CHAPTER 3 - PROJECT DESCRIPTION

Table of contents

Table index

Figure index

3. Project description

This chapter provides a description of the project for the purposes of the EIS. It describes the infrastructure proposed and estimated land requirements. An indicative construction methodology is provided, including timing, likely resources, access and facilities. A description of how the project would be operated, maintained and decommissioned is also provided.

3.1 Project overview

The project includes constructing, operating (including maintaining) and decommissioning an underground natural gas transmission pipeline and associated above ground infrastructure to connect the approved Narrabri Gas Project to the approved Hunter Gas Pipeline.

A summary of the project's main features is provided in Table 3.1 and shown on Figure 3.1 and Figure 3.2 (key operational features) and Figure 3.3 and Figure 3.4 (key construction features). Further detail on the project's features is provided in the figures in Appendix B (Map book). A description of the proposed infrastructure, land requirements, construction methodology, operation and future decommissioning is provided in sections 3.2 to 3.8.

The project would not include some preliminary works, including surveys, test drilling, test excavations, geotechnical or soils investigations or other tests, sampling or investigations undertaken for the purposes of assessing the project.

The project design and construction methodology presented in this EIS would be further refined during the detailed design and construction planning process. This would be undertaken in consultation with landholders, regulators and infrastructure owners (as relevant), and in accordance with the:

- mitigation measures provided in the chapters in Part B of the EIS (and consolidated in Appendix F (Consolidated mitigation measures))
- design refinement process described in chapter 20 (Approach to environmental management and mitigation).

Table 3.1 Project overview

Project feature	Description	Section reference
Project site	The term 'project site' refers to the area required to construct, operate (including maintain) and decommission the project. The project site has an area of about 373 ha.	2.2.2 and 3.3
Project infrastructure and operation		
Pipeline	Underground high pressure steel natural gas transmission pipeline, extending from the Narrabri Gas Project Leewood facility, via the Narrabri Gas Project Bibblewindi facility, to the tie-in point with the Hunter Gas Pipeline, with a total length of about 55 km.	3.2.1
Surface infrastructure	Surface infrastructure required during operation includes: • two scraper stations used for access to the pipeline for internal cleaning and inspection • corrosion protection systems including cathodic protection units, anode beds and test points • pipeline marker signs • permanent access tracks.	3.2.2

Project feature	Description	Section reference
Operational footprint	The term 'operational footprint' refers to the area of land required to operate the pipeline, including the permanent easement for the pipeline and land required for surface infrastructure. The operational footprint, which is the same as the permanent land requirements, has an area of about 171 ha, most (about 96 per cent) of which consists of the permanent easement.	3.3.1
Operational workforce	About four people.	3.7.2
Estimated development cost	About $120 million (excluding value for purchasing biodiversity offsets).	n/a
Project life	The project would operate until the Narrabri Gas Project ceases operation.	n/a
Construction		
Disturbance footprint	The term 'disturbance footprint' refers to the area that would be subject to direct land disturbance and clearing to construct the project. It excludes areas approved for disturbance for the Narrabri Gas Project and the Hunter Gas Pipeline and areas where trenchless crossings are proposed. The disturbance footprint has an area of about 212 ha.	3.3
Program	Construction is proposed to commence (pending approvals) around the end of 2026. Construction work would be undertaken over three phases with breaks in between each phase. The three phases consist of: • the main construction works – taking about four months • hydrotesting – taking about a month • commissioning – taking about four months. Operation is expected to commence around the end of 2028 and to conclude when production ends for the Narrabri Gas Project.	3.5.1
Construction ancillary facilities	Three construction facilities are proposed: • Leewood – use of land within the approved Narrabri Gas Project Leewood facility • Bibblewindi – use of land within the approved Narrabri Gas Project Bibblewindi facility • Baan Baa – a new construction compound is proposed south of Baan Baa near the Kamilaroi Highway. Temporary workspaces are also proposed along the project site to support construction.	3.6.2
Access tracks/road works	New access tracks and works to a number of existing roads, forestry tracks, intersections, and private accesses are proposed to provide access to the construction right of way and the Baan Baa construction compound.	3.6.3
Workforce numbers	A construction workforce of up to about 200 people during the main construction works phase, and about 20 workers on average during other construction phases.	3.6.1
Workforce accommodation	Existing workforce accommodation facilities at Narrabri and Boggabri would be used to accommodate the construction workforce.	3.6.1
Water requirements	Non-potable water required during construction: • estimated total of about 47 ML. Water sources: • water sourced in accordance with relevant water access licence(s) • if available, water produced by the Narrabri Gas Project reverse osmosis plant at the Leewood facility and/or from municipal sources.	3.6.4

Project feature	Description	Section reference
Pipeline crossings	**Watercourses** The project would cross a number of watercourses. Six watercourse crossings are proposed to be constructed using horizonal directional drilling methods: • Bohena Creek and an adjacent unnamed watercourse • Little Sandy Creek • Tulla Mullen Creek and two adjacent unnamed watercourses (combined crossing with Delwood Road). There would also be about 33 watercourse crossings where standard trenching construction methods would be used.	3.4.3
	Roads/rail The project would cross one highway, the Mungindi railway line, and local roads and forestry tracks. Three crossings would be by trenchless crossing methods: • Newell Highway • Delwood Road (combined crossing with Tulla Mullen Creek) • combined crossing of the Mungindi railway line and Curracabah Road. There would also be 28 trenched crossings of roads/tracks, consisting of two crossings of local roads and 26 crossings of forestry tracks. **Utilities** The pipeline would be installed above or below utilities including: • 4 electricity transmission lines • 3 communications cables.	3.4.3

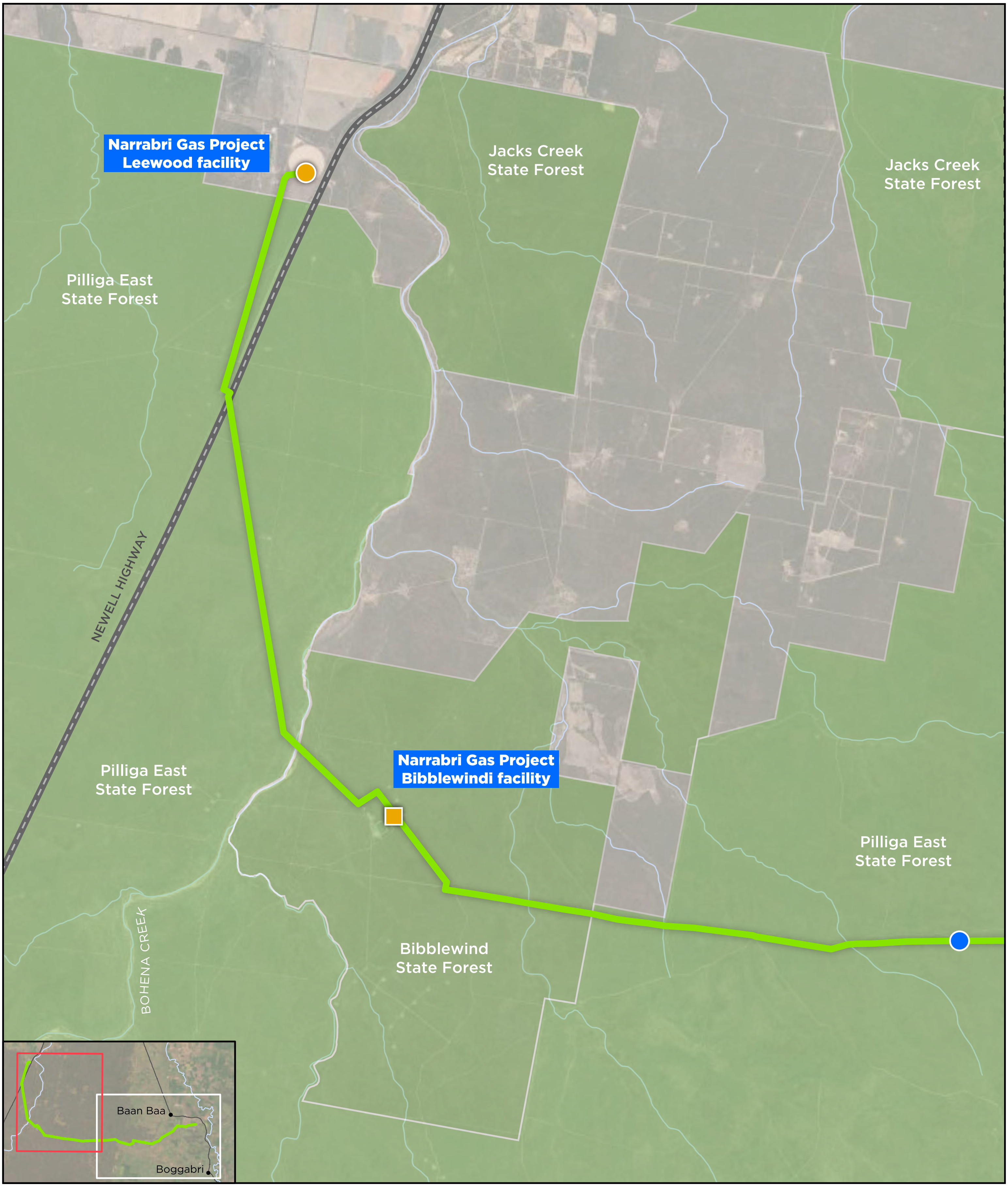

Figure 3.1 The project – key operational features – map 1

Legend

Project infrastructure: Pipeline easement · Scraper station · Cathodic protection system · New permanent access tracks

Highway · Watercourse

Santos | HUNTER GAS PIPELINE

Data source: Roads, Rail, watercourses - DCS2024; State Forest - Forestry 2024; Hunter gas pipeline - Santos 2023; Google Maps Sat: ©OpenStreetMap (and) contributors, CC-BY-SA;World Imagery: Earthstar Geographics.

0 1 2 3 4
Kilometres

Figure 3.2 The project – key operational features – map 2

Legend

Project infrastructure: Pipeline easement · Scraper station · Cathodic protection system · New permanent access tracks

Stage 2 Hunter Gas Pipeline – Indicative pipeline route · Stage 3 Hunter Gas Pipeline – Indicative pipeline route

Town · Highway · Railway line · Watercourse

0 1 2 3 4
Kilometres

Data source: Roads, Rail, watercourses - DCS2024; State Forest - Forestry 2024; Hunter gas pipeline - Santos 2023; Google Maps Sat: ©OpenStreetMap (and) contributors, CC-BY-SA;World Imagery: Earthstar Geographics.

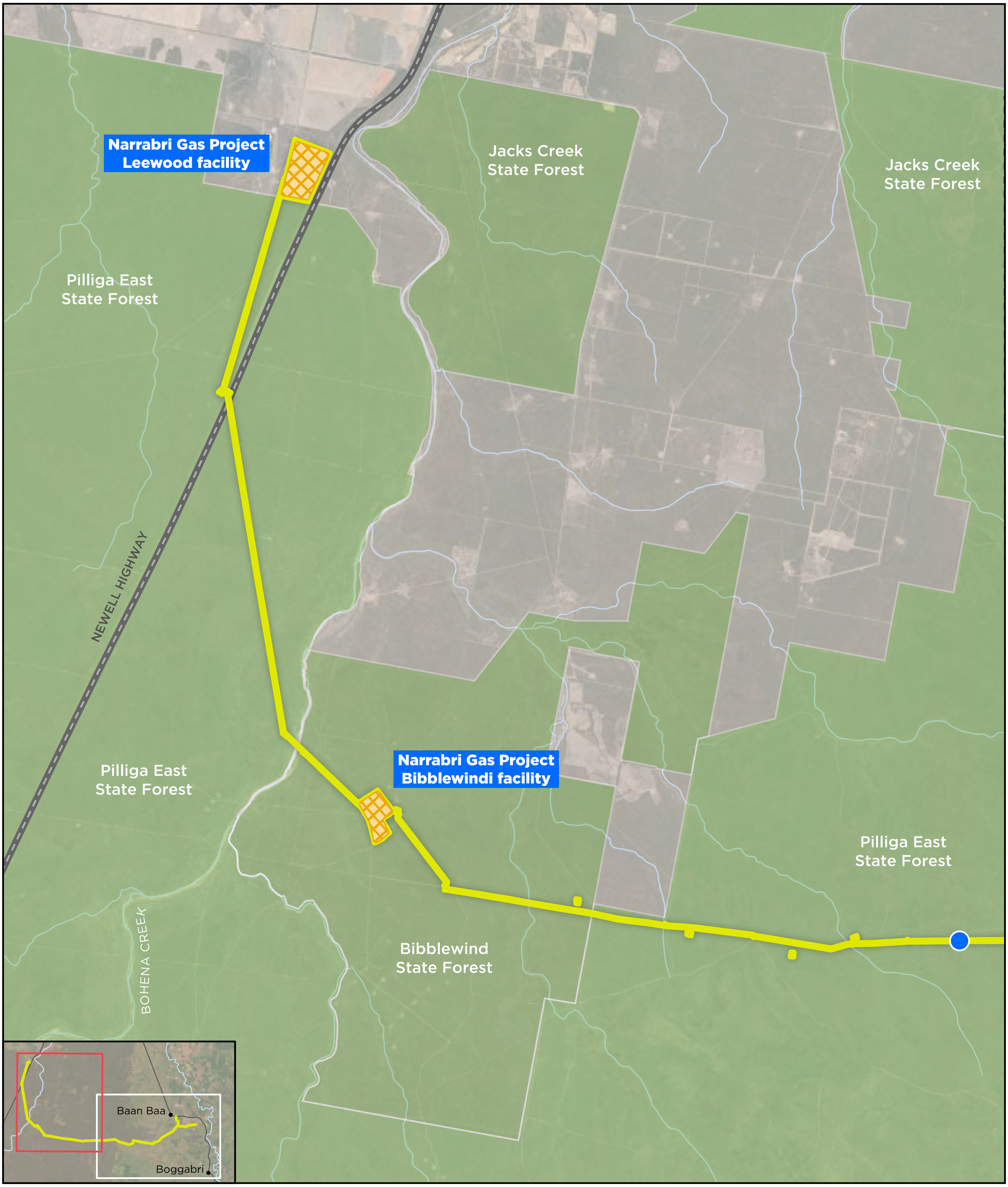

Figure 3.3 The project – key construction features – map 1

Legend

Project infrastructure: Project site Construction facility New access tracks

Highway Railway line Watercourse

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Data source: Roads, Rail, watercourses - DCS2024; State Forest - Forestry 2024; Hunter gas pipeline - Santos 2023; Google Maps Sat: ©OpenStreetMap (and) contributors, CC-BY-SA;World Imagery: Earthstar Geographics.

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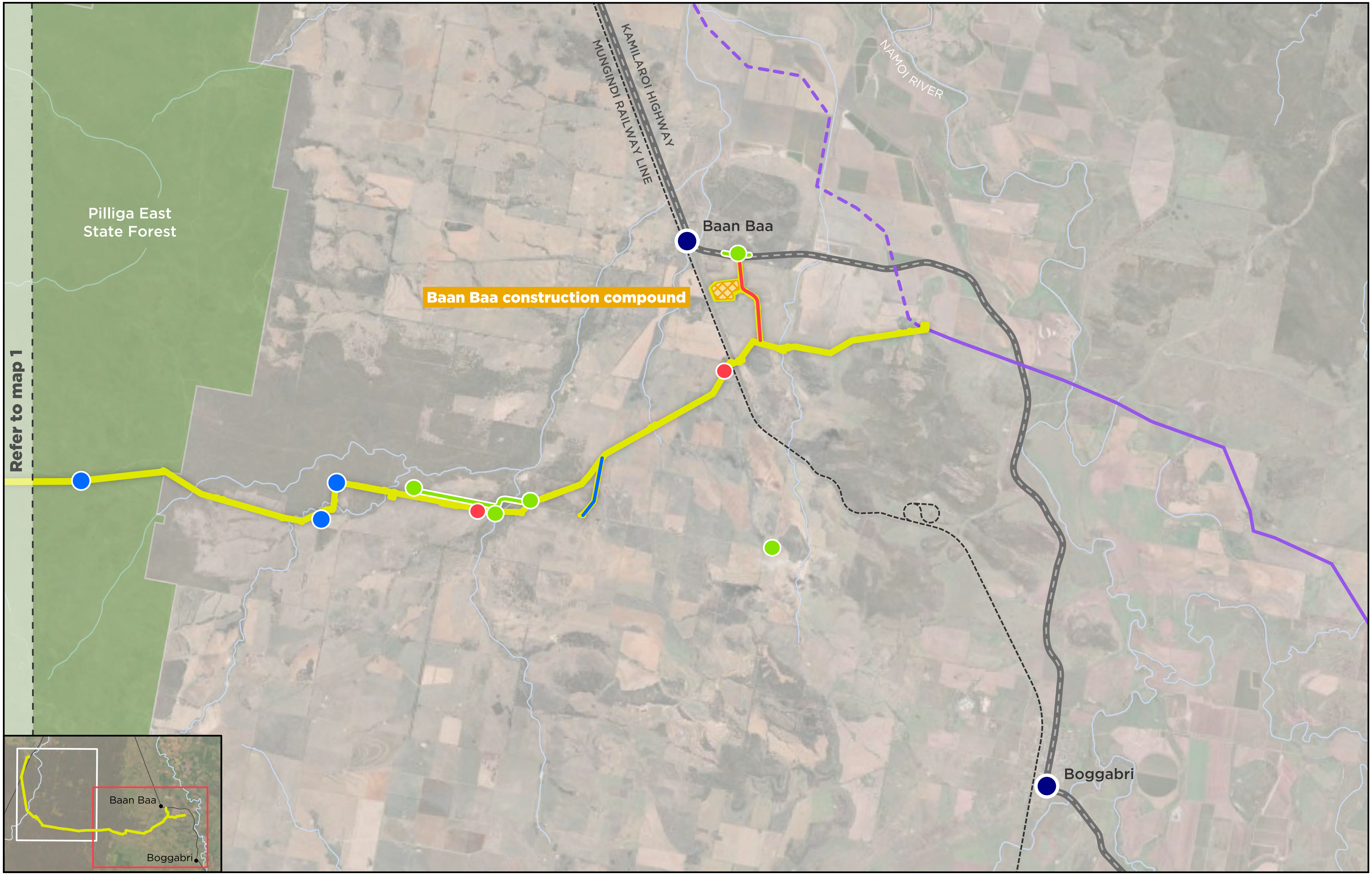

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Figure 3.4 The project – key construction features – map 2

Legend

Project infrastructure:

- Project site
- Construction facility
- New access tracks
- Works to existing private access tracks
- Works to existing public roads and intersections
- Stage 2 Hunter Gas Pipeline – Indicative pipeline route
- Stage 3 Hunter Gas Pipeline – Indicative pipeline route
- Town
- Highway
- Railway line
- Watercourse

0 1 2 3 4
Kilometres

Data source: Roads, Rail, watercourses - DCS2024; State Forest - Forestry 2024; Hunter gas pipeline - Santos 2023; Google Maps Sat: ©OpenStreetMap (and) contributors, CC-BY-SA;World Imagery: Earthstar Geographics.

3.2 Permanent project infrastructure

3.2.1 Pipeline

Design requirements

The pipeline would be designed, constructed, operated, maintained and decommissioned in accordance with:

- AS 2885
- APGA Code of Environmental Practice
- the project approval
- *Pipelines Act 1967* (NSW) (Pipelines Act) licence requirements.

Features

The pipeline would be constructed of high strength steel and installed underground. The key features of the proposed pipeline (preliminary design elements) are listed in Table 3.2. These would be subject to further refinement during detailed design.

The indicative construction methodology to install the pipeline is described in sections 3.4.2 and 3.4.3.

Table 3.2 Pipeline features

Design element	Preliminary specification
Nominal diameter	DN500, which is equivalent to about 508 millimetres
Wall thickness	About 8 to 10 millimetres in most locations, with the exception of areas where conditions and AS 2885 dictate a need for heavier wall sections (for example road and watercourse crossings).
Design life	40 years
Pipeline depth	AS 2885 requires a minimum depth (from the top of the pipeline) ranging from 450 to 900 millimetres, depending on ground conditions and land use. The final depth of cover would be determined during detailed design in consultation with landholders and asset owners, taking into consideration existing and future land uses, ground conditions, soils and crossing types.
Gas type	Natural gas compliant with *AS 4564:2020 General-purpose natural gas*
Transmission capacity	Up to 200 terajoules per day
Maximum allowable operating pressure	15.3 megapascals
Corrosion protection	**Pipeline coating** The pipeline would be coated with a fusion bonded epoxy external coating system or similar. **Cathodic protection** Additional electronic corrosion protection would be provided, consisting of surface facilities and a buried anode bed, designed and operated in accordance with *AS 2832.1:2015 Cathodic protection of metals: pipes and cables* and *AS/NZS 2885.3:2022 Pipelines — Gas and liquid petroleum, Part 3: Operation and maintenance* (AS/NSZ 2885.3:2022) (see section 3.2.2).

3.2.2 Surface infrastructure

Scraper stations

Scraper stations allow the insertion and/or retrieval of pipeline cleaning and inspection tools. These tools, known as pipeline inspection gauges, are used to clean the internal pipe walls and to monitor for internal defects. The tools are loaded into the upstream scraper station, propelled along the pipeline using the flowing gas as the driving force, and collected at the downstream scraper station. Scraper stations are isolated from the main pipeline during normal operation and only pressurised when in use.

Two scraper stations would be required to operate the project. The following locations are proposed (see Figure 3.1 and Figure 3.2, with further detail in Figure B.3.1 and Figure B.3.26 in Appendix B (Map book)):

- within the Narrabri Gas Project Leewood facility
- at the tie-in point with the Hunter Gas Pipeline.

Equipment at each scraper station would typically include:

- pipeline inspection tool launcher or receiver
- pipeline blowdown vent
- isolation valves
- bypass facilities
- control facilities
- solar panels to power facilities within the scraper station (as required)
- control system cabinet containing electronics for telemetry and control of the station.

Figure 3.5 shows a typical scraper station arrangement.

Figure 3.5 Example of a typical scraper station

Corrosion protection system

Corrosion protection is required to maintain safe and reliable operations and protect the buried pipeline from decay. The pipeline's primary corrosion protection would be provided by the external coating applied during the manufacturing process (as described in Table 3.2).

Corrosion protection would also be provided by an electronic cathodic protection system. Cathodic protection is a method to prevent external corrosion by using a direct electrical current. The cathodic protection system protects the pipeline by creating an extremely low voltage circuit between the pipeline and buried anode beds. The low voltage circuit generates a negative electrical potential on the pipeline, which prevents electro-chemical reactions that cause corrosion. The cathodic protection system would include:

- two cathodic protection units located adjacent to the pipeline (see example at Figure 3.6)
- a buried anode bed associated with each cathodic protection unit with minimal surface facilities, including a junction box mounted on a galvanised steel upstand and a vent pipe to exhaust small volumes of oxygen produced by the anodes.

Figure 3.6 Example of a cathodic protection unit (with solar panels)

The cathodic protection units are proposed to be located (see Figure 3.1 and Figure 3.2, with further detail in Figure B.3.8 and Figure B.3.19 in Appendix B (Map book)):

- within the Bibblewindi facility
- near the intersection of Caloola Road and Towri Road (in Lot 1 DP434968).

The anode beds would be offset from the pipeline by about 100 to 200 metres. Depending on the final design, each anode bed may contain up to 20 anodes and extend as long as 100 metres. A buried cable would connect the pipeline to the anode bed.

Cathodic protection test points would be installed at intervals of about two to five kilometres along the alignment. The cathodic protection test points would be used to measure the electrical potential along the pipeline and allow for ongoing monitoring of corrosion protection being provided by the anode bed. The test points would consist of a small box mounted on a galvanised steel or aluminium post about 1.2 metres high (see example at Figure 3.7) with cables run internally in the post connected directly to the pipeline.

Figure 3.7 Example of a cathodic protection test point

A temporary cathodic protection system of sacrificial anodes would be installed as the pipeline sections are buried to provide protection prior to the commissioning of the permanent cathodic protection system. These would be installed at the same location as the cathodic protection test points described above and consist of buried bags of magnesium anodes. Once the permanent cathodic protection system has been installed, the temporary cathodic protection system would be disconnected from the pipeline.

Pipeline marker signs

Pipeline marker signs would be installed along the alignment in accordance with AS 2885 to indicate the presence of the underground pipeline and reduce the risk of inadvertent damage.

Marker signs would be placed so that at least one sign would be visible at any location along the corridor, with a typical spacing of about 500 metres. Signs would be placed in consultation with landholders.

A typical marker sign is shown in Figure 3.8.

Figure 3.8 Example of a pipeline marker sign

Power and telecommunications

Power supply to scraper stations and the cathodic protection system would be via solar power or connection to mains electricity supply (where available).

Communications would be provided by fixed satellite dishes or existing communication networks.

Access tracks and upgrades

To facilitate access to the construction right of way and the Baan Baa construction compound, some upgrades to existing roads, tracks and intersections, and new access tracks are proposed (see section 3.6.3). Some access tracks would be retained during operation (subject to landholder agreement) to facilitate ongoing access to the easement for maintenance.

3.3 Land requirements

A summary of the project's indicative land requirements and approach to acquisition of the permanent easement is provided in the following sections. Further information about the land requirements, and the potential land use and property impacts of these requirements, is provided in chapter 11 (Land use and agriculture).

3.3.1 Permanent land requirements

An easement provides a pipeline licensee access to construct, operate (including maintaining) and decommission the pipeline, and to regulate activities within the easement, to ensure the safety and reliability of the pipeline.

An easement is registered on the land title and remains on the title following any future changes in land ownership. The nominal easement width is proposed to be 30 metres along the length of the pipeline, as shown in the figures in Appendix B (Map book). The registered easement would also include areas required for the surface infrastructure.

It is estimated that about 170.8 hectares of land would be permanently required to operate the project. Most of this land (about 96 per cent) would be subject to the permanent easement. Relatively small areas of land (about 6.8 hectares) would be occupied by surface infrastructure including retained access tracks – some of which would be located within land approved for use for the Narrabri Gas Project and Hunter Gas Pipeline.

Easement acquisition

Santos is participating in easement negotiations with landholders along the alignment in accordance with the Pipelines Act. Santos' aim is to work with landholders to reach a mutually acceptable agreement, including the location of the pipeline alignment, the amount of compensation payable, and arrangements during construction that consider individual circumstances and uses of the land.

Santos will work with landholders to understand their current and reasonably foreseeable future land uses to seek to ensure the pipeline is designed to accommodate requirements. Further information about how land within the easement can be used by landholders is provided in section 11.4.

3.3.2 Additional temporary land requirements (construction only)

In addition to the project's anticipated permanent land requirements (mainly consisting of the permanent easement), some land would be required during the main construction works (as described in section 3.5.1). These areas would be required for:

- construction ancillary facilities (including construction facilities and temporary workspaces) (see section 3.6.2)
- access to the construction right of way and construction ancillary facilities (see section 3.6.3).

About 202 hectares of land would be required for temporary use during construction only. To minimise the need for additional vegetation clearing and other disturbance, about 75 per cent of the project's temporary land requirements would be located within areas subject to approved uses for the Narrabri Gas Project. A summary of the estimated temporary land requirements during construction, which are in addition to the permanent land requirements (see section 3.3.1), is provided in Table 3.3.

Areas required temporarily for construction would be rehabilitated following construction unless otherwise agreed with the landholder or asset owner.

Table 3.3 Estimated additional temporary land requirements

Construction infrastructure	Approximate areas within land subject to approved uses for the Narrabri Gas Project (ha)	Approximate additional areas required (ha)
Baan Baa construction compound	0	21.0
Use of the approved Leewood and Bibblewindi facilities, and other temporary workspaces	151.6	18.2
New access tracks, road/track upgrades and vehicle/truck turns	0.1	11.0
Total	**151.7**	**50.2**

3.4 Indicative construction methodology

3.4.1 Site establishment

Survey and fencing

Survey and fencing works would be completed prior to the commencement of main construction works. Surveyors would mark the extent of the clearing limits.

Fencing crews would be mobilised to install temporary gates and fences where required. Installed gates and fences would enable the movement of the construction crew across properties whilst protecting livestock. Temporary gateways would be installed as identified through landholder/stakeholder consultation.

Clear and grade

Clearing and grading would be carried out to provide a level, safe and efficient construction surface. The construction right of way would be typically 30 metres wide to provide adequate space for construction activities, as well as storage of topsoil and subsoil. A typical layout is shown in Figure 3.9.

The construction right of way would be narrowed where practicable to avoid or minimise impacts to identified environmental, heritage and land use constraints. The extent of narrowing would depend on site-specific conditions and constraints.

The construction right of way and temporary workspaces would be stripped of topsoil and cleared of vegetation. Stripped topsoil and cleared vegetation would be stockpiled along the edges of the construction right of way or in temporary workspaces and used as part of the site restoration process. Cleared vegetation would be mulched for use in rehabilitation or transported off site where required. Breaks would be left in stockpiled vegetation and topsoil for fence lines, tracks and watercourses.

Topsoil would also be stripped and stockpiled during development of the Baan Baa construction compound. Earthworks would be undertaken to provide a level working area for the compound. Gravel surfacing would be used to provide an all weather surface where required. Erosion and sediment controls would be installed and perimeter fencing erected to separate construction areas from publicly accessible areas.

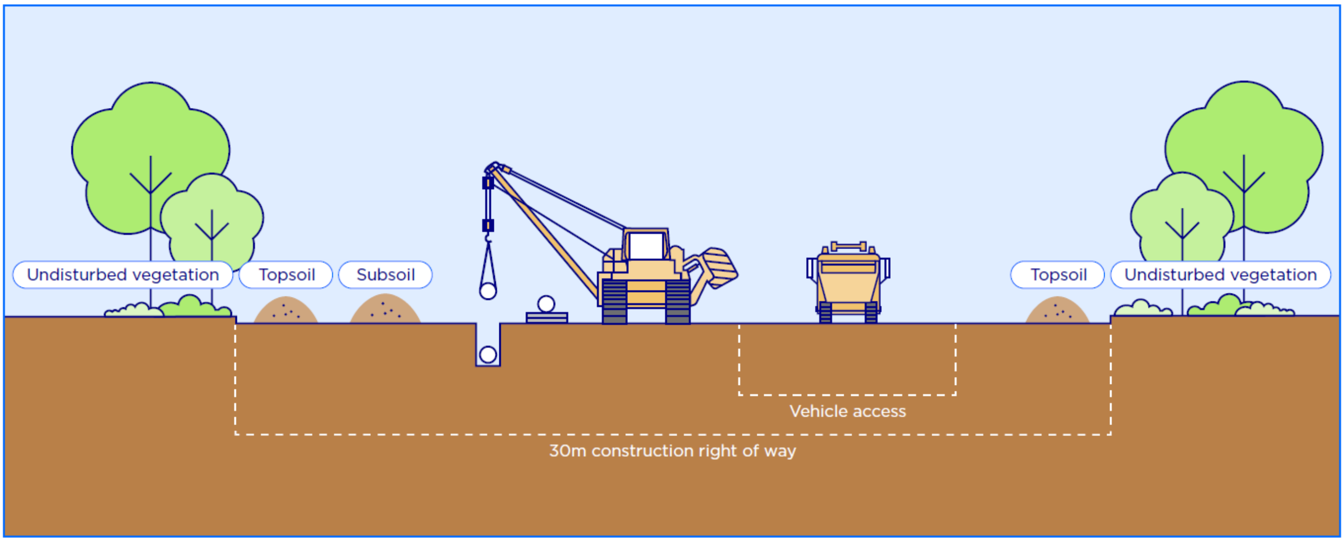

Figure 3.9 Typical right of way layout

3.4.2 Pipeline installation

Pipeline construction involves a repetitive sequence of activities, which are planned, scheduled and integrated to function as a continuous production process. An overview of the key activities is provided below.

Stringing, welding and coating

Stringing is the term used to describe the laying out of the pipe segments in preparation for welding. The pipe would be transported to the construction right of way and laid end-to-end along the surface of the construction right of way on skids to protect the coating from damage (see example at Figure 3.10). Where required, pipe segments would be bent using a pipe bending machine to match the required vertical and/or horizontal profile.

Figure 3.10 Example of pipeline stringing

Once the pipe segments are strung, a line-up crew would position the pipe using side-boom tractors and, if required, internal line-up clamps. Specialised construction crews would then weld pipe segments together in strings of up to one kilometre in length. Each weld would be subjected to non-destructive testing to check for compliance to specification and ensure the integrity of each weld.

Once the pipe sections are welded, the weld area would be grit blasted, cleaned and coated with a field joint coating system. A defect survey would be conducted on the pipeline following installation to ensure the integrity of the coating.

Trenching

Most of the pipeline would be installed by trenching which is described further below. Trenchless construction methods that would be used at crossing of nominated watercourses and transport infrastructure are described in section 3.4.3.

Depending on ground conditions, a trench about 0.9 metres in width would be dug by wheel or chain trenchers, rock saws or excavators (see example at Figure 3.11) and trench spoil (subsoil) would be temporarily stockpiled along the edge of the construction right of way, separately to topsoil.

In hard rock terrain where the use of wheel or chain trenchers, rock saws or excavators is not feasible, controlled blasting may be used. The need for blasting would be confirmed by geotechnical investigations undertaken to support detailed design. Should blasting be required, a blast management plan would be prepared prior to commencement. All blasting activities would be undertaken by appropriately qualified personnel in accordance with the requirements of the relevant legislation and standards.

Trenching distances achieved each day would vary dependent on terrain type, equipment and weather conditions. Typically, 2.5 kilometres can be trenched daily under good conditions.

Breaks in the trench would be left for watercourses, to facilitate stock and wildlife crossings, and agricultural vehicle movements where required, in consultation with landholders. Measures to minimise the potential for fauna impacts during construction (including entrapment) would be included in the biodiversity management plan (that would form part of the CEMP) (see section 6.6). Santos would also liaise with landholders to mitigate stock access to the construction right of way.

AS 2885 requires a minimum pipeline depth (from the top of the pipeline) ranging from 450 to 900 millimetres, depending on ground conditions and land use. The final depth would be determined during detailed design in consultation with landholders and asset owners, taking into consideration existing and future land uses, ground conditions, soils and crossing types.

Figure 3.11 Example of trenching and spoil placement

Lowering in and backfilling

Following trench excavation, the welded pipe strings would be lifted, inspected and lowered into the trench using side-boom tractors. After lowering-in, the strings are welded together (a 'tie-in') in the trench. Figure 3.12 shows an example of the lowering-in operation.

Figure 3.12 Example of lowering in the pipeline using side boom tractors

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 spoil to remove rocks and coarse materials and depositing the fine material in the base of the trench. In some instances, padding material may need to be imported from other locations.

Where required, trench breakers would be installed in the trench to control lateral water movement along the trench at locations such as adjacent to watercourses or on steep slopes. Trench breakers are constructed typically from sacks of soil or sand, bentonite, stabilised sand or spray applied polyurethane foam.

Trench spoil would then be returned to the trench and compacted to minimise the likelihood of ground subsidence over the pipe. Trench spoil displaced by the pipeline would be spread evenly over the construction right of way prior to the reinstatement of topsoil (see section 3.4.5).

Pipeline identification marker tape would be installed at the appropriate depths during the backfilling and compaction process.

Where the pipeline crosses an underground utility, additional mechanical protection may be installed in accordance with asset owner requirements.

The length of open trench would be kept to a minimum as far as practicable.

Hydrostatic testing

Once the pipeline has been installed, it would be hydrostatically tested (hydrotested) in accordance with AS 2885 to prove integrity. Hydrotesting involves filling the entire pipeline, or sections of the pipeline, with water and pressurising it to the specified test pressure. Hydrotesting, including the time required to fill the pipeline with water, is expected to take about five to 10 days per test section. The test pressure would be sustained for the required period in accordance with the AS 2885 test parameters.

Biocides and corrosion inhibiting chemicals, in the form of oxygen scavengers, may be added to the hydrotest water depending upon the quality of the available water and the length of time the water is required to be held in the pipeline.

Hydrotest water would be subject to testing and beneficially reused following treatment (if required) or disposed of in accordance with the waste management practices described in chapter 17 (Waste management).

Once the pipeline has been dewatered, the pipeline would be dried during commissioning as described in section 3.4.5.

The scraper stations (see section 3.4.4) would be connected to the pipeline following completion of hydrotesting.

3.4.3 Crossing types and methods

The pipeline would be installed beneath watercourses, various state and local roads/tracks, utilities and the Mungindi railway line using either standard trenching or trenchless construction methods, including horizontal directional drilling and other methods. The different types of crossings and proposed crossing methods (subject to further investigation during detailed design) are outlined below.

Crossing types

Watercourse crossings

Subject to the outcomes of geotechnical investigations, crossings of the following watercourses are proposed to be undertaken by horizontal directional drilling (see Figure B.2.7, Figure B.2.18 and Figure B.2.20 in Appendix B (Map book)):

- Bohena Creek and an adjacent unnamed watercourse
- Little Sandy Creek (one location)
- Tulla Mullen Creek and two adjacent unnamed watercourses (combined crossing with Delwood Road).

Other watercourse crossings (about 33, which are lower order watercourses, most with a Strahler stream order of one) would be undertaken using standard trenching.

Four watercourses are crossed by existing roads/tracks that that are proposed for upgrading and/or new access tracks.

Roads and railway crossings

Three crossings are proposed using trenchless construction methods (such as auger bores, pipe jacking, pipe hammers, track bores, slip bores, guide bores or micro tunnelling) at the following locations (see Figure B2.3, Figure B.2.20 and Figure B.2.23 in Appendix B (Map book)):

- Newell Highway
- Delwood Road (combined crossing with Tulla Mullen Creek)
- Mungindi railway line (combined crossing with Curracabah Road).

There would also be 28 trenched road/track crossings:

- two crossings of unsealed local roads (Towri Road and Caloola Road)
- 26 crossings of unsealed forestry tracks.

Utilities crossed by the pipeline

The pipeline would be installed above or below utilities including four trenched crossings of overhead electricity transmission lines (two 11 kilovolt (kV) lines, a 66 kV line and a 132 kV line) and three trenched crossings of buried communications cables.

The indicative approach for these crossings is described below.

Crossing methods

Trenched crossings

The majority of watercourse crossings would be undertaken when the watercourses are dry or pooled using standard trenching methods as described in section 3.4.2. For these crossings, the banks of watercourses would be cleared and graded to enable a suitable slope and access for construction equipment. Watercourse bed and bank material and trench spoil would be excavated and stockpiled separately on either side of the watercourse. If pooled water is present, appropriate dewatering methods would be implemented, depending on water levels at the time.

At selected, more environmentally sensitive locations, the construction right of way width would be reduced to about 20 metres. This would reduce impacts on the watercourse and the riparian zones. Additional temporary working spaces outside the watercourse and construction right of way would be needed on both sides of the watercourse for temporary storage of topsoil, subsoil, watercourse bed and bank material and to provide additional working area not available at the watercourse.

Measures to minimise the potential for water quality, watercourse stability and aquatic ecology impacts would be implemented in accordance with the soil and water management plan in the Construction Environmental Management Plan (CEMP). Further information is provided in sections 7.6 and 8.6.

The majority of crossings of local roads, forestry tracks and utilities would be undertaken using standard trenching methods. Construction of these crossings would be undertaken in consultation with the requirements of asset owners. Measures to minimise the potential for road access impacts would be implemented in accordance with the traffic and access management plan in the CEMP (see section 13.6).

Trenchless crossings

Trenchless crossings would be carried out by a specialist work crew and may take a number of days to weeks to complete depending on length, site-specific characteristics and constraints.

Horizontal directional drilling

Horizontal directional drilling is used to install pipelines where conventional open trench construction is not feasible or where disturbance to surface environmental features, land use or physical obstacles is required to be avoided.

Horizontal directional drilling is a surface launched process. A specialised horizontal directional drill rig drills an inclined pilot hole that is steered along a drill path from the entry point to the designated exit point on the far side of the crossing. The pilot hole is reamed to a larger diameter and then a pipe string prefabricated to the specific length of the crossing is pulled back though the bore hole. Drilling fluids, comprised predominantly of water and bentonite, are used to transport cuttings, stabilise the bore and lubricate the cutting tools. Figure 3.13 shows a typical process and Figure 3.14 shows a typical entry and exit point workspace layout.

Although directional drilling avoids impacts to the surface feature that is being crossed, the technique introduces additional environmental considerations. These include drill site sediment control, drilling fluids management, waste management, and clearing of land for the entry and exit pads and pipe stringing areas. Horizontal directional drilling activities typically must be undertaken continuously, so there is the potential for noise impacts during the quieter night time periods that requires careful management. Access for vehicles and additional equipment is required resulting in the need for additional temporary working areas and/or creation of new access tracks. To address these issues, site-specific management procedures are typically prepared.

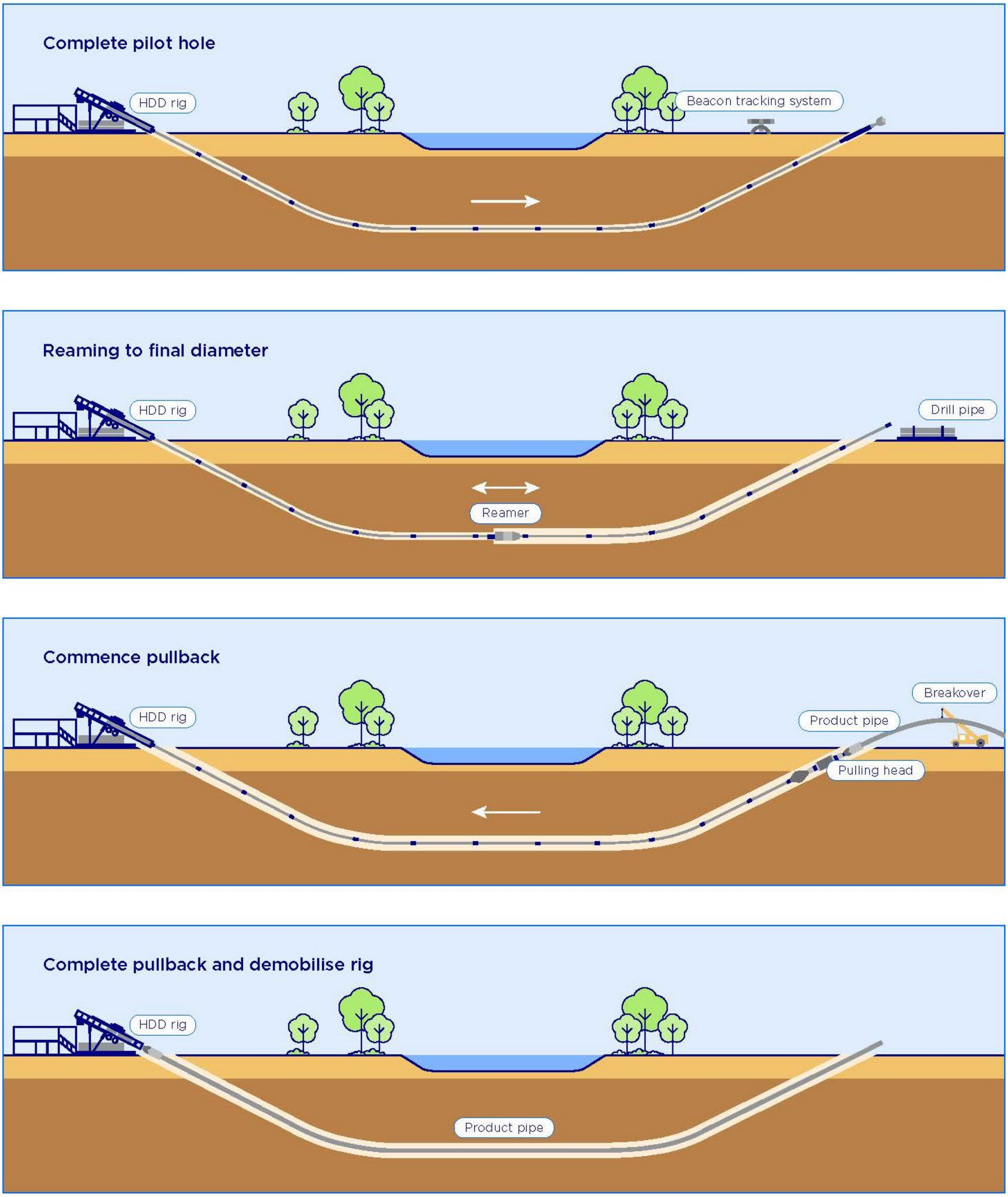

Figure 3.13 Indicative horizontal directional drilling process

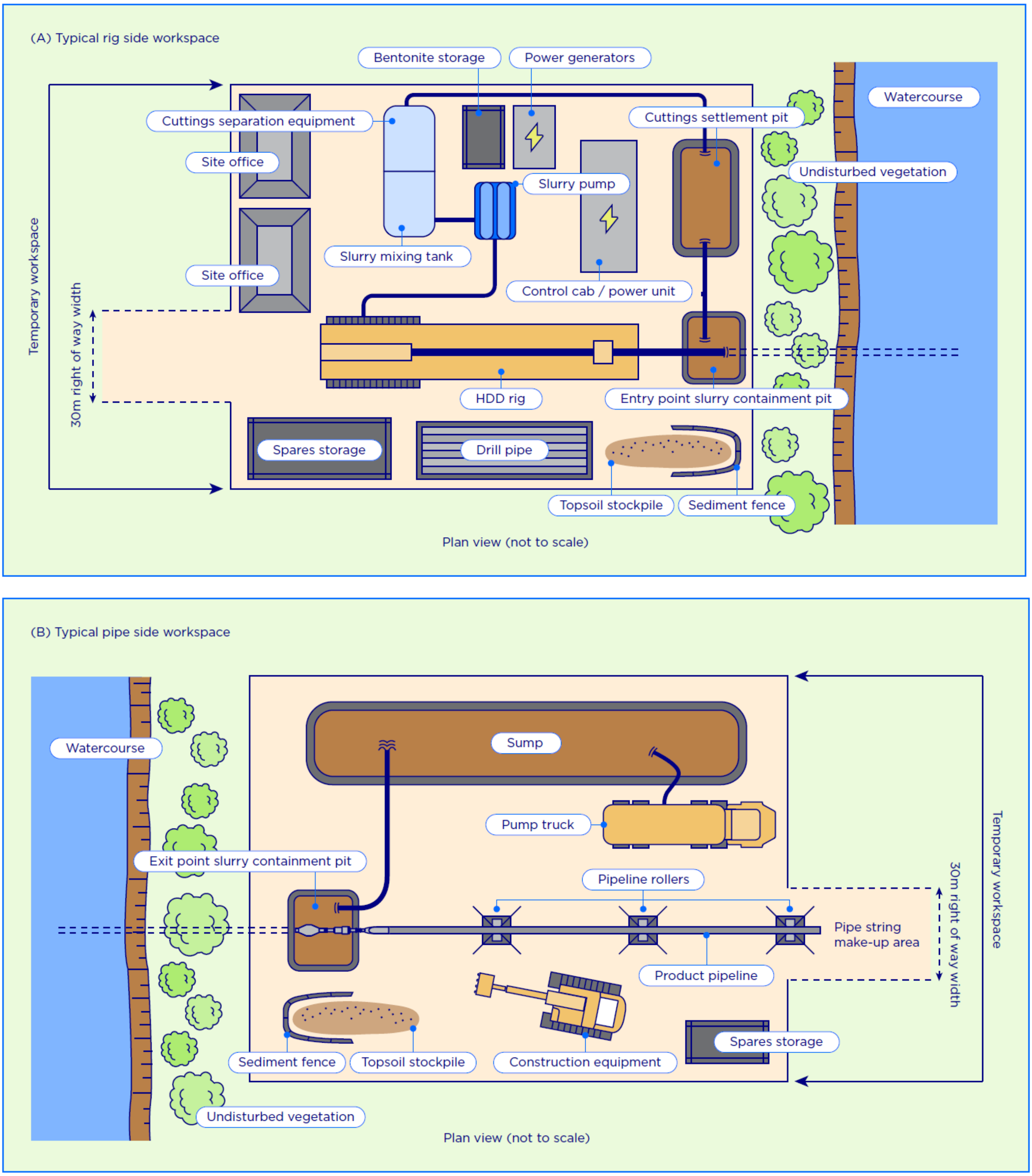

Figure 3.14 Horizontal directional drilling – indicative workspace layout

Other trenchless methods

Other trenchless methods include auger bores, pipe jacking, pipe hammers, track bores, slip bores, guided bores and micro tunnelling. These methods typically require the establishment of launch and receival bell holes on either side of the crossing at the required depth as the path of the bore must be on a straight trajectory.

The crossing distance achievable with these methods is typically limited when compared with horizontal directional drilling. However, as they are launched at final depth, other trenchless methods can be completed in closer proximity to the crossing feature resulting in a shorter crossing length. A typical workspace layout and cross section is shown in Figure 3.15.

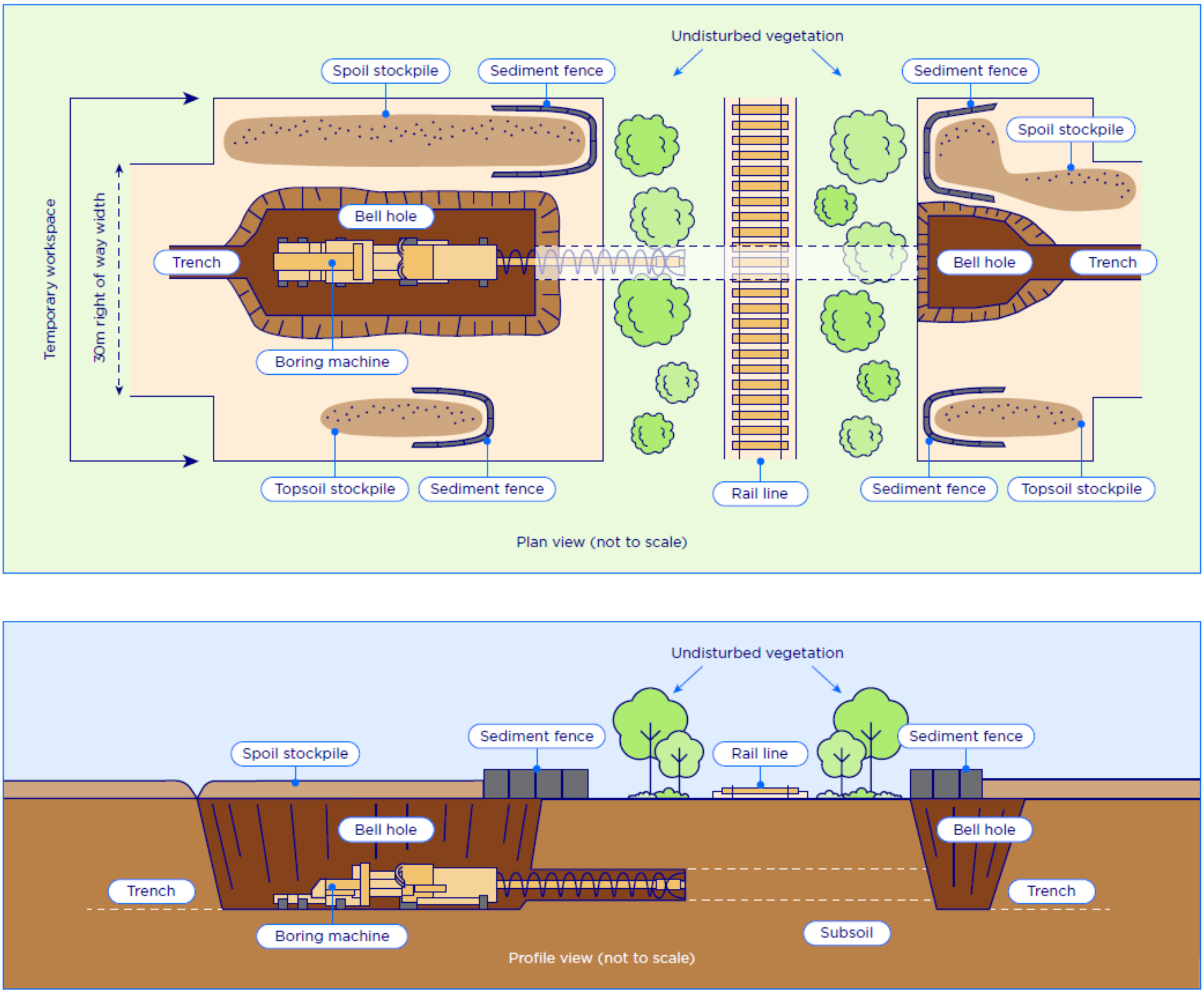

Figure 3.15 Other trenchless construction methods – indicative workspace layout

3.4.4 Surface infrastructure

The indicative approach to constructing the proposed surface infrastructure (see section 3.2.2) is described below.

Scraper stations

The sites for the two proposed scraper stations (one within the Leewood facility and the other at the Hunter Gas Pipeline tie-in point) would be levelled and covered with gravel. Pipe support and structural footings would be installed and prefabricated pipe spools and skids brought to site and installed in the appropriate positions. Scraper stations would be connected to the pipeline following completion of pipeline hydrotesting.

Cathodic protection system

The two cathodic protection units would be installed within the pipeline easement (one within the Bibblewindi facility and one near the intersection of Caloola and Towri roads) and typically mounted to an instrument stand or similar frame on a concrete foundation. A new power pole and meter would be required if powered by mains electricity. If solar powered, solar panels and a battery system would be installed on a concrete pad and depending on local conditions, gravel and fencing may be installed. The buried anodes beds would be installed in a trench or in vertical boreholes and backfilled with carbon backfill and then natural material.

Anode cables would connect into a junction box and a single cable would be run in a trench back to the cathodic protection unit at the pipeline.

Access tracks

Construction of the proposed new access tracks (see section 3.6.3) would generally consist of:

- clearing and grading the tracks
- installing fence gates or grids where required
- stockpiling of topsoil and subsoil (excavated material may be removed off site)
- earthworks to specified cut/fill levels, if required
- placement and compaction of gravel
- installation of drainage, e.g. table drains and turnout drains.

Upgrades to existing access tracks may include, but are not limited to:

- widening at intersections to allow heavy vehicle movements
- grading and watering the existing road surface as required to remove undulations and ensure it is suitably compacted
- placing gravel on the tracks in erosion prone or low-lying areas
- repairing existing table drains and turnout drains as required to ensure effective water management.

3.4.5 Reinstatement, rehabilitation and commissioning

Reinstatement and rehabilitation

Following installation of the pipeline, the trench would be progressively backfilled, and topsoil respread as construction progresses along the right of way. Other disturbed areas not required for operation of the project would be reinstated and rehabilitated as soon as practicable after construction is complete.

Reinstatement and rehabilitation would include the following typical activities:

- demobilising or relocating construction compounds and other ancillary facilities
- removing all equipment, materials and waste from the project site
- removing temporary fencing and signage
- decommissioning site access roads that are no longer required

- re-contouring consistent with the surrounding landform and drainage patterns
- installing erosion controls, where required
- reinstatement of topsoil
- lightly scarifying disturbed areas to promote vegetation growth
- cleared vegetation may be mulched and placed in disturbed areas to assist soil retention and provision of seed stock where feasible
- reseeding or revegetating, using appropriate species, may be undertaken in agricultural land in consultation with the landholder
- allowing for natural regeneration/revegetation of vegetated areas
- reinstating habitat features (e.g. logs and rocks) where required in consultation with landholders
- managing stock access where required (in consultation with landholders) in support of revegetation.

Within vegetated areas, an operational corridor would be maintained to a width of about 20 metres over the pipeline with shallow rooted, non-woody ground layer/understorey vegetation (which would be allowed to regenerate naturally). Overstorey trees that germinate in this area would be removed to ensure pipeline integrity and maintain access.

The remaining disturbed areas would be allowed to naturally regenerate (see Figure 3.16).

In agricultural areas, the rehabilitation methodology would be developed in consultation with landholders. The aim of rehabilitation would be returning disturbed areas not required for operation to their former use and making them suitable for long-term agricultural activities (see Figure 3.17).

Rehabilitation would be carried out in accordance with the rehabilitation strategy (described below).

Rehabilitation strategy

A rehabilitation strategy would be prepared to guide rehabilitation and restoration planning, implementation, and monitoring and maintenance of disturbed areas (excluding the areas that would be occupied by permanent surface infrastructure). The strategy would:

- identify rehabilitation objectives, criteria and requirements in accordance with the APGA Code of Environmental Practice
- establish roles and responsibilities
- define rehabilitation actions and requirements
- define monitoring and maintenance requirements
- describe adaptive management approaches if monitoring identifies a need
- require consultation with landholders on rehabilitation requirements.

The strategy would include:

- reestablishment of landforms and soil/ground surface
- reinstatement of natural drainage patterns
- rehabilitation (including revegetation where appropriate) of watercourses and riparian areas disturbed during construction
- rehabilitation of disturbed areas to agreed conditions
- vegetation requirements
- provision of habitat features.

Separate rehabilitation objectives would be developed for vegetated areas and for agricultural land.

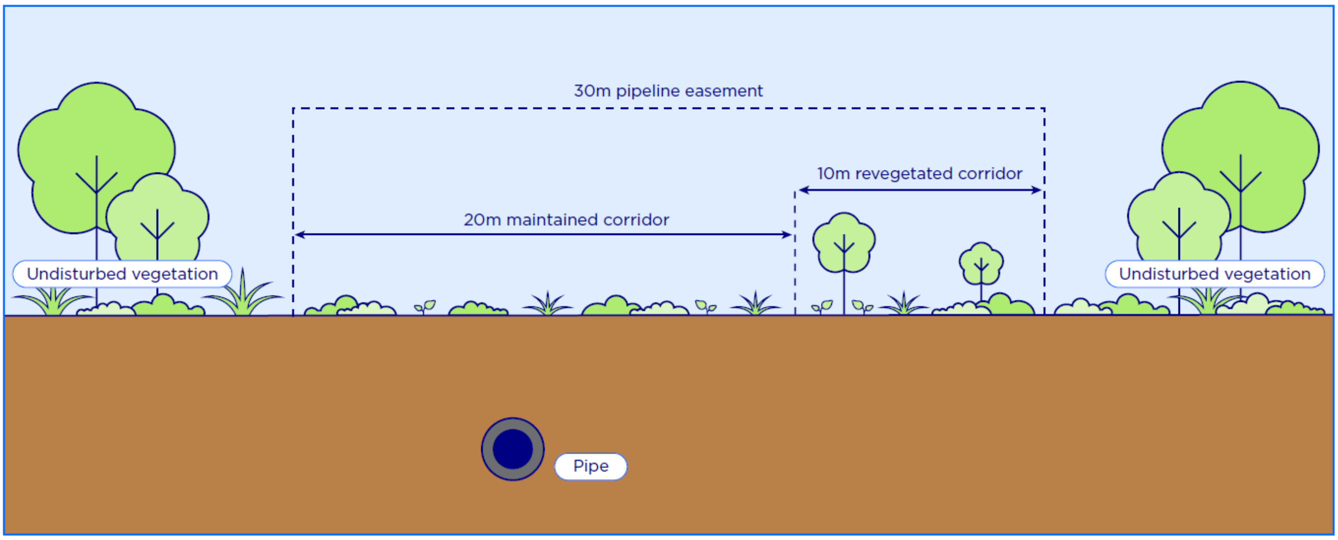

Figure 3.16 Vegetated land during operation – typical cross section

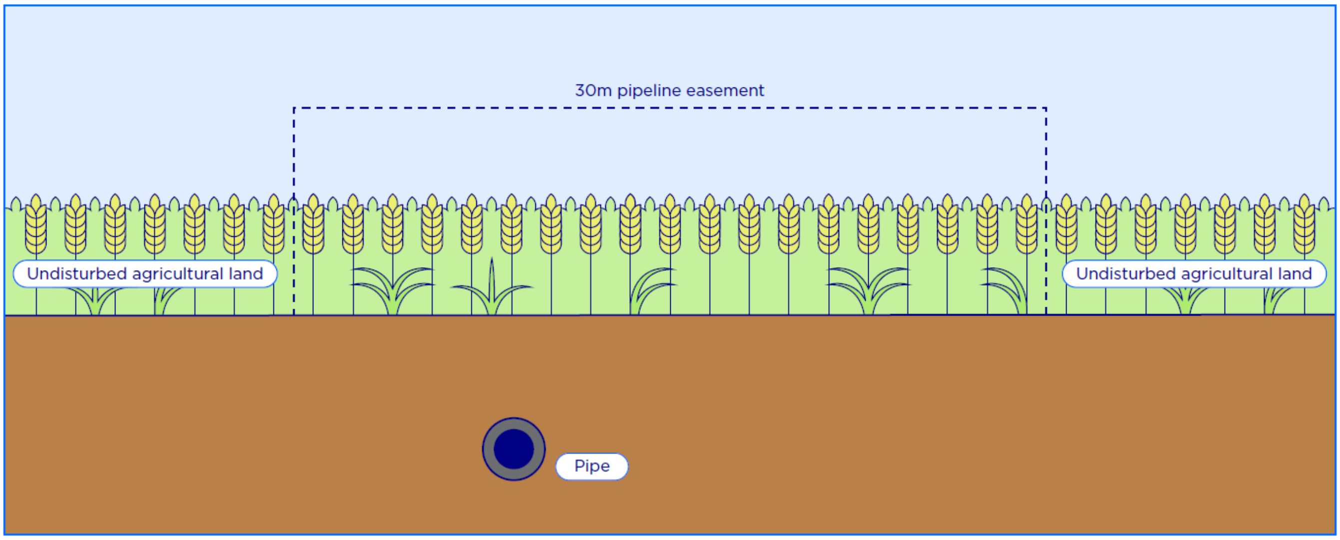

Figure 3.17 Agricultural (cropped) land during operation – typical cross section

Commissioning

The following commissioning activities would be undertaken in accordance with the consent to commence operation requirements outlined in section 25 of the Pipelines Act:

- instrument calibration
- performance testing of all systems, valves and equipment
- pipeline inspection gauge run to confirm defects caused by construction are not present
- pipeline drying, via running pipeline inspection gauges propelled by dry air, so that initial gas is maintained to standard
- pipeline commissioning, including purging air from the pipeline, and introducing gas under controlled conditions.

A detailed pipeline commissioning program would be prepared and subjected to safety and risk analysis as required.

3.5 Construction program and timing

3.5.1 Program

Construction is expected to be undertaken in three phases:

- The main construction works, following a period of site establishment, are expected to take about four months. During this phase, the pipeline and surface infrastructure would be installed, and the construction right of way and temporary workspaces would be reinstated.
- Hydrotesting would take about a month.
- Commissioning would take about four months.

There would be breaks where no work would take place following the main construction works and prior to commissioning. This schedule may be optimised during detailed design and once a construction contractor is appointed.

Construction is proposed to commence around the end of 2026 subject to obtaining approvals. Operation is expected to commence around the end of 2028 and would continue until the Narrabri Gas Project ceases operation.

3.5.2 Working hours

The construction workforce would work a 21 days on/seven days off roster. During work periods, work is proposed to be undertaken during the project working hours as described below.

During the seven days off, works would generally be limited to specified activities such as trenchless crossings, delivery of oversized plant or structures, maintenance of plant and equipment, work with no potentially affected noise sensitive receivers and emergencies/unexpected circumstances as described in Table 3.4.

Out-of-hours work (6pm to 6am) would also be required as described below.

Recommended standard working hours

Most construction works would be undertaken within the recommended standard working hours defined by the *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009):

- Normal construction:
  - Monday to Friday: 7am to 6pm
  - Saturday: 8am to 1pm
  - Sundays and public holidays: no work.
- Blasting:
  - Monday to Friday: 9am to 5pm
  - Saturday: 9am to 1pm
  - Sundays and public holidays: no blasting.

Work proposed to be undertaken outside these hours is described below.

Project working hours

During the 21 day working period, it is proposed that construction activities would be undertaken between 6am and 6pm, seven days a week. This involves the following work hours in addition to recommended standard working hours:

- Monday to Friday: 6am to 7am
- Saturday: 6am to 8am and 1pm to 6pm
- Sundays and public holidays: 6am to 6pm.

Extended working hours for construction activities during the working periods are proposed to:

- reduce the overall construction timeframe of the project, including the length of time that individual receivers are exposed to noise
- maximise the use of the workforce once mobilised to site
- provide flexibility to program a range of work activities.

Any blasting required would be undertaken during recommended standard working hours. No works, other than for emergency or exceptional circumstances, are proposed during the following periods:

- Christmas shut down period (two to three weeks)
- Easter period (Friday to Monday inclusive)
- ANZAC Day.

Out-of-hours work

Table 3.4 lists specified activities that would be undertaken outside the above project working hours (known as out-of-hours work). These works are required:

- to minimise disruption to traffic and disturbance to surrounding landholders
- as a result of the type of construction equipment, processes and methodologies
- for the safety of the construction workforce and community
- to minimise the potential for environmental impacts.

Work would also be undertaken out of hours where there are no affected residents or in accordance with a negotiated agreement with affected residents.

Work outside the project working hours would be undertaken in accordance with an out-of-hours work protocol that would be prepared as part of the CEMP. Further information about the approach to managing out-of-hours work is provided in chapter 9 (Noise and vibration).

Table 3.4 Specified activities that may be undertaken outside project working hours

Specified activity	Justification
Horizontal directional drilling	Once the horizontal directional drill rig is operating, it must keep running to maintain the borehole and drilling fluid integrity until drilling is complete. This may need to occur out-of-hours.
Boring for other trenchless construction methods	Similar to horizontal directional drilling, other trenchless methods may need to continue uninterrupted until completion to ensure the integrity of the borehole.
Hydrostatic testing and drying	Hydrostatic testing needs to be completed as a single process and cannot cease midway as the pipeline needs to be maintained at pressure and monitored during the entirety of the testing procedure.
Non-destructive testing	Some testing works may be completed outside standard working hours to minimise the duration the pipeline trench remains open.
Transport by oversized trucks	Delivery of construction plant, equipment and materials.
Maintenance of plant and equipment	Plant and equipment maintenance may be undertaken outside project working hours to ensure machinery can operate efficiently.
Emergencies/unexpected circumstances	Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
Fauna spotter / catcher activity	Open trenches would be inspected by fauna spotter / catcher pre-dawn.
Work agreed to by potentially affected residents	Work carried out in accordance with hours and noise limits specified in any negotiated agreements with residents (owners and occupiers), developed in consultation with these residents.
Work with no potentially affected residences	Work that does not result in noise affected residences as defined by Table 2 in the *Interim Construction Noise Guideline* (DECC, 2009) (or its latest version).

3.6 Construction resources, access and facilities

3.6.1 Workforce

Estimated workforce

The project is expected to require a peak construction workforce of up to about 200 personnel for about four months during the main construction works phase (see section 3.5.1).

Outside this phase, the typical workforce would comprise about 20 workers on average during hydrotesting and commissioning.

Workforce accommodation

The workforce would be accommodated at existing commercial workforce accommodation facilities in Narrabri and/or Boggabri. Construction would be scheduled based on the availability of sufficient accommodation for the workforce.

3.6.2 Construction ancillary facilities

Construction facilities

The project would require three construction facilities to support construction. Two facilities would involve using the approved Narrabri Gas Project Leewood and Bibblewindi facilities at the western end of the project site. A third new construction facility, the Baan Baa construction compound, would be established at the eastern end of the project site. Potential impacts within the Leewood and Bibblewindi facilities associated with clearing and site establishment would be managed in accordance with the terms of the approval for the Narrabri Gas Project.

These facilities would support a range of construction uses, including:

- laydown and materials storage, including the main pipe receival and laydown area
- offices and staff amenities, including parking
- bunded fuel/hazardous material storage and refuelling area
- vehicle wash bays
- maintenance areas.

The facilities would be used for the duration of construction (see section 3.5.1).

Following completion of construction, the Leewood and Bibblewindi facilities would continue to be used for the Narrabri Gas Project in accordance with the terms of approval for that project.

The Baan Baa construction compound would continue to be used to construct the Hunter Gas Pipeline for a period of about two years.

The locations of these facilities are listed in Table 3.5 and shown on Figure 3.3 and Figure 3.4 (and in more detail in Figure B.2.1, Figure B.2.8 and Figure B.2.24 in Appendix B (Map book)).

Table 3.5 Main construction facilities

Facility	Location	Current approved use	Access
Leewood facility[1]	Within the approved Narrabri Gas Project Leewood facility Lot 1 DP 771141 9489 Newell Highway, Bohena Creek	Gas processing, water management and supporting infrastructure, including laydown areas, staff amenities, car parking, chemical and fuel storage	Off Newell Highway via Old Mill Road
Bibblewindi facility[1]	Within the approved Narrabri Gas Project Bibblewindi facility Garlands Road, Bibblewindi State Forest	Gas compression, water storage and supporting infrastructure, including storage and utility areas, staff amenities and car parking.	Off Newell Highway via X-line and Garlands Road (both forestry tracks)
Baan Baa construction compound	Within private property (leased for use by the project) Lot 4 DP 1109170 Kamilaroi Highway, Baan Baa	Agricultural	Directly off Kamilaroi Highway via existing property access

Note: 1. Approved facility for the Narrabri Gas Project.

Temporary workspaces

In addition to the construction right of way and the construction facilities described above, temporary workspaces would also be required to facilitate construction. An overview of the types of temporary workspaces and their proposed use is provided in Table 3.6. A number of these would use areas to be established as part of the approved Narrabri Gas Project.

The indicative locations of these areas are shown in Appendix B (Map book). The final locations would be subject to consultation and agreement with the relevant landholder. Final locations for the Narrabri Gas Project workspaces would be in accordance with the terms of the approval for that project.

It is noted that areas within the construction right of way would also be used for a variety of construction related uses (in addition to the main construction/trenching works), including parking of vehicles, short-term storage of construction materials, hydrotesting equipment and water storage, and assembly and testing of pre-fabricated crossing sections for trenchless crossings.

Table 3.6 Proposed use of temporary workspaces

Proposed use/main activity	Description
Temporary laydown/storage in Narrabri Gas Project well pads	Land occupied by existing/approved Narrabri Gas Project well pads in the vicinity of the construction right of way, which would be disturbed in accordance with the approval for that project, would be used for temporary laydown/storage while construction is undertaken in the vicinity.
Vehicle/truck turnaround and turning arcs	Additional areas would be required along the construction right of way to allow vehicle and trucks to turn around and exit the construction right of way at the nearest road once materials and equipment are delivered. Additional areas are also required at intersections due to the turning radius limitations of the trucks, to avoid contact with road edges, trees and road signs.
Vegetation stockpiles	In heavily vegetated areas, additional areas along the edges of the construction right of way would be required for storage of cleared timber. These would require an extra ten metres adjacent to the construction right of way.
Additional areas at crossings	Additional areas would be required at crossing locations for equipment and storage of materials, including topsoil, trench spoil and watercourse bed and bank materials, and launch/receival of trenchless construction methods (as described in section 3.4.2). These would be located either side of the crossing, adjacent to the construction right of way.

Proposed use/main activity	Description
Induction bends	Additional areas would be required at locations where induction bends need to be installed for large pipeline direction changes. These require a larger excavation than construction of the main line to allow for welding, field joint coating and testing, as these activities are conducted in the trench.
Side slope	An additional area is required for spoil storage associated with sections with substantial side slope, which would require cut and fill to be completed to create a level workspace for pipeline construction.

3.6.3 Transport and access

Transport and access requirements involving access to and from the construction right of way and the construction ancillary facilities include:

- delivery of pipe to the construction facilities, and transport to the construction right of way
- delivery and transport of construction plant, equipment and materials to and from the construction facilities and the construction right of way, including components for surface infrastructure
- transport of water from water source/s (see section 3.6.4) to storage areas at the construction facilities and temporary workspaces and to the construction right of way, roads and access tracks
- transport fuel to the construction facilities and to the construction right of way
- worker movements, including transport of the construction workforce to/from workforce accommodation facilities and work areas.

Site access and proposed works

During construction, access would be required to the construction right of way and construction ancillary facilities for delivery of materials, equipment and personnel. Existing roads and tracks would be utilised as far as practicable; however, upgrades to some existing roads/tracks and some new access tracks would also be required to ensure safe and efficient access. Details of the proposed road/track upgrades and new roads/tracks proposed are provided in Table 4.2 in Technical Report 9 (Traffic and transport), and include the following:

- works to existing public roads and intersections, including Delwood Road, Caloola Road, Baan Baa Road, Curracabah Road and Towri Road
- Kamilaroi Highway/Baan Baa Waste Facility access intersection upgrade (described below)
- works to existing private access tracks
- new access tracks.

The locations of the proposed works are shown in the figures in Appendix B (Map book).

Inspection of the existing road network would occur prior to construction to confirm if any additional works are required. If required, access track design and planning would include consultation with relevant landholders and the relevant roads authority to confirm detailed requirements. Grading of other roads and tracks used for construction access would be undertaken as required, in consultation with the asset owner, to improve road condition and safety.

It is proposed to retain some of the proposed new roads/tracks following construction to facilitate access to the permanent easement during operation, subject to agreement with the landholder.

Kamilaroi Highway/Baan Baa Waste Facility access intersection upgrade

The intersection of the Kamilaroi Highway and the public access to the Baan Baa Waste Facility is proposed to be upgraded to maintain safe and efficient traffic conditions during use by project vehicles entering and leaving the proposed Baan Baa construction compound.

The proposed upgrade, details of which would be confirmed in consultation with Transport for NSW and Narrabri Shire Council and undertaken in accordance with relevant road design guidelines, would provide a new right and left turn arrangements from the Kamilaroi Highway so that turning traffic is separated from through traffic.

An indicative concept for the intersection is provided in Figure 3.18.

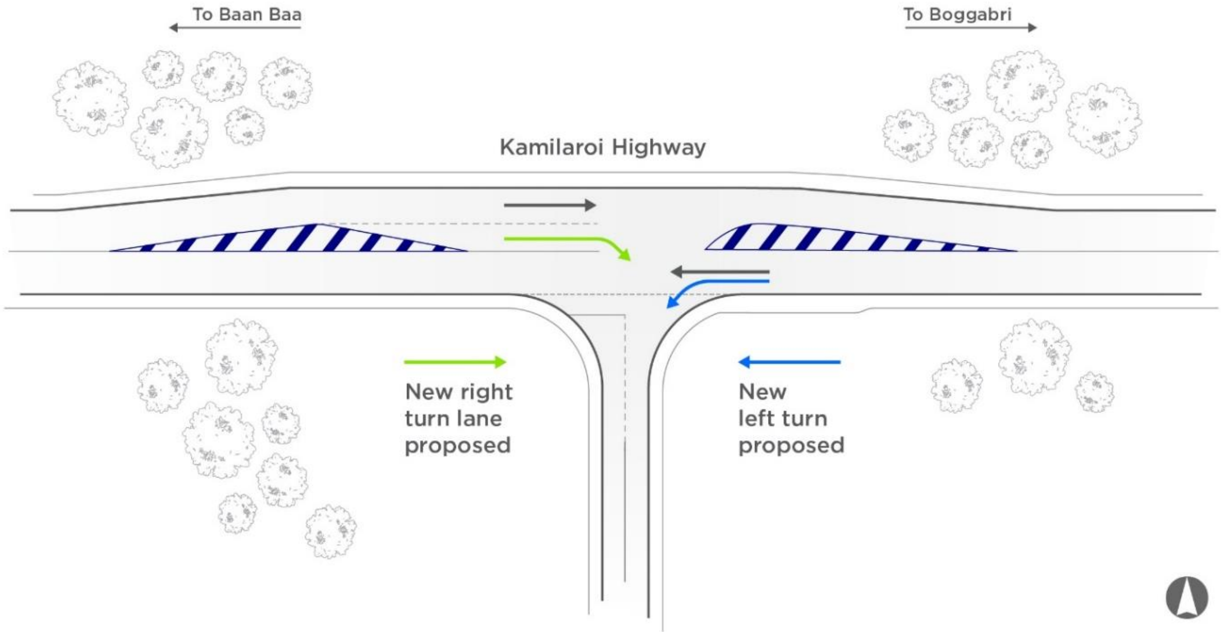

Figure 3.18 Kamilaroi Highway/Baan Baa Waste Facility access intersection upgrade – indicative concept

Traffic movements

Construction vehicle movements would comprise both heavy and light vehicles and would vary across the project site depending on the activity being undertaken, logistics and location. Vehicle movements will include delivery of pipe, plant, equipment, fuel and water to the construction facilities and the construction right of way and worker transport from the accommodation facilities to site.

Further information about construction traffic movements, including indicative volumes and routes, is provided in chapter 13 (Traffic and transport).

3.6.4 Water

Water use

The main uses of non-potable water required during construction would include:

- dust suppression for stockpiles, access tracks and the construction right of way (quantity would vary according to weather conditions)
- horizontal directional drilling as a component of drilling fluid
- hydrotesting.

Preliminary estimates indicate a total of about 47 megalitres of non-potable water would be required for construction. This equates to an estimated average use of about 400 kilolitres per day for the duration of the main construction works (see section 3.5.1).

Potable water would be required for ablutions at construction facilities.

Water sources

Potable water

Potable water would be trucked to site and stored in tanks provided by the local supplier. Water would be required for site offices and ablutions. Bottled water would be provided for drinking water.

Construction water

Non-potable construction water would be sourced in accordance with relevant water access licence(s) appropriate to the various water sources being considered.

If available at the time of construction, water would also be sourced from the Narrabri Gas Project reverse osmosis plant located at the Leewood facility and/or from municipal sources.

Construction water would be stored at the construction facilities and at the temporary workspaces.

Further information about construction water requirements, including the project water balance, the proposed approach to supplying construction water and the potential licensing requirements, is provided in chapter 8 (Water) and Technical Report 4 (Water).

3.6.5 Power and telecommunications

Power would be supplied by on-site generators at the construction facilities. Communication systems would use the facilities in place for the Narrabri Gas Project and/or temporary repeater towers.

It is proposed to store diesel fuel in tank(s) at the construction ancillary facilities. Diesel would be stored in accordance with *AS 1940:2017 The storage and handling of flammable and combustible liquids*. Plant and equipment located along the construction right of way would be refuelled using a delivery tanker. It is estimated that about one megalitre of diesel would be required for the construction of the pipeline and surface infrastructure and to operate the construction facilities for the construction period.

Electricity for construction activities such as welding and horizontal directional drilling equipment would be supplied by diesel generators.

Construction vehicles would be fitted with radios (UHF or VHF) for communication between vehicles. The radios would require the installation of temporary repeater towers (about 10 to 30 metres high) at intervals along the project site. The towers would be powered by local solar panels. Upon completion of the construction phase, the temporary repeater towers would be removed.

3.7 Operation and maintenance

3.7.1 Operational activities

Operation of the pipeline is expected to commence around the end of 2028. The pipeline would be designed to operate with minimal operator intervention using a supervisory control and data acquisition (SCADA) system for system sequencing, alarm monitoring and control. The pipeline would be continually monitored to confirm it is operating within the pipeline operating parameters. Remotely operated isolation valves would automatically close and raise an alarm in the event of an emergency.

Odorants would not be used in the pipeline.

A routine operation and maintenance program would be implemented, which would include external coating surveys, ground and/or aerial patrols, repair or replacement of faulty/damaged components, internal cleaning of the pipeline, corrosion monitoring and remediation, and easement maintenance.

Releases of small quantities of gas at the scraper station would result from internal pipeline cleaning and would involve the release of about two cubic metres of gas into the atmosphere. These events would be infrequent and only occur about once per year on average.

Aerial and/or ground inspections would include activities such as checking for vegetation encroachment close to the easement, detection of erosion, monitoring of rehabilitation success and detection of weed species. Other maintenance activities may be undertaken infrequently as required, which could include limited areas of excavation around the pipeline. Any excavation of material would be undertaken in a similar manner to construction (that is, topsoil would be stockpiled separately from trench spoil, and the site would be restored as soon as practical following completion of maintenance works in accordance with the rehabilitation strategy).

Monitoring of the cathodic protection system would be undertaken on a regular basis. The frequency of monitoring would be determined in accordance with AS/NSZ 2885.3:2022 during the development of the detailed operating procedures.

Access to the permanent easement would be necessary for inspections and to follow-up issues identified during inspections.

Remedial activities for erosion, subsidence and weed management may be required, particularly during the first 12 months following construction.

Maintenance activities would be managed in accordance with Santos' standard operating procedures (see section 20.3) to ensure potential impacts are appropriately managed and minimised as far as practicable.

Regular consultation would be maintained with landholders whose properties are traversed by the pipeline and a 'before-you-dig' system for excavation and locations initiated.

3.7.2 Operational workforce

Operation of the pipeline would require about four personnel consisting of field and control room staff. It is likely that field staff would be based in Narrabri while the control room staff would operate from the Santos Brisbane office.

Field staff would be responsible for day-to-day maintenance and patrolling of the pipeline. Control room staff would remotely monitor and control gas flows into and out of the pipeline via SCADA and coordinate field staff activities on the pipeline as required.

3.8 Decommissioning

3.8.1 Approach

When a decision is taken to cease operation of the pipeline, decommissioning would be undertaken in accordance with relevant statutory approvals, the legislative requirements of the day (currently the Pipelines Act and Pipelines Regulation 2023 (NSW)), relevant Australian Standards (currently AS 2885) and in consultation with relevant regulatory authorities.

It is anticipated at this point in time that decommissioning would involve retiring the pipeline, with the majority of the underground pipeline expected to remain in place. Leaving the pipeline underground minimises the need to disturb land and re-establish vegetation, which would be required to excavate and remove the pipeline.

Decommissioning an underground gas pipeline in accordance with AS 2885 involves a structured and safety-focused approach as described below.

Key requirements

A central requirement of AS 2885 in the decommissioning of gas pipelines is preparation of a comprehensive plan (referred to as an abandonment plan), which must be underpinned by a robust safety management study. The abandonment plan outlines the technical and procedural steps necessary to ensure that all potential risks associated with a retired pipeline are effectively identified, assessed and managed. The safety management study plays a key role in this process by facilitating a structured risk assessment that considers matters such as surrounding infrastructure, land uses, managing residual gas, external interference, and potential for environmental impacts. In accordance with AS 2885.6, the abandonment plan and safety management study must demonstrate that risks are managed, and that appropriate controls are in place to maintain safety over the long term.

The plan must also consider the future land use of the pipeline corridor, ensuring that the decommissioned pipeline does not pose a hazard to people, property or the environment. This holistic, lifecycle-based approach reflects AS 2885's emphasis on proactive risk management and stakeholder engagement throughout the decommissioning process.

In accordance with AS 2885, preparing the abandonment plan involves a process called 'segment analysis', which is a detailed evaluation of individual sections of the pipeline. AS 2885 emphasises that each segment may have unique characteristics, such as proximity to residences, environmental sensitivity, or differing construction materials, that influence the risk profile. This analysis allows decommissioning approaches to be tailored to the specific conditions of each pipeline section and surrounding land use and infrastructure (such as where it passes under key watercourses, road and rail infrastructure).

The management of residual gas is one of the technical considerations addressed in the abandonment plan. AS 2885 does not prescribe a single method but requires that the selected approach be justified through a risk-based analysis and aligned with the overall safety objectives of the standard. A range of technically feasible options may be considered for the removal or safe management of residual gas in accordance with AS 2885, including purging with inert gas, controlled release, vacuum extraction, controlled combustion, or other engineered solutions. The selection of the appropriate method would be guided by the outcomes of the safety management study, taking into account factors such as pipeline configuration, residual gas volume, potential environmental, community and amenity impacts, operational safety, and the environmental controls, regulations and technology that exist at the time of decommissioning.

3.8.2 Key activities and anticipated resources

In accordance with these requirements (as they currently exist), it is expected that decommissioning would involve:

- leaving the pipeline in place
- reducing the remaining gas in the pipeline as much as possible by delivery to customers for use
- managing residual gas at the tie-in point with the Hunter Gas Pipeline in accordance with the abandonment plan (as described above)
- disconnecting the pipeline from all surface facilities, including the cathodic protection system
- removing all surface facilities
- where required by the abandonment plan (as determined by the segment analysis), sections of the pipeline may be cut, capped and filled to prevent subsidence, which could involve excavating an access hole (known as a 'bell hole') at either end of the section to be filled
- long-term monitoring (if required in accordance with the safety management study).

The detail of works required, how and where they would be undertaken, and the approach to management, would be determined during the decommissioning and safety management study process in accordance with AS 2885 and the regulatory requirements that exist at the time.

Only limited areas would be subject to surface disturbance as a result of decommissioning, including the location of surface facilities, and sections where cutting, capping and filling would be required.

It is expected that such works could take up to about a week at each location and involve similar equipment to that used during construction. A workforce of up to about 20 people at a time is expected, over a period of about 12 months with periods of inactivity.

3.8.3 Environmental management

These above processes (including the safety management study, segment analysis and preparation of the abandonment plan in accordance with AS 2885) ensure that all activities would be risk-based, systematically assessed, and compliant with industry, community and regulatory standards for safety and environmental protection. The structured approach mandated by AS 2885 promotes proactive risk mitigation, stakeholder engagement, and environmental management, thereby supporting a safe and responsible transition of the pipeline from operational to decommissioned status.

The approach to environmental management during decommissioning, as determined by the safety management study, segment analysis and abandonment plan, would be summarised in a decommissioning environmental management plan. The plan would be prepared in accordance with relevant statutory requirements and the APGA Code of Environmental Practice, and in consultation with relevant regulatory authorities and landholders. Further information about the decommissioning environmental management plan is provided in section 20.4.