

Chapter 20

Agriculture



This chapter discusses the potential impacts on agriculture from the construction and operation of the Gas Import Jetty and Pipeline Project (the Project). This chapter is based on the impact assessment presented in EES Technical Report O: *Agriculture impact assessment*.

20.1 Overview

Agriculture is a significant industry in the region the Project would be located within. It is the predominant form of land use in the northern section of the Pipeline Works from approximately KP15 (kilometre point) of the pipeline onwards towards Pakenham (see EES Attachment VII Map book).

The importance of agriculture in the study area is highlighted in the agricultural policies and provisions outlined in the Planning Schemes of the municipalities the pipeline would traverse. The *Pipelines Act 2005* states that consideration must be given to planning policies in the selection of the pipeline alignment and its design even though planning approvals under the *Planning and Environment Act 1987* are not required where an approval is required under the *Pipelines Act 2005*. Careful consideration has been given to implementing the intent of agricultural planning policies in the selection of the pipeline alignment and the design process.

The pipeline's construction has the potential to disrupt farming activities with changes to land access, agricultural land being unavailable for farming use and potential damage to farming infrastructure. Any impacts to land access or farming use during construction would be for a limited time only. Impacted land would also require rehabilitation once construction was complete. The pipeline would be constructed entirely underground so would have limited potential to impact agricultural activities once operating.

The pipeline alignment and its design were informed by a wide range of variables, including agricultural activities within the study area. The alignment largely avoids areas with market gardens and where possible runs along existing easements to minimise potential impacts on agricultural activities. Appropriate mitigation measures and landholder compensation have been adopted to reduce potential impacts and achieve equitable outcomes. These measures have been designed to implement the intent of agricultural policies and planning provisions in the study area that aim to protect the integrity of agricultural activities.

20.2 EES evaluation objective

The scoping requirements for the EES set out the following relevant draft evaluation objective:

Social, economic, amenity and land use – To minimise potential adverse social, economic, amenity and land use effects, including impacts at local and regional scales.

To assess potential impacts of the Project on agricultural activities, an agricultural impact assessment was undertaken (see EES Technical Report O: *Agriculture impact assessment*).

20.3 Methodology

The approach adopted for the agricultural impact assessment involved the following key tasks:

- a review of relevant legislation and policy at international, Commonwealth, state and local level
- a review of relevant baseline data and reports including topography, climate and soils
- characterisation of existing regional agricultural features
- identification and inspection of the different soil associations along the pipeline alignment by APA Land Access Officers, including collecting soil samples from a hand auger (manual drilling tool) to determine soil information at several locations along the pipeline alignment
- consideration of the most appropriate construction and rehabilitation methods that might be applied
- identification of the impacts on farming activities during construction and operation of the Project
- identification of the potential loss of agricultural productivity from the installation of the pipeline, the types of amelioration that could be considered and how they would be applied
- a risk assessment as described in **Chapter 5 Key approvals and assessment framework** to inform the impact assessment and development of additional mitigation measures
- development of mitigation measures in response to the agricultural impact assessment.

20.4 Study area

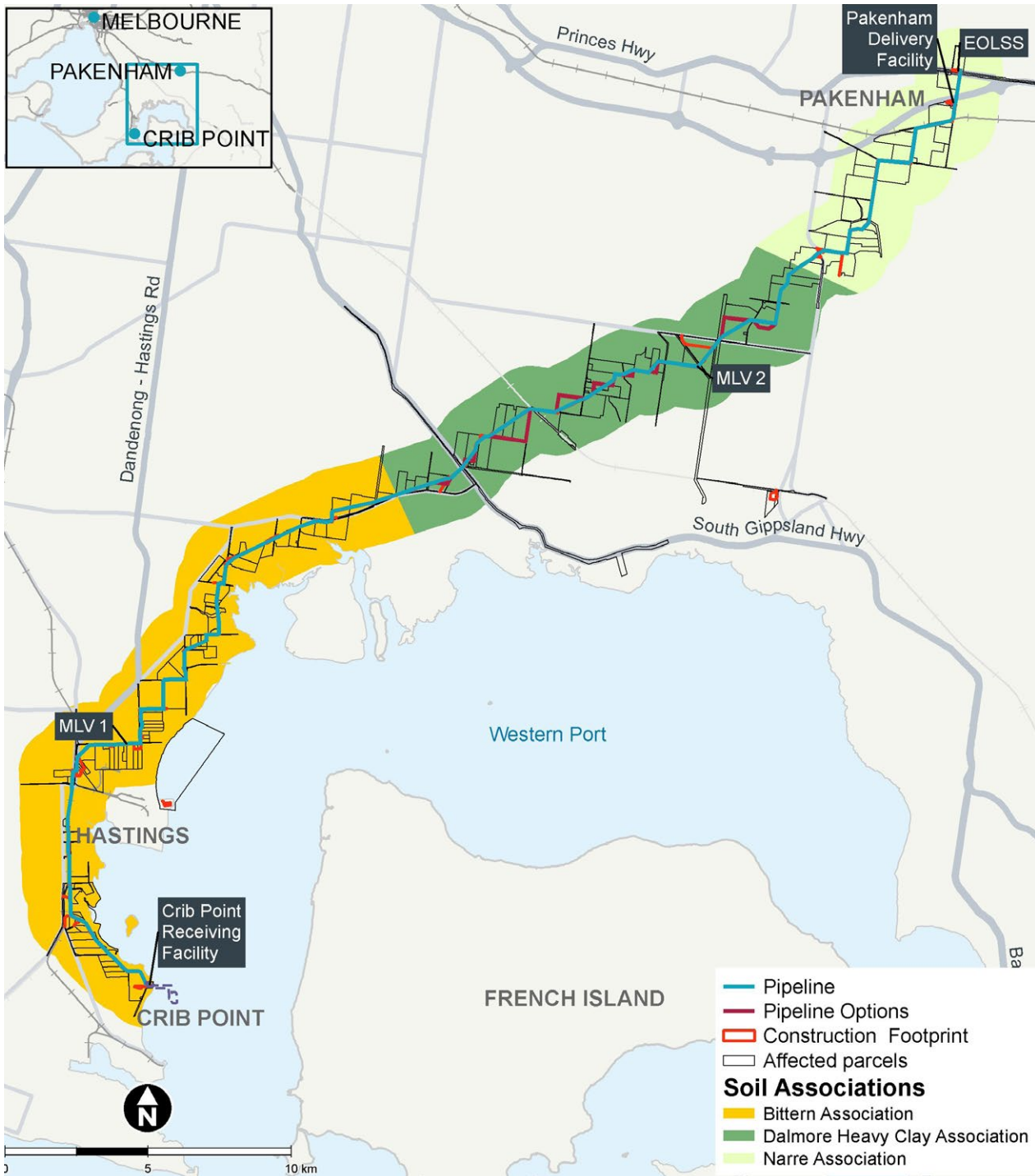
The study area for the agricultural impact assessment corresponds with the land parcels that would be disturbed during construction and operation of the Project. The study area is shown in **Figure 20-1**.

The study area comprises 173 hectares of land between Crib Point and Pakenham. Land use across the study area consists of a mix of road corridors, industrial land, conservation reserves, peri-urban, rural residential, rural living and commercial farming purposes.

The study area features three different soil associations:

1. Bittern Association
2. Dalmore Heavy Clay Association
3. Narre Association

The locations of each soil association within the study area are shown in **Figure 20-1**. Each soil association supports various agricultural activities along the pipeline alignment.



▲ Figure 20-1: Agriculture study area

20.5 Existing conditions

The existing conditions assessment considered the regional environment setting relevant to the study area and evaluated the different soil associations along the pipeline alignment and the types of agricultural use they support.

20.5.1 Topography and landform

The study area is located within the Western Port catchment. The catchment is approximately 3,700 square kilometres in area and contains over 2,200 kilometres of rivers and creeks. Its topography ranges from the hilly regions near the Bunyip State Park and Strzelecki Ranges to the low lying, flat to undulating terrain of the former Koo Wee Rup swamp. Surface water drains from the higher regions down to Western Port.

Most of the catchment is modified to support rural and green wedge land uses. Although the area contains a mixture of land uses, the main land use is agriculture.

The Pipeline Works would traverse coastal floodplains in the lower reaches of the catchment where the relief is mostly low lying and generally flat to gently undulating. The ground surface elevation is one to two metres Australian Height Datum (AHD) above sea level in the southern part of the study area and gently rises to 10 to 25 metres AHD above sea level in the northern part.

20.5.2 Climate

The study area has a temperate climate. Agricultural activities are determined by rainfall and temperature as well as soils, landform water resources and vegetation patterns.

The average annual rainfall across the study area ranges from 715 millimetres at Cerberus near Crib Point to 870 millimetres at Pakenham. The combination of rainfall, temperature, evaporation, topography and soil type leads to a growing season which normally starts early to mid-April and continues through the winter, ending in mid- to late-December.

Seasonal conditions are relevant to the construction of the Project as some soils in the Project Area are difficult to work with when wet. Temperature, rainfall and soil moisture condition are also critical for the effective re-establishment of crop and pasture species along the pipeline alignment during the post-construction rehabilitation phase.



Soil profiles and associations

Soil profiles and associations are derived from the detailed regional and soil and landform mapping information for Port Phillip and Westernport on the Agriculture Victoria website at: http://vro.agriculture.vic.gov.au/dpi/vro/portregnsf/pages/port_soil_survey.

Agriculture Victoria defines soil associations as a grouping of adjoining soil types that occur in a pattern that may be repeated in different parts of the area, and which therefore occupy a particular, and usually distinctive, part of the landscape.

Soil profiles are described according to horizons, A, B, and C. A horizon is the topsoil, B horizon, the subsoil and C horizon, the parent material.

20.5.3 Soils and soil associations

Three soil associations were identified in the study area:

- Bittern Association
- Dalmore Heavy Clay Association
- Narre Association.

Each has significantly different profile textures, nutrient status and drainage characteristics and would require a specific treatment method during rehabilitation of any soil disturbance.

Bittern Association – Crib Point to Fisheries Road at Devon Meadows


The A horizon of the Bittern Association are usually sandy loams, becoming more bleached with depth. The B horizon starts at a depth of 40 centimetres with ironstone gravel concretions at the interface. The A horizon has high permeability due to its sandy nature but limited water holding capacity. The sharp interface between A and B horizons can result in winter waterlogging.

Intensive agriculture can be practised on these soils under conditions of good drainage and an irrigation water supply. Catchment dams are the main source of water. The Eastern Irrigation Scheme which delivers recycled water to Devon Meadows is not available in the immediate vicinity of the pipeline alignment.

Land quality is moderate in the Bittern Association. A few larger landholdings are of greater than 100 hectares, but most are less than 20 hectares in size and in private ownership. Equine activities are the most intensive grazing enterprise and include agistment, thoroughbred breeding and training. Cattle production also occurs in the Bittern Association, along with a small amount of intensive agriculture which is limited by the lack of suitable soils and a reliable irrigation supply.

The profile characteristics of the Bittern Association are described in **Table 20-1**.

Table 20-1: Bittern Association soil profile characteristics

Bittern Association	Horizon	Horizon Depth (mm)	Description
	Surface A1	0 -200	Dark brown; sandy loam; pH 7.0; clear change to A2.
	Surface A2	200 – 350	Sporadically bleached; light sandy loam; firm consistence dry; contains many (40%) iron-cemented sandstone and ferruginous nodules (mainly in the 30-35 cm zone); pH 5.8; sharp change to B21.
	Subsoil B21	350 – 800	Yellowish brown with bright yellowish brown and red mottles; light medium clay; moderate medium blocky, parting to strong fine sub-angular blocky structure; strong consistence dry; pH 6.4; gradual change to B22.
	Subsoil B22	800 – 1200	Light grey, yellowish brown and red mottles; light medium clay; strong coarse polyhedral structure; strong consistence dry; contains many (30%) iron cemented sandstone; pH 6.2.

Dalmore Heavy Clay Association – Fisheries Road at Devon Meadows to Soldiers Road at Rythdale

The A horizon of Dalmore Heavy Clay Association are medium to heavy clays which transition to grey plastic clays and at one metre depth, to grey impervious clay subsoil. The surface phase of Dalmore Clay is used for pasture production. The soil cracks deeply when dry but swells when wet and has low water infiltration.

The heavy surface soil of this association encourages perennial pasture production as the preferred use. Beef is the main enterprise with some dairy grazing. Property sizes are relatively small in the 20 to 60-hectare range with many landholdings operating as hobby farms. The number of commercial farms is low.


The profile characteristics of the Dalmore Heavy Clay Association are described in **Table 20-2**.



Hobby farm

A hobby farm is a small farm that is maintained without the expectation of being a primary source of income.

Table 20-2: Dalmore Heavy Clay Association soil profile characteristics

Dalmore Heavy Clay Association	Horizon	Horizon Depth (mm)	Description
	Surface A1	0 -200	Black: medium clay, strong coarse blocky, parting to moderate medium polyhedral structure; weakly self-mulching surface; rigid consistence dry; pH 6-1; clear transition to B21.
	Subsoil B21	200 – 500	Very dark grey: medium heavy clay; strong very coarse blocky, parting to moderate coarse blocky (and moderate fine lenticular at depth) structure; slickensides present; rigid consistence dry; pH 7.1; clear transition to B22.
	Subsoil B22	500 – 900	Dark grey with faint olive yellow diffuse mottles; medium heavy clay; moderate medium lenticular, parting to fine lenticular structure; slickensides present; very firm consistence moist; pH 7.5; clear transition to B31.
	Subsoil B31	900 – 1300	Light grey with brownish yellow mottles; medium clay; coarse lenticular structure; large slickensides present; firm consistence moist; contains occasional 'ironstone' (1-2 cm size) and manganese stains; pH 7.4.

Narre Association - Soldiers Road at Rythdale to Pakenham East

Most of the soils in the Narre Association are grey to brown clay loams to sandy loams that exhibit a rusty brown mottle with depth. The subsoil occurs as an abrupt transition to mottled brown-grey medium to heavy clay at a depth of 40 to 50 centimetres.

High levels of organic matter are required to maintain soil particle aggregation. The A horizon becomes more bleached with depth and demonstrates low inherent fertility. Periodic waterlogging occurs due to the slowly permeable subsoil. These characteristics favour pasture over cropping.

Management practices for crop production require minimum tillage, residue retention and pasture rotation to build up organic matter levels.

Property sizes are in the 30 to 80-hectare range with diverse land uses, including commercial farms, hobby farms and rural living. Many landholdings are pasture based and mostly directed to beef production. Equine, dairy, agistment and broiler production are other land uses.

The profile characteristics of the Narre Association are described in **Table 20-3**.




What is inherent fertility?

Inherent fertility is a relative indicator of the soil's capacity to retain and release nutrients for uptake by plants and is associated with clay and organic matter content.

What is tillage?

Agricultural preparation of soil by mechanical agitation of various types, such as digging, stirring and overturning.

Table 20-3: Narre Association soil profile characteristics

Narre Association	Horizon	Horizon Depth (mm)	Description
	Surface A1	0 -150	Dark brown (10YR3/3); light sandy clay loam; hard setting surface condition; weak coarse blocky, parting to weak crumb structure; firm consistence moist; pH 5.5.
	Surface A2	150 – 250	Pale brown, conspicuously bleached [with some sporadic bleaching]; coarse sandy loam; firm consistence moist; contains a few (5-10%) quartz fragments (2-5 mm in size); pH 5.8; abrupt and wavy change to B21.
	Subsoil B21	250 – 650	Greyish brown with brown and yellowish brown mottles; sandy clay; moderate coarse blocky structure; very firm consistence moist; contains a few (5-10%) quartz fragments (2-5 mm in size); pH 5.3.
	Subsoil B22	650 – 1000	Grey with yellowish brown mottles; heavy clay; strong lenticular structure; contains a few (5-10%) quartz fragments (2-4 mm in size); pH 5.5.
	Subsoil B23	1000+	Light brownish grey with brownish yellow mottles; heavy clay; lenticular structure; contains quartz.

20.5.4 Land use patterns

Population growth has increased the number of residential subdivisions within the broader area in recent decades, which has reduced the size of agricultural holdings. Agricultural activities have increasingly focused on grazing. Beef production is the major grazing activity in the study area with the main enterprises including breeding for veal production and steer fattening. Other significant grazing enterprises are dairy heifer agistment and equine agistment and training.

Vegetable production is the most common soil-based enterprise, predominantly root crops and leafy vegetables. Vegetable growing is an intensive production system and requires considerable investment in drainage, irrigation, capital improvements and specialised machinery. The pipeline alignment would avoid vegetable production enterprises except for two properties.

Capital-intensive enterprises in the study area include broiler (chicken) production and some equine enterprises.

Broiler production is based in sheds rather than on agricultural land and direct impacts on these facilities have been avoided. Facilities associated with equine enterprises include stables, yards, riding arenas, training tracks and fencing. Soil-based intensive agriculture is not considered a capital intensive enterprise as soil is the critical input for success, whereas broiler production and equine enterprises require infrastructure investment as the major input.

Table 20-4 summarises the soil associations identified as part of the existing agricultural conditions to inform the agricultural impact assessment in **Section 20.8** (*Construction impacts*) of this chapter and **Section 20.9** (*Operation impacts*). See EES Attachment VII Map Book for KP locations along the pipeline alignment.

Table 20-4: Summary of soil associations, landform and agricultural land use

Approximate kilometre point (KP) along pipeline alignment	Soil association	Occurrence	Landform	Agricultural land use	Soil description	Soil units
KP0-KP27	Bittern	Crib Point to Fisheries Road, Devon Meadows	Undulating low hills	Predominantly grazing	Fine sandy loams to fine sandy clay loams overlying clay subsoil	Bi: Bittern Me: Merricks Ha: Hastings Pe: Pearcedale To/Cr: Toomuc/ Cranbourne
KP27-KP44	Dalmore Heavy Clay	Fisheries Road, Devon Meadows to Soldiers Road, Rythdale	Flat terrain	Predominantly cattle grazing	Dark grey medium to heavy clay, transition to a dark grey plastic overlying grey impervious clay at 1000 mm	Dahs: Dalmore clay heavy surface
KP44-KP57	Narre Association	Soldiers Road, Rythdale to Pakenham	Flat to undulating plain	Predominantly cattle grazing	Brown-grey clay loams overlying mottled clay sub soils at 400 mm	Nr: Narre clay loam Nr/sr: Narre clay loam with sandy rises

Melbourne's foodbowl

Melbourne's foodbowl is the peri-urban land surrounding the urban area and is divided into two distinct areas. The inner foodbowl is the metropolitan area of Greater Melbourne, including urban local government areas on the edge of the metropolitan fringe bordering the Urban Growth Boundary. The outer foodbowl is the next ring of peri-urban local government areas. The size and location of the inner and outer foodbowls are shown in **Figure 20-2**.

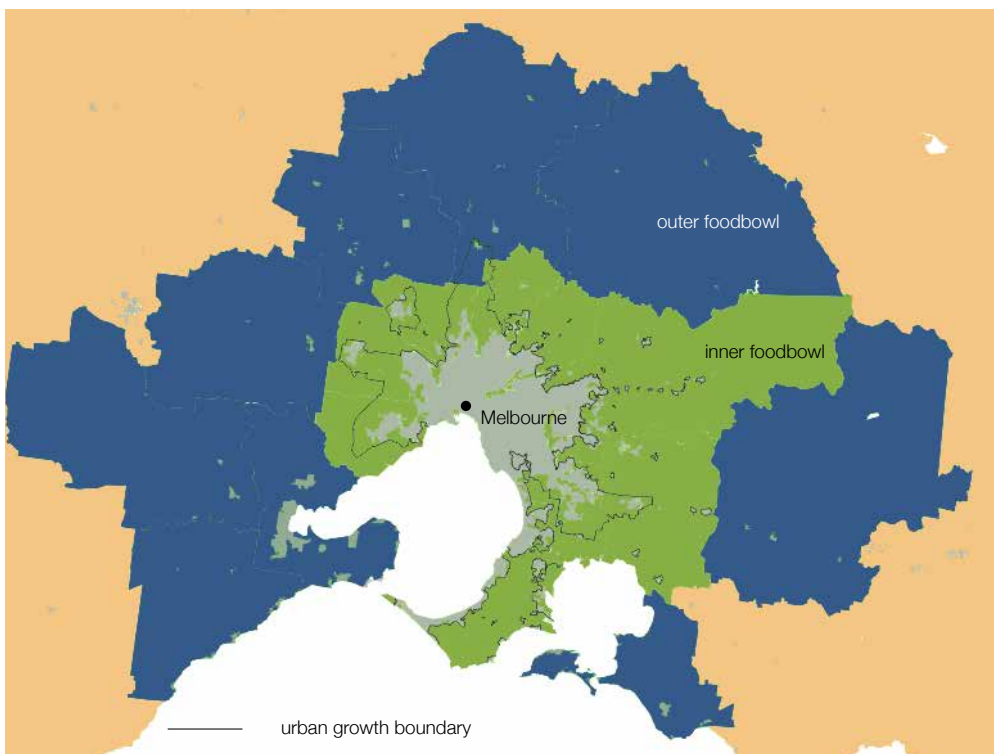
As outlined in *Melbourne's foodbowl: Now and at seven million* (Sheridan et al. 2015), the foodbowl produces enough food to meet around 41 per cent of Melbourne's food needs. Food production is typically intensive, high-value production on relatively small areas of land. The inner foodbowl represents only two per cent of Victoria's agricultural land yet contributes a significant proportion of the state's fruit and vegetable production. The inner foodbowl benefits from access to markets, labour, food processing facilities and water sources.



What is peri-urban land?

Peri-urban land refers to the zones of transition from rural to urban land uses, located between the outer limits of urban and regional centres and the rural environment. It can be described as the landscape interface between urban and rural.

The area of agricultural land in the inner foodbowl is decreasing due to urban growth, with areas of farmland in the City of Casey converted to urban development as the Urban Growth Boundary has been shifted further out. It is estimated this urban development on agricultural land will more than halve the inner foodbowl's capacity to meet the food needs of Greater Melbourne over the next 30 years (from 41 per cent in 2015 to 18 per cent in 2050).



◀ **Figure 20-2:** Melbourne's foodbowl (Source: Melbourne's foodbowl: Now and at seven million (Sheridan et al. 2015))

20.6 Stakeholder engagement

Relevant landholders and stakeholders were consulted for the agricultural impact assessment. Key issues and potential impacts identified by landholders as items of concern were (and how the issue has been addressed in the risk assessment of the agricultural impact assessment):

- temporary access restrictions during construction and permanent severance of properties (see Risk ID AG1, AG2 and AG3)
- disruptions to access (see Risk ID AG2)
- the need to replace or duplicate facilities (see Risk ID AG4)
- loss of productivity (see Risk ID AG7)
- higher management costs
- temporary or permanent loss of land (see Risk ID AG1)
- permanently reduced productivity on the easement land
- biosecurity, particularly poultry disease, but also weeds (see Risk ID AG5)
- impacts on shedding, replacement relocation (see Risk ID AG4)
- water supply, temporary arrangements needed during construction period, relocation of pipes and troughs (see Risk ID AG4)
- short and long-term implications for pivots and travelling irrigators (see Risk ID AG4 and AG6)
- drains, major and minor (see Risk ID AG4)
- rock-sealed tracks for vehicles and animals (see Risk ID AG4)
- dust, noise, visual amenity (see Risk ID AG3)
- noise that could cause significant poultry deaths in sheds (noise can panic free-range poultry which can lead to 'piling' and smothering) (see Risk ID AG3)
- the effect on horses from noise and subsidence (see Risk ID AG3)
- loss of grazing, need for pasture rehabilitation (see Risk ID AG1)
- loss of hay for on farm fodder conservation (see Risk ID AG1)
- concern with pugging, subsidence after rehabilitation (see Risk ID AG6)
- the transfer of weeds including blackberry, capeweed, gorse and bathurst burr (see Risk ID AG5)
- potential need to move horses off property, training, riding instruction (see Risk ID AG4)
- potential impact on lot yield for future subdivision (see Risk ID AG6).

These concerns were considered in the agricultural impact assessment and have been included if it was assessed there was potential for impacts to occur.

20.7 Risk assessment

The risk assessment identified the risks associated with agriculture as a result of the Project during its construction and operation in accordance with the method described in **Chapter 5** Key approvals and assessment framework.

This risk assessment included consideration of the environmental, social, economic and health and safety consequences of each risk and their likelihood of occurring.

Table 20-5 summarises the agricultural risks identified. A complete risk register including the likelihood and consequence of each risk pathway is provided in EES Attachment III *Environmental risk report*.

Risk ratings were applied to each identified risk pathway, assuming that initial mitigation measures were in place. Where the initial risk ratings were categorised as medium or higher, additional mitigation measures were developed to lower the residual risk where possible.

Agriculture risks identified during the construction and operation of the Pipeline Works are rated as low, with the exception of two that are rated medium.

The temporary loss of agricultural land and reduced access to land from construction of the pipeline have been assigned a risk rating of medium, with a likelihood rating of almost certain where both events are planned to occur due to the Pipeline Works (Risk ID AG1 and Risk AG2). All other risks identified for the construction and operation of the Pipeline Works have been assigned a rating of low.

The construction and operation impacts are discussed in **Section 20.8** (*Construction impacts*) and **Section 20.9** (*Operation impacts*) of this chapter.

Section 20.10 (*Mitigation measures*) of this chapter and **Chapter 25** *Environmental Management Framework* set out the mitigation measures.

Table 20-5: Risks – agricultural

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
Construction						
AG1	Pipeline Works	The installation of the pipeline results in temporary loss of land for agricultural use.	MM-AG01 Landholder consultation MM-AG03 Compensation for affected parties	Medium	No additional mitigation measures identified	Medium
AG2	Pipeline Works	Pipeline construction activities cause reduced access, loss of productivity and greater management costs on blocks with affected access.	MM-AG01 Landholder Consultation MM-AG02 Alternative access arrangements MM-AG03 Compensation for affected parties	Medium	No additional mitigation measures identified	Medium
AG3	Pipeline Works	Disturbance due to noise, dust and livestock injury impacts agricultural productivity.	MM-AG01 Landholder consultation MM-AG02 Alternative access arrangements Dust suppression in accordance with mitigation measures listed in Chapter 12 Air Quality (MM-AQ01)	Low	No additional mitigation measures identified	Low
AG4	Pipeline Works	Disruption to agricultural activities due to temporary removal or changes to use of infrastructure	MM-AG04 Identification of third-party services MM-AG05 Management of third- party services MM-AG06 Crossing water infrastructure MM-RH06 Reinstatement of infrastructure	Low	No additional mitigation measures identified	Low
AG5	Pipeline Works	Transference of weed and diseases between properties impacts biosecurity of land	MM-AG07 Biosecurity Management Protocol MM-AG08 Imported topsoil of an appropriate quality	Low	No additional mitigation measures identified	Low
Operation						
AG6	Pipeline Works	Pipeline alignment and ongoing management of the pipeline results in loss of land for agricultural use	MM-AG1 Landholder consultation MM-AG3 Compensation for affected landholders	Low	No additional mitigation measures identified	Low
AG7	Pipeline Works	Pipeline alignment and ongoing management results in permanently reduced productivity on easement land due to soil degradation and subsidence	MM-RH01 Progressive reinstatement MM-RH02 Reinstatement of existing topography. MM-RH03 Soil amelioration MM-RH04 Seeding for revegetation and soil stabilisation MM-RH05 Monitoring disturbed area	Low	No additional mitigation measures identified	Low

20.8 Construction impacts

The construction components included within the agricultural impact assessment include:

- temporary loss of land (Risk ID AG1)
- restricted access to land (Risk ID AG2)
- reduced productivity from disruption (Risk ID AG3 and Risk ID AG4)
- biosecurity (Risk ID AG5).

20.8.1 Temporary loss of land (Risk ID AG1)

The area of land temporarily unavailable for agricultural purposes during construction would be 117.96 hectares. This loss represents 0.03 per cent of the total land use of the same classification within the inner foodbowl. The percentage of land temporarily impacted in the study area compared to the area of similar value agricultural land in the region is considered negligible.

Table 20-6 details how much area of the inner foodbowl is used for identified land uses and how much of that which the Project would impact during its construction, including in percentage terms.

Temporary loss of land is estimated as the production loss incurred by the farming system over the time period involved for construction of the pipeline. The costs of this loss can become significant when intensive agriculture is being practiced, where holding sizes are small, infrastructure is substantial, the crop value is high and when the construction or rehabilitation process is delayed. Loss of land to smaller holding sizes could have a greater impact than larger holdings with a similar land use. Costs associated with temporary loss of land would be greater and more significant for small landholdings.

Selection of the pipeline alignment included consideration of how to reduce the severity of impacts from the temporary loss of agricultural land. In particular, the alignment would avoid high-value agricultural land and minimise diagonal passage through landholdings. Where possible, the alignment follows roadways, drainage reserves, property boundaries and existing easements.

Although the pipeline construction is expected to take up to 15 months overall, the linear nature of the construction works means the construction periods for individual properties would be much shorter (typically six months). The seasonal nature of the agriculture industry means that the works could potentially be timed to further reduce impacts. Compensation for the temporary removal of agricultural land from production would be agreed and paid to directly affected landholders as appropriate under the provisions of the *Pipelines Act 2005*.

Other control measures may be implemented to further alleviate productivity impacts from loss of land (see mitigation measure MM-AG01). These control measures may include providing crossing points and installing gates and additional water supply points. Appropriate financial compensation for landowners affected by temporary loss of land would also assist in ameliorating impacts (see mitigation measure MM-AG03).

Table 20-6: Temporary loss of agricultural land due to the Project

Agricultural land use type	Area (ha) in inner foodbowl	Area (ha) impacted during construction	Percentage of land use within inner foodbowl impacted by the Project
Cropping (mixed farming and grazing generally more than 20 ha)	13,777	1.542	0.01
Grazing modified pastures	235,964	95.228	0.04
Horse studs	4,323	3.602	0.08
Poultry farms	2,041	3.936	0.19
Rural residential with agricultural	76,883	10.569	0.01
Seasonal vegetables and herbs (market gardens)	4,218	2.729	0.06
Glasshouses	114	0.351	0.31
Total	337,320	117.96	0.03

20.8.2 Restricted access to land (Risk ID AG2)

During construction, there is the potential for restricted or reduced access to land, resulting in lost productivity and higher management costs. Restricted or reduced access is predominantly a result of the linear construction right of way (ROW) dividing blocks of land. Construction of the pipeline is expected to impact 100 agricultural properties and potentially restrict access to some properties, although this would be temporary. Although the pipeline construction is expected to take up to 15 months overall, the linear nature of the construction works means the construction periods for individual properties would be much shorter (typically six months).

Where temporary restrictions on access to land or reduced land access would occur during construction the following would be implemented:

- alternative access would be provided for stock and machinery such as heavy vehicles across the ROW where required (see mitigation measure MM-AG02)
- relocation or duplication of facilities such as yards or water supply would be considered as appropriate (see mitigation measure MM-AG01).

APA and/or its nominated construction contractor(s) would consult with affected landholders before construction starts to identify the appropriate management method, including access to the ROW, stock management and management of overland water flow (MM-AG01).

Compensation to landholders affected by the pipeline's construction would be paid for temporary loss of access to their land during construction which causes direct production losses as required under the *Pipelines Act 2005* and the *Land Acquisition and Compensation Act 1986* (see mitigation measure MM-AG03).

20.8.3 Reduced productivity (Risk IDs AG3 and AG4)

Construction of the Project has the potential to reduce agricultural productivity through disturbance associated with dust and noise and the loss of farming infrastructure.

Disturbance (Risk ID AG3)

The construction of the Pipeline Works has potential to generate dust and noise and cause animal injury. For example, noise may panic free range poultry and cause them to 'pile' and suffocate.

Dust is a concern where leafy vegetables are grown because of the potential for contamination. However, the pipeline alignment avoids areas close to where leafy vegetables are grown to reduce this risk. The alignment traverses only two properties engaged in vegetable production. In both cases, the alignment is located immediately adjacent to or near an existing oil and gas pipeline easement. Impacts on vegetable production enterprises within the study area are therefore considered to be minimal.

Potential impacts from dust on other landholdings and enterprises is considered minor and able to be acceptably managed with standard construction management practices such as watering down the construction ROW and stockpile areas when weather conditions present a risk of dust generation (see **Chapter 12 Air Quality**).

The trench would generally not be accessible to livestock when it is open due to barriers created on each side of the ROW by stockpiles and the welded pipe string. Where practical and desirable, suitable arrangements would be made with landholders to exclude or manage stock access during construction and to recently reinstated areas (see mitigation measure MM-AG02).

It is unlikely that construction noise would significantly impact nearby agricultural enterprises given the separation distances involved and the implementation of pipeline construction practices typically used for similar projects. Suitable amelioration strategies include well located fencing, appropriate buffers and effective communication between landowners and construction contractors so that areas could be destocked, or alternative access provided before construction starts (see mitigation measures MM-RH03 and MM-AG01).

Loss of infrastructure (Risk ID AG4)

Some facilities and infrastructure may be in the path of the construction ROW and require removal or relocation. These facilities may include buildings, fencing, yards, access points or water supply points. A loss of infrastructure or facilities may disrupt agricultural activities and reduce productivity and potential economic value. All third-party services within the easement would be identified and managed to enable their continued operation during the pipeline's construction where practical (see mitigation measures MM-AG04 and MM-AG05). This includes farm infrastructure. Measures to reinstate these items should also be undertaken post construction and in consultation with landholders and any relevant third parties (see mitigation measure MM-RH06).

20.8.4 Biosecurity (Risk ID AG5)

No endemic soil borne disease represents a contamination risk between landholdings. The potential threat of a breakdown in biosecurity between properties through the transfer of weeds and diseases therefore presents a low risk. To prevent a breakdown in biosecurity, a set of biosecurity environmental standards would be developed for the construction phase of the Project in accordance with the *Catchment and Land Protection Act (1994)*. These standards would be incorporated into the Construction Environmental Management Plan (CEMP) for the Pipeline Works (see mitigation measure MM-AG07). The CEMP would include measures such as meeting Australian Quarantine and Inspection Service (AQIS) regulatory requirements, and ensuring topsoil imported for easement maintenance is of appropriate quality and weed and disease free where practicable (see mitigation measures MM-AG08).

20.9 Operation impacts (Risk IDs AG6 and AG7)

All operational risks for the Project were classified as having a risk rating of low. Notwithstanding this, the concerns identified by stakeholders and the community were:

- restrictions on the construction of farm improvements within the pipeline easement
- restrictions on deep cultivation resulting in loss of land for agricultural use (deep cultivation is typically defined as digging to a depth greater than 0.5 metres and would only apply to specialised crops or instances where it was considered necessary to conduct deep cultivation to a greater than normal depth)
- loss of production through soil degradation caused by unsatisfactory reinstatement method or subsidence.

Potential restrictions on the construction of farm improvements and deep cultivation would only apply to land within the pipeline easement and not to the entire parcel of land in which the easement is situated. These impacts are typical of pipeline projects and are readily managed through the compensation process (see mitigation measure MM-AG03) and ongoing consultation with APA pipeline operators. As the pipeline alignment avoids areas of specialised crops such as the asparagus farms south of the study area, no known properties would be impacted by an inability to conduct deep cultivation. Notwithstanding, cultivation within the pipeline easement to a depth of around 900 millimetres can typically continue to take place under the supervision of an APA pipeline operator.



What is deep cultivation?

Deep cultivation mechanically breaks up compacted soil layers using heavy prongs working at depth to break up compacted soil layers.

Wherever possible, operational impacts of the pipeline were avoided from the outset through the initial alignment selection process involving consultation with landowners to locate the easement in locations where ongoing operation would have least impacts, for instance, along fence lines.

Restoring the soil profile to its original state is one of the most important rehabilitation procedures. The three soil associations in the study area have different soil profile characteristics and are responsive to different rehabilitation methods. Rehabilitation components include soil profile segregation and replacement, vegetation restoration, appropriate land-forming to counter subsidence as well as restoration of drainage lines (see mitigation measures MM-RH02, MM-RH04 and MM-RH03).

An appropriate reinstatement method would be prepared for each of the three soil associations and included in the CEMP for the Pipeline Works. Reinstatement would start progressively post construction and occur as soon as practicable (see mitigation measure MM-RH01).

On the basis that an appropriate reinstatement method is applied and the pipeline easement does not restrict the ongoing use of land for agricultural purposes consistent with its use before the pipeline's construction, ongoing loss of production is not expected.

20.10 Mitigation measures

Table 20-7 sets out the measures developed for mitigating potential impacts on agriculture.

A specific measure related to dust emissions during construction of the Project to mitigate potential impacts on agriculture is also detailed in **Chapter 12 Air quality**.

Table 20-7: Mitigation measures - agriculture

Mitigation measure ID	Mitigation measure	Works area	Project phase
MM-AG01	<p>Landholder and occupier consultation Consultation will be undertaken prior to the commencement of construction with relevant landholders and occupiers regarding property-specific measures to implement during construction and operations including:</p> <ol style="list-style-type: none"> Access across the ROW during construction Stock management Management of overland flow Biosecurity Relocation / duplication of facilities and infrastructure 	Pipeline Works	Design, construction and operation
MM-AG02	<p>Alternative access arrangements Where practical and desirable, suitable arrangements will be made with landholders to exclude or manage stock access during construction and to recently reinstated areas.</p>	Pipeline Works	Construction
MM-AG03	<p>Compensation for affected parties Compensation will be agreed and paid to directly affected landholders as required under the <i>Pipelines Act 2005</i> voluntary process, or the <i>Land Acquisition and Compensation Act 1986</i> where agreement cannot be reached.</p>	Pipeline Works	Design, construction and operation
MM-AG04	<p>Identification of third party services All third party services within the easement, including on farm infrastructure, will be identified and marked on the ground in advance of trenching activities.</p>	Pipeline Works	Design and construction
MM-AG05	<p>Management of third party services All identified third party services to be managed so that their operation can continue during pipeline construction, wherever practicable.</p>	Pipeline Works	Construction
MM-AG06	<p>Crossing water infrastructure Methods and timing of construction for the crossings of water transfer infrastructure to be agreed with relevant landholders and/or operators of the infrastructure prior to any works commencing on the property.</p>	Pipeline Works	Design and construction
MM-AG07	<p>Biosecurity management Biosecurity environmental standards will be developed for the construction phase of the Pipeline Works in accordance with the <i>Catchment and Land Protection Act 1994</i>.</p>	Pipeline Works	Design and construction
MM-AG08	<p>Imported topsoil of appropriate quality Any topsoil imported for easement maintenance will be of an appropriate quality and agreed with the landholder.</p>	Pipeline Works	Construction and operation

Mitigation measure ID	Mitigation measure	Works area	Project phase
MM-RH01	<p>Progressive reinstatement Reinstatement will commence progressively post construction and will be undertaken as soon as practicable. Appropriate reinstatement methods will include:</p> <ol style="list-style-type: none"> An excavation method that enables the segregation of topsoil and subsoil so that replacement can be in the same order. A specific rehabilitation method for each soil association based on soil testing of the different soil associations to determine their nutrient and physical characteristics. 	Pipeline Works	Construction and operation
MM-RH02	<p>Reinstatement of existing topography The construction footprint will be re-profiled to original contours or to new, stable contours where it is not reasonably practical to re-profile to original contour.</p>	Pipeline Works	Construction and operation
MM-RH03	<p>Soil amelioration Soil amelioration and fertiliser will be applied where required as determined by post construction assessments and in consultation with the landholder.</p>	Pipeline Works	Construction and operation
MM-RH04	<p>Seeding for revegetation and soil stabilisation Where seeding is adopted to facilitate prompt revegetation and soil stabilisation, the following principles will be considered:</p> <ol style="list-style-type: none"> Seed mixtures to be formulated with consideration of the vegetation composition of the areas adjacent to the construction footprint and in consultation with the relevant landholder. Only certified seed to be used. Sterile seed stock (cover crop) may be used to provide short term surface stability. Seed to be evenly dispersed over the disturbed area. Seeding to take place as soon as practicable after reinstatement of the soil profile. 	Pipeline Works	Construction and operation
MM-RH05	<p>Monitoring disturbed areas Monitoring of the condition of the right of way (ROW) and other disturbed areas will be completed post construction and remedial measures undertaken, as required, with the aim that all disturbed areas are reprofiled to a stable landform, consistent with original contours and drainage lines, and vegetated with a self-sustaining, non-pest species groundcover.</p>	Pipeline Works	Construction and operation
MM-RH06	<p>Reinstatement of infrastructure All access tracks, fences and gates will be reinstated post construction in consultation with landholders and any relevant third parties.</p>	Pipeline Works	Construction

20.11 Conclusion

The risk of the pipeline's construction impacting agricultural activities is generally low, with only one medium risk identified.

The main impacts to agriculture from the pipeline's construction are restrictions to or reduced access to land, land being temporarily unavailable during the construction period for agricultural use with resulting productivity losses, and loss or damage to agricultural facilities and restriction to capital improvements.

These impacts would be suitably managed by:

- developing an appropriate construction and rehabilitation method for each soil association
- consulting with landholders, providing alternative access arrangements to manage or exclude stock during construction
- effective landholder liaison during the construction and rehabilitation phases
- following any reasonable landholder-specific biosecurity control measures to mitigate the movement of soil and plant materials between properties and the biosecurity of broiler farms
- negotiating appropriate levels of compensation with landowners.

Impacts on agricultural activities once the pipeline was operating are considered unlikely. For example, it is not considered likely the pipeline's operation would restrict the construction of farm improvements and deep cultivation within the pipeline easement, nor cause loss of production through soil degradation from unsatisfactory reinstatement method or subsidence. Ongoing loss of production is not expected to occur with an appropriate reinstatement method.

On the basis that impacts would be short-term in nature and duration and generally limited to the construction phase, and that mitigation measures are readily available to manage potential impacts, it is considered that impacts on agricultural land uses could be managed during the pipeline's construction and operation. An applicable reinstatement methodology for disturbed areas would be implemented with regard to the relevant soil association to mitigate potential ongoing impacts.

Landholder communication would be ongoing during the construction and rehabilitation process to minimise agricultural impacts. Compensation would be available to all landholders for potential impacts during the pipeline's construction in the event the Project results in any financial disadvantage to farming activity. Compensation would also be agreed upon and paid to directly affected landholders for the acquisition of the pipeline easement.

In response to the social, economic, amenity and land use draft evaluation objective, impacts of the Project on agricultural activities have been assessed and mitigation measures have been identified to reduce or minimise these impacts.

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