wildlife Act 1974* (NPW Act)
- National Parks and Wildlife Regulation 2009 (NPW Regulation)
- principles of The Burra Charter (Australia ICOMOS 2013)
- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010)
- key elements of the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010).

The approach taken acknowledged and respected that Aboriginal people have the right to directly participate in matters that may affect their heritage, and have the right to maintain culture, language, knowledge and identity.

The objective of the ACHA was to ensure that Aboriginal people had the opportunity to participate in and improve the outcomes of the assessment by:

- providing relevant information about the cultural significance and values of the Aboriginal objects and/or places within the Project area
- influencing the design of the method to assess cultural and scientific significance of Aboriginal objects and/or places within the Project area
- actively contributing to the development of cultural heritage management options and recommendations for any Aboriginal objects and/or places within the Project area
- being provided with a draft of the assessment reports and inviting comment on the drafts before they are finalised and submitted as part of this EIS.

7.6.2.1 Consultation Process

Consultation with the Aboriginal community was undertaken in accordance with the NPW Act and NPW Regulation, with reference to the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010) guidelines and in consideration of the principles of *The Burra Charter* (Australia ICOMOS 2013). Full details of the consultation process undertaken in relation to the ACHAR are contained in **Appendix 6**.

In summary, the consultation involved:

- **Stage 1:** conducting formal notification of the Project and the ACHA process and provided the opportunity for Aboriginal parties to formally register their interest in the Project. Notifications were developed and the registration of Aboriginal parties was completed in accordance with Part 5, Division 2 Clause 60 of the NPW Regulation. Sixteen parties registered an interest in the Project.
- **Stage 2 and 3:** conducting initial project description consultation, which included presenting information on the proposed Project to all the RAPs who registered an interest in Stage 1 and an expression of interest (EOI) to attend the on-site inspection. A letter providing information regarding the Project and incorporating a draft methodology for the assessment was provided to all registered Aboriginal parties on 29 July 2021, with follow up on 25 August 2021. It was requested that all registered Aboriginal parties provide comment on the proposed assessment methodology and complete an EOI to attend the site inspection. Ten of the RAPs expressed an interest to attend an on-site inspection. The Mindaribba LALC was also engaged to attend the inspection although no formal expression of interested was received.

A copy of the draft ACHA was provided to all registered Aboriginal parties in November 2021 with an invitation to review and comment on all aspects of the document. The registered Aboriginal parties were invited to comment on any aspect of the ACHA, noting that information on cultural significance and any recommendations provided from an Aboriginal cultural perspective would be documented in the final ACHA. The comments received from the RAPs are included in Appendix 1 of the ACHA (refer to **Appendix 6**). A summary of the outcomes provided by the RAPs is provided in **Section 7.6.3.3**.

APA and Umwelt would like to thank the RAPs for the participation in and contribution to this assessment process.

7.6.2.2 Study area

The study area for the ACHAR comprises a 5 m buffer around the Project area.

7.6.2.3 Desktop Review

A search of the AHIMS register was undertaken on 27 May 2021 and 14 December 2021. The extent of the search area and the search results are provided in **Appendix 6**.

There are a total of 381 sites within a broad area surrounding the study area recorded on the AHIMS database. The majority of sites (88.4%) are associated with flaked stone artefacts (including artefact scatters, isolated finds and Potential Archaeological Deposit (PAD)) with the next prevalent site type (7.9%) being grinding grooves (including grooves with artefacts and art).

To supplement the data available via AHIMS and to contribute to the understanding of the archaeological context of the study area more specifically, relevant local assessments were reviewed. Areas that have been subject to previous archaeological assessment are further discussed in **Appendix 6**.

7.6.2.4 Field Survey Strategy

The aim of the field survey was, as far as practical, to record sufficient information to satisfy Requirement 5 of the Code of Practice (DECCW, 2010) and to provide the RAPs participating in the survey with an opportunity to discuss the archaeological and Aboriginal cultural significance of the study area, and any sites/objects observed or revisited. These discussions extended to the archaeological materials that may remain below the surface of the study area.

The field survey was undertaken over four days between 18 and 21 October 2021 and covered approximately 122 ha divided into ten survey units. The survey area was larger than the proposed Project construction footprint and study area. For each survey unit, information was recorded on:

- landform
- gradient
- vegetation
- geology and soils
- identified Aboriginal resources
- levels of average ground surface visibility
- extent and type of exposures (as an indication of the potential for an area to reveal subsurface artefacts or deposits)
- any site or area of identified Aboriginal archaeological potential present
- any site or area of identified historical archaeological potential present.

Through consultation with Heritage NSW, it was determined that no test excavations were to be undertaken during this stage of the assessment. The final Project construction footprint will be determined during and post-EIS assessment as consultation, design and construction planning is further developed, therefore undertaking test excavation at this stage would risk impacting archaeological deposits that may not be subject to impacts associated with the Project.

Areas not included in the survey were:

- existing formed/surfaced access tracks within the Donaldson/Bloomfield land holdings that have been previously assessed and where the proposed tracks have been modified to the extent that there is little or no archaeological potential
- land to which access was unavailable at Lot 30 DP870411 (the proposed Stevens Group Black Hill Industrial Estate that is subject to an approved development consent and has been recently assessed for cultural heritage)
- the area of existing disturbance associated with the former smelter, currently subject to remediation works and also recently assessed as having low archaeological potential with the exception of one area (Hydro PAD 1) (refer to **Section 7.6.3**).

7.6.3 Assessment of Impacts

7.6.3.1 Survey Results

The survey attempted to identify 16 previously recorded sites within or adjacent to the study area and also identified nine new archaeological sites (two artefact scatters and seven isolated artefacts) and nine areas of archaeological potential (potential archaeological deposits - PADs) (**Figure 7.14** and **Figure 7.15**).

The results of the survey are broadly consistent with expectations based on the environmental and archaeological context of the study area. Sites identified within the study area consist of isolated artefacts and low-density artefact scatters, often in disturbed contexts and typically common in association with water resources. The main raw materials used were silcrete, mudstone and tuff. Areas of archaeological potential were typically identified on slightly elevated, low inclination landforms bordering key water courses and wetlands/swamps.

7.6.3.2 Areas of Archaeological Potential

Areas within the study area where visibility was low were assessed for archaeological potential where additional cultural heritage material may be present but were not identified during the survey, either due to low ground surface visibility or because they are present as subsurface deposits.

These areas were assessed with reference to the likelihood that sites would be present in the area (based on landform, access to resources, suitable slope and characteristics for occupation) and the level of previous disturbance. Based on the outcomes of this assessment, it is considered that most of the study area has a low archaeological potential, either as a result of the extent of disturbance or because it comprises landforms that would have been used in a transitory manner by Aboriginal people rather than being suitable for occupation. The reasoning for this is discussed in further detail in **Appendix 6**.

Areas of archaeological potential are as follows:

- KKLP PAD1 is an extension of a previously recorded site (Woods Gully) which was subject to excavation as part of the M1 Pacific Motorway project. The site was found to contain significant archaeological deposit and a conservation zone was established within the road corridor. KKLP PAD1 is assessed to have moderate to high archaeological potential, consistent with the results previous excavations in the Woods Gully site. Given the significance of the site, APA will continue to investigate options to avoid and/or minimise impacts.

- KKLP PAD2 comprises a near level mid to lower slope between Wallis and Buttai Creeks. The landform provides an elevated area above the regular inundation level of both creeks, which would be suitable for camping and provided direct access to wetland resources on the Wallis Creek floodplain. It was assessed that the area has moderate archaeological potential.

- KKLP PAD3 is located on an elevated near level lower slope to the west of Wallis Creek and north of Testers Hollow, which both provide access to permanent water and associated resources. The PAD was recorded in the same landform as an adjacent PAD (TH-PAD-01) investigated for the Cessnock Road upgrade at Testers Hollow, which is in the same environmental context. It was assessed that KKLP PAD3 has moderate to high archaeological potential.

- TH-PAD-01 Extension is a westerly extension of the PAD investigated for the Cessnock Road upgrade at Testers Hollow, located on an elevated near level lower slope that provides direct access to Wallis Creek and Testers Hollow. Consistent with the assessment for TH-PAD-01, the area is assessed as having moderate to high archaeological potential. The area is assessed as having moderate to high archaeological potential.

- KKLP PAD4 is located on an elevated section of lower slope to the north of Testers Hollow. This landform is generally consistent with TH-PAD-01 Extension, but provides access to Testers Hollow only, rather than both Testers Hollow and the Wallis Creek floodplain. It was assessed that KKLP PAD4 has moderate archaeological potential.
- KKLP PAD5 and KKLP PAD6 are located on a low elevation spur located on the eastern edge the Swamp Creek and Wentworth Swamp. The area would have provided level, dry ground for camping while also allowing for direct access to wetland resources. It was assessed that these PADs have moderate archaeological potential.
- KKLP PAD7 is located on a gently inclined lower slope to the west of Swamp Creek. The landform provides an elevated area above the high-water line of the creek, which would be suitable for camping and provided access to Swamp Creek and then to Wentworth Swamp. It was assessed that KKLP PAD7 has moderate archaeological potential.
- Hydro PAD1 was identified by AECOM (2015) to the north-west of the former Kurri Kurri aluminium smelter. Recent investigations by AECOM (2021) have concluded that this area comprises several metres of fill and construction waste from earlier construction activities. Bore logs from land contamination assessments of this area indicate that the natural soil profile beneath the fill has been extensively disturbed. An addendum proposed for the existing ACHA for the smelter site recommends that a request be lodged to the AHIMS Registrar to have the status of Hydro PAD1 changed from 'Valid' to 'Not a Site', As such, Hydro PAD1 is not considered to have archaeological potential.

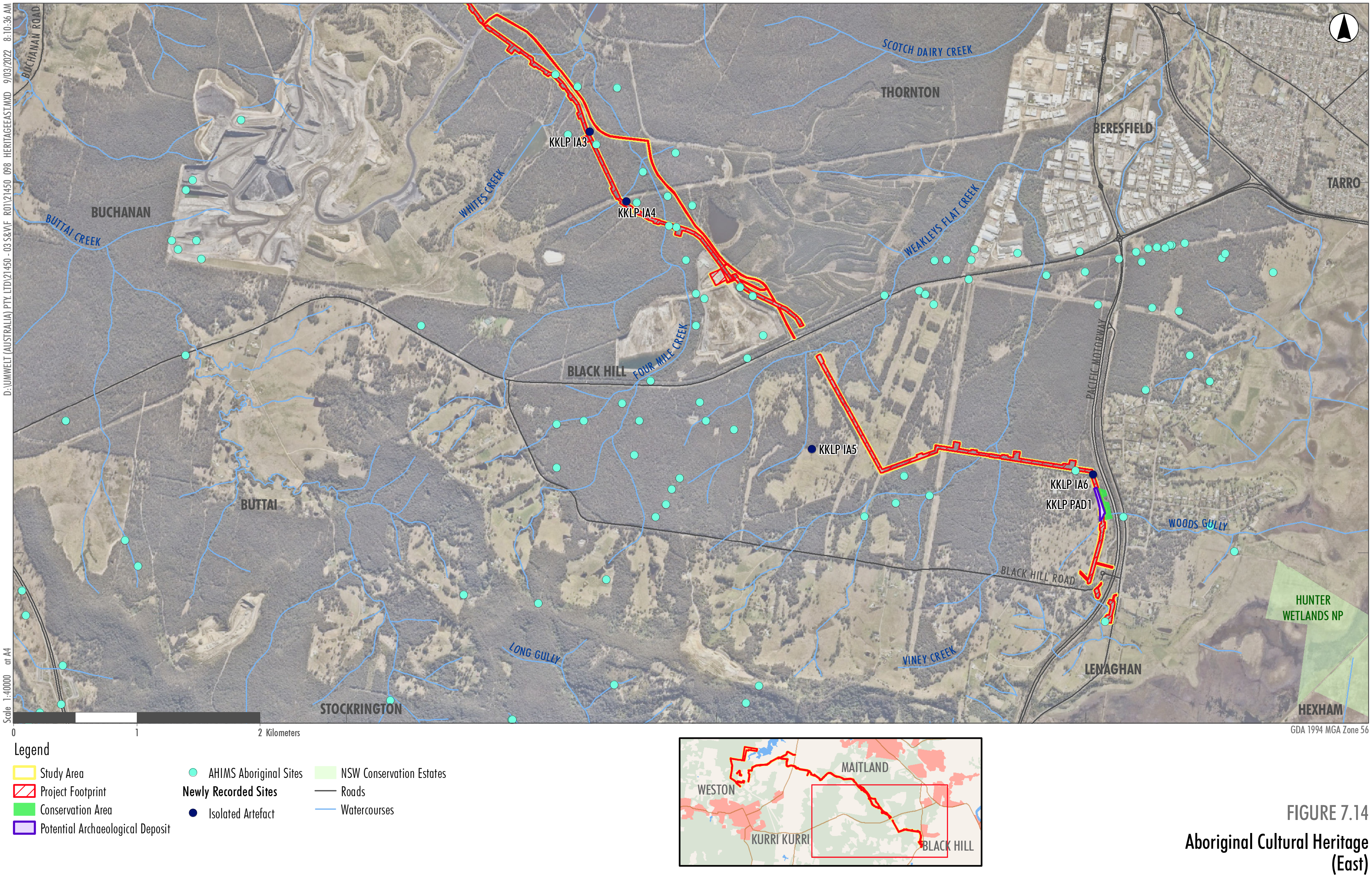
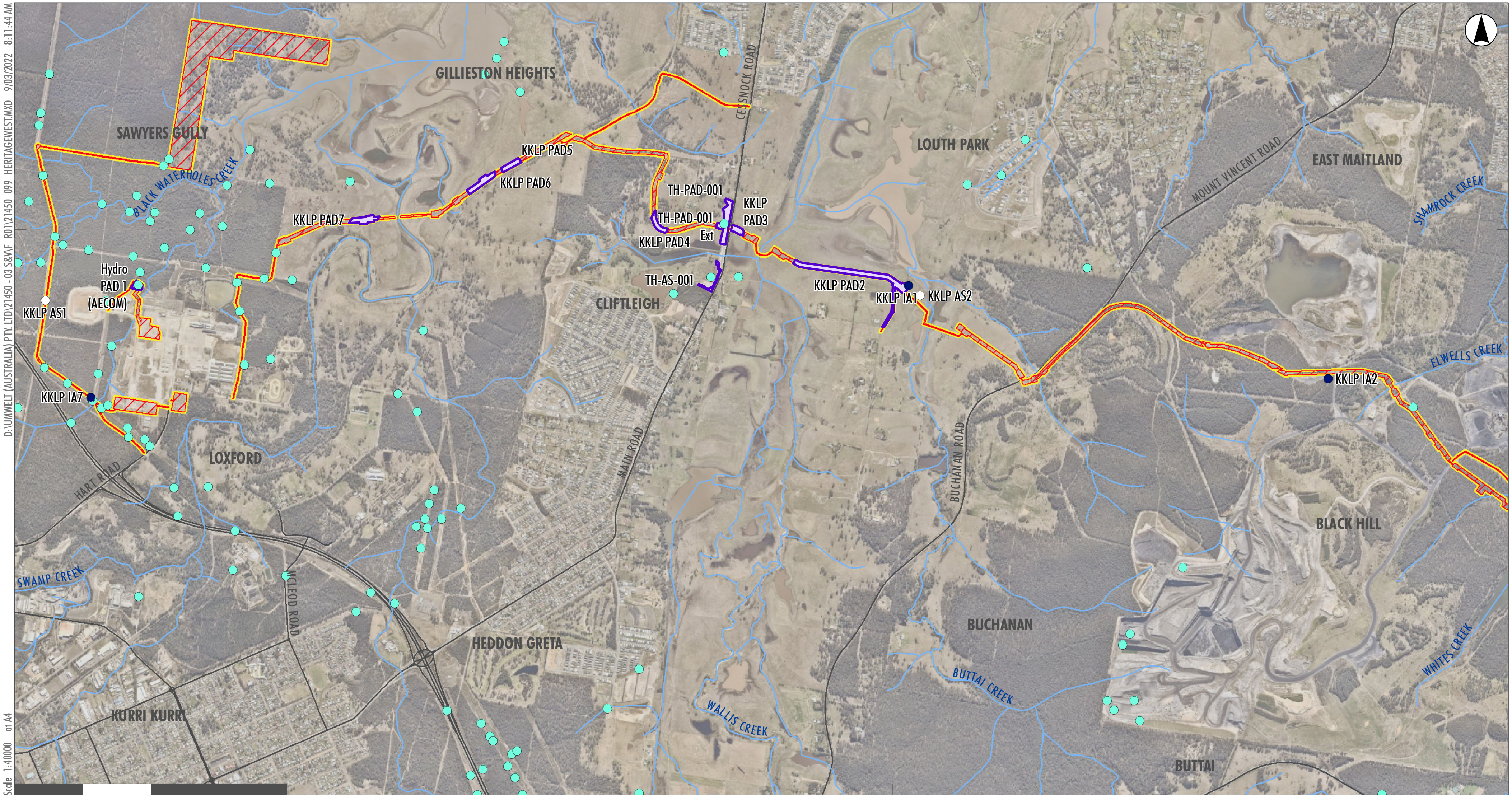


FIGURE 7.14

Aboriginal Cultural Heritage (East)

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Study Area
- Project Footprint
- Potential Archaeological Deposit
- AHIMS Aboriginal Sites

Newly Recorded Sites

- Artefact Scatter
- Isolated Artefact
- Roads
- Watercourses

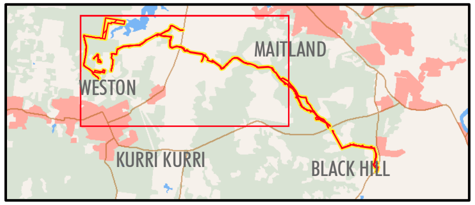


FIGURE 7.15

Aboriginal Cultural Heritage (West)

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

7.6.3.3 Significance assessment

- There is not always consensus about the cultural value of a place as people experience places and events differently, and in some instances cultural values may be in direct conflict. Cultural significance can only be determined by Aboriginal people and is identified through Aboriginal community consultation.
- It was requested that the registered Aboriginal parties provide information regarding the cultural value of the study area, the associated landscape features, archaeological sites, areas of archaeological potential and potential sites in response to the draft report. No specific comments were provided. However, based on in-field comments, it is assumed that all sites and areas of archaeological potential are of cultural value to the registered Aboriginal parties, as is the landscape in which the study area is located.

The archaeological significance of the Project area was assessed in accordance with the criteria provided in the Code of Practice (DECCW, 2010) and determined that:

- the identified stone artefact scatters and isolated artefacts are identified as having low value for rarity, representativeness, educational potential and integrity.
- PADs were given a provisional assessment of either moderate or moderate-high archaeological potential, linked almost entirely to the research potential of the site based on the nature of the evidence that the area *may* contain.

7.6.3.4 Impact assessment

In summary, the impact assessment for identified sites (**Figure 7.15** and **Figure 7.16**) found:

- three sites will not be impacted by the Project
- five sites will be subject to partial impact or may extend into the Project construction footprint
- the remaining sites and the nine areas of PAD (of which three are associated with recorded sites) are located within the Project construction footprint.

The Lower Hunter Valley (including the Project area) has been subject to a range of substantial development activities including mining, infrastructure development (such as the former smelter and Hunter Expressway), residential and industrial development and farming activities. This level of development has resulted in a substantial cumulative impact on Aboriginal cultural heritage, reflected in the partial or complete destruction of many Aboriginal archaeological sites and broader cultural landscapes.

Complete avoidance of all recorded archaeological sites and areas of PAD is not possible given the nature of the Project and the area through which the works are required to be undertaken. However, the Project has specifically been designed to minimise impacts by utilising areas subject to prior disturbance (where practicable) and by avoiding key areas of Aboriginal archaeological sensitivity (where feasible). While mitigation and management measures proposed in **Section 7.6.4** will not prevent impact, they are intended to allow for salvage of identified artefacts and provide an opportunity to gain additional information about the way in which Aboriginal people lived in this area.

7.6.4 Management and Mitigation Measures

Measures presented in **Table 7.14** will be implemented to manage and mitigate Aboriginal cultural heritage related impacts during various stages of the Project.

Table 7.14 Aboriginal cultural heritage management measures

No	Measure	Timing
AH01	Archaeological test investigations will be completed prior to construction impacts occurring at areas identified by the ACHA, if areas are proposed to be impacted following finalisation of Project design. Test investigations will be undertaken in accordance with the ACHMP.	Planning
AH02	An ACHMP will be developed and implemented for the Project in consultation with Heritage NSW, the relevant Indigenous stakeholders, and DPIE and will address the following issues: • Methods to be used for avoidance of sites. • Monitoring of areas where potential sites may exist. • Surface collection or salvage excavations. Management of previously unrecorded CH sites including human remains.	Planning Construction Operations
AH03	Avoidance of identified sites of Aboriginal cultural heritage and will be achieved where practicable by: • Minor realignments of the transmission pipeline alignment. • Narrowing of the ROW. • Leaving sites intact within the ROW with temporary fencing installed during construction. • Adoption of horizontal directional drilling (HDD) at selected watercourse crossings.	Planning Construction
AH04	Where avoidance of Aboriginal sites is not practicable, impacts will be managed in accordance with the ACHMP. Mitigation measures may include recording and salvage of information and artefacts prior to impact.	Construction

7.7 Historic Heritage

An assessment of the potential impacts of the Project on historic heritage values has been undertaken by Umwelt. The Historical Heritage Assessment (HHA) has been undertaken in accordance with the SEARs for the Project as presented in **Table 3.1**, which require the identification of any historic heritage items within the vicinity of the Project area and the assessment of the likelihood and significance of any potential impacts.

A summary of the key findings of the HHA is presented in this section with the full report provided in **Appendix 5**.

7.7.1 Existing Environment

7.7.1.1 Historical Context

A detailed review of the historical context of the Project area and surrounds was undertaken to gain an understanding of the potential historical resource that may occur within and surrounding the Project area. A full description of the historical context of the Project area is included in **Appendix 5** with a summary provided below.

The first exploration into the Hunter Region was made in 1819, with the Hunter Valley opening for free settlement and agricultural use in the early 1820's. Those who settled in the region were predominately engaged in agricultural or pastoral work, with some vineyards being established during the mid to late 1840's. In addition, due to the heavily wooded nature of the region, logging and timber industries were also undertaken (Austar 2021).

The Project area traverses through a landscape which has a long history of mining, which continues to the present day. In particular, the South Maitland Coalfields played a dominant role in the development of the lower Hunter Valley region. These coalfields, which exploited the Greta Coal Measures from south-west of Cessnock to south of Maitland, have been a constant contributing factor in the establishment of settlement and industry with the local area since the nineteenth century. The first mines of this coalfield were established in the late 19th century, with new townships and settlements being established in order to exploit the coal resources. Townships such as Bellbird, Kitchener, Paxton and Kearlsey were established to accommodate mine workers and their families. By the early 20th century, upwards of 17 collieries had been established in the area, prompting improvements to local infrastructure and the extension of the South Maitland Railway.

The coal was used both within Australia and exported to overseas markets including Japan, Chile and the United States. Tonnages peaked during the 1920's, but in the 1930's depression caused a downturn in production and high unemployment. The Second World War temporarily halted this decline with increased production for the war effort. By the mid-1960's, however, there was less demand for coal and technological advances in other mines made the coal-field less competitive.

The transmission pipeline alignment crosses the South Maitland Coalfields around KP 15.8, in the vicinity of the former Glen Ayr colliery, and the South Maitland Railway at KP 16.3.

The area underwent significant change following the decline in coal extraction and processing. As the older collieries such as Neath and Greta Heddon closed, the land within the vicinity was generally excluded from redevelopment, as the former mine operation areas were undesirable or unfit for development. Farms and rural properties, which has slowly spread in the area continues to occupy large areas of land in the regions.

The area met the population growth with new residential developments and facilities. However due to the presence of active and former mining areas, as well as flood plains, significant areas of land within the Project area remained largely undeveloped, with a slight increase in residential buildings following the 1960's, however not at the pace seen elsewhere in the region.

7.7.2 Methodology

7.7.2.1 Assessment Approach

The objectives of the HHA were to identify and assess:

- listed heritage items located within or in proximity to the Project area
- items, buildings, structures or other elements of potential historical heritage significance (i.e., those which are not listed) located within or in proximity to the Project area
- any areas of historical archaeological potential within or in proximity to the Project area
- the likelihood, extent and nature of potential impacts to any listed or unlisted items of heritage significance located within or in proximity to the Project area
- develops appropriate measures to avoid, manage and/or mitigate any identified impacts.

A visual inspection of the Project area was undertaken during October 2021. This inspection was undertaken concurrently with the site survey for the Aboriginal cultural heritage assessment described in **Section 7.6.2.2**.

7.7.2.2 Statutory Framework

The HHA has been undertaken in accordance with guidelines set out in the *NSW Heritage Manual 1996* (Heritage Office and Department of Urban Affairs & Planning), including consideration of:

- Archaeological Assessments
- Assessing Heritage Significance
- Statements of Heritage Impact
- Heritage Terms and Abbreviations.

This HHA has also been prepared with consideration of the best practice principles contained in the:

- The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 1999 (Australia ICOMOS. 2000) (the Burra Charter)
- NSW Heritage Branch (now Heritage NSW), Department of Planning, 2009, Assessing Significance for Historical Archaeological Sites and 'Relics'
- NSW Heritage office (now Heritage NSW), Department of Planning, 2006, *Historical Archaeology Code of Practice*.

7.7.2.3 Identification of Historic Heritage Items

To identify if any known historical heritage items were located within or in the immediate vicinity of the Project area, desktop searches of relevant heritage inventories and databases were conducted including:

- The Australian Heritage Database (including Commonwealth and National Heritage Lists and the Register of National Estate (RNE)
- The State Heritage Register (SHR) and State Heritage Inventory
- Heritage Act Section 170 Heritage and Conservation Registers (H&CR)
- relevant Local Environmental Plans (LEPs).

It has been identified that:

- no Commonwealth or Nationally listed heritage items or places are located within the Project area
- no State listed heritage items are located within the Project area.

However, one heritage item listed on the Cessnock LEP 2011, the 'South Maitland Railway System" (item I212) was identified to cross the Project area (**Figure 7.1616**). Five other listed heritage items were also identified within close proximity of the Project area and are listed in **Table 7.15** below and shown on **Figure 7.1616**.

The analysis of aerial imagery compiled with the historical background of the Project area has not identified any potential heritage significance within the Project area not documented in **Table 7.15**. This was further confirmed during the visual inspection of the Project area undertaken by Umwelt as part of the ACHAR.

7.7.2.4 Historical Archaeological Potential of the Project Area

The Project area has remained largely undeveloped, with the early land use patterns in the area historically associated with grazing and pastoralist efforts. No historical records indicate that any dwelling or structures associated with early pastoral use were located within the Project area. There is low to nil historical archaeological potential associated with the land use prior to the 1890's.

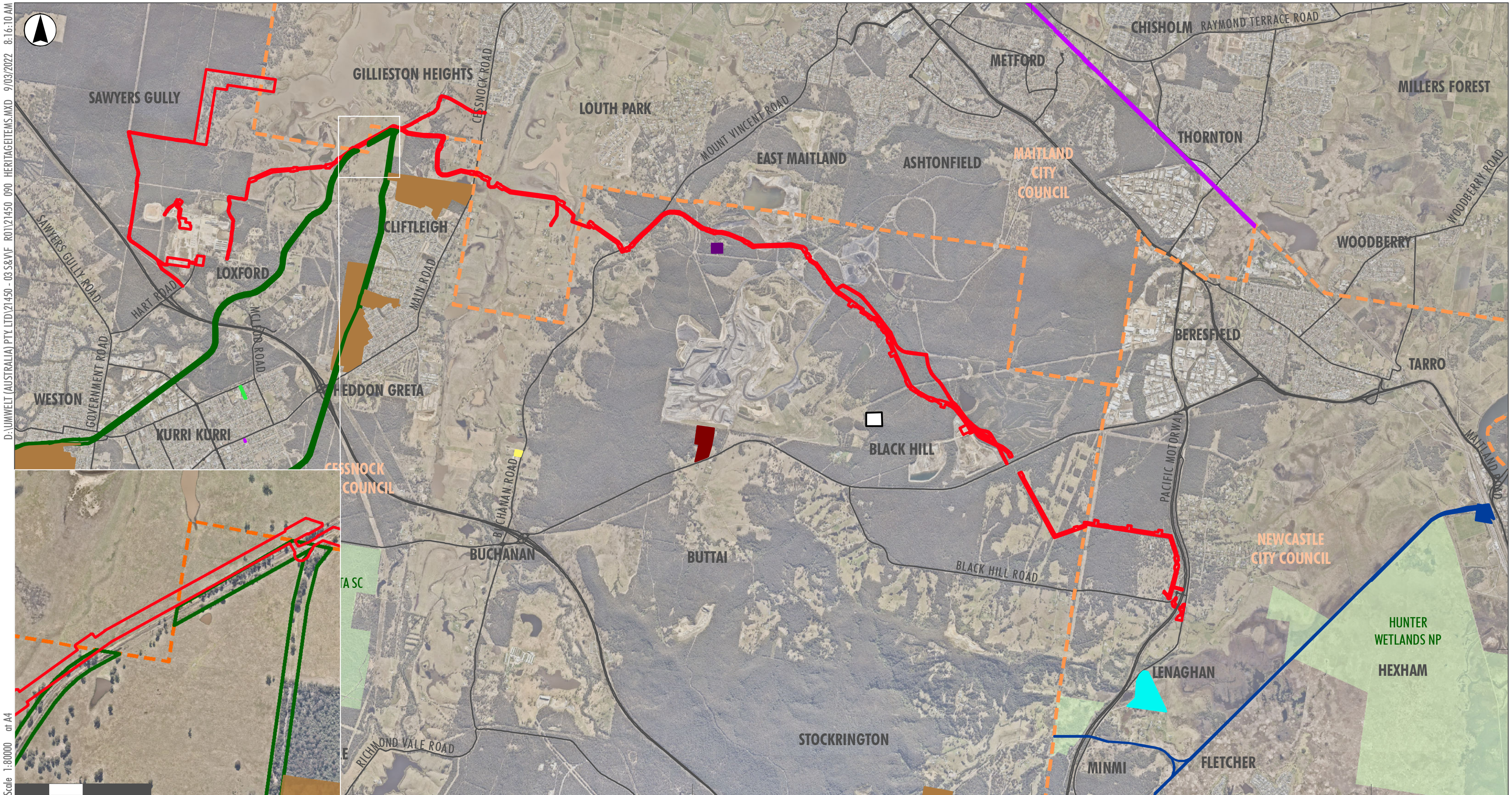
Some parts of the Project area underwent a shift of land use with the discovery of coal seams within the wider area during the late nineteenth century. The continued operation of mines within this part of the Project area has resulted in ongoing modification and reworking of the landscape, including the removal of redundant infrastructure and making safe of former mining areas. This would have resulted in high levels of disturbance to any evidence of historical mining activities in the area, removing most, if not all evidence of previous land use activities within the Project area.

Other areas of recorded historical mining use within the wider landscape are located outside of the Project area. The Project area is considered to have low potential to contain archaeological evidence associated with the early mining within the region.

Overall, the Project area is considered to have low to nil historical archaeological potential.

Table 7.15 Relevant Heritage Listings in proximity to the Project Area

Item Details	Listing Details	Distance to the Project Area
South Maitland Railway System Heritage Item ID 1340065	SEPP 1989 Cessnock LEP 2011 Item I212	Project located partially within the curtilage of this item.
Stoney Pinch Reservoir	Hunter Water Section 170 H&CR Item Number 3630029	Approximately 650m west
Buttai No.1 Reservoir	Hunter Water Section 170 H&CR Item Number 3630004	Approximately 200m south
Buttai No.2 Reservoir	Hunter Water Section 170 H&CR Item Number 3630005	Approximately 200m south
Collieries of the South Maitland Coalfields/ Greta Coal Measures Group (Neath Colliery)	Cessnock LEP 2011 Item I215	Approximately 100 m south
Winston Court	Newcastle LEP 2012 Item I330	Approximately 1.25km southwest
Minmi to Hexham Railway	Newcastle LEP 2012 Item I332	Approximately 1.25km east
Buchanan Gallery	Cessnock LEP 2012 Item I45	Approximately 3.26 km south
Buttai Cemetery—Elliott family graves	Cessnock LEP 2012 Item I46	Approximately 2.81 km south



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Legend

- Project Area
- NSW Conservation Estates
- Local Government Area
- Roads

Heritage Listed

- Trade Union Banners (LEP Item I116)
- Government Railway (LEP Item I119)
- South Maitland Railway Hertiage (LEP Item I212)
- Collieries of the South Maitland Coalfields/Greta Coal Measures Group (1340721) (Neath Colliery) (LEP Item I215)
- Winston Court (LEP Item I330)
- Minmi to Hexham Railway (LEP Item I332)
- Buchanan Gallery (LEP Item I45)
- Buttai Cemetery/Elliott Family Graves (LEP Item I46)
- Buttai Reservoir No. 2 (HW S170 item 3630005)
- Stoney Pinch Reservoir No. 2 (HW S170 Item 3630029)

FIGURE 7.16

Map of Historic Heritage Items

Image Source: Neamap (August 2021, Nov 2021) Data source: NSW LPI (2020;2021)

7.7.3 Assessment of Impacts

7.7.3.1 Impacts to Heritage Items

The South Maitland Railway (item I212 Cessnock LEP 2011), shown on **Figure 7.16**, is the only heritage item located within the Project area. Proposed works in the vicinity of South Maitland Railway involving the transmission pipeline crossing the railway by horizontal boring and the establishment of access tracks and works areas. The proposed works would not require the removal or intervention with the railway or its significant components such as the tracks, sleepers, or embankment. The establishment of the access tracks during construction would result in changes to the setting however this will be a minor and temporary change. Once construction is completed, the transmission pipeline would be buried below the existing ground surface with no visible structures to be introduced into the curtilage of the heritage item. Overall, the Project would not have any adverse physical or visual impacts on the South Maitland Railway.

The heritage items in the vicinity of the Project area are generally located at distances greater than 750 m, with the exception of three items: the Neath Colliery (item I215 Cessnock LEP 2011) located approximately 100 m from the Project area; the Buttai No 1. and No. 2 Reservoirs (item 3630004 and 3630005 Hunter Water Section 170 register) located approximately 200m south of the Project area; and the Stoney Pinch Reservoir (item 3630029 Hunter Water Section 170 register) located approximately 650 m west of the Project area. Components of the Project, including the buried components and the above ground structures, would be located significant distances from any listed heritage items and would therefore not result in any impacts to the views to or from or significant setting of any nearby listed heritage items.

Overall, the Project would not result in any adverse physical or visual impacts to the heritage items in the vicinity of the Project area.

As such, the Project will not result in any physical impacts (either direct or indirect) nor any visual impacts to heritage items (both listed and unlisted) located partially within or in the vicinity of the Project area.

7.7.3.2 Impacts to Historical Archaeology

As discussed in **Section 7.0**, the Project has been assessed as having low to nil potential for archaeological remains associated with early settlement and pastoral land use of the area. There is also low potential for the Project area to retain archaeological remains associated with the early mining activities from the 1890's.

The Project includes ground disturbing activities throughout the construction footprint; however it is determined there is low potential for historical archaeological remains to be located within the Project area. Therefore, the Project has a low risk of resulting in impacts to historical archaeological remains.

7.7.4 Management and Mitigation Measures

Although the Project is not anticipated to result in any adverse impacts on heritage items within or near the Project area, the CEMP for the Project will include measures outlined in **Table 7.16** to mitigate any potential heritage impacts.

Table 7.16 Historic heritage management measures

No	Measure	Timing
HH01	Detailed survey of the Project construction footprint within the vicinity of the South Maitland Railway will be undertaken and all piles of sleepers and associated fabric will be recorded.	Planning Construction
HH02	If any historical heritage sites are identified where avoidance is not practicable, impacts will be mitigated by the recording and salvage of information and artefacts. Recording and salvage will be adopted for all sites where avoidance is not achievable, subject to relevant regulatory approvals.	Construction
HH03	Procedures to implement if an unknown historical heritage site, value or object is discovered during construction will be incorporated into the Project CEMP. This will include guidelines on collection or salvage of historical heritage objects.	Planning Construction

7.8 Air Quality and Odour

An Air Quality Impact Assessment (AQIA) has been completed for the Project by GHD Pty Ltd (GHD, 2021a) to address the SEARs relating to air quality and odour, as presented in **Table 3.1**. The outcomes of the AQIA are summarized below, with the full report available in **Appendix 10**.

7.8.1 Existing Environment

7.8.1.1 Existing Air Quality Conditions

Key air pollutants relevant to the Project include total suspended solids (TSP), particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). **Table 7.17** provides a summary of measured PM_{10}, $PM_{2.5}$, NO_2 and SO_2 concentrations from the nearest monitoring stations to the Project construction footprint in comparison with the relevant assessment criteria described in **section 7.2.8.3**.

During the past five years, there have been several instances when the 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the criteria (presented in bold and grey shaded cells in **Table 7.17**). In addition, the annual average PM_{10} and $PM_{2.5}$ concentrations exceeded the criteria during 2019 (presented in bold and grey shaded cells in **Table 7.17**). During 2018 to 2020, particle levels increased across NSW due to dust from the widespread, intense drought and smoke from bushfires and hazard reduction burning (OEH 2019), with a period of extensive bushfire activity in late 2019 and early 2020.

Table 7.17 Background air quality data

Pollutant	Averaging Period	Recorded background concentration per year (µg/m³)					Assessment criteria (µg/m³)
		2016	2017	2018	2019	2020	
Beresfield							
PM_{10}	24 hour maximum	48.0	49.4	149.1	136.7	77.7	50
	Annual average	18.9	19.4	21.4	25.6	18.3	25
$PM_{2.5}$	24 hour maximum	26.8	18.7	24.9	100.5	49.7	25
	Annual average	7.0	7.2	7.9	11.1	7.3	8
NO_2	1 hour maximum	77.1	75.2	75.2	105.3	65.8	246
	Annual average	13.9	15.5	15.3	13.2	11.6	62
SO_2	1 hour maximum	88.4	144.7	187.6	182.2	101.8	570
	24 hour maximum	19.5	20.7	19.1	22.6	20.7	228
	Annual average	3.6	3.8	4.1	4.3	3.6	60

Pollutant	Averaging Period	Recorded background concentration per year (µg/m³)					Assessment criteria (µg/m³)
		2016	2017	2018	2019	2020	
Wallsend							
PM_{10}	24 hour maximum	65.5	47.9	136.6	127.9	76.1	50
	Annual average	16.3	17.2	18.7	22.4	17.6	25
$PM_{2.5}$	24 hour maximum	48.6	20.4	20.2	108.3	54.5	25
	Annual average	7.3	7.0	7.2	9.9	7.1	8
NO_2	1 hour maximum	69.6	69.6	65.8	79.0	54.5	246
	Annual average	12.6	13.6	12.1	12.2	10.5	62
SO_2	1 hour maximum	101.8	150.1	211.7	134.0	107.2	570
	24 hour maximum	15.7	25.9	20.1	23.6	25.3	228
	Annual average	2.8	3.5	3.1	4.2	4.3	60

7.8.1.2 Meteorological Conditions

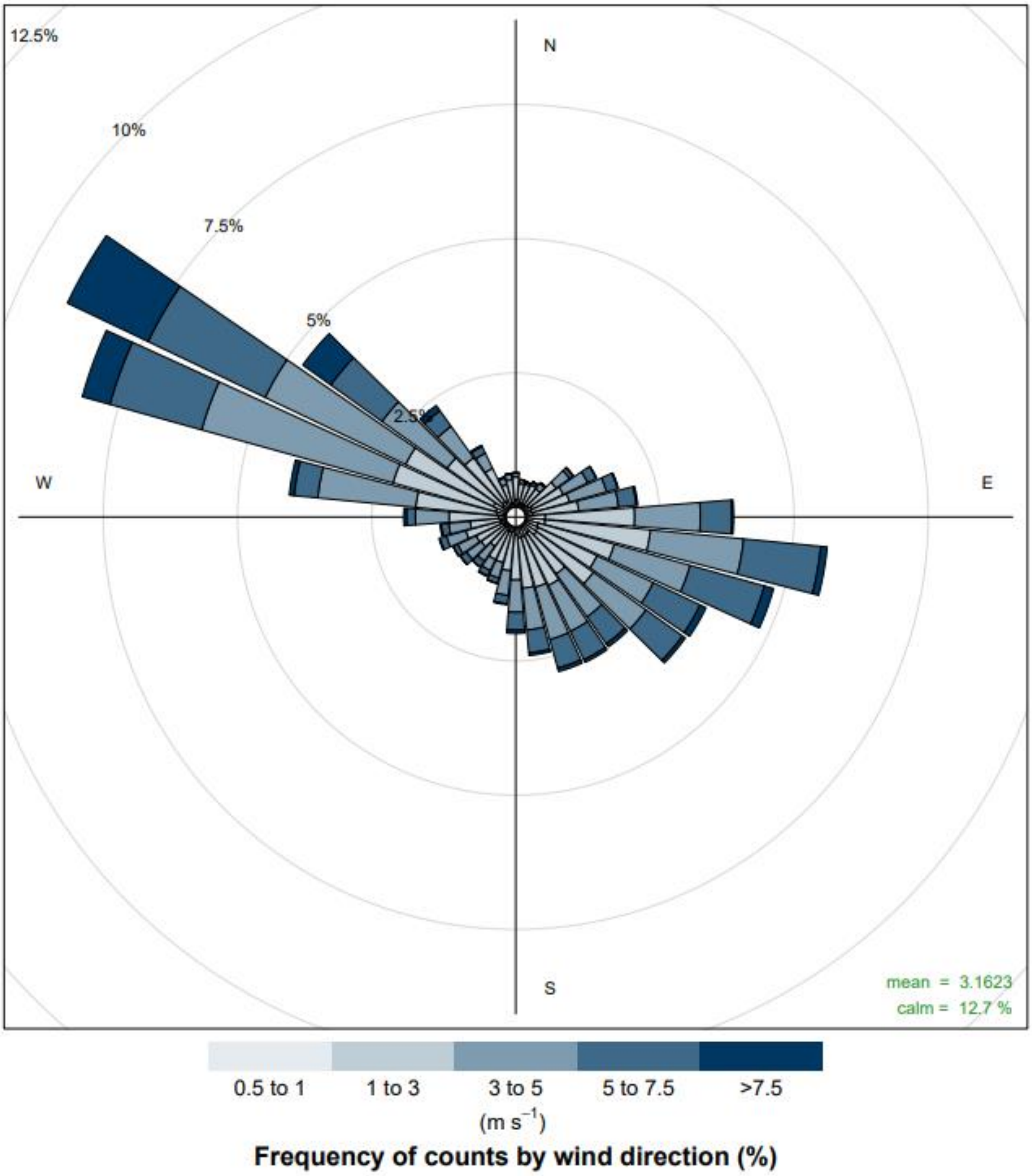
The nearest automatic weather station (AWS) is at the Maitland Airport, approximately 9 km (at the nearest point) to the Project area. This station was commissioned in July 2016 and as such data has been collected for the full years of 2017 through 2020.

Median temperatures recorded at this AWS range from 17°C - 32°C in the summer months and 5.8°C - 19°C in the winter months. Maximum temperatures of up to 45°C have been recorded in the summer months and minimum temperatures of below 0°C have been recorded in winter.

The rainfall statistics for the period 2017 to 2020 show that the number of rain days and the amount of total rainfall are greater during the summer and early autumn months. March has the highest monthly rainfall with an average of 153mm and 12.5 rain days and May has the lowest monthly rainfall with an average of 21mm and 5.8 rain days.

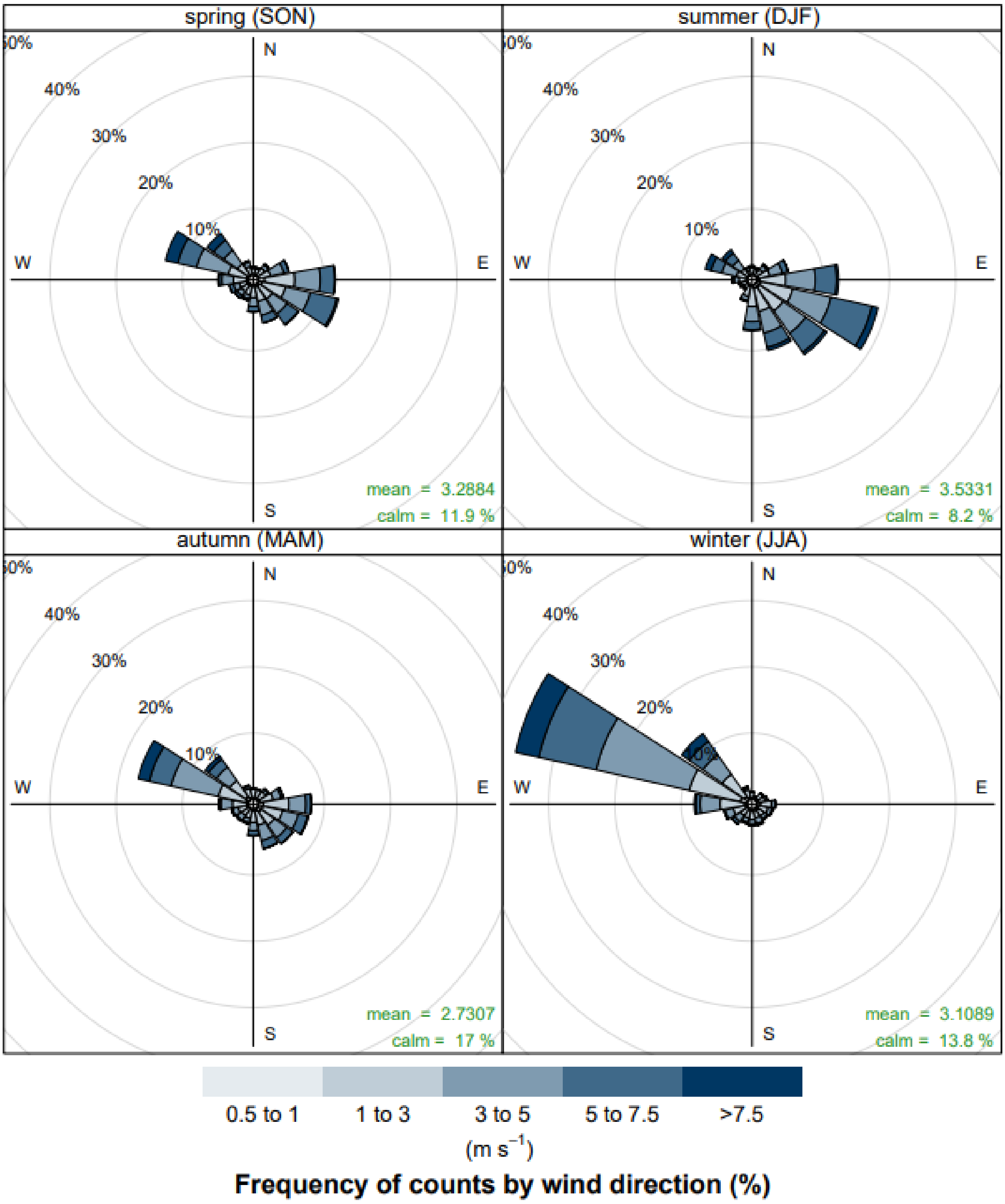
The average annual wind patterns for each year from 2017 to 2020 are shown by the wind roses in **Graph 7.1**. The average wind speed measured was 3.2 metres per second (m/s) and the prevailing winds come from the northwest. This pattern of winds is common for the Lower Hunter Valley and reflects the influence of the northwest to southeast alignment of the Hunter Valley.

High wind speeds (winds greater than 5 m/s which are often attributed to dust lift off) mostly occur from the southeast and northwest. The average seasonal wind is shown by the wind roses in **Graph 7.2**. Higher speed winds from the northwest occur more often during winter. Winds from the southeast occur more often during summer.



Graph 7.1 Average annual wind rose

(Source: GHD, 2021a)



Graph 7.2 Average seasonal wind roses

(Source: GHD, 2021a)

7.8.1.3 Sensitive Receivers

There were 31 sensitive receivers within the Study area that were selected for the AQIA to represent a range of residential, commercial and other potentially sensitive locations within the surrounding communities (refer to **Table 7.18** and **Figure 7.17**). No schools or hospitals were identified within 800 m of the Project area.

Table 7.18 Identified sensitive receivers within study area

Receiver ID	Receiver type	Location	Approximate distance from Project
R01	Dwellings	Kurri Kurri	430m southeast
R02	Offices	Kurri Kurri	1500 m southeast
R03	Dwellings	Loxford	720 m southwest
R04	Dwellings	Sawyers Gully	365 m south west
R05	Dwellings	Sawyers Gully	1300 m southwest
R06	Dwellings	Bishops Bridge	1800 northwest
R07	Dwellings	Bellbird	1700 m north
R08	Dwellings	Sawyers Gully	1600 m north
R09	Dwellings	Cliftleigh	500 m south
R10	Public recreational area	Cliftleigh	680 m south
R11	Dwellings	Cliftleigh	1000 m south
R12	Dwellings	Cliftleigh	130 m north
R13	Dwellings	Cliftleigh	260-500 m north
R14	Dwellings	Gillieston Heights	1100 m north
R15	Dwellings	Louth Park	270 m south
R16	Dwellings	Louth Park	230 m north
R17	Dwellings	Louth Park	1150 m north
R18	Public recreational area and offices	Beresfield	1800 m north
R19	Public recreational area	Black Hill	170 m south
R20	Dwellings	Black Hill	200 m east
R21	Dwellings	Black Hill	240 m east
R22	Dwellings	Black Hill	420 m south
R23	Dwellings	Loxford	1400 m west
R24	Dwellings	Gillieston Heights	110 m east
R25	Dwellings	Louth Park	50 m west
R26	Dwellings	Lenaghan	240 m east
R27	Dwellings	Black Hill	190 m southwest
R28	School	Black Hill	900 m south
R29	School	Kurri Kurri	2000 m south
R30	School	Kurri Kurri	1500 east
R31	Dwellings	Cessnock	1415 m east

Of the above, eleven sensitive receivers occurwithin 300 m of the transmission pipeline construction footprint and are shown in **Figure 7.17** as these are the key receivers of concern with respect to the outcomes of the modelling. Where there is more than one receptor in a residential cluster, the nearest receptor has been identified on the figure. The low number of sensitive receivers within 300m of the construction footprint is primarily due to the design of the Project such that distances to residences and residential areas have been maximised as far as practicable. No sensitive receivers are located within 1,400 m of the storage pipeline construction footprint.

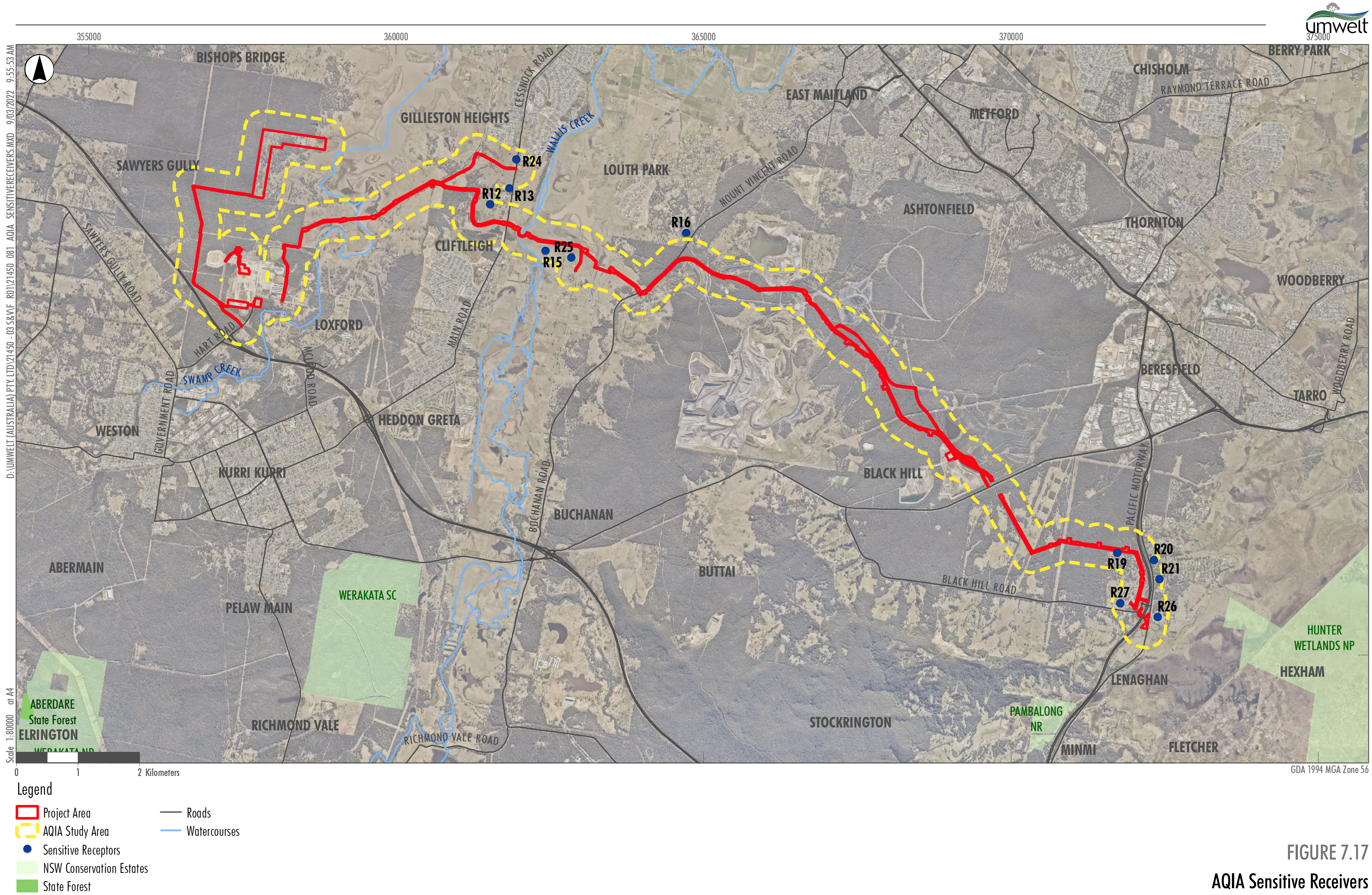


FIGURE 7.17

AQIA Sensitive Receivers

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021), GHD (November 2021)

7.8.2 Methodology

7.8.2.1 Statutory Framework

The AQIA was prepared to assess the potential impacts of the Project in accordance with the following relevant legislation, policy and guidelines:

- NSW Protection of the Environment Operations Act 1997 (POEO Act)
- NSW Protection of the Environment Operations (Clean Air) Regulation 2021 (POEO Clean Air Regulation)
- National Environment Protection Council (NEPC) National Environment Protection (Ambient Air Quality) Measure 2021 (the Air NEPM)
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007)
- Technical framework - Assessment and management of odour from stationary sources in NSW (the Technical Framework), NSW Department of Environment and Conservation (DEC, 2006b)
- NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2017) (the Approved Methods)
- Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management (2016) (IAQM guidance).

7.8.2.2 Assessment Approach

The AQIA broadly involved:

- A review of the Project construction footprint to identify sensitive receivers in the study area.
- A review of the existing regional ambient air quality and meteorology including the nearby Bureau of Meteorology (BoM) weather station located at Maitland Airport and the nearby Department of Planning, Industry and Environment (DPIE) air quality monitoring stations (AQMS) located at Beresfield and Wallsend.
- Preparation of an emissions inventory that considered typical construction and operational activities associated with the Project.
- A model configuration using Ausplume (version 6.0) software to predict particulate (PM_{10}, $PM_{2.5}$ and TSP) concentration at various distances from the Project area and other key construction areas using the estimated emissions, relevant physical site characteristics and worst-case meteorological data. Seven scenarios were identified and modelled as outlined below. A buffer was created where the air quality criteria can be achieved. Key components of the model configuration are:
  - a worst-case screening meteorological dataset prepared in accordance with the Approved Methods
  - horizontal dispersion was parameterised according to equations for the Pasquill-Gifford curves
  - averaging time period of 24-hour and all hours (annual)
  - a surface roughness height of 0.1 m (flat rural)
  - emissions were modelled as area sources between the construction hours of 6am to 6pm

- an assessment of the potential impacts to air quality at sensitive receivers
- provide recommendations for reasonable and feasible air quality mitigation measures.

- Identification and assessment of the potential cumulative impacts on air quality (including dust, odour and other pollutants) during construction of the Project. The outcomes of this assessment are discussed in **Section 7.16.3.1** of this EIS. Cumulative impacts are expected to be significant in Scenario 1 and Scenario 2 and have been accounted for in the modelling.

Assessment Scenarios

Dispersion modelling of the following construction scenarios was undertaken to assess Project dust emissions (PM_{10}, $PM_{2.5}$ and TSP) during construction against the relevant criteria:

- Scenario 1: Combined light and heavy vehicles activity on unpaved roads
- Scenario 2: General construction of the transmission pipeline and light vehicles on unpaved roads
- Scenario 3: General construction of the storage pipeline
- Scenario 4: Clearing for fixed construction areas (HDD exit and entry sites, truck turnaround areas, and trenched and bored crossings)
- Scenario 5: General construction of compressor and delivery stations and general construction of the JGN offtake facility and JGN delivery facility
- Scenario 6: Clearing for vegetation stockpiles
- Scenario 7: Clearing for pipe stockpiles.

Further details regarding the assessment methodology, including the full detail of the construction and operational emission inventory and emission factors, are provided in the Air Quality Impact Assessment (**Appendix 10**).

7.8.2.3 Assessment Criteria

Assessment criteria for the Project were predominantly taken from the Approved Methods. Assessment criteria for NO^2 and SO^2 were also sourced from the Air NEPM air quality objectives as these represent the most recent and stringent standards for protection of the air quality environment.

Relevant assessment criteria for the key air pollutants associated with construction and operation of the Project are presented in **Table 7.19**. The criteria apply to the total impact (increment plus background) and must be reported as the 100th percentile (maximum).

Table 7.19 Air quality impact assessment criteria

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m³)	
				EPA Assessment Criteria	Air NEPM
Airborne particulate matter and common gaseous pollutants					
TSP	Annual	Sensitive receiver	Cumulative	90	-
PM_{10}	24 hour	Sensitive receiver	Cumulative	50	50
	Annual	Sensitive receiver	Cumulative	25	25
$PM_{2.5}$	24 hour	Sensitive receiver	Cumulative	25	25 (reduced to 20 in 2025)
	Annual	Sensitive receiver	Cumulative	8	8 (reduced to 7 in 2025)

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m^3)	
				EPA Assessment Criteria	Air NEPM
Deposited dust	Annual (maximum increase)	Sensitive receiver	Cumulative	2 g/m^2/month	-
	Annual (maximum total)	Sensitive receiver	Cumulative	4 g/m^2/month	-
NO_2	1 hour	Sensitive receiver	Cumulative	246	164
	Annual	Sensitive receiver	Cumulative	62	31
SO_2	1 hour	Sensitive receiver	Cumulative	570	286 (reduced to 215 in 2025)
	24 hour	Sensitive receiver	Cumulative	228	57

7.8.2.4 Study Area

The study area for the AQIA is defined as a 300 m buffer around the Project construction footprint as shown in **Figure 7.17**.

7.8.3 Assessment of Impacts

7.8.3.1 Construction Impacts

The primary emission of concern during construction is dust. Dust emissions during construction would largely result from ground disturbance associated with vegetation clearing, topsoil stripping, excavation works and trenching, stockpiling of vegetation and topsoil, vehicle movements on unsealed tracks, delivery of pipe segments and other materials, general material handling, backfilling and rehabilitation of all disturbed areas.

Dust impacts from construction activities were modelled based on worst-case meteorological conditions daily and over a full year. Fine particle emissions associated with exhausts from vehicles and plant used during construction are accounted for in the emission factors for earthmoving and handling used in the assessment.

The modelling results show that PM_{10} is the critical constituent of interest as where the PM_{10} criteria are met, TSP and $PM_{2.5}$ criteria are also met, as outlined in the following sections.

Exhaust emissions during construction are expected to be discontinuous, transient, and mobile.

There is also some potential for odour impacts due to potentially acid sulfate soils (PASS) within the Project area and a former poultry farm at Blackhill located at KP2.5 to KP4.4.

- **Scenario 1 - Combined light and heavy vehicles on unpaved roads:** PM_{10} criteria is met at all sensitive receivers other than R24 at 110 m and R27 at 190 m from the construction footprint. Modelling indicates that with level 2 watering (>2 litres/m^2/h) the daily PM_{10} criteria and $PM_{2.5}$ criteria are met at 110 m and 10 m respectively from the Project area. As such, with level 2 watering, dust criteria is predicted to be met at these two receivers.
- Additionally, an access track which connects Valley View Lane to the transmission pipeline construction footprint at KP 13.2 is proposed for restricted use during wet conditions. Modelling predicts that the daily PM_{10} criteria can be met at the nearest sensitive receiver (R25, at 50 m) with level 2 watering.

- **Scenario 2 – General construction of transmission pipeline and light vehicles on unpaved roads:** PM_{10} criteria is met at all sensitive receivers other than R12 at 130m and R19 at 170m. Modelling shows that with level 2 watering (>2 litres/m^2/h), the daily PM_{10} criteria is met at these sensitive receivers.
- **Scenario 3 - General construction of storage pipeline:** Daily and annual PM_{10} criteria is met at the nearest sensitive receiver.
- **Scenario 4 – Fixed construction**: Daily and annual PM_{10} criteria is met at the nearest sensitive receiver, which is R12, at 130m. Daily and annual $PM_{2.5}$ and TSP are met at all distances.
- **Scenario 5 – General construction of associated surface facilities:** Daily and annual PM_{10} criteria is met at the nearest sensitive receivers to the compressor and delivery stations (R01 and R04 at 800m each). Daily and annual $PM_{2.5}$ and TSP are met at all distances.
- **Scenario 6 – Vegetation stockpiles:** Daily and annual PM_{10} criteria is met at the nearest sensitive receiver (R12, at 130m). Daily and annual $PM_{2.5}$ and TSP are met at all distances.
- **Scenario 7 – Pipe stockpiles:** Daily and annual PM_{10} criteria is met at the nearest sensitive receiver (R01, at 430m). Daily and annual $PM_{2.5}$ and TSP are met at all distances.

Odour Emissions

As discussed in **Section 7.3.3**, construction activities may encounter ASS particularly when excavation works occur in the Wallis Creek flood plain. When exposed during construction activities, ASS has the potential to oxidise and generate odours by releasing hydrogen sulphide gas. However, given the location and distance to sensitive receivers (0.7 km, 0.28 km and 1 km respectively) and management measures outlined in **Sections 7.3.5** and **7.8.4**, odour impacts due to ASS are not anticipated.

Buried waste and illegally dumped waste may result in odour impacts through exposure of unknown contaminants. Excavation activities in and around the former poultry farm located at KP2.5 to KP4.4, on the southern side of John Renshaw Drive, could potentially expose buried waste that could produce such odour impacts. While the Project does not traverse any known dead pits there may be other sources of odour encountered during construction. As identified in **Section 7.3.5**, buried waste and illegally dumped waste would be managed through unexpected contamination procedures. It is therefore not considered likely that disturbance of these wastes during construction would result in significant odour impacts.

7.8.3.2 Operational Impacts

Air quality impacts from the general operation of the Project are expected to be minimal and the result of regular and periodic inspection and maintenance along the transmission and storage pipelines and to the surface infrastructure.

Venting events during pigging will involve the release of methane into the ambient atmosphere. However, these events will be infrequent (once every 10 years) and short term in duration. Maintenance testing of the storage pipeline will be completed once every seven to 10 years and will require some gas venting. Fugitive emissions of methane and carbon dioxide from pipeline operations are further discussed in **Section 7.9.** No flaring of fugitive gases is proposed.

Combustion emissions during operation of the delivery station are expected from water bath heaters. When the HPP is operating on natural gas the water bath heaters consume a maximum of about 32.4 GJ/hr of natural gas. This makes up less than 0.5% of the energy consumption of the HPP when operating on natural gas at maximum load consuming 7,298 GJ/hr (Jacobs 2021, Table 15.12). When the HPP is not operating on natural gas, the water bath heaters operate in standby mode consuming a minor quantity of natural gas.

The assessment report for the HPP EIS (DPIE 2021, p v) notes that air quality modelling indicates that there would only be a minor incremental increase in ambient concentrations of key air pollutants at sensitive receivers around the site, and that modelling conservatively assumed that the HPP was operating throughout the entire year. As such, the minor emissions from combustion of natural gas during operation of the delivery station are not expected to lead to any material increase in cumulative air quality impacts at sensitive receptors when the HPP is operating.

The compressor station is electrically driven, so no gas combustion emissions will occur.

The AQIA concluded that operational air quality impacts from the Project are not anticipated.

7.8.4 Management and Mitigation Measures

Measures presented in **Table 7.20** will be implemented to manage and mitigate dust and odour impacts during various stages of the Project.

Table 7.20 Air quality management measures

No	Measure	Timing
AQ01	A dust control plan will be prepared and incorporated into the Project CEMP.	Planning Construction
AQ02	Plant and equipment will be maintained in good condition to minimise ignition risk, spills and air emissions that may cause nuisance.	Construction Operations
AQ03	Vehicle speed within the construction site boundary, including access tracks, will be restricted to a maximum of 40kph.	Construction
AQ04	Construction vehicles with potential for loss of loads (such as dust or litter) will be covered when using public roads.	Construction
AQ05	Dust suppression will be undertaken when a dust hazard is expected or observed. Dust suppression may include using water sprays, water extension agents, soil stabilising polymers or other media on: • Unpaved work areas subject to traffic or wind. • Sand, spoil and aggregate stockpiles. • During the loading and unloading of dust generating materials.	Construction
AQ06	Dust suppression will be undertaken when construction works are in proximity to the following specific receptors and winds are blowing towards them: • Receptor 24 (463-457 Cessnock Rd) – 110 m to an unpaved access track with light and heavy vehicle use. • Receptor 27 (21-25 Black Hill Rd) - 190 m from an unpaved access track with light and heavy vehicle use. • Receptor 12 (532 Main Rd) – 130 m from the ROW where there will be construction works and light and heavy vehicles. • Receptor 19 (2 Black Hill Rd) - 170 m from the ROW where there will be construction works and light and heavy vehicles.	Construction

No	Measure	Timing
AQ07	When using water for dust suppression the amount of water for dust suppression applied will not exceed what is required to effectively suppress dust. The application of water for dust suppression will: • Not cause on-site ponding or runoff. • Be directly to the area being dust suppressed. • Not harm vegetation surrounding the area being dust suppressed. • Not cause visible salting.	Construction
AQ08	If the works are creating levels of dust which may significantly impact on residential amenity, the works will be modified or stopped until the dust hazard is reduced to an acceptable level.	Construction
AQ09	Blasting (if required) will not be undertaken if weather conditions (i.e. wind speed and direction) are likely to result in air quality impacts at sensitive receptors.	Construction

7.9 Greenhouse Gas

The SEARs required an assessment of the likely greenhouse (GHG) impacts of the Project, including measures to minimise GHG emissions. Accordingly, a Greenhouse Gas (GHG) and Energy assessment was undertaken for the Project to quantify and consider the potential impacts arising of the Project's GHG emissions. The assessment included a calculation of:

- **Scope 1 emissions** - direct emissions over which the Proponent has a high level of control. e.g. fuel combustion and direct use of gas.
- **Scope 2 emissions** - emissions from the generation of purchased electricity consumed by the Proponent.
- **Scope 3 emissions** - indirect greenhouse gas emissions other than scope 2 emissions that are generated in the wider economy. They occur as a consequence of the activities of the Project, but from sources not owned or controlled by the Project. This includes emissions generated downstream via the combustion of gas during the operational period.
- The details and outcomes of the GHG and Energy assessment are provided in full in this section.

7.9.1 Methodology

The assessment framework is based on the methodologies and emission factors contained in guidelines and documentation including:

- National Greenhouse Accounts (NGA) Factors 2021 (Department of Industry, Science, Energy and Resources, 2021a) (the NGA Factors)
- NGER (Measurement) Determination 2008 (as amended) and NGER Act 2007, Commonwealth Department of Environment and Energy
- Carbon Gauge GHG Assessment Calculator for Road Projects (Transport Authorities Greenhouse Group Australia and New Zealand, 2013).
- These guidelines are considered representative of good practice GHG accounting in Australia.

All activity data and relevant inputs were provided by APA or other technical studies for the Project, as referenced. Mapping information was reviewed and land clearing information was applied to the Transport Authorities Greenhouse Group's Carbon Gauge GHG Assessment Calculator for Road Projects. Fugitive emissions of methane and carbon dioxide from pipeline operations were estimated using Method 1 from the NGER (Measurement) Determination. Scope 3 emissions for downstream gas used calculations developed for the HPP EIS (Jacobs, 2021a).

7.9.1.1 Assumptions and Exclusions

The Project has a number of potential emission sources, however, the key emission sources often targeted by mitigation measures include diesel and electricity use. The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (WRI/WBCSD, 2004).

Assumptions

Assumptions used in the estimation of GHG emissions for the Project are listed in **Table 7.21**.

The emissions inventory developed for the Project is based on a 12 month construction period and a 30 year operational period. Global warming potentials (GWP) utilised in this assessment are consistent with 2021 amendments to the *National Greenhouse and Energy Reporting Regulations 2008* and the National Greenhouse and Energy Reporting (Measurement) Determination 2008.

Table 7.21 Project and Data Assumptions

Parameter	Assumptions
Construction	
Diesel Consumption – transport and stationary purposes	The total quantity of diesel fuel to be combusted during the construction period is anticipated to be approximately 2,600 kL. This value represents all diesel consumed by: • transport vehicles for personnel transport and other construction activities, including the transportation of pipeline components. • stationary engines including heavy machinery such as excavators, generators, pumps and compressors.
Lost Carbon Sink due to land clearing	The total area of uncleared and undisturbed land conservatively assumed in this calculation is approximately 80ha. The Transport Authorities Greenhouse Group Carbon Gauge GHG Assessment Calculator for Road Projects was used to estimate the quantity of lost carbon sink associated with land clearing. The calculation is a highly conservative estimate which assumes: • all carbon pools (i.e. woody, non-woody, debris and soil) are removed • all carbon is converted to carbon dioxide and released into the atmosphere • sequestration from revegetation of the project is not included. The calculator also assumes a consistent maximum potential biomass class and does not consider the quality of native vegetation (remnant, regrowth or derived) present across the Project area. Quality and class of vegetation present across the Project area varies from good to poor as noted in the Biodiversity Development Assessment Report (Umwelt, 2022a).

Parameter	Assumptions
Operational	
Diesel Consumption – transport purposes	The expected quantity of diesel fuel to be combusted annually during the operation of the Project is 6kL. It was assumed that 500L per month of diesel would be used for general day to day operations including for monitoring, maintenance and inspections of Project components.
Gas Consumption – water bath heaters	Two water bath heaters are proposed for use across the operational period. Water bath heaters will combust gas at a maximum usage rate of 32.4 GJ/hr. It is assumed the water bath heaters will be in operation approximately 10% of the time, as per the maximum approved HPP hours (Jacobs, 2021). The assessment has also assumed a standby rate of 1.4 GJ/hour for the remaining 90% of the time.
Fugitive Emissions	Fugitive emissions from the Project have been considered in this assessment. Types of fugitive emissions accounted for within this assessment include: • Leakages from pipeline network and associated process equipment (Department of Industry, Science, Energy and Resources, 2021) and (American Petroleum Industry , 2009) • Venting of emissions from the Project, as required, for periodic maintenance and testing activities. Testing activities for the storage pipeline will include the release and venting of approximately 5 TJ of natural gas up to every 10 years likely 3-4 events over the life of the project as described in **Section 2.8.1**. Fugitive emissions associated with pipeline and process equipment leaks have been calculated in accordance with the NGER (Measurement) Determination Method 1. It is assumed that no flaring occurs during the operation of the Project.
Electricity Consumption - Compressors	The energy demand of the compressors, which will be connected to the mains power supply, is 7.5 MW. It is assumed the annual utilisation rate of the compressors will be 31% in order to support operation of the HPP for a 10% annual utilisation rate as per approval conditions for that project. This assessment has utilised the current emissions intensity factor for Scope 2 emissions in NSW for the 30 year operational period for the Project. The outputs of the scope 2 emissions assessment are considered highly conservative as the emissions intensity factor for Scope 2 emissions in NSW is projected to decrease as the NSW electricity grid continues to decarbonise.

Exclusions

The emission sources listed in **Table 7.22** have been excluded from the assessment as modelling activity data from these sources of emissions are unlikely to generate material emissions to influence the decision-making outcomes of stakeholders.

Table 7.22 Project and Data Exclusions

Emission source	Scope	Description
Combustion of petrol and LPG fuels for energy	Scope 1	Petrol and Liquid Petroleum Gas
Industrial processes	Scope 1	Sulphur hexafluoride (high voltage switch gear). Hydrofluorcarbon (commercial and industrial refrigeration) Venting of gas other than nominated maintenance and testing works for Project components.
Carbon Sequestration	Scope 1	Revegetation of disturbed areas during operations
Construction materials	Scope 3	Embodied carbon/energy of construction and waste materials
Solid waste	Scope 3	Solid waste to landfill
Employee and business travel	Scope 3	Employees travelling between their place of residence and the Project. Employee travel from accommodation to work areas during construction has been included.

7.9.2 Impact Assessment

7.9.2.1 Construction emissions

Estimated emissions occurring as a result of construction activities for the Project are provided in **Table 7.23**. Values provided in **Table 7.23** are rounded to the nearest tonne.

Construction is anticipated to be occur over a 12 month period.

Table 7.23 Construction Emissions

Description	Type	Emissions (t CO_2-e)
Diesel Combustion – Transport & Stationary engines	Scope 1	7,407
Land Clearing – Lost carbon sink	Scope 1	54,816
	Scope 1 Total	**62,223**
Diesel	Scope 3	361
	Scope 3 Total	**361**
	Total	**62,584**

The Project is forecast to produce approximately 62,584 t CO_2-e Scope 1 emissions during the construction period of which approximately 54,816 t CO_2-e emissions is due to land clearing activities. This is considered a highly conservative estimate for the reasons noted in **Table 7.21**. It is noted that removal of carbon sinks from land clearing activities is not a source of emissions reportable under the NGER scheme. There are no scope 2 emissions forecast to be produced during construction, as the project does not propose to utilise electricity from the NSW electricity grid during this period. Based on the calculations in **Table 7.23**, construction emissions would not meet the threshold for application for NGER Reporting or the Emissions Reduction Fund Safeguard Mechanism.

7.9.2.2 Operational Emissions

Estimated annual operational emissions occuring as a result of operation of the Project is provided in **Table 7.24**. **Graph 7.3** demonstrates that the Project's GHG inventory is dominated by Scope 3 emissions. Approximately 95% of the Project's emissions occur outside the operational control of the Project. Approximately 5% of the GHG emissions associated with operation of the Project are related to onsite energy use and fugitive emissions.

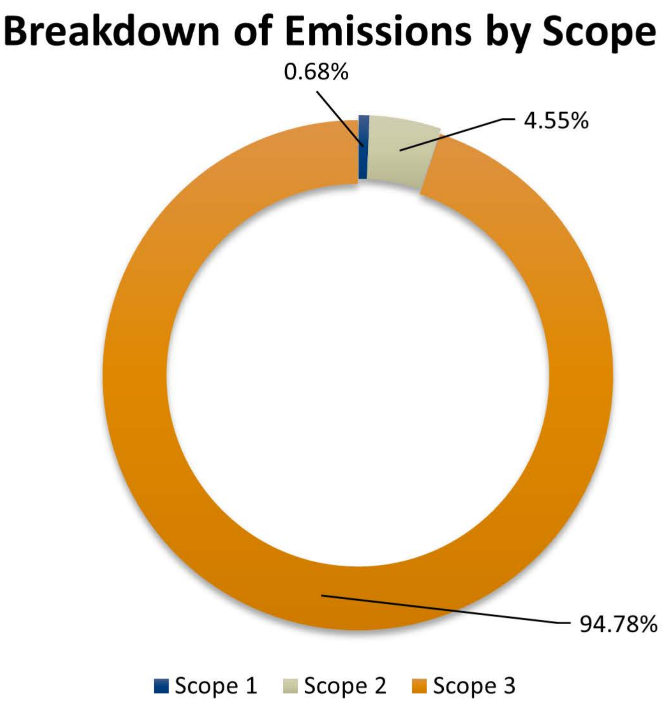
Estimated emissions occurring as a result of operation of the Project over a 30 year period is provided in **Table 7.25**. Values provided in **Table 7.24** and **Table 7.25** are rounded to the nearest tonne. Fugitive emissions in **Table 7.25** also incorporate testing and maintenance of the storage pipeline once every seven to 10 years as discussed in **Section 2.8.1**.

Table 7.24 Operational Emissions Estimate (Annual)

Description	Annual emissions (t CO_2-e)
Scope 1 (Direct)	
Diesel Combustion	16
Gas Combustion	2,033
Fugitive Emissions	321
Scope 1 Total	**2,370**
Scope 2 (Indirect)	
Electricity Consumption	15,897
Scope 2 Total	**15,897**

Description	Annual emissions (t CO_2-e)
Scope 3 (Indirect)	
Diesel Combustion	1
Gas Consumption	552
Electricity Consumption	1,427
Combustion of downstream gas[1]	329,438
Scope 3 Total	**331,418**
Total Scope 1 and 2 Annual Operational Emissions	**18,267**
Total Scope 1, 2 & 3 Annual Operational Emissions	**349,685**

[1] Table 15.12 (Jacobs, 2021a)



Graph 7.3 Breakdown of Annual Emissions by Scope

Table 7.25 Operational Emissions (Total – 30 Year period))

Description	Emissions (t CO_2-e)
Scope 1 (Direct)	
Diesel Combustion	488
Gas Combustion	60,981
Fugitive Emissions	9,633
Scope 1 Total	**71,102**
Scope 2 (Indirect)	
Electricity Consumption	476,914
Scope 2 Total	**476,914**

Description	Emissions (t CO_2-e)
Scope 3 (Indirect)	
Diesel Combustion	25
Gas Consumption	16,568
Electricity Consumption	42,800
Combustion of downstream gas[5]	9,592,100
Scope 3 Total	**9,621,176**
Total Scope 1 and 2 Operational Emissions	**548,016**
Total Scope 1, 2 and 3 Operational Emissions (30 years)	**10,199,509**

The Project is estimated to produce approximately 2,370 t CO_2-e Scope 1 emissions annually during operations. Approximately 9,633 t CO_2-e of Scope 1 emissions would also be emitted once every 7 to 10 years during operations (i.e. up to 4 events across duration of operations) as a result of testing events (**Section 2.8.1**). This value has been prorated in **Table 7.24** and accounted for in **Table 7.25**.

The Project is estimated to produce approximately 15,897 t CO_2-e of Scope 2 emissions per annum.

Based on the above calculations, annual operational emissions (Scope 1 and 2) from the Project would not meet the facility threshold for application for NGER Reporting or the Emissions Reduction Fund Safeguard Mechanism. The Project is estimated to consume 118 TJ of energy per annum. Based on this calculation, annual operational energy consumption from the Project would meet the facility threshold for application for NGER Reporting.

Gas combusted downstream (Scope 3) of the Project will generate GHG emissions beyond the operational control of the Project. Combustion of the gas downstream of the Project is the largest source of emissions associated with the Project at 329,438 t CO_2-e per annum (Jacobs, 2021a). In total, emissions from the combustion of gas downstream across the 30 year operational period of the approved HPP is approximately 9.6Mt CO_2-e.

7.9.2.3 Impact on National Emissions

Anthropogenic climate change occurs on a global basis and the emissions of a single point source is not material when considering the future impact on the climate. For example, CO_2 has a residence time in the atmosphere of approximately 100 years. During this period, the emission of a single facility/the Project will combine with other anthropogenic and natural climate forcing emissions and activities to precipitate a global outcome. The global nature of the impacts of climate change such as temperature increases, sea level rise, ecological impacts, changes in crop productivity and disease distribution are well documented.

Australia's GHG inventory as of June 2021 is approximately 498.6Mt CO_2-e/year (Department of Industry, Science, Energy and Resources, 2021b). Taking into account Scope 1 and 2 emissions only, the Project would contribute 8,267t CO_2-e to Australia's GHG inventory annually, which represents an increase of 0.0037% to the Australia's National GHG inventory.

The purpose of the Project is to provide infrastructure that enables gas to be supplied to the approved HPP. As noted by DPIE in the HPP Notice of Decision (DPIE 2021a), the HPP would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables.

[5] Tables 15.11 and 15.12 (Jacobs, 2021a)

7.9.3 Management and Mitigation Measures

Potential GHG impacts would be managed and mitigated through the implementation of measures including:

- Selection of electric drive compressors to eliminate emissions from gas combustion
- Construction plant and equipment will be well maintained and regularly serviced, as per manufacturer's requirements so that vehicular and machinery emissions remain within relevant air quality guidelines and standards
- Equipment will be maintained appropriately to minimise risk of unintended leakages, venting and other unforeseen maintenance activities. This includes management and monitoring of the pipeline in accordance with relevant Australian Standards
- Operational equipment and machinery such as water bath heaters and compressors will only be used as required based on the demand requirements of the HPP.
- Record keeping will be maintained of land cleared, disturbed and rehabilitated for the Project, fuel consumption and amounts of gas vented. This will allow that project to accurately state its GHG emissions profile, and comparison with the estimates provided within the current assessment.

7.10 Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) was prepared by Umwelt to assess the noise and vibration impacts associated with the Project. In accordance with the SEARs, the NVIA addresses noise and vibration impacts from construction, operations and transportation associated with the Project. The assessment describes the existing noise environment and identifies the sources of potential impacts whilst proposing mitigation strategies to effectively reduce noise and vibration emissions. Consistent with the requirements of the SEARs, the NVIA has been prepared in accordance with the following policies and guidelines:

- Noise Policy for Industry (EPA, 2017)
- NSW Road Noise Policy (DECCW NSW, 2011)
- Interim Construction Noise Guideline (DECC, 2009)
- Assessing Vibration: A Technical Guideline (DEC, 2006a)
- Construction Noise and Vibration Guideline, v1.0 (RMS, 2016)
- Australian Standard 1055-2018 Acoustics – Description and measurement of environmental noise (Standards Australia, 2018).

A summary of the key findings of the NVIA is provided in this section and the full report is provided in **Appendix 11**.

7.10.1 Existing Environment

Existing noise levels in the area surrounding the Project were determined by background noise monitoring supplemented by contemporary noise assessments previously undertaken in the area. The noise impact assessment for the HPP Response to Submissions (Jacobs, 2021c) was used in this assessment for background noise levels at the western endof the Project. Background noise levels for the central area of the Project were sourced from a noise assessment undertaken by Jacobs (2019) for major road works at Testers Hollow.

To determine background noise levels at the eastern end of the Project, attended noise monitoring was undertaken by Umwelt at 146 Lenaghans Drive, Lenaghan over a 10-day period in September 2021.

Meteorological data was obtained from the Bureau of Meteorology (BoM) Automatic Weather Station at Cessnock Airport, and periods of unsuitable weather conditions (high wind conditions or rainfall) were excluded from the noise monitoring data.

7.10.1.1 Sensitive Receivers and Noise Catchment Areas

A review of land ownership and receiver locations in proximity to the Project was undertaken as part of the NVIA process using aerial imagery. Most sensitive receivers in the vicinity of the project are residential receivers. The mining areas of Donaldson Coal and Ashtonfields have not been considered sensitive receivers in this assessment, as noise levels in many parts of these active mining areas will likely exceed the noise levels of construction or operational activities associated with the Project.

The NVIA grouped residential receivers into noise catchment areas (NCAs) which were determined based on areas of similar background noise levels. Some areas were also further divided into smaller sub-areas of similar setback distance from Project areas. NCAs for the project are shown in **Figure 7.18** and adopted Rating Background Levels (RBLs) for each NCA are shown in **Table 7.26**.

The total number of sensitive receivers identified within all NCAs was 13,627.

Table 7.26 Rating Background Levels

NCA	Rating Background Levels (RBLs), dB(A)		
	Day (7 am – 6 pm)	Evening (6 pm – 10 pm)	Night (10 pm – 7 am)
1a, 1b, 1c, 1d	45	45	36
2	40	43	38
3a, 3b	38	39	37
4a, 4b, 4c	38	36	32
5	37	41	35
6a, 6b, 6c	37	32	30
7a, 7b, 7c, 7d	37	33	30
8a, 8b	45	43	35

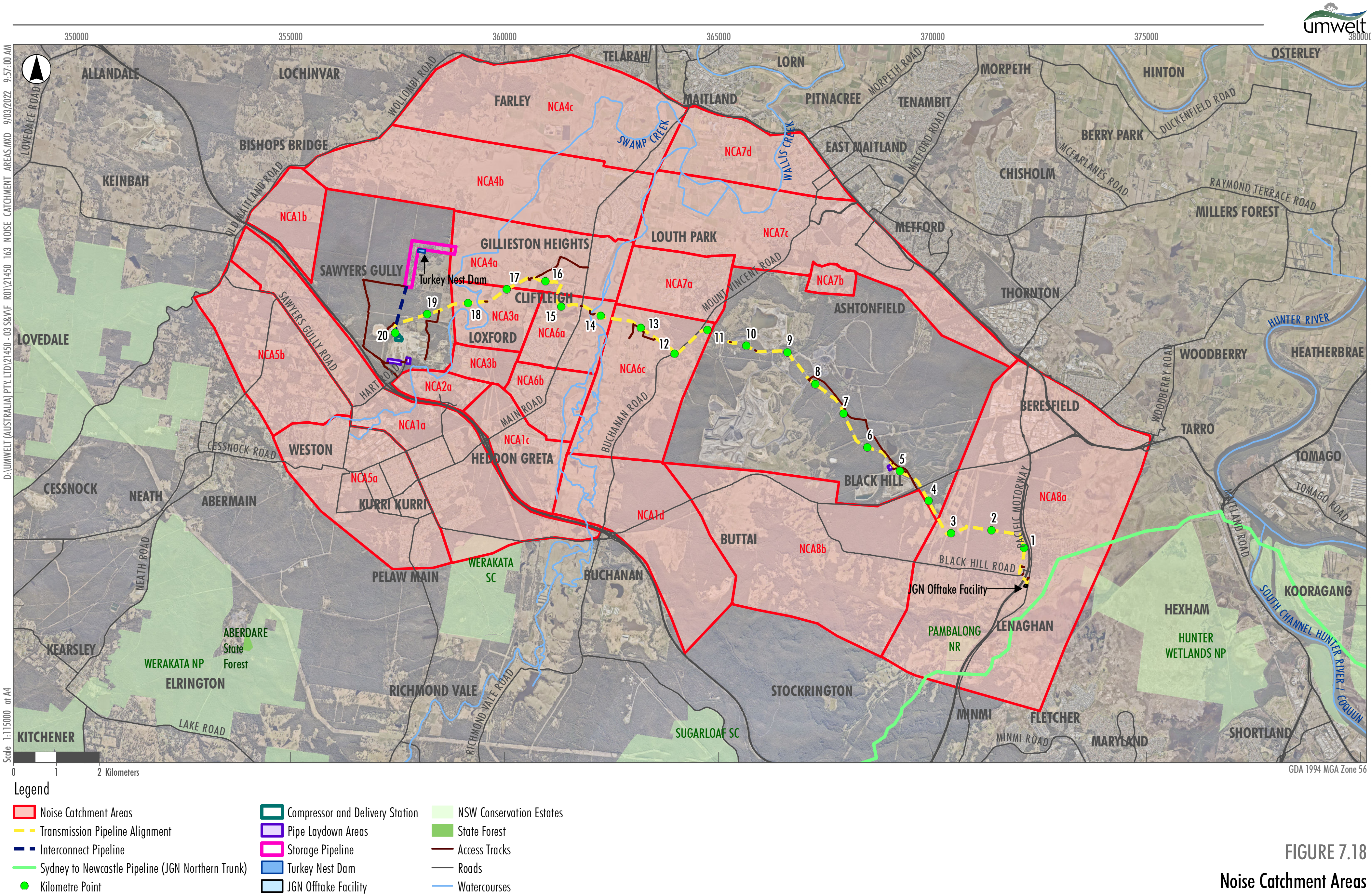


FIGURE 7.18
Noise Catchment Areas

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

7.10.1.2 Representative Receivers

Compressor and Delivery Station Receivers

An operational model was used to determine the potential noise impacts from the compressor and delivery station at the nearest receivers adjacent to this part of the Project. The receivers included in this model are consistent with those adopted in the HPP assessments (Jacobs, 2021a) and are detailed in **Table 7.27**.

Table 7.27 Operational receivers adjacent to the compressor and delivery station

NCA	Representative Receiver ID	Nearest Receiver Type	Receiver details	Approximate separation distance (m)
NCA 1	R1-1	Residential	103 Bishops Bridge Rd, Sawyers Gully	1,075
NCA 2	R2-1	Residential	10 Dawes Ave, Loxford	1,175
	R2-2	Commercial	6 Dawes Ave, Loxford	1,050
NCA 3	R3-1	Residential	20 Bowditch Ave, Loxford	1,650
	R3-2	Commercial	18 Bowditch Ave, Loxford	1,625
	R3-3	Education	TAFE Kurri Kurri, McLeod Road, Loxford	1,950
NCA 4	R4-1	Residential	464 Cessnock Road, Gillieston Heights	3,375
NCA 5	R5-1	Residential	59 Sawyers Gully Road, Sawyers Gully	1,800

JGN Offtake Facility Receivers

An operational model was used to determine the potential noise impacts from the JGN Offtake Facility at the nearest receivers adjacent to this part of the Project. The receivers included in this model are detailed in **Table 7.28**.

Table 7.28 Operational receivers adjacent to the JGN Offtake Facility

NCA	Representative Receiver ID	Nearest Receiver Type	Receiver details	Approximate separation distance (m)
NCA8	R8-1	Residential	2 Phoenix Road, Black Hill	650
	R8-2	Residential	159 Lenaghans Drive, Lenaghan	350
	R8-3	Residential	153 Lenaghans Drive, Lenaghan	250
	R8-4	Residential	141a Lenaghans Drive, Lenaghan	450
	R8-5	Residential	146 Lenaghans Drive, Lenaghan	475
	R8-6	Residential	21 Black Hill Road, Lenaghan	400
	R8-7	Residential	4 Black Hill Road, Black Hill	800
	R8-8	Residential	Hunter Valley Equestrian Centre (2 Black Hill Road, Black Hill)	1,075

7.10.2 Methodology

7.10.2.1 Construction Noise

Noise modelling of construction activities was undertaken with the proprietary computer noise modelling software SoundPLAN version 8.2, using the CONCAWE noise prediction algorithms. The noise models were developed using three-dimensional terrain data. Ground absorption for the area was modelled as acoustically soft ground.

Construction noise levels have been predicted under default worst-case meteorological conditions (D-class with 3m/s windspeed or F-class with 2m/s windspeed) in accordance with the *Noise Policy for Industry* (NPfI). These meteorological conditions represent worst-case enhancing conditions for both standard and outside standard hour construction activities.

The assessment considered the potential for cumulative noise levels at the nearby sensitive receivers from the simultaneous construction activities for the KKLP project and HPP project. The outcomes of the assessment are discussed in **Section 7.10.4.5** and **7.16.3.2** of this EIS.

7.10.2.2 Operational Noise

As with the construction noise predictions, operational noise level predictions were undertaken with the proprietary computer noise modelling software SoundPLAN version 8.2, using the CONCAWE noise prediction algorithms. The noise models were developed using three-dimensional terrain data.

Operational noise levels have been predicted under default worst-case meteorological conditions (D-class with 3m/s windspeed or F-class with 2m/s windspeed) in accordance with the NPfI. These meteorological conditions represent worst-case enhancing conditions for either day, evening or night periods.

The assessment considered the cumulative noise levels at the nearby sensitive receivers from the simultaneous operation of the compressor station, delivery station and the HPP. The outcomes of the assessment are discussed in **Section 7.10.4.5** and **7.16.3.2** of this EIS.

7.10.3 Criteria

7.10.3.1 Construction Noise

The *Interim Construction Noise Guideline* (ICNG) (RMS, 2016) provides noise management criteria for construction activities. The criteria are intended to guide the need for, and the selection of, feasible and reasonable work practices to minimise construction noise impacts.

The ICNG notes that a residential receiver is 'noise affected' if the LAeq(15min) construction noise level exceeds the rating background noise level by more than 10 dB during recommended standard hours. A residential receiver is 'highly noise affected' if the LAeq(15min) construction noise level exceeds 75 dB(A). Outside recommended standard hours a residential area is 'noise affected' if the LAeq(15min) construction noise level exceeds the rating background noise level by more than 5 dB(A). Standard construction hours defined by the ICNG are:

- Monday to Friday: 7 am to 6 pm
- Saturday: 8 am to 1 pm
- Sunday and Public Holidays: No work.

The assessment of construction noise has assumed that all identified receivers are residential, to address potential impacts on other sensitive uses that have not otherwise been identified. Light industrial, heavy industrial, infrastructure and educational land uses have been assessed separately, based on land zoning, and using the ICNG construction Noise Management Levels (NMLs).

The potential for both sleep disturbance and awakenings has been considered using a contemporary approach as nominated in the NPfI. For the purposes of this assessment, the 52 dB(A) LAmax parameter has been adopted to assess the potential for sleep disturbance from construction noise during the night-time period in all NCAs except for NCA2, where the LAmax parameter is 53 dB(A), based on the night period RBL in that NCA being slightly higher than other areas.

The construction NMLs for residential receivers are summarised in **Table 7.29** based on the adopted RBLs presented in **Table 7.26**. Light industrial, heavy industrial and infrastructure land use zones have been applied a NML of 75 dB(A) $L_{Aeq(15min)}$ in accordance with the ICNG. The Kurri Kurri Tafe is located in NCA2a and has an internal noise level target of 45 dB(A) $L_{Aeq(15min)}$, which translates to an external noise level target of 55 dB(A) $L_{Aeq(15min)}$, with an assumed noise reduction of 10 dB(A) across the building façade.

Table 7.29 Construction Noise Management Levels

NCA	Standard Hours	Outside of Standard Hours				Highly Noise Affected
	Day	Day	Evening	Night		
	LAeq(15min)	LAeq(15min)	LAeq(15min)	LAeq(15min)	LAmax	LAeq(15min)
1a, 1b, 1c, 1d	55	50	50	41	52	75
2	50	45	45[2]	43	53	75
3a, 3b	48	43	43[2]	42	52	75
4a, 4b, 4c	48	43	41	37	52	75
5	47	42	42[2]	40	52	75
6a, 6b, 6c	47	42	37	35	52	75
7a, 7b, 7c, 7d	47	42	38	35	52	75
8a, 8b	55	50	48	40	52	75

Notes: [1] *Recommended standard hours: Monday to Friday 7 am - 6 pm; Saturday 8 am - 1 pm.*
[2] *Evening criterion set to be equal to the day outside of hours in accordance with the NPfI (evening criteria cannot exceed day criteria).*

In summarising the potential construction-related noise impacts on the communities surrounding the Project area, the approach from the CNVG has been adopted where a perception category is assigned to each receiver based on the difference between the predicted noise level and the noise management level. The noise perception categories from the CVNG are summarised for each time period in **Table 7.30**.

Table 7.30 Construction Noise Perception Categories

Noise Perception Category	Noise level range above NML, dB(A)	
	Standard construction hours	Outside standard hours
Noticeable	N/A	1 dB(A) to 5 dB(A) above NML
Clearly audible	1 dB(A) to 10 dB(A) above NML	5 dB(A) to 15 dB(A) above NML
Moderately intrusive	10 dB(A) to 20 dB(A) above NML	15 dB(A) to 25 dB(A) above NML
Highly intrusive	> 20 dB(A) above NML	> 25 dB(A) above NML

7.10.3.2 Construction Vibration

Recommended safe working distances for vibration-generating equipment from sensitive receivers (i.e. the receiver building or its occupants) are given in Table 2 of the NSW Construction Noise and Vibration Guideline (CNVG) (RMS, 2016) and reproduced in **Table 7.31** below.

Table 7.31 Recommended minimum working distances

Plant Item	Rating/Description	Minimum Working Distance (m)[1]	
		Cosmetic damage (residential building)	Human response
Vibratory roller	< 50 kN (typically 1-2 tonnes)	5	15-20
	< 100 kN (typically 2-4 tonnes)	6	20
	< 200 kN (typically 4-6 tonnes)	12	40
	< 300 kN (typically 7-13 tonnes)	15	100
	> 300 kN (typically 13-18 tonnes)	20	100
	> 300 kN (> 18 tonnes)	25	100
Small hydraulic hammer	300 kg (5-12 t excavator)	2	7
Medium hydraulic hammer	900 kg (12-18 t excavator)	7	23
Large hydraulic hammer	1600 kg (18-34 t excavator)	22	73
Vibratory pile driver	Sheet piles	2-20	20
Pile boring	≤ 800 mm	2 (nominal)	4
Jackhammer	Handheld	1 (nominal)	2

Source: Construction Noise and Vibration Guideline Table 2 (RMS, 2016)
Note [1] More stringent conditions may apply to heritage or other sensitive structures.

7.10.3.3 Operational Noise

The operational noise criteria applicable to the Project have been derived in accordance with the NPfI, which sets out two noise criteria to assess the potential noise impacts resulting from industrial activity. The first is used to control short-term intrusive noise and its impacts on residents whilst the second is used to protect against cumulative noise impacts and maintain noise level amenity for particular land uses. Applying the more stringent of the two as the project noise trigger level ensures that intrusive noise is limited, and amenity is protected and that no single industry can unacceptably change the noise level of an area.

The project noise trigger levels for intrusiveness and amenity, derived from adopted background noise levels presented in **Section 7.10.1,** are presented in **Table 7.32**. It should be noted that the project noise trigger levels provide a benchmark or objective for assessing a project but are not intended for use as mandatory requirements. The project noise trigger level, if exceeded, indicates a potential noise impact on the community and so triggers a management response such as further investigation of mitigation measures.

Table 7.32 Project Noise Trigger Levels, dB(A)

NCA	Time of day	Project intrusiveness noise level $L_{Aeq(15min)}$	Project amenity noise level $L_{Aeq(15min)}$	Project noise trigger level $L_{Aeq(15min)}$
NCA1	Day	50	58	50
	Evening	50	48	48
	Night	41	43	41

NCA	Time of day	Project intrusiveness noise level $L_{Aeq(15min)}$	Project amenity noise level $L_{Aeq(15min)}$	Project noise trigger level $L_{Aeq(15min)}$
NCA2	Day	45	58	45
	Evening	45	48	45
	Night	43	43	43
NCA3	Day	43	53	43
	Evening	43	43	43
	Night	42	38	38
NCA4	Day	43	48	43
	Evening	41	43	41
	Night	37	38	37
NCA5	Day	42	53	42
	Evening	42	43	42
	Night	40	38	38
NCA6	Day	42	53	42
	Evening	37	43	37
	Night	35	38	35
NCA7	Day	42	53	42
	Evening	38	43	38
	Night	35	38	35
NCA8	Day	50	53	50
	Evening	48	43	43
	Night	40	38	38

Note [1] Day period is 7 am-6 pm Monday-Saturday and 8 am-6 pm Sunday and Public Holidays, evening period is 6 pm-10 pm and night period is 10 pm to commencement of day period.

To assess potential sleep disturbance impacts from the facility during the night period, a maximum sound power level 3 dB greater than the combined sound power level of the facility was adopted. Acoustically, this represents a doubling of the operational noise level and is therefore considered to be a conservative approach to determine potential sleep disturbance impacts.

7.10.3.4 Road Traffic Noise

The *NSW Road Noise Policy* (DECCW, 2011) sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments, or planned building developments. **Table 7.33** outlines the road traffic noise criteria relevant to the Project for residential land uses as defined by the *NSW Road Noise Policy*.

Table 7.33 Road Traffic Noise Criteria, Residential

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/ sub-arterial road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15 hour) 60 (external)	LAeq(9 hour) 55 (external)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Local road	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq(1 hour) 55 (external)	LAeq(1 hour) 50 (external)

Source: NSW Road Noise Policy (DECCW, 2011)

7.10.4 Assessment of Impacts

7.10.4.1 Construction Noise

Construction activities will occur in different areas of the Project construction footprint during and outside of standard construction hours. Four construction scenarios have been modelled to determine worst-case construction noise levels.

- Scenario 1 assesses general construction activities planned along the transmission pipeline, storage pipeline and at associated surface facilities during standard hours.
- Scenario 2 assesses continuous activities which are required to extend to outside standard hours for HDD and horizontal boring under roads, railways and watercourses.
- Scenario 3 assesses construction of the storage pipeline outside standard hours, as construction of this component of the Project is planned to occur both during and outside of standard construction hours given the remote location and large separation to sensitive receivers.
- Scenario 4 assesses operation of pumps used during hydrostatic testing of the transmission pipeline and storage pipeline during commissioning works, which will be required to operate outside of standard hours.

Details of the modelled elements, source locations, associated sound power levels and assumptions for each scenario are provided in Section 5.4 of the NVIA contained in **Appendix 11**. Results for the four modelled scenarios are summarised below.

Scenario 1 – Standard hours construction stages

Of the 13,627 sensitive receivers mapped in all NCAs, the modelling of worst case construction noise impacts during standard hours shows that one residential receiver is predicted to experience highly intrusive noise. Seventeen residential receivers are predicted to experience moderately intrusive noise at some point of the construction phase. This result is primarily due to the design of the Project such that distances to residences and residential areas have been maximised as far as practicable. Residences predicted to experience moderately intrusive noise for this scenario are located near to the first kilometre of the transmission pipeline and adjacent to Main Road near KP 14.5 of the transmission pipeline. Reasonable and feasible noise mitigation measures will be required at these locations in particular to minimise the potential impacts on communities surrounding the Project during standard construction hours.

Predicted noise levels at industrial, infrastructure and educational receivers will comply with applicable NMLs during standard construction hours.

Scenario 2 - Outside standard hours HDD and boring

HDD and horizontal boring are typically required to be completed without interruption in order to maintain the integrity of the bore. As such, noise impacts outside standard hours, particularly in the evening and night periods, require careful management for these activities.

Without noise management, a number of sensitive receivers are predicted to experience noise levels above the applicable NMLs in each period (day, evening and night) outside of standard hours under Scenario 2. Although none would experience highly intrusive noise, 1 (day), 12 (evening) and 29 (night) receivers would potentially experience moderately intrusive noise. In addition, 64 receivers across NCAs 4a, 6a, 6c and 8a are predicted to receive noise levels above the sleep disturbance noise management level of 52 dB(A) L_{Amax}.

Most of the affected receivers are associated with the HDD of Wallis Creek, the horizontal bore of Main Road and to a lesser extent the HDD of Buttai Creek. The HDDs of Swamp Creek and the Kurri Kurri Regrowth proposed stewardship area, and the six proposed horizontal bores between KP5 and KP12, do not affect any receivers during the night period at a moderately intrusive level or above.

The modelling results and analysis indicate that reasonable and feasible noise mitigation measures will be required to minimise the potential impacts on communities surrounding the Project under this scenario, focussed on the areas described above.

Available noise mitigation measures for HDD activities include:

- Selection of appropriate drilling rigs
- Scheduling noisiest activities to the day time period as far as practicable
- Enclosing or shielding stationary equipment such as generators and pumps
- Installing sound blankets around all or sections of the HDD entry and/or exit site

Consultation with potentially affected residences will also be undertaken.

Each HDD will have a specific drilling plan prepared by the contractor in consultation with APA. Noise control requirements will be specified as part of each plan, including modelling of noise emissions and details of specific noise mitigation measures to be applied.

Predicted noise levels at industrial, infrastructure and educational receivers will comply with applicable NMLs under this scenario.

Scenario 3 – Outside standard hours storage pipeline construction works

Modelling of worst case noise impacts during storage pipeline construction works outside standard hours predicts that no sensitive receptors will experience moderately intrusive noise or greater during any period, and less than five sensitive receivers will experience noticeable noise during the day period. This result is primarily a consequence of the remote location of the storage pipeline construction footprint.

Storage pipeline construction works during the night period will be limited to 6am to 7am, during which time the modelling predicts that five and 261 sensitive receivers will experience clearly audible and noticeable noise levels respectively. No evening work is planned for the storage pipeline.

No sensitive receivers would experience exceedance of the sleep disturbance NML.

Predicted noise levels at industrial, infrastructure and educational receivers will comply with applicable NMLs under this scenario.

Scenario 4 – Outside standard hours hydrostatic testing

The noise levels at all receivers are predicted to be less than the NMLs for this scenario.

7.10.4.2 Construction Vibration

Many items of construction equipment generate vibration that may be perceptible to receivers and cause annoyance or structural damage to buildings or other structures.

The types of vibration-sensitive receivers in the Project area likely include:

- Residential dwellings (occupants)
- Residential dwellings (structures)
- Commercial/agricultural buildings.

All separation distances between the Project and receivers are greater than the minimum working distance of 100 m for human response outlined in the CNVG (refer to **Table 7.31**), suggesting that vibration impacts from construction activities will be negligible.

Should more intensive vibration generating equipment be used for the Project, or at locations nearer to receivers or near identified heritage structures, it is recommended that a targeted vibration assessment be undertaken.

7.10.4.3 Operational Noise

Three operational noise scenarios have been considered as part of this assessment to address operational noise emissions from the following project components:

- Scenario 1 – Compressor and Delivery Station, located adjacent to the HPP
- Scenario 2 – JGN Offtake Facility, located near Lenaghans Drive at the eastern end of the project
- Scenario 3 – Storage Pipeline maintenance venting every 7 to 10 years.

Details of the modelled elements, source locations, associated sound power levels and assumptions for each scenario are provided in Section 6 of the NVIA contained in **Appendix 11**.

Results are summarised in the following sections:

Scenario 1 – Compressor Station and Delivery Station

Project noise trigger levels for receivers located near the Compressor and Delivery Station are based on RBLs determined for the noise catchment areas surrounding the HPP, as described in **Section 7.10.2** and are shown in **Table 7.34**. As these facilities may operate at any time in a 24-hour period, predicted noise levels have been compared to the most restrictive night period project noise trigger level and also against the sleep disturbance parameter determined in accordance with the NPfI.

Table 7.34 Predicted Operational Noise Levels, Scenario 1

Noise Catchment Area	Receiver ID	Nearest Receiver Type	Operational Noise Assessment		Sleep Disturbance Assessment	
			Night Period Criteria LAeq(15min)	Predicted Noise Levels LAeq(15min)	Sleep Disturbance Criteria LAmax	Predicted Noise Levels LAmax
NCA 1	R1-1	Residential	41	31[1]	52	34[1]
NCA 2	R2-1	Residential	43	32[1]	53	35[1]

Noise Catchment Area	Receiver ID	Nearest Receiver Type	Operational Noise Assessment		Sleep Disturbance Assessment	
			Night Period Criteria LAeq(15min)	Predicted Noise Levels LAeq(15min)	Sleep Disturbance Criteria LAmax	Predicted Noise Levels LAmax
	R2-2	Commercial	60	34[1]	N/A	N/A
NCA 3	R3-1	Residential	38	24	52	27
	R3-2	Commercial	60	26	N/A	N/A
	R3-3	Education	40	22	N/A	N/A
NCA 4	R4-1	Residential	37	16	52	18
NCA 5	R5-1	Residential	38	23	52	25

Note: [1] Result includes a modifying factor of +2 dB(A) due to low-frequency content

Based on the results in **Table 7.34** the noise levels from the Compressor Station and Delivery Station are predicted to comply with the day, evening and night period noise limits and the sleep disturbance criteria at the nearest representative receivers.

Scenario 2 – JGN Offtake Facility

Project noise trigger levels for receivers near the JGN Offtake Facility are based on RBLs determined for NCA8 in **Section 7.10.2** and are shown in **Table 7.35**. As the JGN Offtake Facility may operate at any time as required in a 24-hour period, predicted noise levels have been compared to the most restrictive night period project noise trigger level and also against the sleep disturbance parameter determined in accordance with the NPfI.

Table 7.35 Predicted Operational Noise Levels, Scenario 2

Noise Catchment Area	Receiver ID	Nearest Receiver Type	Operational Noise Assessment		Sleep Disturbance Assessment	
			Night Period Criteria LAeq(15min)	Predicted Noise Levels LAeq(15min)	Sleep Disturbance Criteria LAmax	Predicted Noise Levels LAmax
NCA 8	R8-1	Residential	38	21	52	23
	R8-2	Residential	38	39[1]	52	37
	R8-3	Residential	38	42[1]	52	40
	R8-4	Residential	38	37[1]	52	34
	R8-5	Residential	38	33[1]	52	34
	R8-6	Residential	38	38[1]	52	35
	R8-7	Residential	38	24	52	27
	R8-8	Residential	38	20	52	23

Note:[1] Result includes a modifying factor of +2 dB(A) or + 5 dB(A) due to low-frequency content. Shaded cells represent an exceedance of criteria

Based on the results in **Table 7.35** the operational noise levels from the JGN offtake facility are predicted to comply with the day and evening noise limits and the sleep disturbance criteria. However, operational noise levels from the JGN offtake facility are predicted to exceed the night period noise limits at the two nearest representative receivers (R8-2 and R8-3).

Noise modelling of the JGN offtake facility has used preliminary engineering design data that is likely to overestimate noise emissions from this facility. Further noise assessments and, if required, mitigation will be undertaken during detailed design for the JGN offtake facility. Management measures to further mitigate noise emissions will be implemented if impacts to sensitive receivers are predicted to be noise criteria.

Scenario 3 – Storage Pipeline maintenance venting every 7 to 10 years

Venting of the storage pipeline will need to occur on an infrequent basis for maintenance and testing purposes, approximately once every seven to 10 years. As the sound power levels of venting activities are not currently known this scenario was not able to be modelled at this stage of the Project.

Reasonable and feasible noise control and mitigation are likely to be required for this activity and may include sacrificial noise attenuators, temporary localised noise barriers and time restrictions (i.e. day time only). The reasonable and feasible noise controls will be determined during the detailed design phase.

Even with the inclusion of reasonable and feasible noise controls, this activity may still result in elevated noise impacts above the operational noise limits at the sensitive receivers surrounding the facility. However, due to the rare occurrence of the venting activity, combined with the incorporation of reasonable and feasible noise controls, elevated noise limits may be derived specifically for this venting activity during the detailed design phase.

7.10.4.4 Road Traffic Noise

The Project's traffic and transport impacts would primarily occur during the construction phase as a result of:

- delivery of plant, equipment and materials to the Project area
- transport of pipe segments from the Port of Newcastle to the Project area
- construction activities at or near roads, and
- transport of construction crews between the Project area and accommodation facilities.

To account for the worst-case scenario, traffic generation during the peak construction period (estimated to take place on the fourth month of construction works, around April 2023) has been analysed and assessed.

The potential impacts from the construction-related road traffic noise have been evaluated based on the proposed access and transport routes with consideration of existing traffic volumes and the addition of construction-related traffic volumes.

The potential increase in road traffic noise levels for all affected roads is less than the 2 dB(A) relative increase criterion for both the day and night average noise levels, and the AM and PM peak hour noise levels. Therefore, the increase is only considered a minor impact that would be barely perceptible to the average person. Additionally, this relative increase is only temporary and applicable during the construction period for the Project.

Operational traffic is not anticipated to materially increase from that already assessed as part of the HPP, therefore no further assessment has been undertaken.

7.10.4.5 Cumulative Noise with the HPP

Potential cumulative impacts from simultaneous construction and operation of the Project and the HPP Project have been considered.

The assessment of simultaneous construction conservatively considered the highest predicted construction-related noise levels within each NCA surrounding the HPP (NCA 1 to NCA 5). The potential nett increase in construction noise levels as a result of simultaneous construction activities was assessed as minor and is estimated to be between 0 and 1 dB(A).

Simultaneous operation of the compressor station, delivery station and HPP is highly unlikely to occur. This scenario would require the compressor station to be discharging to the storage pipeline at the same time as gas is flowing out of the storage pipeline into the delivery station and HPP. Nevertheless this scenario was considered for a conservative assessment of noise impacts.

The analysis indicated that the noise contribution of the compressor station and delivery station is minor relative to the HPP. The predicted cumulative noise levels indicate that the simultaneous operation of the compressor station, delivery station and HPP results in a negligible change in cumulative noise levels at the nearby sensitive receivers compared to the operation of the HPP in isolation. The cumulative noise levels are predicted to comply with the recommended amenity noise levels at each of the nearby sensitive receivers.

7.10.5 Management and Mitigation Measures

Measures presented in **Table 7.36** will be implemented to manage and mitigate noise and vibration impacts during various stages of the Project.

Table 7.36 Noise and vibration management measures

No	Measure	Timing
NV01	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The CEMP and NVMP will be regularly updated to account for any changes in noise and vibration management of the Project.	Planning Construction
NV02	Except in the event of an emergency, construction activities will only be undertaken outside of standard construction hours (defined in the NSW Interim Construction Noise Guideline as 7:00 am to 6:00 pm weekdays and 8:00 am to 1:00 pm on Saturdays at no time on Sundays and public holidays) where feasible and reasonable noise mitigation measures are in place and approval conditions can be complied with.	Planning Construction
NV03	Blasting, if required, will be carried out in accordance with the following measures: a. Conducted only where conventional excavation or trenching is ineffective or impractical, or if blasting will provide a reduction in environmental impacts. b. Conducted with appropriate dust control measures. c. Conducted according to a blast procedure prepared by a qualified person. d. Conducted only where consultation has occurred with affected landholders.	Construction
NV04	Broadband reversing alarms will be used in preference to 'beeper' reversing alarms on construction vehicles and machinery.	Construction
NV05	As noise generated by venting at the JGN Offtake Facility, the compressor station, delivery station and storage pipeline is dependent upon the detailed design of these facilities, noise profiles will be reassessed during detailed design and management measures to mitigate noise from venting will be implemented if sensitive receivers are expected to be impacted.	Planning Operations
NV06	Pumps and compressors used for hydrotesting and pigging activities will be muffled or otherwise treated to reduce noise emissions.	Construction
NV07	Additional noise modelling and, if required, mitigation will be undertaken during detailed design for the JGN offtake facility, compressor station and delivery station. Management measures to further mitigate noise emissions will be implemented if impacts to sensitive receivers are predicted to be above the relevant noise criteria.	Planning Operations
HD01	A HDD management plan including drill profile design, work method statement, proposed volumetric drilling fluid tracking program and proposed intervention levels, will be prepared for each HDD prior to the commencement of HDD activities. The management plan will include specific noise mitigation requirements for each HDD.	Planning

7.11 Traffic and Transport

A Traffic Impact Assessment (TIA) has been prepared by GHD (GHD, 2021c) in accordance with the SEARs, as presented in **Table 3.1**. The TIA undertook a review of existing traffic conditions and site access arrangements, assessed traffic and transport impacts to the local road network arising from the construction and operation of the Project, and determined measures to mitigate and manage any adverse impacts to existing road users and road infrastructure. The assessment addressed traffic impacts from the transport of material and personnel related to the Project, focusing particularly on peak construction traffic generation for each road impacted by the Project. A full copy of the TIA is provided in **Appendix 12** with the outcomes of the assessment summarised below.

7.11.1 Existing Environment

7.11.1.1 Road Network

The Project is situated in the Lower Hunter region of NSW, within the Cessnock, Maitland and Newcastle LGAs. The Project Area is approximately 35 km by road from the Port of Newcastle.

The major transport routes through the area include the M1 Pacific Motorway, New England Highway, Hunter Expressway and John Renshaw Drive. Key roads along the road network likely to be used by Project traffic are identified and described in **Table 7.37** and shown on **Figure 7.19**.

Table 7.37 Road Network Description

Road	Description
M1 Pacific Motorway	The Pacific Motorway, also known as the M1, is a state road that links Sydney to Newcastle and the Hunter Regions of NSW. It has a length of 127 km and runs an approximate north-south direction, with the northern terminus beginning at its intersection with John Renshaw Drive in Beresfield; and ending with NorthConnex in Wahroonga. The M1 is a sealed divided carriageway with two lanes in each direction. The carriageway widths are approximately 7 m (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. Near the Project area, the general speed limit is 80 km /h. There is no provision of pedestrian facilities, cycling lanes or public transport facilities along the highway. No designated parking facilities are provided near the Project area.
New England Highway	The New England Highway is an 830-km highway that forms part of Australia's national highway system. It connects Newcastle in NSW to Toowoomba Region in Queensland. The section of the road in proximity to the Project forms part of Routes A1 and A43. The highway is a sealed divided carriageway with two lanes in each direction. The carriageway widths are approximately 7 m (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. The general speed limit is 80 km/h. Bus stop facilities are present along the length of the highway, providing access to local and intercity bus services. Access to the Hunter Rail Line is possible via Tarro Station. No designated parking facilities or pedestrian facilities are provided, with on-road cycling facilities generally provided within the shoulder area.

Road	Description
Hunter Expressway	Hunter Expressway is a state road in the Hunter Region, NSW that spans approximately 40 km from Belford in the Singleton Council to Cameron Park in the City of Lake Macquarie, passing though the LGAs of Maitland and Cessnock. The Hunter Expressway is a sealed divided carriageway with two lanes in each direction. The carriageway widths are approximately 7 m (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. The general speed limit in 110 km/h. No public transport services or designated parking, cycling or pedestrian facilities are provided along the expressway.
John Renshaw Drive	John Renshaw Drive is a state road oriented in an east-west direction from Kurri Kurri to Beresfield in the Hunter Region. It links Hunter Expressway, the Pacific Motorway, and the New England Highway. John Renshaw Drive is a sealed divided carriageway with one to two lanes in each direction. The carriageway widths are approximately 7 m (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. The general speed limit is 80km/h. No designated parking, cycling or pedestrian facilities are provided along the road. No bus stop facilities are provided along John Renshaw Drive but some designated bus pick-up and drop-off points are present.
Maitland Road	Maitland Road is an arterial road that connects the Newcastle central business district (CBD) to the northwest edge of the City of Newcastle, connecting to the New England Highway and the Pacific Highway. The road forms part of Route A43 of the national highway network. Maitland Road is a sealed carriageway with two lanes in each direction. It is a single undivided carriageway at the southern portion of the road and divided by a median beginning at the intersection with Maud Street up to the northern terminus. The carriageway widths are approximately 7 (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. The speed limit ranges from 50 to 60 km/h. Bus stop facilities are present along the length of the road, providing access to local and intercity bus services. The southern terminus of the road is within walking distance from Newcastle Interchange rail station where the Hunter Line and Central Coast & Newcastle lines can be accessed. On-street parking is permitted along sections of the road near Newcastle CBD. Footpaths and pedestrian crossing facilities as well as on-road cycling facilities are provided.
Weakleys Drive	Weakleys Drive is a state road that links M1 Pacific Motorway to the New England Highway. It is oriented in a north-south alignment and passes through the suburbs of Thornton and Beresfield. Weakleys Drive is a sealed divided carriageway with two lanes in each direction. The carriageway widths are approximately 7 m (3.5 m per lane). Lane markings and shoulders are provided on both sides of the carriageway. The general speed limit is 60km/h. No designated parking, pedestrian or public transport facilities are provided along the length of the road. On-street cycle paths are provided separated by lane markings.
Main Road / Cessnock Road	Main Road/Cessnock Road, is a state road that provides a direct connection between Kurri Kurri and Maitland. The road is a sealed undivided carriageway with two marked lanes catering to two-way traffic with a shoulder provided on each side. The carriageway is approximately 7 m wide (3.5 m per lane). No designated parking, cycling or pedestrian facilities are provided along the road. Bus stop facilities are provided along sections of the road located near Hunter Expressway. Designated drop-off and pick-up areas (without designated facilities) are also present along the length of the road.

Road	Description
Buchanan Road	Buchanan Road is a regional road that provides an alternative north-south link between the LGAs of Cessnock and Maitland. It begins with its intersection (roundabout) with John Renshaw Drive in the south and terminates at East Maitland in the north. Buchanan Road is a sealed undivided carriageway with two marked lanes catering to two-way traffic. The carriageway widths are approximately 6 m (3 m per lane) with no shoulders provided. The speed limit ranges from 60 to 80 km/h. No designated parking, cycling or pedestrian facilities are provided along the road. No bus stop facilities are provided along Buchanan Road but some designated bus pick-up and drop-off points are present.
Lenaghans Drive	Lenaghans Drive is an undivided two-lane carriageway that runs in a north-south alignment, parallel to the M1 Pacific Motorway. It has one lane in each direction and terminates at M1 Pacific Motorway to the north and Woodford Street in the south.
Black Hill Road	Black Hill Road is an undivided two-lane carriageway that runs in an east-west alignment, connecting M1 Pacific Motorway, John Renshaw Drive, and Lenaghans Drive.

The Pacific Motorway, John Renshaw Drive, Hunter Expressway and the New England Highway permit 25/26 m B-Double and oversize overmass (OSOM) vehicles, with OSOM travel conditions for some sections of the New England Highway and Hunter Expressway.

7.11.1.2 Traffic Volumes

Traffic volume data for the road network has been obtained from the Transport for NSW 'Traffic Volume Viewer' website and existing secondary data from available traffic studies within the study area. The most recent traffic data available was between 2015 and 2018. The historical data was extrapolated to 2021 traffic volumes by adopting the following assumptions:

- a traffic growth rate of 1 % per annum
- peak hour traffic is equivalent to 10 % of average daily traffic.

A summary of the derived traffic volume counts is provided in **Table 7.38**.

Table 7.38 Existing traffic volumes

Road	Direction	AADT[6]	Existing traffic	
			AM peak (vph)[7]	PM peak (vph)[4]
Maitland Road	Southbound	11,397	1,013	856
	Northbound	11,626	720	1,024
New England Highway	Southbound	38,978	1,588	2,924
	Northbound	36,622	3,103	2,445
John Renshaw Drive	Eastbound	5693	463	429
	Westbound	6038	371	565
Hunter Expressway	Eastbound	15,356	1,159	1,391
	Westbound	15,323	1,139	1,253
M1 Pacific Motorway	Southbound	18,050	1,140	1,598
	Northbound	18,327	1,201	1,138
Weakleys Drive	Southbound	No data	878	1,089

[6] AADT = Annual Average Daily Traffic
[7] vph = vehicles per hour

Road	Direction	AADT[6]	Existing traffic	
			AM peak (vph)[7]	PM peak (vph)[4]
	Northbound	No data	1,228	936
Buchanan Road	Southbound	No data	278	480
	Northbound	No data	324	351
Main Road	Southbound	8,317	840	840
	Northbound	8,458	854	854

7.11.1.3 Traffic Conditions and Road Capacity

Existing road traffic conditions were analysed by Level of Serivce (LOS), which is a qualitative description of the performance of a road facility. LOS uses a set of letters from A to F to denote different levels of congestion of a corridor or network, with "A" being the most desirable (i.e. free flow) and "F" being the worst (i.e. forced or breakdown flow). LoS "D" is generally adopted as the acceptable lower-limit threshold for major traffic-carrying roads.

The analysis indicates that:

- New England Highway's northbound direction is operating at LoS D, signifying that it is nearing capacity during the AM peak period.
- Main Road is operating near capacity, with existing volumes approaching the limit of 900 vph for LoS D. Main Road has been recorded operate at LoS D as early as 2018, and has been identified by the Cessnock City Council as one of the key roads in the LGA which needed improvements.
- Other roads in the study area are operating below capacity and have the capacity to accommodate additional traffic.

7.11.1.4 Public and Active Transport

Tarro Train Station, part of the Hunter Intercity Train Line, is the nearest train station to the Project. At the nearest point, it is approximately 7 km from the Project area.

Bus services in the vicinity of the Project area are operated by Rover Coaches. Several bus stops and pick-up and drop-off points are present along John Renshaw Drive, Main Road and Buchanan Road. The routes and approximate frequencies are detailed in **Appendix 12**.

Active transport facilities in proximity to the Project area are limited and have poor connectivity. Cycling routes along key roads, such as John Renshaw Drive, Main Road, Buchanan Road are not continuous. Footpaths are also observed to be mostly limited to roads within suburbs. No dedicated footpaths or cycling lanes provide direct access to the Project area.

7.11.1.5 Road Safety

A road safety review was undertaken based on the Transport for NSW Centre for Road Safety's crash statistics over the latest five-year recoding period (2016 to 2020 inclusive), within a two-kilometre radius from the Project area. The data revealed:

- a total of 112 road crash incidents were recorded during this period.
- There was one fatal crash, 32 serious injury crashes and 27 moderate injury crashes; other incidents included 9 minor injury crashes and 43 non-casualty (tow-away) crashes.

- The predominant crash type category is Crashes with vehicles coming from the same direction (30 incidents), followed by Off-path on straight (24 incidents), Off-path on curve (18 incidents), and Vehicles from adjacent direction (17 incidents).

An analysis of crash incidents within 500 m of intersections between the local road network and Project access tracks and the transmission pipeline alignment identified seven crashes. Of these areas, six crashes occurred on Main Road in the vicinity of the transmission pipeline crossing location or the turnoff to the access track to the north of the transmission pipeline alignment. Three out of the six crashes resulted in serious injuries.

7.11.2 Methodology

7.11.2.1 Statutory Framework

The TIA was prepared to assess the potential impacts of the Project in accordance with the following relevant legislation, policy and guidelines:

- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development (Austroads, 2016)
- Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Austroads, 2021)
- Guide to Traffic Generating Developments Updated Traffic Surveys (Roads and Maritime, 2013)
- Roads and Maritime Services Traffic Modelling Guidelines (2013)
- Traffic Control and Work Sites Technical Manual (Transport for NSW, 2020).

7.11.2.2 Assessment Approach

The TIA broadly involved:

- A review of the existing traffic and transport environment in the study area.
- A review of the existing road and transport conditions, traffic volumes and crash data.
- Identification of traffic volumes related to Project construction and operation activities.
- Modelling of peak traffic generation scenarios related to construction activities.
- Midblock assessments of key roads in the study area.
- Identification and assessment of the potential impacts of the Project traffic on the local road network and the performance of key intersections during construction and operation.
- Identification and assessment of the potential cumulative impacts on traffic during construction of the Project, which are discussed in **Section 7.16.3.3** of this EIS.
- Determining suitable management and mitigation measures to reduce identified impacts.

A summary of the methodology used to assess the potential impacts of the Project on the transport network is provided below in **Table 7.39**.

Table 7.39 Assessment methodology approach

Transport and traffic component	Assessment approach
Impact on traffic generation	Traffic data was obtained from permanent counts data published on the Transport for NSW Traffic Volume Viewer and secondary data from available traffic studies and reports of other developments within the study area. Traffic counts for 2021 were estimated by applying a 1% per annum growth rate and peak hour traffic was estimated as equivalent to 10% of average daily traffic. For the purposes of this assessment, the traffic generation during the peak construction period (estimated to take place on the fourth month of construction works, around April 2023) was analysed to account for the worst-case scenario.
Mid-block analysis	Level of Service (LoS) is a qualitative description of the performance of a road facility that uses a set of letters from A to F to denote different levels of congestion of a corridor or network, with "A" being the most desirable (i.e. free flow) and "F" being the worst (i.e. forced or breakdown flow). LoS "D" is generally adopted as the acceptable lower limit threshold for major traffic-carrying roads.
Impacts on access	Desktop analysis using Google Maps and Google Street view to determine the longitudinal site distance at the construction worksite access points.
Impacts on parking	Desktop analysis of existing parking provisions compared with parking provisions during construction and operation of the Project.
Impacts on public transport	Desktop analysis of existing public transport facilities and services provided in proximity to the Project, evaluated against potential impacts on public transport operations during construction and operation of the Project.
Impacts on road users	Analysis of expected impacts on road users during the construction of the Project.
Impacts on road safety	Road crash information along roads forming part of the proposed construction vehicle routes in proximity to the Project area (within 2 km radius) was collected from Transport for NSW Centre for Road Safety's crash statistics over the latest five-year recoding period (2016 to 2020 inclusive).
Impacts on rail line	Analysis of expected impacts to identified rail line during the construction of the Project.
Impacts on road infrastructure	Analysis of impacts on road condition and/or potential damage to roads during the construction of the Project.

7.11.2.3 Study Area

The study area identified for the TIA encompasses:

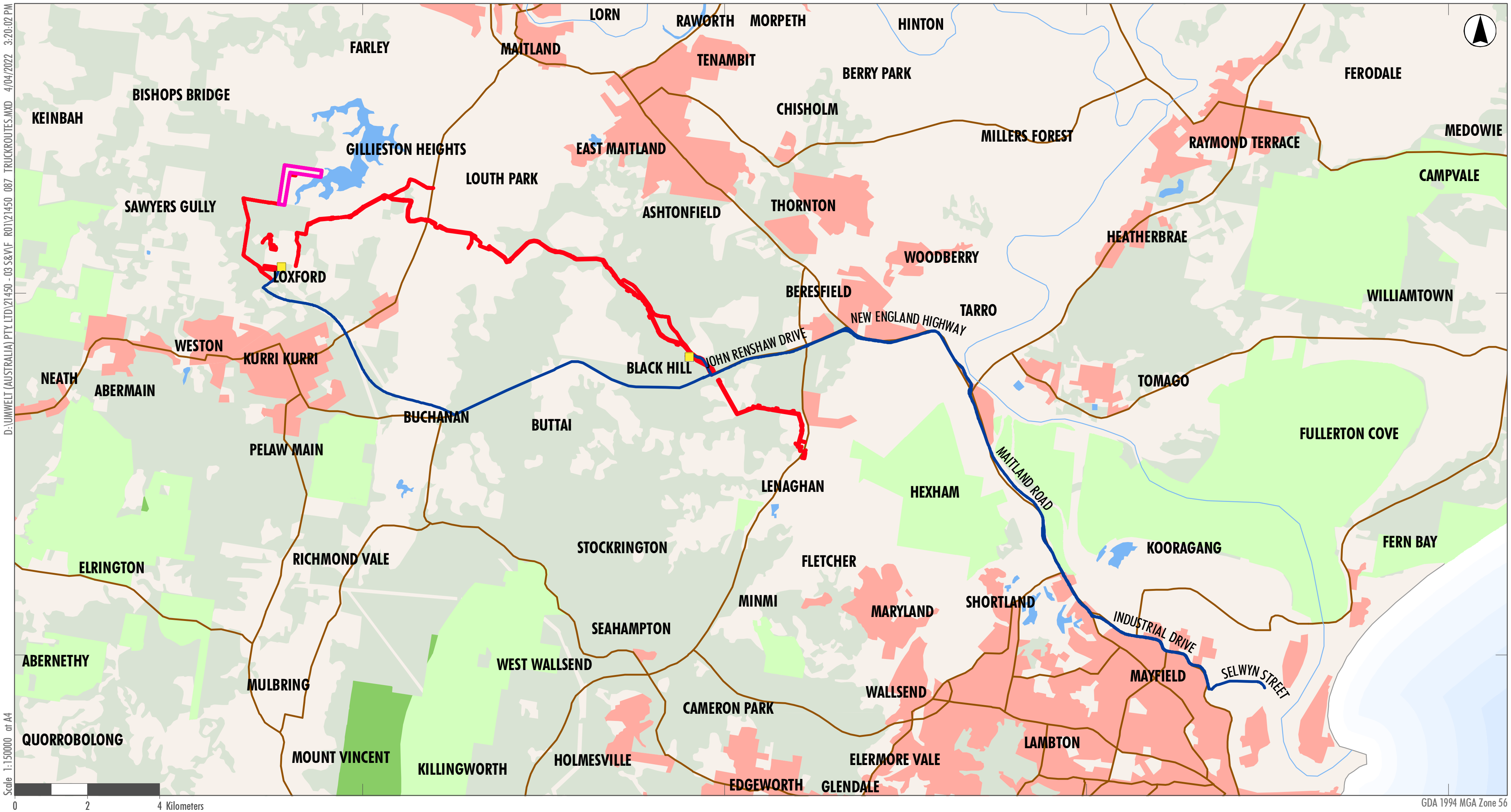
- the transport network that provides the likely access routes to be used by construction and operational vehicles associated with the Project and
- the transport routes that will be traversed by the Project area or that would be affected by physical construction works.

Construction for the Project will not be limited to a single location, and in particular will shift location along the transmission pipeline alignment as construction progresses. To account for this the Project was categorised broadly into three main areas for assessment of construction traffic impacts to the local road network:

- East transmission pipeline/JGN offtake facility, referring to the eastern section of the transmission pipeline from Lenaghans Drive to John Renshaw Drive. The JGN offtake facility is located in this area, which can be accessed via Lenaghans Drive.

- Central transmission pipeline, referring to the section of the transmission pipeline from John Renshaw Drive to Buchanan Road and the Wallis Creek floodplain. The area can be accessed via John Renshaw Drive or Buchanan Road.
- West transmission pipeline/storage pipeline, referring to the western section of the transmission pipeline (TP) located to the west of Main Road. This western section of this area is also where the storage pipeline (SP), compressor station and delivery station are located. The transmission pipeline between Main Road and Swamp Creek can be accessed via Main Road. The transmission pipeline West of Swamp Creek, as well as the compressor station, delivery station and storage pipeline can be accessed via Hart Road.

The proposed route for transport of pipe segments from the Port of Newcastle to the Project area is shown on **Figure 7.19**.



Legend

- KKLP Transmission Pipeline Alignment
- KKLP Storage Pipeline Construction Footprint
- Construction Heavy Vehicle Haulage Route (Pipe Transport from the Port to Centralised Laydown Areas)
- Laydown Area
- Urban Areas
- National Parks
- NSW State Forest
- Native Vegetation
- Lakes
- Roads
- Watercourse

FIGURE 7.19

Proposed Transport Route

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2021)

7.11.2.4 Construction traffic assumptions

Impacts from the Project to traffic volumes on the local road network would primarily occur during the construction phase as a result of:

- transport of pipe segments from the Port of Newcastle to the Project area
- delivery of plant, equipment and materials to the Project area
- transport of construction crews between the Project area and accommodation facilities.

Peak vehicle movements for these activities will generally not occur simultaneously. Mobilisation of construction equipment and delivery of pipe segments from Port to laydown areas will occur earlier in the construction phase than peak light vehicle movements for workforce transport (estimated to take place on the fourth month of construction works) and peak heavy vehicle deliveries to work areas. Workforce numbers are likely to decline substantially for the remainder of the construction period. Similarly, peak light vehicle movements for workforce transport will occur in the early morning and late afternoon, and will not substantially overlap with daily heavy vehicles deliveries.

Nevertheless, to provide a conservative estimate of construction traffic impacts, the delivery of pipe segments from Port of Newcastle to laydown areas was assumed to occur simultaneously with peak truck deliveries from laydown areas to work areas and peak light vehicle movements from accommodation to work areas.

Daily traffic generation

The estimated peak vehicle movements generated during construction are described in the detail in the TIA, and summarised briefly in the following sections.

Heavy vehicle movements associated with pipe deliveries are expected to take place between 7:00 am and 6:00 pm, Monday to Friday.

Light vehicle movements associated with the movement of personnel are expected to occur slightly earlier and later than the standard work hours i.e. between 6:00 to 7:00 am for ingress, and around 5:00 pm onwards for egress. However, for the purposes of a conservative assessment, light vehicle movements were included during the peak hour analysis.

Delivery of pipeline construction plant and equipment

Construction equipment and heavy machinery for the transmission and storage pipelines will be mobilised directly to the construction footprint, once initial clearing and grading operations have commenced and sufficient space is available. To enable a conservative assessment of traffic impact, it is assumed that 140 pieces of heavy construction equipment will be transported over a three or four week-period from either Queensland (via the Pacific Highway), Sydney (via the M1 Pacific Motorway), Dubbo (via the Golden Highway) or Victoria (via the Hume Highway).

Delivery of associated surface facilities plant, equipment and materials

It is assumed that heavy construction equipment will be mobilised by 50-tonne floats, with approximately 12 deliveries of large heavy machinery during mobilisation, and the same during demobilisation. It is also assumed that five Franna cranes will be distributed across the surface facility construction sites, all self-mobilised.

Pipe segment deliveries

As discussed in **Section 2.8.3** and **Section 7.11.1.3**, the most likely road transport route from the port would follow Selwyn Street, Industrial Drive (A43), Maitland Road/Pacific Highway (A43), New England Highway (A1), John Renshaw Drive (B68) for both transmission and storage pipeline segments. Transmission pipeline segments are then proposed to be stored on an existing hardstand associated with the former Donaldson Open Cut Coal Mine, with access off John Renshaw Drive. Storage pipeline segments would be transported further along John Renshaw Drive, then the Hunter Expressway (M15) and Hart Road to the proposed laydown areas at the site of the former Hydro aluminium smelter. Likely transport routes are shown on **Figure 7.19**.

Approximately 1,062 truck movements would be required to transport pipe segments from the Port to the laydown areas for the storage pipeline (including the DN350 interconnect pipeline and pipe bends) and 60 truck deliveries for the transmission pipeline. The significantly higher number of truck movements for the storage pipeline is primarily due to only two large diameter pipe segments being transported on a single truck. Deliveries for the transmission pipeline and storage pipeline to laydown areas are likely to require approximately three and 43 days of pipe delivery operations respectively, assuming 25 truck deliveries for each pipeline per day.

Up to 50 trucks per day (equivalent to 5 deliveries per hour) delivering pipe segments from the Port of Newcastle to dedicated laydown areas.

Construction worker movements between accommodation and work areas

Workers are assumed to travel from accommodation to the work areas on a daily basis in light vehicles. Approximately 199 light vehicles movements (including cars and utility vehicles) are assumed in the morning and evening during the peak construction period to transport 398 workers, assuming two workers will travel per light vehicle. Accommodation is assumed to be at Maitland (35 % of the workforce), Kurri Kurri and nearby suburbs (20 %), Cessnock (20 %), Newcastle (15 %) and Beresfield/Thornton (10 %). These trips will utilise different local roads to access the respective work areas.

Traffic generation during peak construction is summarised in **Table 7.40**.

Table 7.40 Estimated traffic generation during peak construction

Affected roads	Direction	Construction traffic generation				Total construction traffic generation (vph)	
		AM Peak (vph)		PM Peak (vph)			
		LV	HV	LV	HV	AM Peak	PM Peak
Maitland Road	Southbound	0	4	30	4	4	34
	Northbound	30	4	0	4	34	4
New England Highway	Southbound	0	4	30	4	4	34
	Northbound	30	4	0	4	34	4
John Renshaw Drive	Eastbound	18	13	38	13	31	51
	Westbound	28	13	18	13	51	31
Hunter Expressway	Eastbound	38	9	28	9	47	37
	Westbound	28	9	38	9	37	47
M1 Pacific Motorway	Southbound	46	9	0	9	55	9
	Northbound	0	9	46	9	9	55
Weakleys Drive	Southbound	36	0	0	0	36	0
	Northbound	0	0	36	0	0	36

Affected roads	Direction	Construction traffic generation				Total construction traffic generation (vph)	
		AM Peak (vph)		PM Peak (vph)			
		LV	HV	LV	HV	AM Peak	PM Peak
Buchanan Road	Southbound	15	9	28	9	24	37
	Northbound	28	9	15	9	37	24
Main Road	Southbound	39	9	0	9	48	9
	Northbound	0	9	39	9	9	48
Lenaghans Drive	Southbound	46	9	0	9	55	9
	Northbound	0	9	46	9	9	55

Note: LV = light vehicle HV = heavy vehicle vph = vehicles per hour

7.11.3 Assessment of Impacts

7.11.3.1 Road and rail crossings

Pipeline crossings of sealed roads and the South Maitland Railway will be carried out using horizontal boring or horizontal directional drilling (HDD) to avoid disrupting the flow of traffic. No material impacts to traffic flow due to construction of pipeline crossings are anticipated.

7.11.3.2 Construction traffic impacts

Impacts on road network performance

The LoS analysis indicates that with background traffic growth and additional vehicle traffic generated by the construction works, most roads within the study area would continue to operate at satisfactory levels of service (LoS between A to D).

Construction activities are predicted to have the highest impact along John Renshaw Drive, increasing traffic volumes by up to 13.5 %; and on Buchanan Road, increasing traffic volumes by up to 11.2 %. The value for John Renshaw Drive is based on the highly conservative worst-case scenario wherein the transmission and storage pipeline deliveries would occur during the same period, and would also coincide with the peak workforce (light vehicle) movements. Realistically, the likelihood of occurrence of this scenario would be very low; but in the extreme case that it does occur, the impact would be restricted to the time required to deliver the transmission pipe segments, which is estimated to be less than a week. Despite the conservative estimates of the impacts, the LoS of both roads would range from B to D, indicating that the roads still have ample capacity to accommodate traffic.

Main Road, which is already operating near capacity in 2021 (LoS D), is predicted to operate at LoS E in the southbound direction during AM peak hour and in the northbound direction during PM peak hour. This effect is caused primarily by workers travelling between accommodation in Maitland and work areas, which comprise 39 out of the 48 additional Project vehicles along Main Road.

It should be noted that light vehicle construction traffic ingress is expected to occur between 6 - 7 am, outside the morning peak period of Main Road (8 - 9 am). Without the additional light vehicles, the increase in traffic along Main Road during the AM peak hour would only be at 1.1 % and it continue to operate at LoS D.

The same would be the case in the afternoon peak period, with light vehicle construction traffic egress expected to occur generally beyond 5 pm, outside of Main Road’s afternoon peak period (4 - 5 pm). Without the additional light vehicles, the increase along Main Road during the PM peak hour would only be at 1.0 % and LoS D would be maintained.

The analysis further indicates that the Project is expected to have minor adverse impacts to the peak hour traffic volumes along the roads within the vicinity of the Project.

While Project construction traffic generation is not expected to greatly impact the roads during peak period, it is acknowledged that Main Road is already currently operating near capacity and would potentially be sensitive to changes in traffic. As such, measures to further minimise impacts on Main Road would be considered d as part of the development of the construction Traffic Management Plan. Plausible measures may include further traffic modelling once construction workforce numbers are finalised, requiring morning and afternoon light vehicle movements to be undertaken outside of peak hours, limiting workforce accommodation in Maitland, or provision of shuttle buses to transport a proportion of workers using Main Road during peak use construction periods.

Based on the above, it is considered that construction activities will have minimal impacts on future peak hour traffic volumes with peak road network conditions remaining similar to existing conditions.

Impacts on access

Results from the desktop analysis show that site distances at access points meet the minimum sight distance requirement derived from the *Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections* (GHD, 2021c).

Impacts on parking

Parking for all construction vehicles and worker vehicles will be contained on-site within the Project area. As such, car parking would have no impact on the existing road network.

Impacts on public transport

Potential impact of the construction traffic on public transport operations is confined to Main Road and John Renshaw Drive. There is the potential for slight increases in journey time during peak construction period as a result of increases in traffic. However, it is considered that the Project's construction traffic would have a minor impact on public transport operations.

Impacts on public transport facilities have been avoided by locating access points away from these facilities.

Impacts on road safety

Any changes in the road environment such as lane closures, detours, traffic circulation, and increased traffic generation and volume can potentially have impacts on road safety. Project construction methods have been designed to reduce road and traffic disruptions which, in turn, reduces risk to road safety.

The assessment has identified a section of Main Road in proximity of the Project area that may have existing traffic hazards given the number of reported road crash incidents. The potential impacts on road safety will be mitigated and managed in the Construction Traffic Management Plan (CTMP).

Impacts of heavy vehicle use

Haulage and delivery of materials and equipment will use existing approved heavy vehicle and OSOM routes and will not introduce any changes to the vehicle composition on these roads. Should the delivery of materials and equipment require the use of OSOM vehicles, appropriate travel and access permits will be obtained through the NHVR portal for the sections of the road with travel conditions.

Impacts on road infrastructure

The increase in traffic associated with the construction activities could result in impacts on the condition of roads along construction routes, particularly along unsealed roads.

Relevant roads will be subject to a Road Dilapidation Report, to be prepared prior to the commencement of construction activities. Any defects attributable to construction activities will be rectified or compensated in consultation with the relevant road authorities. Roads will also be monitored throughout the construction works, with temporary repairs carried out if required. As such, the proposed construction activities are expected to have minimal impacts on road condition.

7.11.3.3 Operational Impacts

During the operation of the Project, it is anticipated traffic generation numbers will be minimal as it is proposed that 5 personnel would be employed during operations to perform regular routine inspections and maintenance work along the transmission and storage pipelines.

At specific intervals throughout the Project's operational life, some additional light and heavy vehicles would be generated for specific activities (pigging of the transmission pipeline and testing of the storage pipeline). However these would be substantially lower than with the construction phase. It is unlikely that operational vehicle movements would have any impacts on the operation of the surrounding road network as these roads have capacity to accommodate the relatively low increase in operational traffic.

Operational impacts of the Project on road safety are expected to be negligible. All parking for operational vehicles would be accommodated on the Project area.

No impacts on public transport, pedestrians, cyclists or road accessibility are expected.

7.11.4 Management and Mitigation and Measures

Measures presented in **Table 7.41** will be implemented to manage and mitigate traffic and transport impacts during various stages of the Project. These measures will be consolidated into a Traffic Management Plan (TMP), prepared prior to the commencement of construction, in order manage the increase in traffic volumes across the road network due to the Project.

Table 7.41 Traffic and transport management measures

No	Measure	Timing
TT01	All roads that are sealed at the time of the project approval and the South Maitland Railway will be crossed using trenchless construction techniques.	Planning Construction
TT02	Pipeline crossings of unsealed roads will be constructed using methods and depth of cover determined in consultation with the relevant road authority and landholders. Installation of bypass tracks, detours or crossing plates will be undertaken as required.	Planning Construction
TT03	Detailed design of all road and rail crossings will be informed by the requirements of the relevant road or rail authority including obtainment of applicable permits prior to the commencement of construction of the relevant works.	Planning Construction
TT04	The condition of public roads used for transport between pipe laydown areas and the transmission pipeline and storage pipeline construction footprint will be assessed by a Road Dilapidation Report prior to construction commencing and following completion of construction. Any defects attributable to construction activities will be rectified or compensated in consultation with the relevant road authorities.	Planning Construction
TT05	Any oversized or over weight loads will be transported in accordance with the requirements of the relevant road authority.	Planning Construction

No	Measure	Timing
TT06	A Traffic Management Plan (TMP) will be prepared as a component of the CEMP and will address, amongst other issues: a. Sufficient on-site parking for all vehicles. b. Covering or containing heavy vehicles loads. c. Minimising dust and/or sediment being tracked onto the public road network. d. Minimising traffic noise impacts. e. Transport options for workers to the site. f. Public notifications for any disruptions to traffic, the closure of roads or other infrastructure, oversize or overmass vehicle use, peak construction periods, and any emergencies. g. Driver's Code of Conduct.	Planning Construction
TT07	Access for emergency vehicles will be maintained for the duration of the construction works, in accordance with emergency vehicle requirements.	Construction

7.12 Hazards, Risks and Bushfire

The SEARs required an assessment of the hazards and risks posed to public safety associated with the storage, handling and transport of hazardous materials and dangerous goods during Project construction and operation, in addition to an assessment of potential impacts on, and from, bushfires and flooding.

This section summarises the outcomes of the assessment of hazards, risks and bushfire. Flooding risk and hazard is addressed in **Section 7.4**.

7.12.1 Hazards

A Preliminary Hazard Analysis (PHA) was prepared by Umwelt in accordance with the SEARs for the Project (refer to **Table 3.1**) and relevant guidelines and legislative requirements. The following section contains a summary of the key outcomes of the PHA, while a full copy of the report is provided in **Appendix 13**.

7.12.1.1 Methodology

The PHA includes an assessment of the risks associated with potential hazardous events that may occur during the construction, operation, maintenance and decommissioning of the following Project components:

- Transmission pipeline to provide a gas supply from the existing SNP via receipt and delivery facilities, to the HPP site.
- Compressor station at the termination of the transmission pipeline to boost gas pressure prior to transfer to a storage pipeline.
- High pressure storage pipeline downstream of the compressor station to hold approximately 70 TJ) of gas ready to supply the HPP.
- Delivery station to receive gas from the storage pipeline and control temperature, pressure and flow rate prior to delivery of gas to the HPP.

The PHA was prepared in accordance with the following guidelines and legislative requirements:

- Applying SEPP 33: Hazardous and Offensive Development Application Guidelines, NSW Department of Planning, 2011 (SEPP 33)
- Multi-level Risk Assessment, NSW Department of Planning and Infrastructure, 2011 (MLRA)

- Hazardous Industry Planning Advisory Paper 4 – Risk Criteria for Land Use Safety Planning, NSW Department of Planning, 2011 (HIPAP 4)
- Hazardous Industry Planning Advisory Paper 6 – Hazard Analysis, NSW Department of Planning, 2011 (HIPAP 6)
- Manual for Classification and Prioritization of Risks due to Major Accidents in Process and Related Industries, International Atomic Energy Agency (IAEA), 1996.

The methodology used to identify and assess the potential Project hazards and respective failure scenarios that have the potential for off-site impact is outlined in **Appendix 13** with results detailed in the sections below.

7.12.1.2 Preliminary Screening

During the construction phase of the Project, APA will utilise a 60 kL self-bunded diesel storage tank for refuelling vehicles and mobile plant. SEPP 33 does not define screening thresholds for combustible liquids such as diesel (Class C1). All combustible liquids will be stored in accordance with *AS 1940 – 2017 The storage and handling of flammable and combustible liquids* (AS 1940) with adequate separation distances from any minor quantities of Class 3 flammable liquids. As such the diesel may be assessed as a Class C1 combustible liquid and is therefore not subject to SEPP 33 screening.

Only minor quantities of hazardous materials (i.e. below SEPP 33 screening thresholds) will be transported to and/or stored on the construction sites, and these materials will be managed in accordance with a Construction Environment Management Plan (CEMP) developed specifically for the Project.

During the operational phase of the Project, the storage quantity of natural gas (a Class 2.1 flammable gas) exceeds the SEPP 33 screening threshold and therefore confirms that a PHA is required for the Project.

7.12.1.3 Risk Classification and Prioritisation

The objective of the risk classification and prioritisation process is to identify whether the risks identified as part of the SEPP 33 preliminary screening process are acceptable, or whether further assessment is required. The process involves:

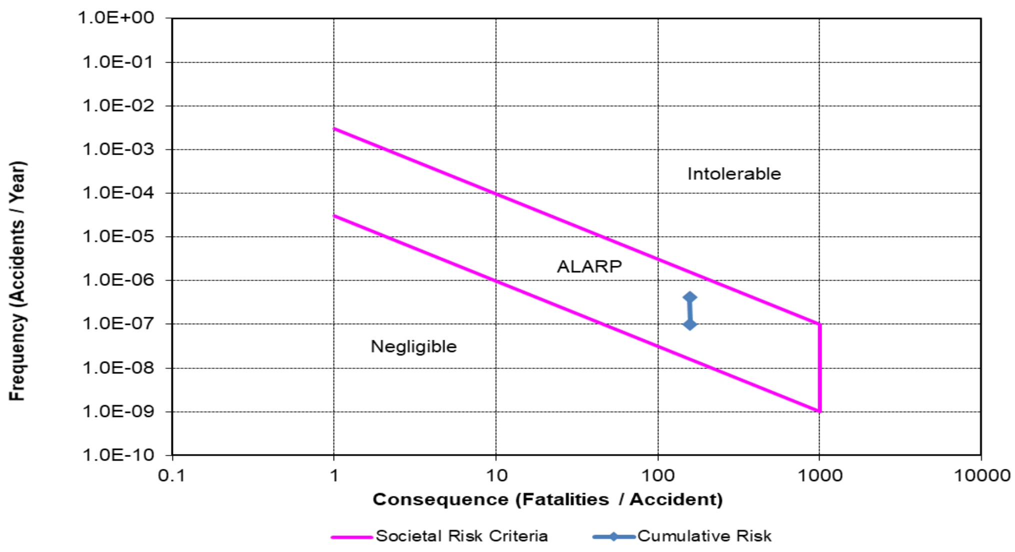
- classification of the type of activities and materials inventories
- estimation of consequences
- estimation of probabilities of major accidents for fixed installations
- estimation of societal risk
- evaluation of alternatives
- assessment using criteria to determine the required level of risk assessment.

Details of the scenarios modelled, and the consequence and probability number estimates are outlined in **Table 7.42**. Only two scenarios were assessed as only two activities associated with the Project involve significant quantities of hazardous materials, i.e. the storage of natural gas in the storage pipeline and the transport of natural gas in the transmission pipeline.

Table 7.42 Dangerous Goods Scenarios Modelled for Societal Risk

Scenario	Substance	ADG/Division Class	Activity	Hazardous Event	Consequence Number ($Ca_{,s}$)	Probability Number ($N_{i,s}$)
S1	Natural Gas (15.2 Mpa)	2.1	Storage	Fire/Explosion	157.1	3.2×10^{-7}
T1	Natural Gas (6.9 Mpa)	2.1	Transport	Fire/Explosion	1.0	1.0×10^{-7}

The cumulative risk of the modelled scenarios (S1 and T1) is presented in **Graph 7.4**.



Graph 7.4 Societal risk plot

The end point of the cumulative risk curve for the Project hazards (refer to **Graph 7.4**) is within the As Low As Reasonably Possible (ALARP) region, which indicates that a Level 2 semi-quantitative risk assessment is required to demonstrate that HIPAP 4 criteria can be met for the Project. Elements of a Level 1 assessment are also required (as indicated in Table 5 of MLRA).

7.12.1.4 Risk Assessment

Level 1 Qualitative Risk Assessment

A hazard identification workshop was undertaken using guidewords as prompts to assist workshop attendees identify potential hazardous events and scenarios that could have off-site impacts. Credible hazardous events and scenarios were recorded, and risk scoring was applied by the workshop attendees for each hazardous event and scenario. The guidewords used and the minutes from the hazard identification workshop are contained in Appendix B of the PHA (refer to **Appendix 13**).

The hazard study identified the following hazardous event scenarios with the potential for off-site consequences as being credible and requiring further assessment (i.e. semi-quantitative assessment):

JGN Offtake Station

- DN350 mm flange leak @ 6.9 Mpa, leak size based on gasket failure between bolts holes, immediate ignition (jet fire)
- DN350 mm flange leak @ 6.9 Mpa, leak size based on gasket failure between bolts holes (flash fire).

Transmission Pipeline

- Excavator tooth penetrates pipeline resulting in 50 mm diameter hole, immediate ignition (jet fire)
- Excavator tooth penetrates pipeline resulting in 50 mm diameter hole, delayed ignition (flash fire).

Compressor and Delivery Station

- DN400 mm flange leak @ 15.32 Mpa, leak size based on gasket failure between bolts holes, immediate ignition (jet fire)
- DN400 mm flange leak @ 15.32 Mpa, leak size based on gasket failure between bolts holes, delayed ignition (flash fire)
- Compressor heat exchanger tube rupture (heat exchangers comprise DN20, DN25 and DN32 tubes) @ 4.14 Mpa (DN32), 8.08 Mpa (DN25) and 15.32 Mpa (DN20), immediate ignition (jet fire)
- Compressor heat exchanger tube rupture (heat exchangers comprise DN20, DN25 and DN32 tubes) @ 4.14 Mpa (DN32), 8.08 Mpa (DN25) and 15.32 Mpa (DN20), delayed ignition (flash fire)
- Vapour cloud explosion within compressor acoustic enclosure, base modelling on volume of enclosure and gas concentration at the UEL, i.e. maximum fuel load of explosive atmosphere.

Storage and Interconnect Pipelines

- DN350 mm flange leak on above ground storage pipeline header arrangement @ 15.3 Mpa, leak size based on gasket failure between bolts holes, immediate ignition (jet fire)
- DN350 mm flange leak on above ground storage pipeline header arrangement @ 15.3 Mpa, leak size based on gasket failure between bolts holes , delayed ignition (flash fire)
- Excavator tooth penetrates pipeline resulting in 50 mm diameter hole, immediate ignition (jet fire)
- Excavator tooth penetrates pipeline resulting in 50 mm diameter hole, delayed ignition (flash fire).
- Justification for the inclusion/exclusion of various scenarios is provided in Section 5.4 of the PHA (**Appendix 13**).

Level 2 Semi-Quantitative Assessment

The potential off-site impacts of the hazardous events identified in the Level 1 Assessment are exposure to damaging, injurious and fatal levels of thermal radiation and explosion overpressure. Consequence modelling using the Breeze Incident Analyst (Breeze®) software package was undertaken to determine the maximum extent for the range of credible hazardous events. The frequency of these credible hazardous events was then estimated using published failure frequency data and combined with the consequence analysis results to assess the Project risks with respect to HIPAP 4 risk criteria. Detailed calculations are provided in Sections 6 and 7 of the PHA.

All Project components were assessed as meeting the HIPAP 4 criteria for individual fatality risk, injury risk and propagation risk:

- All Project components were assessed as meeting the HIPAP 4 individual fatality risk criteria appropriate to their surrounding land use (refer to Section 7.1 of the PHA).

- The frequencies of the modelled credible hazardous events for all Project components with potential injurious impacts to residential and sensitive receivers were estimated to be below the HIPAP 4 criteria of 50 x 10^{-6} events/year (refer to Section 7.2 of the PHA).

- The frequency of hazardous events with potential propagation impacts for all Project components were estimated to be below the HIPAP 4 criteria of 50 x 10^{-6} events/year (refer to Section 7.3 of the PHA).

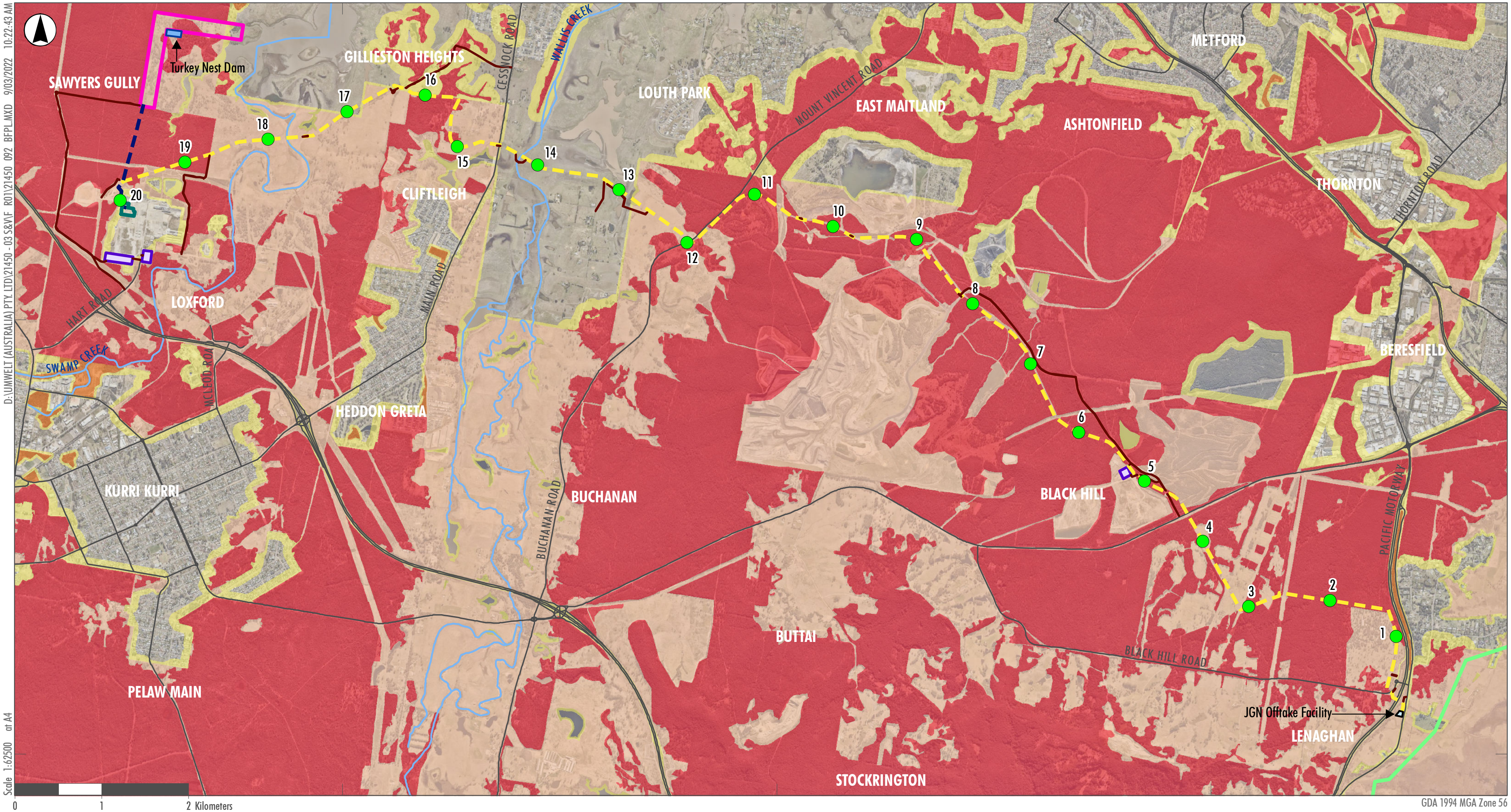
7.12.2 Bushfire

This section provides a bushfire assessment prepared in accordance with *Planning for Bushfire Projection* (NSW RFS, 2019), including an assessment of potential bushfire hazards applicable to the Project and the proposed bushfire management for the Project.

7.12.2.1 Existing Environment

Sections of the Project area fall within land identified as bushfire prone land by the NSW Rural Fire Service (RFS) bushfire prone land mapping (RFS, 2021) (refer to **Figure 7.20**).

In relation to the surface facilities, the JGN offtake facility is proposed to be located on cleared grazing land currently identified as vegetation category 3 (lower risk). The compressor and delivery station will be located on the existing hard stand of the former Hydro aluminium smelter. The surrounding area is predominantly cleared and is partially identified as Bushfire Buffer (refer to **Figure 7.20**).



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks
- Roads

Bushfire Prone Land Vegetation Category Mapping

- Vegetation Buffer (100m to Category 1 Vegetation and 30m to Category 2 Vegetation)
- Vegetation Category 1 (High Risk)
- Vegetation Category 2 (Medium Risk)
- Vegetation Category 3 (Low Risk)

FIGURE 7.20

Bushfire Prone Land

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

7.12.2.2 Bushfire Threat Assessment and Management

Planning for Bushfire Protection (NSW RFS, 2019) indicates that hazardous developments, are considered hazardous as much for their ability to start bush fires as their susceptibility to bush fire impacts, and that new hazardous developments should be avoided on bushfire prone land. However, where this cannot be avoided hazardous industries may require the preparation of a performance-based solution and potentially include a bushfire design brief. Additionally, assessment should consideration of DPIE Hazardous Industry Planning and Assessment Papers (HIPAPs).

Given that the majority of the Project is located below ground with the surface facilities located within predominantly cleared areas and asset protection zones (APZ) can be applied, a performance-based solution and bushfire design brief is not considered necessary. Rather, appropriate management measures are proposed to be applied to the Project including application of APZs to surface infrastructure to address bushfire risk and management.

The bushfire management measures will be applicable to the construction and operations phase and included in the proposed Emergency Management Plan for the Project. The Emergency Management Plan will be developed consistent with *Hazardous Industry Planning Advisory Paper No. 1 Emergency Planning* (HIPAP 1) (Department of Planning, 2011b) and *Planning for Bushfire Protection* (NSW RFS, 2019). The Emergency Management Plan will be developed in consultation with the RFS and DPIE Hazard Team.

As discussed in **Section 7.12.1.4**, the PHA indicates that appropriate risk management measures can be applied to the Project to meet HIPAP 4 risk criteria for individual fatality, injury and propagation. Appropriate hazard safeguards and controls have been identified to be applied to the Project through the development and implementation of the Emergency Management Plan which will assist with the management of bushfire.

Through the development and implementation of relevant bushfire management measures and identified hazard safeguards and controls, it is considered that potential bushfire risk associated with the Project can be appropriately managed.

7.12.3 Hazard Management and Mitigation Measures

Measures presented in **Table 7.43** will be implemented to manage and mitigate hazards, risks and bushfire during various stages of the Project.

Table 7.43 Hazards, Risks and Bushfire management measures

No	Measure	Timing
HR01	Emergency Response Plans consistent with HIPAP No. 1 Emergency Planning (Department of Planning, 2011b) and Planning for Bushfire Protection 2019 (NSW RFS, 2019) will be developed and implemented for both the construction and operations phases of the Project.	Construction Operations
HR02	A qualified person will be appointed as Site Safety Advisor during construction and will have on-site a set of the relevant safety data sheets (SDS) for hazardous and dangerous materials.	Construction

No	Measure	Timing
HR03	Dangerous goods, as defined by the Australian Dangerous Goods Code, and flammable and combustible liquids will be stored and handled in accordance with: • The requirements of all relevant Australian Standards. • Within a bunded area with a minimum bund capacity of 110% of the volume of the largest single stored vessel within the bund. • The NSW EPA's Storing and Handling of Liquids: Environmental Protection – Participants Handbook if the chemicals are liquids. In the event of an inconsistency between the requirements in (a) to (c) above, the most stringent requirement shall prevail to the extent of the inconsistency. For the purpose of the above, any tanks or other storage vessels that are interconnected and may distribute their contents either by gravity or automated pumps must be considered a single vessel.	Construction Operations
HR04	Spill kits will be available at all locations where machinery/plant are operating, refuelling points and fuel and chemical storage locations.	Construction
HR05	Where flammable or combustible chemicals are required to be stored on-site, fire-fighting equipment will be available that is proportionate to the risk of the materials stored.	Construction
HR06	Routine visual monitoring and recording of chemicals and fuel storage facilities will occur.	Construction
HR07	Refuelling of vehicles and machinery, other than hand held machinery, will utilise auto shut off valves. Refuelling of vehicles and mobile machinery will not occur within 50 m of a watercourse.	Construction
HR08	Vehicles/plant/machinery/equipment will be maintained in good condition to minimise the potential for leaks/spills to occur.	Construction
HR09	Vehicle and equipment will be inspected daily to check for oil, lubricant or fuel leaks and general wear and tear of hoses.	Construction
HR10	A Bushfire Management Plan (BMP) will be prepared for Project construction and operations, informed by consultation with the Rural Fire Service.	Construction
HR11	Open fires, including open barbeques, billy fires, and brush burning, will not be permitted on site.	Construction Operations
HR12	Hot works activities will only be undertaken during a declared Total Fire Ban where an exemption has been issued by NSW RFS. These works will be undertaken in accordance with the conditions of the exemption.	Construction
HR13	The following precautions will be taken to minimise the possibility of fire due to hot work activities: • The area over which hot work will take place will be maintained free of combustible material. • Firefighting equipment, including a validated portable fire extinguisher, and trained personnel to be available during all hot work operations. • Water trucks will be available to respond to fire.	Construction
HR14	The Project will implement the APA HSE Management System.	Planning Construction Operations
HR15	Requirements for pipeline buoyancy control in flood risk areas will be assessed during detailed design and implemented as required.	Planning Construction

No	Measure	Timing
HR16	Detailed design of the transmission and storage pipelines will give consideration to the following: • Control philosophy for the MLV including potential automation to limit the amount of gas that can escape from a ruptured pipeline. • Protection of above ground structures from inadvertent or deliberate acts, which may cause damage to exposed equipment and piping.	Planning Construction Operations
HR17	Measures to mitigate mine subsidence risks to the transmission pipeline within Mine Subsidence Districts will be determined in consultation with Subsidence Advisory NSW.	Planning Construction Operations
HR18	First aid facilities and a nurse, paramedic or other suitably qualified health care professional will be available to service construction areas.	Construction
HR19	As per the requirements of AS2885 and the APA safety management system the following measures will be implemented: • Surface facilities will be located in secure compounds . • Hazardous area classification will be undertaken for all installations and a hazardous area dossier prepared for the Project. • Atmosphere testing (e.g. Oxygen, LEL) will be undertaken as required (depending on activities) for personnel entry to surface facility compounds and mandatory testing for vehicle entry (as a vehicle is an ignition source). • Compressor acoustic enclosures will be ventilated and have gas detection systems that initiate shut down. • A maintenance system will be implemented that includes routine inspection and maintenance plans in accordance with AS/NZS 2885.3. • Pipeline markers and signage will be placed at a frequency to ensure continual line of sight along the alignment and will also be located at any bends, at property boundary fences and either side of crossings such as roads or watercourses. • Pipeline marker tape will be buried above the along entire length of all underground pipelines to indicate the presence of the pipeline to anyone undertaking an excavation above the pipeline. • The location of all underground pipelines will be registered with Dial Before You Dig.	

7.13 Visual Amenity

A visual assessment was undertaken by Umwelt to determine the existing landscape setting and assess the potential visual impacts of the Project on the surrounding visual environment in accordance with the SEARs, as outlined in **Table 3.1**. The details and outcomes of the visual assessment are provided in full in this section.

Specifically, this section provides a description of the existing landscape setting and visual potential visibility of the Project, potential visual impacts, viewpoints and assessment methodology, assessment of impacts, and visual mitigation and management measures.

7.13.1 Existing Environment

As discussed earlier in the EIS, the Project area extends from the rural locality of Lenaghan at the eastern most point of the Project area, to approximately 2 km north of Kurri Kurri at the western most point.

The landscape character surrounding the Project area is characterised by a mix of vegetated (undeveloped) land within the mining leases of the former Donaldson open cut mine and operational Bloomfield open cut mine, and small holding agriculture with rural living and existing infrastructure (such as roads, railway, water trunk and reticulation mains and overhead transmission lines).

Broadly, the topography of the Project area is characterised (from east to west) by undulating low rises and rolling low hills to level to gently undulating floodplains in Wallis Creek and Swamp Creek. The Project area is predominantly within a rural landscape, with the nearest residential suburbs (current extents of Cliftleigh and Gillieston Heights) located approximately 600 m away from the transmission pipeline alignment at the closest point (KP 15.0). The compressor station and delivery station are located in an industrial locality being the site of the former Kurri Kurri aluminium smelter.

As discussed in **Section 7.2**, the zoning on land traversed by the Project corridor is predominantly RU2 – Rural Landscape with pockets of environmental zonings including E2 – Environmental Conservation in the lower floodplain areas of Swamp Creek and Wallis Creek.

Due to the rural landscape character of the area, the land within and surrounding the Project area is considered to provide views of moderate scenic quality.

7.13.2 Visibility of the Project

Construction activities would have visibility to a number of key viewpoint locations across the Project area, ranging from road users along the local and main roads traversing through the Project area to private residences on affected landholders' properties. However due to the short-term duration and the transient nature of construction works (as outlined in **Section 2.8**), the focus of the visual impact assessment was on the operational (long term) visual implications of the Project.

As detailed in **Section 2.3**, most of the Project infrastructure would be underground and therefore not visible during operation. Reinstatement and rehabilitation of the construction footprint will also occur. Pipeline construction can, however, create visually striking features if linear clearing is undertaken through forested landscapes adjacent to accessible viewpoints. Construction of the transmission pipeline, storage pipeline or interconnect pipeline will not create viewpoints of linear clearings through forested landscapes given that:

- The vegetated buffer southern boundary of the Stevens Group Hunter Business Park will be maintained.
- HDD is proposed for the transmission pipeline crossing of John Renshaw Drive, with entry and exit points set back from the road such that no linear clearings will be visible to road users.
- There is no public access to the Donaldson and Bloomfield mine sites where the transmission pipeline traverses areas of forested landscape
- HDD is proposed for the transmission pipeline and interconnect pipeline crossings of the densely vegetated Kurri Kurri Regrowth stewardship area
- The storage pipeline is remote from the nearest residential areas and located in an area that comprises predominantly grassland and regrowth vegetation.

The compressor station deliver station and the JGN offtake facility would be above ground and therefore potentially have visibility to surrounding receivers. The compressor and delivery station would be located within the HPP project site boundary, directly adjacent to the HPP, in an existing industrial landscape.

A Landscape Character and Visual Amenity Assessment was undertaken for the HPP as part of the HPP EIS (Jacobs, 2021a). This assessment found that overall, the visual impact of the HPP proposal is considered to be low to negligible due to the limited visibility of the HPP from sensitive receivers. The DPIE assessment of the HPP EIS found that the visual impact would be low due to the existing industrial landscape character and sensitivity and limited visibility and distance from accessible viewpoints (DPIE 2021a). Given that the compressor station and delivery station are of significantly smaller scale to the HPP, which has two turbine exhaust stacks approximately 36 m in height and around 11 m in diameter, a low to negligible visual impact is also reasonably concluded for these components of the Project. The vent compound will house a vent stack with a height of no greater than 30m, and so will be lower in height than the HPP turbine exhaust stacks. The diameter of the vent stack is 27 cm, which is also significantly smaller than the diameter of the HPP turbine exhaust stacks. Given these considerations it is reasonable to conclude that the vent stack will have no greater visual impact than the HPP turbine exhaust stacks.

The JGN offtake facility will be located west of Lenaghans Drive in an open grassed paddock area on a southeast facing slope. The site for the JGN offtake facility is gently sloped in a north-west to south-east direction, making the JGN offtake facility visible to viewpoint locations to southeast and for northbound traffic on Lenaghans Drive. A number of rural residential properties are located east Lenaghans Drive and to the south of the JGN offtake facility, these will have views of the JGN offtake facility. Views to the far north, east and west would be screened due to the topography and dense vegetation.

Based on the above, the methodology for the visual assessment and selection of viewpoint locations (as outlined in **Section 7.13.3**) focused on the JGN offtake facility.

7.13.3 Assessment Methodology and Viewpoints

A radial topographic analysis technique was used to identify areas from where the JGN offtake facility would potentially be visible, based on ground topography alone (no allowance was made for existing vegetation). Based on the radial analysis, six viewpoint (VP) locations (as shown on **Figure 7.21**) were identified for further analysis.

A site inspection was conducted on 9 February 2022 to confirm the visibility of the JGN offtake facility to these six viewpoint locations, collect accurate data and photographs for the development of photomontages, as well as to determine potential impacts on the visual environment. From the six viewpoint locations, two viewpoints had visibility of the JGN offtake facility and are considered representative of the worst-case viewing locations:

- VP 1 – Lenaghans Drive, Lenaghan – looking north along Lenaghans Drive, towards the JGN Offtake Facility, through surrounding rural residential properties.
- VP 2 – Lenaghans Drive, Lenaghan – looking southwest, west, and northwest towards JNG Offtake Facility.

Photographs were taken from both viewpoints in landscape format using a full-frame sensor digital camera with a 35mm prime lens mounted on a APS-C crop frame camera. Photomontages of each viewpoint have been prepared by Umwelt and are provided in **Figure 7.22** and **Figure 7.23**.

Legend

- JGN Offtake Facility
- Transmission Pipeline Alignment
- Transmission Pipeline Construction Footprint
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Access Tracks
- Watercourses

Viewpoint Locations

- Assessed
- Not Assessed

FIGURE 7.21

Viewpoint Locations

Image Source: Data source:

7.13.4 Assessment of Impacts

As discussed in **Section 7.13.2**, the primary visual impact associated with the Project will be the JGN offtake facility with visibility to private properties to the south and east as well as northbound traffic traveling on Lenaghans Drive. Photomontages provided in **Figure 7.22** and **Figure 7.23** illustrates views from VP1 and VP2 prior to construction commencing, after construction without mitigation and after construction with vegetation screening established.

APA has committed to establish landscape screening (planting) at the JGN offtake facility to reduce the visibility of the facility to users of Lenaghans Drive and nearby residences.

FIGURE 7.22

Viewpoint 1 Photomontage

Image Source: Umwelt (2022)

FIGURE 7.23

Viewpoint 2 Photomontage

Image Source: Umwelt (2022)

Based on the above, it is considered that the visual impacts associated with the operational phase of the Project are suitably manageable and acceptable.

7.13.5 Management and Mitigation Measures

Measures presented in **Table 7.44** will be implemented to manage and mitigate visual impacts during various stages of the Project.

Table 7.44 Visual management measures

No	Measure	Timing
LV1	Light generated during construction and operations will be managed in general accordance with the requirements in Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting.	Planning Construction Operations
LV2	The construction site at the JGN offtake facility will be appropriately screened to mitigate visual impacts to users of Lenaghans Drive and nearby residences.	Construction
LV3	Landscape screening (planting) will be undertaken at the JGN offtake facility to mitigate visual impacts to users of Lenaghans Drive and nearby residences based on detailed design, additional viewshed analysis and further consultation with potentially affected residents.	Operations

7.14 Social Amenity

A comprehensive Social Impact Assessment (SIA) has been prepared by Umwelt to identify, assess, manage potential negative impacts and enhance positive social impacts associated with the Project on local and neighbouring communities. This assessment has been undertaken in accordance with the SEARs relating to social impacts, as presented in **Table 3.1**. The full report is provided in **Appendix 9** with the outcomes of the assessment summarised below.

The SIA has been prepared in accordance with the requirements of NSW Government's Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021f).

Engagement with the community has been a key component of the environmental assessment and SIA (refer to **Section 6.0**). As part of the SIA process, stakeholders were engaged through a wide range of mechanisms (refer to **Section 6.1**).

7.14.1 Social Baseline

The study area used for the SIA, referred to as the social locality, comprises the 11 state suburbs (SSC)) intersected by or proximal to the Project construction footprint, as shown in **Figure 7.24**. These suburbs are Sawyers Gully, Loxford, Kurri Kurri, Heddon Greta, Cliftleigh, Gillieston Heights, Louth Park, Buchanan, Buttai, Black Hill and Lenaghan.

Strategically important transportation and infrastructure networks through the social locality include the Pacific Highway, the Hunter Expressway, rail infrastructure associated with the Hunter Valley Coal Chain, key transmission infrastructure, and existing gas pipelines.

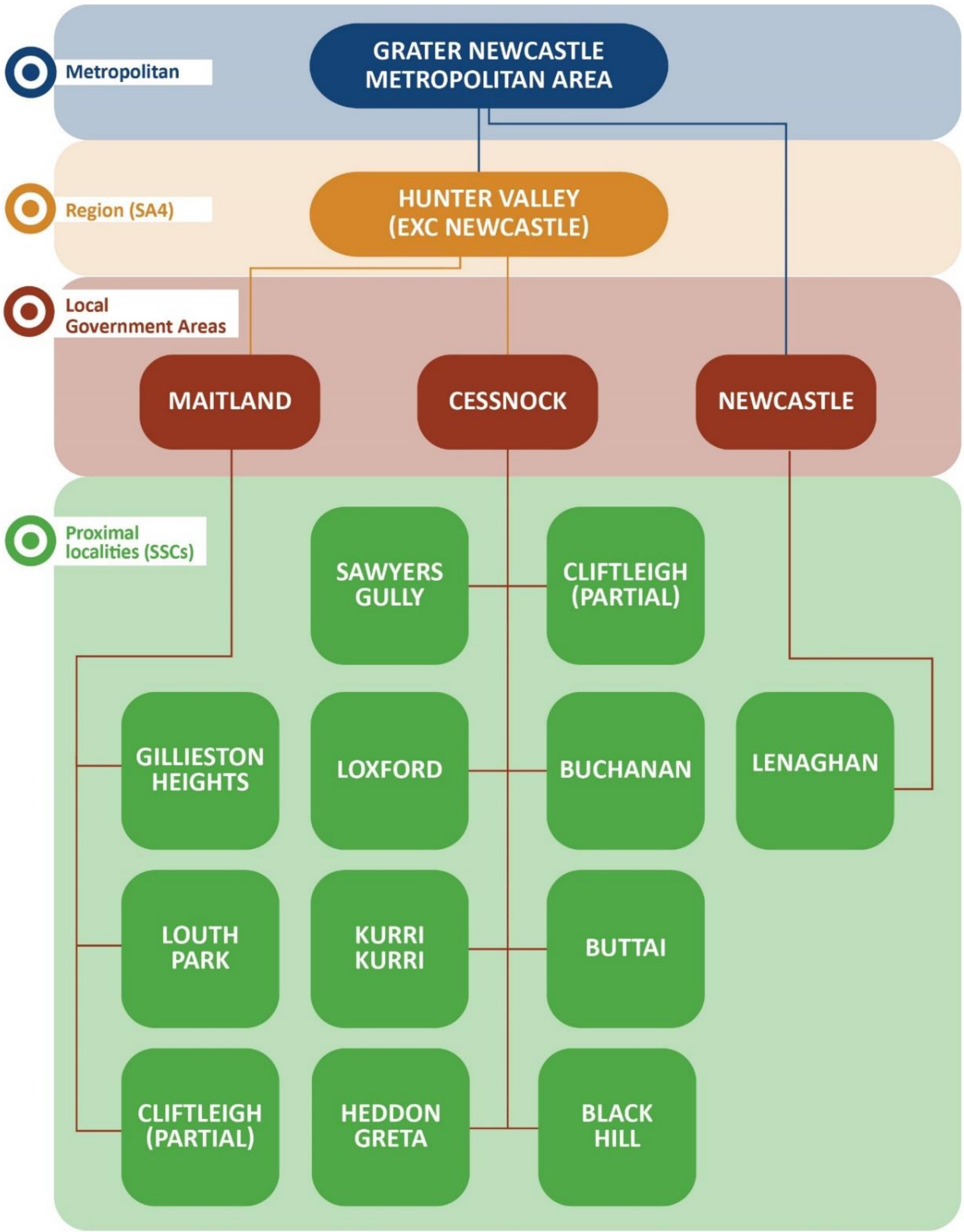


Figure 7.24 Communities of Interest Used to Define the Social Locality

The broader Cessnock, Newcastle, and Maitland LGAs support a population of over 287,000 people, with the Cessnock and Maitland LGAs having populations of approximately 55,500 and 77,500 people respectively. The population of the Hunter region[8] is projected to reach 862,250 by 2036 and has consequently been identified as the State's fastest metropolitan growth area (DPIE, 2016).

The Project is located within the Bellbird and Maitland growth corridor, which includes the SSCs and townships of Kurri Kurri and Heddon Greta (Cessnock City Council, 2021). Significant residential development has occurred in this area over the previous decade. It is further proposed that this area will support an additional 400-500 new dwellings per year up to 2036 within the Cessnock LGA and house a projected population of 77,291 people by 2036 (approximately population 22% growth).

The value of residential development has more than doubled in the Cessnock LGA area from $70,455,000 in 2010-11 to $187,775,000 in the 2019-20 period. Data from the 2020-21 financial year indicates that a total of 824 houses were approved in this financial year, an increase of 222 dwellings since 2010-11.

Currently, mining accounts for 38% of the Hunter Valley's gross regional product, facilitated by proximity to the Port of Newcastle - Australia's third largest port and the largest coal export port in the world. Some commentators have proposed that the economy is set to diversify further as the operating context for mining and energy generation continue to undergo significant change (Regional NSW, 2018).

Visions for future development of the region include diversifying the economy through significant global gateways (Port of Newcastle and Newcastle Airport), enhancing inter-regional linkages, preparing for diversification of the energy sector, supporting key knowledge and services sectors, such as defence and education, and protecting agricultural productivity (DPIE, 2016).

7.14.2 Methodology

SIA is an approach to predicting and assessing the likely consequences of a proposed action in social terms and developing options and opportunities to improve social outcomes. Best practice SIA is participatory and involves understanding impacts from the perspectives of those involved in a personal, community, social or cultural sense, to provide a complete picture of potential impacts, their context and meaning.

The SIA undertaken for the Project involved the following key phases:

- **Preparatory Planning** – undertaking appropriate planning for the Project, defining the social locality and the development of a stakeholder engagement strategy to inform the preparation of the SIA.
- **Profiling** – defining the baseline social context in which the Project is based.
- **Scoping** – identifying key social impacts/issues relevant to the Project.
- **Assessment and Prediction of Impacts** – evaluating and predicting positive and negative social impacts.
- **Strategy Development** – identifying strategies to minimise negative impacts and enhance positive impacts associated with the Project.
- **Monitoring and Evaluation** – development of a framework outlining how social impacts should be monitored and evaluated should the Project proceed.

[8] For the purposes of the Hunter Regional Plan 2036 (DPIE, 2016), the 'Hunter Region' is defined using the ABS statistical area codes of Hunter Region exc Newcastle SA4, and Newcastle and Lake Macquarie SA4.

Engagement with the community has also been undertaken at key phases of the SIA, to afford a participatory approach to assessment, involve stakeholders in the clarification of issues and concerns and in the identification of strategies to address negative and enhance positive impacts relating to the Project.

As part of preparing a SIA for the Project, a wide range of stakeholders have been identified and involved over a number of key phases (refer to **Section 6.0** and **Appendix 9**).

Stakeholder identification was undertaken by:

- Review of publicly available documents undertaken to support the profiling of the local and regional community (including a review of recent media and local community service directories) and the identification of salient stakeholder issues in the relevant communities.
- Outcomes of historical engagement.
- Review of community interest and submissions on the HPP.
- As outlined in **Section 6.0**, key stakeholder groups who were engaged to inform the SIA include:
- Directly affected landholders
- Representatives from special interest and community groups
- Key stakeholders including service providers, local businesses, local community groups, local Government, State Government agencies, and Mindaribba Local Aboriginal Land Council.

In addition to the above, 16 RAPs were also specifically consulted with regards to cultural heritage and associated values within the Project area.

Stakeholders were contacted via multiple means, including meetings, phone calls, doorknocking, random survey and emails. Additional contact attempts were also made with those community stakeholders who had responded that they would be in contact with the Project team should they decide they were interested in participating in an interview.

A total of 402 community members also participated in a general community survey across the social locality. Households within the sample area were consulted via a random telephone survey undertaken by Taverner Research from 11 to 23 November 2021. Random sampling was used to contact households in the defined area, with 4,693 numbers supplied from proximal suburbs. Randomly selected numbers were called up to five times at different hours of the afternoon/evening on weekdays and on weekends. A response rate of 17.7% (the percentage of surveys completed) was obtained. Community members who undertook this survey are referred to as the wider community in subsequent sections.

Community engagement sought to identify potential cumulative impacts on the social locality generated from concurrent projects underway and potential cumulative impacts on the environment, employment and energy infrastructure. The issues raised are discussed throughout this section and the assessment of outcomes are discussed in **Section 7.16.3.6**.

7.14.3 Engagement findings

Key findings of the stakeholder engagement process are summarised in this section.

Stakeholders perceived that the potential impacts on surroundings – the natural environment, access to recreational areas and public safety – were key potential negative impacts of the Project. In relation to positive impacts, the potential contribution of the Project to the local and regional economy and facilitation of the energy transition away from coal, were also frequently noted.

Both key stakeholders (20%) and the wider community (39%) identified **local employment and procurement opportunities** as key project benefits. The broader community (27%) were far more likely to identify **safety risks** associated with gas infrastructure as a perceived impact than key stakeholders (10%). In contrast, key stakeholders were more likely to identify the **cumulative impact of developments impacting rural land** as a concern (20% of key stakeholders versus 0% of the wider community).

Both key stakeholders (5%) and the wider community (9%) indicated support for the Project's ability to support **transitions to renewable energy**. The project's contribution to more **reliable electricity supply** was identified by both the wider community and key stakeholders as a key benefit, and it was more frequently identified as a key benefit by community members (56% versus 24%).

When considering surroundings and social amenity, 35% of key stakeholders identified **effects on natural amenity and recreational areas** as a concern, while 15% of the broader community pointed to **damage to vegetation** in proximity to the Project. The broader community also raised concerns about impacts during construction, such as **increased traffic** (4%) and **disruption to social amenity** during construction as a results of **noise, traffic and dust** (5%). Despite these challenges, 19% of key stakeholders also expressed **support for APA's chosen alignment** and its contribution to lower environmental impacts and disruption.

Fifteen percent (15%) of key stakeholders and five percent (5%) of the broader community raised a perception that **community engagement** had been insufficient as a concern. Interviews also highlighted a concern that the Project contributed to climate change, creating issues for future generations (10%) while 3% of the broader community identified a perception of an inadequate project justification as a problem. Approximately 5% of key stakeholders also identified impacts to **Aboriginal cultural heritage** as a key concern.

Each of these, and additional themes, raised during consultation are further assessed in **Section 7.14.4**.

Further details on community issues raised during consultation are provided in **Appendix 9**.

7.14.4 Assessment of Impacts

According to the SIA Guideline, social impacts can be grouped into several categories and may involve changes to people's way of life, community, accessibility, culture, health and wellbeing, surroundings, livelihoods, and decision-making systems. The assessment of perceived impacts (positive and negative) in relation to the Project, identified through stakeholder and community consultation, was undertaken for these categories and related sub-categories as presented in **Table 7.45**.

Table 7.45 Social Impact Categories

Categories	Sub-categories
Livelihoods	• Local employment, procurement and capacity development opportunities • Intergenerational equity and the Project's effect on climate change • Local community investment • Changing land use of the properties the pipeline traverses • Perceived decrease in property value in proximity to the pipeline
Accessibility and Way of Life	• Provision of a reliable electricity supply • Disruptions to road infrastructure and traffic concerns • Pressure on capacity of local services and infrastructure due to population change • Concern relating to increased energy prices • Cumulative effects of other projects underway within the social locality and the broader region

Categories	Sub-categories
Surroundings and Social Amenity	• Impact to ecosystems and loss of habitat • Safety and perception of risk or damage to land and property • Loss of visual amenity and rural character • Loss of social amenity due to traffic, noise and dust
Engagement and Decision Making	• Community participation and information provision • Project justification
Community	• Disruption to place attachment and community character • Conflicting views and impacts on community cohesion
Health and Wellbeing	• Impacts to both physical and mental health and may include psychological stress resulting from uncertainty, financial and/or other pressures, as well as changes to individual and public health
Culture	• Effects on people's shared beliefs, customs, values, as well as their local culture, heritage, as well as their ability to access cultural resources

The SIA highlights positive and negative impacts from the Project related to these categories and sub-categories, as follows.

7.14.4.1 Livelihoods

The positive social impact of local employment and procurement associated with construction of the Project has been ranked as a ***high, positive*** social impact (likely to occur and of moderate benefit), given the scale of local employment opportunities; and a ***low, positive*** social impact (possible to occur and minor benefit) during operations, as once operating, the Project is likely to provide only minimal employment.

Perceived conflicts relating to renewable energy transitions and intergenerational equity in the region is assessed to be a ***medium*** social impact (possible and of moderate magnitude).

Community contribution and investment as a result of the Project is assessed to be a ***medium, positive*** social impact (almost certain, with a moderate magnitude).

The social impacts associated with changing land use, particularly on properties through which the transmission pipeline traverses, has been assessed as ***medium*** social impact (possible but of minor magnitude) for host landholders; and a ***low*** social impact for other land uses (unlikely and minimal magnitude).

Potential for a decline in property values for host landholders is considered a ***low*** social impact (possible but of minor magnitude), and a ***low*** social impact for proximal landholders (possible but of minimal magnitude).

7.14.4.2 Accessibility and Way of Life

Increased reliability in electricity supply has been rated as a ***high, positive*** social impact (likely and of major magnitude). However, while it is acknowledged that there is a need for increased electricity generation infrastructure, some respondents questioned the justification for gas infrastructure as the mechanism for achieving this objective.

The social impact on road infrastructure and traffic, particularly during the peak construction period, is likely to be ***medium*** (likely and of minor magnitude). Impacts are likely to be most significant in localities in close proximity to the pipeline development (e.g. Black Hill, Cliftleigh, Gillieston Heights and Sawyers Gully).

The impact of population change during construction because of the Project has been assessed as a ***low*** social impact, likely to occur but with a minimal change to population across the relevant LGAs. The social impacts associated with the presence of the operational workforce is also considered ***low***.

The positive social impact of increased provision of services and goods because of population change during construction of the Project has been assessed as a ***medium, positive*** social impact, likely to occur with a minor change across the relevant LGAs.

The social impact of the Project on access to short term accommodation and local services is likely to be ***high*** for localities immediately adjacent to the Project (including Kurri Kurri, Abermain, Black Hill, Buttai and Cliftleigh) (likely and of moderate magnitude), and ***low*** for the broader social locality of Newcastle, Maitland and Cessnock LGAs (unlikely and minor).

The impact of the Project on rental housing and homelessness is likely to be ***medium*** (likely and of moderate magnitude) for localities immediately adjacent to the Project (including Kurri Kurri, Abermain, Black Hill and Cliftleigh) and ***low*** (possible and of minor magnitude) for the broader social locality of Newcastle, Cessnock and Maitland.

The social impact of the Project on health services and infrastructure is likely to be of ***medium*** significance (possible and of minor magnitude) for localities immediately adjacent to the Project (including Kurri Kurri, Abermain, Black Hill and Cliftleigh) and ***low*** (unlikely and of minor magnitude) for the broader social locality of Newcastle, Cessnock and Maitland LGAs.

The social impact of the cumulative effects of the Project in the social locality and the broader region is likely to be ***medium*** (possible and of moderate magnitude). Impacts in this regard, are likely to be both negative, relating to cumulative loss of natural environment and pressure on accommodation and community services, and positive, relating to improved infrastructure for electricity production, support for renewable energy transitions and other job-creating projects.

7.14.4.3 Surroundings and Social Amenity

The social impact of loss of values associated with the natural environment due to the Project's impact on environmental ecosystems is ***medium*** (likely and of minor magnitude) for the broader community given the chosen Project design and is considered ***high*** (likely and of moderate magnitude) for local environmental groups.

The social impact relating to perceived public safety risks associated with the construction and operation of the Project has been ranked as a ***medium*** social impact (possible and of moderate magnitude).

The social impact relating to loss of visual amenity and rural character due to the Project has been ranked as ***medium*** (possible and of minor magnitude) during the construction phase and ***low*** (possible and of minimal magnitude) during Project operation.

The social impact of a loss of social amenity during the construction phase of the Project has been ranked as ***medium*** (likely and of minor magnitude) for the localities immediately proximal to the Project (Kurri Kurri, Black Hill, Gillieston Heights and Sawyers Gully) and ***low*** (unlikely and of minimal magnitude) for the broader social locality.

7.14.4.4 Engagement and Decision Making

The social impact relating to community participation in the assessment process and decision-making systems has been ranked as a ***medium, positive*** social impact (possible and of a moderate magnitude).

The social impact of perceived insufficient community participation and information sharing has been ranked as a ***medium, negative*** social impact (possible and of a moderate magnitude).

7.14.4.5 Community

The social impact of the Project on people's attachment to place has been ranked as a ***low*** social impact (unlikely to occur and of minimal magnitude).

The social impact of the Project on community cohesion has been ranked as a ***low*** social impact (unlikely to occur and of minimal magnitude).

7.14.4.6 Health and Wellbeing

The social impact of the Project on health and well-being has been ranked as a ***low*** social impact. Impacts of air pollution and contamination of drinking water on health and wellbeing have also been ranked as ***low*** (unlikely to occur with minor consequence). Impacts on health services and infrastructure have been ranked as a ***low*** social impact (unlikely and of minor magnitude) in proximal communities, and ***low*** (unlikely and of minor magnitude) on the broader social locality.

7.14.4.7 Culture

The social impact of the Project on culture (that is, people's shared beliefs, customs, values, language, and dialect, as well as their local culture, heritage, and ability to access cultural resources) has been ranked as a ***medium*** social impact (possible to occur with minor magnitude).

7.14.5 Management and Mitigation Measures

Measures presented in **Table 7.46** will be implemented to manage and mitigate social impacts during various stages of the Project.

Table 7.46 Social management measures

No	Measure	Timing
SA1	A Project-specific Local Industry and Indigenous Participation Plan will be developed with the intention of promoting local, regional and Indigenous business and employment opportunities associated with the Project.	Planning Construction
SA2	APA will require the appointed construction contractor to implement a workforce management strategy, including strategies for accommodation, employment and procurement.	Planning Construction
SA3	A stakeholder engagement plan will continue to be implemented to facilitate ongoing consultation with relevant stakeholders throughout the Project so that stakeholders have access to information regarding the nature of the proposed Project activities and their likely impacts.	Planning Construction Operations
SA4	A complaints management system will continue to be put in place that documents: a. Name of persons receiving complaint. b. Name of person making the complaint. c. Date and time of complaint. d. Nature of the complaint. e. Actions taken to rectify and timeframe for action. f. Actions to minimise risk of reoccurrence. g. Name of person(s) responsible for undertaking the required actions.	Construction Operations

No	Measure	Timing
SA5	APA will continue to implement a Community Grants Program that targets proximal communities within the social locality and prioritises investments directly related to identified community needs.	Planning Construction

7.15 Waste Management

This section presents an assessment of waste generation and management during the construction, commissioning and operation stages of the Project. Details and outcomes of the waste generation and management assessment are provided in full in this section.

The majority of waste management requirements will be related to the construction and commissioning of the Project. Waste generation during operations will be minimal and largely limited to maintenance activities.

7.15.1 Waste Guidelines

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) assists in the achievement of the objectives of the *Protection of the Environment Operations Act 1997* (PoEO Act). The NSW Government has established the following waste management hierarchy under the WARR Act:

- Avoidance
- Re-use
- Recycle (resource recovery)
- Disposal.

The primary guideline used within NSW for the classification and management of both liquid and non-liquid wastes is the *Waste Classification Guidelines Part 1: Classifying Waste* NSW DECC (2008). Waste streams that may be generated from construction, commissioning and operation of the Project have been classified in accordance with the aforementioned guidelines to identify the level of environmental risk.

Waste classifications under the Waste Classification Guidelines are described in **Table 7.47** below.

Table 7.47 NSW Waste classification guidelines

Classification	Description
Special Waste	Includes waste that has unique regulatory requirements such as asbestos or tyres and includes anything classified as special waste under an EPA gazettal notice.
Liquid waste	Waste (excluding special waste) that has an angle of repose of less than 5 degrees above horizontal, becomes free-flowing at or below 60ºC or when it is transported, is generally not capable of being picked up by a spade or shovel or is classified as liquid waste under an EPA gazettal notice.
Hazardous waste	Hazardous waste (other than special waste or liquid waste) includes waste that is a dangerous good that is classified under the Transport of Dangerous Goods Code as a ‘Class 1’ to ‘Class 8’ type of waste. It can also include coal tar or coal tar pitch waste, lead-acid or nickel-cadmium batteries lead paint waste or any mixture containing one of these types of wastes.
General solid waste (putrescible) (GSWp)	GSWp waste (other than special waste, liquid waste, hazardous waste or restricted solid waste) includes standard household and litter bins waste that is collected by or on behalf of local councils, food waste, animal waste, manure and night soil and any grit of screening from sewage treatment systems.

Classification	Description
General solid waste (non-putrescible) (GSWnp)	GSWnp waste (other than special waste, liquid waste, hazardous waste, restricted solid waste or GSWp) includes household recyclable waste that does not contain food waste, garden waste, wood waste, waste that was previously in dangerous containers that have been thoroughly cleaned out, virgin excavated material and building and demolition waste.

7.15.2 Existing Environment

Waste generated by the Project that cannot be reused or recycled would be disposed of at suitable waste management facilities within the three affected LGAs. A review of operating waste management facilities within these LGAs was undertaken to determine suitability to take waste generated by the Project. The facilities most likely to receive waste from the Project are:

- Summerhill Waste Management Centre in the Newcastle LGA – operating under EPL No. 5897. The total amount of all waste received at the premises must not exceed 362,000 tonnes per annum.
- Cessnock Waste Management Centre in the Cessnock LGA – operating under EPL No. 6121. The total amount of all waste received at the premises must not exceed 60,000 tonnes per annum.
- Mount Vincent Road Waste Management Centre in the Maitland LGA – operating under EPL No. 6116. The total amount of all waste received at the premises must not exceed 100,000 tonnes per annum.

APA will consult with local councils prior to the commencement of construction to identify suitable waste disposal locations.

7.15.3 Assessment methodology

A desktop assessment was undertaken which involved:

- development of a Project waste inventory.
- Initial classification of wastes generated by the Project, to identify wastes which may be recycled, require landfilling and/or may be classified as hazardous and require special arrangements (or cannot be disposed of locally).
- Review of the capacity of, and acceptable wastes that can be received by, waste management facilities in the LGAs traversed by the alignment.

Waste types and quantities considered as part of this assessment are indicative estimates and have been identified for the purpose of determining potential impacts and proposed mitigation and management measures.

7.15.4 Waste Inventory

7.15.4.1 Construction wastes

The majority of waste from the Project will be generated during the construction stage. A range of wastes will be generated by construction activities for pipelines and associated surface facilities, including:

- Wastes from transportation and storage of pipe.
- Wastes from survey, clearing of the construction footprint and trenching.
- Coating waste.

- Drilling cuttings and excess rock.
- Welding/grinding waste (e.g. spent welding rods).
- Machinery waste.

The estimated volume of waste generated during construction and requiring disposal in appropriately licenced facilities is approximately 1,096m^3. An inventory of wastes generated during construction of the Project is provided in **Table 7.48**.

Two items in the waste inventory, cuttings generated during HDD and the excavated base of the turkeys nest storage, account for around 84% of estimated waste generation during construction.

HDD cuttings are fragments of naturally occurring rock and organic matter excavated during HDD boring and reaming processes. As described in **Section 2.8.1.8**, cuttings are coated in drilling mud, which primarily comprises water and the clay mineral bentonite. Separation of cuttings and drilling muds occurs at the HDD site, typically by centrifuges, which enables re-use of drilling muds and disposal of cuttings as a general solid waste (non-putrescible) or liquid waste depending on the separation efficiency.

Land application of HDD cuttings has been identified as a potentially sustainable way to improve agricultural lands without harm to the environment, given the primary constituents are bentonite and crushed in-situ rock (Daniel et al. 2020a, Daniel et al. 2020b). As the beneficial reuse of HDD cuttings would divert a significant waste stream away from landfill, APA will investigate the feasibility of land application of HDD cuttings from the Project in consultation with the NSW EPA.

The turkeys nest storage is proposed to hold water prior to and following hydrotesting of the storage pipeline. If the storage pipeline is unlined internally, small volumes of millscale (iron oxide) will flush from the pipeline and collect in the turkeys nest following hydrotesting and settle onto its base. The turkeys nest will be allowed to dry following hydrotesting and prior to decommissioning. During decommissioning, the base of the turkeys nest storage is proposed to be excavated and transported to appropriately licenced facilities. The material at the base of the storage will comprise excavated natural material used during construction and small volumes of millscale flushed from the storage pipeline. It is anticipated that this waste stream would be classified as a general solid waste (non-putrescible).

Table 7.48 Construction Waste Inventory

Waste	Classification	Estimated quantity (m^3)	End use
Mulched timber and tree root balls	General solid waste (putrescible)	-	Reuse on ROW during rehabilitation for mulch or habitat features
Bevel protectors	General solid waste (non-putrescible)	-	Recycle, scrap steel
Rope spacers	General solid waste (non-putrescible)	4	Landfill
Sawdust bags	General solid waste (non-putrescible)	63	Landfill
Timber skids	General solid waste (non-putrescible)	-	Reuse
Temporary sediment fencing	General solid waste (non-putrescible)	1.3	Landfill
Waste oils (l)	Hazardous waste	13.1	Hazardous waste
Oil filters	Hazardous waste	0.7	Hazardous waste
Fuel filters	Hazardous Waste	18.4	Hazardous waste
Air filters	General solid waste (non-putrescible)	20.9	Landfill

Waste	Classification	Estimated quantity (m^3)	End use
Epoxy drums – transmission pipeline and interconnect pipeline	Hazardous Waste	1.3	Hazardous waste
Epoxy pots – transmission pipeline and interconnect pipeline	Hazardous Waste	0.1	Hazardous waste
Epoxy drums – storage pipeline	Hazardous waste	4.1	Hazardous waste
Epoxy pots – storage pipeline	Hazardous waste	0.2	Hazardous waste
Disposable sperm suit	General solid waste (non-putrescible)	0.5	Landfill
Gloves	General solid waste (non-putrescible)	0.1	Landfill
Survey pegs	General solid waste (non-putrescible)	0.5	Landfill
Trencher teeth	General solid waste (non-putrescible)	-	Recycle, scrap steel
Transmission pipe offcuts – tie ins	General solid waste (non-putrescible)	-	Reuse long offcuts
Welding – grinding and buffing discs, electrode stubs	General solid waste (non-putrescible)	0.2	Recycle short off cuts, scrap steel"
Old fencing material (m)	General solid waste (non-putrescible)	8.0	Landfill
Office waste in camp offices	General solid waste (non-putrescible)	-	Landfill
Tyres	Special waste	19	Landfill
Portaloos	Liquid waste	-	Trucked to licensed facility
HDD cuttings (m^3)	General solid waste (non-putrescible) or liquid waste depending on moisture content following separation	628.3	Landfill Trucked to licensed facility
Turkeys nest excavated base post hydrotesting	General solid waste (non-putrescible)	292	Landfill
Associated Surface Facilities general construction waste	General solid waste (non-putrescible)	20	Land fill

Construction works may generate amounts of excess spoil. Where excavated material is unfit for re-use within pipeline trenches, residual spoil may be spread across the ROW to create a berm that will naturally flatten over time or disposed of to an appropriately licensed facility. Vegetation cleared during construction works will be placed over cleared areas to reduce the erosive capacity of the site and will not be transported off-site.

7.15.4.2 Operational wastes

Quantities of wastes generated during operation of the Project will be minor compared to the construction phase.

Waste will be generated from pigging of the transmission pipeline and interconnect pipeline every 10 years as part of maintenance activities. This waste is typically dust and millscale from inside the pipe. Volumes are likely to less than 1m^3 for both pipelines when pigging is undertaken. This waste would be collected at scraper station locations and tested for waste classification prior to disposal, typically at a suitable solid waste management facility.

If the storage pipeline is tested by hydrotesting rather than pigging, and is unlined, then a volume of material from the base of the turkeys nest storage similar to that generated during construction will require excavation and disposal approximately every seven to 10 years.

Small volumes of waste oils and grease from maintenance of associated surface facilities will be produced during operations.

7.15.5 Potential Impacts

7.15.5.1 Construction Impacts

The majority of Project waste would be generated during the construction stage. Potential impacts from waste generation during construction may include:

- The reduction of aesthetic quality and visual amenity of the construction area, and water quality of local watercourses and drainage lines if wastes are not effectively controlled. This is particularly relevant for gross pollutants (litter) that may become wind borne and enter any watercourses during constructions.
- Health and safety of workers and other visitors to the site.
- Waste disposed from the Project to local landfill would reduce their respective landfill volume available for other waste generators.
- Waste produced during construction could cause a reduction in land capability if not appropriately stored and handled.

Measures in **Table 7.49** would be implemented during the construction of the Project to suitably manage these waste impacts.

7.15.5.2 Operational Impacts

Impacts originating from waste are expected to be minor during the operations of the Project.

7.15.6 Management Measures

Measures presented in **Table 7.49** will be implemented to manage waste during various stages throughout the life of the Project.

Table 7.49 Waste management measures

No	Management measure	Timing
WR1	Identification of suitable waste disposal locations will occur prior to construction commencing in consultation with local waste sub-contractors and local councils.	Planning Construction
WR2	Waste materials generated during construction and operations will be reused or recycled where practicable or collected and transported by licenced contractors for disposal at appropriately licenced facilities. Any waste proposed to be disposed of to an offsite location will be classified in accordance with the EPA's Waste Classification Guidelines.	Construction Operations
WR3	Waste generated outside the site will not to be received at the site for storage, treatment, processing, reprocessing, or disposal.	Construction
WR4	All general and regulated waste records will be retained for waste tracking purposes.	Construction Operations
WR5	Portable toilet facilities will be available for work construction crews on the construction footprint.	Construction
WR6	Refuse containers will be located at each worksite to enable collection of waste, with regular removal from worksites to designated areas.	Construction
WR7	Refuse containers will be lidded to mitigate fauna access.	Construction
WR8	Use of any excess rock generated during trench excavation will be discussed with the relevant landholder and/or local councils. If uses cannot be identified excess rock will be removed from the construction footprint and disposed of appropriately.	Construction
WR09	APA will investigate options for land disposal of HDD cuttings in consultation with the NSW EPA, and implement if feasible.	Construction

7.16 Cumulative Impacts

As discussed in **Section 1.6** and **Section 7.2.4**, there are a number of existing and future (approved and proposed) developments near or adjacent the Project that may result in cumulative impacts should the construction and/or operation activities of these developments overlap or interact with the Project. When considered in isolation, the environmental, social, economic and other impacts associated with a project may be considered minor. However, these minor impacts may be more substantial when the impact of multiple developments on the same receivers are considered.

This section provides an assessment of the potential cumulative impacts associated with the construction and operation of the Project when considered together with other developments and activities occurring near the Project and presents the approach to the management of these impacts. This assessment was undertaken in accordance with the requirements of the SEARs, as outlined in **Table 3.1**, and the NSW *Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPIE, 2021b).

7.16.1 Assessment Methodology

In accordance with the CIA guidelines a cumulative scoping assessment was undertaken to identify the potential for cumulative impacts to occur as a result of the Project (refer to **Appendix 14**). The methodology used in the scoping summary is outlined below.

Nearby developments with the potential to result in cumulative impacts with or as a result of the Project were identified using the following sources:

- NSW DPIE Major Projects website
- Transport for NSW

- Cessnock City Council, Maitland City Council, and City of Newcastle development application registers.

Relevant developments were selected based on the following screening criteria:

- **scale** – all major or known developments planned in proximity to the Project
- **location** – developments near the Project
- **timeframe** – relevant developments recently completed or likely to be carried out at some point during the construction and operation of the Project
- **status** – the status of the development at the time of each staged assessment (including forecast timeframes for construction and operation), including approved and proposed developments.

Generally, cumulative impacts have been qualitatively assessed, with the expected cumulative impacts determined based on the perceived likelihood of impact and scale of interaction between the Project and those identified for the cumulative assessment (refer to **Table 7.50**). In some cases, a quantitative assessment (i.e. air or noise modelling) was also carried out to identify and assess the potential cumulative impacts of the Project.

Consultation with the relevant stakeholders for the developments listed in **Table 7.50** that are directly impacted by the Project has been ongoing in order to understand how these other developments interact with the Project and ensure they are appropriately considered in the cumulative impact assessment.

7.16.2 Identified Developments

Developments that may contribute to the cumulative impacts of the Project are summarised in **Table 7.50**. In some instances, sufficient detail relating to the developments is not currently available to inform a detailed assessment. However, where construction timeframes are not known, predictions have been made about the likelihood of overlapping construction periods, based on the most current and publicly available information.

The developments identified in **Table 7.50** are in various stages of delivery and planning, with a number of developments yet to be approved by the relevant authority. The likely impacts of these developments will be assessed by the relevant approval authority as part of the development consent process for each individual development.

Table 7.50 Identified Developments and Cumulative Impact Summary

Development	Detail	Cumulative Impact
Approved – construction to commence, underway or completed		
Black Hill Industrial Estate	Directly adjacent (north) of Project area Construction expected to commence mid-2022 Potential construction overlap with Project between Q4 2022 and Q3 2023	Air quality and odour during construction of development Noise and vibration during construction of development
Cliftleigh Urban Precinct	1 km south of Project area Construction timing unknown – assume worst case and construction overlapping	Traffic and transport during construction of development Social and economic during construction of development

Development	Detail	Cumulative Impact
Hydro Kurri Kurri Aluminium Smelter Remediation	Directly adjacent to Project area Demolition and remediation of areas to be used by the Project expected to be completed. Ongoing remediation works for the broader smelter area likely to be overlapping with Project construction. No overlapping impacts during operations	Air quality and odour during construction of development Noise and vibration during construction of development Traffic and transport during construction of development
Regrowth Kurri Kurri	Directly adjacent to Project area Construction timing unknown but expected to be later and not overlapping with Project construction Operations will overlap with use of the adjacent industrial precinct.	None
Testers Hollow Roadworks	Directly adjacent to Project area Construction has commenced and is expected to be completed in early 2023 Potential for construction overlap with Project between Q4 2022 and early 2023	None
Maitland Hospital	10 km north of Project area Development has been Approved Construction to be completed in early 2022 No construction overlap with Project No overlapping impacts during operations	None
Richmond Vale Rail Trail	1.5 km south of Project area Construction timing unknown	None
Queensland-Hunter Gas Pipeline	18 km north of Project area NSW Government approval specifies construction must be completed by October 2024 Potential construction overlap with Project between Q4 2022 and Q4 2023	None
Huntlee - Stage 1 Development	19 km northwest of Project Area Potential construction overlap with Project between Q4 2022 and Q4 2023	None
Proposed – under assessment or in planning and design phase		
Hunter Power Project	Directly adjacent (west) to Project area Construction to commence January 2022 cease in August 2023 Potential Construction overlap with Project between Q4 2022 and Q3 2023 Overlap in operations to potentially result in cumulative noise impacts	Air quality and odour during construction and operation of development Noise and vibration during construction and operation of development Traffic and transport during construction of development Hazards and risks during construction and operation of development

Development	Detail	Cumulative Impact
JGN Delivery Facility	Directly adjacent (east) to Project area Construction likely to overlap with Project between Q4 2022 and Q4 2023 Cumulative noise and vibration impacts during operation are not anticipated as these facilities will not operate simultaneously	Air quality and odour during construction of development Noise and vibration during construction of development Hazard and risk during construction and operation Visual during construction and operation of development
Lower Hunter Freight Corridor	Directly adjacent (east) to Project area Construction not expected to commence for at least 10 years	None
M1 Pacific Motorway extension to Raymond Terrace	Directly adjacent to Project area Construction to commence in 2024 and cease in 2028 No construction overlap with Project	None
Broaden Management Industrial Estate	Directly adjacent to Project area No construction overlap expected	None
Hexham Train Facility Modification 2 - Depot Relocation and Wagon Stowage	6.5 km east of Project area Construction timing unknown – assume worst case and construction overlapping	None
Hexham Metal Recycling Site Alterations Modification 6	7 km east of Project area Construction timing unknown – assume worst case and construction overlapping	None
Rutherford Park Freight and Business Centre	6 km northwest of Project area Construction timing unknown – assume worst case and construction overlapping	None
The Heights Learning Community, Gillieston Heights	1.5 km north of Project area Construction to commence in 2021/2022 until 2024 Potential construction overlap with Project between Q4 2022 and Q4 2023	Traffic and transport during construction of development Social and economic during construction of development
Gillieston Heights South - Eastern Precinct	1 km north of Project area DA not submitted yet Construction timing unknown - assume worst case and construction overlapping	Traffic and transport during construction of development Social and economic during construction of development
Weston Aluminium Additional Waste Streams	2 km south of Project area Development does not involve any construction activities	None

7.16.3 Assessment of Impacts

Detailed cumulative assessment has been undertaken where potential for impact has been identified through the cumulative scoping assessment (refer to **Appendix 14**) relevant to the Project. As summarised in **Table 7.50**, this assessment has focused on particular identified projects and relevant impacts, this includes the potential noise, air, hazards and risks, visual, traffic and social/economic impacts, the cumulative impacts are discussed below.

7.16.3.1 Air quality and Odour

The JGN offtake facility and adjacent JGN delivery facility are likely to be constructed concurrently. Modelling undertaken as part of the AQIA (**Section 7.8.2**) indicates that the cumulative air quality impacts of these projects will be within the relevant criteria at the nearest sensitive receptors.

Significant clearing activities for the approved Black Hill Industrial Estate may occur simultaneously with Project construction. Coordinated mitigation measures may be required in this area if construction occurs simultaneously, particularly if simultaneous construction occurs in the south eastern section of the industrial estate as this is closest to sensitive receptors to the east of the M1 Pacific Motorway.

Concurrent construction is likely to occur for the HPP, the Project, and ongoing works for the smelter remediation development. Air quality impacts due to this development and the Project are expected to be insignificant and temporary. Standard construction site management techniques would be used to ensure dust is minimised and kept to acceptable levels at the Project boundary.

During operations, potential emissions from the delivery station water bath heaters are assessed to be negligible and unlikely to lead to any cumulative air quality impacts when the HPP is operating.

Management measures to address the Project’s air quality and odour impacts are outlined in **Section 7.8.4**.

7.16.3.2 Noise and Vibration

Potential cumulative impacts during both the construction and operation of the Project have been considered in the NVIA (**Section 7.10**) and were found to result in a minor potential increase in noise impacts onto the surrounding community.

During the Project construction phase, collaboration with the construction activities at the HPP and the Black Hill Industrial Estate should be undertaken if construction is to occur simultaneously. with the implementation of reasonable and feasible mitigation and would lead to a minor reduction in cumulative construction noise levels at the nearby sensitive receivers.

Cumulative noise and vibration impacts during operation of the JGN offtake facility and JGN delivery facility are not anticipated as these facilities will not operate simultaneously. The offtake facility will operate when gas flows from the transmission pipeline into the SNP whereas the delivery facility will operate when gas flows out of SNP into the transmission pipeline.

7.16.3.3 Transport

Vehicle access for Hydro Kurri Kurri Aluminium Smelter Demolition and Remediation Project and the HPP would mainly utilise Hunter Expressway, which is currently operating at LoS A. Additional construction traffic for the Project combined with assumed traffic levels of (approximately 29 vph for the remediation and approximately 13 vph for HPP) would have minimal impact on the road network. Other major planned developments in proximity to the Project (that is, the Cessnock Road Upgrade at Testers Hollow and the M1 Pacific Motorway extension to Raymond Terrace) are not anticipated to overlap with the Project’s construction works and cumulative impacts resulting from these other projects are unlikely. Construction of various residential developments in the suburbs surrounding Main Road (Cliftleigh and Gillieston Heights in Maitland) are ongoing and heavy vehicles generated by these activities have been a constant presence in the area for the last several years, with dwelling approvals in the area reported to have had a high increase since 2018. As such, traffic generated from these activities are assumed to have been captured in the baseline traffic data and would not result to significant cumulative impacts. Additionally, works on the western end of the Project area that would require access from Main Road would be carried out in a span of 2 to 3 months and would not impact the area for the entire 12-month duration of the Project.

The TIA concluded that cumulative construction impacts resulting from other developments in proximity to the Project are expected to be minimal.

7.16.3.4 Hazards and Risks

As required by the SEARs (**Table 3.1**) the PHA for the Project (refer to **Section 7.12.1**) considered the PHA prepared for the HPP (Kurri Kurri Power Station (SSI-12590060), particularly in relation to the potential for propagation of hazardous events between the Project and the HPP. The PHA further also assessed the potential for propagation of hazardous events between the JGN offtake facility and the adjacent Jemena controlled JGN delivery facility.

The PHA for the Project notes that no hazardous events associated with the HPP were identified in the HPP Hazard and Risk Assessment, with respect to impacts that could result in propagation to the compressor station and delivery station at a frequency exceeding HIPAP 4 criteria. The PHA concluded that the frequency of hazardous events with potential propagation impacts for all Project components were estimated to be below the HIPAP 4 criteria.

The mitigation and management measures in **Section 7.12.3** are considered appropriate to manage any cumulative hazards and risk related to the Project.

7.16.3.5 Visual

There is potential for cumulative visual impacts with the simultaneous construction of the JGN offtake facility and JGN delivery facility. However, as construction activities will be of a temporary nature, these impacts are considered to be minor.

Once operational, the JGN offtake facility would be screened with vegetation (refer to **Section 7.13.5**) to reduce the long term visual impact associated with the Project.

7.16.3.6 Social and Economic

The SIA considered cumulative social impacts of the Project and other developments that may interact, as identified in **Table 7.50**.

As discussed in **Section 6.5**, there is sufficient accommodation to support the workforce for multiple projects (120 establishments and 1,064 rooms available). However, it is noted that at certain times accommodation can be less available and measures to manage these impacts are appropriate.

In consideration of the likelihood of the construction phase of the identified developments overlapping with the construction phase of the Project and the economic capacity of the region, the SIA considers that the potential cumulative impacts associated with the Project will be manageable. APA acknowledges that the cumulative social impacts of development on local communities within the region, particularly impacts associated with the influx of construction workers, subsequent impacts on local community services, as well as impacts associated with construction related activities, will remain a key challenge for all developers, and other key stakeholders (Government, local businesses and service providers, community groups and landholders/residents).

Such impacts will require proactive engagement and effective collaboration, to ensure appropriate social and environmental impact management, and the enhancement and augmentation of benefits for local communities. The Project-specific Local Industry and Indigenous Participation Plan that will be developed and implemented by APA for the Project will include measures to address potential cumulative impacts (both positive and negative) and provide an appropriate platform for APA to manage the contribution of the Project to the relevant cumulative issues.

APA will require the appointed construction contractor to implement a workforce management strategy, including strategies for accommodation, employment and procurement, which will assist in the management of the cumulative social and economic impacts. These strategies will be developed in the lead up to the construction phase of the Project to reflect and respond to actual regional demand conditions at that time, especially in relation to concurrent projects.

7.16.4 Management and Mitigation Measures

Developments which have the potential to interact with the Project have been considered during the development of the Project design (refer to **Section 2.0**).

The environmental management measures for key issues outlined throughout **Section 7.0** and summarised in **Section 8.0** will be implemented to minimise the cumulative impacts of the Project.

SECTION 8.0

Matters of National Environmental Significance

8.0 Matters of National Environmental Significance

On 8 February 2022, the Department of Agriculture, Water and Environment (DAWE) confirmed the Kurri Kurri Lateral Pipeline Project (the Project) constitutes a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions under the EPBC Act for the proposed action are:

- Listed threatened species and communities (sections 18 and 18A)
- Specifically, DAWE considered the Project is likely to have a significant impact on:
- River-flat Eucalypt Forest on Coastal Floodplains of southern New South Wales and eastern Victoria Critically Endangered Ecological Community (CEEC)
- regent honeyeater (*Anthochaera phrygia*)
- swift parrot (Lathamus discolor)
- koala (Phascolarctos cinereus)
- grey-headed flying fox (*Pteropus poliocephalus*)

The assessment path for the Project is in accordance with the *Amending Agreement No. 1 to the Bilateral Agreement* under Section 45 of the EPBC Act relating to environmental assessment between the Commonwealth and NSW Governments. DAWE has issued its assessment requirements which have been incorporated into the SEARs for the Project (refer to **Appendix 1** of this EIS) which state:

"The amending agreement sets out the information requirements for the Department to appropriately undertake the assessment under the amended bilateral. In particular, please note sufficient information will need to be included in the EIS to inform the Department's assessment as required under the following:

- Section 6 – Assessment: including for example significance assessment on Matters of National Environmental Significance; and
- Section 7 – Relevant plans, policies and other instruments: including for example sufficient information to demonstrate that the action is not inconsistent with these relevant plans including threat abatements plans, recovery plans, and consideration of relevant polices and guidelines for example bioregional plans"

The assessment of the Matters of National Environmental Significance including the additional information outlined above is provided in **Appendix 15** and should be read in conjunction with the EIS and the Biodiversity Development Assessment Report (BDAR) (provided in **Appendix 4**) prepared by Umwelt (Umwelt 2022). **Section 8.1** below provides a summary of the key findings of the assessment of the MNES.

8.1 Summary of MNES Impacts

The direct impacts of the Project, as they relate to the clearing of EPBC Act-listed CEEC and threatened species habitat, as summarised in **Table 8.1**, is predicted to be medium to long-term. A detailed biodiversity offset and rehabilitation program will be prepared as part of the Project in order to compensate for the residual impacts of habitat loss that cannot be adequately avoided or minimised.

Table 8.1 Predicted Impacts from the Project on EPBC Act listed threatened species and communities

Impact Type	MNES	Description	Nature of Impact	Direct Impact Area
Direct	River-flat Eucalypt Forest CEEC	Loss of 1.1 ha of forest through clearing.	Permanent	1.1 ha
Direct	regent honeyeater	Removal of potential foraging habitat containing key feed trees including 0.46 ha important mapped area	Permanent	46.83 ha
Direct	swift parrot	Removal of potential foraging habitat containing key feed trees and suitable	Permanent	51.81 ha
Direct	koala	Removal of potential habitat containing regionally relevant feed trees	Permanent	57.72 ha
Direct	grey-headed flying-fox	Removal of potential foraging habitat	Permanent	49.33 ha
Indirect	Non-specific Biodiversity related MNES	Noise impacts during construction may have a minor indirect impact on fauna species. Potential impacts include noise disturbing the roosting and foraging behaviour of fauna species and/or reducing the occupancy of areas of otherwise suitable habitat.	Medium term	-
Indirect	Non-specific Biodiversity related MNES	Air quality impacts during construction have the potential to adversely impact native species from dust generating activities during ground disturbing works. Potential impacts include dust covering vegetation thereby potentially reducing vegetation health and growth and increased air pollutants for native species (flora and fauna).	Medium term	-

Impact Type	MNES	Description	Nature of Impact	Direct Impact Area
Indirect	Non-specific Biodiversity related MNES	Weed species could be inadvertently brought into the Project area with imported materials or could invade naturally through removal of native vegetation. The presence of weed species within the Project area has the potential to decrease the value of extant vegetation to native species, particularly threatened species. Populations of feral fauna species such as foxes, rabbits, pigs, deer, dogs and cats can increase and quickly populate new areas as a result of disturbance.	Medium term	-
Cumulative	Non-specific Biodiversity related MNES	The history of land clearing associated with agriculture and approved mining industrial and urban development has resulted in an incremental loss of vegetation and fauna habitat surrounding the Project area, and within the Hunter Valley more generally. The Project will result in a loss of approximately 64.73 ha of native vegetation in various condition states. The Project will remove vegetation and further increase fragmentation and isolation of habitats, and thus contribute to cumulative habitat loss and vegetation clearance in the locality.	Medium – long term	-
Consequential	Non-specific Biodiversity related MNES	The Project uses existing infrastructure facilities where possible, therefore consequential impacts are not predicted.	Medium – long term	-

The proposed rehabilitation and reinstatement of habitat will mean that, over time, impacts will not be completely irreversible as most key ecological features will be recovered. Rehabilitation and regeneration of the construction footprint, in addition to an appropriate biodiversity offset strategy will ensure that there is no residual significant impact to the landscape in the medium-long term as a result of the Project.

8.2 Proposed Biodiversity Offset Strategy

To meet offsets required for Commonwealth listed entities for controlled actions under the NSW BOS, APA retains the ability to:

- retire biodiversity credits based on the like-for-like provisions in the Biodiversity Conservation Regulation 2017
- fund biodiversity conservation actions that are listed in the Ancillary rules: Biodiversity conservation actions and directly benefit the threatened entity impacted
- pay into the Biodiversity Conservation Fund, noting it is the proponent's responsibility to notify the Biodiversity Conservation Trust that their payment is for a controlled action.

Further threatened species surveys will be conducted in areas that have been subject to access restrictions and seasonal limitations to ascertain whether additional species credits are required to offset the impacts of the Project i.e. for the koala. Until these surveys have been completed, it will be assumed that the koala is present in PCTs with suitable habitat for the purposes of generating offset calculations, despite the very low likelihood that they occur in the Project area.

The MNES that were determined by DAWE to be significantly impacted by the Project are included in the credit liability for ecosystems and relevant species-credits required to be offset.

The Biodiversity Offset Strategy will be developed with consideration of the need to compensate for residual significant impacts to River-flat Eucalypt Forest CEEC, the koala, grey-headed flying-fox, regent honeyeater and swift parrot, with the aim to maintain or improve the biodiversity values of the surrounding region in the medium to long term. This aim will be delivered through the securing of in-perpetuity ‘like-for-like’ land-based offsets and in conjunction with the various impact mitigation and offset strategies that are proposed to be employed as part of the Project.

Further details regarding the proposed biodiversity offset strategy are discussed in **Appendix 15**.

SECTION 9.0

Summary of Commitments

9.0 Summary of Commitments

This section addresses the requirement in the SEARs for a consolidated summary of all proposed management and mitigation measures, identifying all the commitments in the EIS. The environmental commitments for the Project are summarised in **Table 9.1**. The summary identifies the technical discipline that the commitment is relevant to, a unique ID, the commitment itself and the stage of the Project when the commitment will be implemented.

Post-exhibition of the EIS, commitments may be revised during the submissions phase. The final list of management measures and commitments will be incorporated into the construction environmental management plan (CEMP) and operations environmental management plan (OEMP) as appropriate. The CEMP and OEMP will be centralised, scope-specific documents that describe all environmental risks related to the Project and required actions to manage those risks, including conditions of approval.

The CEMP and OEMP will be supported by a number of sub-plans which provide detailed environmental controls to manage key environmental issues. The CEMP and OEMP shall be reviewed and updated as necessary throughout the relevant phases of the Project.

Table 9.1 Summary of Project Commitments

Discipline	ID	Mitigation Measure	Timing
General	G01	The Project will be designed, constructed and operated in accordance with AS2885. The transmission pipeline will also be designed, constructed and commissioned in accordance with the requirements of ASME B31.12-ASME Design code for Hydrogen Piping and Pipelines, in order to maintain readiness for potential use of hydrogen in the east coast gas network. • Environmental management measures for the Project will be consistent with the most recent revision of the APGA Code of Environmental Practice (currently 2017).	Planning Construction Operations
General	G02	All Project personnel will undertake an induction that will include environmental and cultural heritage management requirements.	Construction
General	G03	Typical construction hours for the Project will be as follows: • Transmission pipeline and JGN offtake facility: 7 am to 6 pm Monday to Friday and 8am to 1pm Saturdays • Storage pipeline: 6 am to 6 pm seven days per week • Compressor station and delivery station: 6am to 6pm weekdays and 8am to 1pm Saturdays.	Construction
General	G04	The following activities may extend beyond typical construction hours listed in G03: Trenchless crossings, hydrotesting, non-destructive testing (NDT), pipe transport from port to laydown areas, and activities delayed by extenuating circumstances beyond the control of the Project.	Construction
General	G05	The minimum depth of cover, from the top of the transmission and storage pipelines to natural ground level, will be 900 mm.	Construction
Land Use	LU01	All reasonable steps will be undertaken to provide landholders with a dedicated point of contact to provide continuity for the duration of the Project.	Planning Construction Operations
Land Use	LU02	All reasonable steps will be undertaken to enter into an agreement with each landholder on fair and reasonable terms with compensation to be paid as required under the Pipelines Act 1967 and the Land Acquisition (Just Terms Compensation) Act 1991. Agreements will include commitments to agreed measures to minimise the impact of the Project on landholder activities which will be managed in a central database.	Planning Construction
Land Use	LU03	APA will fund the reasonable pre-agreed costs of legal, valuation and other advisory services incurred in negotiating with APA such that landholders can access appropriate independent advice without facing out of pocket costs.	Planning Construction
Land Use	LU04	A Schedule of Landholder Agreements will be compiled and maintained, documenting actions to be carried out on each property.	Planning Construction

Discipline	ID	Mitigation Measure	Timing
Land Use	LU03	APA will fund the reasonable pre-agreed costs of legal, valuation and other advisory services incurred in negotiating with APA such that landholders can access appropriate independent advice without facing out of pocket costs.	Planning Construction
Land Use	LU04	A Schedule of Landholder Agreements will be compiled and maintained, documenting actions to be carried out on each property.	Planning Construction
Land Use	LU05	Prior to any construction works commencing on a property, consultation will be undertaken with relevant landholders regarding property-specific measures to implement during construction and operations, including where relevant: • Access during construction • Ongoing mining operations • Stock management • Management of overland flow • Biosecurity • Reinstatement.	Planning Construction
Land Use	LU06	A Biosecurity Management Plan will be developed for the construction phase of the Project and incorporated into the CEMP for the Project.	Construction
Land Use	LU07	A Biosecurity Management Plan will be developed for the operations phase of the Project and incorporated into the OEMP for the Project.	Operations
Land Use	LU08	The approved construction footprint will be clearly demarcated and identified during the construction stage with survey pegs and at some locations with flagging, bunting or similar. Environmental features to be retained within the construction footprint will be similarly demarcated and identified.	Construction
Land Use	LU9	All third party services within the Project construction footprint will be identified and marked on the ground in advance of trenching activities.	Construction
Land Use	LU10	All identified third party services and water lines will be managed so that their operation can continue during pipeline construction, wherever practicable.	Construction
Soils and Contamination	SC01	Soil management measures consistent with the APGA Code of Environmental Practice (2017) will be employed during the construction of the Project.	Construction

Discipline	ID	Mitigation Measure	Timing
Soils and Contamination	SC02	Specific erosion and sediment control plans will be developed for each project component (JGN offtake facility, transmission pipeline, storage pipeline, compressor station and delivery station) following completion of geotechnical studies. Erosion and sediment control plans will be prepared in accordance with the APGA Code and will include: • Minimising the area and duration of soil disturbance. • Progressively rehabilitating disturbed areas. • Maintaining sheet flow conditions to the maximum possible extent. • Water velocity reduction measures and redirection of runoff to stable ground. • Transfer of overland flow through the ROW. • Diversion banks at the crest of steep areas such as stream banks to divert flow away from backfilled trenches. • Trench blocks (i.e. trench/sack breakers) and compaction of backfilled soils to be used to prevent subsurface erosion and subsidence along backfilled trench.	Construction
Soils and Contamination	SC03	Construction activities between Buttai Creek and Wallis Creek (KP13.1 to KP14.15), and the HDD workspace at the western side of Swamp Creek (KP 18.0), will be undertaken in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998), unless soil surveys demonstrate potential acid sulfate soils are not present.	Construction
Soils and Contamination	SC04	A trench and lay methodology will be applied at areas with potential for shallow groundwater and acid sulfate soils between Buttai Creek and Wallis Creek (KP13.1 to KP14.15) to limit the time between commencement of trench excavation and completion of trench backfilling to three days or less, excluding bellholes at HDD and tie-in locations.	Construction
Soils and Contamination	SC05	If sumps and cuttings settlement pits are required at HDD workspaces between Buttai Creek and Wallis Creek (KP13.1 to KP14.15), or at the western side of Swamp Creek (KP18.0), they will be constructed above ground with no ground disturbance other than stripping of topsoil.	Construction

Discipline	ID	Mitigation Measure	Timing
Soils and Contamination	SC06	The following measures will be implemented to manage topsoil: • Soil management measures will be appropriate to the soil type at each location. • Vegetation will be cleared prior to stripping of topsoil. • Topsoil will not be stripped when saturated. • Topsoil will be stripped across the Project construction footprint, typically to maximum depths determined during pre-construction surveys. In soil types with topsoil depth of 30 cm or greater, the stripping depth may be reduced to ensure stockpiles can be accommodated within the transmission pipeline and storage pipeline ROW widths. Above the trench, topsoil will generally be stripped to the full depth, but to a maximum of 30 cm, to mitigate mixing with subsoil. • Stripped topsoil will be stockpiled separately from woody material and subsoil stockpiles. • Topsoil stockpile heights will not exceed 2 m. • Gaps in the linear topsoil stockpiles will be left at appropriate intervals for drainage and for the movement of vehicles and fauna through the site. • Any topsoil stockpiles to be maintained for an extended period of time (i.e. >4 months) will have the surface left in a rough state and protected with a soil stabilising polymer or seeded with appropriate species and monitored for weed management. • Topsoil stockpiles, other than linear stockpiles on the transmission pipeline ROW, will be clearly signposted. • Topsoil will not be used as a padding material. • Stockpiled topsoil will be respread over the construction footprint to a minimum depth of 100 mm, or to the depth that topsoil was stripped if this was less than 100 mm. • Topsoil will not be respread for rehabilitation when saturated.	Construction
Soils and Contamination	SC07	The following measures will be implemented to manage subsoil: • Subsoil will be excavated and stockpiled separately from topsoil. • The trenches will be compacted to an appropriate density following backfilling with subsoil. • Excess displaced subsoil will be prevented from mixing with topsoil. • Excess subsoil will be stockpiled separately for disposal by appropriate methods, which may include placement elsewhere on the subject property in consultation with the relevant landholder. Monitoring for dispersion and erosion of subsoil stockpiles will be undertaken, particularly for sodic soils. The installation of further ESC or addition of ameliorants, such as gypsum or lime, based on the pH of the soil, will be undertaken as required.	Construction

Discipline	ID	Mitigation Measure	Timing
Soils and Contamination	SC08	Where padding material cannot be provided from trench spoil, clean borrow material of an appropriate quality will be sourced from an established supplier.	Construction
Soils and Contamination	SC09	Any topsoil imported for reinstatement or easement maintenance will be of an appropriate quality and agreed with the landholder.	Construction
Soils and Contamination	SC10	Prior to construction commencing on a property, discussions will be held with the landholder or manager to identify any potentially contaminated sites.	Planning
Soils and Contamination	SC11	Construction of the compressor station and delivery station will not commence until a site audit statement has been prepared by a site auditor accredited by the NSW Environment Protection Authority. Note: This condition has been included because the remediation of the former aluminium smelter site is being carried out under a separate consent.	Planning
Soils and Contamination	SC12	In the event that contaminated sites are uncovered during construction the following measures will be undertaken: • Cessation of ground disturbance at the location and within the immediate vicinity. • Assessment of the site contamination and determination of appropriate remedial action in consultation with the EPA where required.	Construction
Soils and Contamination	SC13	• Spills of hazardous materials will be rendered safe (unable to further contaminate) and, where required, collected for treatment and disposal at a designated site, including cleaning materials, absorbents and contaminated soils.	Construction Operations
Water Resources	WA01	Water management measures consistent with the APGA Code of Environmental Practice (2017) will be employed during the construction of the Project.	Planning Construction
Water Resources	WA02	Records will be maintained of the source and volume of water used during construction.	Construction

Discipline	ID	Mitigation Measure	Timing
Water Resources	WA03	The following measures will be applied to all open trenched watercourse crossings, including special crossings: • Where practicable, crossings will be perpendicular to the watercourse. • The transmission pipeline ROW width for open trenched watercourses, including special crossings, will be reduced to 20 m between the banks of the watercourse. • Where practicable, crossings will be constructed during no or low flow conditions. • Crossings will maintain a minimum vertical clearance between the hard invert of the watercourse and the top of the pipeline of 1.5 m. • Flow diversion measures will be installed where construction of crossings during no flow conditions is not feasible. Flow diversion measures may include pumps to enable water to be moved from one side of trench to the other, screened inlets to minimise the entrapment of aquatic fauna and outlet structures that are designed to avoid scouring of the channel. • Trenches between banks will be backfilled within 5 days of excavation. • All obstructions within watercourses that are installed or generated during construction will be removed as soon as practicable after the pipe has been laid and backfilled and use of any access track across the watercourse has ceased. • Material excavated from the bed of watercourses during establishment of the ROW will be stockpiled separately from other materials, outside the active channel and avoiding riparian vegetation wherever practicable and returned to the watercourse bed during reinstatement. • Crossings will be reinstated such that bank stability at the crossing location is the same or better than prior to construction. Stabilising materials such as rock armouring, hydro mulch, jute matting, or other suitable geotextile materials will be applied to watercourse banks where necessary.	Construction
Water Resources	WA04	The following mitigation measures will be applied to special crossings of Viney Creek and Four Mile Creek, in addition to standard mitigation measures for all open trenched watercourses: • Initial disturbance of the watercourse will be restricted to 6 m wide all weather running track. • The timeframe from the start of ROW construction to completion of reshaping to a stable landform will be 20 consecutive days. • The ROW will be reduced to 20 m between banks. • The timeframe for re-instatement including removal of running track will be five consecutive days. • Erosion and sediment control plans will be developed for each stage of each special crossing • The pipeline string will be constructed outside of the watercourse.	Construction

Discipline	ID	Mitigation Measure	Timing
Water Resources	WA05	Any large woody debris or boulders located within the construction footprint of watercourses to be trenched are to be temporarily relocated during construction and returned to the watercourse during reinstatement, at locations where scour risk to the pipeline can be avoided.	Construction
Water Resources	WA06	The following measures will be applied to management of trench water or bell hole water: • Discharge of trench water or bell hole water to land will only be undertaken where water meets relevant water quality guidelines and after consultation (if appropriate) with the relevant landholder. • Trench water or bell hole water will not be discharged into or within 50m of watercourses. Discharge will be to low gradient, stable, grassed areas and be undertaken in accordance with landholder requirements and so as not to cause scour or erosion. • Release of trench water or bell hole water to land will be undertaken to avoid soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids and dissipate flow will be used where required.	Construction
Water Resources	WA07	A Site Dewatering Procedure (to include pipeline trenches) will be prepared and incorporated into the Project CEMP, in the event that ephemeral or temporary groundwater is encountered during construction works.	Planning Construction
Water Resources	WA08	HDD will be used to mitigate impacts to Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek and Black Waterholes Creek. The final extent of HDD will be informed by further investigation of available entry and exit points.	Construction
Water Resources	WA09	Geotechnical analysis of crossings proposed for trenchless technology (HDD or boring) will be undertaken to inform the design of the trenchless crossing.	Construction
Water Resources	WA10	Potential for lateral flow of water along pipeline trenches shall be mitigated by use of appropriate means such as trench blocks (i.e. trench/sack breakers) and / or by compaction of backfilled soils. Areas with potential for lateral water flow include slopes, watercourses and floodplain areas such as Swamp Creek and Wallis Creek.	Construction
Water Resources	WA11	Backfilling of the trench through floodplain areas will use material excavated from the floodplain to maintain hydraulic conductivity.	Construction
Water Resources	WA12	A Soil and Water Management Plan (SWMP) will be prepared and incorporated into the Project CEMP.	Planning Construction
Water Resources	WA13	The access track crossing of Wallis Creek will be designed, constructed and decommissioned in accordance with relevant NSW guidelines and in consultation with DPIE Water.	Planning Construction
Biodiversity	B01	Offsets will be secured to compensate for unavoidable impacts to biodiversity resulting from the construction and operation of the Project, in accordance with relevant offset guidelines.	Planning Construction Operations

Discipline	ID	Mitigation Measure	Timing
Biodiversity	B02	Clearing of woody vegetation will be undertaken with a suitably qualified wildlife handler present to: • Inspect habitat in advance of clearing and relocate fauna. • Advise on clearing techniques that will minimise fauna impact. • Keep records of fauna interactions, as far as practicable, listing the species concerned, the nature of the interaction and its GPS coordinates.	Construction
Biodiversity	B03	Native fauna that are to be relocated must be relocated by suitably qualified and authorised fauna handlers only. Records of all relocations will be retained in accordance with requirements of the CEMP.	Construction
Biodiversity	B04	Cleared vegetation, which may be mulched or stored as is depending on the rehabilitation requirements for specific areas, will be: • Stockpiled separately from topsoil in windrows in a manner which facilitates respreading or salvaging, avoids damage to adjacent live vegetation and does not unreasonably impede stock or wildlife. • Stockpiled away from watercourses and not stored or felled so as to land in watercourse, where practicable. • Stockpiles will have breaks as required by the landholder for access.	Construction
Biodiversity	B05	Welded pipe strings will be end capped to prevent fauna entry.	Construction
Biodiversity	B06	Potential for fauna entrapment within the pipeline trenches will be minimised by: • Minimising to the extent practicable the period of time the trench is open. • Provide opportunities for fauna to exit the trench such as trench plugs or other appropriate measures, at a minimum of every 500 m. • Installation of fauna shelter devices, such as sawdust filled bags, at 250 m intervals along the trench. • Daily pre-start inspections of the open trench, and removal of trapped fauna by suitably qualified personnel as required.	Construction
Biodiversity	B07	In the event that Koala or Grey-headed Flying-fox are discovered within the construction footprint, all mobile construction equipment in the surrounding area will cease work, excluding use of light vehicles to move staff to and from the area. Mobile construction equipment will not recommence work until a wildlife handler has removed the individual or it has been confirmed that the individual has left the workspace. Any captured individuals will be removed and relocated to nearby adjacent habitat away from the construction area.	Construction
Biodiversity	B08	Understorey vegetation to 1.5 m high will be allowed to regenerate across the transmission pipeline ROW between Four Mile Creek and Elwells Creek, but not within 4m of the pipeline, to improve connectivity for ground-dwelling mammals, reptiles and small birds.	Operations

Discipline	ID	Mitigation Measure	Timing
Biodiversity	B09	Options for avoiding or reducing impacts to the River-flat eucalypt forest vegetation community at the north-eastern extent of the storage pipeline footprint will be investigate and implemented if feasible. Any reduction in length of the storage pipeline construction footprint may require an increase in width	Construction
Aboriginal Heritage	AH01	Archaeological test investigations will be completed prior to construction impacts occurring at areas identified by the ACHA, if areas are proposed to be impacted following finalisation of Project design. Test investigations will be undertaken in accordance with the CHMP.	Planning
Aboriginal Heritage	AH02	A CHMP will be developed and implemented for the Project in consultation with Heritage NSW, the relevant Indigenous stakeholders, and DPIE and will address the following issues: • Methods to be used for avoidance of sites. • Monitoring of areas where potential sites may exist. • Surface collection or salvage excavations. • Management of previously unrecorded CH sites including human remains.	Planning Construction Operations
Aboriginal Heritage	AH03	Avoidance of identified sites of Aboriginal cultural heritage will be achieved where practicable by: • Minor realignments of the transmission pipeline alignment. • Narrowing of the ROW. • Leaving sites intact within the ROW with temporary fencing installed during construction. • Adoption of horizontal directional drilling (HDD) at selected watercourse crossings.	Planning Construction
Aboriginal Heritage	AH04	Where avoidance of Aboriginal sites is not practicable, impacts will be managed in accordance with the CHMP. Mitigation measures may include recording and salvage of information and artefacts prior to impact.	Construction
Historic Heritage	HH01	Detailed survey of the Project construction footprint within the vicinity of the South Maitland Railway will be undertaken and all piles of sleepers and associated fabric will be recorded.	Planning Construction
Historic Heritage	HH02	If any historical heritage sites are identified where avoidance is not practicable, impacts will be mitigated by the recording and salvage of information and artefacts. Recording and salvage will be adopted for all sites where avoidance is not achievable, subject to relevant regulatory approvals.	Construction
Historic Heritage	HH03	Procedures to implement if an unknown historical heritage site, value or object is discovered during construction will be incorporated into the Project CEMP. This will include guidelines on collection or salvage of historical heritage objects.	Planning Construction
Air Quality and Odour	AQ01	A dust control plan will be prepared and incorporated into the Project CEMP.	Planning Construction

Discipline	ID	Mitigation Measure	Timing
Air Quality and Odour	AQ02	Plant and equipment will be maintained in good condition to minimise ignition risk, spills and air emissions that may cause nuisance.	Construction Operations
Air Quality and Odour	AQ03	Vehicle speed within the construction site boundary, including access tracks, will be restricted to a maximum of 40 kph.	Construction
Air Quality and Odour	AQ04	Construction vehicles with potential for loss of loads (such as dust or litter) will be covered when using public roads.	Construction
Air Quality and Odour	AQ05	Dust suppression will be undertaken when a dust hazard is expected or observed. Dust suppression may include using water sprays, water extension agents, soil stabilising polymers or other media: • On unpaved work areas subject to traffic or wind. • On sand, spoil and aggregate stockpiles. • During the loading and unloading of dust generating materials.	Construction
Air Quality and Odour	AQ06	Dust suppression will be undertaken when construction works are in proximity to the following specific receivers and winds are blowing towards them: • Receptor 24 (463-457 Cessnock Rd) – 110 m to an unpaved access track with light and heavy vehicle use. • Receptor 12 (532 Main Rd) – 130 m from the ROW where there will be construction works and light and heavy vehicles. • Receptor 19 (2 Black Hill Rd) - 170 m from the ROW where there will be construction works and light and heavy vehicles.	Construction
Air Quality and Odour	AQ07	When using water for dust suppression the amount of water for dust suppression applied will not exceed what is required to effectively suppress dust. The application of water for dust suppression will: • Not cause on-site ponding or runoff. • Be directly to the area being dust suppressed. • Not harm vegetation surrounding the area being dust suppressed. • Not cause visible salting.	Construction
Air Quality and Odour	AQ08	If the works are creating levels of dust which may significantly impact on residential amenity, the works will be modified or stopped until the dust hazard is reduced to an acceptable level.	Construction
Air Quality and Odour	AQ09	Blasting (if required) will not be undertaken if weather conditions (i.e. wind speed and direction) are likely to result in air quality impacts at sensitive receivers.	Construction
Noise and Vibration	NV01	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The CEMP and NVMP will be regularly updated to account for any changes in noise and vibration management of the Project.	Planning Construction

Discipline	ID	Mitigation Measure	Timing
Noise and Vibration	NV02	Except in the event of an emergency, construction activities will only be undertaken outside of standard construction hours (defined in the NSW Interim Construction Noise Guideline as 7:00 am to 6:00 pm weekdays and 8:00 am to 1:00 pm on Saturdays at no time on Sundays and public holidays) where feasible and reasonable noise mitigation measures are in place and approval conditions can be complied with.	Planning Construction
Noise and Vibration	NV03	Blasting, if required, will be carried out in accordance with the following measures: • Conducted only where conventional excavation or trenching is ineffective or impractical, or if blasting will provide a reduction in environmental impacts. • Conducted with appropriate dust control measures. • Conducted according to a blast procedure prepared by a qualified person. • Conducted only where consultation has occurred with affected landholders.	Construction
Noise and Vibration	NV04	Broadband reversing alarms will be used in preference to 'beeper' reversing alarms on construction vehicles and machinery.	Construction
Noise and Vibration	NV05	As noise generated by venting at the JGN Offtake Facility, the compressor station, delivery station and storage pipeline is dependent upon the detailed design of these facilities, noise profiles will be reassessed during detailed design and management measures to mitigate noise from venting will be implemented if sensitive receivers are expected to be impacted.	Planning Operations
Noise and Vibration	NV06	Pumps and compressors used for hydrotesting and pigging activities will be muffled or otherwise treated to reduce noise emissions.	Construction
Noise and Vibration	NV07	Additional noise modelling and, if required, mitigation will be undertaken during detailed design for the JGN offtake facility, compressor station and delivery station. Management measures to further mitigate noise emissions will be implemented if impacts to sensitive receivers are predicted to be above the relevant noise criteria.	Planning Operations
Traffic and Transport	TT01	All sealed roads and the South Maitland Railway will be crossed using trenchless construction techniques.	Planning Construction
Traffic and Transport	TT02	Pipeline crossings of unsealed roads will be constructed using methods and depth of cover determined in consultation with the relevant road authority and landholders. Installation of bypass tracks, detours or crossing plates will be undertaken as required.	Planning Construction
Traffic and Transport	TT03	Detailed design of all road and rail crossings will be informed by the requirements of the relevant road authority including obtainment of applicable permits prior to the commencement of construction of the relevant works.	Planning Construction

Discipline	ID	Mitigation Measure	Timing
Traffic and Transport	TT04	The condition of public roads used for transport between pipe laydown areas and the transmission pipeline and storage pipeline construction footprint will be assessed by a Road Dilapidation Report prior to construction commencing and following completion of construction. Any defects attributable to construction activities will be rectified or compensated in consultation with the relevant road authorities.	Planning Construction
Traffic and Transport	TT05	Any oversized or over weight loads will be transported in accordance with the requirements of the relevant road authority.	Planning Construction
Traffic and Transport	TT06	A Traffic Management Plan (TMP) will be prepared as a component of the CEMP and will address, amongst other issues: • Sufficient on-site parking for all vehicles. • Covering or containing heavy vehicles loads. • Minimising dust and/or sediment being tracked onto the public road network. • Minimising traffic noise impacts. • Transport options for workers to the site. • Public notifications for any disruptions to traffic, the closure of roads or other infrastructure, oversize or overmass vehicle use, peak construction periods, and any emergencies. • Driver's Code of Conduct.	Planning Construction
Traffic and Transport	TT07	Access for emergency vehicles will be maintained for the duration of the construction works, in accordance with emergency vehicle requirements.	Construction
Hazards, Risks and Bushfire	HR01	Emergency Response Plans consistent with HIPAP No. 1 Emergency Planning (Department of Planning, 2011b) and Planning for Bushfire Protection 2019 (NSW RFS, 2019) will be developed and implemented for both the construction and operations phases of the Project.	Construction Operations
Hazards, Risks and Bushfire	HR02	A qualified person will be appointed as Site Safety Advisor during construction and will have on-site a set of the relevant safety data sheets (SDS) for hazardous and dangerous materials.	Construction

Discipline	ID	Mitigation Measure	Timing
Hazards, Risks and Bushfire	HR03	Dangerous goods, as defined by the Australian Dangerous Goods Code, and flammable and combustible liquids will be stored and handled in accordance with: • The requirements of all relevant Australian Standards. • Within a bunded area with a minimum bund capacity of 110% of the volume of the largest single stored vessel within the bund. • The NSW EPA's Storing and Handling of Liquids: Environmental Protection – Participants Handbook if the chemicals are liquids. In the event of an inconsistency between the requirements in (a) to (c) above, the most stringent requirement shall prevail to the extent of the inconsistency. For the purpose of the above, any tanks or other storage vessels that are interconnected and may distribute their contents either by gravity or automated pumps must be considered a single vessel.	Construction Operations
Hazards, Risks and Bushfire	HR04	Spill kits will be available at all locations where machinery/plant are operating, refuelling points and fuel and chemical storage locations.	Construction
Hazards, Risks and Bushfire	HR05	Where flammable or combustible chemicals are required to be stored on-site, fire-fighting equipment will be available that is proportionate to the risk of the materials stored.	Construction
Hazards, Risks and Bushfire	HR06	Routine visual monitoring and recording of chemicals and fuel storage facilities will occur.	Construction
Hazards, Risks and Bushfire	HR07	Refuelling of vehicles and machinery, other than hand held machinery, will utilise auto shut off valves. Refuelling of vehicles and mobile machinery will not occur within 50 m of a watercourse.	Construction
Hazards, Risks and Bushfire	HR08	Vehicles/plant/machinery/equipment will be maintained in good condition to minimise the potential for leaks/spills to occur.	Construction
Hazards, Risks and Bushfire	HR09	Vehicle and equipment will be inspected daily to check for oil, lubricant or fuel leaks and general wear and tear of hoses.	Construction
Hazards, Risks and Bushfire	HR10	A Bushfire Management Plan (BMP) will be prepared for Project construction and operations, informed by consultation with the Rural Fire Service.	Construction
Hazards, Risks and Bushfire	HR11	Open fires, including open barbeques, billy fires, and brush burning, will not be permitted on site.	Construction Operations
Hazards, Risks and Bushfire	HR12	Hot works activities will only be undertaken during a declared Total Fire Ban where an exemption has been issued by NSW RFS. These works will be undertaken in accordance with the conditions of the exemption.	Construction

Discipline	ID	Mitigation Measure	Timing
Hazards, Risks and Bushfire	HR13	The following precautions will be taken to minimise the possibility of fire due to hot work activities: • The area of the construction ROW over which hot work will take place will be maintained free of combustible material. • Firefighting equipment, including a validated portable fire extinguisher, and trained personnel to be available during all hot work operations. • Water trucks will be available to respond to fire.	Construction
Hazards, Risks and Bushfire	HR14	The Project will implement the APA HSE Management System.	Planning Construction Operations
Hazards, Risks and Bushfire	HR15	Requirements for pipeline buoyancy control in flood risk areas will be assessed during detailed design and implemented as required.	Planning Construction
Hazards, Risks and Bushfire	HR16	Detailed design of the transmission and storage pipelines will give consideration to the following: • Control philosophy for the MLV including potential automation to limit the amount of gas that can escape from a ruptured pipeline. • Protection of above ground structures from inadvertent or deliberate acts, which may cause damage to exposed equipment and piping.	Planning Construction Operations
Hazards, Risks and Bushfire	HR17	Measures to mitigate mine subsidence risks to the transmission pipeline within Mine Subsidence Districts will be determined in consultation with Subsidence Advisory NSW.	Planning Construction Operations
Hazards, Risks and Bushfire	HR18	First aid facilities and a nurse, paramedic or other suitably qualified health care professional will be available to service construction areas.	Construction

Discipline	ID	Mitigation Measure	Timing
Hazards, Risks and Bushfire	HR19	As per the requirements of AS2885 and the APA safety management system the following measures will be implemented: • Surface facilities will be located in secure compounds . • Hazardous area classification will be undertaken for all installations and a hazardous area dossier prepared for the Project. • Atmosphere testing (e.g. Oxygen, LEL) will be undertaken as required (depending on activities) for personnel entry to surface facility compounds and mandatory testing for vehicle entry (as a vehicle is an ignition source). • Compressor acoustic enclosures will be ventilated and have gas detection systems that initiate shut down. • A maintenance system will be implemented that includes routine inspection and maintenance plans in accordance with AS/NZS 2885.3. • Pipeline markers and signage will be placed at a frequency to ensure continual line of sight along the alignment and will also be located at any bends, at property boundary fences and either side of crossings such as roads or watercourses. • Pipeline marker tape will be buried above the along entire length of all underground pipelines to indicate the presence of the pipeline to anyone undertaking an excavation above the pipeline. • The location of all underground pipelines will be registered with Dial Before You Dig.	Planning Construction Operations
Visual amenity	LV01	Light generated during construction and operations will be managed in general accordance with the requirements in Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting.	Planning Construction Operations
Visual amenity	LV02	The construction site at the JGN offtake facility will be appropriately screened to mitigate visual impacts to users of Lenaghans Drive and nearby residences.	Construction
Visual amenity	LV03	Landscape screening (planting) will be undertaken at the JGN offtake facility to mitigate visual impacts to users of Lenaghans Drive and nearby residences based on detailed design, additional viewshed analysis and further consultation with potentially affected residents.	Operations
Social Amenity	SA01	A Project-specific Local Industry and Indigenous Participation Plan will be developed with the intention of promoting local, regional and Indigenous business and employment opportunities associated with the Project.	Planning Construction
Social Amenity	SA02	APA will require the appointed construction contractor to implement a workforce management strategy, including strategies for accommodation, employment and procurement.	Planning Construction
Social Amenity	SA03	A stakeholder engagement plan will be implemented to facilitate ongoing consultation with relevant stakeholders throughout the Project so that stakeholders have access to information regarding the nature of the proposed Project activities and their likely impacts.	Planning Construction Operations

Discipline	ID	Mitigation Measure	Timing
Social Amenity	SA04	A complaints management system will be put in place that documents: • Name of persons receiving complaint. • Name of person making the complaint. • Date and time of complaint. • Nature of the complaint. • Actions taken to rectify and timeframe for action. • Actions to minimise risk of reoccurrence. • Name of person(s) responsible for undertaking the required actions.	Construction Operations
Social Amenity	SA05	APA will continue to implement a Community Grants Program that targets proximal communities within the social locality and prioritises investments directly related to identified community needs.	Planning Construction
Waste Management	WR01	Identification of suitable waste disposal locations will occur prior to construction commencing in consultation with local waste sub-contractors and local councils.	Planning Construction
Waste Management	WR02	Waste materials generated during construction and operations will be reused or recycled where practicable or collected and transported by licenced contractors for disposal at appropriately licenced facilities. Any waste proposed to be disposed of to an offsite location will be classified in accordance with the EPA's Waste Classification Guidelines.	Construction Operations
Waste Management	WR03	Waste generated outside the site will not to be received at the site for storage, treatment, processing, reprocessing, or disposal.	Construction
Waste Management	WR04	All general and regulated waste records will be retained for waste tracking purposes.	Construction Operations
Waste Management	WR05	Portable toilet facilities will be available for work construction crews on the construction footprint.	Construction
Waste Management	WR06	Refuse containers will be located at each worksite to enable collection of waste, with regular removal from worksites to designated areas.	Construction
Waste Management	WR07	Refuse containers will be lidded to mitigate fauna access.	Construction
Waste Management	WR08	Use of any excess rock generated during trench excavation will be discussed with the relevant landholder and/or local councils. If uses cannot be identified excess rock will be removed from the construction footprint and disposed of appropriately.	Construction
Waste Management	WR09	APA will investigate options for land disposal of HDD cuttings in consultation with the NSW EPA, and implement if feasible.	Construction

Discipline	ID	Mitigation Measure	Timing
Existing Infrastructure	EI01	APA will undertake a detailed dial before you dig and site investigation regime to define exact locations of services.	Planning
Existing Infrastructure	EI02	Further consultation with service providers will occur to agree to any required protective measures during construction.	Planning Construction
Existing Infrastructure	EI03	Searching for services will be conducted by hand or using service location devices. Once services are located, these will be flagged with signage or coloured tape to ensure they are easily identified for the duration of works in that area. In the event of any unforeseen service discovery, the appropriate utility provider will be contacted, and appropriate remedial actions taken.	Construction
Rehabilitation	R01	Reinstatement will commence progressively post construction and will be undertaken as soon as practicable.	Construction
Rehabilitation	R02	Stockpiled vegetation will be respread over appropriate sections of the construction footprint (but not directly over the pipelines) during rehabilitation, unless other management measures are likely to improve rehabilitation outcomes.	Construction
Rehabilitation	R03	Reasonable landholder requirements regarding respreading of stockpiled vegetation will be considered.	Construction
Rehabilitation	R04	Where seeding is adopted to facilitate prompt revegetation and soil stabilisation, the following principles will be considered: • Seed mixtures to be formulated with consideration of the vegetation composition of the areas adjacent to the construction footprint and in consultation with the relevant landholder. • Sterile seed stock (cover crop) may be used to provide short term surface stability. • Seed to be evenly dispersed over the disturbed area. • Seeding to take place as soon as practicable after reinstatement of the soil profile. • A suitable fertilizer/soil conditioner may be applied depending on soil conditions and any landholder requirements.	Construction
Rehabilitation	R05	The construction footprint will be re-profiled to original contours or to new, stable contours where it is not reasonably practical to re-profile to original contour.	Construction
Rehabilitation	R06	Soil amelioration with fertiliser, gypsum and/or lime will be undertaken where consistent with identified rehabilitation outcomes for the location.	Construction
Rehabilitation	R07	Compaction relief will be implemented by ripping or scarifying areas of the construction footprint which have been compacted by construction activities. Particular attention will be given to areas subject to regular watering and high traffic volume.	Construction
Rehabilitation	R08	Where relevant and practicable arrangements will be made with landholders to exclude or manage stock access to recently reinstated areas.	Construction

Discipline	ID	Mitigation Measure	Timing
Rehabilitation	R09	All access tracks, fences and gates will be reinstated post construction, subject to consultation with landholders and any relevant third parties.	Construction
Rehabilitation	R10	Permanent access gates will be installed post construction, where required at fence intersections.	Construction
Rehabilitation	R11	All temporary above ground infrastructure will be removed at the completion of construction unless required for biosecurity or other environmental controls.	Construction
Rehabilitation	R12	Monitoring of the condition of the ROW and other disturbed areas will be completed post construction and remedial measures undertaken, as required, with the aim that all disturbed areas are re-profiled to a stable landform consistent with original contours and drainage lines and vegetated with a self-sustaining, non-pest species groundcover.	Construction
Rehabilitation	R13	Habitat features removed during construction such as large hollow logs and large rocks will be returned to the ROW during rehabilitation if consistent with rehabilitation objectives at a particular location. Landholder requirements will be considered prior to returning habitat features to the ROW.	Construction
Rehabilitation	R14	During operations, environmental and safety inspections of the alignment will be typically undertaken monthly by air and annually or biennially by on-ground inspection, and at other intervals as informed by Safety Management Studies undertaken in accordance with AS2885. Corrective actions will be implemented as required.	Operations
HDD	HD01	A HDD management plan including drill profile design, work method statement, proposed volumetric drilling fluid tracking program and proposed intervention levels, will be prepared for each HDD prior to the commencement of HDD activities. The management plan will include specific noise mitigation requirements for each HDD.	Planning
HDD	HD02	Natural run-off will be diverted round and away from HDD and bore entry and exit areas to avoid sediment entrainment and mixing with drilling compounds.	Construction
HDD	HD03	Where practicable, sump pits will be constructed at the bottom of the drill site in accordance with the following: The sump pit will be positioned (during site planning) so that all runoff from the drilling compound will flow into it. The sump pit will be of such dimensions as to provide a buffer for the drilling fluid returns. An earth bund will be placed around the sump pit to contain any spillage. Where the HDD site may be subject to flooding or shallow groundwater, the sump pits and cutting settlement pits will instead be constructed above ground or skips will be used.	Construction
HDD	HD04	Drilling will preferentially use non-toxic (e.g. bentonite) and/or biodegradable drilling muds. The composition of HDD drilling muds and an assessment of their environmental risk will be included in the HDD Management Plan required under D1.	Construction
HDD	HD05	Appropriate spill response and clean-up equipment (e.g. sandbags, vac-truck) will be maintained on-site during HDD activities.	Construction

Discipline	ID	Mitigation Measure	Timing
HDD	HD06	Contractor(s) that are suitably qualified and experienced in trenchless installation techniques will be used.	Construction
HDD	HD07	HDD entry and exit workspaces will be microsited to be above the 50% AEP flood level, as far as practical.	Construction
HDD	HD08	HDD return lines will be constructed from high quality HDPE pipe, with heat welded joins between pipe lengths. An ecologist will supervise the placement of surface return lines, which will be micro-sited to avoid threatened plants. Surface return lines will be subject to regular visual inspection during drilling.	Construction
Cleaning, hydrostatic testing	HT01	Pre-cleaning of the transmission pipeline prior to hydrostatic testing will be undertaken to remove weld debris, dust and surface scale. Any waste water will be captured and removed by an EPA licenced waste contractor.	Construction
Cleaning, hydrostatic testing	HT02	Reuse water to conserve water and minimise the number of discharge locations where the hydrotest schedule allows.	Construction
Cleaning, hydrostatic testing	HT03	The following measures will be applied to management of hydrotest water: • If biocides and oxygen scavengers are used during hydrotesting they will be selected to be biodegradable. • Oxygen scavengers and biocides that are used during hydrostatic testing will be neutralised before disposal, in accordance with manufacturer guidelines, to ensure that the water is free from any remaining active biocide and oxygen scavengers before discharge to land. • At the completion of hydrotesting, hydrotesting water will be sampled and analysed, using a NATA accredited laboratory, to ensure that no biocides and oxygen scavengers are detected, and to establish an appropriate method of disposal or reuse. • Discharge of hydrotest water to land will only be undertaken where water meets relevant water quality guidelines and after consultation (if appropriate) with the relevant landholder. • If hydrotest water does not meet relevant water quality guidelines, it may be treated on site or transported by licenced contractors for disposal at an appropriately licenced facility. • Hydrotest water will not be discharged into or within 50m of watercourses. Discharge will be to low gradient, stable, grassed areas and be undertaken in accordance with landholder requirements. • Discharge of hydrotest water to land will be undertaken to avoid scour, soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids and dissipate flow will be used where required.	Construction
Cleaning, hydrostatic testing	HT04	Dams holding hydrostatic test water may remain for landholders' beneficial use with landholder and regulatory approval if water quality requirements are met.	Planning Construction

SECTION 10.0

Evaluation of Merits

10.0 Evaluation of Merits

This section provides an evaluation of merits of the Project and a conclusion for the EIS, taking into consideration biophysical, social and economic impacts, the suitability of the Project area and whether or not the Project is in the public interest. The Project is also considered in the context of the objects of the EP&A Act (refer to **Section 10.4**), including the principles of ecologically sustainable development (ESD) as defined in Schedule 2 of the EP&A Regulation 2000 (refer to **Section 10.4**).

10.1 Project Justification

Although the Project is subject to separate assessment and approval processes, it was included in the CSSI declaration for the HPP and is necessary for the operation of that project. Approval for the HPP was granted under the NSW planning system, subject to conditions, on 17 December 2021.

In its evaluation of the merits of the HPP outlined in the Environmental Assessment Report, DPIE (2021c) states:

The Department considers that the development of a gas-fired power station in the Hunter region would contribute to energy reliability and security in the NEM as it transitions away from coal-fired power station power generation over the next 10-15 years. The project is recognised as a committed project in the recent 2021 Electricity Statement of Opportunities as it would provide firming capacity to supplement the increasing supply of renewable energy and contribute to overall system reliability in the NEM (DPIE, 2021c).

In addition, the Notice of Decision issued by the Minister for Planning and Public Spaces (DPIE, 2021d) concludes that the HPP would strengthen energy security in NSW as it would:

- contribute to closing the previously forecast reliability gap in 2023-2024 following the retirement of Liddell Power Station
- mitigate electricity supply scarcity for the Hunter, Sydney and Wollongong regions associated with the retirement of Vales Point Power Station in 2029
- mitigate reliability risks associated with the potential early exit of coal-fired power stations ahead of planned closure timeframes
- provide an ongoing source of synchronous energy to contribute to system security
- contribute to avoiding electricity price increases following the closure of Liddell Power Station for the scenario described in the Report of the Liddell Taskforce.

These conclusions have been further confirmed by the announcement from Origin Energy during February 2022 of the potential early retirement of Eraring Power Station in August 2025. Eraring Power Station is Australia's largest power station, and provides approximately 25% of New South Wales' power requirements.

The Notice of Decision also notes that the HPP would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables.

The Project is proposed to facilitate the HPP by providing infrastructure to transfer gas from the SNP. Therefore, the HPP could not provide the benefits described above without the Project proceeding.

In addition, the Project would provide direct and indirect employment opportunities and flow-on economic benefits to the region. The Project would deliver economic benefits to the Hunter Region and NSW as a whole by generating a capital investment value of approximately $264 million, creating up to 398 construction jobs at the peak of construction and up to 5 operational FTE jobs for the life of the Project.

10.2 Suitability of the site

As described in **Section 5.0**, a range of design concepts and alignments for the Project have been evaluated based on detailed consideration of the landscape and land uses in the area. The design concept and alignment that has been assessed in this EIS was selected as it provides an acceptable degree of construction complexity, the greatest potential to minimise the environmental and social impacts, as well as providing an economic solution with the lowest cost of all feasible design concepts considered.

Mitigation of the potential for conflict with existing and future surrounding land uses has been considered during Project design and informed by ongoing consultation with current and proposed future land users where known. In particular, the Project has been designed so that:

- The transmission pipeline alignment impacts the lowest number of landholdings of all alignment options considered, avoids all conservation and forestry estate, is preferentially located on land that has been or is approved for clearing, follows existing linear pipeline infrastructure for around 33 % of its length, and avoids areas suitable for residential development as far as practicable.
- The compressor station and delivery station are proposed to be located directly adjacent to the HPP, on land which has supported industrial operations since 1969 and provides significant separation distances to the closest residences.
- The storage pipeline is proposed to be located in an area of the buffer zone of the former Kurri Kurri aluminium smelter that is remote from all surrounding development and has previously been subject to clearing across the majority of the area.
- Trenchless crossings are proposed to avoid surface impacts to all sealed roads, key biodiversity features (such as the proposed stewardship area for Regrowth Kurri Kurri and mapped important habitat for the regent honeyeater) and the main watercourses in the area (Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek, Black Waterholes Creek).

As described in **Section 7.2**, reasonable and practicable design, construction and operation measures have been proposed to minimise potential land use conflict with existing, approved or proposed major resource or infrastructure projects in the vicinity of the Project. Specifically, design measures based on ongoing consultation have been developed, or are subject to ongoing consultation, to mitigate potential land use conflicts with the M1 Pacific Motorway, Lower Hunter Freight Corridor, light industrial developments of the 'Emerging Black Hill Precinct', Hunter Water Corporation infrastructure, coal mining operations (Abel underground mine, Donaldson open cut mine, Bloomfield open cut mine), residential development west of Wallis Creek, the Regrowth Kurri Kurri project, and the Hydro aluminium smelter remediation project.

10.3 Environmental, Social and Economic Impacts

The environmental, social and economic impacts of the Project have been identified and subject to a detailed environmental assessment based on:

- assessment of the site characteristics (existing environment)
- focused consultation with relevant government agencies

- engagement with local community, affected landholders and other stakeholders
- environmental and social impact assessment
- application of the principles of Ecologically Sustainable Development (ESD), including the precautionary principle, intergenerational equity, conservation of biological diversity and valuation and pricing of resources
- expert technical assessment.

The key issues identified, including those specified in the SEARs, were subject to comprehensive specialist assessment to identify the potential impacts of the Project on the existing environment. These assessments are detailed in **Section 7.0** and the appendices to this EIS.

Whilst there are many complex aspects which must be read in their entirety to fully understand these assessments, **Table 10.1** provides an overview of the key outcomes of the environmental, social and economic impact assessment.

Table 10.1 Overview of Environmental, Social and Economic Outcomes

Environmental/ Social Issue	Overview of Key Outcomes (after Proposed Management, Mitigation and Offsets)
Land use	The Project will require approximately 103 ha of land during construction and 2 ha during operations. Potential land use conflicts have been mitigated as far as practicable during Project design, as informed by ongoing consultation with current and future land users where known. Key current and proposed land uses for which the Project has adopted design and mitigation measures are the M1 Pacific Motorway, Lower Hunter Freight Corridor, Emerging Black Hill Precinct, Donaldson and Bloomfield coal mining operations, Hunter Water Corporation trunk mains, Cliftleigh and Gillieston Heights housing release areas, the Kurri Kurri Regrowth Project, the Kurri Kurri smelter remediation project and the HPP. Material adverse impacts to current and proposed land uses are not expected during construction or operation of the Project, as discussed in **Section 7.2**.
Soils and Contamination	The dominant soil landscapes traversed by the transmission pipeline and storage pipeline are the Beresfield and Shamrock Hill soil landscapes. The podzolic and solodic soils associated with these landscapes typically demonstrate low fertility and are acidic, though importantly the acidity is unrelated to iron sulphide sediments found in acid sulfate soils. These soils will require management when exposed or stockpiled during construction typically using standard techniques such as application of neutralising ameliorants (lime and gypsum). Erosion risks during construction can be effectively managed using standard techniques in accordance with the Code of Practice and relevant requirements of Managing Urban Stormwater: Soils and Construction – Volume 2A, Installation of services. Erosion and sediment control plans will be developed for the Project, informed by geotechnical assessments that are currently underway. A sampling program was undertaken to assess potential for acid sulfate soils at eight locations on the transmission pipeline alignment where it traverses the Wallis Creek floodplain and adjacent to Swamp Creek, and at the north eastern extremity of the storage pipeline construction footprint adjacent to Wentworth Swamp. Potential acid sulfate soils were identified at 2.4 to 2.5 m depth at the storage pipeline construction footprint sampling location. Excavation to this depth will not occur at this location during construction. Sampling at the proposed HDD pad immediately east of Wallis Creek identified acid sulfate soil from 1.4 m depth. APA has committed to extend the length of the HDD of Wallis Creek to avoid trenching in this area. Sampling at all other locations did not locate either actual or potential acid sulfate soil. Management of acid sulfate soils will be undertaken in accordance with Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998.

Environmental/ Social Issue	Overview of Key Outcomes (after Proposed Management, Mitigation and Offsets)
	A preliminary contamination assessment identified limited potential for contamination to be encountered within the Project construction footprint. Sites with known contamination are a former broiler farm traversed by the transmission pipeline between KP2.6 and KP4.3 and the former Kurri Kurri aluminium smelter. Both sites are subject to Remedial Action Plans to be implemented by the site owners prior to commercial and industrial use of the sites. The pipeline alignment avoids most known sites of contamination from buried demolition waste and organic material on the broiler farm but sits adjacent to one site. Construction of the Project at the site of the former Kurri Kurri aluminium smelter will not commence until a site audit statement has been prepared by a site auditor accredited by the NSW Environment Protection Authority Soil sampling at locations where the transmission pipeline crosses Hunter Water Corporation trunk mains did not identify any lead contamination, which has been detected in other parts of the regional water network adjacent to older trunk mains. Measures proposed in **Section 7.3.5** will be implemented to appropriately manage soils and contamination risks during the various stages of the Project.
Water	The Project has been designed to mitigate potential impacts to larger watercourses by selection of appropriate crossing locations, implementation of trenchless crossing techniques (Weakleys Flat Creek, Buttai Creek, Wallis Creek, Swamp Creek, Black Waterholes Creek) or implementation of enhanced measures to minimise construction duration and land disturbance at special crossings (Viney Creek, Four Mile Creek). There is limited potential to intercept groundwater during construction, with areas of highest probability being the transmission pipeline alignment through the Wallis Creek floodplain and adjacent to Swamp Creek. Construction and operation of the Project will not materially impact groundwater availability for current and future uses. Water consumption during construction is estimated to be 33ML, which is a very small proportion of regional water availability. Water consumption during operations is expected to be negligible.
Biodiversity	Vegetation surveys confirmed the presence of 10 native plant community types (PCT) encompassing around 65 ha of the project construction footprint. Of this native vegetation, 20.5 ha is considered to be in moderate to good condition with the remaining 44 ha is classified as thinned/disturbed, poor quality or derived grassland. Four endangered ecological communities listed under the NSW Biodiversity Conservation Act 2016 (BC Act) occur over approximately 60ha of the construction footprint being Hunter Lowland Redgum Forest (1.7 ha), Kurri sand swamp woodland (2.5 ha), Lower Hunter Spotted Gum Ironbark Forest (49.9 ha), and freshwater wetlands on coastal floodplains of the NSW North Coast (5.4 ha). One critically endangered ecological community listed under the EPBC Act (River-flat eucalypt forest) occurs across 1.1 ha of the storage pipeline construction footprint. Fifteen individuals of *Eucalyptus parramattensis* subsp. *decadensis* and four individuals of small-flower Grevillea (both listed as Vulnerable under the EPBC Act and BC Act), and 19 individuals of *Callistemon linearifolius* (listed as Vulnerable under the BC Act), were located within the construction footprint. Habitat for several species of threatened fauna is also present. The Project concept and construction footprint has been designed to avoid or minimise potential impacts to biodiversity as far as practicable, including use of existing industrial land for the compressor station and delivery station, positioning of the storage pipeline in previously cleared land in the former Kurri Kurri aluminium smelter buffer zone, and almost entirely avoiding mapped important habitat for the critically endangered Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*) (refer to **Sections 7.5**). Use of trenchless crossing techniques has enabled surface disturbance to be avoided for a proposed biodiversity stewardship area and for a population of 269 individual small-flower Grevillea.

Environmental/ Social Issue	Overview of Key Outcomes (after Proposed Management, Mitigation and Offsets)
	Measures proposed in **Section 7.0** will be implemented to appropriately manage potential impacts to biodiversity during the various stages of the Project. A biodiversity offsets strategy in accordance with the requirements of applicable state and Commonwealth polices and regulations will be developed and implemented.
Aboriginal Cultural Heritage	An Aboriginal Cultural Heritage assessment was undertaken for the Project in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). A predictive model, based on landforms present in the Project footprint and review of previous Aboriginal Cultural Heritage investigations in the local area, indicated that stone artefact scatters/isolated artefacts may be present throughout the study area with presence of other site types (scarred trees, grinding grooves, burials) considered unlikely or rare. Field surveys located nine new archaeological sites (two artefact scatters and seven isolated artefacts), of which three are outside of the Project construction footprint and will not be impacted. Nine areas of potential archaeological deposit (PAD) were identified within the Project construction footprint for further investigation, should impacts be unavoidable. Measures for management of potential impacts to Aboriginal cultural heritage will be consolidated into a Cultural Heritage Management Plan (CHMP) as discussed in **Section 7.6.4.**
Historic Heritage	The Project does not impact on any heritage items listed on national or State heritage registers. One site of local heritage significance listed under the Cessnock LEP 2011, the 'South Maitland Railway System", is traversed by the transmission pipeline. A horizontal bore is proposed for the transmission pipeline crossing of the South Maitland Railway, which will avoid direct surface impacts to the railway. Overall, the Project would not result in any adverse physical or visual impacts to historic heritage in the vicinity of the Project area.
Air Quality and Odour	The air assessment identified dust (PM_{10}) during construction as the primary emission of concern for the Project. Modelling of PM_{10} emissions during construction activities, assuming worst case meteorological conditions, predicted that daily PM_{10} criteria could be met at all nearby sensitive receptors for the JGN offtake facility, compressor station, delivery station and storage pipeline. A small number of receptors in close proximity to the transmission pipeline were identified as exceeding daily PM_{10} criteria. When enhanced dust control measures (watering at >2 litres/m^2/h) are applied to construction activities near these residences the daily criteria is met. Air quality impacts from the operation of the Project are expected to be minimal. The compressor station is electrically driven, so no combustion emissions will occur. Combustion of natural gas will occur during operation of water bath heaters for the delivery station, however emissions are assessed as minor and unlikely to lead to any cumulative air quality impacts when the HPP is operating. Air quality control measures proposed in **Section 7.8.4** would effectively mitigate any potential air quality emissions from the Project during construction and operations.
Greenhouse Gas	The Project will generate GHG emissions during construction, primarily due to vegetation clearing and diesel combustion, and to a lesser extent during operations due to combustion of natural gas by the delivery station and small volumes of natural gas released during maintenance. Scope 1 and 2 GHG emissions for the 30 year life of the Project are calculated to be 71,102 tCO_2-e and 476,914 t CO_2-e respectively. As noted by DIPE (2021b), the HPP would contribute to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables. The Project is necessary to facilitate the HPP.

Environmental/ Social Issue	Overview of Key Outcomes (after Proposed Management, Mitigation and Offsets)
Noise and Vibration	Modelling of noise generated by the Project indicates that pipeline and surface facility construction can generally be undertaken to meet noise guidelines and with minimal impacts to nearby sensitive receptors. Some construction activities which require continuous operations, notably HDD of watercourses, require careful management to mitigate potential noise impacts during night-time periods. Vibration and construction traffic noise impacts are assessed as minor and well within guidelines. The compressor station and delivery station are main operational noise sources for the Project and have been strategically located near the HPP, away from sensitive receivers. Modelling of cumulative noise emissions of these facilities with operation of the HPP predicts that noise criteria are met are the nearest residences. Modelling of the JGN offtake facility indicates that night-time noise impacts at the two closest sensitive receptors are marginally above guideline levels during worst case meteorological conditions. Further work will be undertaken during detailed design to reduce noise emissions from this facility in order to meet guideline levels.
Traffic and Transport	Modelling of traffic generated during the construction of the Project indicates that impacts to the local road network, road safety, public transport infrastructure or pedestrian facilities are generally not material. Use of Main Road by Project workers returning to accommodation in Maitland in the afternoon was identified as the most significant potential impact to the local traffic network, given this road is already approaching saturation during peak hours. The most significant increase to existing traffic volumes on the local road network is estimated to occur for John Renshaw Drive. This assessment was based on a worst case scenario with pipe delivery from Port of Newcastle to laydown areas, pipe delivery from laydown areas to work areas, and peak construction workforce movements all occur simultaneously, which is highly unlikely. John Renshaw Drive was assessed to remain well within recommended level of service during this period. With the traffic management measures proposed in **Section 7.8.4**, it is considered that the Project's traffic and transport impacts during construction would be effectively managed. Traffic impacts during operations are negligible.
Hazards, Risks and Bushfire	Results of the preliminary hazard analysis show that appropriate risk management measures can be applied to the Project to meet HIPAP 4 risk criteria for individual fatality, injury and propagation. Through the development and implementation of relevant bushfire management measures and identified hazard safeguards and controls, it is considered that potential bushfire risk associated with the Project can be appropriately managed.
Visual Amenity	The visual amenity assessment determined that impacts associated with the Project are primarily constrained to the construction phase when land clearing and movement of construction equipment will occur. Visual impacts during operations are generally minor as pipelines are buried and surface infrastructure has been located in areas of compatible land use with low visibility from residences and roads. The JGN Offtake Facility will require landscape screening and other visual mitigation given its location in a rural setting adjacent to Lenaghans Drive.
Social Amenity	Community consultation undertaken to inform the social impact assessment undertaken for the Project identified potential impacts on surroundings (the natural environment, access to recreational areas and public safety) as key perceived negative impacts of the Project. The potential contribution of the Project to the local and regional economy and facilitation of the energy transition away from coal, were frequently noted as a benefit of the Project. While a number of potentially negative social impacts have been identified through the SIA process, measures proposed would adequately address these and contribute positively to the social locality.

Environmental/ Social Issue	Overview of Key Outcomes (after Proposed Management, Mitigation and Offsets)
Waste Management	The majority of waste generation for the Project will occur during construction and commissioning. Cuttings produced during HDD of key watercourses and environmentally sensitive features are the major waste generated during construction. Waste generation during operations will be minimal and largely limited to used products from maintenance activities. Mitigation measures listed in **Section 9.0** summarise APA commitments to avoid, re-use, recycle and dispose of waste where appropriate.

10.4 Consideration of the Objects of the EP&A Act

The objects of the EP&A Act, and how these are addressed by the Project, are outlined in **Table 10.2** below.

Table 10.2 Objects of the EP&A Act

Object	Response
To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The Project design and mitigation measures detailed in this EIS allow for the proper management, development and conservation of natural and other resources. The Project can provide long-term positive impacts to the social and economic welfare of the community by facilitating the HPP, while minimising short term and long-term environmental impacts. Careful site selection has ensured that the Project would not result in the sterilisation of natural resources, including mineral resources.
To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	An assessment of the Project against the principles of ecologically sustainable development (ESD) is provided in **Section 10.4** below. The aims, structure and content of this EIS have incorporated the ESD principles. The mitigation measures in **Section 7.0** provide an auditable environmental management commitment to these parameters.
To promote the orderly and economic use and development of land.	The Project has been designed with consideration of existing and proposed land uses and promotes the orderly and economic use and development of land.
To promote the delivery and maintenance of affordable housing.	The Project does not involve delivery of housing. Avoidance and minimisation of potential impacts to the current and proposed residential development in the Cliftleigh and Gillieston Heights urban release areas has been addressed by Project design and mitigation measures. It is possible that some construction workers may choose to rent within the social locality for the duration of the construction period. This has potential to increase pressure on rental prices, particularly in the context of existing low rental vacancy rates within the Hunter Region. However, any such impacts from increased demand for rental accommodation is likely to be low given demand for rental accommodation near the social locality by workers is expected to be minor given. Based on previous pipeline project experience, hotel accommodation is expected to be the primary form of accommodation for construction workers.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The Project is designed and includes mitigation measures to minimise impacts on the abundance and distribution of flora, fauna and ecological communities for the short and long term. The potential impacts to threatened species, communities and their habitats have been assessed in accordance with the BC Act and the Project incorporates appropriate measures to avoid, minimise or compensate for any impacts (refer to **Section 7.5**).

Object	Response
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Heritage assessments have confirmed that the Project will not impact upon any areas of built heritage. An Aboriginal cultural heritage assessment, including consultation with local Aboriginal communities, was carried out during the environmental assessment phase, with measures developed to avoid or minimise impacts to Aboriginal cultural heritage.
To promote good design and amenity of the built environment.	Project design will be completed in accordance with applicable standards for industrial development, with particular emphasis on mitigation of noise emissions to protect the acoustic amenity of the built environment.
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Design, construction and maintenance of Project components will be undertaken in accordance with applicable standards. The Preliminary Hazard Analysis demonstrates that the Project complies with the criteria of Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning (Department of Planning, 2011c) in regard to the safety of adjacent properties.
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	The Proposal has been declared to be critical State Significant Infrastructure and is therefore assessed under Division 5.2 of the EP&A Act. While consultation with local government is a key element of the stakeholder engagement strategy for the Proposal, local councils have no statutory authority in the assessment or determination of State significant infrastructure. The Proposal has been assessed in this EIS with consideration for relevant State and Local environmental planning instruments and the EIS has been prepared to respond to applicable environmental planning legislation and agency comments.
To provide increased opportunity for community participation in environmental planning and assessment.	Engagement activities undertaken during the development of the EIS are outlined in **Section 6.0**. APA will continue to consult with the local community and key stakeholders during the Project's development.

10.5 Ecologically Sustainable Development

Clause 7(1) (f) of the Environmental Planning and Assessment Regulation 2000 requires an EIS to provide justification for a development with specific reference to the principles of ecologically sustainable development (ESD) as set out in the Regulation. To justify the Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The principles of ESD encompass the following:

- the precautionary principle
- intergenerational equity
- conservation of biological diversity
- valuation, pricing and incentive mechanisms.

An assessment of the Project against the principles of ESD is provided in the sections below.

10.5.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> *'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> - careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
> - an assessment of the risk-weighted consequences of various options.'

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, the EIS includes an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

The assessment process has involved a detailed study of the existing environment (refer to **Section 7.0**), and where applicable the use of scientific modelling to assess and determine potential impacts as a result of the Project (such as noise and flooding). To this end, there has been careful evaluation as part of the Project design and assessment process to avoid, where possible, irreversible damage to the environment. Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the Project. Mitigation measures and commitments are summarised in **Section 9.0**.

The decision-making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- Government authorities, landholders potentially affected by the Project, the local community, the Aboriginal community and other stakeholders were consulted during preparation of this EIS (refer to **Section 6.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures.
- The community has been engaged throughout the development and assessment of the Project through a range of mechanisms including one-on-one meetings, community information sessions to inform project design and management of key issues, and community information sheets, amongst other mechanisms (refer to Section 6.0) which provided landholders and stakeholders with both information and the opportunity to influence Project outcomes.

Consistent with the precautionary principle, the environmental assessment of the Project has sought to minimise environmental impact through the avoidance of impacts and a range of mitigation measures are proposed to address identified residual impacts. These measures will be implemented either during the Projects construction or operation.

10.5.2 Intergenerational Equity

The EP&A Regulation defines the principle of intergenerational equity as:

> *'... that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'*

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The Project is considered to be consistent with the principle of intergenerational equity as it can be carried out in a way that would maintain the health, diversity and productivity of the environment now and into the future. The Project would promote the social and economic welfare of the current generation without imposing any significant burdens on individuals or groups within the existing local or regional community and without compromising the needs of any future generations. Key reasons for this consideration are as follows:

- The Project would benefit both existing and future generations by facilitating the HPP, the intergenerational benefits of which have been assessed by DPIE (2021a, 2021b) as contributing to energy reliability and security in the NEM as it transitions away from coal-fired power generation over the next 10-15 years and contributing to the net reduction of greenhouse gas emissions in the energy sector by providing ongoing firming of intermittent renewables.
- The Project would use a very small amount of the region's land and water resources during construction, and a negligible amount during operations, particularly when compared to current mining, residential and agricultural land uses in the region.
- The Project would not affect any designated State conservation areas or State forests. The majority of land disturbed by the Project would be progressively rehabilitated to a high standard so that it can be returned to its previous use.
- The assessments conducted for this EIS conclude that the Project would not have significant impacts on any of the region's natural or cultural resources (minerals, water, land, air, flora and fauna, cultural heritage or existing land uses) either now or in the future. The Project would not prevent future generations from being able to inherit and benefit from a region that has extensive and diverse natural and cultural resources.
- The Project includes measures to minimise impacts on the distribution and abundance of flora, fauna and ecological communities for the short and long term, as discussed below:
- An Aboriginal cultural heritage assessment, including consultation with local Aboriginal communities, was carried out during the environmental assessment phase, with measures developed to avoid or minimise the potential for irreparable damage to occur to Aboriginal cultural heritage.
- The Project can comply with the relevant safety standards set out in Government legislation, policies and guidelines.
- The Project would not impose any significant or unreasonable burdens on the local or regional community. Directly affected landowners will be compensated as required under the *Pipelines Act 1967* and the *Land Acquisition (Just Terms Compensation) Act 1991*.

In summary, the Project has been designed and refined to minimise intergenerational impacts, including potential impacts on existing and future land uses, biodiversity and cultural heritage.

10.5.3 Conservation of Biological Diversity

The EP&A Regulation identifies that the principle of conservation of biological diversity and ecological integrity should be a fundamental consideration in the decision-making process. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them.

- The Project includes measures to minimise impacts on the abundance and distribution of flora, fauna and ecological communities for the short and long term, including:

- Design of a Project construction footprint that uses existing disturbed areas (for the JGN offtake facility, compressor station, delivery station and storage pipeline) or areas approved for disturbance by other projects (Stevens Group Hunter Business Park) wherever practicable.
- Design of a Project construction footprint that almost entirely avoids mapped important habitat for the regent honeyeater and swift parrot.

- Trenchless crossing of the proposed Regrowth Kurri Kurri stewardship area and a population of around 269 individuals of the threatened *Grevillea parviflora* subsp. *parviflora* north of the HPP.
- Further investigating and implementing practicable options to avoid or minimise impacts to the 1.1 ha stand of the critically endangered ecological community River-flat eucalypt forest at the north-eastern extremity of the storage pipeline construction footprint.
- Development and implementation of biodiversity offsets strategy in accordance with the requirements of applicable state and Commonwealth polices and regulations.

All environmental components, ecosystems and habitat values potentially affected by the Project have been assessed in the BDAR (refer to **Appendix 4**). Potential biodiversity related impacts are outlined in this EIS (refer to **Section 7.5**) and measures to ameliorate any negative impact are outlined in **Section 9.0**. The Project is expected to have minor adverse impacts on biodiversity.

10.5.4 Valuation Principle

The goal of improved valuation of natural capital is included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle has been defined in the EP&A Regulation as follows:

> *… that environmental factors should be included in the valuation of assets and services, such as:*
>
> *(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;*
>
> *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and*
>
> *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The Project is considered to be consistent with the valuation principle of ESD as APA will be required to pay the full costs associated with:

- Ensuring the Project is designed and implemented in accordance with the relevant standards, including AS2885.
- Offsetting residual impacts to biodiversity in accordance with state and Commonwealth guidelines.
- Managing any waste produced by the Project in a safe and sustainable way in accordance with the NSW government's waste minimisation hierarchy.
- Meeting obligations in relation to compensation for directly affected landholders as require under the *Pipelines Act 1967* and the *Land Acquisition (Just Terms Compensation) Act 1991*.

The environmental consequences of the Project have been assessed in this EIS (refer to **Section 7.0**) and mitigation measures identified for factors with potential for adverse impact (**Section 9.0**). Implementing the mitigation measures would impose an economic cost on APA, increasing both the capital and operating costs of the Project. In this manner environmental resources have been given appropriate valuation.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in **Section 9.0** provide an auditable environmental management commitment to these parameters. The Project would be considered ecologically sustainable, due to the social, economic and environmental benefits discussed in **Section 10.3**, and the mitigation measures put in place to protect from adverse impacts on the environment.

10.6 Post-Approval Monitoring

As summarised in **Section 9.0**, the environmental, social and economic impacts of the Project will be managed through a series of mitigation measures and commitments. APA will undertake regular monitoring of the Project post-approval, during construction and throughout the operational phase. Disciplines outlined in **Section 9.0** will be monitored with specific attention on evaluating the effectiveness of each measure.

10.7 Conclusion

As outlined above, the Project has been assessed against the principles of ESD as required by the EP&A Act and EP&A Regulation. This assessment has indicated that while the Project, like any large-scale development, would have impacts, these impacts can be effectively managed, mitigated and offset and the development will result in significant social and economic benefits. The assessment concludes that the Project is consistent with the principles of ESD.

In addition to providing long-term, strategic benefits to the State of NSW through provision of regional investment, reliable electricity generation and facilitation of increased renewable generation by providing infrastructure that enables gas to be supplied to the approved HPP, the Project will also provide direct financial benefits to the regional and local community, including:

- Infrastructure investment of the Project is approximately $264 million
- Employment generation creating a peak of up to around 398 jobs during the construction phase with up to around 5 full time equivalent (FTE) jobs during the operational phase
- Indirect benefits to local services through the construction and operation phases.

With the implementation of the management, mitigation and offset measures proposed by APA, the assessment has concluded that the Project would result in a net benefit to the NSW community.

SECTION 11.0

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11.0 References

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SECTION 12.0

Glossary and Abbreviations

12.0 Glossary and Abbreviations

Glossary	Meaning
Annual Exceedance Probability (AEP)	The probability that an accumulated rainfall given total or peak flowrate for a given duration will be exceeded in any one year.
Alignment	The centreline of the ROW selected for assessment in the EIS.
Alluvium	Sediment transported and deposited by flowing water.
Average Recurrence Interval (ARI)	The average, or expected, value of the periods between exceedancesof a given rainfall total accumulated or peak flow rate for a given duration.
Bell hole	An enlarged area of trench.
Benefit CostRatio (BCR)	Ratio of the present value of the incremental benefits of the Project case to the present value of the incremental costs of the Project case.Projects with a BCR greater than one have net benefits to society overthe appraisal period.
Bioregion	A large land area which is characterised by broad, landscape-scalenatural features.
Borrow pit	Surface excavation for the extraction of materials such as sand or clay.
Cathodic protection system	Application of an electrical current to the pipeline exterior to prevent electrochemical corrosion.
Cation Exchange Capacity (CEC)	The ability of the soil to retain exchangeable cations. This influences the soil's ability to hold on to essential nutrients, and is an indication of soil fertility.
Clear and grade	The preparation of the construction right of way for vehicular movement, trenching and other construction activities, involving clearing vegetation and other obstacles from the right of way, grading topsoil to the edge of the right of way, and creating a safe working surface (and slope) for construction.
Colluvium	Unconsolidated sediment transported by gravity (i.e. mass movement: landslide, mudflow or soil creep), deposited on a lower slope and/or at the base of a slope.
Computable General Equilibrium (CGE)	An economic model used to assess the impacts of a major development.
Construction footprint	The area of land directly disturbed for construction of the Project consisting of the construction right of way, extra work spaces, temporary construction camps, temporary access tracks and any other ancillary facilities required to construct the pipeline.
Construction right of way (ROW)	Corridor generally of 25m width.
Crown lands	Land that is owned and managed by the State Government.
Decibel (dB)	Unit used for expressing the sound pressure level (SPL) or sound power level (SWL) in acoustics.
Decibel: A- weighted (dBA)	A unit used to describe the sound pressure level as perceived by the human ear. The A-weighting refers to the range of frequencies that the human ear typically detects.
Decibel: linear weighted (dBL)	Linear weighted decibels, used to measure the air pressure change caused by blasting.
Decommissioning	The process by which a pipeline is made inoperative at the end of its useful life. Different options for decommissioning may be considered as part of this process.
Demographics	Statistics and information relating to a population, or sections of a population as distinguished by factors such as age, sex, social background, etc.
Easement	A right held by the proponent to make use of the land for a specific purpose (in this case, for the installation and operation of a pipeline). The easement for the Project will typically be 30m wide.

Glossary	Meaning
Ecologically Sustainable Development (ESD)	Defined by the Australian National Strategy for ESD (1992) as "development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends".
Ecosystem credit	The class of biodiversity credits created or required for the impact on general biodiversity values and some threatened species; that is, for biodiversity values except threatened species or populations that require species credits.
Ethnography	The study of people and cultures, from the point of view of the subject of the study.
Extra Work Space (EWS)	Additional land adjacent to the construction ROW which is temporarily disturbed during construction for laydown, storage, turnaround and other activities.
Gilgai	A naturally forming depression in the ground caused by swelling and cracking of clays during wet and dry seasons.
Grading	Levelling of the construction ROW using graders, backhoes or bulldozers.
Greenhouse gases	These are direct gas emissions that have the potential to absorb heat in the earth's atmosphere. They include carbon dioxide (CO2), nitrous oxide (NO2) and methane (CH4).
Groundwater dependent ecosystem (GDE)	Any ecosystem that uses groundwater at any time, or for any duration, in order to maintain its composition and condition.
Horizontal Directional Drilling (HDD)	A 'trenchless technology' by which a pipeline tunnel is drilled at a shallow angle under a crossing (e.g. a waterway, wetland, road or railway) through which the pipe is then threaded.
Hydrostatic pressure testing	A pipeline testing process used to test welds and pipeline integrity in high pressure hydrocarbon pipelines. The process involves filling the newly constructed pipeline with pressurised water or other medium, enabling the detection of leaks.
Hyporheic zone	Zone of exchange of groundwater and river water in the saturated sediments of a riverbed.
IBRA Region	Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. The IBRA classifies Australia's landscapes into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information.
IBRA Sub-region	Interim Biogeographic Regionalisation for Australia (IBRA) subregions. IBRA subregions are more localised and homogenous geomorphological units in each bioregion.
Köppen climate classification	A climate classification system which divides areas into climate zones based on seasonal rainfall and temperature patterns.
LAeq(time period)	The noise level as perceived by the human ear over a time period, measured in decibels. This is the equivalent continuous sound which would contain the same energy as a varying sound over the specified time period.
LAmax.	The maximum noise level as perceived by the human ear in a specific time period, measured in decibels.
Landholder	A general term used to refer to the legal owner or manager of a parcel of land. It may be a private landholder, Government or private utility, or a Government Agency responsible for management of a particular parcel of Crown land (e.g. National Parks or Forestry areas).
Level of Service (LOS)	This is the standard measure used to understand how well road intersections perform. This takes into account speed, traffic volume, layout, delays and freedom of movement. A LoS of A, B or C is satisfactory, while a LoS of D, E or F is near or exceeding capacity and unsatisfactory.
Line list	A document for construction contractors which itemises the management procedures to be undertaken at locations along the alignment and which contains site-specific or property-specific information for field reference.

Glossary	Meaning
Mainline Valve	A surface facility consisting of a valve used to isolate sections of the pipeline, located at intervals along its length.
Maximum Allowable Operating Pressure	Refers to the wall strength of a pressurised cylinder such as a pipeline or storage tank and how much pressure the walls may safely hold in normal operation.
Midblock assessment	This assesses how well road networks perform between intersections. This assessment is based on a volume to capacity ratio for each road.
Net Present Value (NPV)	Present value of the incremental benefits of the Project case minus the present value of the incremental costs of the Project case. Projects with a positive NPV have net benefits to society over the appraisal period.
Padding	Fine-grained material placed in the trench to protect the pipeline coating from damage.
Paper road	A right of way on crown land which may or may not have been developed as a road.
Pipeline licence	A licence granted under the Pipelines Act 1967 granting the right to construct a pipeline to transport petroleum on land subject to the licence.
Pipeline Inspection Gauge (PIG)	A tool which is inserted into a pipeline and propelled along by hydrotest water or by gas, to clean and inspect the pipe internally.
Pigging	The act of forcing a PIG through a pipeline for the purposes of displacing or separating fluids, and cleaning or inspecting the line.
Particulates	This is airborne dust and can be classed as PM2.5 (dust particles smaller than 2.5 micrograms), PM10 (dust particles smaller than 10 micrograms but greater than 2.5 micrograms) and TSP (total suspended particles). Deposited dust is dust of any size fraction deposited on surfaces.
Photomontage	Photograph of a viewpoint overlain with a computer rendered image to produce a representation of the landscape with Project infrastructure incorporated.
Potable water	Water suitable for human consumption.
The Project	The proposed construction and operation of the Kurri Kurri Lateral Pipeline (KKLP).
The proponent	APA Group (APA).
Purging	Using gas to remove all air from the pipeline.
Rehabilitation	Rehabilitation is the process of restoring a site or area's environmental attributes by returning an area to its pre-disturbance state. The process may include initial stabilisation, followed by regeneration, revegetation or restoration, depending upon the defined scope of works. Commonly the main objective of rehabilitation is either reinstatement of, or improvement on, the pre-existing condition.
Reinstatement	Reinstatement is the process of re-establishing a pre-existing physical condition, and usually involves bulk earth works and structural replacement of pre-existing attributes of a site, such as soil, surface topography, drainage, culverts, fences and gates.
Saline soil	A soil with a high concentration of soluble salts (e.g. salt (NaCl) and gypsum (CaSO4 2H2O)).
Scope 1 emissions	These emissions are released to the atmosphere as a direct result of an activity or series of activities at a facility, for example emissions from the burning of diesel fuel in trucks.
Scope 2 emissions	These emissions are released to the atmosphere as an indirect result of activity, for example, the use of electricity by a factory which has been generated from the burning of coal in a power station.
Scope 3 emissions	These emissions are indirect emissions generated in the wider economy as a consequence of the activities at a facility, for example combustion of natural gas by downstream end consumers.
Scraper station	A surface facility used to launch and receive PIGs into and from the pipeline system.

Glossary	Meaning
Sensitive receiver	This is a location where people are likely to work or live. They are defined by the occupancy and the activities performed at the location. Sensitive receivers can include dwellings, schools, hospitals, offices and parks.
Side-boom	Construction equipment, consisting of a modified bulldozer with a boom crane, designed for lowering a pipe string into a trench.
Sight distance	The sight distance is the minimum distance from an intersection required to allow a driver to avoid a collision.
Sodic soil	A soil with a high proportion (>5%) of sodium ions bound to clay particles. High sodicity causes clay to swell when wet, and the clay particles move so far apart that they separate and disperse.
Species credit	Species credit. The class of biodiversity credit created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
Stakeholder	A person or group affected by, or concerned with an issue or enterprise.
Statistical Areas Level 3 (SA3)	Geographical areas that are used for the output of regional data, including census data.
Stringing	Laying the pipe adjacent to the pipeline trench.
Study area	The area of land constituting the Project's construction footprint which has been the subject of assessment and investigation to provide context for relevant technical disciplines. The boundaries of the study area will vary between technical disciplines depending on the environmental values of interest in the surrounding landscape. For example, the Study area for Aboriginal and Non-Aboriginal Heritage is likely to be larger than the study area for the Preliminary Hazard Analysis.
Skids	Timber blocks used to keep pipe lengths off the ground.
Subsoil	The layer of soil beneath the topsoil, usually with finer texture, denser composition and stronger in colour.
Topsoil	The top layer of soil with a high organic matter content, comprising material which is usually darker, more fertile and better structured than the underlying layers.
Trenching	Excavation of a trench for burial of a pipeline.
Trench blocks	Impermeable barriers placed in the trench during pipelaying to prevent erosion along the pipeline in the backfilled trench. They are generally installed adjacent to watercourses and in sloping terrain, and are designed to allow water to seep up and out of the backfilled trench, where it is diverted away from the pipeline construction area by erosion control berms.
Trench plug	Short section of trench left unexcavated to allow access across the trench.
Trench spoil	Soil from the pipeline trench.
Trench water	Water (usually shallow groundwater, rainwater or runoff) in the pipeline trench.
Visual amenity	The views that a resident or receiver may have of the surrounding area.

Abbreviation	Definition
AEMO	Australian Energy Market Operator
APA	APA Group (APA).
BC Act	Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
CTGM	Chichester Trunk Gravity Main
COVID-19	Coronavirus 2019
DAWE	Commonwealth Department of Agriculture, Water and Environment
DECCW	NSW Department of Environment, Climate Change and Water (former)
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental impact statement
EP&A	EP&A Regulation NSW Environmental Planning and Assessment Regulation 2000
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPI	Environmental planning instrument
EPL	Environment protection licence
FM Act	NSW Fisheries Management Act 1994
HPP	Hunter Power Project
Infrastructure SEPP	NSW State Environmental Planning Policy (Infrastructure) 2007
KKLP	Kurri Kurri Lateral Pipeline
kPA	Kilopascal
LEP	Local environmental plan
LGA	Local government area
Mitigation	Reduction in severity
MNES	Matters of National environmental significance
MPa	Megapascal
NPW Act	NPW Act NSW National Parks and Wildlife Act 1974
OEH	NSW Office of Environment and Heritage (former)
PMST	Protected matters search tool
POEO Act	Act NSW Protection of the Environmental Operations Act 1997
SEARs	Secretary's environmental assessment requirements
SEPP	State environmental planning policy
SEPP 33	NSW State Environmental Planning Policy No 33—Hazardous and Offensive Development
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
State and Regional SEPP	State Environmental Planning Policy (State and Regional Development) 2011
TJ	Terajoules

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