Appendix I

Preliminary Water Assessment

Preliminary Water Assessment

Hunter Transmission Project

Prepared for Energy Corporation of NSW

May 2024

Preliminary Water Assessment

Hunter Transmission Project

Energy Corporation of NSW

E220595 RP6

May 2024

Version	Date	Prepared by	Approved by	Comments
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1 Introduction

1.1 Project overview

The Hunter Transmission Project (HTP) involves the construction and operation of a new 500 kilovolt (kV) double circuit transmission line between two new substations, one at Bayswater and the other in Olney State Forest. The nominal distance of the new transmission line would be approximately 100 kilometres (km). The HTP also includes developing associated infrastructure, such as upgrades to the existing Bayswater and Eraring substations, road upgrades, access roads, laydown and temporary construction facilities.

An overview of the regional context of the proposed HTP corridor is shown in Figure 1.1. The corridor can be generally separated into three zones: HTP North – Bayswater to Broke, HTP Central – Pokolbin to Corrabare, and HTP South – Olney to Eraring.

The HTP corridor has been selected to avoid and minimise impacts on people and the environment. This corridor will be refined during detailed design to further reduce the impacts of the project.

This preliminary water assessment identifies key water-related constraints for the project and its potential surface water and groundwater impacts, including water demand and supply options.

1.2 Surface water environment

The project area extends across the Hunter River catchment and interacts with the Lake Macquarie and Tuggerah Lake catchments at the southern extent of the HTP corridor. The Hunter River catchment is about 21,500 km^2 and is the largest coastal catchment in NSW. The Lake Macquarie and Tuggerah Lake catchments cover an area of 1,630 km^2 and are bordered by a series of east flowing streams in the north, and the Sugarloaf Ranges to the north-west. Surface water features of the project area are shown in Figure 1.2.

The Hunter River, including the major tributary Wollombi Brook and other permanent and ephemeral tributaries of the river, intersect the project area. Key fish habitat is present within some of the named watercourses within the project area.

Catchment conditions vary greatly across the project area from highly disturbed areas such coal mines in the north to elevated State forests in the south with a mix of agricultural and small townships interspersed throughout. Water quality of the waterways within the project area is variable.

The nearest wetlands of international importance under the Ramsar Convention are the Hunter Estuary Wetlands, which consist of the Kooragang Nature Reserve and the Shortland Wetland Reserve, are located in downstream reaches of the Hunter River. Although the southern extent of the project area is located about 30 km from the wetlands, the streamflow connection between the project area and the wetlands is approximately 120 km.

Surface water across the HTP corridor is administered under the following Water Sharing Plans (WSPs):

- *Water Sharing Plan for the Hunter Regulated River Water Source 2016* applies to extraction from the Hunter River in HTP North and regulates extraction downstream of water storages regulated by Water NSW (namely Glennies Creek Dam and Glenbawn Dam).

- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022* applies to rivers and streams that are not controlled by releases from upstream storages regulated by WaterNSW. This WSP applies to the vast majority of surface water features traversed by the project area.

- *Central Coast Unregulated and Alluvial Water Sources 2022* applies to rivers and streams that are not controlled by releases from upstream storages regulated by WaterNSW. This WSP applies to a small portion of the southern end of the project area.

1.3 Groundwater environment

Groundwater features of the project area are shown in Figure 1.3. The project area is located in the Hunter region of the Permo-Triassic Sydney Basin, which includes the following main groundwater systems that are generally defined by their host geology:

- Local, shallow groundwater hosted by unconsolidated Quaternary Alluvium associated with the Hunter River and its tributaries in the HTP North and HTP Central. Hydraulic connectivity between the local alluvial groundwater and surface water systems is expected. These deposits typically comprise basal gravels and boulders overlain by an upwards-fining sequence of sands, silts and clays.

- Local to regional groundwater systems associated with the Triassic-aged porous sedimentary rock units (Narrabeen Group and the Hawkesbury Sandstone), comprising sandstones and siltstones. These units outcrop in the elevated terrains of the Hunter Valley, in HTP Central and HTP South.

- Local to regional groundwater systems associated with the Permian aged porous sedimentary rock units, comprising sandstones, siltstones and coal measures. The central Hunter Valley floor comprises exposed sedimentary Permian rocks which are overlain by sedimentary Triassic rocks in HTP Central and HTP South. The regional, Permian sedimentary groundwater system is overlain in parts by local shallow alluvium, particularly in HTP North in association with the Hunter River.

These groundwater systems have different hydrogeological properties. Groundwater occurs in the pore spaces between the alluvial sediments in the unconsolidated alluvial aquifers, and conversely in rock mass pore spaces and secondary porosity features, such as joints, faults and voids in the sedimentary fractured rock units (i.e. sandstones, siltstones and coal measures). The depth to groundwater is shallow, i.e. between 2–10 metres below ground level (mbgl) in the alluvial system, and variable in the sedimentary rock groundwater system (i.e. between 5–50 mbgl).

The Quaternary sediments associated with the Hunter River and its tributaries form the most productive source of groundwater within the Hunter Valley in terms of yield and water quality (Kellet 1987). However, water quality can be highly variable (i.e. fresh to brackish) and can receive contributions from the underlying moderately brackish to saline Permo-Triassic sequences (EMM 2015). The water quality of the Triassic units ranges from fresh to marginal but is not as saline as groundwater within the underlying Permian units (Mackie 2009). The Permian groundwater is brackish to moderately saline, owing to low permeability and the limited flow of groundwater through these rocks (EMM 2015).

Groundwater across the project area is administered under the following WSPs:

- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022*. Groundwater in the relevant groundwater sources (various) is contained in the unconsolidated alluvial sediments associated with rivers and coastal floodplains of the Hunter River catchment.

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. The relevant water source is the Sydney Basin–North Coast Groundwater Source, within which groundwater is contained in Triassic-aged porous sedimentary sandstone and siltstone rock units, and Permian-aged porous sedimentary sandstone, siltstone and coal measures rock units.

1.4 Overview of project constraints and potential impacts to water

Project surface water and groundwater constraints to be considered during the design include:

- surface water and groundwater sources and water quality

- watercourses and riparian corridors

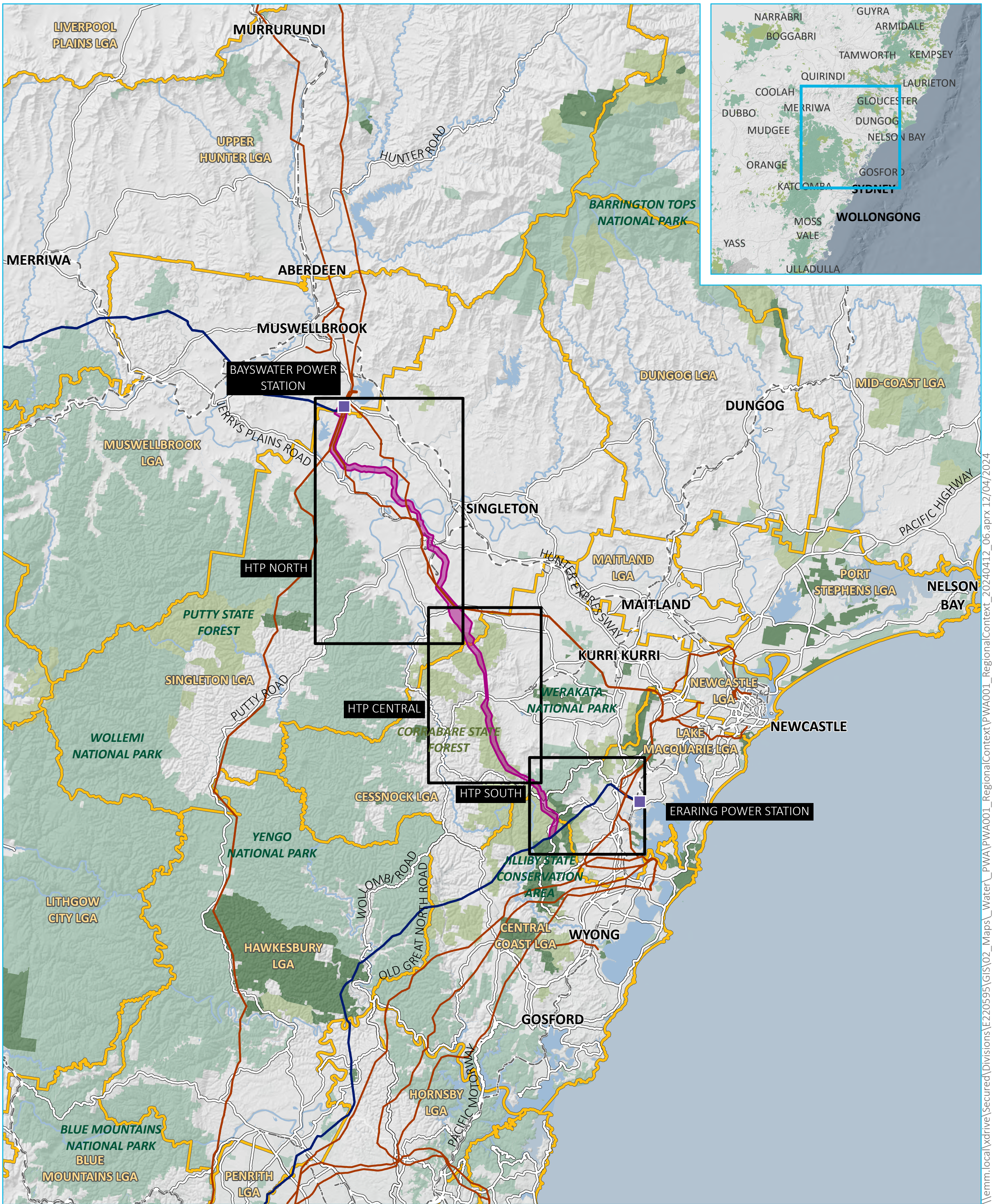
- flood-liable land
- third-party groundwater users (i.e. water supply bores operated for stock and domestic, irrigation or other commercial purposes)
- high priority groundwater dependent ecosystems (GDEs) and water- related culturally significant sites listed in the relevant water sharing plans
- potential GDEs, as characterised by publicly available mapping (BoM GDE Atlas) and field mapping and investigations, including:
  - terrestrial GDEs
  - aquatic GDEs
  - subterranean GDEs.

These constraints are discussed further in Chapter 2 of this preliminary water assessment.

Potential impacts of the project to surface water and groundwater include:

- pollution and geomorphic impacts on watercourses and riparian corridors due to:
  - land disturbances
  - construction activities (groundwater dewatering and concrete batching)
  - wastewater management (construction workforce accommodation and construction processes)
- altering flood conditions or the susceptibility of land to flood due to placement of infrastructure and other built elements
- physical disruption to third-party groundwater users where project infrastructure coincides with landholder bores
- groundwater quality impact to existing users during construction works
- groundwater drawdown impacts on existing users due to:
  - dewatering associated with construction of towers
  - extraction of groundwater to supply project construction.

The significance of the HTP's potential impacts are discussed further in Chapter 4 of this preliminary water assessment.



Source: EMM (2024); Beca (2024); EnergyCo (2024); ABS (2021); DCSSS (2023); GA (2009)

0 25 50 km

GDA2020 MGA Zone 56

N

KEY

- HTP corridor
- Power station
- 500 kV transmission line
- 330 kV transmission line
- Rail line
- Major road
- NPWS reserve
- State conservation area
- State forest
- Local government area

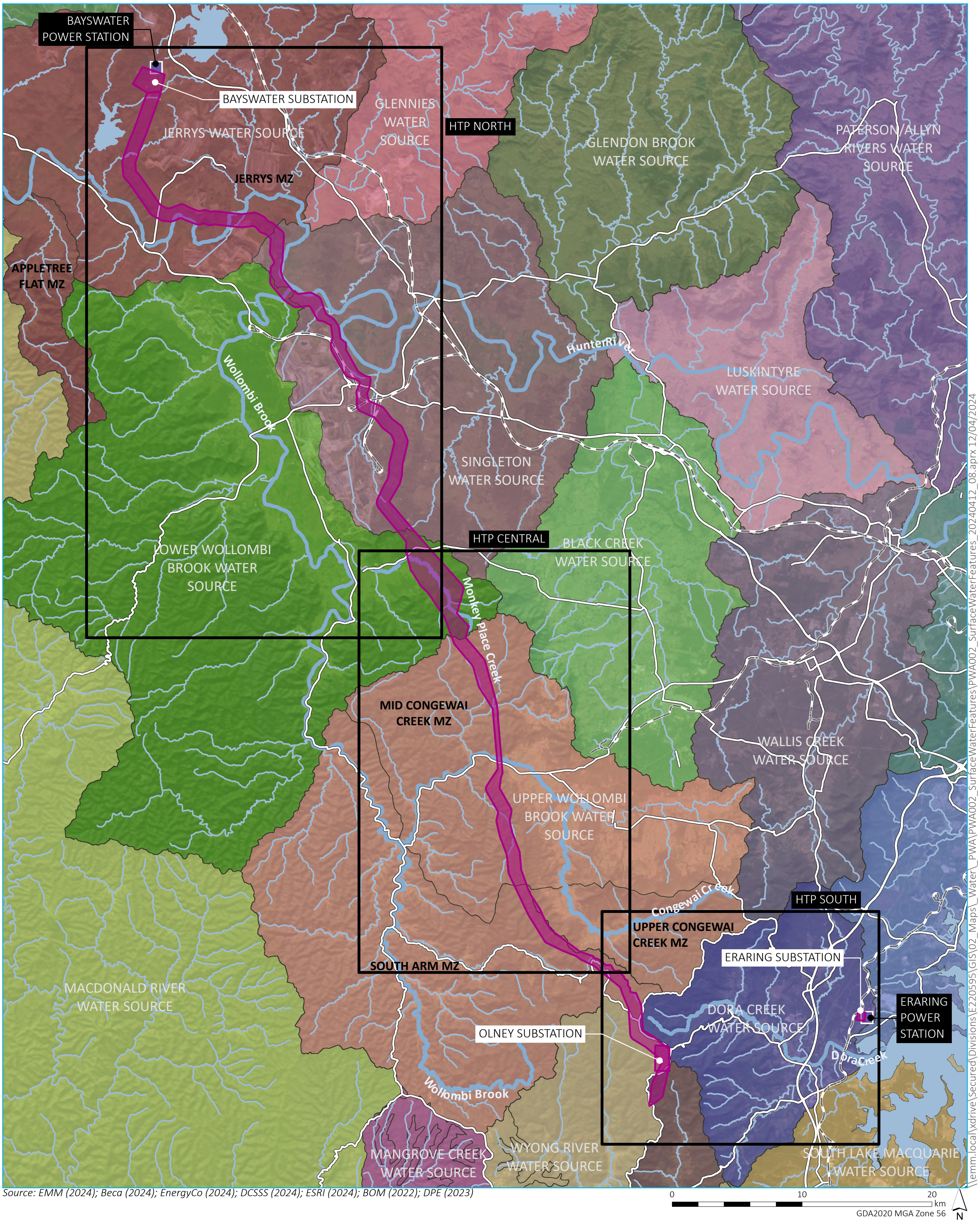
INSET KEY

- Major road
- NPWS reserve
- State forest

Regional context

Hunter Transmission Project
Preliminary Water Assessment
Figure 1.1

creating opportunities



Source: EMM (2024); Beca (2024); EnergyCo (2024); DCSSS (2024); ESRI (2024); BOM (2022); DPE (2023)

KEY

- HTP corridor
- Power station

Central Coast Unregulated and Alluvial WSP
- Wyong River Water Source
- Jilliby Jilliby Creek Water Source
- Mangrove Creek Water Source

Greater Metropolitan Region Unregulated River Water Sources 2023
- Macdonald River Water Source

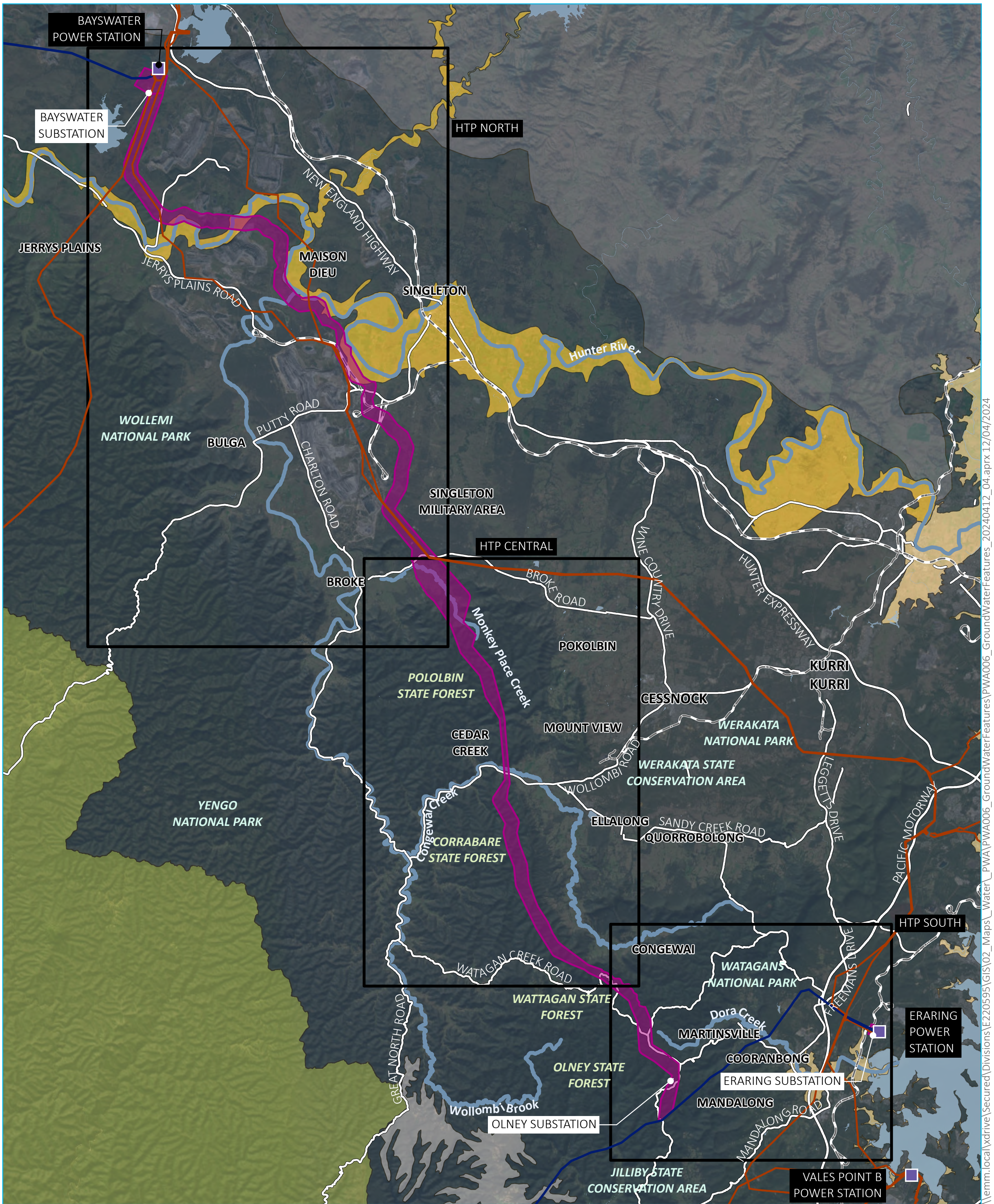
Hunter Unregulated and Alluvial WSP
- Black Creek Water Source
- Dora Creek Water Source
- Doyles Creek Water Source
- Glendon Brook Water Source
- Glennies Water Source
- Hunter River Tidal Pool Water Source
- Jerrys Water Source
- Lower Wollombi Brook Water Source
- Luskintyre Water Source
- Muswellbrook Water Source
- Newcastle Water Source
- North Lake Macquarie Water Source
- Paterson/Allyn Rivers Water Source
- Singleton Water Source
- South Lake Macquarie Water Source
- Upper Paterson Water Source
- Upper Wollombi Brook Water Source
- Wallis Creek Water Source
- Key watercourse
- Named watercourse
- Named waterbody
- Major road
- Rail line

Note: Management Zone (MZ)

Surface water features and sources

Hunter Transmission Project
Preliminary Water Assessment
Figure 1.2

EMM
creating opportunities



Source: *EMM (2024); Beca (2024); EnergyCo (2024); DCSSS (2024); ESRI (2024); BOM (2022); DPE (2023)*

0 10 20 km

GDA2020 MGA Zone 56

N

KEY

- HTP corridor

Greater Metropolitan Region Groundwater Sources 2011

- Sydney Basin North Groundwater Source

North Coast Fractured and Porous Rock Groundwater Sources 2016

- Kulnura Mangrove Mountain Groundwater Source
- New England Fold Belt Coast Groundwater Source
- Sydney Basin-North Coast Groundwater Source

Hunter Unregulated and Alluvial Water Sources 2009

- Hunter Coastal Floodplain Alluvial Groundwater Source
- Hunter Regulated River Alluvial Water Source
- Key watercourse
- Named waterbody
- 500 kV transmission line
- 330 kV transmission line
- Power station
- Rail line
- Major road

Groundwater features and sources

Hunter Transmission Project
Preliminary Water Assessment
Figure 1.3

EMM
creating opportunities

2 Key constraints to project design

This chapter describes the key surface water and groundwater constraints that will be considered during project design.

2.1 Riparian corridors

Project works undertaken in close proximity to waterways should be consistent with the DPE (2022) guidelines for riparian corridors on waterfront land. The guidelines are relevant to avoiding and minimising impacts on riparian corridors and associated vegetated riparian zones (VRZ)

To meet guideline objectives and maintain the environmental function of riparian corridors, the following principles will be considered in project design:

- locate built elements outside of the riparian corridor/VRZ, particularly for higher order streams
- minimise the number of new watercourse crossings required
- limit disturbance of existing minor watercourses and associated riparian corridors to those areas where there is:
  - limited ecological value
  - surface degradation due to existing land uses
- rehabilitate any temporary disturbance to minor watercourses following construction.

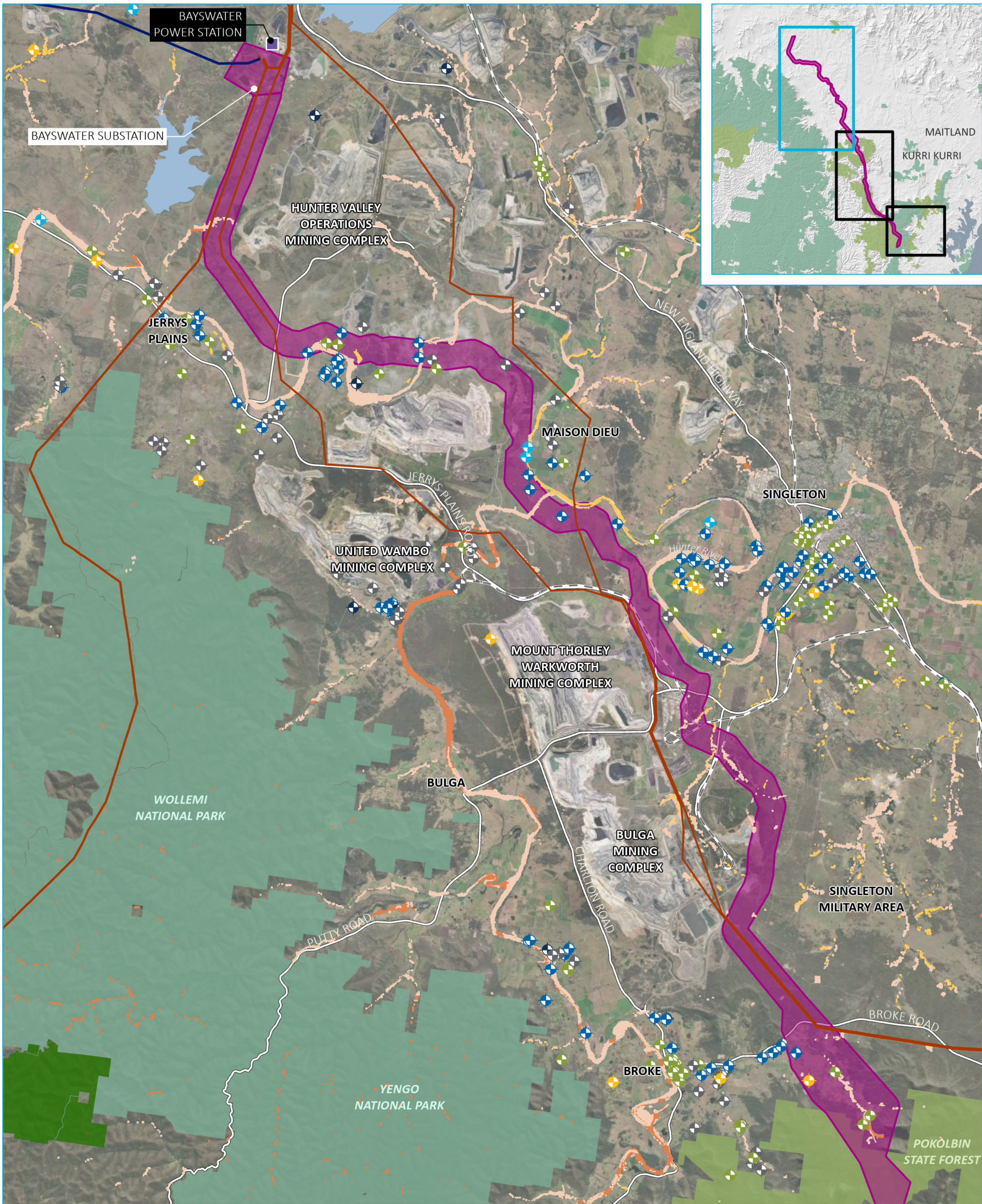
2.2 Groundwater dependent ecosystems

GDEs can include terrestrial vegetation (i.e. wetlands, shrubs/trees with deep rooting depths), aquatic communities (plant and animal species occupying waterways that receive groundwater), and subterranean systems (i.e. karst and fractures in rock), which at some point depend on groundwater. A GDE may be entirely dependent on groundwater for survival or may use groundwater opportunistically for a supplementary source of water.

Assessment of GDEs for the HTP will involve review of the:

- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022* for listed high priority GDEs
- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* for listed high priority GDEs
- GDE Atlas (BoM 2022).

GDEs as per the High Ecological Value Aquatic Ecosystems (HEAVAE) dataset are shown in Figure 2.1 to Figure 2.3.



Source: EMM (2024); Beca (2024); EnergyCo (2024); ABS (2021); DCSSS (2024); ESRI (2024); BOM (2022); DPE (2024)

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KEY

- HTP corridor
- Exisiting landowner bore
  - Commercial and industrial
  - Dewatering
  - Irrigation
  - Stock and domestic
  - Unknown
  - Water supply
- Groundwater dependent ecosystem
  - High
  - Medium
  - Low
- Power station
- 500 kV transmission line
- 330 kV transmission line
- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

HTP North- Groundwater dependent ecosystems and users

Hunter Transmission Project
Preliminary Water Assessment
Figure 2.1

EMM
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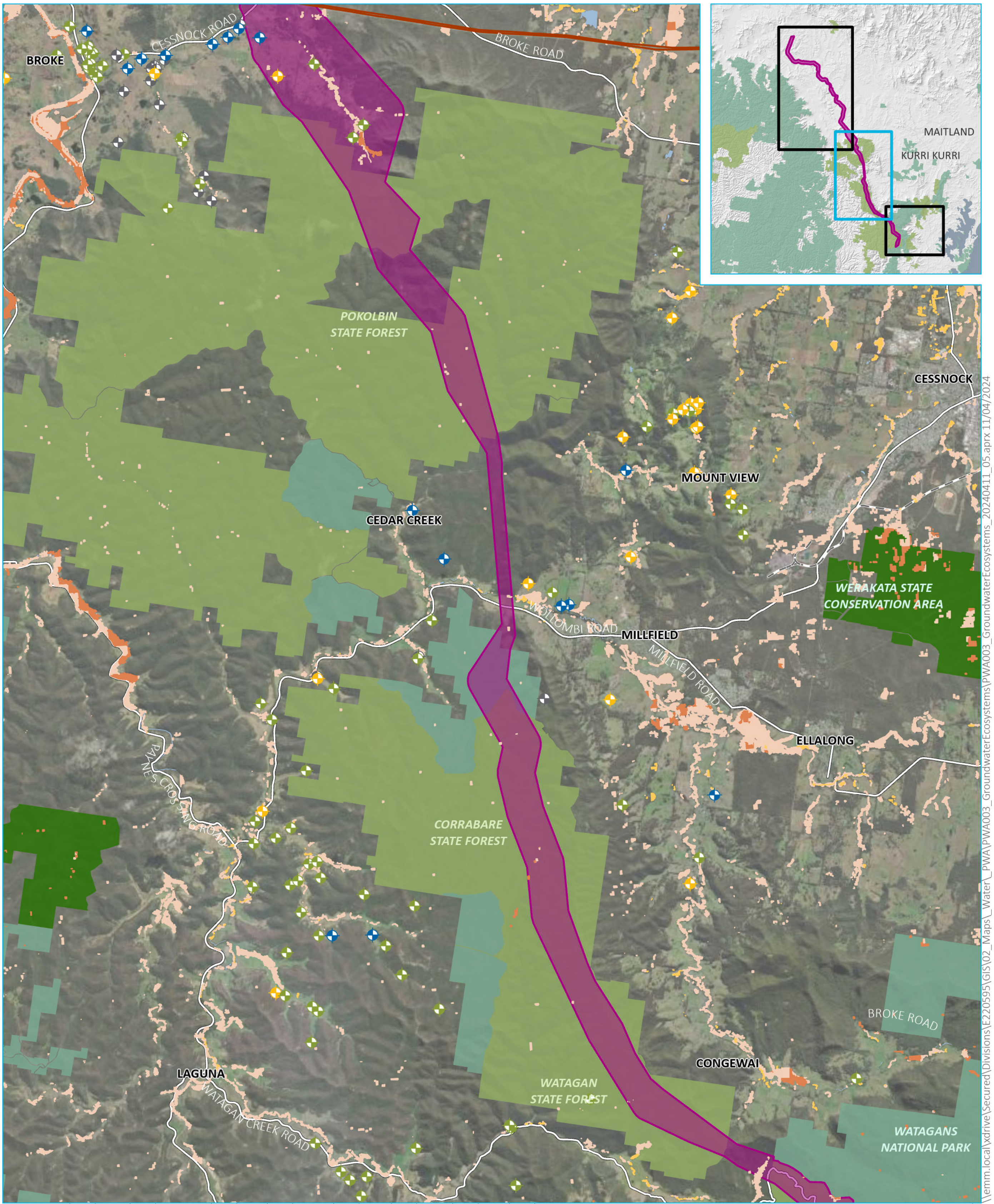


Source: EMM (2024); Beca (2024); EnergyCo (2024); ABS (2021); DCSSS (2024); ESRI (2024); BOM (2022); DPE (2024)

0 2.5 5 km
GDA2020 MGA Zone 56
N

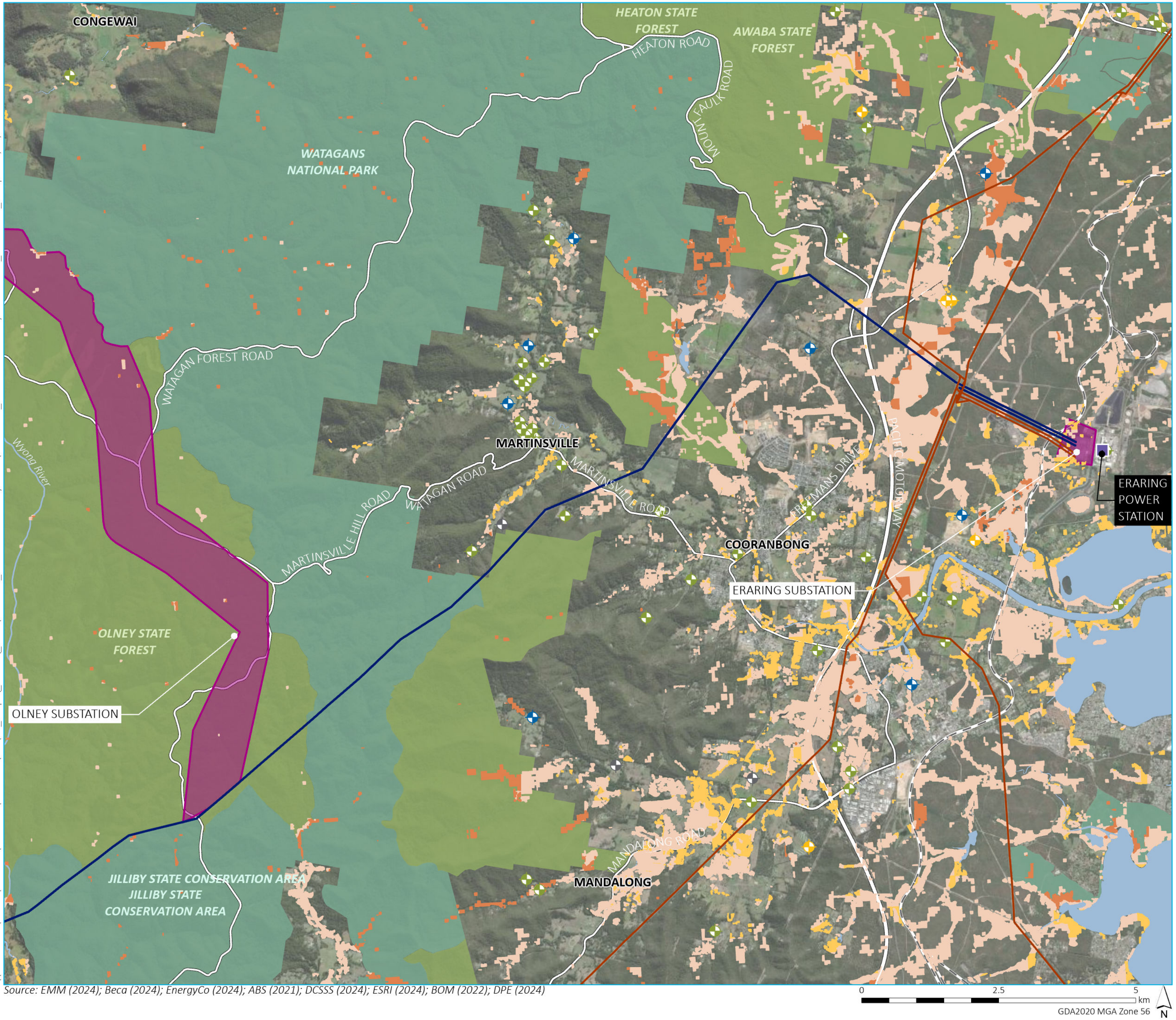
KEY

- HTP corridor
- Exisiting landowner bore
  - Irrigation
  - Stock and domestic
  - Unknown
  - Water supply
- Groundwater dependent ecosystem
  - High
  - Medium
  - Low
- Power station
- 500 kV transmission line
- 330 kV transmission line
- Rail line
- Major road
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

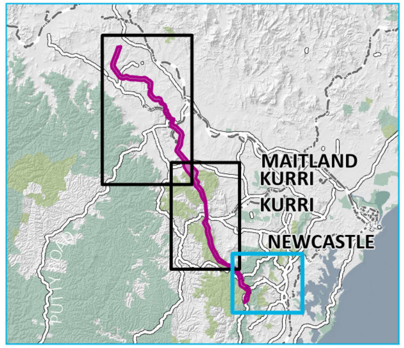
HTP Central- Groundwater dependent ecosystems and users

Hunter Transmission Project
Preliminary Water Assessment
Figure 2.2

EMM
creating opportunities



Source: EMM (2024); Beca (2024); EnergyCo (2024); ABS (2021); DCSSS (2024); ESRI (2024); BOM (2022); DPE (2024)



KEY

- HTP corridor

Exisiting landowner bore
- Irrigation
- Stock and domestic
- Unknown
- Water supply

Groundwater dependent ecosystems
- High
- Medium
- Low
- Power station
- 500 kV transmission line
- 330 kV transmission line
- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS managed land
- State forest

HTP South- Groundwater dependent ecosystems and users

Hunter Transmission Project
Preliminary Water Assessment
Figure 2.3

EMM
creating opportunities

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Review of the HEAVAE dataset indicates small, isolated patches of terrestrial vegetation GDEs, particularly adjacent to the Hunter River and its tributaries. Review of the Bureau of Meteorology Groundwater Dependent Ecosystem Atlas indicates there is low potential for terrestrial GDEs across the project area, with moderate to high potential for terrestrial GDEs immediately adjacent to permanent watercourses.

2.3 Flood-liable land

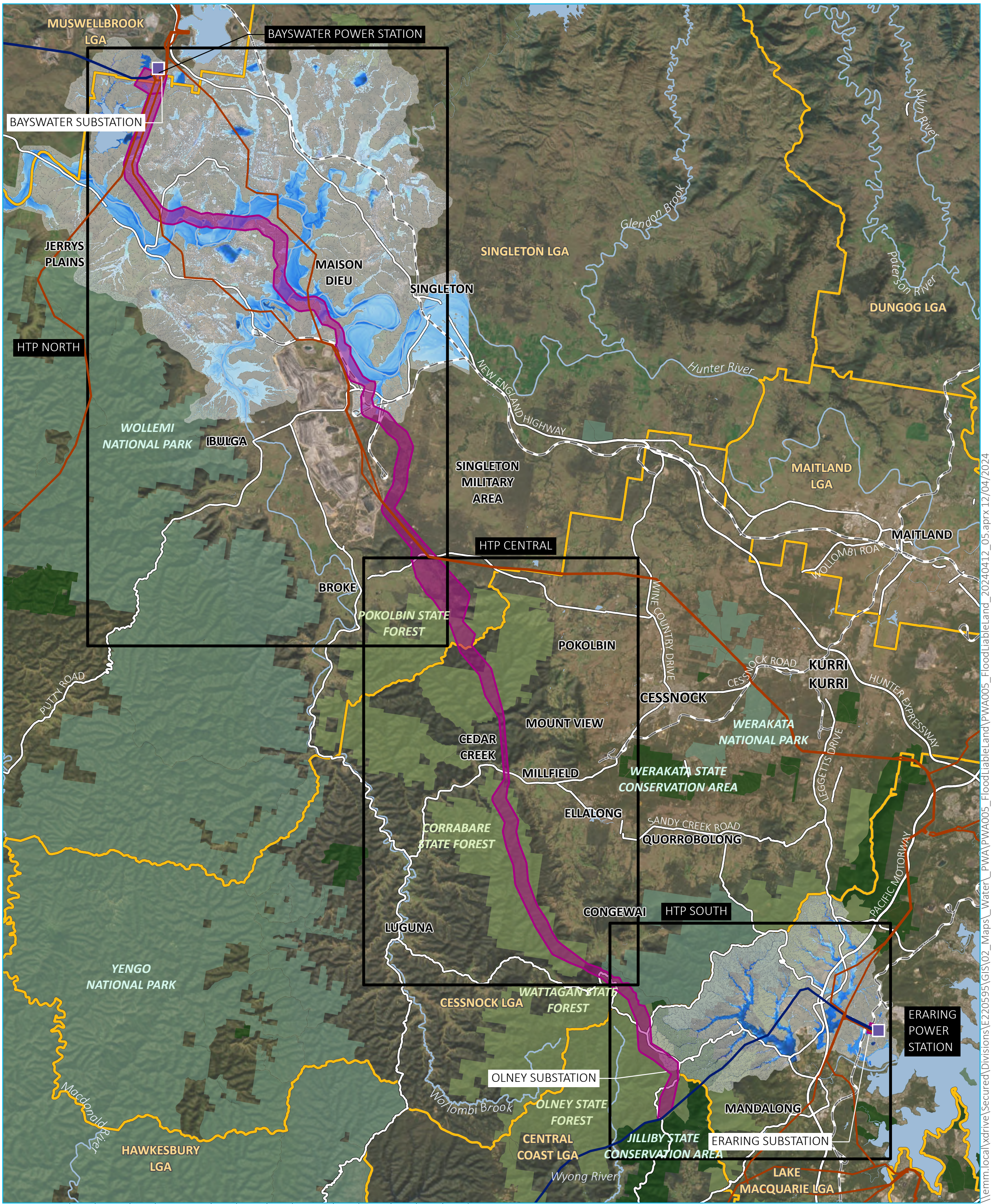
The project area covers a large area of the Hunter River floodplain. The transmission line would traverse the floodplain for considerable length, approximately 15 km, and require crossings of both the Hunter River and Wollombi Brook. Numerous other crossings would be required over named and unnamed watercourses along the length of the corridor.

Assessing flood risk will be a key factor in determining the design of the project, particularly for permanent infrastructure or temporary works in the floodplain. Development in the floodplain could also alter flood risks experienced by flood-sensitive receptors across the project area.

To adequately consider the flood risks of the project, detailed flood modelling will be undertaken covering relevant areas of the Hunter River floodplain. Flood modelling may also be undertaken in other areas to further inform design and identify potential impacts to flood behaviour due to the project. Figure 2.4 shows the extents of flood modelling undertaken for the project to date.

2.4 Other water users

There is third party landholder and industrial (mining) reliance on groundwater, comprising water supply production bores and mine dewatering bores, predominantly in HTP North. Landholder bores are shown in in Figure 2.1 to Figure 2.3 and are coloured according to intended purpose when the bore was drilled.



Source: EMM (2024); Beca (2024); EnergyCo (2024); ABS (2021); DCSSS (2023); ESRI (2024); GA (2009)

0 5 10 km
GDA2020 MGA Zone 56
N

KEY

- HTP corridor
- Flood modelling extents
- Depth of flooding (PMF)
  - 20 m
  - 0.3 m
- Power station
- 500 kV transmission line
- 330 kV transmission line
- Rail line
- Major road
- Major watercourse
- NPWS reserve
- State conservation area
- State forest
- Named waterbody
- Local government area

Flood modelling extents

Hunter Transmission Project
Preliminary Water Assessment
Figure 2.4

EMM
creating opportunities

3 Water demand and supply

Water will be required for the HTP for the construction of access roads, concrete batching, dust suppression and landscaping. Water demands for the HTP are expected to be between 500 megalitres (ML) and 1,000 ML during construction.

A range of water sources will be considered for the HTP, including groundwater, regulated surface water, unregulated surface water and potable water sources. Due to the size and varying water quality needs, it is likely that a combination of these water sources will supply the HTP.

This section presents the outcomes from a preliminary water supply options assessment.

3.1 Preliminary estimate of water demands

Precise water demand estimates for the HTP have not yet been determined. The identified water requirements for similar transmission projects have been used to give an estimate of the HTP water requirements.

The HTP water demand estimates are further broken down into the non-potable and potable demand elements for HTP North, HTP Central and HTP South based on the approximate percentage of the project area that is contained in each. The water demand estimates are shown in Table 3.1 below. These will be further revised during project design.

Table 3.1 HTP water demand estimates

	HTP North		HTP Central		HTP South		HTP total	
Non-potable demands	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**
Compaction (general)	22	36	15	25	6	11	43	72
Compaction (Pavements)	11	21	7	15	3	6	21	42
Dust suppression	44	63	31	44	13	19	88	125
Landscaping	1	5	0	3	0	1	1	9
Sub Total	**77**	**124**	**54**	**87**	**23**	**37**	**153**	**248**
Potable demands	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**	**Peak Annual Demand (ML/yr)**	**Total Demand (ML)**
Concrete	4	8	3	6	1	2	8	16
Drinking water	4	10	4	10	4	10	13	30
Construction compounds and accommodation camps	57	128	57	128	57	128	172	383
Sub Total	**66**	**146**	**64**	**143**	**63**	**140**	**193**	**429**
TOTAL	**142**	**270**	**118**	**230**	**86**	**177**	**346**	**677**

3.2 Water supply options

A preliminary review of water supply options has been undertaken. Water supply options examined comprised surface water, groundwater and other supply options, with a focus on environmental sources (i.e. surface water and groundwater).

The ability to access water is dependent on:

- the physical availability of water in the water source, consistent with any limitations or restrictions imposed by the applicable WSP
- the quality of the water
- securing water access licences (WALs) and allocations to authorise the water take. Note that, apart from the porous rock groundwater source, all water sources in the project area are fully committed, so water entitlements and/or allocations required for the HTP will need to be sourced from the water market. Given the water demands are short term, engagement with the temporary (allocation) water market is likely to be achievable.

An evaluation of surface and groundwater options, based on water availability (i.e. flow rates and groundwater yields), water quality (i.e. electrical conductivity) and licensing opportunities is presented in Table 3.2 and Table 3.3 for HTP North and HTP Central/HTP South, respectively.

In summary:

- water source types and supply availability vary along the project area in terms of reliability, yield, quality and depth and liquidity of the water market
- across the project area, obtaining water supply of potable quality will be the most challenging. Investigation of alternative supplies (urban water, etc) could be considered
- for HTP North:
  - supply from the Hunter River is the preferred option for HTP North. The project area is in close proximity to the regulated river, which is very reliable. The water market is deep and liquid, so obtaining the necessary allocation for the construction period should be achievable. Supply could also be obtained from the Hunter alluvium, although the groundwater may not be fresh enough for potable demands (if untreated)
  - the southern portion of HTP North is more remote from the Hunter River. The Lower Wollombi Brook Alluvium could provide a suitable non-potable supply source. While not an active water market, there are sufficient aquifer access licence entitlements in the system to obtain short term allocation
- for HTP Central and HTP South, the smaller unregulated river surface water sources are fresher and could be a suitable supply but may not provide the required reliability in dry or drought conditions. The groundwater in the extensive Sydney Basin sandstones could provide supply security – as a backup to surface water during dry times, or as a sole source. Other options include the alluvium in the Wollombi Brook (upper and lower), depending on the distance from the demand hubs. Obtaining water allocations in this area will be more challenging given the lack of market depth and liquidity, but is not insurmountable, given the short-term nature of the allocation requirement

- other water supply options that may be able to supply water to the project have not yet been considered in detail. The availability of supply, logistics and appropriate water quality would be considered for each potential supply option. Town water will be further considered to supply the construction compounds and water may need to be trucked in for construction in remote areas in HTP Central and HTP South. Other alternate water supply options include surplus water from nearby mines, large waterbodies such as Lake Liddell and the privately operated Cooranbong Water Centre.

Table 3.2 HTP - North – overview of water supply options

	Surface water supply options				Groundwater supply options			Other water supply options
Water demand requirements	**Hunter Regulated River**	**Jerrys Water Source**		**Lower Wollombi Brook**	**Hunter Regulated River Alluvium**	**Lower Wollombi Brook Alluvium**	**Sydney Basin – North Coast Groundwater Source (Permian)**	**Mine water** **Town water supply (Jerrys Plains, Maison Dieu, Singleton, Mt Thorley, Broke)** **Waterbodies (Lake Lidell, Plashett Reservoir)** **Trucking in water**
		Bayswater Creek	**Bowmans Creek**					
Yield / Reliability • Potable (peak): – 66 ML/yr – 0.2 ML/day • Non-potable peak: – 77 ML/yr – 0.2 ML/day	General Security Licence – Reliable but reduced in times of drought. High Security Licence – Very Reliable	Unavailable <5% of days	Unavailable 10 - 20% of days	Unavailable 10 - 30% of days	Average yield 3 L/s (0.26 ML/day)	Average yield 3.7 L/s (0.32 ML/day)	Average yield 2.7 L/s (0.23 ML/day)	Not assessed
Water quality	Fresh to marginal	Marginal to slightly saline	Fresh to brackish	Downstream - Fresh to brackish Upstream - Fresh to marginal	Marginal to brackish	Brackish	Brackish to moderately saline for coal seams	Not assessed
Licensing availability	General Security (over 80,000-unit shares) High Security (over 16,000-unit shares)	2,044 shares from Jerrys Water Source		6,663 shares form Lower Wollombi Brook Water Source	23,536 shares from Hunter Regulated River Alluvial Water Source (Upstream and Downstream Glennies Creek Mgt Zone)	3,745 shares from Lower Wollombi Brook Water Source	68,283.5 from Sydney Basin-North Coast Groundwater Source	Not applicable
Other considerations					Ample existing bores	Ample existing bores	Ample existing bores Avoid moderately saline coal seams Deeper bores, and need to rely on intersection of fractures	Water quality Reliability (particularly in drought) Practicalities and number of trucking movements
OUTCOME - POTABLE	Potentially suitable (depending on water quality requirements)	Unsuitable (due to water quality)	Unsuitable (due to water quality)	Unsuitable (due to water quality)	Unsuitable (due to water quality)	Unsuitable (due to water quality)	Unsuitable (due to water quality)	Not assessed
OUTCOME - NON-POTABLE	Suitable	Potentially suitable	Potentially suitable	Potentially suitable (water quality improves upstream)	Suitable	Suitable	Potentially suitable	Not assessed
CONCLUSION	Potable: Further investigate ability to access and location of town water supply. Non-Potable – Hunter River Regulated Water Source most reliable supply identified in the north of the assessment area and is the preferred option. Groundwater from either the alluvium (or Permian) could provide a supplementary supply, with the alluvium presenting an easier option than the Permian groundwater systems. The Lower Wollombi Brook Alluvium could provide a suitable non-potable source for the southern end of the northern assessment area, where the HTP is further from the Hunter River.							

Table 3.3 HTP Central and HTP South – overview of water supply options

	Surface water supply options			**Groundwater water supply options**			**Other water supply options**
Water demand requirements	**Upper Wollombi Brook**		**Dora Creek Water Source**	**Upper Wollombi Brook Alluvium**	**Lower Wollombi Brook Alluvium**	**Sydney Basin – North Coast Groundwater Source (Triassic)**	**Town water / Hunter Water supply (Millfield, Pelton, Bellbird)** **Trucking** **Mine water**
	Southern Arm MZ	**Congewai Creek MZ**	**Dora Ck**	**Congewai Creek Alluvium**			
Yield^ • Non-potable peak: – 54 ML/yr – 0.2 ML/day • Potable (peak): – 66 ML/yr – 0.2 ML/day	Unavailable 5–10% of days	Recorded flows since 2020 have not ceased. Reliable (but consider with caution due to short dataset)	Not available in reviewed dataset	Average yield 1.0 L/s (0.09 ML/day)	Average yield 3.7 L/s (0.32 ML/day)	Average yield 2.1 L/s ML/day)	Not assessed
Water quality	Not available in reviewed dataset	Not available in reviewed dataset	Not available in reviewed dataset	Fresh	Brackish	Fresh to marginal	Potable
Licensing availability	525 shares	1,670 shares	796 shares	74 shares from Upper Wollombi Brook Water Source (Mid Congewai Creek Management Zone)	3,745 shares from Lower Wollombi Brook Water Source	68,283.5 shares from Sydney Basin-North Coast Groundwater Source	Not applicable
Other considerations	Confirm water quality with further desktop review or surface water monitoring	Confirm water quality with further desktop review or surface water monitoring	Further desktop review may provide indication of streamflow and water quality	Some existing bores	Ample existing bores	Few existing bores Deeper bores, rely on intersection of fractures	Water quality Reliability (particularly in drought) Practicalities and number of trucking movements
OUTCOME - POTABLE	Potentially suitable	Potentially suitable	Not assessed	Potentially suitable	Unsuitable (due to water quality)	Potentially suitable	Not assessed
OUTCOME - NON-POTABLE	Potentially suitable	Potentially suitable	Not assessed	Potentially suitable	Suitable	Suitable	Not assessed
CONCLUSION	Potable: Further investigate ability to access and location of town water supply. Non-potable – Smaller unregulated river surface water sources are fresher and could be a suitable supply but may not provide the required reliability in dry or drought conditions. The groundwater in the extensive Sydney Basin Triassic sandstones could provide supply security – as a backup to surface water during dry times, or as a sole source. Other options include the alluvium in the Lower Wollombi Brook or from Congewai Creek alluvium, although the majority of available groundwater shares would be required and reported yields are relatively lower than other alluvial sources.						

Notes: ^ Demand estimates based on previous project design in which southern assessment are was much larger. As a result, demand estimates provided are based on central assessment area only.

4 Potential impacts to surface water and groundwater users

4.1 Riparian corridors

Although consideration will be given to avoiding riparian corridors in design, it is possible that some built elements of the HTP may be located within riparian corridors or VRZs.

A detailed mapping exercise will be undertaken to assess the extent of waterfront land and associated VRZs for all mapped watercourses within the development footprint. This will be determined in accordance with the DPE (2022) guidelines for controlled activities in riparian corridors on waterfront land.

It is expected that significant adverse impacts to riparian corridors will be avoided due to the following measures:

- the development footprint will avoid, where possible, existing watercourses and associated riparian corridors and minimise the number of new watercourse crossings required
- where instream works (i.e. activities within the mapped corridor) are proposed, these works will be designed and constructed to consider local hydraulic conditions and minimise local flooding impacts. An assessment for these activities will be undertaken against the DPE (2022) guidelines
- all temporary disturbance will be rehabilitated following construction.

4.2 GDEs and aquifer interference

The HTP may interact with groundwater during the construction of the transmission tower footings, and any subsurface excavations required for the construction of substations and roads. Such interaction would comprise minor groundwater dewatering during the construction phase of works only. The potential impacts to groundwater users from groundwater interception could include minor and temporary groundwater drawdown at registered landholder bores and/or mapped GDEs. However, excavations are likely to be very minor and temporary in nature with potential impacts effectively mitigated with the appropriate location of infrastructure and construction controls.

The HTP is unlikely to materially affect groundwater resources but will require approval under the Water Management Act 2000, *Aquifer Interference Policy* (AIP) (DPI 2012) and relevant Water Sharing Plans. It is also unlikely to result in more than minimal harm on landholder bores. Furthermore, any groundwater 'take' greater than 3 ML due to dewatering of excavations (or other construction activities) will require a WAL.

The assessment of excavations that are deemed aquifer interference activities in accordance with the AIP, will comprise a brief desktop-based, analytical assessment of potential impacts on landholder bores and GDE locations, which will be based on publicly available information. This analytical assessment will also inform any licence volume estimates for temporary construction works.

An assessment of the potential drawdown impacts from groundwater supply (if required), will comprise analytical calculations of potential groundwater level drawdown using publicly available data. Similar to potential dewatering impacts, groundwater supply could cause groundwater level drawdown at GDEs and/or landholder bores. Assessment of drawdown impacts on GDEs and other uses resulting from extraction from a water supply work will be required to meet the 'dealings' assessment criteria applied by DCCEEW-Water.

Interaction with listed high priority GDEs will be avoided where possible. Reference to the *Preliminary Biodiversity Assessment* (WSP 2024) notes impacts to potential GDEs will be avoided, minimised and/or offset in accordance with the Biodiversity Assessment Methodology.

Direct interference with landholder bores, including landholder bore access, will be avoided where possible. If groundwater level drawdown is predicted to exceed the AIP minimal impact consideration for groundwater level, comprising greater than two metres of drawdown at registered landholder bores, or if a water supply works will be physically impacted, “make good” arrangements with landholders comprising compensation will be undertaken.

4.3 Changes to flooding conditions

As mentioned in Section 2.3, the project area traverses flood-liable land, primarily within the Hunter River floodplain. Where infrastructure or built elements are placed, or there are substantial changes to ground levels, on flood-liable land may alter local flood conditions.

To assess the impact of the project on flooding, both qualitative and quantitative assessments will be undertaken.

Quantitative assessment involving flood modelling will be undertaken to assess post-development conditions and any impacts to flooding and sensitive receivers in the project area. Detailed flood modelling will be considered for areas where extensive disturbance and changes to ground levels are proposed in flood-liable areas and could result in significant changes to local flood behaviour.

It is anticipated that qualitative assessment of potential flood impacts will be appropriate for most of the project elements where the following can be demonstrated:

- proposed works can either avoid flood prone land or be located away from areas subject to frequent and/or significant flooding; or

- proposed works can be readily designed to avoid or minimise impacts to flooding (e.g. no/minimal change to ground levels).

Stormwater and flooding mitigation measures will be developed to minimise flood risks and impacts.

4.4 Water pollution

Two primary risks contributing to water pollution during construction and operation of the HTP are soil erosion and transport of sediment into receiving watercourses, and poor or ineffective wastewater management practices.

4.4.1 Land disturbance activities

If unmanaged during the construction phase, ground disturbance during earthworks and other site activities (e.g. material handling, new buildings, new substations, trenching for services and grading for new access roads) may lead to exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses. This risk can continue into the operational phase with poor site stabilisation, poor reestablishment of ground cover revegetation, or instream erosion due to failed channel lining within engineered diversions. The occurrence of these risks will lead to ongoing exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses.

Key risks to downstream water quality as a result of land disturbance activities during construction and operation of the HTP will be identified. Effective management and mitigation strategies to minimise downstream impacts, such as erosion and sediment control measures and site stabilisation, will be developed in a Water Management Plan (WMP).

Following construction, site rehabilitation will stabilise disturbed areas and minimise the potential for ongoing soil erosion and subsequent mobilisation/transport downstream of each site. Recommended rehabilitation principles and approaches will be described in the WMP.

In the event of flooding that impacts construction work sites or compounds, either as a result of mainstream flooding along watercourses or local overland flooding, there is potential for entrainment of sediment, vegetation, plant/equipment, hazardous substances/chemicals and other debris in floodwaters that is carried downstream. This risk can be adequately managed by suitable construction site planning that considers flood risk, avoids use of higher risk areas (i.e. subject to more frequent and/or severe flooding) and implements suitable controls for areas subject to lower risk (i.e. less frequent and/or severe flooding). Management of these risks would also be considered in the WMP.

4.4.2 Discharge of wastewater

Water quality could also be affected during construction as a result of poor or ineffective wastewater management practices. Sources of wastewater will include:

- groundwater dewatering
- concrete batching
- wastewater from temporary construction facilities (i.e., construction workforce accommodation).

For the various sources of wastewater, there will be a range of mitigation measures and controls to implement which may include:

- reuse of groundwater where practicable (knowledge of water quality and groundwater quality required)
- appropriate stormwater mitigation measures
- pump out systems for wastewater.

Management of wastewater will be undertaken during project design and will identify appropriate mitigation measures and controls, including the location and configuration of temporary wastewater management systems based on site conditions and constraints.

5 Suggested environmental assessment requirements

The suggested Secretary's environmental assessment requirements (SEARs) for HTP in relation to water are to:

- avoid or minimise impacts on watercourses, riparian corridors, aquifers and groundwater dependent ecosystems, having regard to the Controlled Activities on Waterfront Land (DPI, 2018) guidelines, Fish Passage Requirements for Waterway Crossings (DPI, 2003) and Aquifer Interference Policy (DPI, 2012)
- calculate the projects water demand and demonstrate there will always be sufficient water for the project, having regard to relevant Water Sharing Plans
- describe the measures that will be used to avoid and minimise water pollution, including the erosion and sediment controls in accordance with the Managing Urban Stormwater: Soils & Construction series (Blue Book), including Volumes 1, 2A and 2C (Landcom) and wastewater controls
- demonstrate the project will not adversely affect any key fish habitat or threatened aquatic species
- minimise the projects flood risks and demonstrate that it will not adversely affect flood conditions or the susceptibility of land to flood.

References

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